



Cascade Lake Compiler Benchmarks

2 x Intel Xeon Platinum 8280 testing for a future article.

Automated Executive Summary

GCC 8.3.0: march=skylake had the most wins, coming in first place for 35% of the tests.

Based on the geometric mean of all complete results, the fastest (GCC 8.3.0: march=native) was 1.051x the speed of the slowest (GCC 8.3.0: march=skylake). GCC 8.3.0: march=native was 1.051x the speed of GCC 8.3.0: march=skylake, GCC 9.0.1: march=skylake was 0.967x the speed of GCC 8.3.0: march=native, GCC 9.0.1: march=native was 0.999x the speed of GCC 9.0.1: march=skylake.

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

Timed PHP Compilation (Time To Compile) at 1.175x
FFTW (Build: Float + SSE - Size: 2D FFT Size 4096) at 1.108x
Sysbench (Test: CPU) at 1.096x
Timed LLVM Compilation (Time To Compile) at 1.089x
FFTW (Build: Stock - Size: 2D FFT Size 4096) at 1.083x
C-Ray (Total Time - 4K, 16 Rays Per Pixel) at 1.079x
Timed ImageMagick Compilation (Time To Compile) at 1.069x
SciMark (Computational Test: Dense LU Matrix Factorization) at 1.06x

Sysbench (Test: Memory) at 1.039x

SVT-HEVC (1080p 8-bit YUV To HEVC Video Encode) at 1.038x.

Test Systems:

GCC 8.3.0: march=skylake

GCC 8.3.0: march=native

Processor: 2 x Intel Xeon Platinum 8280 @ 4.00GHz (56 Cores / 112 Threads), Motherboard: GIGABYTE MD61-SC2-00 v01000100 (T15 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 386048MB, Disk: Samsung SSD 970 PRO 512GB, Graphics: ASPEED Family, Monitor: VE228, Network: 2 x Intel X722 for 1GbE + 2 x QLogic FastLinQ QL41000 10/25/40/50GbE

OS: Ubuntu 18.04, Kernel: 5.1.0-999-generic (x86_64) 20190329, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native

Compiler Notes: --disable-multilib --enable-checking=release

Processor Notes: Scaling Governor: intel_pstate powersave

Python Notes: Python 2.7.15rc1 + Python 3.6.7

Security Notes: __user pointer sanitization + Enhanced IBRS IBPB: conditional RSB filling + SSB disabled via prctl and seccomp

GCC 9.0.1: march=skylake

GCC 9.0.1: march=native

Processor: 2 x Intel Xeon Platinum 8280 @ 4.00GHz (56 Cores / 112 Threads), Motherboard: GIGABYTE MD61-SC2-00 v01000100 (T15 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 386048MB, Disk: Samsung SSD 970 PRO 512GB, Graphics: ASPEED Family, Monitor: VE228, Network: 2 x Intel X722 for 1GbE + 2 x QLogic FastLinQ QL41000 10/25/40/50GbE

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Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native

Compiler Notes: --disable-multilib --enable-checking=release

Processor Notes: Scaling Governor: intel_pstate powersave

Python Notes: Python 2.7.15rc1 + Python 3.6.7

Security Notes: __user pointer sanitization + Enhanced IBRS IBPB: conditional RSB filling + SSB disabled via prctl and seccomp

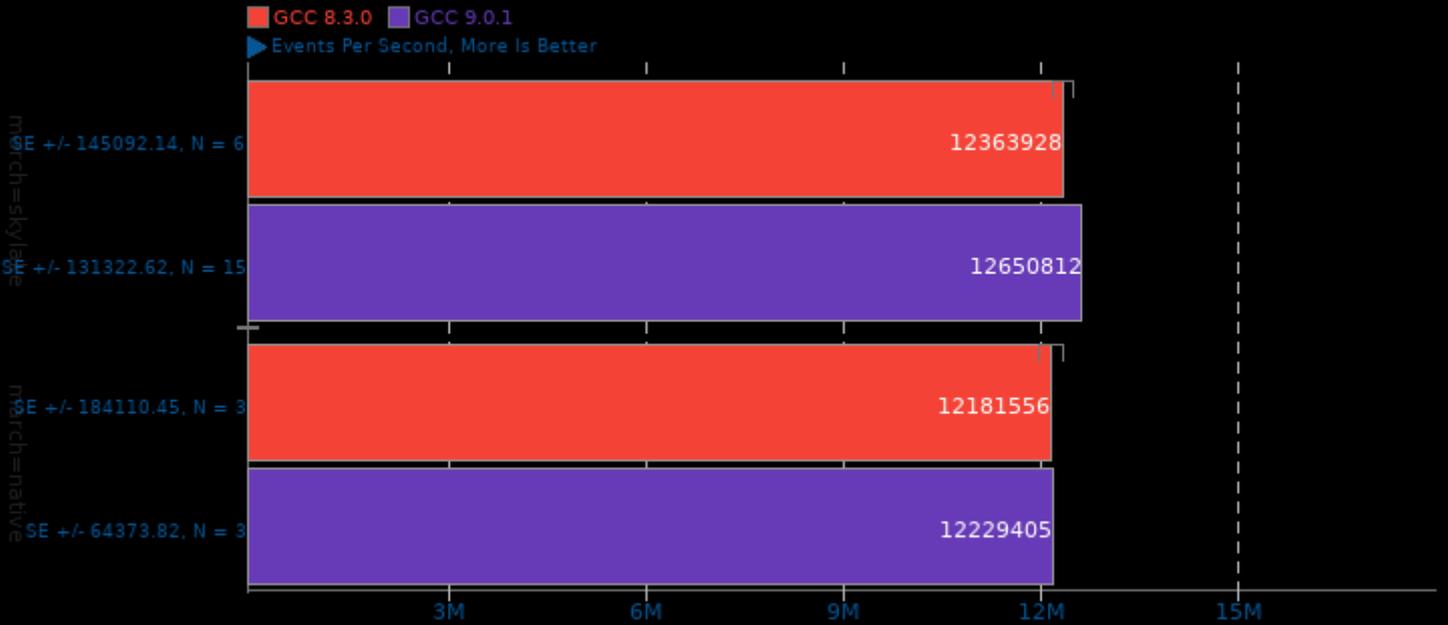
	GCC 8.3.0: march=skylake	GCC 8.3.0: march=native	GCC 9.0.1: march=skylake	GCC 9.0.1: march=native
Sysbench - Memory (Events/sec)	12363928	12181556	12650812	12229405
Normalized	97.73%	96.29%	100%	96.67%
Standard Deviation	2.9%	2.6%	4%	0.9%
Sysbench - CPU (Events/sec)	95094	97359	104187	95597
Normalized	91.27%	93.45%	100%	91.76%
Standard Deviation	2%	1.1%	1.1%	0.6%
TTSIOD 3D Renderer - P.R.W.S.S.M (FPS)	992	991		
Normalized	100%	99.9%		
Standard Deviation	1.6%	2.8%		
SVT-AV1 - 1.8.b.Y.T.A.V.E (FPS)	21.91	21.71	21.81	21.62
Normalized	100%	99.09%	99.54%	98.68%
Standard Deviation	1%	0.2%	1.3%	1.6%
SVT-HEVC - 1.8.b.Y.T.H.V.E (FPS)	272	267	262	270
Normalized	100%	98.16%	96.32%	99.26%
Standard Deviation	2.3%	2.9%	3.1%	2.6%
SVT-VP9 - 1.8.b.Y.T.V.V.E (FPS)	273	280	274	273
Normalized	97.5%	100%	97.86%	97.5%
Standard Deviation	1%	0.2%	0.6%	2.5%
VP9 libvpx Encoding - v.V.1.V.E (FPS)	23.67	23.82	23.69	23.92
Normalized	98.95%	99.58%	99.04%	100%
Standard Deviation	0.6%	0.3%	0.2%	0.7%
GraphicsMagick - Swirl	229	228	226	226
Normalized	100%	99.56%	98.69%	98.69%
Standard Deviation				0.3%
GraphicsMagick - Rotate	228	229	226	227
Normalized	99.56%	100%	98.69%	99.13%
Standard Deviation		0.3%		0.4%
GraphicsMagick - Sharpen (Iterations/min)	213	212	215	214
Normalized	99.07%	98.6%	100%	99.53%
Standard Deviation	0.3%		0.3%	0.3%
GraphicsMagick - Enhanced (Iterations/min)	226	224	223	221
Normalized	100%	99.12%	98.67%	97.79%
Standard Deviation			0.3%	
GraphicsMagick - Resizing (Iterations/min)	208	209	207	210
Normalized	99.05%	99.52%	98.57%	100%
Standard Deviation		0.8%	1.7%	0.6%
GraphicsMagick - Noise-Gaussian (Iterations/min)	204	203	201	200
Normalized	100%	99.51%	98.53%	98.04%
Standard Deviation	0.3%			0.5%
GraphicsMagick - HWB Color Space (Iterations/min)	246	247	245	243
Normalized	99.6%	100%	99.19%	98.38%
Standard Deviation			0.2%	
BYTE Unix Benchmark - Dhrystone 2 (LPS)	38113722	36984027	37564540	36940557
Normalized	100%	97.04%	98.56%	96.92%
Standard Deviation	0%	2.2%	2.8%	2.7%

FFTW - Stock - 2D FFT Size 4096	5739	6048	5586	5616
(Mflops)				
Normalized	94.89%	100%	92.36%	92.86%
Standard Deviation	0.6%	0.8%	0.6%	1.9%
FFTW - Float + SSE - 2D FFT Size 4096	16980	17360	18231	18815
(Mflops)				
Normalized	90.25%	92.27%	96.9%	100%
Standard Deviation	1.4%	2.7%	2.5%	0.6%
LuaJIT - Composite (Mflops)	1470	1461	1461	1468
Normalized	100%	99.39%	99.39%	99.86%
Standard Deviation	0.1%	0.3%	0.3%	0.1%
SciMark - Composite (Mflops)	2485	2527	2526	2572
Normalized	96.62%	98.25%	98.21%	100%
Standard Deviation	0%	0.1%	0.5%	0.2%
SciMark - Monte Carlo (Mflops)	882	881	821	878
Normalized	100%	99.89%	93.08%	99.55%
Standard Deviation	0%	0%	12.3%	0.4%
SciMark - F.F.T (Mflops)	739	740	741	757
Normalized	97.62%	97.75%	97.89%	100%
Standard Deviation	0.2%	0.2%	1.3%	0.7%
SciMark - S.M.M (Mflops)	3111	3156	3168	3190
Normalized	97.52%	98.93%	99.31%	100%
Standard Deviation	0.1%	0.1%	0.5%	0.1%
SciMark - D.L.M.F (Mflops)	5675	5841	5894	6016
Normalized	94.33%	97.09%	97.97%	100%
Standard Deviation	0%	0.3%	0.6%	0.3%
SciMark - J.S.O.R (Mflops)	2018	2014	2008	2017
Normalized	100%	99.8%	99.5%	99.95%
Standard Deviation	0%	0.1%	0.3%	0%
Himeno Benchmark - P.P.S (MFLOPS)	2999	3011	3025	3021
Normalized	99.14%	99.54%	100%	99.87%
Standard Deviation	0.2%	0.1%	0.1%	0.1%
7-Zip Compression - C.S.T (MIPS)	245181	242482	243207	240828
Normalized	100%	98.9%	99.19%	98.22%
Standard Deviation	2.2%	1.5%	1.2%	2.5%
Memcached mcperv - Get	57526	106156	58709	57151
(Operations/sec)				
Normalized	54.19%	100%	55.3%	53.84%
Standard Deviation	0.6%	9.7%	2.3%	1.3%
Memcached mcperv - Set	21914	63645	24187	24618
(Operations/sec)				
Normalized	34.43%	100%	38%	38.68%
Standard Deviation	10.4%	0.5%	7.3%	0.9%
NGINX Benchmark - S.W.P.S	30248	30401	30134	30208
(Reqs/sec)				
Normalized	99.5%	100%	99.12%	99.37%
Standard Deviation	1.5%	0.5%	1.1%	0.8%
Apache Benchmark - S.W.P.S	25617	25353	24904	25244
(Reqs/sec)				
Normalized	100%	98.97%	97.22%	98.54%
Standard Deviation	1%	2.7%	0.6%	1.4%
OpenSSL - R.4.b.P (Signs/sec)	13539	13812	13817	13803
Normalized	97.99%	99.96%	100%	99.9%
Standard Deviation	0.8%	0.3%	1%	0.8%

PostgreSQL pgbench - Buffer Test - Normal Load - Read Only (TPS)	947953	943836	936200	954573
Normalized	99.31%	98.88%	98.08%	100%
Standard Deviation	0.6%	0.6%	0.6%	1.2%
PostgreSQL pgbench - Buffer Test - Normal Load - Read Write (TPS)	5667	8075	11684	11274
Normalized	48.5%	69.11%	100%	96.49%
Standard Deviation	8.4%	25.5%	1.3%	2.9%
Apache Siege - 250 (Transactions/sec)	34621	34767	33856	34973
Normalized	98.99%	99.41%	96.81%	100%
Standard Deviation	0.2%	0%	0.8%	1.5%
t-test1 - 2 (sec)	7.69	7.66	7.70	7.78
Normalized	99.61%	100%	99.48%	98.46%
Standard Deviation	1.8%	2.5%	0.2%	2.3%
Timed MAFFT Alignment - M.S.A (sec)	4.86	5.04	4.86	5.02
Normalized	100%	96.43%	100%	96.81%
Standard Deviation	2.9%	0.8%	3.1%	6%
Timed ImageMagick Compilation - Time To Compile (sec)	18.90	18.67	19.86	19.95
Normalized	98.78%	100%	94.01%	93.58%
Standard Deviation	1.2%	1.9%	0.9%	1.7%
Timed LLVM Compilation - Time To Compile (sec)	112	114	121	122
Normalized	100%	98.25%	92.56%	91.8%
Timed PHP Compilation - Time To Compile (sec)	50.37	50.65	59.20	58.83
Normalized	100%	99.45%	85.08%	85.62%
Standard Deviation	0.3%	0.7%	0.8%	0.4%
C-Ray - Total Time - 4.1.R.P.P (sec)	11.29	11.47	10.63	11.36
Normalized	94.15%	92.68%	100%	93.57%
Standard Deviation	2%	0.3%	0.9%	0.3%
Primesieve - 1.P.N.G (sec)	4.64	4.75		
Normalized	100%	97.68%		
Standard Deviation	0.3%	0.3%		
AOBench - 2048 x 2048 - Total Time (sec)	39.34	38.93	38.10	38.03
Normalized	96.67%	97.69%	99.82%	100%
Standard Deviation	0.3%	0.4%	0.1%	0.1%
XZ Compression - C.u.1.0.3.s.i.i.C.L.9 (sec)	92.06	91.38	91.19	91.14
Normalized	99%	99.74%	99.95%	100%
Standard Deviation	0.9%	0.2%	0.1%	0.6%
Zstd Compression - C.u.1.0.3.s.i.i.C.L.1 (sec)	9.24	9.15	9.17	9.18
Normalized	99.03%	100%	99.78%	99.67%
Standard Deviation	3.4%	1.5%	2.8%	2.4%
LAME MP3 Encoding - WAV To MP3 (sec)	9.49	9.37	9.19	9.16
Normalized	96.52%	97.76%	99.67%	100%
Standard Deviation	0.1%	0.2%	0.1%	0.2%

