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Intel Xeon vs. AMD EPYC Linux Performance Benchmarks

Tests for a future article of AMD EPYC vs. Intel Xeon Linux benchmarks on Ubuntu.

Automated Executive Summary

2 x EPYC 7601 had the most wins, coming in first place for 75% of the tests.

Based on the geometric mean of all complete results, the fastest (2 x EPYC 7601) was 6.376x the speed of the slowest (Xeon Silver 4108). 2xamd7501 was 0.913x the speed of 2 x EPYC 7601, 2 x Xeon Gold 6138 was 0.802x the speed of 2xamd7501, EPYC 7601 was 0.802x the speed of 2 x Xeon Gold 6138, EPYC 7551 was 0.948x the speed of EPYC 7601, EPYC 7401P was 0.84x the speed of EPYC 7551, EPYC 7351P was 0.811x the speed of EPYC 7401P, Xeon E5-2687W v3 was 0.663x the speed of EPYC 7351P, EPYC 7251 was 0.775x the speed of Xeon E5-2687W v3, Xeon Silver 4108 was 0.804x the speed of EPYC 7251.

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

m-queens (Time To Solve) at 12.99x
John The Ripper (Test: Traditional DES) at 9.302x
m-queens (Time To Solve) at 9.265x
Sysbench (Test: CPU) at 9.242x
John The Ripper (Test: Blowfish) at 8.771x
POV-Ray (Trace Time) at 8.591x

NAMD (ATPase Simulation - 327,506 Atoms) at 8.515x
ebizzy at 8.405x
Stockfish (Total Time) at 8.1x
asmFish (1024 Hash Memory, 26 Depth) at 8.047x.

Test Systems:

EPYC 7251

Processor: AMD EPYC 7251 8-Core @ 2.10GHz (8 Cores / 16 Threads), Motherboard: TYAN B8026T70AE24HR (V1.02.B10 BIOS), Chipset: AMD Family 17h, Memory: 129024MB, Disk: 280GB INTEL SSDPE21D280GA, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Broadcom and subsidiaries NetXtreme BCM5720 Gigabit PCIe

OS: Ubuntu 18.10, Kernel: 4.18.0-8-generic (x86_64), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

EPYC 7351P

Processor: AMD EPYC 7351P 16-Core @ 2.40GHz (16 Cores / 32 Threads), Motherboard: TYAN B8026T70AE24HR (V1.02.B10 BIOS), Chipset: AMD Family 17h, Memory: 129024MB, Disk: 280GB INTEL SSDPE21D280GA, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Broadcom and subsidiaries NetXtreme BCM5720 Gigabit PCIe

OS: Ubuntu 18.10, Kernel: 4.18.0-8-generic (x86_64), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

EPYC 7401P

Processor: AMD EPYC 7401P 24-Core @ 2.00GHz (24 Cores / 48 Threads), Motherboard: TYAN B8026T70AE24HR (V1.02.B10 BIOS), Chipset: AMD Family 17h, Memory: 129024MB, Disk: 280GB INTEL SSDPE21D280GA, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Broadcom and subsidiaries NetXtreme BCM5720 Gigabit PCIe

OS: Ubuntu 18.10, Kernel: 4.18.0-8-generic (x86_64), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

EPYC 7551

Processor: AMD EPYC 7551 32-Core @ 2.00GHz (32 Cores / 64 Threads), Motherboard: GIGABYTE MZ31-AR0-00 v01010101 (F07 BIOS), Chipset: AMD Family 17h, Memory: 28672MB, Disk: 525GB 2115 + 2 x Samsung SSD 960 EVO 500GB, Graphics: ASPEED ASPEED Family, Network: Realtek RTL8111/8168/8411

OS: Ubuntu 18.10, Kernel: 4.18.0-9-generic (x86_64), Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1024x768

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

EPYC 7601

Processor: AMD EPYC 7601 32-Core @ 2.20GHz (32 Cores / 64 Threads), Motherboard: TYAN B8026T70AE24HR (V1.02.B10 BIOS), Chipset: AMD Family 17h, Memory: 129024MB, Disk: 280GB INTEL SSDPE21D280GA, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Broadcom and subsidiaries NetXtreme BCM5720 Gigabit PCIe

OS: Ubuntu 18.10, Kernel: 4.18.0-8-generic (x86_64), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

