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Talos II Dual 22-Core POWER9 Spectre Benchmarks

POWER9 Spectre mitigation benchmarks by Michael Larabel.

Automated Executive Summary

No Protection had the most wins, coming in first place for 87% of the tests.

Based on the geometric mean of all complete results, the fastest (No Protection) was 1.166x the speed of the slowest (Default Kernel + User Protection). Kernel Protection was 0.955x the speed of No Protection and Default Kernel + User Protection was 0.898x the speed of Kernel Protection.

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

PyBench (Total For Average Test Times) at 2.252x
PHPBench (PHP Benchmark Suite) at 2.066x
Stress-NG (Test: Lsearch) at 1.926x
Cython benchmark at 1.713x
Stress-NG (Test: Glibc Qsort Data Sorting) at 1.458x
GNU MPC (Multi-Precision Benchmark) at 1.356x
Stress-NG (Test: Semaphores) at 1.315x
Compile Bench (Test: Read Compiled Tree) at 1.227x
POV-Ray (Trace Time) at 1.189x

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Hackbench (Count: 32 - Type: Process) at 1.178x.

Test Systems:

Kernel Protection

Default Kernel + User Protection

No Protection

Processor: POWER9 altivec supported @ 3.80GHz (44 Cores / 176 Threads), Motherboard: PowerNV T2P9D01 REV 1.01, Memory: 65536MB, Disk: Samsung SSD 960 EVO 500GB, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Broadcom NetXtreme BCM5719 Gigabit PCIe

OS: Ubuntu 18.10, Kernel: 4.18.0-10-generic (ppc64le), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=powerpc64le-linux-gnu --disable-libphobos --disable-multilib --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,d,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-nls --enable-objc-gc=auto --enable-plugin --enable-secureplt --enable-shared --enable-targets=powerpcle-linux --enable-threads=posix --host=powerpc64le-linux-gnu --program-prefix=powerpc64le-linux-gnu- --target=powerpc64le-linux-gnu --with-cpu=power8 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-long-double-128 -v
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: powernv-cpufreq ondemand
Python Notes: Python 2.7.15+ + Python 3.6.7

	Kernel Protection	Default Kernel + User Protection	No Protection
Stockfish - Total Time (Nodes/s)	79799227	**79135103**	**83011846**
Normalized	96.13%	95.33%	100%
Standard Deviation	3.2%	1.5%	1.6%
BYTE Unix Benchmark - Dhrystone 2 (LPS)	**26258513**	**26755821**	26618718
Normalized	98.14%	100%	99.49%
Standard Deviation	3.3%	0.1%	0.7%
Timed Linux Kernel Compilation - Time To Compile (sec)	50.66	**55.46**	**50.01**
Normalized	98.72%	90.17%	100%
Standard Deviation	3.3%	3.3%	3.2%
Stress-NG - Hsearch (Bogo Ops/s)	186931	**164138**	**201660**
Normalized	92.7%	81.39%	100%
Standard Deviation	8.3%	6.9%	1.1%
AOBench - 2048 x 2048 - Total Time (sec)	**59.51**	**64.61**	59.52
Normalized	100%	92.11%	99.98%
Standard Deviation	0.1%	0%	0%
PyBench - T.F.A.T.T (Milliseconds)	1939	**4090**	**1816**
Normalized	93.66%	44.4%	100%

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Standard Deviation		0.2%	0.3%
Timed LLVM Compilation - Time To Compile (sec)	174	**185**	**172**
Normalized	98.85%	92.97%	100%
Go Benchmarks - build (ns/op)	28049160231	**29899607203**	**27993756394**
Normalized	99.8%	93.63%	100%
Standard Deviation	0.6%	3.3%	3.9%
GNU MPC - M.P.B (Global Score)	5370	**4007**	**5433**
Normalized	98.84%	73.75%	100%
Standard Deviation		0.1%	0.1%
Cython benchmark (sec)	40.66	**66.62**	**38.88**
Normalized	95.62%	58.36%	100%
Standard Deviation	2.8%	0.1%	0.1%
Go Benchmarks - http (ns/op)	**1928510**	**1341717**	1568381
Normalized	69.57%	100%	85.55%
Standard Deviation	36.2%	27.8%	40%
PHPBench - P.B.S (Score)	**330044**	**159731**	329783
Normalized	100%	48.4%	99.92%
Standard Deviation	0.3%	1.8%	1.8%
Timed ImageMagick Compilation - Time To Compile (sec)	27.77	**30.03**	**27.28**
Normalized	98.24%	90.84%	100%
Standard Deviation	3.2%	2.9%	0.8%
Compile Bench - Compile (MB/s)	2533	**2324**	**2539**
Normalized	99.76%	91.53%	100%
Standard Deviation	0.6%	0.6%	0.8%
Stress-NG - Memory Copying (Bogo Ops/s)	8340	**8317**	**8368**
Normalized	99.67%	99.39%	100%
Standard Deviation	3.2%	2.6%	3.2%
Stress-NG - CPU Stress (Bogo Ops/s)	12321	**12279**	**12402**
Normalized	99.35%	99.01%	100%
Standard Deviation	0.3%	0.1%	0.1%
Stress-NG - Semaphores (Bogo Ops/s)	**347166**	347517	**456638**
Normalized	76.03%	76.1%	100%
Standard Deviation	2.6%	2.1%	3.3%
Stress-NG - Tsearch (Bogo Ops/s)	889	**859**	**898**
Normalized	99%	95.66%	100%
Standard Deviation	0.5%	1.2%	0.5%
Stress-NG - Forking (Bogo Ops/s)	**58592**	59360	**60585**
Normalized	96.71%	97.98%	100%
Standard Deviation	1.9%	0.3%	0.8%
Stress-NG - Socket Activity (Bogo Ops/s)	27094	**26272**	**28717**
Normalized	94.35%	91.49%	100%
Standard Deviation	0.7%	0.9%	1.3%
Stress-NG - Crypto (Bogo Ops/s)	8149	**8075**	**8298**
Normalized	98.2%	97.31%	100%
Standard Deviation	1.4%	0.9%	0.2%
Stress-NG - Vector Math (Bogo Ops/s)	88416	**88154**	**88699**
Normalized	99.68%	99.39%	100%
Standard Deviation	0.4%	0.2%	0.4%
Stress-NG - G.Q.D.S (Bogo Ops/s)	368	**253**	**369**
Normalized	99.73%	68.56%	100%
Standard Deviation	0.3%	0.3%	0.7%
Stress-NG - Lsearch (Bogo Ops/s)	386	**202**	**389**
Normalized	99.23%	51.93%	100%

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Standard Deviation	0.5%	1.1%	0.3%
Stress-NG - G.C.S.F (Bogo Ops/s)	1370824	**1290587**	**1379226**
Normalized	99.39%	93.57%	100%
Standard Deviation	1.1%	0.9%	1.8%
Stress-NG - S.V.M.P (Bogo Ops/s)	6492204	**6293617**	**6607012**
Normalized	98.26%	95.26%	100%
Standard Deviation	0.9%	1.8%	2.4%
Rodinia - O.S (sec)	29.60	**29.77**	**28.57**
Normalized	96.52%	95.97%	100%
Standard Deviation	0.3%	0.1%	0.3%
POV-Ray - Trace Time (sec)	24.92	**25.99**	**21.85**
Normalized	87.68%	84.07%	100%
Standard Deviation	0.9%	0.6%	1.2%
Hackbench - 32 - Process (sec)	27.17	**28.14**	**23.89**
Normalized	87.93%	84.9%	100%
Standard Deviation	1.4%	0.1%	0.3%
Go Benchmarks - garbage (ns/op)	1211245	**1233700**	**1106825**
Normalized	91.38%	89.72%	100%
Standard Deviation	3.6%	3.5%	0.5%
Bork File Encrypter - F.E.T (sec)	22.22	**22.51**	**22.16**
Normalized	99.73%	98.45%	100%
Standard Deviation	0.3%	0.2%	0.2%
Go Benchmarks - json (ns/op)	4238819	**4898644**	**3813471**
Normalized	89.97%	77.85%	100%
Standard Deviation	0.1%	6.2%	2.5%
OpenSSL - R.4.b.P (Signs/sec)	**7417**	7394	**7390**
Normalized	100%	99.69%	99.64%
Standard Deviation	0.6%	1.2%	0.6%
Rodinia - OpenMP LavaMD (sec)	18.37	**18.76**	**16.75**
Normalized	91.18%	89.29%	100%
Standard Deviation	3.4%	2.4%	2%
C-Ray - Total Time - 4.1.R.P.P (sec)	**19.05**	18.93	**17.83**
Normalized	93.6%	94.19%	100%
Standard Deviation	0.4%	0.1%	0.3%
Primesieve - 1.P.N.G (sec)	**17.49**	17.47	**16.38**
Normalized	93.65%	93.76%	100%
Standard Deviation	0.3%	0.5%	0.4%
Rodinia - OpenMP CFD Solver (sec)	13.25	**14.79**	**12.93**
Normalized	97.58%	87.42%	100%
Standard Deviation	0.9%	1%	0.7%
Rust Prime Benchmark - P.N.T.T.2.0.0 (sec)	**3.72**	3.51	**3.32**
Normalized	89.25%	94.59%	100%
Standard Deviation	3.5%	2.9%	3.2%
FFTE - N.2.1.C.F.R (MFLOPS)	6770		
Standard Deviation	0%		
Compile Bench - Read Compiled Tree (MB/s)	1823	**1538**	**1887**
Normalized	96.61%	81.51%	100%
Standard Deviation	0.7%	0.5%	0.1%
Compile Bench - Initial Create (MB/s)	346	**296**	**348**
Normalized	99.43%	85.06%	100%
Standard Deviation	0.1%	1%	0.9%

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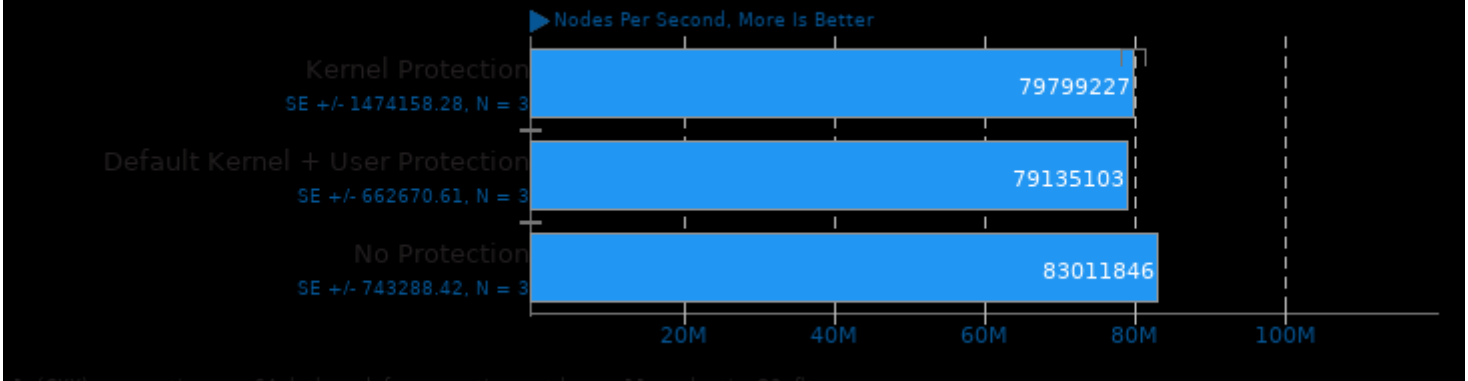
Stockfish 9

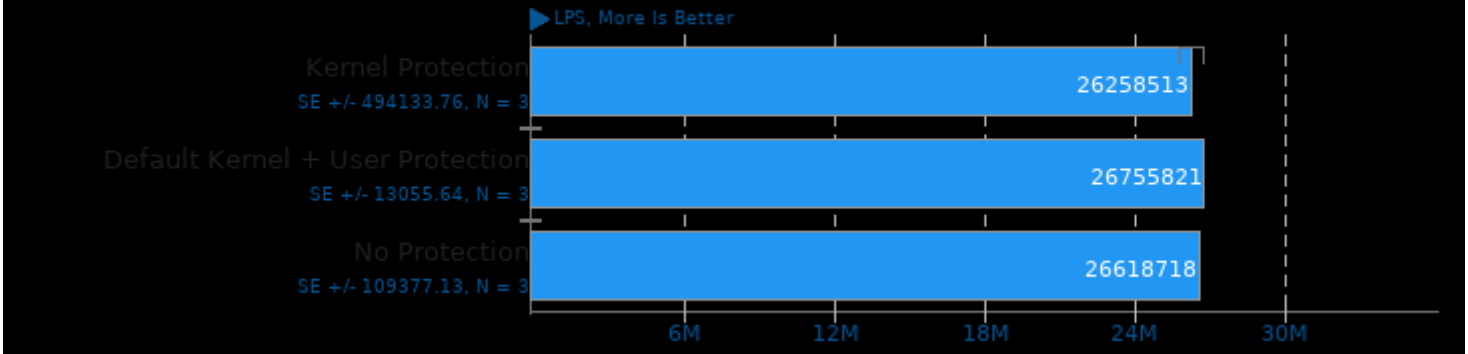
Total Time



1. (CXX) g++ options: -m64 -lpthread -fno-exceptions -std=c++11 -pedantic -O3 -flto

