

Cache Simulation

ECEN 4593

12/16/2013



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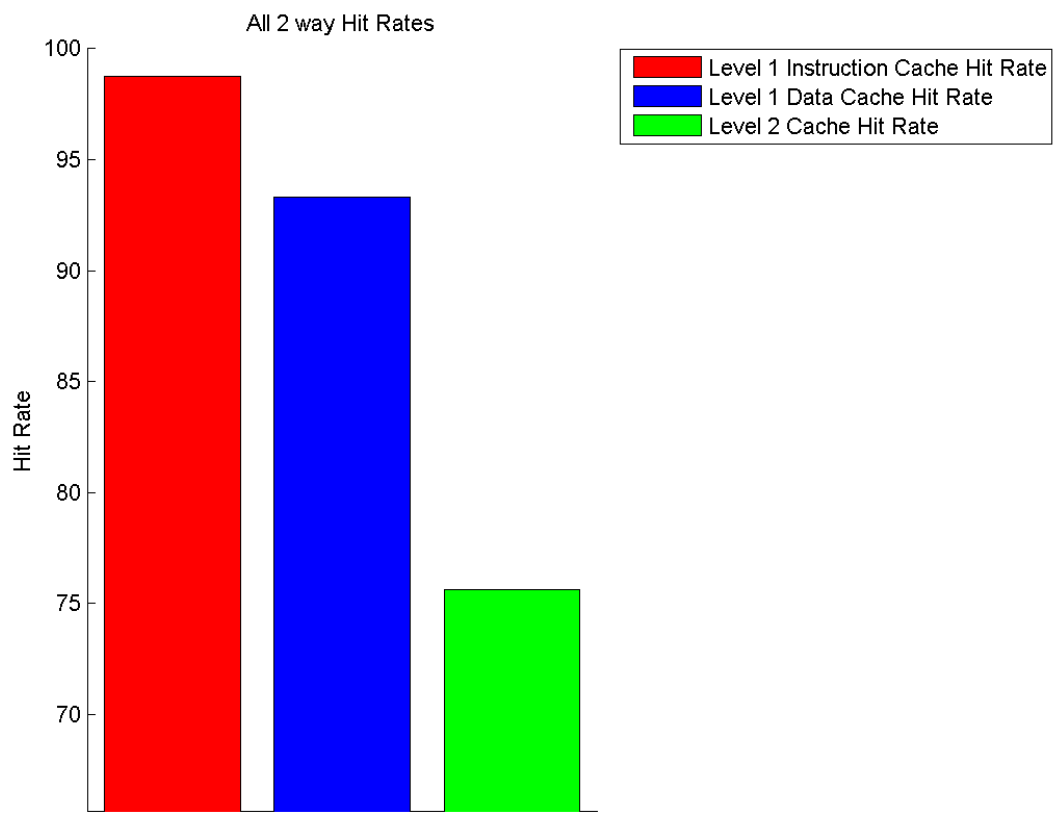
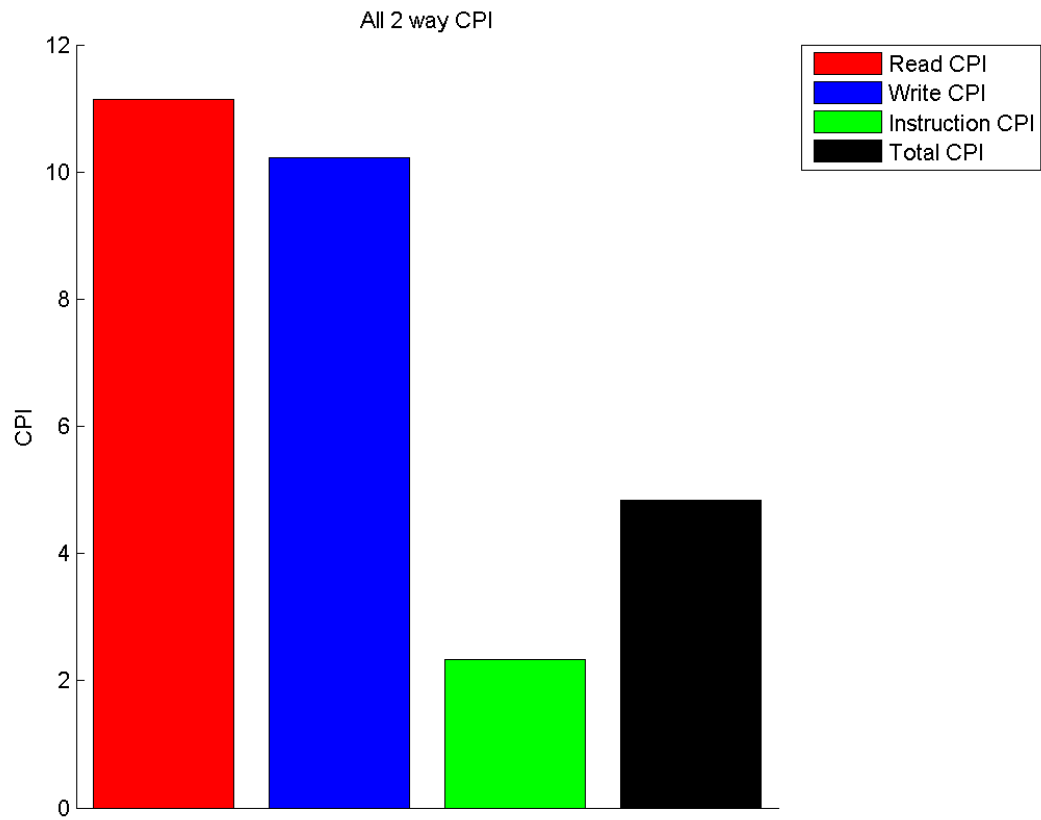
Summary

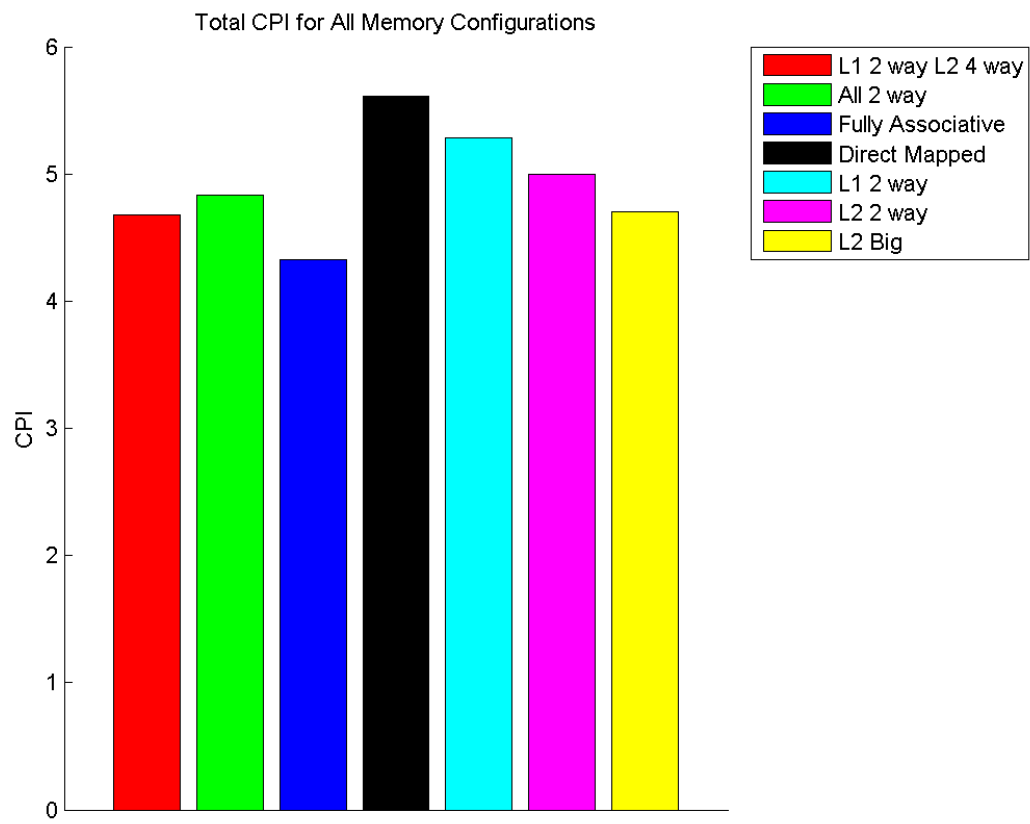
Main Conclusion

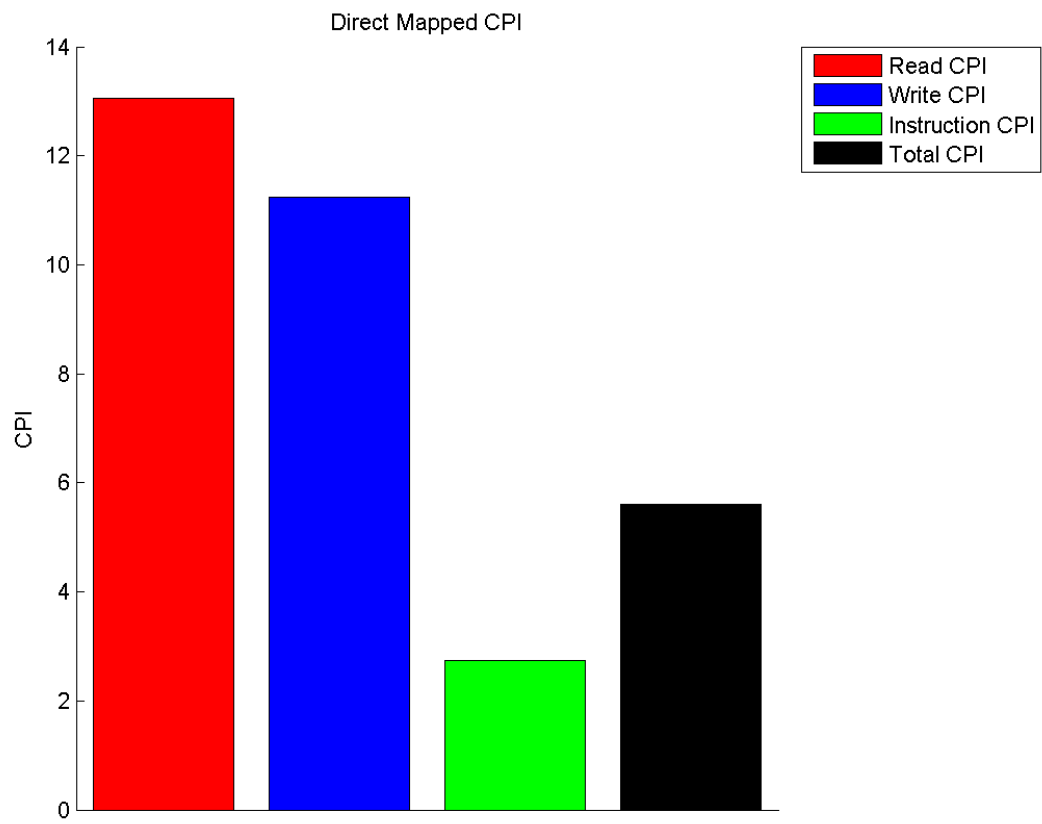
In this project, we simulated various cache configurations using several test, each containing roughly 5 billion memory references. Results were generated to observe the counts of the different reference types and the associated hit/miss rates. The different types of configurations were:

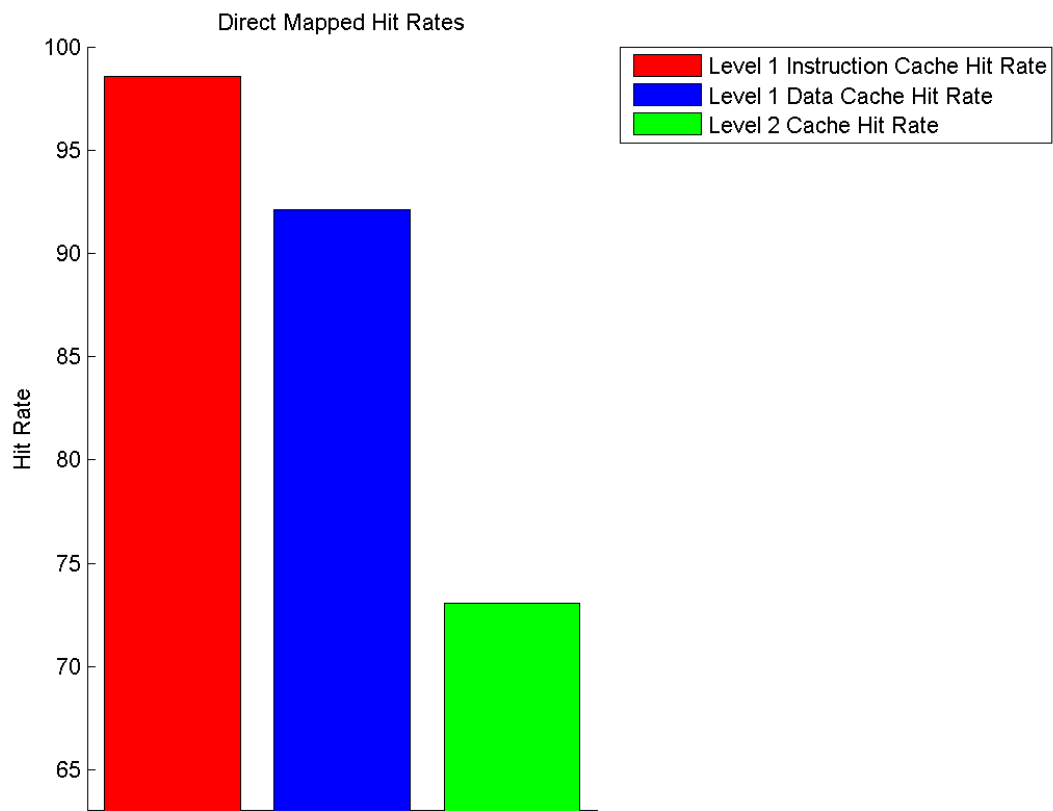
- Base (default) -8KB direct-mapped Icache, 8KB direct-mapped Dcache, with a unified 64KB direct-mapped Level-2 cache.
- L1-2way - 8KB two-way set associative Icache, 8KB two-way set associative Dcache, with a unified 64KB direct-mapped Level-2 cache.
- L2-2way - 8KB direct-mapped Icache, 8KB direct-mapped Dcache, with a unified 64KB two-way set associative Level-2 cache.
- All-2way - 8KB two-way set associative Icache, 8KB two-way set associative Dcache, with a unified 64KB two-way set associative Level-2 cache.
- 2-4way 8KB two-way set associative Icache, 8KB two-way set associative Dcache, with a unified 64KB four-way set associative Level-2 cache.
- L2-Big 8KB two-way set associative Icache, 8KB two-way set associative Dcache, with a unified 128KB direct-mapped Level-2 cache.
- All-FA - Fully Associative 8KB Icache, 8KB Dcache, and 64KB Level-2 cache.

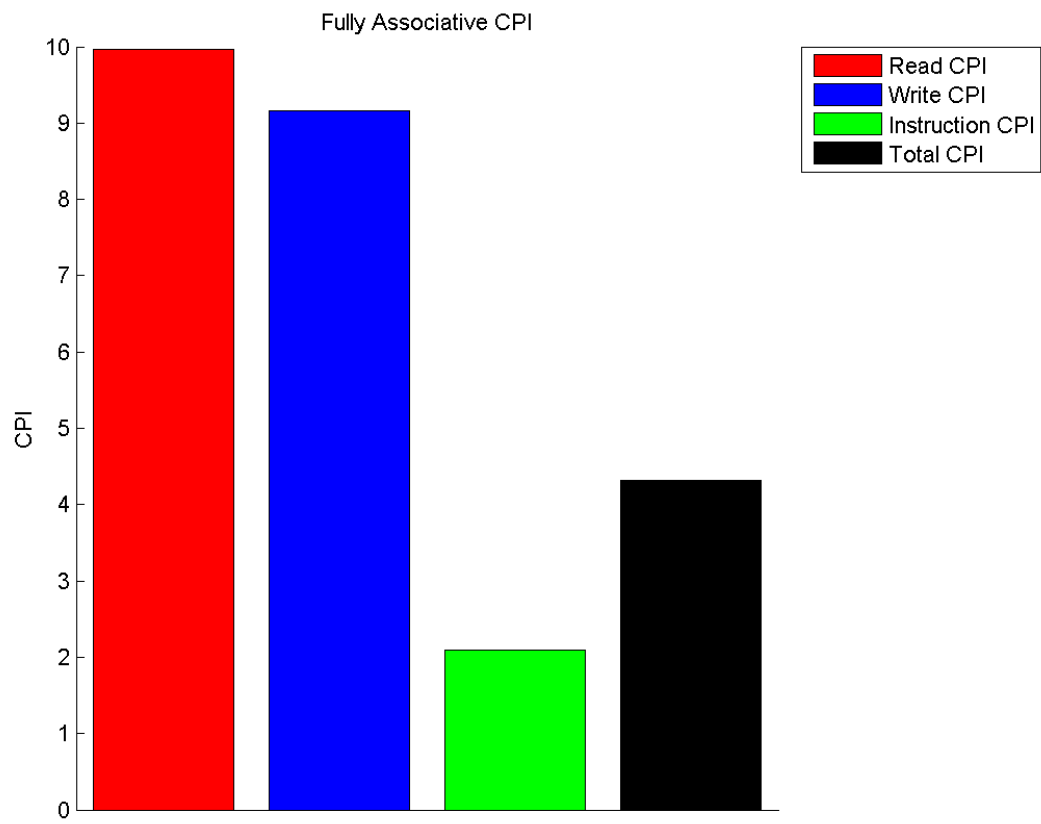
The Following are the plots of our results ##Results Plots

