www.phoronix-test-suite.com

Intel Xeon Ice Lake Mitigation Comparison

Intel CPU Xeon Scalable Ice Lake mitigation benchmark impact by Michael Larabel for a future article.

Automated Executive Summary

mitigations=off had the most wins, coming in first place for 51% of the tests.

Based on the geometric mean of all complete results, the fastest (mitigations=off) was 1.002x the speed of the slowest (Default).

The results with the greatest spread from best to worst included:

Apache HBase (Test: Random Read - Clients: 1) at 1.032x
Apache HBase (Test: Random Read - Clients: 1) at 1.032x
Apache HBase (Test: Random Write - Clients: 1) at 1.027x
Mobile Neural Network (Model: SqueezeNetV1.0) at 1.026x
Redis (Test: SET) at 1.025x
Renaissance (Test: Random Forest) at 1.023x
PJSIP (Method: OPTIONS, Stateless) at 1.02x
Mobile Neural Network (Model: inception-v3) at 1.017x
TensorFlow Lite (Model: Inception V4) at 1.017x
KeyDB at 1.015x.

Test Systems:

Default

mitigations=off

Processor: 2 x Intel Xeon Platinum 8380 @ 3.40GHz (80 Cores / 160 Threads), Motherboard: Intel M50CYP2SB2U (SE5C6200.86B.0022.D08.2103221623 BIOS), Chipset: Intel Device 0998, Memory: 504GB, Disk: 800GB INTEL SSDPF21Q800GB, Graphics: ASPEED, Monitor: VE228, Network: 2 x Intel X710 for 10GBASE-T + 2 x Intel E810-C for QSFP

OS: Ubuntu 21.04, Kernel: 5.11.0-17-generic (x86_64), Desktop: GNOME Shell 3.38.4, Display Server: X Server, Compiler: GCC 10.3.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-link-mutex --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-gDeRY6/gcc-10-10.3.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-gDeRY6/gcc-10-10.3.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-build-config=bootstrap-lto-lean --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / errors=remount-ro,relatime,rw / Block Size: 4096
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0xd000270
Java Notes: OpenJDK Runtime Environment (build 11.0.11+9-Ubuntu-0ubuntu2)
Python Notes: Python 3.9.4
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Vulnerable + spectre_v1: Vulnerable: __user pointer sanitization and usercopy barriers only; no swapgs barriers + spectre_v2: Vulnerable IBPB: disabled STIBP: disabled + srbds: Not affected + tsx_async_abort: Not affected

	Default	mitigations=off
Apache HBase - Rand Read - 1 (us - Latency)	**1097**	**1132**
Normalized	100%	96.91%
Standard Deviation	1.2%	1.5%
Apache HBase - Rand Read - 1 (Rows/sec)	**907**	**879**
Normalized	100%	96.91%
Standard Deviation	1.3%	1.5%
Apache HBase - Rand Write - 1 (us - Latency)	**37**	**38**
Normalized	100%	97.37%
Standard Deviation	4.5%	5.7%
Mobile Neural Network - SqueezeNetV1.0 (ms)	**4.868**	**4.743**
Normalized	97.43%	100%
Standard Deviation	0.2%	0.6%
Redis - SET (Reqs/sec)	**1720527**	**1762945**
Normalized	97.59%	100%
Standard Deviation	1.1%	4.7%
Renaissance - Rand Forest (ms)	**2992**	**2925**
Normalized	97.78%	100%
Standard Deviation	1.8%	1.5%
PJSIP - OPTIONS, Stateless (Responses/sec)	**40482**	**41291**
Normalized	98.04%	100%
Standard Deviation	0.8%	1.4%
Mobile Neural Network - inception-v3 (ms)	**25.904**	**25.465**

Normalized	98.31%	100%
Standard Deviation	0.8%	1.4%
TensorFlow Lite - Inception V4 (us)	**691668**	**680103**
Normalized	98.33%	100%
Standard Deviation	1.1%	2.1%
KeyDB (Ops/sec)	**516052**	**508188**
Normalized	100%	98.48%
Standard Deviation	1.2%	5.6%
DaCapo Benchmark - Tradebeans (msec)	**17045**	**16796**
Normalized	98.54%	100%
Standard Deviation	2.4%	1.7%
Apache HBase - Seq Read - 1 (Rows/sec)	**922**	**909**
Normalized	100%	98.59%
Standard Deviation	2%	2.1%
Apache HBase - Seq Read - 1 (us - Latency)	**1081**	**1096**
Normalized	100%	98.63%
Standard Deviation	2%	2.2%
PJSIP - INVITE (Responses/sec)	**2588**	**2623**
Normalized	98.67%	100%
Standard Deviation	2.1%	0.2%
SQLite Speedtest - Timed Time - Size 1,000 (sec)	**59.564**	**60.183**
Normalized	100%	98.97%
Standard Deviation	0.6%	0.3%
Renaissance - T.H.R (ms)	**6119**	**6173**
Normalized	100%	99.13%
Standard Deviation	2.1%	1.3%
InfluxDB - 4 - 10000 - 2,5000,1 - 10000 (val/sec)	**721645**	**727924**
Normalized	99.14%	100%
Standard Deviation	0.4%	0.7%
Renaissance - I.M.D.S (ms)	**18901**	**19055**
Normalized	100%	99.19%
Standard Deviation	2.4%	4%
Timed Node.js Compilation - Time To Compile (sec)	**101.312**	**102.107**
Normalized	100%	99.22%
Standard Deviation	0.9%	0.4%
Renaissance - Apache Spark ALS (ms)	**3449**	**3423**
Normalized	99.24%	100%
Standard Deviation	1.7%	2%
VOSK Speech Recognition Toolkit (sec)	**28.618**	**28.402**
Normalized	99.25%	100%
Standard Deviation	2.3%	2.4%
InfluxDB - 64 - 10000 - 2,5000,1 - 10000 (val/sec)	**1188389**	**1196124**
Normalized	99.35%	100%
Standard Deviation	0.6%	0.2%
Renaissance - G.A.U.J.F (ms)	**6677**	**6637**
Normalized	99.4%	100%
Standard Deviation	2.3%	2%
TensorFlow Lite - SqueezeNet (us)	**47670**	**47386**
Normalized	99.4%	100%
Standard Deviation	0.7%	1.5%
Apache HBase - Rand Write - 1 (Rows/sec)	**25670**	**25804**
Normalized	99.48%	100%
Standard Deviation	5.2%	4.6%
DaCapo Benchmark - H2 (msec)	**10754**	**10710**
Normalized	99.59%	100%

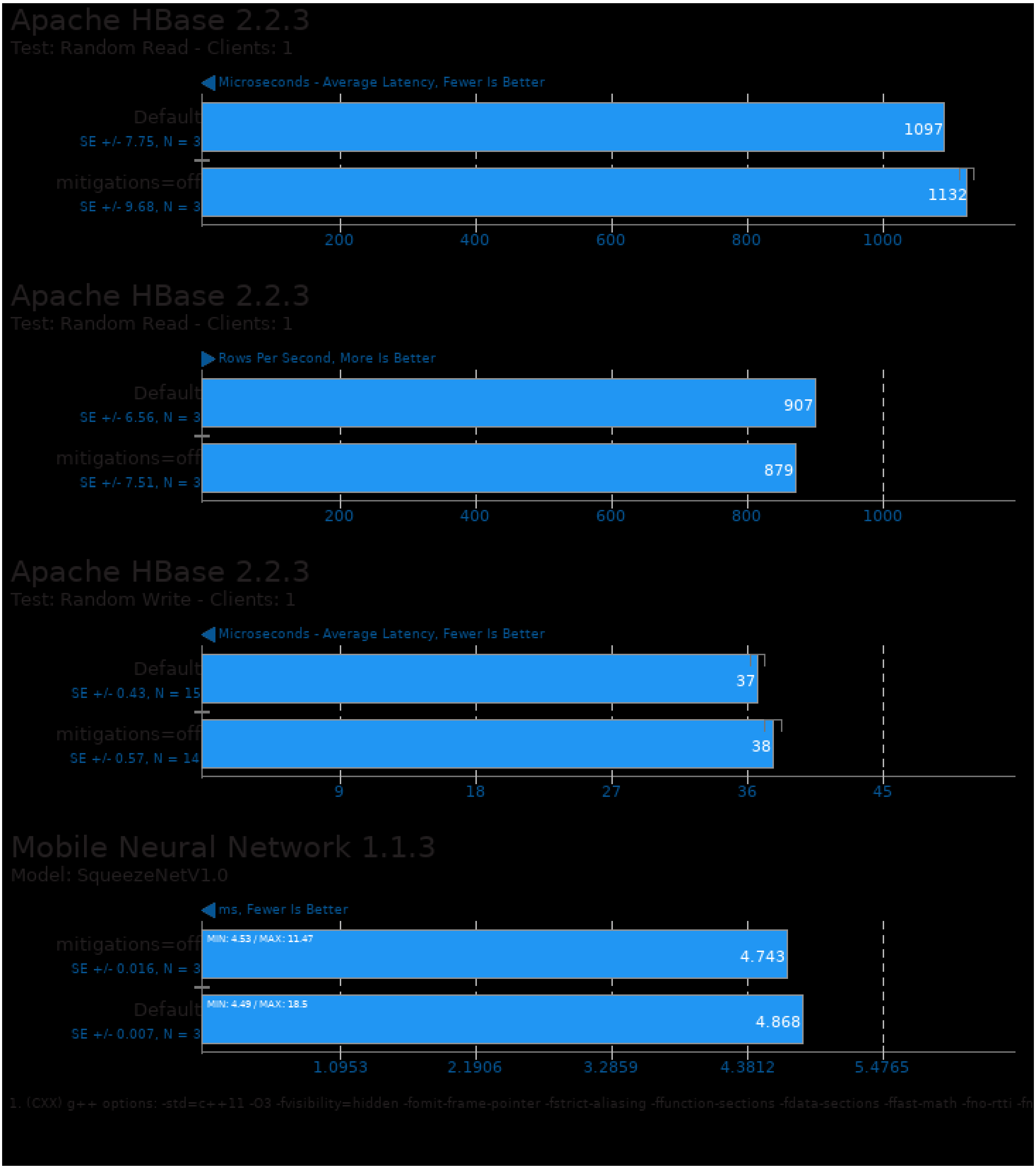
Intel Xeon Ice Lake Mitigation Comparison

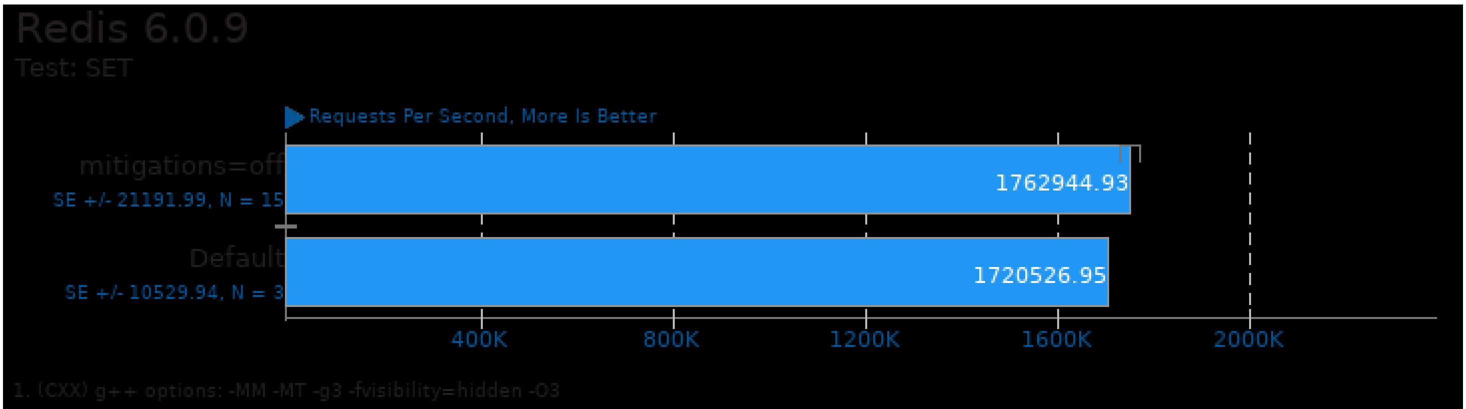
Standard Deviation	1.2%	0.7%
Renaissance - A.U.C.T (ms)	**30002**	**30103**
Normalized	100%	99.67%
Standard Deviation	2.8%	4.2%
Apache HBase - Increment - 1 (us - Latency)	**1762**	**1767**
Normalized	100%	99.72%
Standard Deviation	1.9%	0.8%
Timed Mesa Compilation - Time To Compile (sec)	**18.961**	**19.014**
Normalized	100%	99.72%
Standard Deviation	0.8%	0.6%
PostMark - D.T.P (TPS)	**6214**	**6199**
Normalized	100%	99.76%
Standard Deviation	2.4%	1.4%
PJSIP - OPTIONS, Stateful (Responses/sec)	**3821**	**3813**
Normalized	100%	99.79%
Standard Deviation	0.5%	0.2%
Sockperf - Latency Ping Pong (usec)	**8.347**	**8.362**
Normalized	100%	99.82%
Standard Deviation	2.3%	2.4%
Apache HBase - Increment - 1 (Rows/sec)	**566**	**565**
Normalized	100%	99.82%
Standard Deviation	1.8%	0.9%
Chia Blockchain VDF - Square Plain C++ (IPS)	**139967**	**140200**
Normalized	99.83%	100%
Standard Deviation	1%	0.5%
PostgreSQL pgbench - 100 - 250 - Read Write - Average Latency (ms)	**8.682**	**8.695**
Normalized	100%	99.85%
Standard Deviation	0.4%	0.4%
PostgreSQL pgbench - 100 - 250 - Read Write (TPS)	**28904**	**28865**
Normalized	100%	99.87%
Standard Deviation	0.5%	0.3%
Apache HBase - Seq Write - 1 (Rows/sec)	**30564**	**30602**
Normalized	99.88%	100%
Standard Deviation	5.5%	5.3%
Timed Godot Game Engine Compilation - Time To Compile (sec)	**74.877**	**74.940**
Normalized	100%	99.92%
Standard Deviation	1.3%	1%
Timed Linux Kernel Compilation - Time To Compile	**24.780**	**24.762**
Normalized	99.93%	100%
Standard Deviation	5%	5.7%
ctx_clock - C.S.T (Clocks)	228	228
Apache HBase - Seq Write - 1 (us - Latency)	31	31
Standard Deviation	6.5%	6.2%
PostgreSQL pgbench - 100 - 250 - Read Only - Average Latency (ms)	**0.263**	**0.262**
Normalized	99.62%	100%
Standard Deviation	6.6%	3.4%
PostgreSQL pgbench - 100 - 250 - Read Only (TPS)	**957966**	**958345**
Normalized	99.96%	100%
Standard Deviation	6.4%	3.4%
Renaissance - Scala Dotty (ms)	**1792**	**1737**
Normalized	96.96%	100%
Standard Deviation	13.6%	8.2%

