

Benchmark 1: spec00-bzip2

These are the cache values from the **bzip2** benchmark without any changes.

Instruction Count: 362,993,028

Cycle Count: 417,769,347

Sampler: TASS

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	2.0	238,638,066	0%	0%	100%	0%	0%
DL1	9.1	114,584,807	2.7%	4.5%	96.9%	95.7%	0%
L2	63.6	3,124,247	66.8%	66.8%	33.2%	0%	0%
Memory	60	1,936,828	0%	0%	100%	100%	0%

For the first parameter change, I wanted to see what would happen if I increase the associativity of the **IL1 cache from 4 to 8**. I was expecting an increase in the miss rate, hoping that there would be a slight increase in the number of capacity misses. Here are the results.

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	2.0	238,638,068	0%	0%	100%	0%	0%
DL1	9.0	114,584,600	2.7%	4.5%	96.9%	95.7%	0%
L2	63.6	3,093,261	66.6%	66.6%	33.4%	0%	0%
Memory	60	1,916,468	0%	0%	100%	100%	0%

Most of the benchmark results did not change except for a slight decrease in the hit rate of the **L2** cache. I'm not quite sure why this happened, my assumption is that some of the data had been pushed down to a lower level which resulted in more hits. Specifically, an increase in 0.2% for the hit rate of read instructions.

The next change was a decrease in the block size of the **DL1 cache from 32 to 8**. I expected an increase in the miss rate if I were to decrease the spacial locality of that level. With an increased miss rate with the L1 cache, I was also expecting an increase in the number of memory accesses for L2. Here are the results. As expected, there was an increase

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	2.0	238,638,068	0%	0%	100%	0%	0%
DL1	9.2	114,584,600	4.9%	7.4%	94.7%	93.1%	0%
L2	63.6	5,620,958	35.2%	38.9%	63.4%	0%	0%
Memory	60	1,762,288	0%	0%	100%	100%	0%

in miss rate for DL1 and in the number of memory accesses for L2. Although for a decrease in block size from 32 to 8, I was expecting a much larger increase in miss rate. I also did not expect the miss rate of the L2 cache to decrease as much as it did. I assume this is due to a lot of data having to be pushed down to L2 instead of being stored in L1, which would then lead to an increase in its hit rate.

Benchmark 2: spec00-crafty

Instruction Count: 362,993,023

Cycle Count: 406,031,896

Sampler: TASS

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	2.3	235,407,812	0.2%	0.4%	99.8%	0%	0%
DL1	7.1	116,117,768	0.6%	0.7%	99.1%	99.9%	0%
L2	77.1	1,075,601	97.0%	97.0%	3.0%	0%	0%
Memory	60	1,023,978	0%	0%	100%	100%	0%

First change was to **increase block size of DL1 from 32 to 64**. Based on the previous benchmark, I was expecting a small increase or decrease of miss rate, since I would be increasing spatial locality, but decreasing temporal locality. Without knowing exactly what the benchmarks are performing, it would be difficult to make an educated guess of the effects.

There would be an minuscule increase in the miss rate of DL1, but a quite significant de-

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	2.3	235,407,809	0.2%	0.4%	99.8%	0%	0%
DL1	7.1	116,117,175	0.7%	0.9%	98.9%	99.8%	0%
L2	55.3	1,235,659	59.0%	59.9%	40.1%	0%	0%
Memory	60	727,730	0%	0%	100%	100%	0%

crease in the miss rate of the L2 cache. Similar to the previous benchmark, this was probably due to the L1 cache not being able to hold as much data as before. There was also a decrease in the number of memory accesses from main memory.

The next change was to **decrease associativity of DL1 from 4 to direct-mapped**. I was attempting to make a more significant change to the hit rate of DL1 since all the previous changes have been small. The results are as follows

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	2.3	235,407,809	0.2%	0.4%	99.8%	0%	0%
DL1	9.8	116,117,045	3.7%	4.6%	95.1%	97.6%	0%
L2	71.9	4,704,187	92.6%	92.6%	7.4%	0%	0%
Memory	60	3,957,805	0%	0%	100%	100%	0%

As hoped, the change created a much more significant change. By changing the associativity of the L1 cache from 4 to being direct-mapped, there was a significant increase of misses overall. A 3% increase in primary misses for L1 is the largest change I have observed so far. Furthermore, although there was technically a slight decrease in miss rate for L2, the number of memory accesses increased significantly, which results in more misses in general.