2 x EPYC 7601

Processor: 2 x AMD EPYC 7601 32-Core @ 2.62GHz (64 Cores / 128 Threads), Motherboard: Dell 02MJ3T (1.2.5 BIOS), Chipset: AMD Family 17h, Memory: 516096MB, Disk: 120GB SSDSCKJB120G7R, Graphics: Matrox Matrox G200eW3, Monitor: VE228, Network: Broadcom and subsidiaries BCM57416 NetXtreme-E Dual-Media 10G RDMA

OS: Ubuntu 18.10, Kernel: 4.18.0-8-generic (x86_64), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1600x1200

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v

Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

Xeon E5-2687W v3

Processor: Intel Xeon E5-2687W v3 @ 3.50GHz (10 Cores / 20 Threads), Motherboard: MSI X99S SLI PLUS (MS-7885) v1.0 (1.E0 BIOS), Chipset: Intel Xeon E7 v3/Xeon, Memory: 32768MB, Disk: 525GB 2115 + 80GB INTEL SSDSCKGW08, Graphics: NVIDIA GeForce GTX 770, Audio: Realtek ALC892, Network: Intel Connection

OS: Ubuntu 18.10, Kernel: 4.18.0-9-generic (x86_64), Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1024x768

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

Xeon Silver 4108

Processor: Intel Xeon Silver 4108 @ 3.00GHz (8 Cores / 16 Threads), Motherboard: TYAN S7100AG2NR (V3.02 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 23552MB, Disk: 525GB 2115 + 240GB Force MP500, Graphics: ASPEED ASPEED Family, Audio: Realtek ALC892, Monitor: VE228, Network: Intel I350 Gigabit Connection

OS: Ubuntu 18.10, Kernel: 4.18.0-9-generic (x86_64), Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

2 x Xeon Gold 6138

Processor: 2 x Intel Xeon Gold 6138 @ 3.70GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106 (V1.01 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 96256MB, Disk: 256GB Samsung SSD 850 + Samsung SSD 970 EVO 250GB, Graphics: ASPEED ASPEED Family, Monitor: VE228, Network: Intel I210 Gigabit Connection

OS: Ubuntu 18.10, Kernel: 4.18.0-8-generic (x86_64), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes: CXXFLAGS=-O3-march=native CFLAGS=-O3-march=native
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++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave
Python Notes: Python 2.7.15+ + Python 3.6.7rc1
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB IBRS_FW + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

2xamd7501

Processor: 2 x AMD EPYC 7501 32-Core @ 2.00GHz (64 Cores / 128 Threads), Motherboard: Supermicro H11DSi-NT v1.01 (1.1c BIOS), Chipset: AMD Family 17h, Memory: 64512MB, Disk: 1000GB Western Digital WD10EZEX-22M + 128GB ADATA SX900 + 4 x 512GB SAMSUNG MZVKW512HMJP-00007, Graphics: AMD Radeon PRO SSG 16GB (1500/945MHz), Audio: AMD Device aaf8, Monitor: C49HG9x, Network: Intel 10G X550T

OS: Ubuntu 18.10, Kernel: 4.18.0-13-generic (x86_64), Desktop: GNOME Shell 3.30.1, Display Server: X Server 1.20.1, Display Driver: amdgpu 18.1.0, OpenGL: 4.5 Mesa 19.0.0-devel padoka PPA (LLVM 9.0.0), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 3840x1080