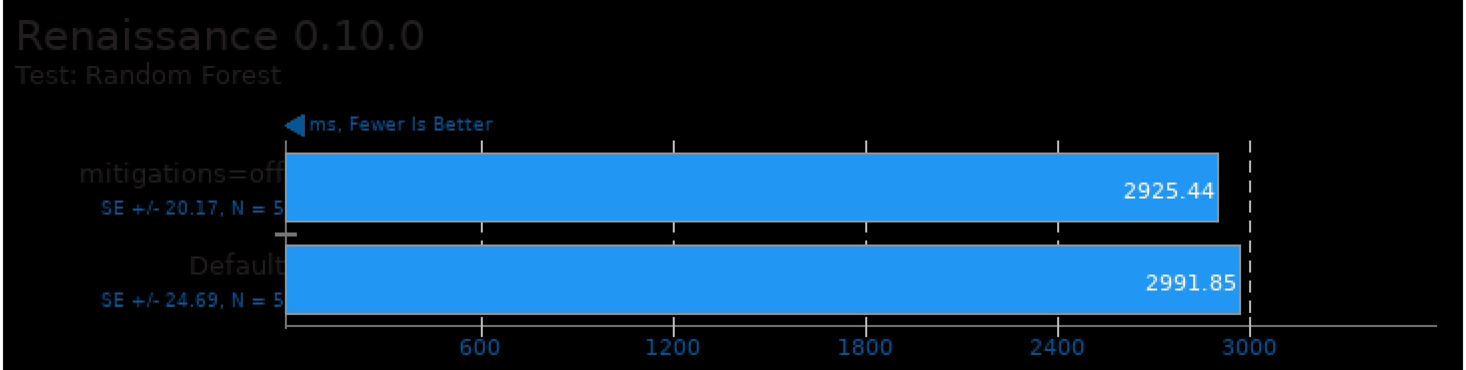
Intel Xeon Ice Lake Mitigation Comparison

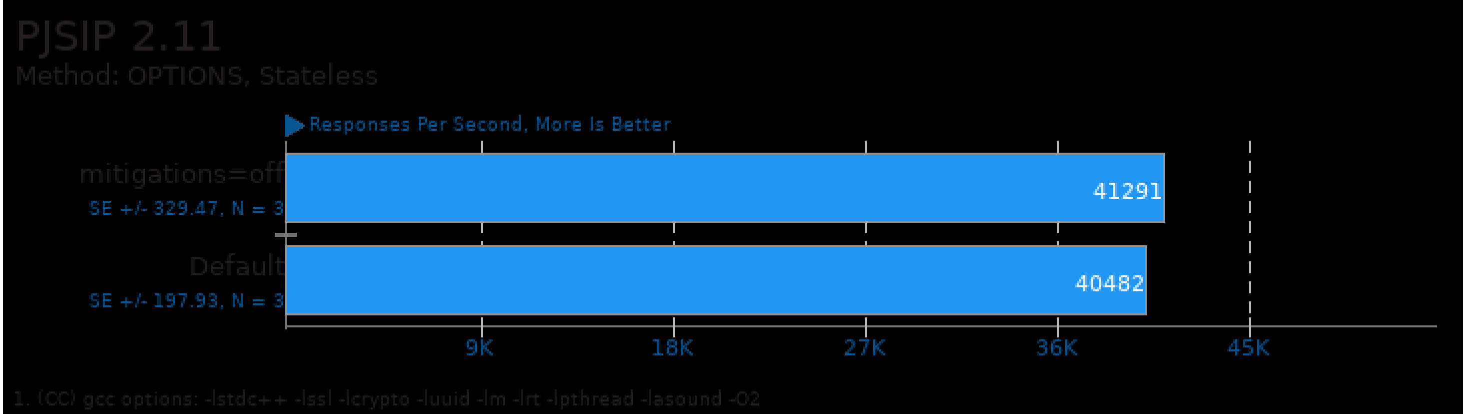
Sockperf - Throughput (Messages/sec)	315557	320939
Normalized	98.32%	100%
Standard Deviation	8%	2%

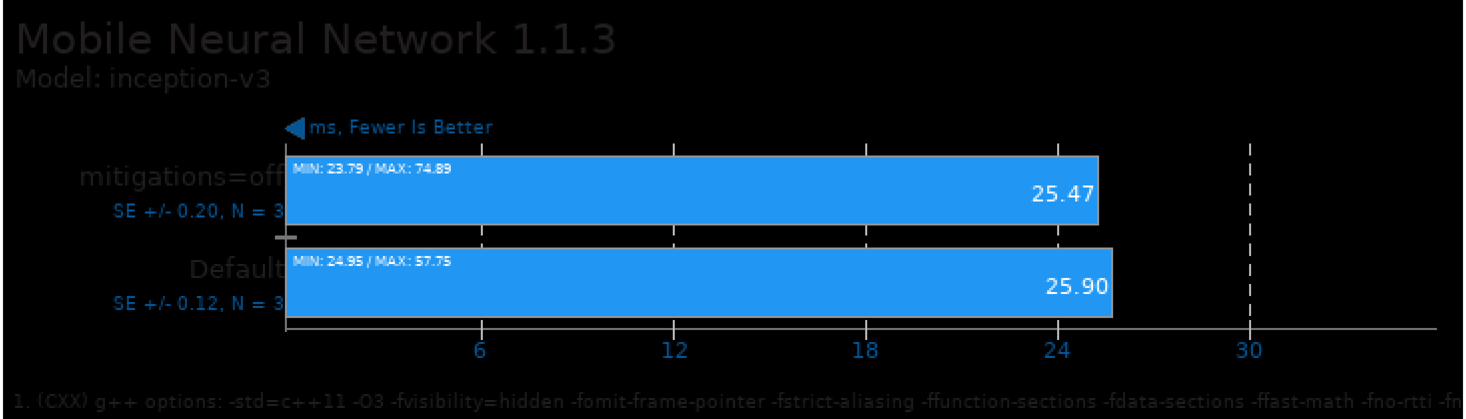
Intel Xeon Ice Lake Mitigation Comparison



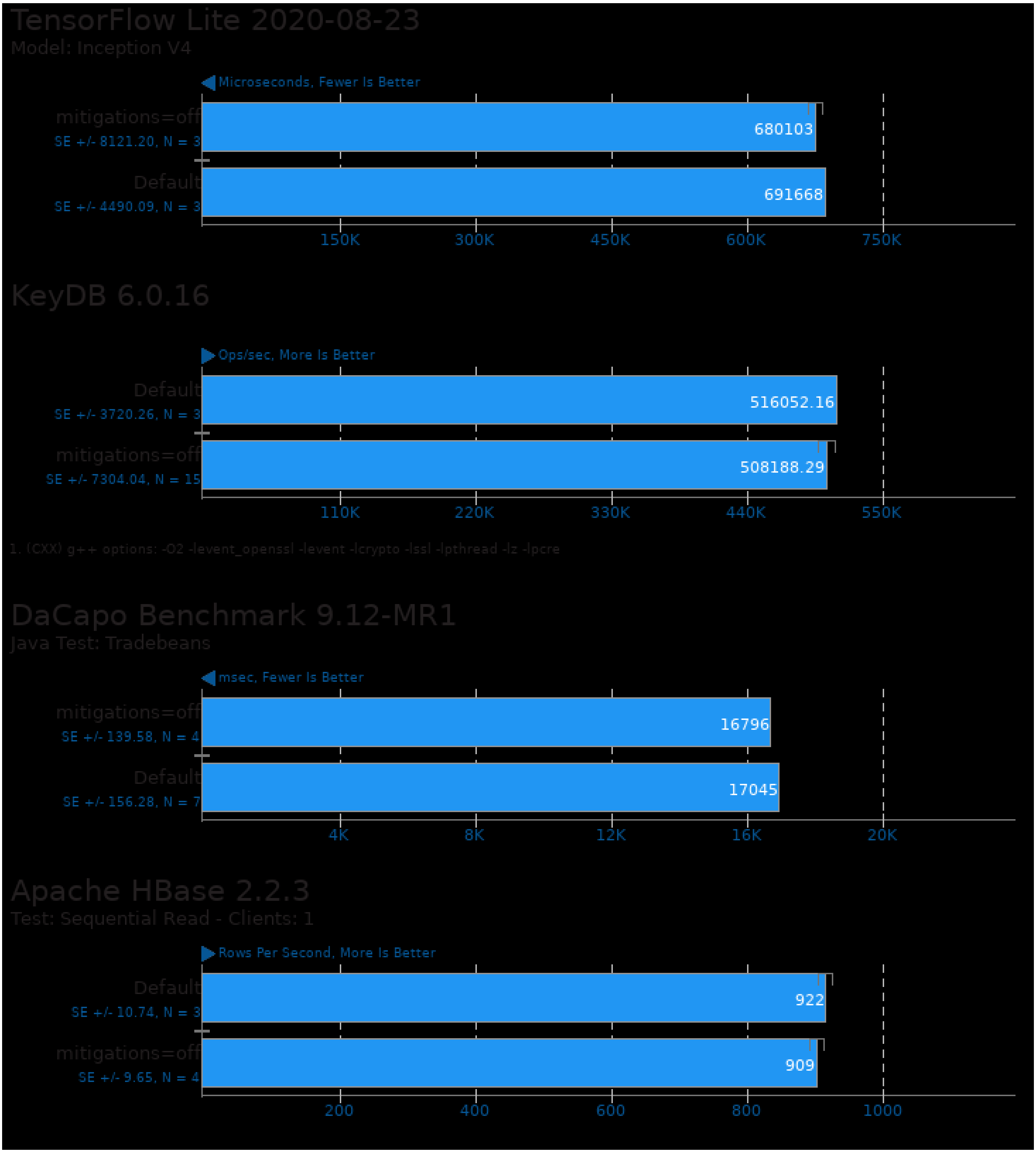

Redis 6.0.9
Test: SET
Requests Per Second, More Is Better
mitigations=off
SE +/- 21191.99, N = 15
1762944.93
Default
SE +/- 10529.94, N = 3
1720526.95
400K
800K
1200K
1600K
2000K
1. (CXX) g++ options: -MM -MT -g3 -fvisibility=hidden -O3


Renaissance 0.10.0
Test: Random Forest
ms, Fewer Is Better
mitigations=off
SE +/- 20.17, N = 5
2925.44
Default
SE +/- 24.69, N = 5
2991.85
600
1200
1800
2400
3000

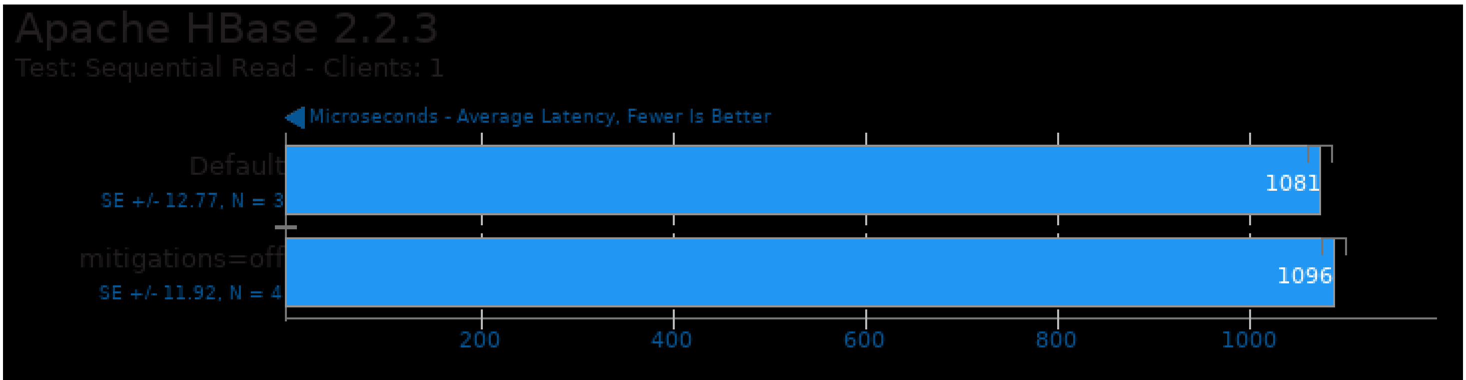

PJSIP 2.11
Method: OPTIONS, Stateless
Responses Per Second, More Is Better
mitigations=off
SE +/- 329.47, N = 3
41291
Default
SE +/- 197.93, N = 3
40482
9K
18K
27K
36K
45K
1. (CC) gcc options: -lstdc++ -lssl -lcrypto -luuid -lm -lrt -lpthread -lasound -O2