Benchmark 3: spec00-gcc

Instruction Count: 362,993,023

Cycle Count: 822,813,193

Sampler: TASS

For these tests I wanted to try and affect the sim time instead of playing with the cache parameters. Here are the base values

	Rabbit	Warmup	Detail	Timing
KIPS	97816	N/A	517248	1308
Time	11.6%	0%	1.8%	86.6%
Inst	51.8%	0%	43%	5.2%

Simulation Time: 347.499 seconds

For the first change, I reduced the L3(I assume this is main memory) **size from 2GB to 1GB**. I was expecting a large increase in the simulation time, and perhaps an increase in miss rate for memory. Here are the results

	Rabbit	Warmup	Detail	Timing
KIPS	102904	N/A	248056	11288
Time	5.7%	0%	2%	92.4%
Inst	51.8%	0%	43%	5.2%

Simulation Time: 648.099 seconds

As expected, the total simulation time doubled entirely from reducing the size of memory. Sadly, there were no changes to the miss rates of any of the caches, which is why none of the values are currently displayed. However, I was confused as to why the IPC did not change, as I had initially thought that the reducing in memory capacity would have at least a minor effect.

The next change was to the **instruction queue size from 24 to 12**. I am expecting changes similar to that of the previous benchmark test, here are the results.

	Rabbit	Warmup	Detail	Timing
KIPS	101110	N/A	244754	11199
Time	5.7%	0%	2%	92.4%
Inst	51.8%	0%	43%	5.2%

Simulation Time: 653.169 seconds

Similar to the previous test, I was expecting more changes to the CPU's general performance, but the only thing that changed was the massive increase in simulation time as well. This effect makes sense as the CPU can only look at half the instructions at a time.

Benchmark 4: spec00-gzip**Instruction Count:** 362,993,053**Cycle Count:** 352,727,393**Sampler:** TASS

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	2	237,010,544	0%	0%	100%	0%	0%
DL1	11.4	101,478,498	2.5%	6.6%	97.8%	90.0%	0%
L2	67.6	2,504,678	33.9%	33.9%	66.1%	0%	0%
Memory	60	1,371,981	0%	0%	100%	100%	0%

The first parameter change was to **completely remove the IL1** cache. I wanted to see the effect it would have by removing a whole level of the cache. I expect to have an increase in memory accesses for DL1 and perhaps a change in the miss rate for all the lower level caches. Here were the results

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	-	-	-	-	-	-	-
DL1	11.4	101,478,498	2.5%	6.6%	97.8%	90.0%	0%
L2	67.6	2,504,025	33.9%	33.9%	66.1%	0%	0%
Memory	60	1,371,085	0%	0%	100%	100%	0%

For some reason nothing had changed except for the fact the IL1 cache was missing from the report, I was sure that I did it correctly, so I am unsure as to why none of the values had changed. I expected the number of memory accesses to change for DL1 but it had stayed the exact same.

This time I wanted to **remove DL1** instead and see if there would be any change. Because of the previous benchmark test not having any affect, I expect the same from this one. Here are the results

Cache	Average Memory Latency	MemAccesses	MissRate1	MissRate2	RD	WR	BUS
IL1	2.0	237,010,637	0%	0%	100%	0%	0%
DL1	-	-	-	-	-	-	-
L2	67.6	425	99.8%	99.8%	0%	0%	0%
Memory	60	425	0%	0%	99.9%	100%	0%

Due to the removal of the DL1 cache, there was a significant decrease in memory accesses from L2 and main memory, which basically no hits. I am still unsure as to why this is the case, as I would have though there would be an increase in memory accesses with the lower levels. I might have changed the parameters incorrectly in my bash script.