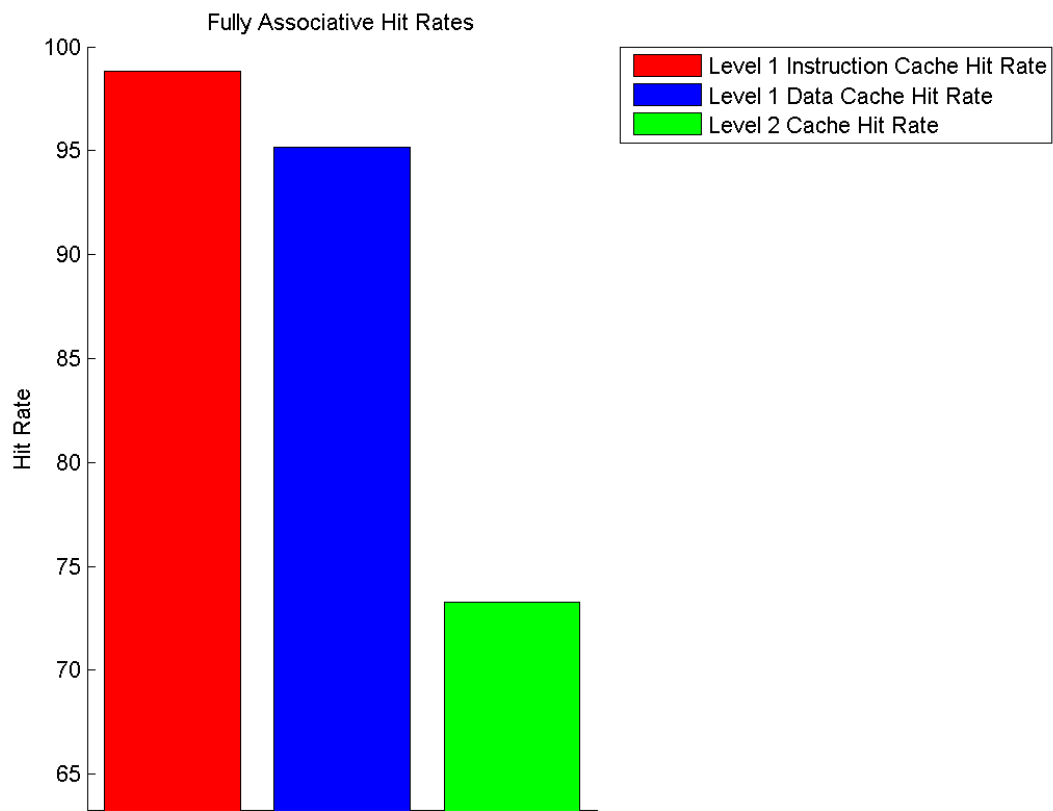


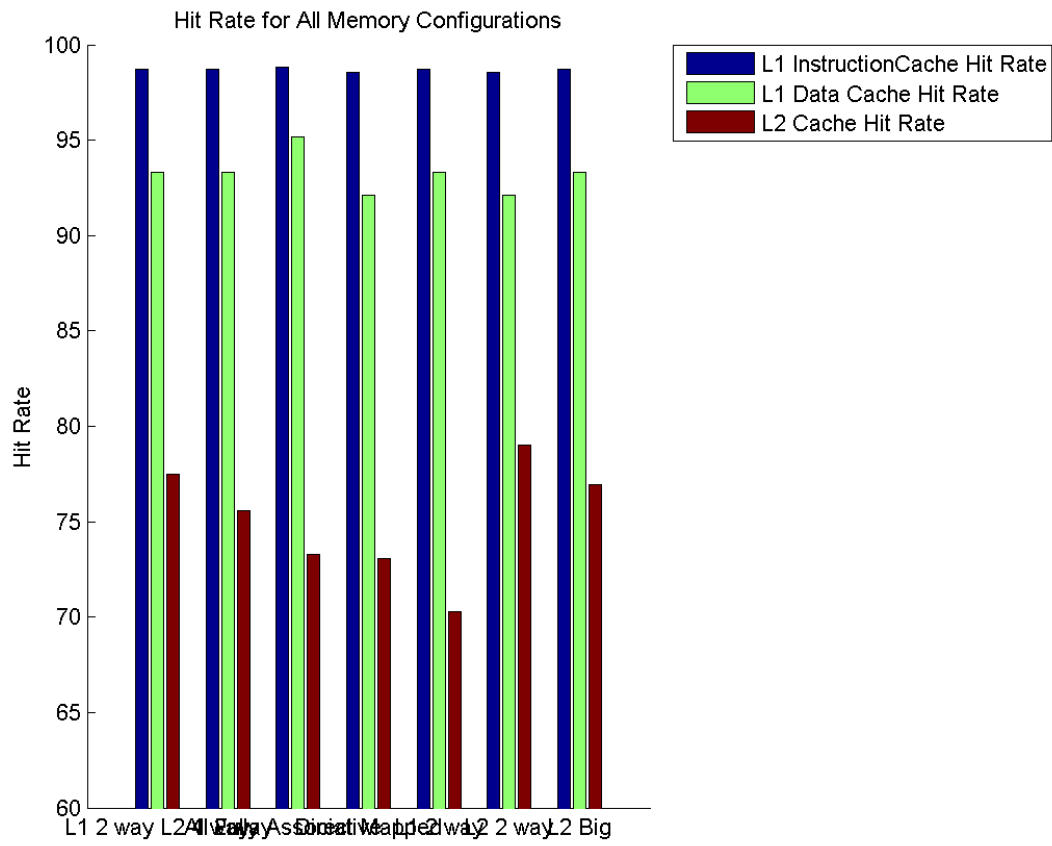


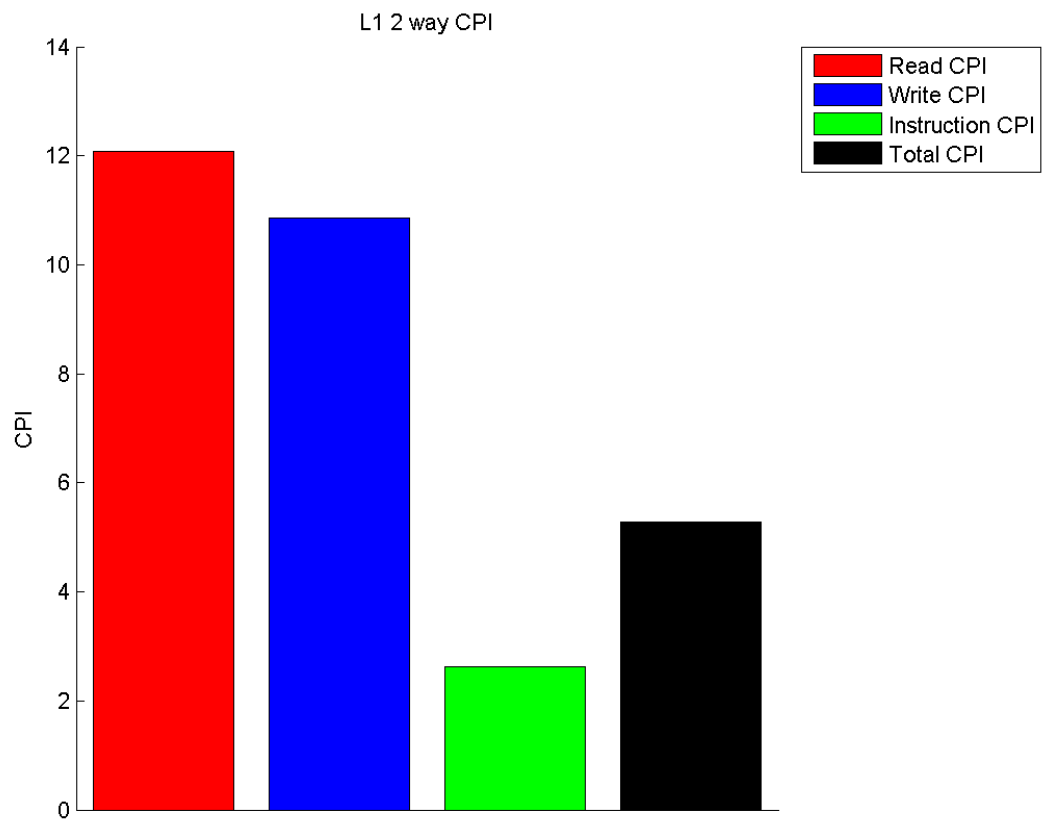


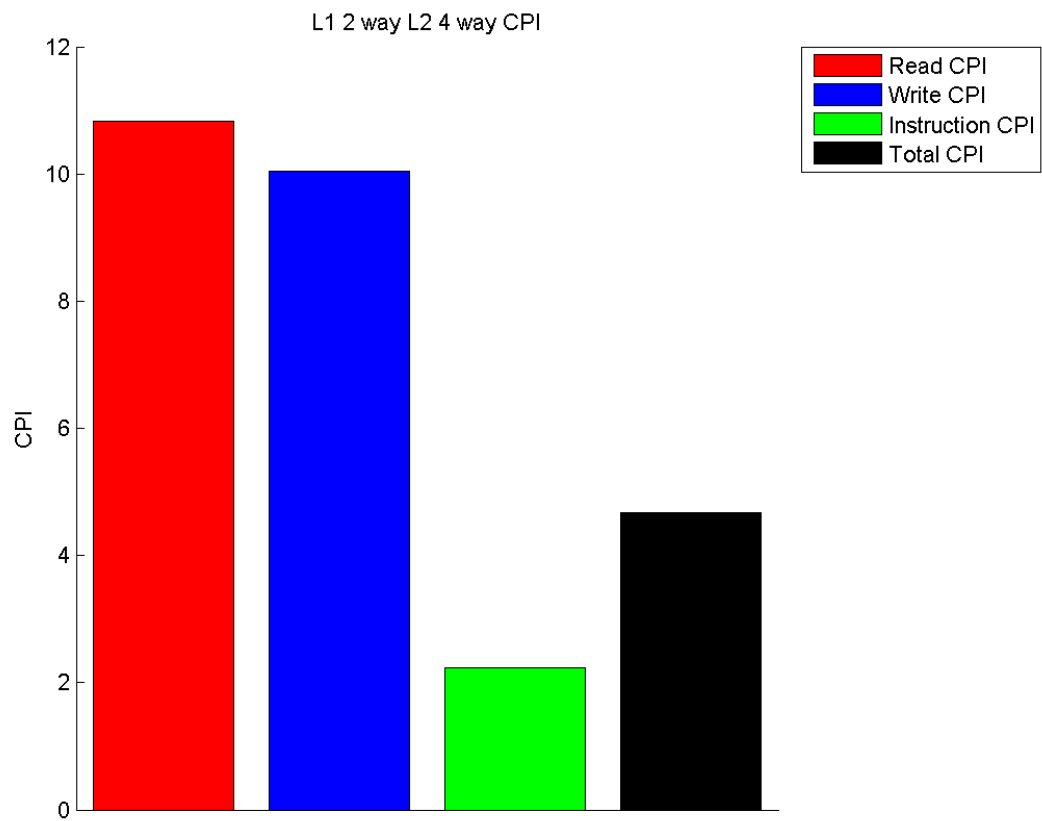
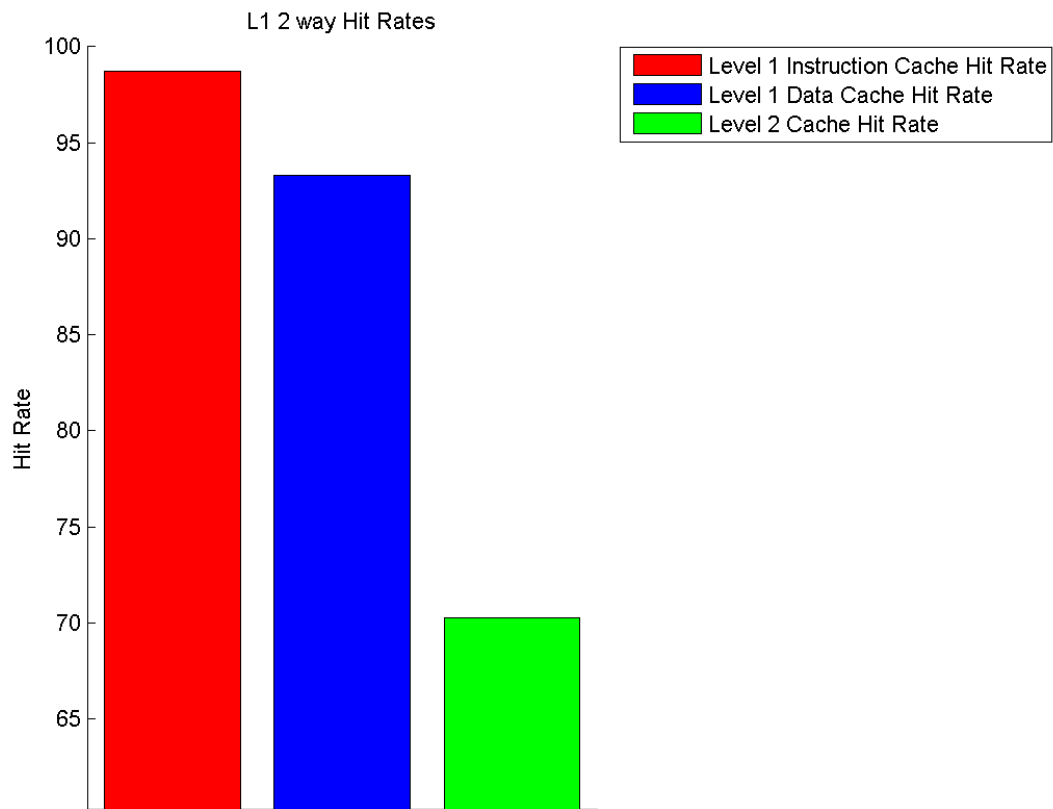


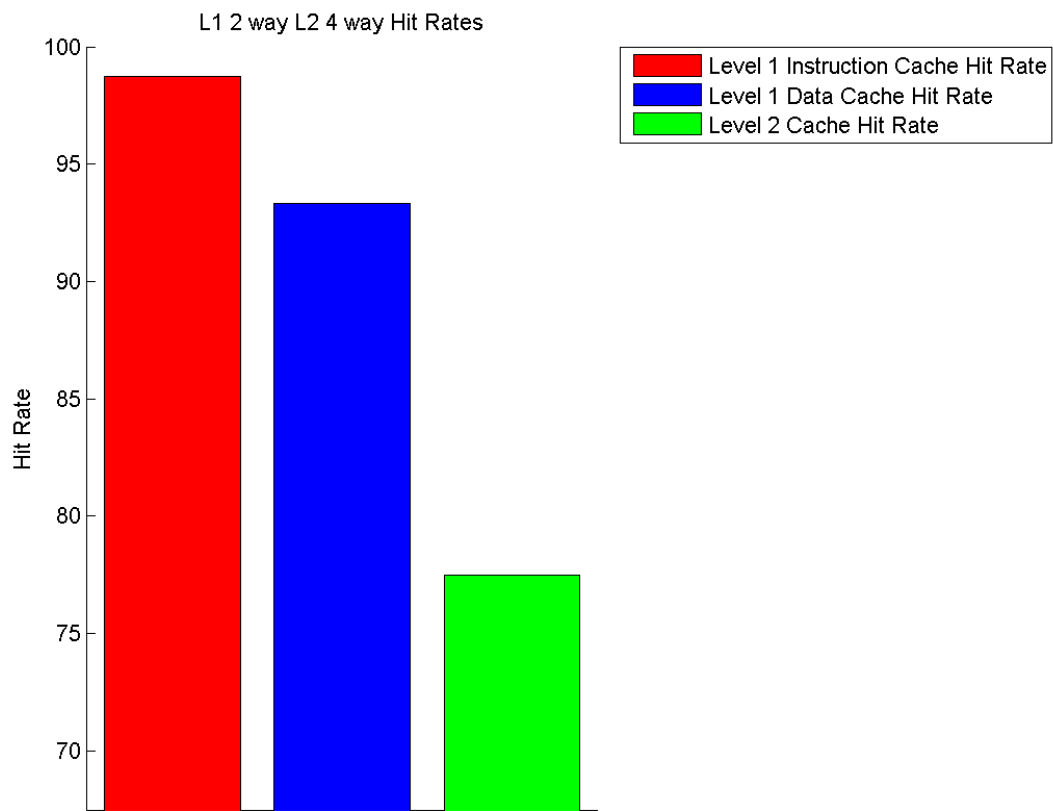


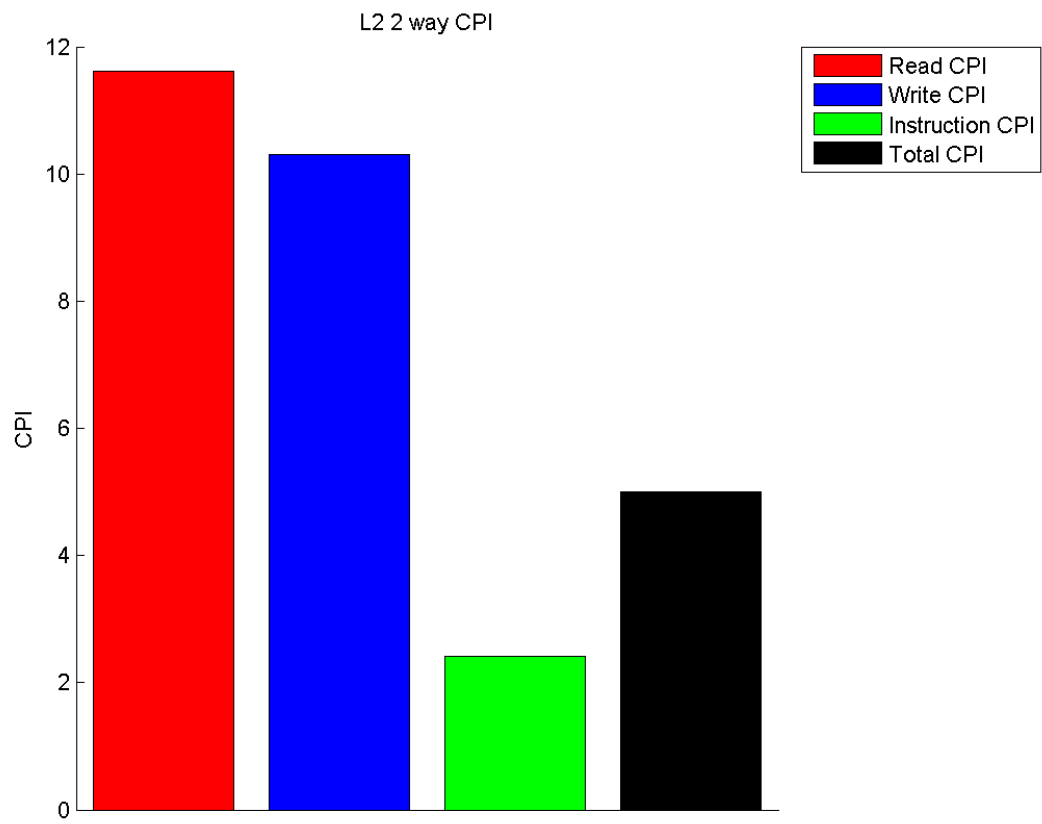


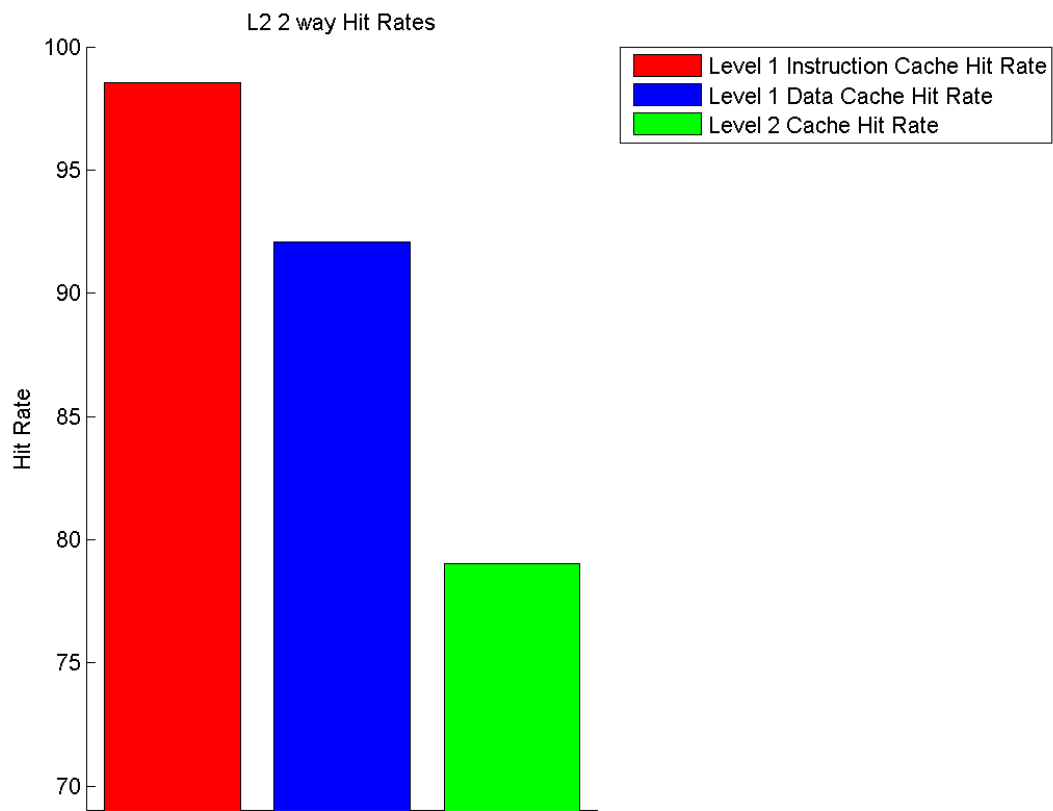


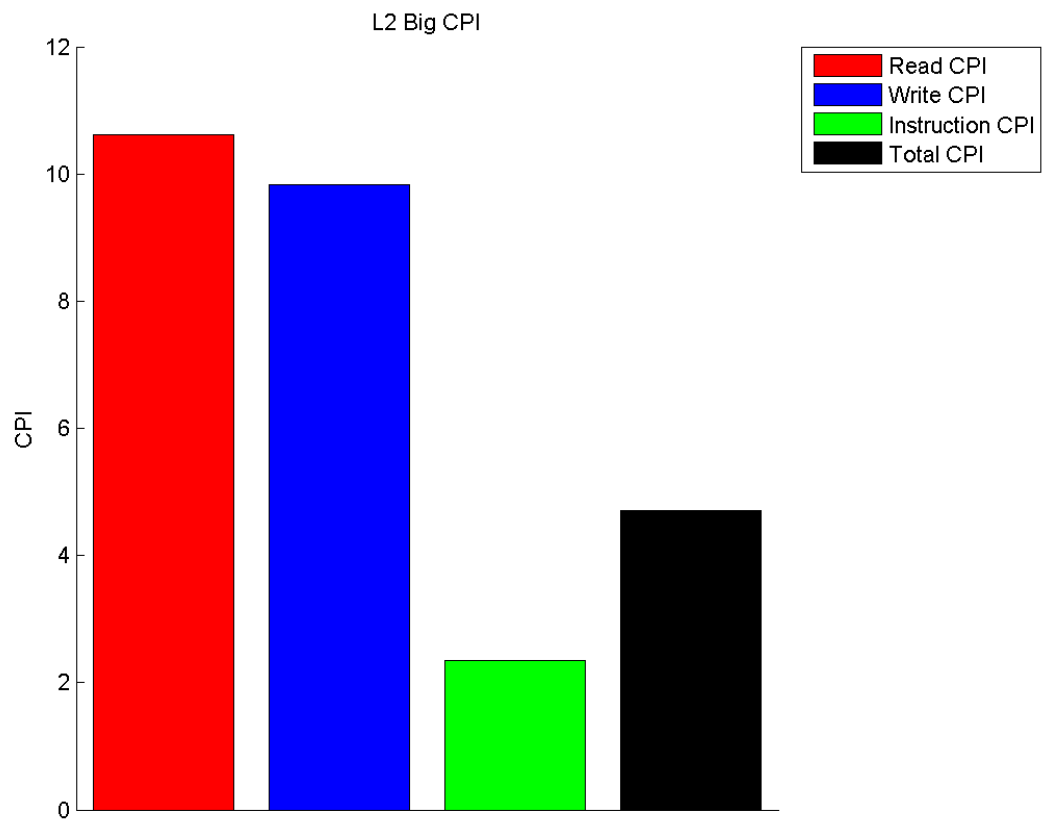


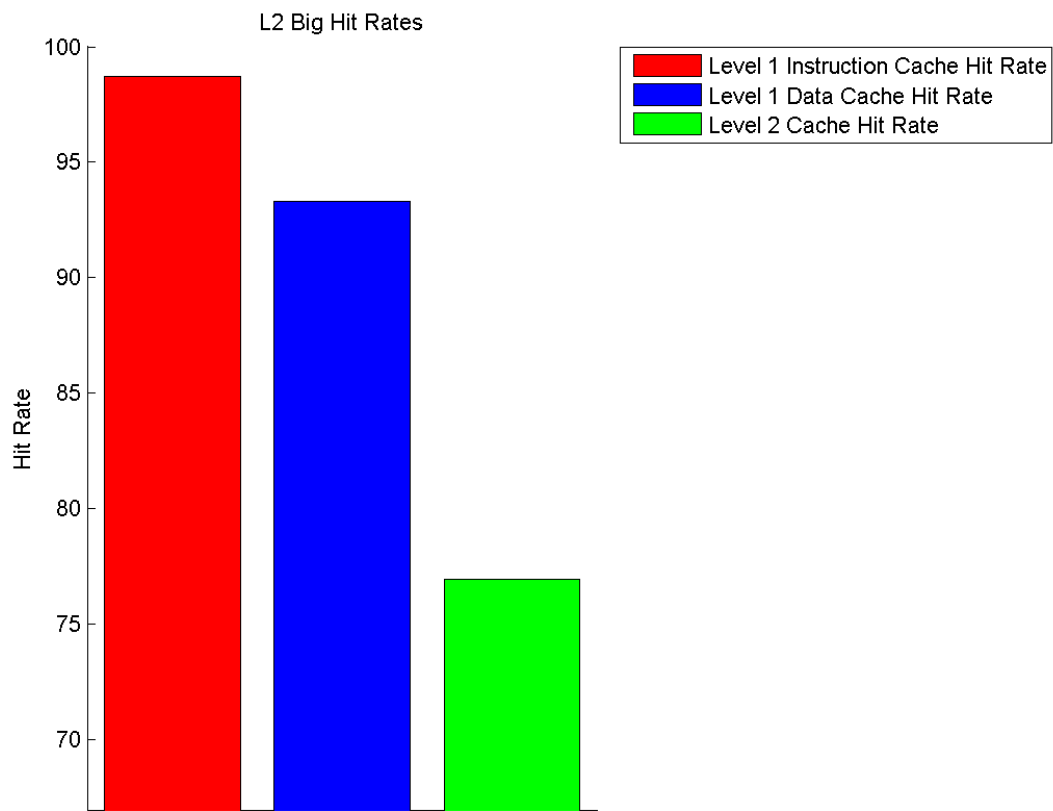












##Affect of chunksize on cost We also simulated the affect on cost of the variance in chunksize and found that increases the width, while decreasing execution time, also increased cost. The cost/benefit ratio was likely best in the 32 byte width.

