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HP Zbook Ubuntu Linux vs. Windows

HP Zbook benchmarks by Michael Larabel for a future article.

Automated Executive Summary

Ubuntu 20.10 had the most wins, coming in first place for 37% of the tests.

Based on the geometric mean of all complete results, the fastest (Ubuntu 20.10) was 1.134x the speed of the slowest (Ubuntu 20.04 LTS Default). Windows 10 Pro was 0.953x the speed of Ubuntu 20.10 and Ubuntu 20.04 LTS Default was 0.925x the speed of Windows 10 Pro.

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

Stockfish (Total Time) at 1.809x
SVT-AV1 (Encoder Mode: Enc Mode 8 - Input: 1080p) at 1.718x
SVT-HEVC (1080p 8-bit YUV To HEVC Video Encode) at 1.688x
NAMD (ATPase Simulation - 327,506 Atoms) at 1.675x
SVT-AV1 (Encoder Mode: Enc Mode 4 - Input: 1080p) at 1.656x
Primesieve (1e12 Prime Number Generation) at 1.642x
Intel Open Image Denoise (Scene: Memorial) at 1.621x
Blender (Blend File: BMW27 - Compute: CPU-Only) at 1.618x
Chaos Group V-RAY (Mode: CPU) at 1.614x

Appleseed (Scene: Material Tester) at 1.612x.

Test Systems:

Ubuntu 20.04 LTS Default

Processor: Intel Core i9-10885H @ 5.30GHz (8 Cores / 16 Threads), Motherboard: HP 8736 (S91 Ver. 01.04.01 BIOS), Chipset: Intel Comet Lake PCH, Memory: 32GB, Disk: 2048GB Kioxia KXG50PNV2T04, Graphics: NVIDIA Quadro RTX 5000 with Max-Q Design 16GB (600/6000MHz), Audio: Intel Comet Lake PCH cAVS, Network: Intel Wi-Fi 6 AX201

OS: Ubuntu 20.04, Kernel: 5.6.0-1047-oem (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.32.03, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.109, Vulkan: 1.2.145, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-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: intel_pstate powersave - CPU Microcode: 0xe2 - Thermald 1.9.1
OpenCL Notes: GPU Compute Cores: 3072
Java Notes: OpenJDK Runtime Environment (build 11.0.10+9-Ubuntu-0ubuntu1.20.04)
Python Notes: Python 3.8.5
Security Notes: itlb_multihit: KVM: Mitigation of Split huge pages + l1tf: 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 Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

Windows 10 Pro

Processor: Intel Core i9-10885H @ 2.40GHz (8 Cores / 16 Threads), Motherboard: HP 8736 (S91 Ver. 01.04.01 BIOS), Memory: 2 x 16384 MB 2933MHz Samsung K4ABG165WA-MCWE, Disk: 1908GB KXG50PNV2T04 KIOXIA, Graphics: Intel UHD + NVIDIA Quadro RTX 5000 with Max-Q Design 16GB, Network: Intel Wi-Fi 6 AX201 160MHz

OS: Microsoft Windows 10 Pro Build 19042, Kernel: 10.0 (x86_64), Display Driver: 452.25 (27.20.100.8190), File-System: NTFS, Screen Resolution: 1920x1080

Java Notes: operable program or batch file.
Python Notes: Python 3.7.1

Ubuntu 20.10

Processor: Intel Core i9-10885H @ 5.30GHz (8 Cores / 16 Threads), Motherboard: HP 8736 (S91 Ver. 01.04.01 BIOS), Chipset: Intel Comet Lake PCH, Memory: 32GB, Disk: 2048GB Kioxia KXG50PNV2T04, Graphics: NVIDIA Quadro RTX 5000 with Max-Q Design 16GB, Audio: Intel Comet Lake PCH cAVS, Network: Intel Wi-Fi 6 AX201

OS: Ubuntu 20.10, Kernel: 5.8.0-43-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.32.03, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.109, Vulkan: 1.2.155, Compiler: GCC 10.2.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug

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--enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-JvwpWM/gcc-10-10.2.0/debian/tmp-gcn/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-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: intel_pstate powersave - CPU Microcode: 0xe2 - Thermald 2.3
OpenCL Notes: GPU Compute Cores: 3072
Java Notes: OpenJDK Runtime Environment (build 11.0.10+9-Ubuntu-0ubuntu1.20.10)
Python Notes: Python 3.8.6
Security Notes: itlb_multihit: KVM: Mitigation of VMX disabled + l1tf: 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 Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

	Ubuntu 20.04 LTS Default	Windows 10 Pro	Ubuntu 20.10
Blender - Barbershop - NVIDIA OptiX (sec)	**1166**	**1220**	1202
Normalized	100%	95.57%	97.06%
Standard Deviation	0.4%	0.3%	2.3%
Blender - Barbershop - CPU-Only (sec)	**1242**	960.64	**804.94**
Normalized	64.83%	83.79%	100%
Standard Deviation	0.1%	0.3%	1.9%
Blender - Barbershop - CUDA (sec)	**715.42**	**767.04**	722.86
Normalized	100%	93.27%	98.97%
Standard Deviation	0.2%	0.4%	0.7%
asmFish - 1.H.M.2.D (Nodes/s)	**16160117**	24519320	**24722839**
Normalized	65.37%	99.18%	100%
Standard Deviation	1.4%	2.9%	1.1%
LuxCoreRender OpenCL - Food (M samples/sec)	1.31	**1.59**	**1.29**
Normalized	82.39%	100%	81.13%
Standard Deviation	7.7%	9%	9.6%
LuxCoreRender OpenCL - LuxCore Benchmark (M samples/sec)	2.25	**2.79**	**2.22**
Normalized	80.65%	100%	79.57%
Standard Deviation	5.2%	5.2%	6.8%
Blender - BMW27 - CPU-Only (sec)	**312.38**	242.99	**193.06**
Normalized	61.8%	79.45%	100%
Standard Deviation	0.7%	1.8%	2.5%
Unigine Heaven - 1920 x 1080 - Fullscreen - OpenGL (FPS)	**143.058**	**125.992**	141.667
Normalized	100%	88.07%	99.03%
Standard Deviation	1.2%	0.9%	1%
Selenium - Jetstream 2 - Firefox (Score)	**89.145**	**105.480**	91.302
Normalized	84.51%	100%	86.56%
Standard Deviation	1.9%	0.1%	1.8%
LuxCoreRender OpenCL - DLSC (M samples/sec)	2.70	**3.20**	**2.69**
Normalized	84.38%	100%	84.06%
Standard Deviation	5.6%	4.6%	7.4%
Appleseed - Material Tester (sec)	**431.7954**	**267.944**	272.939958
Normalized	62.05%	100%	98.17%

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Unigine Valley - 1920 x 1080 - Fullscreen - OpenGL (FPS)	124.981	**115.240**	**126.999**
Normalized	98.41%	90.74%	100%
Standard Deviation	0.4%	0.1%	0.3%
RealSR-NCNN - 4x - Yes (sec)	**96.640**	**116.202**	96.666
Normalized	100%	83.17%	99.97%
Standard Deviation	2.4%	2.4%	2.4%
Chaos Group V-RAY - CPU (vsamples)	**5114**	7868	**8256**
Normalized	61.94%	95.3%	100%
Standard Deviation	3.9%	2.4%	2.1%
SVT-AV1 - Enc Mode 0 - 1080p (FPS)	**0.095**	0.123	**0.125**
Normalized	76%	98.4%	100%
Standard Deviation	0%	0.5%	0%
NAMD - ATPase Simulation - 327,506 Atoms (days/ns)	**3.38206**	2.57006	**2.01875**
Normalized	59.69%	78.55%	100%
Standard Deviation	0.8%	2.5%	0.2%
Stockfish - Total Time (Nodes/s)	**9758771**	**17650864**	16321454
Normalized	55.29%	100%	92.47%
Standard Deviation	2.4%	4.8%	2.4%
Selenium - ARES-6 - Firefox (ms)	**45.00**	**38.53**	44.61
Normalized	85.62%	100%	86.37%
Standard Deviation	0.8%	0.4%	1.6%
Embree - Pathtracer ISPC - Crown (FPS)	**7.1250**	10.1384	**11.0712**
Normalized	64.36%	91.57%	100%
Standard Deviation	2%	2.6%	0.6%
OctaneBench - Total Score (Score)	**191.050854**	**189.755645**	190.460889
Normalized	100%	99.32%	99.69%
Selenium - Jetstream 2 - Google Chrome (Score)	156.870	**168.388**	**155.633**
Normalized	93.16%	100%	92.43%
Standard Deviation	1.7%	0.6%	1.5%
LuxCoreRender - DLSC (M samples/sec)	**0.89**	1.25	**1.38**
Normalized	64.49%	90.58%	100%
Standard Deviation	2.4%	0.9%	0.7%
FAHBench (Ns/Day)	191.5848	**148.6594**	**192.1998**
Normalized	99.68%	77.35%	100%
Standard Deviation	0.1%	0.1%	0%
Selenium - StyleBench - Google Chrome (Runs / Minute)	**38.11**	**32.81**	38.0
Normalized	100%	86.09%	99.71%
Standard Deviation	1%	1.9%	0.7%
LuxCoreRender OpenCL - R.C.a.P (M samples/sec)	5.41	**6.95**	**5.35**
Normalized	77.84%	100%	76.98%
Standard Deviation	5.4%	8.4%	8.1%
Minion - Quasigroup (sec)	101.807396	**109.386**	**98.632110**
Normalized	96.88%	90.17%	100%
Standard Deviation	0.4%	0.9%	0.1%
LuxCoreRender - R.C.a.P (M samples/sec)	**0.97**	1.24	**1.50**
Normalized	64.67%	82.67%	100%
Standard Deviation	2.4%	2.5%	2%
Blender - BMW27 - CUDA (sec)	**87.50**	**92.02**	89.30
Normalized	100%	95.09%	97.98%

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Standard Deviation	0.1%	0%	0%
Embree - Pathtracer - Crown (FPS)	6.0679	8.4674	9.6295
Normalized	63.01%	87.93%	100%
Standard Deviation	2.1%	2.2%	1.1%
Chaos Group V-RAY - NVIDIA RTX GPU (vrays)	599	607	604
Normalized	98.68%	100%	99.51%
Standard Deviation	1.6%	0.5%	0.4%
Zstd Compression - 19 (MB/s)	28.7	29.5	29.4
Normalized	97.29%	100%	99.66%
Standard Deviation	0.5%	0.2%	0.2%
Chaos Group V-RAY - NVIDIA CUDA GPU (vpaths)	537	467	535
Normalized	100%	86.96%	99.63%
Standard Deviation		0.6%	0.4%
Selenium - StyleBench - Firefox (Runs /	102.4	69.6	103
Normalized	99.42%	67.57%	100%
Standard Deviation	2.3%	0.2%	1.5%
Selenium - Speedometer - Firefox (Runs/min)	113	122	113.5
Normalized	92.62%	100%	93.03%
Standard Deviation		1.2%	0.9%
Intel Open Image Denoise - Memorial (Images / Sec)	4.54	7.01	7.36
Normalized	61.68%	95.24%	100%
Standard Deviation	1.7%	3.5%	1.1%
IndigoBench - OpenCL GPU - Bedroom (M samples/s)	5.086	5.032	5.076
Normalized	100%	98.94%	99.8%
Standard Deviation	0.2%	0.3%	0%
Embree - Pathtracer - Asian Dragon (FPS)	7.5987	10.1755	11.3866
Normalized	66.73%	89.36%	100%
Standard Deviation	1.4%	0.8%	0.7%
IndigoBench - OpenCL GPU - Supercar (M samples/s)	16.465	16.063	16.482
Normalized	99.9%	97.46%	100%
Standard Deviation	0.1%	0.1%	0.1%
IndigoBench - CPU - Bedroom (M samples/s)	0.939	1.416	1.491
Normalized	62.98%	94.97%	100%
Standard Deviation	0.2%	2.3%	2.3%
IndigoBench - CPU - Supercar (M samples/s)	2.166	3.404	3.443
Normalized	62.91%	98.87%	100%
Standard Deviation	0.1%	1%	0.2%
Selenium - Speedometer - Google Chrome (Runs/min)	141	140	140
Normalized	100%	99.29%	99.29%
Embree - Pathtracer ISPC - Asian Dragon (FPS)	9.2380	13.0289	13.7405
Normalized	67.23%	94.82%	100%
Standard Deviation	1.2%	2.3%	0.7%
Minion - Solitaire (sec)	58.186170	46.414	59.466844
Normalized	79.77%	100%	78.05%
Standard Deviation	0.5%	0.4%	0.3%
Git - T.T.C.C.G.C (sec)	43.202	56.111	43.639
Normalized	100%	76.99%	99%

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Standard Deviation	0.6%	0.4%	0.3%
Selenium - ARES-6 - Google Chrome (ms)	**16.31**	**16.47**	16.46
Normalized	100%	99.03%	99.09%
Standard Deviation	1.4%	0.3%	1.1%
WebP Image Encode - Q.1.L.H.C (Encode Time - sec)	34.161	**34.774**	**32.272**
Normalized	94.47%	92.8%	100%
Standard Deviation	2.3%	0.2%	1.2%
Xonotic - 1920 x 1080 - Ultimate (FPS)	305.2479432	**226.3982672**	**308.3416536**
Normalized	99%	73.42%	100%
Standard Deviation	0.9%	0.9%	2.2%
Minion - Graceful (sec)	44.402204	**46.433**	**43.512780**
Normalized	98%	93.71%	100%
Standard Deviation	0.6%	0.7%	0.4%
DaCapo Benchmark - H2 (msec)	**3087**	**2844**	2863
Normalized	92.13%	100%	99.34%
Standard Deviation	7%	6.4%	6%
Selenium - PSPDFKit WASM - Google Chrome (Score)	3180	**3021**	**3195**
Normalized	95%	100%	94.55%
Standard Deviation	0.2%	0.8%	0.1%
Xonotic - 1920 x 1080 - Ultra (FPS)	379.5378785	**275.3018494**	**389.3286006**
Normalized	97.49%	70.71%	100%
Standard Deviation	0.3%	1.9%	0.4%
dav1d - Summer Nature 4K (FPS)	**112.94**	145.03	**148.77**
Normalized	75.92%	97.49%	100%
Standard Deviation	2.5%	0.5%	0.1%
Selenium - PSPDFKit WASM - Firefox (Score)	3034	**2855**	**3062**
Normalized	94.1%	100%	93.24%
Standard Deviation	1%	0.1%	0.7%
DaCapo Benchmark - Tradesoap (msec)	5650	**6737**	**3772**
Normalized	66.76%	55.99%	100%
Standard Deviation	9.6%	2.1%	2.4%
Xonotic - 1920 x 1080 - High (FPS)	431.0089029	**303.7297520**	**440.1627414**
Normalized	97.92%	69%	100%
Standard Deviation	1.7%	1.9%	1%
Selenium - W.i - Google Chrome (ms)	29.1590	**30.2234**	**29.1428**
Normalized	99.94%	96.42%	100%
Standard Deviation	0.6%	2.5%	1.5%
Primesieve - 1.P.N.G (sec)	**45.131**	27.693	**27.481**
Normalized	60.89%	99.23%	100%
Standard Deviation	2.3%	2%	1.6%
Selenium - Kraken - Firefox (ms)	1029	**958.2**	**1032**
Normalized	93.14%	100%	92.81%
Standard Deviation	1.2%	0.3%	0.1%
SVT-AV1 - Enc Mode 4 - 1080p (FPS)	**1.900**	**3.147**	3.006
Normalized	60.37%	100%	95.52%
Standard Deviation	2.1%	0.3%	0.7%
Selenium - Kraken - Google Chrome (ms)	**775.4**	**824.5**	787.1
Normalized	100%	94.04%	98.51%
Standard Deviation	0.3%	1.4%	0.2%
DaCapo Benchmark - Jython (msec)	4092	**4175**	**3689**
Normalized	90.15%	88.36%	100%
Standard Deviation	5%	3.4%	1.4%
SVT-AV1 - Enc Mode 8 - 1080p (FPS)	**16.525**	**28.389**	26.215

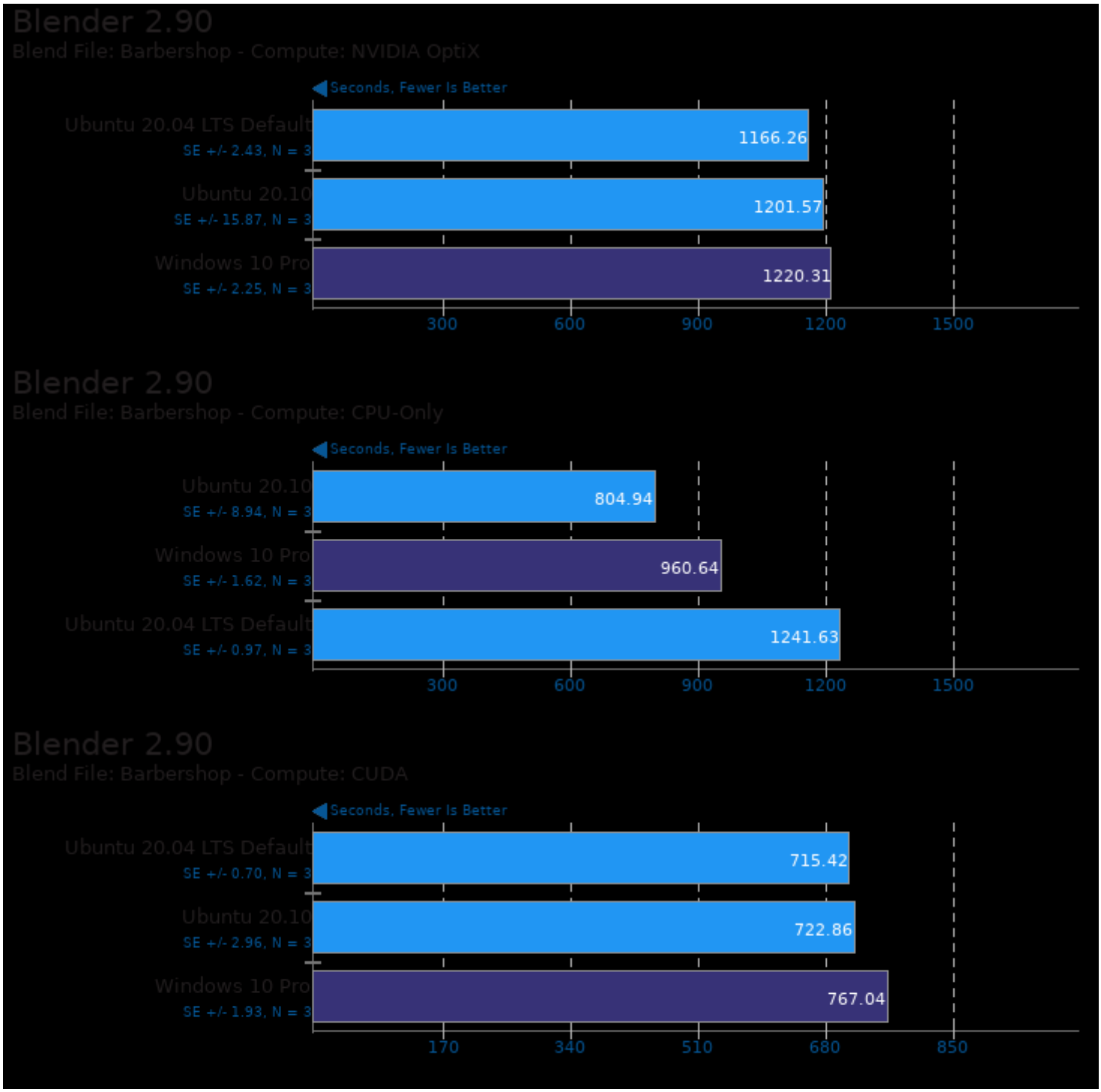
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Normalized	58.21%	100%	92.34%
Standard Deviation	2.5%	0.9%	0.7%
Xonotic - 1920 x 1080 - Low (FPS)	496.7493646	**342.5536655**	**515.9857096**
Normalized	96.27%	66.39%	100%
Standard Deviation	1.7%	1.1%	0.7%
XZ Compression - C.u.1.0.3.s.i.i.C.L.9 (sec)	**32.144**	29.101	**28.778**
Normalized	89.53%	98.89%	100%
Standard Deviation	1.7%	0.2%	0.2%
DaCapo Benchmark - Tradebeans (msec)	**3919**	**2818**	2832
Normalized	71.91%	100%	99.51%
Standard Deviation	5.2%	2.5%	1.5%
Zstd Compression - 3 (MB/s)	**2836**	**2912**	2897
Normalized	97.38%	100%	99.47%
Standard Deviation	1%	0.7%	0.9%
RealSR-NCNN - 4x - No (sec)	13.673	**12.964**	**13.800**
Normalized	94.81%	100%	93.94%
Standard Deviation	1.1%	3.8%	1.2%
PyBench - T.F.A.T.T (Milliseconds)	**835**	**1231**	852
Normalized	100%	67.83%	98%
Standard Deviation	1.4%	0.9%	1.5%
SVT-HEVC - 1.8.b.Y.T.H.V.E (FPS)	**26.24**	**44.29**	43.73
Normalized	59.25%	100%	98.74%
Standard Deviation	2.3%	0.9%	0.6%
WavPack Audio Encoding - WAV To WavPack (sec)	**13.094**	**12.588**	12.831
Normalized	96.14%	100%	98.11%
Standard Deviation	0.3%	0.1%	0.1%
x264 - H.2.V.E (FPS)	**57.16**	82.40	**83.16**
Normalized	68.73%	99.09%	100%
Standard Deviation	2.9%	0.5%	1.6%
Selenium - W.c - Firefox (ms)	**447.5**	**445.9**	446.0
Normalized	99.64%	100%	99.98%
Standard Deviation	0.9%	0.1%	1.5%
dav1d - S.N.1 (FPS)	**460.87**	**543.08**	539.00
Normalized	84.86%	100%	99.25%
Standard Deviation	3.2%	0.1%	0.2%
Hashcat - SHA-512 (H/s)	**1136100000**	**1054753333**	1125500000
Normalized	100%	92.84%	99.07%
Standard Deviation	0.8%	6.3%	0.7%
Selenium - W.c - Google Chrome (ms)	**369.3818**	**376.6447**	370.0717
Normalized	100%	98.07%	99.81%
Standard Deviation	1%	1%	0.6%
WebP Image Encode - Q.1.L (Encode Time - sec)	15.217	**15.672**	**14.748**
Normalized	96.92%	94.1%	100%
Standard Deviation	0.2%	0.2%	0.2%
Waifu2x-NCNN Vulkan - 2x - 3 - Yes (sec)	**5.863**	**6.458**	6.090
Normalized	100%	90.79%	96.27%
Standard Deviation	0.7%	7.7%	0.6%
SVT-VP9 - V.Q.O - Bosphorus 1080p (FPS)	**88.42**	**125.40**	123.16
Normalized	70.51%	100%	98.21%
Standard Deviation	5.4%	1.1%	0.5%