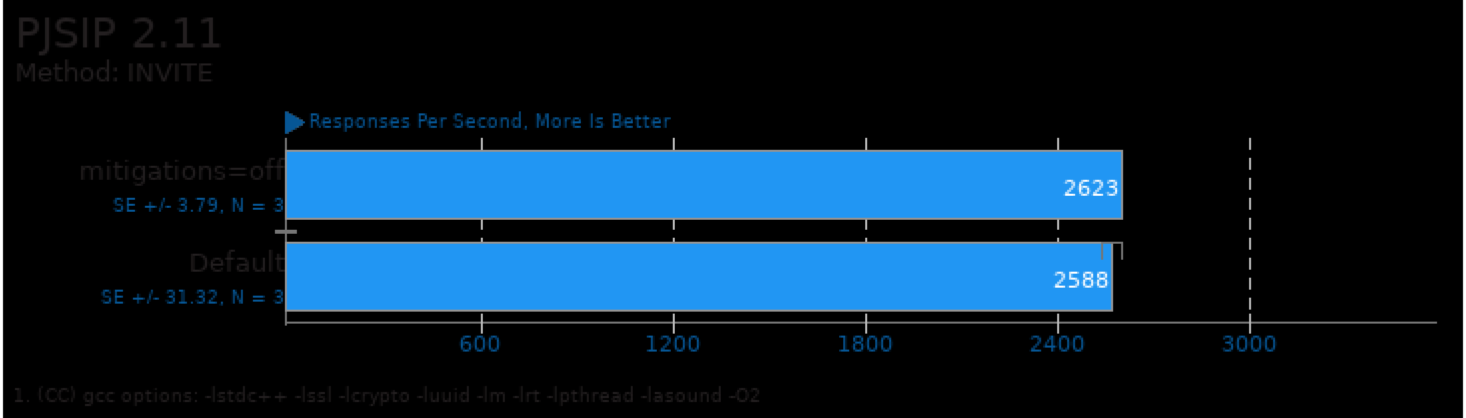

Mobile Neural Network 1.1.3
Model: inception-v3
ms, Fewer Is Better
mitigations=off
SE +/- 0.20, N = 3
MIN: 23.79 / MAX: 74.89
25.47
Default
SE +/- 0.12, N = 3
MIN: 24.95 / MAX: 57.75
25.90
6
12
18
24
30
1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fn

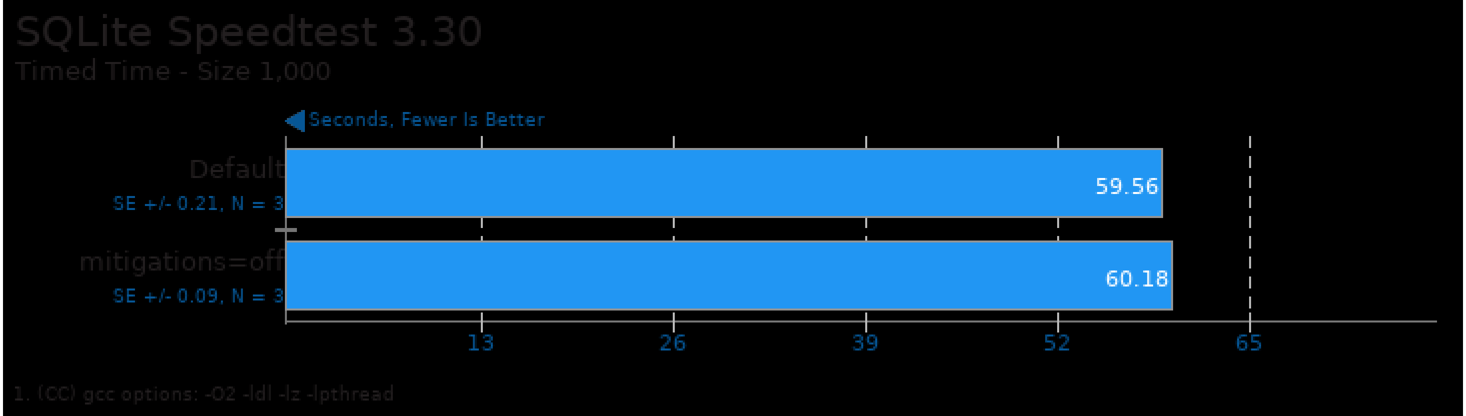
Intel Xeon Ice Lake Mitigation Comparison

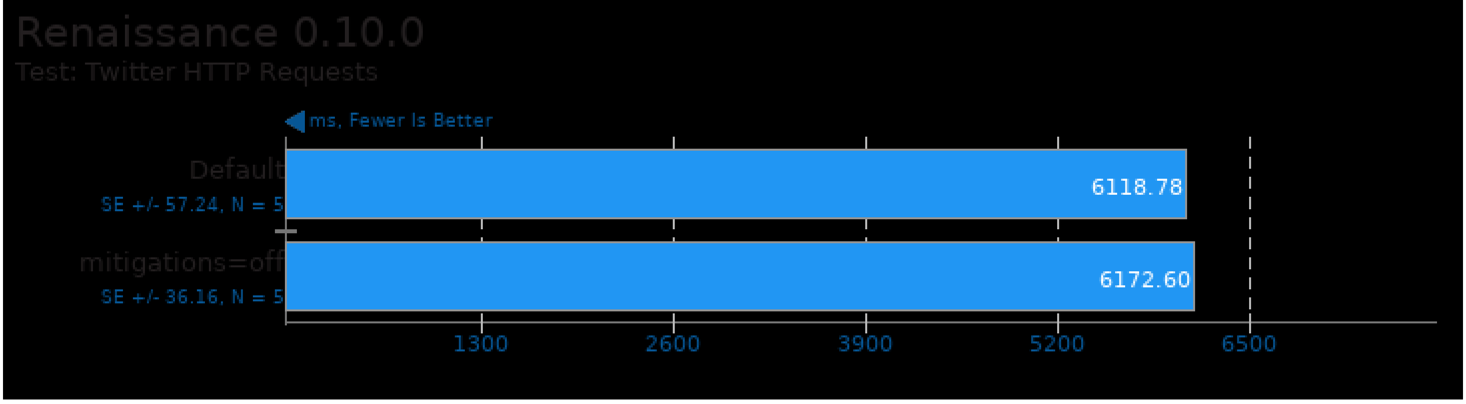


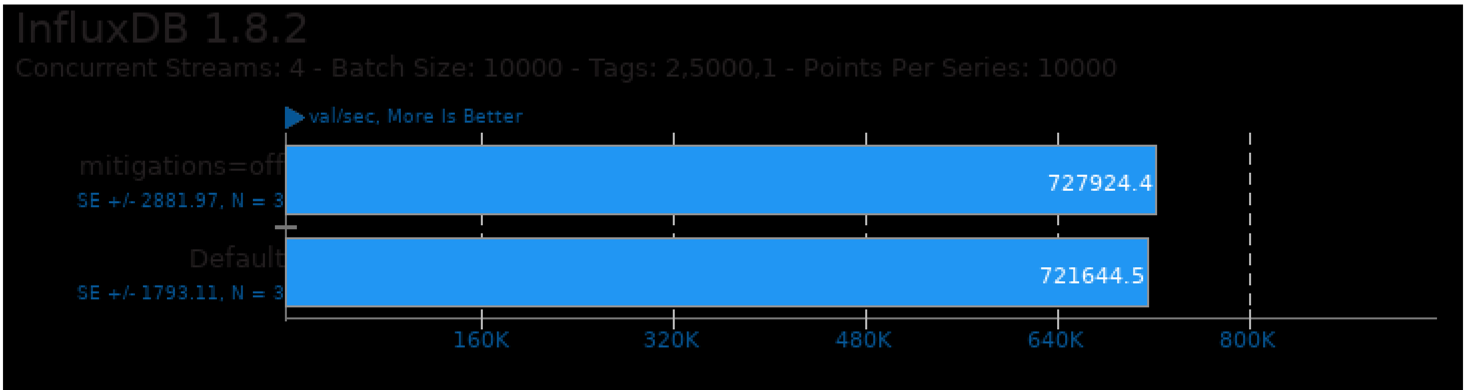
Intel Xeon Ice Lake Mitigation Comparison

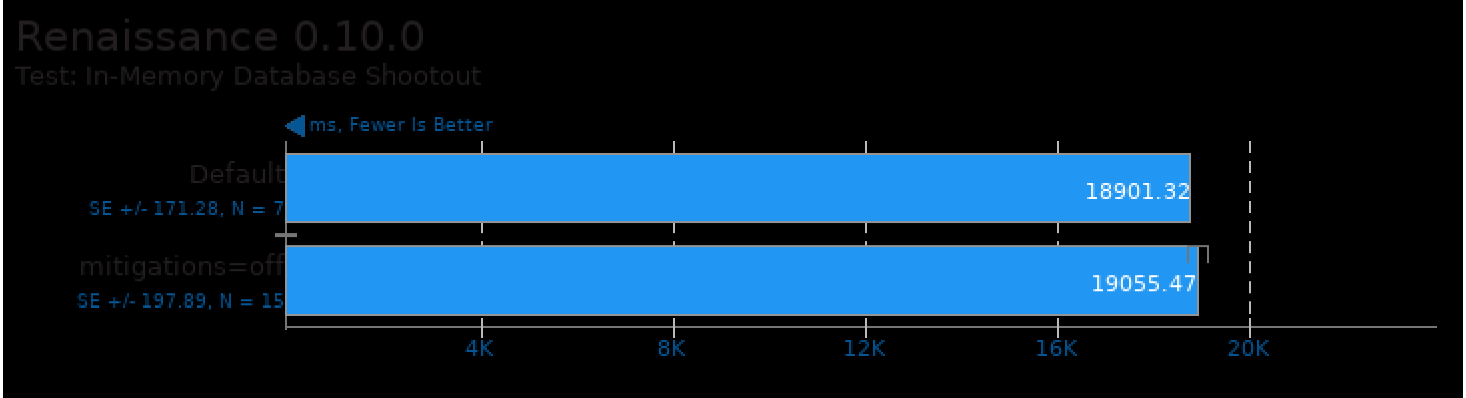


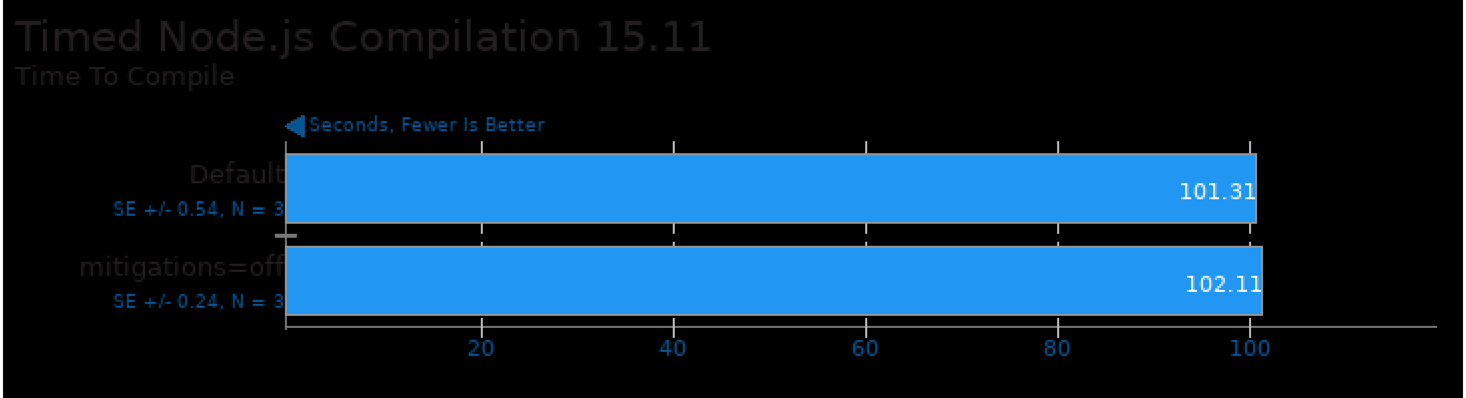


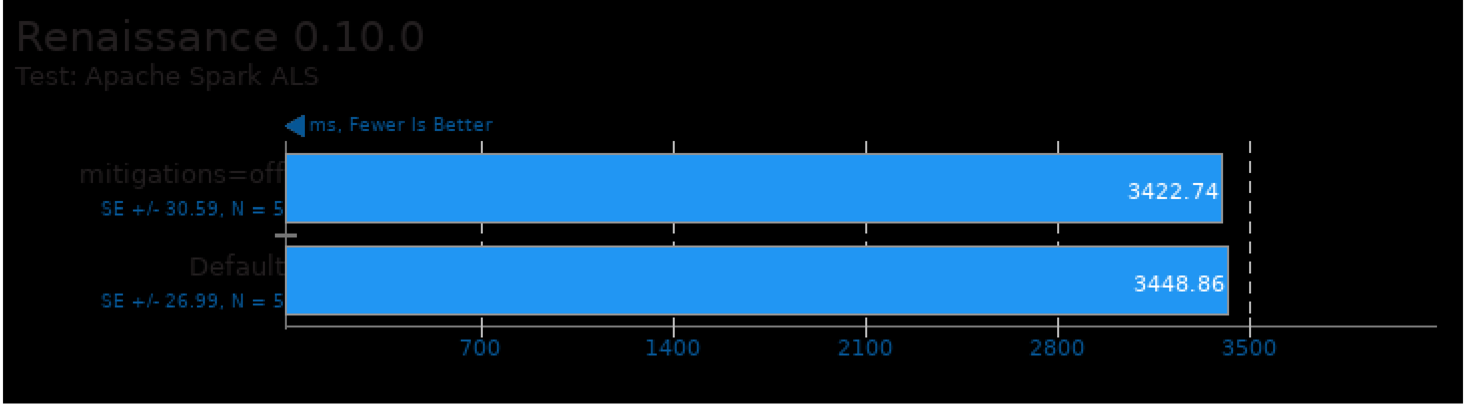




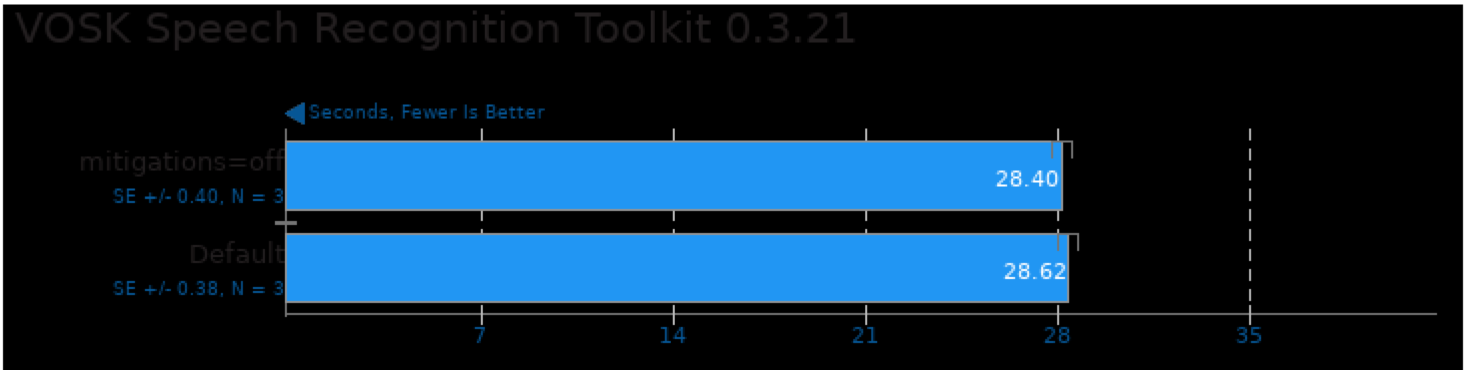

InfluxDB 1.8.2
Concurrent Streams: 4 - Batch Size: 10000 - Tags: 2,5000,1 - Points Per Series: 10000
val/sec, More Is Better
mitigations=off
SE +/- 2881.97, N = 3
727924.4
Default
SE +/- 1793.11, N = 3
721644.5
160K
320K
480K
640K
800K

