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AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

AMD Ryzen 9 3900XT Zen 2 comparison after two years of Ubuntu Linux... Benchmarks for a future article on Phoronix by Michael Larabel.

Automated Executive Summary

Ubuntu 21.10 had the most wins, coming in first place for 79% of the tests.

Based on the geometric mean of all complete results, the fastest (Ubuntu 21.10) was 1.161x the speed of the slowest (Ubuntu 19.10).

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

NCNN (Target: Vulkan GPU - Model: vgg16) at 4.078x
NCNN (Target: Vulkan GPU - Model: resnet50) at 2.833x
NCNN (Target: Vulkan GPU - Model: googlenet) at 2.822x
NCNN (Target: Vulkan GPU - Model: resnet18) at 2.732x
NCNN (Target: Vulkan GPU - Model: alexnet) at 2.577x
NCNN (Target: Vulkan GPU - Model: squeezenet_ssdlite) at 2.472x
NCNN (Target: Vulkan GPU - Model: mnasnet) at 2.408x
NCNN (Target: Vulkan GPU-v2-v2 - Model: mobilenet-v2) at 2.203x
NCNN (Target: Vulkan GPU-v3-v3 - Model: mobilenet-v3) at 2.118x

NCNN (Target: Vulkan GPU - Model: regnety_400m) at 2.059x.

Test Systems:

Ubuntu 19.10

Processor: AMD Ryzen 9 3900XT 12-Core @ 3.80GHz (12 Cores / 24 Threads), Motherboard: MSI MEG X570 GODLIKE (MS-7C34) v1.0 (1.B3 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 500GB Seagate FireCuda 520 SSD ZP500GM30002, Graphics: AMD Radeon RX 56/64 8GB (1630/945MHz), Audio: AMD Vega 10 HDMI Audio, Monitor: ASUS MG28U, Network: Realtek Device 2600 + Realtek Device 3000 + Intel Device 2723

OS: Ubuntu 19.10, Kernel: 5.3.0-18-generic (x86_64), Desktop: GNOME Shell 3.34.1, Display Server: X Server 1.20.5, OpenGL: 4.5 Mesa 19.2.1 (LLVM 9.0.0), Vulkan: 1.1.107, Compiler: GCC 9.2.1 20191008, File-System: ext4, Screen Resolution: 3840x2160

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,objc++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-offload-targets=nvptx-none,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-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
Processor Notes: Scaling Governor: acpi-cpufreq ondemand (Boost: Enabled) - CPU Microcode: 0x8701021
Graphics Notes: GLAMOR - BAR1 / Visible vRAM Size: 256 MB
Java Notes: OpenJDK Runtime Environment (build 11.0.7+10-post-Ubuntu-2ubuntu219.10)
Python Notes: Python 3.7.5
Security Notes: I1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional STIBP: conditional RSB filling

Ubuntu 21.10

Processor: AMD Ryzen 9 3900XT 12-Core @ 3.80GHz (12 Cores / 24 Threads), Motherboard: MSI MEG X570 GODLIKE (MS-7C34) v1.0 (1.B3 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: 500GB Seagate FireCuda 520 SSD ZP500GM30002 + 0GB Ultra Luxe, Graphics: AMD Radeon RX 56/64 (1630/945MHz), Audio: AMD Vega 10 HDMI Audio, Monitor: ASUS MG28U, Network: Realtek Device 2600 + Realtek Killer E3000 2.5GbE + Intel Wi-Fi 6 AX200

OS: Ubuntu 21.10, Kernel: 5.13.0-16-generic (x86_64), Desktop: GNOME Shell 40.5, Display Server: X Server + Wayland, Vulkan: 1.2.182, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 3840x2160

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,objc++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-link-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-11-ZPT0kp/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-11-ZPT0kp/gcc-11-11.2.0/debian/tmp-gcn/usr --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
Processor Notes: Scaling Governor: acpi-cpufreq schedutil (Boost: Enabled) - CPU Microcode: 0x8701021
Java Notes: OpenJDK Runtime Environment (build 11.0.12+7-Ubuntu-0ubuntu3)
Python Notes: Python 3.9.7
Security Notes: i1tb_multihit: Not affected + I1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional STIBP: conditional RSB filling + srbs: Not affected + tsx_async_abort: Not affected

	Ubuntu 19.10	Ubuntu 21.10
JPEG XL libjxl - PNG - 8 (MP/s)	0.89	0.9
Normalized	98.89%	100%
Standard Deviation	2.2%	0%
Blender - Classroom - CPU-Only (sec)	303.06	303.22
Normalized	100%	99.95%
Standard Deviation	0.2%	0.1%
Selenium - Jetstream 2 - Firefox (Score)	102.254	93.589
Normalized	100%	91.53%
Standard Deviation	2.3%	0.6%
NAS Parallel Benchmarks - SP.C (Mop/s)	5262	5298
Normalized	99.3%	100%
Standard Deviation	0%	0.9%
BRL-CAD - V.P.M (VGR Performance Metric)	190898	189236
Normalized	100%	99.13%
OpenSSL - SHA256 (byte/s)	17925407470	17036576568
Normalized	100%	95.04%
Standard Deviation	1%	2.4%
Appleseed - Emily (sec)	260.63497	260.550744
Normalized	99.97%	100%
ACES DGEMM - S.F.P.R (GFLOP/s)	4.186831	4.434919
Normalized	94.41%	100%
Standard Deviation	3.4%	2.1%
GROMACS - MPI CPU - water_GMX50_bare (Ns/Day)	1.131	1.128
Normalized	100%	99.73%
Standard Deviation	0.3%	0.1%
LZ4 Compression - 3 - D.S (MB/s)	10543	10594
Normalized	99.52%	100%
Standard Deviation	0.3%	0.9%
LZ4 Compression - 3 - Compression Speed (MB/s)	60.88	60.94
Normalized	99.9%	100%
Standard Deviation	1.4%	3.3%
asmFish - 1.H.M.2.D (Nodes/s)	39787936	39947743
Normalized	99.6%	100%
Standard Deviation	1.2%	1.2%
Selenium - ARES-6 - Firefox (ms)	48.12	40.28
Normalized	83.71%	100%
Standard Deviation	0.2%	1.1%
CloverLeaf - L.E.H (sec)	134.38	133.72
Normalized	99.51%	100%
Standard Deviation	0.2%	0.1%
VP9 libvpx Encoding - Speed 5 - Bosphorus 4K (FPS)	13.82	14.57
Normalized	94.85%	100%
Standard Deviation	1.4%	3.5%
Mobile Neural Network - inception-v3 (ms)	31.650	31.107
Normalized	98.28%	100%
Standard Deviation	0.4%	1.4%
Mobile Neural Network - mobilenet-v1-1.0 (ms)	5.495	5.412
Normalized	98.49%	100%
Standard Deviation	0.6%	1.3%
Mobile Neural Network - MobileNetV2_224 (ms)	4.586	4.274
Normalized	93.2%	100%
Standard Deviation	0.2%	1.5%
Mobile Neural Network - SqueezeNetV1.0 (ms)	6.803	6.578
Normalized	96.69%	100%

	Standard Deviation	0.4%	1%
Mobile Neural Network - resnet-v2-50 (ms)	Normalized	34.512	33.793
	Standard Deviation	1.1%	0.8%
Mobile Neural Network - squeezenetv1.1 (ms)	Normalized	4.825	4.600
	Standard Deviation	0.2%	1.4%
Mobile Neural Network - mobilenetV3 (ms)	Normalized	2.936	2.532
	Standard Deviation	0.2%	1.7%
Blender - BMW27 - CPU-Only (sec)	Normalized	105.07	105.76
	Standard Deviation	0.2%	0.3%
Zstd Compression - 8 - D.S (MB/s)	Normalized	3806	4066
	Standard Deviation	0.8%	0.2%
Zstd Compression - 8 - Compression Speed (MB/s)	Normalized	1283	1312
	Standard Deviation	3.5%	1.8%
Appleseed - Disney Material (sec)	Normalized	156.85189	158.820565
	Standard Deviation	100%	98.76%
Appleseed - Material Tester (sec)	Normalized	158.008326	157.152413
	Standard Deviation	99.46%	100%
PyPerformance - python_startup (Milliseconds)	Normalized	11.9	6.31
	Standard Deviation	53.03%	100%
	Normalized	0%	0.1%
SVT-AV1 - Preset 4 - Bosphorus 4K (FPS)	Normalized	1.648	1.669
	Standard Deviation	98.74%	100%
	Normalized	0.2%	0.6%
PHPBench - P.B.S (Score)	Normalized	696173	757984
	Standard Deviation	91.85%	100%
	Normalized	2.6%	2.3%
NAMD - ATPase Simulation - 327,506 Atoms (days/ns)	Normalized	1.49809	1.49551
	Standard Deviation	99.83%	100%
	Normalized	0.3%	0.2%
NAS Parallel Benchmarks - LU.C (Mop/s)	Normalized	24905	25246
	Standard Deviation	98.65%	100%
	Normalized	0.1%	0%
NCNN - CPU - regnety_400m (ms)	Normalized	11.90	10.78
	Standard Deviation	90.59%	100%
	Normalized	0.9%	0.3%
NCNN - CPU - squeezenet_ssd (ms)	Normalized	18.83	17.89
	Standard Deviation	95.01%	100%
	Normalized	0.8%	0.2%
NCNN - CPU - yolov4-tiny (ms)	Normalized	26.20	25.07
	Standard Deviation	95.69%	100%
	Normalized	2.6%	0.2%
NCNN - CPU - resnet50 (ms)	Normalized	26.49	25.61
	Standard Deviation	96.68%	100%
	Normalized	0.9%	0%
NCNN - CPU - alexnet (ms)	Normalized	12.59	12.30
	Standard Deviation	97.7%	100%
	Normalized	1%	1.1%
NCNN - CPU - resnet18 (ms)	Normalized	16.37	15.85
	Standard Deviation	96.82%	100%

	Standard Deviation	1%	0.1%
NCNN - CPU - vgg16 (ms)	59.82	59.96	
Normalized	100%	99.77%	
	Standard Deviation	0.5%	0.4%
NCNN - CPU - googlenet (ms)	16.53	15.87	
Normalized	96.01%	100%	
	Standard Deviation	1.4%	0.8%
NCNN - CPU - blazeface (ms)	2.11	2.07	
Normalized	98.1%	100%	
	Standard Deviation	1.5%	0.5%
NCNN - CPU - efficientnet-b0 (ms)	6.86	6.42	
Normalized	93.59%	100%	
	Standard Deviation	0.6%	0.6%
NCNN - CPU - mnasnet (ms)	4.63	4.37	
Normalized	94.38%	100%	
	Standard Deviation	0.1%	0.3%
NCNN - CPU - shufflenet-v2 (ms)	5.06	4.93	
Normalized	97.43%	100%	
	Standard Deviation	0.6%	0.7%
NCNN - CPU-v3-v3 - mobilenet-v3 (ms)	4.58	4.27	
Normalized	93.23%	100%	
	Standard Deviation	0.8%	0.4%
NCNN - CPU-v2-v2 - mobilenet-v2 (ms)	5.20	4.89	
Normalized	94.04%	100%	
	Standard Deviation	1.1%	0.2%
NCNN - CPU - mobilenet (ms)	16.00	15.64	
Normalized	97.75%	100%	
	Standard Deviation	0.4%	0.3%
Chaos Group V-RAY - CPU (vsamples)	14415	14297	
Normalized	100%	99.18%	
	Standard Deviation	0.5%	0.7%
Facebook RocksDB - Rand Fill (Ops/s)	973718	977527	
Normalized	99.61%	100%	
	Standard Deviation	1%	2.4%
Selenium - Speedometer - Firefox (Runs/min)	102.1	158	
Normalized	64.62%	100%	
	Standard Deviation	1.1%	1%
IndigoBench - CPU - Bedroom (M samples/s)	2.882	2.881	
Normalized	100%	99.97%	
	Standard Deviation	0.5%	0.3%
IndigoBench - CPU - Supercar (M samples/s)	6.144	6.182	
Normalized	99.39%	100%	
	Standard Deviation	0.1%	0.5%
Tachyon - Total Time (sec)	60.1184	59.8075	
Normalized	99.48%	100%	
	Standard Deviation	0.3%	0.3%
Facebook RocksDB - Rand Read (Ops/s)	72184348	68886640	
Normalized	100%	95.43%	
	Standard Deviation	1.9%	0.4%
OpenSSL - RSA4096 (verify/s)	229876	230097	
Normalized	99.9%	100%	
	Standard Deviation	0%	0%
OpenSSL - RSA4096 (sign/s)	3552	3554	
Normalized	99.93%	100%	
	Standard Deviation	0.2%	0.2%

NCNN - Vulkan GPU - regnety_400m (ms)	9.35	4.54
Normalized	48.56%	100%
Standard Deviation	0.6%	0.1%
NCNN - Vulkan GPU - squeezenet_ssdlite (ms)	12.78	5.17
Normalized	40.45%	100%
Standard Deviation	1.6%	0.2%
NCNN - Vulkan GPU - yolov4-tiny (ms)	20.21	11.13
Normalized	55.07%	100%
Standard Deviation	1.1%	0.2%
NCNN - Vulkan GPU - resnet50 (ms)	17.45	6.16
Normalized	35.3%	100%
Standard Deviation	0.3%	0.2%
NCNN - Vulkan GPU - alexnet (ms)	10.36	4.02
Normalized	38.8%	100%
Standard Deviation	0.3%	0%
NCNN - Vulkan GPU - resnet18 (ms)	6.42	2.35
Normalized	36.6%	100%
Standard Deviation	1%	0.4%
NCNN - Vulkan GPU - vgg16 (ms)	38.90	9.54
Normalized	24.52%	100%
Standard Deviation	0.1%	0.2%
NCNN - Vulkan GPU - googlenet (ms)	16.17	5.73
Normalized	35.44%	100%
Standard Deviation	0.8%	0.1%
NCNN - Vulkan GPU - blazeface (ms)	1.90	1.59
Normalized	83.68%	100%
Standard Deviation	2.4%	1%
NCNN - Vulkan GPU - efficientnet-b0 (ms)	15.79	9.09
Normalized	57.57%	100%
Standard Deviation	0.9%	0.3%
NCNN - Vulkan GPU - mnasnet (ms)	7.32	3.04
Normalized	41.53%	100%
Standard Deviation	1.8%	0.2%
NCNN - Vulkan GPU - shufflenet-v2 (ms)	4.50	2.52
Normalized	56%	100%
Standard Deviation	0.6%	0.2%
NCNN - Vulkan GPU-v3-v3 - mobilenet-v3 (ms)	7.92	3.74
Normalized	47.22%	100%
Standard Deviation	1.3%	0%
NCNN - Vulkan GPU-v2-v2 - mobilenet-v2 (ms)	6.39	2.90
Normalized	45.38%	100%
Standard Deviation	0.3%	0.2%
NCNN - Vulkan GPU - mobilenet (ms)	11.84	8.14
Normalized	68.75%	100%
Standard Deviation	0%	1.6%
Selenium - StyleBench - Firefox (Runs / Minute)	87.9	105
Normalized	83.71%	100%
Standard Deviation	0.4%	1.1%
Renaissance - Scala Dotty (ms)	805.6	706.7
Normalized	87.72%	100%
Standard Deviation	1.3%	1.6%
PyPerformance - 2to3 (Milliseconds)	286	280
Normalized	97.9%	100%
Standard Deviation	0%	0%
SVT-HEVC - 1 - Bosphorus 1080p (FPS)	11.71	11.59

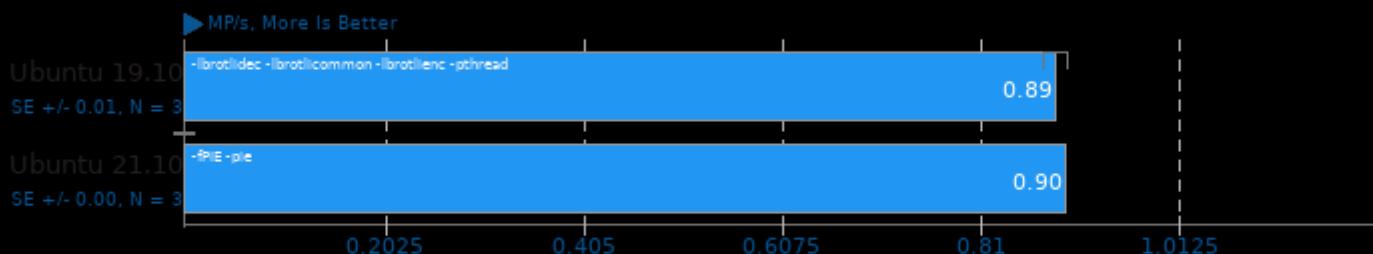
	Normalized	100%	98.98%
	Standard Deviation	0.3%	0.1%
ET: Legacy - 1920 x 1080 (FPS)	454.5	539.1	
	Normalized	84.31%	100%
	Standard Deviation	2.2%	2.7%
Zstd Compression - 19 - D.S (MB/s)	3323	3507	
	Normalized	94.75%	100%
	Standard Deviation	1.7%	1.7%
Zstd Compression - 19 - Compression Speed (MB/s)	37.5	37.2	
	Normalized	100%	99.2%
	Standard Deviation	1.2%	0.4%
PyPerformance - go (Milliseconds)	223	221	
	Normalized	99.1%	100%
	Standard Deviation	1.2%	0.3%
Git - T.T.C.C.G.C (sec)	45.789	44.161	
	Normalized	96.44%	100%
	Standard Deviation	0.3%	2.1%
Xonotic - 3840 x 2160 - Ultimate (FPS)	293.3164160	304.1514878	
	Normalized	96.44%	100%
	Standard Deviation	0.6%	0.3%
NAS Parallel Benchmarks - SP.B (Mops/s)	8910	8915	
	Normalized	99.94%	100%
	Standard Deviation	0.2%	0.7%
AOM AV1 - Speed 6 Realtime - Bosphorus 4K (FPS)	15.43	16.53	
	Normalized	93.35%	100%
	Standard Deviation	0.8%	0.8%
Timed FFmpeg Compilation - Time To Compile (sec)	38.796	37.269	
	Normalized	96.06%	100%
	Standard Deviation	0.7%	0.3%
Tesseract - 1920 x 1080 (FPS)	428.5102	797.3294	
	Normalized	53.74%	100%
	Standard Deviation	1.4%	2.5%
Tesseract - 3840 x 2160 (FPS)	318.1735	340.6871	
	Normalized	93.39%	100%
	Standard Deviation	2.1%	2.4%
Selenium - PSPDFKit WASM - Firefox (Score)	3078	3097	
	Normalized	100%	99.39%
	Standard Deviation	1.2%	1.1%
SVT-AV1 - Preset 8 - Bosphorus 4K (FPS)	18.433	17.508	
	Normalized	100%	94.98%
	Standard Deviation	0.6%	0.8%
Xonotic - 3840 x 2160 - Ultra (FPS)	381.7336497	403.4132669	
	Normalized	94.63%	100%
	Standard Deviation	1%	1.2%
SVT-AV1 - Preset 4 - Bosphorus 1080p (FPS)	5.227	5.223	
	Normalized	100%	99.92%
	Standard Deviation	0.1%	0.6%
x265 - Bosphorus 4K (FPS)	19.58	19.24	
	Normalized	100%	98.26%
	Standard Deviation	1.3%	0.3%
PyPerformance - regex_compile (Milliseconds)	162	151	
	Normalized	93.21%	100%
	Standard Deviation		0%
PyPerformance - django_template (Milliseconds)	49.8	41.1	
	Normalized	82.53%	100%

	Standard Deviation	0.6%	0.2%
Google SynthMark - VoiceMark_100 (Voices)	Normalized	670.474	811.395
	Standard Deviation	0.6%	2.2%
Xonotic - 3840 x 2160 - High (FPS)	Normalized	435.6840882	467.7881184
	Standard Deviation	1%	1%
Stockfish - Total Time (Nodes/s)	Normalized	39264331	38788882
	Standard Deviation	1.5%	1.8%
JPEG XL libjxl - PNG - 5 (MP/s)	Normalized	46.70	49.07
	Standard Deviation	0.5%	0.2%
PyPerformance - chaos (Milliseconds)	Normalized	103	98.5
	Standard Deviation	1.5%	0.1%
PyPerformance - pathlib (Milliseconds)	Normalized	16.7	15.3
	Standard Deviation	1.5%	0%
XZ Compression - C.u.1.0.3.s.i.i.C.L.9 (sec)	Normalized	25.427	25.794
	Standard Deviation	0.6%	0.9%
PyPerformance - pickle_pure_python (Milliseconds)	Normalized	422	393
	Standard Deviation	0.2%	0.3%
FLAC Audio Encoding - WAV To FLAC (sec)	Normalized	13.940	13.225
	Standard Deviation	0.6%	1.2%
VP9 libvpx Encoding - Speed 5 - Bosphorus 1080p	Normalized	26.65	31.74
	Standard Deviation	1.1%	0.7%
NAS Parallel Benchmarks - CG.C (Mops/s)	Normalized	6995	7076
	Standard Deviation	0.5%	0.4%
PyBench - T.F.A.T.T (Milliseconds)	Normalized	921	890
	Standard Deviation	0.6%	1.5%
ET: Legacy - 3840 x 2160 (FPS)	Normalized	444.0	508.1
	Standard Deviation	2.1%	0.9%
NAS Parallel Benchmarks - MG.C (Mops/s)	Normalized	13431	13426
	Standard Deviation	0.1%	0%
AOM AV1 - Speed 9 Realtime - Bosphorus 4K (FPS)	Normalized	49.39	48.59
	Standard Deviation	0.7%	0.4%
x265 - Bosphorus 1080p (FPS)	Normalized	61.58	60.92
	Standard Deviation	0.5%	1.3%
SVT-AV1 - Preset 8 - Bosphorus 1080p (FPS)	Normalized	64.675	64.657
	Standard Deviation	0.5%	0.8%
SVT-HEVC - 7 - Bosphorus 1080p (FPS)	Normalized	151.57	158.83
	Standard Deviation	0.6%	0.1%

	Ubuntu 19.10	Ubuntu 21.10
SVT-VP9 - P.S.O - Bosphorus 1080p (FPS)	206.45	206.06
Normalized	100%	99.81%
Standard Deviation	0.4%	0.1%
SVT-HEVC - 10 - Bosphorus 1080p (FPS)	278.29	290.05
Normalized	95.95%	100%
Standard Deviation	0%	0.3%
yquake2 - OpenGL 1.x - 3840 x 2160 (FPS)	644.7	867.3
Normalized	74.33%	100%
Standard Deviation	0.5%	0.6%
yquake2 - OpenGL 1.x - 1920 x 1080 (FPS)	753.3	941.0
Normalized	80.05%	100%
Standard Deviation	0.8%	0.6%
yquake2 - OpenGL 3.x - 3840 x 2160 (FPS)	916.8	987.5
Normalized	92.84%	100%
Standard Deviation	0.1%	0.3%
yquake2 - OpenGL 3.x - 1920 x 1080 (FPS)	908.9	981.9
Normalized	92.57%	100%
Standard Deviation	0.3%	0.2%

JPEG XL libjxl 0.5

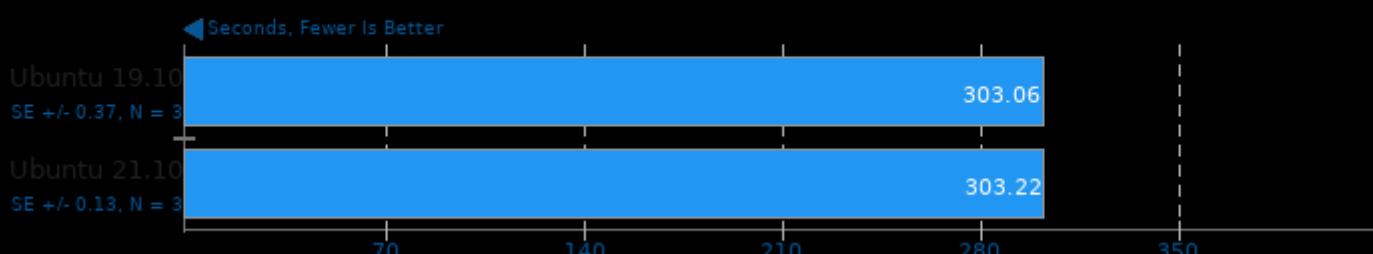
Input: PNG - Encode Speed: 8



1. (CXX) g++ options: -funwind-tables -O3 -O2

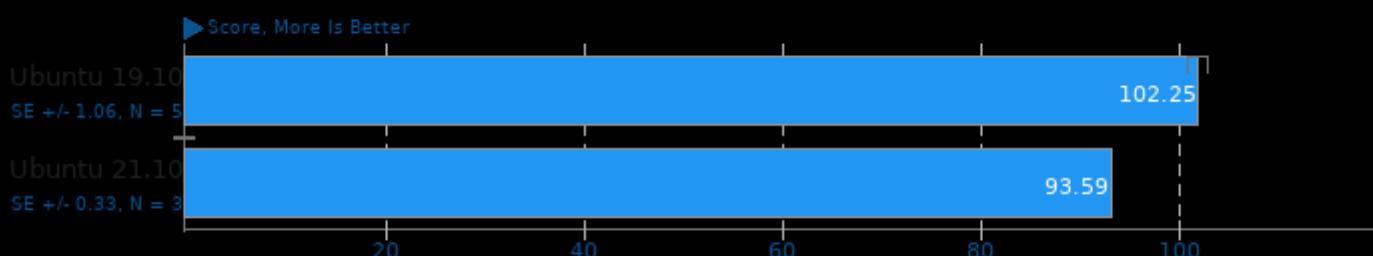
Blender 2.92

Blend File: Classroom - Compute: CPU-Only



Selenium

Benchmark: Jetstream 2 - Browser: Firefox

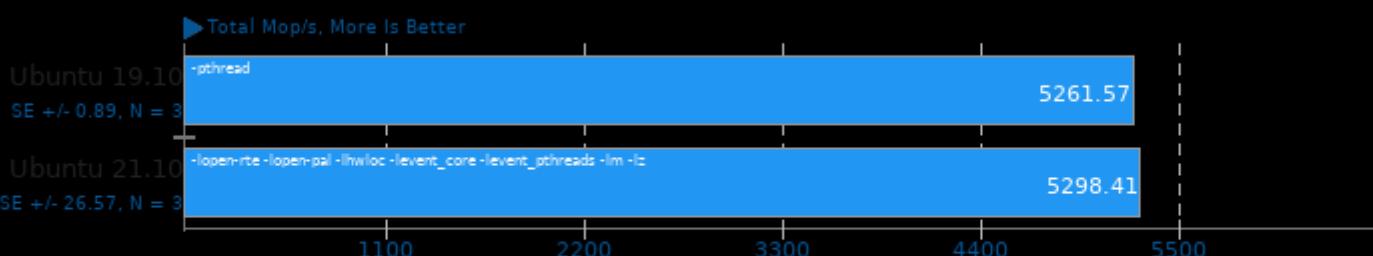


1. Ubuntu 19.10: firefox 69.0.3

2. Ubuntu 21.10: firefox 93.0

NAS Parallel Benchmarks 3.4

Test / Class: SP.C



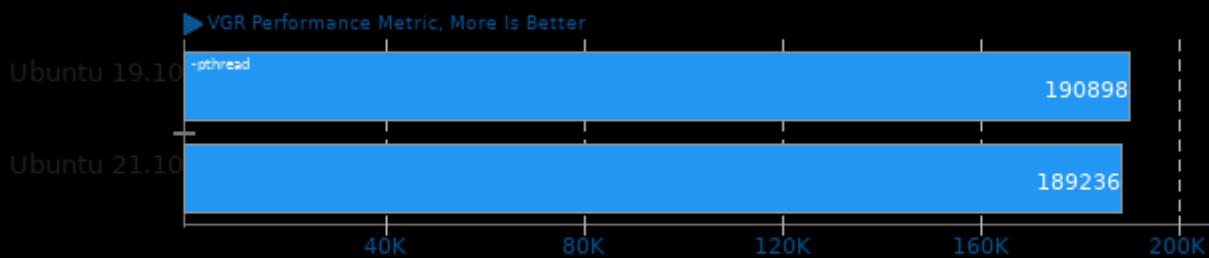
1. (F9X) gfortran options: -O3 -march=native -Impi_usempif08 -Impi_mpifh -Impi