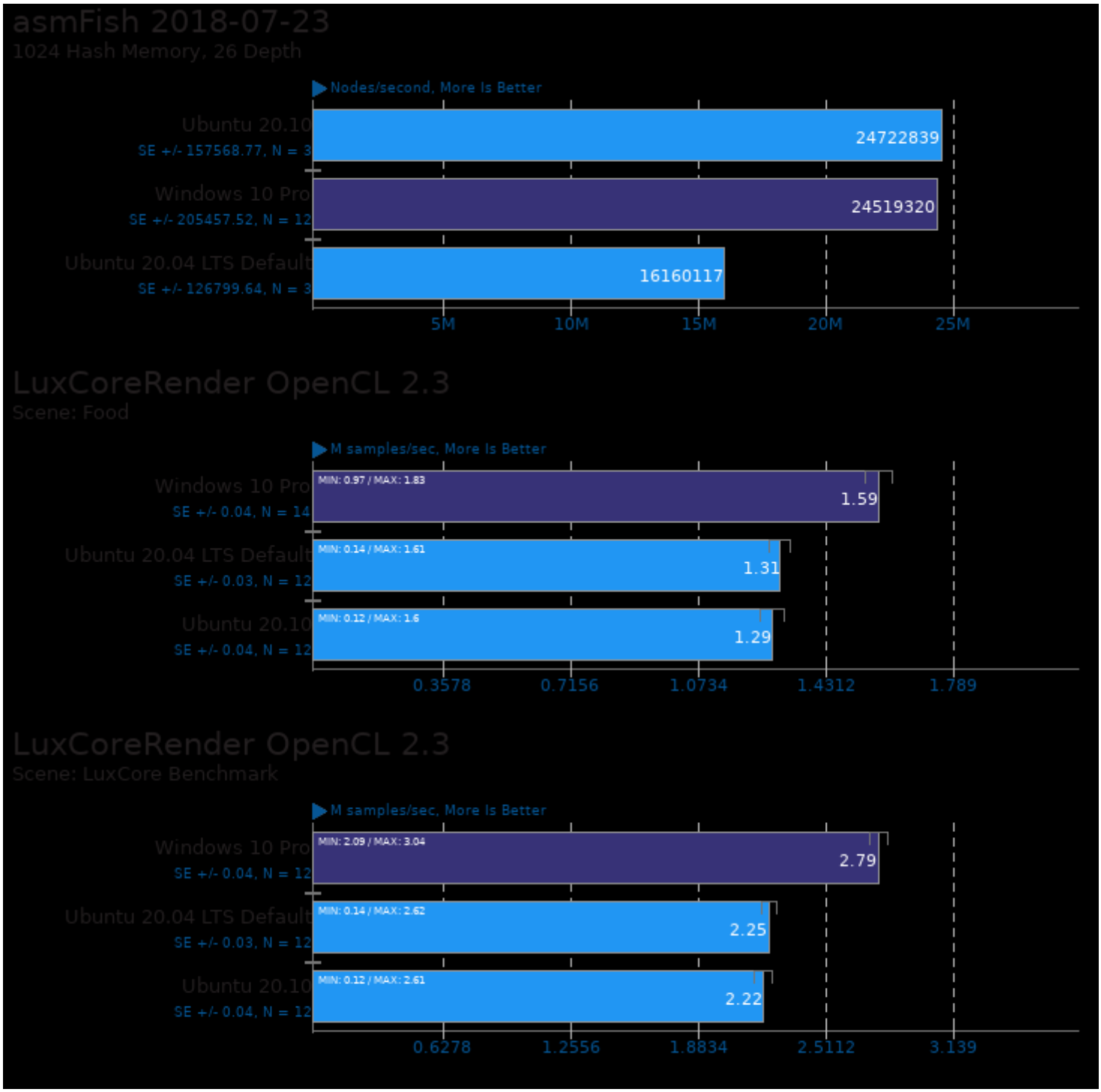
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Opus Codec Encoding - WAV To Opus Encode (sec)	**7.345**	**8.676**	7.578
Normalized	100%	84.66%	96.93%
Standard Deviation	0.4%	1.2%	0.4%
FLAC Audio Encoding - WAV To FLAC (sec)	7.688	**7.347**	**7.864**
Normalized	95.56%	100%	93.43%
Standard Deviation	0.6%	0.4%	1.5%
SVT-VP9 - P.S.O - Bosphorus 1080p (FPS)	**119.56**	**158.29**	155.68
Normalized	75.53%	100%	98.35%
Standard Deviation	5.2%	1%	1%
Selenium - W.i - Firefox (ms)	28.2	**26.3**	**28.4**
Normalized	93.26%	100%	92.61%
Standard Deviation	0.9%	1%	1.8%
Hashcat - MD5 (H/s)	**26123133333**	**24363060000**	25362166667
Normalized	100%	93.26%	97.09%
Standard Deviation	1%	2.5%	1%
LAME MP3 Encoding - WAV To MP3 (sec)	**7.172**	**8.506**	7.530
Normalized	100%	84.32%	95.25%
Standard Deviation	0.2%	0.3%	0.1%
Hashcat - T.R.X (H/s)	**330567**	**313267**	325800
Normalized	100%	94.77%	98.56%
Standard Deviation	0.8%	1%	1%
libavif avifenc - 8 (sec)	**5.573**	5.396	**5.342**
Normalized	95.86%	99%	100%
Standard Deviation	1.8%	2.3%	0.7%
Hashcat - SHA1 (H/s)	**9065000000**	**8663366667**	8862233333
Normalized	100%	95.57%	97.76%
Standard Deviation	0.6%	0.5%	0.5%
WebP Image Encode - Q.1.H.C (Encode Time - sec)	**6.415**	**6.229**	6.267
Normalized	97.1%	100%	99.39%
Standard Deviation	0.1%	0.3%	0.1%
NeatBench - GPU (FPS)	**27.6**	**26.8**	27.3
Normalized	100%	97.1%	98.91%
Standard Deviation	7.6%	8.5%	8%
libavif avifenc - 10 (sec)	**4.934**	**5.017**	4.964
Normalized	100%	98.35%	99.4%
Standard Deviation	0.1%	0.2%	0.6%
Hashcat - 7-Zip (H/s)	**408800**	**363200**	396200
Normalized	100%	88.85%	96.92%
Standard Deviation	0.4%	0.4%	0.2%
WebP Image Encode - Quality 100 (Encode Time - sec)	**2.126**	**2.189**	2.144
Normalized	100%	97.12%	99.16%
Standard Deviation	0.1%	0.3%	0.7%
TSCP - A.C.P (Nodes/s)	**1504866**	**1570423**	1543676
Normalized	95.83%	100%	98.3%
Standard Deviation	0.3%	1.7%	0.4%
WebP Image Encode - Default (Encode Time - sec)	**1.396**	**1.419**	1.398
Normalized	100%	98.38%	99.86%
Standard Deviation	0.6%	0.3%	1.1%

