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AMD Threadripper 2990WX Linux Benchmarks

Initial AMD Ryzen Threadripper 2990WX benchmarks on Ubuntu 18.04 LTS Linux with upgrading to the Linux 4.18 Git kernel, CFLAGS/CXXFLAGS of "-O3 -march=native", using the newer GCC 8.2 code compiler for building out all tests on each respective Intel/AMD CPU microarchitecture, etc. Tests by Michael Larabel for a future article on Phoronix.com. Under embargo until 13 August.

Automated Executive Summary

Threadripper 2990WX had the most wins, coming in first place for 65% of the tests.

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

Smallpt (Global Illumination Renderer; 128 Samples) at 15.188x
Rodinia (Test: OpenMP LavaMD) at 10.526x
ebizzy at 5.26x
OpenSSL (RSA 4096-bit Performance) at 4.886x
C-Ray (Total Time - 4K, 16 Rays Per Pixel) at 4.692x
Blender (Blend File: Classroom - Compute: CPU-Only) at 4.659x
N-Queens (Elapsed Time) at 4.645x
m-queens (Time To Solve) at 4.554x
Primesieve (1e12 Prime Number Generation) at 4.486x
Blender (Blend File: Barbershop - Compute: CPU-Only) at 4.259x.

Test Systems:

Core i7 5960X

Processor: Intel Core i7-5960X @ 3.50GHz (8 Cores / 16 Threads), Motherboard: ASRock X99 Extreme3 (P3.70 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW Protection

Core i7 8700K

Processor: Intel Core i7-8700K @ 4.70GHz (6 Cores / 12 Threads), Motherboard: ASUS TUF Z370-PLUS GAMING (1002 BIOS), Chipset: Intel Device 3ec2, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW + SSB disabled via prctl and seccomp Protection

Core i9 7900X

Processor: Intel Core i7-7900X @ 4.50GHz (10 Cores / 20 Threads), Motherboard: ASRock X299 Extreme4 (P1.30 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW Protection

Core i9 7960X

Processor: Intel Core i9-7960X @ 4.40GHz (16 Cores / 32 Threads), Motherboard: MSI X299 SLI PLUS (MS-7A93) v1.0 (1.A0 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5

Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW Protection

Core i9 7980XE

Processor: Intel Core i9-7980XE @ 4.20GHz (18 Cores / 36 Threads), Motherboard: ASUS PRIME X299-A (1401 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW Protection

Ryzen 7 2700X

Processor: AMD Ryzen 7 2700X Eight-Core @ 3.70GHz (8 Cores / 16 Threads), Motherboard: ASUS ROG CROSSHAIR VII HERO (WI-FI) (0804 BIOS), Chipset: AMD Family 17h, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp Protection

Threadripper 1950X

Processor: AMD Ryzen Threadripper 1950X 16-Core @ 3.40GHz (16 Cores / 32 Threads), Motherboard: Gigabyte X399 AORUS Gaming 7 (F10 BIOS), Chipset: AMD Family 17h, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp Protection

Threadripper 2950X

Processor: AMD Ryzen Threadripper 2950X 16-Core @ 3.50GHz (16 Cores / 32 Threads), Motherboard: MSI MEG X399 CREATION (MS-7B92) v1.0 (1.0EN43 BIOS), Chipset: AMD Family 17h, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release

Processor Notes: Scaling Governor: acpi-cpufreq performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp Protection

Threadripper 2990WX

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (0064 BIOS), Chipset: AMD Family 17h, Memory: 32768MB, Disk: 280GB INTEL SSDPE21D280GA

OS: Ubuntu 18.04, Kernel: 4.18.0-999-generic (x86_64) 20180728, Desktop: GNOME Shell 3.28.2, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, Compiler: GCC 8.2.0, File-System: ext4

Environment Notes: CXXFLAGS=-O3-march=native LIBGL_AWLAYS_SOFTWARE=true CFLAGS=-O3-march=native
Compiler Notes: --disable-multilib --enable-checking=release
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq performance
Python Notes: Python 2.7.15rc1 + Python 3.6.5
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp Protection

ASUS-defaults-No-OC

Processor: Intel Xeon W-3175X @ 4.30GHz (28 Cores / 56 Threads), Motherboard: ASUS ROG DOMINUS EXTREME (0704 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 94GB, Disk: 480GB INTEL SSDPE21D480GA, Graphics: MSI NVIDIA GeForce RTX 2080 Ti 11GB, Audio: Realtek ALC1220, Monitor: LG HDR 4K, Network: Intel I219-LM + Aquantia AQC107 NBase-T/IEEE + Intel-AC 9260

OS: Ubuntu 20.10, Kernel: 5.8.0-48-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.67, OpenGL: 4.6.0, OpenCL: OpenCL 1.2 CUDA 11.2.162, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + CUDA 11.0, 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-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-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 performance - CPU Microcode: 0x2006a08
OpenCL Notes: GPU Compute Cores: 4352
Python Notes: Python 3.8.6
Security Notes: itlb_multihit: KVM: Mitigation of VMX disabled + l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + 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 generic retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling + srbds: Not affected + tsx_async_abort: Mitigation of Clear buffers; SMT vulnerable

ASUS-defaults-NO-OC

Processor: Intel Xeon W-3175X @ 4.30GHz (28 Cores / 56 Threads), Motherboard: ASUS ROG DOMINUS EXTREME (0704 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 94GB, Disk: 480GB INTEL SSDPE21D480GA, Graphics: MSI NVIDIA GeForce RTX 2080 Ti 11GB, Audio: Realtek ALC1220, Monitor: LG HDR 4K, Network: Intel I219-LM + Aquantia AQC107 NBase-T/IEEE + Intel-AC 9260

OS: Ubuntu 20.10, Kernel: 5.8.0-48-generic (x86_64), Desktop: GNOME Shell 3.38.2, Display Server: X Server 1.20.9, Display Driver: NVIDIA 460.67, OpenCL: OpenCL 1.2 CUDA 11.2.162, Vulkan: 1.2.155, Compiler: GCC 10.2.0 + CUDA 11.0, 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-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 performance - CPU Microcode: 0x2006a08
Python Notes: Python 3.8.6
Security Notes: itlb_multihit: KVM: Mitigation of VMX disabled + l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + 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 generic retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling + srbds: Not affected + tsx_async_abort: Mitigation of Clear buffers; SMT vulnerable

	Core i7 5960X	Core i7 8700K	Core i9 7900X	Core i9 7960X	Core i9 7980XE	Ryzen 7 2700X	Threadripper 1950X	Threadripper 2950X	Threadripper 2990WX	ASUS-defaults-No-OC	ASUS-defaults-NO-OC
IndigoBench - Bedroom (M samples/s)	**0.96**	1.01	1.48	2.29	2.47	1.25	2.18	2.20	**3.50**		
Normalized	27.43%	28.86%	42.29%	65.43%	70.57%	35.71%	62.29%	62.86%	100%		
Standard Deviation	0.2%	0.1%	1.3%	0.1%	0.2%	0.2%	0.3%	0.1%	0.7%		
HPC Challenge - G-HPL (GFLOPS)	**90.02280**	90.79620	116.44200	174.55700	185.69600	119.79800	185.84300	196.18200	**308.71600**		157.47933
Normalized	29.16%	29.41%	37.72%	56.54%	60.15%	38.81%	60.2%	63.55%	100%		51.01%
Standard Deviation											0.5%
Parboil - OpenMP CUTCP (sec)	**7.36**	6.62	4.45	3.23	3.05	4.91	3.14	2.94	**2.11**		
Normalized	28.67%	31.87%	47.42%	65.33%	69.18%	42.97%	67.2%	71.77%	100%		
Standard Deviation	0.2%	0.1%	0.5%	0.3%	0.5%	0.6%	0.6%	0.8%	1.6%		
Rodinia - OpenMP LavaMD (sec)	**108.25**	97.95	64.97	44.38	41.53	83.95	48.82	44.87	26.15		**10.284**
Normalized	9.5%	10.5%	15.83%	23.17%	24.76%	12.25%	21.07%	22.92%	39.33%		100%
Standard Deviation	0.2%	1.2%	0.4%	0.3%	0.3%	0.1%	0.2%	0.2%	0.2%		0.3%
Rodinia - OpenMP CFD Solver (sec)	**32.92**	28.04	18.51	12.43	11.53	27.05	13.63	13.20	9.23		**7.731**
Normalized	23.48%	27.57%	41.77%	62.2%	67.05%	28.58%	56.72%	58.57%	83.76%		100%
Standard Deviation	0.3%	3.2%	0.4%	0.4%	0.2%	0.2%	1%	0.6%	0.5%		0.3%
John The Ripper - Blowfish (Real	**11401**	12488	18468	26770	28373	14061	24990	27014	**47648**		
Normalized	23.93%	26.21%	38.76%	56.18%	59.55%	29.51%	52.45%	56.69%	100%		
Standard Deviation	0%	0%	0.3%		0.1%	0.4%	0.3%	0.1%	0.3%		
John The Ripper - Traditional DES (Real C/S)	**43385667**	45037000	63557000	95470000	10126733	59713667	84073333	10998233	**18292767**		
Normalized	23.72%	24.62%	34.74%	52.19%	55.36%	32.64%	45.96%	60.12%	100%		
Standard Deviation	0.2%	0.1%	0.2%	0%	0%	1.2%	1.7%	0.2%	1.6%		
GraphicsMagick - Sharpen (Iterations/min)	**116**	141	169	191	189	155	186	203	**217**		203
Normalized	53.46%	64.98%	77.88%	88.02%	87.1%	71.43%	85.71%	93.55%	100%		93.55%
Standard Deviation						0.6%	1.1%	0.3%			

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GraphicsMagick - Enhanced (Iterations/min)	**116**	181	201	218	215	181	206	227	**232**	226
Normalized	50%	78.02%	86.64%	93.97%	92.67%	78.02%	88.79%	97.84%	100%	97.41%
Standard Deviation				0.3%				0.3%	0.7%	
GraphicsMagick - Noise-Gaussian (Iterations/min)	**106**	125	154	177	177	130	165	180	203	**230**
Normalized	46.09%	54.35%	66.96%	76.96%	76.96%	56.52%	71.74%	78.26%	88.26%	100%
Standard Deviation						0.9%	0.9%	0.8%	0.5%	
Stockfish - Total Time (Nodes/s)	**19309300**	20315767	29615180	45347804	47333077	24581700	42131430	44134771	69672939	**76923196**
Normalized	25.1%	26.41%	38.5%	58.95%	61.53%	31.96%	54.77%	57.38%	90.57%	100%
Standard Deviation	0.8%	1.3%	2.3%	0.7%	2.2%	1.7%	0.9%	1.3%	0.6%	0.6%
asmFish - 1.H.M.2.D (Nodes/s)	**21788413**	23008073	33548721	49904712	53208213	26470600	42408640	44415126	77600140	**87527105**
Normalized	24.89%	26.29%	38.33%	57.02%	60.79%	30.24%	48.45%	50.74%	88.66%	100%
Standard Deviation	0.8%	1.9%	0.8%	1.6%	1.1%	0.3%	2.6%	1.4%	1.1%	1.9%
ebizzy (Records/s)	**264858**	421715	320321	533415	642517	542069	858325	856141	**1393189**	820017
Normalized	19.01%	30.27%	22.99%	38.29%	46.12%	38.91%	61.61%	61.45%	100%	58.86%
Standard Deviation	1.7%	2.6%	2.8%	2.4%	2.5%	3.2%	4.9%	4.5%	1.1%	0.3%
Timed Linux Kernel Compilation -	**93.82**	80.79	56.67	39.55	37.49	77.07	49.87	47.22	**32.04**	
Normalized	34.15%	39.66%	56.54%	81.01%	85.46%	41.57%	64.25%	67.85%	100%	
Standard Deviation	2.2%	1.3%	1.8%	2.7%	3.1%	1.6%	3.1%	2.3%	3.5%	
C-Ray - Total Time - 4.1.R.P.P (sec)	**82.76**	72.87	51.37	35.85	33.69	59.48	32.79	31.21	**17.64**	24.545
Normalized	21.31%	24.21%	34.34%	49.21%	52.36%	29.66%	53.8%	56.52%	100%	71.87%
Standard Deviation	0.1%	0%	0.1%	0%	0.1%	0.2%	0.6%	0.3%	0.4%	0.1%
POV-Ray - Trace Time (sec)	**68.75**	59.52	43.14	30.16	26.09	50.67	30.07	28.49	**17.16**	19.758
Normalized	24.96%	28.83%	39.78%	56.9%	65.77%	33.87%	57.07%	60.23%	100%	86.85%
Standard Deviation	0.1%	0.1%	0.1%	0.2%	0.4%	0.1%	0.7%	0.3%	0.3%	0.7%
Primesieve - 1.P.N.G (sec)	**44.64**	35.62	26.72	16.98	15.44	30.37	18.20	17.31	**9.95**	10.515
Normalized	22.29%	27.93%	37.24%	58.6%	64.44%	32.76%	54.67%	57.48%	100%	94.63%
Standard Deviation	0%	1.4%	2.7%	2%	0.6%	0.2%	0.2%	0.4%	0.3%	1.2%
Smallpt - G.I.R.1.S (sec)	16.53	13.93	9.49	6.42	6.13	12.16	6.94	6.54	**3.89**	**59.081**
Normalized	23.53%	27.93%	40.99%	60.59%	63.46%	31.99%	56.05%	59.48%	100%	6.58%
Standard Deviation	0.1%	0.4%	0.2%	0.4%	0.1%	0.1%	0.1%	0.8%	0.4%	0.9%
FLAC Audio Encoding - WAV To FLAC (sec)	**11.91**	**7.12**	8.17	8.83	7.77	9.31	9.87	9.21	9.50	10.587
Normalized	59.78%	100%	87.15%	80.63%	91.63%	76.48%	72.14%	77.31%	74.95%	67.25%
Standard Deviation	0.2%	0.2%	0.1%	0.1%	0.2%	0.2%	0.6%	0.2%	0.1%	0.2%
Hackbench - 32 - Process (sec)	**97.08**	91.95	69.59	47.86	42.47	74.09	46.72	43.13	**26.83**	38.156
Normalized	27.64%	29.18%	38.55%	56.06%	63.17%	36.21%	57.43%	62.21%	100%	70.32%
Standard Deviation	0.9%	0.3%	0.7%	2%	0.4%	3.1%	3.2%	2.9%	15.8%	0.1%

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m-queens - Time To Solve (sec)	107.82	115.12	75.04	52.81	50.49	77.99	44.61	40.74	25.28	31.085
Normalized	23.45%	21.96%	33.69%	47.87%	50.07%	32.41%	56.67%	62.05%	100%	81.33%
Standard Deviation	0.1%	0%	0.1%	0.1%	0.4%	0.1%	0.4%	0.5%	0.2%	0.2%
N-Queens - Elapsed Time	18.52	19.60	12.73	8.86	8.34	14.10	7.93	7.26	4.22	4.787
Normalized	22.79%	21.53%	33.15%	47.63%	50.6%	29.93%	53.22%	58.13%	100%	88.16%
Standard Deviation	0.1%	0%	0%	0.1%	0%	0.3%	0.1%	0%	1.6%	0%
OpenSSL - R.4.b.P (Signs/sec)	1200	1977	3058	4418	4694	1715	3050	3354	5863	
Normalized	20.47%	33.72%	52.15%	75.35%	80.07%	29.25%	52.02%	57.21%	100%	
Standard Deviation	0%	0.3%	0.5%	0%	0.1%	0.3%	0.2%	0.2%	0.4%	
Darktable - Server Room - CPU-only (sec)	5.25	4.76	3.23	2.63	2.56	4.17	2.74	2.56	2.52	
Normalized	48%	52.94%	78.02%	95.82%	98.44%	60.43%	91.97%	98.44%	100%	
Standard Deviation	0.1%	0%	0.2%	0.1%	0.1%	0.7%	0.4%	1.2%	0.4%	
Sysbench - CPU (Events/sec)	13595	14330	22118	31814	33797	16851	30920	33082	56447	56504
Normalized	24.06%	25.36%	39.14%	56.3%	59.81%	29.82%	54.72%	58.55%	99.9%	100%
Standard Deviation	0.1%	0%	0.1%	0%	0%	0.2%	0%	0%	0.4%	0%
Blender - BMW27 - CPU-Only (sec)	298.85	269.12	182.38	123.08	115.67	228.07	136.60	129.32	78.54	72
Normalized	24.09%	26.75%	39.48%	58.5%	62.25%	31.57%	52.71%	55.68%	91.67%	100%
Blender - Classroom - CPU-Only (sec)	712.65	621.84	418.71	276.04	260.34	503.96	292.83	276.57	155.55	152.96
Normalized	21.46%	24.6%	36.53%	55.41%	58.75%	30.35%	52.24%	55.31%	98.33%	100%
Blender - Barbershop - CPU-Only (sec)	1433	1298	889.28	577.94	539.24	1152	699.98	663.40	394.94	336.37
Normalized	23.48%	25.91%	37.82%	58.2%	62.38%	29.19%	48.05%	50.7%	85.17%	100%
Chaos Group V-RAY - CPU (sec)	112.75	93.07	63.66	43.84	40.89	79.57	50.37	48.02	30.42	
Normalized	26.98%	32.69%	47.79%	69.39%	74.39%	38.23%	60.39%	63.35%	100%	
Standard Deviation	1.2%	0.3%	0.7%	0.5%	0.3%	0.9%	0.3%	0.6%	0.7%	
HPC Challenge - Performance / Cost - G-HPL (GFLOPS/Dollar)					0.10				0.17	
Normalized					58.82%				100%	
Parboil - Performance / Cost - OpenMP CUTCP (sec x					5731				3796	
Normalized					66.23%				100%	

AMD Threadripper 2990WX Linux Benchmarks

Rodinia - Performance / Cost - OpenMP LavaMD (sec x	**78035**	**47044**
Normalized	60.29%	100%
Rodinia - Performance / Cost - OpenMP CFD Solver (sec x Dollar)	**21665**	**16605**
Normalized	76.64%	100%
John The Ripper - Performance / Cost - Blowfish (Real C/S/Dollar)	**15.10**	**26.49**
Normalized	57%	100%
John The Ripper - Performance / Cost - Traditional DES (Real	**53894**	**101683**
Normalized	53%	100%
GraphicsMagick - Performance / Cost - Sharpen (Iterations/min/Dollar)	**0.10**	**0.12**
Normalized	83.33%	100%
GraphicsMagick - Performance / Cost - Enhanced (Iterations/min/Dollar)	**0.11**	**0.13**
Normalized	84.62%	100%
GraphicsMagick - Performance / Cost - Noise-Gaussian (Iterations/min/Dol	**0.09**	**0.11**
Normalized	81.82%	100%
Stockfish - Performance / Cost - Total Time (Nodes/s/Dollar)	**25191**	**38729**
Normalized	65.04%	100%

AMD Threadripper 2990WX Linux Benchmarks

asmFish - Performance / Cost - 1.H.M.2.D (Nodes/s/Dollar)	28317	43135
Normalized	65.65%	100%
ebizzy - Performance / Cost -	341.95	774.42
Normalized	44.16%	100%
Timed Linux Kernel Compilation - Performance / Cost - Time To	70444	57640
Normalized	81.82%	100%
C-Ray - Performance / Cost - Total Time - 4.1.R.P.P (sec x Dollar)	63304	31734
Normalized	50.13%	100%
POV-Ray - Performance / Cost - Trace Time (sec x Dollar)	49023	30871
Normalized	62.97%	100%
Primesieve - Performance / Cost - 1.P.N.G (sec x Dollar)	29012	17900
Normalized	61.7%	100%
Smallpt - Performance / Cost - G.I.R.1.S (sec x Dollar)	11518	6998
Normalized	60.76%	100%
FLAC Audio Encoding - Performance / Cost - WAV To FLAC (sec x	14600	17091
Normalized	100%	85.43%
Hackbench - Performance / Cost - 32 - Process (sec x	79801	48267
Normalized	60.48%	100%