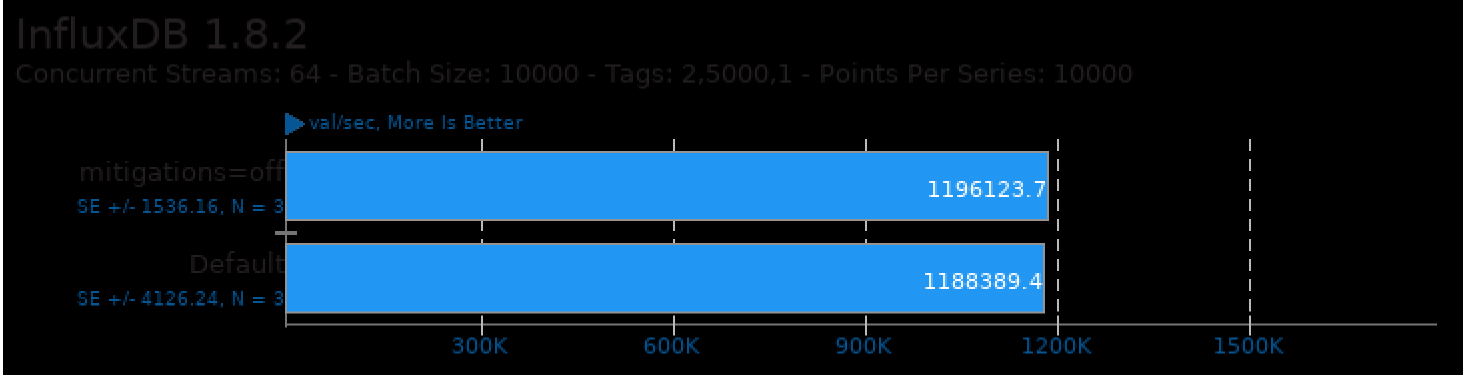

Renaissance 0.10.0
Test: In-Memory Database Shootout
ms, Fewer Is Better
Default
SE +/- 171.28, N = 7
18901.32
mitigations=off
SE +/- 197.89, N = 15
19055.47
4K
8K
12K
16K
20K

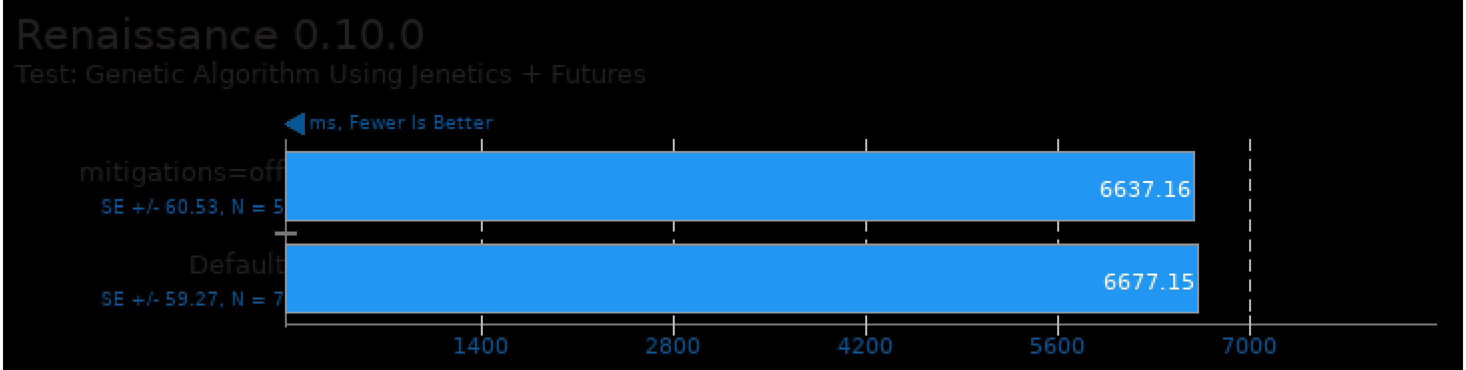

Timed Node.js Compilation 15.11
Time To Compile
Seconds, Fewer Is Better
Default
SE +/- 0.54, N = 3
101.31
mitigations=off
SE +/- 0.24, N = 3
102.11
20
40
60
80
100

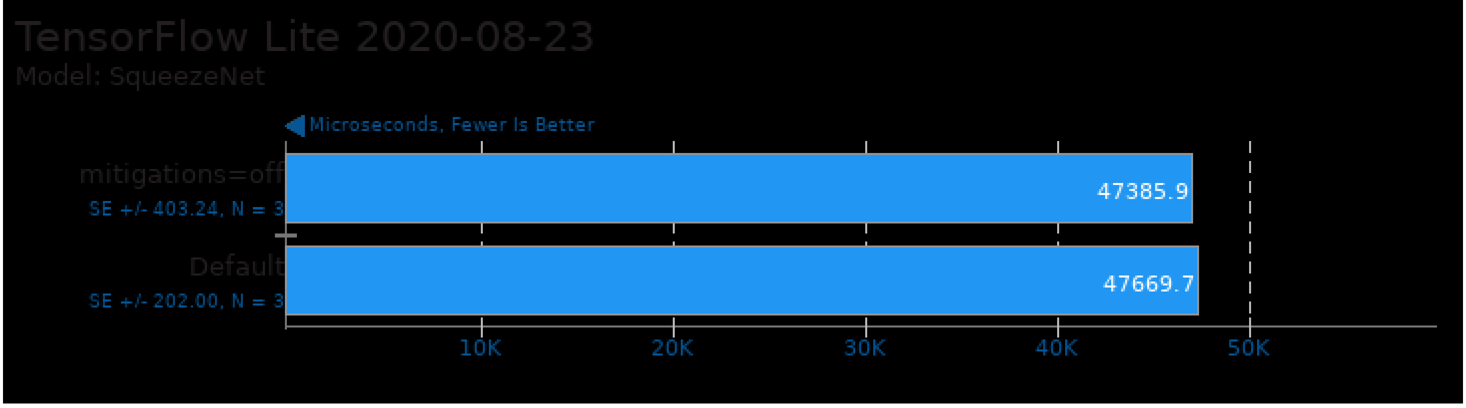

Renaissance 0.10.0
Test: Apache Spark ALS
ms, Fewer Is Better
mitigations=off
SE +/- 30.59, N = 5
3422.74
Default
SE +/- 26.99, N = 5
3448.86
700
1400
2100
2800
3500

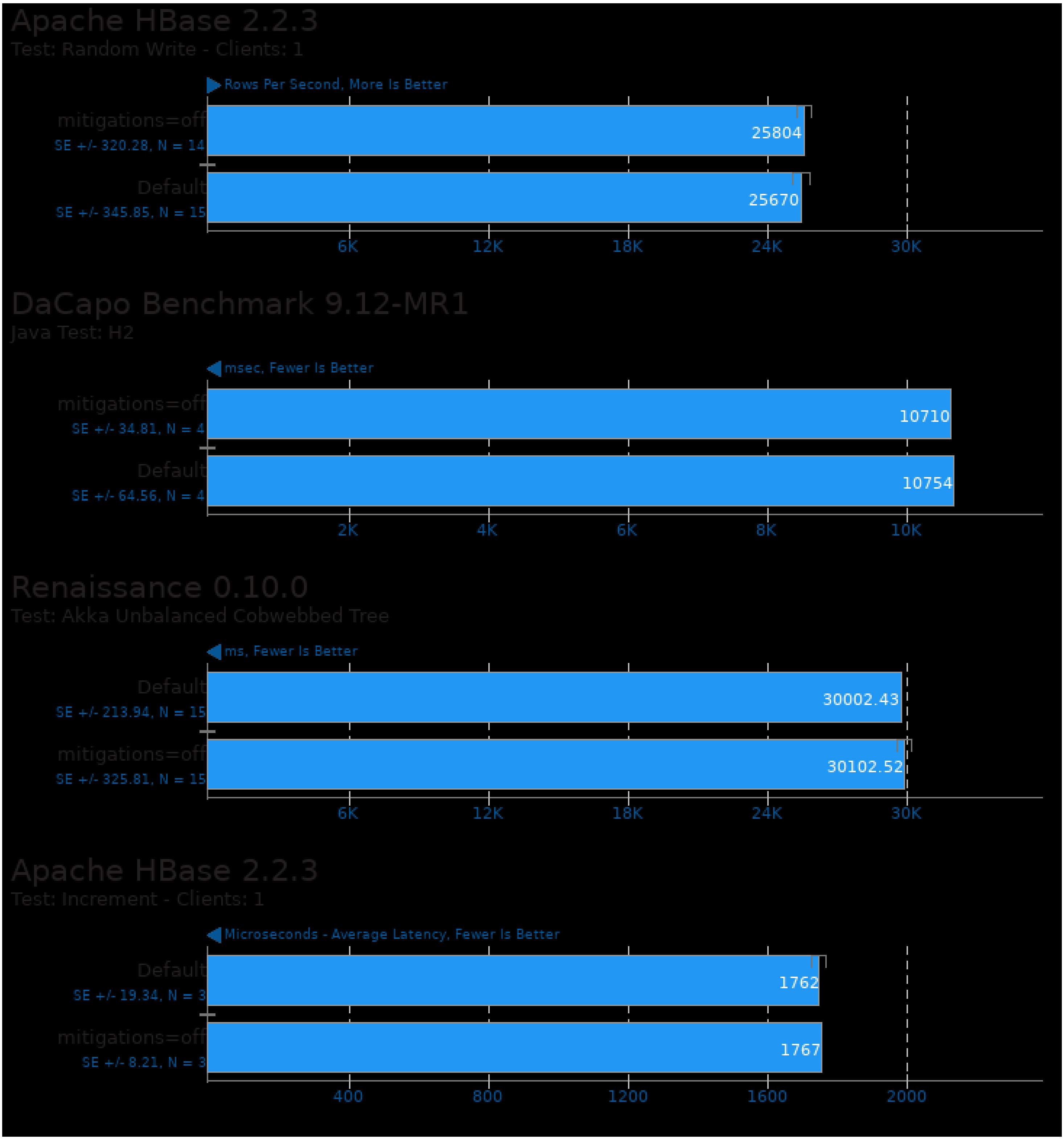
Intel Xeon Ice Lake Mitigation Comparison