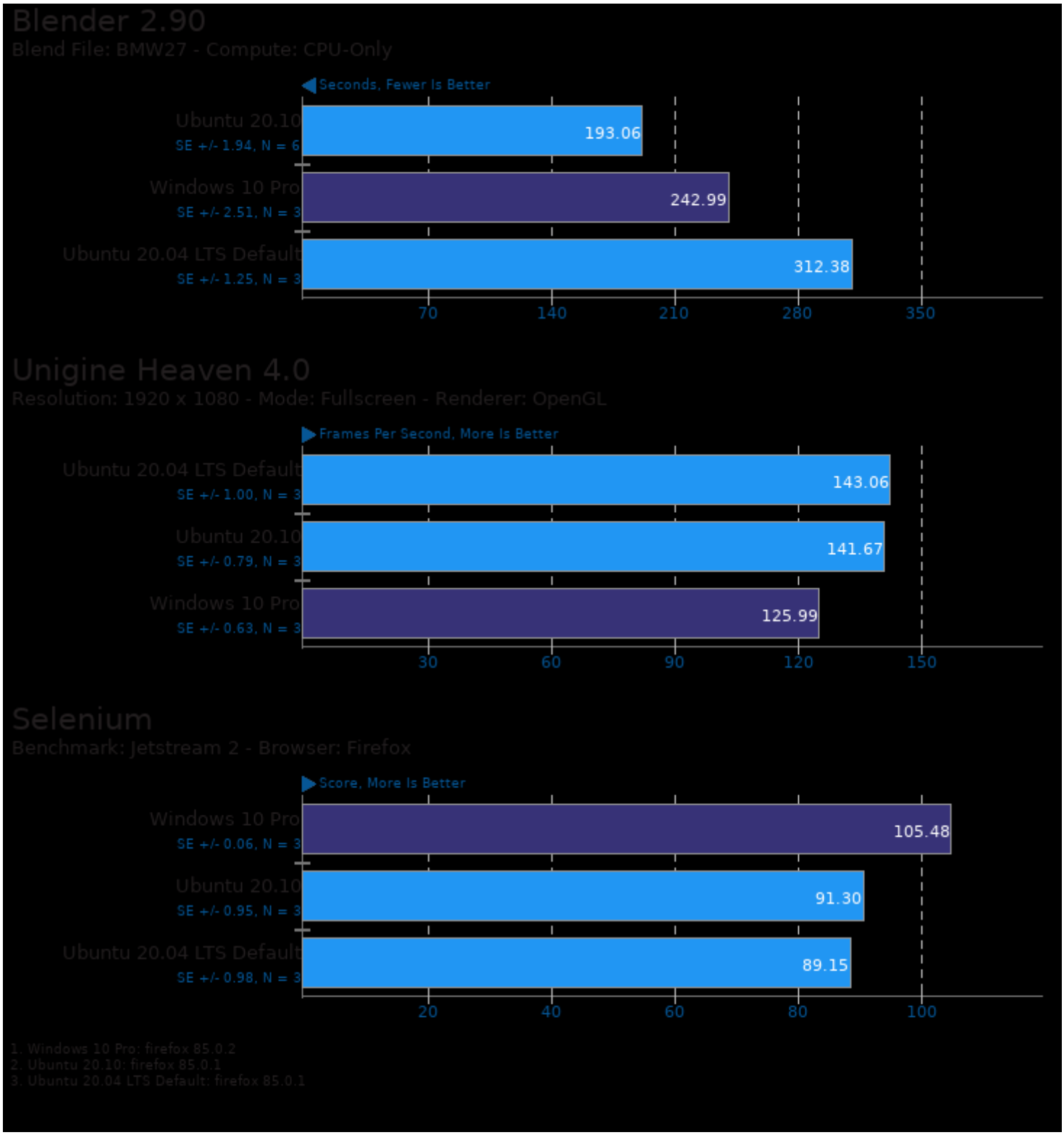
HP Zbook Ubuntu Linux vs. Windows



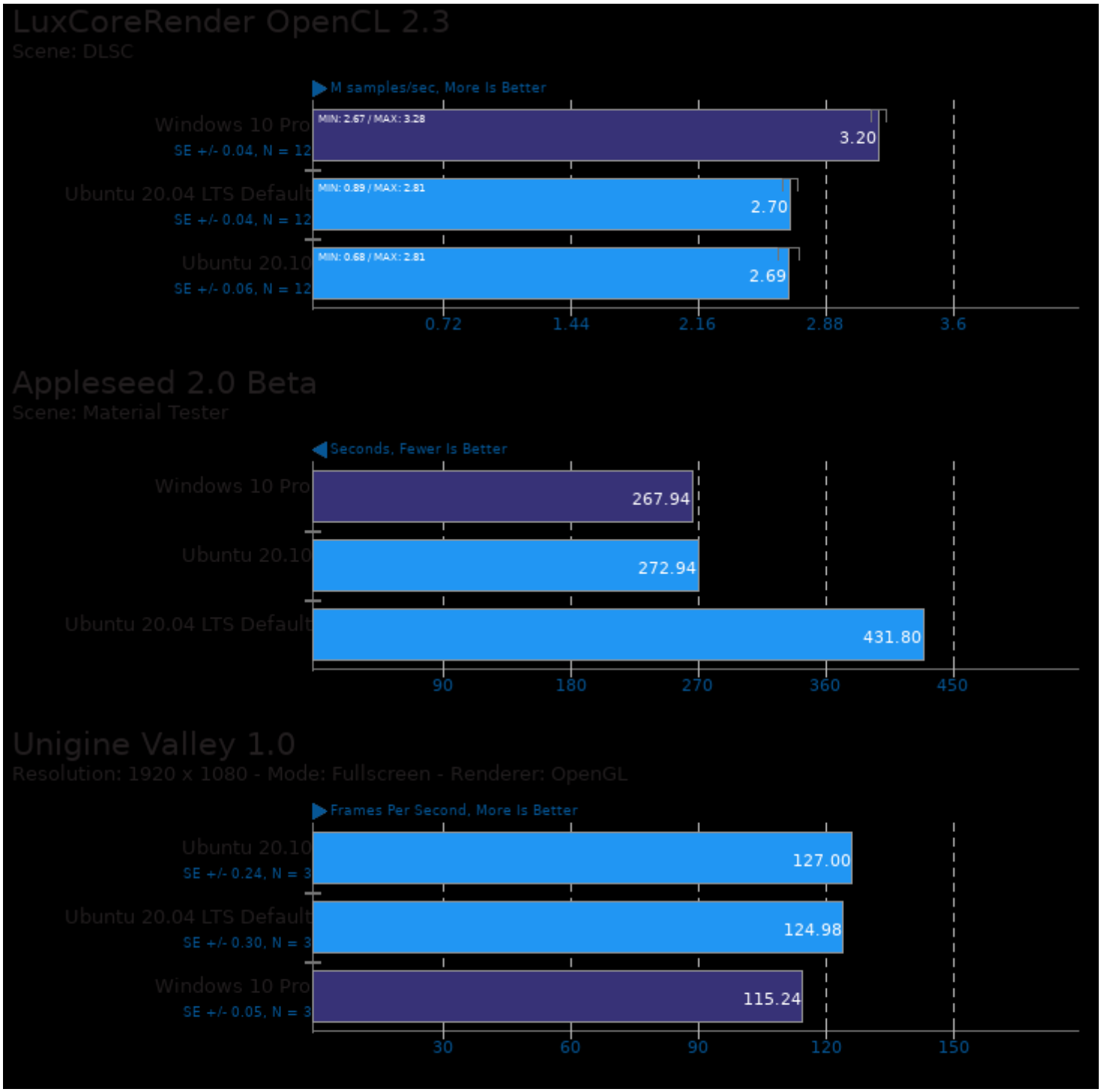
HP Zbook Ubuntu Linux vs. Windows



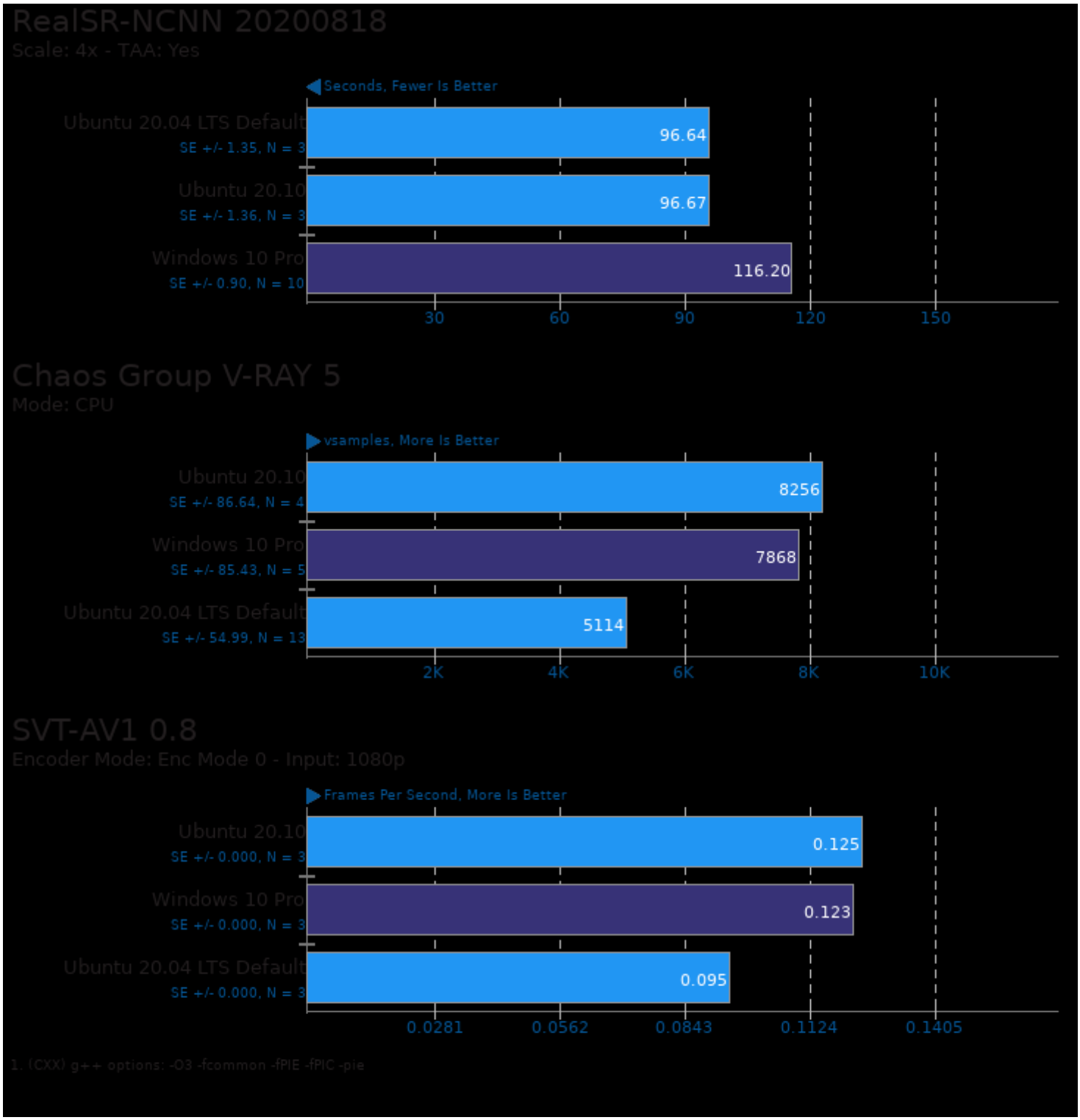
HP Zbook Ubuntu Linux vs. Windows



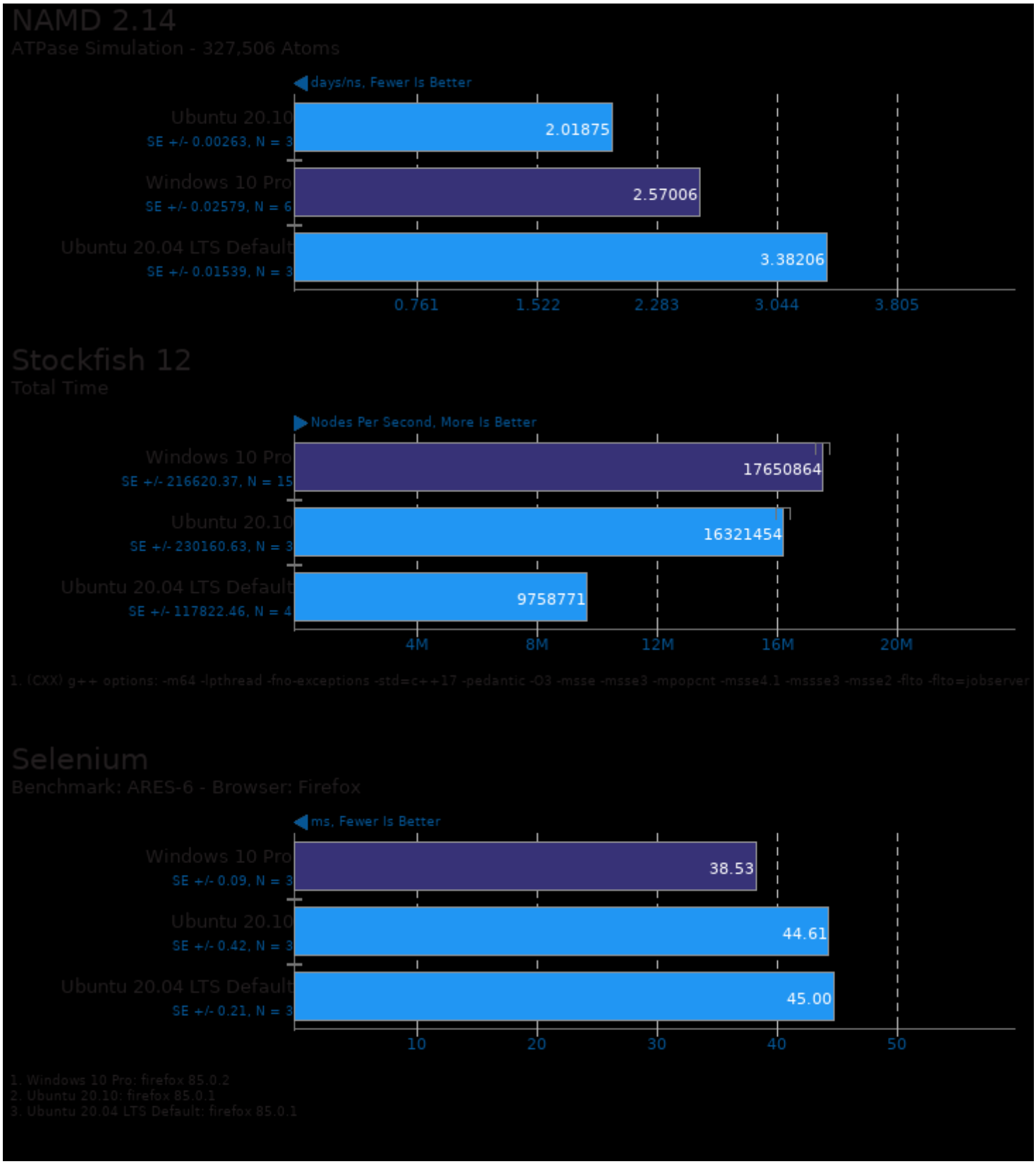
HP Zbook Ubuntu Linux vs. Windows



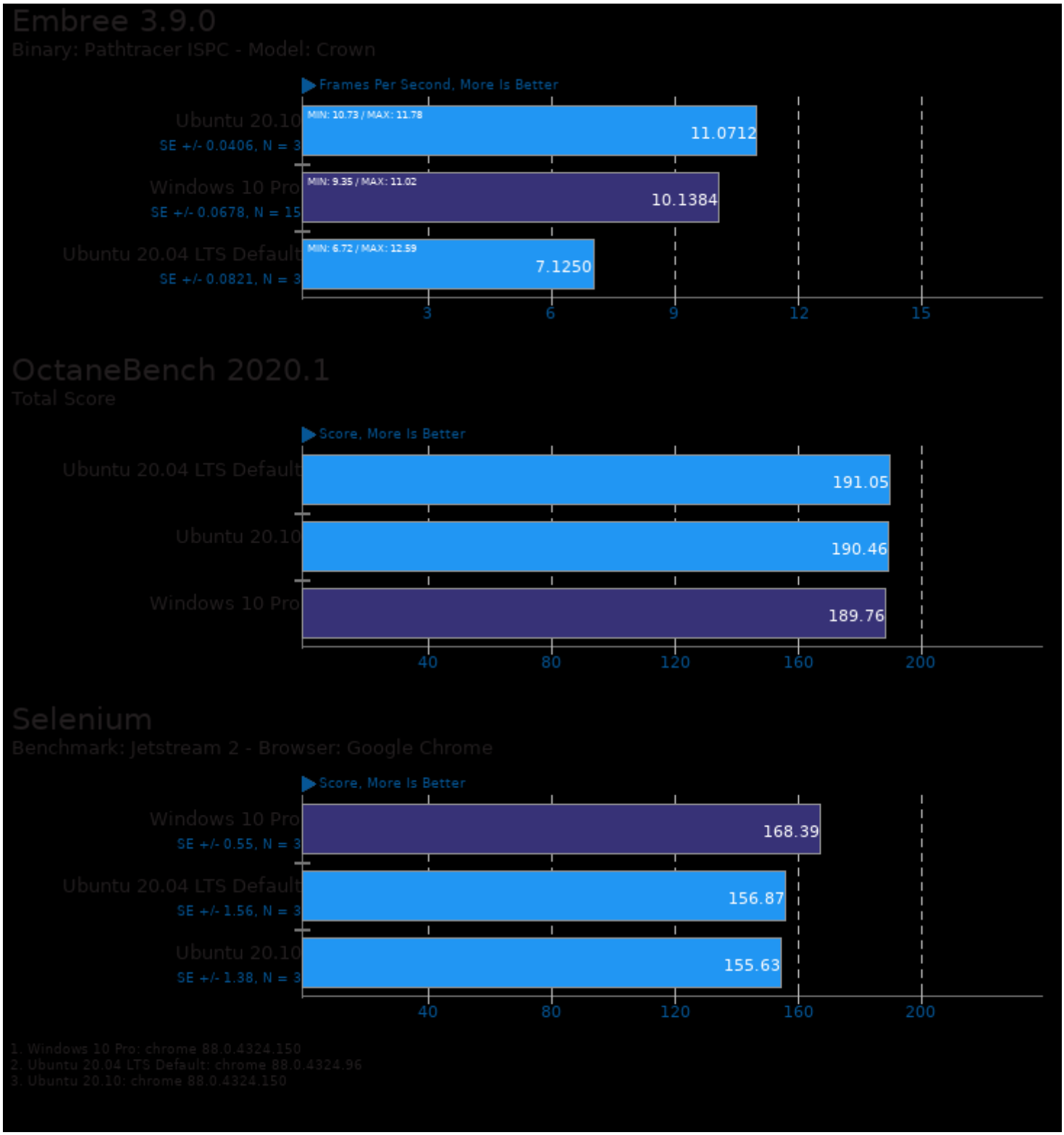
HP Zbook Ubuntu Linux vs. Windows



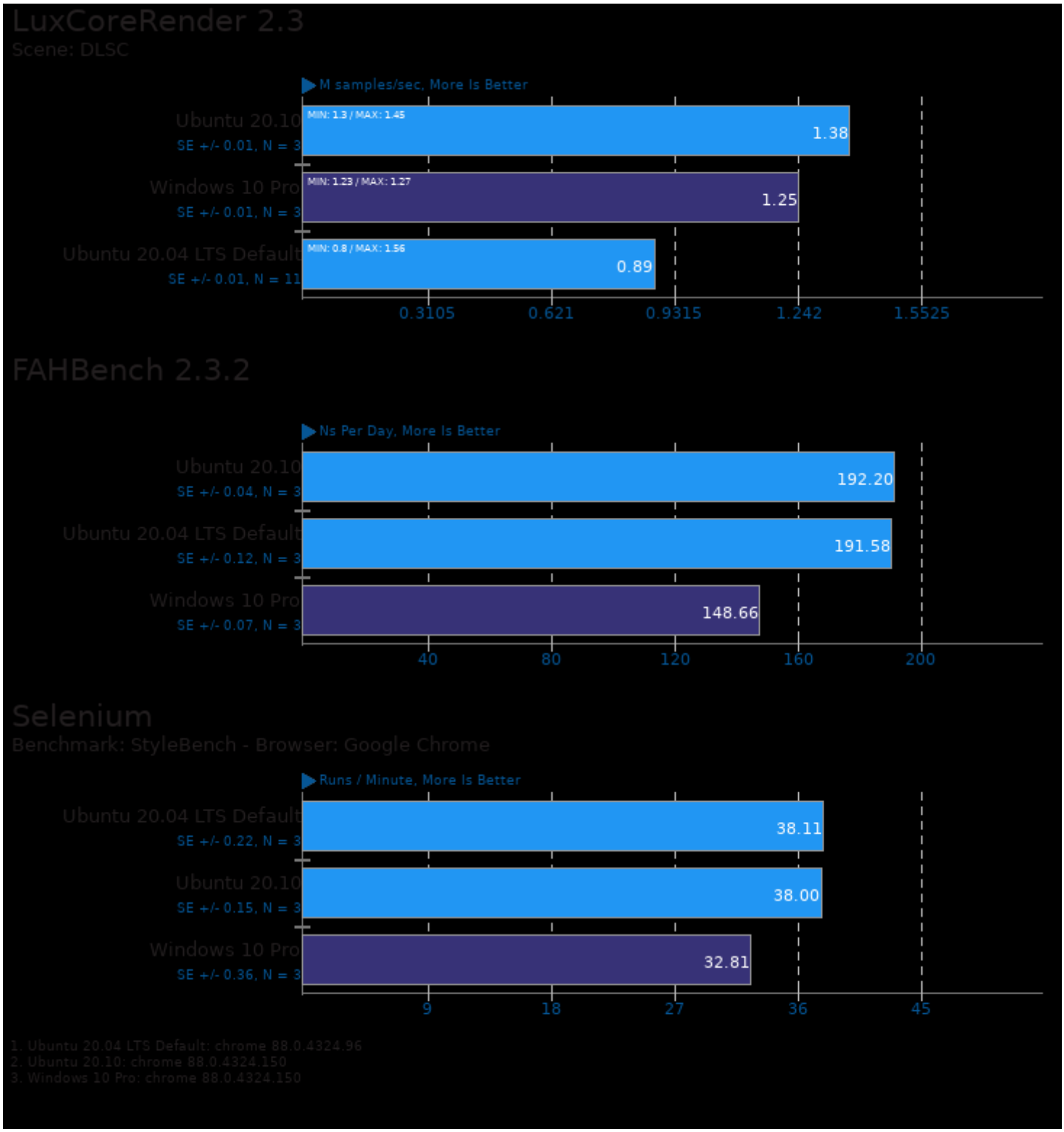
HP Zbook Ubuntu Linux vs. Windows

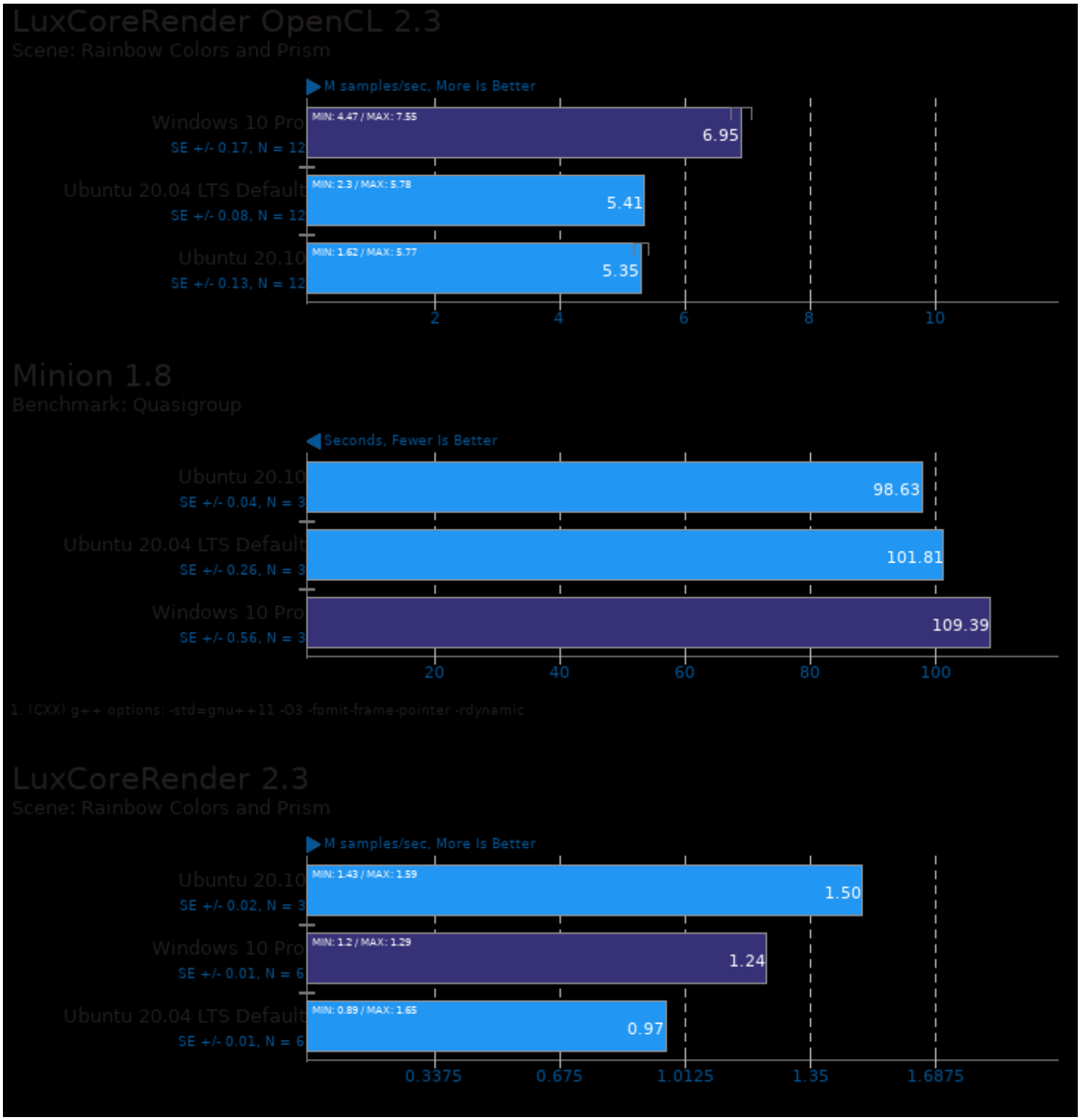


HP Zbook Ubuntu Linux vs. Windows

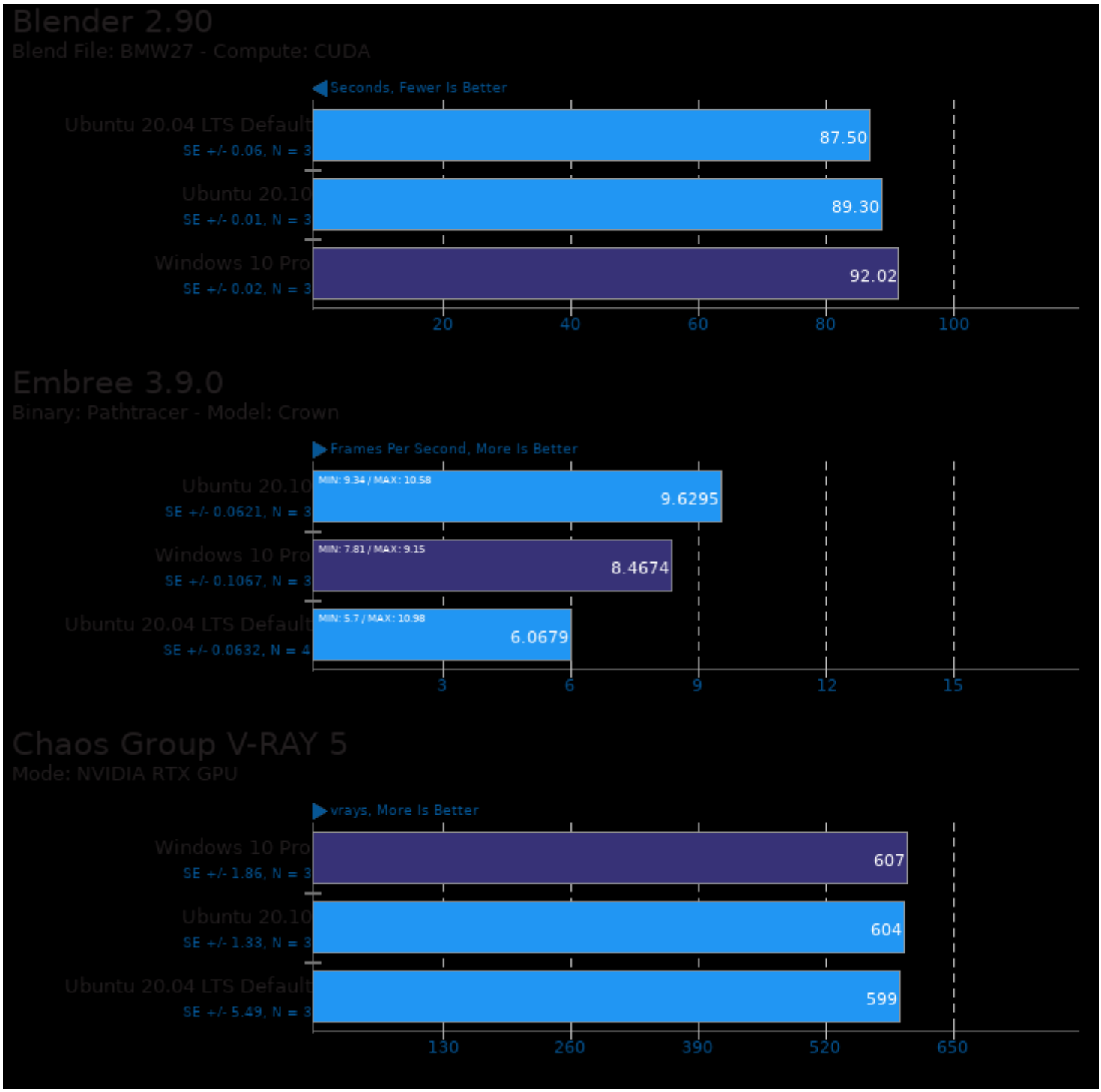


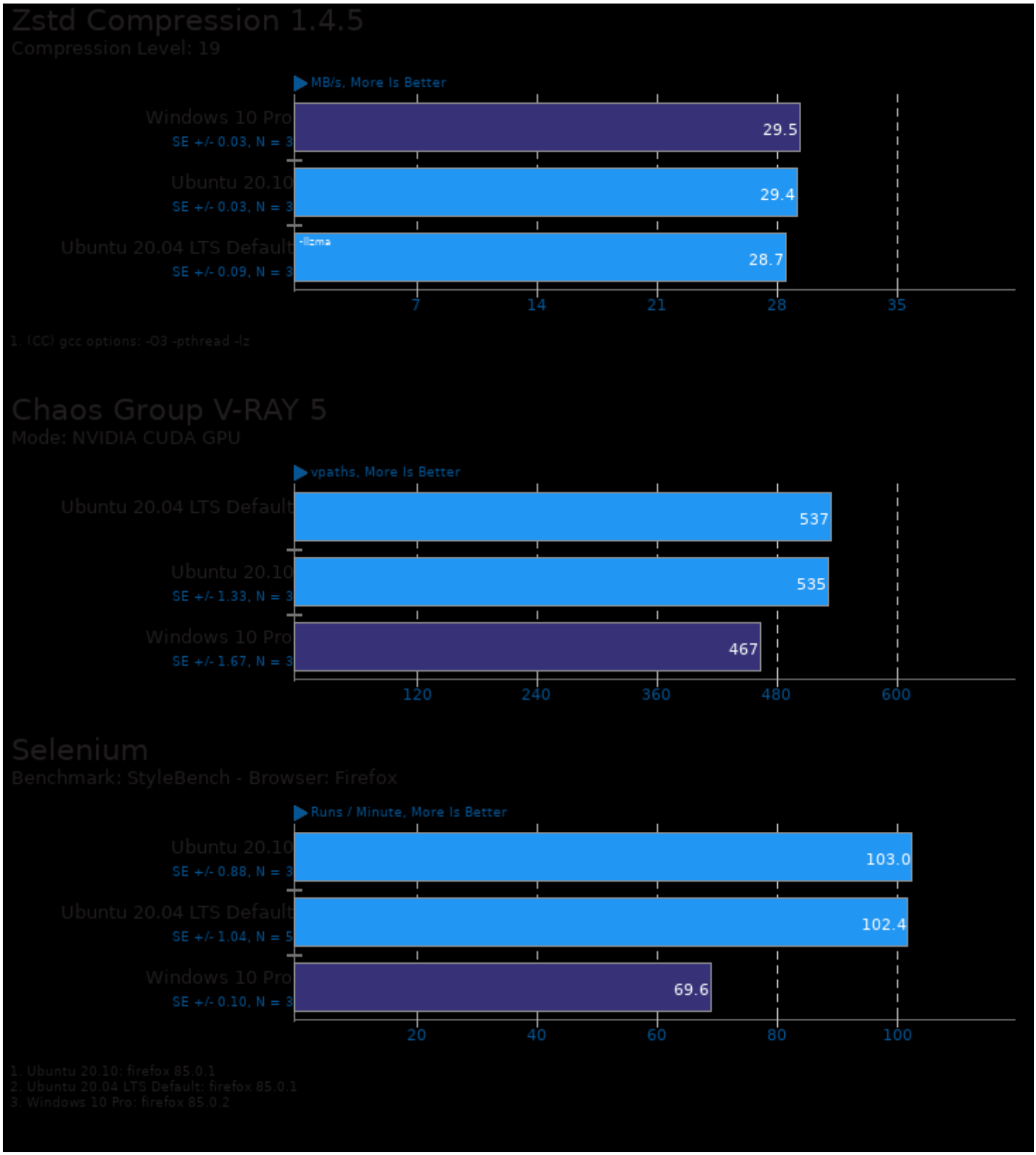
HP Zbook Ubuntu Linux vs. Windows




LuxCoreRender OpenCL 2.3
Scene: Rainbow Colors and Prism
M samples/sec, More Is Better
Windows 10 Pro
SE +/- 0.17, N = 12
MIN: 4.47 / MAX: 7.55
6.95
Ubuntu 20.04 LTS Default
SE +/- 0.08, N = 12
MIN: 2.3 / MAX: 5.78
5.41
Ubuntu 20.10
SE +/- 0.13, N = 12
MIN: 1.62 / MAX: 5.77
5.35
2
4
6
8
10
Minion 1.8
Benchmark: Quasigroup
Seconds, Fewer Is Better
Ubuntu 20.10
SE +/- 0.04, N = 3
98.63
Ubuntu 20.04 LTS Default
SE +/- 0.26, N = 3
101.81
Windows 10 Pro
SE +/- 0.56, N = 3
109.39
20
40
60
80
100
1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic
LuxCoreRender 2.3
Scene: Rainbow Colors and Prism
M samples/sec, More Is Better
Ubuntu 20.10
SE +/- 0.02, N = 3
MIN: 1.43 / MAX: 1.59
1.50
Windows 10 Pro
SE +/- 0.01, N = 6
MIN: 1.2 / MAX: 1.29
1.24
Ubuntu 20.04 LTS Default
SE +/- 0.01, N = 6
MIN: 0.89 / MAX: 1.65
0.97
0.3375
0.675
1.0125
1.35
1.6875

HP Zbook Ubuntu Linux vs. Windows

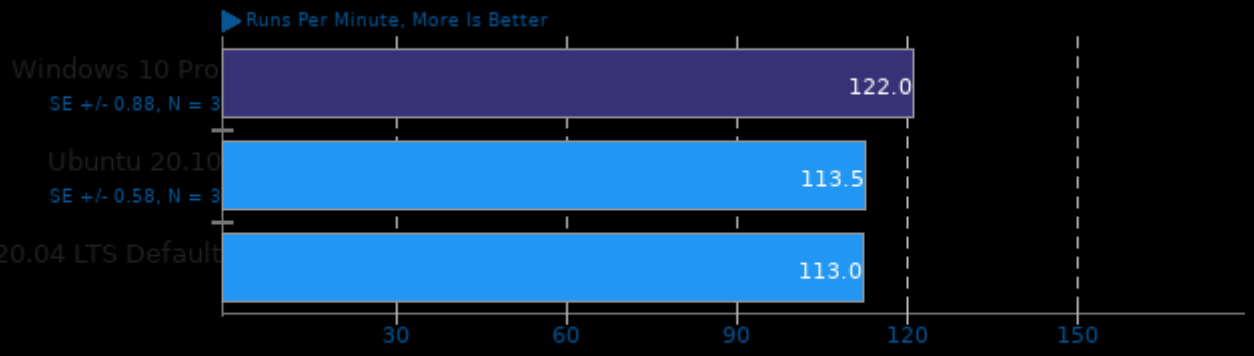



Zstd Compression 1.4.5
Compression Level: 19
MB/s, More Is Better
Windows 10 Pro
SE +/- 0.03, N = 3
29.5
Ubuntu 20.10
SE +/- 0.03, N = 3
29.4
Ubuntu 20.04 LTS Default
-llzma
SE +/- 0.09, N = 3
28.7
7
14
21
28
35
1. (CC) gcc options: -O3 -pthread -lz
Chaos Group V-RAY 5
Mode: NVIDIA CUDA GPU
vpaths, More Is Better
Ubuntu 20.04 LTS Default
537
Ubuntu 20.10
SE +/- 1.33, N = 3
535
Windows 10 Pro
SE +/- 1.67, N = 3
467
120
240
360
480
600
Selenium
Benchmark: StyleBench - Browser: Firefox
Runs / Minute, More Is Better
Ubuntu 20.10
SE +/- 0.88, N = 3
103.0
Ubuntu 20.04 LTS Default
SE +/- 1.04, N = 5
102.4
Windows 10 Pro
SE +/- 0.10, N = 3
69.6
20
40
60
80
100
1. Ubuntu 20.10: firefox 85.0.1
2. Ubuntu 20.04 LTS Default: firefox 85.0.1
3. Windows 10 Pro: firefox 85.0.2

HP Zbook Ubuntu Linux vs. Windows

Selenium

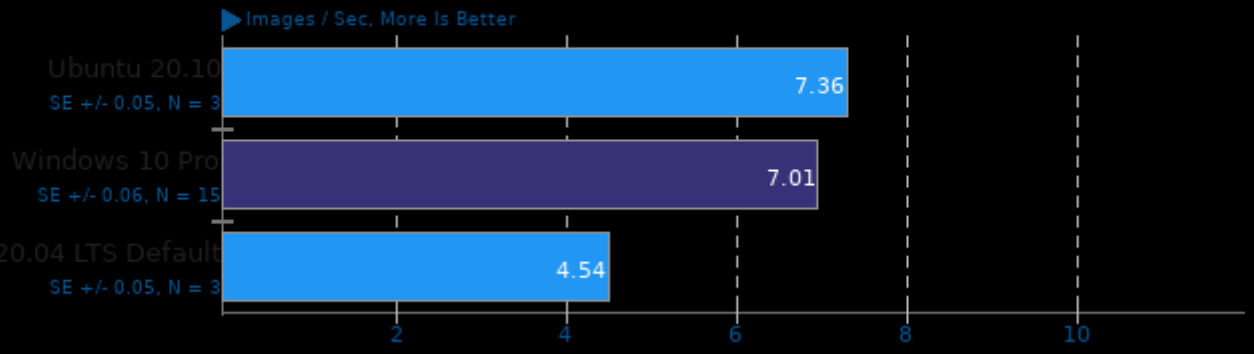
Benchmark: Speedometer - Browser: Firefox



1. Windows 10 Pro: firefox 85.0.2
2. Ubuntu 20.10: firefox 85.0.1
3. Ubuntu 20.04 LTS Default: firefox 85.0.1

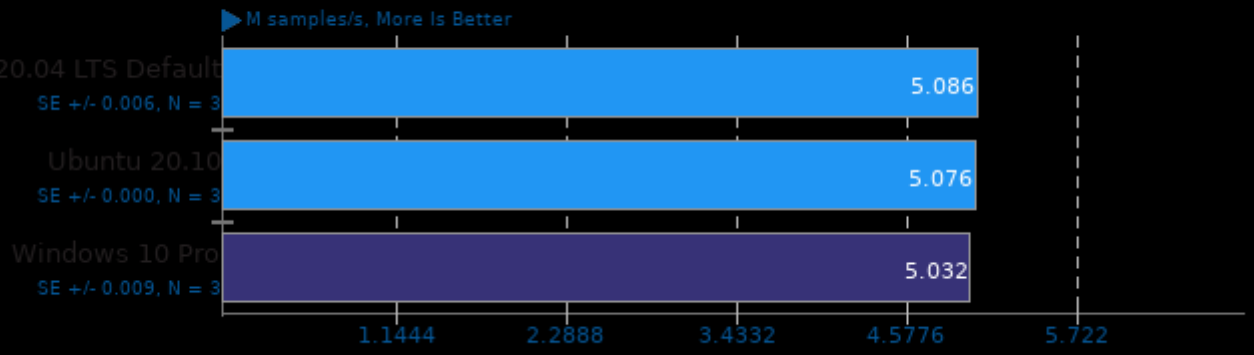
Intel Open Image Denoise 1.2.0

Scene: Memorial

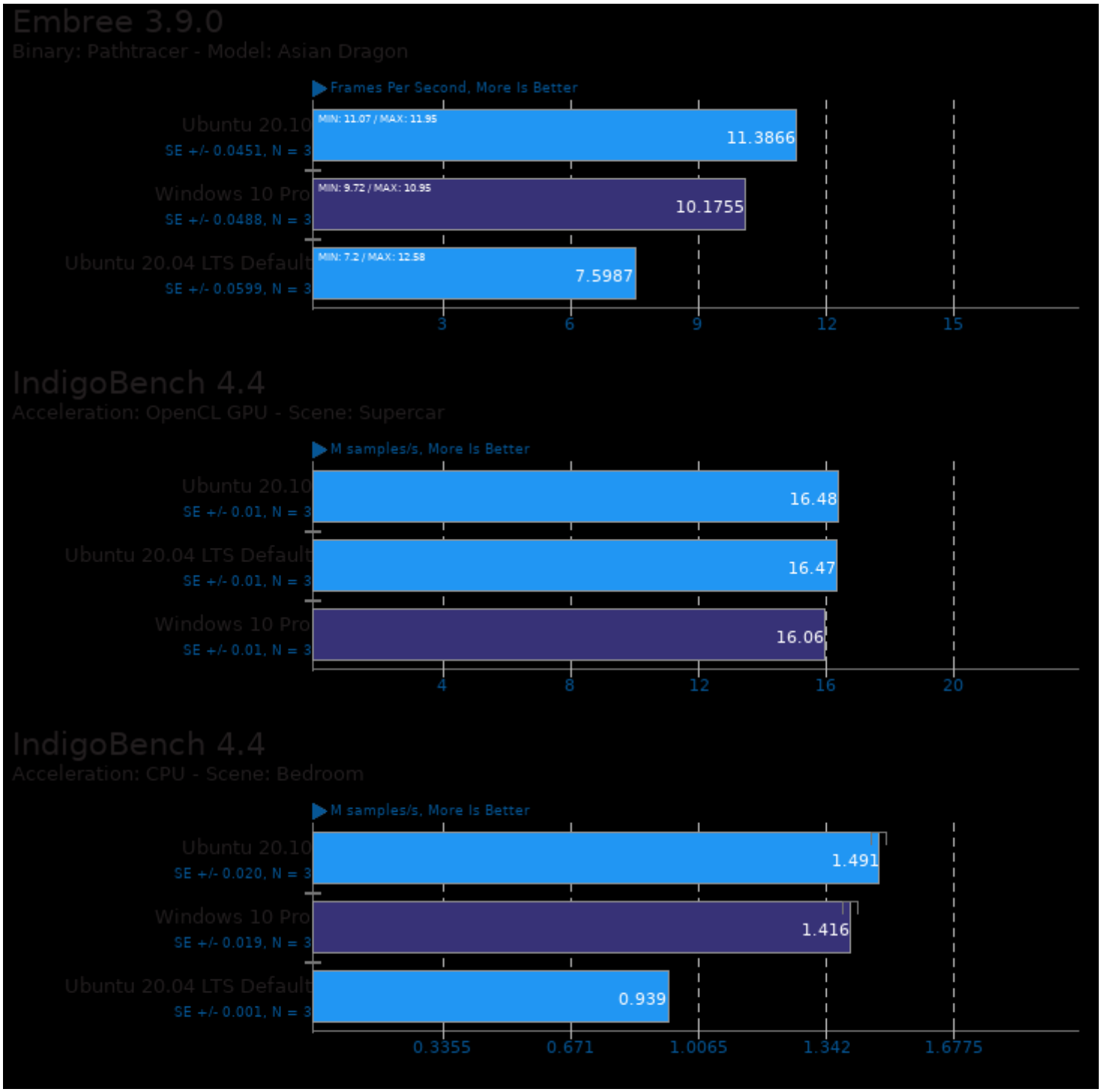


IndigoBench 4.4

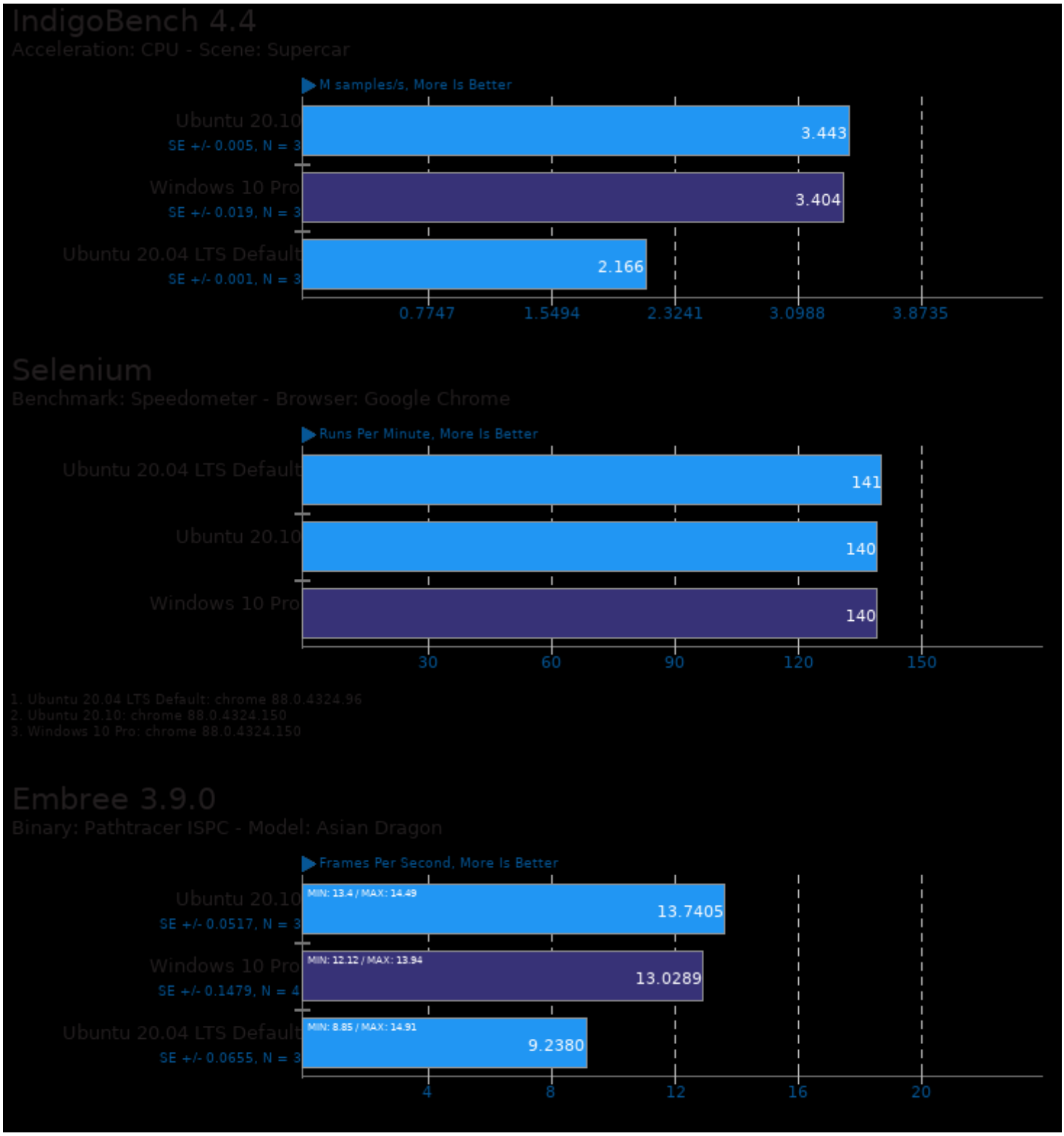
Acceleration: OpenCL GPU - Scene: Bedroom