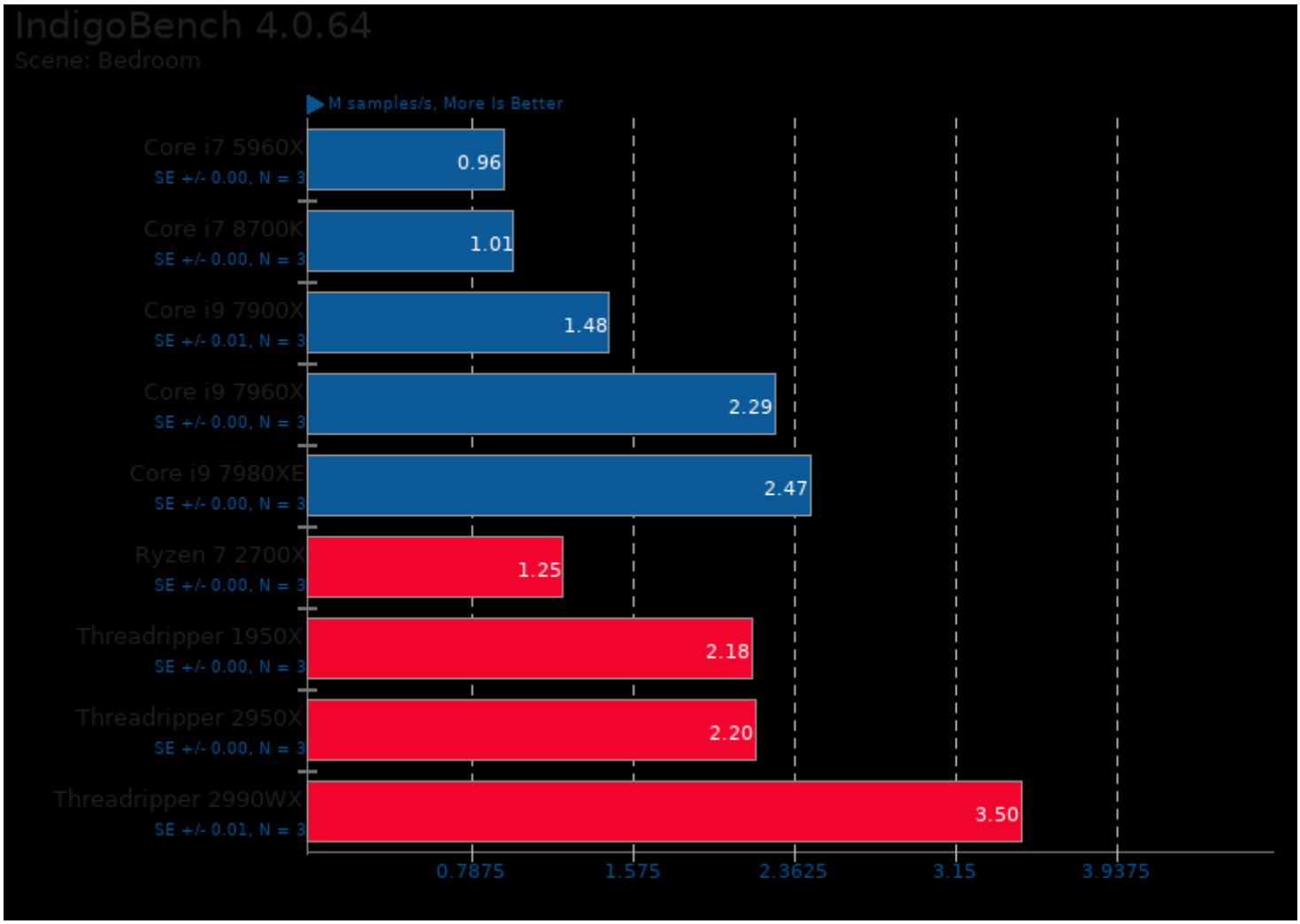
AMD Threadripper 2990WX Linux Benchmarks

m-queens - Performance / Cost - Time To Solve (sec x	94871	45479
Normalized	47.94%	100%
N-Queens - Performance / Cost - Elapsed Time (sec x	15671	7592
Normalized	48.45%	100%
OpenSSL - Performance / Cost - R.4.b.P (Signs/sec/Dollar)	2.50	3.26
Normalized	76.69%	100%
Darktable - Performance / Cost - Server Room - CPU-only (sec x Dollar)	4810	4533
Normalized	94.25%	100%
Sysbench - Performance / Cost - CPU (Events/sec/Dollar	17.99	31.38
Normalized	57.33%	100%
Blender - Performance / Cost - BMW27 - CPU-Only (sec x Dollar)	217344	141293
Normalized	65.01%	100%
Blender - Performance / Cost - Classroom - CPU-Only (sec x Dollar)	489179	279834
Normalized	57.2%	100%
Blender - Performance / Cost - Barbershop - CPU-Only (sec x Dollar)	1013232	710497
Normalized	70.12%	100%

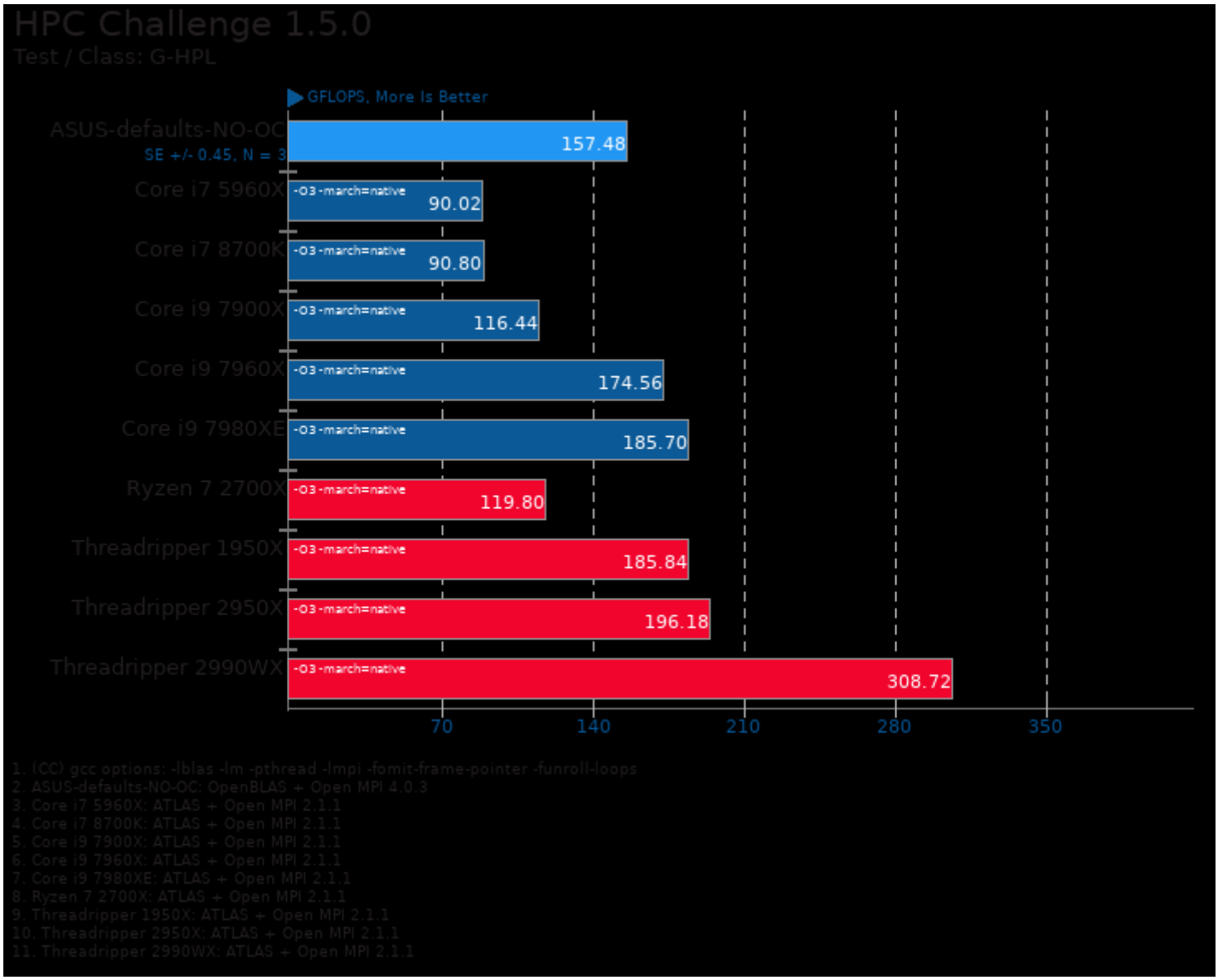
AMD Threadripper 2990WX Linux Benchmarks

Chaos Group V-RAY - Performance / Cost - CPU (sec x Dollar)	76832	54726	
Normalized	71.23%	100%	
Darktable - Server Room - CPU-only (sec)			2.100
Standard Deviation			0.5%

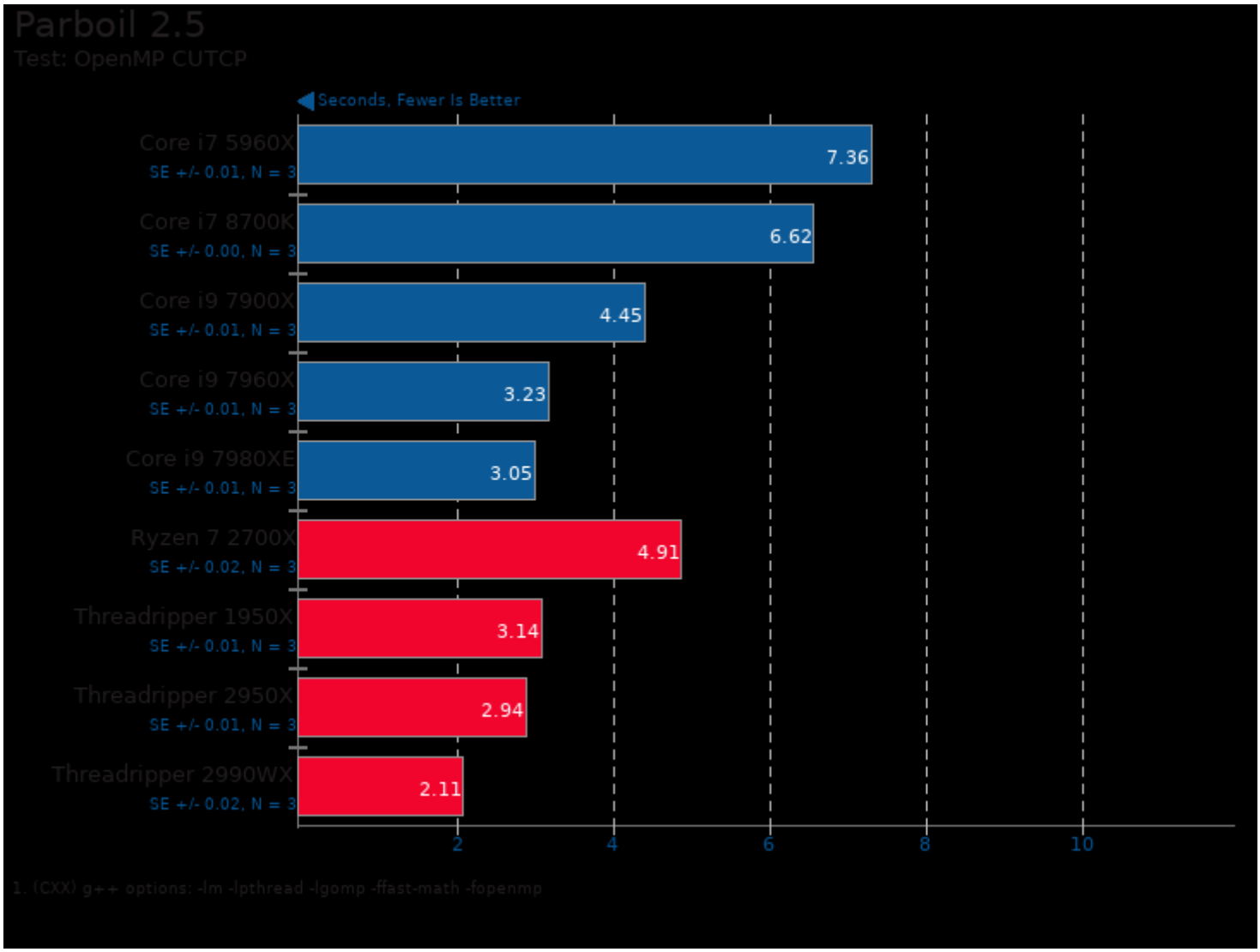
AMD Threadripper 2990WX Linux Benchmarks