Appendix

bzip2: base

```
*****
# File : esesc_1spec00_bzip2.LL1ZKn : Sun Oct 16 14:35:50 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 98587 N/A 600975 1684 27196
Time 14.3% 0.0% 1.9% 83.8% : Sin Time (s) 284.599 Exe 245.747 ms Sin (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 4743.372 ms Sin (1700MHz)
*****
Proc : Delay : Avg.Time : BPType : Total : RAS : BPred : BTB : lBTB : BTAC : WasteRatio : MPKI
0 : 3 : 25.704 : 2bit : 92.60% : 100.00% of 6.87% : 91.32% of 85.25% : 95.24% of 52.37% : 0.00% : 0.00% : 0.14% : 10.60
0 : 4 : 25.704 : 2level : 92.60% : 0.00% of 0.00% : 91.44% of 86.49% : 0.00% of 0.00% : 52.37% : ( 1.24% fixed) : 10.60
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993010 : 362993028 : 53.13% : 15.31% : 0.00% : 22.37% : 9.19% : 6.16% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MlsBr Br4Clk brDelay
0 0.87 0.87 1.00 417769347 43.4 0.0 0.7 3.6 0.1 3.6 0.0 0.0 0.0 0.0 12.5
*****
Cache Occ AvgMenLat MemAccesses MissRate ( RD , WR , BUS)
IL1(0) 0.0 2.0 238638066 0.0% 0.0% (100.0%, 0.0%, 0.0%) 60.7 0.0 GB/s
*****
DL1(0) 0.0 9.1 114584807 2.7% 4.5% ( 96.9%, 95.7%, 0.0%) 29.1 0.0 GB/s
*****
L2(0) 0.0 63.6 3124247 66.8% 66.8% ( 33.2%, 0.0%, 0.0%) 0.8 0.0 GB/s
Memory(0) 0.0 60.0 1936828 0.0% 0.0% (100.0%,100.0%, 0.0%) 0.5 0.0 GB/s
*****
```

bzip2: IL1 associativity from 4 to 8

```
*****
# File : esesc_2spec00_bzip2.8WCWnP : Sun Oct 16 14:53:11 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 78305 N/A 528722 1535 24261
Time 16.0% 0.0% 2.0% 82.0% : Sin Time (s) 315.679 Exe 245.128 ms Sin (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 4731.128 ms Sin (1700MHz)
*****
Proc : Delay : Avg.Time : BPType : Total : RAS : BPred : BTB : lBTB : BTAC : WasteRatio : MPKI
0 : 3 : 25.513 : 2bit : 92.60% : 100.00% of 6.86% : 91.32% of 85.25% : 95.24% of 52.37% : 0.00% : 0.00% : 0.14% : 10.60
0 : 4 : 25.513 : 2level : 92.60% : 0.00% of 0.00% : 91.44% of 86.49% : 0.00% of 0.00% : 52.37% : ( 1.24% fixed) : 10.60
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993010 : 362993024 : 53.13% : 15.31% : 0.00% : 22.37% : 9.19% : 6.16% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MlsBr Br4Clk brDelay
0 0.87 0.87 1.00 416718032 43.6 0.0 0.7 3.6 0.1 3.6 0.0 0.0 0.0 0.0 12.5
*****
Cache Occ AvgMenLat MemAccesses MissRate ( RD , WR , BUS)
IL1(0) 0.0 2.0 238638066 0.0% 0.0% (100.0%, 0.0%, 0.0%) 60.8 0.0 GB/s
*****
DL1(0) 0.0 9.0 114584600 2.7% 4.5% ( 96.9%, 95.7%, 0.0%) 29.2 0.0 GB/s
*****
L2(0) 0.0 63.0 3093261 66.6% 66.6% ( 33.4%, 0.0%, 0.0%) 0.8 0.0 GB/s
Memory(0) 0.0 60.0 1916468 0.0% 0.0% (100.0%,100.0%, 0.0%) 0.5 0.0 GB/s
*****
```