HP Zbook Ubuntu Linux vs. Windows



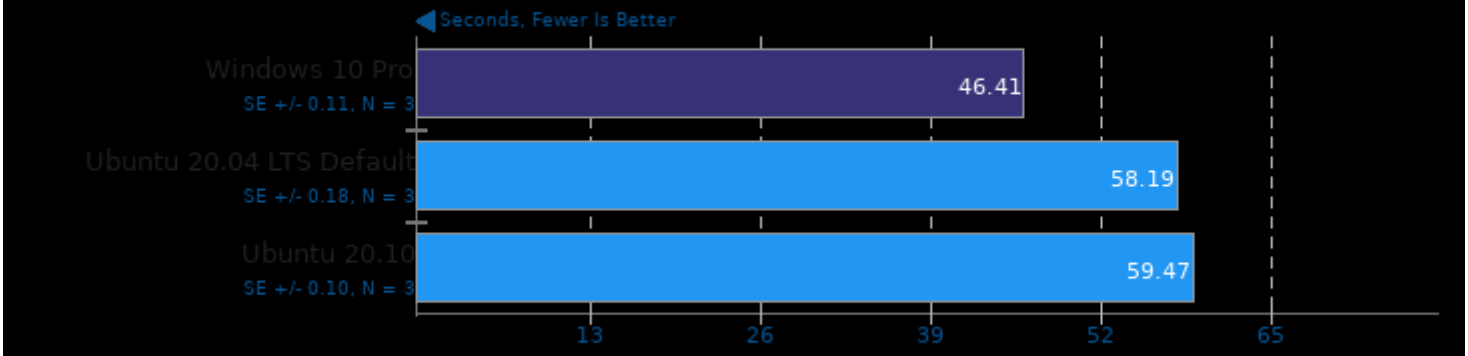
HP Zbook Ubuntu Linux vs. Windows



HP Zbook Ubuntu Linux vs. Windows

Minion 1.8

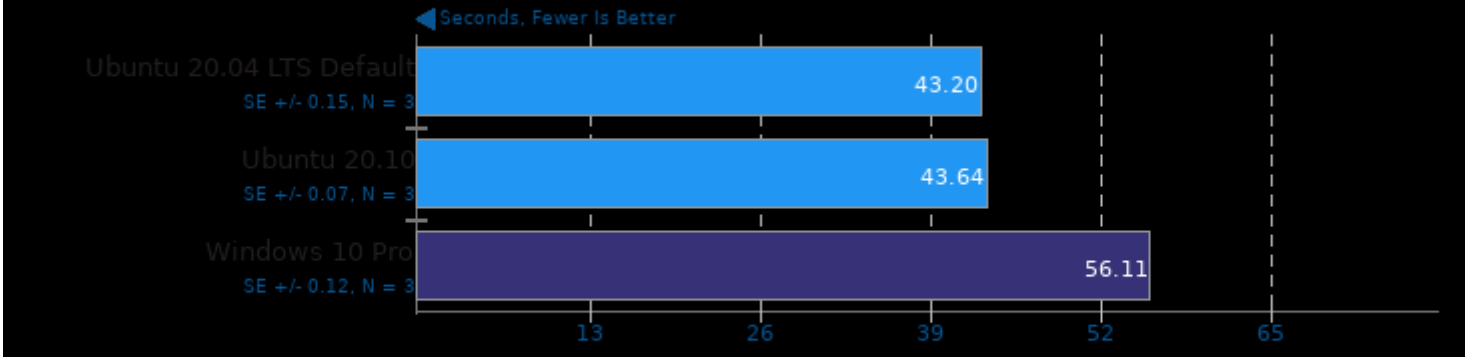
Benchmark: Solitaire



1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

Git

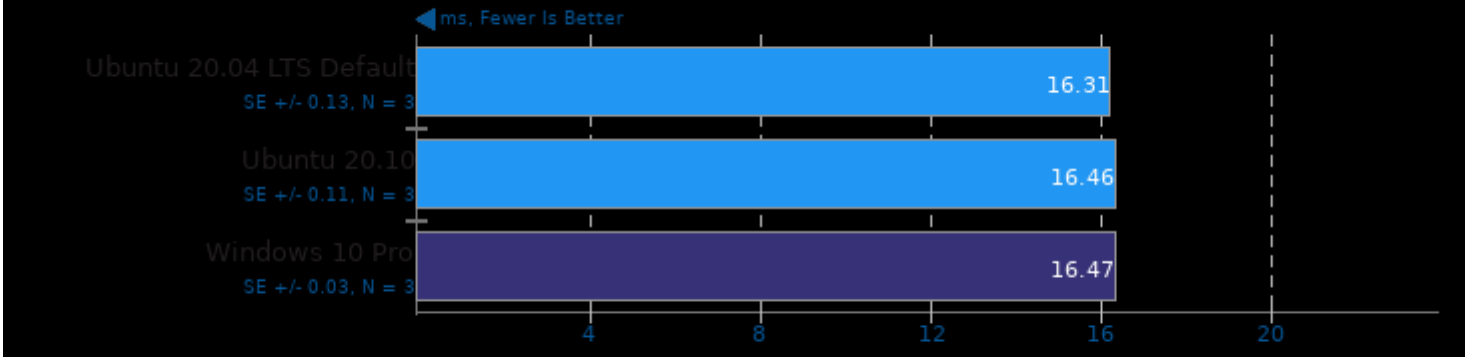
Time To Complete Common Git Commands



1. Ubuntu 20.04 LTS Default: git version 2.25.1
2. Ubuntu 20.10: git version 2.27.0
3. Windows 10 Pro: git version 2.30.1.windows.1

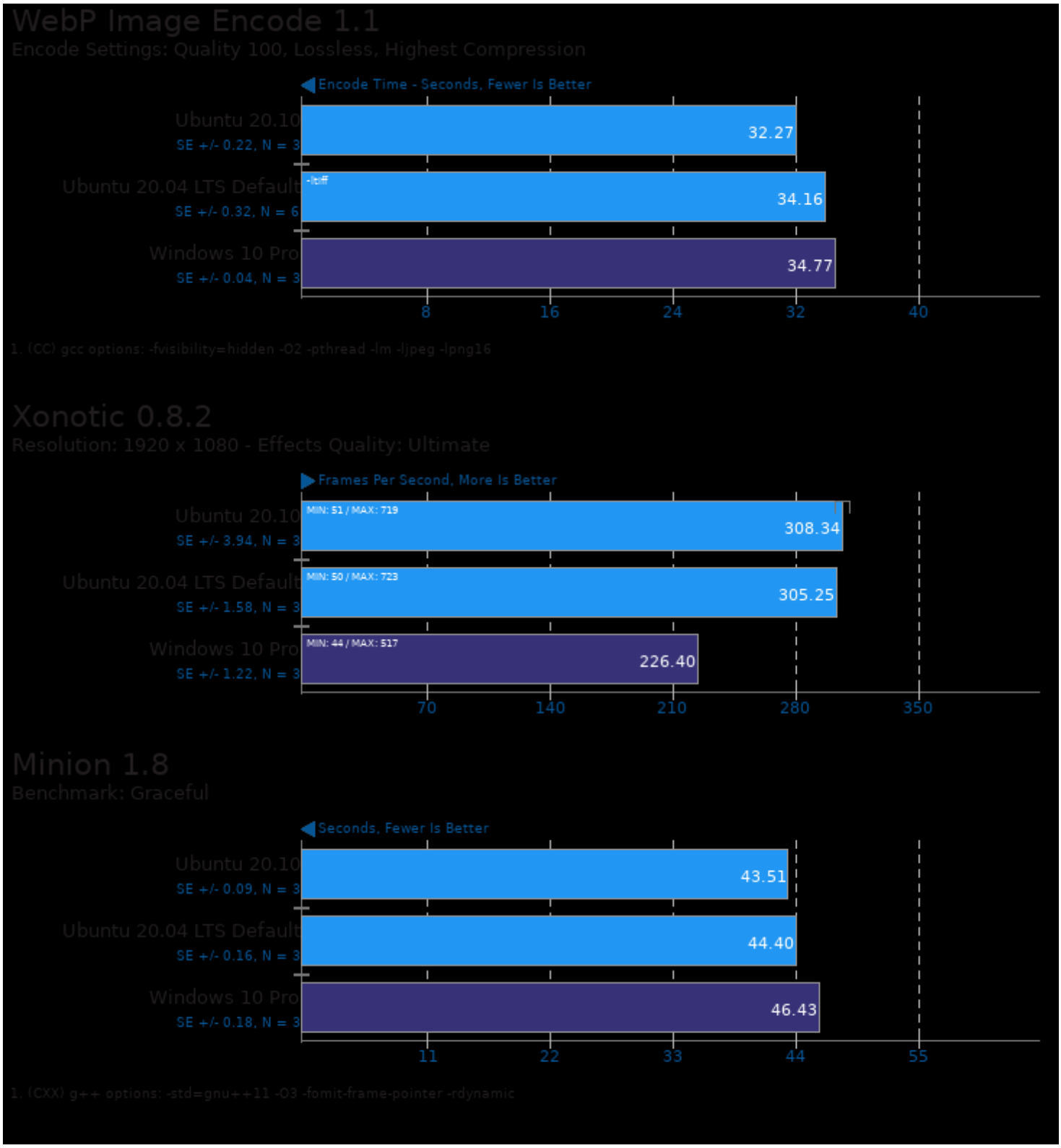
Selenium

Benchmark: ARES-6 - Browser: Google Chrome

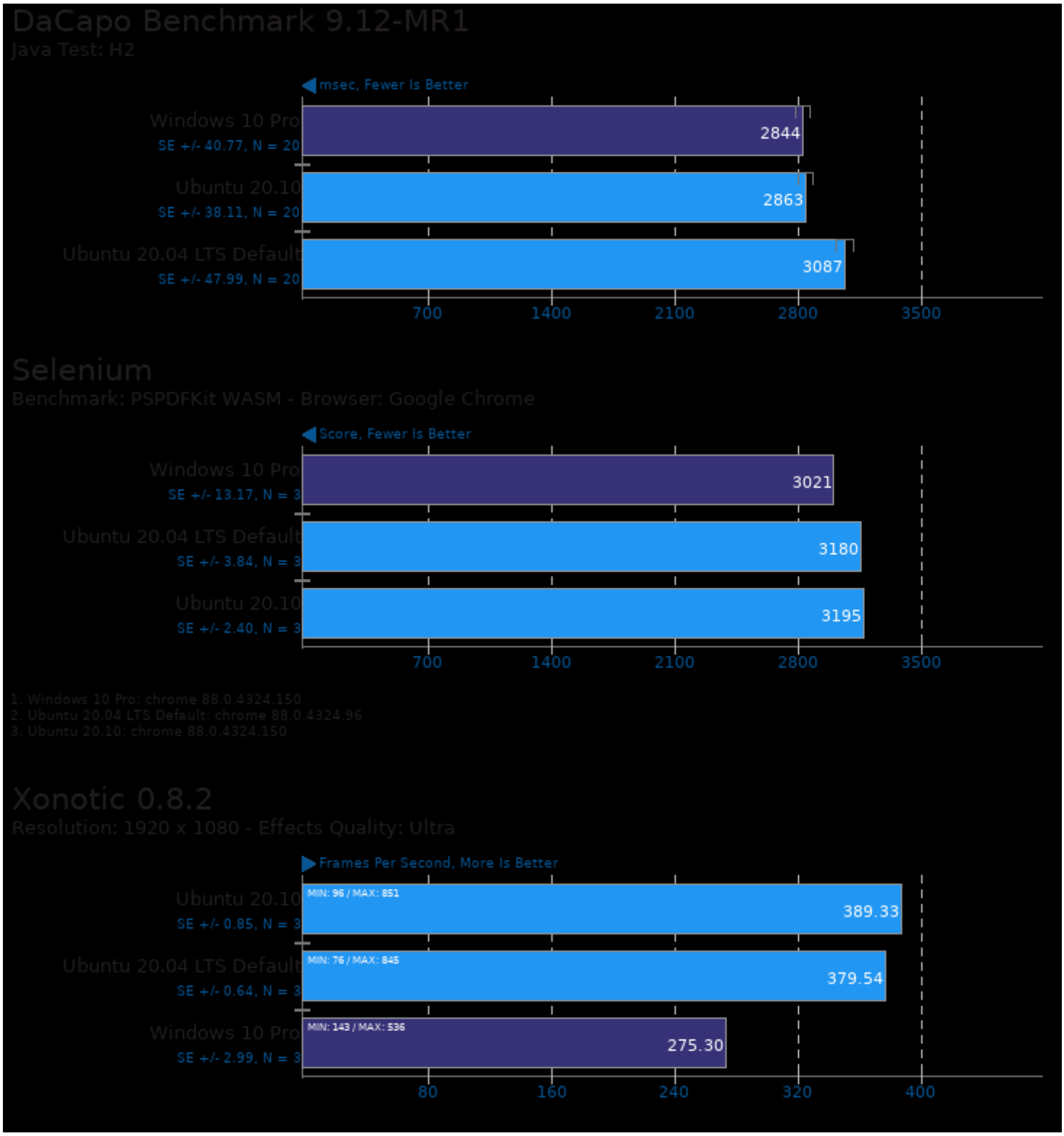


1. Ubuntu 20.04 LTS Default: chrome 88.0.4324.96
2. Ubuntu 20.10: chrome 88.0.4324.150
3. Windows 10 Pro: chrome 88.0.4324.150

HP Zbook Ubuntu Linux vs. Windows

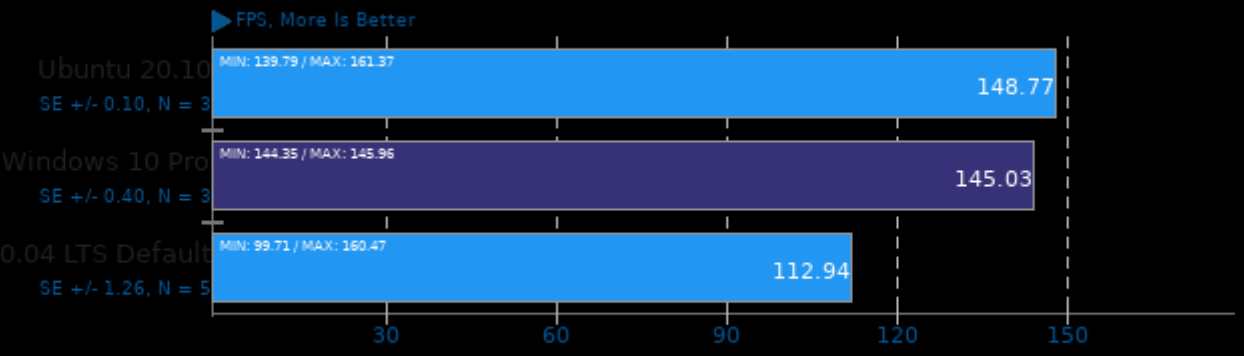


HP Zbook Ubuntu Linux vs. Windows



dav1d 0.8.1

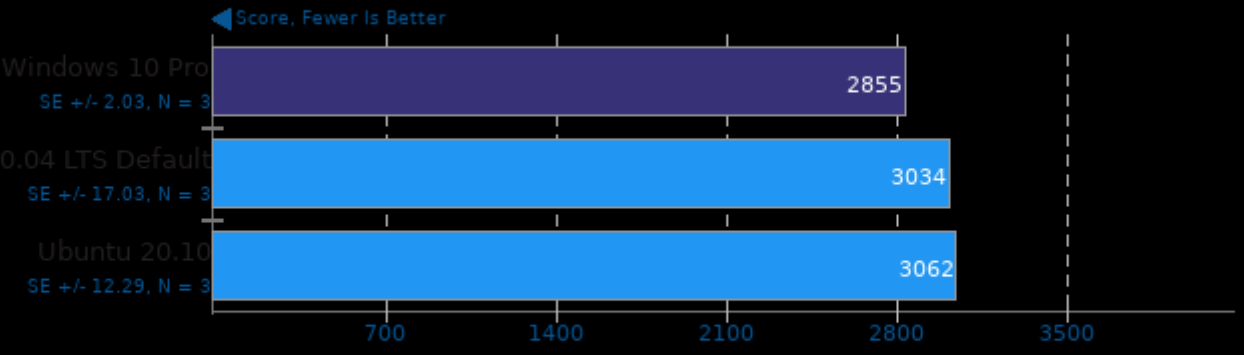
Video Input: Summer Nature 4K



1. (CC) gcc options: -pthread

Selenium

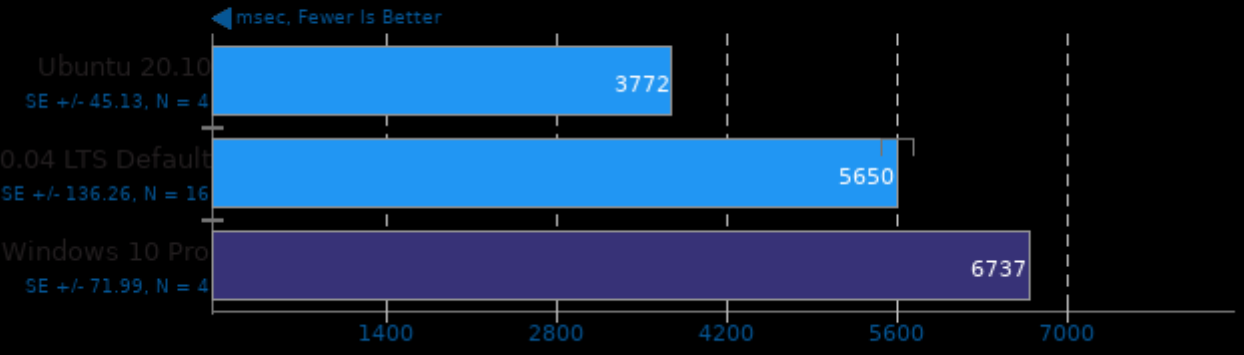
Benchmark: PSPDFKit WASM - Browser: Firefox



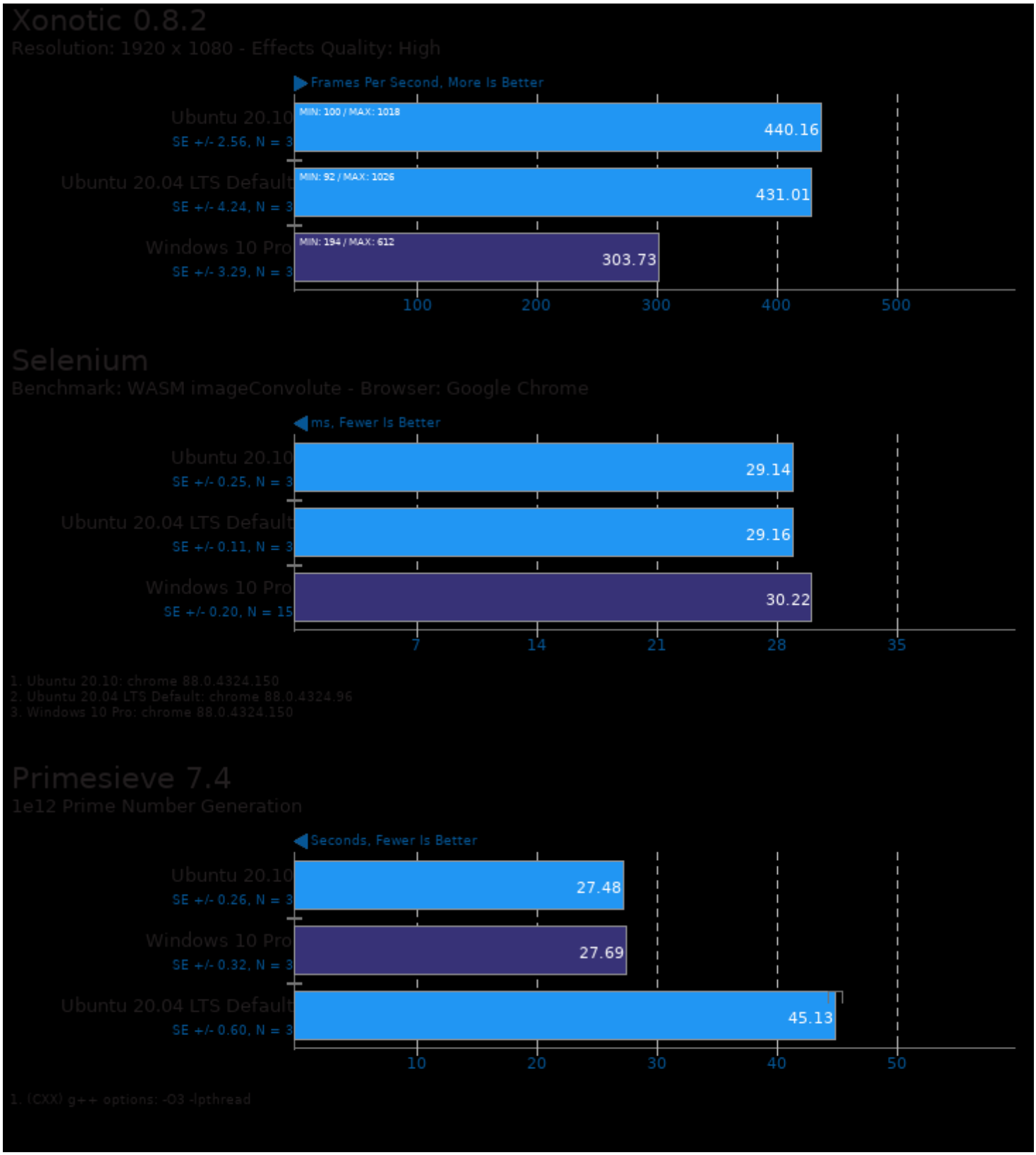
1. Windows 10 Pro: firefox 85.0.2
2. Ubuntu 20.04 LTS Default: firefox 85.0.1
3. Ubuntu 20.10: firefox 85.0.1