Simulation Results

The following pages are the simulation results generated for the specified test and cache-type. The format is test.cache-type.

astar results

astar.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 18962176494; Total refs = 5000000000
Inst refs = 3418797090; Data refs = 308039522

Number of reference types: [Percentage]

Reads = 1273163388 [25.46%]
Writes = 308039522 [6.16%]
Inst = 3418797090 [68.38%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 8744712559 [46.12%]
Writes = 4479430163 [23.62%]
Inst = 5738033772 [30.26%]
Total = 18962176494

Average cycles per activity:

Read = 6.87; Write = 14.54; Inst. = 5.55

Memory Level: L1i

Hit Count = 5720505286 Miss Count = 227995
Total Requests = 5720733281
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 227739; Dirty kickouts = 0; Transfers = 227995

Memory Level: L1d

Hit Count = 2111096166 Miss Count = 95725984
Total Requests = 2206822150
Hit Rate = [95.66%] Miss Rate = [4.34%]
Kickouts = 95725728; Dirty kickouts = 39157323; Transfers = 95725984

Memory Level: L2

Hit Count = 98014320 Miss Count = 37096982
Total Requests = 135111302
Hit Rate = [72.54%] Miss Rate = [27.46%]
Kickouts = 37095958; Dirty kickouts = 24005192; Transfers = 37096982

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$150; Memory cost = \$75

Total cost = \$1025

astar.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 19356863450; Total refs = 5000000000
Inst refs = 3418797090; Data refs = 308039522

Number of reference types: [Percentage]

Reads = 1273163388 [25.46%]
Writes = 308039522 [6.16%]
Inst = 3418797090 [68.38%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 9082330679 [46.92%]
Writes = 4536609835 [23.44%]
Inst = 5737922936 [29.64%]
Total = 19356863450

Average cycles per activity:

Read = 7.13; Write = 14.73; Inst. = 5.66

Memory Level: L1i

Hit Count = 5720505286 Miss Count = 227995
Total Requests = 5720733281
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 227739; Dirty kickouts = 0; Transfers = 227995

Memory Level: L1d

Hit Count = 2111096166 Miss Count = 95725984
Total Requests = 2206822150
Hit Rate = [95.66%] Miss Rate = [4.34%]
Kickouts = 95725728; Dirty kickouts = 39157323; Transfers = 95725984

Memory Level: L2

Hit Count = 95507164 Miss Count = 39604138
Total Requests = 135111302
Hit Rate = [70.69%] Miss Rate = [29.31%]
Kickouts = 39603114; Dirty kickouts = 24209779; Transfers = 39604138

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$100; Memory cost = \$75

Total cost = \$975

astar.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 17981142859; Total refs = 5000000000
Inst refs = 3418797090; Data refs = 308039522

Number of reference types: [Percentage]

Reads = 1273163388 [25.46%]
Writes = 308039522 [6.16%]
Inst = 3418797090 [68.38%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 7825503863 [43.52%]
Writes = 4434255539 [24.66%]
Inst = 5721383457 [31.82%]
Total = 17981142859

Average cycles per activity:

Read = 6.15; Write = 14.40; Inst. = 5.26

Memory Level: L1i

Hit Count = 5720727727 Miss Count = 5554
Total Requests = 5720733281
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 5298; Dirty kickouts = 0; Transfers = 5554

Memory Level: L1d

Hit Count = 2127174314 Miss Count = 79647836
Total Requests = 2206822150
Hit Rate = [96.39%] Miss Rate = [3.61%]
Kickouts = 79647580; Dirty kickouts = 34215058; Transfers = 79647836

Memory Level: L2

Hit Count = 80194503 Miss Count = 33673945
Total Requests = 113868448
Hit Rate = [70.43%] Miss Rate = [29.57%]
Kickouts = 33672921; Dirty kickouts = 23111735; Transfers = 33673945

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

astar.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32

Icache size = 8192 : ways = 1 : block size = 32\pagebreak

astar results

L2-cache size = 65536 : ways = 1 : block size = 64 Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 22047530585; Total refs = 5000000000
Inst refs = 3418797090; Data refs = 308039522

Number of reference types: [Percentage]
Reads = 1273163388 [25.46%]
Writes = 308039522 [6.16%]
Inst = 3418797090 [68.38%]
Total = 5000000000

Total cycles for activities: [Percentage]
Reads = 11432189418 [51.85%]
Writes = 4855722298 [22.02%]
Inst = 5759618869 [26.12%]
Total = 22047530585

Average cycles per activity:
Read = 8.98; Write = 15.76; Inst. = 6.45

Memory Level: L1i
Hit Count = 5720163033 Miss Count = 570248
Total Requests = 5720733281
Hit Rate = [99.99%] Miss Rate = [0.01%]
Kickouts = 569992; Dirty kickouts = 0; Transfers = 570248

Memory Level: L1d
Hit Count = 2086868848 Miss Count = 119953302
Total Requests = 2206822150
Hit Rate = [94.56%] Miss Rate = [5.44%]
Kickouts = 119953046; Dirty kickouts = 46313651; Transfers = 119953302

Memory Level: L2
Hit Count = 115040113 Miss Count = 51797088
Total Requests = 166837201
Hit Rate = [68.95%] Miss Rate = [31.05%]
Kickouts = 51796064; Dirty kickouts = 26912011; Transfers = 51797088

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$525

astar.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 20643292638; Total refs = 5000000000
Inst refs = 3418797090; Data refs = 308039522

Number of reference types: [Percentage]

Reads = 1273163388 [25.46%]
Writes = 308039522 [6.16%]
Inst = 3418797090 [68.38%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 10204093885 [49.43%]
Writes = 4700636859 [22.77%]
Inst = 5738561894 [27.80%]
Total = 20643292638

Average cycles per activity:

Read = 8.01; Write = 15.26; Inst. = 6.04

Memory Level: L1i

Hit Count = 5720505286 Miss Count = 227995
Total Requests = 5720733281
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 227739; Dirty kickouts = 0; Transfers = 227995

Memory Level: L1d

Hit Count = 2111096166 Miss Count = 95725984
Total Requests = 2206822150
Hit Rate = [95.66%] Miss Rate = [4.34%]
Kickouts = 95725728; Dirty kickouts = 39157323; Transfers = 95725984

Memory Level: L2

Hit Count = 87863096 Miss Count = 47248206
Total Requests = 135111302
Hit Rate = [65.03%] Miss Rate = [34.97%]
Kickouts = 47247182; Dirty kickouts = 25426888; Transfers = 47248206

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$50; Memory cost = \$75

Total cost = \$925

astar.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 19862739275; Total refs = 5000000000
Inst refs = 3418797090; Data refs = 308039522

Number of reference types: [Percentage]

Reads = 1273163388 [25.46%]
Writes = 308039522 [6.16%]
Inst = 3418797090 [68.38%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 9527603854 [47.97%]
Writes = 4575457414 [23.04%]
Inst = 5759678007 [29.00%]
Total = 19862739275

Average cycles per activity:

Read = 7.48; Write = 14.85; Inst. = 5.81

Memory Level: L1i

Hit Count = 5720163033 Miss Count = 570248
Total Requests = 5720733281
Hit Rate = [99.99%] Miss Rate = [0.01%]
Kickouts = 569992; Dirty kickouts = 0; Transfers = 570248

Memory Level: L1d

Hit Count = 2086868848 Miss Count = 119953302
Total Requests = 2206822150
Hit Rate = [94.56%] Miss Rate = [5.44%]
Kickouts = 119953046; Dirty kickouts = 46313651; Transfers = 119953302

Memory Level: L2

Hit Count = 127502358 Miss Count = 39334843
Total Requests = 166837201
Hit Rate = [76.42%] Miss Rate = [23.58%]
Kickouts = 39333819; Dirty kickouts = 24302700; Transfers = 39334843

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

astar.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 18111728604; Total refs = 5000000000
Inst refs = 3418797090; Data refs = 308039522

Number of reference types: [Percentage]

Reads = 1273163388 [25.46%]
Writes = 308039522 [6.16%]
Inst = 3418797090 [68.38%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 8383937081 [46.29%]
Writes = 3990685271 [22.03%]
Inst = 5737106252 [31.68%]
Total = 18111728604

Average cycles per activity:

Read = 6.59; Write = 12.96; Inst. = 5.30

Memory Level: L1i

Hit Count = 5720505286 Miss Count = 227995
Total Requests = 5720733281
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 227739; Dirty kickouts = 0; Transfers = 227995

Memory Level: L1d

Hit Count = 2111096166 Miss Count = 95725984
Total Requests = 2206822150
Hit Rate = [95.66%] Miss Rate = [4.34%]
Kickouts = 95725728; Dirty kickouts = 39157323; Transfers = 95725984

Memory Level: L2

Hit Count = 100249135 Miss Count = 34862167
Total Requests = 135111302
Hit Rate = [74.20%] Miss Rate = [25.80%]
Kickouts = 34860119; Dirty kickouts = 20261157; Transfers = 34862167

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

bzip results

bzip.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 24583030591; Total refs = 5000000000
Inst refs = 3812526036; Data refs = 261704626

Number of reference types: [Percentage]

Reads = 925769338 [18.52%]
Writes = 261704626 [5.23%]
Inst = 3812526036 [76.25%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 9863754485 [40.12%]
Writes = 8617088144 [35.05%]
Inst = 6102187962 [24.82%]
Total = 24583030591

Average cycles per activity:

Read = 10.65; Write = 32.93; Inst. = 6.45

Memory Level: L1i

Hit Count = 6101573758 Miss Count = 4671
Total Requests = 6101578429
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 4415; Dirty kickouts = 0; Transfers = 4671

Memory Level: L1d

Hit Count = 1142316349 Miss Count = 94672302
Total Requests = 1236988651
Hit Rate = [92.35%] Miss Rate = [7.65%]
Kickouts = 94672046; Dirty kickouts = 36662551; Transfers = 94672302

Memory Level: L2

Hit Count = 58051975 Miss Count = 73287549
Total Requests = 131339524
Hit Rate = [44.20%] Miss Rate = [55.80%]
Kickouts = 73286525; Dirty kickouts = 31059800; Transfers = 73287549

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$150; Memory cost = \$75
Total cost = \$1025

bzip.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 25083558983; Total refs = 5000000000
Inst refs = 3812526036; Data refs = 261704626

Number of reference types: [Percentage]

Reads = 925769338 [18.52%]
Writes = 261704626 [5.23%]
Inst = 3812526036 [76.25%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 10086351873 [40.21%]
Writes = 8895044164 [35.46%]
Inst = 6102162946 [24.33%]
Total = 25083558983

Average cycles per activity:

Read = 10.90; Write = 33.99; Inst. = 6.58

Memory Level: L1i

Hit Count = 6101573758 Miss Count = 4671
Total Requests = 6101578429
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 4415; Dirty kickouts = 0; Transfers = 4671

Memory Level: L1d

Hit Count = 1142316349 Miss Count = 94672302
Total Requests = 1236988651
Hit Rate = [92.35%] Miss Rate = [7.65%]
Kickouts = 94672046; Dirty kickouts = 36662551; Transfers = 94672302

Memory Level: L2

Hit Count = 54910053 Miss Count = 76429471
Total Requests = 131339524
Hit Rate = [41.81%] Miss Rate = [58.19%]
Kickouts = 76428447; Dirty kickouts = 31358427; Transfers = 76429471

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

bzip.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 24281500400; Total refs = 5000000000
Inst refs = 3812526036; Data refs = 261704626

Number of reference types: [Percentage]

Reads = 925769338 [18.52%]
Writes = 261704626 [5.23%]
Inst = 3812526036 [76.25%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 9655104585 [39.76%]
Writes = 8524382059 [35.11%]
Inst = 6102013756 [25.13%]
Total = 24281500400

Average cycles per activity:

Read = 10.43; Write = 32.57; Inst. = 6.37

Memory Level: L1i

Hit Count = 6101574764 Miss Count = 3665
Total Requests = 6101578429
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 3409; Dirty kickouts = 0; Transfers = 3665

Memory Level: L1d

Hit Count = 1144167534 Miss Count = 92821117
Total Requests = 1236988651
Hit Rate = [92.50%] Miss Rate = [7.50%]
Kickouts = 92820861; Dirty kickouts = 35943014; Transfers = 92821117

Memory Level: L2

Hit Count = 57133189 Miss Count = 71634607
Total Requests = 128767796
Hit Rate = [44.37%] Miss Rate = [55.63%]
Kickouts = 71633583; Dirty kickouts = 30936937; Transfers = 71634607

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

bzip.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 26019113121; Total refs = 5000000000
Inst refs = 3812526036; Data refs = 261704626

Number of reference types: [Percentage]

Reads = 925769338 [18.52%]
Writes = 261704626 [5.23%]
Inst = 3812526036 [76.25%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 10888301657 [41.85%]
Writes = 9024177803 [34.68%]
Inst = 6106633661 [23.47%]
Total = 26019113121

Average cycles per activity:

Read = 11.76; Write = 34.48; Inst. = 6.82

Memory Level: L1i

Hit Count = 6101375143 Miss Count = 203286
Total Requests = 6101578429
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 203030; Dirty kickouts = 0; Transfers = 203286

Memory Level: L1d

Hit Count = 1132622384 Miss Count = 104366267
Total Requests = 1236988651
Hit Rate = [91.56%] Miss Rate = [8.44%]
Kickouts = 104366011; Dirty kickouts = 40274898; Transfers = 104366267

Memory Level: L2

Hit Count = 64682859 Miss Count = 80161592
Total Requests = 144844451
Hit Rate = [44.66%] Miss Rate = [55.34%]
Kickouts = 80160568; Dirty kickouts = 32534806; Transfers = 80161592

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$525

bzip.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 25978858649; Total refs = 5000000000
Inst refs = 3812526036; Data refs = 261704626

Number of reference types: [Percentage]

Reads = 925769338 [18.52%]
Writes = 261704626 [5.23%]
Inst = 3812526036 [76.25%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 10515631991 [40.48%]
Writes = 9361016010 [36.03%]
Inst = 6102210648 [23.49%]
Total = 25978858649

Average cycles per activity:

Read = 11.36; Write = 35.77; Inst. = 6.81

Memory Level: L1i

Hit Count = 6101573758 Miss Count = 4671
Total Requests = 6101578429
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 4415; Dirty kickouts = 0; Transfers = 4671

Memory Level: L1d

Hit Count = 1142316349 Miss Count = 94672302
Total Requests = 1236988651
Hit Rate = [92.35%] Miss Rate = [7.65%]
Kickouts = 94672046; Dirty kickouts = 36662551; Transfers = 94672302

Memory Level: L2

Hit Count = 49391612 Miss Count = 81947912
Total Requests = 131339524
Hit Rate = [37.61%] Miss Rate = [62.39%]
Kickouts = 81946888; Dirty kickouts = 31998479; Transfers = 81947912

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$925

bzip.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 25095920083; Total refs = 5000000000
Inst refs = 3812526036; Data refs = 261704626

Number of reference types: [Percentage]

Reads = 925769338 [18.52%]
Writes = 261704626 [5.23%]
Inst = 3812526036 [76.25%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 10248332597 [40.84%]
Writes = 8741081597 [34.83%]
Inst = 6106505889 [24.33%]
Total = 25095920083

Average cycles per activity:

Read = 11.07; Write = 33.40; Inst. = 6.58

Memory Level: L1i

Hit Count = 6101375143 Miss Count = 203286
Total Requests = 6101578429
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 203030; Dirty kickouts = 0; Transfers = 203286

Memory Level: L1d

Hit Count = 1132622384 Miss Count = 104366267
Total Requests = 1236988651
Hit Rate = [91.56%] Miss Rate = [8.44%]
Kickouts = 104366011; Dirty kickouts = 40274898; Transfers = 104366267

Memory Level: L2

Hit Count = 69905792 Miss Count = 74938659
Total Requests = 144844451
Hit Rate = [48.26%] Miss Rate = [51.74%]
Kickouts = 74937635; Dirty kickouts = 31387343; Transfers = 74938659

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

bzip.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 24388483093; Total refs = 5000000000
Inst refs = 3812526036; Data refs = 261704626

Number of reference types: [Percentage]

Reads = 925769338 [18.52%]
Writes = 261704626 [5.23%]
Inst = 3812526036 [76.25%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 9528316061 [39.07%]
Writes = 8758061210 [35.91%]
Inst = 6102105822 [25.02%]
Total = 24388483093

Average cycles per activity:

Read = 10.29; Write = 33.47; Inst. = 6.40

Memory Level: L1i

Hit Count = 6101573758 Miss Count = 4671
Total Requests = 6101578429
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 4415; Dirty kickouts = 0; Transfers = 4671

Memory Level: L1d

Hit Count = 1142316349 Miss Count = 94672302
Total Requests = 1236988651
Hit Rate = [92.35%] Miss Rate = [7.65%]
Kickouts = 94672046; Dirty kickouts = 36662551; Transfers = 94672302

Memory Level: L2

Hit Count = 58645458 Miss Count = 72694066
Total Requests = 131339524
Hit Rate = [44.65%] Miss Rate = [55.35%]
Kickouts = 72692018; Dirty kickouts = 30289093; Transfers = 72694066

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

gcc results

gcc.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 25714009974; Total refs = 5385175618
Inst refs = 3790327083; Data refs = 1594848535

Number of reference types: [Percentage]

Reads = 1036416945 [19.25%]
Writes = 558431590 [10.37%]
Inst = 3790327083 [70.38%]
Total = 5385175618

Total cycles for activities: [Percentage]

Reads = 9211753170 [35.82%]
Writes = 4158260189 [16.17%]
Inst = 12343996615 [48.00%]
Total = 25714009974

Average cycles per activity:

Read = 8.89; Write = 7.45; Inst. = 6.78

Memory Level: L1i

Hit Count = 6172996863 Miss Count = 160252200
Total Requests = 6333249063
Hit Rate = [97.47%] Miss Rate = [2.53%]
Kickouts = 160251944; Dirty kickouts = 0; Transfers = 160252200

Memory Level: L1d

Hit Count = 2643902763 Miss Count = 111630008
Total Requests = 2755532771
Hit Rate = [95.95%] Miss Rate = [4.05%]
Kickouts = 111629752; Dirty kickouts = 41398093; Transfers = 111630008

Memory Level: L2

Hit Count = 250429265 Miss Count = 62851036
Total Requests = 313280301
Hit Rate = [79.94%] Miss Rate = [20.06%]
Kickouts = 62850012; Dirty kickouts = 15461499; Transfers = 62851036

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$150; Memory cost = \$75
Total cost = \$1025

gcc.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 26900527810; Total refs = 5385175618
Inst refs = 3790327083; Data refs = 1594848535

Number of reference types: [Percentage]

Reads = 1036416945 [19.25%]
Writes = 558431590 [10.37%]
Inst = 3790327083 [70.38%]
Total = 5385175618

Total cycles for activities: [Percentage]

Reads = 9674291276 [35.96%]
Writes = 3878167215 [14.42%]
Inst = 13348069319 [49.62%]
Total = 26900527810