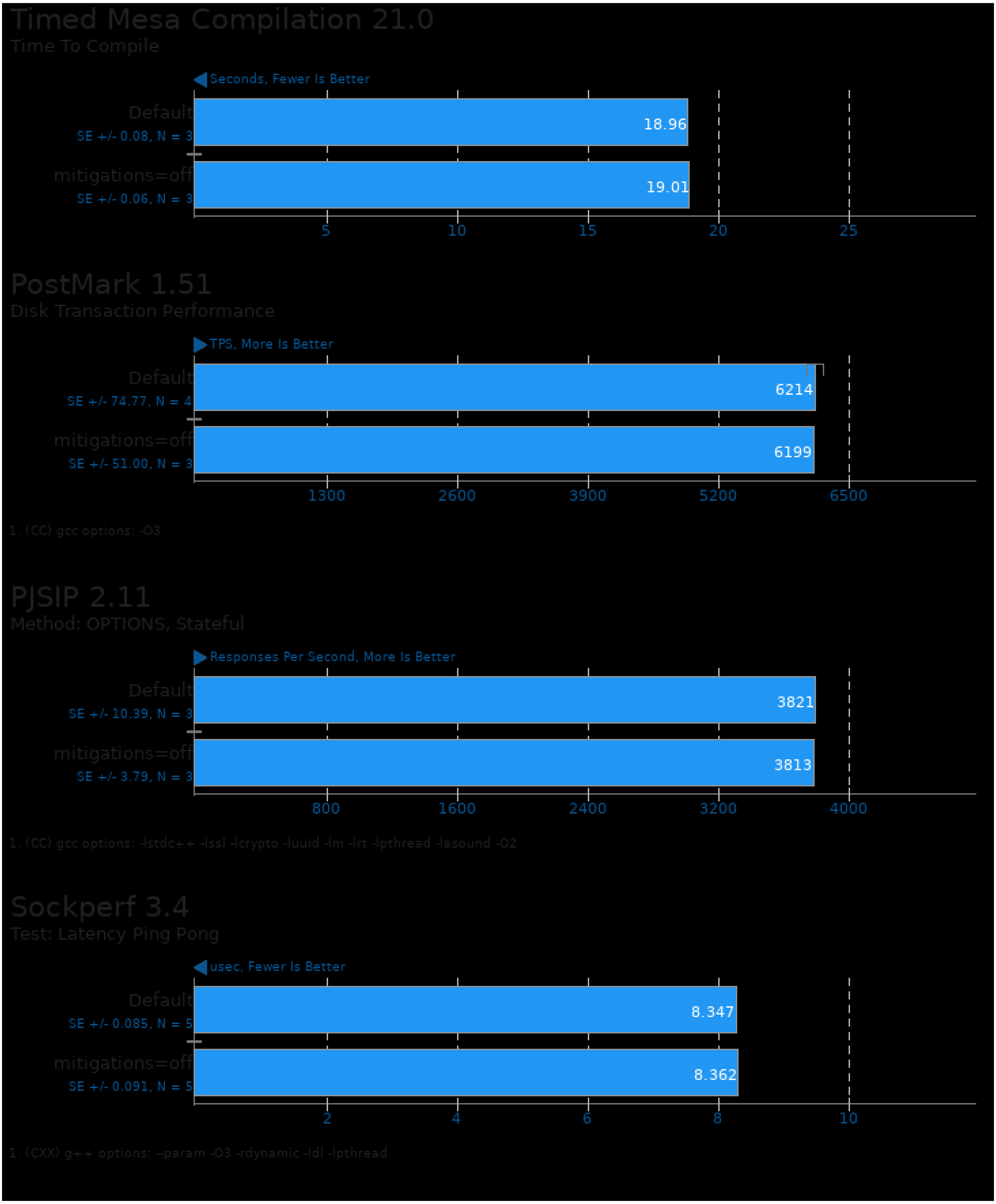


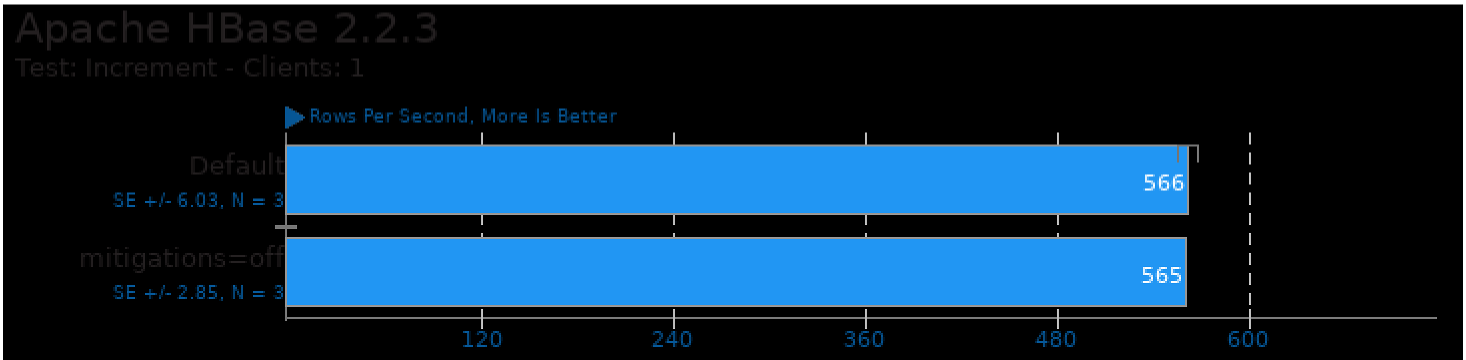


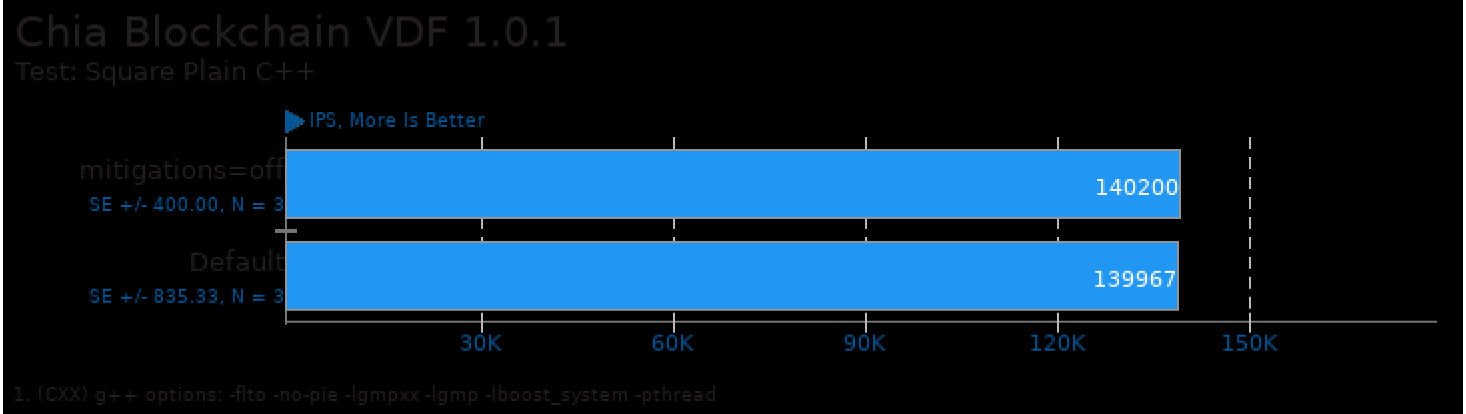


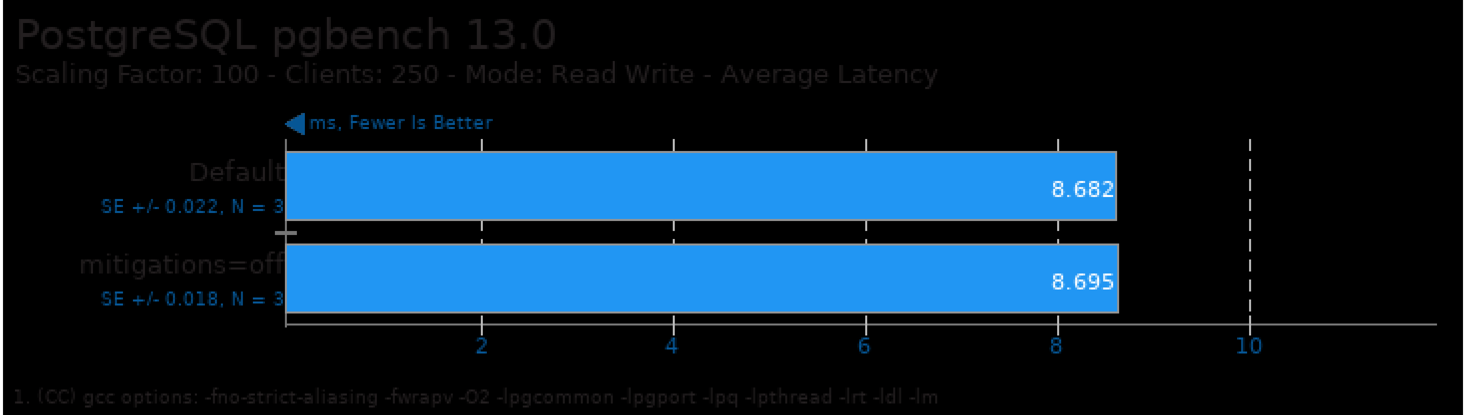

Apache HBase 2.2.3
Test: Random Write - Clients: 1
Rows Per Second, More Is Better
mitigations=off
SE +/- 320.28, N = 14
25804
Default
SE +/- 345.85, N = 15
25670
6K
12K
18K
24K
30K
DaCapo Benchmark 9.12-MR1
Java Test: H2
msec, Fewer Is Better
mitigations=off
SE +/- 34.81, N = 4
10710
Default
SE +/- 64.56, N = 4
10754
2K
4K
6K
8K
10K
Renaissance 0.10.0
Test: Akka Unbalanced Cobwebbed Tree
ms, Fewer Is Better
Default
SE +/- 213.94, N = 15
30002.43
mitigations=off
SE +/- 325.81, N = 15
30102.52
6K
12K
18K
24K
30K
Apache HBase 2.2.3
Test: Increment - Clients: 1
Microseconds - Average Latency, Fewer Is Better
Default
SE +/- 19.34, N = 3
1762
mitigations=off
SE +/- 8.21, N = 3
1767
400
800
1200
1600
2000

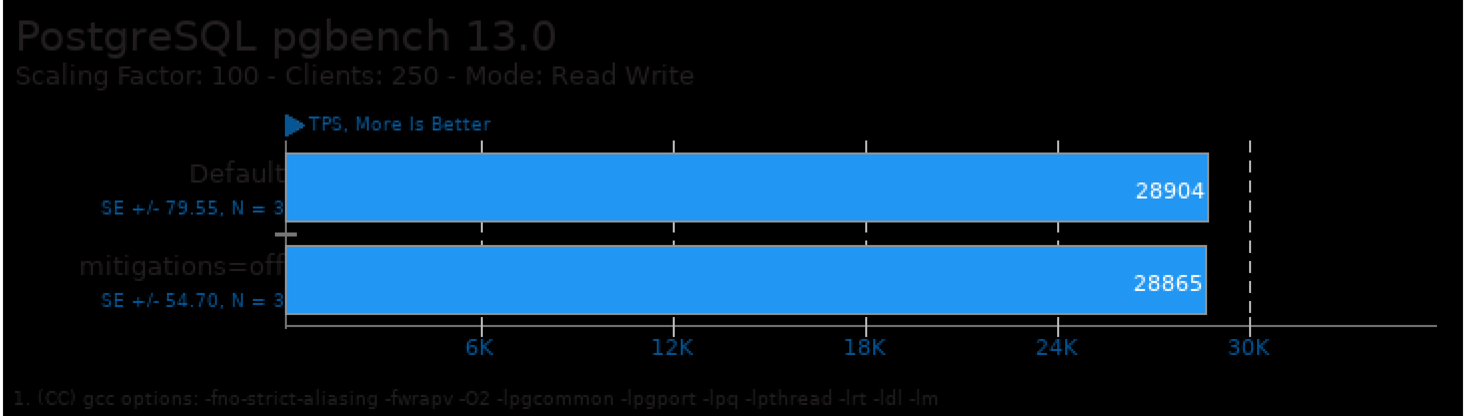
Intel Xeon Ice Lake Mitigation Comparison

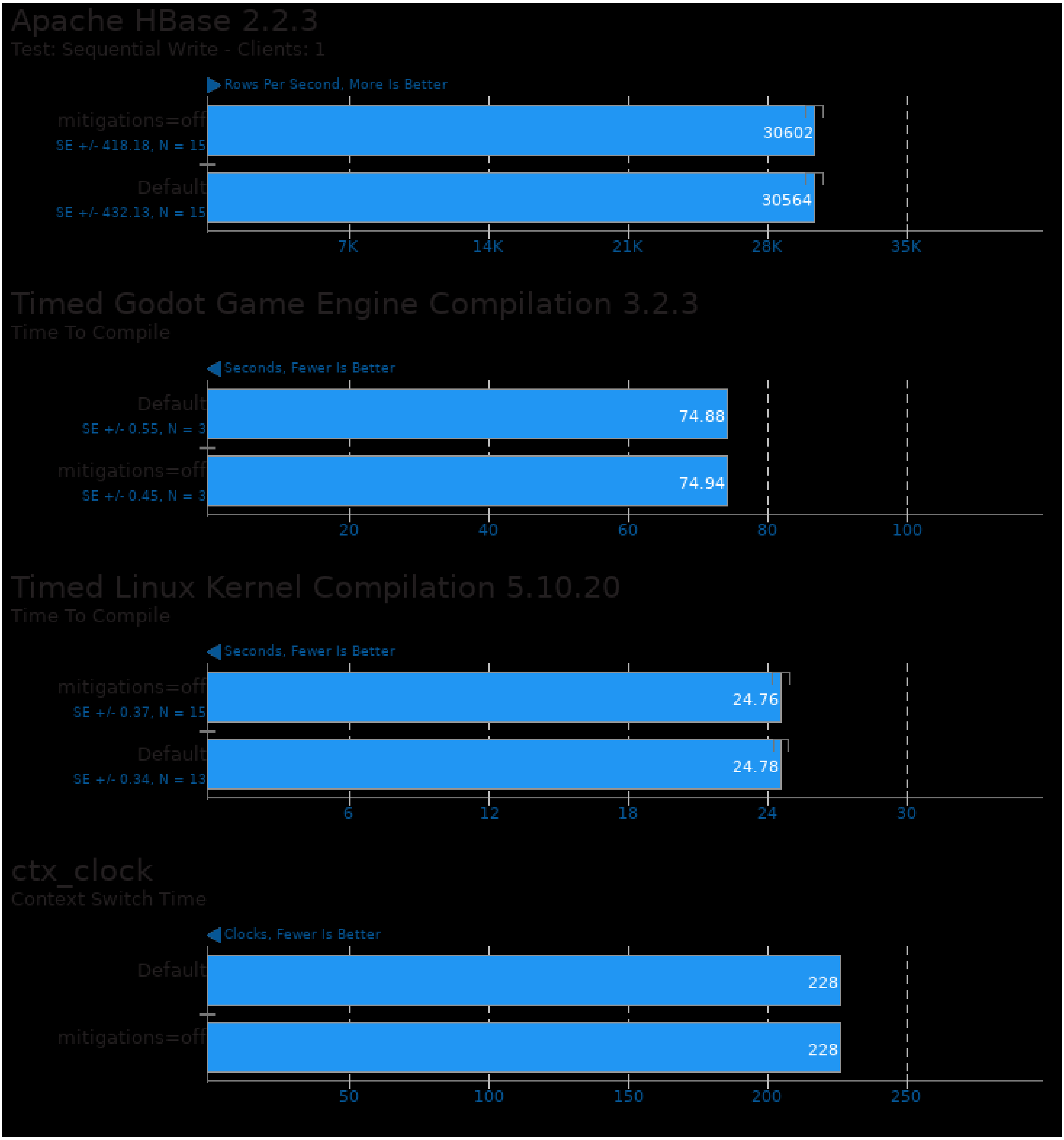


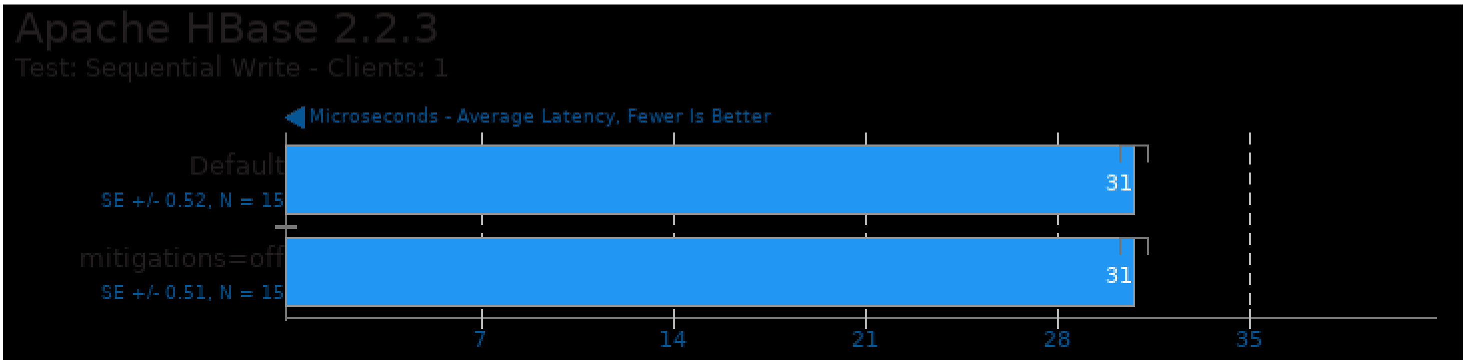

Apache HBase 2.2.3
Test: Increment - Clients: 1
Rows Per Second, More Is Better
Default
SE +/- 6.03, N = 3
566
mitigations=off
SE +/- 2.85, N = 3
565
120
240
360
480
600