bzip2: DL1 block size from 32 to 8

```
*****
# File : esesc_3spec00_bzip2.7MUerl : Sun Oct 16 15:00:50 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 98662 N/A 588140 1604 26099
Time 13.7% 0.0% 1.9% 84.4% : Sin Time (s) 295.369 Exe 244.299 ms Sin (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 4715.811 ms Sin (1700MHz)
*****
Proc : Delay : Avg.Time : BPType : Total : RAS : BPred : BTB : lBTB : BTAC : WasteRatio : MPKI
0 : 3 : 25.177 : 2bit : 92.60% : 100.00% of 6.86% : 91.32% of 85.25% : 95.24% of 52.37% : 0.00% : 0.00% : 0.13% : 10.60
0 : 4 : 25.177 : 2level : 92.60% : 0.00% of 0.00% : 91.44% of 86.49% : 0.00% of 0.00% : 52.37% : ( 1.24% fixed) : 10.60
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993010 : 362993024 : 53.13% : 15.31% : 0.00% : 22.37% : 9.19% : 6.15% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MlsBr Br4Clk brDelay
0 0.87 0.87 1.00 415308299 43.7 0.0 0.6 3.6 0.1 3.6 0.0 0.0 0.0 0.0 12.5
*****
Cache Occ AvgMenLat MemAccesses MissRate ( RD , WR , BUS)
IL1(0) 0.0 2.0 238638066 0.0% 0.0% (100.0%, 0.0%, 0.0%) 61.1 0.0 GB/s
*****
DL1(0) 0.0 9.2 114584600 4.9% 7.4% ( 94.7%, 93.1%, 0.0%) 29.3 0.0 GB/s
*****
L2(0) 0.0 44.6 5620958 35.2% 38.9% ( 63.4%, 0.0%, 0.0%) 1.4 0.0 GB/s
Memory(0) 0.0 60.0 1762288 0.0% 0.0% (100.0%,100.0%, 0.0%) 0.5 0.0 GB/s
*****
```

crafty: base

```
*****
# File : esesc_ispec00_crafty.0A7LPE : Sun Oct 16 15:28:03 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 100332 N/A 564047 1589 25932
Time 13.4% 0.0% 2.0% 84.6% : SIn Time (s) 297.459 Exe 238.842 ms SIn (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 4606.135 ms SIn (1700MHz)
*****
Proc : Delay : Avg.Time : BPType : Total : RAS : BPred : BTB : IBTB : BTAC : WasteRatio : MPKI
0 : 3 : 19.448 : 2bit : 90.45% : 99.92% of 4.80% : 83.04% of 56.32% : 11.75% of 48.33% : 0.00% : 0.00% : 16.54% : 11.16
0 : 4 : 19.448 : 2level : 90.45% : 0.00% of 0.00% : 88.37% of 82.12% : 43.41% of 1.90% : 46.43% : ( 26.59% fixed) : 11.16
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993010 : 362993023 : 55.41% : 12.25% : 0.35% : 21.76% : 10.22% : 2.32% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MlsBr Br4clk brDelay
0 0.89 0.89 1.00 406031896 44.7 0.1 0.0 0.6 0.0 2.7 0.0 0.0 0.0 0.0 11.2
*****
Cache Occ AvgMemLat MemAccesses MissRate ( RD , WR , BUS)
IL1(0) 0.0 2.3 235407812 0.2% 0.4% ( 99.8%, 0.0%, 0.0%) 61.6 0.0 GB/s
*****
DL1(0) 0.0 7.1 116117768 0.6% 0.7% ( 99.1%, 99.9%, 0.0%) 30.4 0.0 GB/s
*****
L2(0) 0.0 77.1 1075601 97.0% 97.0% ( 3.0%, 0.0%, 0.0%) 0.3 0.0 GB/s
Memory(0) 0.0 60.0 1023978 0.0% 0.0% (100.0%,100.0%, 0.0%) 0.3 0.0 GB/s
*****
```