Sysbench 2018-07-28

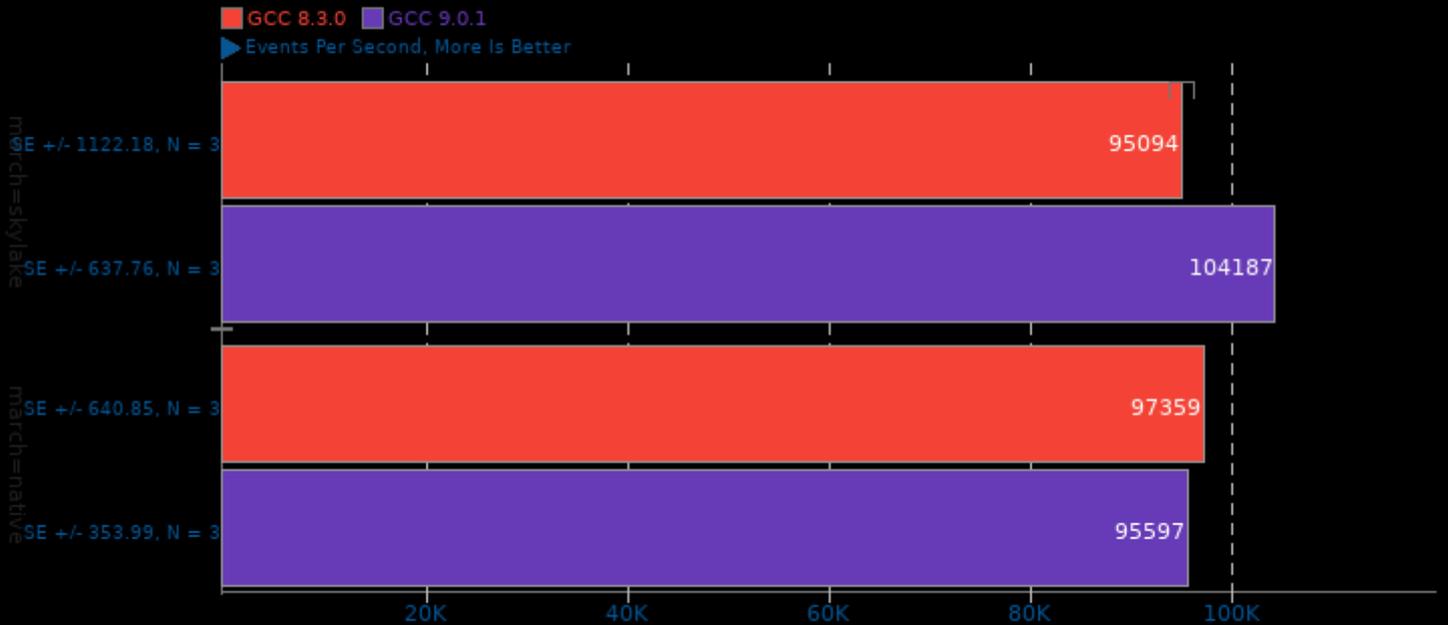
Test: Memory



1. (CC) gcc options: -pthread -O3 -funroll-loops -ggdb3 -rdynamic -ldl -laio -lm

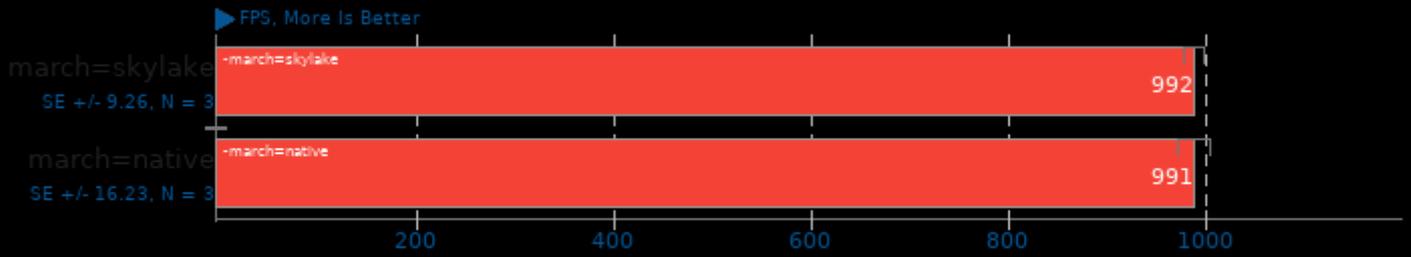
Sysbench 2018-07-28

Test: CPU



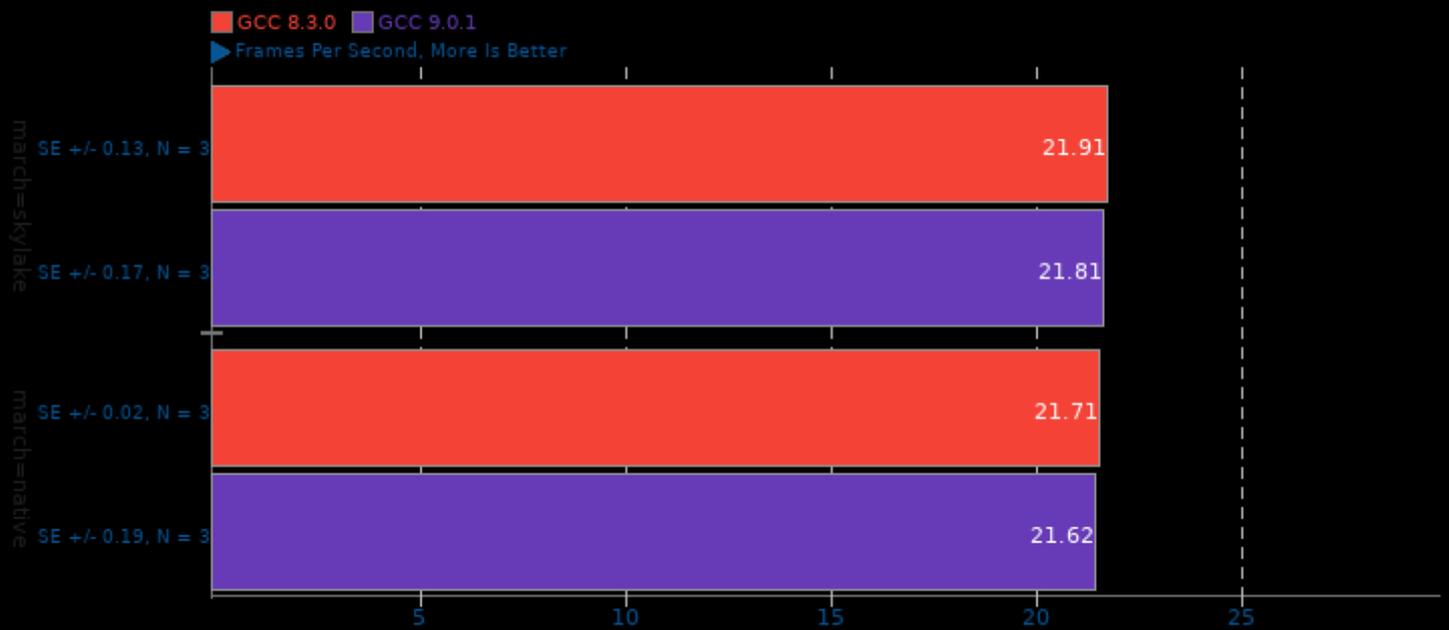
1. (CC) gcc options: -pthread -O3 -funroll-loops -ggdb3 -rdynamic -ldl -laio -lm

TTSIOD 3D Renderer 2.3b Phong Rendering With Soft-Shadow Mapping



1. (CXX) g++ options: -O3 -fomit-frame-pointer -ffast-math -mtune=native -fno-math-errno -msse -mrecip -mfpmath=sse -msse2 -msse3 -fopenmp -fwhole-program-optimization

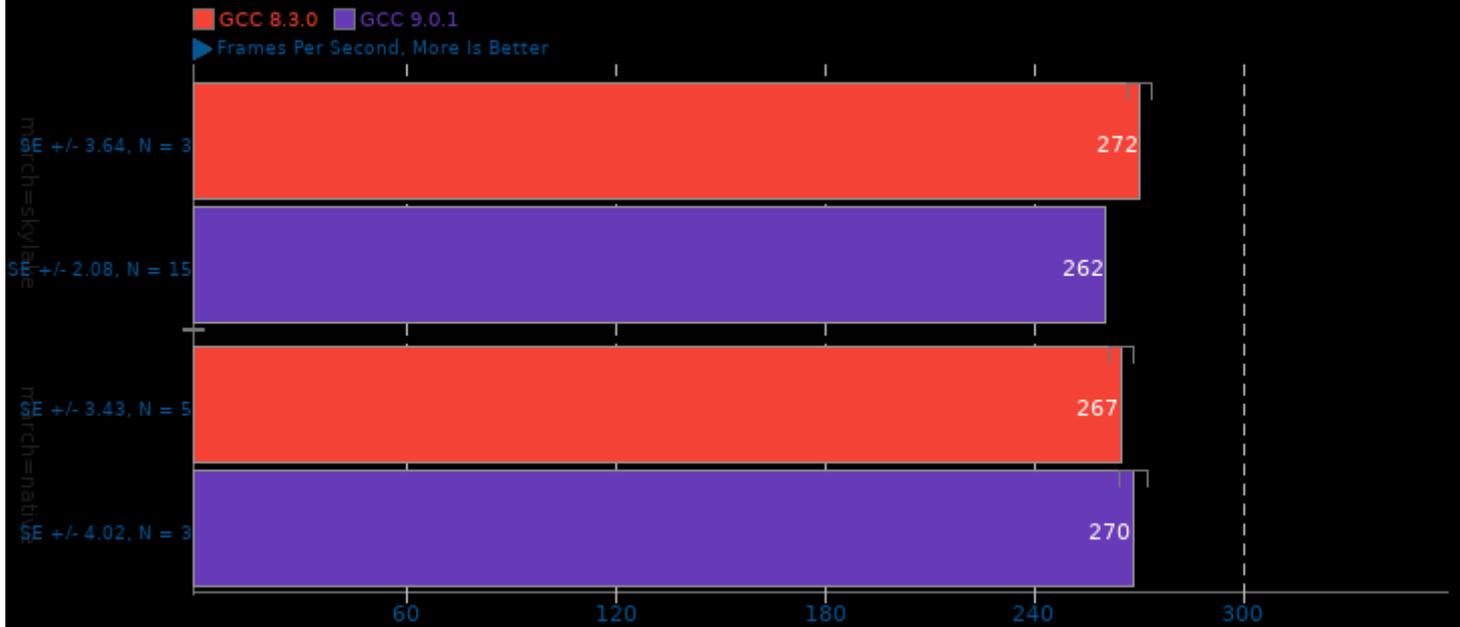
SVT-AV1 2019-03-07 1080p 8-bit YUV To AV1 Video Encode



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

SVT-HEVC 2019-02-03

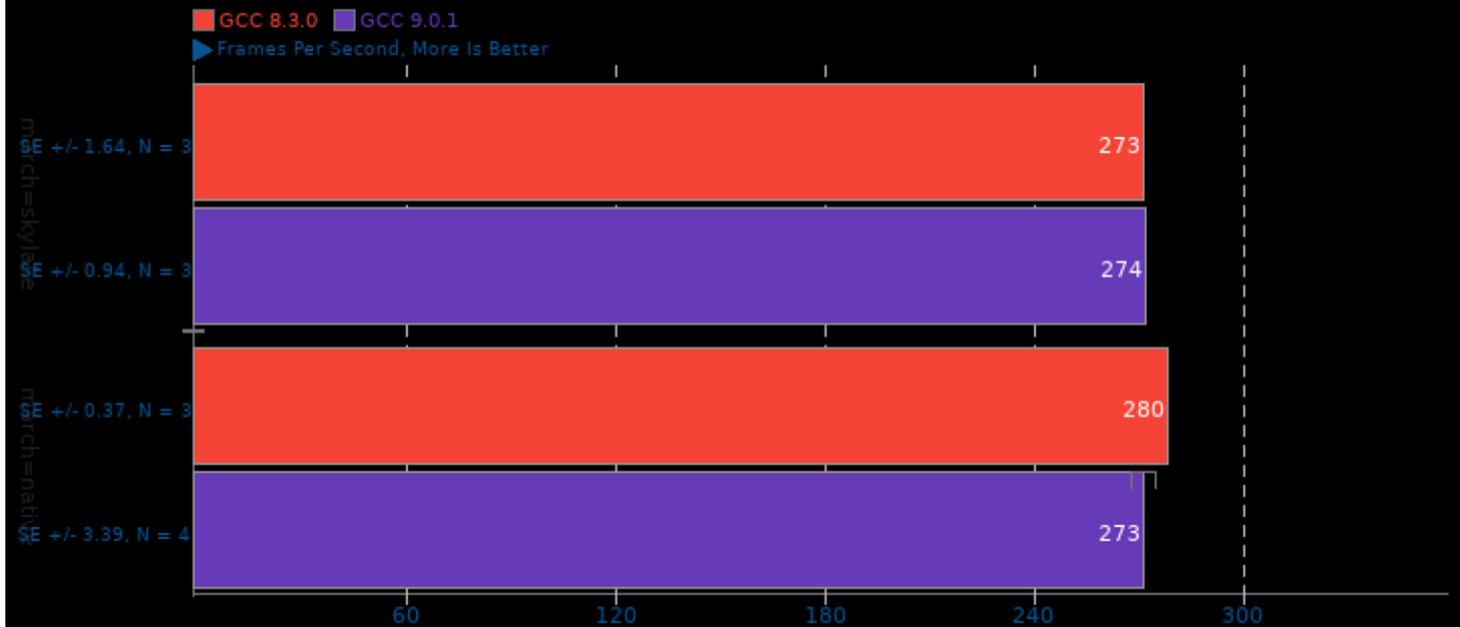
1080p 8-bit YUV To HEVC Video Encode



1. (GCC) gcc options: -O3 -fPIE -fPIC -O2 -fno -fvisibility=hidden -march=native -pie -rdynamic -lpthread -lrt

SVT-VP9 2019-02-17

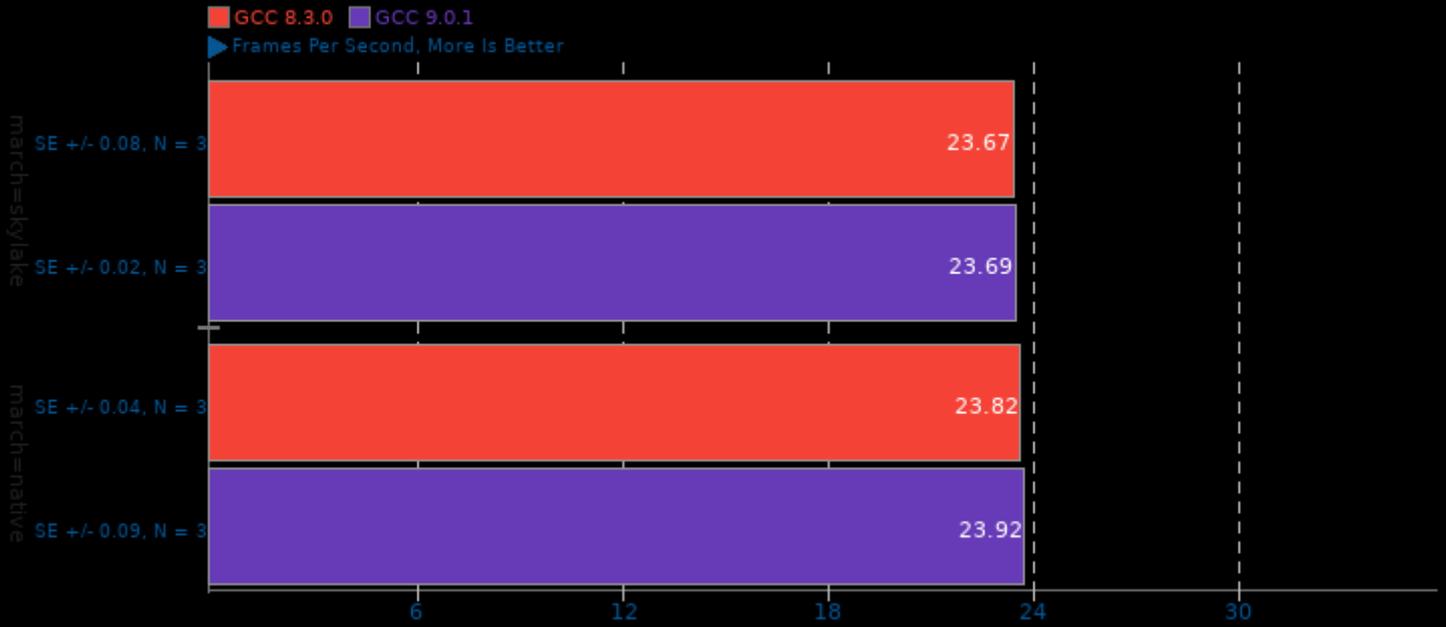
1080p 8-bit YUV To VP9 Video Encode



1. (GCC) gcc options: -O3 -fPIE -fPIC -O2 -fno -fvisibility=hidden -mavx -pie -rdynamic -lpthread -lrt -lm

VP9 libvpx Encoding 1.8.0

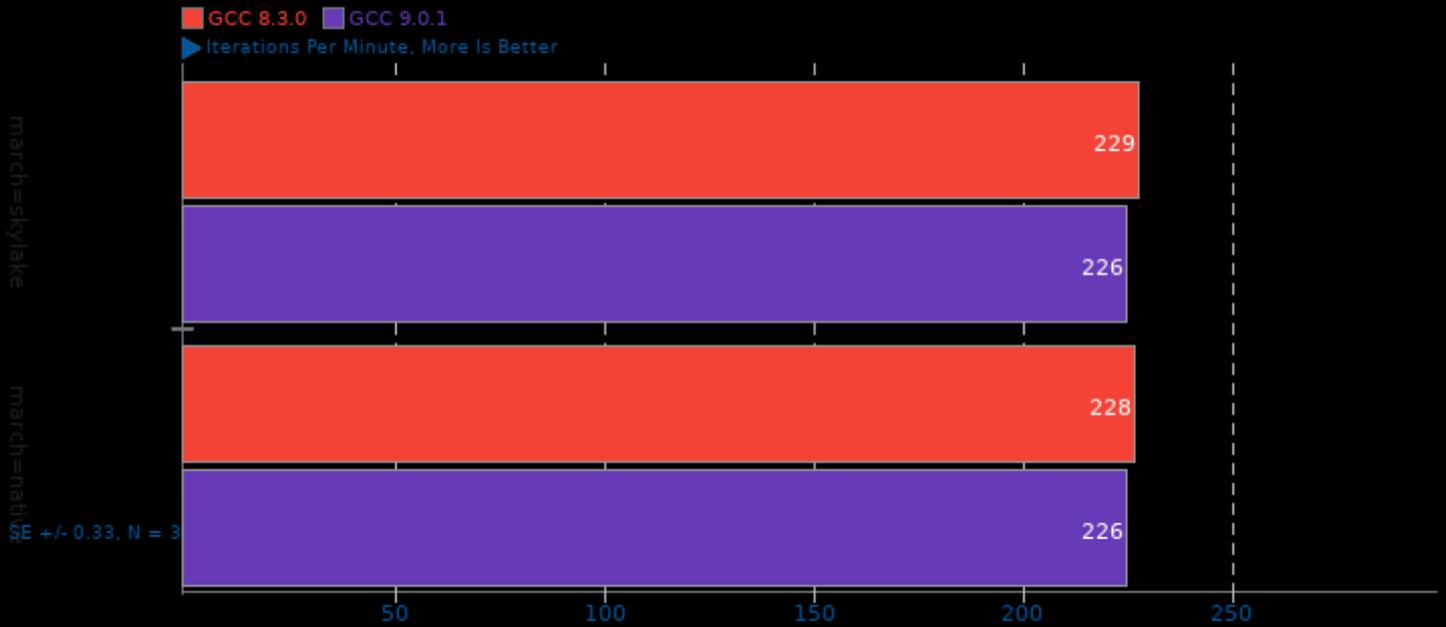
vpxenc VP9 1080p Video Encode



1. (CXX) g++ options: -m64 -lm -lpthread -O3 -fPIC -U_FORTIFY_SOURCE -std=c++11

GraphicsMagick 1.3.30

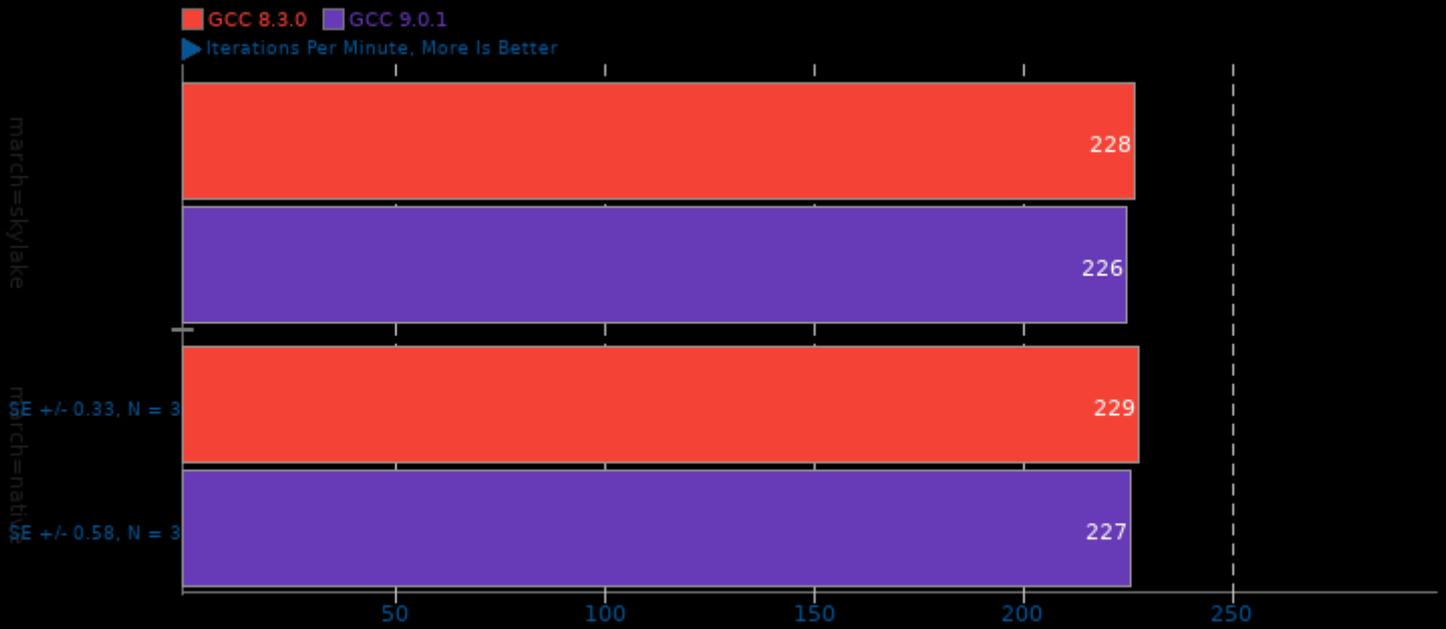
Operation: Swirl



1. (CC) gcc options: -fopenmp -O3 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lz -lm -ldl -lpthread