Average cycles per activity:

Read = 9.33; Write = 6.94; Inst. = 7.10

Memory Level: L1i

Hit Count = 6172996863 Miss Count = 160252200
Total Requests = 6333249063
Hit Rate = [97.47%] Miss Rate = [2.53%]
Kickouts = 160251944; Dirty kickouts = 0; Transfers = 160252200

Memory Level: L1d

Hit Count = 2643902763 Miss Count = 111630008
Total Requests = 2755532771
Hit Rate = [95.95%] Miss Rate = [4.05%]
Kickouts = 111629752; Dirty kickouts = 41398093; Transfers = 111630008

Memory Level: L2

Hit Count = 242232419 Miss Count = 71047882
Total Requests = 313280301
Hit Rate = [77.32%] Miss Rate = [22.68%]
Kickouts = 71046858; Dirty kickouts = 15388487; Transfers = 71047882

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

gcc.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 23367705028; Total refs = 5385175618
Inst refs = 3790327083; Data refs = 1594848535

Number of reference types: [Percentage]

Reads = 1036416945 [19.25%]
Writes = 558431590 [10.37%]
Inst = 3790327083 [70.38%]
Total = 5385175618

Total cycles for activities: [Percentage]

Reads = 8378050320 [35.85%]
Writes = 4443956910 [19.02%]
Inst = 10545697798 [45.13%]
Total = 23367705028

Average cycles per activity:

Read = 8.08; Write = 7.96; Inst. = 6.17

Memory Level: L1i

Hit Count = 6201451332 Miss Count = 131797731
Total Requests = 6333249063
Hit Rate = [97.92%] Miss Rate = [2.08%]
Kickouts = 131797475; Dirty kickouts = 0; Transfers = 131797731

Memory Level: L1d

Hit Count = 2667134774 Miss Count = 88397997
Total Requests = 2755532771
Hit Rate = [96.79%] Miss Rate = [3.21%]
Kickouts = 88397741; Dirty kickouts = 33801767; Transfers = 88397997

Memory Level: L2

Hit Count = 200681534 Miss Count = 53315961
Total Requests = 253997495
Hit Rate = [79.01%] Miss Rate = [20.99%]
Kickouts = 53314937; Dirty kickouts = 15790266; Transfers = 53315961

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

gcc.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 32625960328; Total refs = 5385175618
Inst refs = 3790327083; Data refs = 558431590

Number of reference types: [Percentage]

Reads = 1036416945 [19.25%]
Writes = 558431590 [10.37%]
Inst = 3790327083 [70.38%]
Total = 5385175618

Total cycles for activities: [Percentage]

Reads = 12160191981 [37.27%]
Writes = 4261640360 [13.06%]
Inst = 16204127987 [49.67%]
Total = 32625960328

Average cycles per activity:

Read = 11.73; Write = 7.63; Inst. = 8.61

Memory Level: L1i

Hit Count = 6145071639 Miss Count = 188177424
Total Requests = 6333249063
Hit Rate = [97.03%] Miss Rate = [2.97%]
Kickouts = 188177168; Dirty kickouts = 0; Transfers = 188177424

Memory Level: L1d

Hit Count = 2608007945 Miss Count = 147524826
Total Requests = 2755532771
Hit Rate = [94.65%] Miss Rate = [5.35%]
Kickouts = 147524570; Dirty kickouts = 55576515; Transfers = 147524826

Memory Level: L2

Hit Count = 293923461 Miss Count = 97355304
Total Requests = 391278765
Hit Rate = [75.12%] Miss Rate = [24.88%]
Kickouts = 97354280; Dirty kickouts = 19479583; Transfers = 97355304

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$525

gcc.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 29615075816; Total refs = 5385175618
Inst refs = 3790327083; Data refs = 1594848535

Number of reference types: [Percentage]

Reads = 1036416945 [19.25%]
Writes = 558431590 [10.37%]
Inst = 3790327083 [70.38%]
Total = 5385175618

Total cycles for activities: [Percentage]

Reads = 10684440756 [36.08%]
Writes = 3913297495 [13.21%]
Inst = 15017337565 [50.71%]
Total = 29615075816

Average cycles per activity:

Read = 10.31; Write = 7.01; Inst. = 7.81

Memory Level: L1i

Hit Count = 6172996863 Miss Count = 160252200
Total Requests = 6333249063
Hit Rate = [97.47%] Miss Rate = [2.53%]
Kickouts = 160251944; Dirty kickouts = 0; Transfers = 160252200

Memory Level: L1d

Hit Count = 2643902763 Miss Count = 111630008
Total Requests = 2755532771
Hit Rate = [95.95%] Miss Rate = [4.05%]
Kickouts = 111629752; Dirty kickouts = 41398093; Transfers = 111630008

Memory Level: L2

Hit Count = 225159148 Miss Count = 88121153
Total Requests = 313280301
Hit Rate = [71.87%] Miss Rate = [28.13%]
Kickouts = 88120129; Dirty kickouts = 16973133; Transfers = 88121153

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$50; Memory cost = \$75

Total cost = \$925

gcc.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 28512788720; Total refs = 5385175618
Inst refs = 3790327083; Data refs = 1594848535

Number of reference types: [Percentage]

Reads = 1036416945 [19.25%]
Writes = 558431590 [10.37%]
Inst = 3790327083 [70.38%]
Total = 5385175618

Total cycles for activities: [Percentage]

Reads = 10407330171 [36.50%]
Writes = 4028571224 [14.13%]
Inst = 14076887325 [49.37%]
Total = 28512788720

Average cycles per activity:

Read = 10.04; Write = 7.21; Inst. = 7.52

Memory Level: L1i

Hit Count = 6145071639 Miss Count = 188177424
Total Requests = 6333249063
Hit Rate = [97.03%] Miss Rate = [2.97%]
Kickouts = 188177168; Dirty kickouts = 0; Transfers = 188177424

Memory Level: L1d

Hit Count = 2608007945 Miss Count = 147524826
Total Requests = 2755532771
Hit Rate = [94.65%] Miss Rate = [5.35%]
Kickouts = 147524570; Dirty kickouts = 55576515; Transfers = 147524826

Memory Level: L2

Hit Count = 318575879 Miss Count = 72702886
Total Requests = 391278765
Hit Rate = [81.42%] Miss Rate = [18.58%]
Kickouts = 72701862; Dirty kickouts = 15808736; Transfers = 72702886

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

gcc.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 25244658340; Total refs = 5385175618
Inst refs = 3790327083; Data refs = 1594848535

Number of reference types: [Percentage]

Reads = 1036416945 [19.25%]
Writes = 558431590 [10.37%]
Inst = 3790327083 [70.38%]
Total = 5385175618

Total cycles for activities: [Percentage]

Reads = 9475305530 [37.53%]
Writes = 3159954171 [12.52%]
Inst = 12609398639 [49.95%]
Total = 25244658340

Average cycles per activity:

Read = 9.14; Write = 5.66; Inst. = 6.66

Memory Level: L1i

Hit Count = 6172996863 Miss Count = 160252200
Total Requests = 6333249063
Hit Rate = [97.47%] Miss Rate = [2.53%]
Kickouts = 160251944; Dirty kickouts = 0; Transfers = 160252200

Memory Level: L1d

Hit Count = 2643902763 Miss Count = 111630008
Total Requests = 2755532771
Hit Rate = [95.95%] Miss Rate = [4.05%]
Kickouts = 111629752; Dirty kickouts = 41398093; Transfers = 111630008

Memory Level: L2

Hit Count = 250722324 Miss Count = 62557977
Total Requests = 313280301
Hit Rate = [80.03%] Miss Rate = [19.97%]
Kickouts = 62555929; Dirty kickouts = 12414606; Transfers = 62557977

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

gobmk results

gobmk.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 21091534412; Total refs = 5000000000
Inst refs = 3590215172; Data refs = 1409784828

Number of reference types: [Percentage]

Reads = 959845130 [19.20%]
Writes = 449939698 [9.00%]
Inst = 3590215172 [71.80%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 4212051167 [19.97%]
Writes = 4554324621 [21.59%]
Inst = 12325158624 [58.44%]
Total = 21091534412

Average cycles per activity:

Read = 4.39; Write = 10.12; Inst. = 5.87

Memory Level: L1i

Hit Count = 5906549044 Miss Count = 202703417
Total Requests = 6109252461
Hit Rate = [96.68%] Miss Rate = [3.32%]
Kickouts = 202703161; Dirty kickouts = 0; Transfers = 202703417

Memory Level: L1d

Hit Count = 1926382320 Miss Count = 81940343
Total Requests = 2008322663
Hit Rate = [95.92%] Miss Rate = [4.08%]
Kickouts = 81940087; Dirty kickouts = 49176928; Transfers = 81940343

Memory Level: L2

Hit Count = 297182448 Miss Count = 36638240
Total Requests = 333820688
Hit Rate = [89.02%] Miss Rate = [10.98%]
Kickouts = 36637216; Dirty kickouts = 14278582; Transfers = 36638240

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$150; Memory cost = \$75
Total cost = \$1025

gobmk.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 23153470166; Total refs = 5000000000
Inst refs = 3590215172; Data refs = 1409784828

Number of reference types: [Percentage]

Reads = 959845130 [19.20%]
Writes = 449939698 [9.00%]
Inst = 3590215172 [71.80%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 4799534263 [20.73%]
Writes = 4949693813 [21.38%]
Inst = 13404242090 [57.89%]
Total = 23153470166

Average cycles per activity:

Read = 5.00; Write = 11.00; Inst. = 6.45

Memory Level: L1i

Hit Count = 5906549044 Miss Count = 202703417
Total Requests = 6109252461
Hit Rate = [96.68%] Miss Rate = [3.32%]
Kickouts = 202703161; Dirty kickouts = 0; Transfers = 202703417

Memory Level: L1d

Hit Count = 1926382320 Miss Count = 81940343
Total Requests = 2008322663
Hit Rate = [95.92%] Miss Rate = [4.08%]
Kickouts = 81940087; Dirty kickouts = 49176928; Transfers = 81940343

Memory Level: L2

Hit Count = 286228719 Miss Count = 47591969
Total Requests = 333820688
Hit Rate = [85.74%] Miss Rate = [14.26%]
Kickouts = 47590945; Dirty kickouts = 17583520; Transfers = 47591969

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

gobmk.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 18162037820; Total refs = 5000000000
Inst refs = 3590215172; Data refs = 1409784828

Number of reference types: [Percentage]

Reads = 959845130 [19.20%]
Writes = 449939698 [9.00%]
Inst = 3590215172 [71.80%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3367538156 [18.54%]
Writes = 4089557954 [22.52%]
Inst = 10704941710 [58.94%]
Total = 18162037820

Average cycles per activity:

Read = 3.51; Write = 9.09; Inst. = 5.06

Memory Level: L1i

Hit Count = 5910550092 Miss Count = 198702369
Total Requests = 6109252461
Hit Rate = [96.75%] Miss Rate = [3.25%]
Kickouts = 198702113; Dirty kickouts = 0; Transfers = 198702369

Memory Level: L1d

Hit Count = 1945655004 Miss Count = 62667659
Total Requests = 2008322663
Hit Rate = [96.88%] Miss Rate = [3.12%]
Kickouts = 62667403; Dirty kickouts = 39110446; Transfers = 62667659

Memory Level: L2

Hit Count = 277074230 Miss Count = 23406244
Total Requests = 300480474
Hit Rate = [92.21%] Miss Rate = [7.79%]
Kickouts = 23405220; Dirty kickouts = 11129239; Transfers = 23406244

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

gobmk.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 30885400691; Total refs = 5000000000
Inst refs = 3590215172; Data refs = 1409784828

Number of reference types: [Percentage]

Reads = 959845130 [19.20%]
Writes = 449939698 [9.00%]
Inst = 3590215172 [71.80%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 6934342242 [22.45%]
Writes = 5851441130 [18.95%]
Inst = 18099617319 [58.60%]
Total = 30885400691

Average cycles per activity:

Read = 7.22; Write = 13.00; Inst. = 8.60

Memory Level: L1i

Hit Count = 5894789867 Miss Count = 214462594
Total Requests = 6109252461
Hit Rate = [96.49%] Miss Rate = [3.51%]
Kickouts = 214462338; Dirty kickouts = 0; Transfers = 214462594

Memory Level: L1d

Hit Count = 1898725978 Miss Count = 109596685
Total Requests = 2008322663
Hit Rate = [94.54%] Miss Rate = [5.46%]
Kickouts = 109596429; Dirty kickouts = 60261446; Transfers = 109596685

Memory Level: L2

Hit Count = 294761167 Miss Count = 89559558
Total Requests = 384320725
Hit Rate = [76.70%] Miss Rate = [23.30%]
Kickouts = 89558534; Dirty kickouts = 22992423; Transfers = 89559558

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$525

gobmk.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 28864623302; Total refs = 5000000000
Inst refs = 3590215172; Data refs = 1409784828

Number of reference types: [Percentage]

Reads = 959845130 [19.20%]
Writes = 449939698 [9.00%]
Inst = 3590215172 [71.80%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 5742819949 [19.90%]
Writes = 5558897111 [19.26%]
Inst = 17562906242 [60.85%]
Total = 28864623302

Average cycles per activity:

Read = 5.98; Write = 12.35; Inst. = 8.04

Memory Level: L1i

Hit Count = 5906549044 Miss Count = 202703417
Total Requests = 6109252461
Hit Rate = [96.68%] Miss Rate = [3.32%]
Kickouts = 202703161; Dirty kickouts = 0; Transfers = 202703417

Memory Level: L1d

Hit Count = 1926382320 Miss Count = 81940343
Total Requests = 2008322663
Hit Rate = [95.92%] Miss Rate = [4.08%]
Kickouts = 81940087; Dirty kickouts = 49176928; Transfers = 81940343

Memory Level: L2

Hit Count = 249960133 Miss Count = 83860555
Total Requests = 333820688
Hit Rate = [74.88%] Miss Rate = [25.12%]
Kickouts = 83859531; Dirty kickouts = 20554517; Transfers = 83860555

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$50; Memory cost = \$75

Total cost = \$925

gobmk.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 23971308045; Total refs = 5000000000
Inst refs = 3590215172; Data refs = 1409784828

Number of reference types: [Percentage]

Reads = 959845130 [19.20%]
Writes = 449939698 [9.00%]
Inst = 3590215172 [71.80%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 5255759416 [21.93%]
Writes = 4968107204 [20.73%]
Inst = 13747441425 [57.35%]
Total = 23971308045

Average cycles per activity:

Read = 5.48; Write = 11.04; Inst. = 6.68

Memory Level: L1i

Hit Count = 5894789867 Miss Count = 214462594
Total Requests = 6109252461
Hit Rate = [96.49%] Miss Rate = [3.51%]
Kickouts = 214462338; Dirty kickouts = 0; Transfers = 214462594

Memory Level: L1d

Hit Count = 1898725978 Miss Count = 109596685
Total Requests = 2008322663
Hit Rate = [94.54%] Miss Rate = [5.46%]
Kickouts = 109596429; Dirty kickouts = 60261446; Transfers = 109596685

Memory Level: L2

Hit Count = 337032978 Miss Count = 47287747
Total Requests = 384320725
Hit Rate = [87.70%] Miss Rate = [12.30%]
Kickouts = 47286723; Dirty kickouts = 17689507; Transfers = 47287747

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

gobmk.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 24432123642; Total refs = 5000000000
Inst refs = 3590215172; Data refs = 1409784828

Number of reference types: [Percentage]

Reads = 959845130 [19.20%]
Writes = 449939698 [9.00%]
Inst = 3590215172 [71.80%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 4477299701 [18.33%]
Writes = 4675742197 [19.14%]
Inst = 15279081744 [62.54%]
Total = 24432123642

Average cycles per activity:

Read = 4.66; Write = 10.39; Inst. = 6.81

Memory Level: L1i

Hit Count = 5906549044 Miss Count = 202703417
Total Requests = 6109252461
Hit Rate = [96.68%] Miss Rate = [3.32%]
Kickouts = 202703161; Dirty kickouts = 0; Transfers = 202703417

Memory Level: L1d

Hit Count = 1926382320 Miss Count = 81940343
Total Requests = 2008322663
Hit Rate = [95.92%] Miss Rate = [4.08%]
Kickouts = 81940087; Dirty kickouts = 49176928; Transfers = 81940343

Memory Level: L2

Hit Count = 274576843 Miss Count = 59243845
Total Requests = 333820688
Hit Rate = [82.25%] Miss Rate = [17.75%]
Kickouts = 59241797; Dirty kickouts = 14565517; Transfers = 59243845

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

h264ref results

h264ref.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 11054404152; Total refs = 5000000000
Inst refs = 3369821573; Data refs = 1630178427

Number of reference types: [Percentage]

Reads = 1318509106 [26.37%]
Writes = 311669321 [6.23%]
Inst = 3369821573 [67.40%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3382095820 [30.60%]
Writes = 1141129742 [10.32%]
Inst = 6531178590 [59.08%]
Total = 11054404152

Average cycles per activity:

Read = 2.57; Write = 3.66; Inst. = 3.28

Memory Level: L1i

Hit Count = 5612752700 Miss Count = 32526438
Total Requests = 5645279138
Hit Rate = [99.42%] Miss Rate = [0.58%]
Kickouts = 32526182; Dirty kickouts = 0; Transfers = 32526438

Memory Level: L1d

Hit Count = 2000115150 Miss Count = 40129184
Total Requests = 2040244334
Hit Rate = [98.03%] Miss Rate = [1.97%]
Kickouts = 40128928; Dirty kickouts = 11410984; Transfers = 40129184

Memory Level: L2

Hit Count = 73305679 Miss Count = 10760927
Total Requests = 84066606
Hit Rate = [87.20%] Miss Rate = [12.80%]
Kickouts = 10759903; Dirty kickouts = 2714743; Transfers = 10760927

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$150; Memory cost = \$75
Total cost = \$1025

h264ref.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 11532376438; Total refs = 5000000000
Inst refs = 3369821573; Data refs = 1630178427

Number of reference types: [Percentage]

Reads = 1318509106 [26.37%]
Writes = 311669321 [6.23%]
Inst = 3369821573 [67.40%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3490722566 [30.27%]
Writes = 1212871058 [10.52%]
Inst = 6828782814 [59.21%]
Total = 11532376438

Average cycles per activity:

Read = 2.65; Write = 3.89; Inst. = 3.42

Memory Level: L1i

Hit Count = 5612752700 Miss Count = 32526438
Total Requests = 5645279138
Hit Rate = [99.42%] Miss Rate = [0.58%]
Kickouts = 32526182; Dirty kickouts = 0; Transfers = 32526438

Memory Level: L1d

Hit Count = 2000115150 Miss Count = 40129184
Total Requests = 2040244334
Hit Rate = [98.03%] Miss Rate = [1.97%]
Kickouts = 40128928; Dirty kickouts = 11410984; Transfers = 40129184

Memory Level: L2

Hit Count = 70547988 Miss Count = 13518618
Total Requests = 84066606
Hit Rate = [83.92%] Miss Rate = [16.08%]
Kickouts = 13517594; Dirty kickouts = 3252953; Transfers = 13518618

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

h264ref.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 10572006670; Total refs = 5000000000
Inst refs = 3369821573; Data refs = 1630178427

Number of reference types: [Percentage]

Reads = 1318509106 [26.37%]
Writes = 311669321 [6.23%]
Inst = 3369821573 [67.40%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3019057149 [28.56%]
Writes = 1055253181 [9.98%]
Inst = 6497696340 [61.46%]
Total = 10572006670

Average cycles per activity:

Read = 2.29; Write = 3.39; Inst. = 3.14

Memory Level: L1i

Hit Count = 5606534084 Miss Count = 38745054
Total Requests = 5645279138
Hit Rate = [99.31%] Miss Rate = [0.69%]
Kickouts = 38744798; Dirty kickouts = 0; Transfers = 38745054

Memory Level: L1d

Hit Count = 2015018762 Miss Count = 25225572
Total Requests = 2040244334
Hit Rate = [98.76%] Miss Rate = [1.24%]
Kickouts = 25225316; Dirty kickouts = 6950799; Transfers = 25225572

Memory Level: L2

Hit Count = 61706943 Miss Count = 9214482
Total Requests = 70921425
Hit Rate = [87.01%] Miss Rate = [12.99%]
Kickouts = 9213458; Dirty kickouts = 2446110; Transfers = 9214482

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

h264ref.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 15060822013; Total refs = 5000000000
Inst refs = 3369821573; Data refs = 1630178427

Number of reference types: [Percentage]

Reads = 1318509106 [26.37%]
Writes = 311669321 [6.23%]
Inst = 3369821573 [67.40%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 5806363198 [38.55%]
Writes = 1778199415 [11.81%]
Inst = 7476259400 [49.64%]
Total = 15060822013

Average cycles per activity:

Read = 4.40; Write = 5.71; Inst. = 4.47

Memory Level: L1i

Hit Count = 5609082886 Miss Count = 36196252
Total Requests = 5645279138
Hit Rate = [99.36%] Miss Rate = [0.64%]
Kickouts = 36195996; Dirty kickouts = 0; Transfers = 36196252

Memory Level: L1d

Hit Count = 1961918149 Miss Count = 78326185
Total Requests = 2040244334
Hit Rate = [96.16%] Miss Rate = [3.84%]
Kickouts = 78325929; Dirty kickouts = 21603969; Transfers = 78326185