2. Ubuntu 19.10: Open MPI 3.1.3

3. Ubuntu 21.10: Open MPI 4.1.0

BRL-CAD 7.32.2

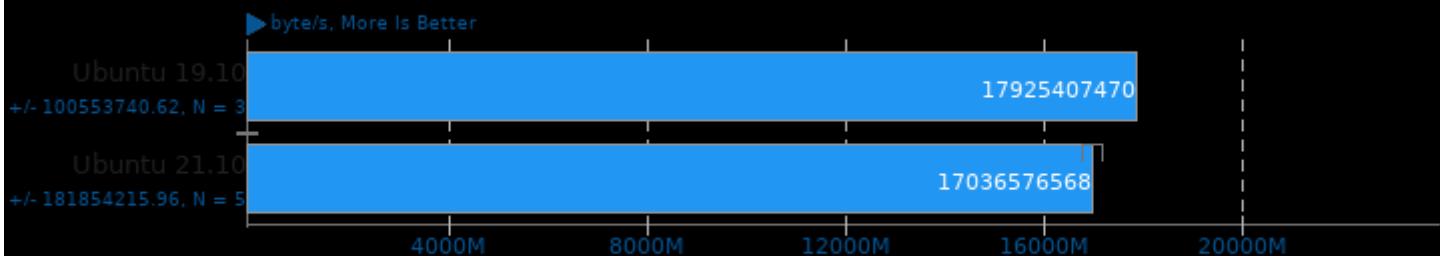
VGR Performance Metric



l. (CXX) g++ options: -std=c++11 -pipe -fvisibility=hidden -fno-strict-aliasing -fno-common -fexceptions -ftemplate-depth=128 -m64 -ggdb3 -O3 -fipa-pt

OpenSSL 3.0

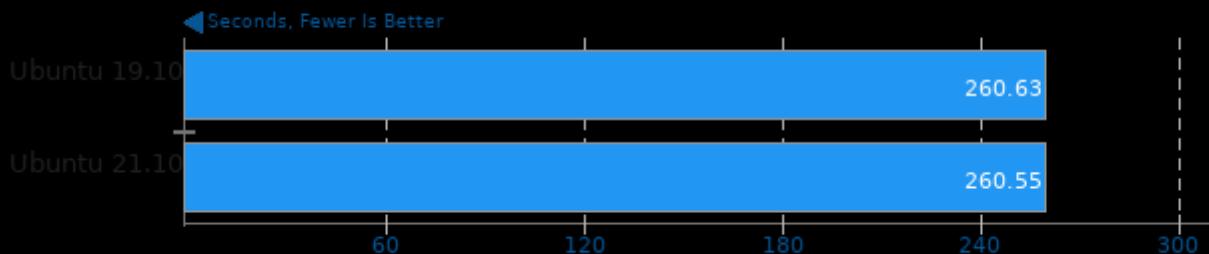
Algorithm: SHA256



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

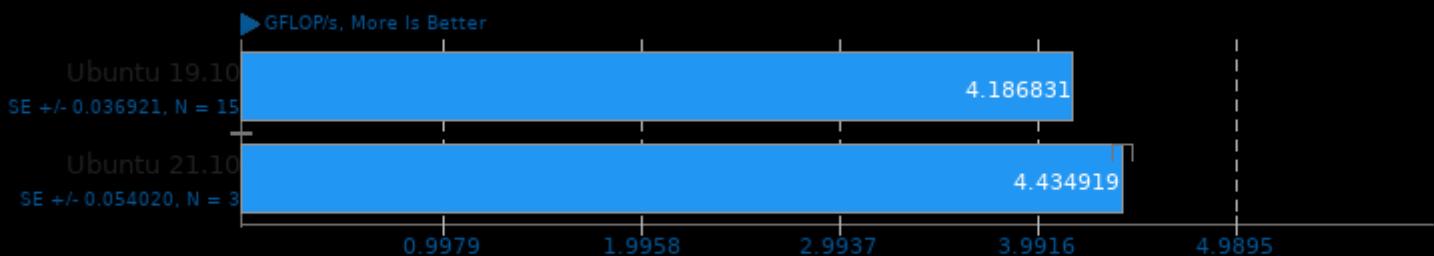
Appleseed 2.0 Beta

Scene: Emily



ACES DGEMM 1.0

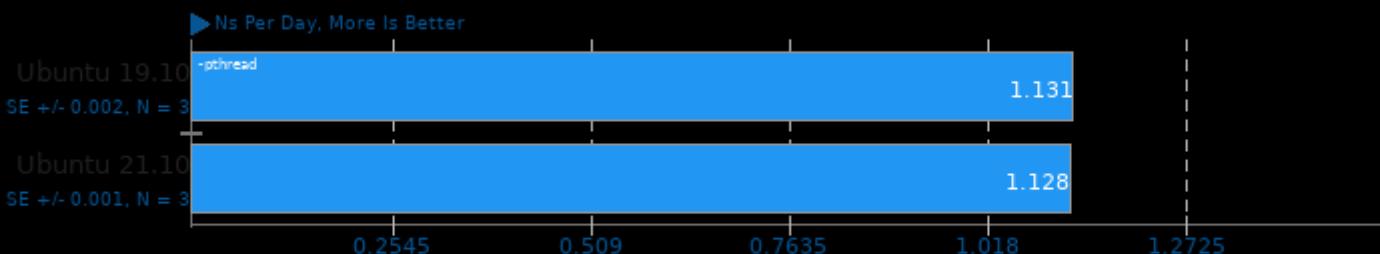
Sustained Floating-Point Rate



l. (CC) gcc options: -O3 -march=native -fopenmp

GROMACS 2021.2

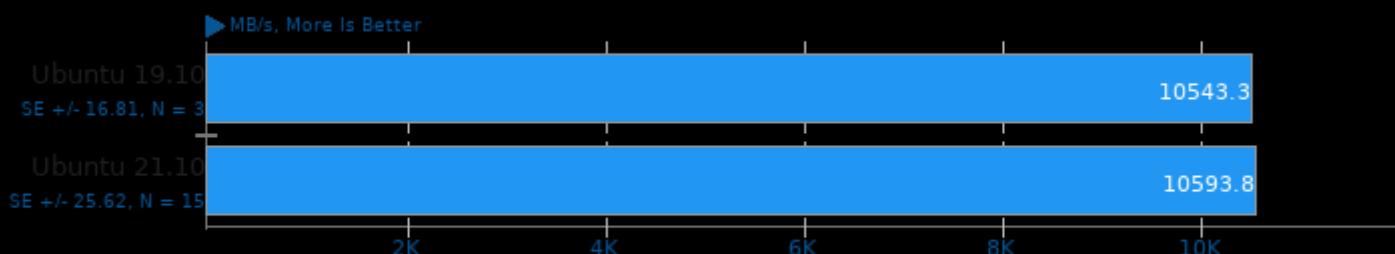
Implementation: MPI CPU - Input: water_GMX50_bare



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

LZ4 Compression 1.9.3

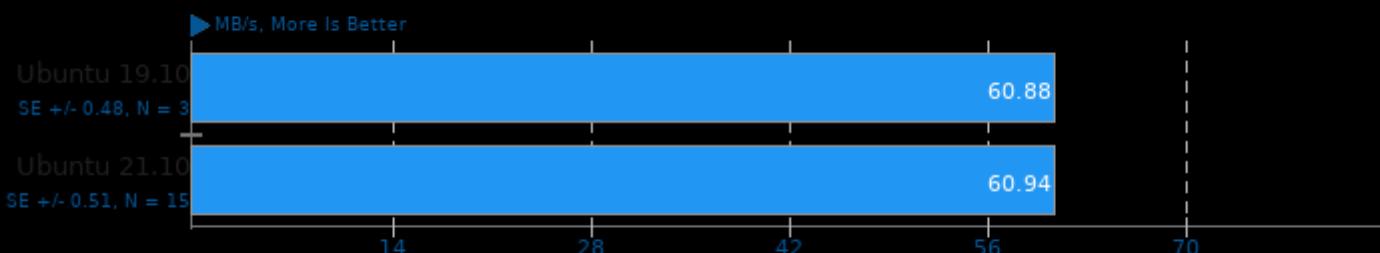
Compression Level: 3 - Decompression Speed



1. (CC) gcc options: -O3

LZ4 Compression 1.9.3

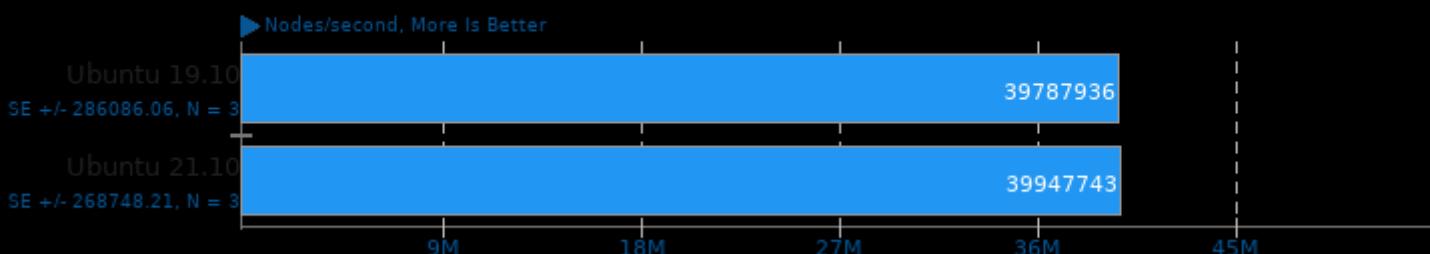
Compression Level: 3 - Compression Speed



1. (CC) gcc options: -O3

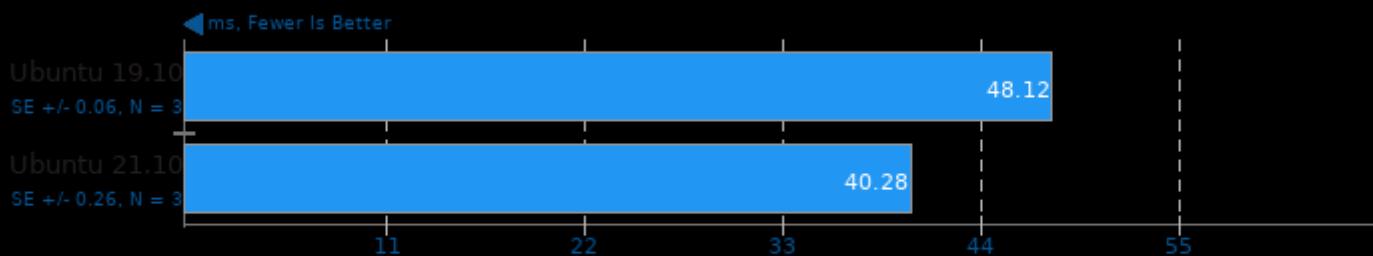
asmFish 2018-07-23

1024 Hash Memory, 26 Depth



Selenium

Benchmark: ARES-6 - Browser: Firefox

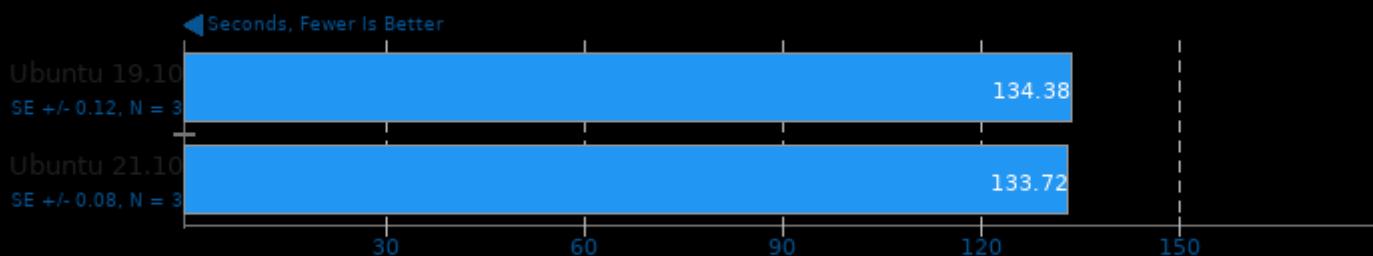


1. Ubuntu 19.10: firefox 69.0.3

2. Ubuntu 21.10: firefox 93.0

CloverLeaf

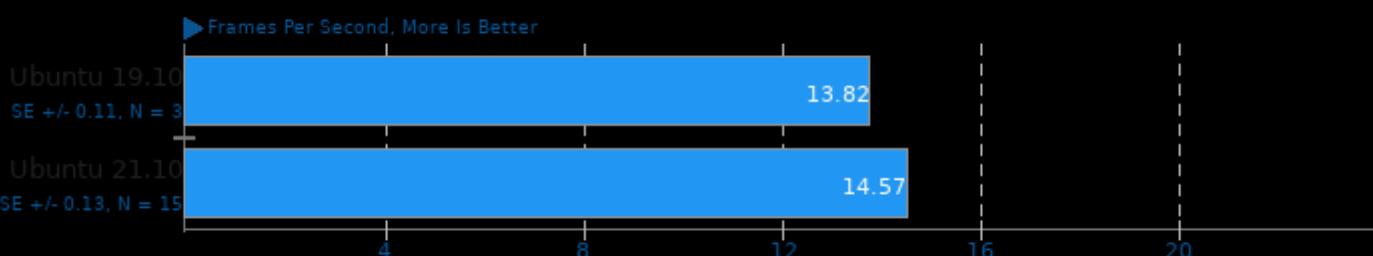
Lagrangian-Eulerian Hydrodynamics



1. (F9X) gfortran options: -O3 -march=native -funroll-loops -fopenmp

VP9 libvpx Encoding 1.10.0

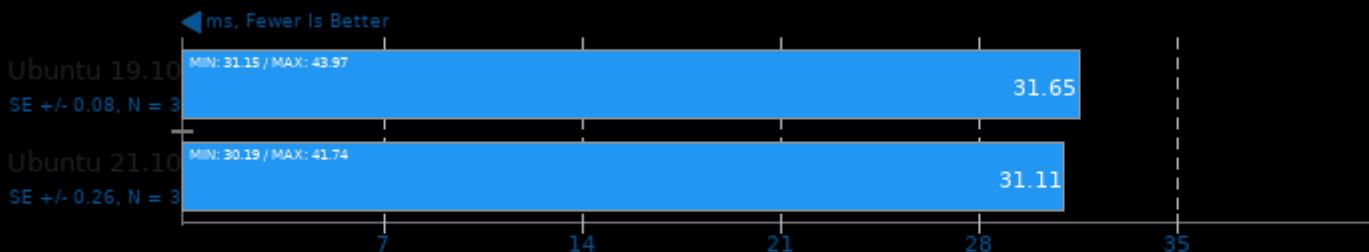
Speed: Speed 5 - Input: Bosphorus 4K



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

Mobile Neural Network 1.2

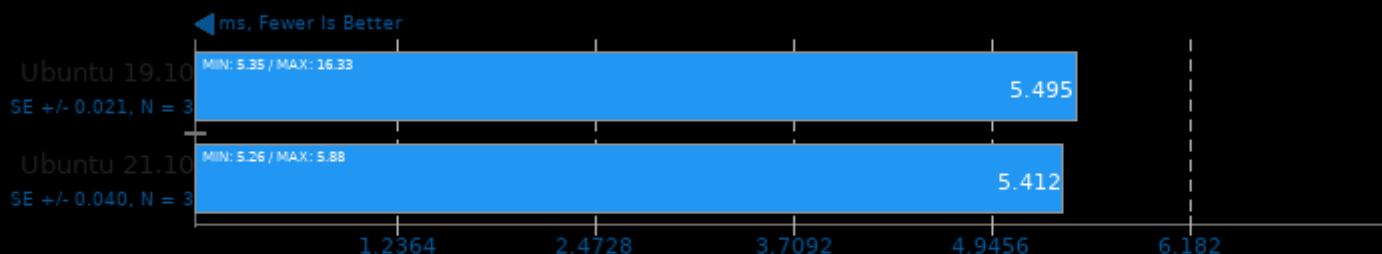
Model: inception-v3



1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fno-tree-vectorize

Mobile Neural Network 1.2

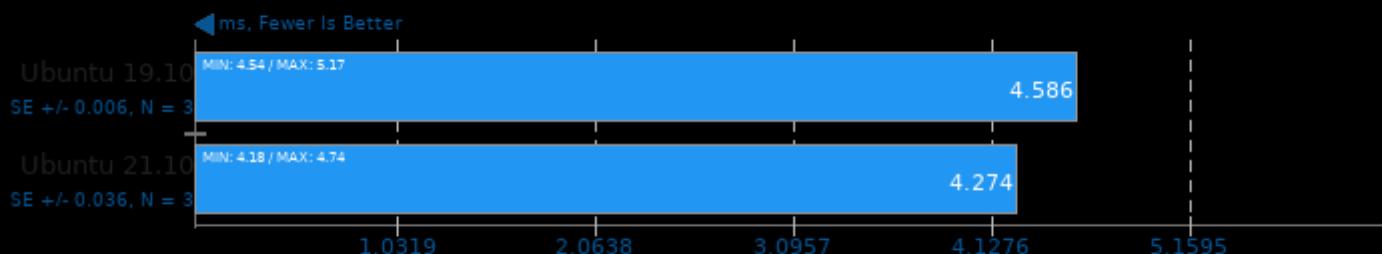
Model: mobilenet-v1-1.0



1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fno-tree-vectorize

Mobile Neural Network 1.2

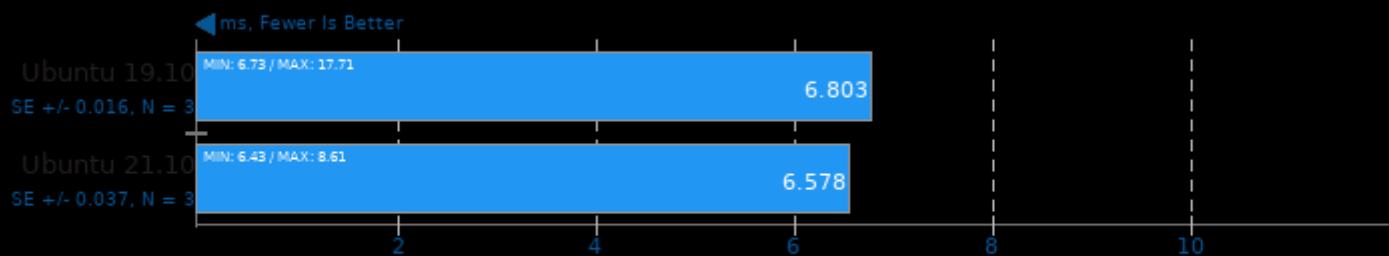
Model: MobileNetV2_224



1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fno-tree-vectorize

Mobile Neural Network 1.2

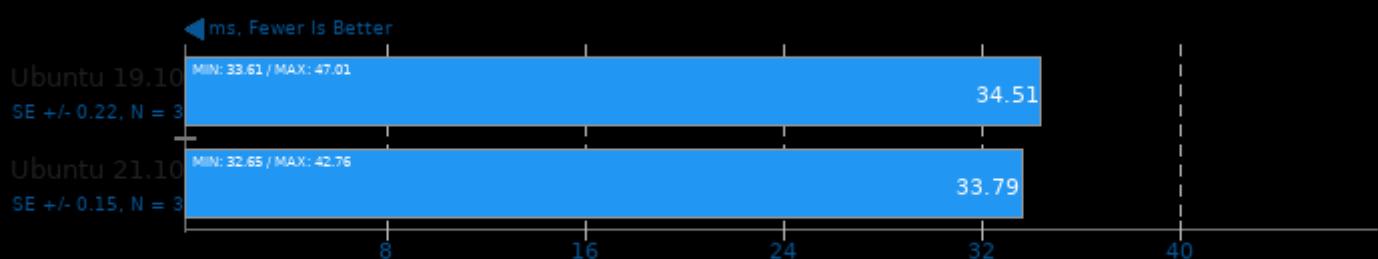
Model: SqueezeNetV1.0



l. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fno-threadsafe-statics

Mobile Neural Network 1.2

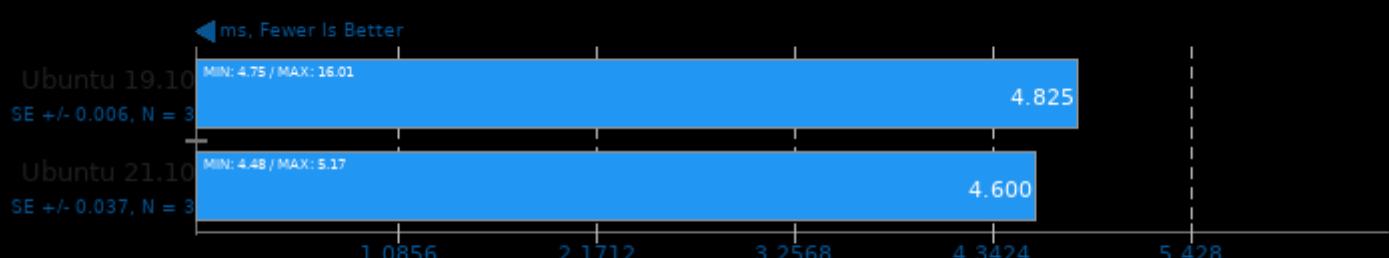
Model: resnet-v2-50



l. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fno-threadsafe-statics

Mobile Neural Network 1.2

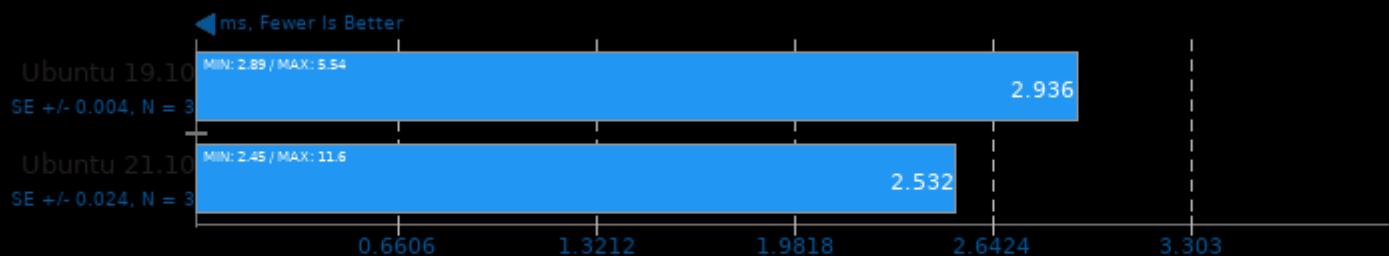
Model: squeezenetv1.1



l. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fno-threadsafe-statics

Mobile Neural Network 1.2

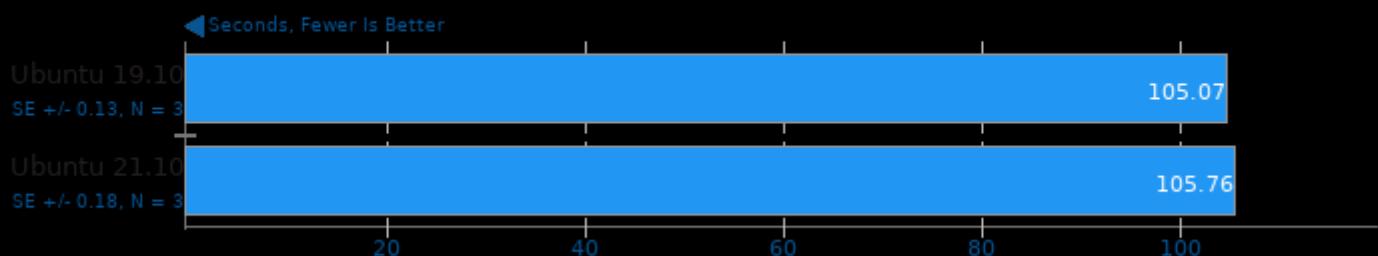
Model: mobilenetV3



1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fno-threadsafe-statics

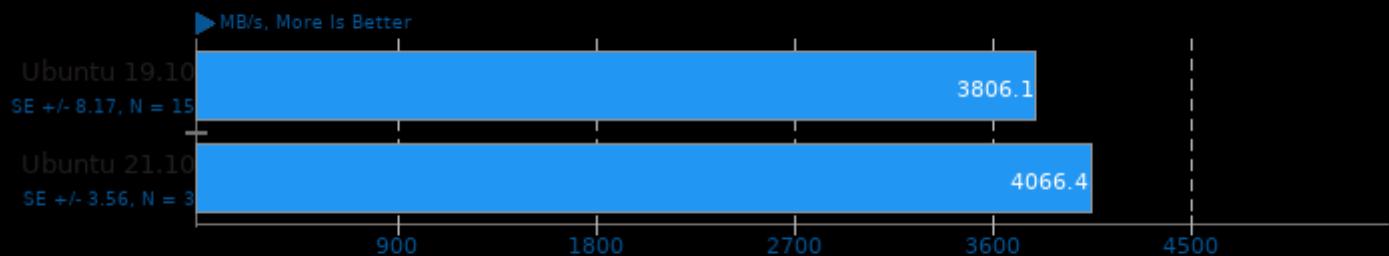
Blender 2.92

Blend File: BMW27 - Compute: CPU-Only



Zstd Compression 1.5.0

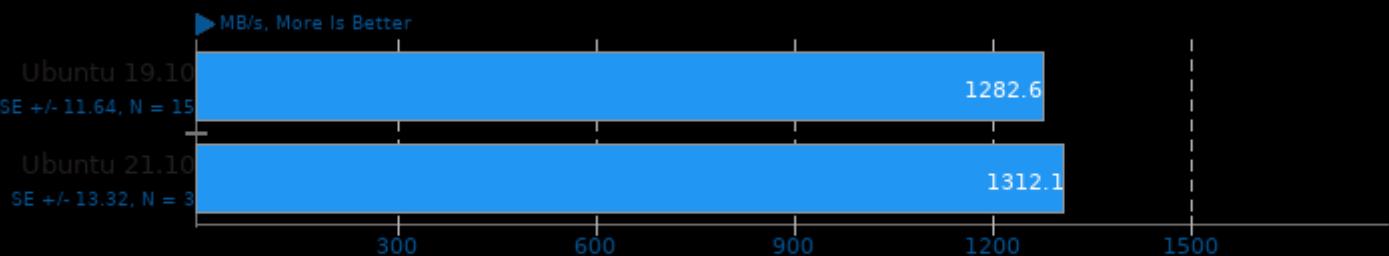
Compression Level: 8 - Decompression Speed