GraphicsMagick 1.3.30

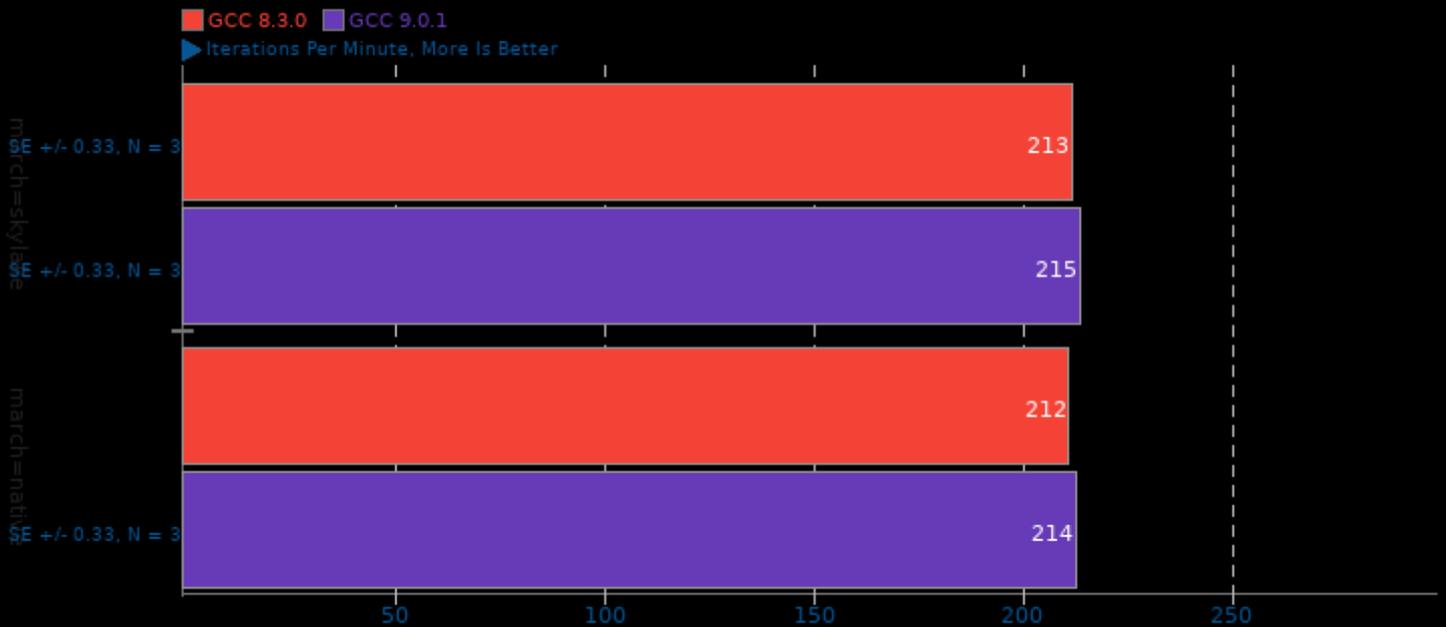
Operation: Rotate



1. (CC) gcc options: -fopenmp -O3 -pthread -ljpeg -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lz -lm -ldl -lpthread

GraphicsMagick 1.3.30

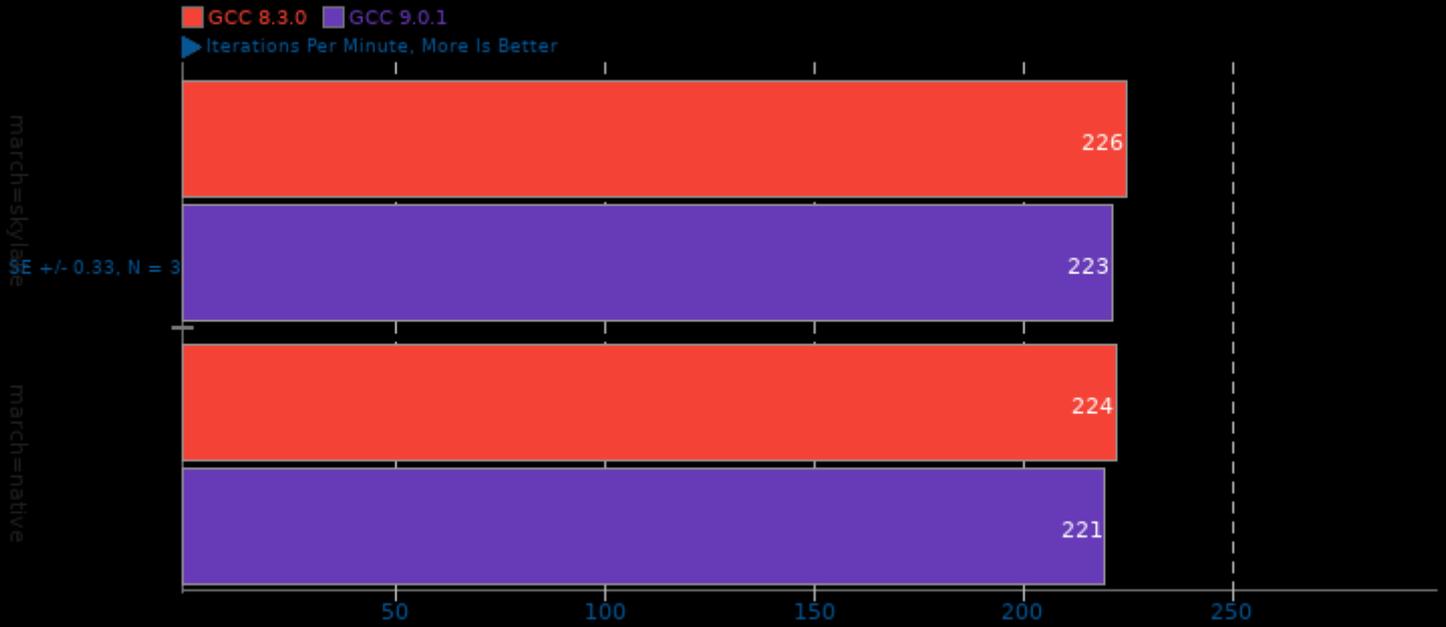
Operation: Sharpen



1. (CC) gcc options: -fopenmp -O3 -pthread -ljpeg -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lz -lm -ldl -lpthread

GraphicsMagick 1.3.30

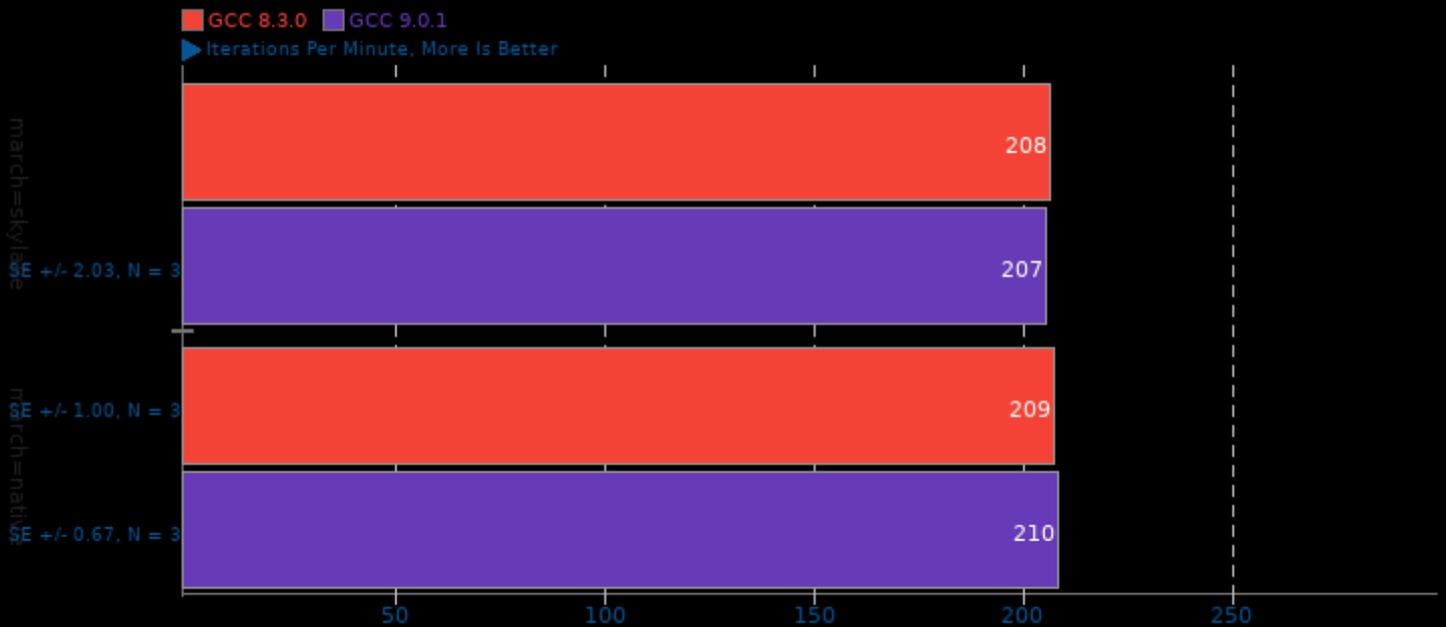
Operation: Enhanced



1. (CC) gcc options: -fopenmp -O3 -pthread -ljpeg -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lz -lm -ldl -lpthread

GraphicsMagick 1.3.30

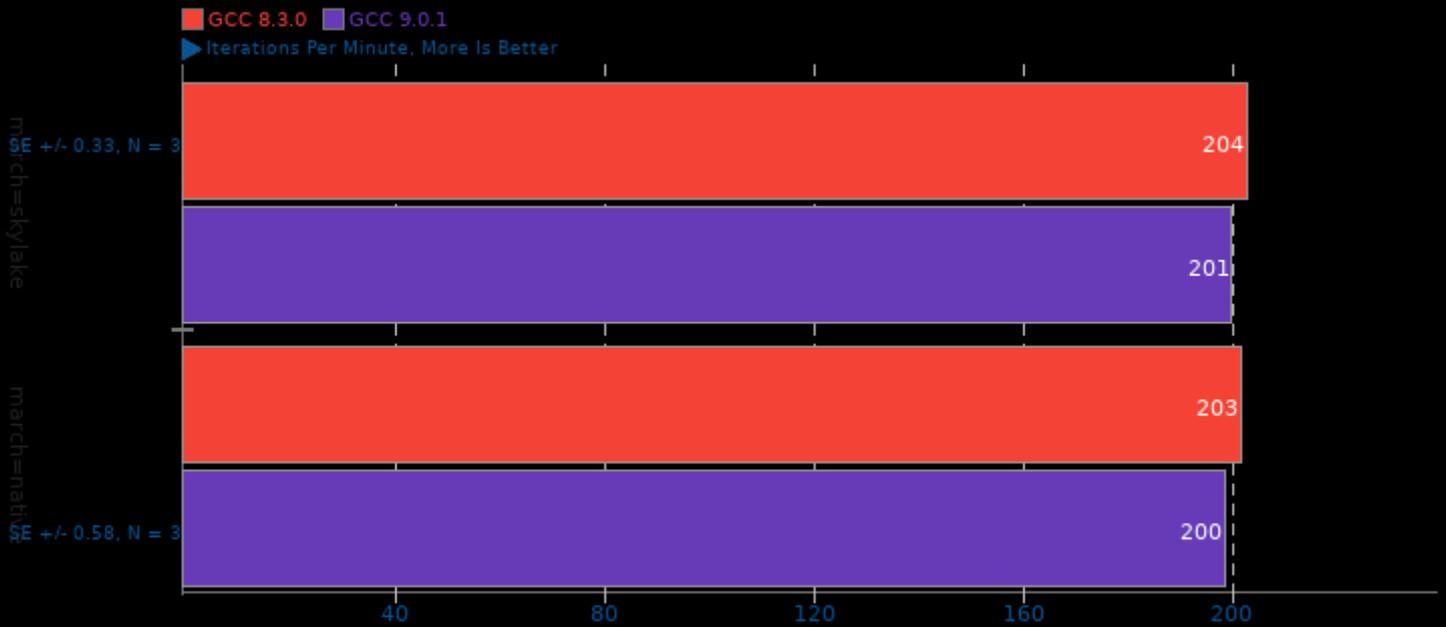
Operation: Resizing



1. (CC) gcc options: -fopenmp -O3 -pthread -ljpeg -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lz -lm -ldl -lpthread

GraphicsMagick 1.3.30

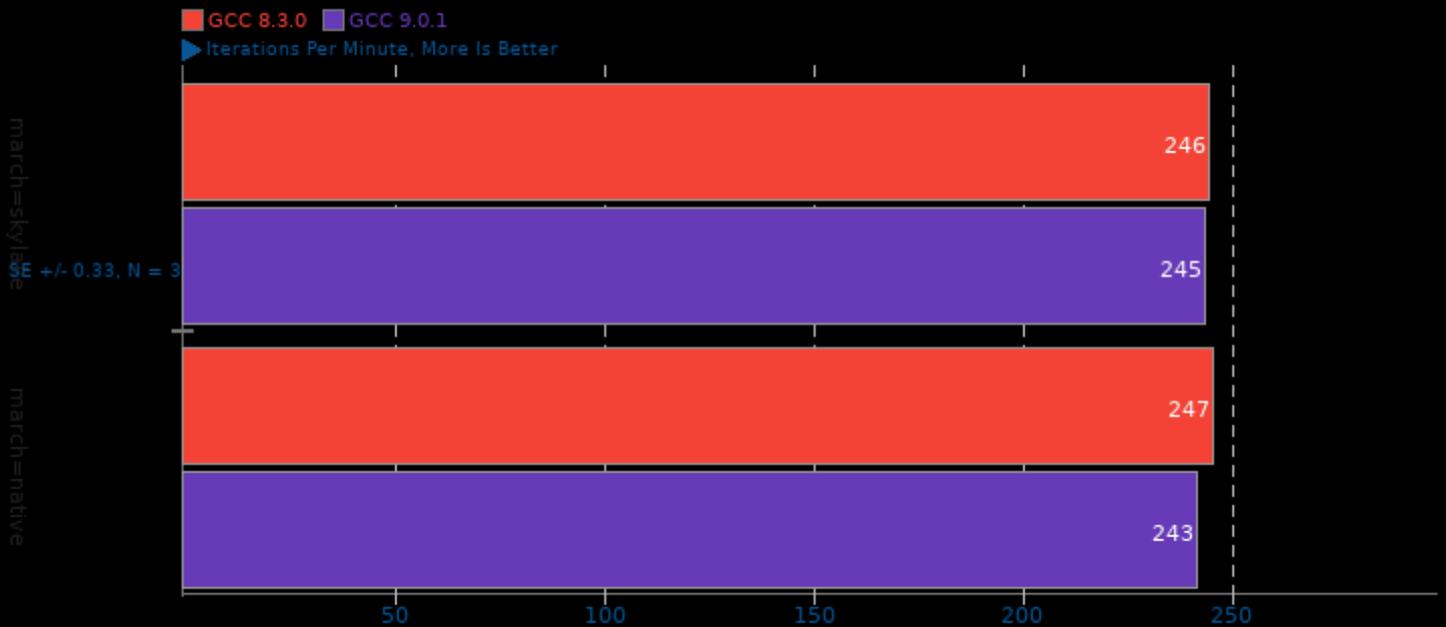
Operation: Noise-Gaussian



1. (CC) gcc options: -fopenmp -O3 -pthread -ljpeg -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lz -lm -ldl -lpthread

GraphicsMagick 1.3.30

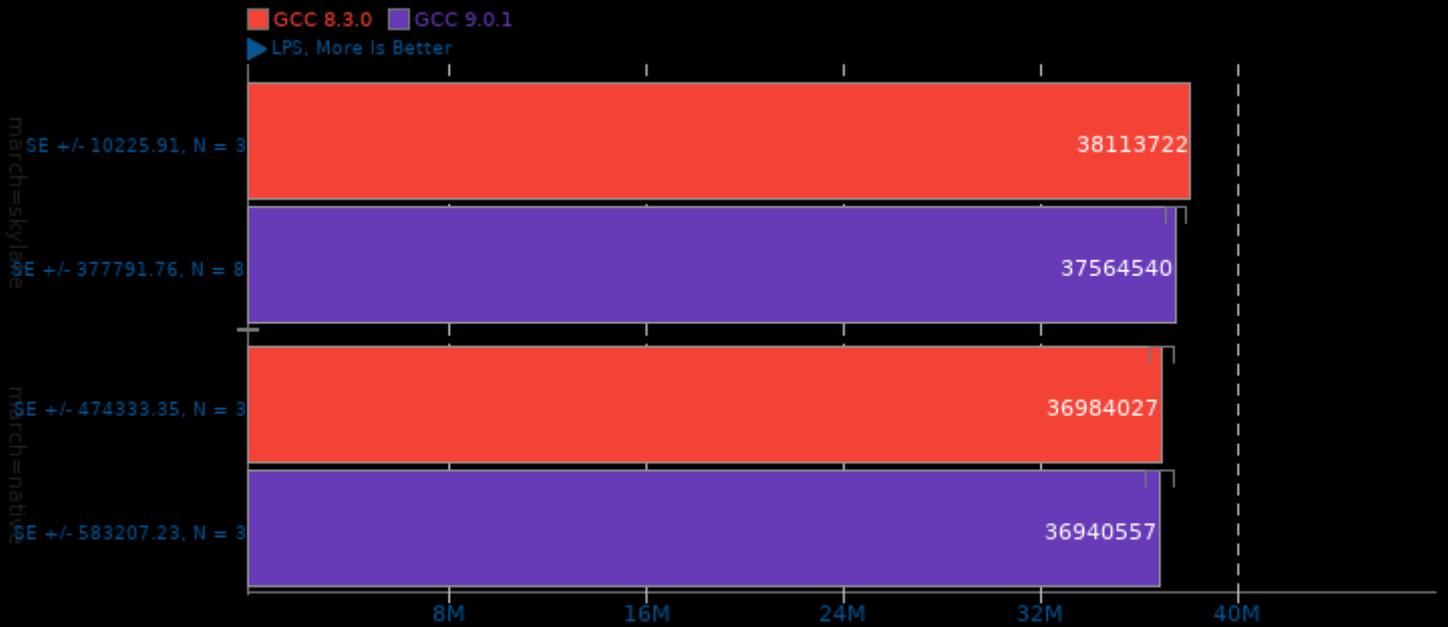
Operation: HWB Color Space



1. (CC) gcc options: -fopenmp -O3 -pthread -ljpeg -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lz -lm -ldl -lpthread