Chia Blockchain VDF 1.0.1
Test: Square Plain C++
IPS, More Is Better
mitigations=off
SE +/- 400.00, N = 3
140200
Default
SE +/- 835.33, N = 3
139967
30K
60K
90K
120K
150K
1. (CXX) g++ options: -flto -no-pie -lgmpxx -lgmp -lboost_system -pthread

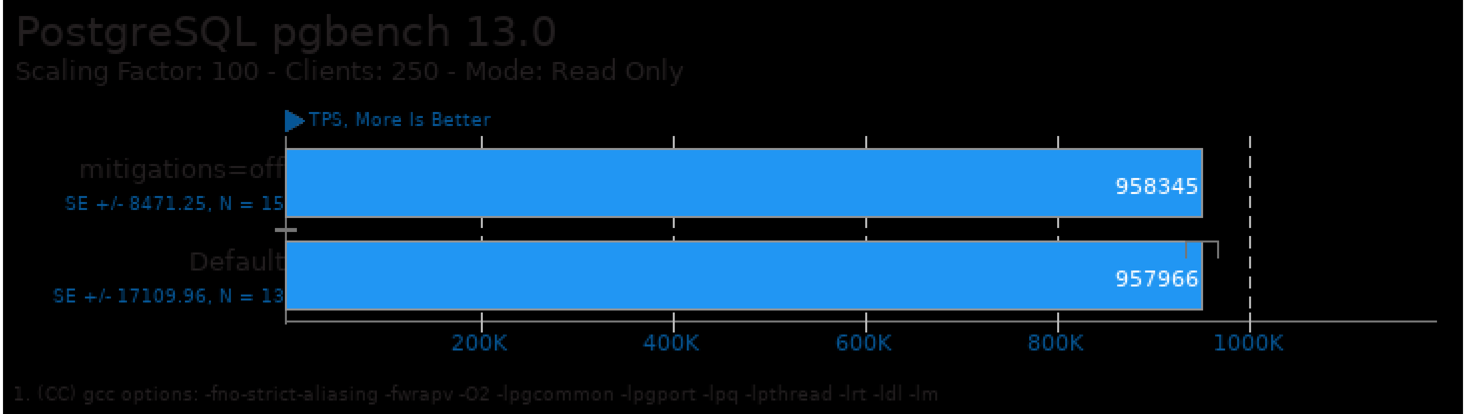

PostgreSQL pgbench 13.0
Scaling Factor: 100 - Clients: 250 - Mode: Read Write - Average Latency
ms, Fewer Is Better
Default
SE +/- 0.022, N = 3
8.682
mitigations=off
SE +/- 0.018, N = 3
8.695
2
4
6
8
10
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -lpgcommon -lpgport -lpq -lpthread -lrt -ldl -lm

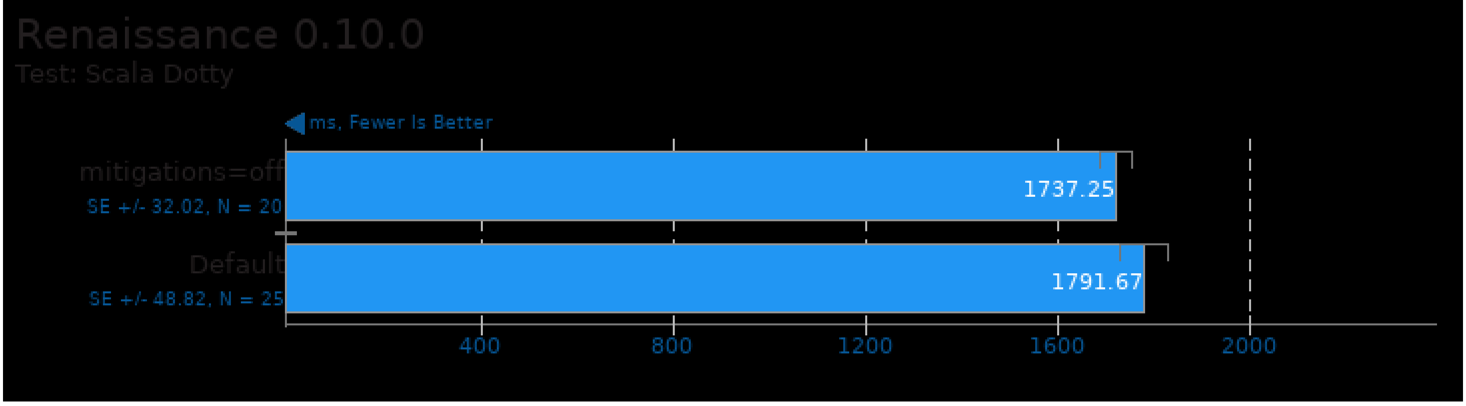

PostgreSQL pgbench 13.0
Scaling Factor: 100 - Clients: 250 - Mode: Read Write
TPS, More Is Better
Default
SE +/- 79.55, N = 3
28904
mitigations=off
SE +/- 54.70, N = 3
28865
6K
12K
18K
24K
30K
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -lpgcommon -lpgport -lpq -lpthread -lrt -ldl -lm

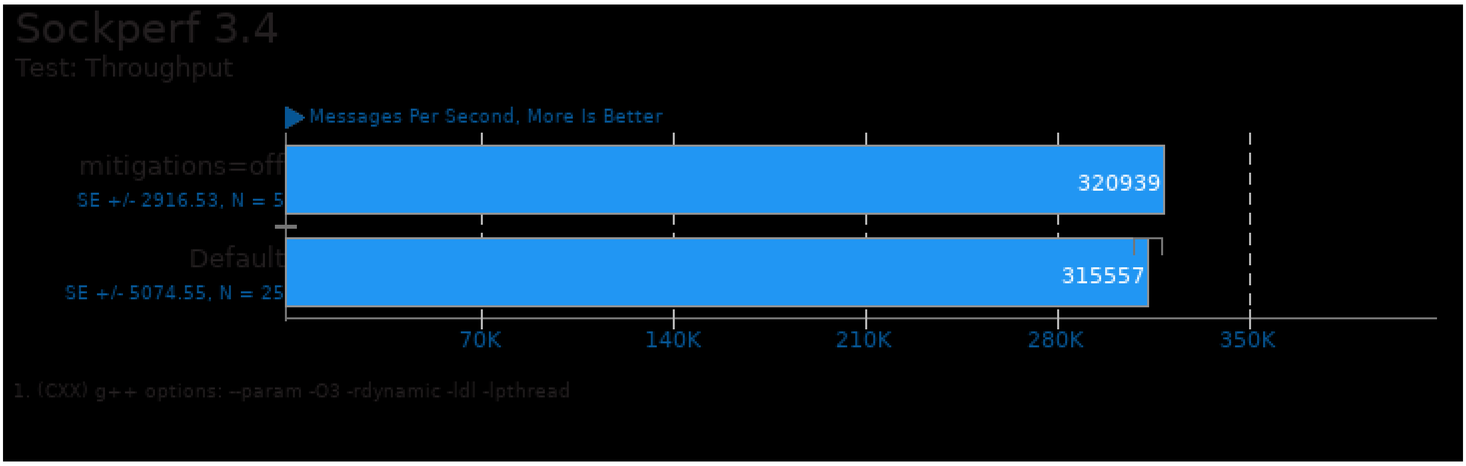

Apache HBase 2.2.3
Test: Sequential Write - Clients: 1
Rows Per Second, More Is Better
mitigations=off
SE +/- 418.18, N = 15
30602
Default
SE +/- 432.13, N = 15
30564
7K
14K
21K
28K
35K
Timed Godot Game Engine Compilation 3.2.3
Time To Compile
Seconds, Fewer Is Better
Default
SE +/- 0.55, N = 3
74.88
mitigations=off
SE +/- 0.45, N = 3
74.94
20
40
60
80
100
Timed Linux Kernel Compilation 5.10.20
Time To Compile
Seconds, Fewer Is Better
mitigations=off
SE +/- 0.37, N = 15
24.76
Default
SE +/- 0.34, N = 13
24.78
6
12
18
24
30
ctx_clock
Context Switch Time
Clocks, Fewer Is Better
Default
228
mitigations=off
228
50
100
150
200
250


Apache HBase 2.2.3
Test: Sequential Write - Clients: 1
Microseconds - Average Latency, Fewer Is Better
Default
SE +/- 0.52, N = 15
31
mitigations=off
SE +/- 0.51, N = 15
31
7
14
21
28
35


PostgreSQL pgbench 13.0
Scaling Factor: 100 - Clients: 250 - Mode: Read Only - Average Latency
ms, Fewer Is Better
mitigations=off
SE +/- 0.002, N = 15
0.262
Default
SE +/- 0.005, N = 13
0.263
0.0592
0.1184
0.1776
0.2368
0.296
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -lpgcommon -lpgport -lpq -lpthread -lrt -ldl -lm

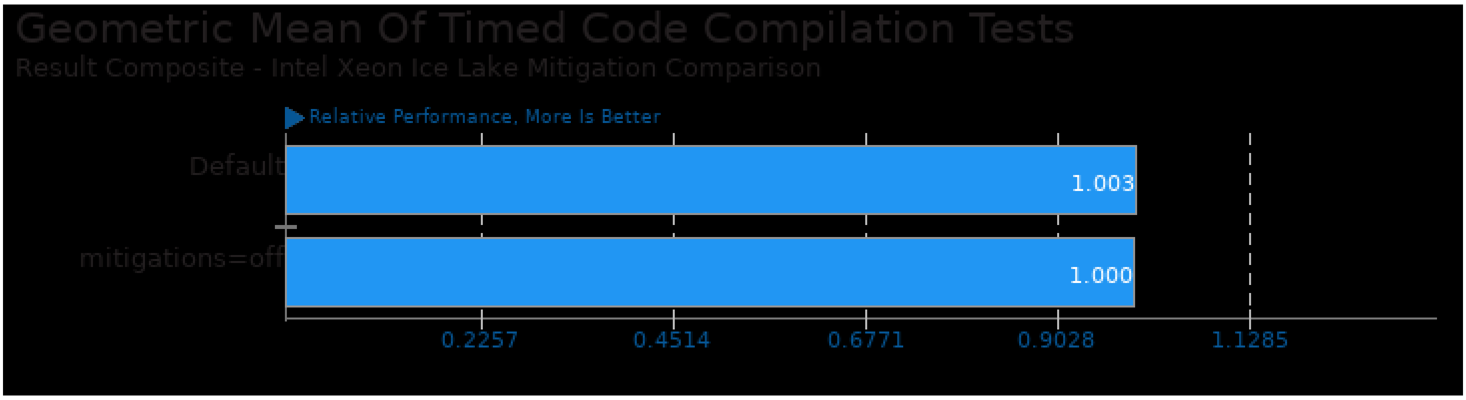

PostgreSQL pgbench 13.0
Scaling Factor: 100 - Clients: 250 - Mode: Read Only
TPS, More Is Better
mitigations=off
SE +/- 8471.25, N = 15
958345
Default
SE +/- 17109.96, N = 13
957966
200K
400K
600K
800K
1000K
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -lpgcommon -lpgport -lpq -lpthread -lrt -ldl -lm


Renaissance 0.10.0
Test: Scala Dotty
ms, Fewer Is Better
mitigations=off
SE +/- 32.02, N = 20
1737.25
Default
SE +/- 48.82, N = 25
1791.67
400
800
1200
1600
2000

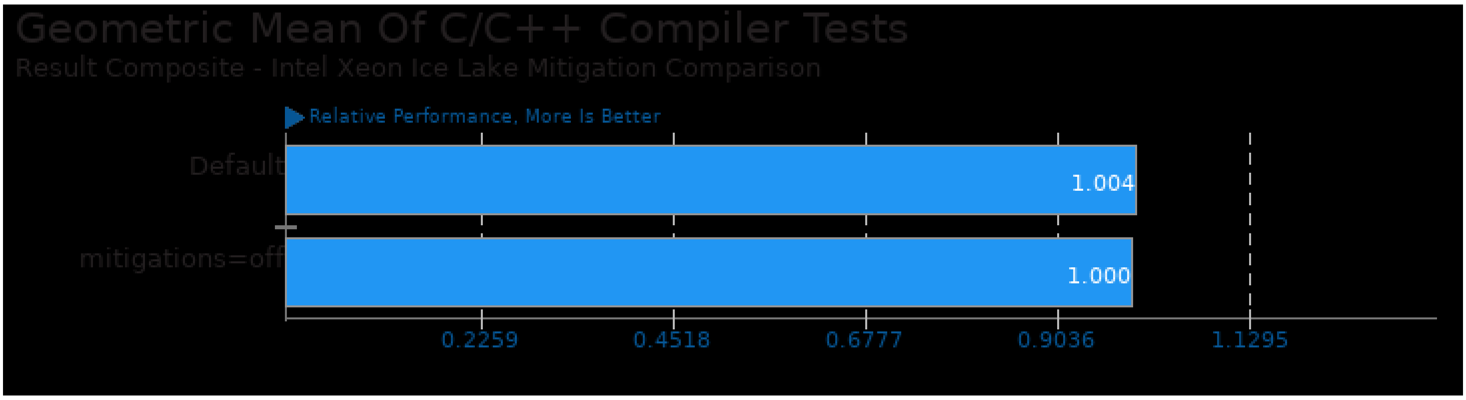

Sockperf 3.4
Test: Throughput
Messages Per Second, More Is Better
mitigations=off
SE +/- 2916.53, N = 5
320939
Default
SE +/- 5074.55, N = 25
315557
70K
140K
210K
280K
350K
1. (CXX) g++ options: --param -O3 -rdynamic -ldl -lpthread