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

Zstd Compression 1.5.0

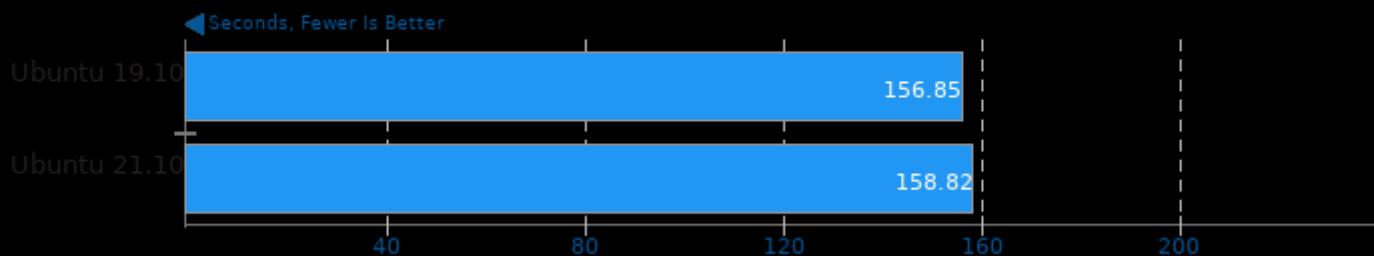
Compression Level: 8 - Compression Speed



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

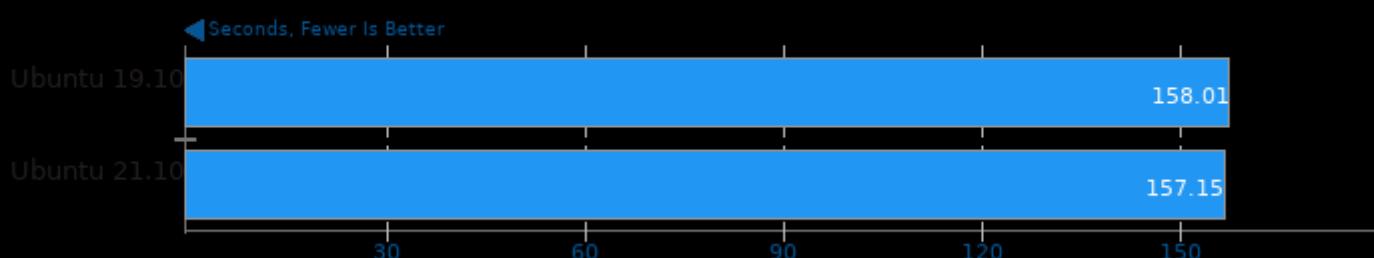
Appleseed 2.0 Beta

Scene: Disney Material



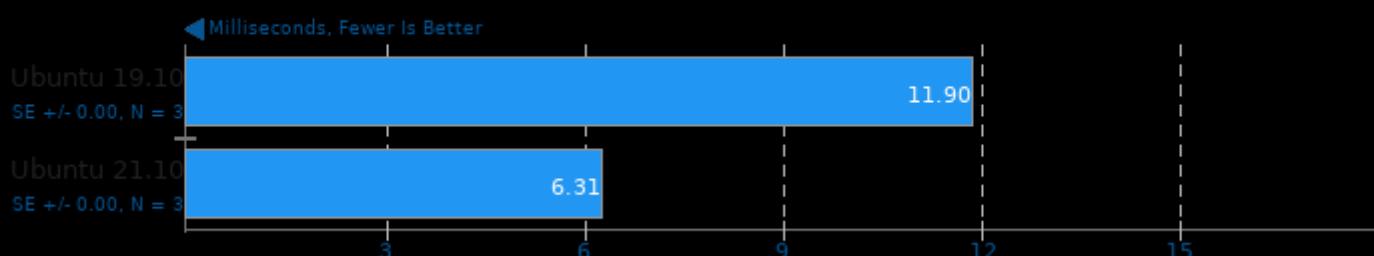
Appleseed 2.0 Beta

Scene: Material Tester



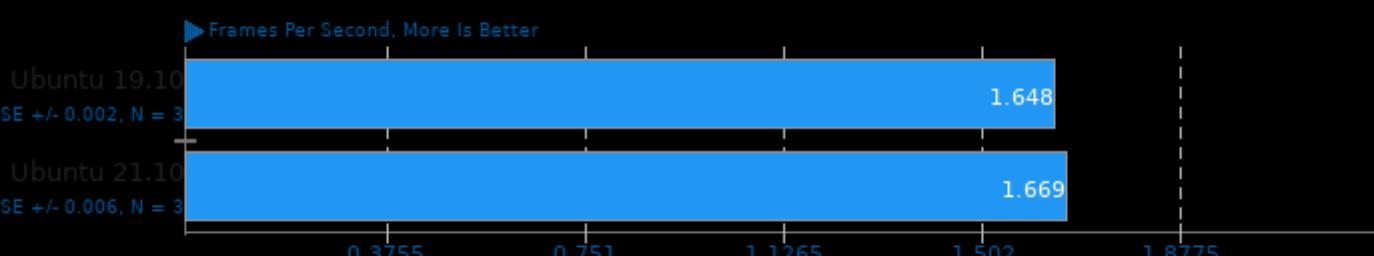
PyPerformance 1.0.0

Benchmark: python_startup



SVT-AV1 0.8.7

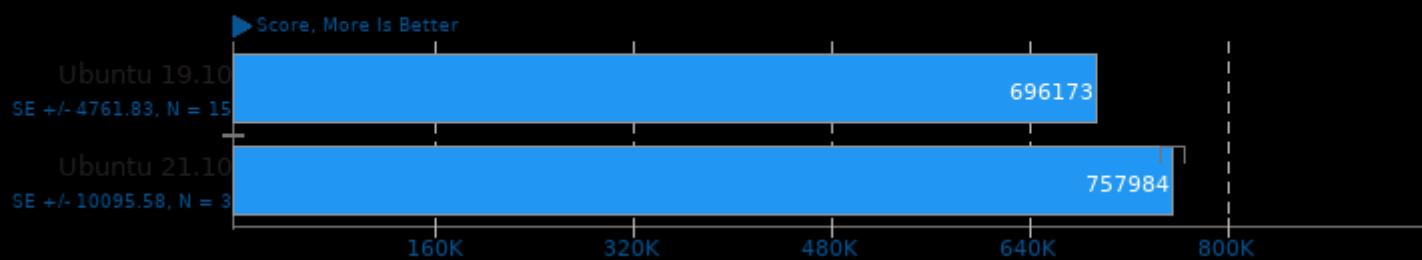
Encoder Mode: Preset 4 - Input: Bosphorus 4K