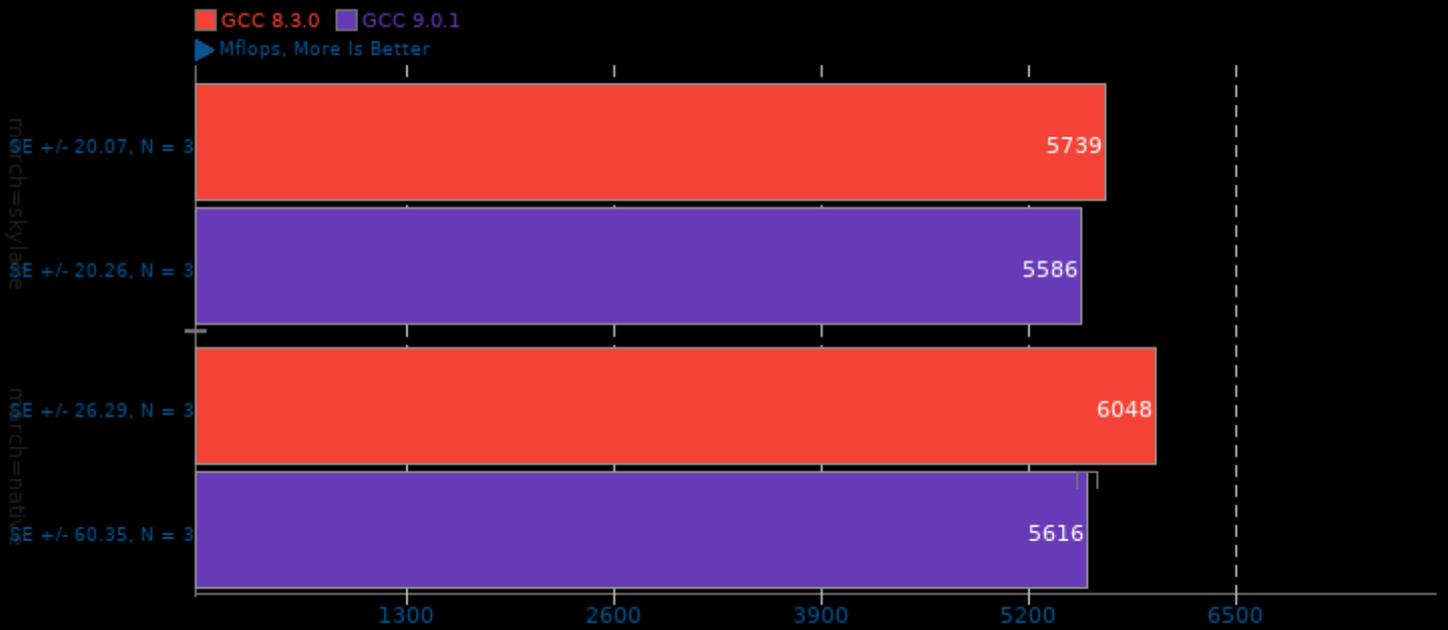
BYTE Unix Benchmark 3.6

Computational Test: Dhrystone 2



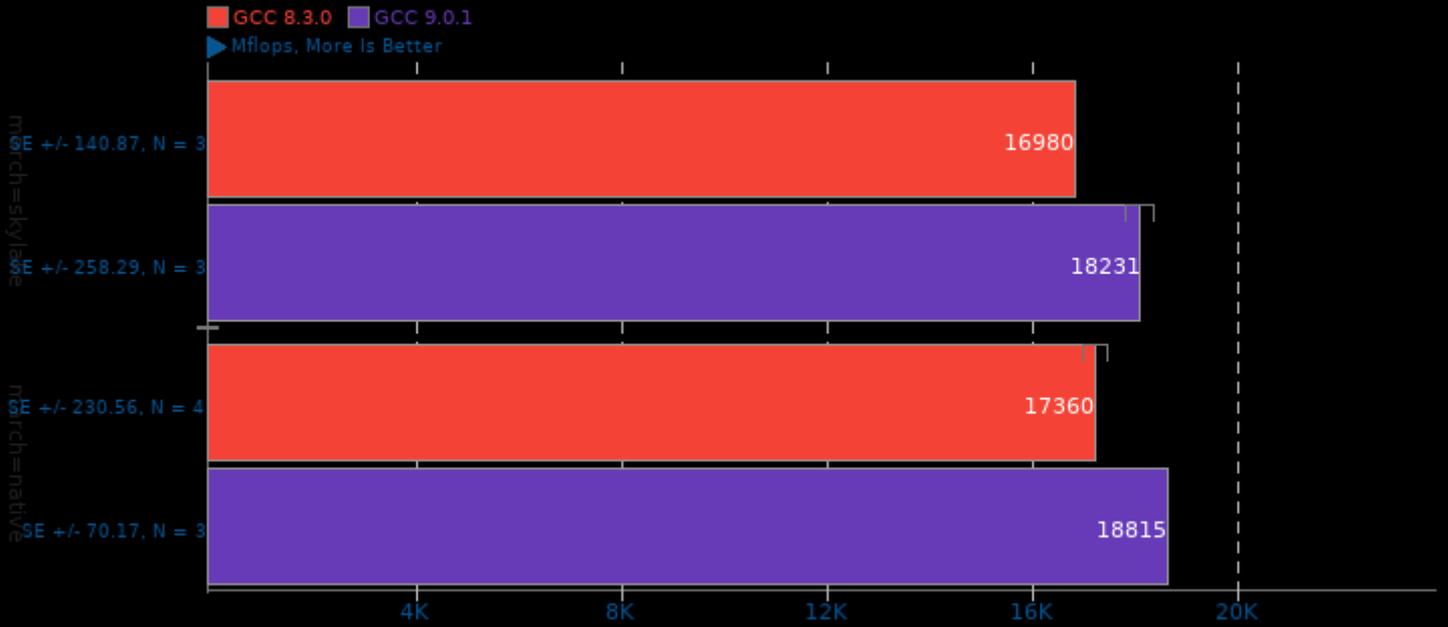
FFTW 3.3.6

Build: Stock - Size: 2D FFT Size 4096



FFTW 3.3.6

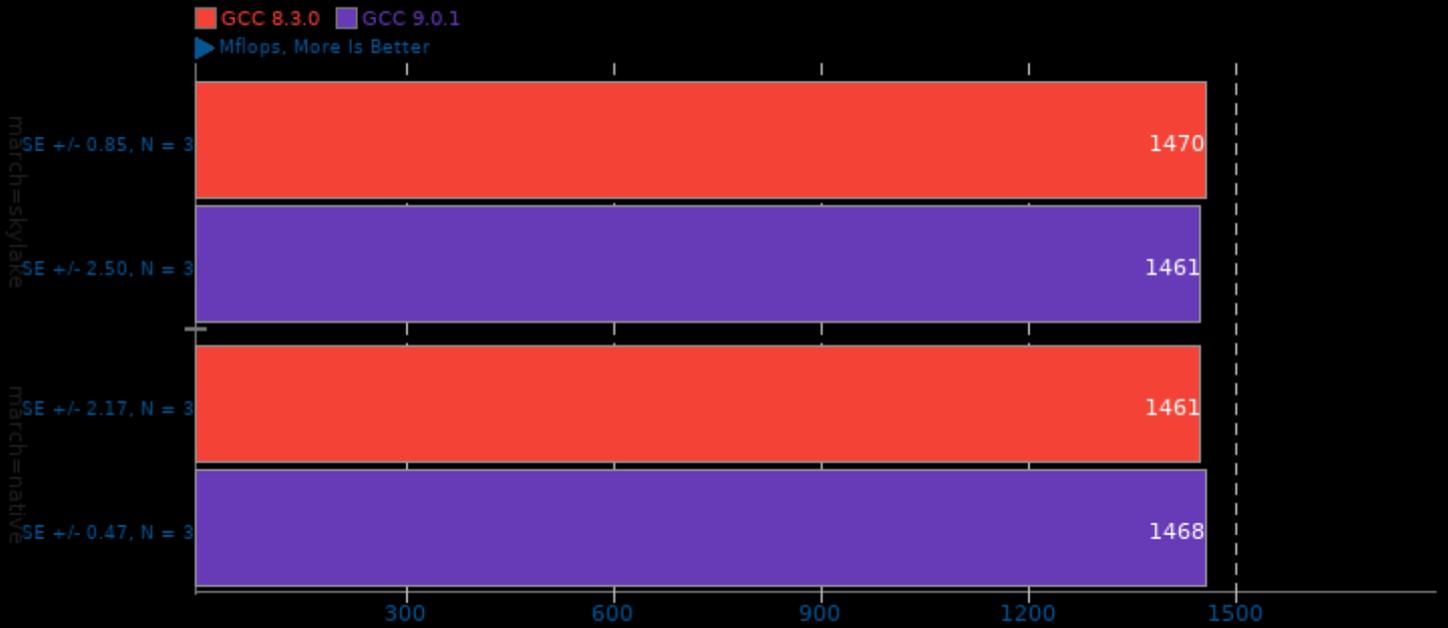
Build: Float + SSE - Size: 2D FFT Size 4096



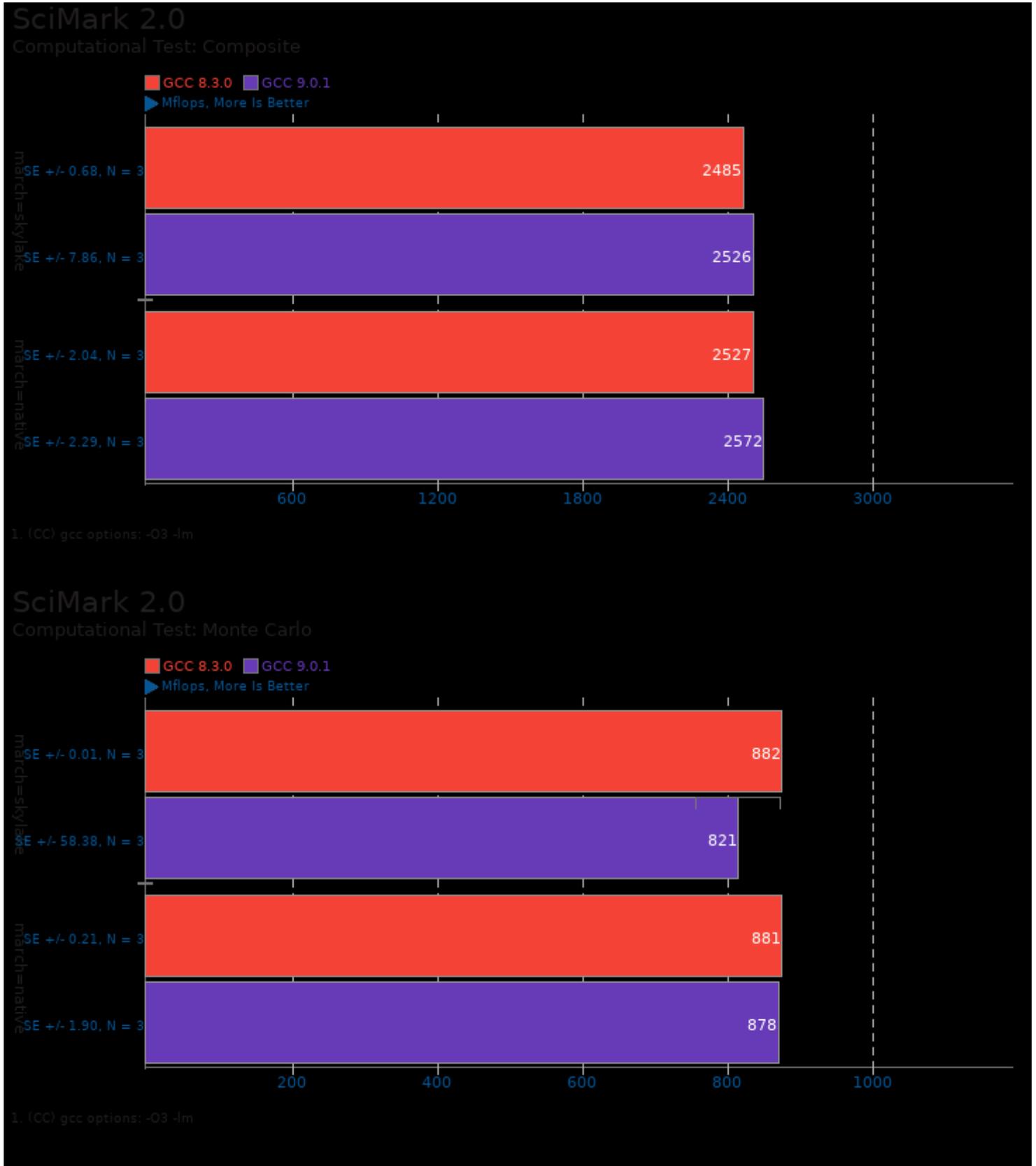
1. (CC) gcc options: -pthread -O3 -lm

LuaJIT 2.1-git

Test: Composite

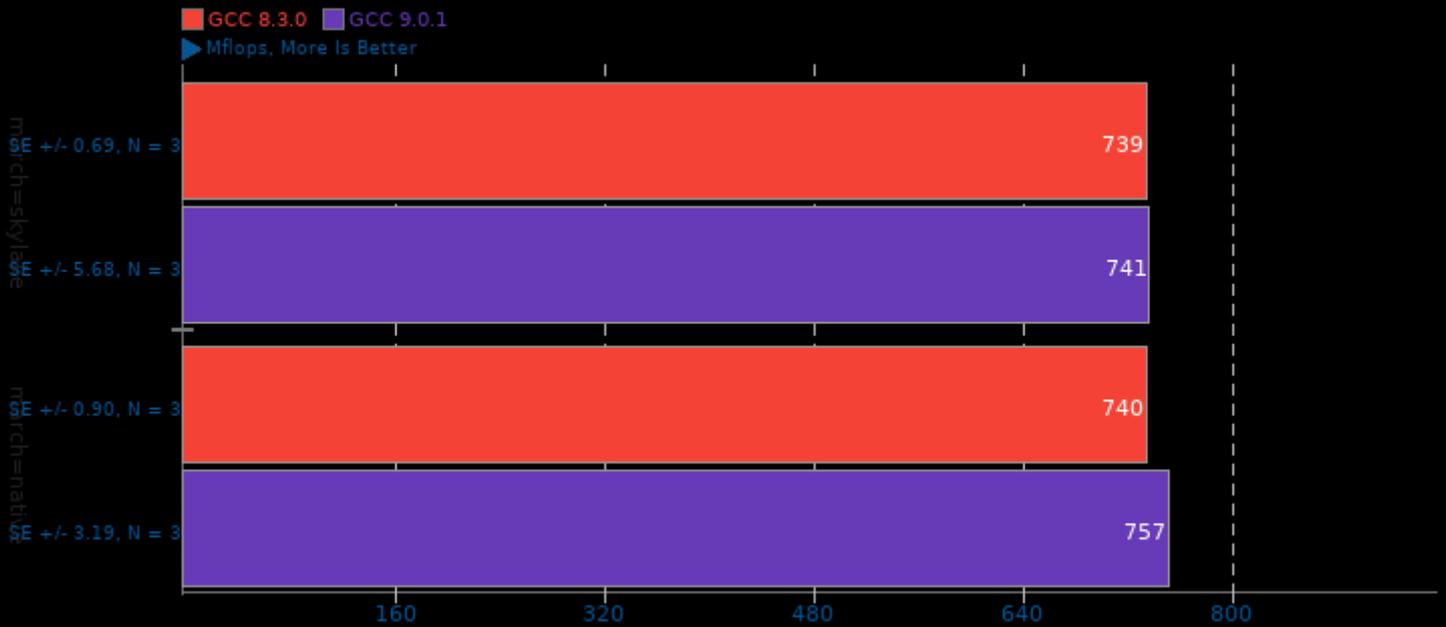


1. (CC) gcc options: -lm -ldl -O2 -fomit-frame-pointer -O3 -U_FORTIFY_SOURCE -fno-stack-protector



SciMark 2.0

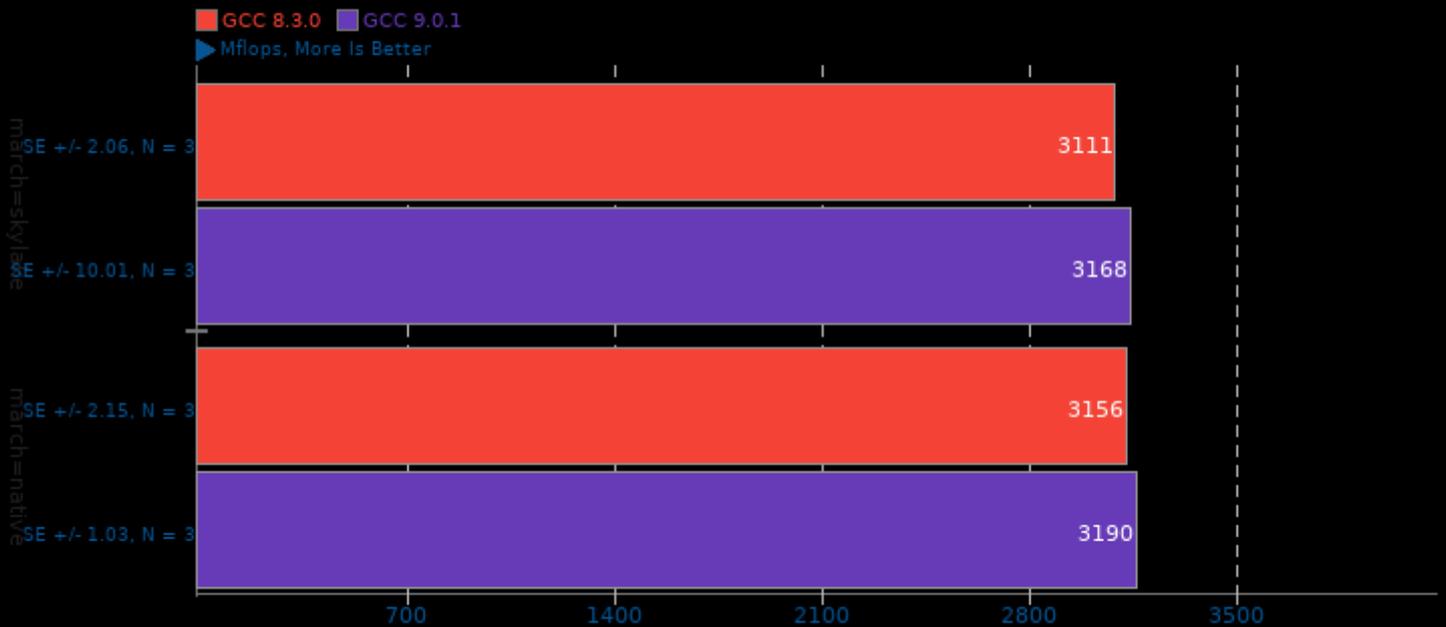
Computational Test: Fast Fourier Transform



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

SciMark 2.0

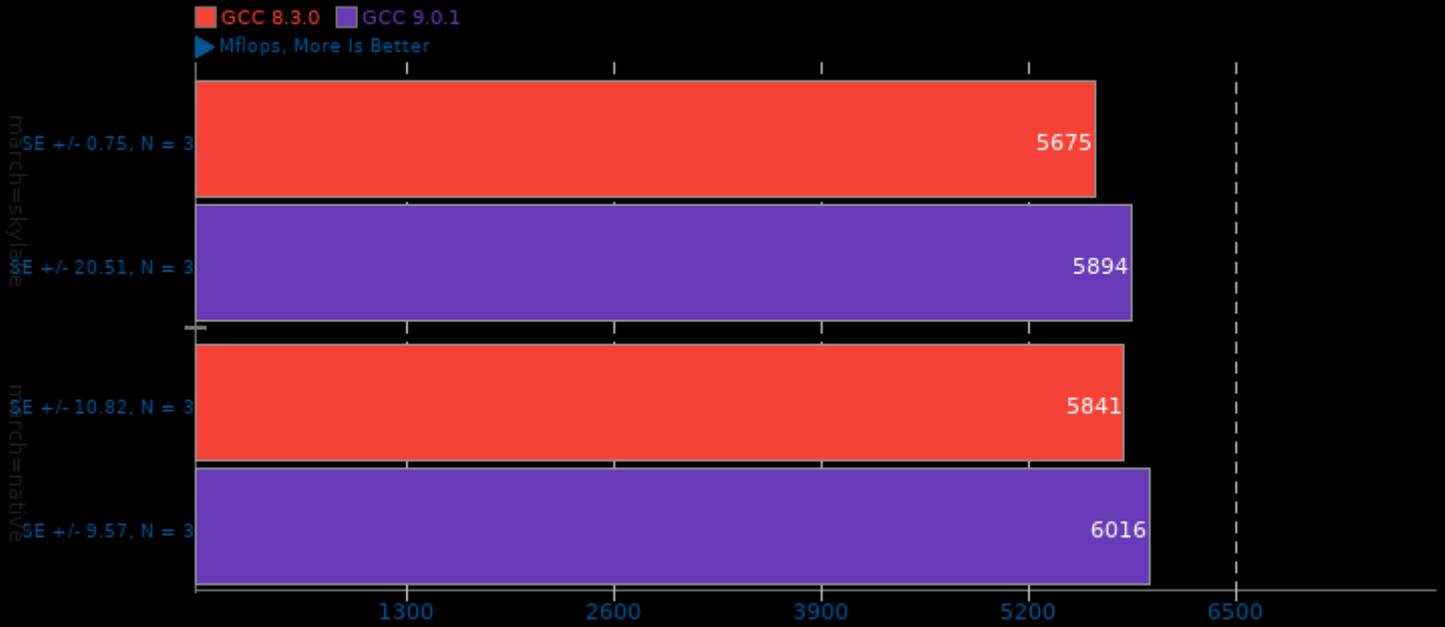
Computational Test: Sparse Matrix Multiply