Intel Xeon Ice Lake Mitigation Comparison

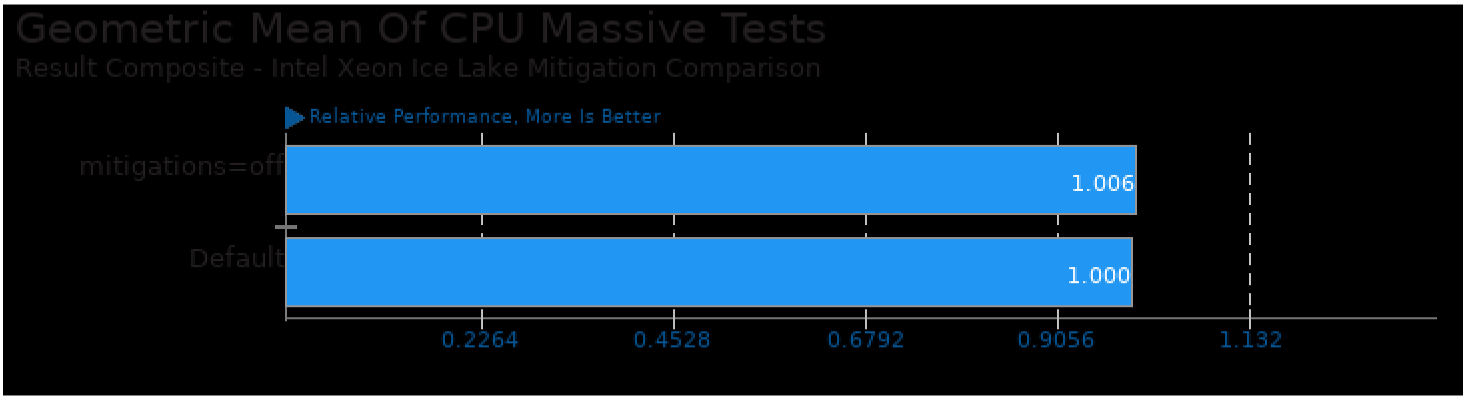
These geometric means are based upon test groupings / test suites for this result file.



Geometric mean based upon tests: pts/build-linux-kernel, pts/build-godot, pts/build-nodejs and pts/build-mesa

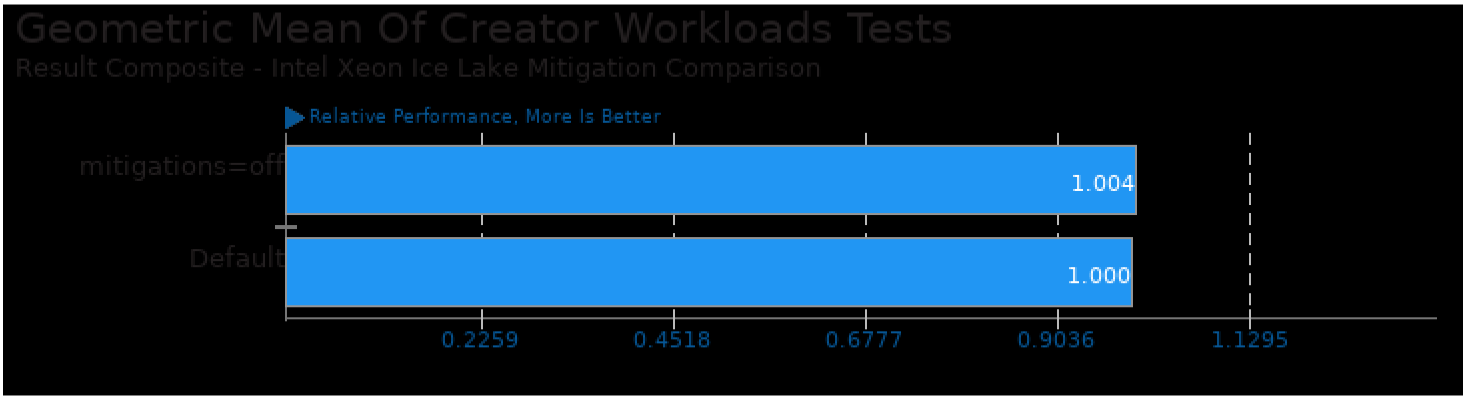


Geometric mean based upon tests: pts/pgbench, pts/sqlite-speedtest and pts/keydb

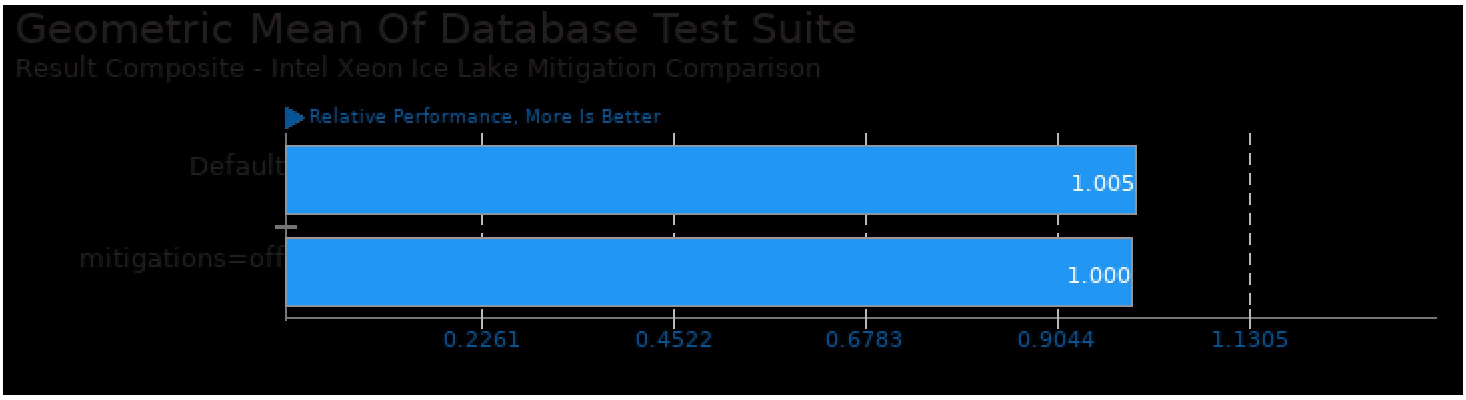


Geometric mean based upon tests: pts/build-linux-kernel, pts/ctx-clock, pts/dacapobench, pts/pgbench, pts/redis, pts/sockperf and pts/renaissance

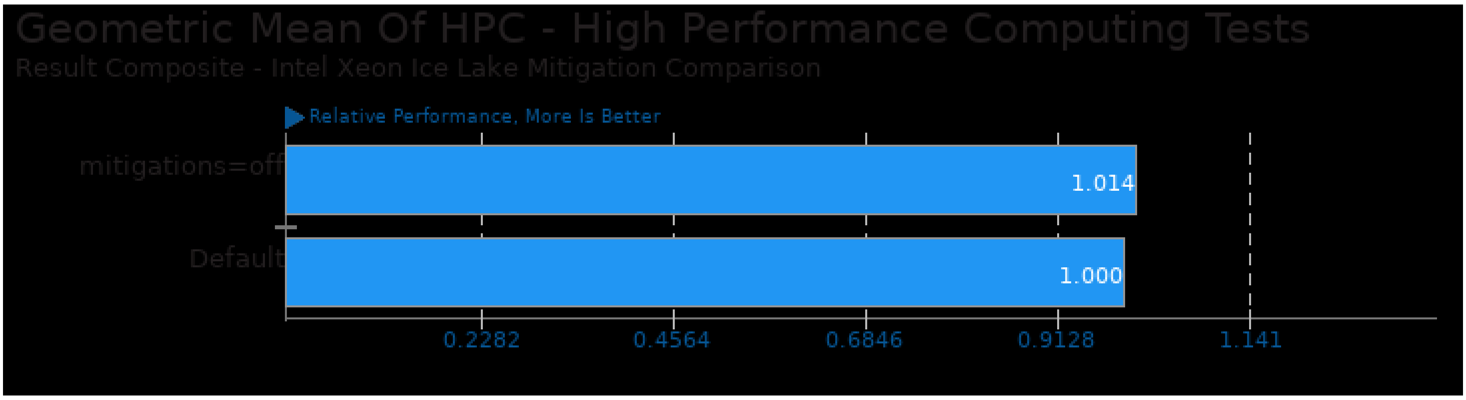
Intel Xeon Ice Lake Mitigation Comparison



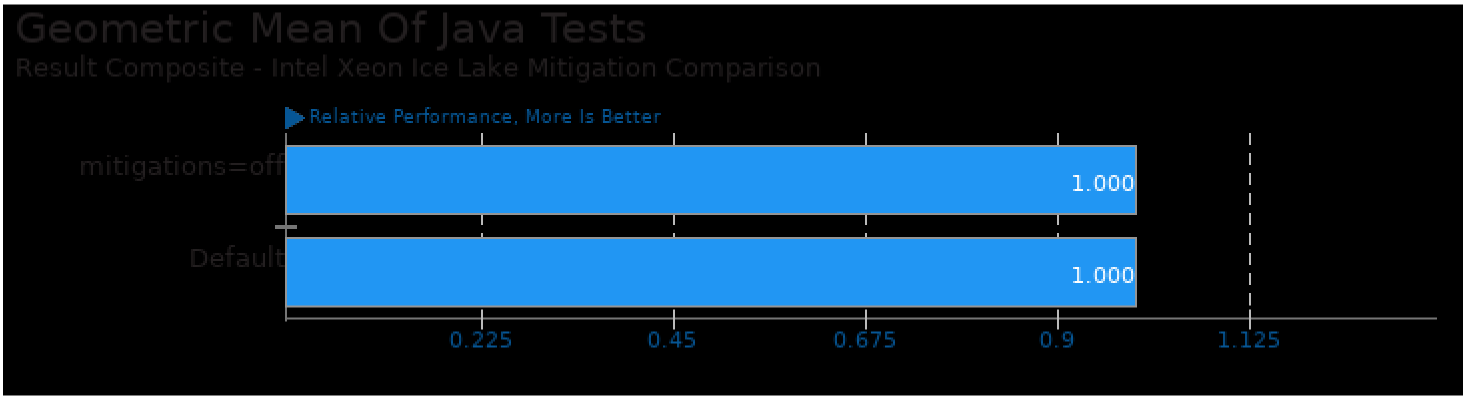
Geometric mean based upon tests: pts/build-godot and pts/vosk



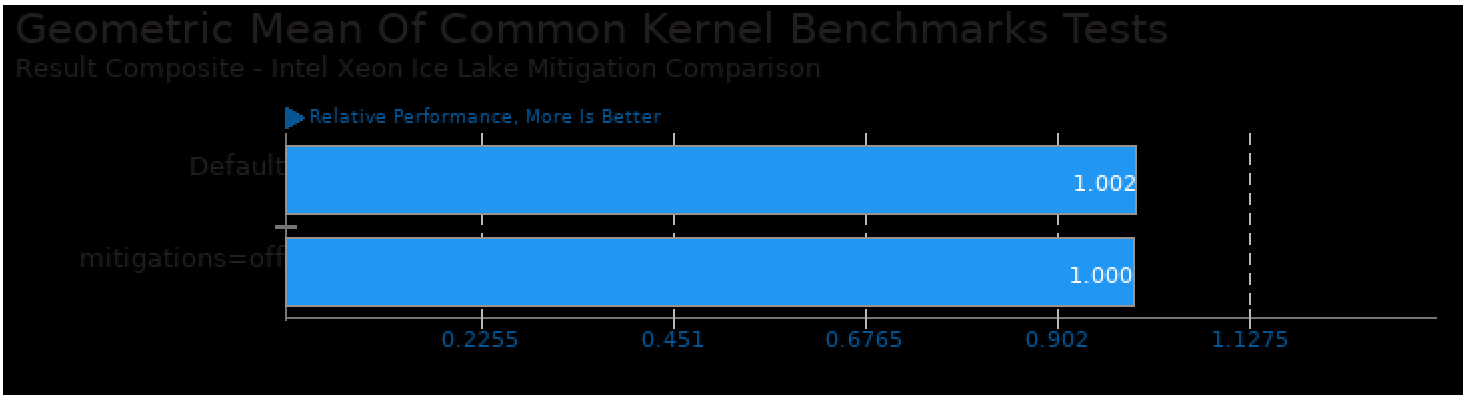
Geometric mean based upon tests: pts/sqlite-speedtest, pts/redis, pts/keydb, pts/hbase, pts/pgbench and pts/influxdb