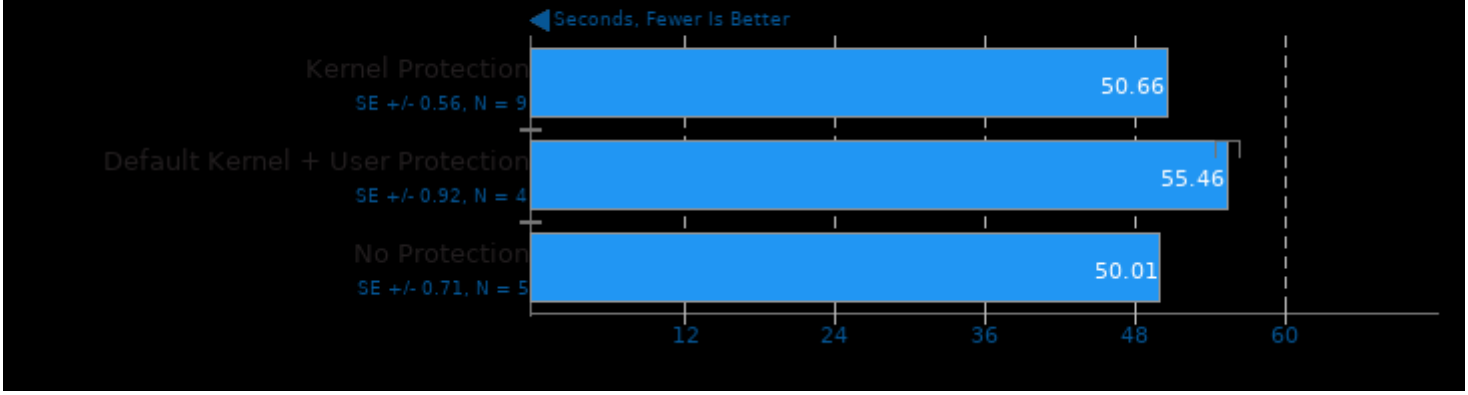
BYTE Unix Benchmark 3.6

Computational Test: Dhrystone 2



Timed Linux Kernel Compilation 4.18

Time To Compile



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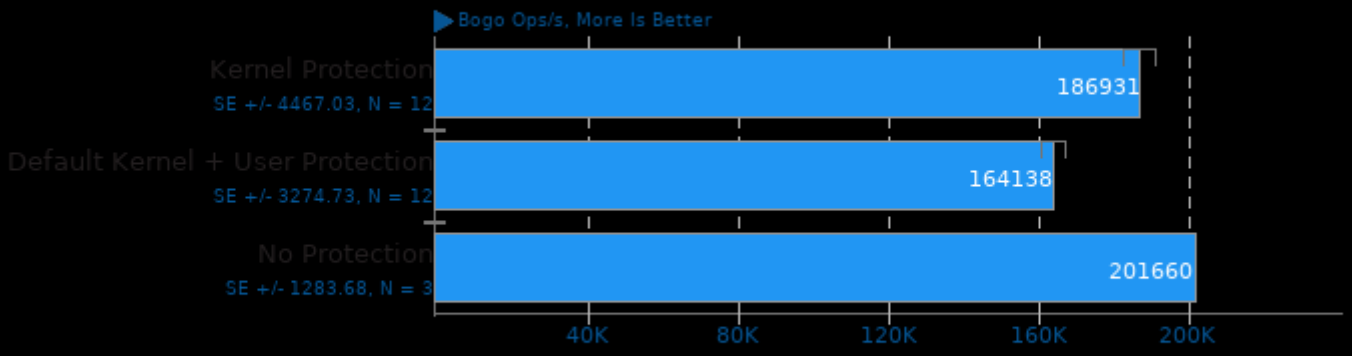
Stress-NG 0.07.26