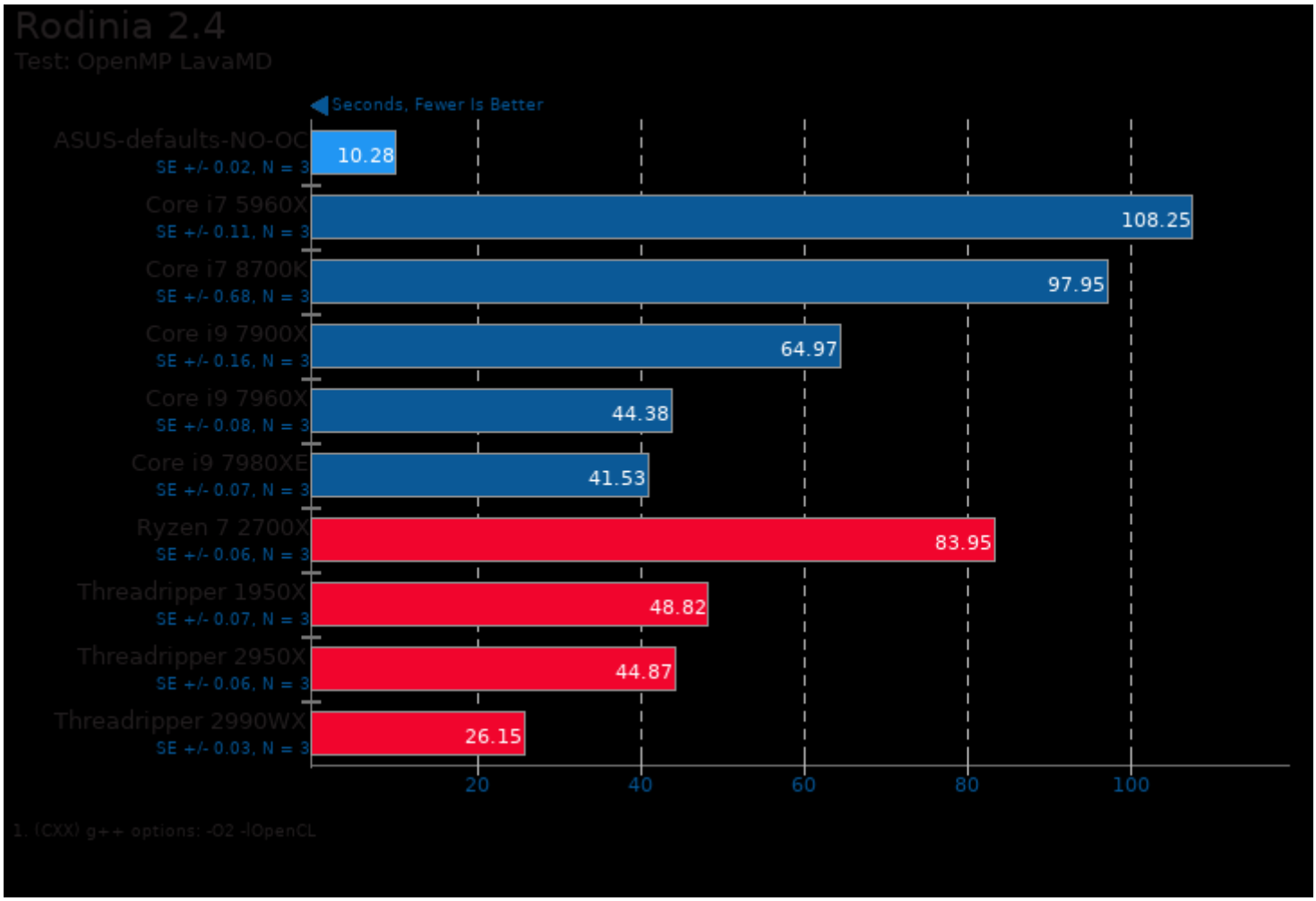


AMD Threadripper 2990WX Linux Benchmarks

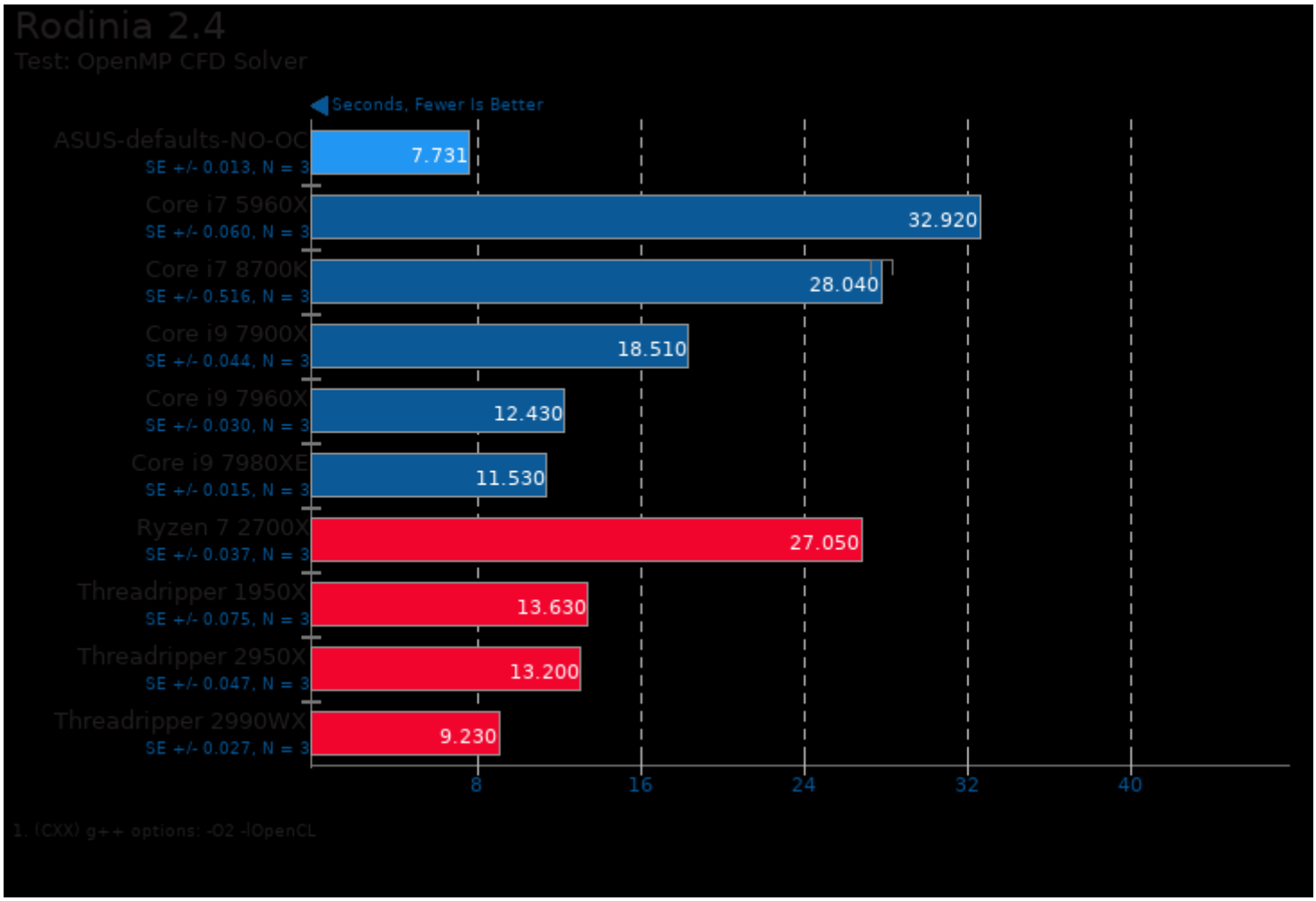


AMD Threadripper 2990WX Linux Benchmarks

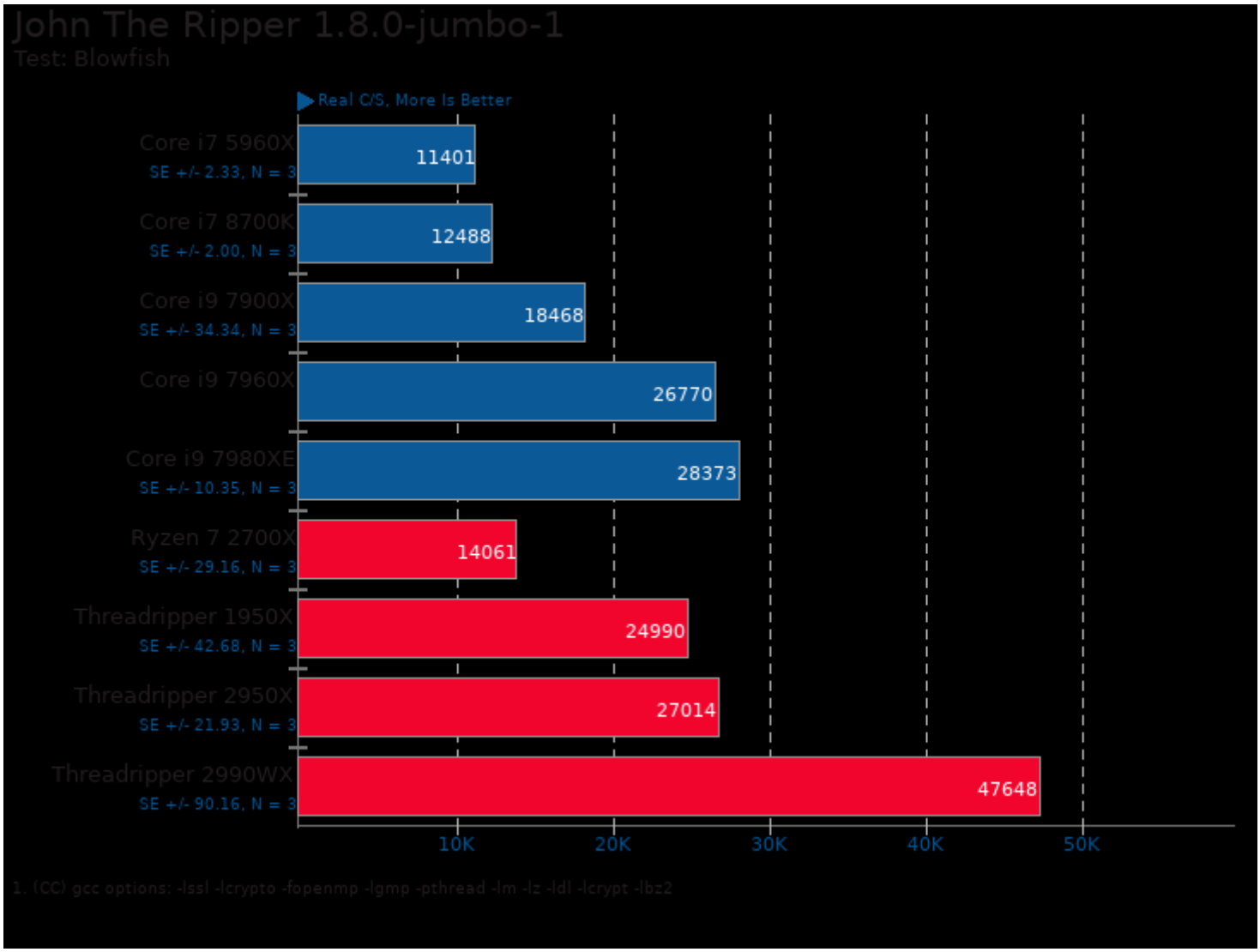


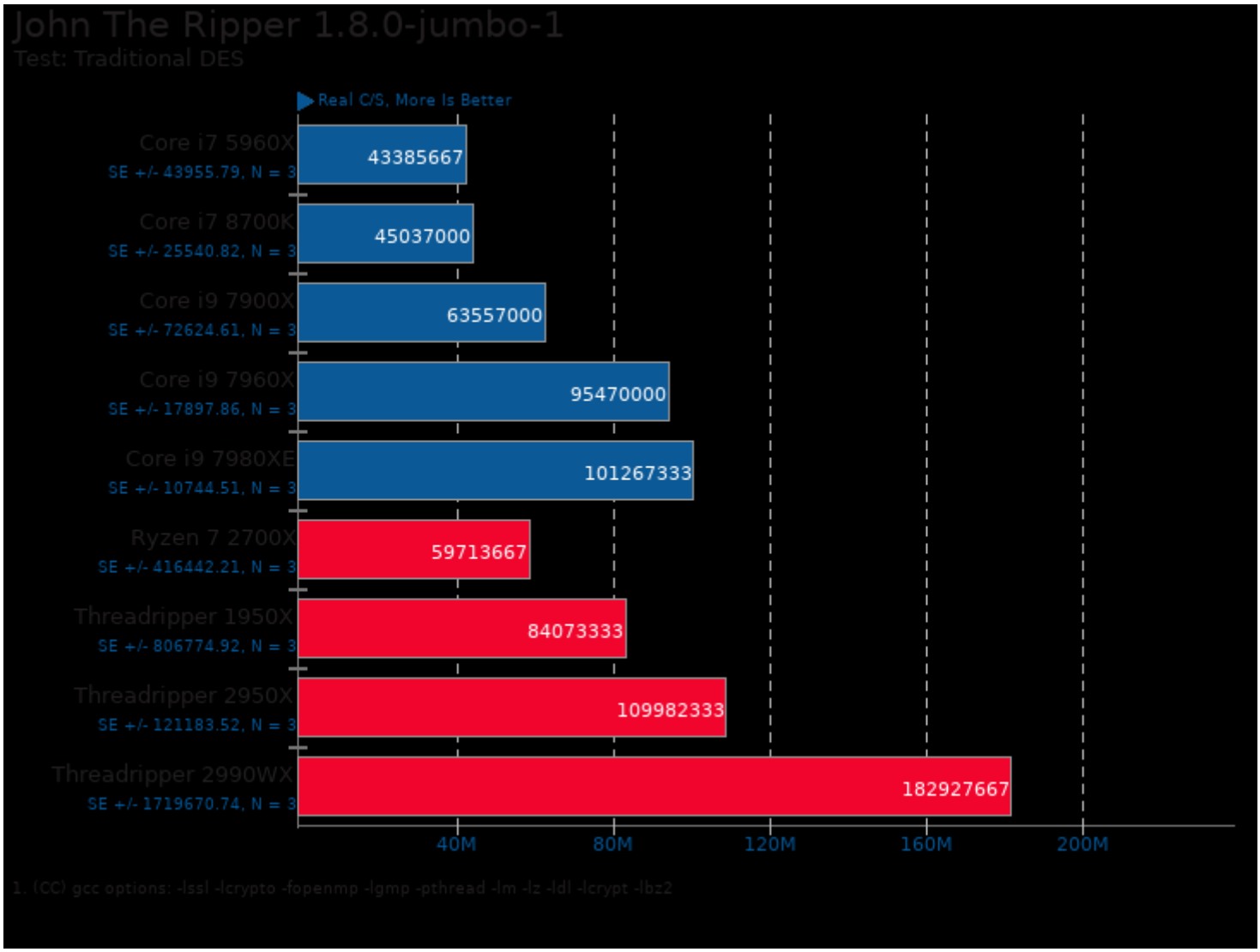

Rodinia 2.4
Test: OpenMP LavaMD
Seconds, Fewer Is Better
ASUS-defaults-NO-OC
SE +/- 0.02, N = 3
10.28
Core i7 5960X
SE +/- 0.11, N = 3
108.25
Core i7 8700K
SE +/- 0.68, N = 3
97.95
Core i9 7900X
SE +/- 0.16, N = 3
64.97
Core i9 7960X
SE +/- 0.08, N = 3
44.38
Core i9 7980XE
SE +/- 0.07, N = 3
41.53
Ryzen 7 2700X
SE +/- 0.06, N = 3
83.95
Threadripper 1950X
SE +/- 0.07, N = 3
48.82
Threadripper 2950X
SE +/- 0.06, N = 3
44.87
Threadripper 2990WX
SE +/- 0.03, N = 3
26.15
20
40
60
80
100
1. (CXX) g++ options: -O2 -lOpenCL

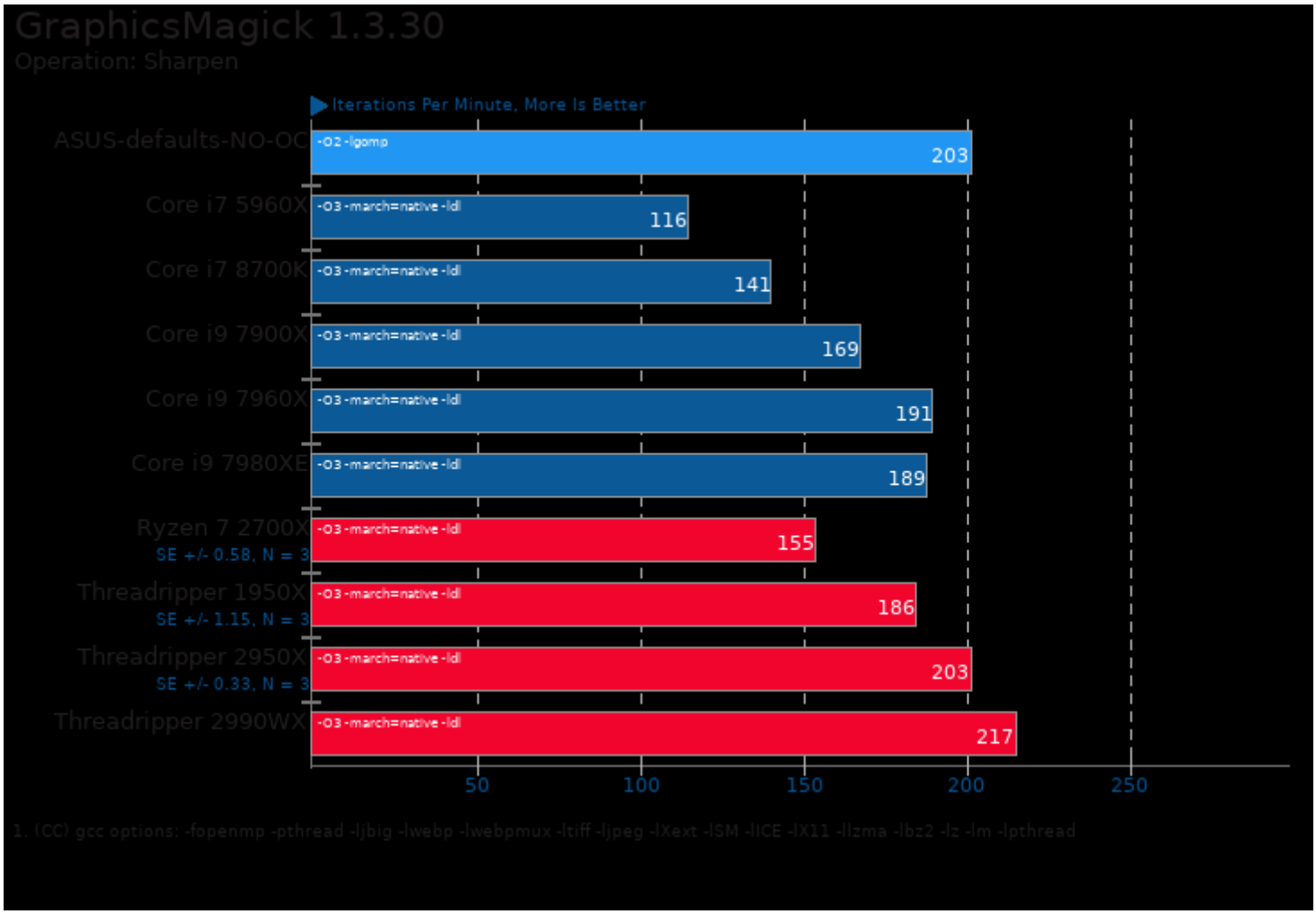
AMD Threadripper 2990WX Linux Benchmarks



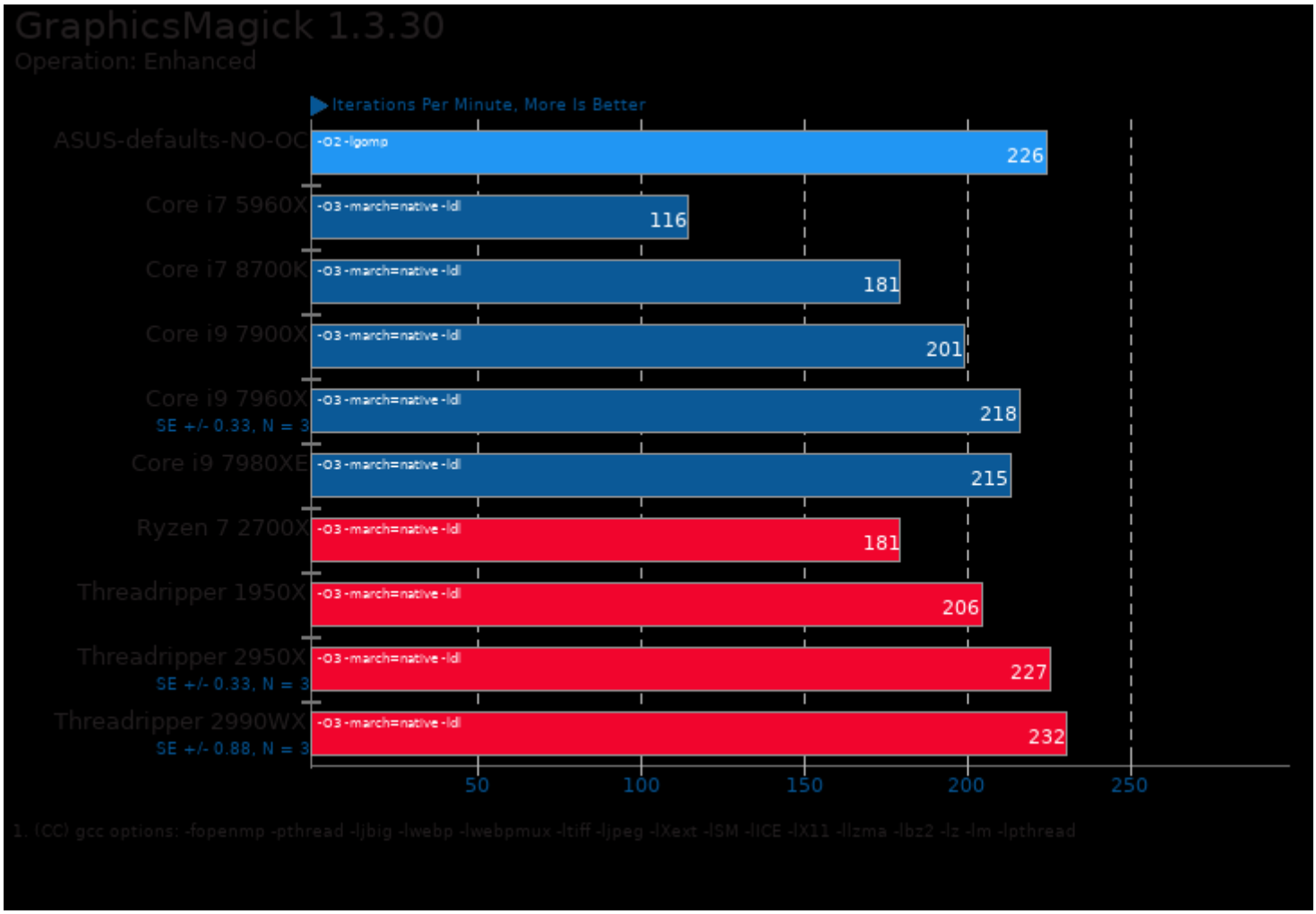
AMD Threadripper 2990WX Linux Benchmarks



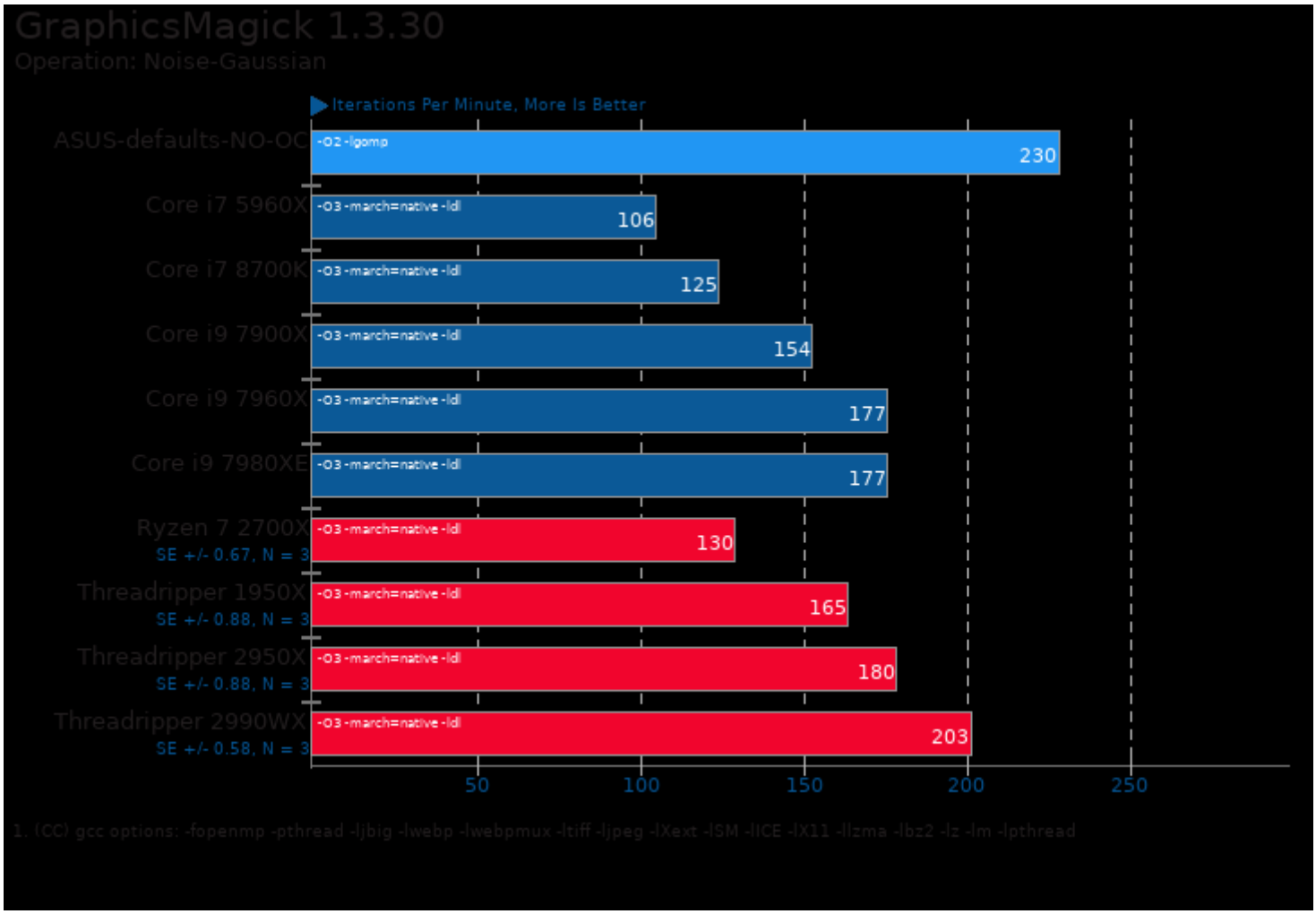

John The Ripper 1.8.0-jumbo-1
Test: Traditional DES
Real C/S, More Is Better
Core i7 5960X
SE +/- 43955.79, N = 3
43385667
Core i7 8700K
SE +/- 25540.82, N = 3
45037000
Core i9 7900X
SE +/- 72624.61, N = 3
63557000
Core i9 7960X
SE +/- 17897.86, N = 3
95470000
Core i9 7980XE
SE +/- 10744.51, N = 3
101267333
Ryzen 7 2700X
SE +/- 416442.21, N = 3
59713667
Threadripper 1950X
SE +/- 806774.92, N = 3
84073333
Threadripper 2950X
SE +/- 121183.52, N = 3
109982333
Threadripper 2990WX
SE +/- 1719670.74, N = 3
182927667
40M
80M
120M
160M
200M
1. (CC) gcc options: -lssl -lcrypto -fopenmp -lgmp -pthread -lm -lz -ldl -lcrypt -lbz2


GraphicsMagick 1.3.30
Operation: Sharpen
Iterations Per Minute, More Is Better
ASUS-defaults-NO-OC
-O2 -lgomp
203
Core i7 5960X
-O3 -march=native -ldl
116
Core i7 8700K
-O3 -march=native -ldl
141
Core i9 7900X
-O3 -march=native -ldl
169
Core i9 7960X
-O3 -march=native -ldl
191
Core i9 7980XE
-O3 -march=native -ldl
189
Ryzen 7 2700X
-O3 -march=native -ldl
155
SE +/- 0.58, N = 3
Threadripper 1950X
-O3 -march=native -ldl
186
SE +/- 1.15, N = 3
Threadripper 2950X
-O3 -march=native -ldl
203
SE +/- 0.33, N = 3
Threadripper 2990WX
-O3 -march=native -ldl
217
50
100
150
200
250
1. (CC) gcc options: -fopenmp -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lSM -lICE -lX11 -llzma -lbz2 -lz -lm -lpthread

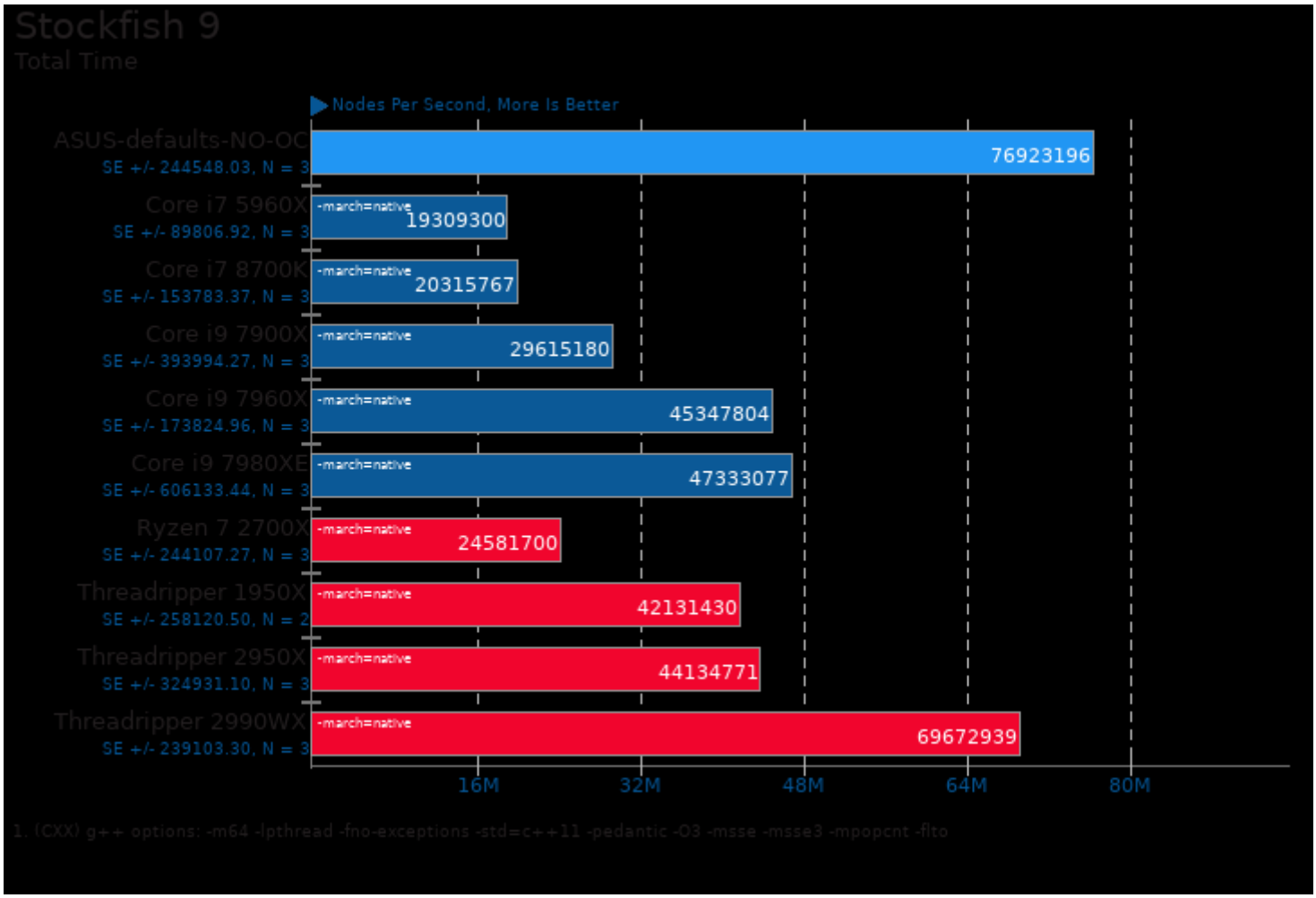
AMD Threadripper 2990WX Linux Benchmarks