1. (CXX) g++ options: -mno-avx -mavx2 -mavx512f -mavx512bw -mavx512dq -pie

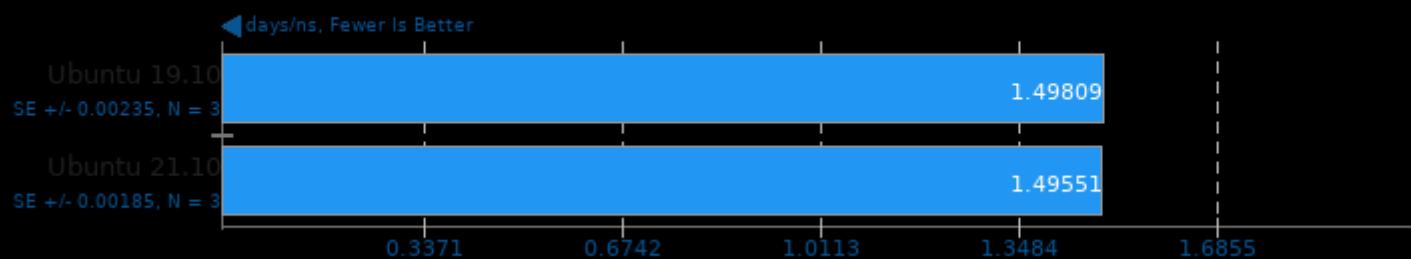
PHPBench 0.8.1

PHP Benchmark Suite



NAMD 2.14

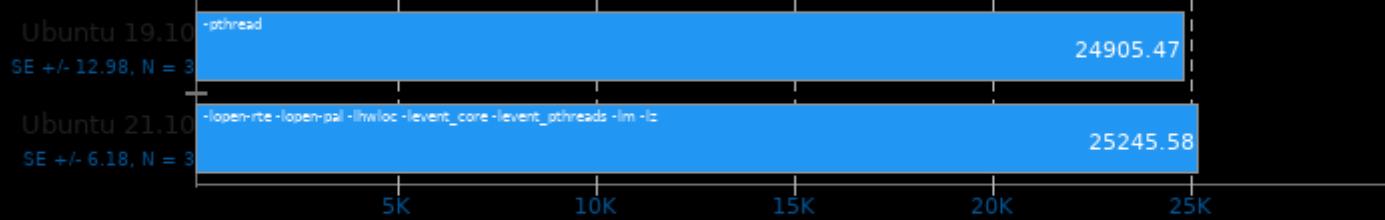
ATPase Simulation - 327,506 Atoms



NAS Parallel Benchmarks 3.4

Test / Class: LU.C

► Total Mop/s, More Is Better



1. (F9X) gfortran options: -O3 -march=native -lmpi_usempif08 -lmpi_mpifh -lmpi

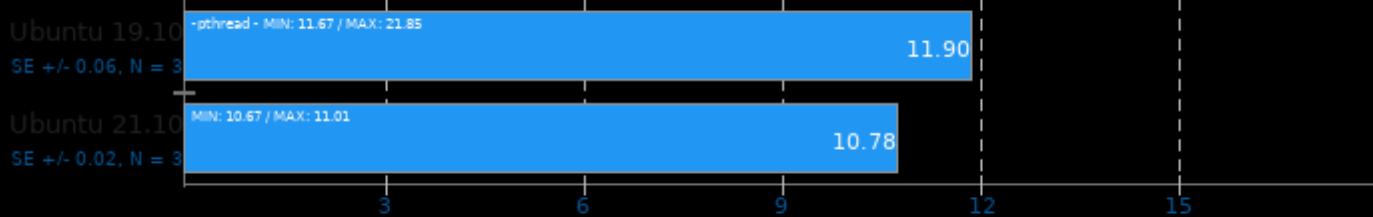
2. Ubuntu 19.10: Open MPI 3.1.3

3. Ubuntu 21.10: Open MPI 4.1.0

NCNN 20210720

Target: CPU - Model: regnety_400m

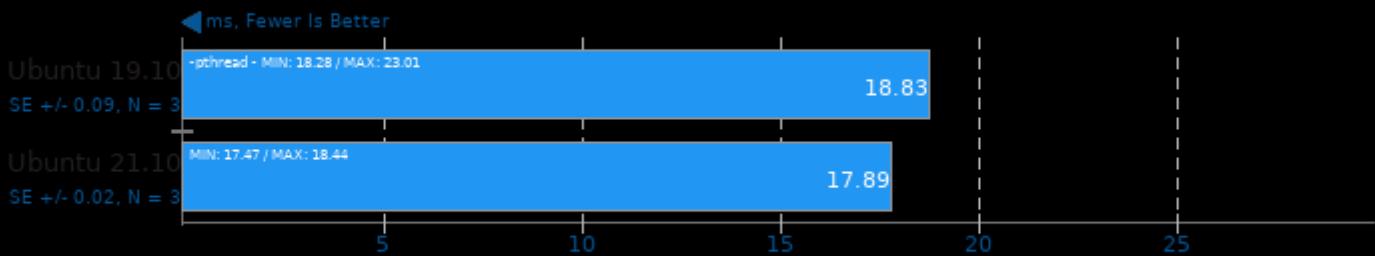
◀ ms, Fewer Is Better



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

NCNN 20210720

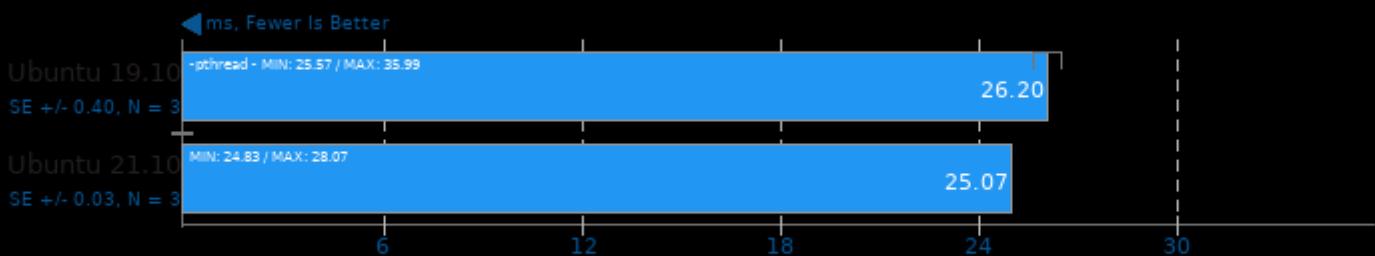
Target: CPU - Model: squeezeonet_ssd



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

NCNN 20210720

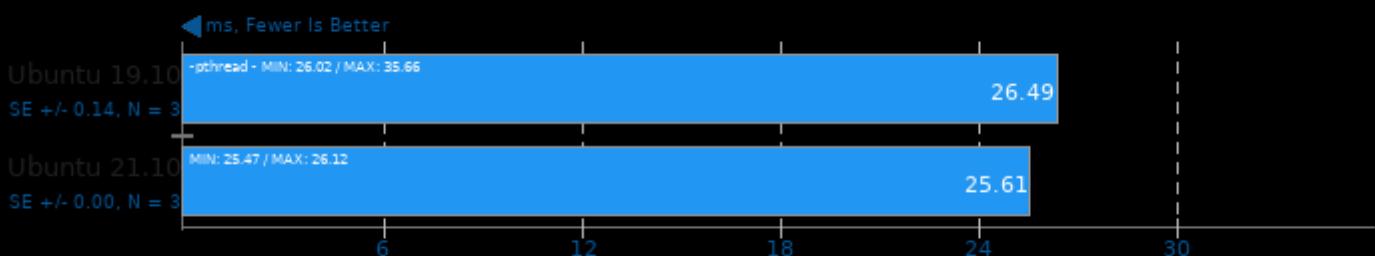
Target: CPU - Model: yolov4-tiny



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

NCNN 20210720

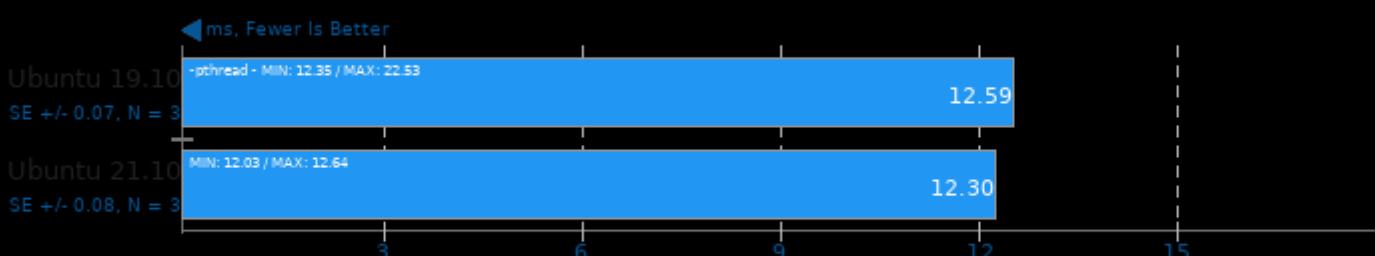
Target: CPU - Model: resnet50



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

NCNN 20210720

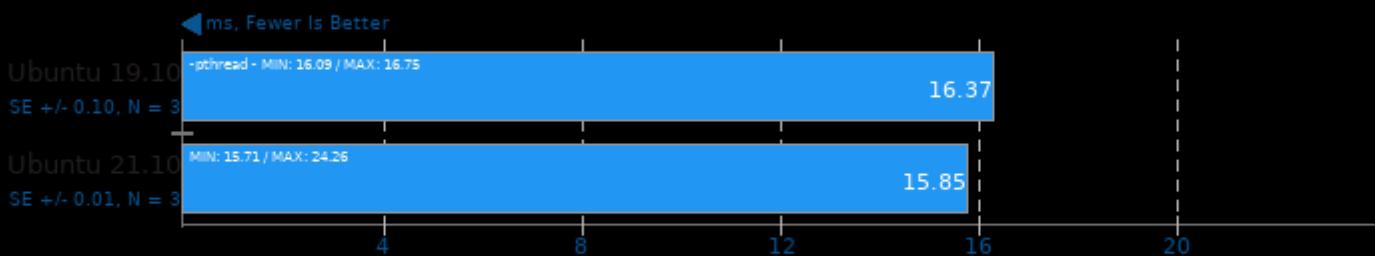
Target: CPU - Model: alexnet



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

NCNN 20210720

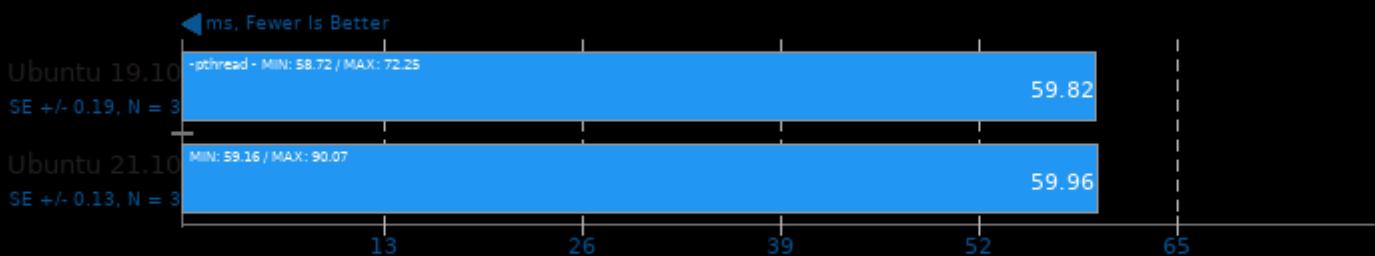
Target: CPU - Model: resnet18



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

NCNN 20210720

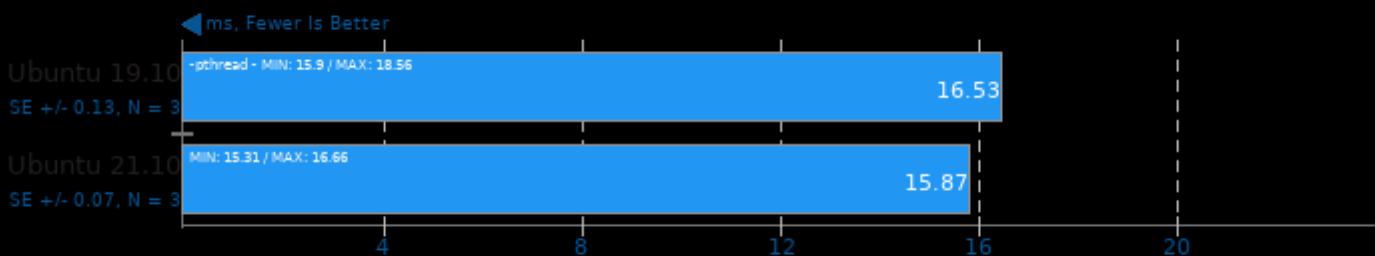
Target: CPU - Model: vgg16



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

NCNN 20210720

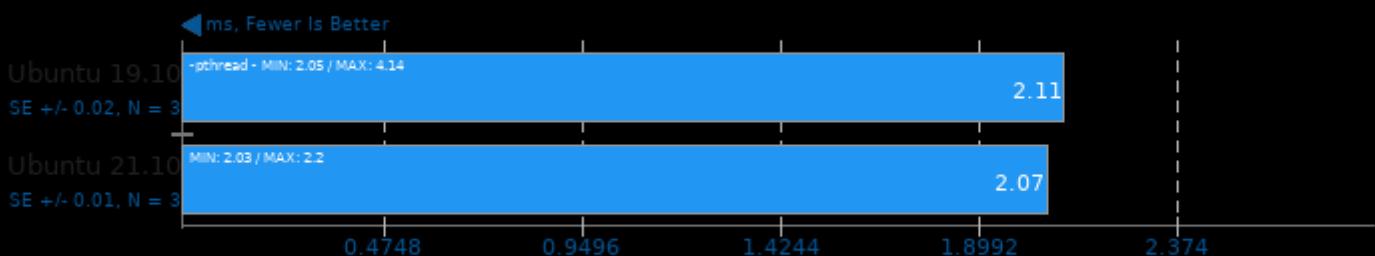
Target: CPU - Model: googlenet



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

NCNN 20210720

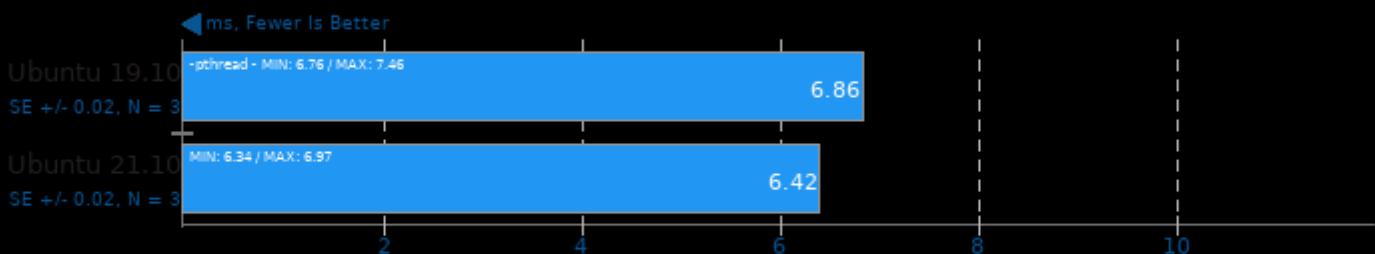
Target: CPU - Model: blazeface



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

NCNN 20210720

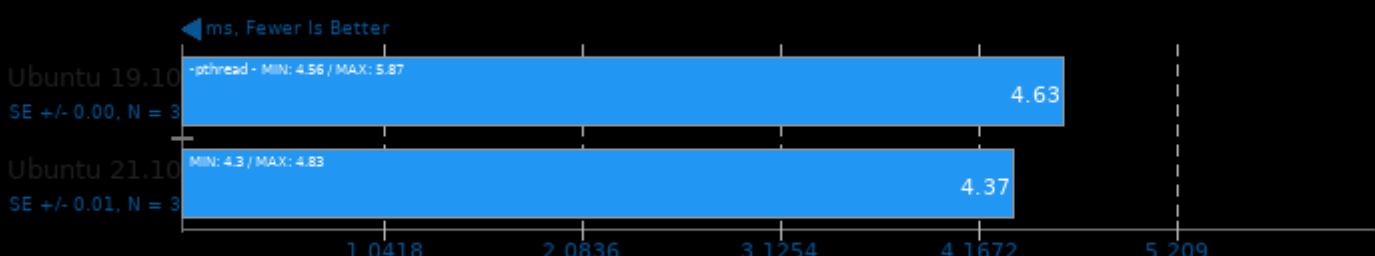
Target: CPU - Model: efficientnet-b0



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

NCNN 20210720

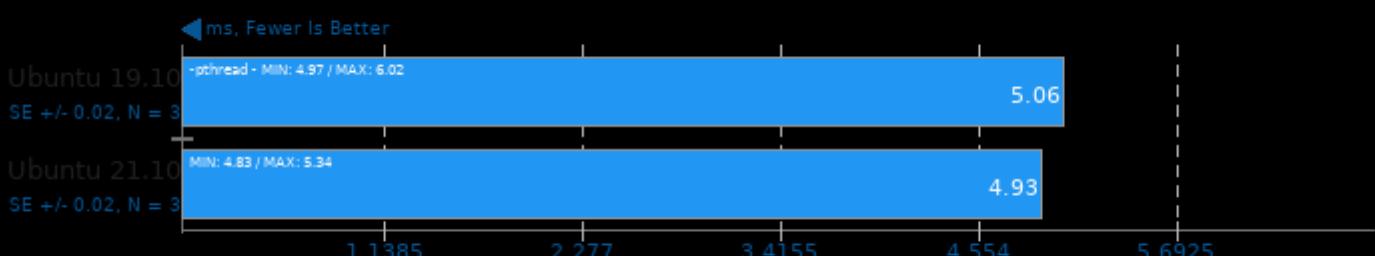
Target: CPU - Model: mnasnet



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

NCNN 20210720

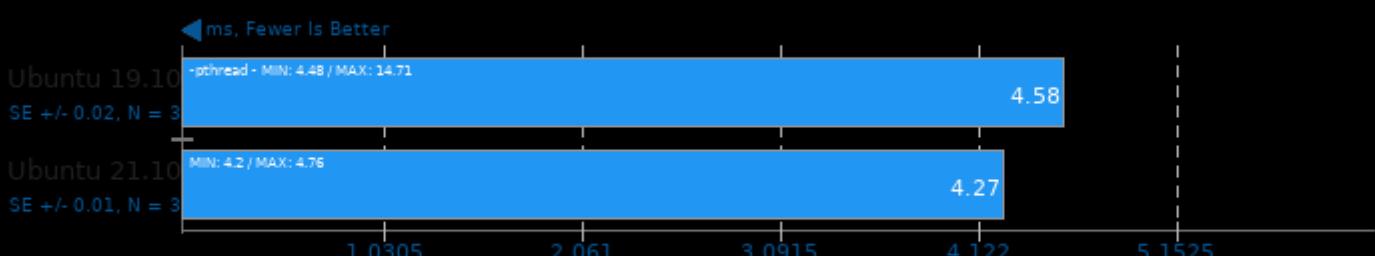
Target: CPU - Model: shufflenet-v2



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

NCNN 20210720

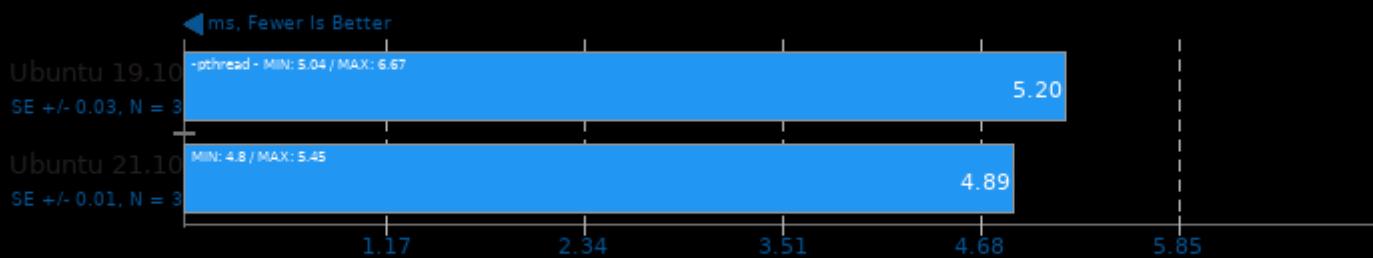
Target: CPU-v3-v3 - Model: mobilenet-v3



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

NCNN 20210720

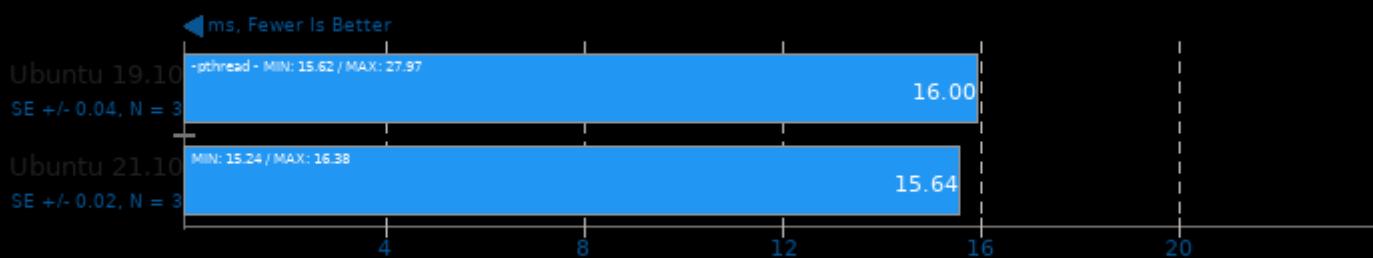
Target: CPU-v2-v2 - Model: mobilenet-v2



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

NCNN 20210720

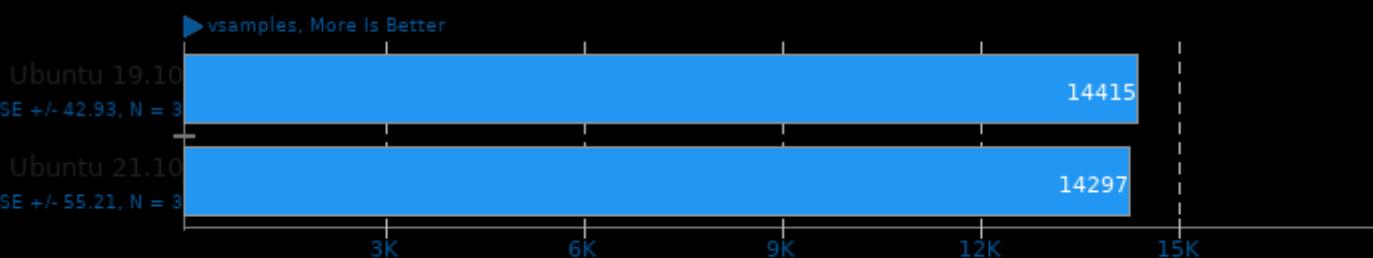
Target: CPU - Model: mobilenet



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

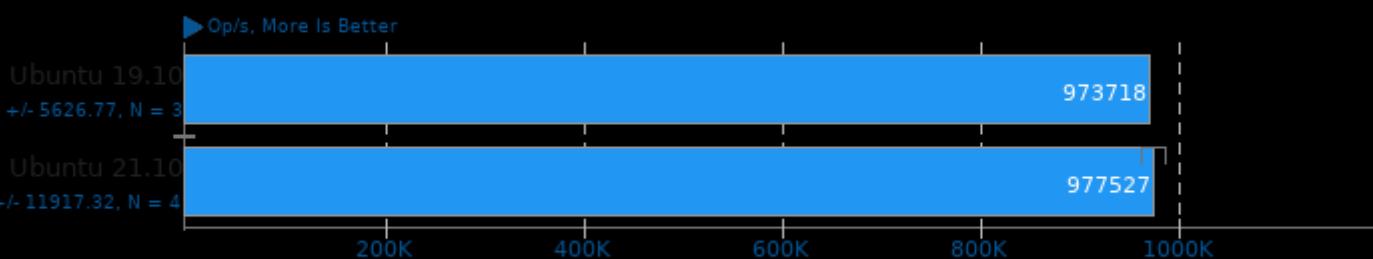
Chaos Group V-RAY 5

Mode: CPU



Facebook RocksDB 6.22.1

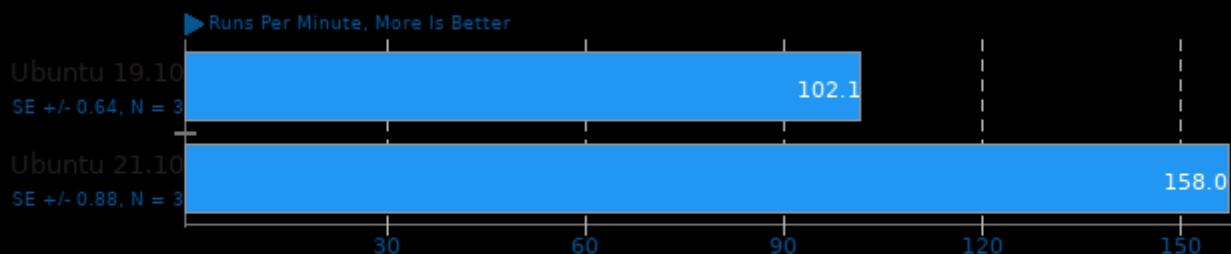
Test: Random Fill



1. (CXX) g++ options: -O3 -march=native -pthread -fno-built-in-memcmp -fno-rtti -lpthread

Selenium

Benchmark: Speedometer - Browser: Firefox

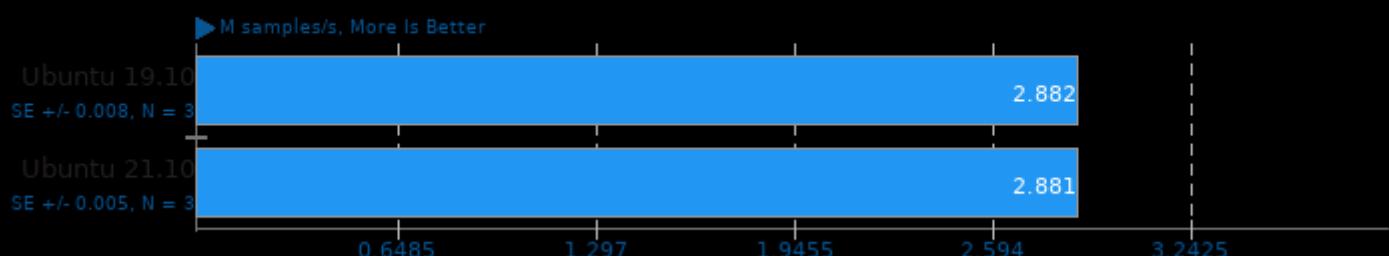


1. Ubuntu 19.10: firefox 69.0.3

2. Ubuntu 21.10: firefox 93.0

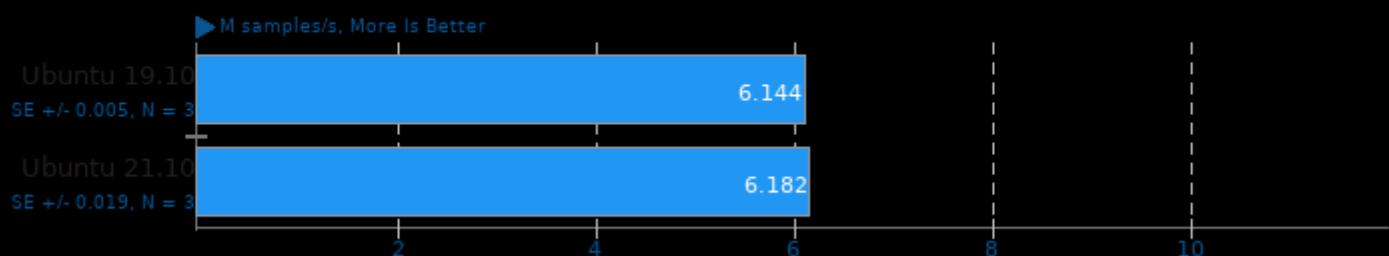
IndigoBench 4.4

Acceleration: CPU - Scene: Bedroom



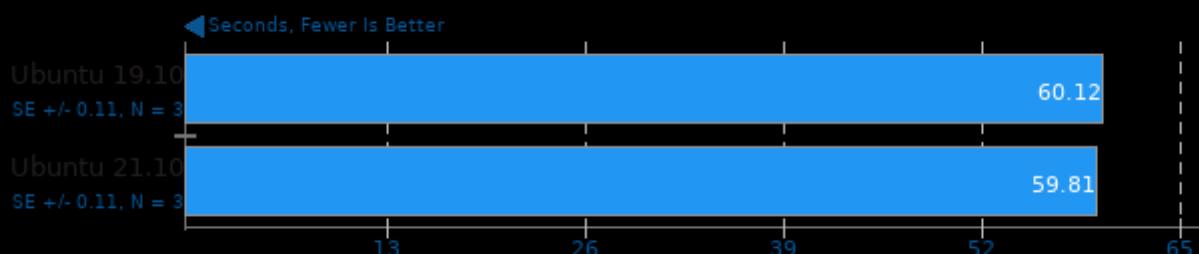
IndigoBench 4.4

Acceleration: CPU - Scene: Supercar



Tachyon 0.99b6

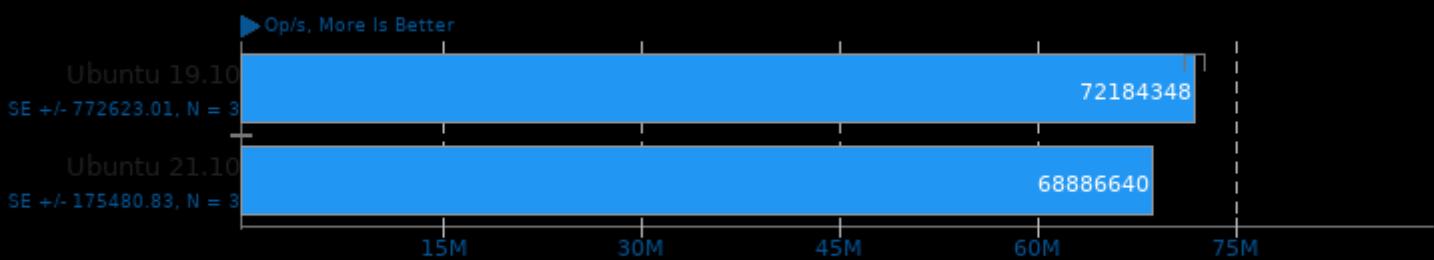
Total Time



1. (CC) gcc options: -m64 -O3 -fomit-frame-pointer -ffast-math -ltachyon -lm -lpthread

Facebook RocksDB 6.22.1

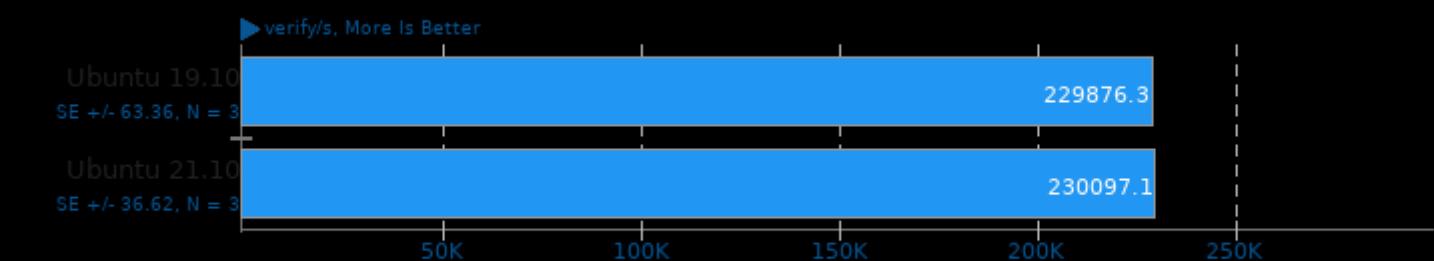
Test: Random Read



1. (CXX) g++ options: -O3 -march=native -pthread -fno-built-in-memcmp -fno-rtti -lpthread

OpenSSL 3.0

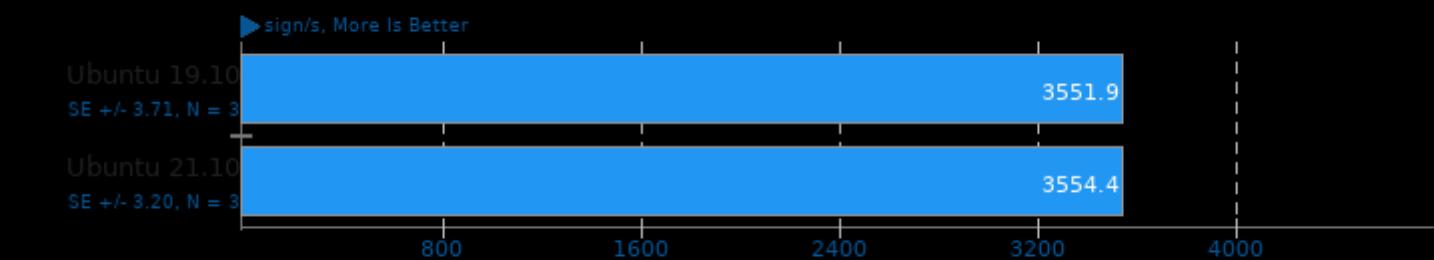
Algorithm: RSA4096



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

OpenSSL 3.0

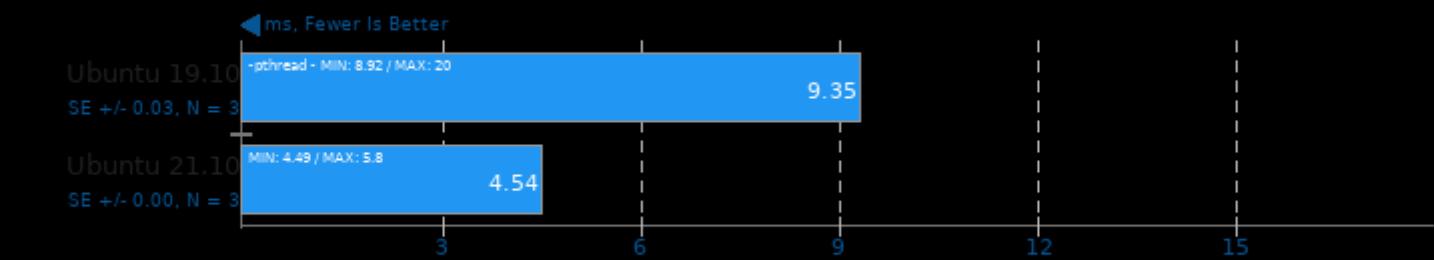
Algorithm: RSA4096



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

NCNN 20210720

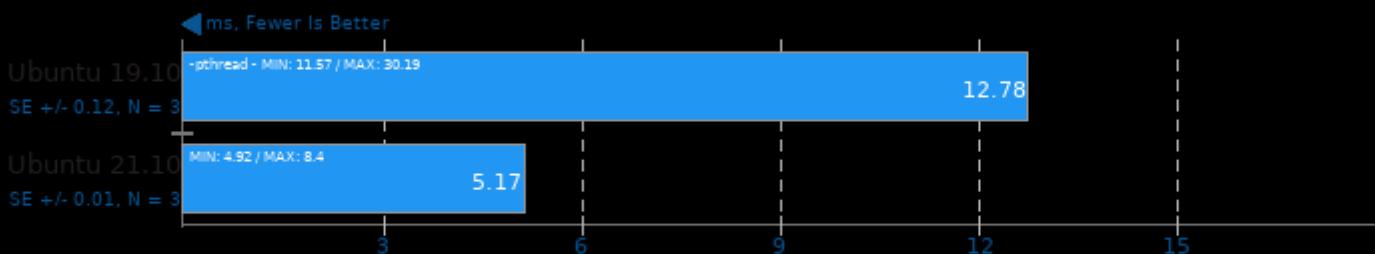
Target: Vulkan GPU - Model: regnety_400m



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

NCNN 20210720

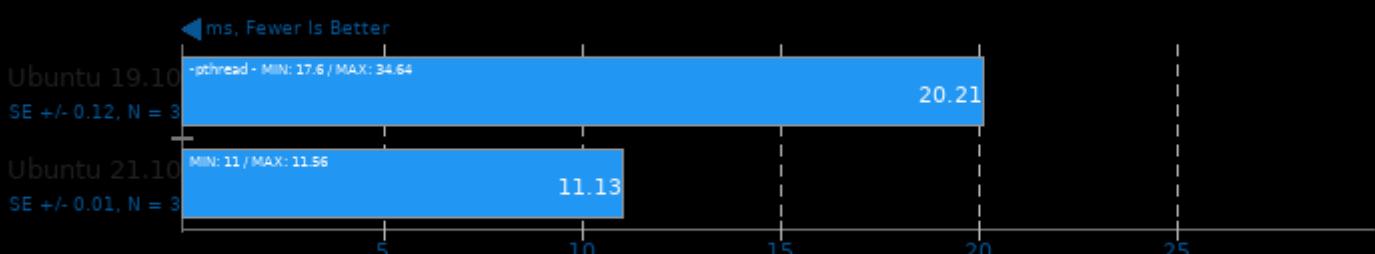
Target: Vulkan GPU - Model: squeezenet_ssd



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

NCNN 20210720

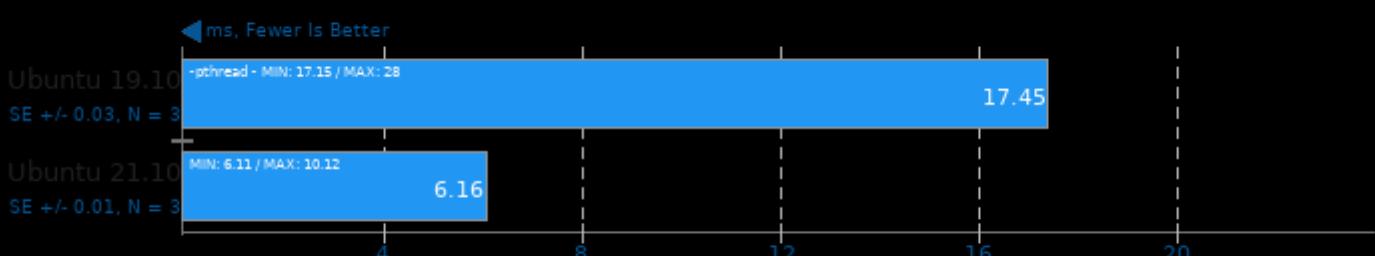
Target: Vulkan GPU - Model: yolov4-tiny



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

NCNN 20210720

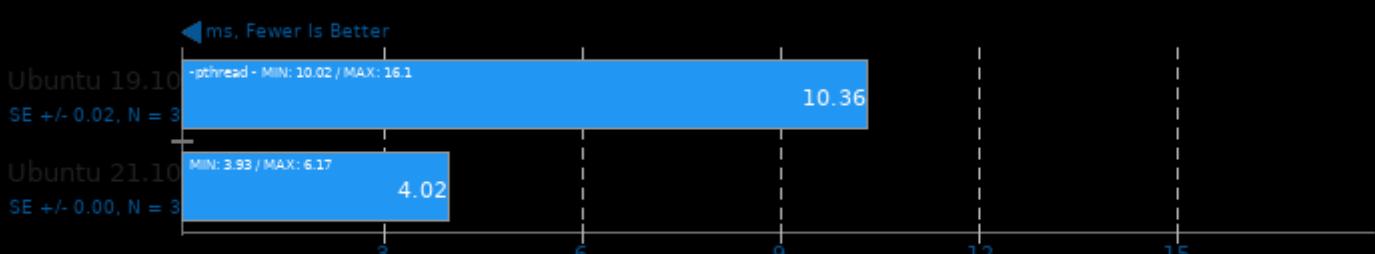
Target: Vulkan GPU - Model: resnet50



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

NCNN 20210720

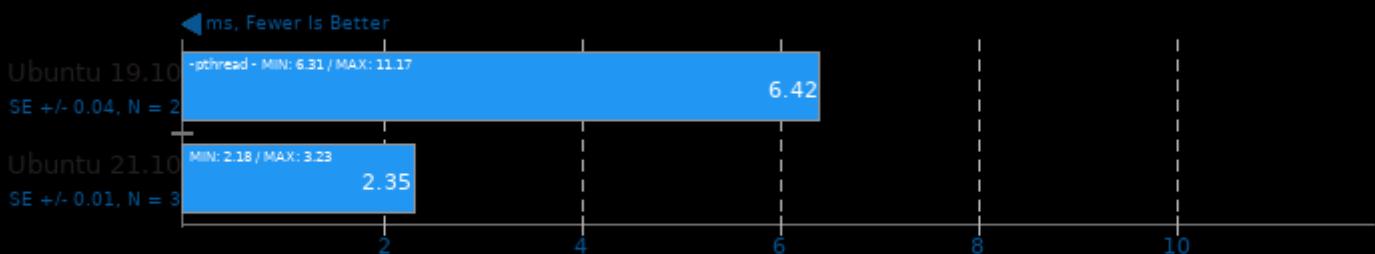
Target: Vulkan GPU - Model: alexnet



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

NCNN 20210720

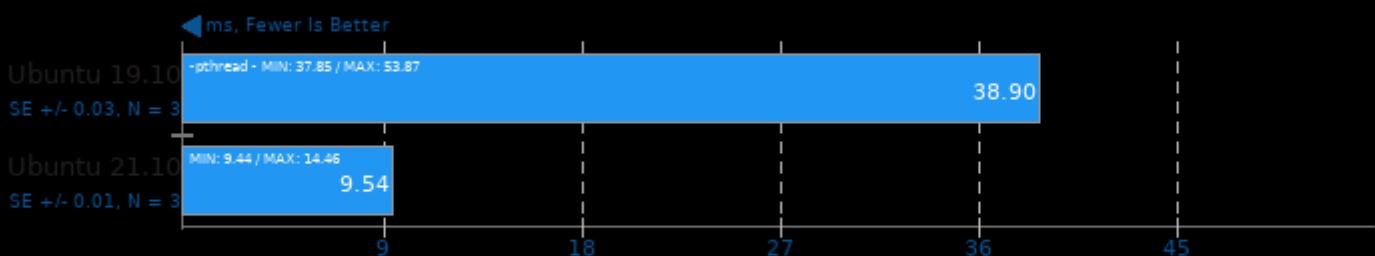
Target: Vulkan GPU - Model: resnet18



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

NCNN 20210720

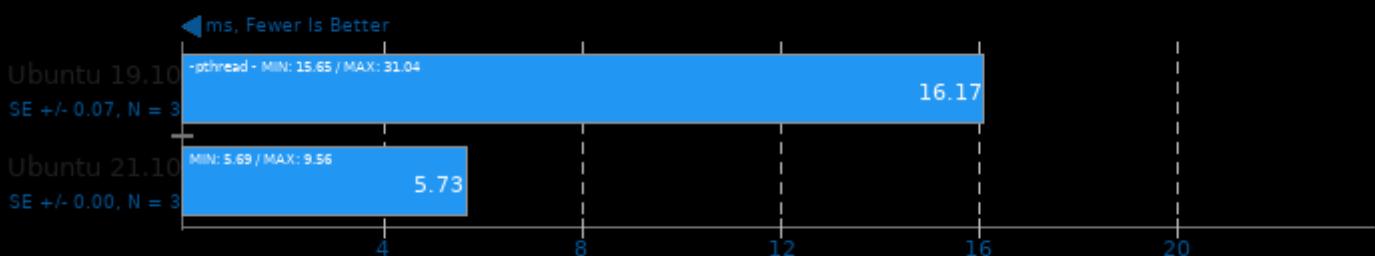
Target: Vulkan GPU - Model: vgg16



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

NCNN 20210720

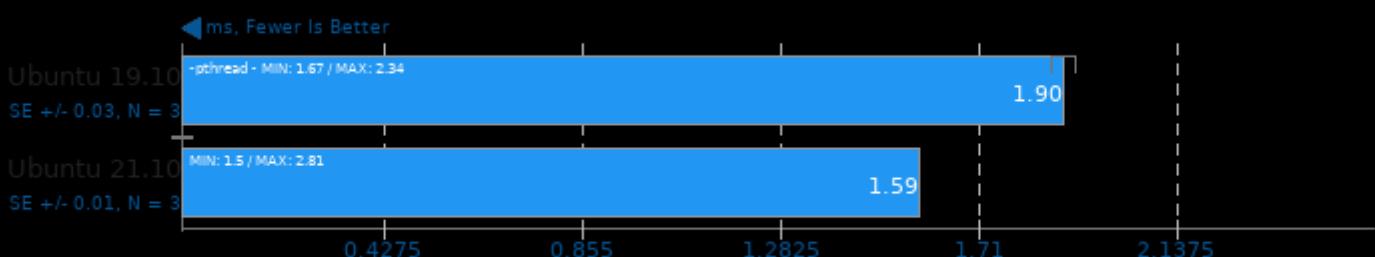
Target: Vulkan GPU - Model: googlenet



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

NCNN 20210720

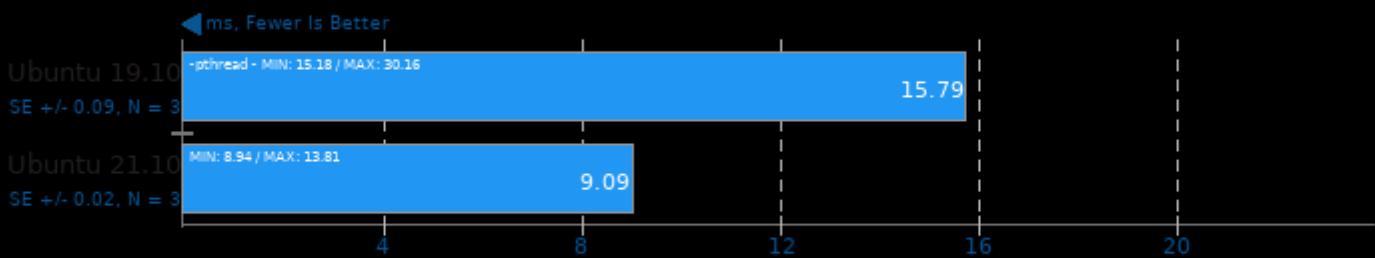
Target: Vulkan GPU - Model: blazeface



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

NCNN 20210720

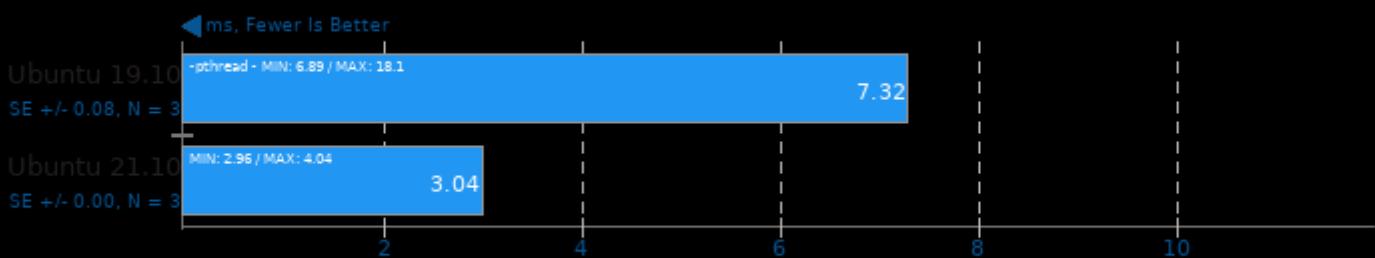
Target: Vulkan GPU - Model: efficientnet-b0