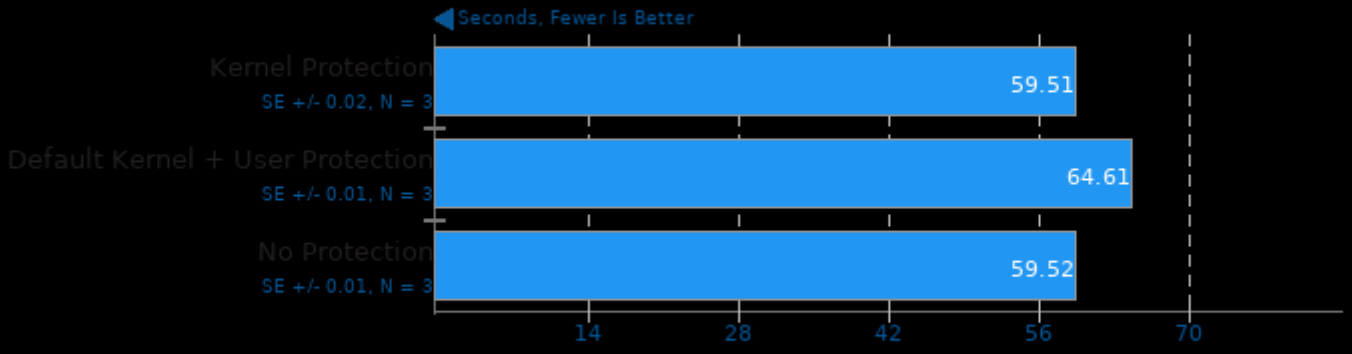
Test: Hsearch



1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc

AOBench

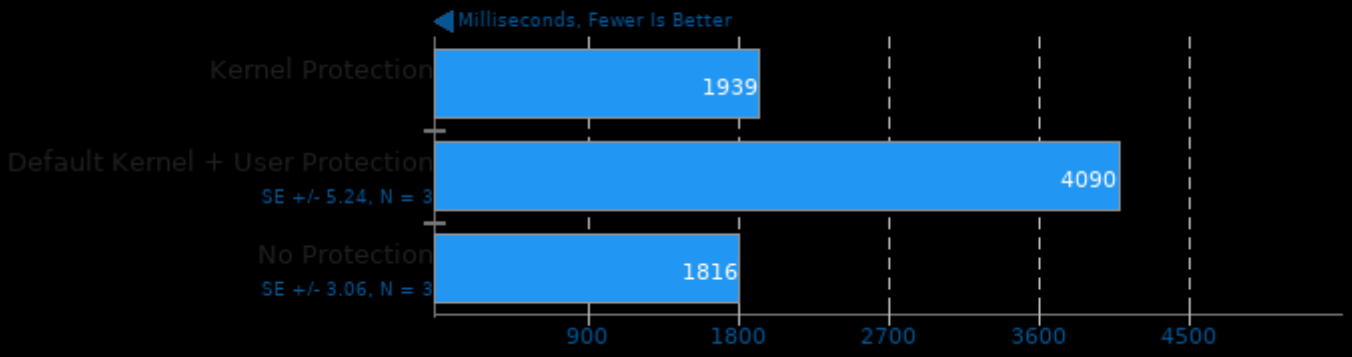
Size: 2048 x 2048 - Total Time



1. (CC) gcc options: -lm -O3

PyBench 2018-02-16

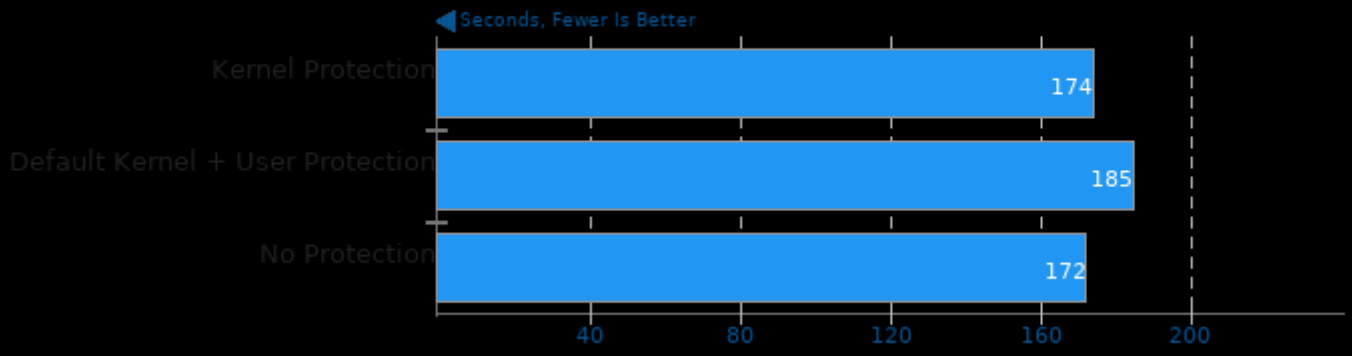
Total For Average Test Times



Talos II Dual 22-Core POWER9 Spectre Benchmarks

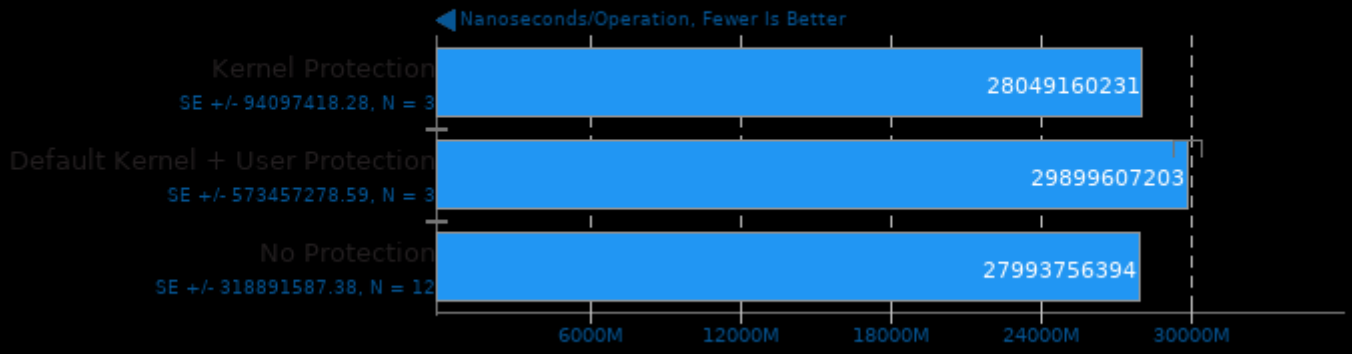
Timed LLVM Compilation 6.0.1

Time To Compile



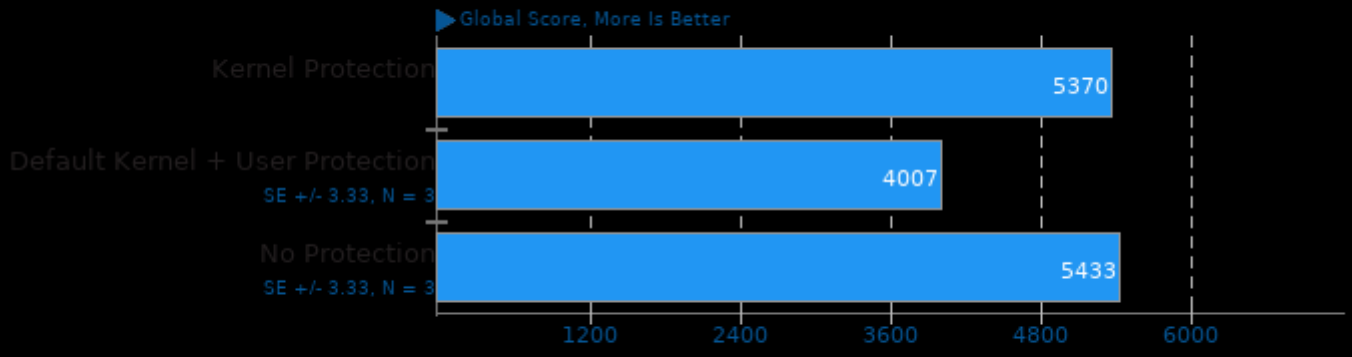
Go Benchmarks

Test: build



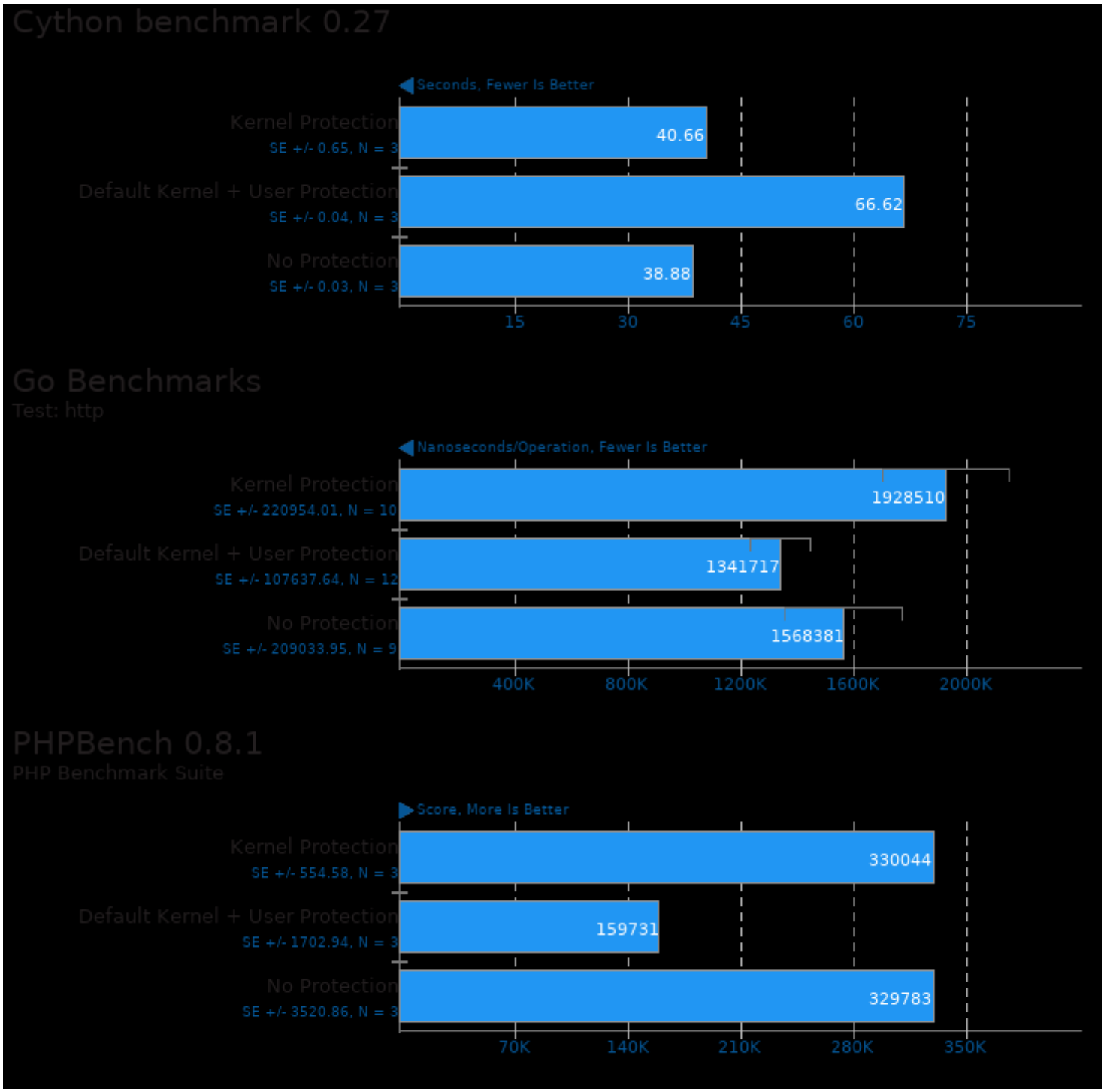
GNU MPC 1.1.0

Multi-Precision Benchmark

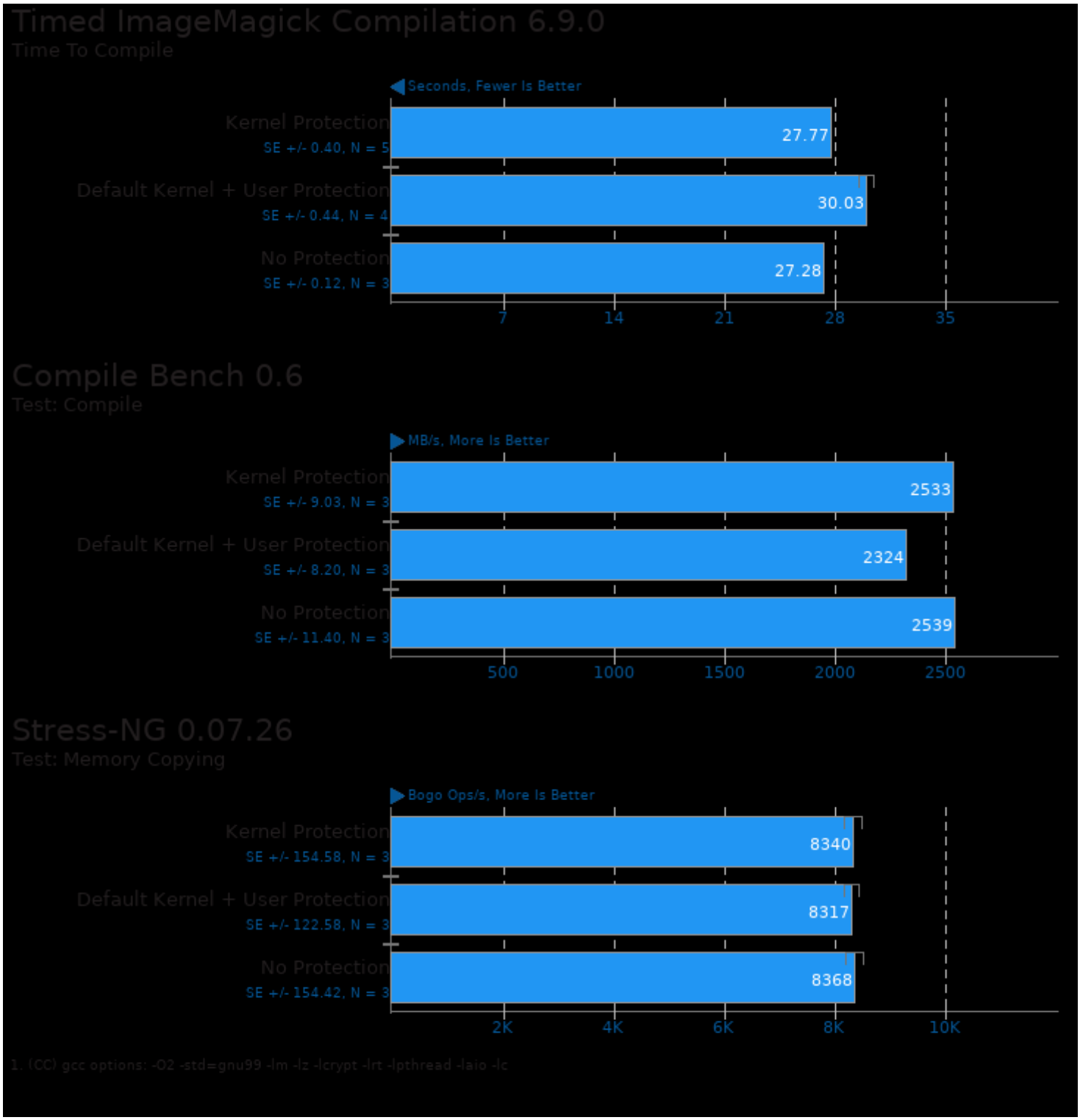


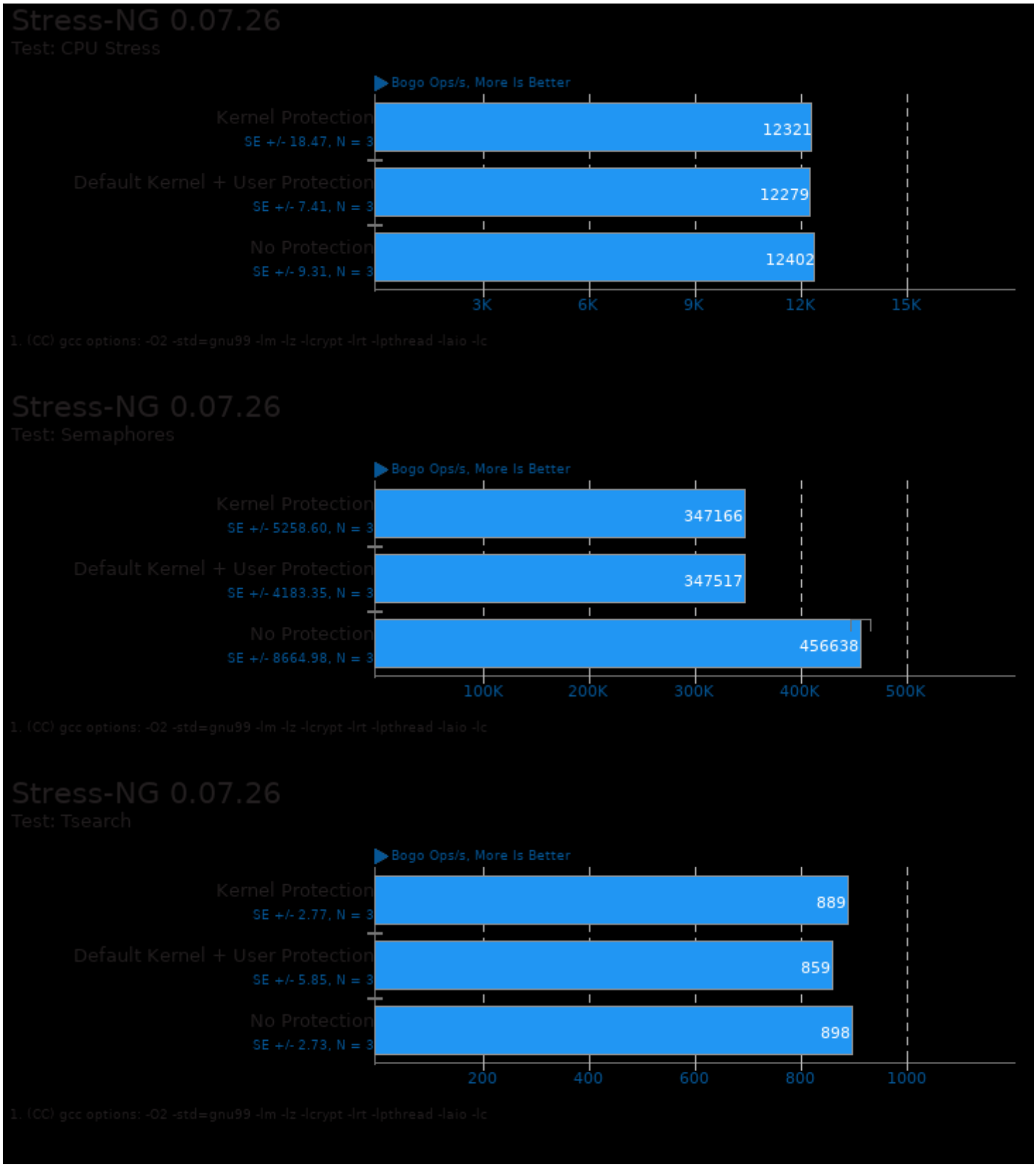
1. (CC) gcc options: -m64 -mtune=power8 -O3 -MT -MD -MP -MF

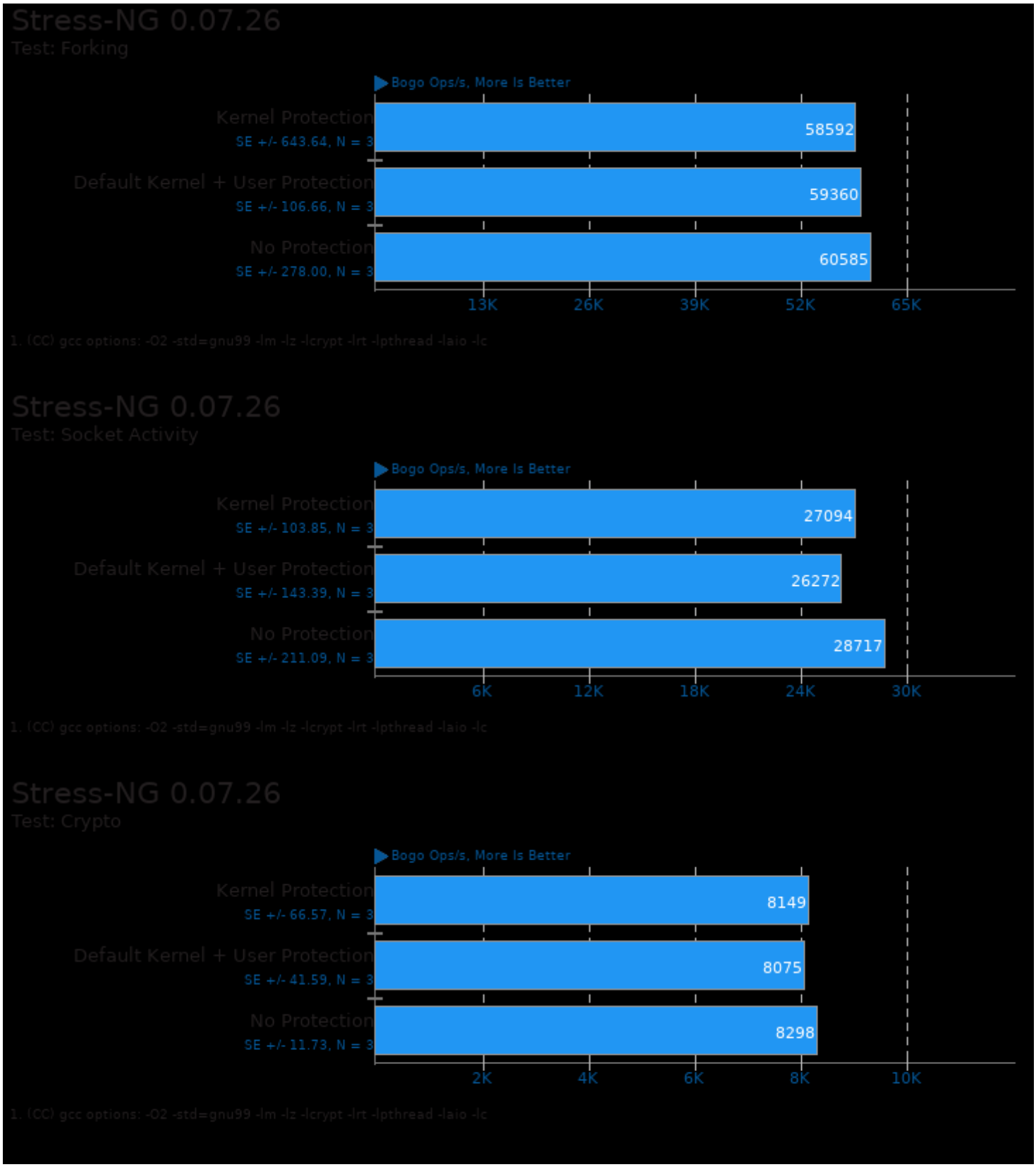
Talos II Dual 22-Core POWER9 Spectre Benchmarks