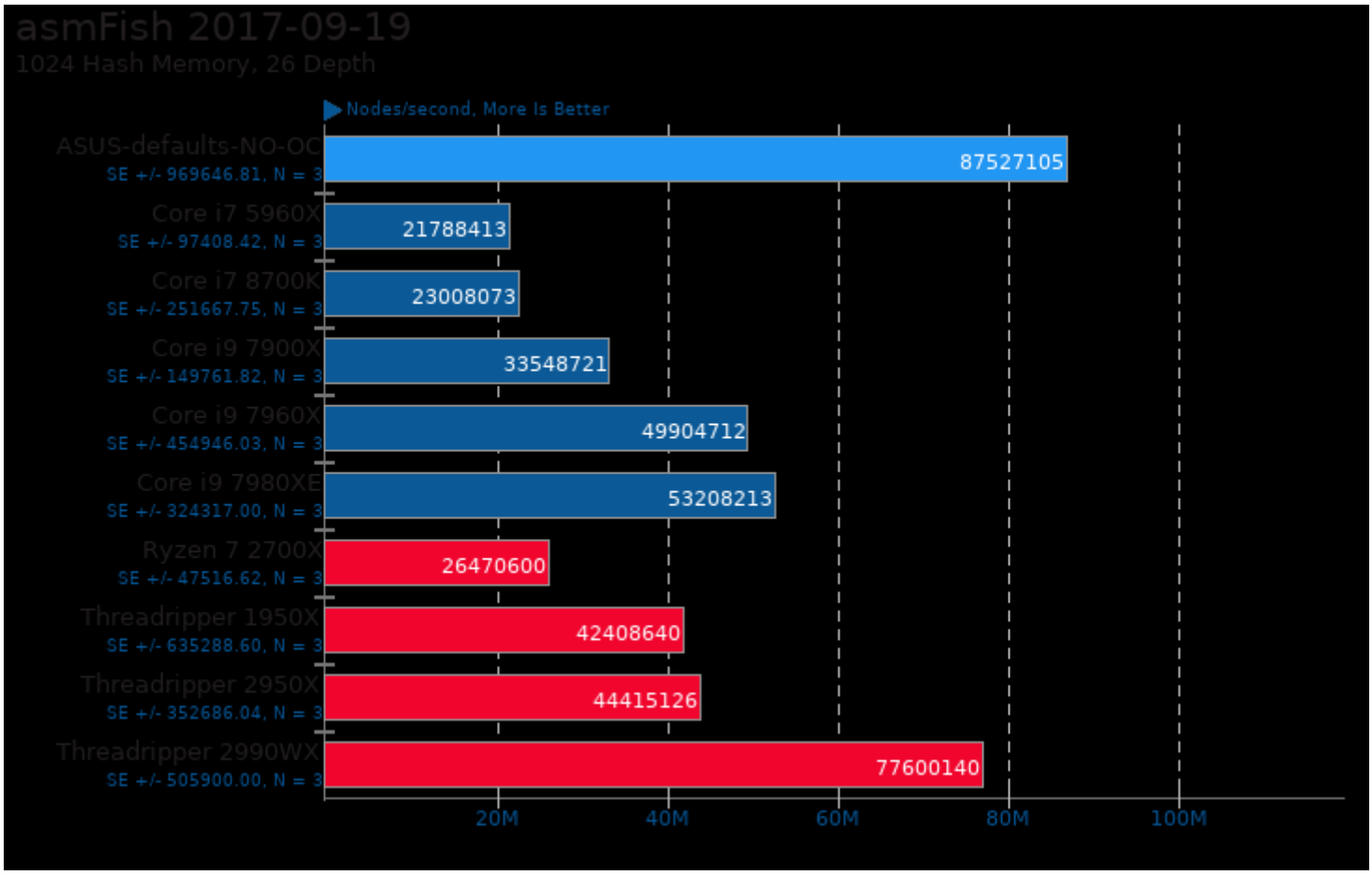
AMD Threadripper 2990WX Linux Benchmarks



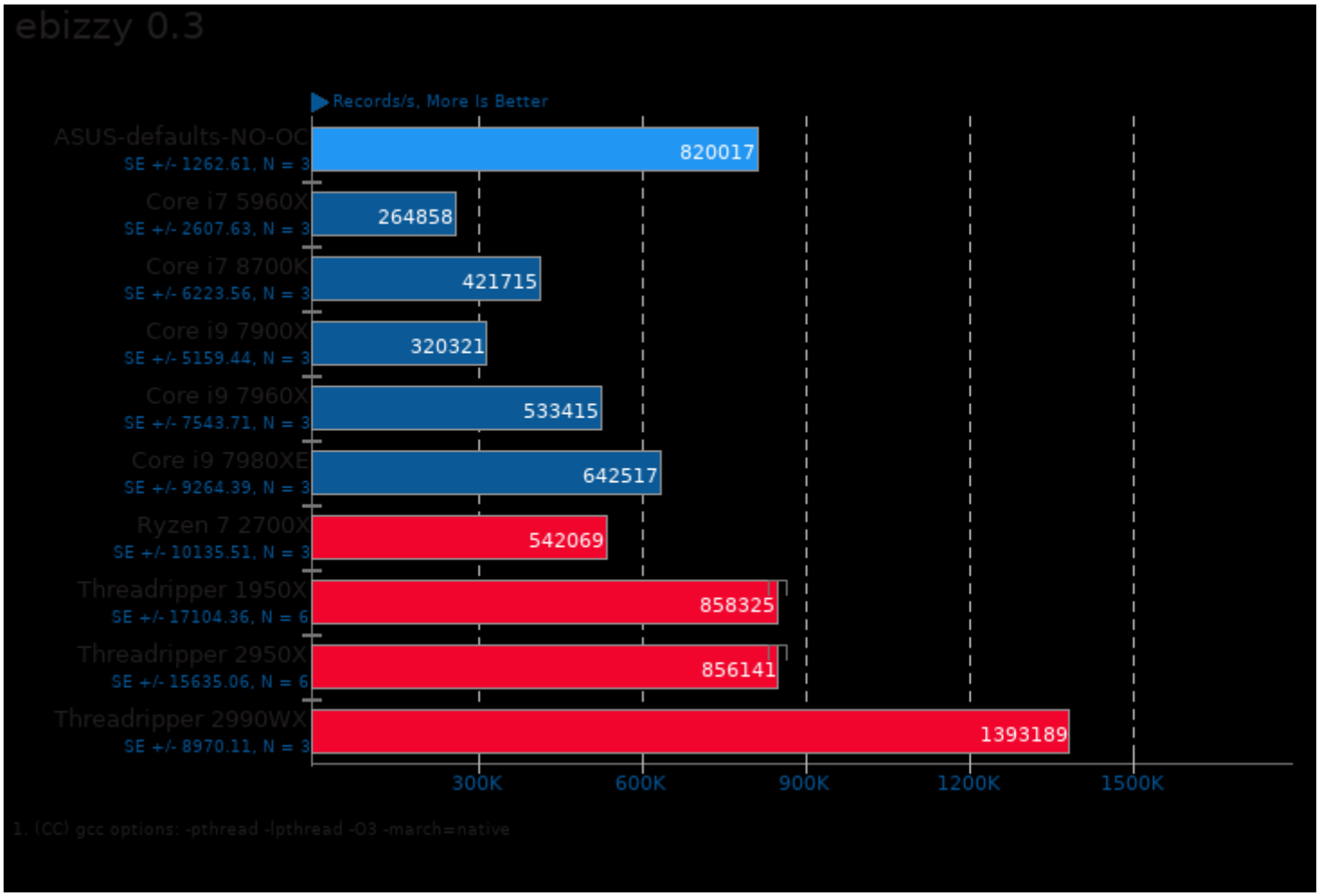
AMD Threadripper 2990WX Linux Benchmarks



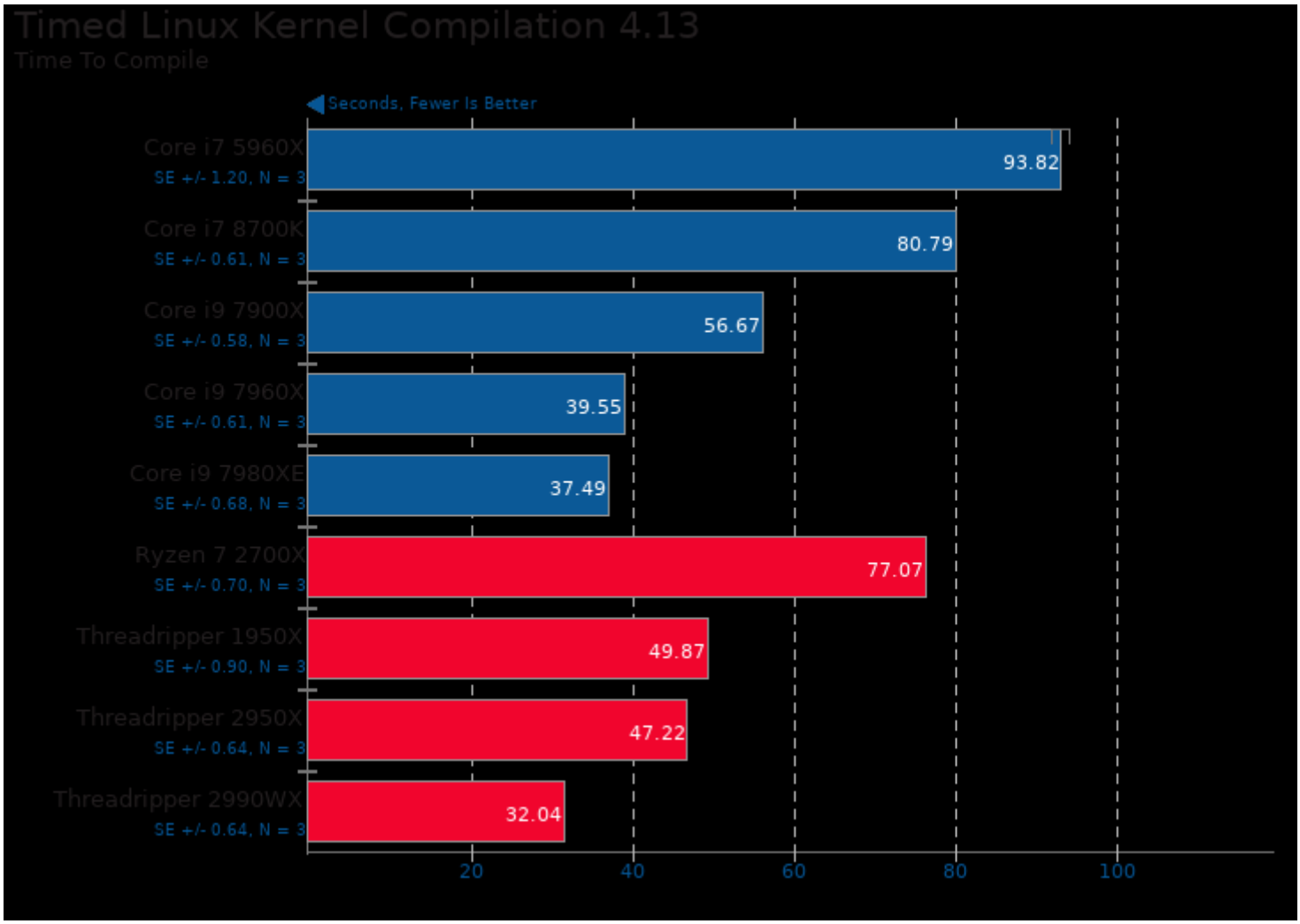
AMD Threadripper 2990WX Linux Benchmarks



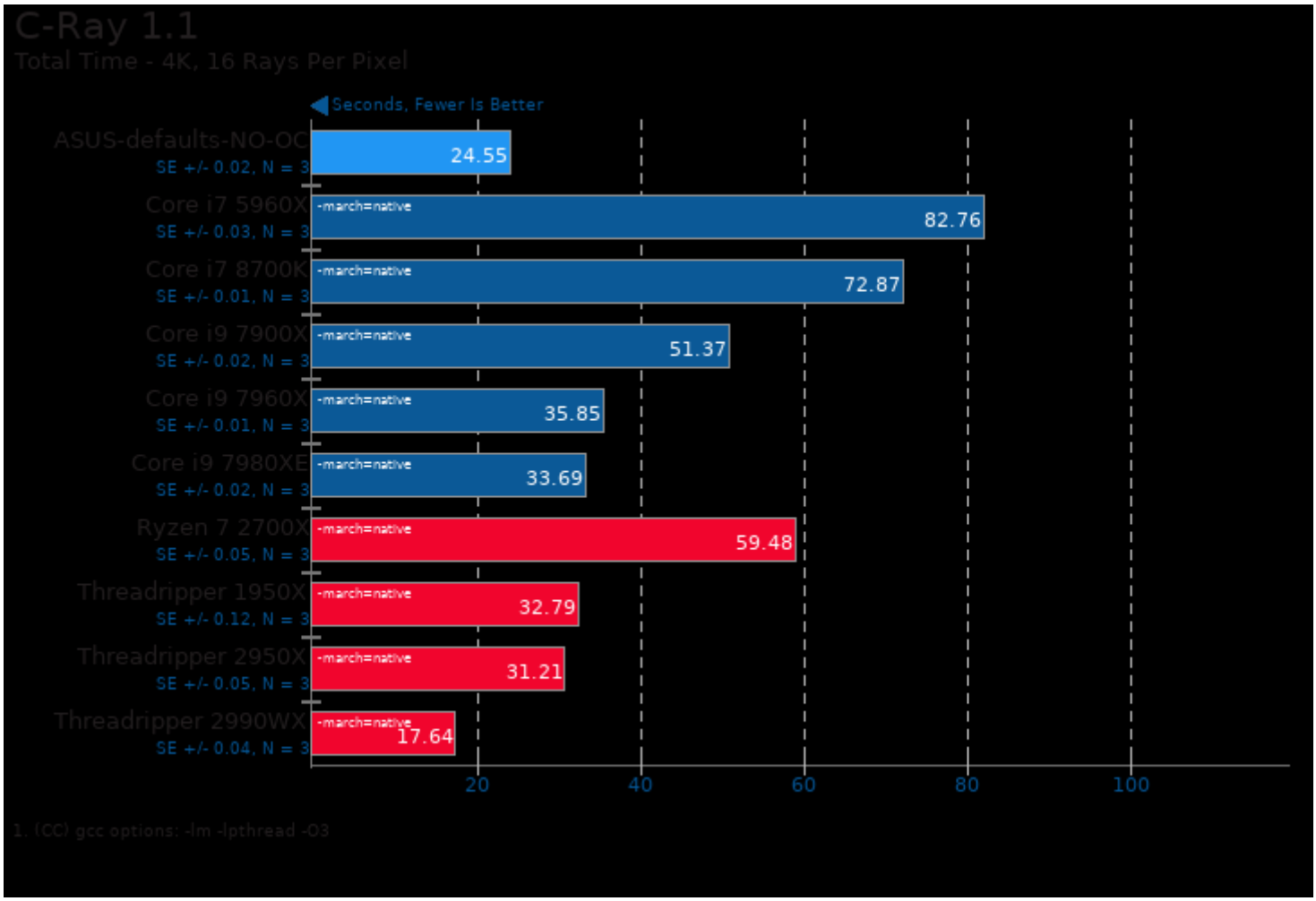
AMD Threadripper 2990WX Linux Benchmarks



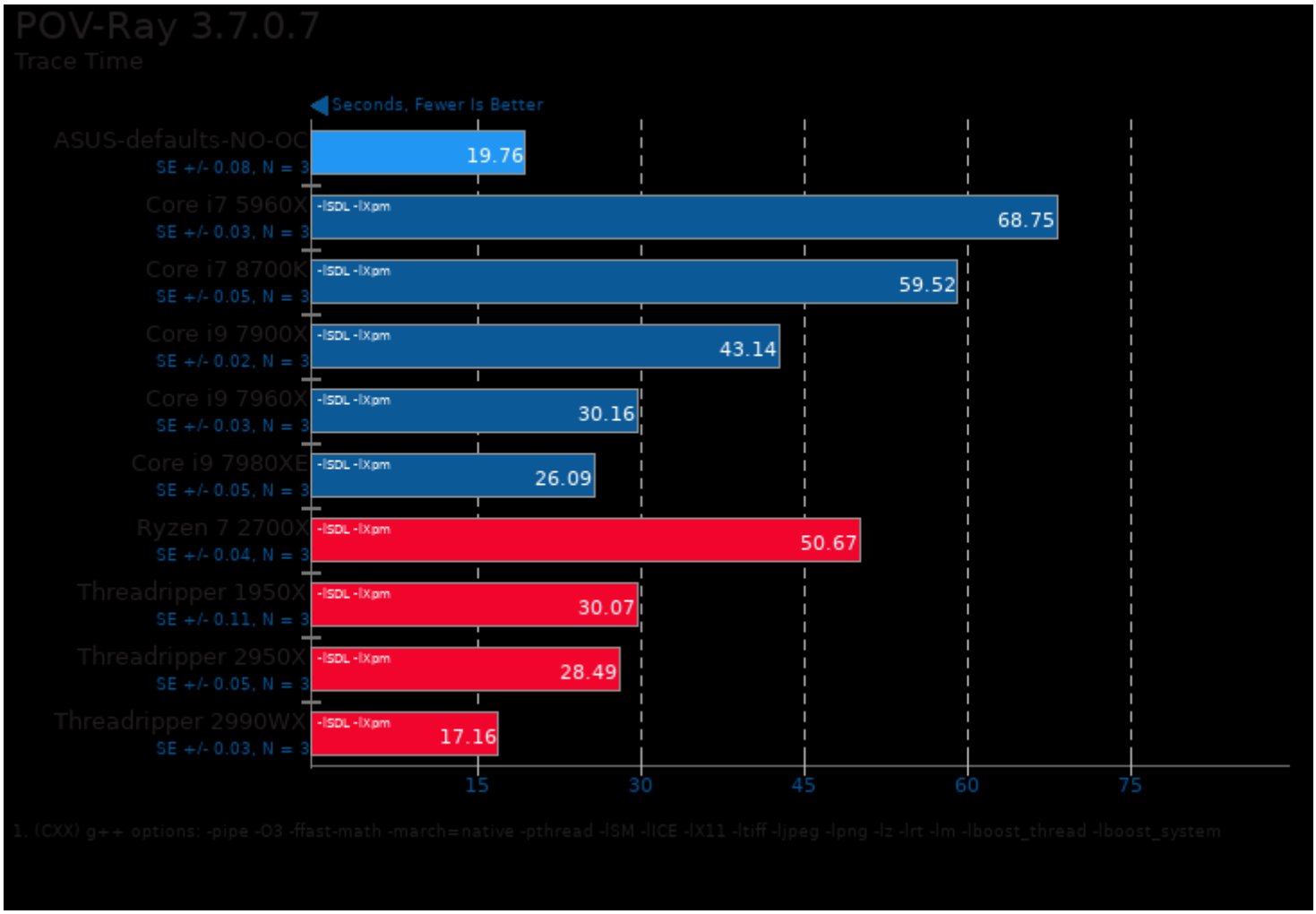
AMD Threadripper 2990WX Linux Benchmarks