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

NCNN 20210720

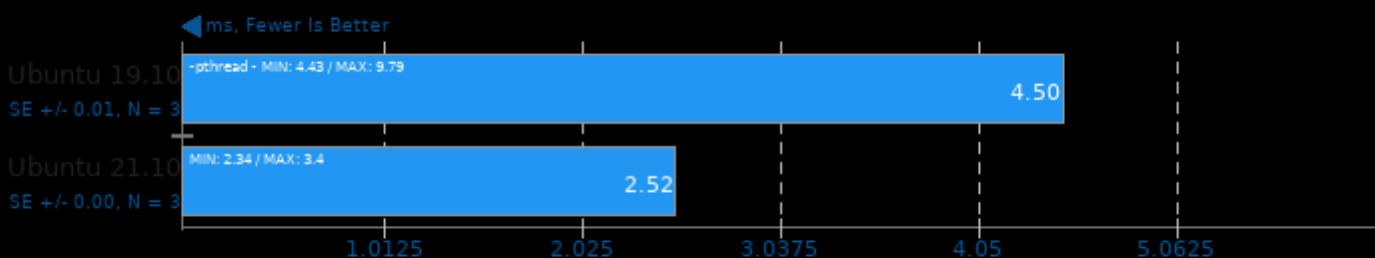
Target: Vulkan GPU - Model: mnasnet



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

NCNN 20210720

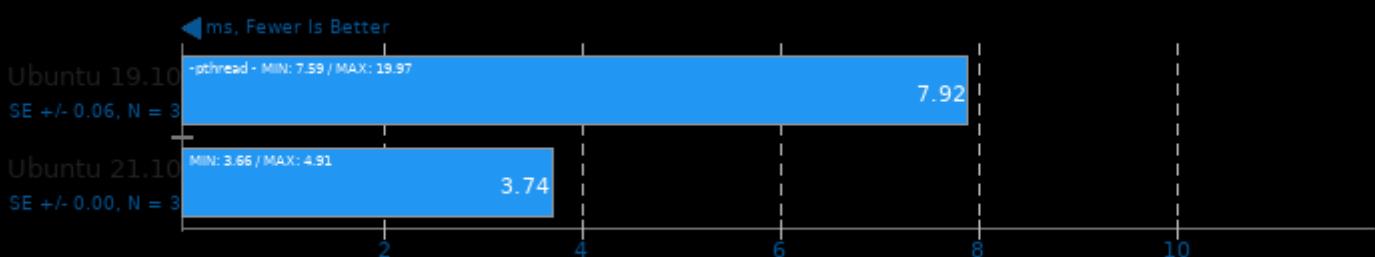
Target: Vulkan GPU - Model: shufflenet-v2



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

NCNN 20210720

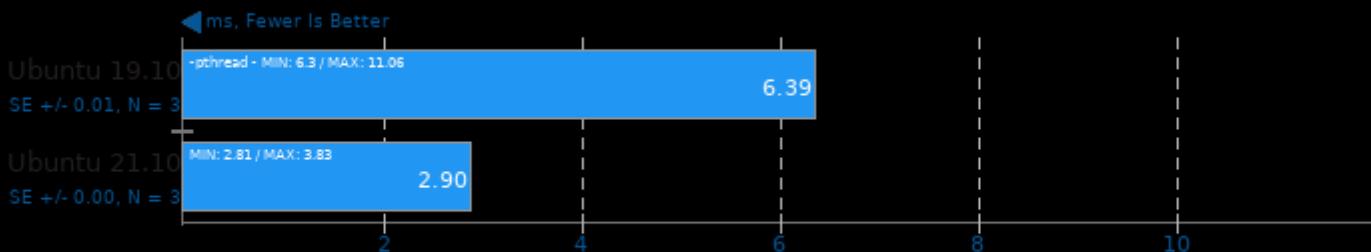
Target: Vulkan GPU-v3-v3 - Model: mobilenet-v3



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

NCNN 20210720

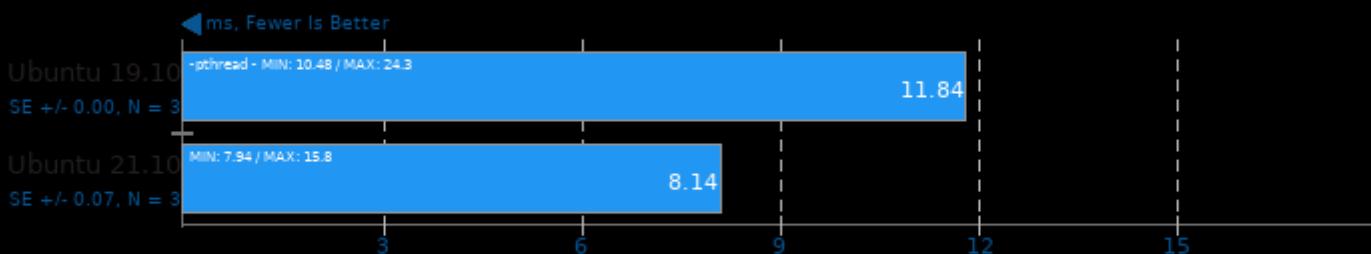
Target: Vulkan GPU-v2-v2 - Model: mobilenet-v2



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

NCNN 20210720

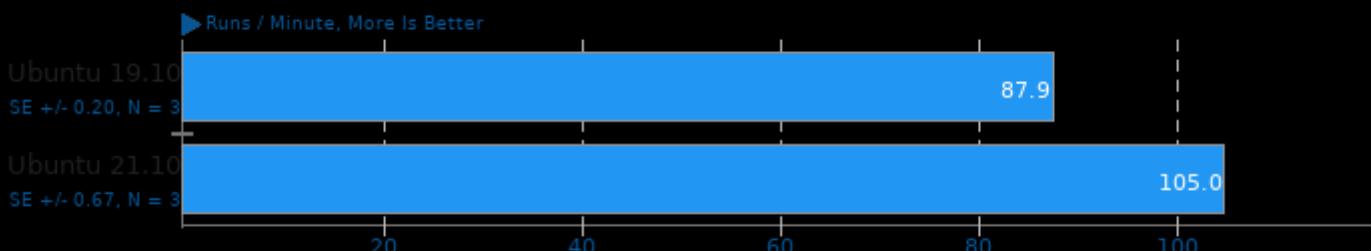
Target: Vulkan GPU - Model: mobilenet



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

Selenium

Benchmark: StyleBench - Browser: Firefox

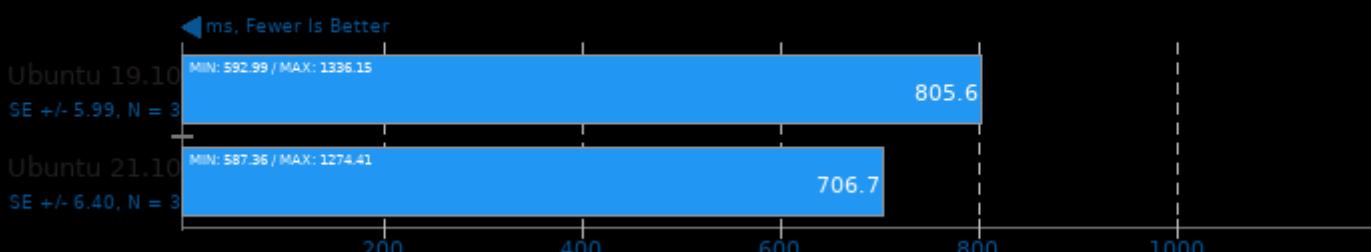


1. Ubuntu 19.10: firefox 69.0.3

2. Ubuntu 21.10: firefox 93.0

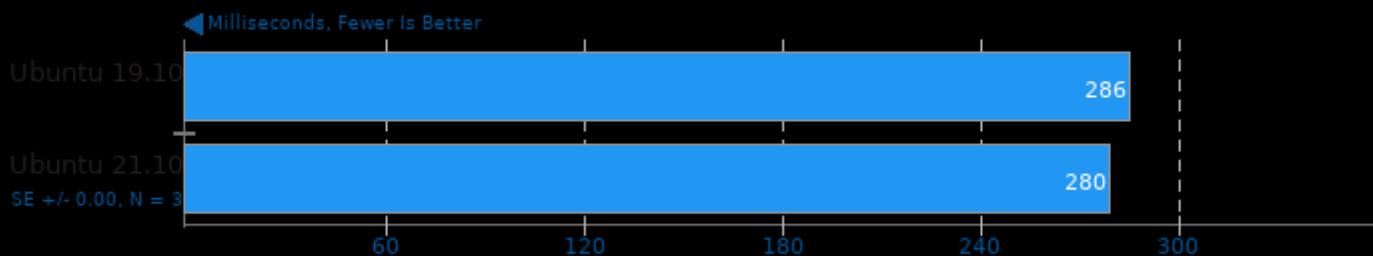
Renaissance 0.12

Test: Scala Dotty



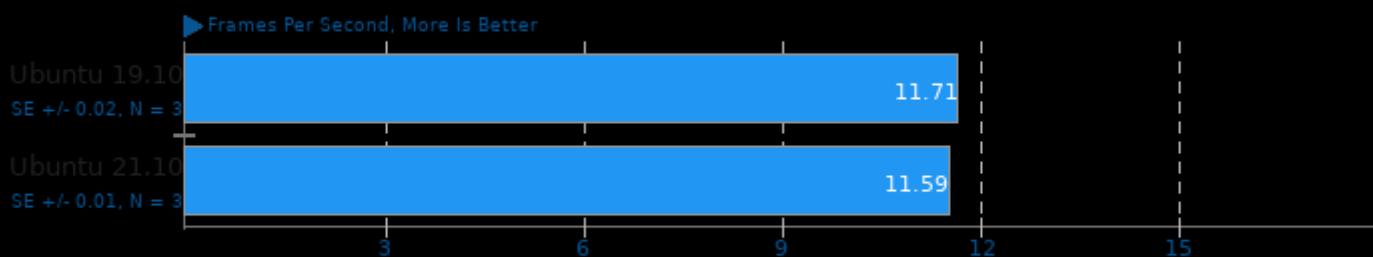
PyPerformance 1.0.0

Benchmark: 2to3



SVT-HEVC 1.5.0

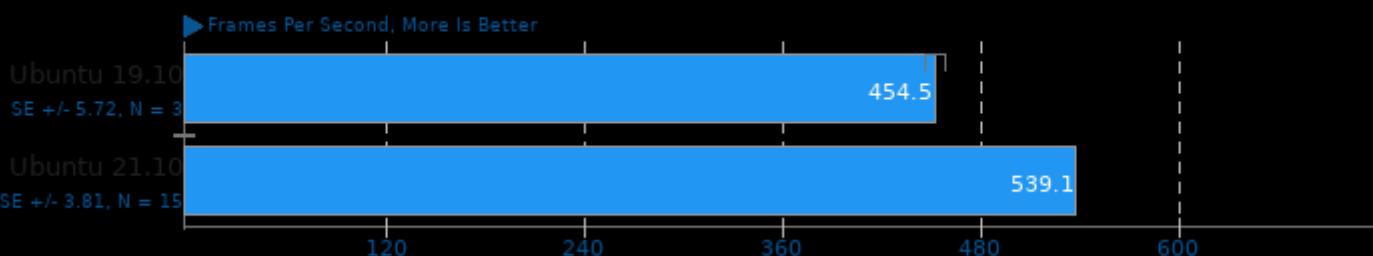
Tuning: 1 - Input: Bosphorus 1080p



1. (CC) gcc options: -fPIE -fPIC -O3 -O2 -pie -rdynamic -lpthread -lrt

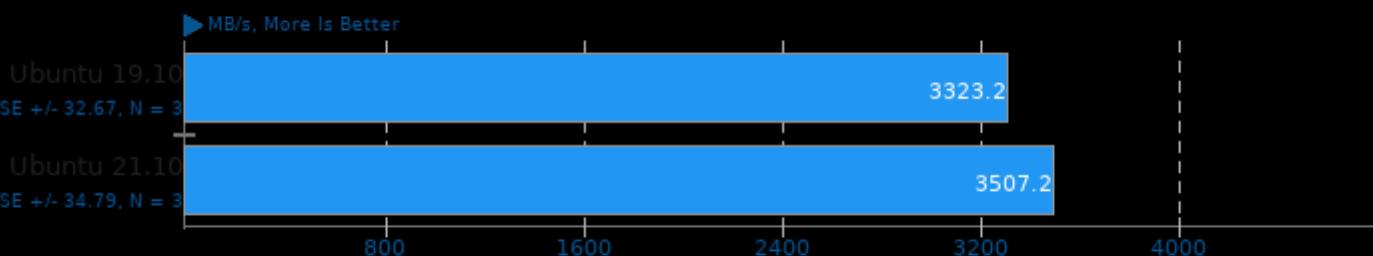
ET: Legacy 2.78

Resolution: 1920 x 1080



Zstd Compression 1.5.0

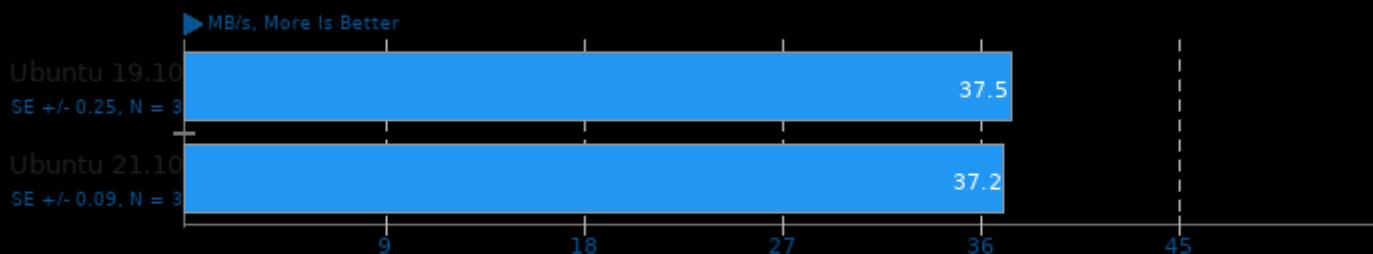
Compression Level: 19 - Decompression Speed



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

Zstd Compression 1.5.0

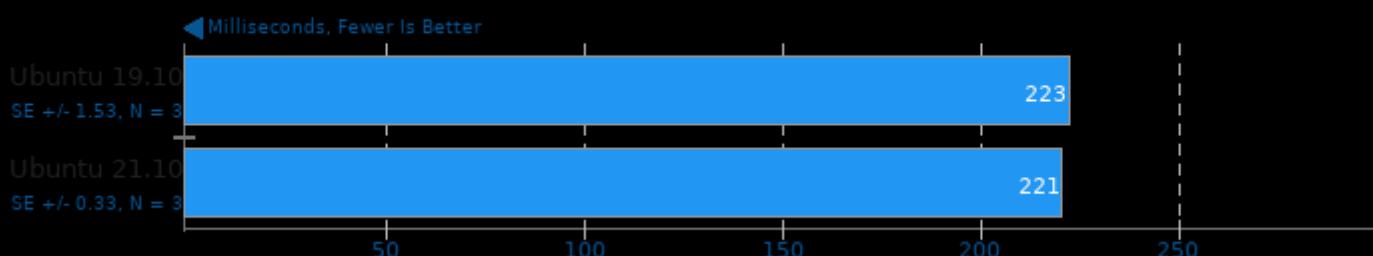
Compression Level: 19 - Compression Speed



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

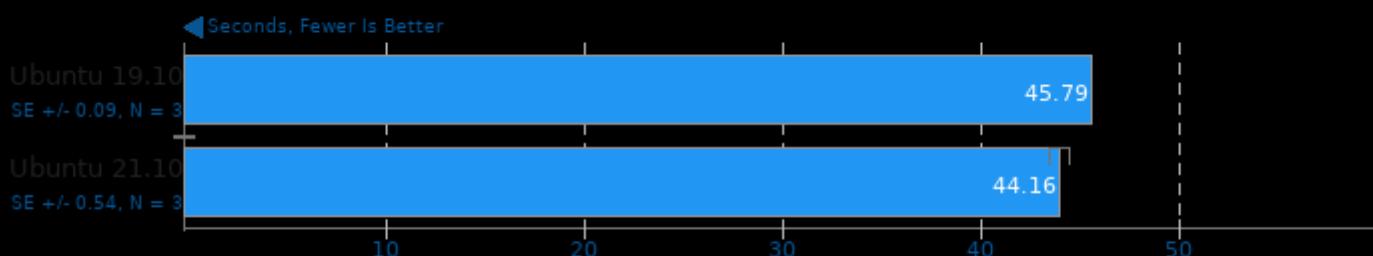
PyPerformance 1.0.0

Benchmark: go



Git

Time To Complete Common Git Commands

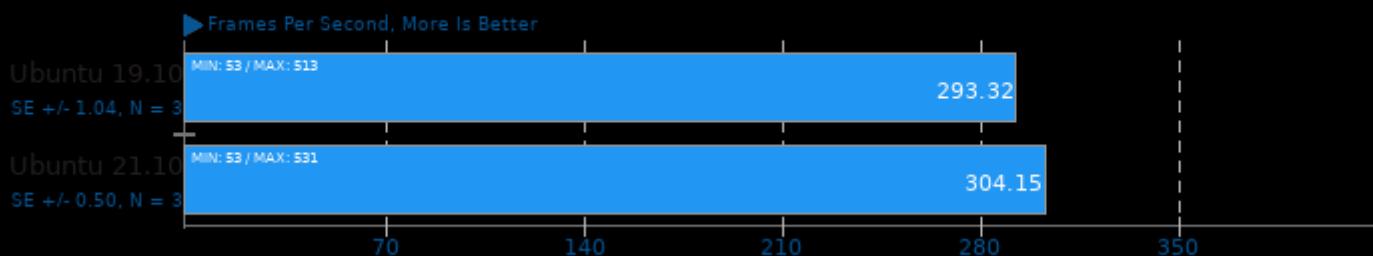


1. Ubuntu 19.10: git version 2.20.1

2. Ubuntu 21.10: git version 2.32.0

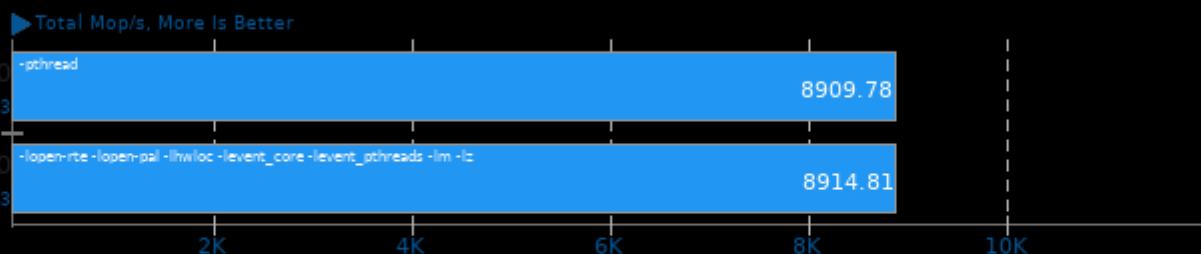
Xonotic 0.8.2

Resolution: 3840 x 2160 - Effects Quality: Ultimate



NAS Parallel Benchmarks 3.4

Test / Class: SP.B



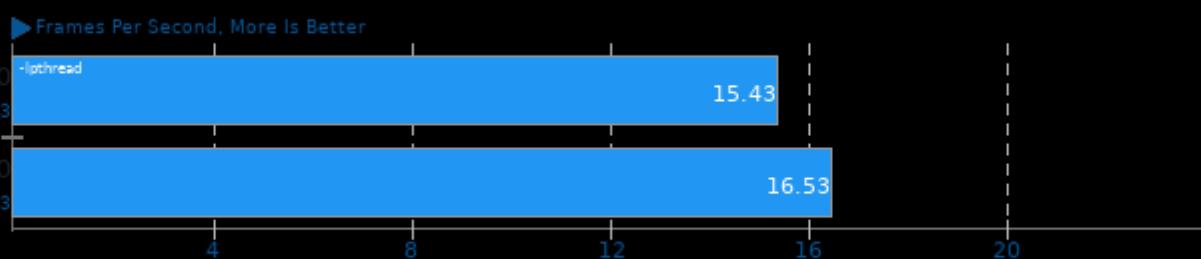
1. (F9X) gfortran options: -O3 -march=native -lmpi_usempif08 -lmpi_mpih -lmpi

2. Ubuntu 19.10: Open MPI 3.1.3

3. Ubuntu 21.10: Open MPI 4.1.0

AOM AV1 3.1

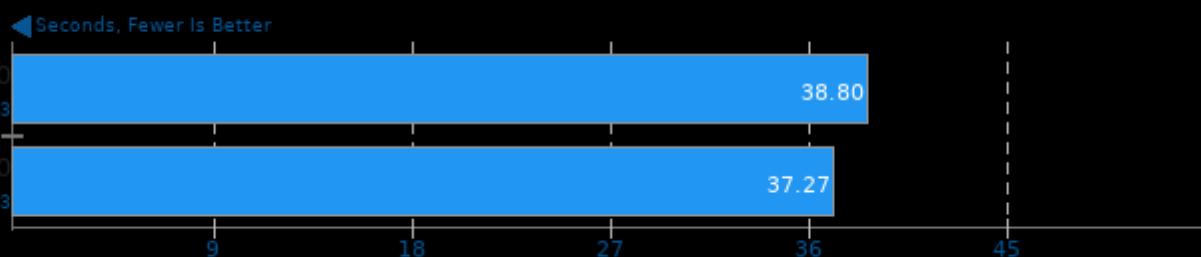
Encoder Mode: Speed 6 Realtime - Input: Bosphorus 4K