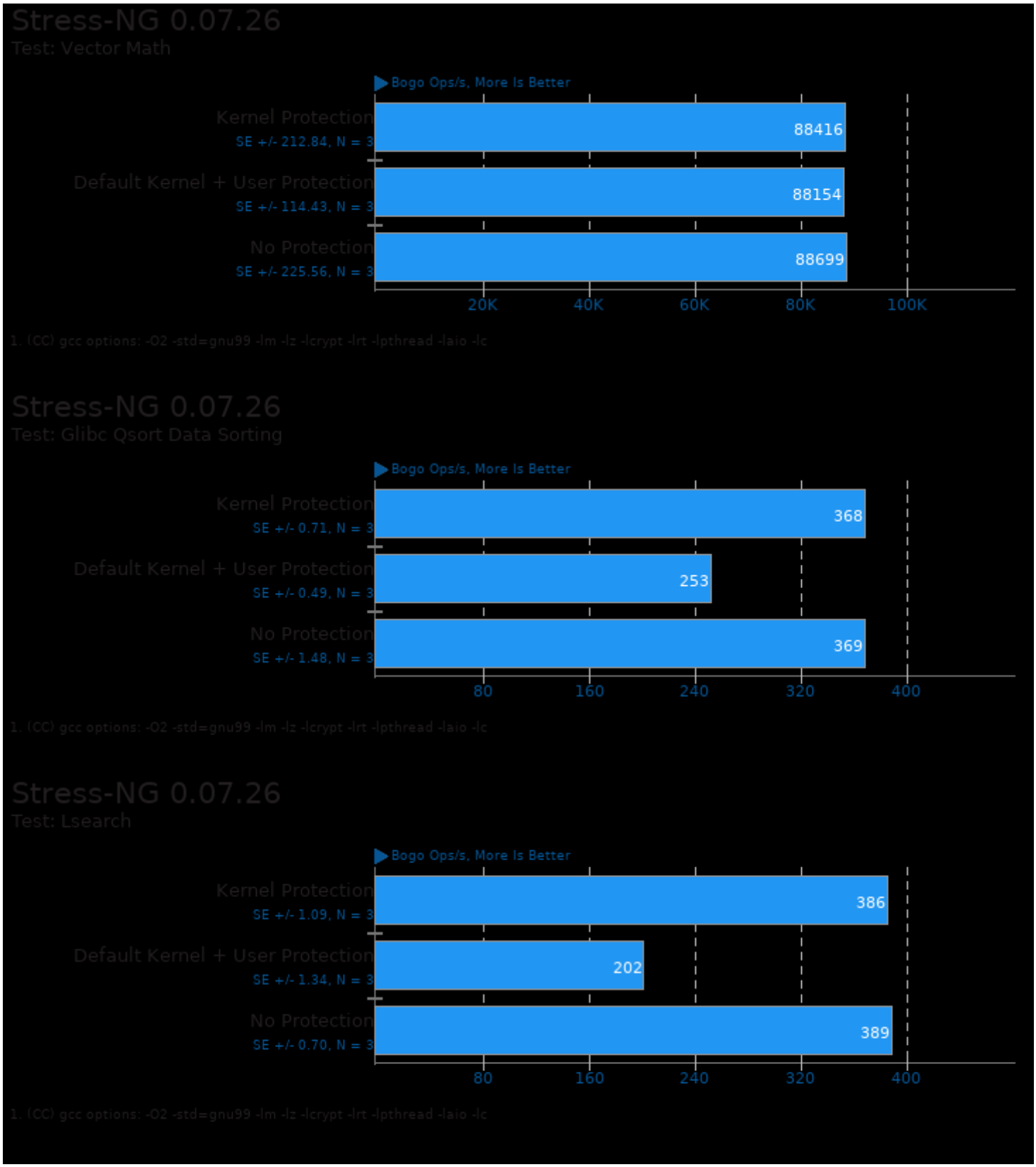
Talos II Dual 22-Core POWER9 Spectre Benchmarks




Stress-NG 0.07.26
Test: CPU Stress
Bogo Ops/s, More Is Better
Kernel Protection
SE +/- 18.47, N = 3
12321
Default Kernel + User Protection
SE +/- 7.41, N = 3
12279
No Protection
SE +/- 9.31, N = 3
12402
3K
6K
9K
12K
15K
1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc
Stress-NG 0.07.26
Test: Semaphores
Bogo Ops/s, More Is Better
Kernel Protection
SE +/- 5258.60, N = 3
347166
Default Kernel + User Protection
SE +/- 4183.35, N = 3
347517
No Protection
SE +/- 8664.98, N = 3
456638
100K
200K
300K
400K
500K
1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc
Stress-NG 0.07.26
Test: Tsearch
Bogo Ops/s, More Is Better
Kernel Protection
SE +/- 2.77, N = 3
889
Default Kernel + User Protection
SE +/- 5.85, N = 3
859
No Protection
SE +/- 2.73, N = 3
898
200
400
600
800
1000
1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc

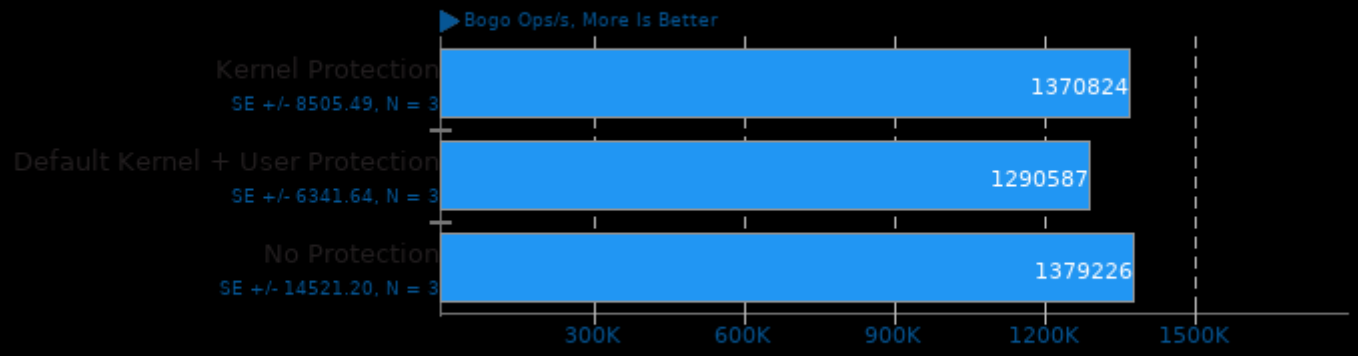

Stress-NG 0.07.26
Test: Forking
Bogo Ops/s, More Is Better
Kernel Protection
SE +/- 643.64, N = 3
58592
Default Kernel + User Protection
SE +/- 106.66, N = 3
59360
No Protection
SE +/- 278.00, N = 3
60585
13K
26K
39K
52K
65K
1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc
Stress-NG 0.07.26
Test: Socket Activity
Bogo Ops/s, More Is Better
Kernel Protection
SE +/- 103.85, N = 3
27094
Default Kernel + User Protection
SE +/- 143.39, N = 3
26272
No Protection
SE +/- 211.09, N = 3
28717
6K
12K
18K
24K
30K
1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc
Stress-NG 0.07.26
Test: Crypto
Bogo Ops/s, More Is Better
Kernel Protection
SE +/- 66.57, N = 3
8149
Default Kernel + User Protection
SE +/- 41.59, N = 3
8075
No Protection
SE +/- 11.73, N = 3
8298
2K
4K
6K
8K
10K
1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc

Talos II Dual 22-Core POWER9 Spectre Benchmarks



Stress-NG 0.07.26

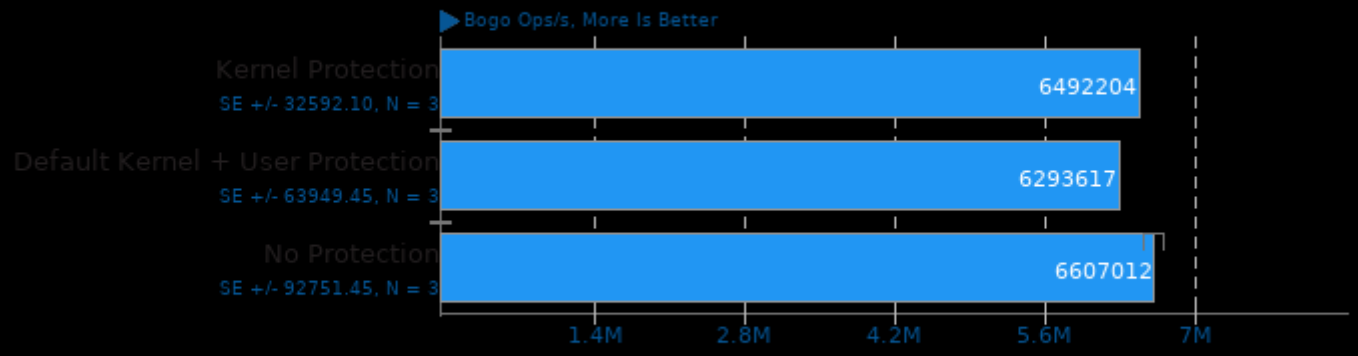
Test: Glibc C String Functions



1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc

Stress-NG 0.07.26

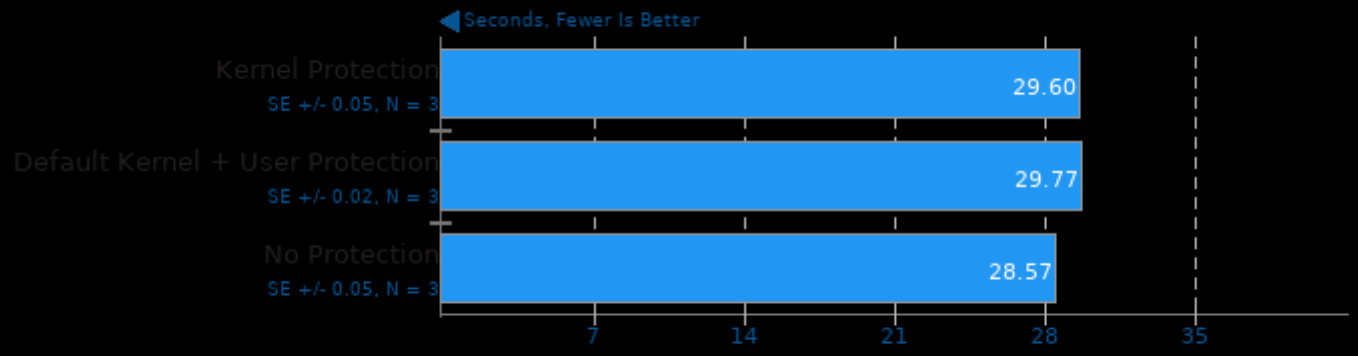
Test: System V Message Passing



1. (CC) gcc options: -O2 -std=gnu99 -lm -lz -lcrypt -lrt -lpthread -laio -lc

Rodinia 2.4

Test: OpenMP Streamcluster

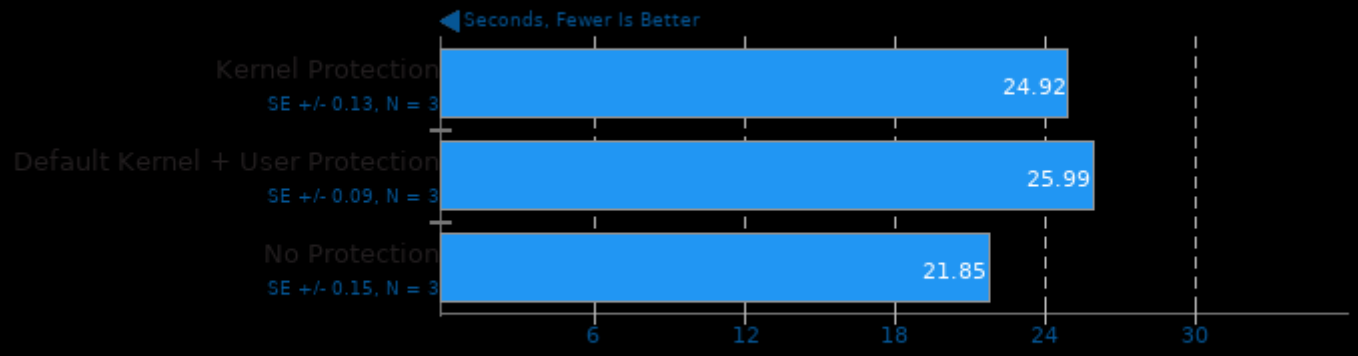


1. (CXX) g++ options: -O2 -lOpenCL

Talos II Dual 22-Core POWER9 Spectre Benchmarks

POV-Ray 3.7.0.7

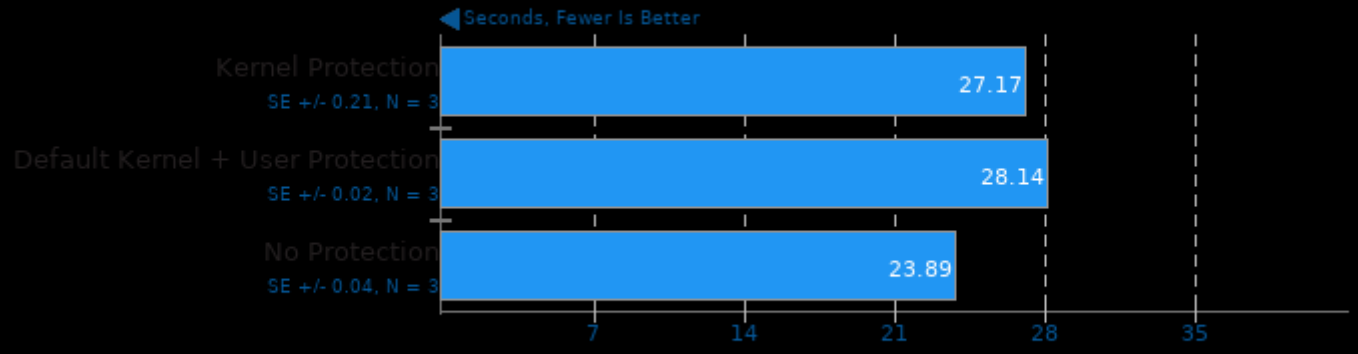
Trace Time



1. (CXX) g++ options: -pipe -O3 -ffast-math -pthread -R/usr/lib -lSDL -lX11 -lIlmImf -lImath -lHalf -lIex -lIexMath -lIlmThread -lpthread -ltiff -ljpeg -lpng -lz