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

SciMark 2.0

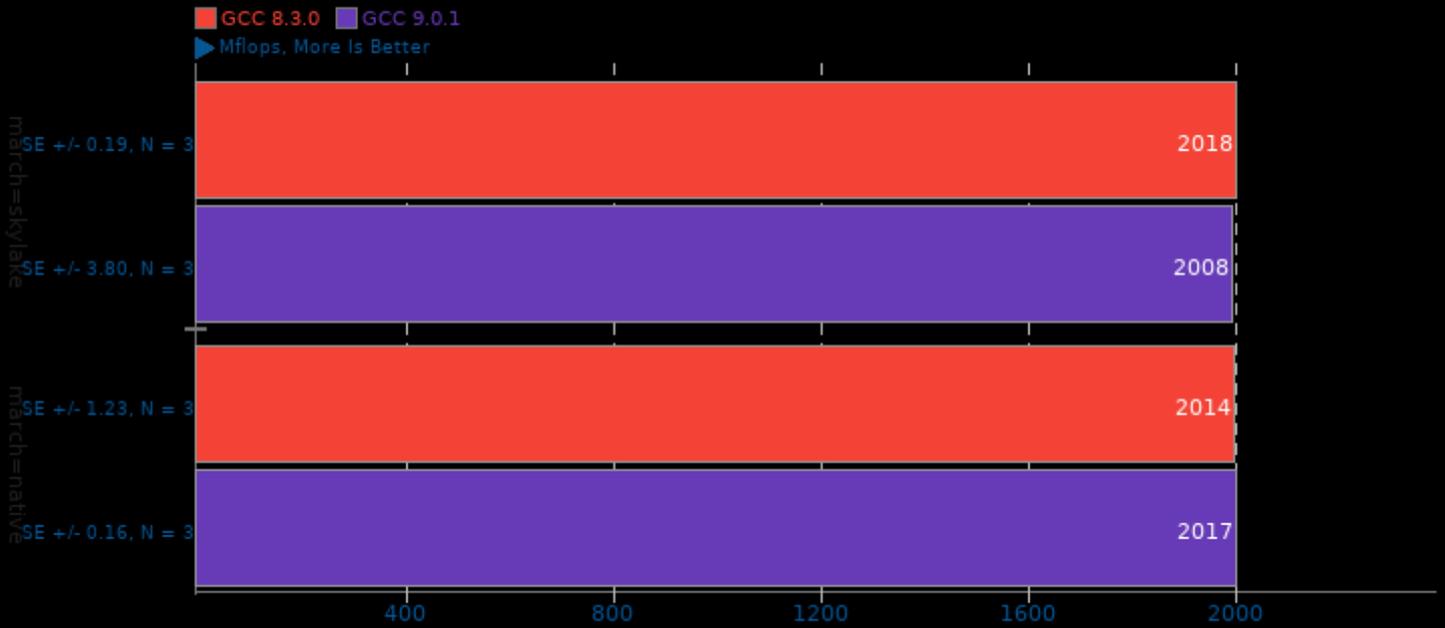
Computational Test: Dense LU Matrix Factorization



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

SciMark 2.0

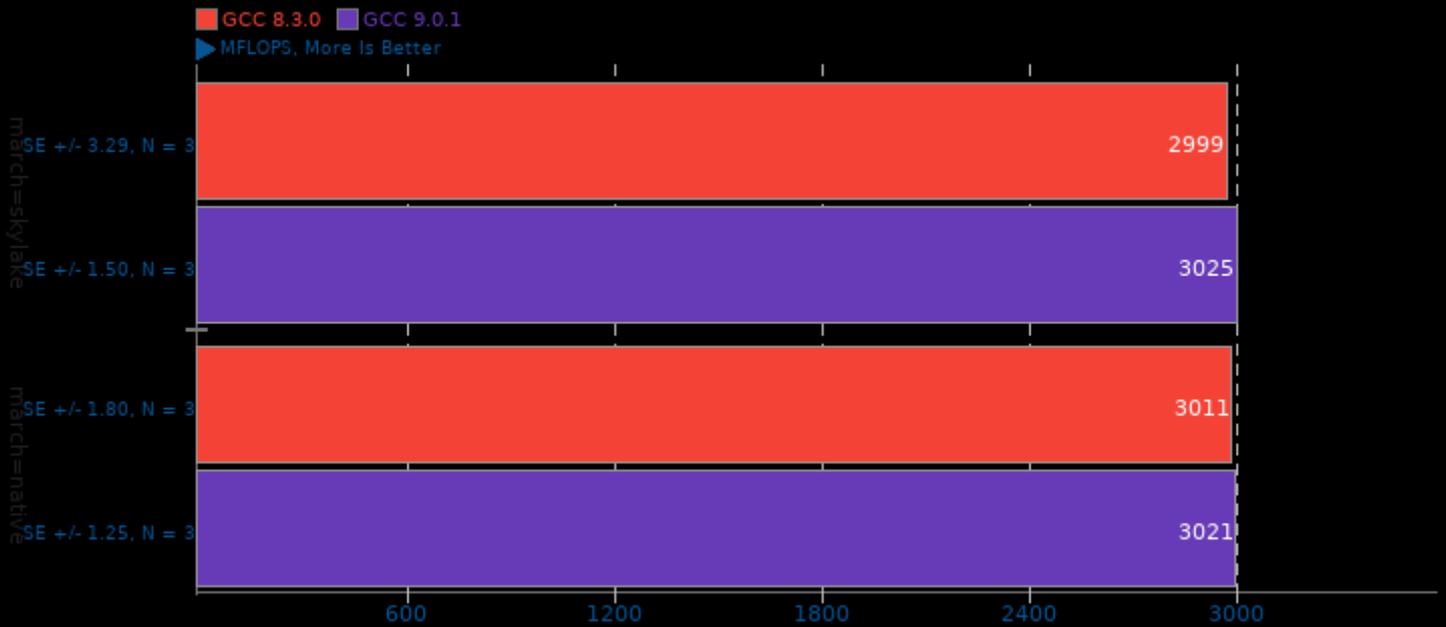
Computational Test: Jacobi Successive Over-Relaxation