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

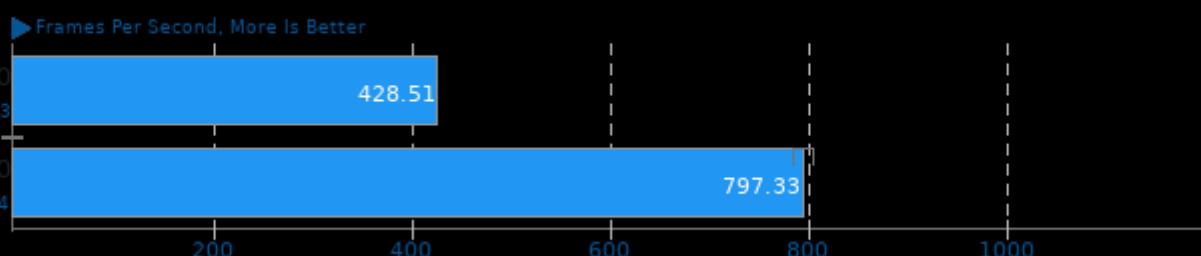
Timed FFmpeg Compilation 4.4

Time To Compile



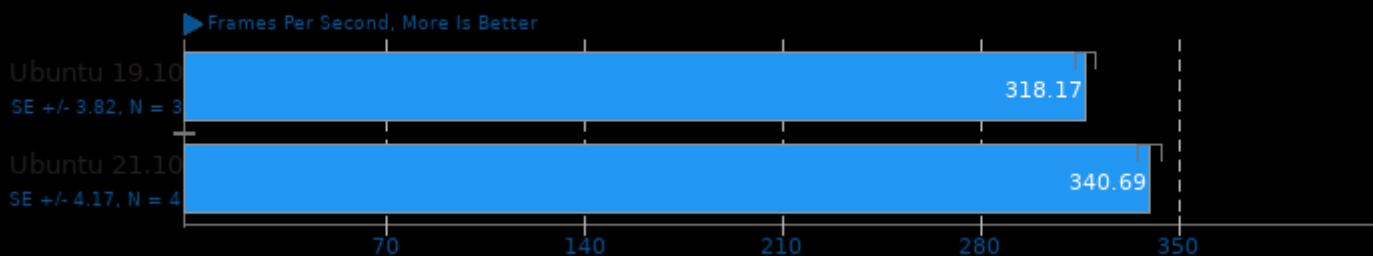
Tesseract 2014-05-12

Resolution: 1920 x 1080



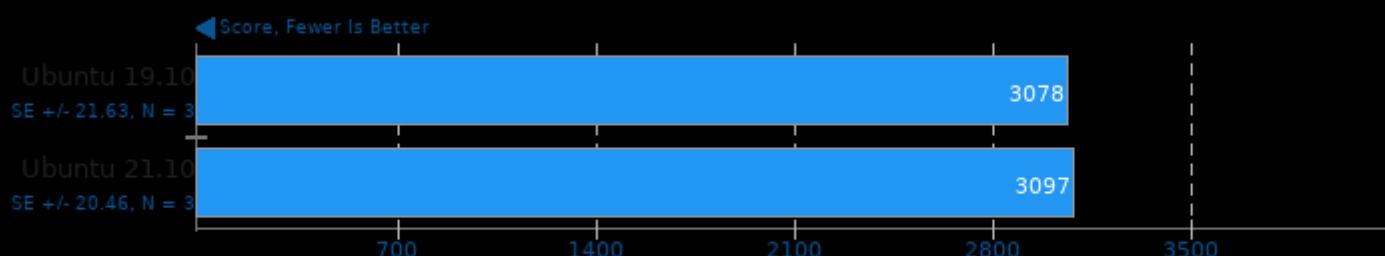
Tesseract 2014-05-12

Resolution: 3840 x 2160



Selenium

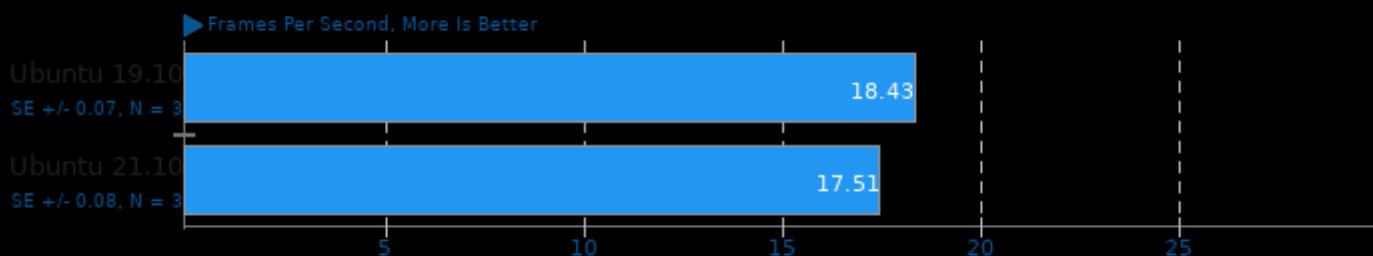
Benchmark: PSPDFKit WASM - Browser: Firefox



1. Ubuntu 19.10: firefox 69.0.3
2. Ubuntu 21.10: firefox 93.0

SVT-AV1 0.8.7

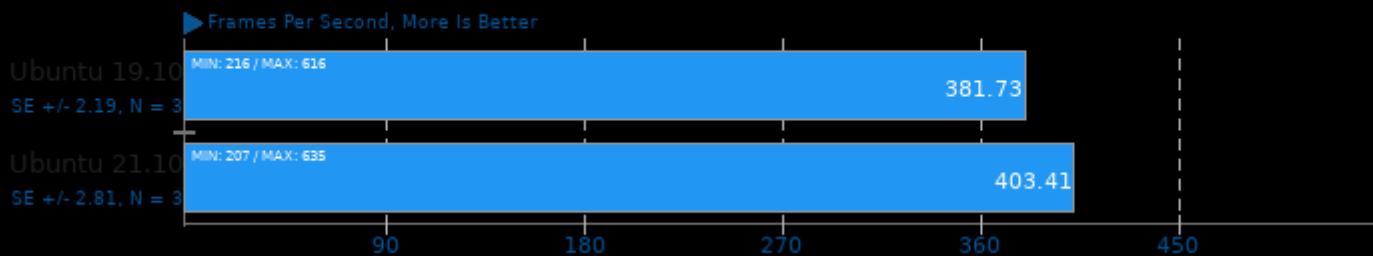
Encoder Mode: Preset 8 - Input: Bosphorus 4K



1. (CXX) g++ options: -mno-avx -mavx2 -mavx512f -mavx512bw -mavx512dq -pie

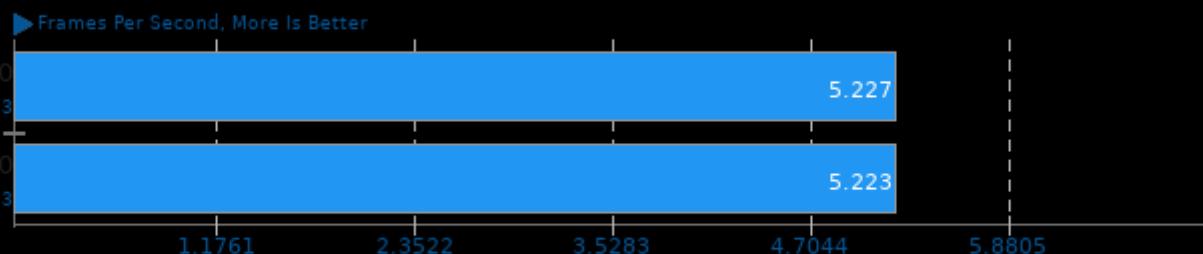
Xonotic 0.8.2

Resolution: 3840 x 2160 - Effects Quality: Ultra



SVT-AV1 0.8.7

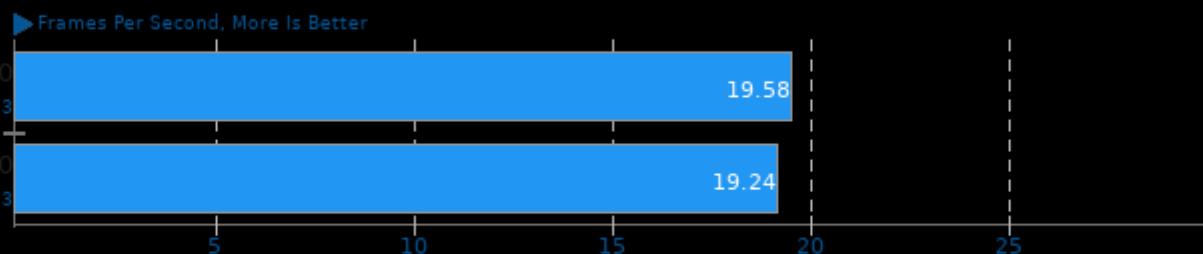
Encoder Mode: Preset 4 - Input: Bosphorus 1080p



1. (CXX) g++ options: -mno-avx -mavx2 -mavx512f -mavx512bw -mavx512dq -pie

x265 3.4

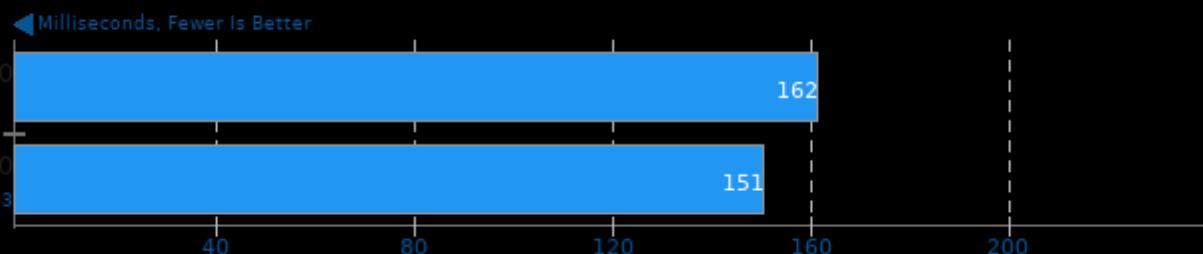
Video Input: Bosphorus 4K



1. (CXX) g++ options: -O3 -rdynamic -lpthread -lrt -ldl -lnuma

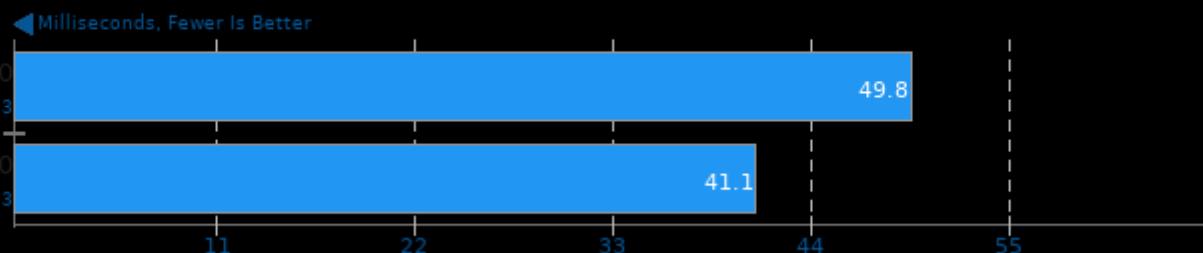
PyPerformance 1.0.0

Benchmark: regex_compile



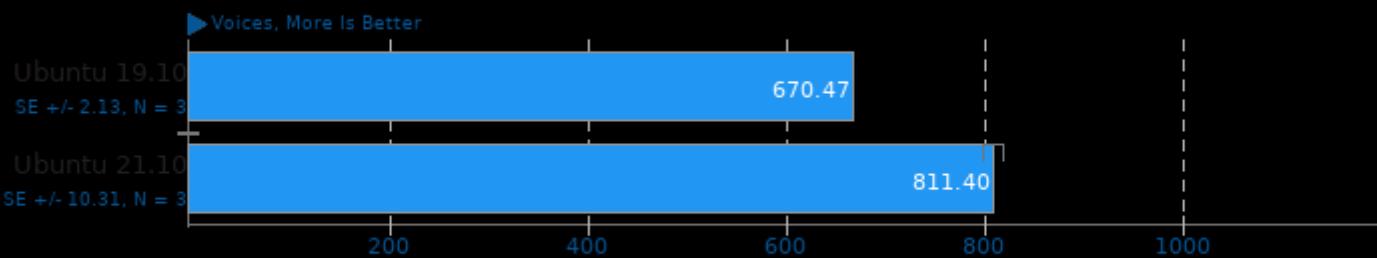
PyPerformance 1.0.0

Benchmark: django_template



Google SynthMark 20201109

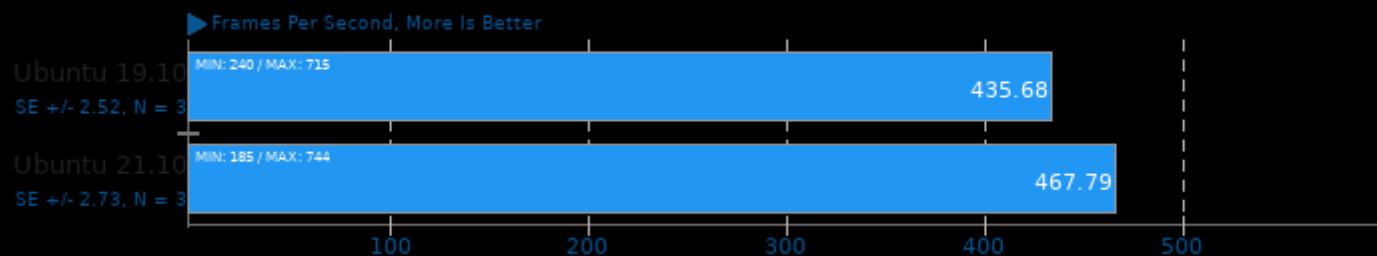
Test: VoiceMark_100



1. (CXX) g++ options: -lm -lpthread -std=c++11 -Ofast

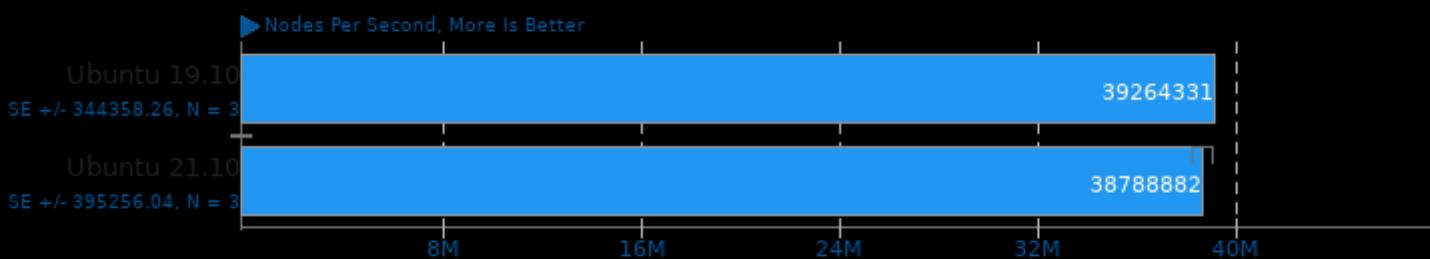
Xonotic 0.8.2

Resolution: 3840 x 2160 - Effects Quality: High



Stockfish 13

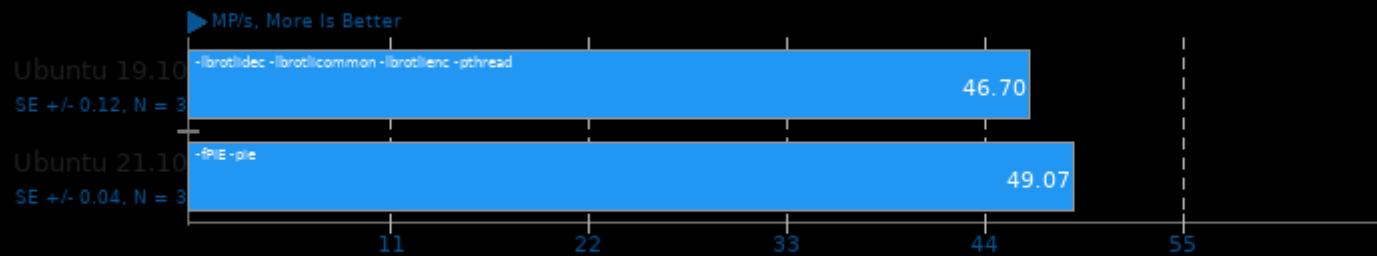
Total Time



1. (CXX) g++ options: -lgcov -m64 -lpthread -fno-exceptions -std=c++17 -fprofile-use -fno-peel-loops -fno-tracer -pedantic -O3 -msse -msse3 -mpopcnt -

JPEG XL libjxl 0.5

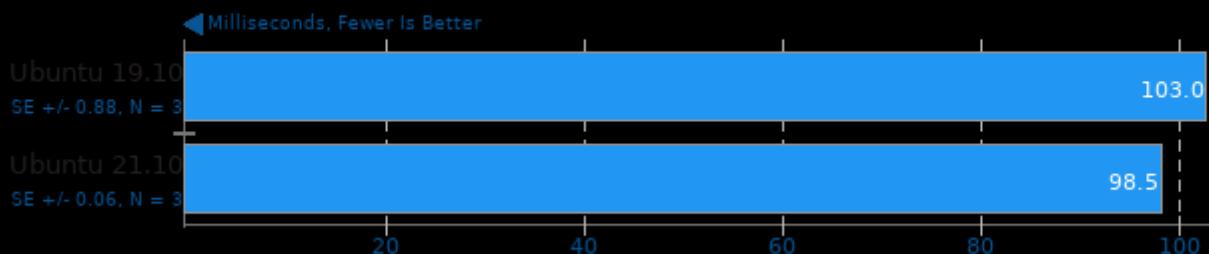
Input: PNG - Encode Speed: 5



1. (CXX) g++ options: -funwind-tables -O3 -O2

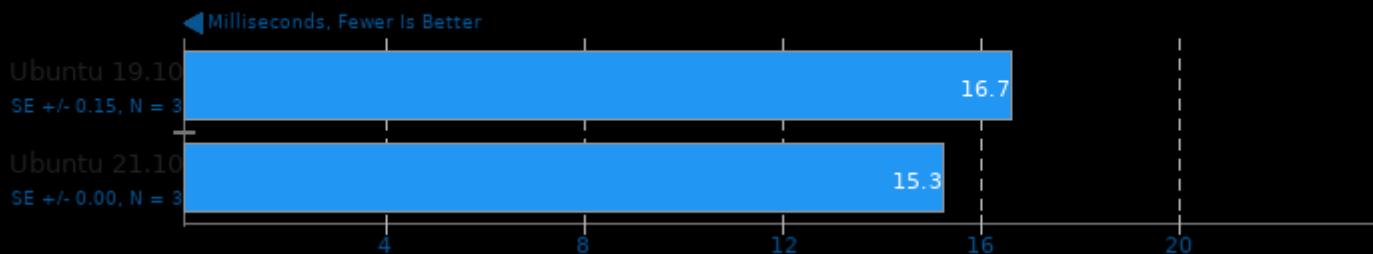
PyPerformance 1.0.0

Benchmark: chaos



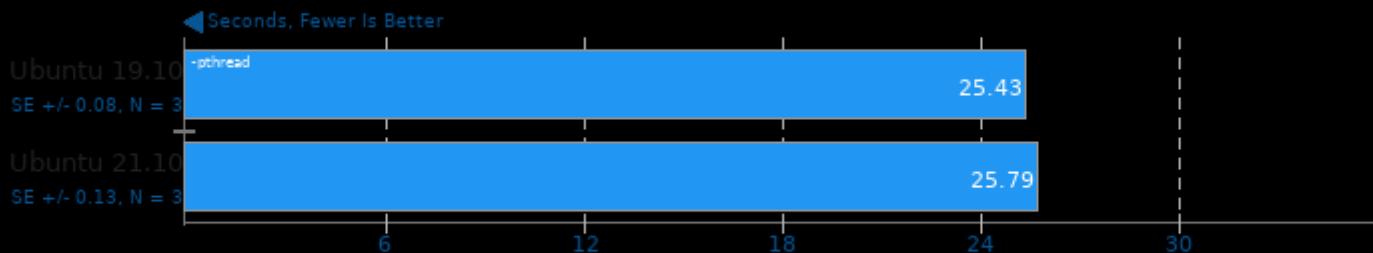
PyPerformance 1.0.0

Benchmark: pathlib



XZ Compression 5.2.4

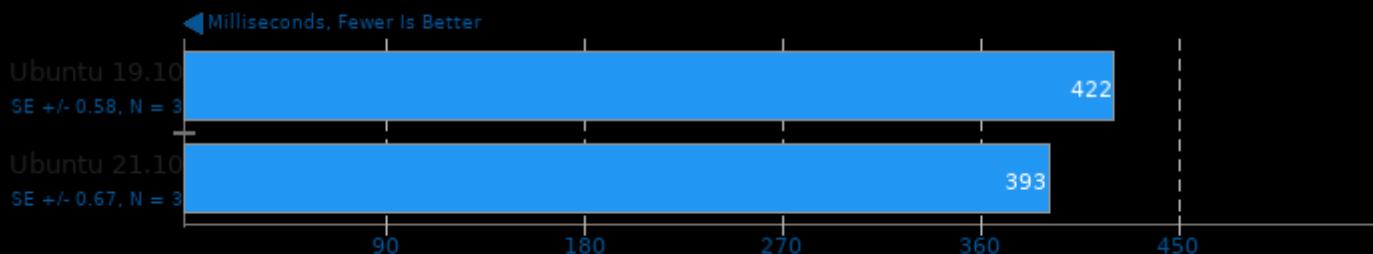
Compressing ubuntu-16.04.3-server-i386.img, Compression Level 9



1. (CC) gcc options: -fvisibility=hidden -O2

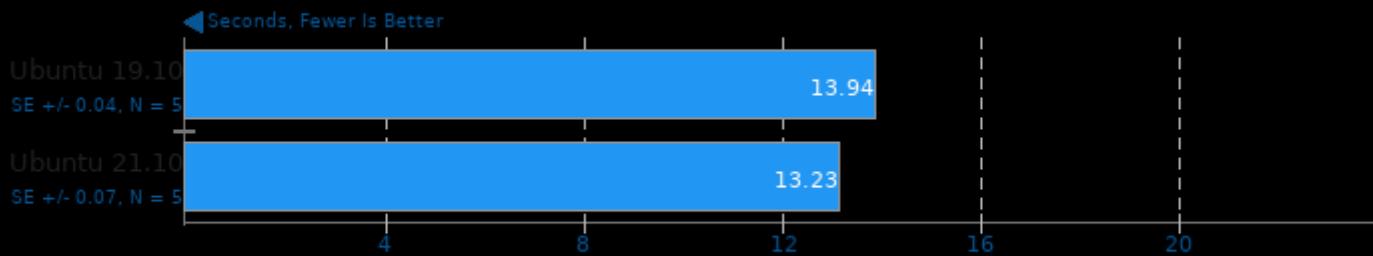
PyPerformance 1.0.0

Benchmark: pickle_pure_python



FLAC Audio Encoding 1.3.3

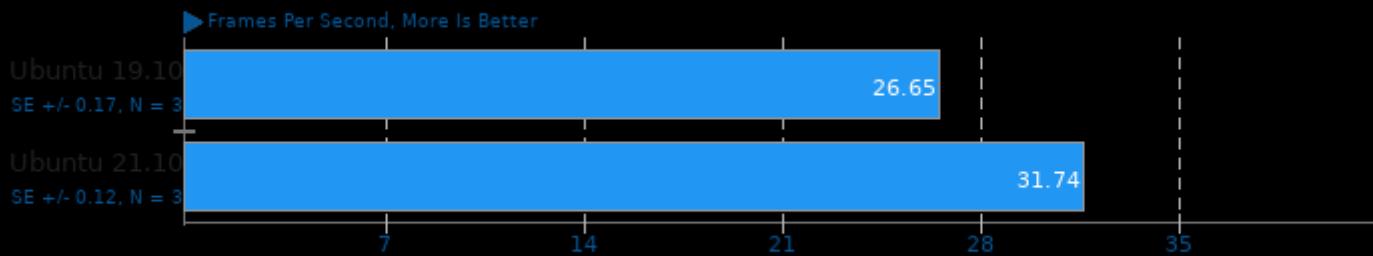
WAV To FLAC



1. (CXX) g++ options: -fvisibility=hidden -fno-rtti

VP9 libvpx Encoding 1.10.0

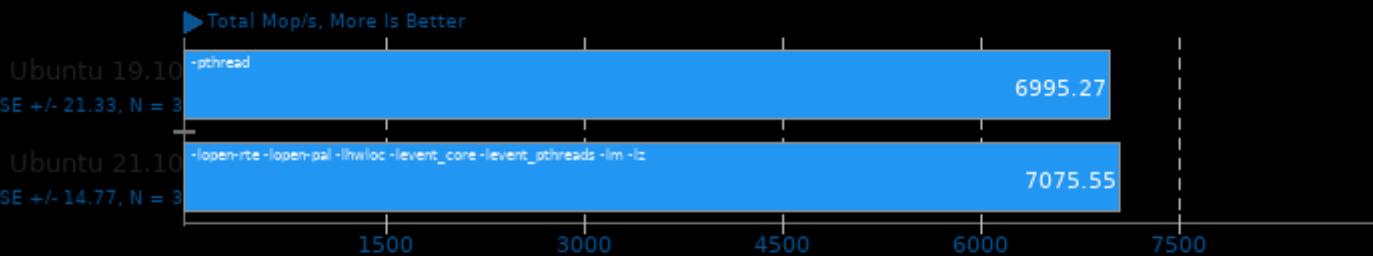
Speed: Speed 5 - Input: Bosphorus 1080p



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

NAS Parallel Benchmarks 3.4

Test / Class: CG.C



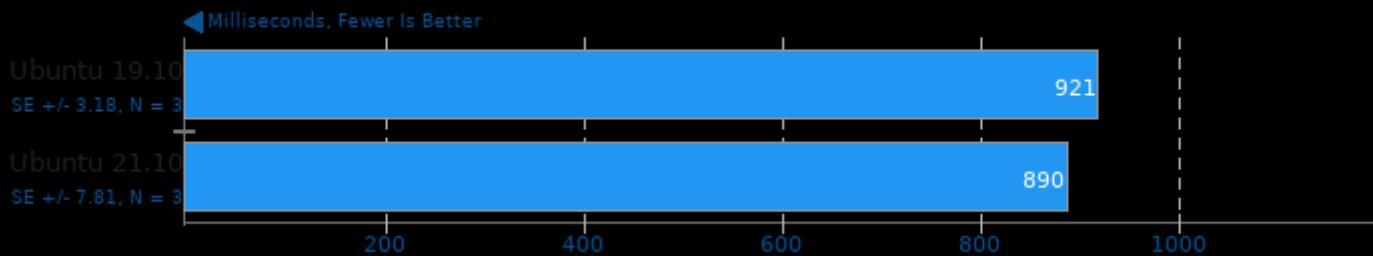
1. (F9X) gfortran options: -O3 -march=native -lmpic_usempif08 -lmpic_mpifh -lmpic