Hackbench

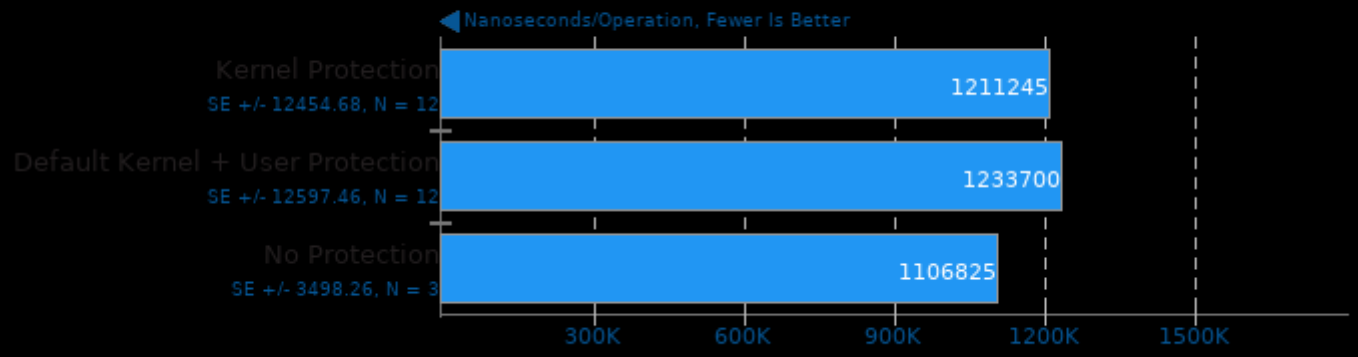
Count: 32 - Type: Process



1. (CC) gcc options: -lpthread

Go Benchmarks

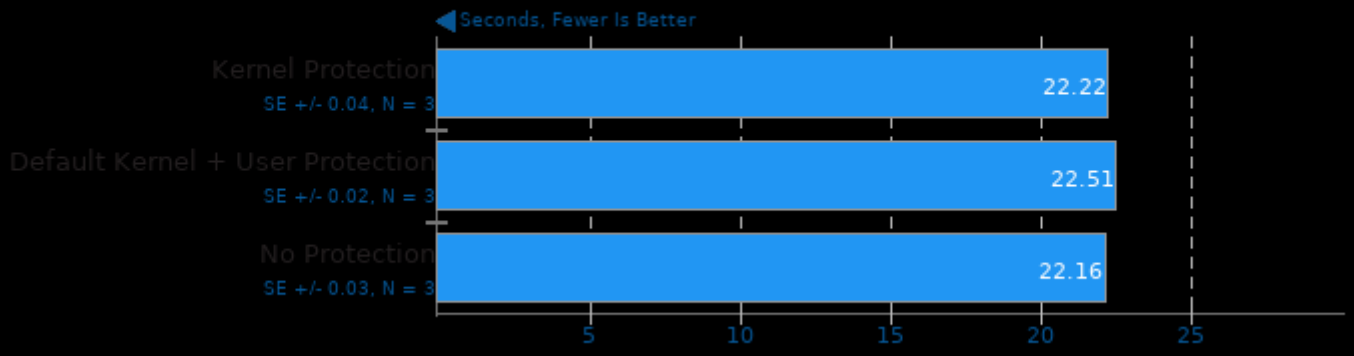
Test: garbage



Talos II Dual 22-Core POWER9 Spectre Benchmarks

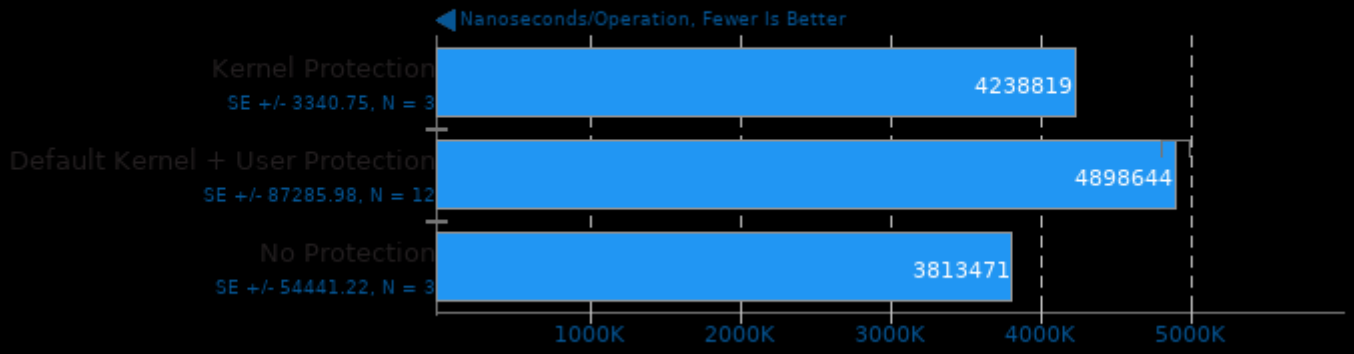
Bork File Encrypter 1.4

File Encryption Time



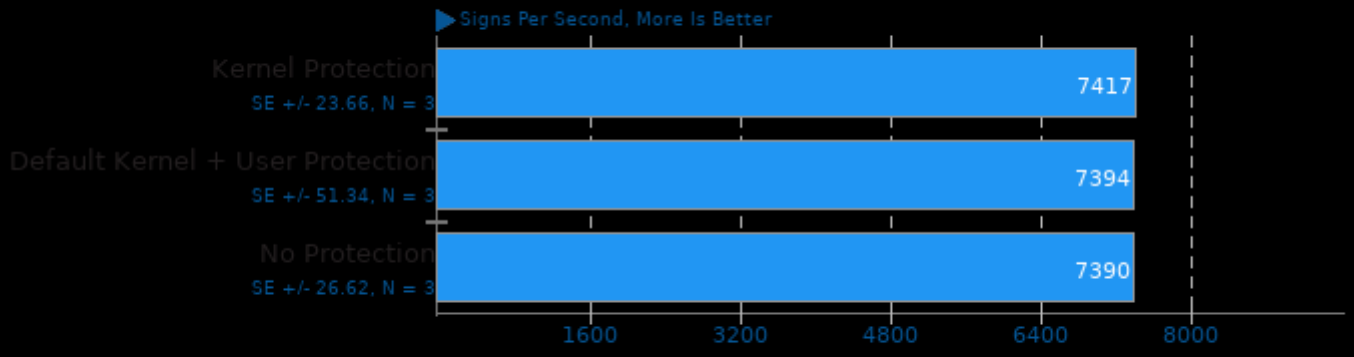
Go Benchmarks

Test: json



OpenSSL 1.1.1

RSA 4096-bit Performance

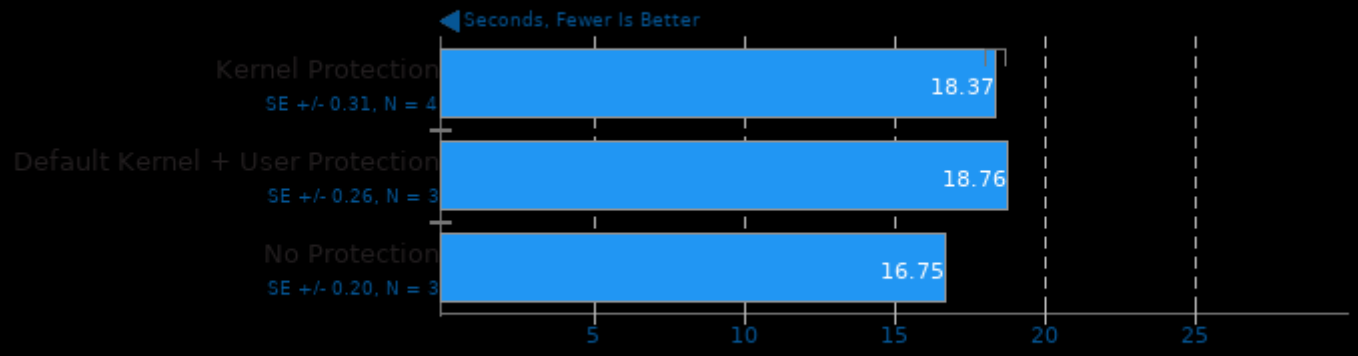


1. (CC) gcc options: -pthread -m64 -O3 -lssl -lcrypto -ldl

Talos II Dual 22-Core POWER9 Spectre Benchmarks

Rodinia 2.4

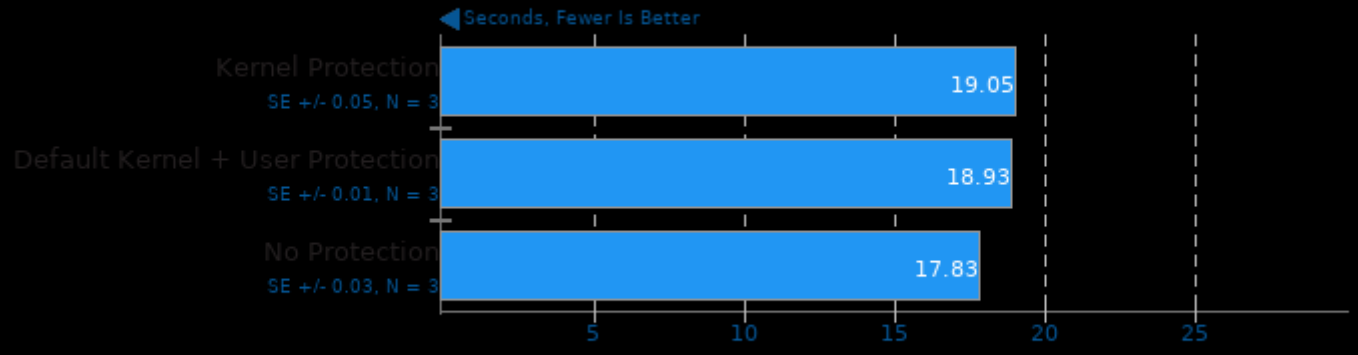
Test: OpenMP LavaMD



1. (CXX) g++ options: -O2 -lOpenCL

C-Ray 1.1

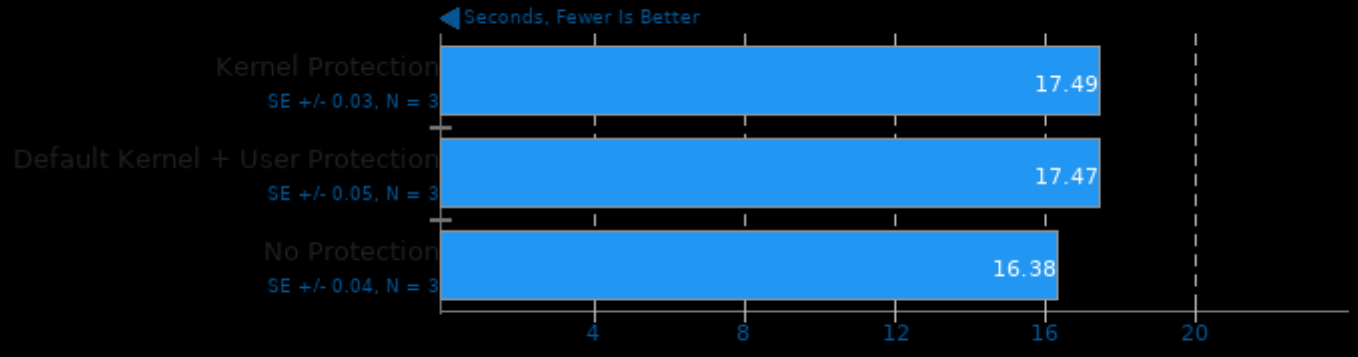
Total Time - 4K, 16 Rays Per Pixel



1. (CC) gcc options: -lm -lpthread -O3

Primesieve 7.1