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

Himeno Benchmark 3.0

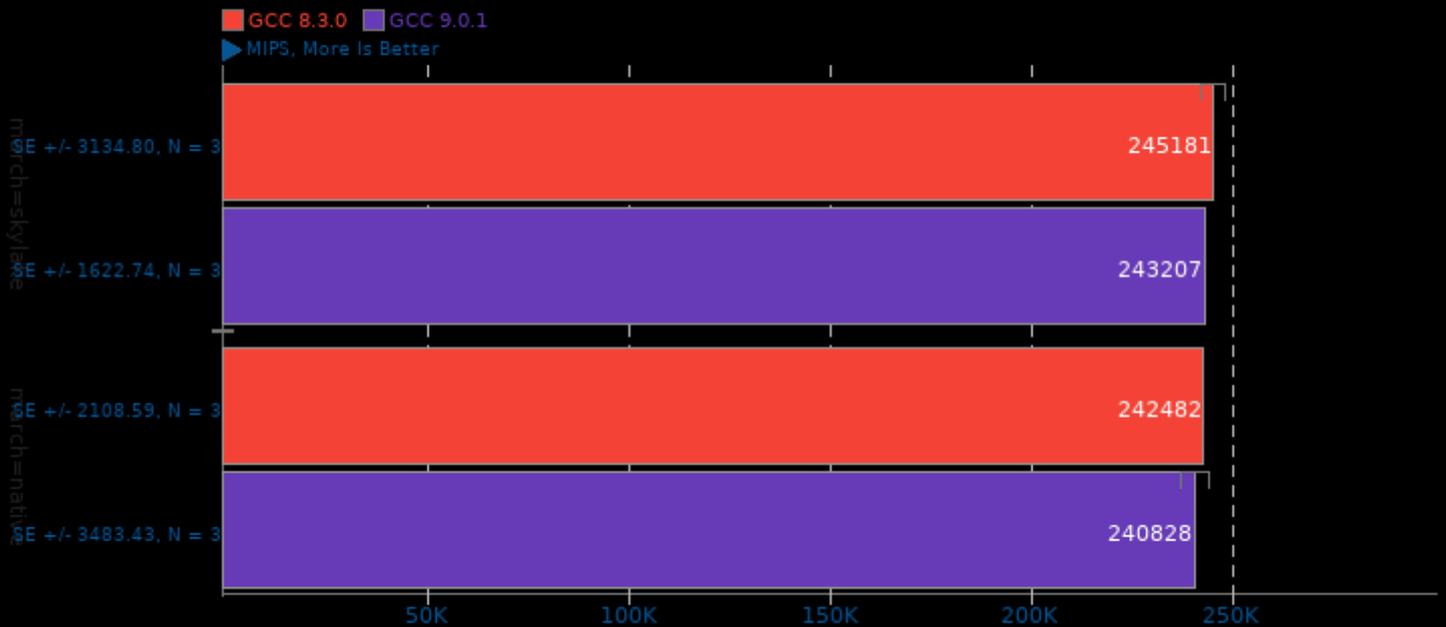
Poisson Pressure Solver



1. (C) gcc options: -O3 -mavx2

7-Zip Compression 16.02

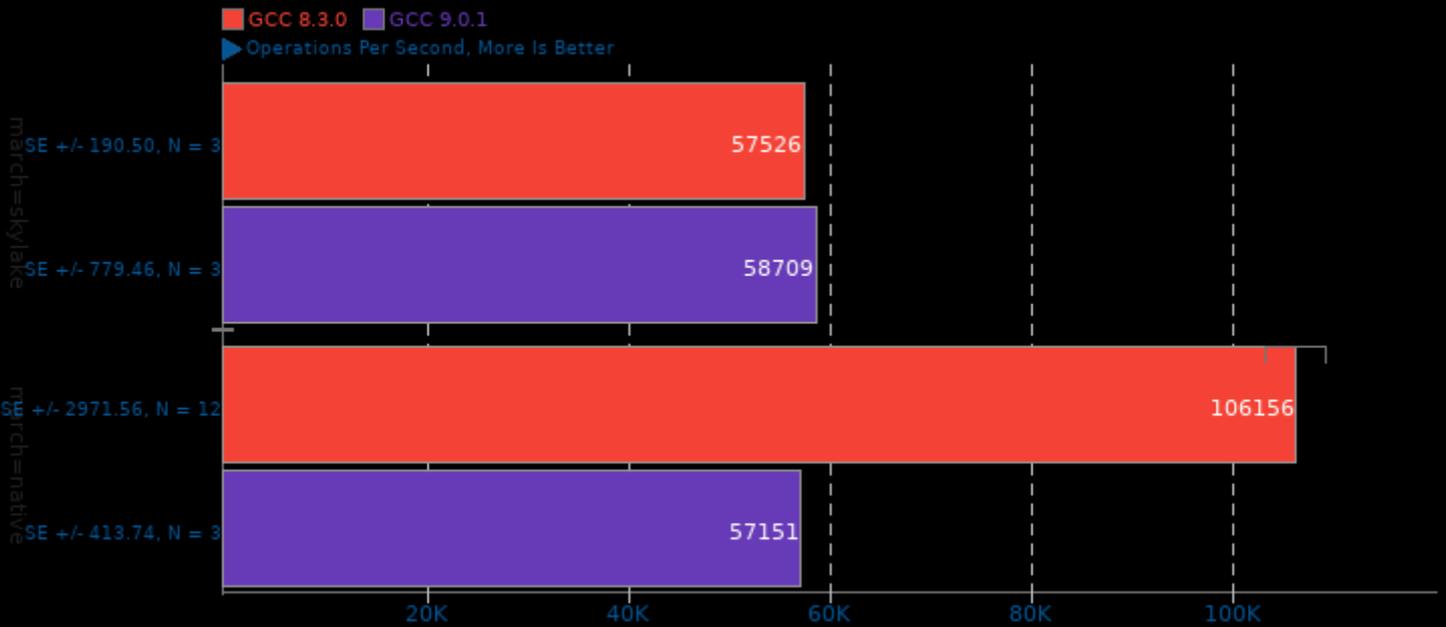
Compress Speed Test



1. (CXX) g++ options: -pipe -lthread

Memcached mcperf 1.5.10

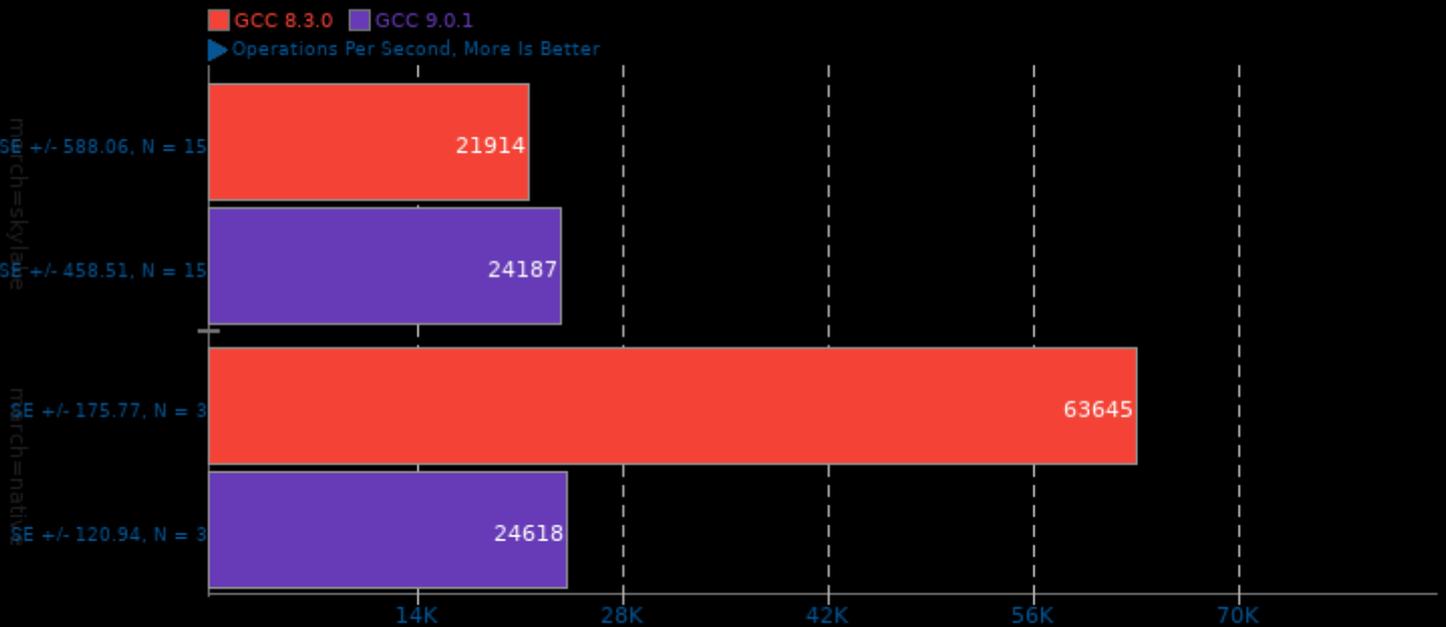
Method: Get



1. (C) gcc options: -O3 -lm -rdynamic

Memcached mcperf 1.5.10

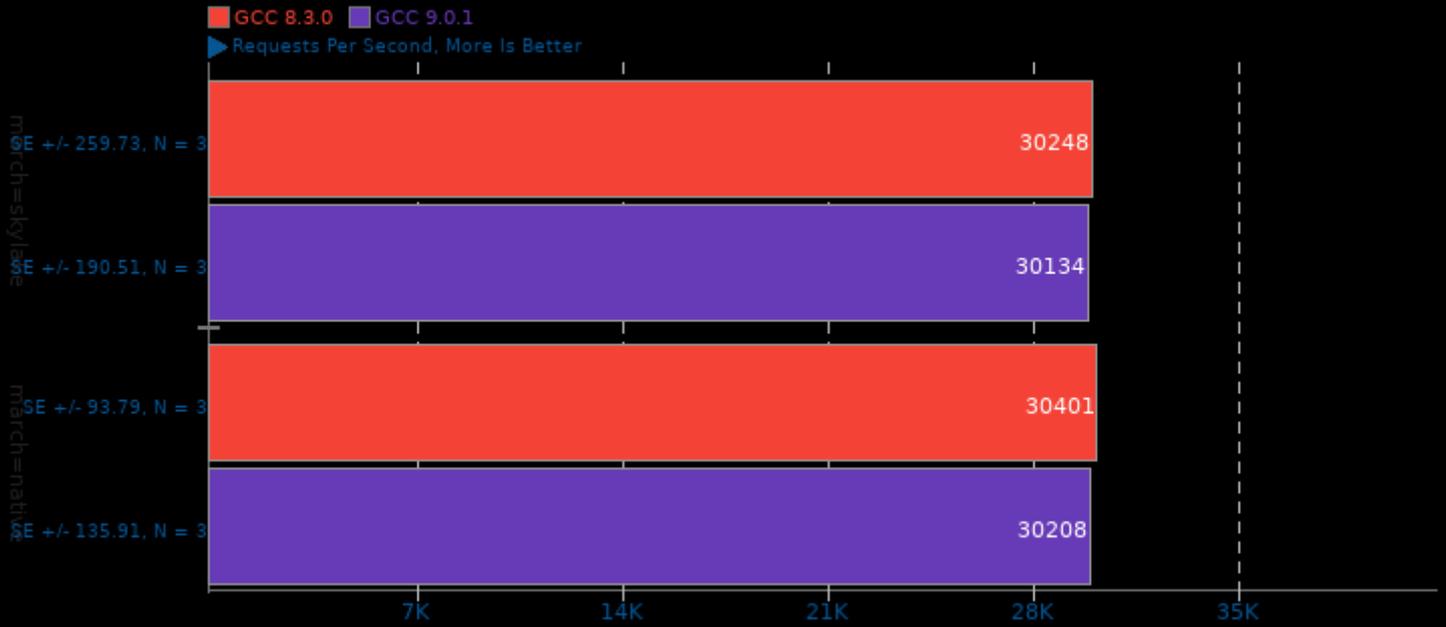
Method: Set



1. (C) gcc options: -O3 -lm -rdynamic

NGINX Benchmark 1.9.9

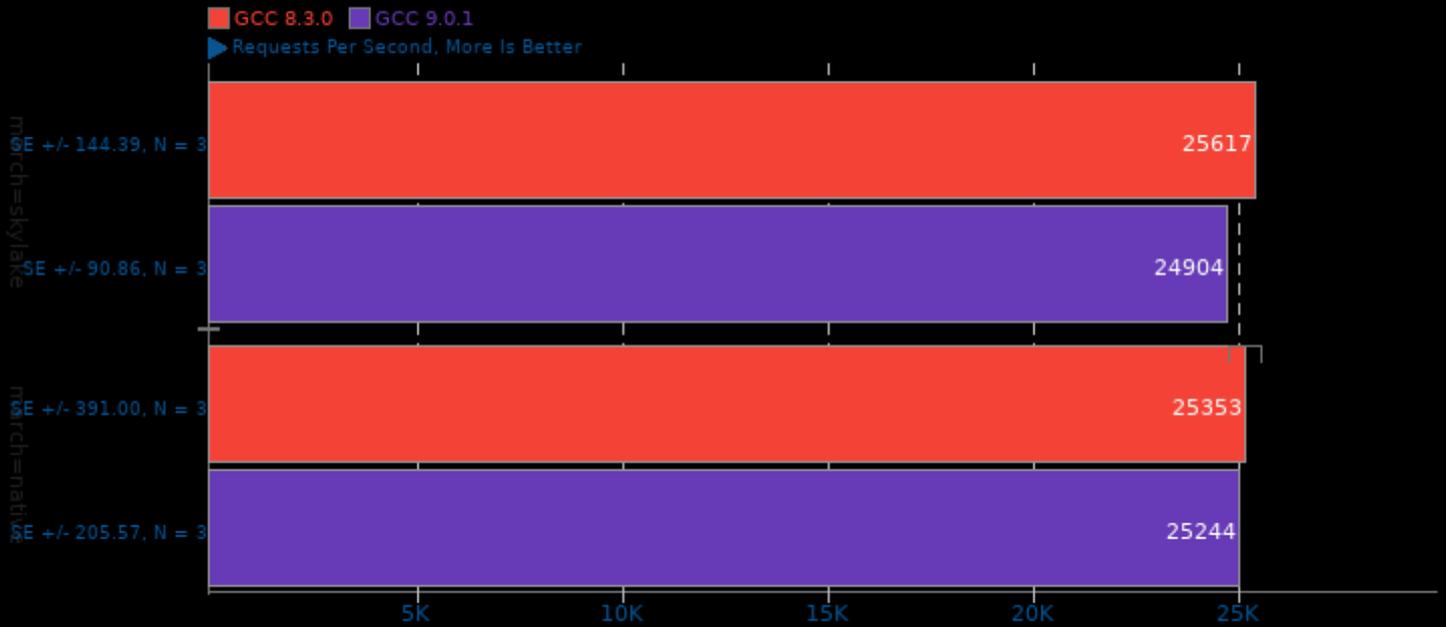
Static Web Page Serving



1. (CC) gcc options: -pthread -lcrypt -lcrypto -lz -O3 -march=native

Apache Benchmark 2.4.29

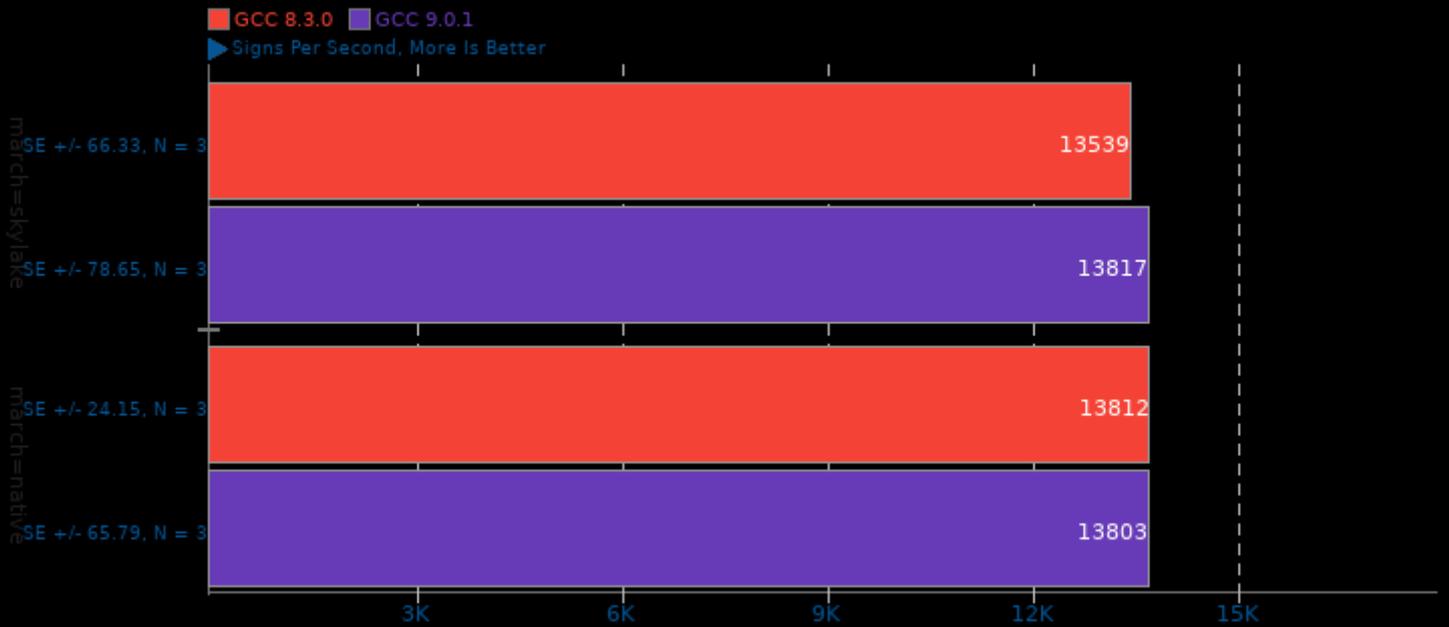
Static Web Page Serving



1. (CC) gcc options: -shared -fPIC -pthread -O3

OpenSSL 1.1.1

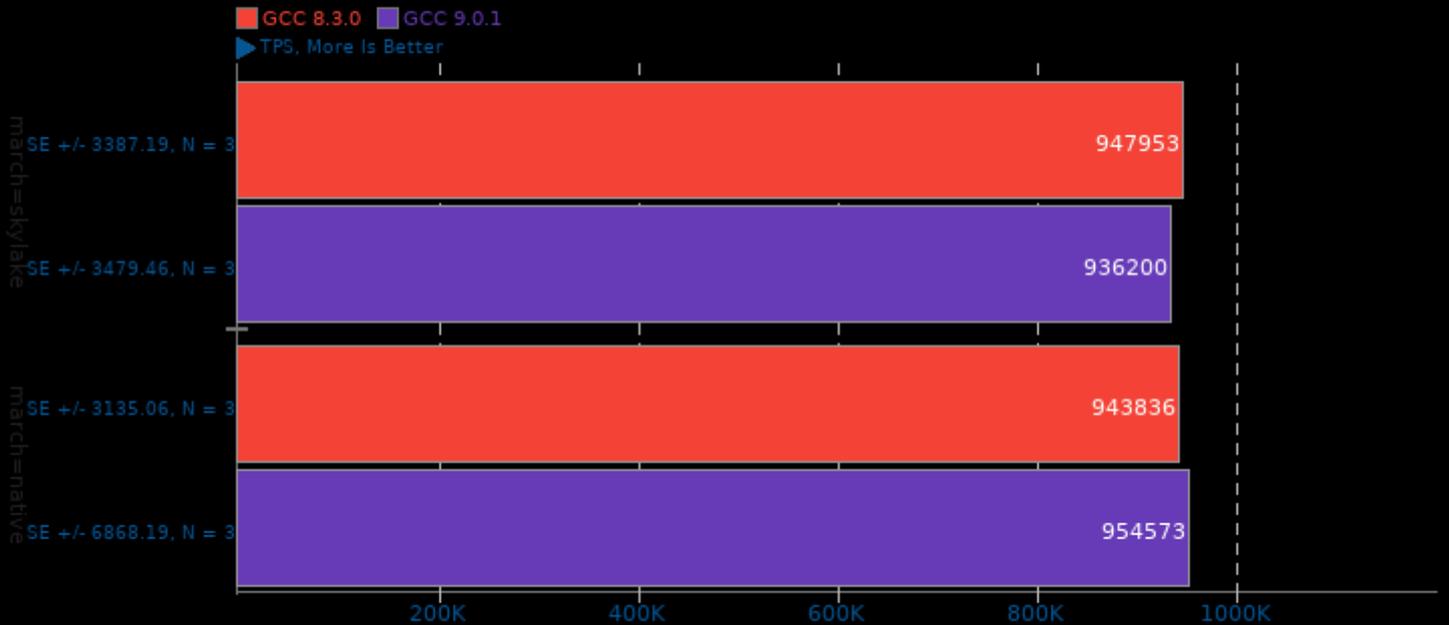
RSA 4096-bit Performance



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

PostgreSQL pgbench 10.3

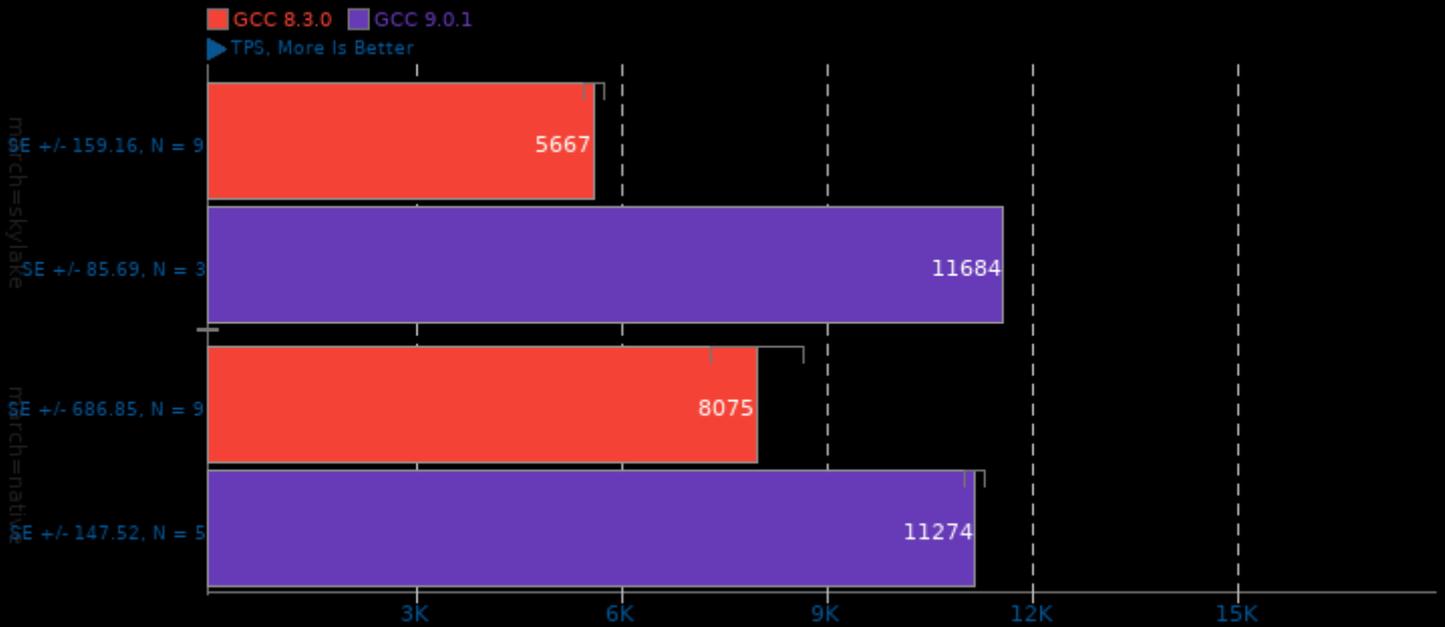
Scaling: Buffer Test - Test: Normal Load - Mode: Read Only



1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O3 -lpgcommon -lpgport -lpq -pthread -lrt -lcrypt -ldl -lm

PostgreSQL pgbench 10.3

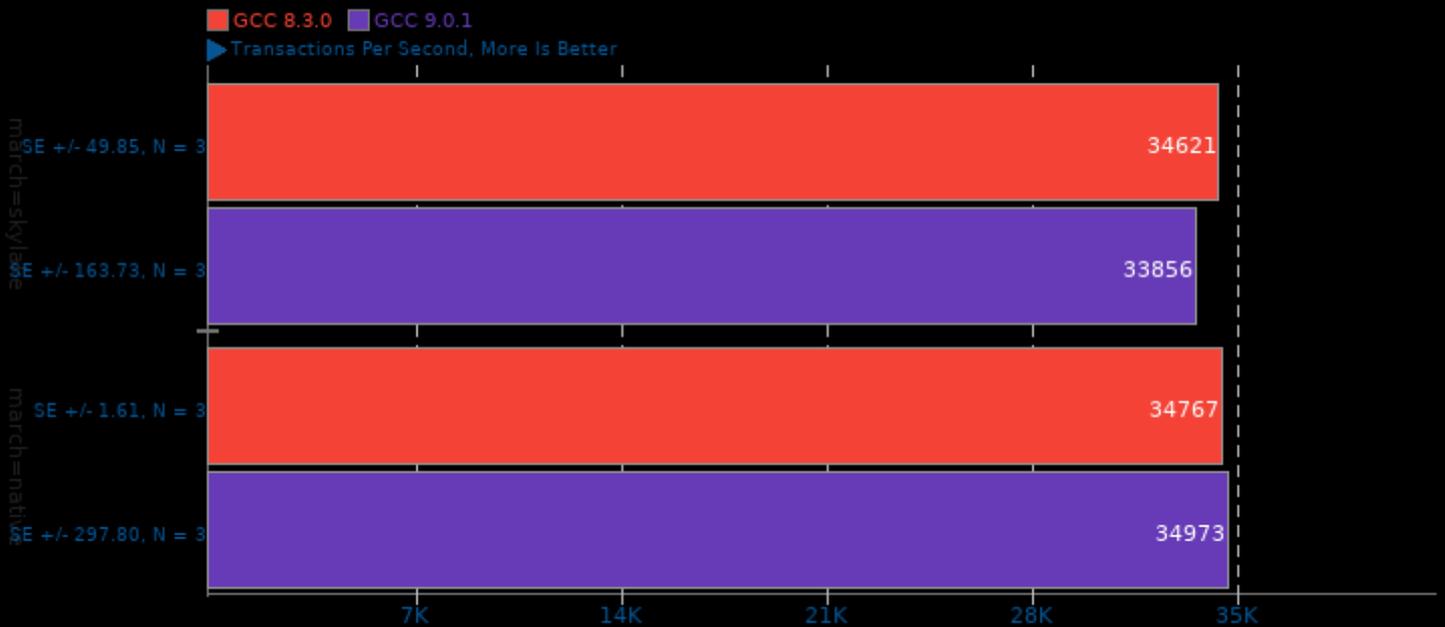
Scaling: Buffer Test - Test: Normal Load - Mode: Read Write



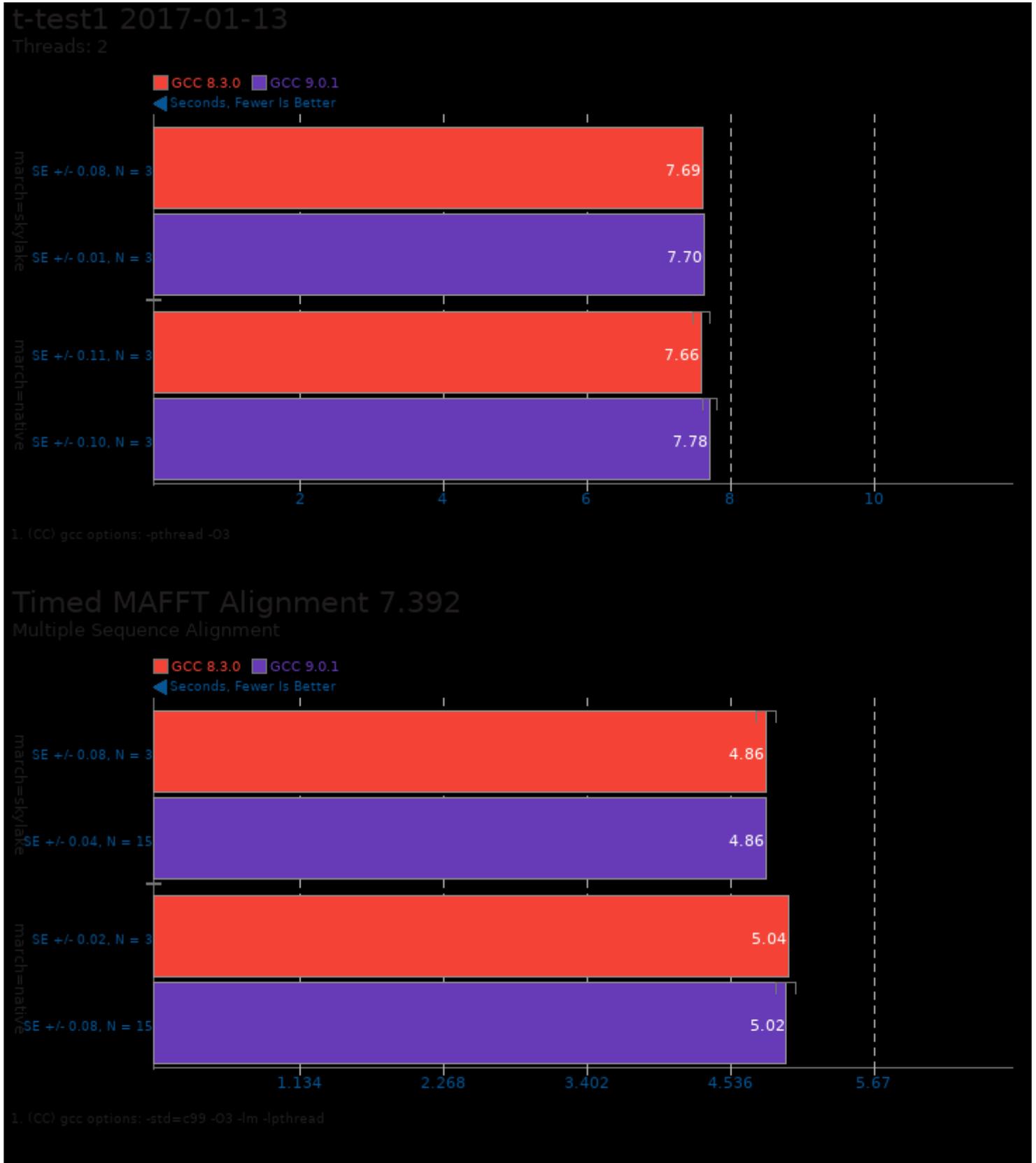
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O3 -lpgcommon -lpgport -lpq -pthread -lrt -lcrypt -ldl -lm