Memory Level: L2

Hit Count = 107141928 Miss Count = 28984478
Total Requests = 136126406
Hit Rate = [78.71%] Miss Rate = [21.29%]
Kickouts = 28983454; Dirty kickouts = 6078713; Transfers = 28984478

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$525

h264ref.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 12635512514; Total refs = 5000000000
Inst refs = 3369821573; Data refs = 1630178427

Number of reference types: [Percentage]

Reads = 1318509106 [26.37%]
Writes = 311669321 [6.23%]
Inst = 3369821573 [67.40%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 4034033184 [31.93%]
Writes = 1446595712 [11.45%]
Inst = 7154883618 [56.63%]
Total = 12635512514

Average cycles per activity:

Read = 3.06; Write = 4.64; Inst. = 3.75

Memory Level: L1i

Hit Count = 5612752700 Miss Count = 32526438
Total Requests = 5645279138
Hit Rate = [99.42%] Miss Rate = [0.58%]
Kickouts = 32526182; Dirty kickouts = 0; Transfers = 32526438

Memory Level: L1d

Hit Count = 2000115150 Miss Count = 40129184
Total Requests = 2040244334
Hit Rate = [98.03%] Miss Rate = [1.97%]
Kickouts = 40128928; Dirty kickouts = 11410984; Transfers = 40129184

Memory Level: L2

Hit Count = 64279012 Miss Count = 19787594
Total Requests = 84066606
Hit Rate = [76.46%] Miss Rate = [23.54%]
Kickouts = 19786570; Dirty kickouts = 4594850; Transfers = 19787594

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$50; Memory cost = \$75

Total cost = \$925

h264ref.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 12539530457; Total refs = 5000000000
Inst refs = 3369821573; Data refs = 1630178427

Number of reference types: [Percentage]

Reads = 1318509106 [26.37%]
Writes = 311669321 [6.23%]
Inst = 3369821573 [67.40%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 4215796512 [33.62%]
Writes = 1349872025 [10.76%]
Inst = 6973861920 [55.62%]
Total = 12539530457

Average cycles per activity:

Read = 3.20; Write = 4.33; Inst. = 3.72

Memory Level: L1i

Hit Count = 5609082886 Miss Count = 36196252
Total Requests = 5645279138
Hit Rate = [99.36%] Miss Rate = [0.64%]
Kickouts = 36195996; Dirty kickouts = 0; Transfers = 36196252

Memory Level: L1d

Hit Count = 1961918149 Miss Count = 78326185
Total Requests = 2040244334
Hit Rate = [96.16%] Miss Rate = [3.84%]
Kickouts = 78325929; Dirty kickouts = 21603969; Transfers = 78326185

Memory Level: L2

Hit Count = 121805164 Miss Count = 14321242
Total Requests = 136126406
Hit Rate = [89.48%] Miss Rate = [10.52%]
Kickouts = 14320218; Dirty kickouts = 3361148; Transfers = 14321242

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

h264ref.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 11545220292; Total refs = 5000000000
Inst refs = 3369821573; Data refs = 1630178427

Number of reference types: [Percentage]

Reads = 1318509106 [26.37%]
Writes = 311669321 [6.23%]
Inst = 3369821573 [67.40%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3361858568 [29.12%]
Writes = 1317807436 [11.41%]
Inst = 6865554288 [59.47%]
Total = 11545220292

Average cycles per activity:

Read = 2.55; Write = 4.23; Inst. = 3.43

Memory Level: L1i

Hit Count = 5612752700 Miss Count = 32526438
Total Requests = 5645279138
Hit Rate = [99.42%] Miss Rate = [0.58%]
Kickouts = 32526182; Dirty kickouts = 0; Transfers = 32526438

Memory Level: L1d

Hit Count = 2000115150 Miss Count = 40129184
Total Requests = 2040244334
Hit Rate = [98.03%] Miss Rate = [1.97%]
Kickouts = 40128928; Dirty kickouts = 11410984; Transfers = 40129184

Memory Level: L2

Hit Count = 70832729 Miss Count = 13233877
Total Requests = 84066606
Hit Rate = [84.26%] Miss Rate = [15.74%]
Kickouts = 13231829; Dirty kickouts = 3641639; Transfers = 13233877

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

hmmer results

hammer.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 17527357776; Total refs = 5000000000
Inst refs = 3099867619; Data refs = 1900132381

Number of reference types: [Percentage]

Reads = 1458512164 [29.17%]
Writes = 441620217 [8.83%]
Inst = 3099867619 [62.00%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 6683420567 [38.13%]
Writes = 5493058317 [31.34%]
Inst = 5350878892 [30.53%]
Total = 17527357776

Average cycles per activity:

Read = 4.58; Write = 12.44; Inst. = 5.65

Memory Level: L1i

Hit Count = 5335586142 Miss Count = 75770
Total Requests = 5335661912
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 75514; Dirty kickouts = 0; Transfers = 75770

Memory Level: L1d

Hit Count = 2114833184 Miss Count = 302236987
Total Requests = 2417070171
Hit Rate = [87.50%] Miss Rate = [12.50%]
Kickouts = 302236731; Dirty kickouts = 129744596; Transfers = 302236987

Memory Level: L2

Hit Count = 422512085 Miss Count = 9545268
Total Requests = 432057353
Hit Rate = [97.79%] Miss Rate = [2.21%]
Kickouts = 9544244; Dirty kickouts = 8327044; Transfers = 9545268

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$150; Memory cost = \$75
Total cost = \$1025

hammer.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 17560234100; Total refs = 5000000000
Inst refs = 3099867619; Data refs = 1900132381

Number of reference types: [Percentage]

Reads = 1458512164 [29.17%]
Writes = 441620217 [8.83%]
Inst = 3099867619 [62.00%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 6738538145 [38.37%]
Writes = 5470608079 [31.15%]
Inst = 5351087876 [30.47%]
Total = 17560234100

Average cycles per activity:

Read = 4.62; Write = 12.39; Inst. = 5.66

Memory Level: L1i

Hit Count = 5335586142 Miss Count = 75770
Total Requests = 5335661912
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 75514; Dirty kickouts = 0; Transfers = 75770

Memory Level: L1d

Hit Count = 2114833184 Miss Count = 302236987
Total Requests = 2417070171
Hit Rate = [87.50%] Miss Rate = [12.50%]
Kickouts = 302236731; Dirty kickouts = 129744596; Transfers = 302236987

Memory Level: L2

Hit Count = 422294201 Miss Count = 9763152
Total Requests = 432057353
Hit Rate = [97.74%] Miss Rate = [2.26%]
Kickouts = 9762128; Dirty kickouts = 8334653; Transfers = 9763152

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$100; Memory cost = \$75

Total cost = \$975

hammer.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 11034082181; Total refs = 5000000000
Inst refs = 3099867619; Data refs = 1900132381

Number of reference types: [Percentage]

Reads = 1458512164 [29.17%]
Writes = 441620217 [8.83%]
Inst = 3099867619 [62.00%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 2528849045 [22.92%]
Writes = 3169003552 [28.72%]
Inst = 5336229584 [48.36%]
Total = 11034082181

Average cycles per activity:

Read = 1.73; Write = 7.18; Inst. = 3.56

Memory Level: L1i

Hit Count = 5335656434 Miss Count = 5478
Total Requests = 5335661912
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 5222; Dirty kickouts = 0; Transfers = 5478

Memory Level: L1d

Hit Count = 2388582881 Miss Count = 28487290
Total Requests = 2417070171
Hit Rate = [98.82%] Miss Rate = [1.18%]
Kickouts = 28487034; Dirty kickouts = 16666918; Transfers = 28487290

Memory Level: L2

Hit Count = 35815917 Miss Count = 9343769
Total Requests = 45159686
Hit Rate = [79.31%] Miss Rate = [20.69%]
Kickouts = 9342745; Dirty kickouts = 8329372; Transfers = 9343769

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600

L2 cache cost = \$550; Memory cost = \$75

Total cost = \$4225

hammer.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 19300058648; Total refs = 5000000000
Inst refs = 3099867619; Data refs = 1900132381

Number of reference types: [Percentage]

Reads = 1458512164 [29.17%]
Writes = 441620217 [8.83%]
Inst = 3099867619 [62.00%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 8901734438 [46.12%]
Writes = 5042116624 [26.12%]
Inst = 5356207586 [27.75%]
Total = 19300058648

Average cycles per activity:

Read = 6.10; Write = 11.42; Inst. = 6.23

Memory Level: L1i

Hit Count = 5335468264 Miss Count = 193648
Total Requests = 5335661912
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 193392; Dirty kickouts = 0; Transfers = 193648

Memory Level: L1d

Hit Count = 2107239056 Miss Count = 309831115
Total Requests = 2417070171
Hit Rate = [87.18%] Miss Rate = [12.82%]
Kickouts = 309830859; Dirty kickouts = 127042822; Transfers = 309831115

Memory Level: L2

Hit Count = 417948548 Miss Count = 19119037
Total Requests = 437067585
Hit Rate = [95.63%] Miss Rate = [4.37%]
Kickouts = 19118013; Dirty kickouts = 10377436; Transfers = 19119037

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400

L2 cache cost = \$50; Memory cost = \$75

Total cost = \$525

hammer.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 18998669942; Total refs = 5000000000
Inst refs = 3099867619; Data refs = 1900132381

Number of reference types: [Percentage]

Reads = 1458512164 [29.17%]
Writes = 441620217 [8.83%]
Inst = 3099867619 [62.00%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 8171959657 [43.01%]
Writes = 5476557345 [28.83%]
Inst = 5350152940 [28.16%]
Total = 18998669942

Average cycles per activity:

Read = 5.60; Write = 12.40; Inst. = 6.13

Memory Level: L1i

Hit Count = 5335586142 Miss Count = 75770
Total Requests = 5335661912
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 75514; Dirty kickouts = 0; Transfers = 75770

Memory Level: L1d

Hit Count = 2114833184 Miss Count = 302236987
Total Requests = 2417070171
Hit Rate = [87.50%] Miss Rate = [12.50%]
Kickouts = 302236731; Dirty kickouts = 129744596; Transfers = 302236987

Memory Level: L2

Hit Count = 413936114 Miss Count = 18121239
Total Requests = 432057353
Hit Rate = [95.81%] Miss Rate = [4.19%]
Kickouts = 18120215; Dirty kickouts = 9892904; Transfers = 18121239

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$925

hammer.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 17652295590; Total refs = 5000000000
Inst refs = 3099867619; Data refs = 1900132381

Number of reference types: [Percentage]

Reads = 1458512164 [29.17%]
Writes = 441620217 [8.83%]
Inst = 3099867619 [62.00%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 7322718042 [41.48%]
Writes = 4974719618 [28.18%]
Inst = 5354857930 [30.34%]
Total = 17652295590

Average cycles per activity:

Read = 5.02; Write = 11.26; Inst. = 5.69

Memory Level: L1i

Hit Count = 5335468264 Miss Count = 193648
Total Requests = 5335661912
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 193392; Dirty kickouts = 0; Transfers = 193648

Memory Level: L1d

Hit Count = 2107239056 Miss Count = 309831115
Total Requests = 2417070171
Hit Rate = [87.18%] Miss Rate = [12.82%]
Kickouts = 309830859; Dirty kickouts = 127042822; Transfers = 309831115

Memory Level: L2

Hit Count = 427281511 Miss Count = 9786074
Total Requests = 437067585
Hit Rate = [97.76%] Miss Rate = [2.24%]
Kickouts = 9785050; Dirty kickouts = 8340647; Transfers = 9786074

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

hammer.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 18141610750; Total refs = 5000000000
Inst refs = 3099867619; Data refs = 1900132381

Number of reference types: [Percentage]

Reads = 1458512164 [29.17%]
Writes = 441620217 [8.83%]
Inst = 3099867619 [62.00%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 7296947663 [40.22%]
Writes = 5493212553 [30.28%]
Inst = 5351450534 [29.50%]
Total = 18141610750

Average cycles per activity:

Read = 5.00; Write = 12.44; Inst. = 5.85

Memory Level: L1i

Hit Count = 5335586142 Miss Count = 75770
Total Requests = 5335661912
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 75514; Dirty kickouts = 0; Transfers = 75770

Memory Level: L1d

Hit Count = 2114833184 Miss Count = 302236987
Total Requests = 2417070171
Hit Rate = [87.50%] Miss Rate = [12.50%]
Kickouts = 302236731; Dirty kickouts = 129744596; Transfers = 302236987

Memory Level: L2

Hit Count = 418914196 Miss Count = 13143157
Total Requests = 432057353
Hit Rate = [96.96%] Miss Rate = [3.04%]
Kickouts = 13141109; Dirty kickouts = 8962481; Transfers = 13143157

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

libquantum results

libquantum.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 29970662679; Total refs = 5000000001
Inst refs = 3767555829; Data refs = 1232444172

Number of reference types: [Percentage]

Reads = 1083175795 [21.66%]
Writes = 149268377 [2.99%]
Inst = 3767555829 [75.35%]
Total = 5000000001

Total cycles for activities: [Percentage]

Reads = 24609862100 [82.11%]
Writes = 353316090 [1.18%]
Inst = 5007484489 [16.71%]
Total = 29970662679

Average cycles per activity:

Read = 22.72; Write = 2.37; Inst. = 7.95

Memory Level: L1i

Hit Count = 5006736635 Miss Count = 5134
Total Requests = 5006741769
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 4878; Dirty kickouts = 0; Transfers = 5134

Memory Level: L1d

Hit Count = 1922666906 Miss Count = 177349393
Total Requests = 2100016299
Hit Rate = [91.55%] Miss Rate = [8.45%]
Kickouts = 177349137; Dirty kickouts = 72829157; Transfers = 177349393

Memory Level: L2

Hit Count = 161436324 Miss Count = 88747360
Total Requests = 250183684
Hit Rate = [64.53%] Miss Rate = [35.47%]
Kickouts = 88746336; Dirty kickouts = 40903547; Transfers = 88747360

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$150; Memory cost = \$75

Total cost = \$1025

libquantum.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 29971322557; Total refs = 5000000001
Inst refs = 3767555829; Data refs = 1232444172

Number of reference types: [Percentage]

Reads = 1083175795 [21.66%]
Writes = 149268377 [2.99%]
Inst = 3767555829 [75.35%]
Total = 5000000001

Total cycles for activities: [Percentage]

Reads = 24610432296 [82.11%]
Writes = 353399652 [1.18%]
Inst = 5007490609 [16.71%]
Total = 29971322557

Average cycles per activity:

Read = 22.72; Write = 2.37; Inst. = 7.96

Memory Level: L1i

Hit Count = 5006736635 Miss Count = 5134
Total Requests = 5006741769
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 4878; Dirty kickouts = 0; Transfers = 5134

Memory Level: L1d

Hit Count = 1922666906 Miss Count = 177349393
Total Requests = 2100016299
Hit Rate = [91.55%] Miss Rate = [8.45%]
Kickouts = 177349137; Dirty kickouts = 72829157; Transfers = 177349393

Memory Level: L2

Hit Count = 161432721 Miss Count = 88750963
Total Requests = 250183684
Hit Rate = [64.53%] Miss Rate = [35.47%]
Kickouts = 88749939; Dirty kickouts = 40904503; Transfers = 88750963

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

libquantum.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 29970131165; Total refs = 5000000001
Inst refs = 3767555829; Data refs = 1232444172

Number of reference types: [Percentage]

Reads = 1083175795 [21.66%]
Writes = 149268377 [2.99%]
Inst = 3767555829 [75.35%]
Total = 5000000001

Total cycles for activities: [Percentage]

Reads = 24610005537 [82.12%]
Writes = 353105532 [1.18%]
Inst = 5007020096 [16.71%]
Total = 29970131165

Average cycles per activity:

Read = 22.72; Write = 2.37; Inst. = 7.95

Memory Level: L1i

Hit Count = 5006739332 Miss Count = 2437
Total Requests = 5006741769
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 2181; Dirty kickouts = 0; Transfers = 2437

Memory Level: L1d

Hit Count = 1922673369 Miss Count = 177342930
Total Requests = 2100016299
Hit Rate = [91.56%] Miss Rate = [8.44%]
Kickouts = 177342674; Dirty kickouts = 72824637; Transfers = 177342930

Memory Level: L2

Hit Count = 161424713 Miss Count = 88745291
Total Requests = 250170004
Hit Rate = [64.53%] Miss Rate = [35.47%]
Kickouts = 88744267; Dirty kickouts = 40903537; Transfers = 88745291

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

libquantum.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 30090872191; Total refs = 5000000001
Inst refs = 3767555829; Data refs = 1232444172

Number of reference types: [Percentage]

Reads = 1083175795 [21.66%]
Writes = 149268377 [2.99%]
Inst = 3767555829 [75.35%]
Total = 5000000001

Total cycles for activities: [Percentage]

Reads = 2471883337 [82.15%]
Writes = 364386966 [1.21%]
Inst = 5007651888 [16.64%]
Total = 30090872191

Average cycles per activity:

Read = 22.82; Write = 2.44; Inst. = 7.99

Memory Level: L1i

Hit Count = 5006734590 Miss Count = 7179
Total Requests = 5006741769
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 6923; Dirty kickouts = 0; Transfers = 7179

Memory Level: L1d

Hit Count = 1920423297 Miss Count = 179593002
Total Requests = 2100016299
Hit Rate = [91.45%] Miss Rate = [8.55%]
Kickouts = 179592746; Dirty kickouts = 73149858; Transfers = 179593002

Memory Level: L2

Hit Count = 163586826 Miss Count = 89163213
Total Requests = 252750039
Hit Rate = [64.72%] Miss Rate = [35.28%]
Kickouts = 89162189; Dirty kickouts = 41019173; Transfers = 89163213

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400

L2 cache cost = \$50; Memory cost = \$75

Total cost = \$525

libquantum.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 29977542917; Total refs = 5000000001
Inst refs = 3767555829; Data refs = 1232444172

Number of reference types: [Percentage]

Reads = 1083175795 [21.66%]
Writes = 149268377 [2.99%]
Inst = 3767555829 [75.35%]
Total = 5000000001

Total cycles for activities: [Percentage]

Reads = 24615392446 [82.11%]
Writes = 354698378 [1.18%]
Inst = 5007452093 [16.70%]
Total = 29977542917

Average cycles per activity:

Read = 22.73; Write = 2.38; Inst. = 7.96

Memory Level: L1i

Hit Count = 5006736635 Miss Count = 5134
Total Requests = 5006741769
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 4878; Dirty kickouts = 0; Transfers = 5134

Memory Level: L1d

Hit Count = 1922666906 Miss Count = 177349393
Total Requests = 2100016299
Hit Rate = [91.55%] Miss Rate = [8.45%]
Kickouts = 177349137; Dirty kickouts = 72829157; Transfers = 177349393

Memory Level: L2

Hit Count = 161393961 Miss Count = 88789723
Total Requests = 250183684
Hit Rate = [64.51%] Miss Rate = [35.49%]
Kickouts = 88788699; Dirty kickouts = 40908513; Transfers = 88789723

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$50; Memory cost = \$75

Total cost = \$925

libquantum.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 30014932033; Total refs = 5000000001
Inst refs = 3767555829; Data refs = 1232444172

Number of reference types: [Percentage]

Reads = 1083175795 [21.66%]
Writes = 149268377 [2.99%]
Inst = 3767555829 [75.35%]
Total = 5000000001

Total cycles for activities: [Percentage]

Reads = 24651531703 [82.13%]
Writes = 355684006 [1.19%]
Inst = 5007716324 [16.68%]
Total = 30014932033

Average cycles per activity:

Read = 22.76; Write = 2.38; Inst. = 7.97

Memory Level: L1i

Hit Count = 5006734590 Miss Count = 7179
Total Requests = 5006741769
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 6923; Dirty kickouts = 0; Transfers = 7179

Memory Level: L1d

Hit Count = 1920423297 Miss Count = 179593002
Total Requests = 2100016299
Hit Rate = [91.45%] Miss Rate = [8.55%]
Kickouts = 179592746; Dirty kickouts = 73149858; Transfers = 179593002

Memory Level: L2

Hit Count = 163998489 Miss Count = 88751550
Total Requests = 252750039
Hit Rate = [64.89%] Miss Rate = [35.11%]
Kickouts = 88750526; Dirty kickouts = 40906049; Transfers = 88751550

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

libquantum.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 29974597627; Total refs = 5000000001
Inst refs = 3767555829; Data refs = 1232444172

Number of reference types: [Percentage]

Reads = 1083175795 [21.66%]
Writes = 149268377 [2.99%]
Inst = 3767555829 [75.35%]
Total = 5000000001

Total cycles for activities: [Percentage]

Reads = 24613708262 [82.12%]
Writes = 353413154 [1.18%]
Inst = 5007476211 [16.71%]
Total = 29974597627

Average cycles per activity:

Read = 22.72; Write = 2.37; Inst. = 7.96

Memory Level: L1i

Hit Count = 5006736635 Miss Count = 5134
Total Requests = 5006741769
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 4878; Dirty kickouts = 0; Transfers = 5134

Memory Level: L1d

Hit Count = 1922666906 Miss Count = 177349393
Total Requests = 2100016299
Hit Rate = [91.55%] Miss Rate = [8.45%]
Kickouts = 177349137; Dirty kickouts = 72829157; Transfers = 177349393

Memory Level: L2

Hit Count = 161410476 Miss Count = 88773208
Total Requests = 250183684
Hit Rate = [64.52%] Miss Rate = [35.48%]
Kickouts = 88771160; Dirty kickouts = 40904698; Transfers = 88773208