2. Ubuntu 19.10: Open MPI 3.1.3

3. Ubuntu 21.10: Open MPI 4.1.0

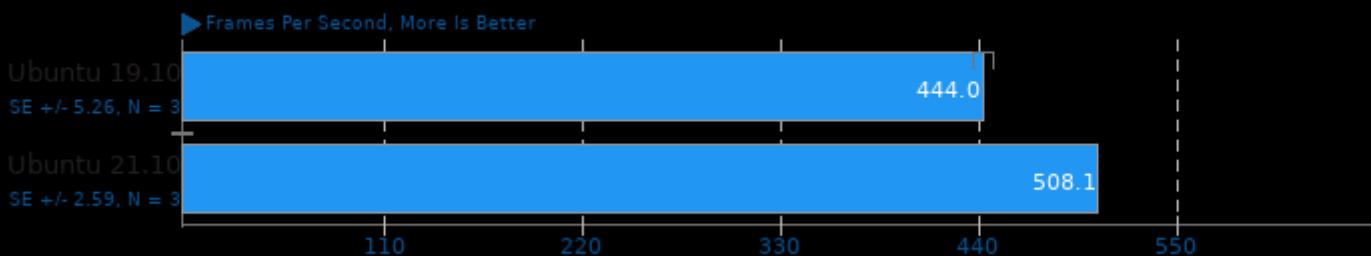
PyBench 2018-02-16

Total For Average Test Times



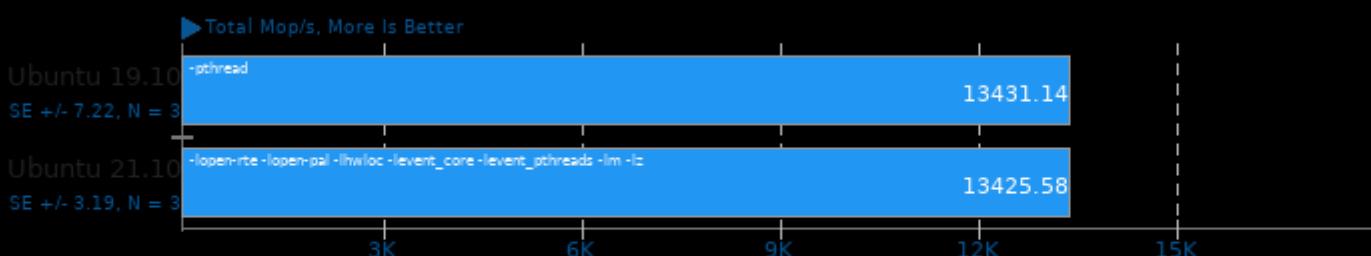
ET: Legacy 2.78

Resolution: 3840 x 2160



NAS Parallel Benchmarks 3.4

Test / Class: MG.C



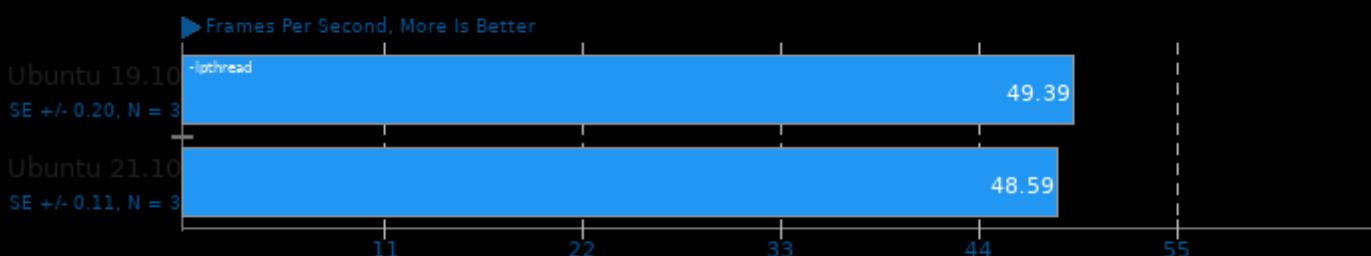
1. (F9X) gfortran options: -O3 -march=native -fmpi_usempif08 -fmpi_mpifh -fmpi

2. Ubuntu 19.10: Open MPI 3.1.3

3. Ubuntu 21.10: Open MPI 4.1.0

AOM AV1 3.1

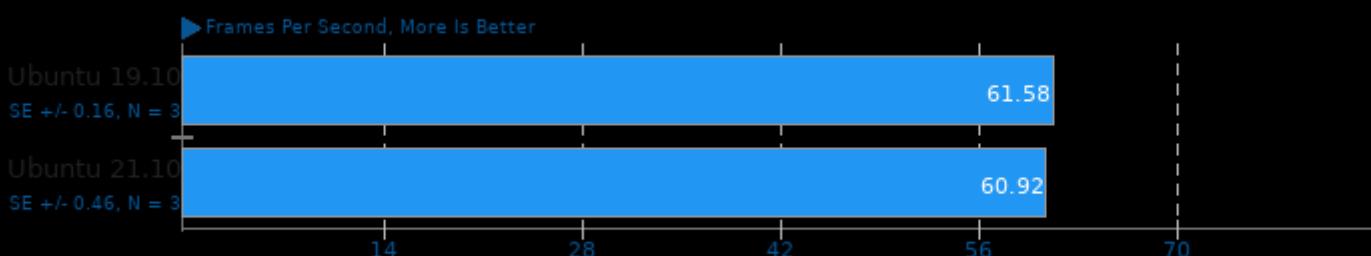
Encoder Mode: Speed 9 Realtime - Input: Bosphorus 4K



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

x265 3.4

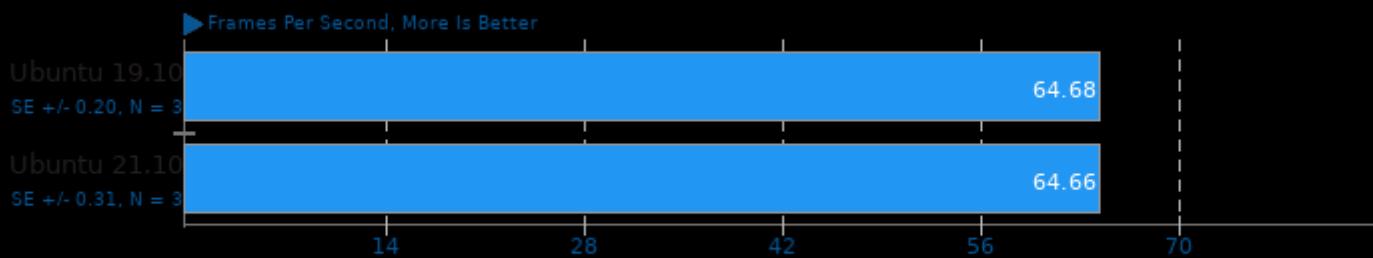
Video Input: Bosphorus 1080p



1. (CXX) g++ options: -O3 -rdynamic -lopt -lrt -ldl -lnuma

SVT-AV1 0.8.7

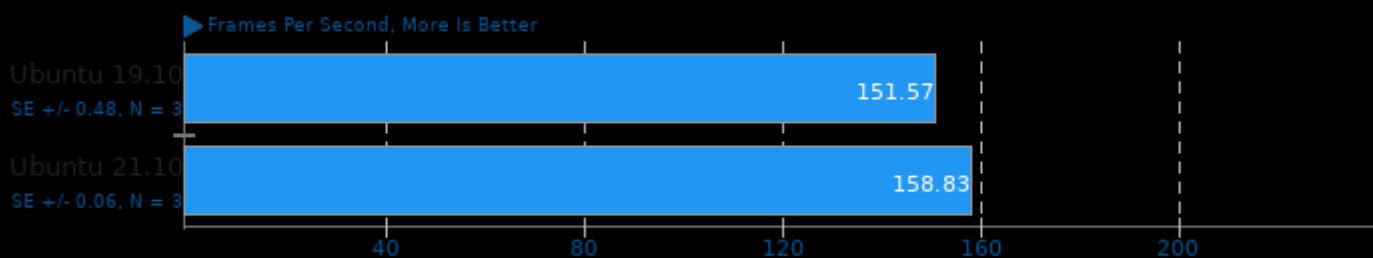
Encoder Mode: Preset 8 - Input: Bosphorus 1080p



1. (CXX) g++ options: -mno-avx -mavx2 -mavx512f -mavx512bw -mavx512dq -pie

SVT-HEVC 1.5.0

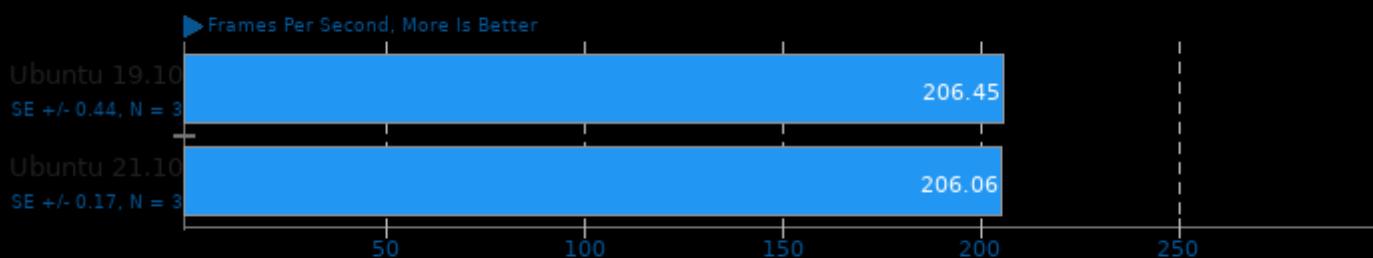
Tuning: 7 - Input: Bosphorus 1080p



1. (CC) gcc options: -fPIE -fPIC -O3 -O2 -pie -rdynamic -lpthread -lrt

SVT-VP9 0.3

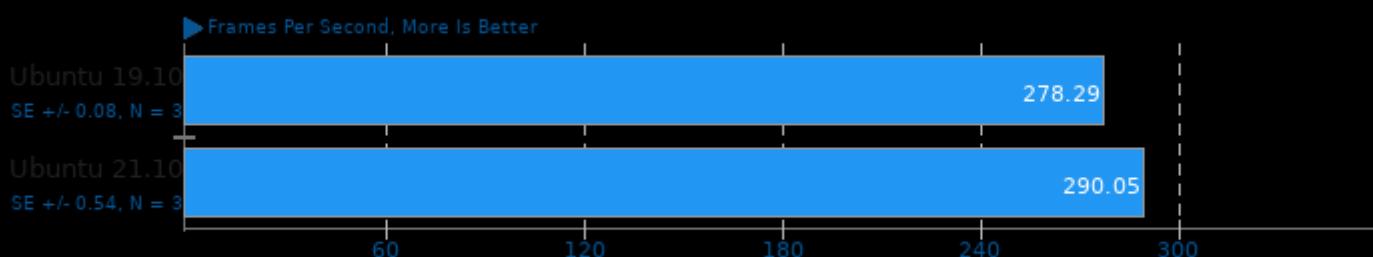
Tuning: PSNR/SSIM Optimized - Input: Bosphorus 1080p



1. (CC) gcc options: -O3 -fcommon -fPIE -fPIC -fvisibility=hidden -pie -rdynamic -lpthread -lrt -lm

SVT-HEVC 1.5.0

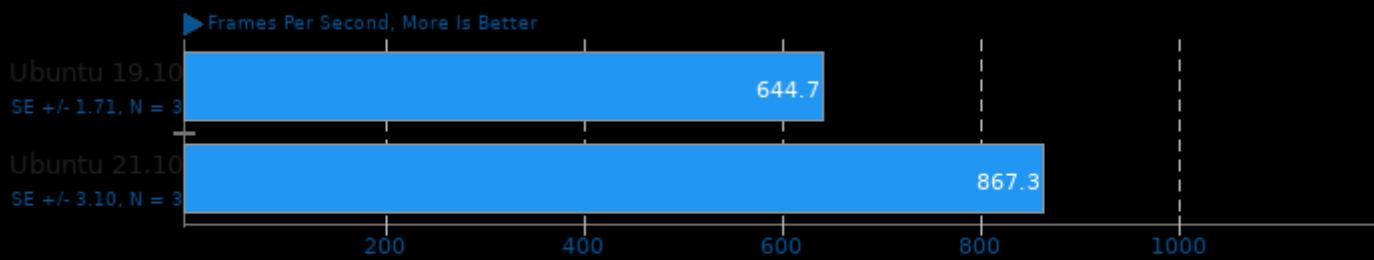
Tuning: 10 - Input: Bosphorus 1080p



1. (CC) gcc options: -fPIE -fPIC -O3 -O2 -pie -rdynamic -lpthread -lrt

yquake2 8.0

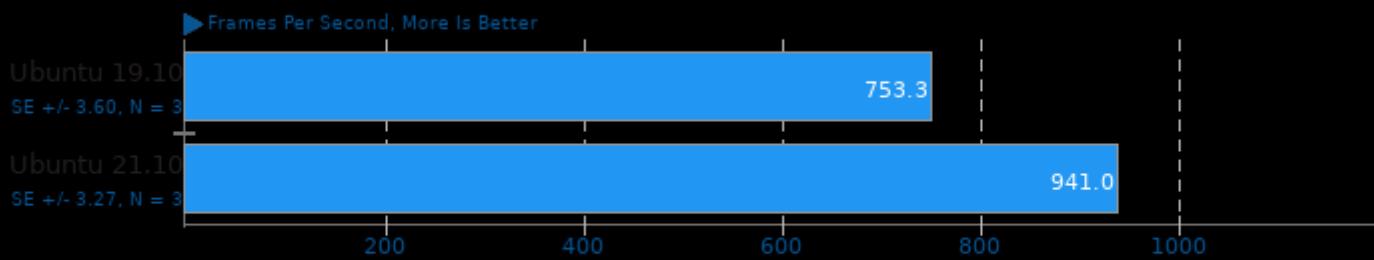
Renderer: OpenGL 1.x - Resolution: 3840 x 2160



1. (CC) gcc options: -lm -ldl -rdynamic -shared -fSDL2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mf

yquake2 8.0

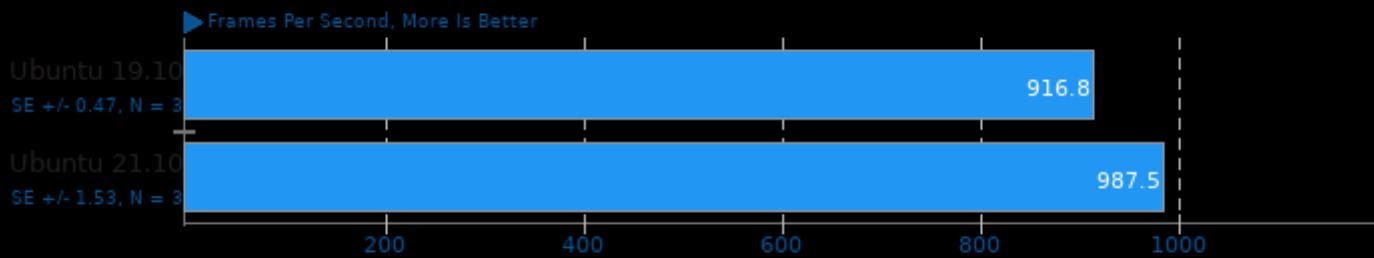
Renderer: OpenGL 1.x - Resolution: 1920 x 1080



1. (CC) gcc options: -lm -ldl -rdynamic -shared -fSDL2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mf

yquake2 8.0

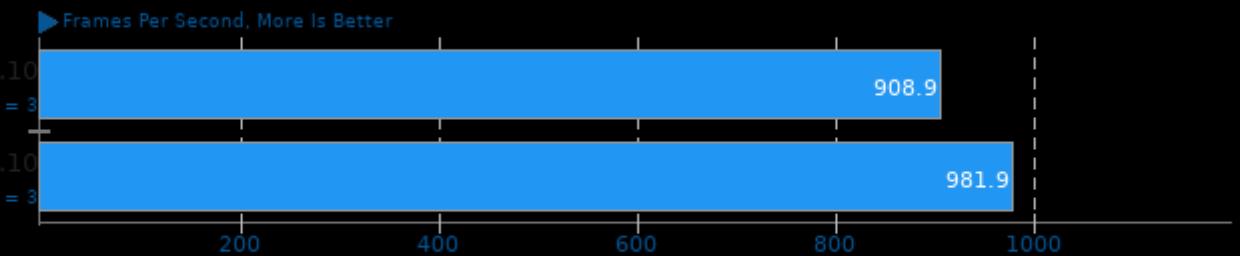
Renderer: OpenGL 3.x - Resolution: 3840 x 2160



1. (CC) gcc options: -lm -ldl -rdynamic -shared -fSDL2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mf

yquake2 8.0

Renderer: OpenGL 3.x - Resolution: 1920 x 1080



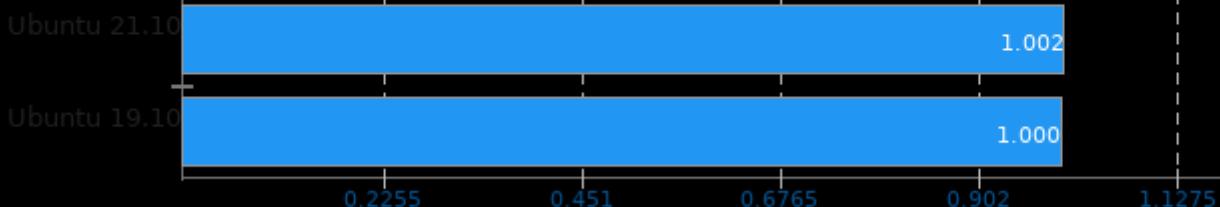
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfpmath=sse

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

Geometric Mean Of AV1 Tests

Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

► Relative Performance, More Is Better



Geometric mean based upon tests: pts/aom-av1 and pts/svt-av1

Geometric Mean Of Web Browsers Tests

Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

► Relative Performance, More Is Better

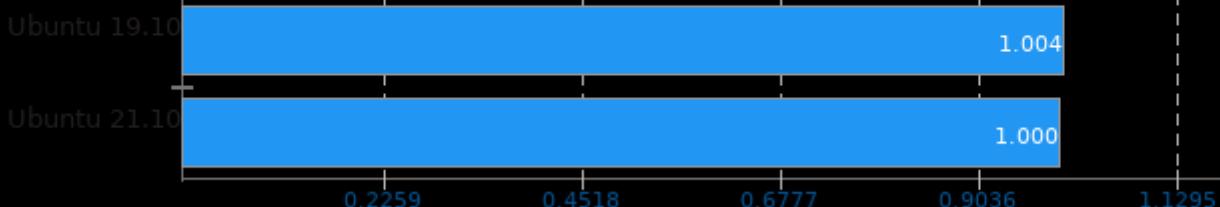


Geometric mean based upon tests: system/selenium

Geometric Mean Of Chess Test Suite

Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

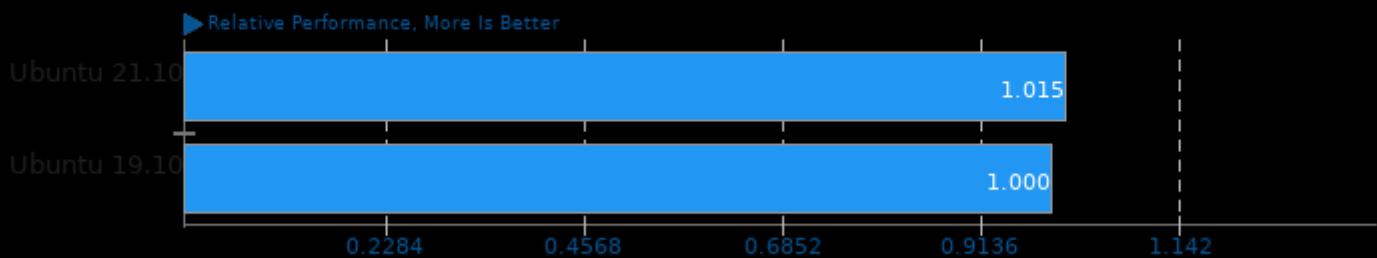
► Relative Performance, More Is Better



Geometric mean based upon tests: pts/stockfish and pts/asmfish

Geometric Mean Of C/C++ Compiler Tests

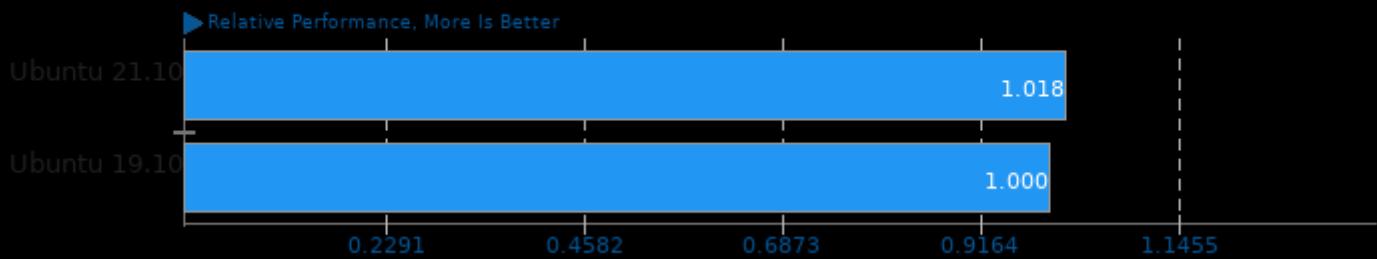
Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10



Geometric mean based upon tests: pts/vpxenc, pts/stockfish, pts/encode-flac, pts/x265, pts/compress-xz, pts/compress-zstd, pts/openssl, pts/aom-av1, pts/svt-av1, pts/svt-vp9, pts/gromacs, pts/build-ffmpeg and pts/tachyon

Geometric Mean Of Compression Tests

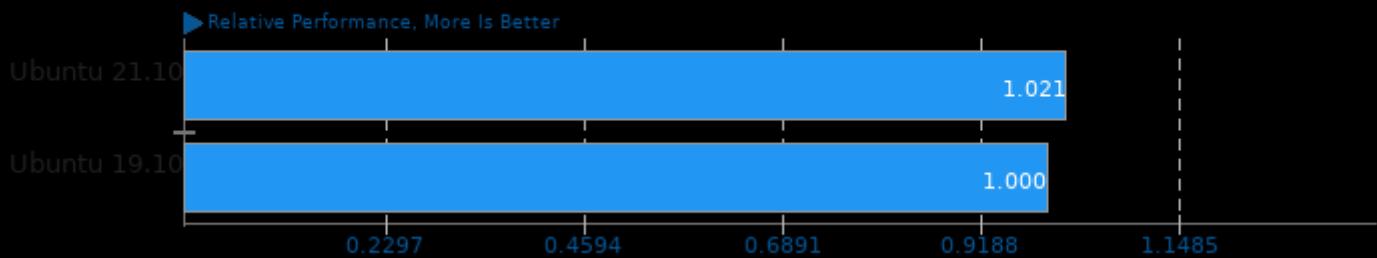
Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10



Geometric mean based upon tests: pts/compress-zstd, pts/compress-lz4 and pts/compress-xz

Geometric Mean Of Creator Workloads Tests

Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

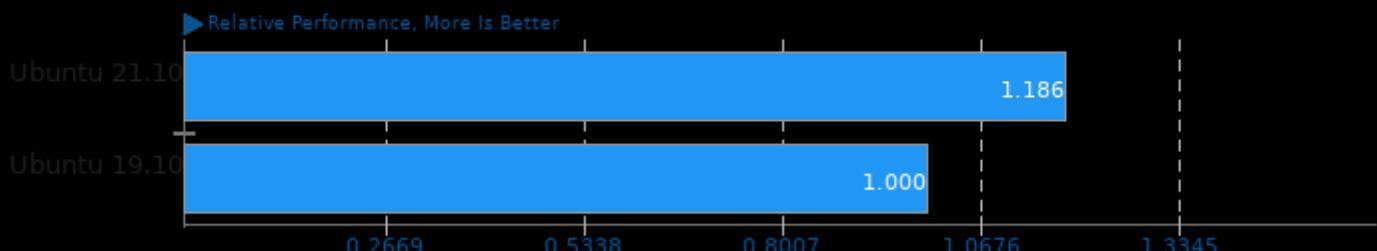


Geometric mean based upon tests: pts/tachyon, pts/blender, pts/appleseed, pts/v-ray, pts/indigobench, pts/svt-vp9, pts/svt-hevc, pts/x265, pts/vpxenc, pts/aom-av1, pts/svt-av1, pts/encode-flac, pts/jpegxl, pts/synthmark and pts/brl-cad

AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

Geometric Mean Of Desktop Graphics Tests

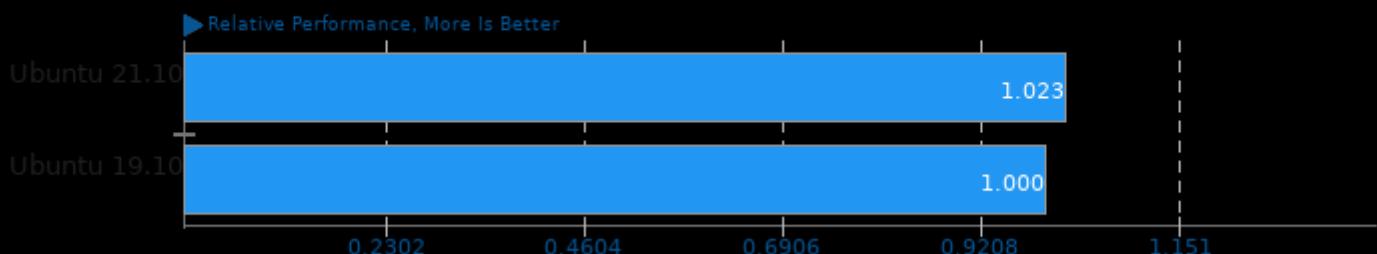
Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10



Geometric mean based upon tests: pts/xonotic and pts/tesseract

Geometric Mean Of Encoding Tests

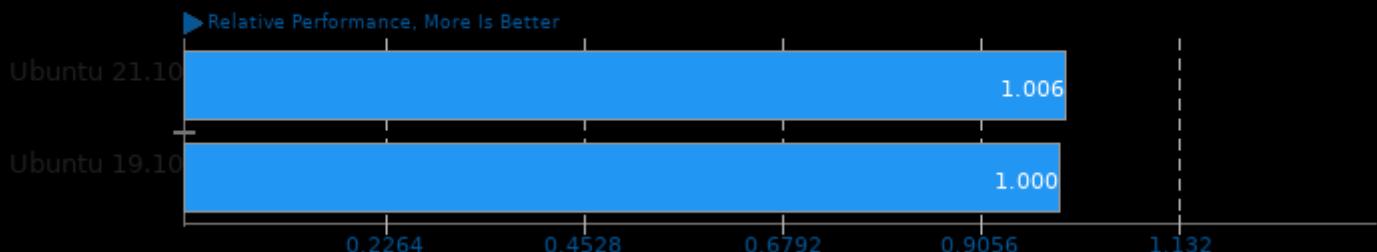
Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10



Geometric mean based upon tests: pts/encode-flac, pts/svt-vp9, pts/svt-hevc, pts/x265, pts/vpxenc, pts/aom-av1 and pts/svt-av1