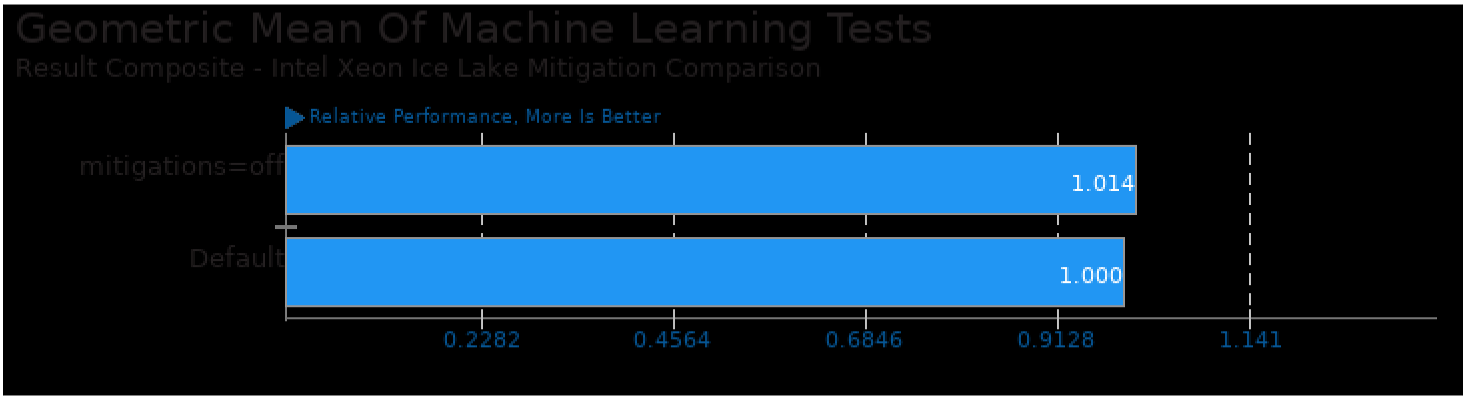
Geometric mean based upon tests: pts/mnn and pts/tensorflow-lite



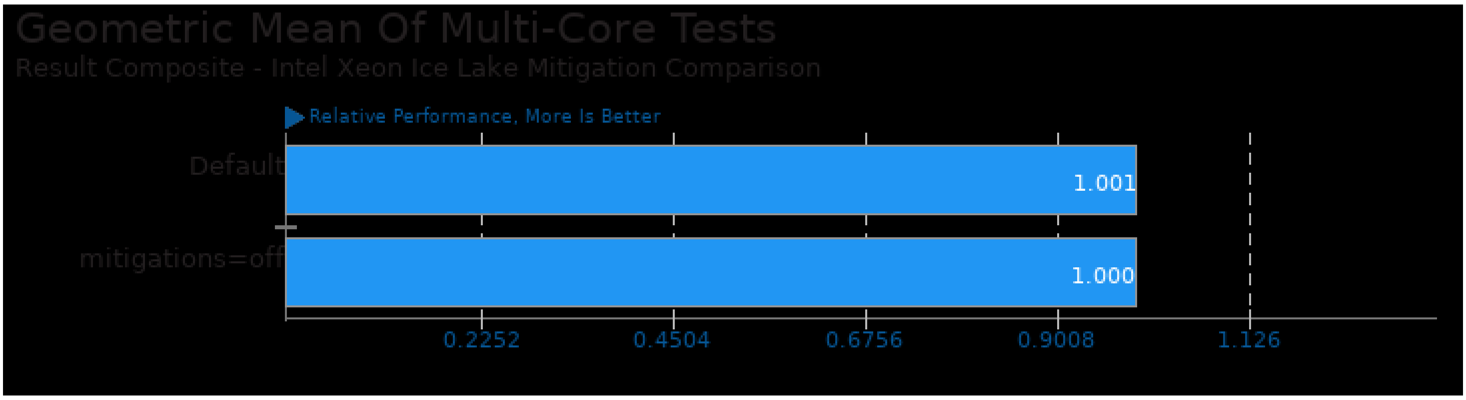
Geometric mean based upon tests: pts/dacapobench and pts/renaissance



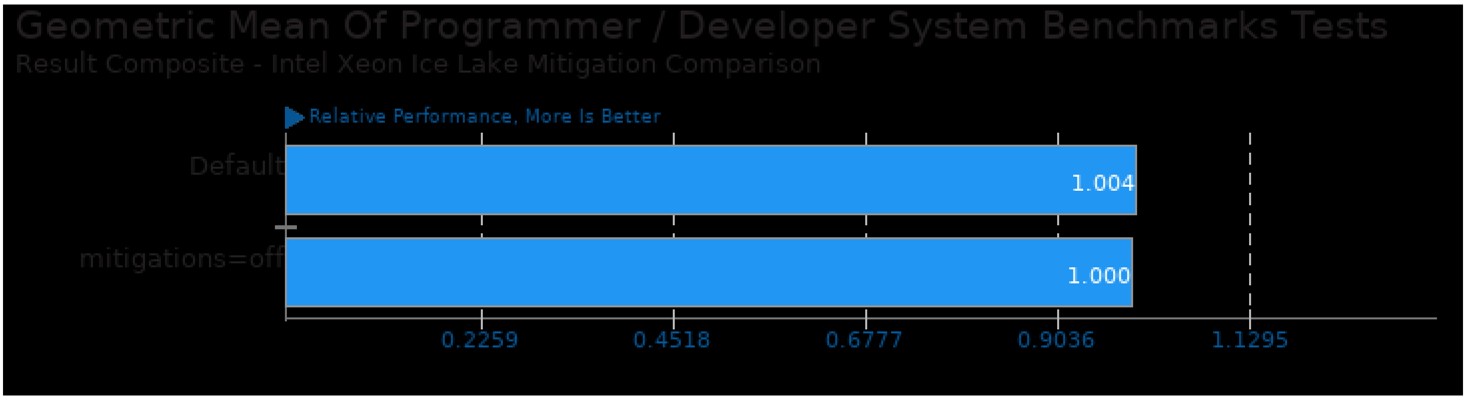
Geometric mean based upon tests: pts/postmark, pts/sqlite-speedtest, pts/pgbench and pts/ctx-clock



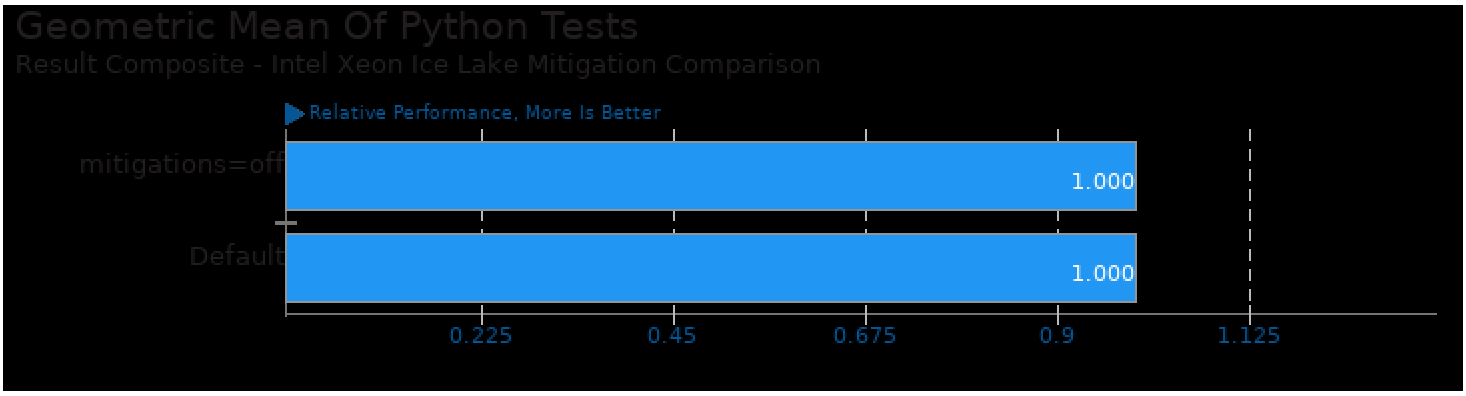
Geometric mean based upon tests: pts/mnn and pts/tensorflow-lite



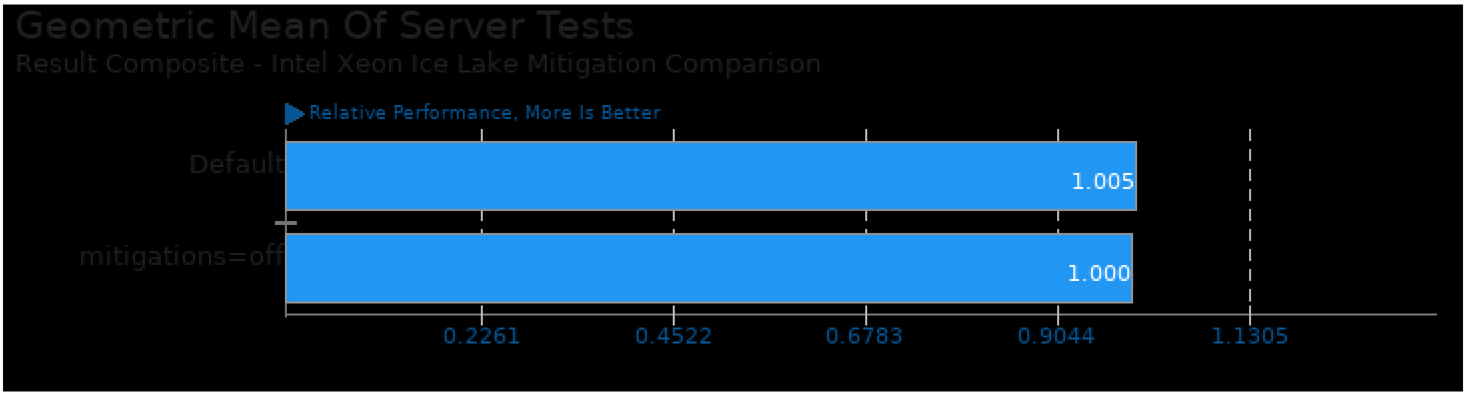
Geometric mean based upon tests: pts/build-linux-kernel, pts/build-godot, pts/build-nodejs, pts/build-mesa and pts/pgbench



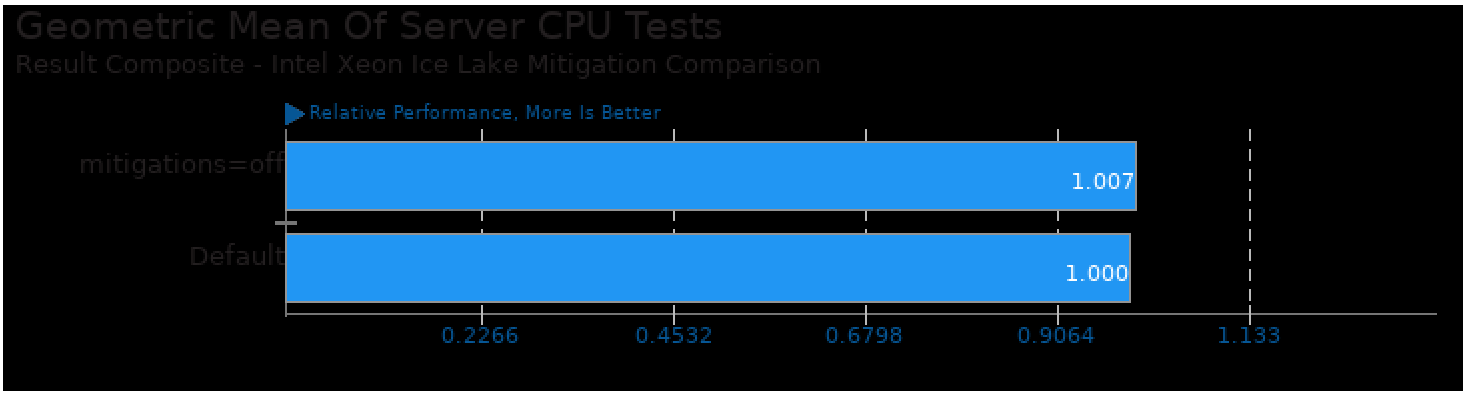
Geometric mean based upon tests: pts/sqlite-speedtest, pts/build-linux-kernel, pts/build-godot, pts/build-nodejs and pts/build-mesa



Geometric mean based upon tests: pts/build-nodejs, pts/vosk, pts/build-mesa, pts/chia-vdf and pts/build-godot

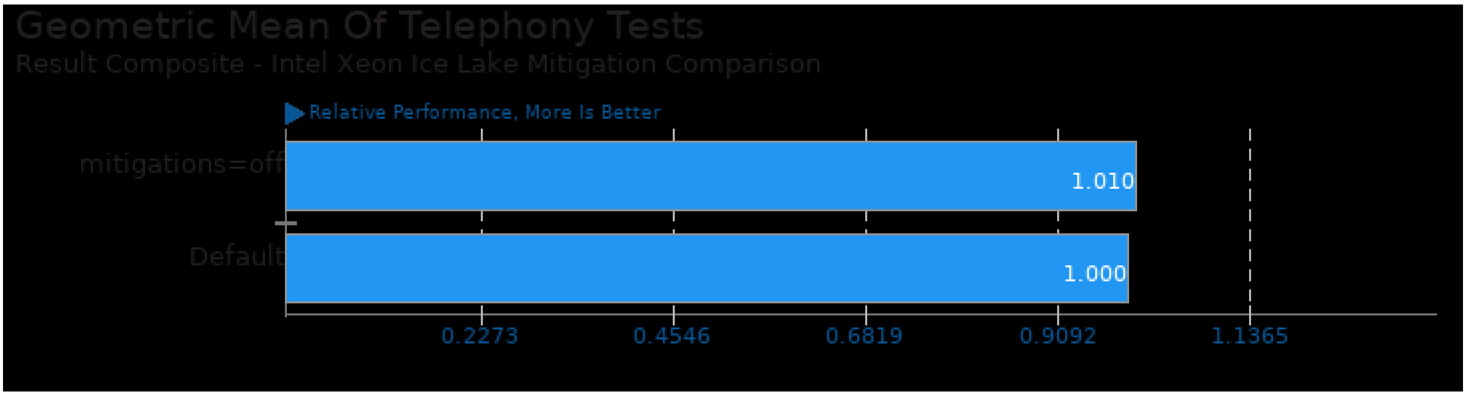


Geometric mean based upon tests: pts/pgbench, pts/redis, pts/keydb, pts/hbase, pts/sqlite-speedtest and pts/influxdb



Geometric mean based upon tests: pts/dacapobench, pts/renaissance, pts/build-linux-kernel, pts/redis and pts/ctx-clock

Intel Xeon Ice Lake Mitigation Comparison



Geometric mean based upon tests: pts/pjsip and pts/vosk

This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 06:04.