DaCapo Benchmark 9.12-MR1

Java Test: Tradesoap

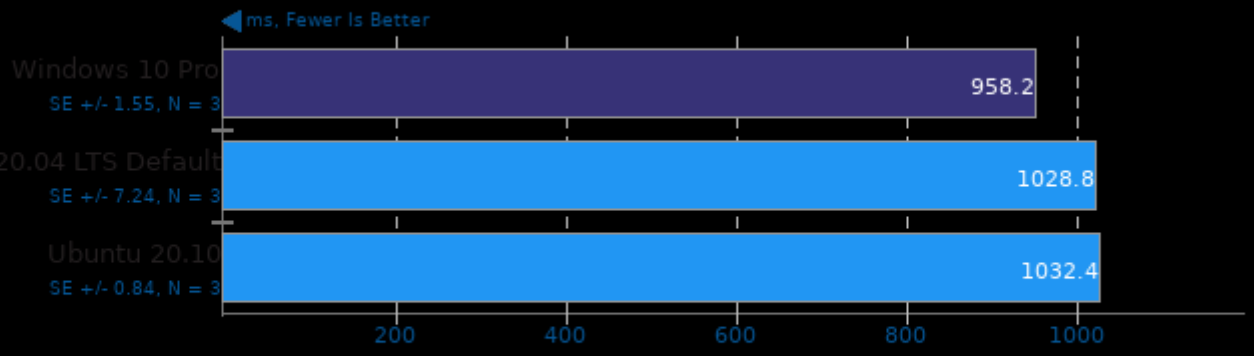


HP Zbook Ubuntu Linux vs. Windows



Selenium

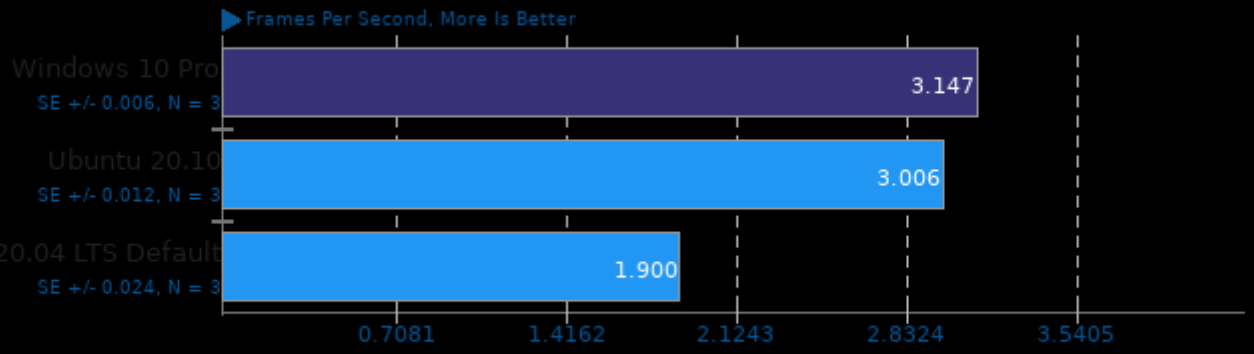
Benchmark: Kraken - Browser: Firefox



1. Windows 10 Pro: firefox 85.0.2
2. Ubuntu 20.04 LTS Default: firefox 85.0.1
3. Ubuntu 20.10: firefox 85.0.1

SVT-AV1 0.8

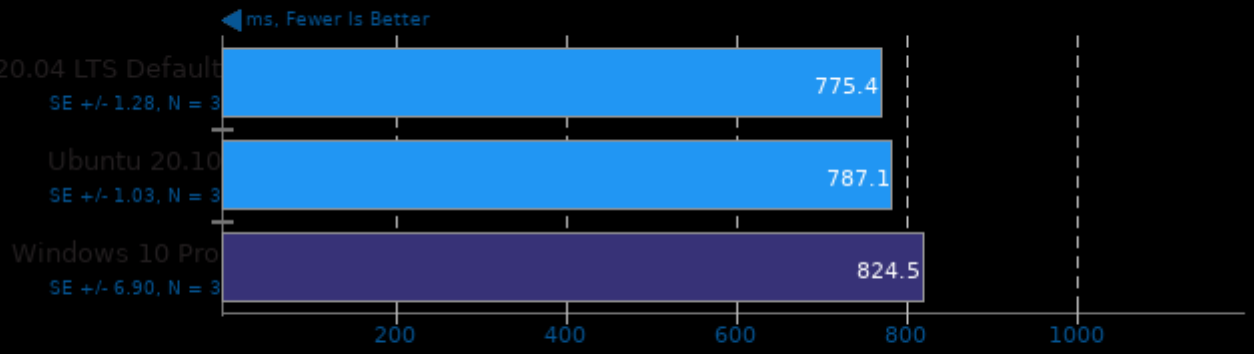
Encoder Mode: Enc Mode 4 - Input: 1080p



1. (CXX) g++ options: -O3 -fcommon -fPIE -fPIC -pie

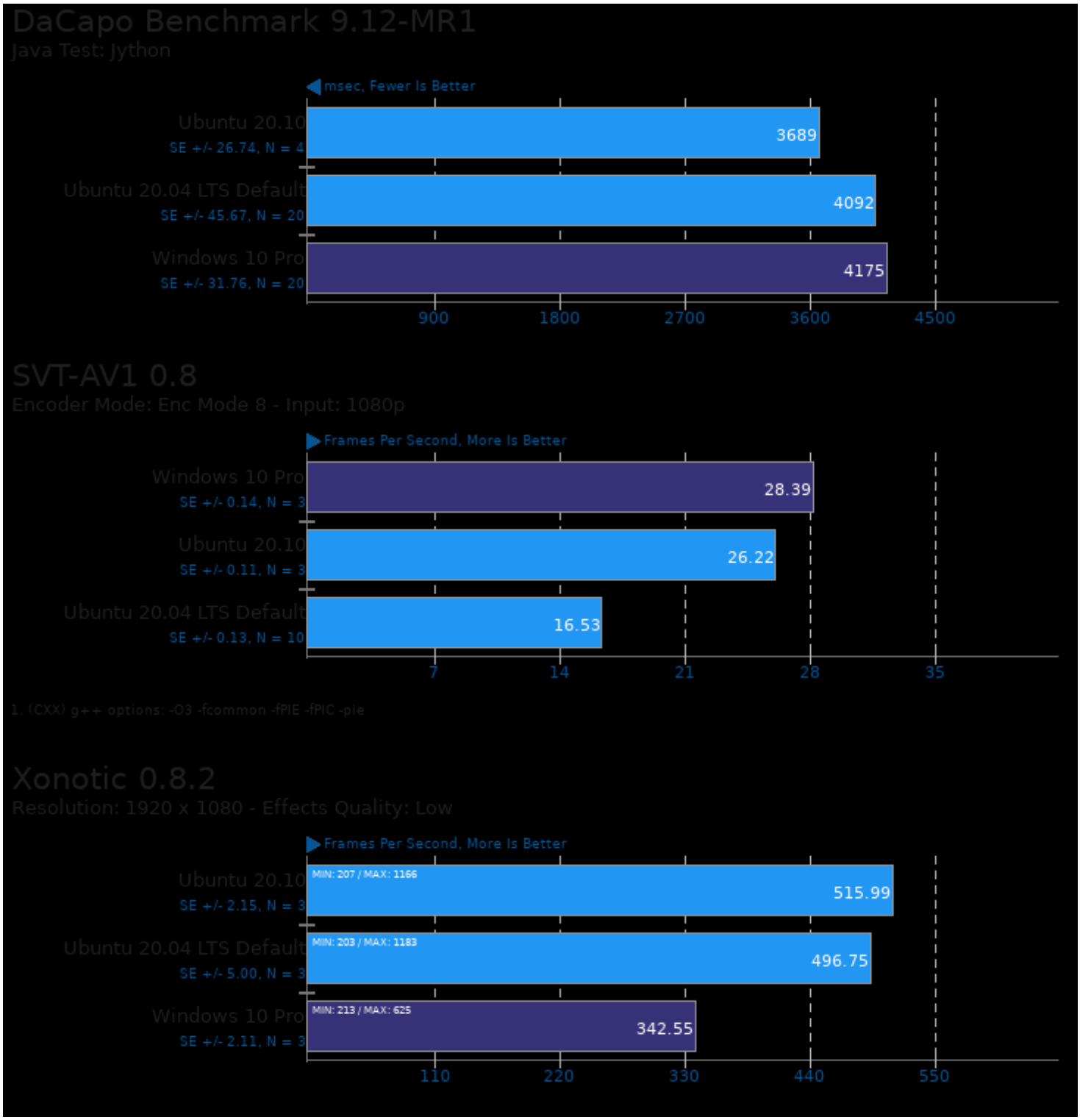
Selenium

Benchmark: Kraken - Browser: Google Chrome

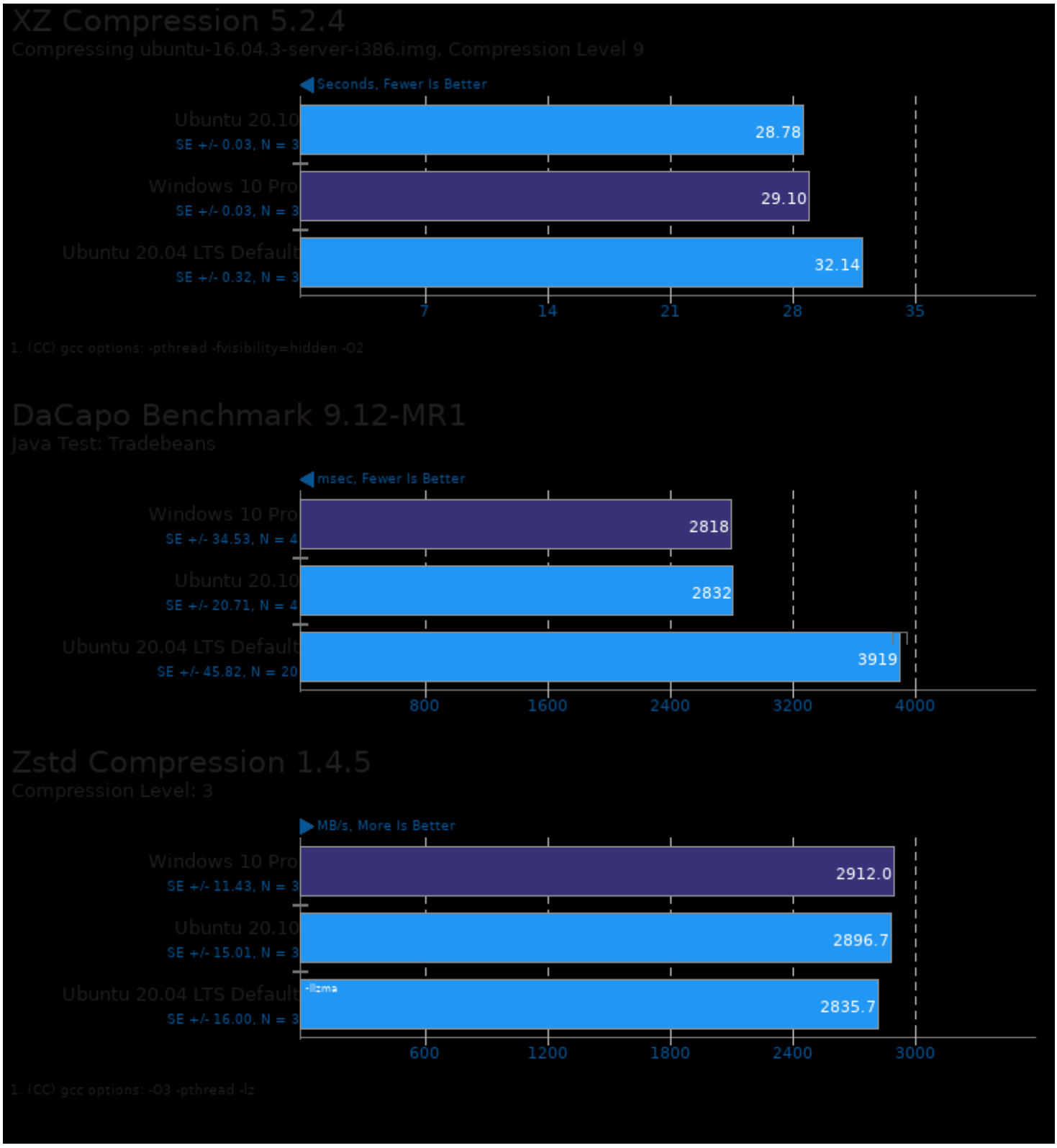


1. Ubuntu 20.04 LTS Default: chrome 88.0.4324.96
2. Ubuntu 20.10: chrome 88.0.4324.150
3. Windows 10 Pro: chrome 88.0.4324.150

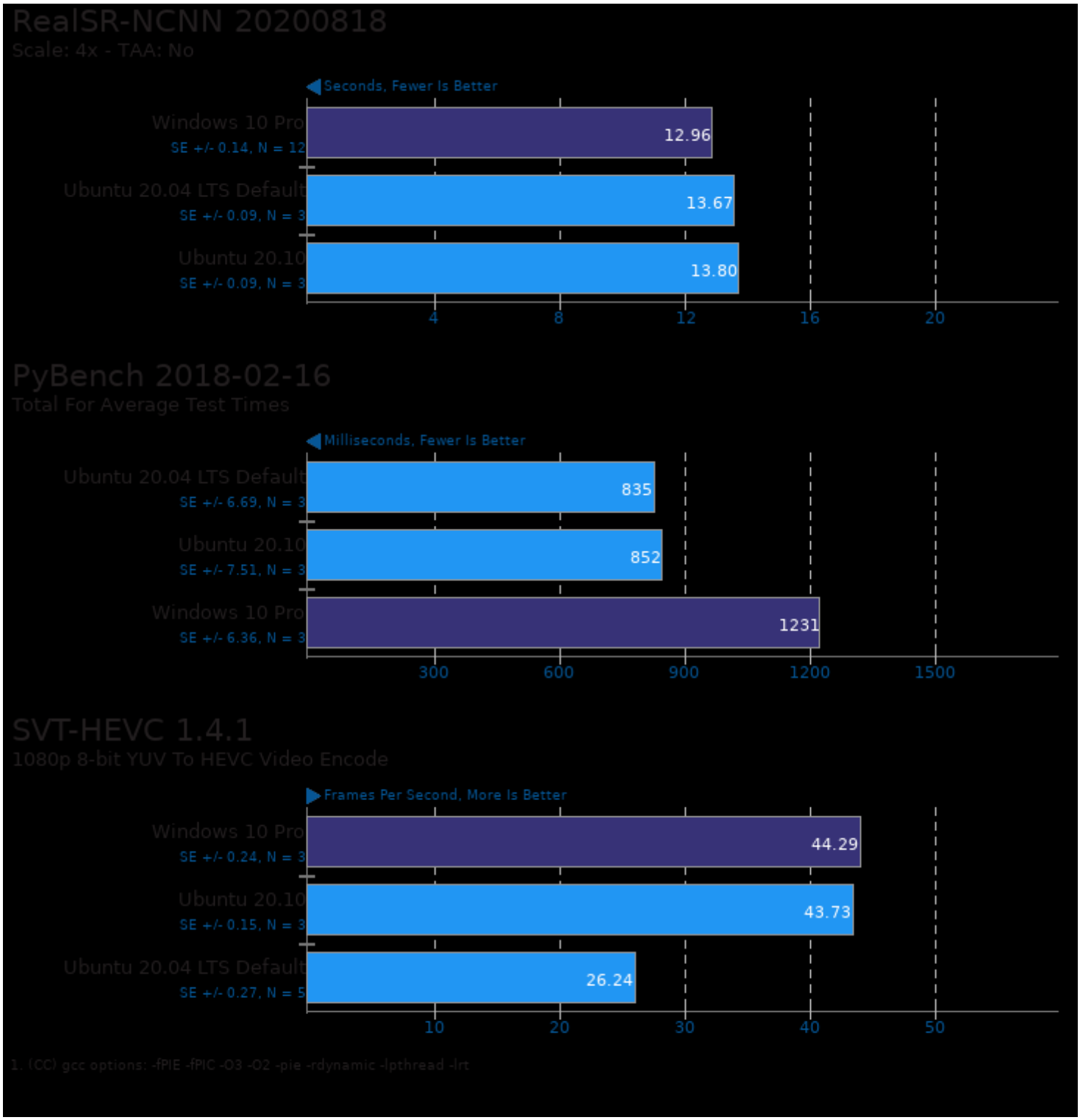
HP Zbook Ubuntu Linux vs. Windows



HP Zbook Ubuntu Linux vs. Windows

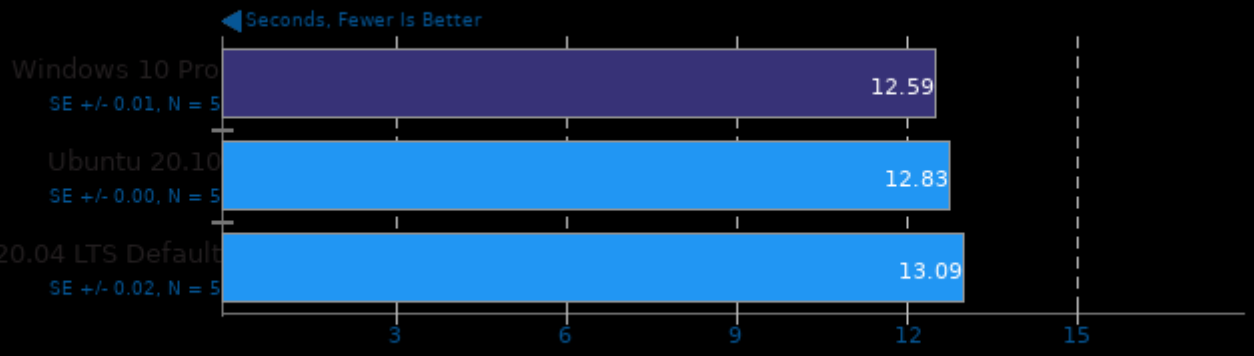


HP Zbook Ubuntu Linux vs. Windows



WavPack Audio Encoding 5.3

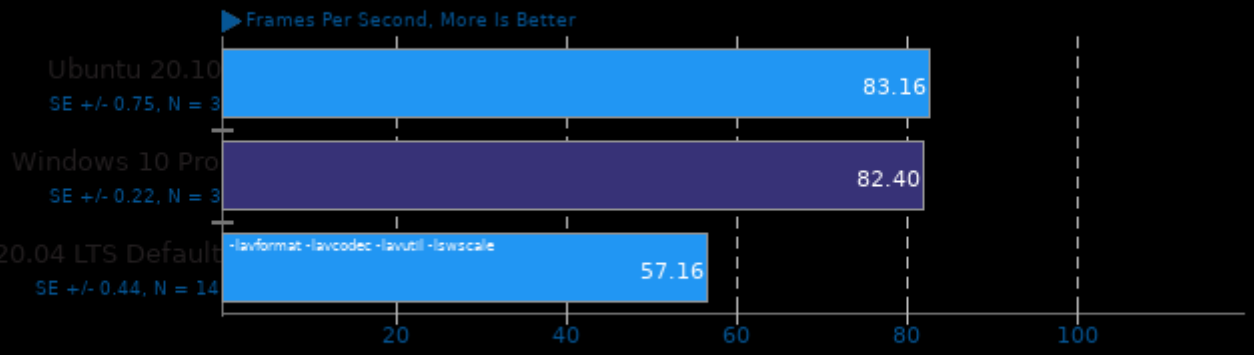
WAV To WavPack



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

x264 2019-12-17

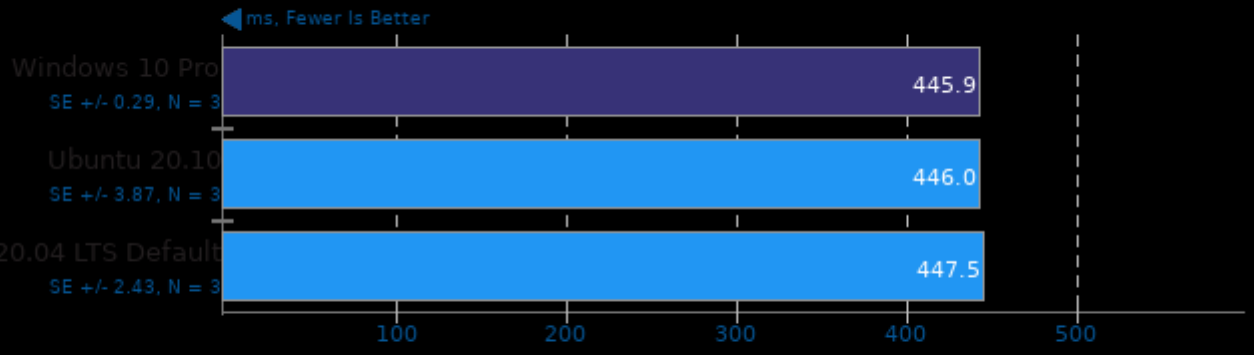
H.264 Video Encoding



1. (CC) gcc options: -ldl -m64 -lm -lpthread -O3 -ffast-math -std=gnu99 -fPIC -fomit-frame-pointer -fno-tree-vectorize

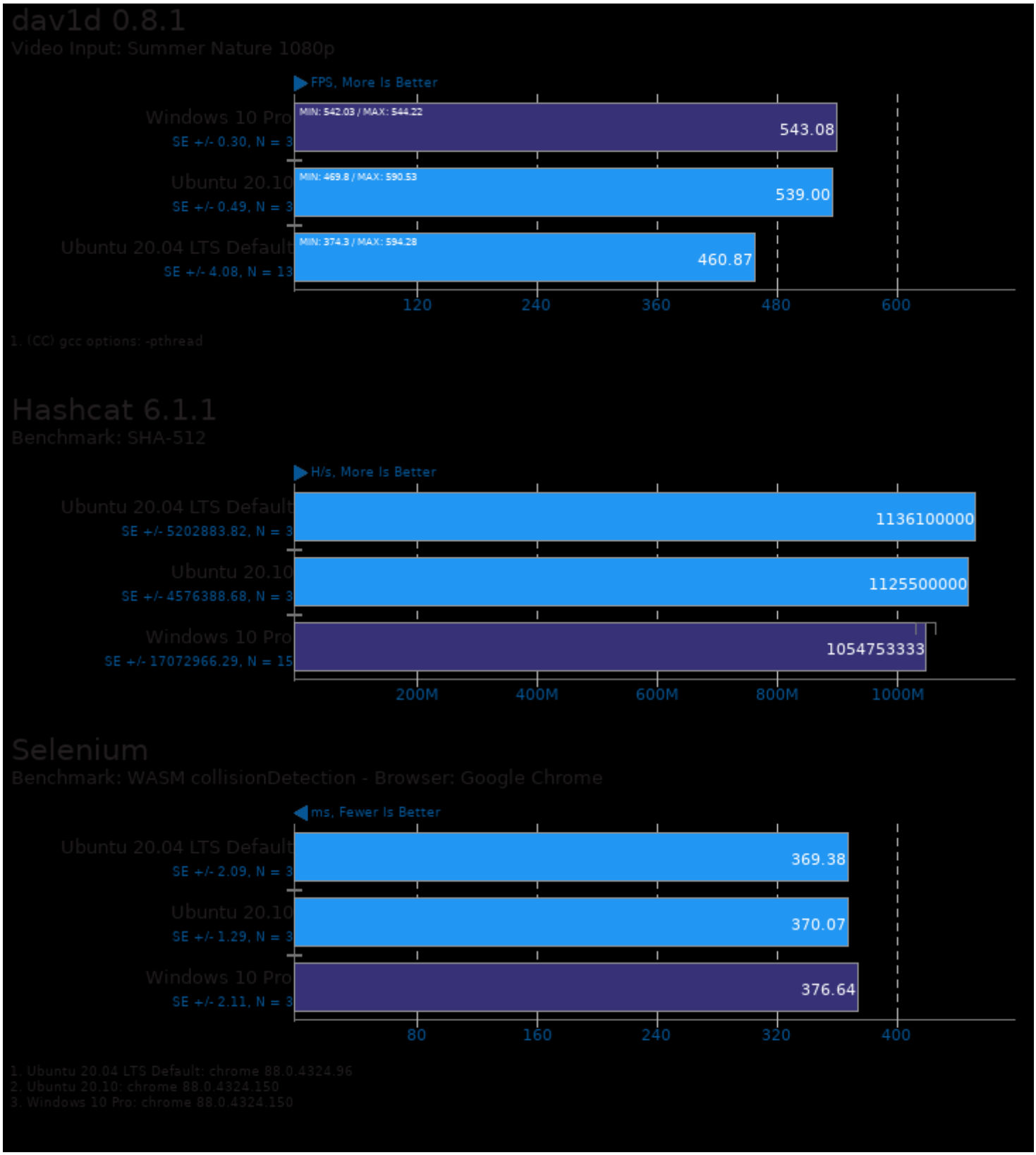
Selenium

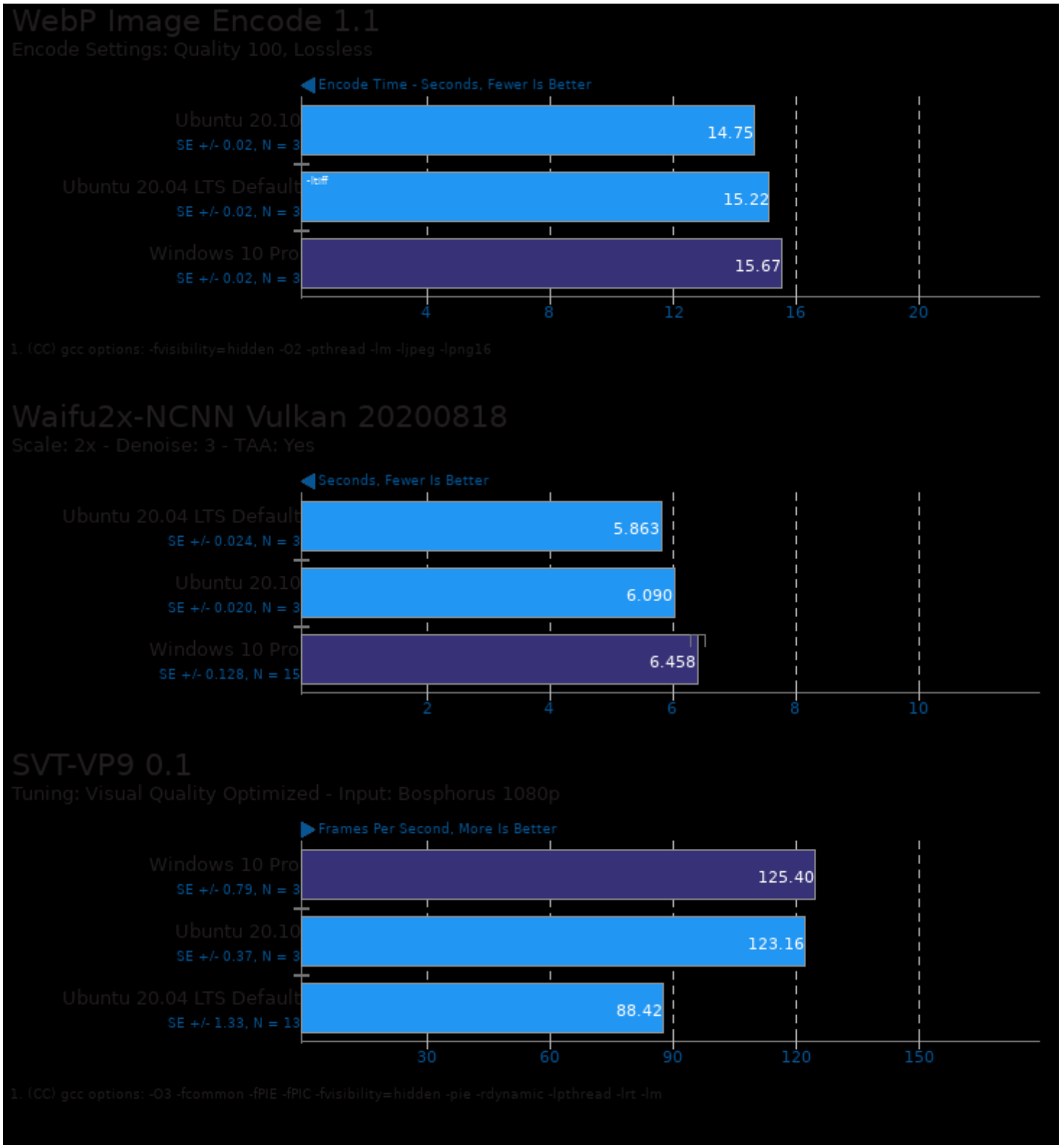
Benchmark: WASM collisionDetection - Browser: Firefox