crafty: DL1 block size from 32 to 64

```
*****
# File : esesc_2spec00_crafty.w0UFQq : Sun Oct 16 15:25:04 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 102856 N/A 572795 1561 25615
Time 13.0% 0.0% 1.9% 85.1% : SIn Time (s) 300.939 Exe 233.798 ms SIn (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 4508.822 ms SIn (1700MHz)
*****
Proc : Delay : Avg.Time : BPType : Total : RAS : BPred : BTB : IBTB : BTAC : WasteRatio : MPKI
0 : 3 : 18.345 : 2bit : 90.45% : 99.92% of 4.80% : 83.04% of 56.32% : 11.75% of 48.33% : 0.00% : 0.00% : 15.86% : 11.16
0 : 4 : 18.345 : 2level : 90.45% : 0.00% of 0.00% : 88.37% of 82.12% : 43.41% of 1.90% : 46.43% : ( 26.60% fixed) : 11.16
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993010 : 362993026 : 55.41% : 12.25% : 0.35% : 21.76% : 10.22% : 2.39% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MlsBr Br4clk brDelay
0 0.91 0.91 1.00 397456577 45.7 0.1 0.0 0.3 0.0 2.0 0.0 0.0 0.0 0.0 11.5
*****
Cache Occ AvgMemLat MemAccesses MissRate ( RD , WR , BUS)
IL1(0) 0.0 2.3 235407809 0.2% 0.4% ( 99.8%, 0.0%, 0.0%) 62.9 0.0 GB/s
*****
DL1(0) 0.0 7.1 116117175 0.7% 0.9% ( 98.9%, 99.8%, 0.0%) 31.0 0.0 GB/s
*****
L2(0) 0.0 55.3 1235659 59.9% 59.9% ( 40.1%, 0.0%, 0.0%) 0.3 0.0 GB/s
Memory(0) 0.0 60.0 727730 0.0% 0.0% (100.0%,100.0%, 0.0%) 0.2 0.0 GB/s
*****
```

crafty: DL1 associativity from 4 to 1

```
*****
# File : esesc_3spec00_crafty.CtMwQv : Sun Oct 16 15:30:47 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 97510 N/A 507197 1332 22177
Time 11.8% 0.0% 1.9% 86.3% : SIn Time (s) 342.519 Exe 317.087 ms SIn (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 6114.807 ms SIn (1700MHz)
*****
Proc : Delay : Avg.Time : BPType : Total : RAS : BPred : BTB : IBTB : BTAC : WasteRatio : MPKI
0 : 3 : 34.232 : 2bit : 90.45% : 99.92% of 4.80% : 83.05% of 56.32% : 11.75% of 48.33% : 0.00% : 0.00% : 22.15% : 11.16
0 : 4 : 34.232 : 2level : 90.45% : 0.00% of 0.00% : 88.37% of 82.12% : 43.41% of 1.90% : 46.43% : ( 26.60% fixed) : 11.16
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993010 : 362993024 : 55.41% : 12.25% : 0.35% : 21.76% : 10.22% : 3.32% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MlsBr Br4clk brDelay
0 0.67 0.67 1.00 539047431 33.7 0.1 0.0 3.6 0.0 13.7 0.0 0.0 0.0 0.0 8.5
*****
Cache Occ AvgMemLat MemAccesses MissRate ( RD , WR , BUS)
IL1(0) 0.0 2.3 235407901 0.2% 0.4% ( 99.8%, 0.0%, 0.0%) 46.4 0.0 GB/s
*****
DL1(0) 0.0 9.8 116117045 3.7% 4.6% ( 95.1%, 97.6%, 0.0%) 22.9 0.0 GB/s
*****
L2(0) 0.0 71.9 4704187 92.6% 92.6% ( 7.4%, 0.0%, 0.0%) 0.9 0.0 GB/s
Memory(0) 0.0 60.0 3957085 0.0% 0.0% (100.0%,100.0%, 0.0%) 0.8 0.0 GB/s
*****
```