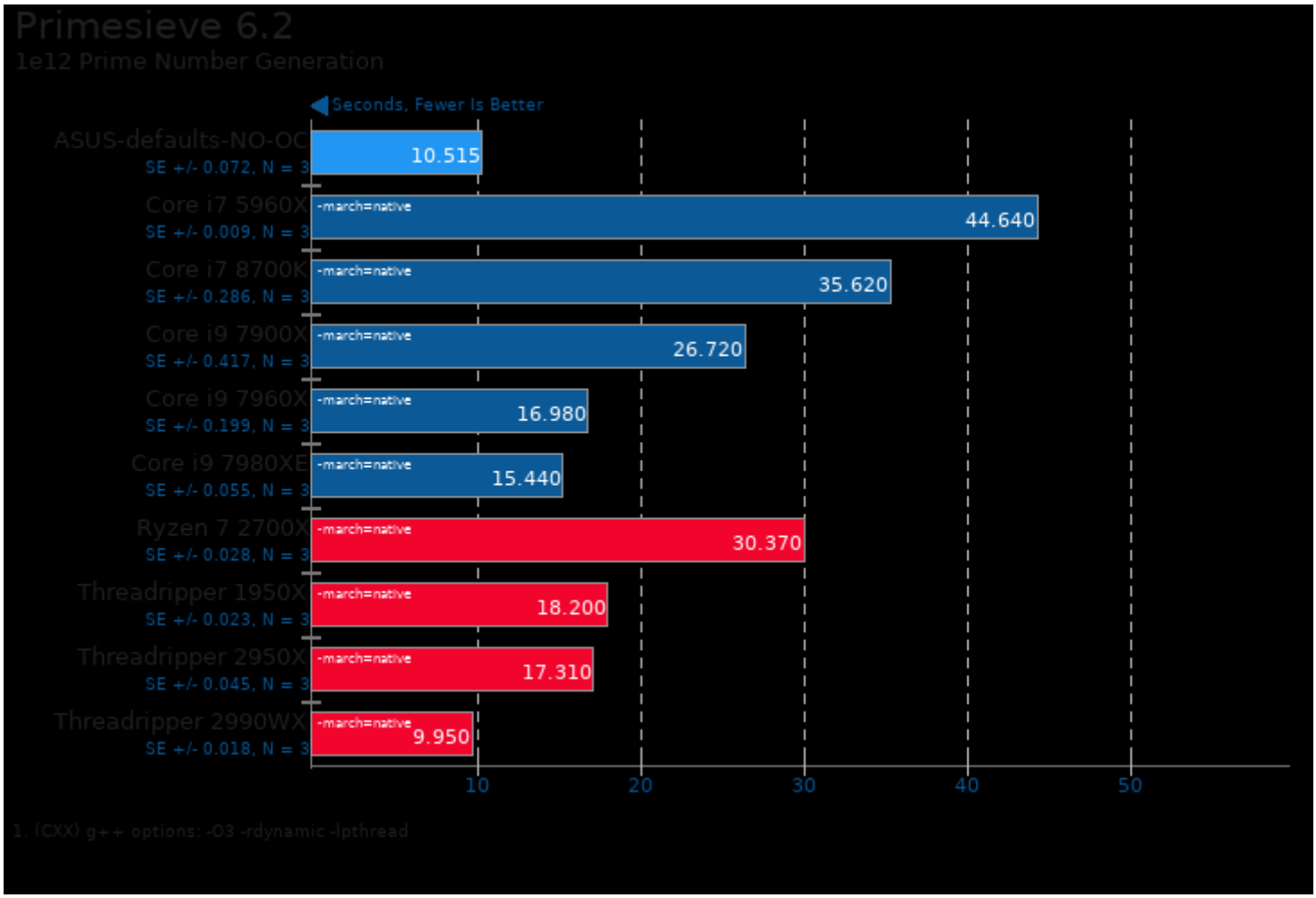
AMD Threadripper 2990WX Linux Benchmarks



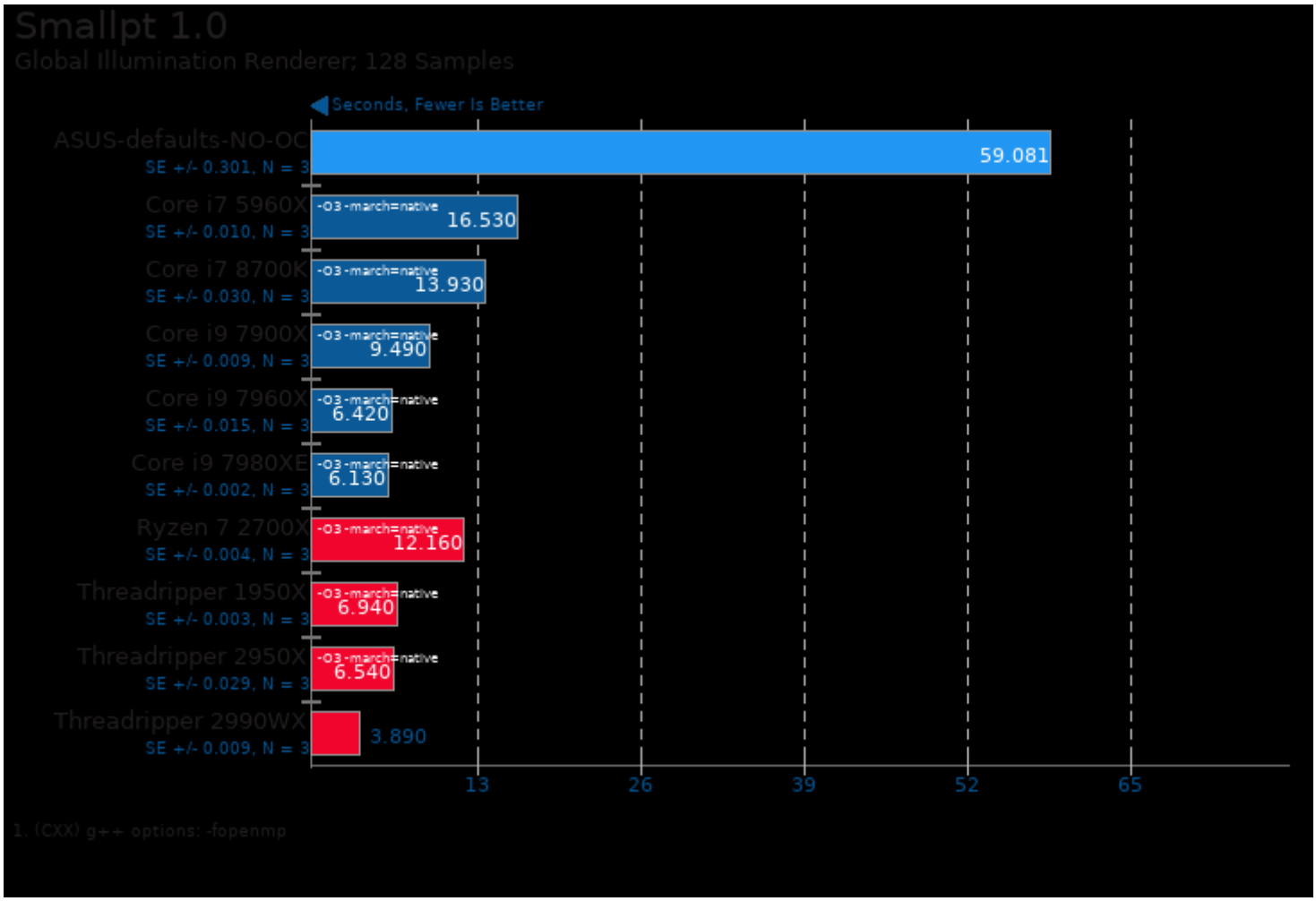
AMD Threadripper 2990WX Linux Benchmarks

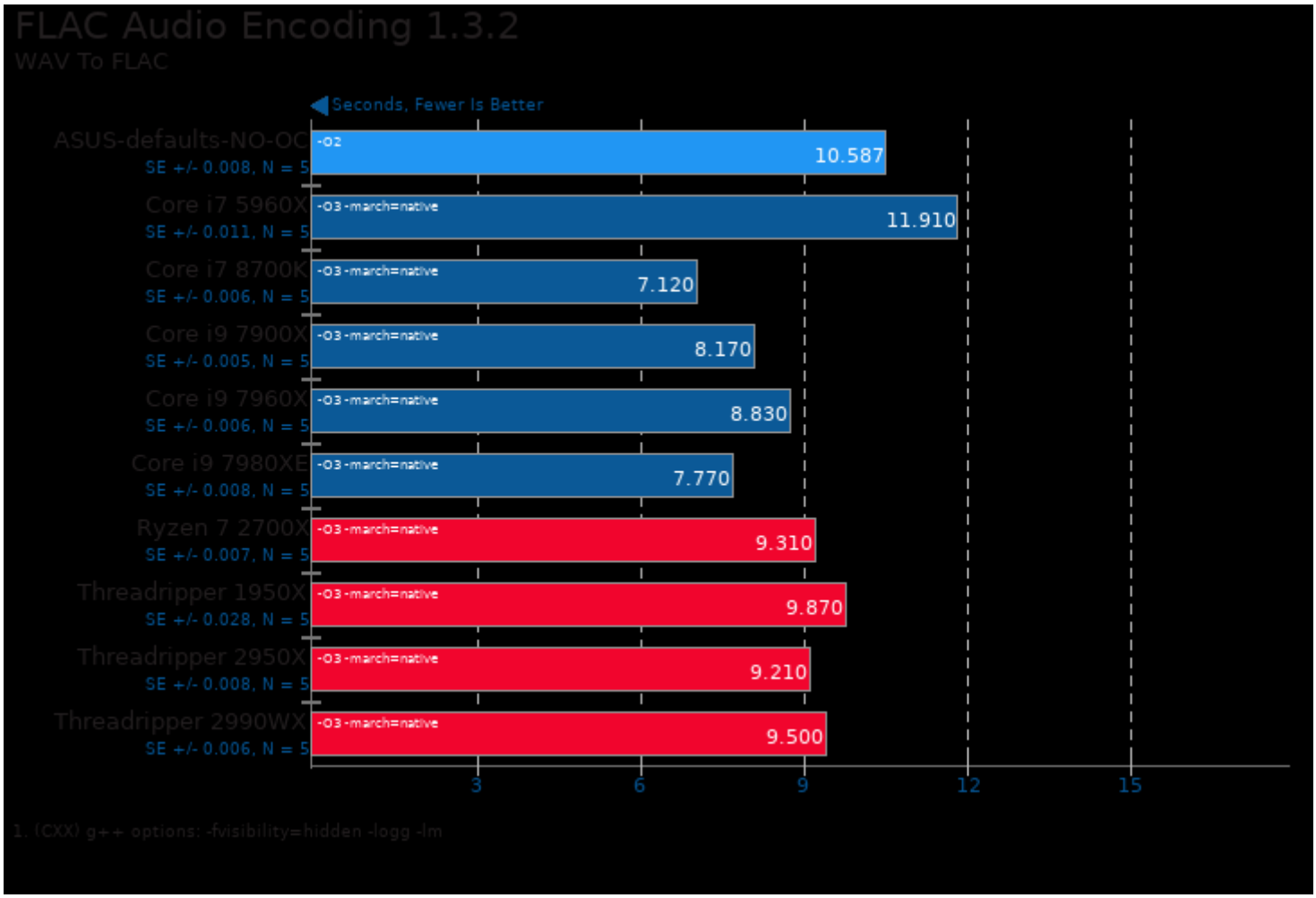


AMD Threadripper 2990WX Linux Benchmarks

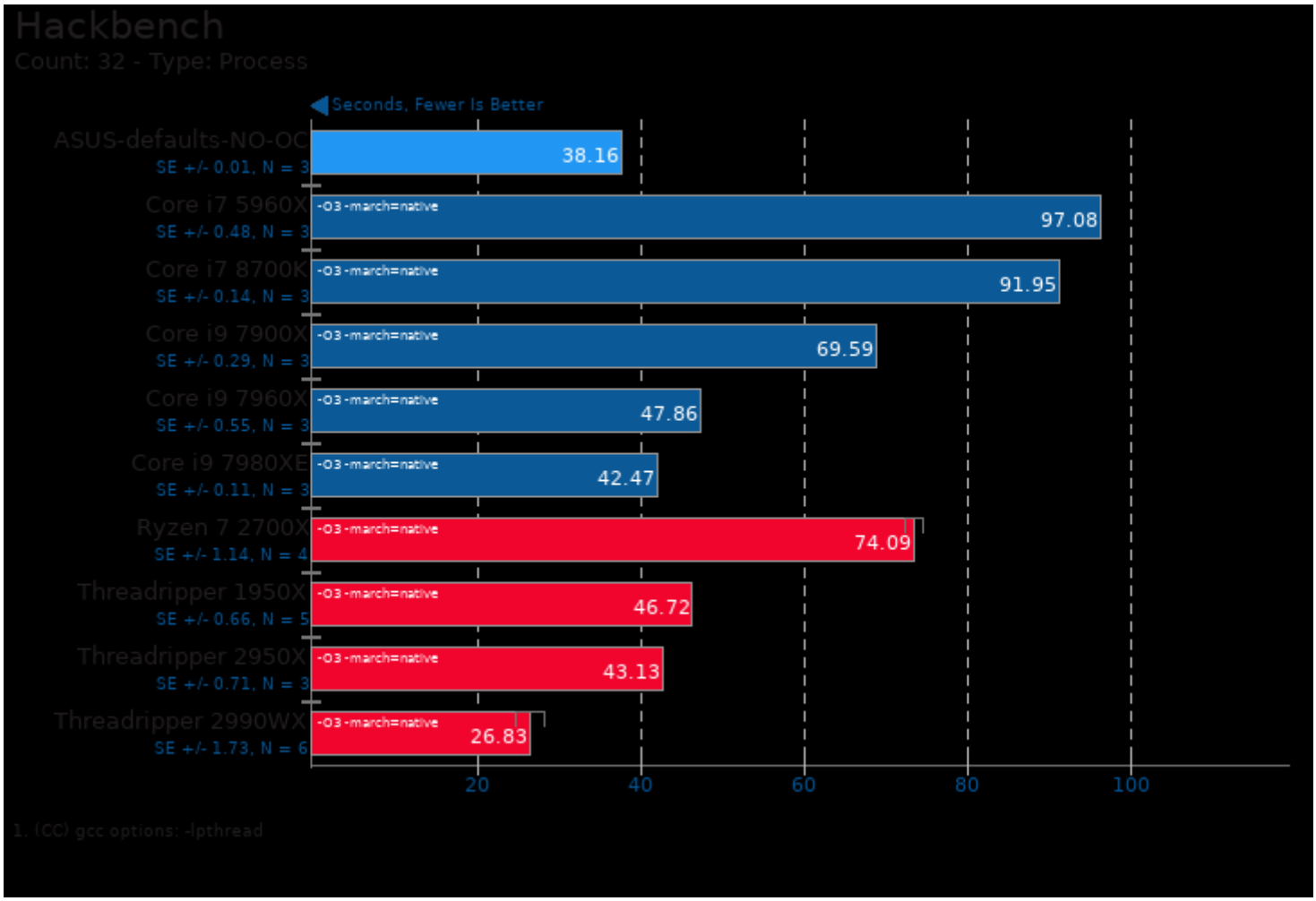


AMD Threadripper 2990WX Linux Benchmarks

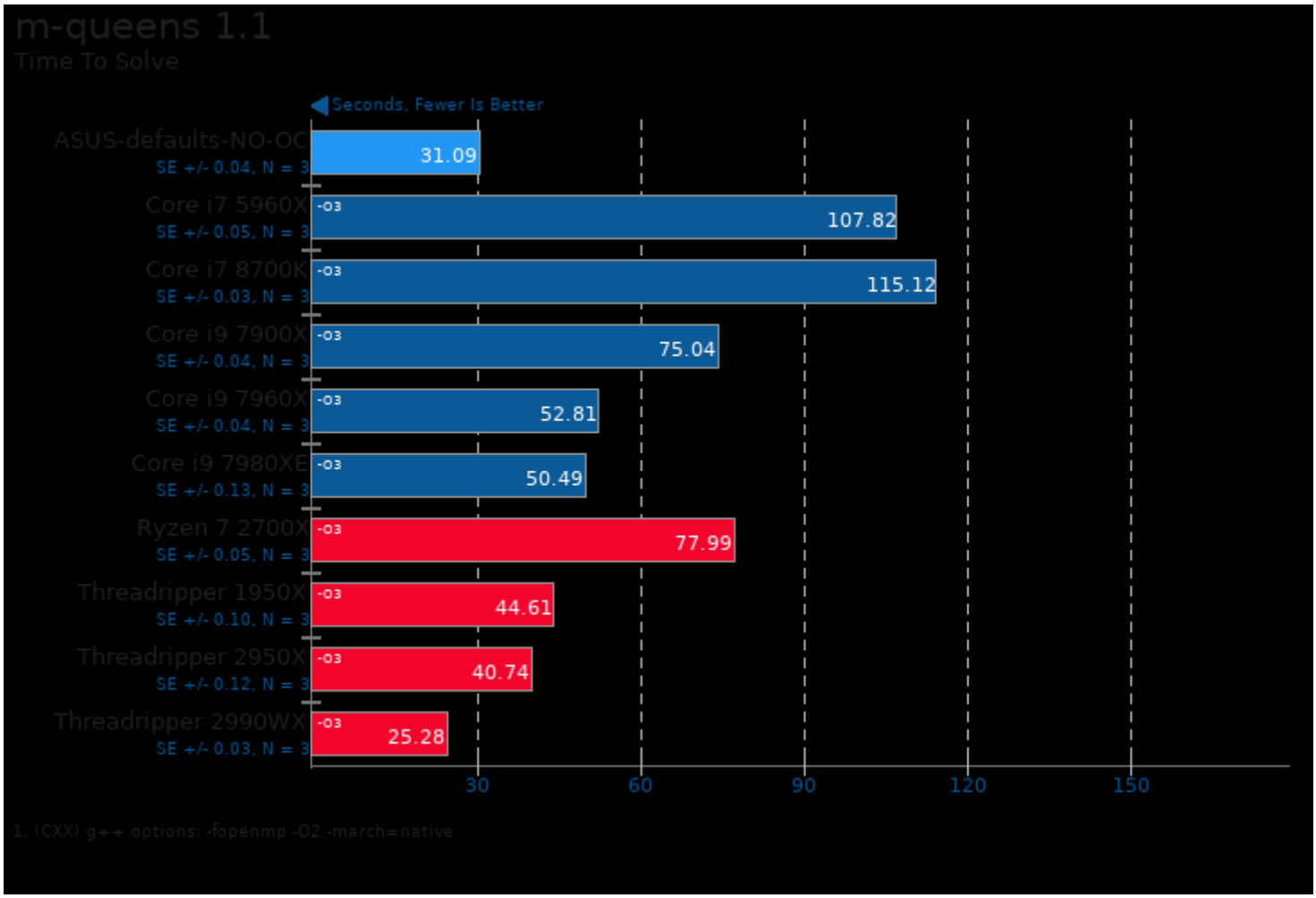



FLAC Audio Encoding 1.3.2
WAV To FLAC
Seconds, Fewer Is Better
ASUS-defaults-NO-OC
SE +/- 0.008, N = 5
-O2
10.587
Core i7 5960X
SE +/- 0.011, N = 5
-O3 -march=native
11.910
Core i7 8700K
SE +/- 0.006, N = 5
-O3 -march=native
7.120
Core i9 7900X
SE +/- 0.005, N = 5
-O3 -march=native
8.170
Core i9 7960X
SE +/- 0.006, N = 5
-O3 -march=native
8.830
Core i9 7980XE
SE +/- 0.008, N = 5
-O3 -march=native
7.770
Ryzen 7 2700X
SE +/- 0.007, N = 5
-O3 -march=native
9.310
Threadripper 1950X
SE +/- 0.028, N = 5
-O3 -march=native
9.870
Threadripper 2950X
SE +/- 0.008, N = 5
-O3 -march=native
9.210
Threadripper 2990WX
SE +/- 0.006, N = 5
-O3 -march=native
9.500
3
6
9
12
15
1. (CXX) g++ options: -fvisibility=hidden -logg -lm

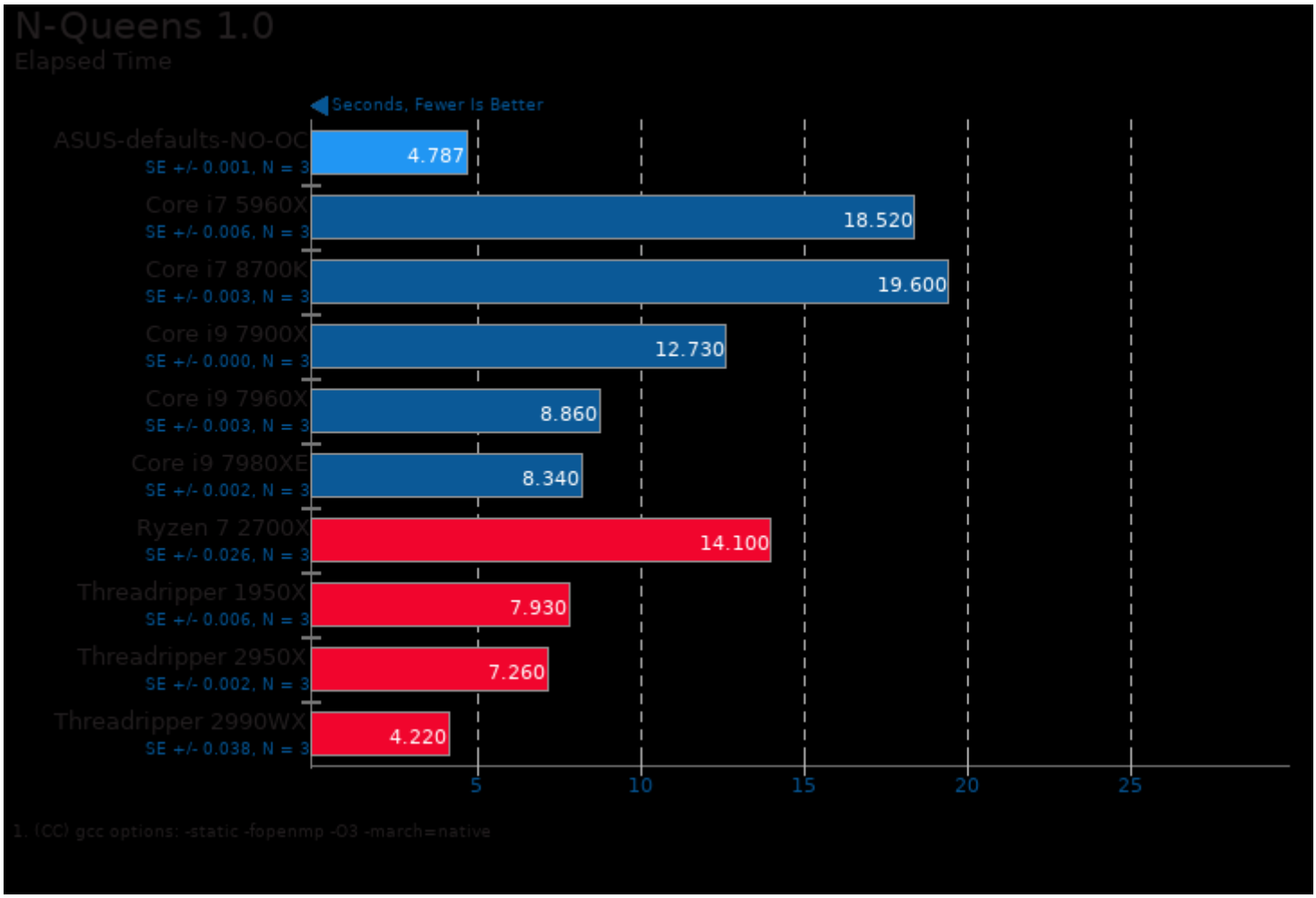
AMD Threadripper 2990WX Linux Benchmarks