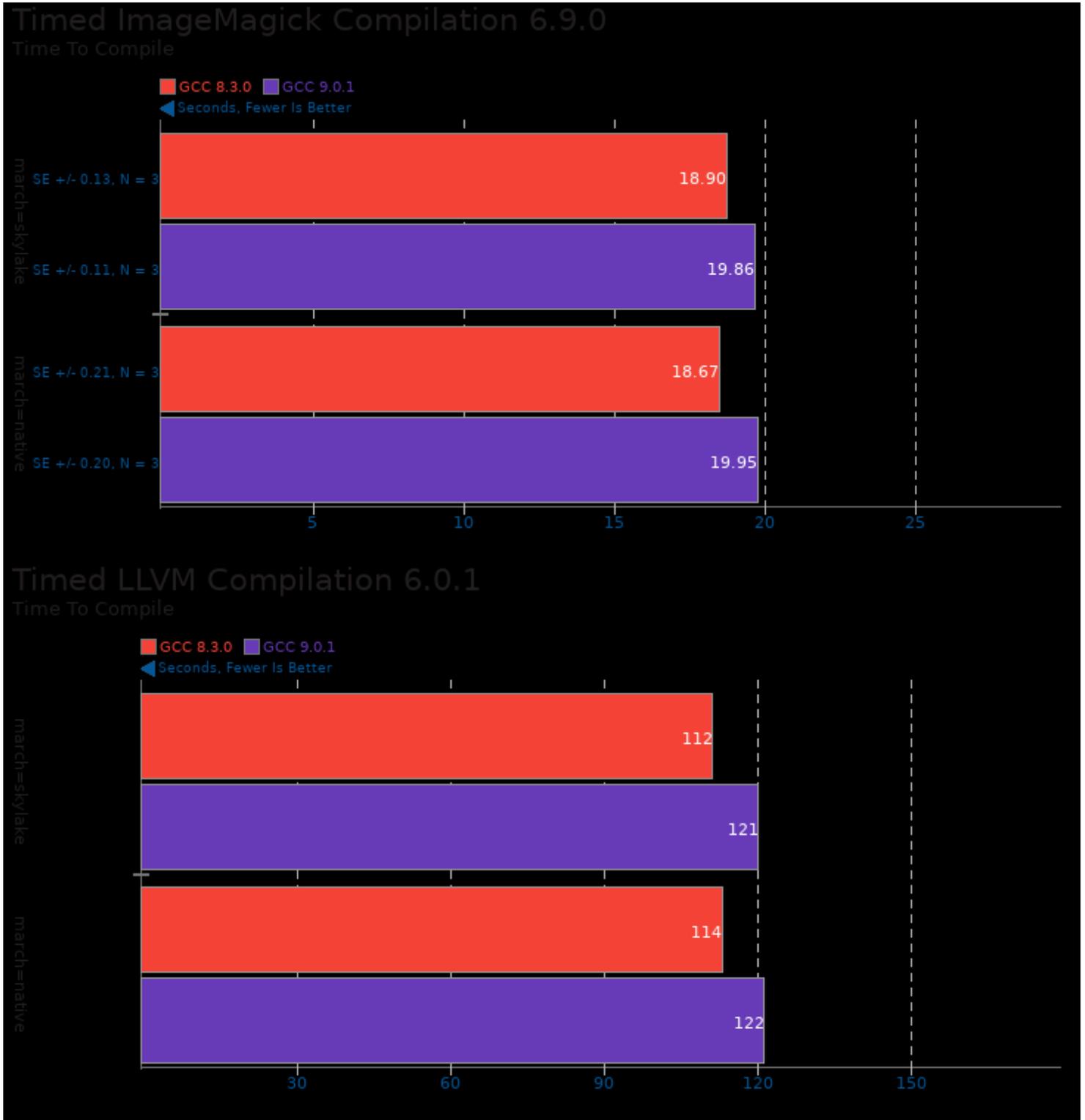
Apache Siege 2.4.29

Concurrent Users: 250



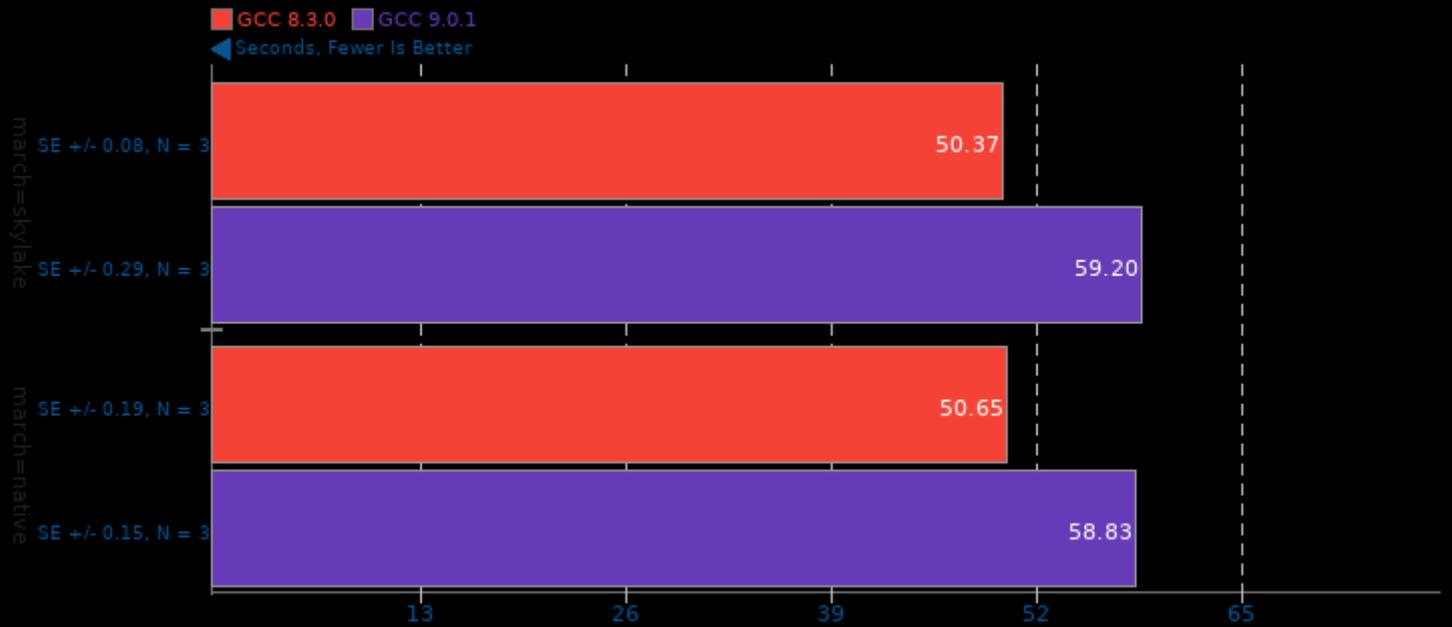
1. (CC) gcc options: -O3 -pthread -ldl -lssl -lcrypto





Timed PHP Compilation 7.1.9

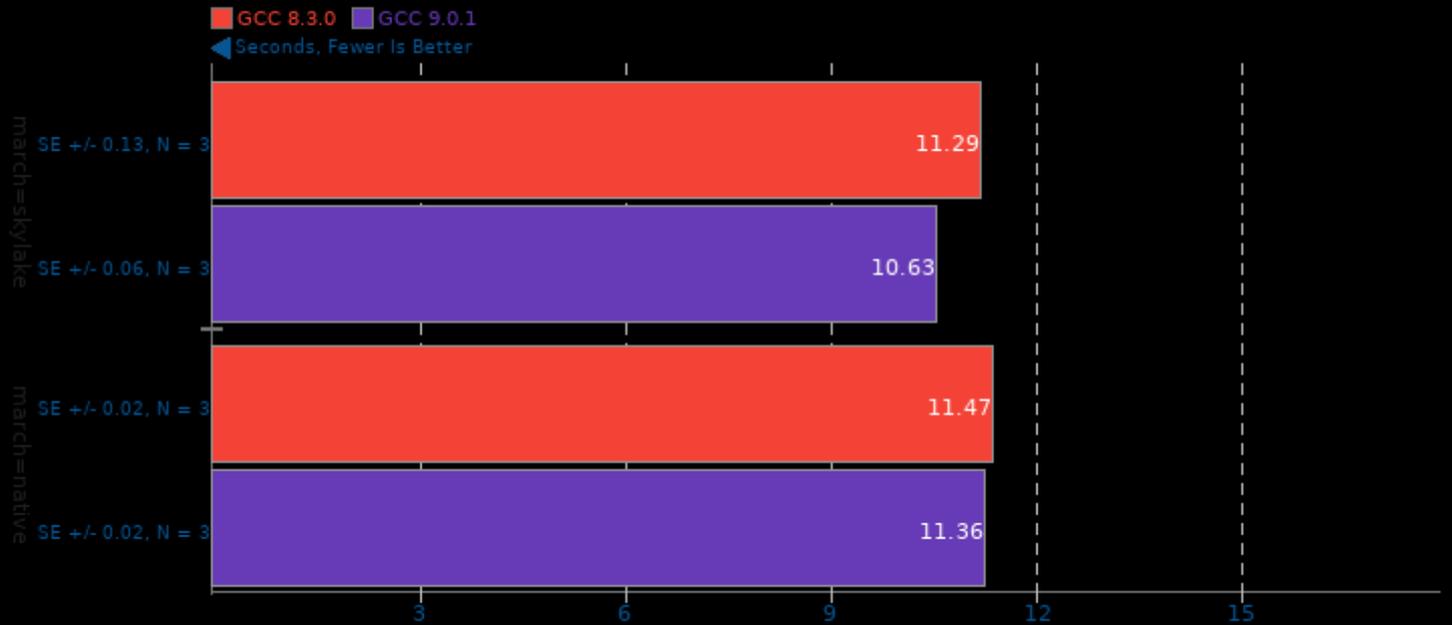
Time To Compile



1. (CC) gcc options: -O3 -pedantic -ldl -lz -lm

C-Ray 1.1

Total Time - 4K, 16 Rays Per Pixel

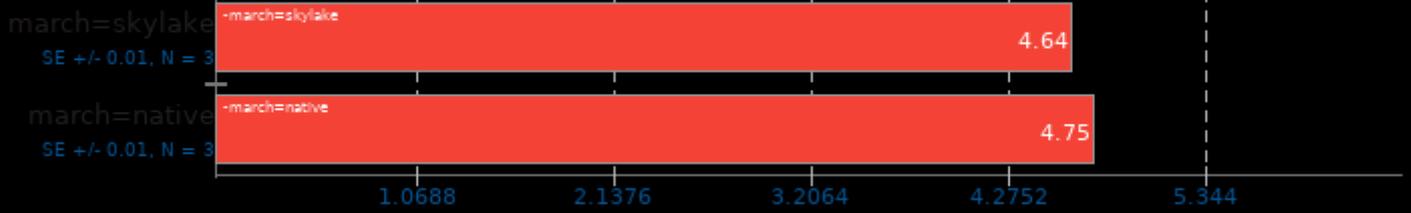


1. (CC) gcc options: -lm -pthread -O3

Primesieve 7.4

1e12 Prime Number Generation

Seconds, Fewer Is Better



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

AOBench

Size: 2048 x 2048 - Total Time

GCC 8.3.0 GCC 9.0.1

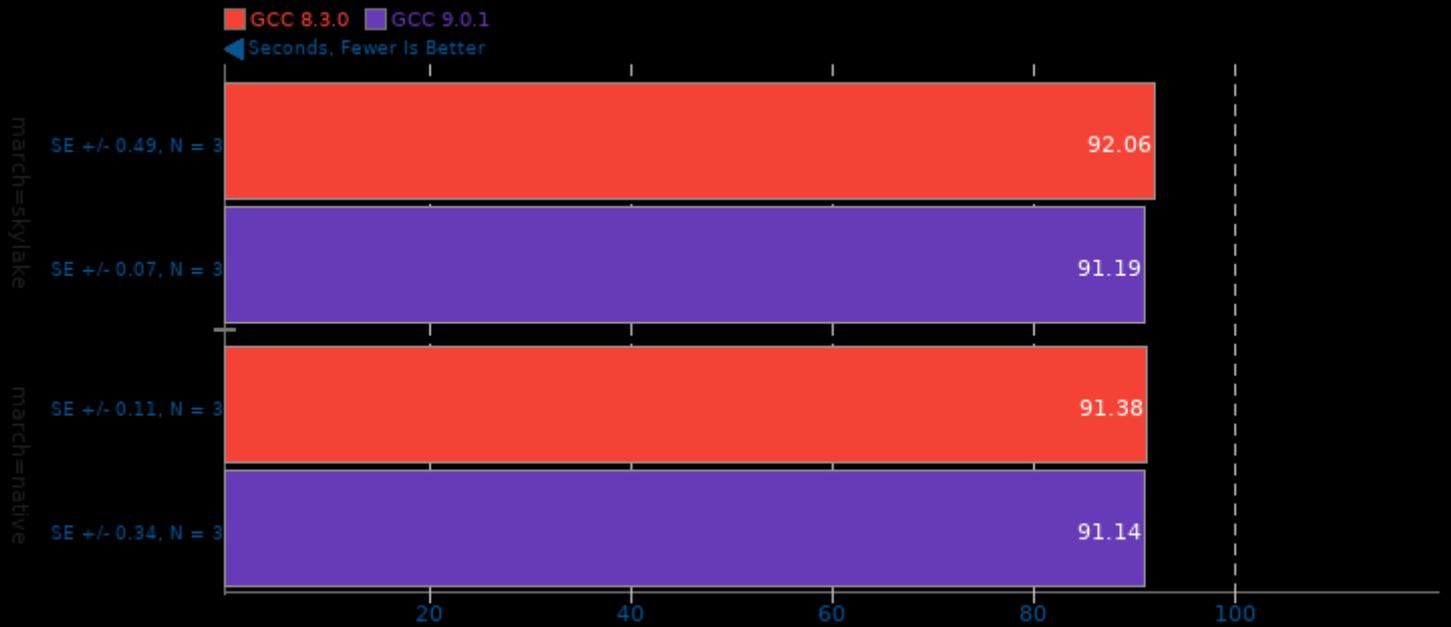
Seconds, Fewer Is Better



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

XZ Compression 5.2.4

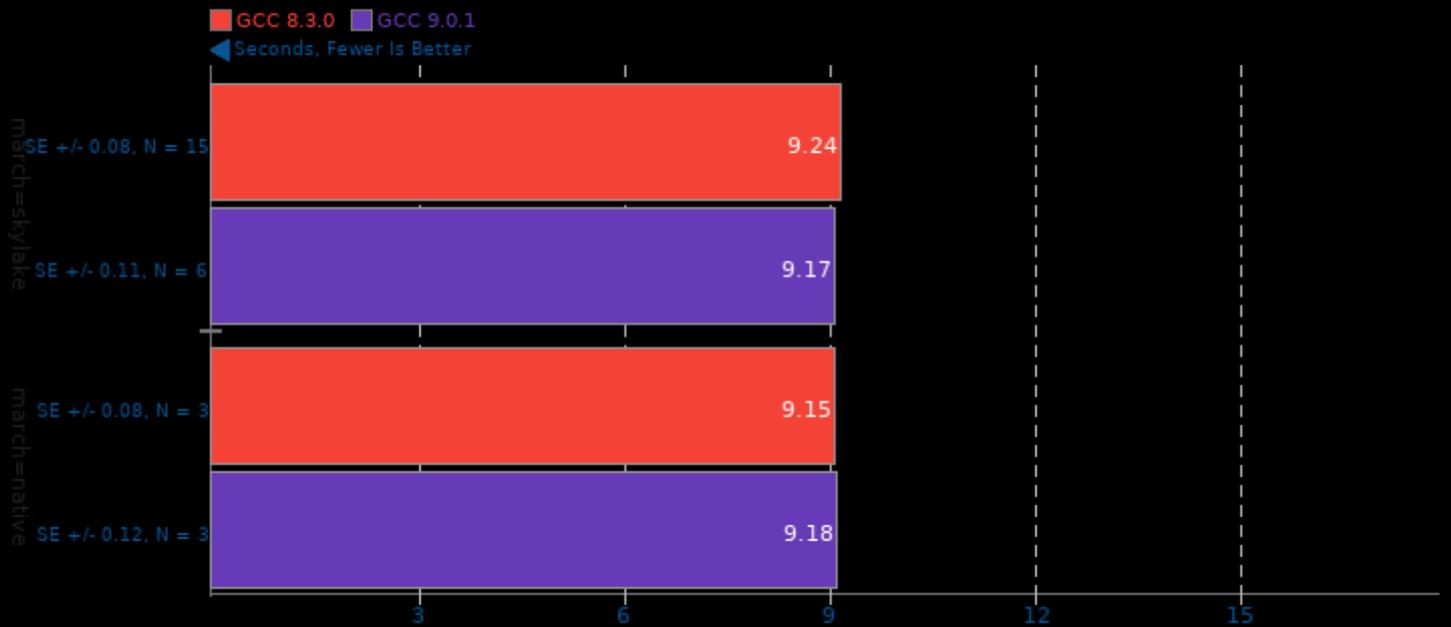
Compressing ubuntu-16.04.3-server-i386.img, Compression Level 9



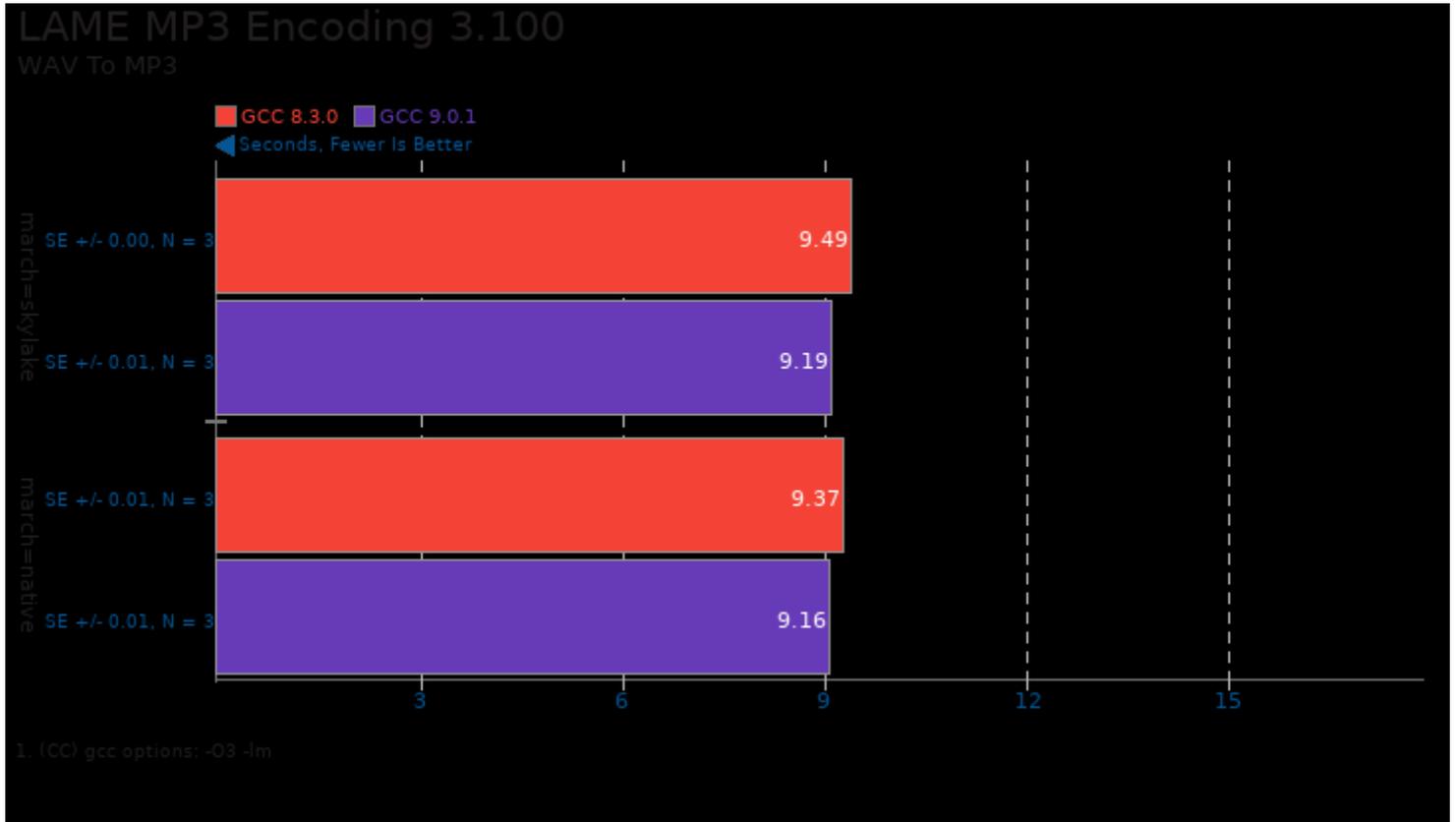
1. (CC) gcc options: -pthread -fvisibility=hidden -O3

Zstd Compression 1.3.4

Compressing ubuntu-16.04.3-server-i386.img, Compression Level 19



1. (CC) gcc options: -O3 -pthread -lz -llzma



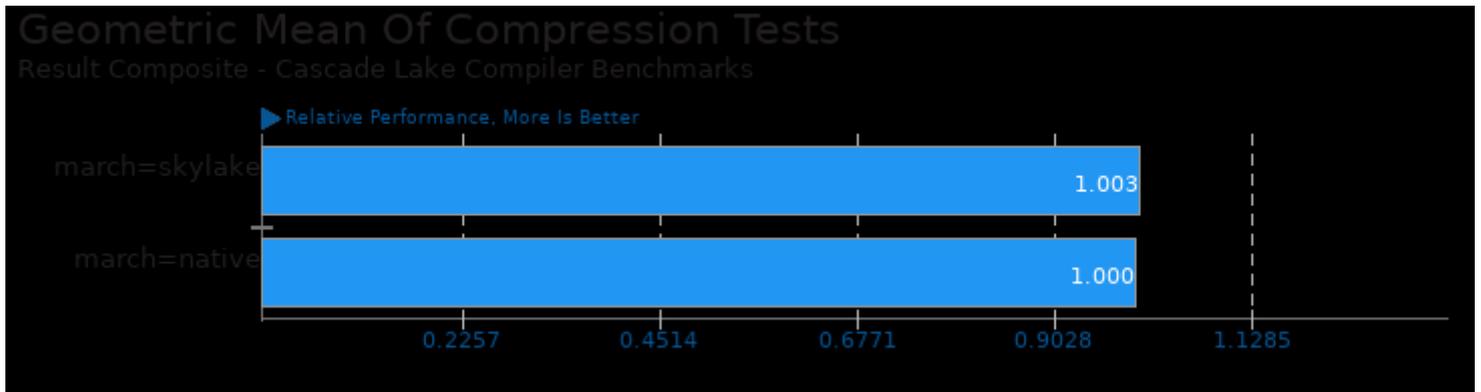
These geometric means are based upon test groupings / test suites for this result file.