gcc: base

```
*****
# File : esesc_1spec00_gcc.bskTkf : Sun Oct 16 18:23:56 2022
*****
Sampler 0 (Procs 0)
  Rabbit Warmup Detail Timing Total KIPS
KIPS 97816 N/A 517248 1308 21848
Time 11.6% 0.0% 1.8% 86.6% : SIn Time (s) 347.499 Exe 484.008 ms SIn (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 9337.833 ms SIn (1700MHz)
*****
Proc : Delay : Avg.Time : BPTYPE : Total : RAS : BPred : BTB : lBTB : BTAC : WasteRatio : MPKI
0 : 3 : 55.818 : 2bitt : 97.60% : 99.98% of 1.75% : 97.23% of 86.46% : 91.89% of 69.24% : 0.00% : 0.00% : 0.19% : 3.32
0 : 4 : 55.818 : 2level : 97.60% : 0.00% of 0.00% : 97.31% of 88.93% : 36.80% of 0.52% : 68.72% : ( 2.61% flxed) : 3.32
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993011 : 362993023 : 37.95% : 14.11% : 0.01% : 22.20% : 25.73% : 1.53% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MIsBr Br4Clk brDelay
0 0.44 0.44 1.00 822813193 22.1 0.0 14.1 42.1 0.0 3.3 0.0 0.0 0.0 0.0 6.1
*****
Cache Occ AvgMemLat MemAccesses MissRate ( RD WR BUS)
IL1(0) 0.0 2.1 240233786 0.1% 0.2% ( 99.9%, 0.0%, 0.0%) 31.0 0.0 GB/s
DL1(0) 0.0 36.7 173980439 17.4% 50.1% ( 78.5%, 44.7%, 0.0%) 22.5 0.0 GB/s
L2(0) 0.0 56.5 38503347 99.0% 99.0% ( 1.0%, 0.0%, 0.0%) 3.9 0.0 GB/s
Memory(0) 0.0 60.0 13049409 0.0% 0.0% (100.0%,100.0%, 0.0%) 1.7 0.0 GB/s
*****
```

gcc: L3 size from 2GB to 1GB

```
*****
# File : esesc_2spec00_gcc.8EWJ35 : Mon Oct 17 19:23:18 2022
*****
Sampler 0 (Procs 0)
  Rabbit Warmup Detail Timing Total KIPS
KIPS 102904 N/A 248056 634 11288
Time 5.7% 0.0% 2.0% 92.4% : SIn Time (s) 648.099 Exe 484.033 ms SIn (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 9339.721 ms SIn (1700MHz)
*****
Proc : Delay : Avg.Time : BPTYPE : Total : RAS : BPred : BTB : lBTB : BTAC : WasteRatio : MPKI
0 : 3 : 55.832 : 2bitt : 97.60% : 99.98% of 1.75% : 97.23% of 86.46% : 91.89% of 69.24% : 0.00% : 0.00% : 0.19% : 3.32
0 : 4 : 55.832 : 2level : 97.60% : 0.00% of 0.00% : 97.31% of 88.93% : 36.80% of 0.52% : 68.72% : ( 2.61% flxed) : 3.32
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993010 : 362993022 : 37.95% : 14.11% : 0.01% : 22.20% : 25.73% : 1.53% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MIsBr Br4Clk brDelay
0 0.44 0.44 1.00 822855594 22.1 0.0 14.1 42.1 0.0 3.3 0.0 0.0 0.0 0.0 6.1
*****
Cache Occ AvgMemLat MemAccesses MissRate ( RD WR BUS)
IL1(0) 0.0 2.1 240233628 0.1% 0.2% ( 99.9%, 0.0%, 0.0%) 31.0 0.0 GB/s
DL1(0) 0.0 36.7 173980055 17.4% 50.1% ( 78.5%, 44.7%, 0.0%) 22.5 0.0 GB/s
L2(0) 0.0 56.5 38503818 99.0% 99.0% ( 1.0%, 0.0%, 0.0%) 3.9 0.0 GB/s
Memory(0) 0.0 60.0 13049868 0.0% 0.0% (100.0%,100.0%, 0.0%) 1.7 0.0 GB/s
*****
```