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

mcf results

mcf.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 64587708787; Total refs = 5000000000
Inst refs = 3554558068; Data refs = 1445441932

Number of reference types: [Percentage]

Reads = 1184346362 [23.69%]
Writes = 261095570 [5.22%]
Inst = 3554558068 [71.09%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 56159742143 [86.95%]
Writes = 2802629522 [4.34%]
Inst = 5625337122 [8.71%]
Total = 64587708787

Average cycles per activity:

Read = 47.42; Write = 10.73; Inst. = 18.17

Memory Level: L1i

Hit Count = 5556837506 Miss Count = 3727791
Total Requests = 5560565297
Hit Rate = [99.93%] Miss Rate = [0.07%]
Kickouts = 3727535; Dirty kickouts = 0; Transfers = 3727791

Memory Level: L1d

Hit Count = 2222035229 Miss Count = 477920277
Total Requests = 2699955506
Hit Rate = [82.30%] Miss Rate = [17.70%]
Kickouts = 477920021; Dirty kickouts = 56907367; Transfers = 477920277

Memory Level: L2

Hit Count = 242256819 Miss Count = 296298616
Total Requests = 538555435
Hit Rate = [44.98%] Miss Rate = [55.02%]
Kickouts = 296297592; Dirty kickouts = 28350393; Transfers = 296298616

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$150; Memory cost = \$75
Total cost = \$1025

mcf.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 65762757685; Total refs = 5000000000
Inst refs = 3554558068; Data refs = 1445441932

Number of reference types: [Percentage]

Reads = 1184346362 [23.69%]
Writes = 261095570 [5.22%]
Inst = 3554558068 [71.09%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 57188910693 [86.96%]
Writes = 2937552140 [4.47%]
Inst = 5636294852 [8.57%]
Total = 65762757685

Average cycles per activity:

Read = 48.29; Write = 11.25; Inst. = 18.50

Memory Level: L1i

Hit Count = 5556837506 Miss Count = 3727791
Total Requests = 5560565297
Hit Rate = [99.93%] Miss Rate = [0.07%]
Kickouts = 3727535; Dirty kickouts = 0; Transfers = 3727791

Memory Level: L1d

Hit Count = 2222035229 Miss Count = 477920277
Total Requests = 2699955506
Hit Rate = [82.30%] Miss Rate = [17.70%]
Kickouts = 477920021; Dirty kickouts = 56907367; Transfers = 477920277

Memory Level: L2

Hit Count = 236482836 Miss Count = 302072599
Total Requests = 538555435
Hit Rate = [43.91%] Miss Rate = [56.09%]
Kickouts = 302071575; Dirty kickouts = 30722160; Transfers = 302072599

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$100; Memory cost = \$75

Total cost = \$975

mcf.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 64006419233; Total refs = 5000000000
Inst refs = 3554558068; Data refs = 1445441932

Number of reference types: [Percentage]

Reads = 1184346362 [23.69%]
Writes = 261095570 [5.22%]
Inst = 3554558068 [71.09%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 55731988539 [87.07%]
Writes = 2713525247 [4.24%]
Inst = 5560905447 [8.69%]
Total = 64006419233

Average cycles per activity:

Read = 47.06; Write = 10.39; Inst. = 18.01

Memory Level: L1i

Hit Count = 5560562431 Miss Count = 2866
Total Requests = 5560565297
Hit Rate = [100.00%] Miss Rate = [0.00%]
Kickouts = 2610; Dirty kickouts = 0; Transfers = 2866

Memory Level: L1d

Hit Count = 2228332896 Miss Count = 471622610
Total Requests = 2699955506
Hit Rate = [82.53%] Miss Rate = [17.47%]
Kickouts = 471622354; Dirty kickouts = 56471083; Transfers = 471622610

Memory Level: L2

Hit Count = 232651854 Miss Count = 295444705
Total Requests = 528096559
Hit Rate = [44.05%] Miss Rate = [55.95%]
Kickouts = 295443681; Dirty kickouts = 26355722; Transfers = 295444705

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

mcf.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 69001516345; Total refs = 5000000000
Inst refs = 3554558068; Data refs = 1445441932

Number of reference types: [Percentage]

Reads = 1184346362 [23.69%]
Writes = 261095570 [5.22%]
Inst = 3554558068 [71.09%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 59662300021 [86.47%]
Writes = 3584983790 [5.20%]
Inst = 5754232534 [8.34%]
Total = 69001516345

Average cycles per activity:

Read = 50.38; Write = 13.73; Inst. = 19.41

Memory Level: L1i

Hit Count = 5553186526 Miss Count = 7378771
Total Requests = 5560565297
Hit Rate = [99.87%] Miss Rate = [0.13%]
Kickouts = 7378515; Dirty kickouts = 0; Transfers = 7378771

Memory Level: L1d

Hit Count = 2208579079 Miss Count = 491376427
Total Requests = 2699955506
Hit Rate = [81.80%] Miss Rate = [18.20%]
Kickouts = 491376171; Dirty kickouts = 61081061; Transfers = 491376427

Memory Level: L2

Hit Count = 244156909 Miss Count = 315679350
Total Requests = 559836259
Hit Rate = [43.61%] Miss Rate = [56.39%]
Kickouts = 315678326; Dirty kickouts = 37111965; Transfers = 315679350

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$525

mcf.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 68203945143; Total refs = 5000000000
Inst refs = 3554558068; Data refs = 1445441932

Number of reference types: [Percentage]

Reads = 1184346362 [23.69%]
Writes = 261095570 [5.22%]
Inst = 3554558068 [71.09%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 59159947855 [86.74%]
Writes = 3357610480 [4.92%]
Inst = 5686386808 [8.34%]
Total = 68203945143

Average cycles per activity:

Read = 49.95; Write = 12.86; Inst. = 19.19

Memory Level: L1i

Hit Count = 5556837506 Miss Count = 3727791
Total Requests = 5560565297
Hit Rate = [99.93%] Miss Rate = [0.07%]
Kickouts = 3727535; Dirty kickouts = 0; Transfers = 3727791

Memory Level: L1d

Hit Count = 2222035229 Miss Count = 477920277
Total Requests = 2699955506
Hit Rate = [82.30%] Miss Rate = [17.70%]
Kickouts = 477920021; Dirty kickouts = 56907367; Transfers = 477920277

Memory Level: L2

Hit Count = 224412753 Miss Count = 314142682
Total Requests = 538555435
Hit Rate = [41.67%] Miss Rate = [58.33%]
Kickouts = 314141658; Dirty kickouts = 35571841; Transfers = 314142682

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$925

mcf.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 66148639025; Total refs = 5000000000
Inst refs = 3554558068; Data refs = 1445441932

Number of reference types: [Percentage]

Reads = 1184346362 [23.69%]
Writes = 261095570 [5.22%]
Inst = 3554558068 [71.09%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 57447468513 [86.85%]
Writes = 2998201112 [4.53%]
Inst = 5702969400 [8.62%]
Total = 66148639025

Average cycles per activity:

Read = 48.51; Write = 11.48; Inst. = 18.61

Memory Level: L1i

Hit Count = 5553186526 Miss Count = 7378771
Total Requests = 5560565297
Hit Rate = [99.87%] Miss Rate = [0.13%]
Kickouts = 7378515; Dirty kickouts = 0; Transfers = 7378771

Memory Level: L1d

Hit Count = 2208579079 Miss Count = 491376427
Total Requests = 2699955506
Hit Rate = [81.80%] Miss Rate = [18.20%]
Kickouts = 491376171; Dirty kickouts = 61081061; Transfers = 491376427

Memory Level: L2

Hit Count = 257890049 Miss Count = 301946210
Total Requests = 559836259
Hit Rate = [46.07%] Miss Rate = [53.93%]
Kickouts = 301945186; Dirty kickouts = 31055973; Transfers = 301946210

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

mcf.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 61642585531; Total refs = 5000000000
Inst refs = 3554558068; Data refs = 1445441932

Number of reference types: [Percentage]

Reads = 1184346362 [23.69%]
Writes = 261095570 [5.22%]
Inst = 3554558068 [71.09%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 52912454089 [85.84%]
Writes = 3102818564 [5.03%]
Inst = 5627312878 [9.13%]
Total = 61642585531

Average cycles per activity:

Read = 44.68; Write = 11.88; Inst. = 17.34

Memory Level: L1i b

Hit Count = 5556837506 Miss Count = 3727791
Total Requests = 5560565297
Hit Rate = [99.93%] Miss Rate = [0.07%]
Kickouts = 3727535; Dirty kickouts = 0; Transfers = 3727791

Memory Level: L1d

Hit Count = 2222035229 Miss Count = 477920277
Total Requests = 2699955506
Hit Rate = [82.30%] Miss Rate = [17.70%]
Kickouts = 477920021; Dirty kickouts = 56907367; Transfers = 477920277

Memory Level: L2

Hit Count = 264388875 Miss Count = 274166560
Total Requests = 538555435
Hit Rate = [49.09%] Miss Rate = [50.91%]
Kickouts = 274164512; Dirty kickouts = 30394371; Transfers = 274166560

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

omnetpp results

omnetpp.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 24624143952; Total refs = 5000000000
Inst refs = 3378592184; Data refs = 1621407816

Number of reference types: [Percentage]

Reads = 1003285503 [20.07%]
Writes = 618122313 [12.36%]
Inst = 3378592184 [67.57%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 10812702131 [43.91%]
Writes = 2884530741 [11.71%]
Inst = 10926911080 [44.37%]
Total = 24624143952

Average cycles per activity:

Read = 10.78; Write = 4.67; Inst. = 7.29

Memory Level: L1i

Hit Count = 5562290006 Miss Count = 169506523
Total Requests = 5731796529
Hit Rate = [97.04%] Miss Rate = [2.96%]
Kickouts = 169506267; Dirty kickouts = 0; Transfers = 169506523

Memory Level: L1d

Hit Count = 2831035564 Miss Count = 128933838
Total Requests = 2959969402
Hit Rate = [95.64%] Miss Rate = [4.36%]
Kickouts = 128933582; Dirty kickouts = 52662659; Transfers = 128933838

Memory Level: L2

Hit Count = 297846930 Miss Count = 53256090
Total Requests = 351103020
Hit Rate = [84.83%] Miss Rate = [15.17%]
Kickouts = 53255066; Dirty kickouts = 16006430; Transfers = 53256090

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$150; Memory cost = \$75

Total cost = \$1025

omnetpp.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 26731294078; Total refs = 5000000000
Inst refs = 3378592184; Data refs = 1621407816

Number of reference types: [Percentage]

Reads = 1003285503 [20.07%]
Writes = 618122313 [12.36%]
Inst = 3378592184 [67.57%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 11634865463 [43.53%]
Writes = 3006093279 [11.25%]
Inst = 12090335336 [45.23%]
Total = 26731294078

Average cycles per activity:

Read = 11.60; Write = 4.86; Inst. = 7.91

Memory Level: L1i

Hit Count = 5562290006 Miss Count = 169506523
Total Requests = 5731796529
Hit Rate = [97.04%] Miss Rate = [2.96%]
Kickouts = 169506267; Dirty kickouts = 0; Transfers = 169506523

Memory Level: L1d

Hit Count = 2831035564 Miss Count = 128933838
Total Requests = 2959969402
Hit Rate = [95.64%] Miss Rate = [4.36%]
Kickouts = 128933582; Dirty kickouts = 52662659; Transfers = 128933838

Memory Level: L2

Hit Count = 285155479 Miss Count = 65947541
Total Requests = 351103020
Hit Rate = [81.22%] Miss Rate = [18.78%]
Kickouts = 65946517; Dirty kickouts = 17822132; Transfers = 65947541

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

omnetpp.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 21350619282; Total refs = 5000000000
Inst refs = 3378592184; Data refs = 1621407816

Number of reference types: [Percentage]

Reads = 1003285503 [20.07%]
Writes = 618122313 [12.36%]
Inst = 3378592184 [67.57%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 9609039874 [45.01%]
Writes = 2781024934 [13.03%]
Inst = 8960554474 [41.97%]
Total = 21350619282

Average cycles per activity:

Read = 9.58; Write = 4.50; Inst. = 6.32

Memory Level: L1i

Hit Count = 5629221660 Miss Count = 102574869
Total Requests = 5731796529
Hit Rate = [98.21%] Miss Rate = [1.79%]
Kickouts = 102574613; Dirty kickouts = 0; Transfers = 102574869

Memory Level: L1d

Hit Count = 2872587378 Miss Count = 87382024
Total Requests = 2959969402
Hit Rate = [97.05%] Miss Rate = [2.95%]
Kickouts = 87381768; Dirty kickouts = 35789727; Transfers = 87382024

Memory Level: L2

Hit Count = 179655647 Miss Count = 46090973
Total Requests = 225746620
Hit Rate = [79.58%] Miss Rate = [20.42%]
Kickouts = 46089949; Dirty kickouts = 15197632; Transfers = 46090973

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

omnetpp.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 38112996044; Total refs = 5000000000
Inst refs = 3378592184; Data refs = 1621407816

Number of reference types: [Percentage]

Reads = 1003285503 [20.07%]
Writes = 618122313 [12.36%]
Inst = 3378592184 [67.57%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 17170126019 [45.05%]
Writes = 4025729142 [10.56%]
Inst = 16917140883 [44.39%]
Total = 38112996044

Average cycles per activity:

Read = 17.11; Write = 6.51; Inst. = 11.28

Memory Level: L1i

Hit Count = 5504343699 Miss Count = 227452830
Total Requests = 5731796529
Hit Rate = [96.03%] Miss Rate = [3.97%]
Kickouts = 227452574; Dirty kickouts = 0; Transfers = 227452830

Memory Level: L1d

Hit Count = 2777241685 Miss Count = 182727717
Total Requests = 2959969402
Hit Rate = [93.83%] Miss Rate = [6.17%]
Kickouts = 182727461; Dirty kickouts = 81269890; Transfers = 182727717

Memory Level: L2

Hit Count = 376230358 Miss Count = 115220079
Total Requests = 491450437
Hit Rate = [76.56%] Miss Rate = [23.44%]
Kickouts = 115219055; Dirty kickouts = 30897936; Transfers = 115220079

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$525

omnetpp.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 32288001088; Total refs = 5000000000
Inst refs = 3378592184; Data refs = 1621407816

Number of reference types: [Percentage]

Reads = 1003285503 [20.07%]
Writes = 618122313 [12.36%]
Inst = 3378592184 [67.57%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 14172071139 [43.89%]
Writes = 3440137319 [10.65%]
Inst = 14675792630 [45.45%]
Total = 32288001088

Average cycles per activity:

Read = 14.13; Write = 5.57; Inst. = 9.56

Memory Level: L1i

Hit Count = 5562290006 Miss Count = 169506523
Total Requests = 5731796529
Hit Rate = [97.04%] Miss Rate = [2.96%]
Kickouts = 169506267; Dirty kickouts = 0; Transfers = 169506523

Memory Level: L1d

Hit Count = 2831035564 Miss Count = 128933838
Total Requests = 2959969402
Hit Rate = [95.64%] Miss Rate = [4.36%]
Kickouts = 128933582; Dirty kickouts = 52662659; Transfers = 128933838

Memory Level: L2

Hit Count = 253772464 Miss Count = 97330556
Total Requests = 351103020
Hit Rate = [72.28%] Miss Rate = [27.72%]
Kickouts = 97329532; Dirty kickouts = 24784895; Transfers = 97330556

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$925

omnetpp.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 29625290268; Total refs = 5000000000
Inst refs = 3378592184; Data refs = 1621407816

Number of reference types: [Percentage]

Reads = 1003285503 [20.07%]
Writes = 618122313 [12.36%]
Inst = 3378592184 [67.57%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 12769534275 [43.10%]
Writes = 3248658338 [10.97%]
Inst = 13607097655 [45.93%]
Total = 29625290268

Average cycles per activity:

Read = 12.73; Write = 5.26; Inst. = 8.77

Memory Level: L1i

Hit Count = 5504343699 Miss Count = 227452830
Total Requests = 5731796529
Hit Rate = [96.03%] Miss Rate = [3.97%]
Kickouts = 227452574; Dirty kickouts = 0; Transfers = 227452830

Memory Level: L1d

Hit Count = 2777241685 Miss Count = 182727717
Total Requests = 2959969402
Hit Rate = [93.83%] Miss Rate = [6.17%]
Kickouts = 182727461; Dirty kickouts = 81269890; Transfers = 182727717

Memory Level: L2

Hit Count = 422138664 Miss Count = 69311773
Total Requests = 491450437
Hit Rate = [85.90%] Miss Rate = [14.10%]
Kickouts = 69310749; Dirty kickouts = 18147271; Transfers = 69311773

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

omnetpp.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 25432866562; Total refs = 5000000000
Inst refs = 3378592184; Data refs = 1621407816

Number of reference types: [Percentage]

Reads = 1003285503 [20.07%]
Writes = 618122313 [12.36%]
Inst = 3378592184 [67.57%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 10452319647 [41.10%]
Writes = 2742125121 [10.78%]
Inst = 12238421794 [48.12%]
Total = 25432866562

Average cycles per activity:

Read = 10.42; Write = 4.44; Inst. = 7.53

Memory Level: L1i

Hit Count = 5562290006 Miss Count = 169506523
Total Requests = 5731796529
Hit Rate = [97.04%] Miss Rate = [2.96%]
Kickouts = 169506267; Dirty kickouts = 0; Transfers = 169506523

Memory Level: L1d

Hit Count = 2831035564 Miss Count = 128933838
Total Requests = 2959969402
Hit Rate = [95.64%] Miss Rate = [4.36%]
Kickouts = 128933582; Dirty kickouts = 52662659; Transfers = 128933838

Memory Level: L2

Hit Count = 291485025 Miss Count = 59617995
Total Requests = 351103020
Hit Rate = [83.02%] Miss Rate = [16.98%]
Kickouts = 59615947; Dirty kickouts = 15148462; Transfers = 59617995

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

sjeng results - 16 byte chunksize

sjeng.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 16484929329; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3065836395 [18.60%]
Writes = 4306099762 [26.12%]
Inst = 9112993172 [55.28%]
Total = 16484929329

Average cycles per activity:

Read = 3.25; Write = 11.16; Inst. = 4.49

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 188261297 Miss Count = 22227279
Total Requests = 210488576
Hit Rate = [89.44%] Miss Rate = [10.56%]
Kickouts = 22226255; Dirty kickouts = 12216342; Transfers = 22227279

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

sjeng.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 14139701025; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 1961018059 [13.87%]
Writes = 3843641666 [27.18%]
Inst = 8335041300 [58.95%]
Total = 14139701025

Average cycles per activity:

Read = 2.08; Write = 9.96; Inst. = 3.85

Memory Level: L1i

Hit Count = 6149998030 Miss Count = 117961620
Total Requests = 6267959650
Hit Rate = [98.12%] Miss Rate = [1.88%]
Kickouts = 117961364; Dirty kickouts = 0; Transfers = 117961620

Memory Level: L1d

Hit Count = 1677223669 Miss Count = 42742511
Total Requests = 1719966180
Hit Rate = [97.51%] Miss Rate = [2.49%]
Kickouts = 42742255; Dirty kickouts = 28288596; Transfers = 42742511

Memory Level: L2

Hit Count = 178032175 Miss Count = 10960552
Total Requests = 188992727
Hit Rate = [94.20%] Miss Rate = [5.80%]
Kickouts = 10959528; Dirty kickouts = 9763906; Transfers = 10960552

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$75
Total cost = \$4225

sjeng.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 20451581796; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 4901784903 [23.97%]
Writes = 4733673095 [23.15%]
Inst = 10816123798 [52.89%]
Total = 20451581796

Average cycles per activity:

Read = 5.19; Write = 12.27; Inst. = 5.57

Memory Level: L1i

Hit Count = 6153493906 Miss Count = 114465744
Total Requests = 6267959650
Hit Rate = [98.17%] Miss Rate = [1.83%]
Kickouts = 114465488; Dirty kickouts = 0; Transfers = 114465744

Memory Level: L1d

Hit Count = 1620645788 Miss Count = 99320392
Total Requests = 1719966180
Hit Rate = [94.23%] Miss Rate = [5.77%]
Kickouts = 99320136; Dirty kickouts = 47314155; Transfers = 99320392

Memory Level: L2

Hit Count = 220160792 Miss Count = 40939499
Total Requests = 261100291
Hit Rate = [84.32%] Miss Rate = [15.68%]
Kickouts = 40938475; Dirty kickouts = 14964988; Transfers = 40939499

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400

L2 cache cost = \$50; Memory cost = \$75

Total cost = \$525

sjeng.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 18975932191; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3983730189 [20.99%]
Writes = 4505228388 [23.74%]
Inst = 10486973614 [55.26%]
Total = 18975932191

Average cycles per activity:

Read = 4.22; Write = 11.68; Inst. = 5.17

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 172976270 Miss Count = 37512306
Total Requests = 210488576
Hit Rate = [82.18%] Miss Rate = [17.82%]
Kickouts = 37511282; Dirty kickouts = 14069120; Transfers = 37512306

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$50; Memory cost = \$75
Total cost = \$925

sjeng.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 17344705544; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3612182955 [20.83%]
Writes = 4422931907 [25.50%]
Inst = 9309590682 [53.67%]
Total = 17344705544

Average cycles per activity:

Read = 3.83; Write = 11.46; Inst. = 4.73

Memory Level: L1i

Hit Count = 6153493906 Miss Count = 114465744
Total Requests = 6267959650
Hit Rate = [98.17%] Miss Rate = [1.83%]
Kickouts = 114465488; Dirty kickouts = 0; Transfers = 114465744

Memory Level: L1d

Hit Count = 1620645788 Miss Count = 99320392
Total Requests = 1719966180
Hit Rate = [94.23%] Miss Rate = [5.77%]
Kickouts = 99320136; Dirty kickouts = 47314155; Transfers = 99320392

Memory Level: L2

Hit Count = 238682704 Miss Count = 22417587
Total Requests = 261100291
Hit Rate = [91.41%] Miss Rate = [8.59%]
Kickouts = 22416563; Dirty kickouts = 12088723; Transfers = 22417587

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$575

sjeng.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 16062181067; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3014187529 [18.77%]
Writes = 4251838506 [26.47%]
Inst = 8796155032 [54.76%]
Total = 16062181067

Average cycles per activity:

Read = 3.19; Write = 11.02; Inst. = 4.38

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 190788074 Miss Count = 19700502
Total Requests = 210488576
Hit Rate = [90.64%] Miss Rate = [9.36%]
Kickouts = 19698454; Dirty kickouts = 11831779; Transfers = 19700502

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$75
Total cost = \$975

sjeng.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 16 : chunktime = 20

Execute time = 15703613311; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 2790253285 [17.77%]
Writes = 4288695826 [27.31%]
Inst = 8624664200 [54.92%]
Total = 15703613311

Average cycles per activity:

Read = 2.96; Write = 11.12; Inst. = 4.28

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 193045090 Miss Count = 17443486
Total Requests = 210488576
Hit Rate = [91.71%] Miss Rate = [8.29%]
Kickouts = 17442462; Dirty kickouts = 11624326; Transfers = 17443486

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$150; Memory cost = \$75
Total cost = \$1025

sjeng results - 32 byte chunksize

sjeng_32_memWidth.2-4-way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 32 : chunktime = 20

Execute time = 14540900831; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 2561371245 [17.61%]
Writes = 3505089746 [24.11%]
Inst = 8474439840 [58.28%]
Total = 14540900831

Average cycles per activity:

Read = 2.71; Write = 9.08; Inst. = 3.96

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 193045090 Miss Count = 17443486
Total Requests = 210488576
Hit Rate = [91.71%] Miss Rate = [8.29%]
Kickouts = 17442462; Dirty kickouts = 11624326; Transfers = 17443486

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$150; Memory cost = \$175

Total cost = \$1125

sjeng_32_memWidth.All-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 32 : chunktime = 20

Execute time = 15107184489; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 2761338715 [18.28%]
Writes = 3518035082 [23.29%]
Inst = 8827810692 [58.43%]
Total = 15107184489

Average cycles per activity:

Read = 2.93; Write = 9.12; Inst. = 4.12

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 188261297 Miss Count = 22227279
Total Requests = 210488576
Hit Rate = [89.44%] Miss Rate = [10.56%]
Kickouts = 22226255; Dirty kickouts = 12216342; Transfers = 22227279

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$100; Memory cost = \$175

Total cost = \$1075

sjeng_32_memWidth.All-FA Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 32 : chunktime = 20

Execute time = 13310722705; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 1842293859 [13.84%]
Writes = 3150547706 [23.67%]
Inst = 8317881140 [62.49%]
Total = 13310722705

Average cycles per activity:

Read = 1.95; Write = 8.17; Inst. = 3.63

Memory Level: L1i

Hit Count = 6149998030 Miss Count = 117961620
Total Requests = 6267959650
Hit Rate = [98.12%] Miss Rate = [1.88%]
Kickouts = 117961364; Dirty kickouts = 0; Transfers = 117961620

Memory Level: L1d

Hit Count = 1677223669 Miss Count = 42742511
Total Requests = 1719966180
Hit Rate = [97.51%] Miss Rate = [2.49%]
Kickouts = 42742255; Dirty kickouts = 28288596; Transfers = 42742511

Memory Level: L2

Hit Count = 178032175 Miss Count = 10960552
Total Requests = 188992727
Hit Rate = [94.20%] Miss Rate = [5.80%]
Kickouts = 10959528; Dirty kickouts = 9763906; Transfers = 10960552

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$175
Total cost = \$4325

sjeng_32_memWidth.default Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 32 : chunktime = 20

Execute time = 18215402316; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 4254281623 [23.36%]
Writes = 3862741495 [21.21%]
Inst = 10098379198 [55.44%]
Total = 18215402316

Average cycles per activity:

Read = 4.51; Write = 10.01; Inst. = 4.96

Memory Level: L1i

Hit Count = 6153493906 Miss Count = 114465744
Total Requests = 6267959650
Hit Rate = [98.17%] Miss Rate = [1.83%]
Kickouts = 114465488; Dirty kickouts = 0; Transfers = 114465744

Memory Level: L1d

Hit Count = 1620645788 Miss Count = 99320392
Total Requests = 1719966180
Hit Rate = [94.23%] Miss Rate = [5.77%]
Kickouts = 99320136; Dirty kickouts = 47314155; Transfers = 99320392

Memory Level: L2

Hit Count = 220160792 Miss Count = 40939499
Total Requests = 261100291
Hit Rate = [84.32%] Miss Rate = [15.68%]
Kickouts = 40938475; Dirty kickouts = 14964988; Transfers = 40939499

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$175
Total cost = \$625

sjeng_32_memWidth.L1-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 32 : chunktime = 20

Execute time = 16912675151; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3426637309 [20.26%]
Writes = 3662511588 [21.66%]
Inst = 9823526254 [58.08%]
Total = 16912675151

Average cycles per activity:

Read = 3.63; Write = 9.49; Inst. = 4.61

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 172976270 Miss Count = 37512306
Total Requests = 210488576
Hit Rate = [82.18%] Miss Rate = [17.82%]
Kickouts = 37511282; Dirty kickouts = 14069120; Transfers = 37512306

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$50; Memory cost = \$175

Total cost = \$1025

sjeng_32_memWidth.L2-2way Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 32 : chunktime = 20

Execute time = 15964453144; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3320227315 [20.80%]
Writes = 3637679347 [22.79%]
Inst = 9006546482 [56.42%]
Total = 15964453144

Average cycles per activity:

Read = 3.52; Write = 9.43; Inst. = 4.35

Memory Level: L1i

Hit Count = 6153493906 Miss Count = 114465744
Total Requests = 6267959650
Hit Rate = [98.17%] Miss Rate = [1.83%]
Kickouts = 114465488; Dirty kickouts = 0; Transfers = 114465744

Memory Level: L1d

Hit Count = 1620645788 Miss Count = 99320392
Total Requests = 1719966180
Hit Rate = [94.23%] Miss Rate = [5.77%]
Kickouts = 99320136; Dirty kickouts = 47314155; Transfers = 99320392

Memory Level: L2

Hit Count = 238682704 Miss Count = 22417587
Total Requests = 261100291
Hit Rate = [91.41%] Miss Rate = [8.59%]
Kickouts = 22416563; Dirty kickouts = 12088723; Transfers = 22417587

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$175
Total cost = \$675

sjeng_32_memWidth.L2-Big Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 32 : chunktime = 20

Execute time = 14800889827; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 2723557449 [18.40%]
Writes = 3478965786 [23.51%]
Inst = 8598366592 [58.09%]
Total = 14800889827

Average cycles per activity:

Read = 2.89; Write = 9.02; Inst. = 4.03

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 190788074 Miss Count = 19700502
Total Requests = 210488576
Hit Rate = [90.64%] Miss Rate = [9.36%]
Kickouts = 19698454; Dirty kickouts = 11831779; Transfers = 19700502

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$175
Total cost = \$1075

##sjeng results - 64 byte chunksize

sjeng_64_memWidth.2-4-way_64 Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 4 : block size = 64
Memory ready time = 50 chunksize = 64 : chunktime = 20

Execute time = 13959544591; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 2446930225 [17.53%]
Writes = 3113286706 [22.30%]
Inst = 8399327660 [60.17%]
Total = 13959544591

Average cycles per activity:

Read = 2.59; Write = 8.07; Inst. = 3.80

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 193045090 Miss Count = 17443486
Total Requests = 210488576
Hit Rate = [91.71%] Miss Rate = [8.29%]
Kickouts = 17442462; Dirty kickouts = 11624326; Transfers = 17443486

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$150; Memory cost = \$275

Total cost = \$1225

sjeng_64_memWidth.All-2way_64 Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 64 : chunktime = 20

Execute time = 14418312069; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 2609089875 [18.10%]
Writes = 3124002742 [21.67%]
Inst = 8685219452 [60.24%]
Total = 14418312069

Average cycles per activity:

Read = 2.76; Write = 8.10; Inst. = 3.93

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 188261297 Miss Count = 22227279
Total Requests = 210488576
Hit Rate = [89.44%] Miss Rate = [10.56%]
Kickouts = 22226255; Dirty kickouts = 12216342; Transfers = 22227279

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800

L2 cache cost = \$100; Memory cost = \$275

Total cost = \$1175

sjeng_64_memWidth.All-FA_64 Simulation Results

Memory system:

Dcache size = 8192 : ways = 256 : block size = 32
Icache size = 8192 : ways = 256 : block size = 32
L2-cache size = 65536 : ways = 1024 : block size = 64
Memory ready time = 50 chunksize = 64 : chunktime = 20

Execute time = 12896233545; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 1782931759 [13.83%]
Writes = 2804000726 [21.74%]
Inst = 8309301060 [64.43%]
Total = 12896233545

Average cycles per activity:

Read = 1.89; Write = 7.27; Inst. = 3.51

Memory Level: L1i

Hit Count = 6149998030 Miss Count = 117961620
Total Requests = 6267959650
Hit Rate = [98.12%] Miss Rate = [1.88%]
Kickouts = 117961364; Dirty kickouts = 0; Transfers = 117961620

Memory Level: L1d

Hit Count = 1677223669 Miss Count = 42742511
Total Requests = 1719966180
Hit Rate = [97.51%] Miss Rate = [2.49%]
Kickouts = 42742255; Dirty kickouts = 28288596; Transfers = 42742511

Memory Level: L2

Hit Count = 178032175 Miss Count = 10960552
Total Requests = 188992727
Hit Rate = [94.20%] Miss Rate = [5.80%]
Kickouts = 10959528; Dirty kickouts = 9763906; Transfers = 10960552

L1 cache cost (Icache \$1800) + (Dcache \$1800) = \$3600
L2 cache cost = \$550; Memory cost = \$275
Total cost = \$4425

sjeng_64_memWidth.default_64 Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 64 : chunktime = 20

Execute time = 17097312576; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3930529983 [22.99%]
Writes = 3427275695 [20.05%]
Inst = 9739506898 [56.97%]
Total = 17097312576

Average cycles per activity:

Read = 4.17; Write = 8.88; Inst. = 4.66

Memory Level: L1i

Hit Count = 6153493906 Miss Count = 114465744
Total Requests = 6267959650
Hit Rate = [98.17%] Miss Rate = [1.83%]
Kickouts = 114465488; Dirty kickouts = 0; Transfers = 114465744

Memory Level: L1d

Hit Count = 1620645788 Miss Count = 99320392
Total Requests = 1719966180
Hit Rate = [94.23%] Miss Rate = [5.77%]
Kickouts = 99320136; Dirty kickouts = 47314155; Transfers = 99320392

Memory Level: L2

Hit Count = 220160792 Miss Count = 40939499
Total Requests = 261100291
Hit Rate = [84.32%] Miss Rate = [15.68%]
Kickouts = 40938475; Dirty kickouts = 14964988; Transfers = 40939499

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$50; Memory cost = \$275
Total cost = \$725

sjeng_64_memWidth.L1-2way_64 Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 65536 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 64 : chunktime = 20

Execute time = 15881046631; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3148090869 [19.82%]
Writes = 3241153188 [20.41%]
Inst = 9491802574 [59.77%]
Total = 15881046631

Average cycles per activity:

Read = 3.34; Write = 8.40; Inst. = 4.33

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 172976270 Miss Count = 37512306
Total Requests = 210488576
Hit Rate = [82.18%] Miss Rate = [17.82%]
Kickouts = 37511282; Dirty kickouts = 14069120; Transfers = 37512306

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$50; Memory cost = \$275
Total cost = \$1125

sjeng_64_memWidth.L2-2way_64 Simulation Results

Memory system:

Dcache size = 8192 : ways = 1 : block size = 32
Icache size = 8192 : ways = 1 : block size = 32
L2-cache size = 65536 : ways = 2 : block size = 64
Memory ready time = 50 chunksize = 64 : chunktime = 20

Execute time = 15274326944; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 3174249495 [20.78%]
Writes = 3245053067 [21.25%]
Inst = 8855024382 [57.97%]
Total = 15274326944

Average cycles per activity:

Read = 3.36; Write = 8.41; Inst. = 4.16

Memory Level: L1i

Hit Count = 6153493906 Miss Count = 114465744
Total Requests = 6267959650
Hit Rate = [98.17%] Miss Rate = [1.83%]
Kickouts = 114465488; Dirty kickouts = 0; Transfers = 114465744

Memory Level: L1d

Hit Count = 1620645788 Miss Count = 99320392
Total Requests = 1719966180
Hit Rate = [94.23%] Miss Rate = [5.77%]
Kickouts = 99320136; Dirty kickouts = 47314155; Transfers = 99320392

Memory Level: L2

Hit Count = 238682704 Miss Count = 22417587
Total Requests = 261100291
Hit Rate = [91.41%] Miss Rate = [8.59%]
Kickouts = 22416563; Dirty kickouts = 12088723; Transfers = 22417587

L1 cache cost (Icache \$200) + (Dcache \$200) = \$400
L2 cache cost = \$100; Memory cost = \$275
Total cost = \$775

sjeng_64_memWidth.L2-Big_64 Simulation Results

Memory system:

Dcache size = 8192 : ways = 2 : block size = 32
Icache size = 8192 : ways = 2 : block size = 32
L2-cache size = 131072 : ways = 1 : block size = 64
Memory ready time = 50 chunksize = 64 : chunktime = 20

Execute time = 14170244207; Total refs = 5000000000
Inst refs = 3670499634; Data refs = 1329500366

Number of reference types: [Percentage]

Reads = 943680682 [18.87%]
Writes = 385819684 [7.72%]
Inst = 3670499634 [73.41%]
Total = 5000000000

Total cycles for activities: [Percentage]

Reads = 2578242409 [18.19%]
Writes = 3092529426 [21.82%]
Inst = 8499472372 [59.98%]
Total = 14170244207

Average cycles per activity:

Read = 2.73; Write = 8.02; Inst. = 3.86

Memory Level: L1i

Hit Count = 6161247964 Miss Count = 106711686
Total Requests = 6267959650
Hit Rate = [98.30%] Miss Rate = [1.70%]
Kickouts = 106711430; Dirty kickouts = 0; Transfers = 106711686

Memory Level: L1d

Hit Count = 1652962197 Miss Count = 67003983
Total Requests = 1719966180
Hit Rate = [96.10%] Miss Rate = [3.90%]
Kickouts = 67003727; Dirty kickouts = 36772907; Transfers = 67003983

Memory Level: L2

Hit Count = 190788074 Miss Count = 19700502
Total Requests = 210488576
Hit Rate = [90.64%] Miss Rate = [9.36%]
Kickouts = 19698454; Dirty kickouts = 11831779; Transfers = 19700502

L1 cache cost (Icache \$400) + (Dcache \$400) = \$800
L2 cache cost = \$100; Memory cost = \$275
Total cost = \$1175

Source Code

The following is the source code for the simulation. The file `main.cpp` acts as the processor while `Memory-Module.cpp` generates instances of various cache-levels.

main.cpp

```
/**
 * Brian Campuzano, Ryan Riley
 * ECEN 4593, Memory Simulation Project
 * Fall 2013, Professor Pleszkun
 * University of Colorado @ Boulder
 *
 * This file is the main runfile
 */
#include <iostream>
#include <stdio.h>
#include <stdlib.h>
#include <fstream>
#include <string>
#include <vector>
#include <sstream>
#include <map>
#include <iomanip>
#include <cmath>
#include "StdTypes.h"
#include "MemoryModule.h"

#define procBusWidth 4

using namespace std;
using namespace Valhalla;

int main(int argc, char ** argv)
{
    //creating a map to store the addresses of the params
    std::map <string, int*> params;
    //setting default values

    /** \brief These are the default values for the L1 Cache */
    int L1_BLOCK_SIZE = 32;
    int L1_MEMORY_SIZE = 8192;
    int L1_ASSOCIATIVITY = 1;
    int L1_HIT_PENALTY = 1;
    int L1_MISS_PENALTY = 1;

    /** \brief These are the default values for the L2 Cache */
    int L2_BLOCK_SIZE = 64;
    int L2_MEMORY_SIZE = 65536;
    int L2_ASSOCIATIVITY = 1;
    int L2_HIT_PENALTY = 4;
    int L2_MISS_PENALTY = 6;
    int L2_TRANSFER_TIME = 6;
    int L2_TRANSFER_WIDTH = 16;

    /** \brief These are the default values for Main Memory */
    int MAIN_MEMORY_SEND_ADDRESS_TIME = 10;
```

```

int MAIN_MEMORY_READY_TIME = 50;
int MAIN_MEMORY_CHUNK_SEND_TIME = 20;
int MAIN_MEMORY_ADDRESS_WIDTH = 16;

//initializing params map
params["L1_BLOCK_SIZE"] = &L1_BLOCK_SIZE;
params["L1_MEMORY_SIZE"] = &L1_MEMORY_SIZE;
params["L1_ASSOCIATIVITY"] = &L1_ASSOCIATIVITY;
params["L1_HIT_PENALTY"] = &L1_HIT_PENALTY;
params["L1_MISS_PENALTY"] = &L1_MISS_PENALTY;
params["L2_BLOCK_SIZE"] = &L2_BLOCK_SIZE;
params["L2_MEMORY_SIZE"] = &L2_MEMORY_SIZE;
params["L2_ASSOCIATIVITY"] = &L2_ASSOCIATIVITY;
params["L2_HIT_PENALTY"] = &L2_HIT_PENALTY;
params["L2_MISS_PENALTY"] = &L2_MISS_PENALTY;
params["L2_TRANSFER_TIME"] = &L2_TRANSFER_TIME;
params["L2_TRANSFER_WIDTH"] = &L2_TRANSFER_WIDTH;
params["MAIN_MEMORY_SEND_ADDRESS_TIME"] = &MAIN_MEMORY_SEND_ADDRESS_TIME;
params["MAIN_MEMORY_READY_TIME"] = &MAIN_MEMORY_READY_TIME;
params["MAIN_MEMORY_CHUNK_SEND_TIME"] = &MAIN_MEMORY_CHUNK_SEND_TIME;
params["MAIN_MEMORY_ADDRESS_WIDTH"] = &MAIN_MEMORY_ADDRESS_WIDTH;

if(argc > 1){

    //open and read config file and create a report file
    ifstream config(argv[1]);
    string line;
    if (config.is_open())
    {
        cout << "Config filename: " << argv[1] << endl;
        int param_count = 0;
        while (getline(config,line) )
        {
            string buffer;
            stringstream ss(line);
            vector<string> tokens;
            while (ss >> buffer) tokens.push_back(buffer);
            *params[tokens[0]] = atoi(tokens[1].c_str());
            cout << "Set parameter " << tokens[0] << " to " << tokens[1] << endl;
            param_count++;
        }
        config.close();
        cout << "Set " << param_count << " parameter(s) from config file " << endl;
    }
    if ( L1_ASSOCIATIVITY == -1) L1_ASSOCIATIVITY = L1_MEMORY_SIZE / L1_BLOCK_SIZE;
    if ( L2_ASSOCIATIVITY == -1) L2_ASSOCIATIVITY = L2_MEMORY_SIZE / L2_BLOCK_SIZE;
}

//Variables for mem operations
char op;
uint64 address;
uint32 byteSize;
uint64 time = 0;
uint64 refNum = 0;

```



```

uint64 iCount = 0;
uint64 wCount = 0;
uint64 rCount = 0;
uint32 blockSize = 4;
uint64 rTime = 0;
uint64 iTime = 0;
uint64 wTime = 0;
cout << "Creating Main Memory." << endl;
MemoryModule * mainMemory = new MemoryModule();

mainMemory->printMemoryModuleSetup();
cout << "Creating L2 Cache." << endl;

MemoryModule * l2Cache = new MemoryModule("L2",
                                           L2_BLOCK_SIZE,
                                           L2_MEMORY_SIZE,
                                           L2_ASSOCIATIVITY,
                                           L2_HIT_PENALTY,
                                           L2_MISS_PENALTY,
                                           MAIN_MEMORY_SEND_ADDRESS_TIME + MAIN_MEMORY_READY_TIME,
                                           MAIN_MEMORY_CHUNK_SEND_TIME,
                                           MAIN_MEMORY_ADDRESS_WIDTH,
                                           mainMemory,
                                           "Memory");

l2Cache->printMemoryModuleSetup();
cout << "Creating L1 Data Cache." << endl;

MemoryModule * l1DataCache = new MemoryModule("L1Data",
                                                L1_BLOCK_SIZE,
                                                L1_MEMORY_SIZE,
                                                L1_ASSOCIATIVITY,
                                                L1_HIT_PENALTY,
                                                L1_MISS_PENALTY,
                                                0,
                                                L2_TRANSFER_TIME,
                                                L2_TRANSFER_WIDTH,
                                                l2Cache,
                                                "L2");

l1DataCache->printMemoryModuleSetup();
cout << "Creating L1 Instruction Cache." << endl;

MemoryModule * l1InstCache = new MemoryModule("L1Inst",
                                                L1_BLOCK_SIZE,
                                                L1_MEMORY_SIZE,
                                                L1_ASSOCIATIVITY,
                                                L1_HIT_PENALTY,
                                                L1_MISS_PENALTY,
                                                0,
                                                L2_TRANSFER_TIME,
                                                L2_TRANSFER_WIDTH,
                                                l2Cache,
                                                "L2");