1. Windows 10 Pro: firefox 85.0.2
2. Ubuntu 20.10: firefox 85.0.1
3. Ubuntu 20.04 LTS Default: firefox 85.0.1

HP Zbook Ubuntu Linux vs. Windows

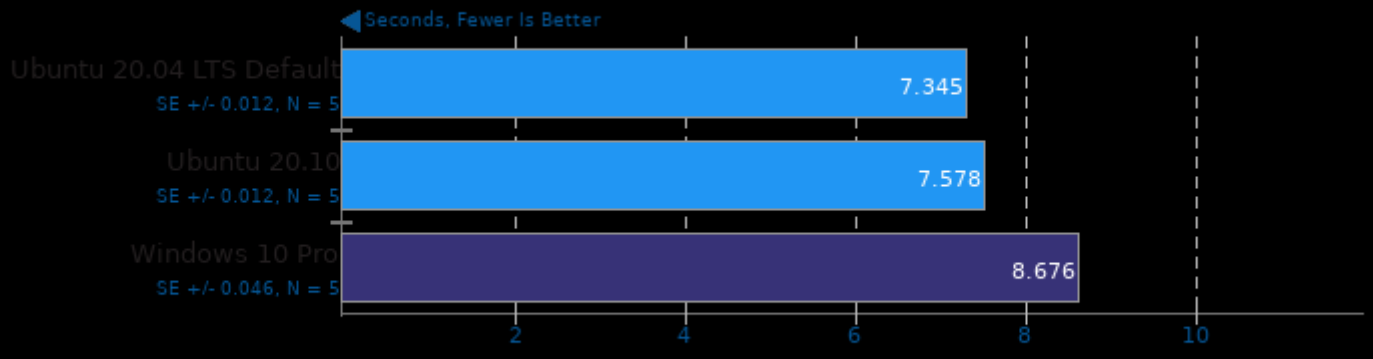



WebP Image Encode 1.1
Encode Settings: Quality 100, Lossless
Encode Time - Seconds, Fewer Is Better
Ubuntu 20.10
SE +/- 0.02, N = 3
14.75
Ubuntu 20.04 LTS Default
SE +/- 0.02, N = 3
15.22
Windows 10 Pro
SE +/- 0.02, N = 3
15.67
4
8
12
16
20
1. (CC) gcc options: -fvisibility=hidden -O2 -pthread -lm -ljpeg -lpng16
Waifu2x-NCNN Vulkan 20200818
Scale: 2x - Denoise: 3 - TAA: Yes
Seconds, Fewer Is Better
Ubuntu 20.04 LTS Default
SE +/- 0.024, N = 3
5.863
Ubuntu 20.10
SE +/- 0.020, N = 3
6.090
Windows 10 Pro
SE +/- 0.128, N = 15
6.458
2
4
6
8
10
SVT-VP9 0.1
Tuning: Visual Quality Optimized - Input: Bosphorus 1080p
Frames Per Second, More Is Better
Windows 10 Pro
SE +/- 0.79, N = 3
125.40
Ubuntu 20.10
SE +/- 0.37, N = 3
123.16
Ubuntu 20.04 LTS Default
SE +/- 1.33, N = 13
88.42
30
60
90
120
150
1. (CC) gcc options: -O3 -fcommon -fPIE -fPIC -fvisibility=hidden -pie -rdynamic -lpthread -lrt -lm

HP Zbook Ubuntu Linux vs. Windows

Opus Codec Encoding 1.3.1

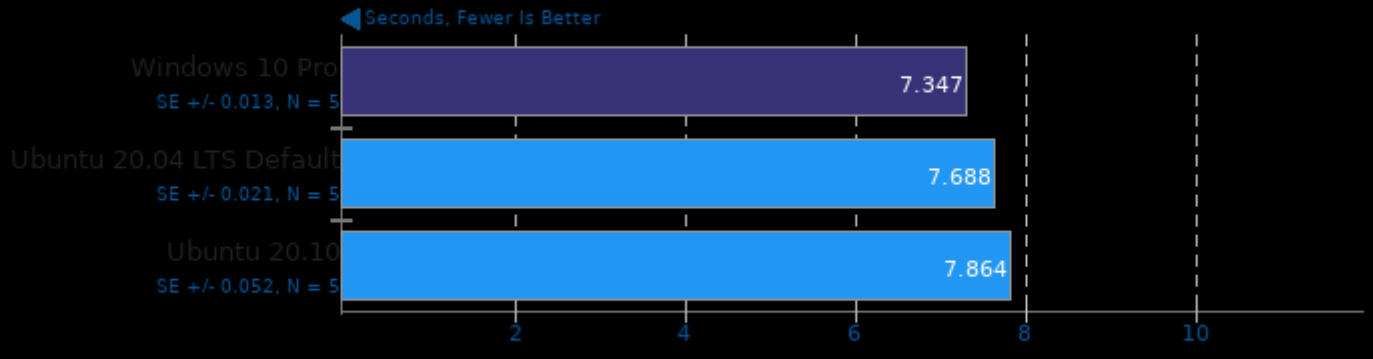
WAV To Opus Encode



1. (CXX) g++ options: -fvisibility=hidden -logg -lm

FLAC Audio Encoding 1.3.2

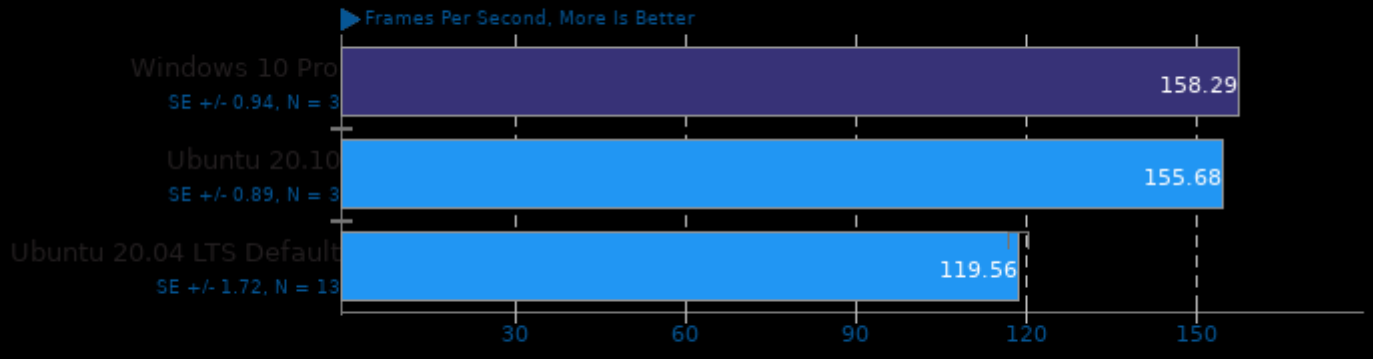
WAV To FLAC



1. (CXX) g++ options: -O2 -fvisibility=hidden -logg -lm

SVT-VP9 0.1

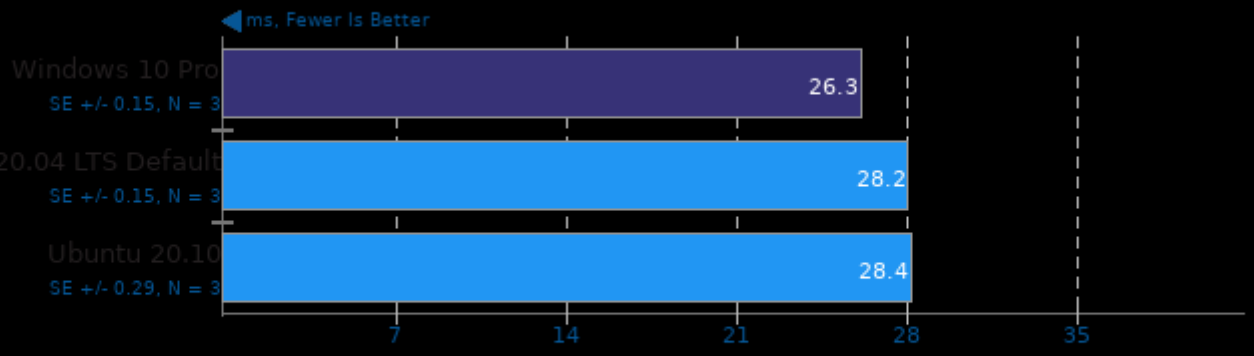
Tuning: PSNR/SSIM Optimized - Input: Bosphorus 1080p



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

Selenium

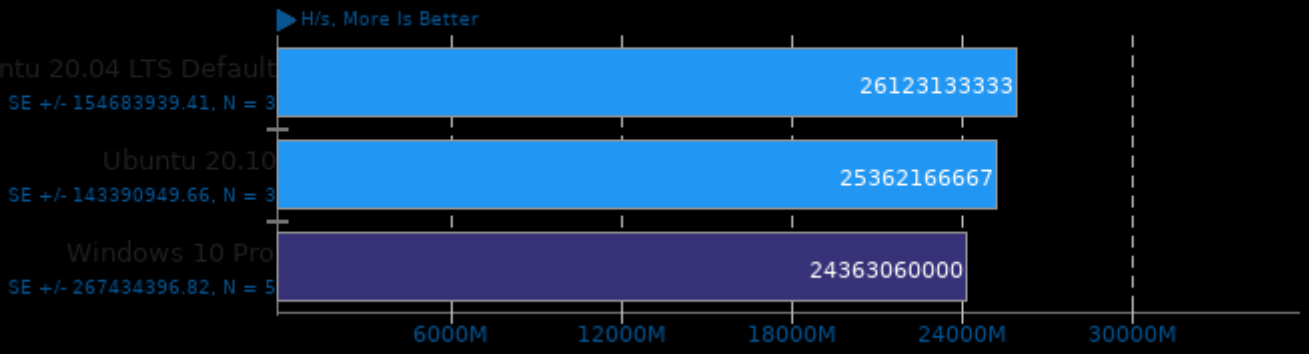
Benchmark: WASM imageConvolute - Browser: Firefox



1. Windows 10 Pro: firefox 85.0.2
2. Ubuntu 20.04 LTS Default: firefox 85.0.1
3. Ubuntu 20.10: firefox 85.0.1

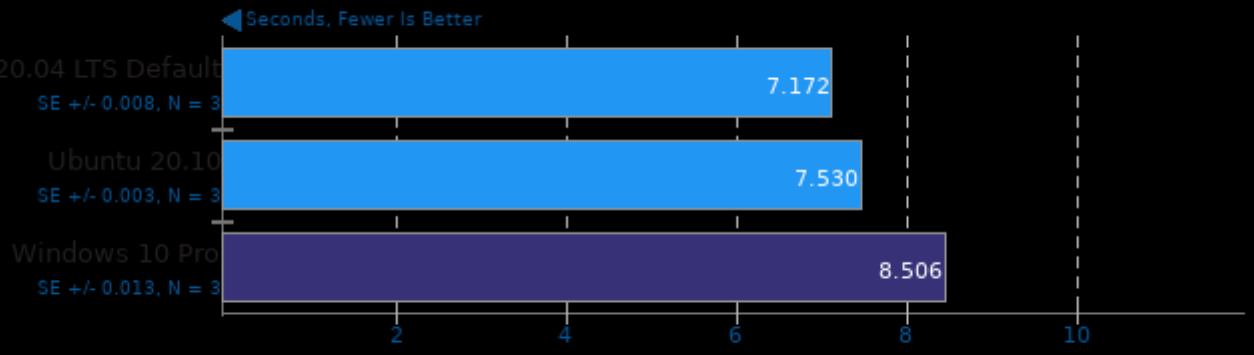
Hashcat 6.1.1

Benchmark: MD5



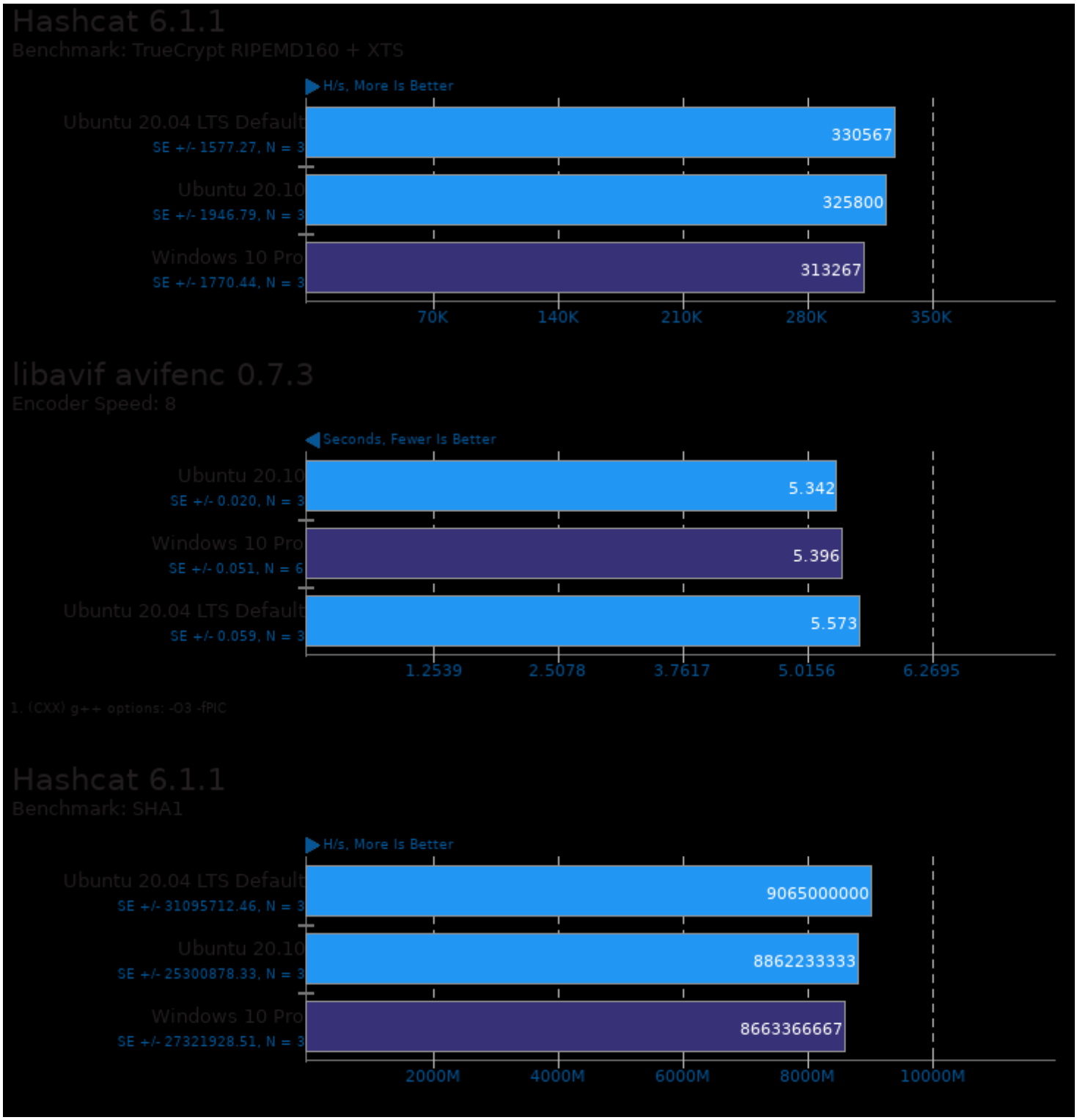
LAME MP3 Encoding 3.100

WAV To MP3

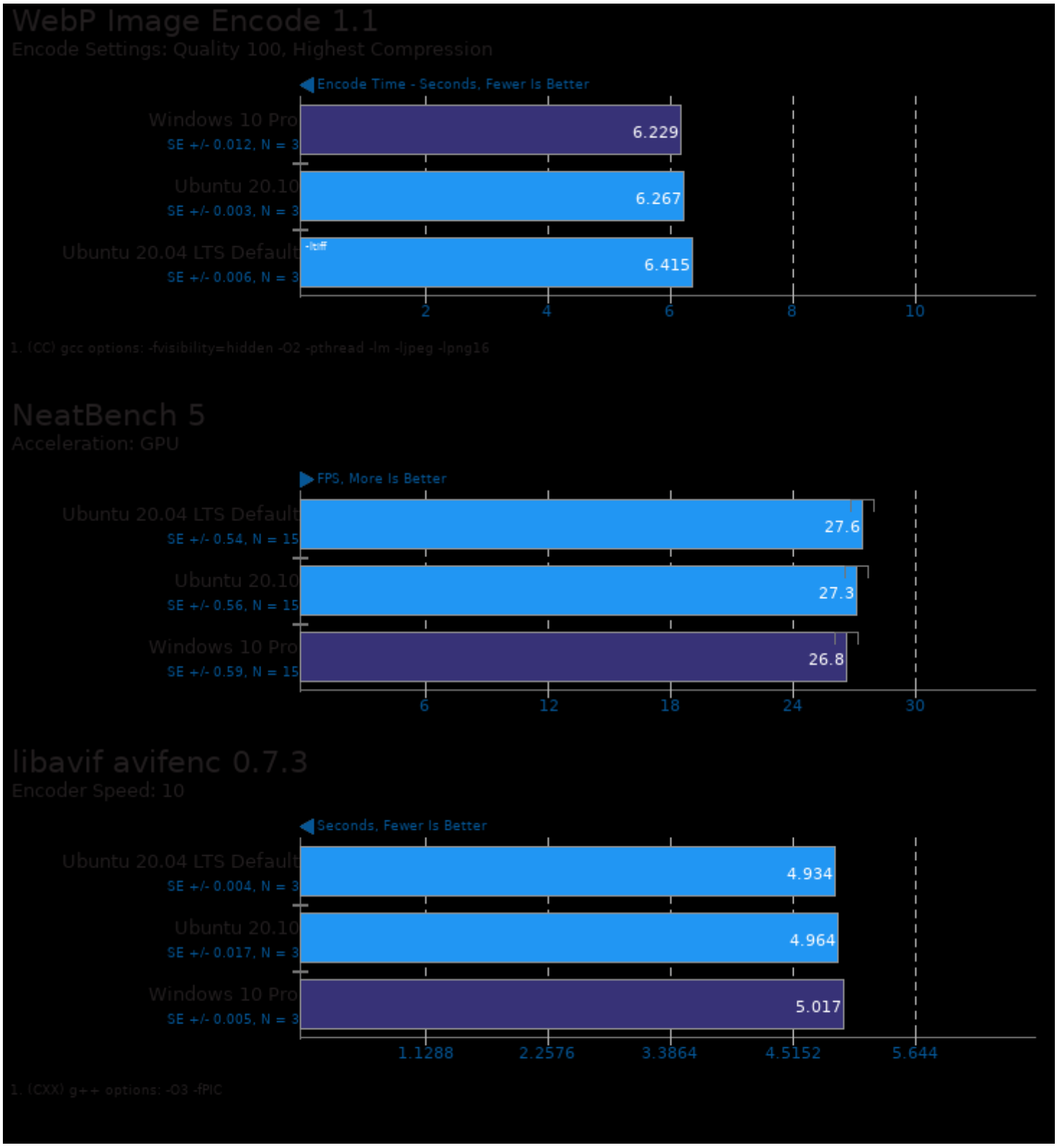


1. (CC) gcc options: -O3 -ffast-math -funroll-loops -fschedule-insns2 -fbranch-count-reg -fforce-addr -pipe -lm