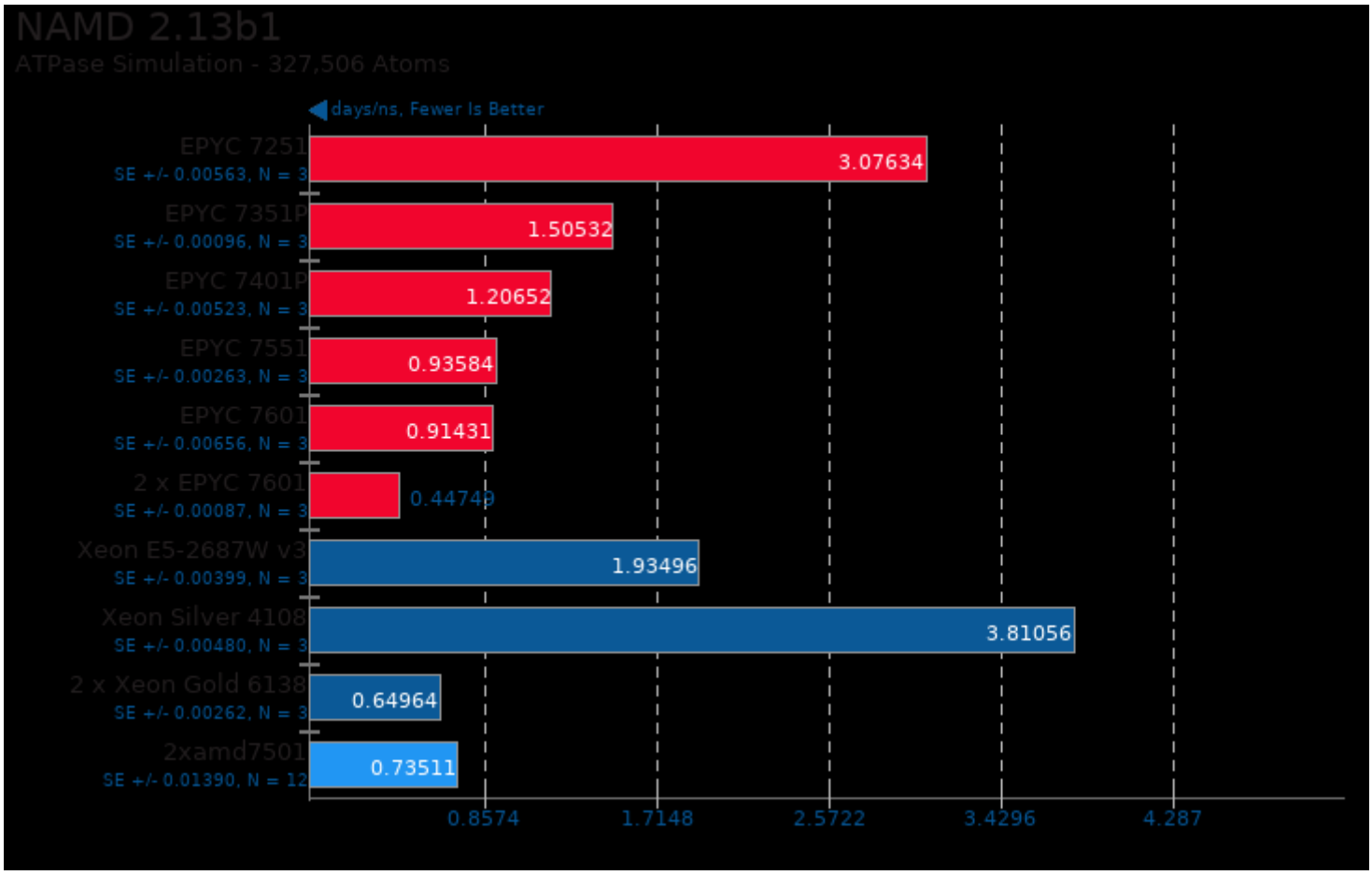
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --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 --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15+ + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB + SSB disabled via prctl and seccomp