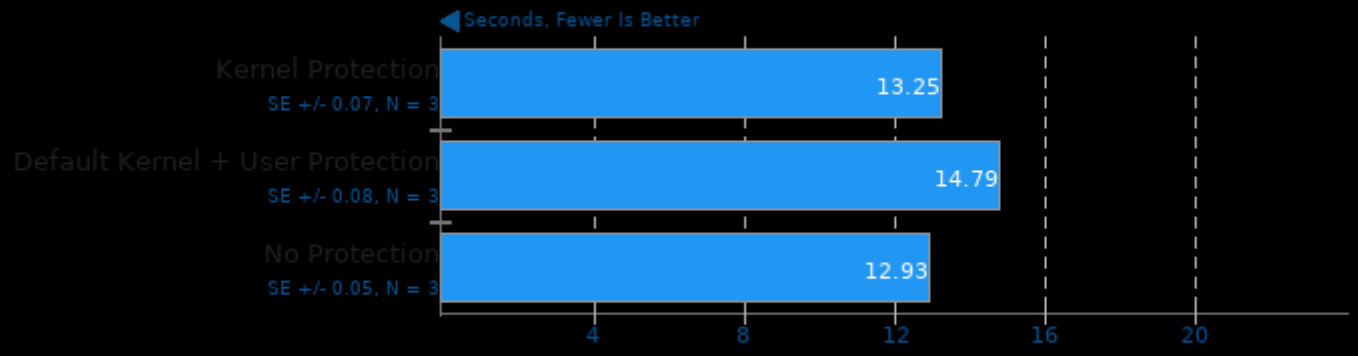
1e12 Prime Number Generation



1. (CXX) g++ options: -O3 -lpthread

Rodinia 2.4

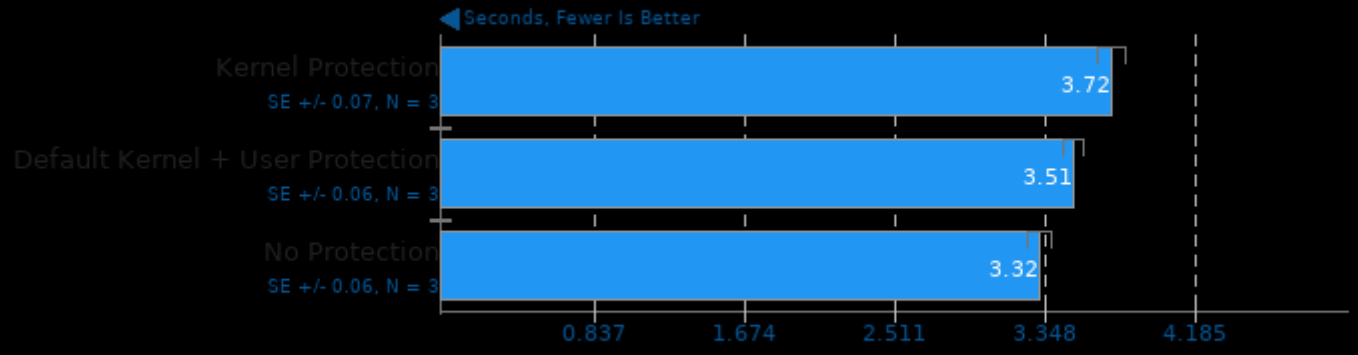
Test: OpenMP CFD Solver



1. (CXX) g++ options: -O2 -lOpenCL

Rust Prime Benchmark

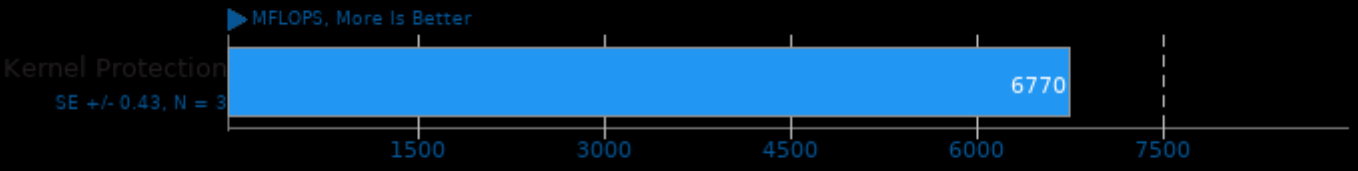
Prime Number Test To 200,000,000



1. (CC) gcc options: -m64 -pie -nodefaultlibs

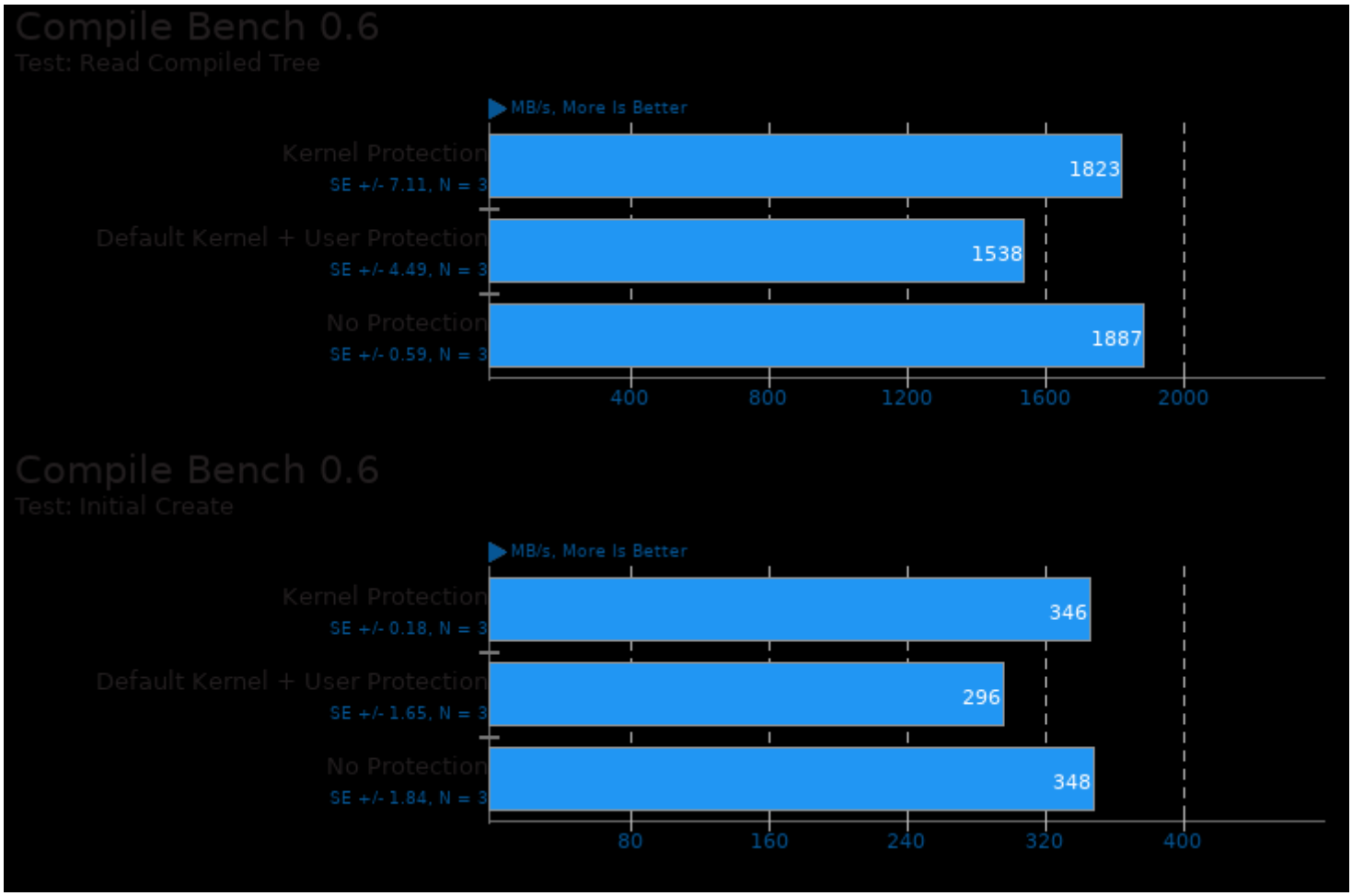
FFTE 6.0

Test: N=256, 1D Complex FFT Routine

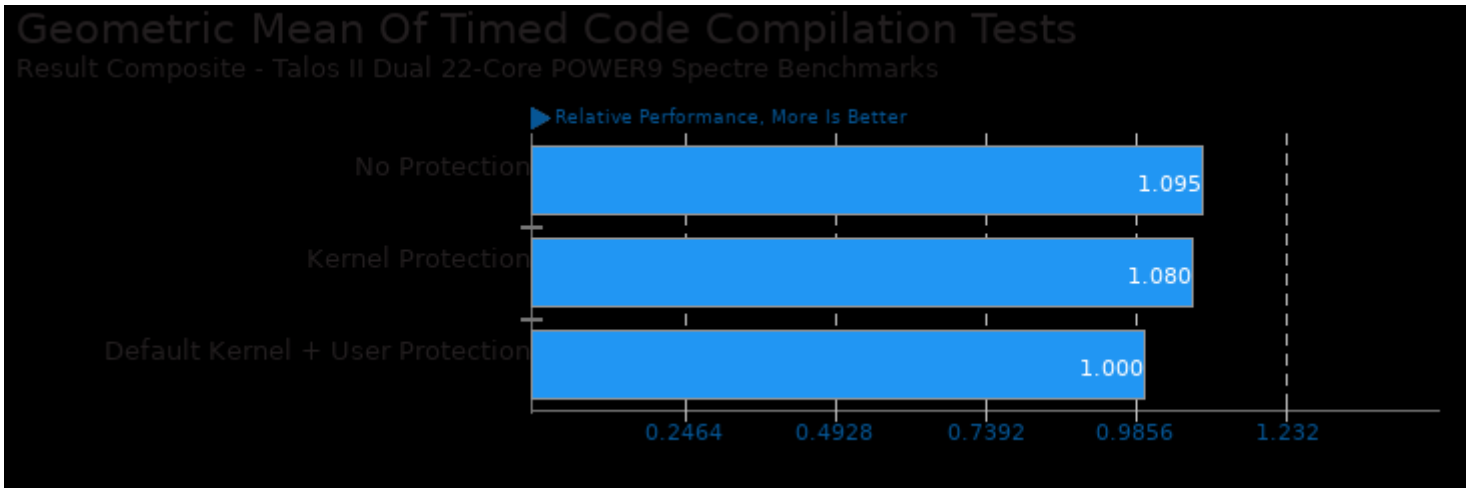


1. (F9X) gfortran options: -O3 -fomit-frame-pointer -fopenmp -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi

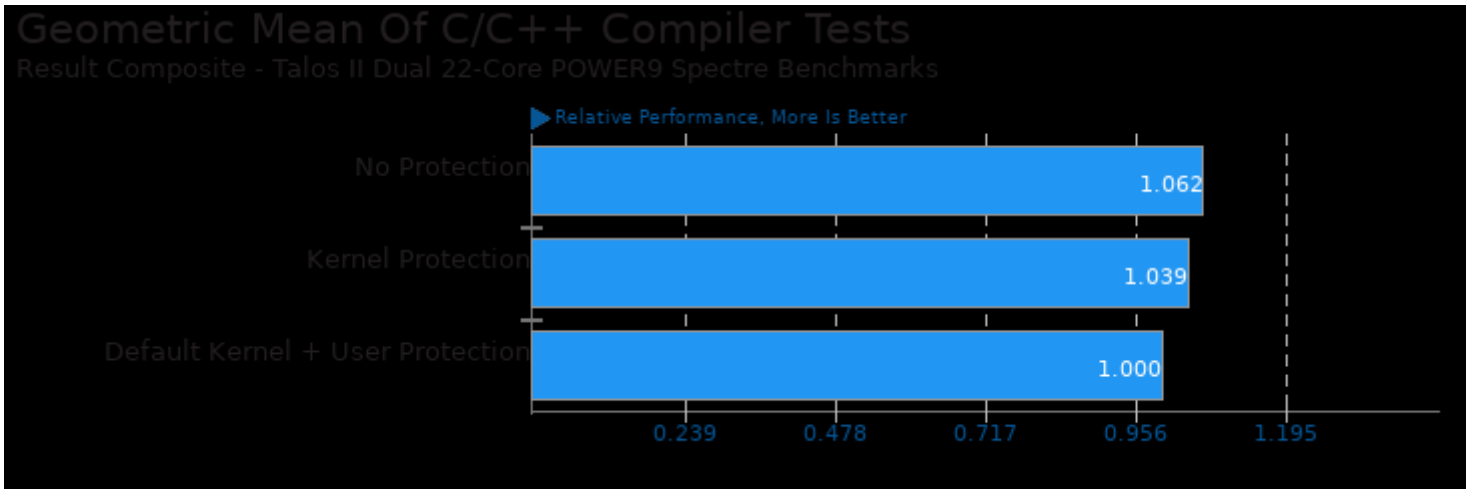
Talos II Dual 22-Core POWER9 Spectre Benchmarks



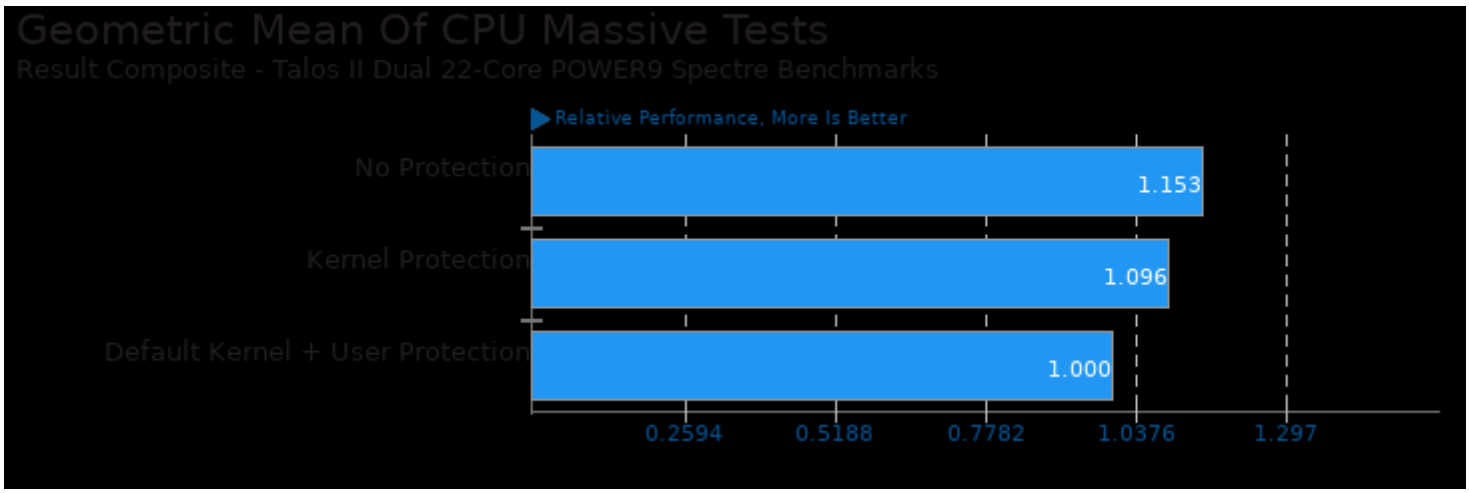
These geometric means are based upon test groupings / test suites for this result file.