Geometric mean based upon tests: pts/himeno and pts/mafft



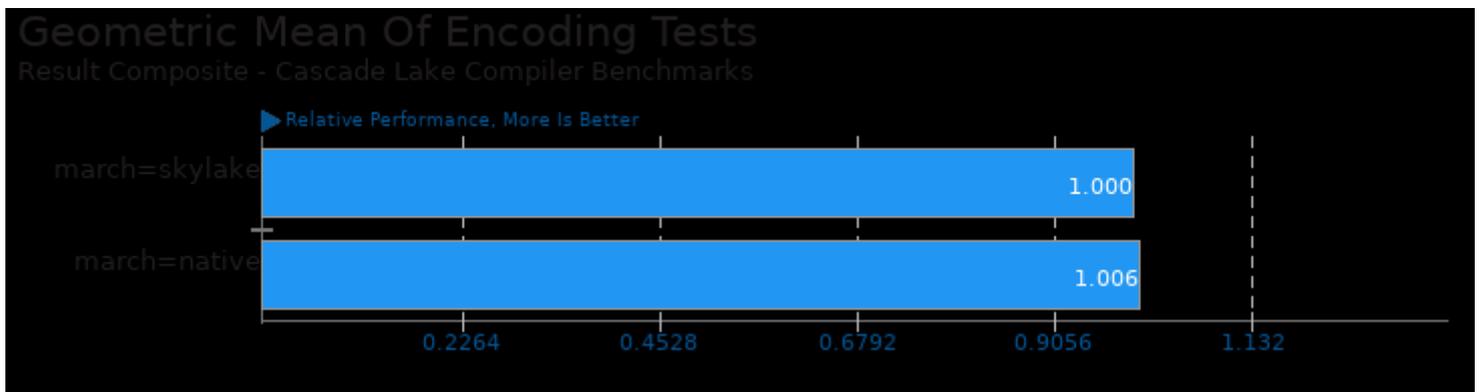
Geometric mean based upon tests: pts/build-php, pts/build-imagemagick and pts/build-llvm



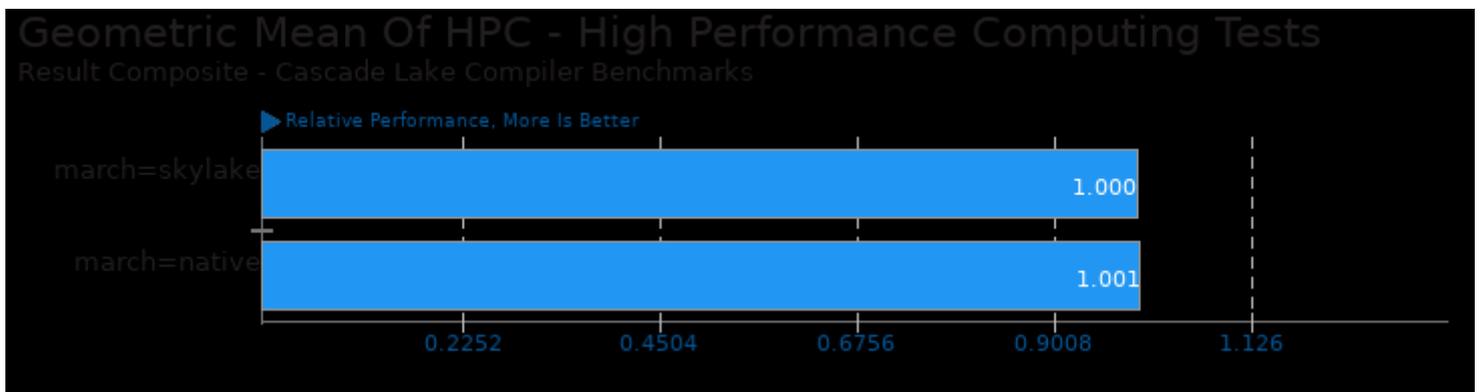
Geometric mean based upon tests: pts/compress-7zip, pts/compress-zstd and pts/compress-xz



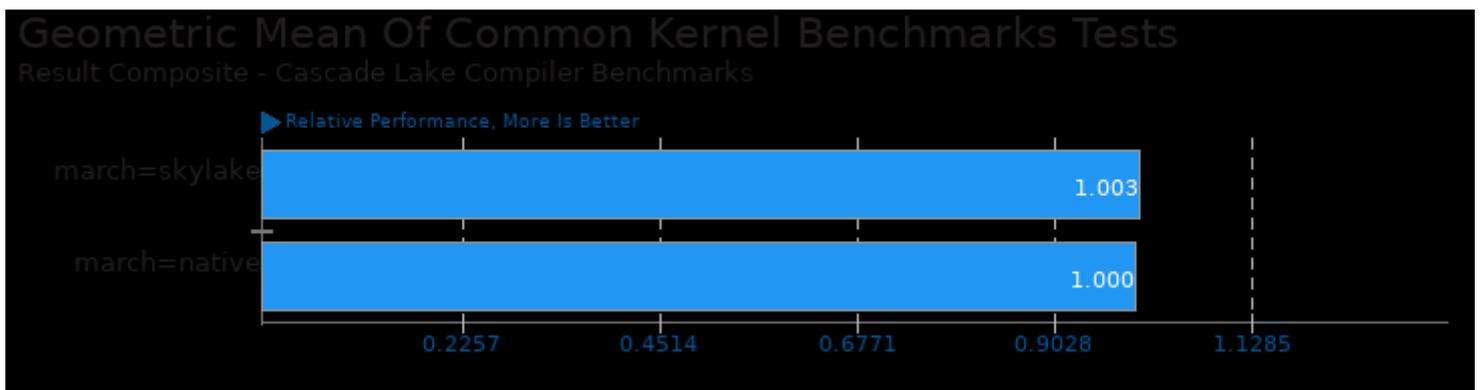
Geometric mean based upon tests: pts/c-ray, pts/aobench, pts/ttsiod-renderer, pts/svt-vp9, pts/svt-hevc, pts/vpxenc, pts/svt-av1, pts/encode-mp3, pts/graphics-magick and pts/luajit



Geometric mean based upon tests: pts/encode-mp3, pts/svt-vp9, pts/svt-hevc, pts/vpxenc and pts/svt-av1



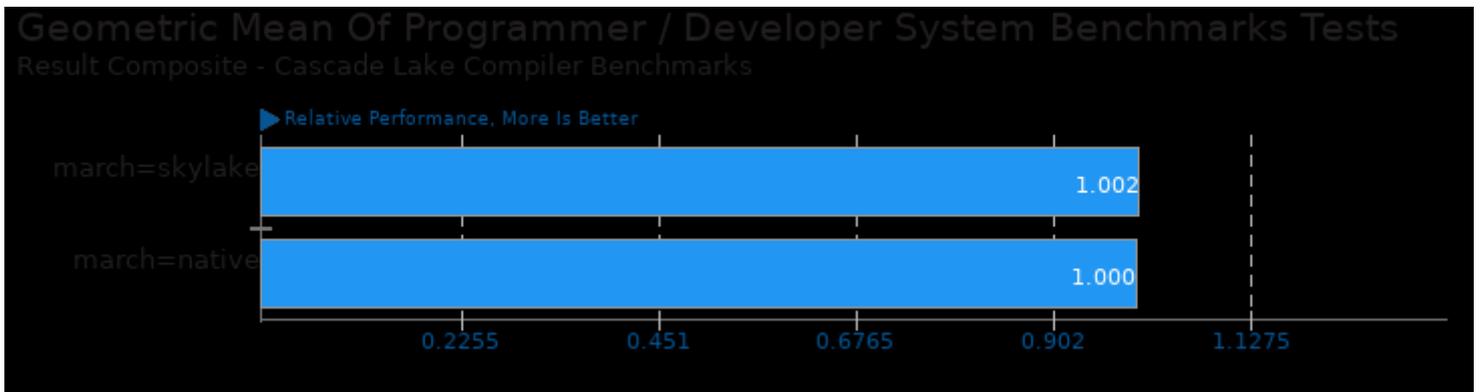
Geometric mean based upon tests: pts/fftw, pts/himeno and pts/mafft



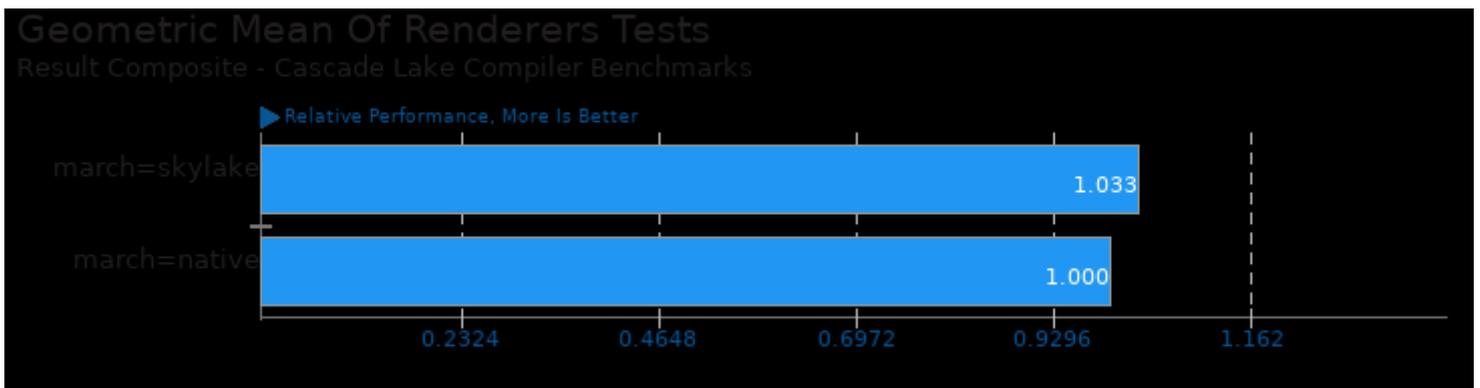
Geometric mean based upon tests: pts/apache, pts/pgbench, pts/t-test1 and pts/openssl



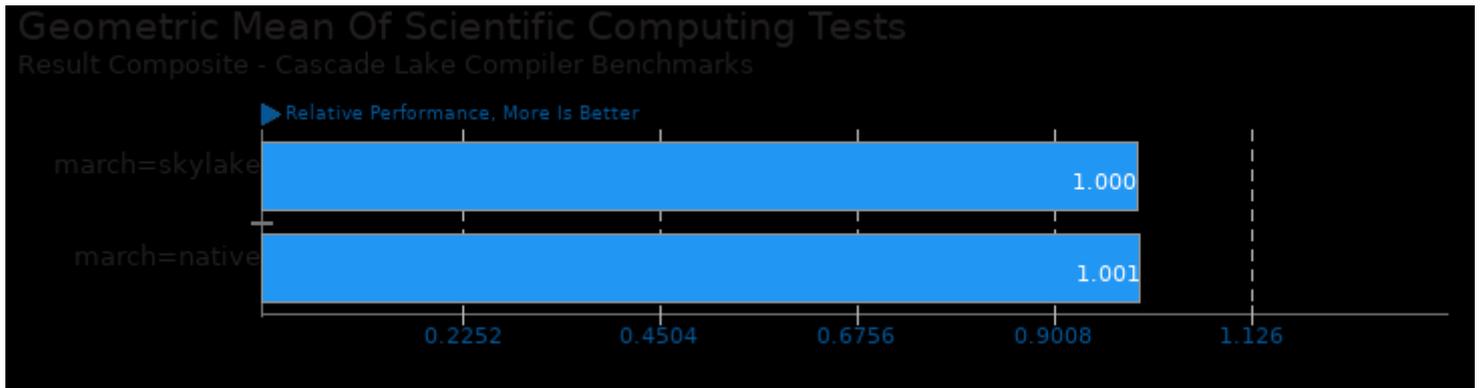
Geometric mean based upon tests: pts/sysbench, pts/c-ray, pts/svt-vp9, pts/svt-hevc, pts/vpxenc, pts/svt-av1, pts/primesieve, pts/graphics-magick, pts/compress-7zip, pts/compress-zstd, pts/build-php, pts/build-imagemagick, pts/build-llvm, pts/aobench, pts/ttsiod-renderer and pts/pgbench



Geometric mean based upon tests: pts/compress-zstd, pts/build-php, pts/build-imagemagick and pts/build-llvm



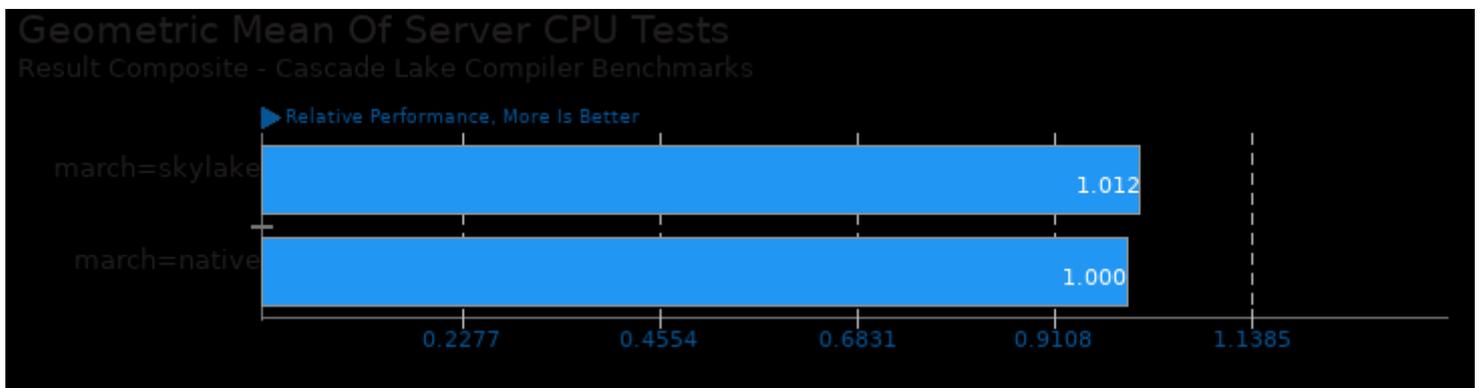
Geometric mean based upon tests: pts/c-ray, pts/aobench and pts/ttsiod-renderer



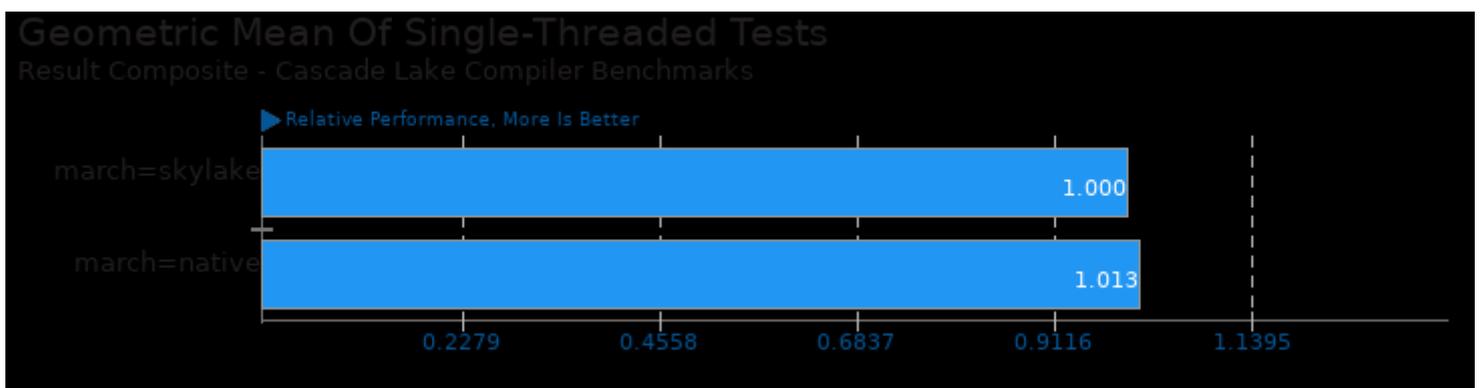
Geometric mean based upon tests: pts/fftw, pts/himeno and pts/mafft



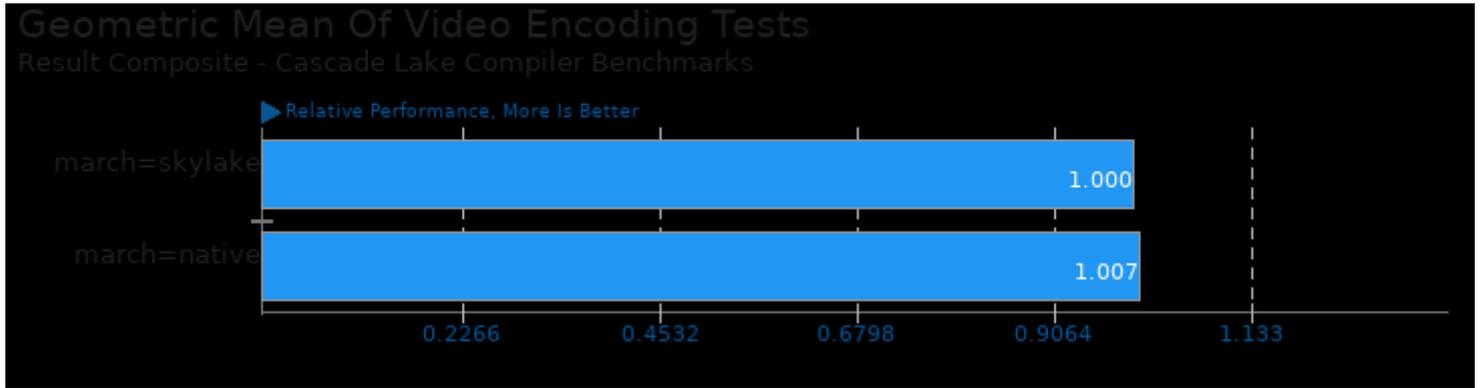
Geometric mean based upon tests: pts/apache, pts/nginx, pts/apache-siege, pts/pgbench, pts/mcperft and pts/openssl



Geometric mean based upon tests: pts/svt-av1, pts/svt-hevc, pts/svt-vp9, pts/himeno, pts/compress-7zip, pts/build-php, pts/build-llvm, pts/c-ray, pts/compress-zstd, pts/openssl, pts/sysbench and pts/apache-siege



Geometric mean based upon tests: pts/byte, pts/luajit, pts/scimark2, pts/encode-mp3 and pts/nginx



Geometric mean based upon tests: pts/svt-vp9, pts/svt-hevc, pts/vpxenc and pts/svt-av1



Geometric mean based upon tests: pts/himeno and pts/sysbench

This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 06:50.