```

```

l1InstCache->printMemorySetup();
cout << "After initialization" << endl;

while (scanf("%c %llx %ld\n",&op,&address,&byteSize) == 3)
{
    switch(op)
    {
        case 'I':
            iCount++;
            break;
        case 'R':
            rCount++;
            break;
        case 'W':
            wCount++;
            break;
        default:
            continue;
    }
    uint64 remainder = address % blockSize;
    if(remainder != 0)
    {
        address -= remainder;
        byteSize += remainder;
    }
    int bytesToFetch = byteSize;

    cout << "-----" << endl;
    cout << "Ref " << refNum;
    cout << ": Addr = " << hex << address;
    cout << ", Type = " << op;
    cout << ", BSize = " << byteSize << endl;
    while (bytesToFetch > 0)
    {
        bytesToFetch -= procBusWidth;

        uint64 tempTime;
        switch(op)
        {
            case 'I':
                //Intruction fetch
                tempTime = l1InstCache->checkMemoryEntry(CACHE_READ, address, procBusWidth);
                time += tempTime;
                iTime += tempTime;

                break;
            case 'R':
                tempTime = l1DataCache->checkMemoryEntry(CACHE_READ, address, procBusWidth);
                time += tempTime;
                rTime += tempTime;
                break;
            case 'W':
                tempTime = l1DataCache->checkMemoryEntry(CACHE_WRITE, address, procBusWidth);
                time += tempTime;

```

```

        wTime += tempTime;
        break;
    default:
        continue;
    }

    address += procBusWidth;

}

    cout << "Simulated time = " << dec << time << endl;
    refNum++;
}
/*
uint64 time = l1DataCache->checkMemoryEntry(CACHE_WRITE, 65536, 32);
cout << "Time for memory lookup 1: " << time << endl;
time = l1DataCache->checkMemoryEntry(CACHE_WRITE, 4096, 32);
cout << "Time for memory lookup 2: " << time << endl;

time = l1DataCache->checkMemoryEntry(CACHE_READ, 8192, 32);
cout << "Time for memory lookup 3: " << time << endl;
time = l1DataCache->checkMemoryEntry(CACHE_READ, 256, 32);
cout << "Time for memory lookup 4: " << time << endl;

time = l1DataCache->checkMemoryEntry(CACHE_READ, 512, 32);
cout << "Time for memory lookup 5: " << time << endl;

*/
/*
    cout << "L1 instruction cache" << endl;
    l1InstCache->printMemoryEntries();
    cout << "L1 data cache" << endl;
    l1DataCache->printMemoryEntries();
    cout << "L2 cache" << endl;
    l2Cache->printMemoryEntries();
*/

cout << "Test Complete." << endl;

if(argc == 3){
    int L1SizeCost = ((L1_MEMORY_SIZE)/4096)*100;
    int L2SizeCost = ((L2_MEMORY_SIZE)/65536)*50;
    int L1AssociativityCost = (log2(L1_ASSOCIATIVITY) * (L1_MEMORY_SIZE/4096)) * 100;
    int L2AssociativityCost = (log2(L2_ASSOCIATIVITY) * (L2_MEMORY_SIZE/65536)) * 50;
    int MemReadyCost = ((50 / MAIN_MEMORY_READY_TIME) - 1) * 200;
    int MemChunkSizeCost = (log2(MAIN_MEMORY_ADDRESS_WIDTH) - log2(16)) * 100;
    int baseMemCost = 75;
    int l1iCost = L1SizeCost + L1AssociativityCost;
    int l1dCost = L1SizeCost + L1AssociativityCost;
    int l2Cost = L2SizeCost + L2AssociativityCost;
    int memCost = baseMemCost + MemReadyCost + MemChunkSizeCost;
    int totalCost = memCost + l2Cost + l1iCost + l1dCost;
}

```

```

std::stringstream str;

ofstream outfile;
std::string s = argv[1];
cout << s << endl;
std::string delimiter = "/";

std::string token;
token = s.substr(s.find(delimiter)+1, std::string::npos);

str << argv[2] << "." << token.c_str();

outfile.open(str.str().c_str());

outfile << "-----\n";
outfile << "\t" << str.str().c_str() << "\t Simulation Results\n";
outfile << "-----\n\n\n";

outfile << "\t Memory system: \n";
outfile << "\t\t Dcache size = " << L1_MEMORY_SIZE << " : ways = " << L1_ASSOCIATIVITY <<
" : block size = " << L1_BLOCK_SIZE << endl;
outfile << "\t\t Icache size = " << L1_MEMORY_SIZE << " : ways = " << L1_ASSOCIATIVITY <<
" : block size = " << L1_BLOCK_SIZE << endl;
outfile << "\t\t L2-cache size = " << L2_MEMORY_SIZE << " : ways = " << L2_ASSOCIATIVITY <<
" : block size = " << L2_BLOCK_SIZE << endl;
outfile << "\t\t Memory ready time = " << MAIN_MEMORY_READY_TIME << " chunksize = " <<
MAIN_MEMORY_ADDRESS_WIDTH << " : chunktime = " << MAIN_MEMORY_CHUNK_SEND_TIME <<
"\n\n" << endl;

outfile << "\t Execute time = " << dec << time << " ; Total refs = " << refNum <<
"\n\t Inst refs = " << iCount << " ; Data refs = " << wCount + rCount << "\n\n" << endl;
outfile << "\t Number of reference types: [Percentage]\n\t Reads = " << rCount <<
" " << "[" << fixed << setprecision(2) <<
(float) (((float) rCount / (float) (wCount + rCount + iCount)) * 100) << "]" << endl;
outfile << "\t Writes = " << wCount << " " <<
 "[" << fixed << setprecision(2) <<
(float) (((float) wCount / (float) (wCount + rCount + iCount)) * 100) << "]" <<
endl;
outfile << "\t Inst = " << iCount << " " <<
 "[" << fixed << setprecision(2) <<
(float) (((float) iCount / (float) (wCount + rCount + iCount)) * 100) << "]" <<
endl;
outfile << "\t Total = " << wCount + iCount + rCount << "\n\n" << endl;

outfile << "\t Total cycles for activities: [Percentage]\n\t Reads = " <<
rTime << " " << "[" << fixed << setprecision(2) <<
(float) (((float) rTime / (float) (wTime + rTime + iTime)) * 100) << "]" << endl;
outfile << "\t Writes = " << wTime << " " <<
 "[" << fixed << setprecision(2) <<
(float) (((float) wTime / (float) (wTime + rTime + iTime)) * 100) << "]" <<
endl;
outfile << "\t Inst = " << iTime << " " <<

```

```

[" << fixed << setprecision(2) <<
(float) (((float) iTime/(float) (wTime + rTime + iTime)) * 100) << "%]" <<
endl;
outfile << "\t          Total = " << wTime + iTime + rTime << "\n\n" << endl;

outfile << "\t Average cycles per activity: \n\t          Read = " << fixed << setprecision(2) <<
(float) ((float) rTime/(float) (rCount)) << ";   Write = " << fixed << setprecision(2) <<
(float) ((float) wTime/(float) (wCount))<< ";   Inst. = " << fixed << setprecision(2) <<
(float) ((float) time/(float) (iCount))<< endl;

outfile << "\n\n\t Memory Level: L1i \n";
outfile << "\t          Hit Count = " << l1InstCache->hits() << " " << "Miss Count = " <<
l1InstCache->misses() << endl;
outfile << "\t          Total Requests = " << l1InstCache->hits() + l1InstCache->misses() << endl;
outfile << "\t          Hit Rate = " <<
[" << fixed << setprecision(2) <<
(float) (((float) l1InstCache->hits()/ (float) ( l1InstCache->hits() +
l1InstCache->misses())) * 100) <<
"%]" << "   Miss Rate = " <<
[" << fixed << setprecision(2) <<
(float) (((float) l1InstCache->misses()/ (float) ( l1InstCache->hits() +
l1InstCache->misses())) * 100) <<
"%]" << endl;
outfile << "\t          Kickouts = " << l1InstCache->kicks() <<
";   Dirty kickouts = " << l1InstCache->dirtyKicks() <<";   Transfers = " <<
l1InstCache->transfers() << endl;

outfile << "\n\n\t Memory Level: L1d \n";
outfile << "\t          Hit Count = " << l1DataCache->hits() << " " << "Miss Count = " <<
l1DataCache->misses() << endl;
outfile << "\t          Total Requests = " << l1DataCache->hits() +
l1DataCache->misses() << endl;
outfile << "\t          Hit Rate = " <<
[" << fixed << setprecision(2) <<
(float) (((float) l1DataCache->hits()/ (float) ( l1DataCache->hits() +
l1DataCache->misses())) * 100) <<
"%]" << "   Miss Rate = " << [" << fixed << setprecision(2) <<
(float) (((float) l1DataCache->misses()/ (float) ( l1DataCache->hits() +
l1DataCache->misses())) * 100) <<
"%]" << endl;
outfile << "\t          Kickouts = " << l1DataCache->kicks() << ";   Dirty kickouts = " <<
l1DataCache->dirtyKicks() <<";   Transfers = " << l1DataCache->transfers() << endl;

outfile << "\n\n\t Memory Level: L2 \n";
outfile << "\t          Hit Count = " << l2Cache->hits() << " " << "Miss Count = " <<
l2Cache->misses() << endl;
outfile << "\t          Total Requests = " << l2Cache->hits() + l2Cache->misses() << endl;
outfile << "\t          Hit Rate = " << [" << fixed << setprecision(2) <<
(float) (((float) l2Cache->hits()/ (float) ( l2Cache->hits() + l2Cache->misses())) * 100) <<
"%]" << "   Miss Rate = " <<
[" << fixed << setprecision(2) <<
(float) (((float) l2Cache->misses()/ (float) ( l2Cache->hits() + l2Cache->misses())) * 100) << "%]"

```

```

endl;
outfile << "\t      Kickouts = " << l2Cache->kicks() << "; Dirty kickouts = " <<
l2Cache->dirtyKicks() <<"; Transfers = " << l2Cache->transfers() << endl;

outfile << "\n\n\n\t L1 cache cost (Icache $" << l1iCost << ") + (Dcache $" <<
l1dCost << ") = $" << l1iCost + l1dCost << "\n";
outfile << "\t L2 cache cost = $" << l2Cost << "; Memory cost = $" << memCost << "\n";
outfile << "\t Total cost = $" << totalCost << endl;

    outfile.close();
}

return 0;

}

```

MemoryModule.cpp

```
/**
 * Brian Campuzano, Ryan Riley
 * ECEN 4593, Memory Simulation Project
 * Fall 2013, Professor Pleszkun
 * University of Colorado @ Boulder
 *
 * This file implements the interface described in MemoryModule.h
 */

#include <stddef.h>
#include <iostream>
#include <list>
#include <string>

#include "StdTypes.h"

#include "MemoryModule.h"

using namespace std;

#define MEMORY_MODULE_DEBUG 0
#ifdef MEMORY_MODULE_DEBUG
#define DEBUG_MODULE_COUT(m) cout << m
#else
#define DEBUG_MODULE_COUT(m)
#endif //MEMORY_MODULE_DEBUG

namespace Valhalla
{
    MemoryModule::MemoryModule(void)
    {
        blockSize = 0;
        memorySize = 0;
        associativity = 0;
        hitPenalty = 0;
        transferPenalty = 0;
        nextMemoryModule = NULL;
        hitCount = 0;
        missCount = 0;
        indexBitMask = 0;
        tagBitMask = 0;
        tagShiftAmount = 0;
        indexShiftAmount = 0;
        memoryEntries = NULL;
        dirtyKick = 0;
        kickCount = 0;
        transferCount = 0;
    }

    MemoryModule::MemoryModule(std::string newModuleName,
                               uint32 newBlockSize,
```

```

        uint64 newMemorySize,
        uint64 newAssociativity,
        uint32 newHitPenalty,
        uint32 newMissPenalty,
        uint32 mainMemoryStartupPenalty,
        uint32 newTransferPenalty,
        uint32 newBusWidthToNextMemoryModule,
        MemoryModule * newNextMemoryModule,
        std::string newNameNextMemoryModule)
{
    moduleName = newModuleName;
    blockSize = newBlockSize;
    memorySize = newMemorySize;
    associativity = newAssociativity;
    hitPenalty = newHitPenalty;
    missPenalty = newMissPenalty;

    transferPenalty = mainMemoryStartupPenalty +
        newTransferPenalty*(newBlockSize/newBusWidthToNextMemoryModule);

    nextMemoryModule = newNextMemoryModule;
    nameNextMemoryModule = newNameNextMemoryModule;
    hitCount = 0;
    missCount = 0;
    dirtyKick = 0;
    kickCount = 0;
    transferCount = 0;

    if(!inititalizeMemoryEntries())
    {
        cerr << "MemoryModule: Failed to initialize memory entries." << endl;
    }
    tagShiftAmount = 0;
    uint64 logHold = rows;
    while(logHold != 1)
    {
        tagShiftAmount++;
        logHold >>= 1;
    }
    indexShiftAmount = 0;
    logHold = blockSize;
    while(logHold != 1)
    {
        indexShiftAmount++;
        logHold >>= 1;
    }
    indexBitMask = rows - 1;
    tagBitMask = ~indexBitMask;
    indexBitMask <<= indexShiftAmount;
    tagBitMask <<= indexShiftAmount;
    tagShiftAmount += indexShiftAmount;
}

uint64 MemoryModule::hits()

```



```

{
    return hitCount;
}

uint64 MemoryModule::misses()
{
    return missCount;
}

uint64 MemoryModule::dirtyKicks()
{
    return dirtyKick;
}

uint64 MemoryModule::kicks()
{
    return kickCount;
}

uint64 MemoryModule::transfers()
{
    return transferCount;
}

uint64 MemoryModule::checkMemoryEntry(CacheOperation operation, uint64 address, uint32 byteSize)
{
    if(nextMemoryModule == NULL)
    {
        //Main memory, increment hit counter return 0
        hitCount++;
        return 0;
    }

    uint64 rv = 0;
    uint64 index = 0;
    uint64 tag = 0;
    uint64 writeBackAddress = 0;
    uint64 endAddressValue = address + byteSize;
    bool hitFlag = false;

    for(; address < endAddressValue; address += blockSize)
    {
        DEBUG_MODULE_COUT("Level " << moduleName << " access addr = 0x" << hex <<
        address << ", reftype = " << dec << operation << endl);
        index = (address & indexBitMask) >> indexShiftAmount;
        tag = (address & tagBitMask) >> tagShiftAmount;
        DEBUG_MODULE_COUT("    index = 0x" << hex << index << ", tag = 0x" << tag);
        for(MemoryList::iterator it = memoryEntries[index].begin(); it != memoryEntries[index].end(); it++)
        {
            if((it->validBit == true) && (it->tag == tag))
            {
                DEBUG_MODULE_COUT("    HIT" << endl);
                //cache hit, LRU bump
                //copy MemoryEntry and push it to the front, then delete old entry
            }
        }
    }
}

```

```

        //unsure if this will create a copy...
        MemoryEntry hit = MemoryEntry((*it));
        if(operation == CACHE_WRITE)
        {
            hit.dirtyBit = true;
        }
        memoryEntries[index].push_front(hit);
        memoryEntries[index].erase(it);
        hitCount++;
#ifdef MEMORY_MODULE_DEBUG
        cout << "Add " << moduleName << " hit time (+ " << dec << hitPenalty << ")" << endl;
#endif
        rv += hitPenalty;
        hitFlag = true;
        break;
    }
}
if(hitFlag)
{
    hitFlag = false;
    continue;
}
DEBUG_MODULE_COUT(" MISS" << endl);
rv += missPenalty;
#ifdef MEMORY_MODULE_DEBUG
    cout << "Add " << moduleName << "miss time (+ " << dec << missPenalty << ")" << endl;
#endif

//cache miss write it to cache via LRU
MemoryEntry missed = MemoryEntry();
missed.validBit = true;
if(operation == CACHE_WRITE)
{
    missed.dirtyBit = true;
}
else
{
    missed.dirtyBit = false;
}
missed.tag = tag;
//delete last memory entry
MemoryEntry toDelete = memoryEntries[index].back();
transferCount++;
if(toDelete.validBit){
    kickCount++;
    if(toDelete.dirtyBit)
    {
        //need to write entry, reconstruct address.
        DEBUG_MODULE_COUT("    checkMemoryEntry: write back needed");
        writeBackAddress = (toDelete.tag << tagShiftAmount) | (index << indexShiftAmount);
        rv += transferPenalty +
        nextMemoryModule->checkMemoryEntry(CACHE_WRITE, writeBackAddress, blockSize);
        dirtyKick++;
    }
}

```

```

    }

    memoryEntries[index].pop_back();
    //put cache miss at front.
    memoryEntries[index].push_front(missed);

    missCount++;
    if(operation == CACHE_READ)
    {
        rv += nextMemoryModule->checkMemoryEntry(operation, address, blockSize);
        DEBUG_MODULE_COUT("Bringing line into " << moduleName << "." << endl);
        rv += transferPenalty;
        DEBUG_MODULE_COUT("Add " << nameNextMemoryModule << " to " <<
            moduleName << " transfer time (+ " << dec << transferPenalty << ")" << endl);
        rv += hitPenalty;
#ifdef MEMORY_MODULE_DEBUG
        cout << "Add " << moduleName << "hit replay time (+ " << hitPenalty << ")" << endl;
#endif
    }
    else
    {
        //operation is a cache write, and missed the cache, this code isn't right
        rv += transferPenalty + nextMemoryModule->checkMemoryEntry(CACHE_READ, address, blockSize);
        rv += hitPenalty;
    }
}

return rv;
}

bool MemoryModule::inititalizeMemoryEntries(void)
{
    if(blockSize == 0 || associativity == 0)
    {
        cerr << "inititalizeMemoryEntries: blockSize or associativity equals 0." << endl;
        return false;
    }
    rows = (memorySize/blockSize)/associativity;
    if(rows == 0)
    {
        cerr << "inititalizeMemoryEntries: memory rows equals 0." << endl;
        return false;
    }
    MemoryEntry temp;
    memoryEntries = new MemoryList[rows];
    for(uint64 i = 0; i < rows; i++)
    {
        for(uint64 j = 0; j < associativity; j++)
        {
            temp = MemoryEntry();
            temp.validBit = false;
            temp.dirtyBit = false;
            temp.tag = 0;
            memoryEntries[i].push_back(temp);
        }
    }
}

```

```

    return true;
}

void MemoryModule::printMemoryModuleSetup(void)
{
#ifdef MEMORY_MODULE_DEBUG
    DEBUG_MODULE_COUT("Block Size: " << blockSize << endl);
    DEBUG_MODULE_COUT("Memory Size: " << memorySize << endl);
    DEBUG_MODULE_COUT("Associativity: " << associativity << endl);
    DEBUG_MODULE_COUT("Hit Penalty: " << hitPenalty << endl);
    DEBUG_MODULE_COUT("Transfer Penalty: " << transferPenalty << endl);
    DEBUG_MODULE_COUT("Hit Count: " << hitCount << endl);
    DEBUG_MODULE_COUT("Miss Count: " << missCount << endl);
    DEBUG_MODULE_COUT("Hit Penalty: " << hitPenalty << endl);
    DEBUG_MODULE_COUT("Rows: " << rows << endl);
    DEBUG_MODULE_COUT("Index Bit Mask: 0x" << hex << indexBitMask << endl);
    DEBUG_MODULE_COUT("Tag Bit Mask: 0x" << hex << tagBitMask << dec << endl);
    DEBUG_MODULE_COUT("Tag Shift Amount: " << tagShiftAmount << endl);
    DEBUG_MODULE_COUT("Index Shift Amount: " << indexShiftAmount << endl);
    if(nextMemoryModule == NULL)
    {
        DEBUG_MODULE_COUT("Next Memory Module Doesn't Exist" << endl);
    }
    else
    {
        DEBUG_MODULE_COUT("Next Memory Module Exists" << endl);
    }
    if(memoryEntries == NULL)
    {
        DEBUG_MODULE_COUT("Memory Entries are NULL" << endl);
    }
    else
    {
        DEBUG_MODULE_COUT("Memory Entries not NULL" << endl);
        //printMemoryEntries();
    }
#endif //MEMORY_MODULE_DEBUG
}

void MemoryModule::printMemoryEntries(void)
{
#ifdef MEMORY_MODULE_DEBUG
    uint64 j;
    for(uint64 i = 0; i < rows; i++)
    {
        j = 0;
        for(MemoryList::const_iterator it = memoryEntries[i].begin(); it != memoryEntries[i].end(); it++)
        {
            DEBUG_MODULE_COUT("(" << i << ", " << j << ") Valid: " << it->validBit <<
            ", Dirty: " << it->dirtyBit << ", Tag: " << it->tag << endl);
            j++;
        }
    }
}

```

```
#endif //MEMORY_MODULE_DEBUG  
}  
}
```