Geometric mean based upon tests: pts/build-linux-kernel, pts/build-imagemagick and pts/build-llvm



Geometric mean based upon tests: pts/aobench, pts/stockfish, pts/build-imagemagick, pts/build-llvm, pts/c-ray and pts/openssl



Geometric mean based upon tests: pts/build-llvm, pts/build-linux-kernel, pts/c-ray, pts/compilebench, pts/cython-bench, pts/go-benchmark, pts/hackbench, pts/openssl, pts/phpbench, pts/povray, pts/primesieve, pts/rodinia, pts/rust-prime, pts/stockfish and pts/stress-ng

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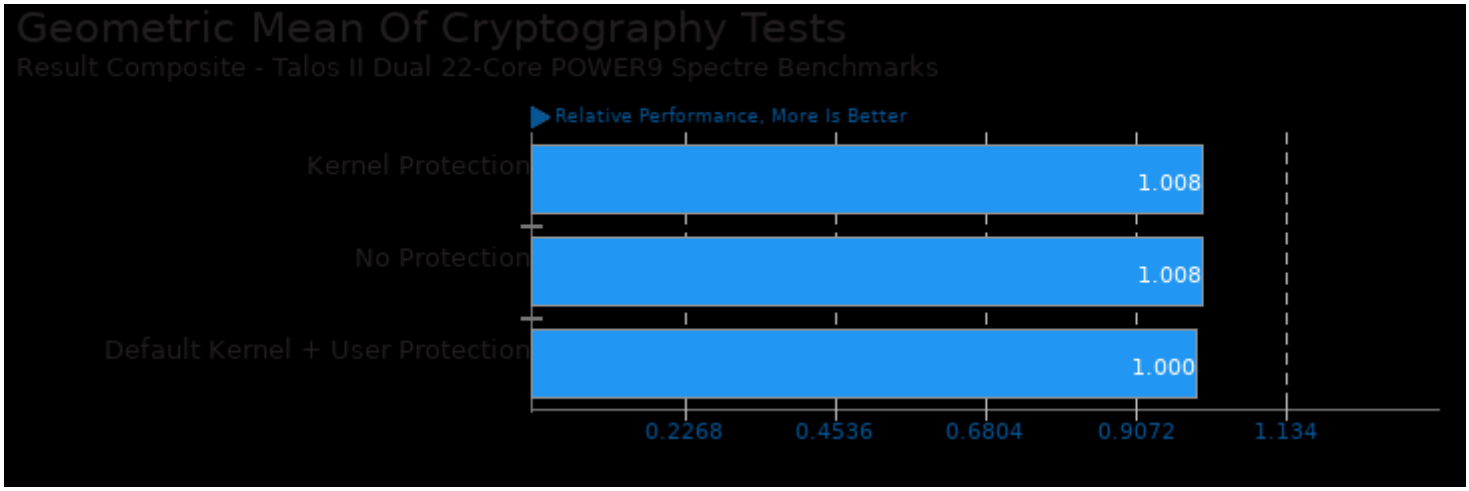
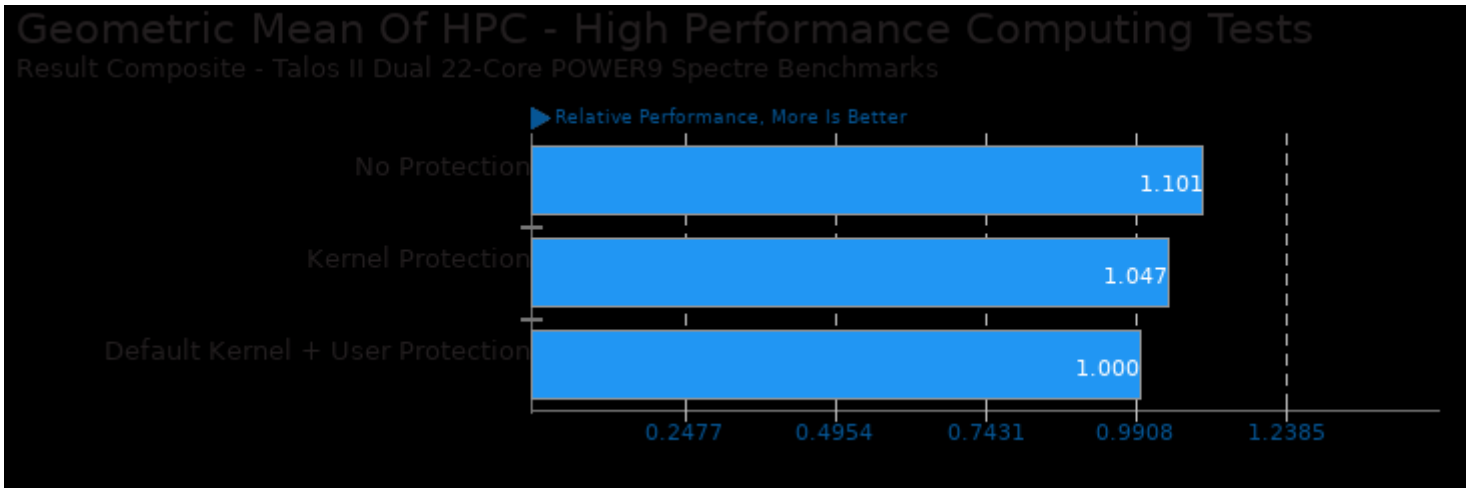
Geometric mean based upon tests: pts/c-ray, pts/povray and pts/aobench

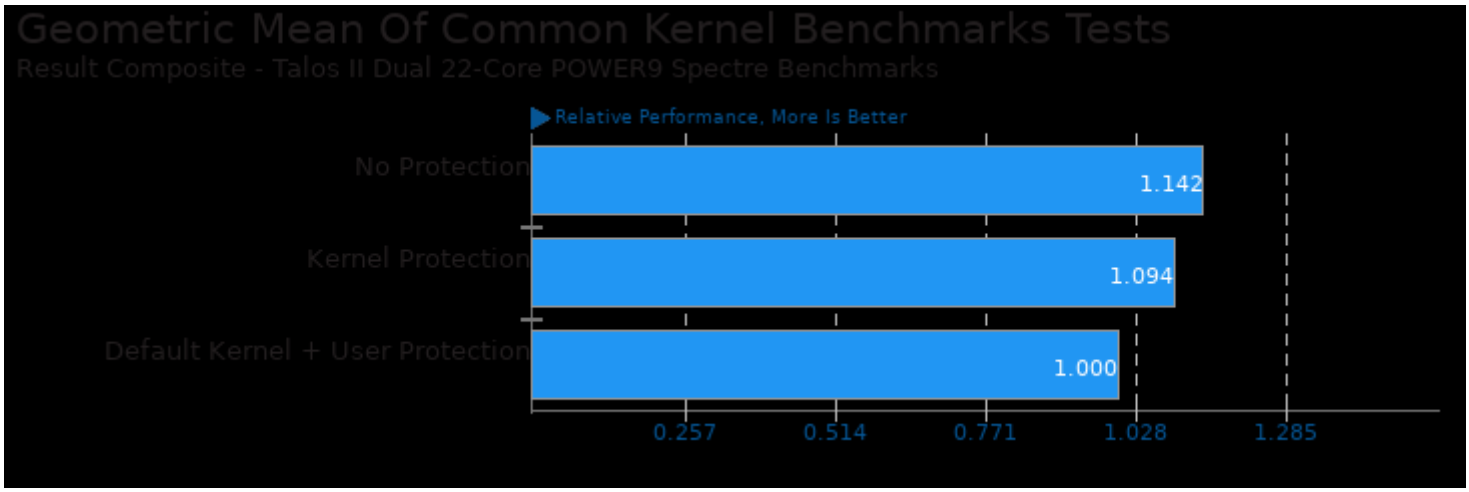


Geometric mean based upon tests: pts/openssl and pts/bork

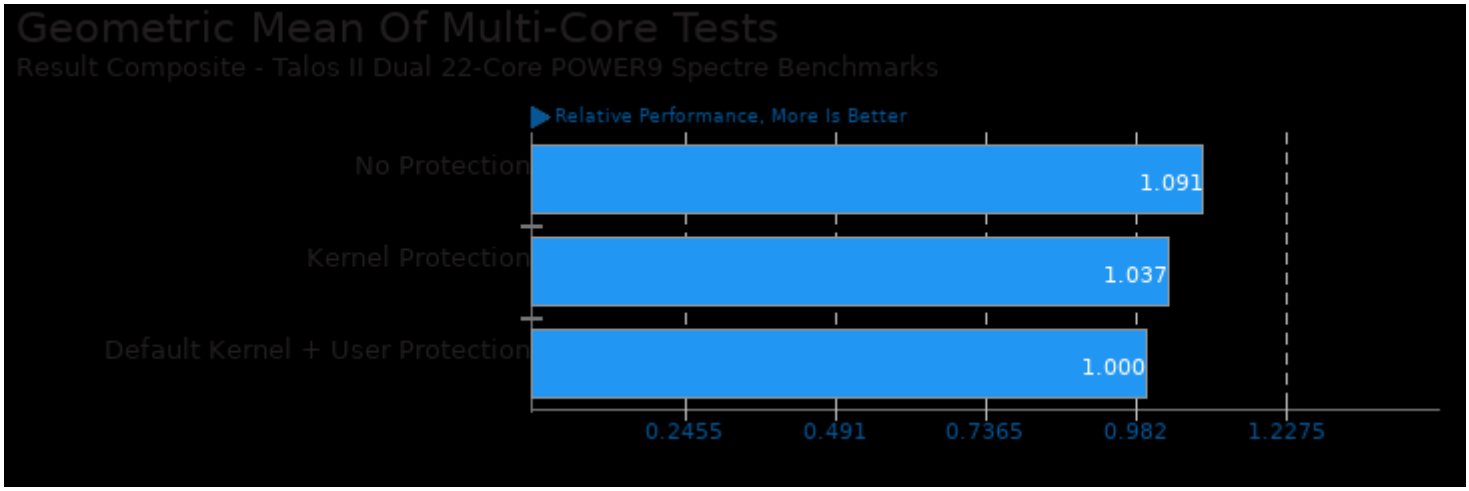


Geometric mean based upon tests: pts/rodinia and pts/ffte

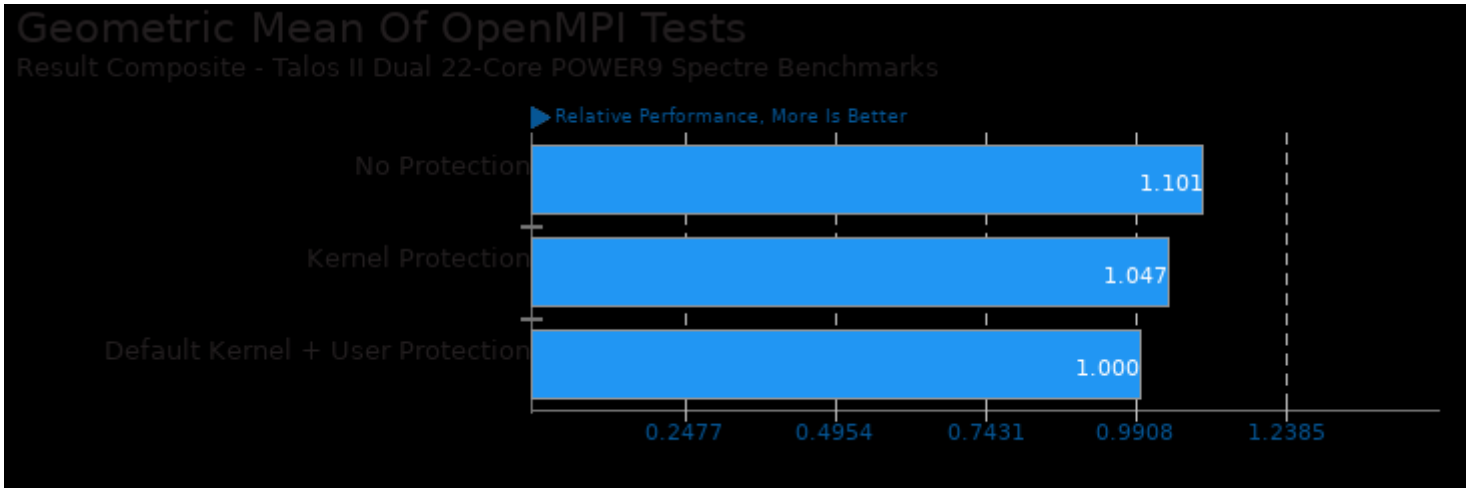
Talos II Dual 22-Core POWER9 Spectre Benchmarks