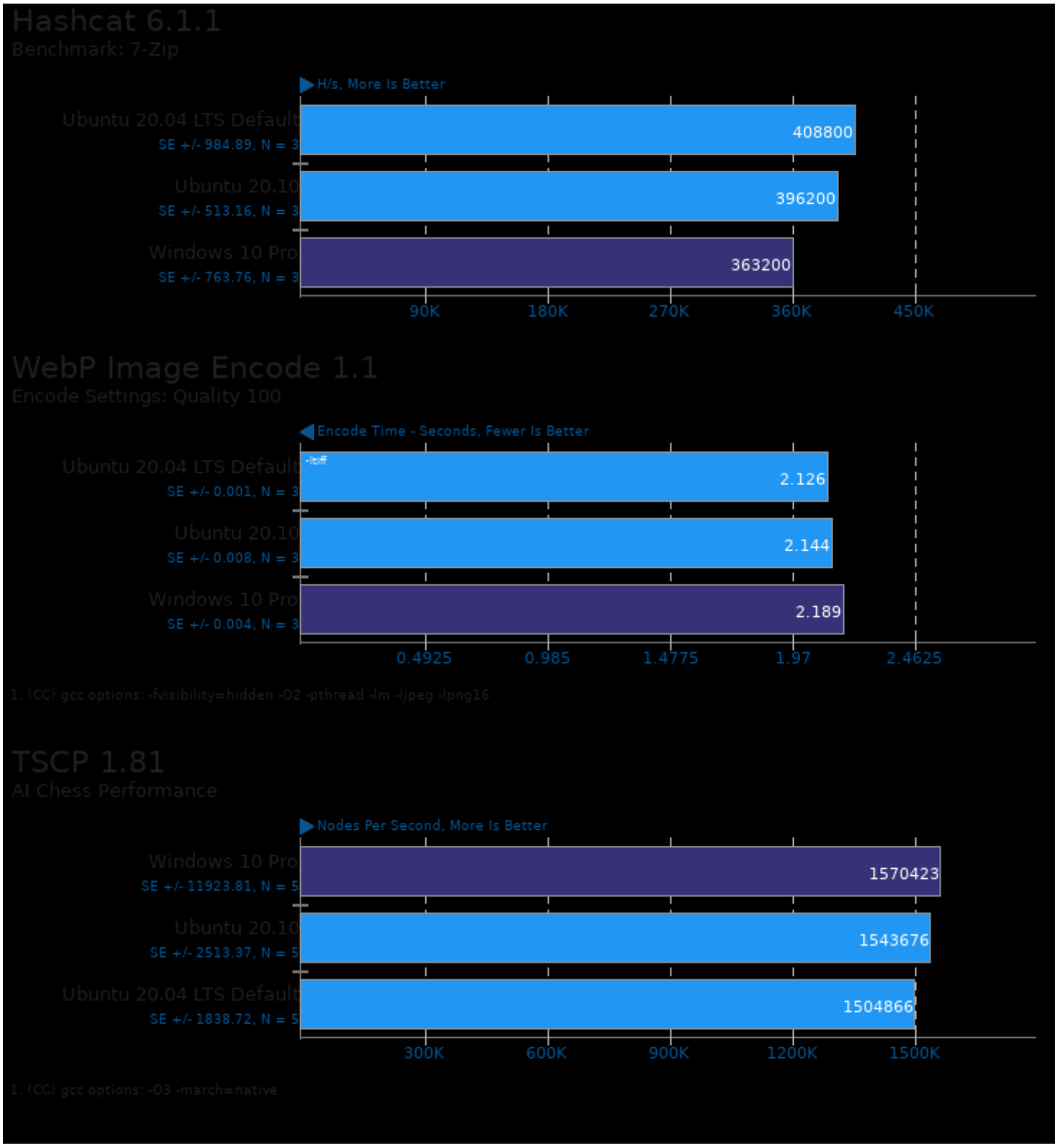
HP Zbook Ubuntu Linux vs. Windows

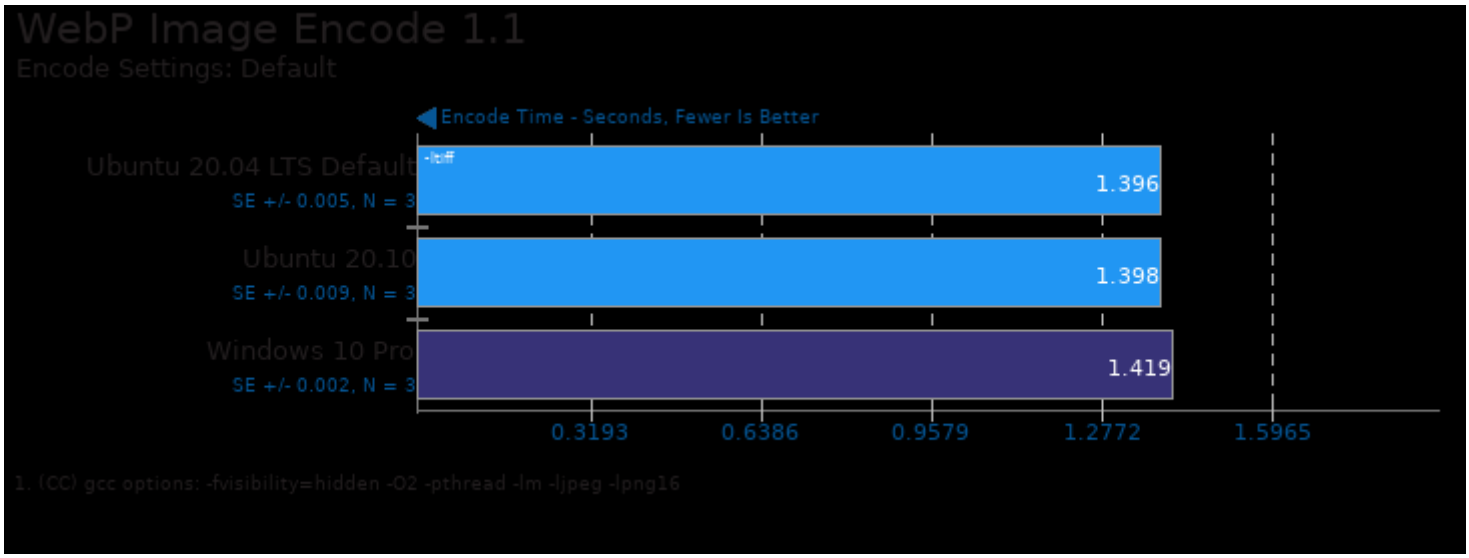


HP Zbook Ubuntu Linux vs. Windows



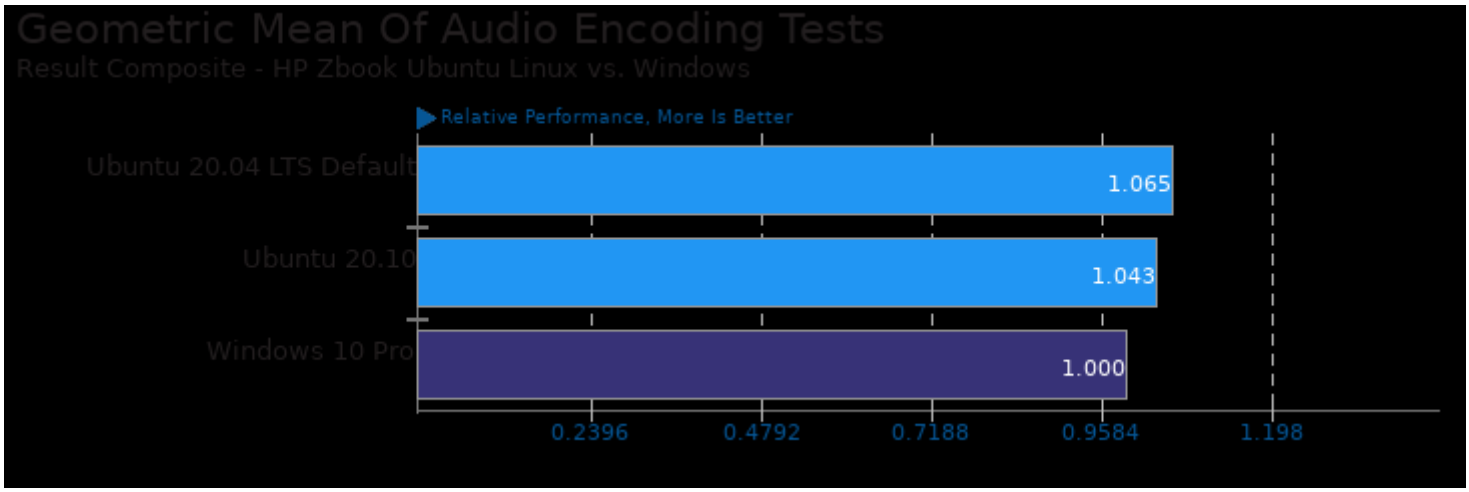
HP Zbook Ubuntu Linux vs. Windows




WebP Image Encode 1.1
Encode Settings: Default
Encode Time - Seconds, Fewer Is Better
Ubuntu 20.04 LTS Default
SE +/- 0.005, N = 3
1.396
Ubuntu 20.10
SE +/- 0.009, N = 3
1.398
Windows 10 Pro
SE +/- 0.002, N = 3
1.419
0.3193
0.6386
0.9579
1.2772
1.5965
1. (CC) gcc options: -fvisibility=hidden -O2 -pthread -lm -ljpeg -lpng16

HP Zbook Ubuntu Linux vs. Windows

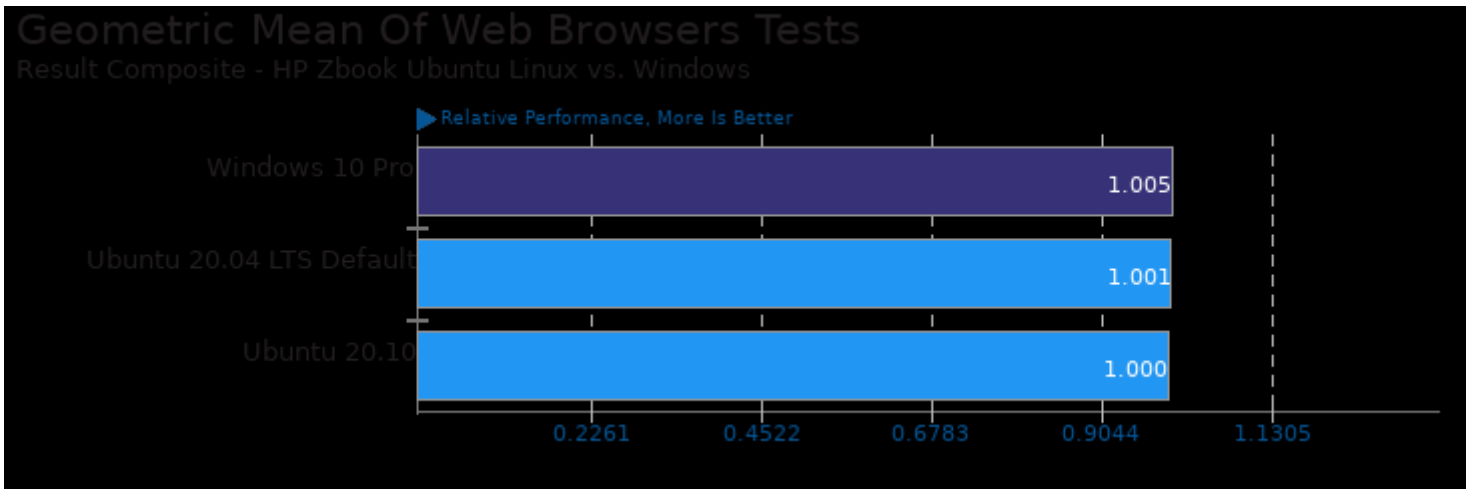
These geometric means are based upon test groupings / test suites for this result file.



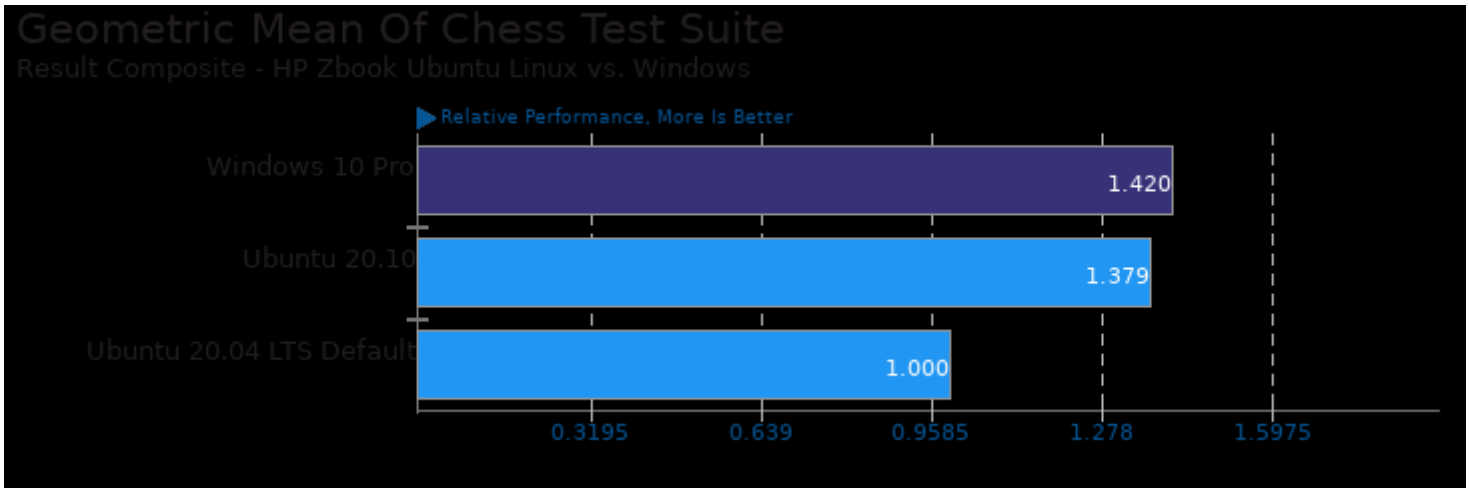
Geometric mean based upon tests: pts/encode-mp3, pts/encode-flac, pts/encode-wavpack and pts/encode-opus



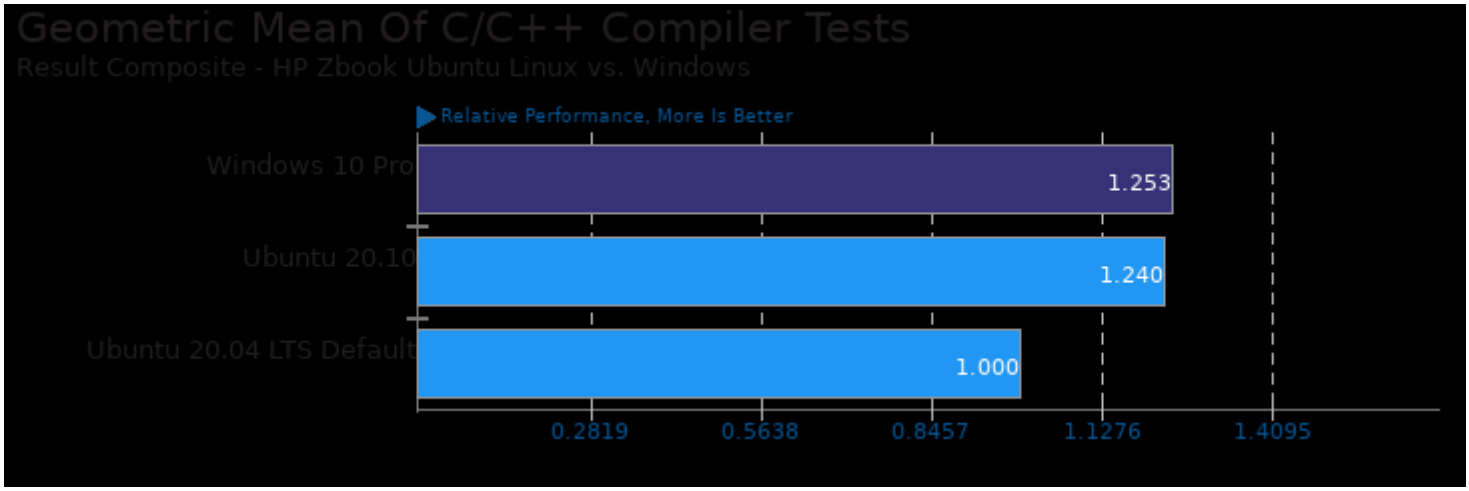
Geometric mean based upon tests: pts/dav1d, pts/svt-av1 and pts/avifenc



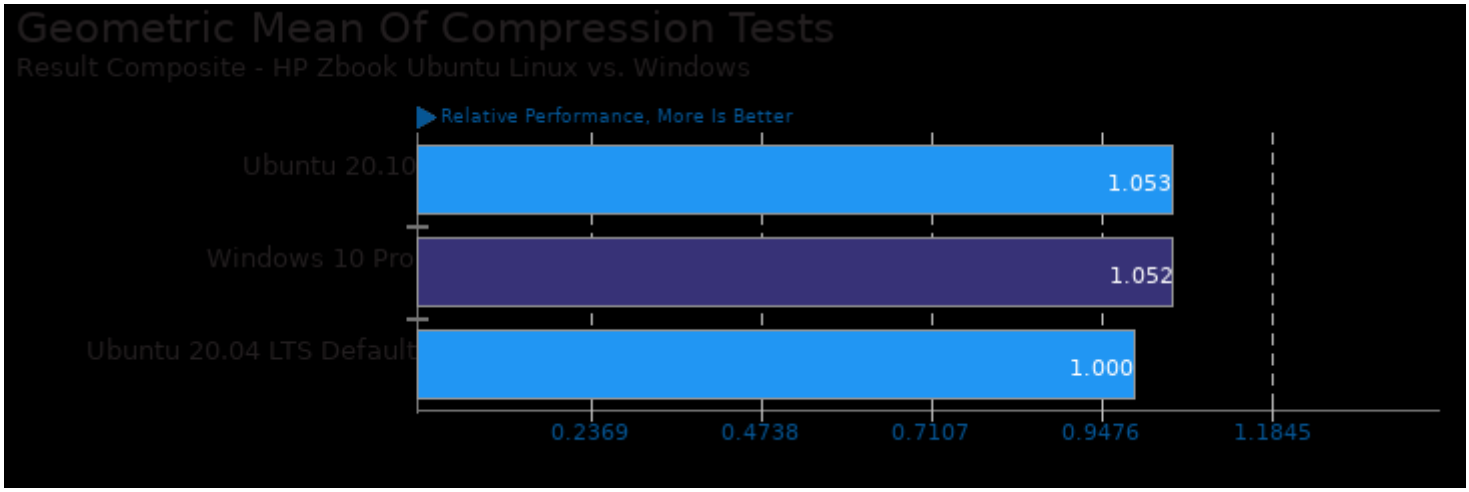
Geometric mean based upon tests: system/selenium



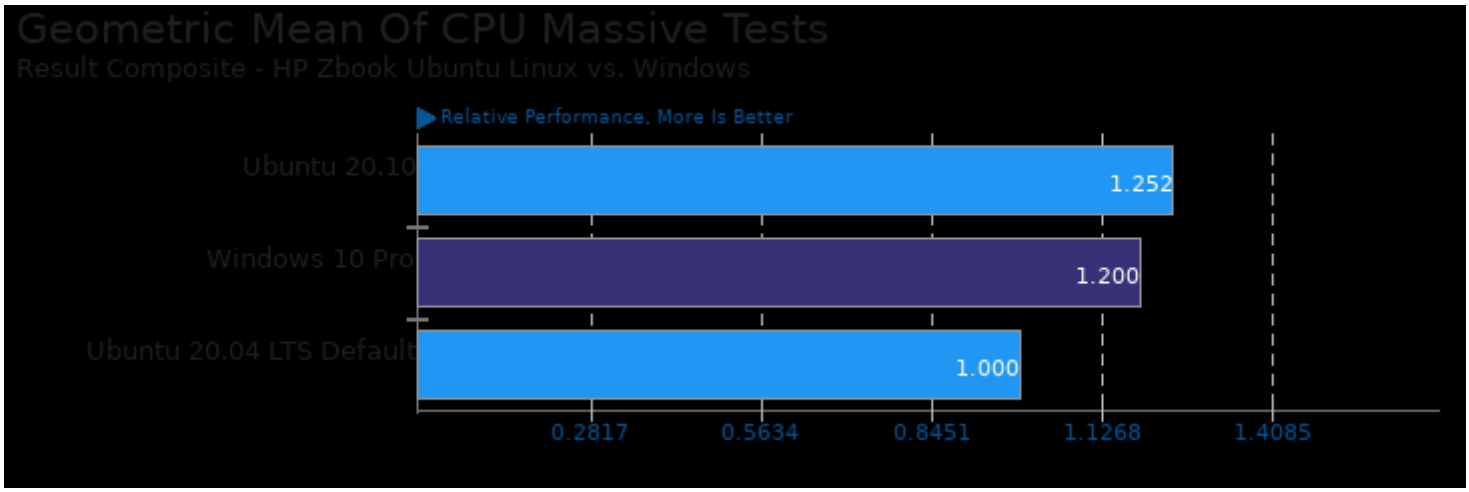
Geometric mean based upon tests: pts/tscp, pts/stockfish and pts/asmfish



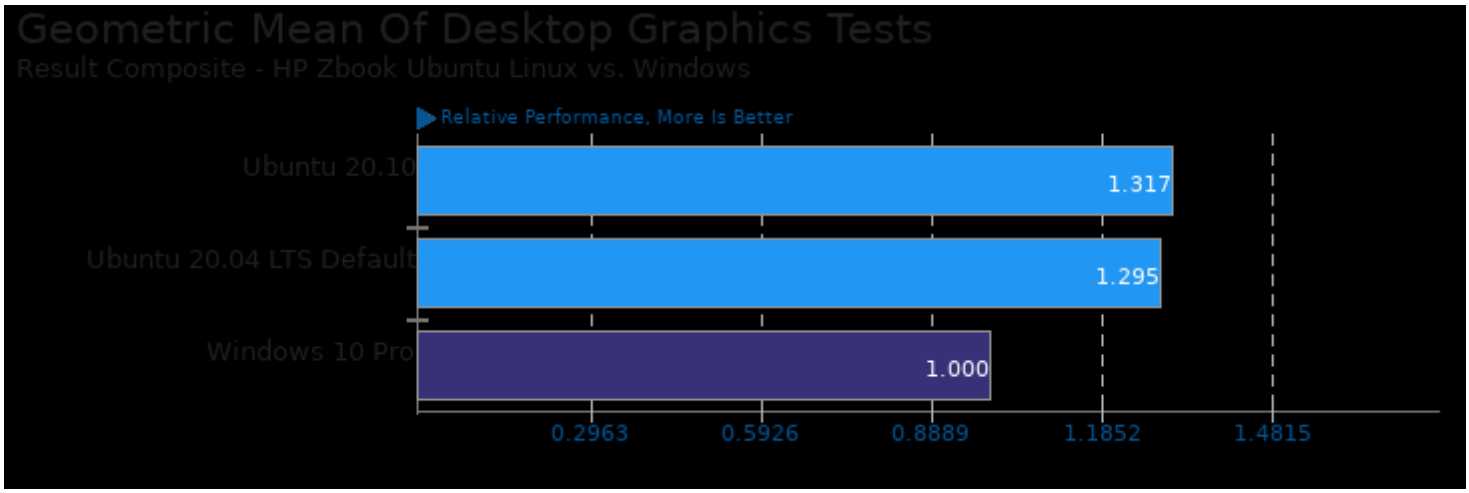
Geometric mean based upon tests: pts/tscp, pts/stockfish, pts/encode-mp3, pts/encode-flac, pts/dav1d, pts/x264, pts/compress-xz, pts/compress-zstd, pts/svt-av1 and pts/svt-vp9



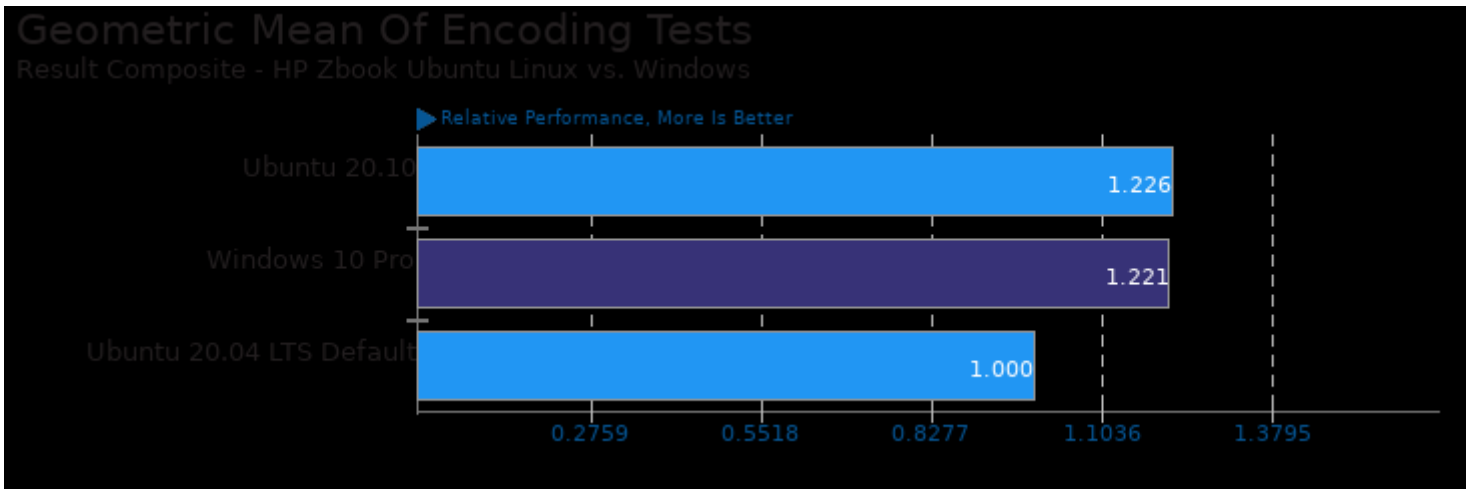
Geometric mean based upon tests: pts/compress-zstd and pts/compress-xz



Geometric mean based upon tests: pts/asmfish, pts/compress-xz, pts/compress-zstd, pts/dacapobench, pts/dav1d, pts/svt-av1, pts/svt-hevc, pts/svt-vp9, pts/x264, pts/encode-flac, pts/encode-mp3, pts/minion, pts/namd, pts/primesieve, pts/stockfish, pts/v-ray and pts/blender

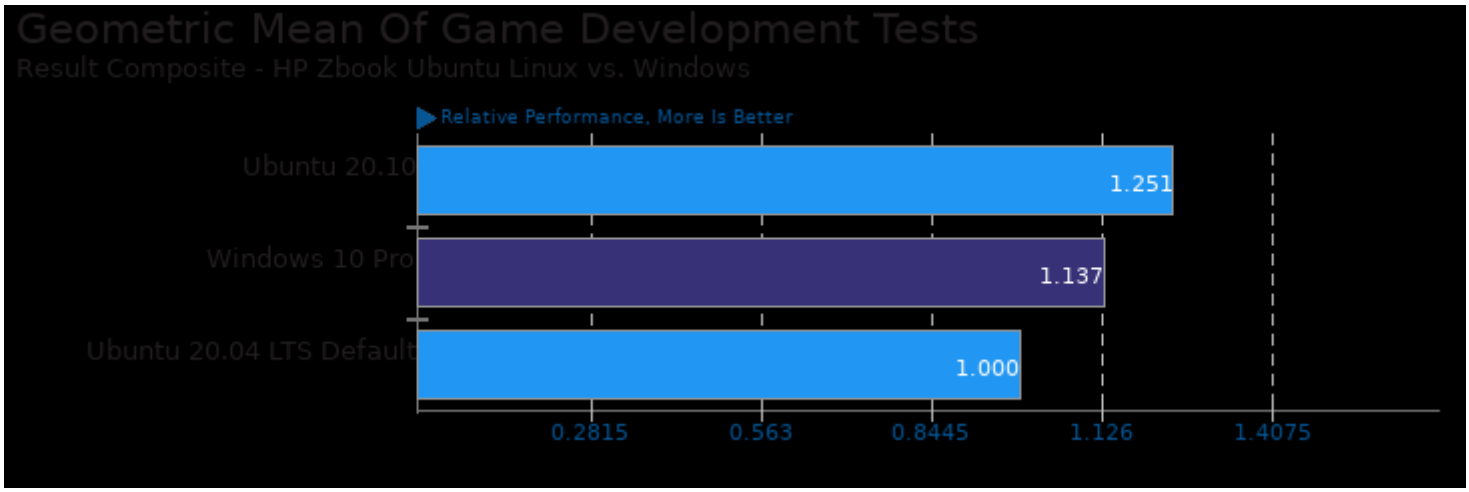


Geometric mean based upon tests: pts/xonotic, pts/unigine-valley and pts/unigine-heaven