Geometric Mean Of Fortran Tests

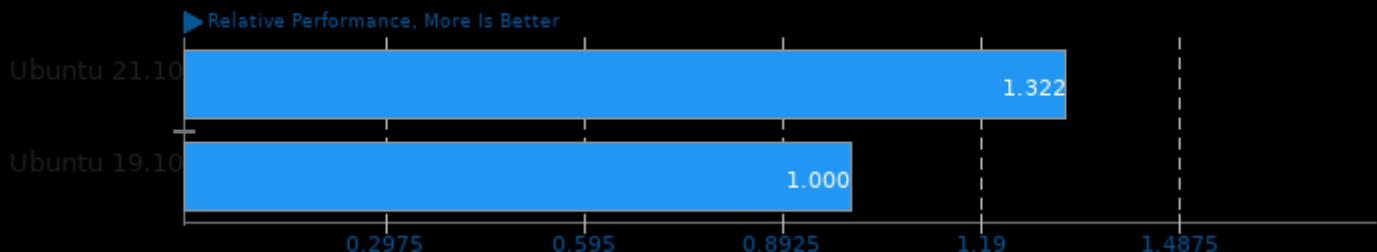
Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10



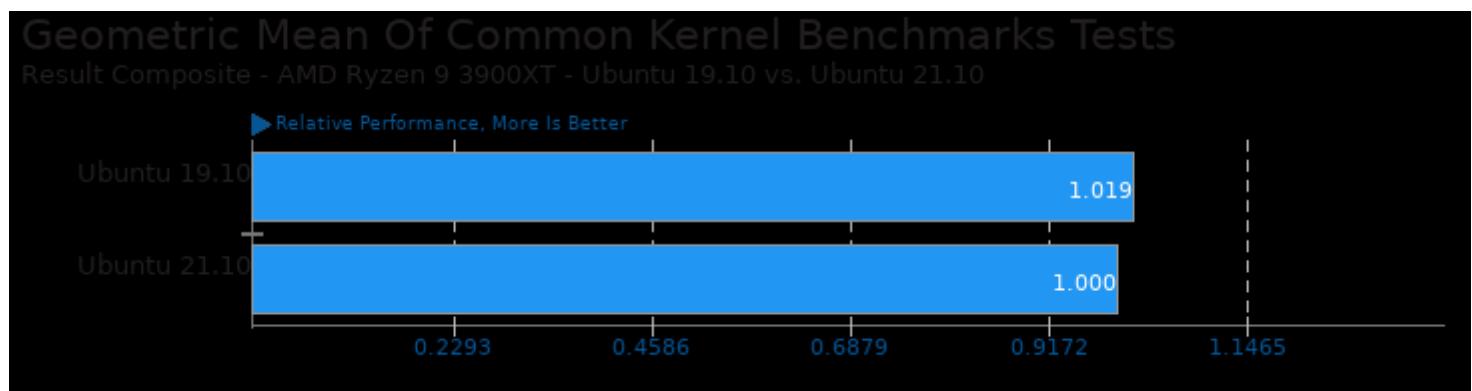
Geometric mean based upon tests: pts/npb and pts/cloverleaf

Geometric Mean Of HPC - High Performance Computing Tests

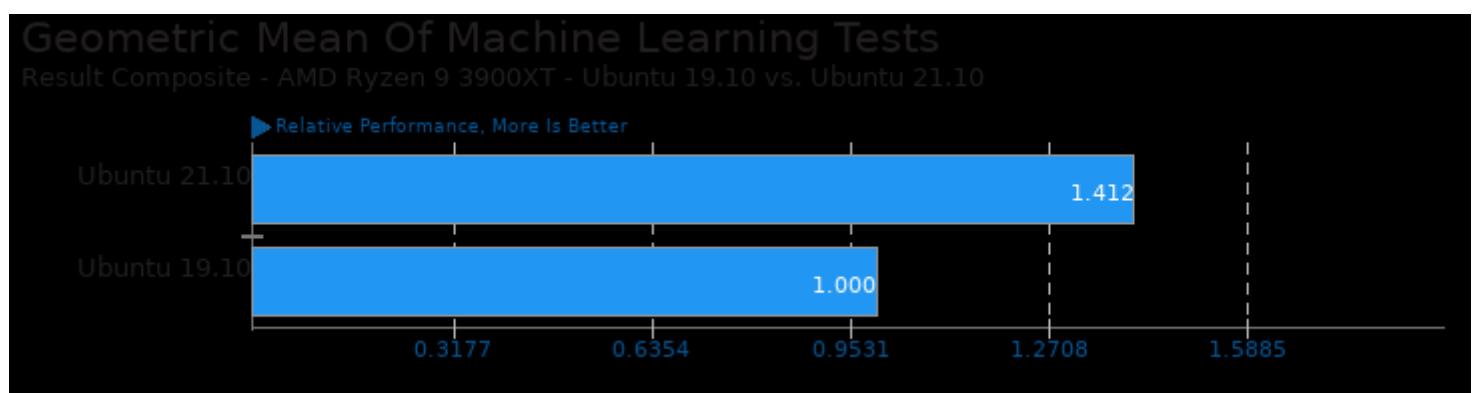
Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10



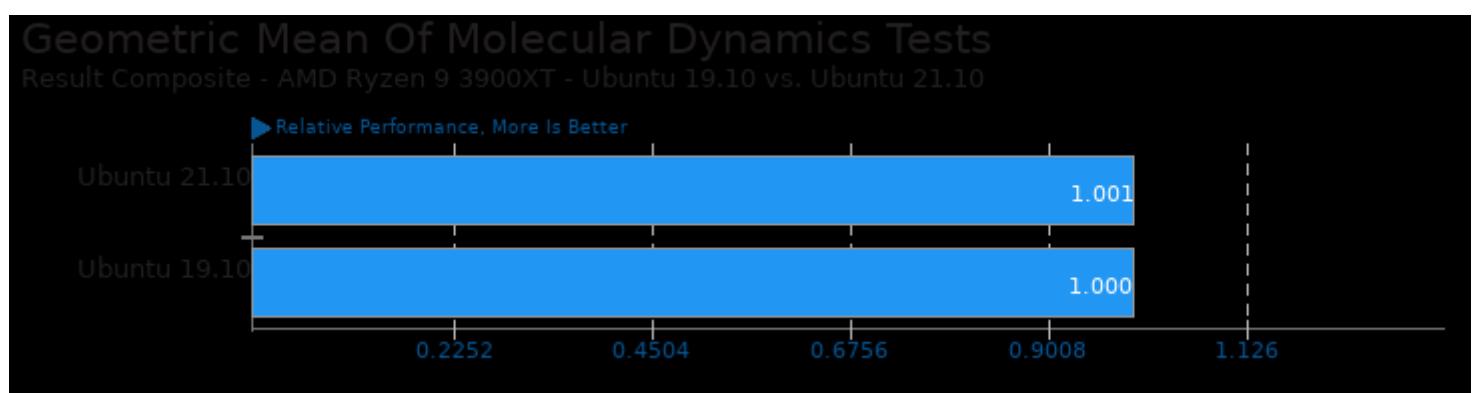
Geometric mean based upon tests: pts/npb, pts/mt-dgemm, pts/namd, pts/gromacs, pts/cloverleaf, pts/mnn and pts/ncnn



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



Geometric mean based upon tests: pts/mnn and pts/ncnn



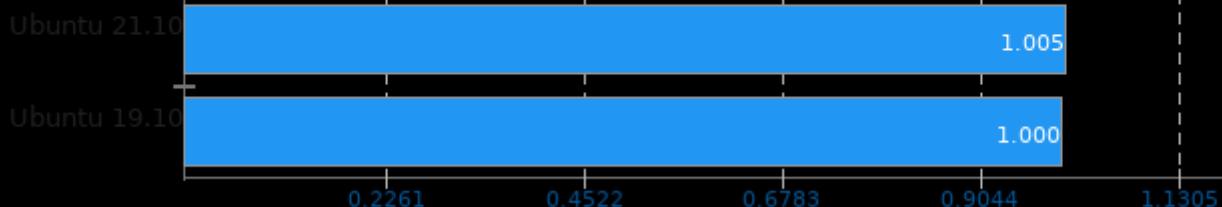
Geometric mean based upon tests: pts/namd, pts/gromacs and pts/cloverleaf

AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

Geometric Mean Of MPI Benchmarks Tests

Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

► Relative Performance, More Is Better

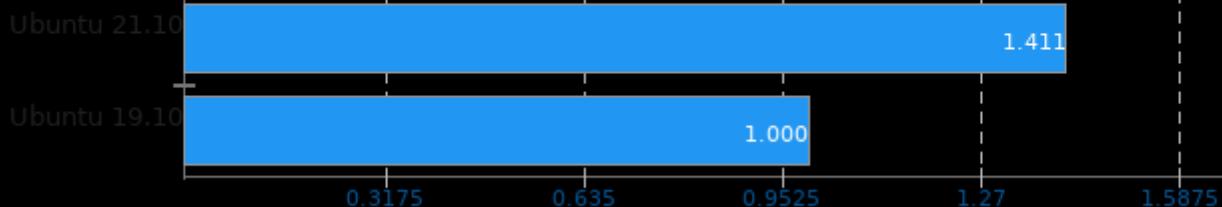


Geometric mean based upon tests: pts/gromacs and pts/npb

Geometric Mean Of NVIDIA GPU Compute Tests

Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

► Relative Performance, More Is Better

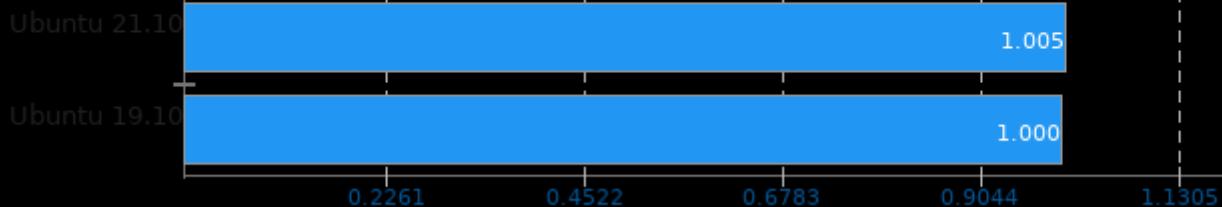


Geometric mean based upon tests: pts/gromacs, pts/indigobench, pts/v-ray, pts/blender and pts/ncnn

Geometric Mean Of OpenMPI Tests

Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

► Relative Performance, More Is Better

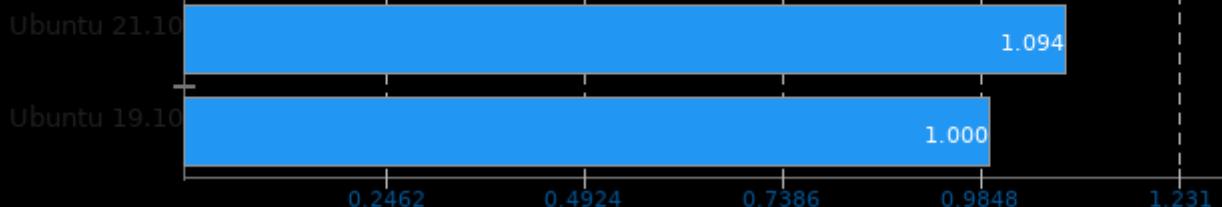


Geometric mean based upon tests: pts/npb, pts/gromacs and pts/cloverleaf

Geometric Mean Of Programmer / Developer System Benchmarks Tests

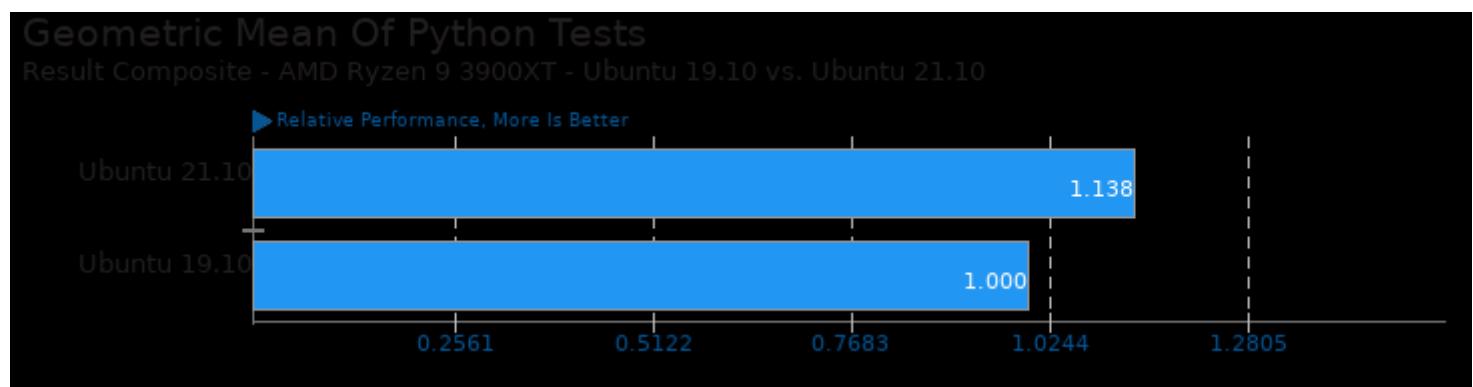
Result Composite - AMD Ryzen 9 3900XT - Ubuntu 19.10 vs. Ubuntu 21.10

► Relative Performance, More Is Better

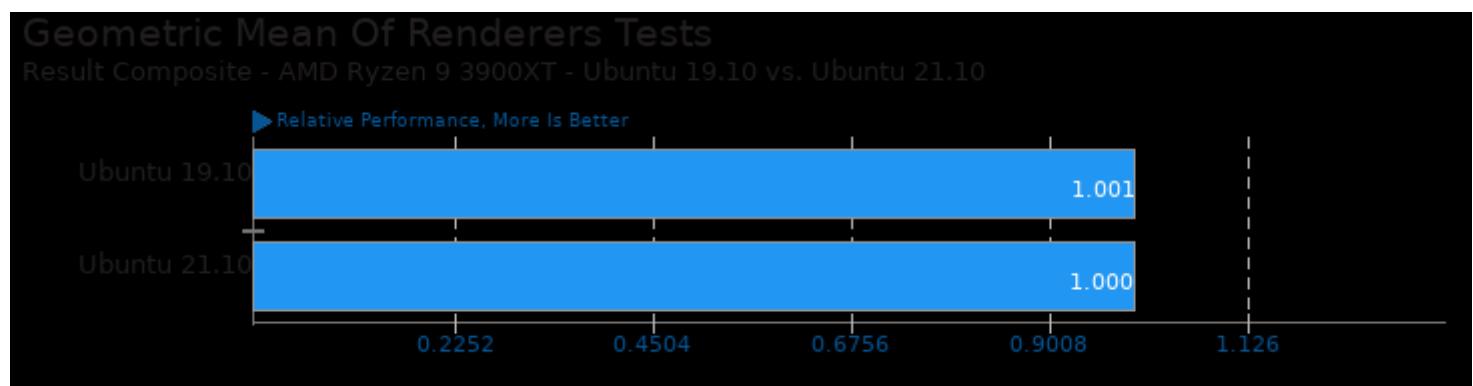


Geometric mean based upon tests: pts/git, pts/compress-zstd, pts/pyperformance, pts/pybench, pts/build-ffmpeg and

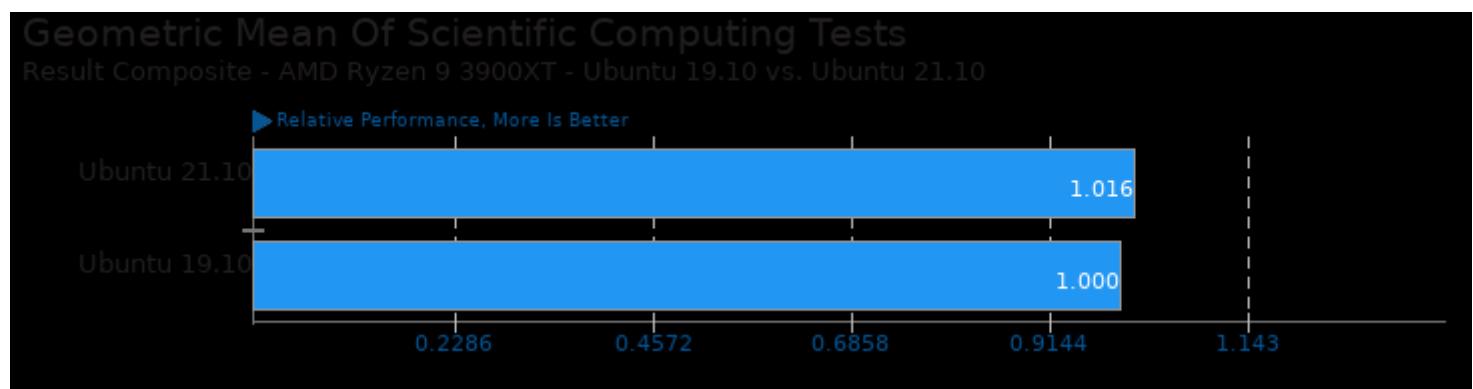
pts/mt-dgemm



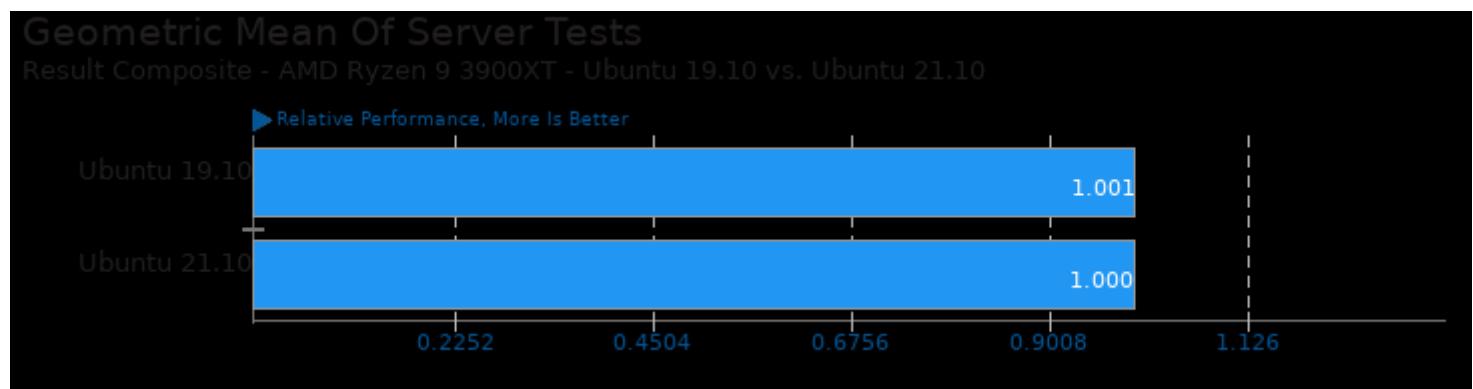
Geometric mean based upon tests: pts/pybench and pts/pyperformance



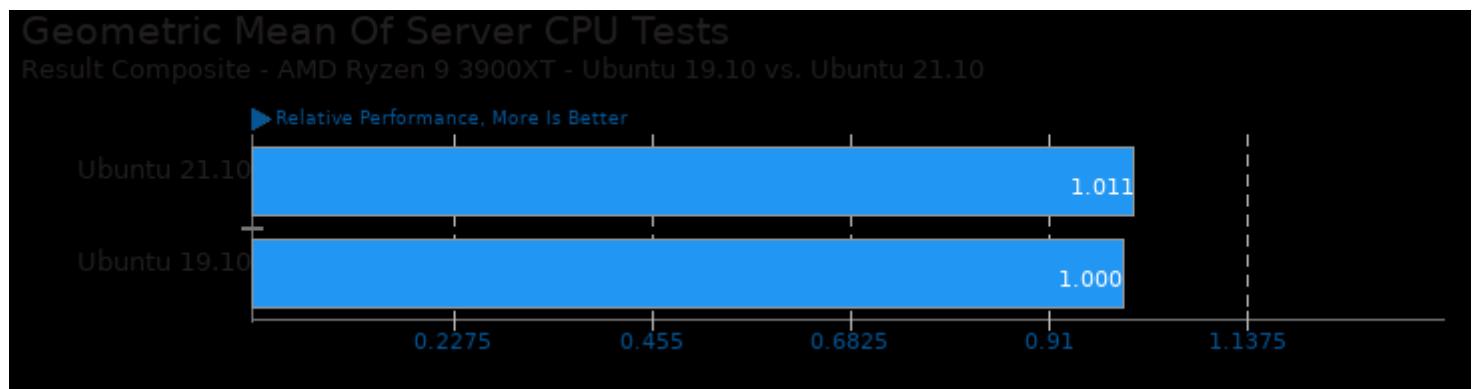
Geometric mean based upon tests: pts/tachyon, pts/blender, pts/appleseed, pts/v-ray and pts/indigobench



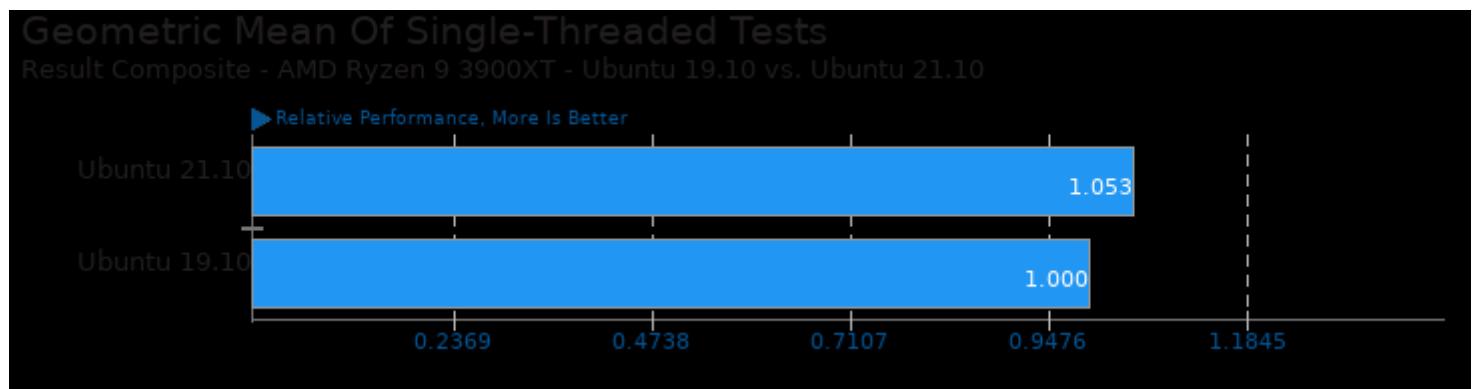
Geometric mean based upon tests: pts/mt-dgemm, pts/namd, pts/gromacs and pts/cloverleaf



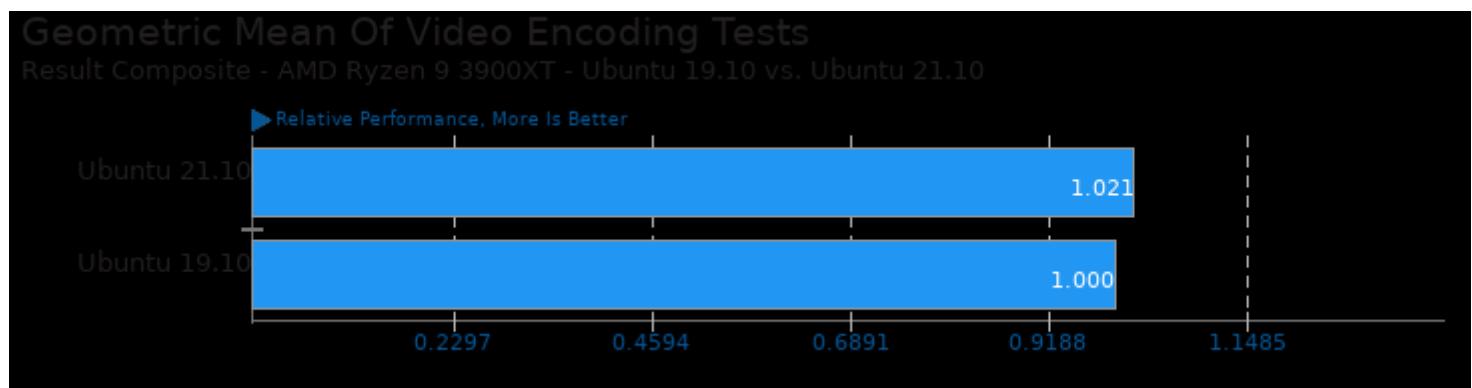
Geometric mean based upon tests: pts/rocksdb, pts/phpbench and pts/openssl



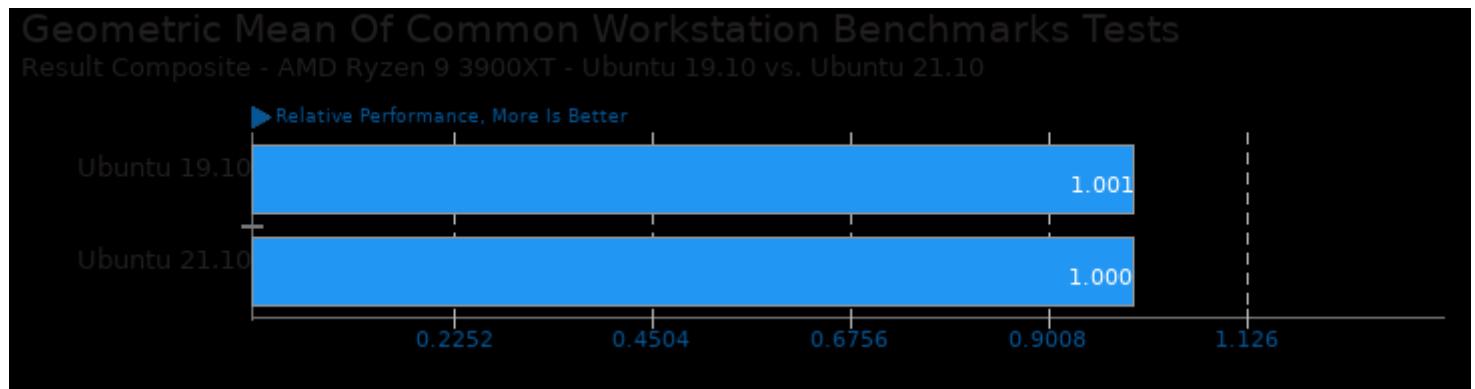
Geometric mean based upon tests: pts/npb, pts/namd, pts/renaissance, pts/svt-av1, pts/svt-hevc, pts/svt-vp9, pts/x265, pts/stockfish, pts/asmfish, pts/compress-zstd, pts/openssl, pts/blender, pts/appleseed, pts/pybench and pts/phpbench



Geometric mean based upon tests: pts/encode-flac, pts/pybench, pts/phpbench and pts/git



Geometric mean based upon tests: pts/svt-vp9, pts/svt-hevc, pts/x265, pts/vpxenc, pts/aom-av1 and pts/svt-av1



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