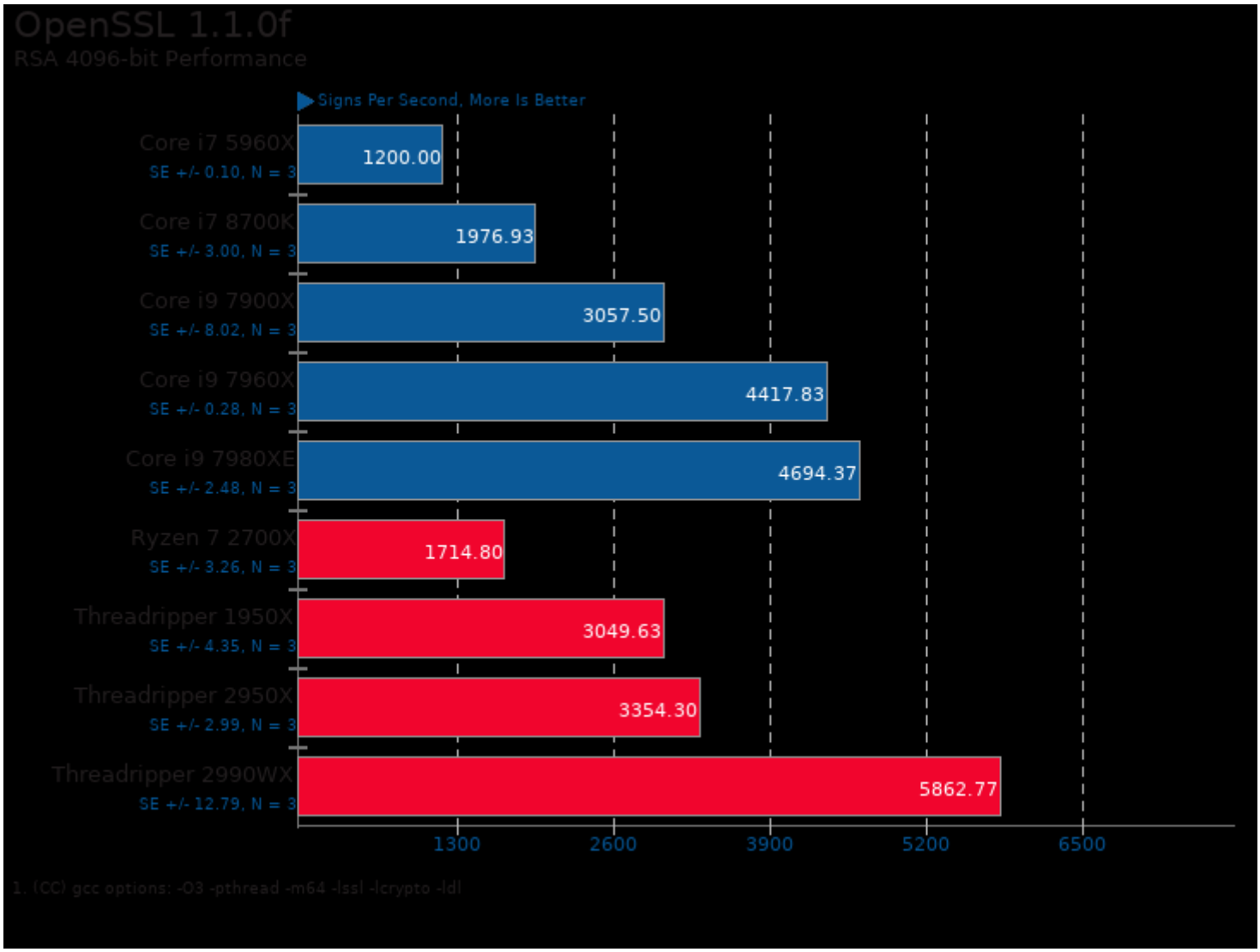


AMD Threadripper 2990WX Linux Benchmarks

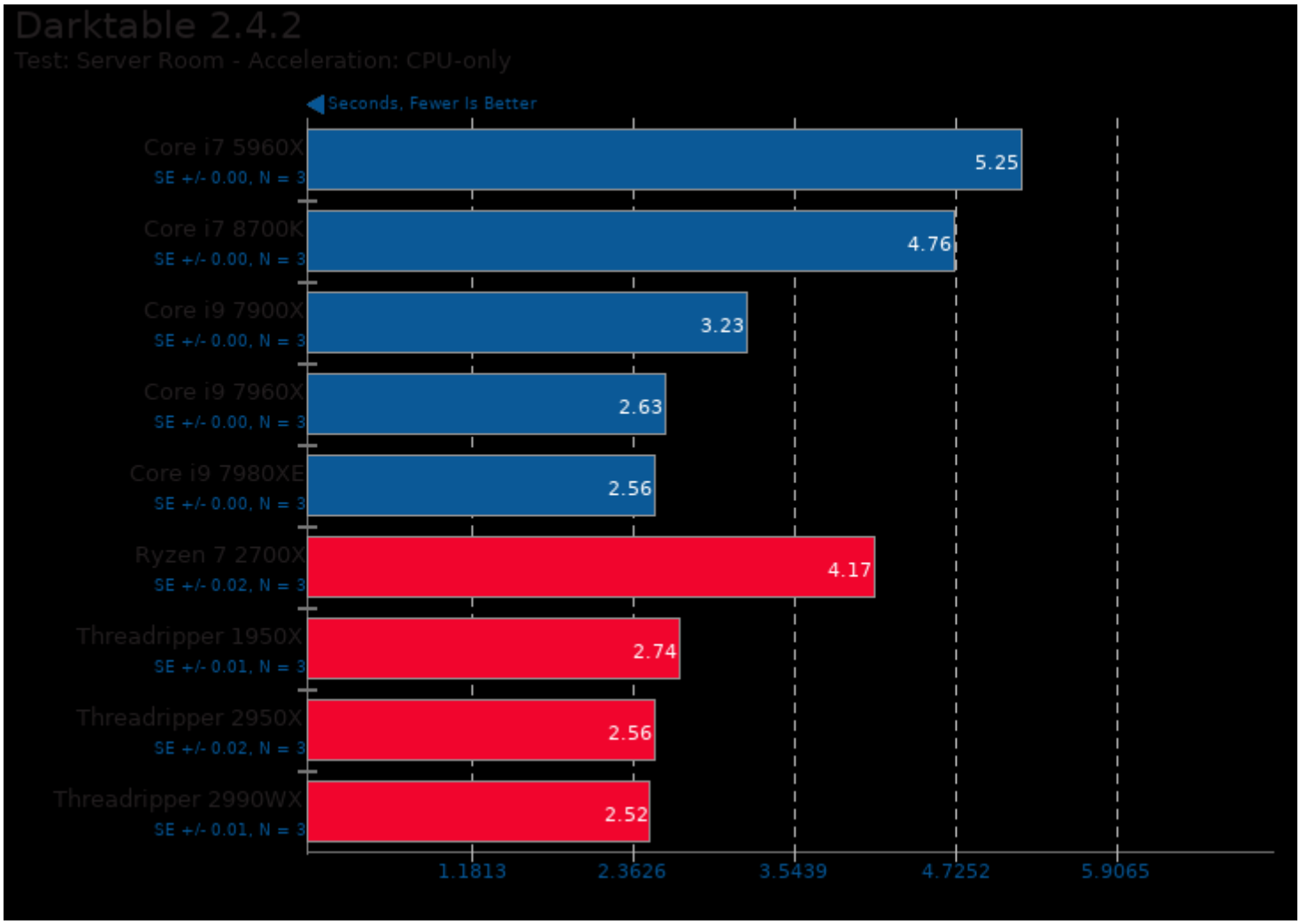


AMD Threadripper 2990WX Linux Benchmarks

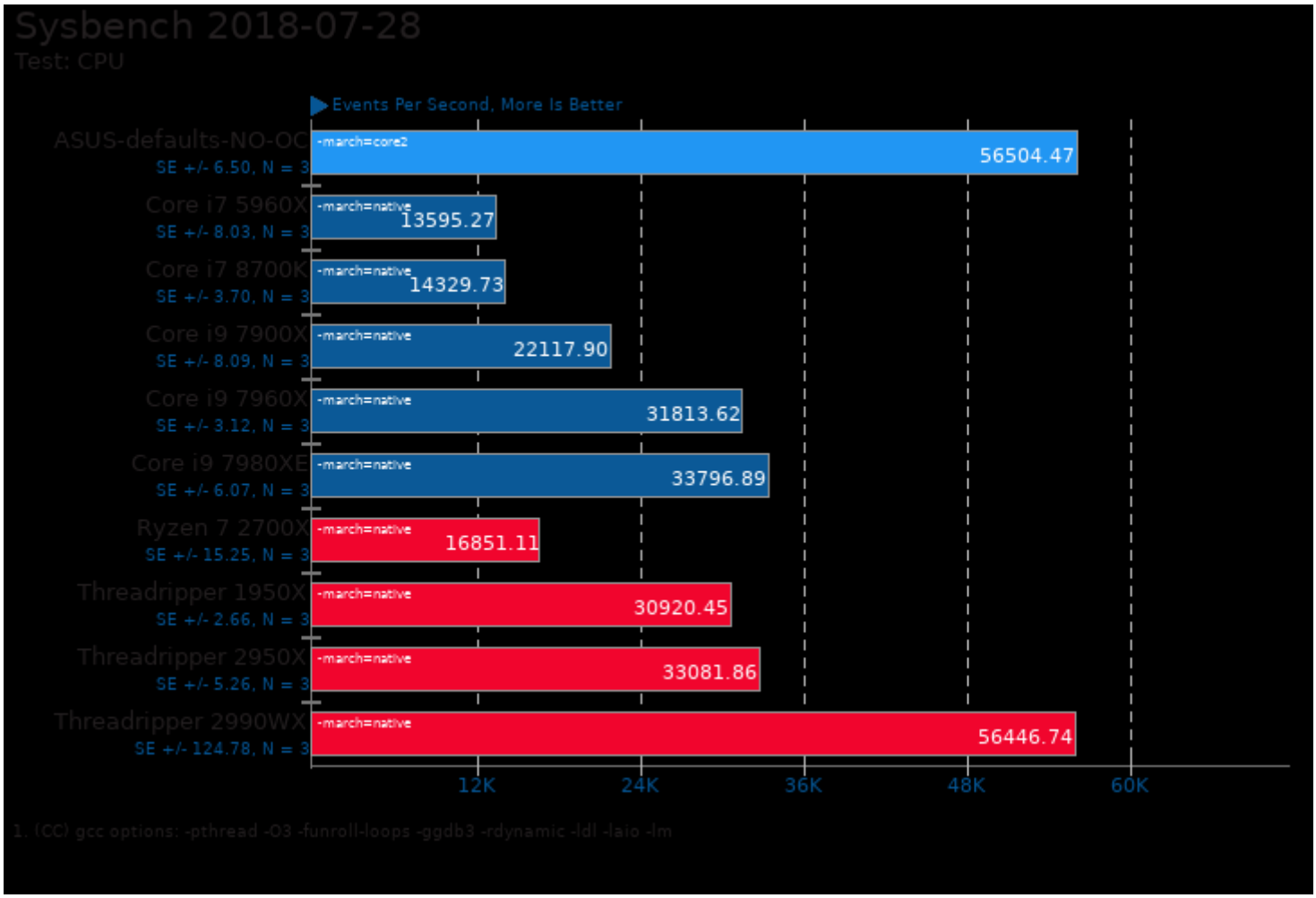



OpenSSL 1.1.0f
RSA 4096-bit Performance
Signs Per Second, More Is Better
Core i7 5960X
SE +/- 0.10, N = 3
1200.00
Core i7 8700K
SE +/- 3.00, N = 3
1976.93
Core i9 7900X
SE +/- 8.02, N = 3
3057.50
Core i9 7960X
SE +/- 0.28, N = 3
4417.83
Core i9 7980XE
SE +/- 2.48, N = 3
4694.37
Ryzen 7 2700X
SE +/- 3.26, N = 3
1714.80
Threadripper 1950X
SE +/- 4.35, N = 3
3049.63
Threadripper 2950X
SE +/- 2.99, N = 3
3354.30
Threadripper 2990WX
SE +/- 12.79, N = 3
5862.77
1300
2600
3900
5200
6500
1. (CC) gcc options: -O3 -pthread -m64 -lssl -lcrypto -ldl

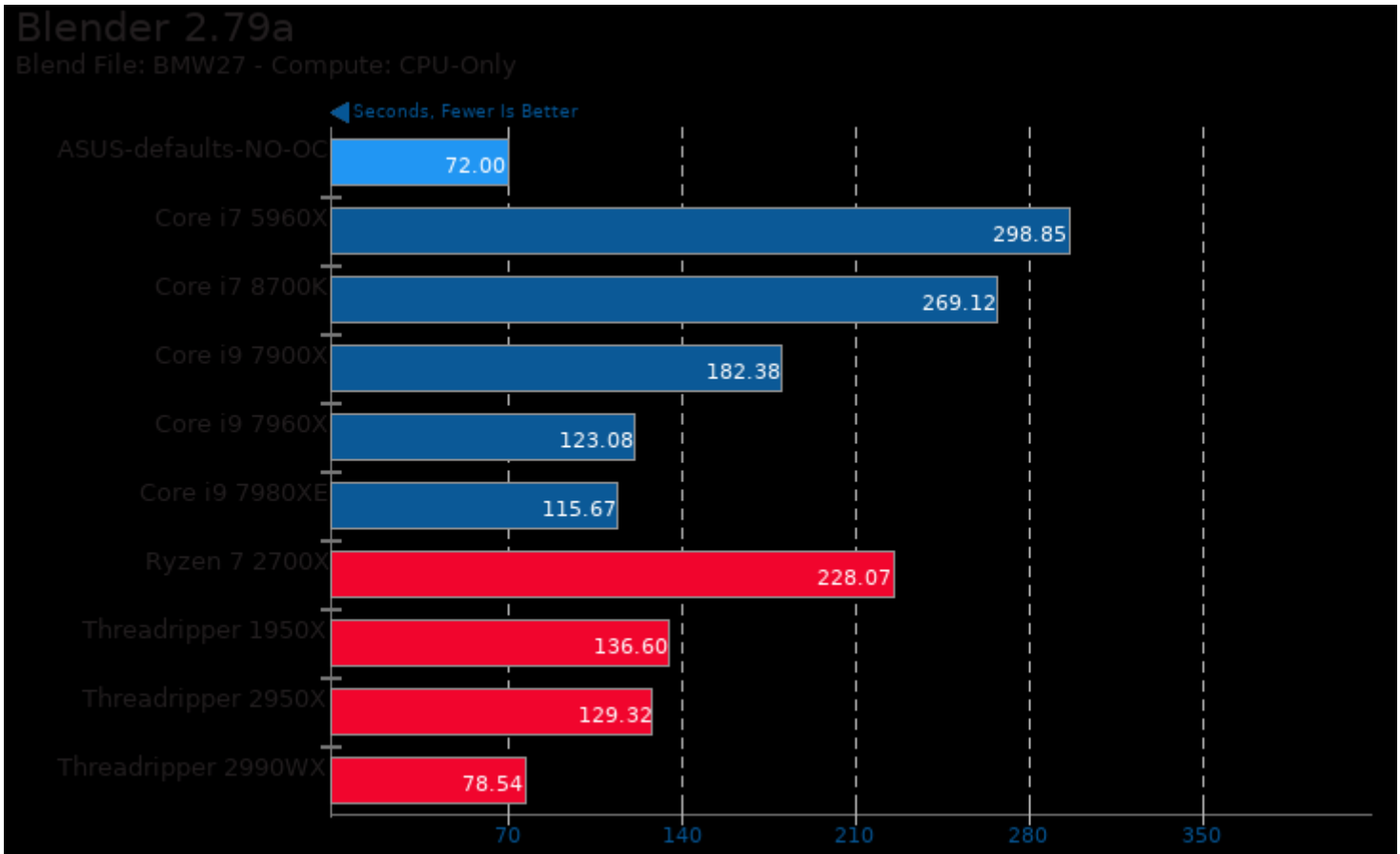
AMD Threadripper 2990WX Linux Benchmarks