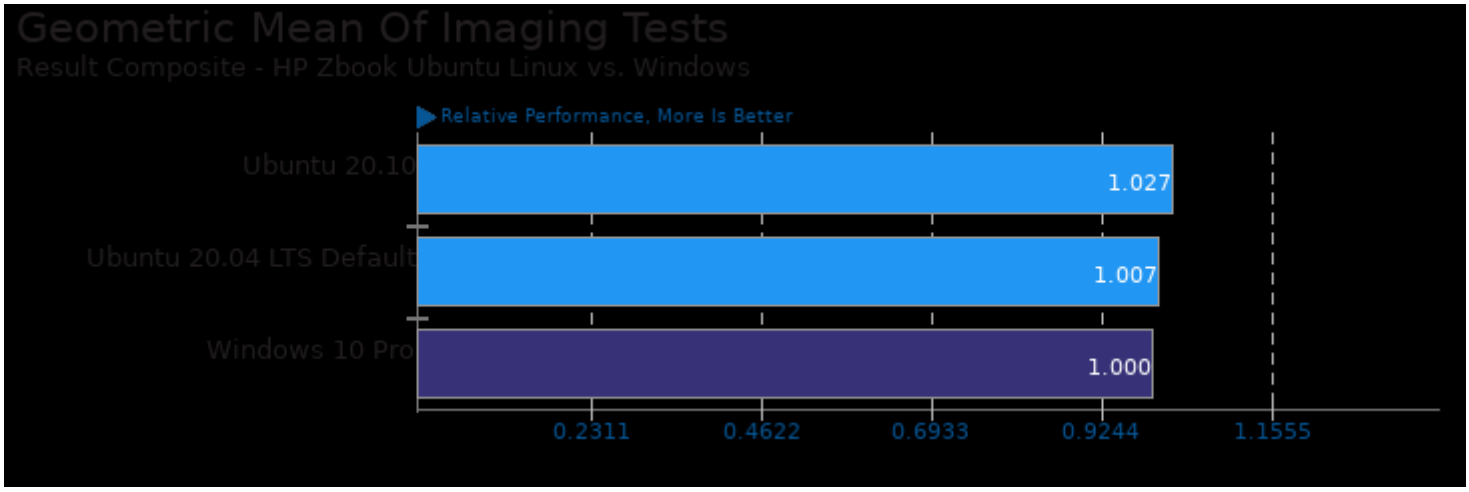


Geometric mean based upon tests: pts/encode-mp3, pts/encode-flac, pts/encode-wavpack, pts/encode-opus, pts/svt-vp9, pts/svt-hevc, pts/x264, pts/dav1d, pts/svt-av1 and pts/avifenc

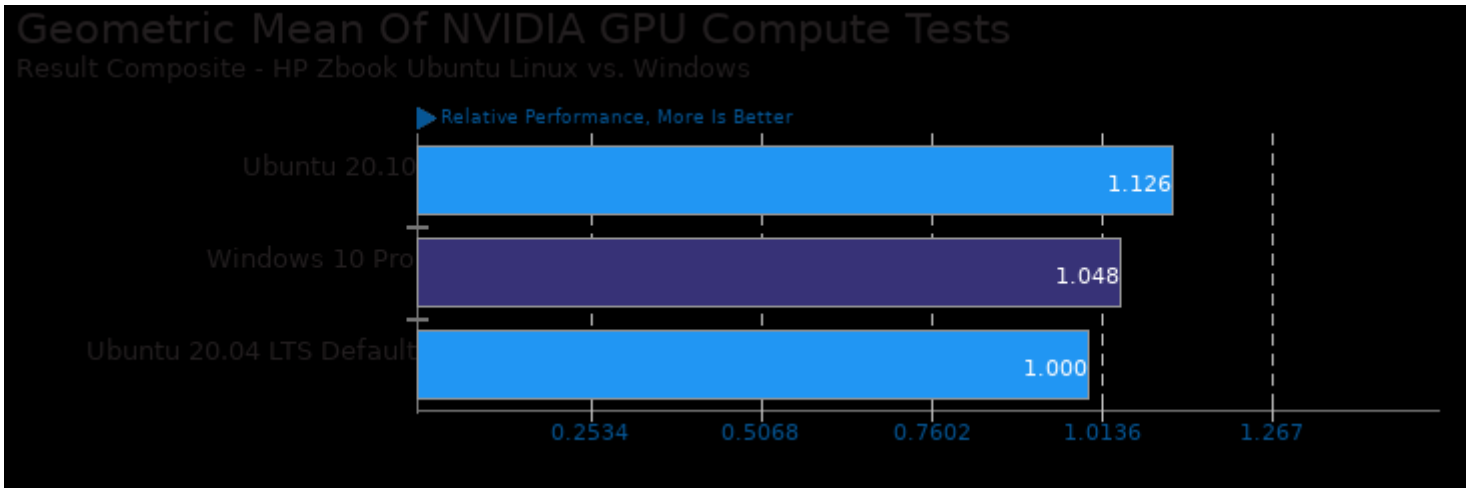
HP Zbook Ubuntu Linux vs. Windows



Geometric mean based upon tests: pts/blender and pts/oidn

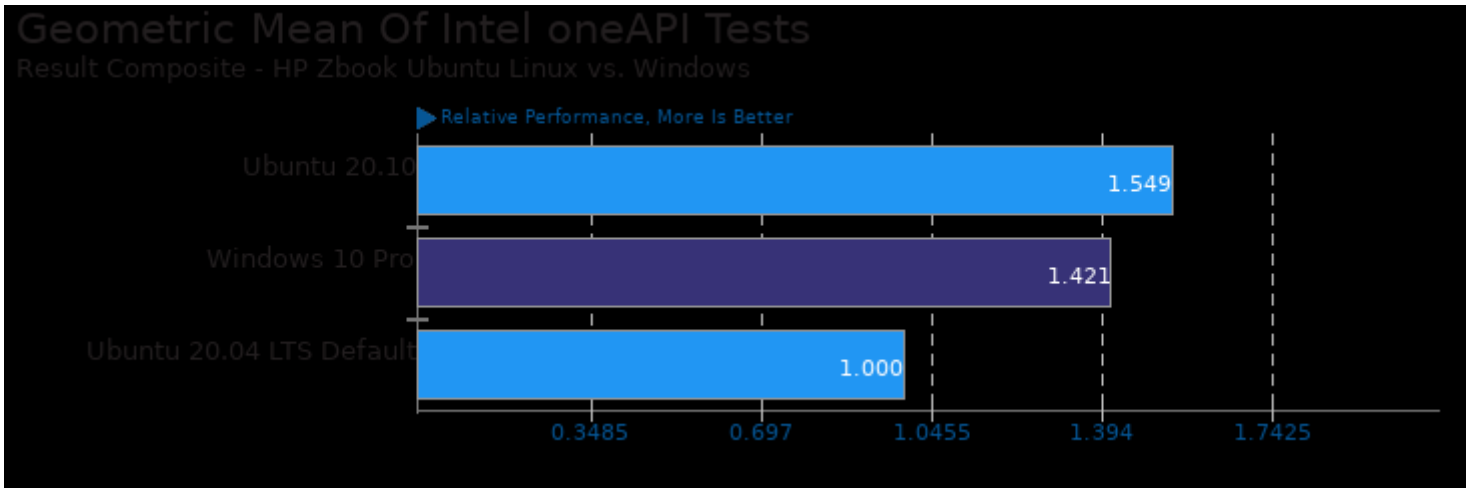


Geometric mean based upon tests: pts/webp and pts/avifenc

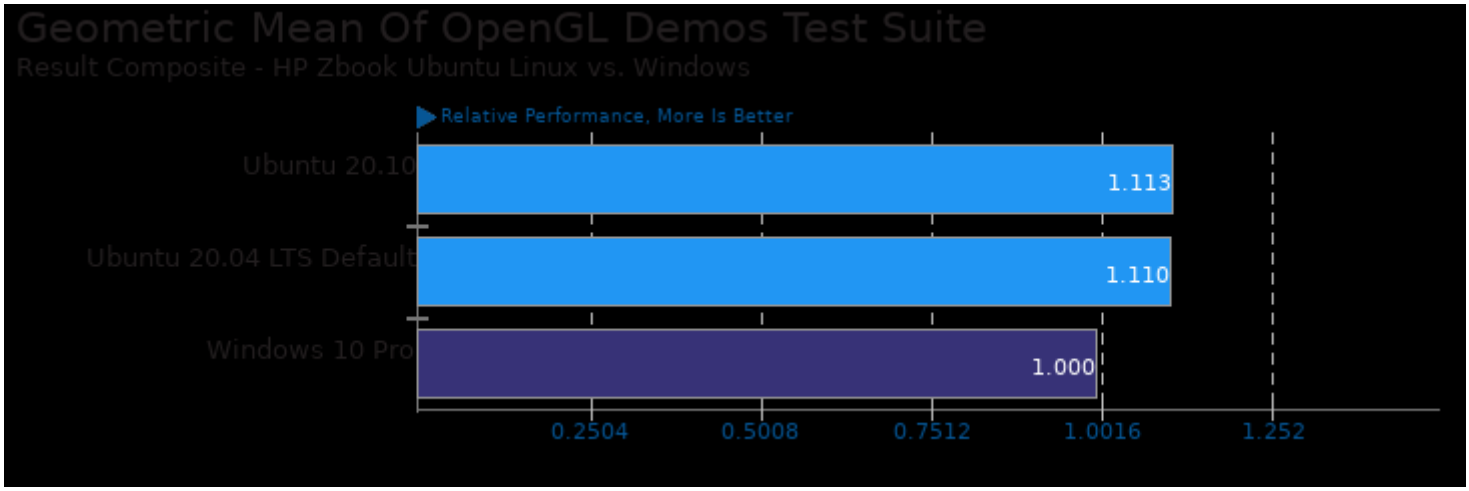


Geometric mean based upon tests: pts/hashcat, pts/fahbench, pts/octanebench, pts/luxcorerender, pts/neatbench, pts/indigobench, pts/v-ray, pts/blender, pts/realsr-ncnn and pts/waifu2x-ncnn

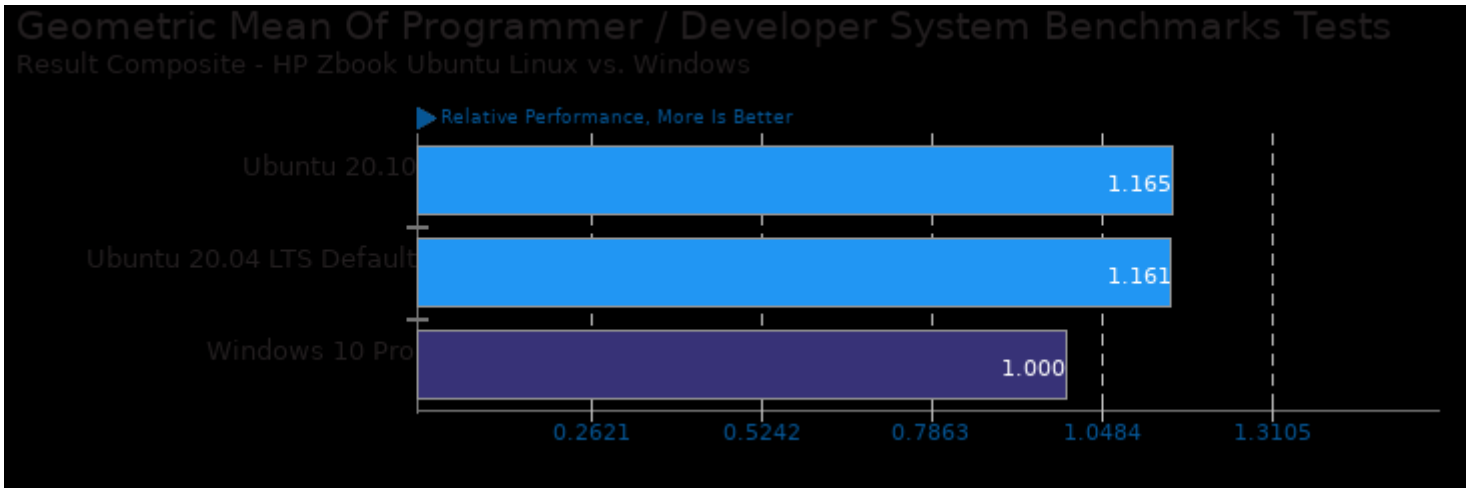
HP Zbook Ubuntu Linux vs. Windows



Geometric mean based upon tests: pts/embree and pts/oidn



Geometric mean based upon tests: pts/unigine-valley and pts/unigine-heaven



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

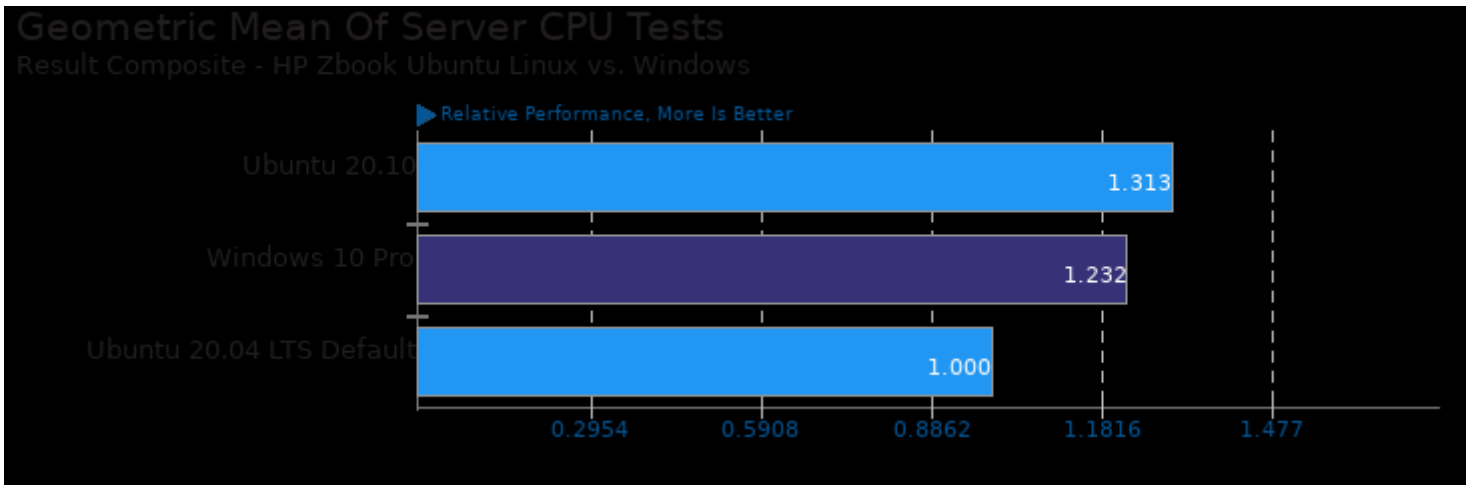
HP Zbook Ubuntu Linux vs. Windows



Geometric mean based upon tests: system/selenium and pts/pybench

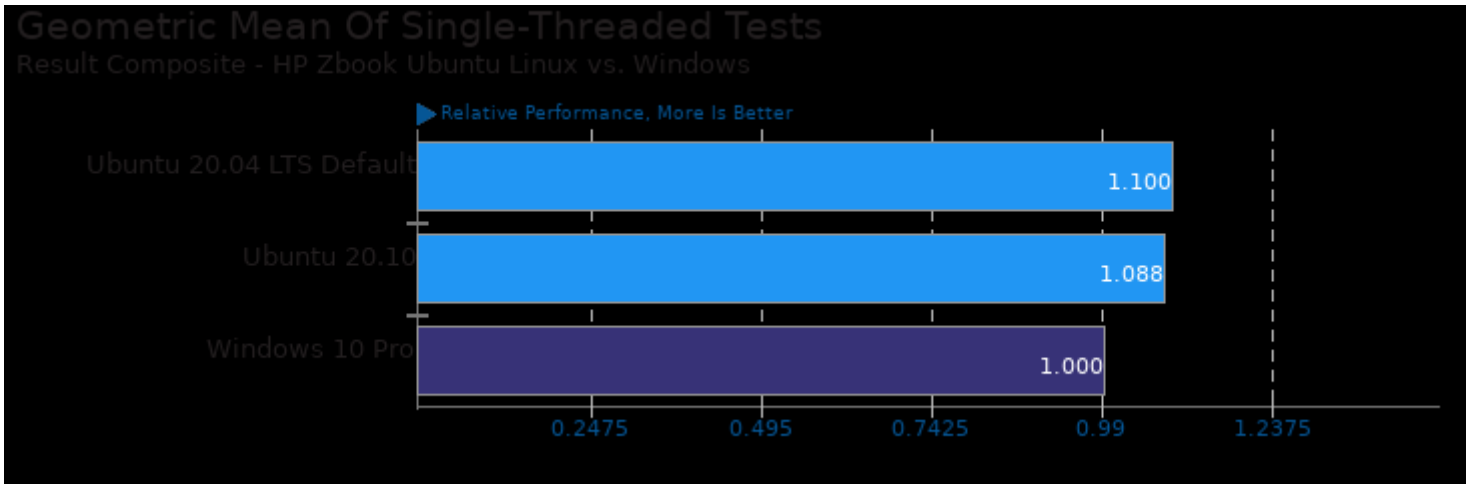


Geometric mean based upon tests: pts/blender, pts/appleseed, pts/luxcorerender, pts/v-ray and pts/indigobench

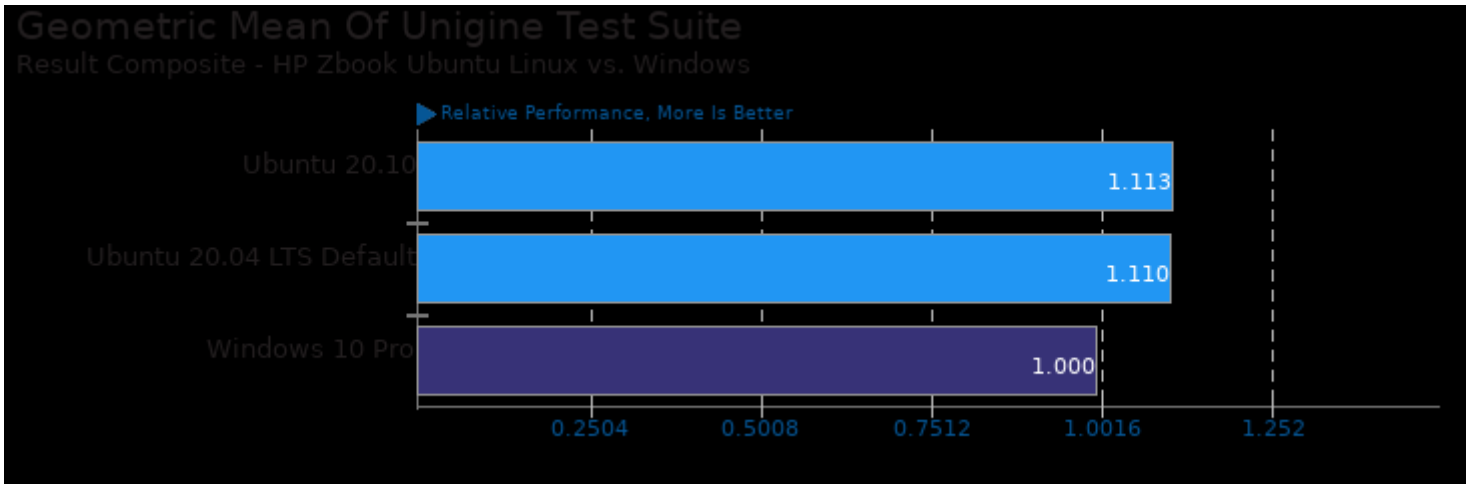


Geometric mean based upon tests: pts/namd, pts/dacapobench, pts/svt-av1, pts/svt-hevc, pts/svt-vp9, pts/x264, pts/dav1d, pts/stockfish, pts/asmfish, pts/compress-zstd, pts/blender, pts/appleseed and pts/pybench

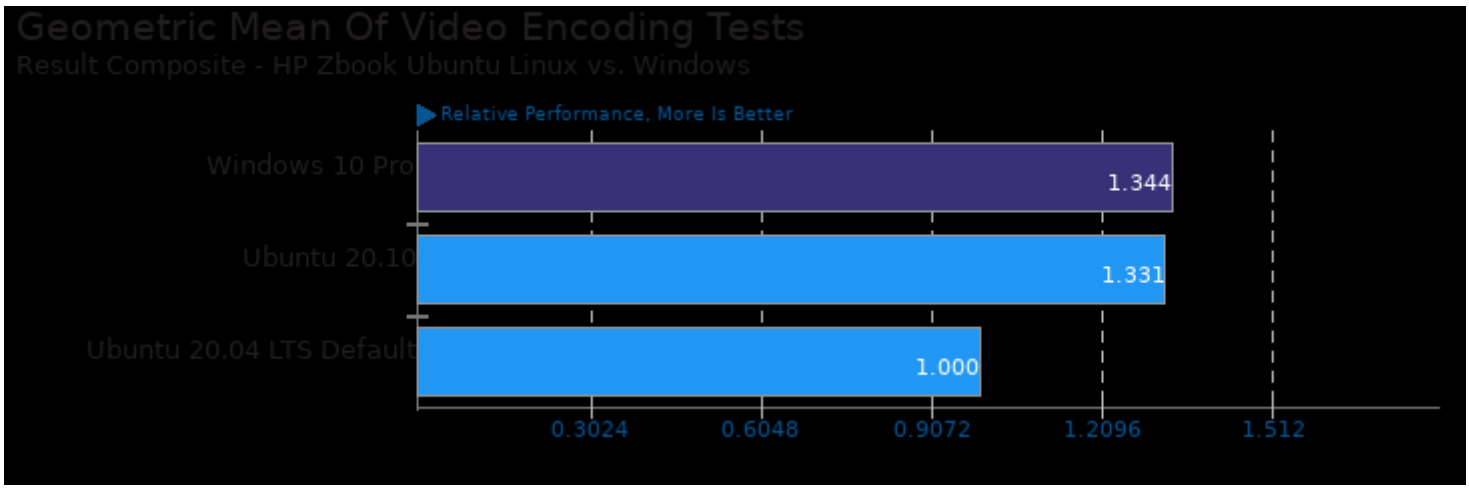
HP Zbook Ubuntu Linux vs. Windows



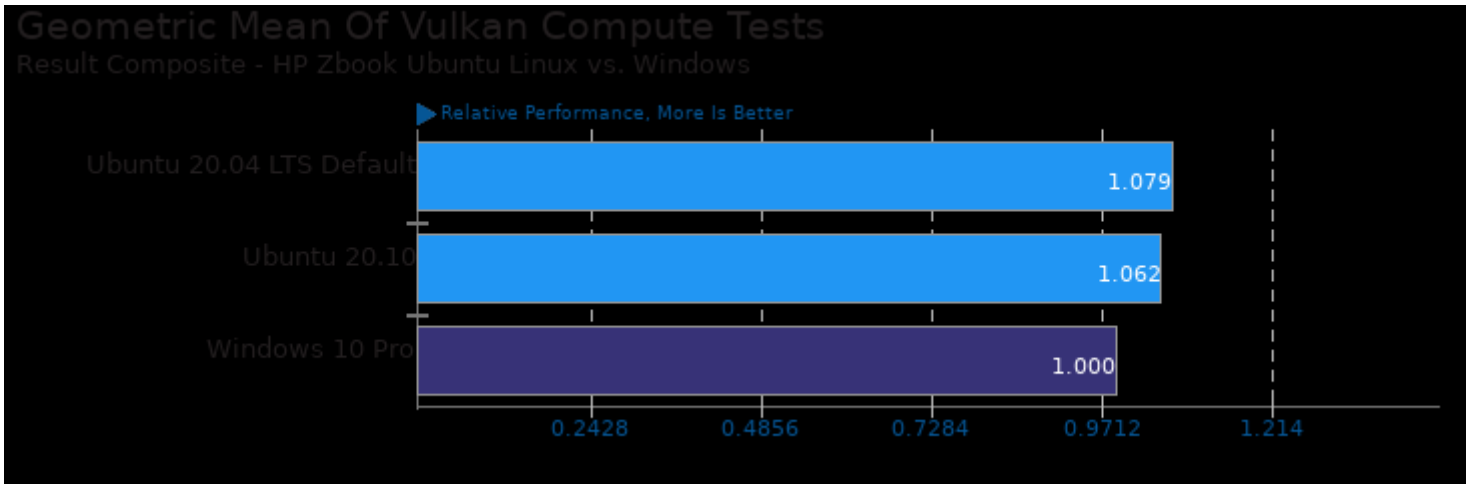
Geometric mean based upon tests: pts/encode-flac, pts/encode-mp3, pts/minion, pts/pybench and pts/git



Geometric mean based upon tests: pts/unigine-valley and pts/unigine-heaven



Geometric mean based upon tests: pts/svt-vp9, pts/svt-hevc, pts/x264, pts/dav1d, pts/svt-av1 and pts/avifenc



Geometric mean based upon tests: pts/realsr-ncnn and pts/waifu2x-ncnn



Geometric mean based upon tests: pts/blender and pts/git

This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 12:04.