gcc: Instruction queue from 24 to 12

```
*****
# File : esesc_3spec00_gcc.vW7XJD : Mon Oct 17 19:43:08 2022
*****
Sampler 0 (Procs 0)
  Rabbit Warmup Detail Timing Total KIPS
KIPS 101110 N/A 244754 629 11199
Time 5.7% 0.0% 2.0% 92.3% : SIn Time (s) 653.169 Exe 484.158 ms SIn (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% : Approx Total Time 9342.009 ms SIn (1700MHz)
*****
Proc : Delay : Avg.Time : BPTYPE : Total : RAS : BPred : BTB : lBTB : BTAC : WasteRatio : MPKI
0 : 3 : 55.871 : 2bitt : 97.60% : 99.98% of 1.75% : 97.23% of 86.46% : 91.89% of 69.24% : 0.00% : 0.00% : 0.19% : 3.32
0 : 4 : 55.871 : 2level : 97.60% : 0.00% of 0.00% : 97.31% of 88.93% : 36.80% of 0.52% : 68.72% : ( 2.60% flxed) : 3.32
*****
Proc : nCommit : nInst : AALU : BALU : CALU : LALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993010 : 362993022 : 37.95% : 14.11% : 0.01% : 22.20% : 25.73% : 1.53% : N/A : 0.00
*****
Proc IPC uIPC Active Cycles Busy LDQ STQ IWLn ROB Regs IO maxBr MIsBr Br4Clk brDelay
0 0.44 0.44 1.00 823068046 22.1 0.0 14.1 42.1 0.0 3.4 0.0 0.0 0.0 0.0 6.1
*****
Cache Occ AvgMemLat MemAccesses MissRate ( RD WR BUS)
IL1(0) 0.0 2.1 240233578 0.1% 0.2% ( 99.9%, 0.0%, 0.0%) 31.0 0.0 GB/s
DL1(0) 0.0 36.7 173979952 17.4% 50.1% ( 78.5%, 44.7%, 0.0%) 22.5 0.0 GB/s
L2(0) 0.0 56.5 38502306 99.0% 99.0% ( 1.0%, 0.0%, 0.0%) 3.9 0.0 GB/s
Memory(0) 0.0 60.0 13048819 0.0% 0.0% (100.0%,100.0%, 0.0%) 1.7 0.0 GB/s
*****
```

gzip: base

```

*****
# File : esesc_1spec00_gzip.4k4vdp : Mon Oct 17 19:53:33 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 102477 N/A 332076 878 15284 : Sin Time (s) 489.399 Exe 254.804 ms Sin (1700MHz)
Time 7.7% 0.0% 2.0% 90.3% : Approx Total Time 4909.896 ms Sin (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% :

Proc : Delay : Avg.Time : BPTYPE : Total : RAS : BPrd : BTB : LBTB : BTAC : WasteRatio : MPKI
0 : 3 : 19.924 : 2bit : 89.92% : 100.0% of 5.70% : 87.70% of 82.00% : 84.49% of 65.47% : 0.00% : 0.00% : 0.02% : 13.33
0 : 4 : 19.924 : 2level : 89.92% : 0.00% of 0.00% : 88.53% of 87.90% : 46.74% of 0.00% : 65.46% : ( 5.91% fixed) : 13.33

Proc : nCommit : nInst : AALU : BALU : CALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993011 : 362993053 : 58.07% : 13.97% : 0.00% : 17.99% : 9.97% : 16.90% : N/A : 0.00

Proc IPC uIPC Active Cycles Busy LDQ STQ IWin ROB Regs IO maxBr MIsBr Br4Clk brDelay
0 0.84 0.84 1.00 432657332 41.9 0.0 5.5 0.8 0.0 8.8 0.0 0.0 0.0 0.0 10.9

Cache Occ AvgMemLat MemAccesses MissRate ( RD , WR , BUS)
LI1(0) 0.0 2.0 237010544 0.0% 0.0% (100.0%, 0.0%, 0.0%) 58.2 0.0 GB/s
DL1(0) 0.0 11.4 101478188 2.5% 6.0% ( 97.8%, 98.0%, 0.0%) 24.9 0.0 GB/s
L2(0) 0.0 67.6 2504678 33.9% 33.9% ( 66.1%, 0.0%, 0.0%) 0.0 0.0 GB/s
Memory(0) 0.0 60.0 1371901 0.0% 0.0% (100.0%,100.0%, 0.0%) 0.3 0.0 GB/s
*****