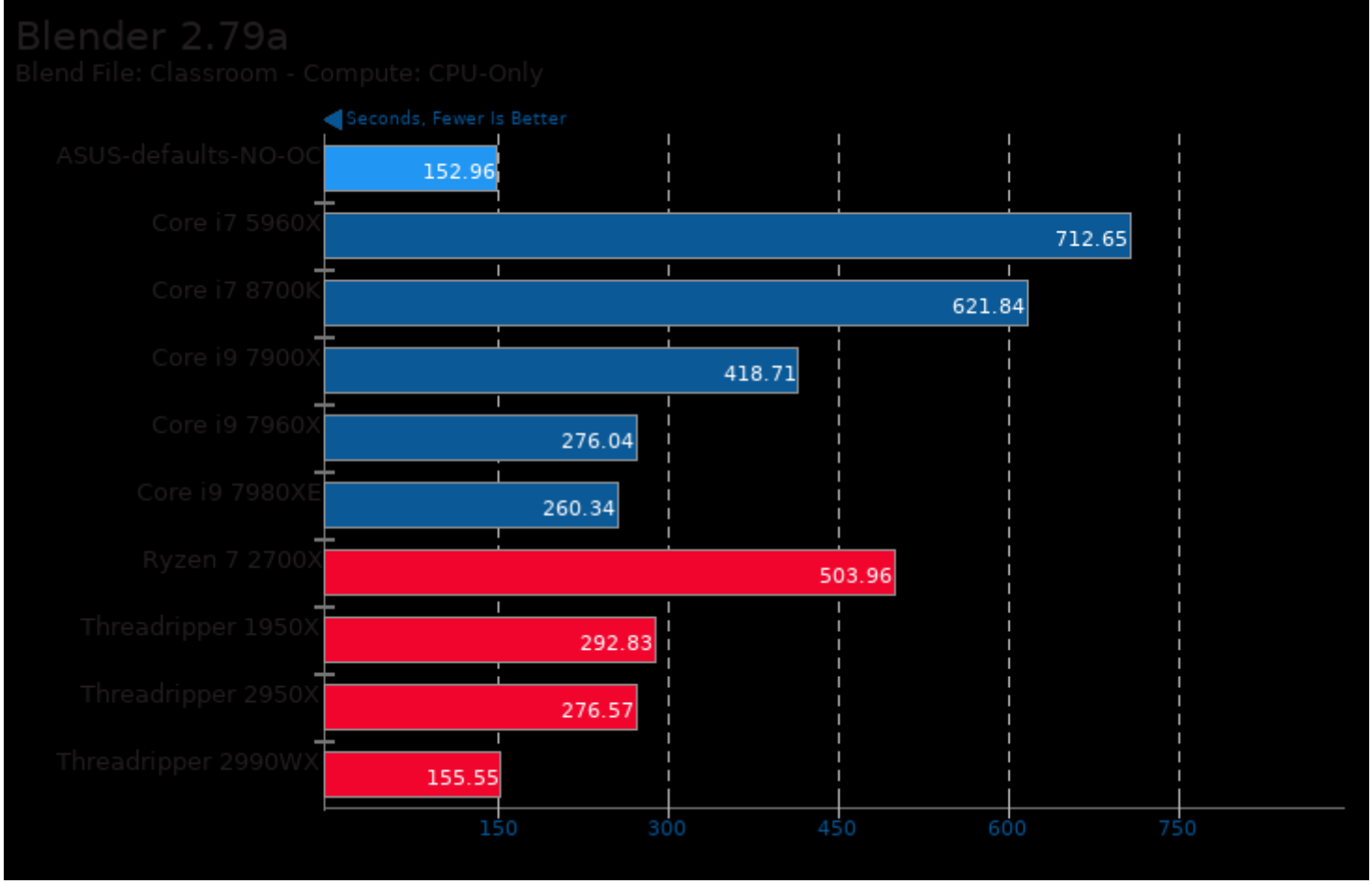


AMD Threadripper 2990WX Linux Benchmarks

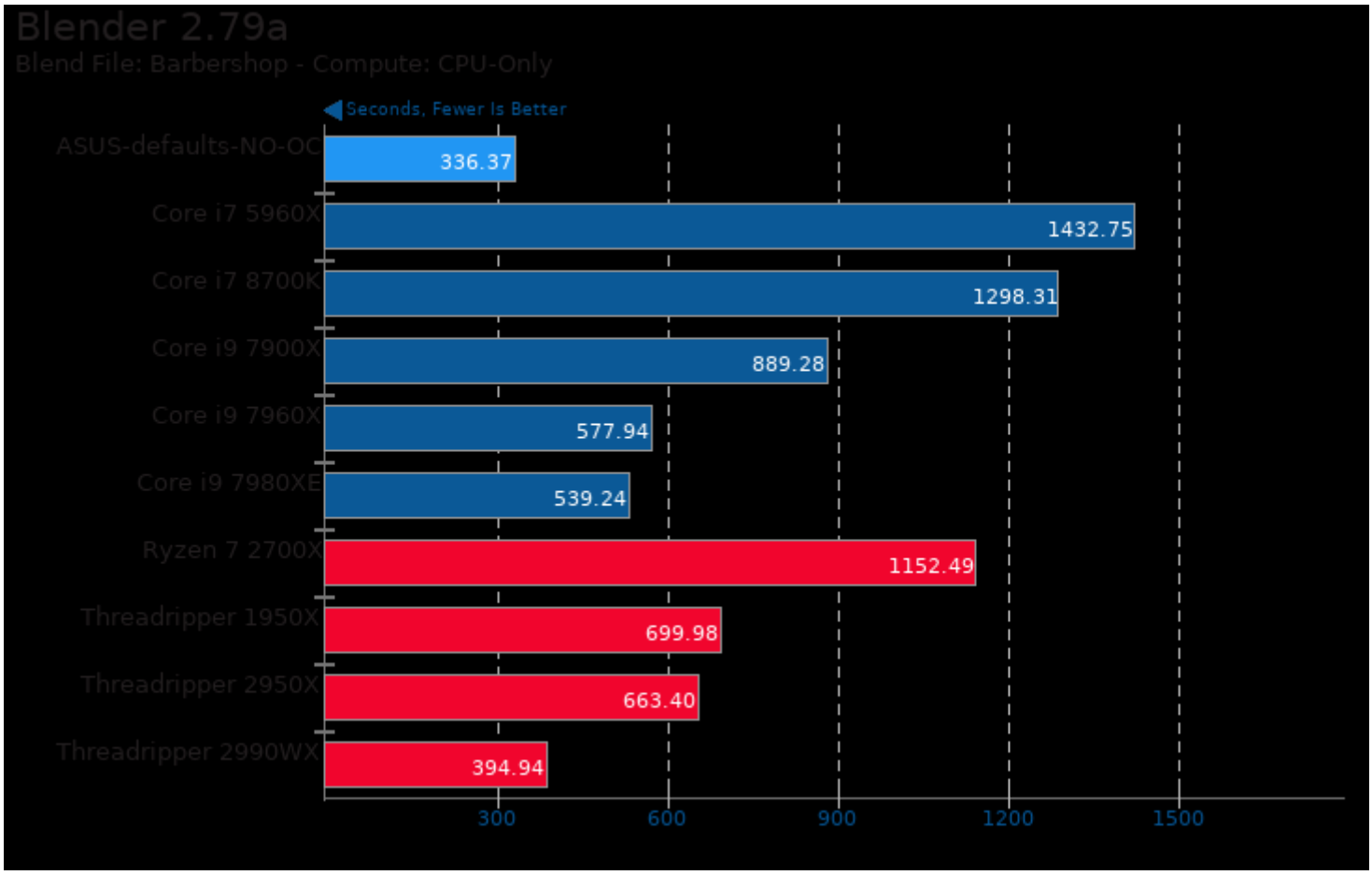


AMD Threadripper 2990WX Linux Benchmarks

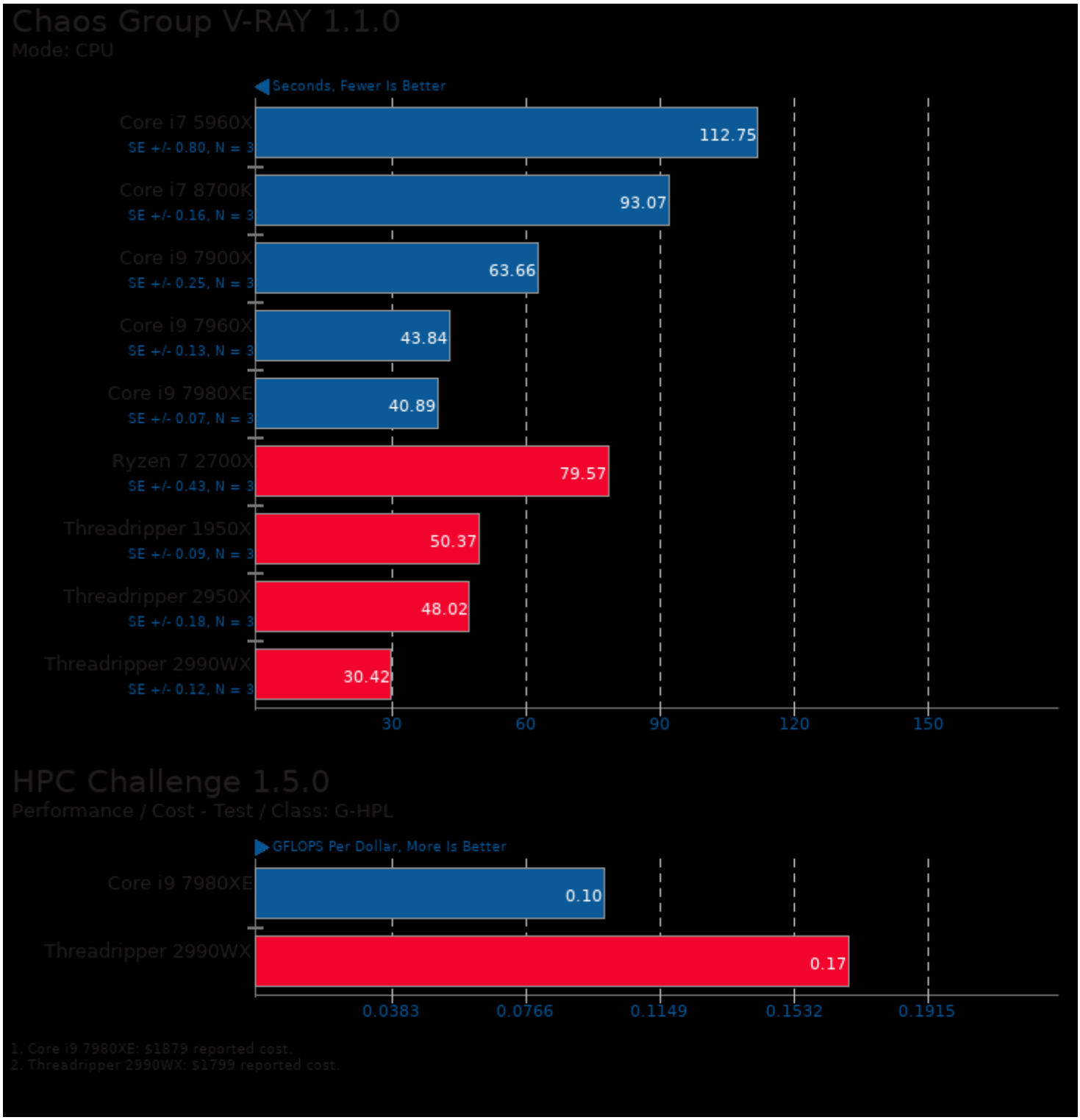




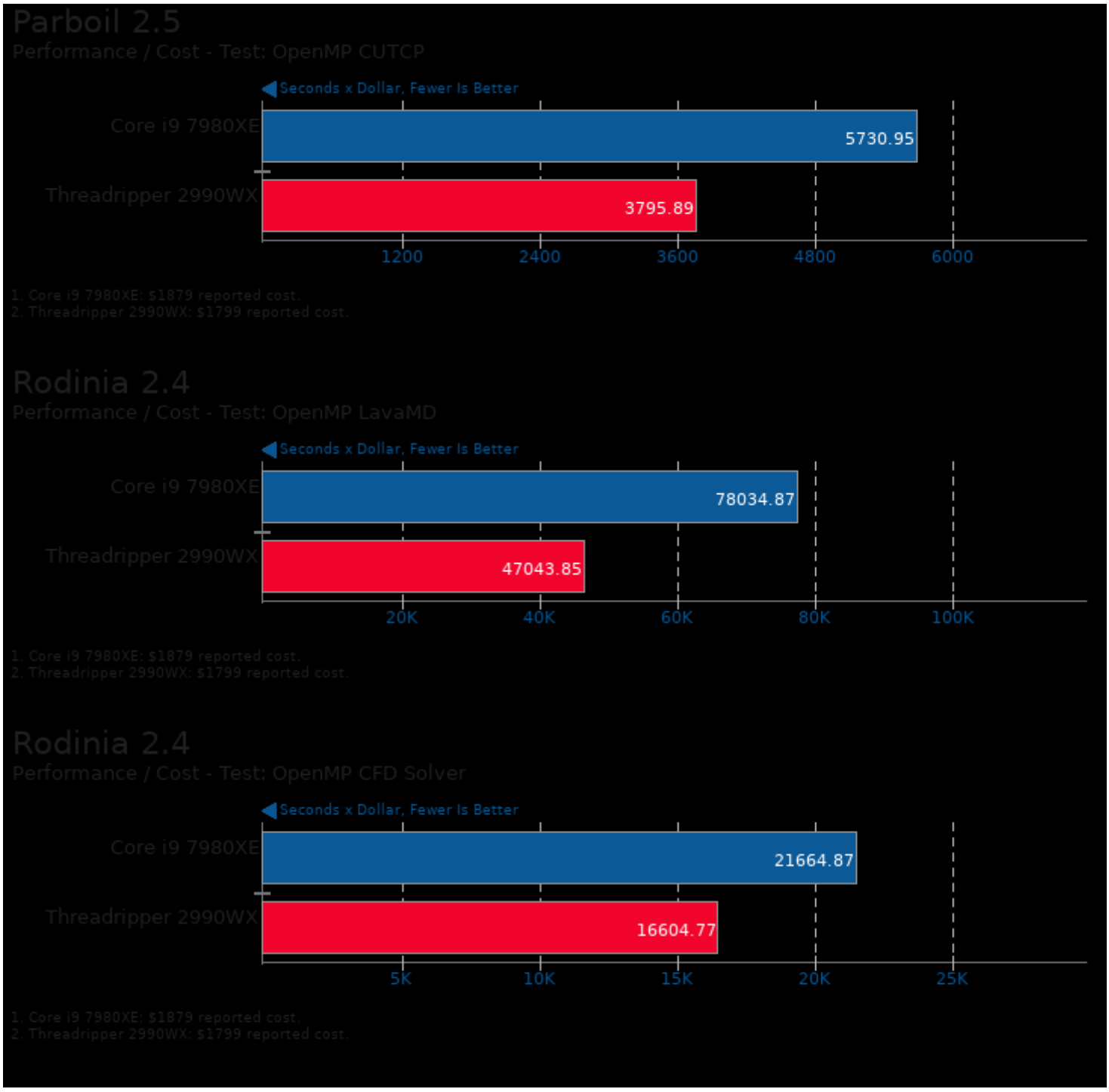
AMD Threadripper 2990WX Linux Benchmarks

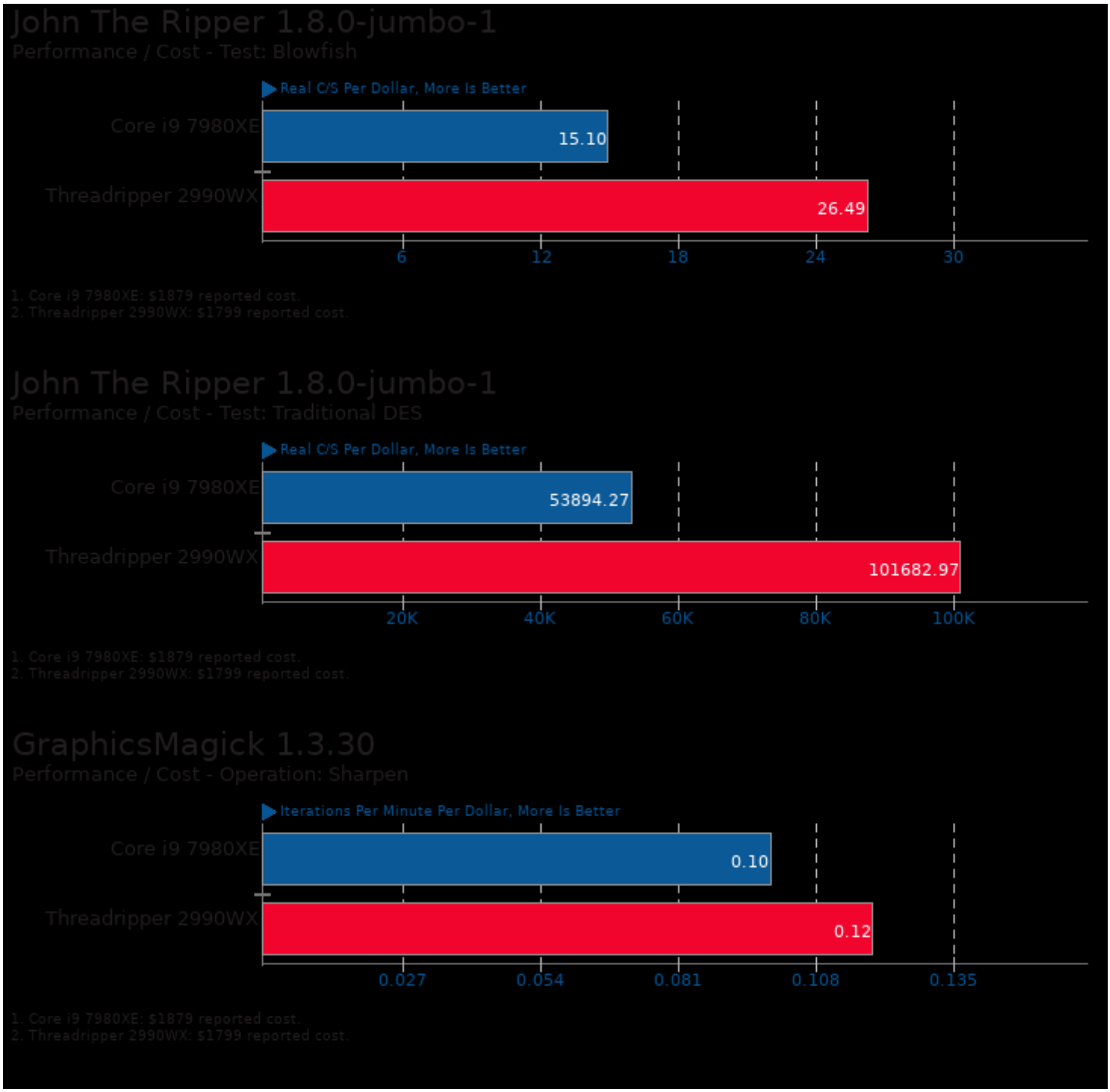


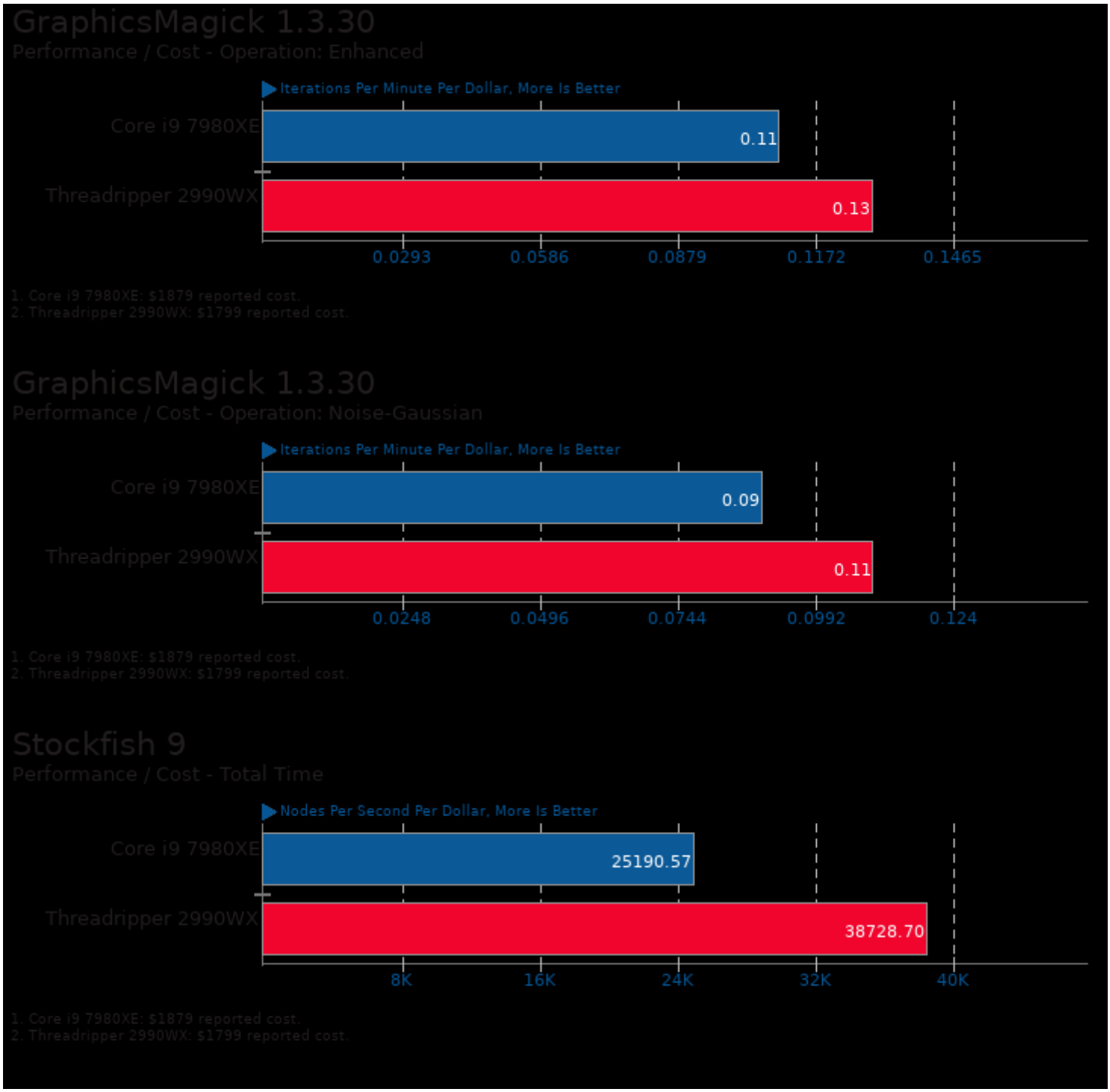
AMD Threadripper 2990WX Linux Benchmarks



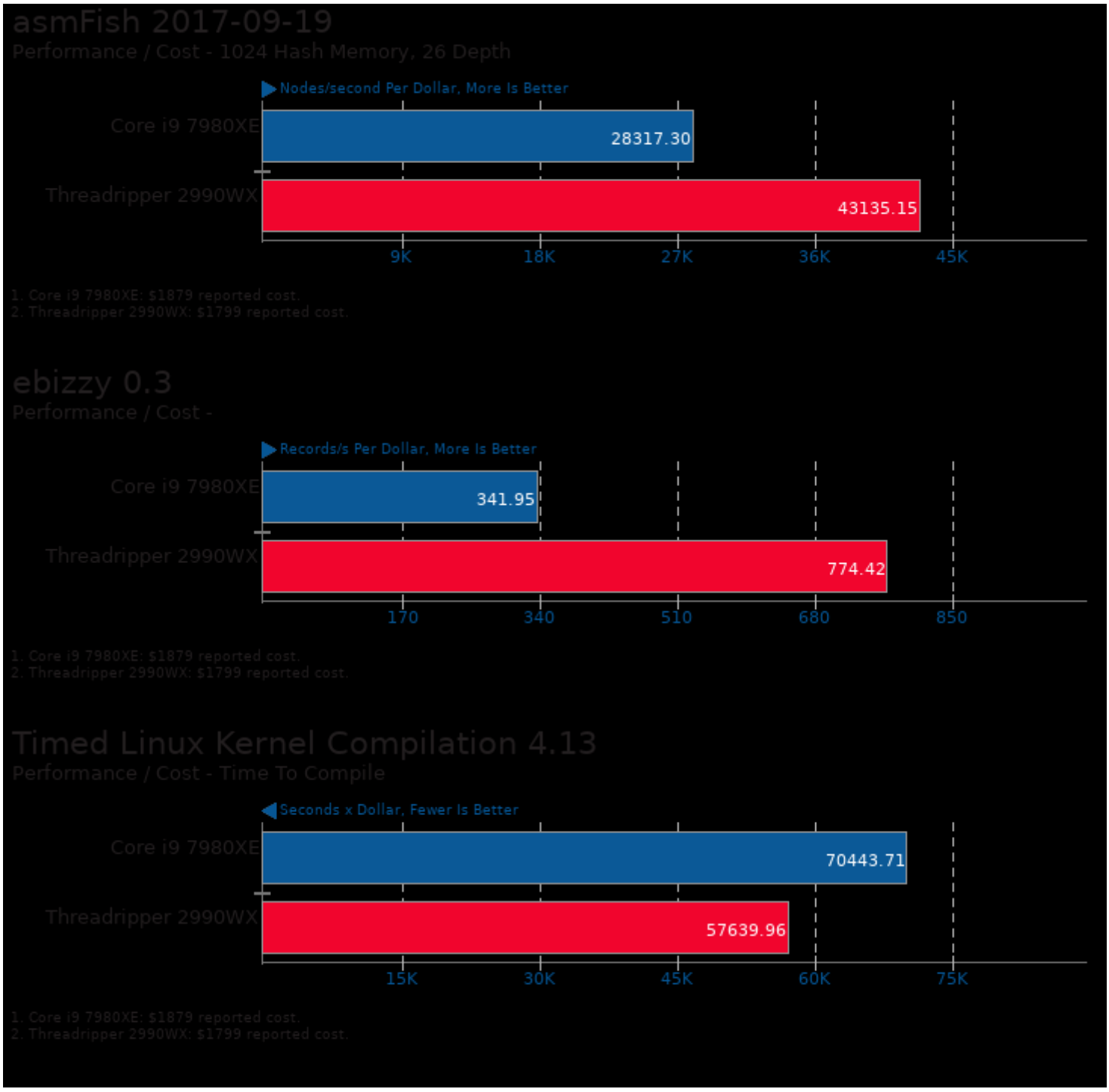
AMD Threadripper 2990WX Linux Benchmarks




John The Ripper 1.8.0-jumbo-1
Performance / Cost - Test: Blowfish
Real C/S Per Dollar, More Is Better
Core i9 7980XE
15.10
Threadripper 2990WX
26.49
6
12
18
24
30
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.
John The Ripper 1.8.0-jumbo-1
Performance / Cost - Test: Traditional DES
Real C/S Per Dollar, More Is Better
Core i9 7980XE
53894.27
Threadripper 2990WX
101682.97
20K
40K
60K
80K
100K
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.
GraphicsMagick 1.3.30
Performance / Cost - Operation: Sharpen
Iterations Per Minute Per Dollar, More Is Better
Core i9 7980XE
0.10
Threadripper 2990WX
0.12
0.027
0.054
0.081
0.108
0.135
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.