Geometric mean based upon tests: pts/openssl, pts/hackbench and pts/stress-ng

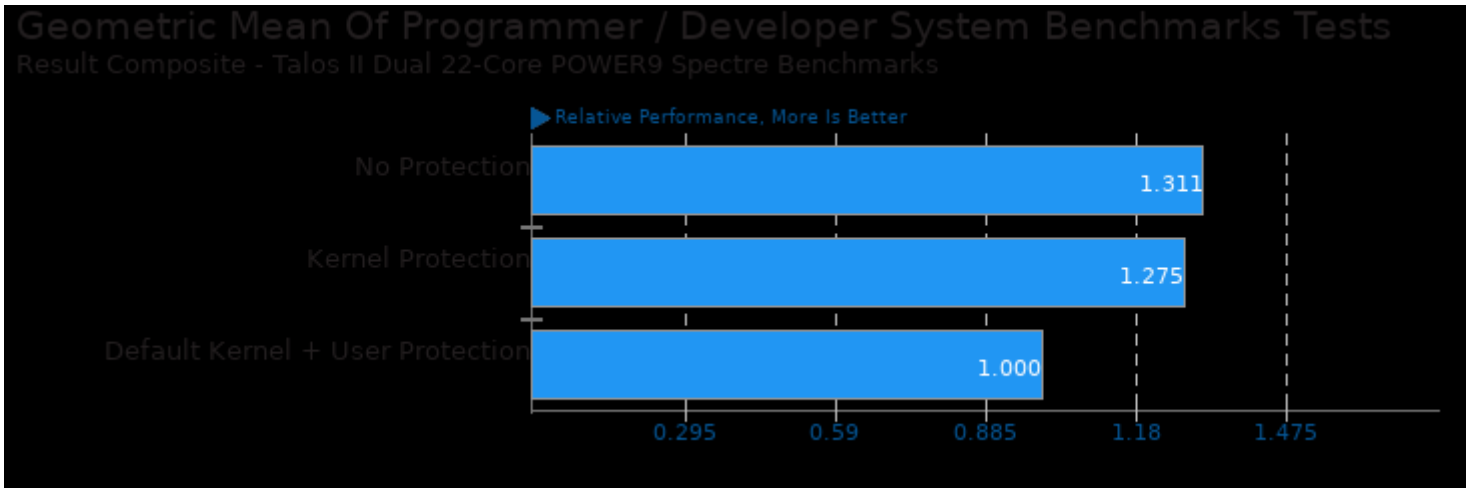


Geometric mean based upon tests: pts/c-ray, pts/povray, pts/stockfish, pts/primesieve, pts/rodinia, pts/build-linux-kernel, pts/build-imagemagick, pts/build-llvm, pts/rust-prime and pts/aobench

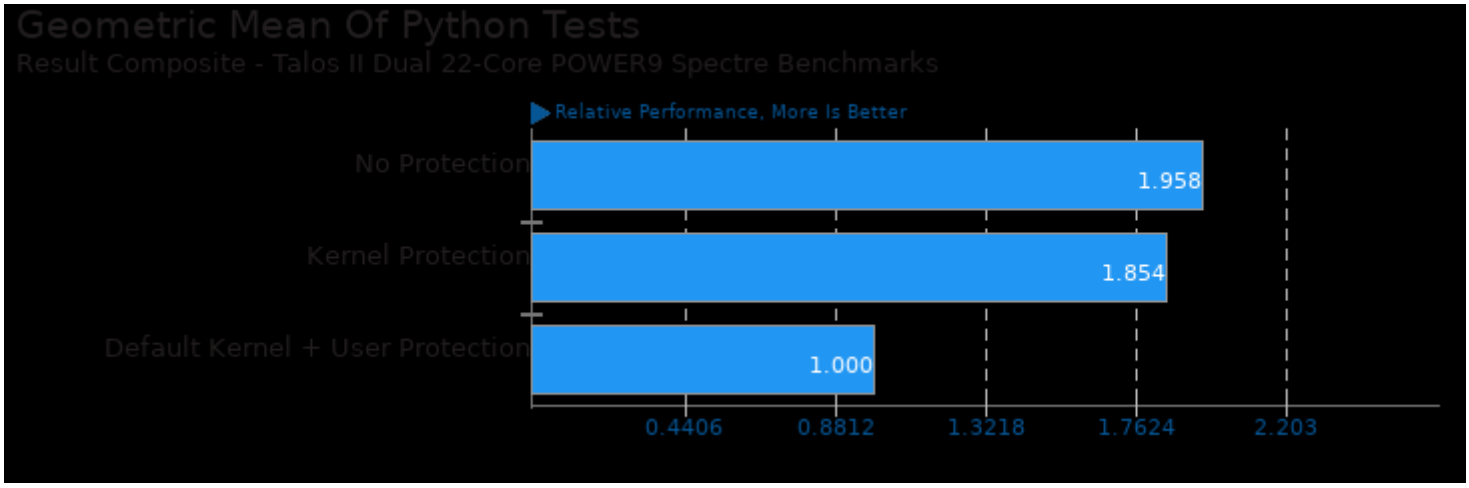


Geometric mean based upon tests: pts/rodinia and pts/ffte

Talos II Dual 22-Core POWER9 Spectre Benchmarks

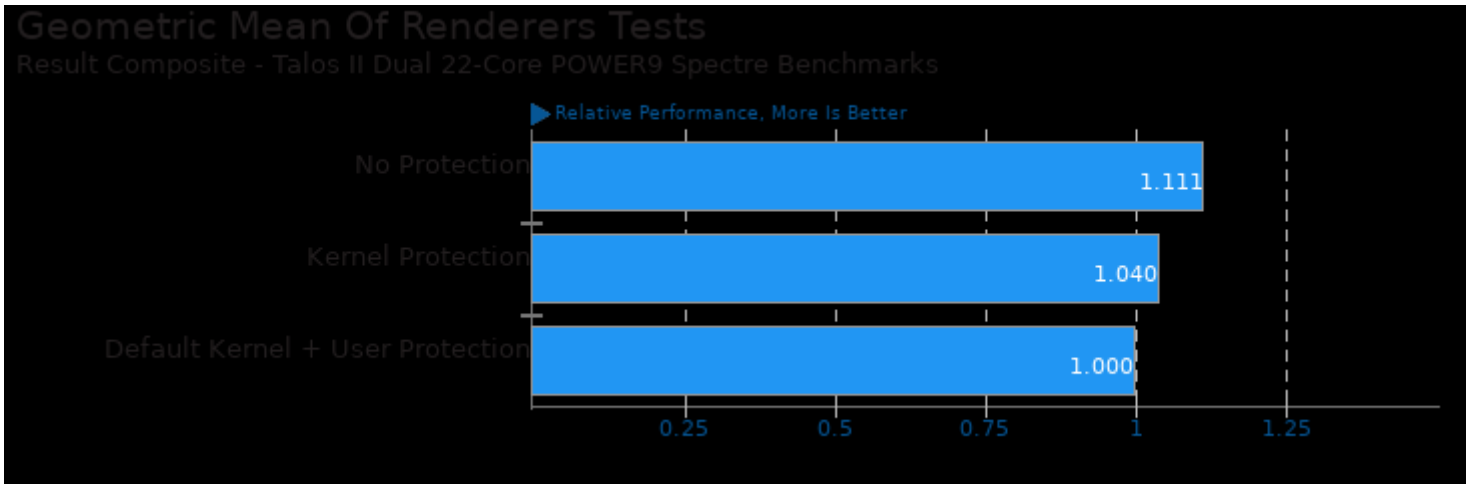


Geometric mean based upon tests: pts/pybench, pts/build-linux-kernel, pts/build-imagemagick and pts/build-llvm



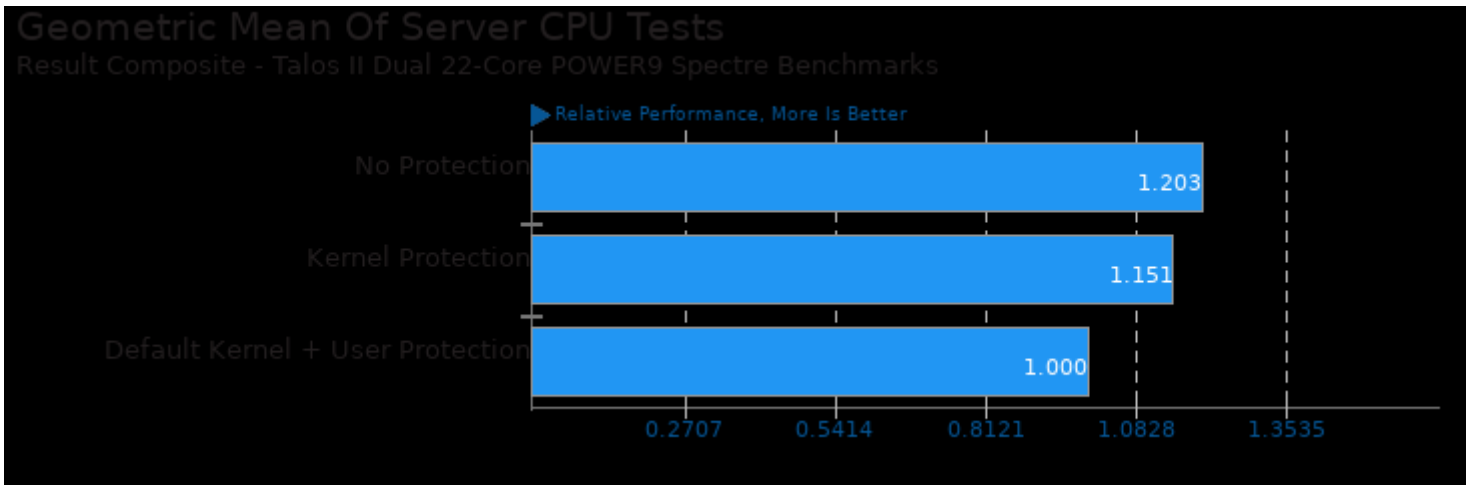
Geometric mean based upon tests: pts/pybench and pts/cython-bench

Geometric mean based upon tests: pts/c-ray and pts/povray



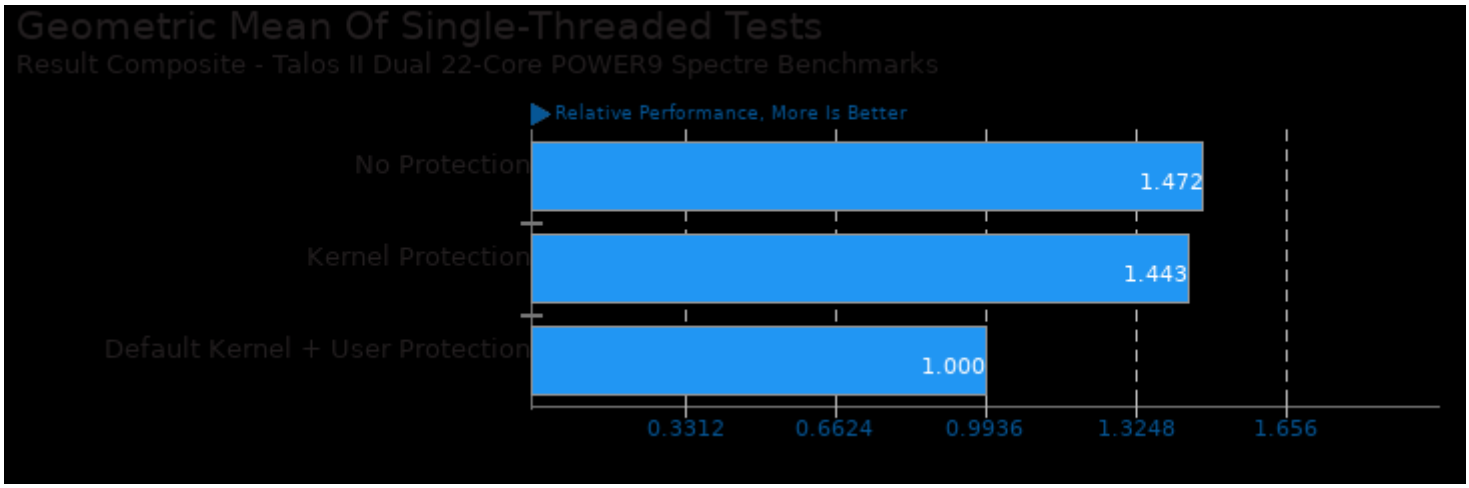
Geometric mean based upon tests: pts/c-ray, pts/povray and pts/aobench

Geometric mean based upon tests: pts/phpbench and pts/openssl



Geometric mean based upon tests: pts/rodinia, pts/stockfish, pts/build-linux-kernel, pts/build-llvm, pts/c-ray, pts/povray, pts/hackbench, pts/openssl, pts/stress-ng, pts/pybench, pts/cython-bench and pts/phpbench

Talos II Dual 22-Core POWER9 Spectre Benchmarks



Geometric mean based upon tests: pts/bork, pts/byte, pts/pybench and pts/phpbench

This file was automatically generated via the Phoronix Test Suite benchmarking software on Thursday, 28 March 2024 06:05.