```

gzip: IL1 removed

```

*****
# File : esesc_2spec00_gzip.7Pnu8G : Mon Oct 17 20:00:35 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 106964 N/A 393852 1027 17723 : Sin Time (s) 421.629 Exe 254.407 ms Sin (1700MHz)
Time 6.0% 0.0% 1.9% 89.3% : Approx Total Time 4988.933 ms Sin (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% :

Proc : Delay : Avg.Time : BPTYPE : Total : RAS : BPrd : BTB : LBTB : BTAC : WasteRatio : MPKI
0 : 3 : 19.924 : 2bit : 89.92% : 100.0% of 5.70% : 87.70% of 82.00% : 84.49% of 65.47% : 0.00% : 0.00% : 0.02% : 13.33
0 : 4 : 19.924 : 2level : 89.92% : 0.00% of 0.00% : 88.53% of 87.90% : 46.94% of 0.00% : 65.46% : ( 5.91% fixed) : 13.33

Proc : nCommit : nInst : AALU : BALU : CALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993011 : 362993053 : 58.07% : 13.97% : 0.00% : 17.99% : 9.97% : 16.90% : N/A : 0.00

Proc IPC uIPC Active Cycles Busy LDQ STQ IWin ROB Regs IO maxBr MIsBr Br4Clk brDelay
0 0.84 0.84 1.00 432594518 42.0 0.0 5.5 0.8 0.0 8.8 0.0 0.0 0.0 0.0 10.9

Cache Occ AvgMemLat MemAccesses MissRate ( RD , WR , BUS)
DL1(0) 0.0 11.4 101478400 2.5% 6.0% ( 97.8%, 98.0%, 0.0%) 24.0 0.0 GB/s
L2(0) 0.0 67.6 2504025 33.6% 33.8% ( 66.2%, 0.0%, 0.0%) 0.0 0.0 GB/s
Memory(0) 0.0 60.0 1371805 0.0% 0.0% (100.0%,100.0%, 0.0%) 0.3 0.0 GB/s
*****

```

gzip: DL1 removed

```

*****
# File : esesc_3spec00_gzip.xsYAFM : Mon Oct 17 20:07:23 2022
*****
Sampler 0 (Procs 0)
Rabbit Warmup Detail Timing Total KIPS
KIPS 110851 N/A 417075 1008 10432 : Sin Time (s) 400.359 Exe 207.487 ms Sin (1700MHz)
Time 6.0% 0.0% 1.9% 89.3% : Approx Total Time 4000.659 ms Sin (1700MHz)
Inst 51.8% 0.0% 43.0% 5.2% :

Proc : Delay : Avg.Time : BPTYPE : Total : RAS : BPrd : BTB : LBTB : BTAC : WasteRatio : MPKI
0 : 3 : 13.075 : 2bit : 89.92% : 100.0% of 5.70% : 87.70% of 82.00% : 84.49% of 65.47% : 0.00% : 0.00% : 0.07% : 13.33
0 : 4 : 13.075 : 2level : 89.92% : 0.00% of 0.00% : 88.53% of 87.90% : 46.94% of 0.00% : 65.46% : ( 5.91% fixed) : 13.33

Proc : nCommit : nInst : AALU : BALU : CALU : SALU : LD Fwd : Replay : Worst Unit (clk)
0 : 362993011 : 362993053 : 58.07% : 13.97% : 0.00% : 17.99% : 9.97% : 15.37% : N/A : 0.00

Proc IPC uIPC Active Cycles Busy LDQ STQ IWin ROB Regs IO maxBr MIsBr Br4Clk brDelay
0 1.03 1.03 1.00 352727393 51.5 0.0 0.0 0.0 0.0 4.2 0.0 0.0 0.0 0.0 13.4

Cache Occ AvgMemLat MemAccesses MissRate ( RD , WR , BUS)
LI1(0) 0.0 2.0 237010637 0.0% 0.0% (100.0%, 0.0%, 0.0%) 71.4 0.0 GB/s
L2(0) 0.0 77.1 425 99.8% 99.8% ( 0.0%, 0.0%, 0.0%) 0.0 0.0 GB/s
Memory(0) 0.0 60.0 425 0.0% 0.0% ( 99.9%, 0.0%, 0.0%) 0.0 0.0 GB/s
*****

```