GraphicsMagick 1.3.30
Performance / Cost - Operation: Enhanced
Iterations Per Minute Per Dollar, More Is Better
Core i9 7980XE
Threadripper 2990WX
0.11
0.13
0.0293
0.0586
0.0879
0.1172
0.1465
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.
GraphicsMagick 1.3.30
Performance / Cost - Operation: Noise-Gaussian
Iterations Per Minute Per Dollar, More Is Better
Core i9 7980XE
Threadripper 2990WX
0.09
0.11
0.0248
0.0496
0.0744
0.0992
0.124
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.
Stockfish 9
Performance / Cost - Total Time
Nodes Per Second Per Dollar, More Is Better
Core i9 7980XE
Threadripper 2990WX
25190.57
38728.70
8K
16K
24K
32K
40K
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

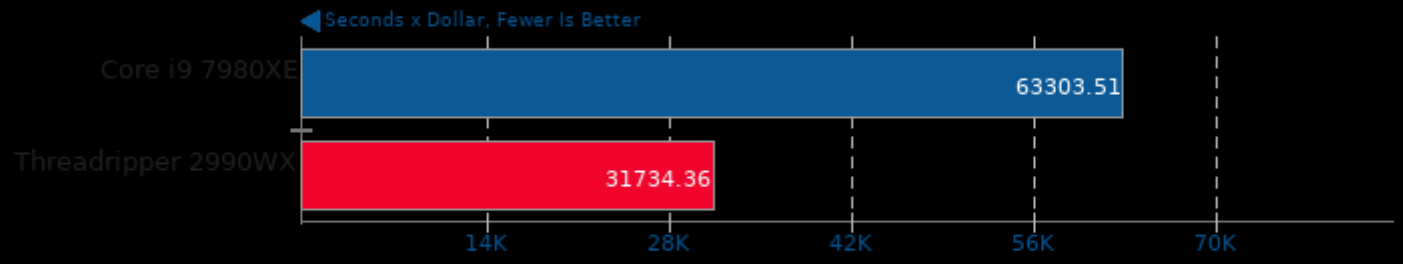
AMD Threadripper 2990WX Linux Benchmarks



AMD Threadripper 2990WX Linux Benchmarks

C-Ray 1.1

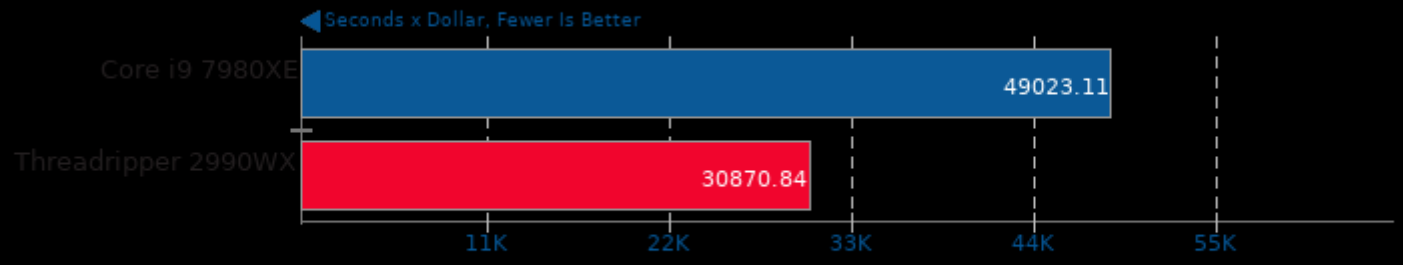
Performance / Cost - Total Time - 4K, 16 Rays Per Pixel



1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

POV-Ray 3.7.0.7

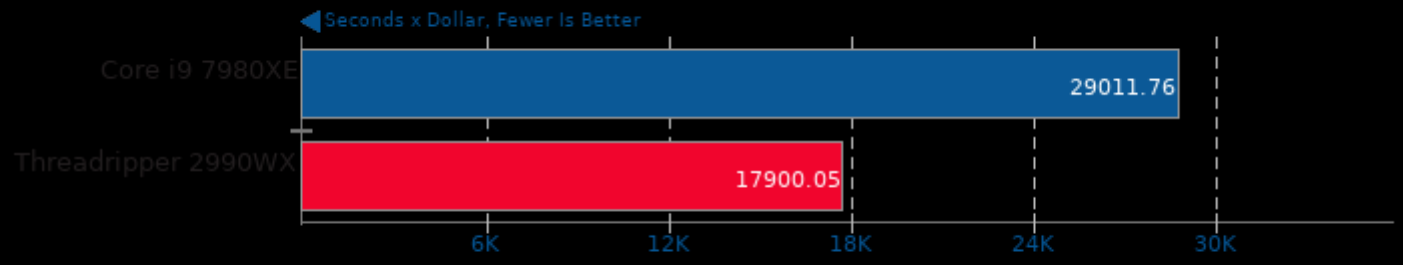
Performance / Cost - Trace Time



1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

Primesieve 6.2

Performance / Cost - 1e12 Prime Number Generation

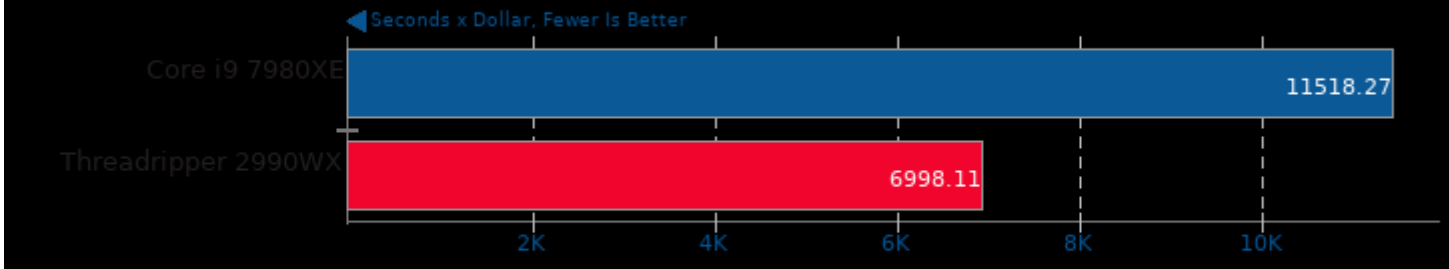


1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

AMD Threadripper 2990WX Linux Benchmarks

Smallpt 1.0

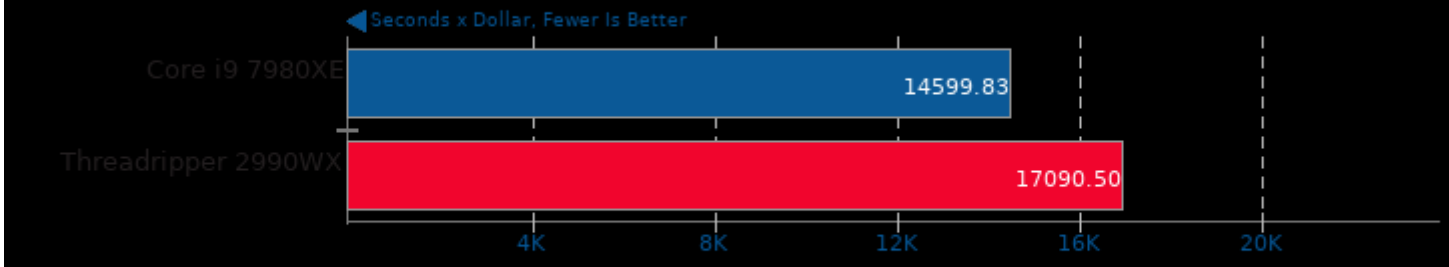
Performance / Cost - Global Illumination Renderer; 128 Samples



1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

FLAC Audio Encoding 1.3.2

Performance / Cost - WAV To FLAC



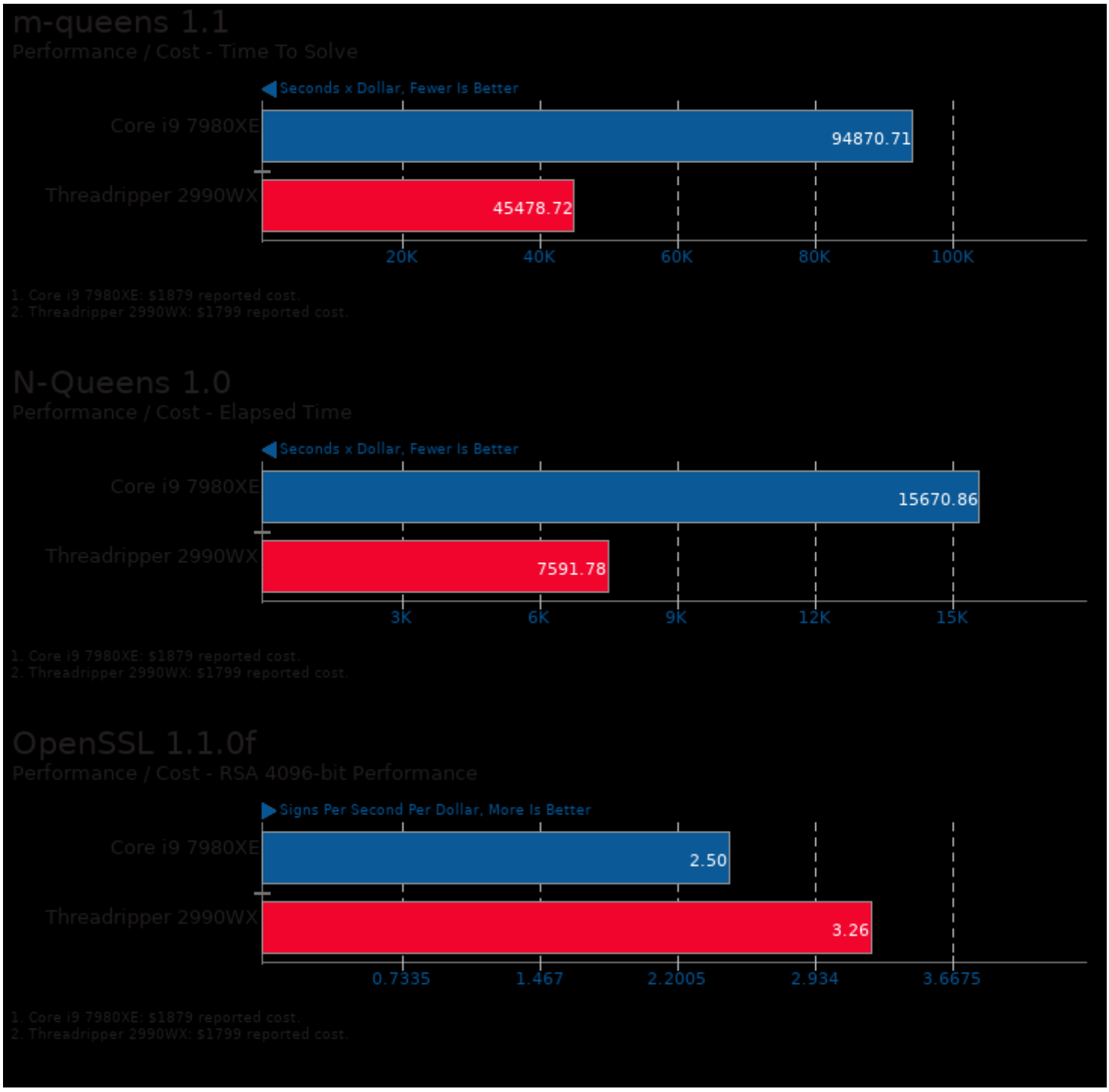
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

Hackbench

Performance / Cost - Count: 32 - Type: Process



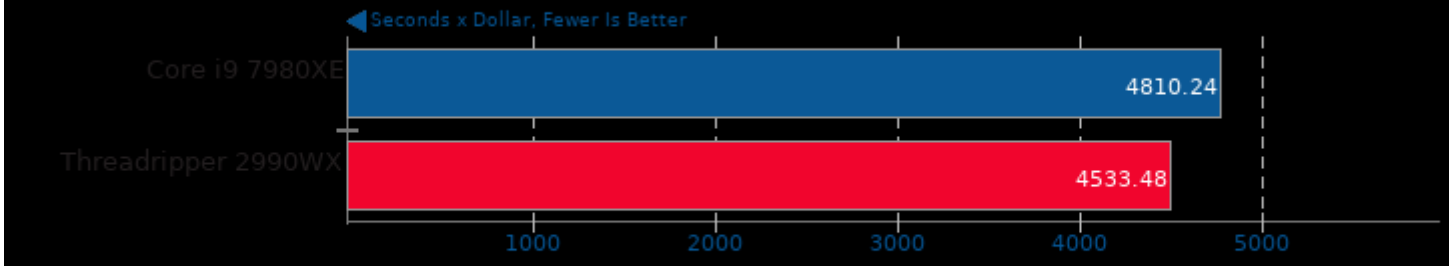
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.


m-queens 1.1
Performance / Cost - Time To Solve
Seconds x Dollar, Fewer Is Better
Core i9 7980XE
94870.71
Threadripper 2990WX
45478.72
20K
40K
60K
80K
100K
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.
N-Queens 1.0
Performance / Cost - Elapsed Time
Seconds x Dollar, Fewer Is Better
Core i9 7980XE
15670.86
Threadripper 2990WX
7591.78
3K
6K
9K
12K
15K
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.
OpenSSL 1.1.0f
Performance / Cost - RSA 4096-bit Performance
Signs Per Second Per Dollar, More Is Better
Core i9 7980XE
2.50
Threadripper 2990WX
3.26
0.7335
1.467
2.2005
2.934
3.6675
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

AMD Threadripper 2990WX Linux Benchmarks

Darktable 2.4.2

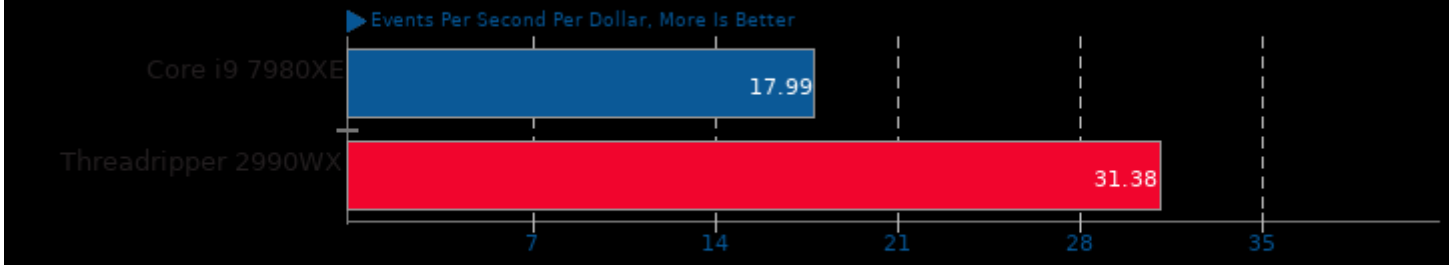
Performance / Cost - Test: Server Room - Acceleration: CPU-only



1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

Sysbench 2018-07-28

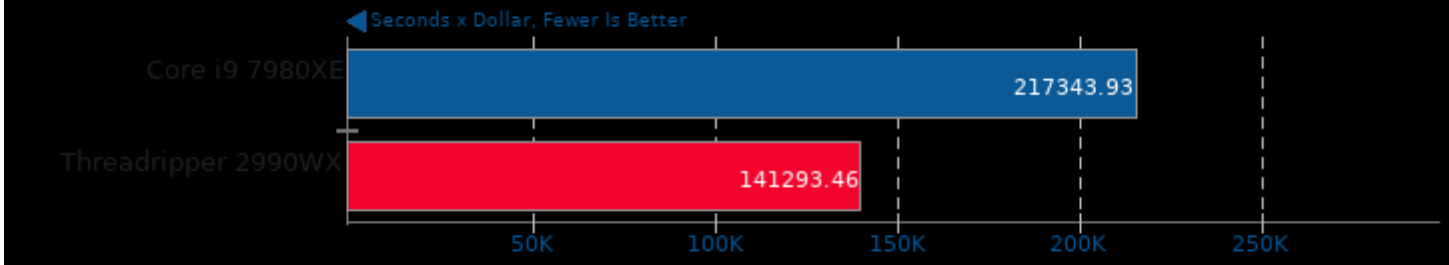
Performance / Cost - Test: CPU



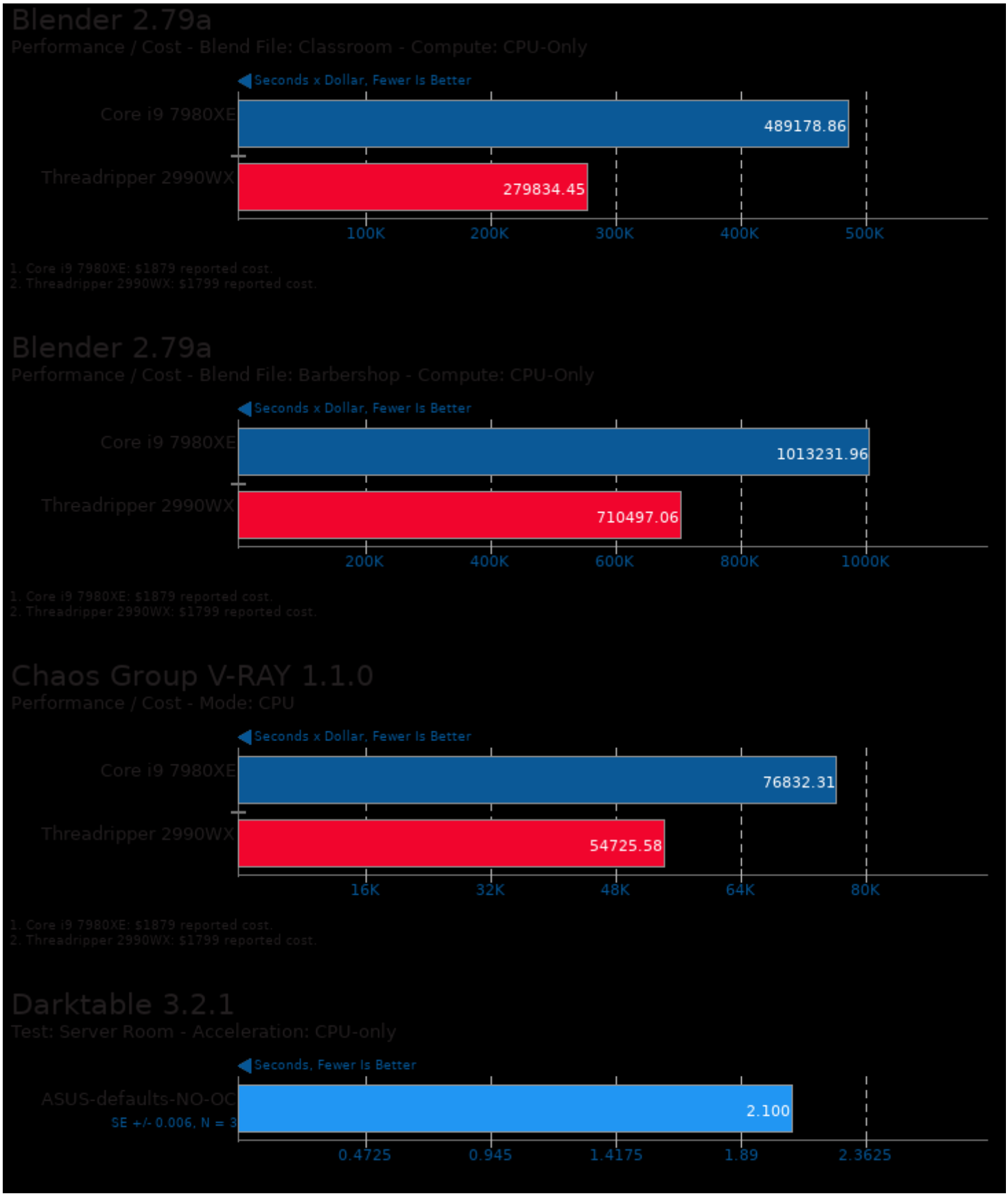
1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.

Blender 2.79a

Performance / Cost - Blend File: BMW27 - Compute: CPU-Only



1. Core i9 7980XE: $1879 reported cost.
2. Threadripper 2990WX: $1799 reported cost.



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