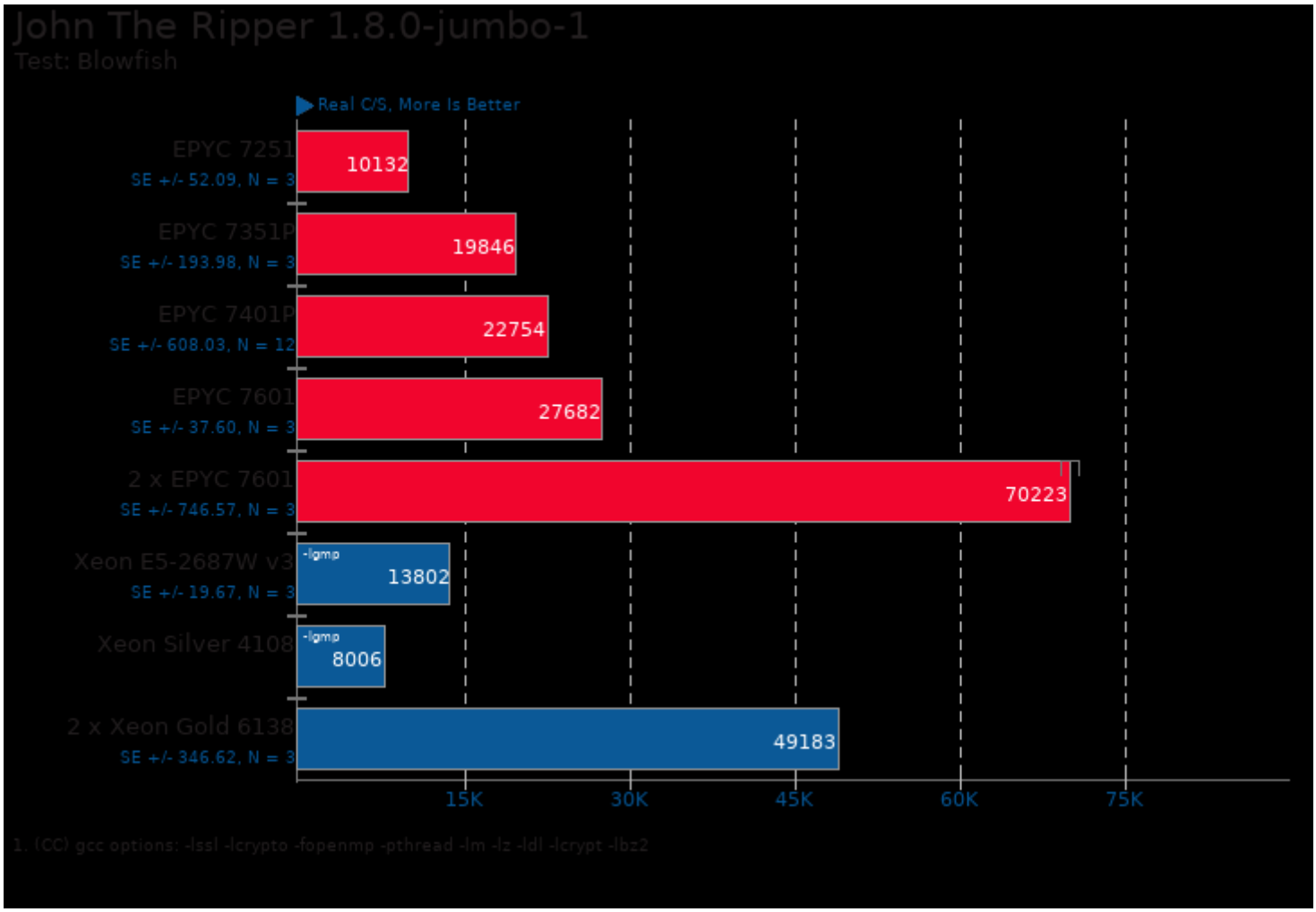
	EPYC 7251	EPYC 7351P	EPYC 7401P	EPYC 7551	EPYC 7601	2 x EPYC 7601	Xeon E5-2687 W v3	Xeon Silver 4108	2 x Xeon Gold 6138	2xamd7501
NAMD - ATPase Simulation - 327,506 Atoms	3.07634	1.50532	1.20652	0.93584	0.91431	**0.44749**	1.93496	**3.81056**	0.64964	0.73511
Normalized	14.55%	29.73%	37.09%	47.82%	48.94%	100%	23.13%	11.74%	68.88%	60.87%
Standard Deviation	0.3%	0.1%	0.8%	0.5%	1.2%	0.3%	0.4%	0.2%	0.7%	6.6%
John The Ripper - Blowfish (Real C/S)	10132	19846	22754		27682	**70223**	13802	**8006**	49183	
Normalized	14.43%	28.26%	32.4%		39.42%	100%	19.65%	11.4%	70.04%	
Standard Deviation	0.9%	1.7%	9.3%		0.2%	1.8%	0.2%		1.2%	
John The Ripper - Traditional DES (Real C/S)	4268733 3	8351833 3	1066886 67		1382016 67	**2584390 00**	5226566 7	**2778233 3**	1492466 67	
Normalized	16.52%	32.32%	41.28%		53.48%	100%	20.22%	10.75%	57.75%	
Standard Deviation	0.2%	0.4%	0.2%		0.9%	1.2%	0.2%	0.1%	2.7%	
7-Zip Compression - C.S.T (MIPS)	32590	63667	81664	91318	98518	**156310**	44675	**28680**	146340	140007
Normalized	20.85%	40.73%	52.24%	58.42%	63.03%	100%	28.58%	18.35%	93.62%	89.57%
Standard Deviation	0.8%	2.1%	0.5%	3.5%	1.7%	4.7%	0.7%	1.9%	1.7%	6%
Stockfish - Total Time (Nodes/s)	1632267 6	3300275 4	4316002 8	5470653 1	5726159 2	1024773 45	2222652 2	**1279305 4**	6882163 7	**1036188 96**
Normalized	15.75%	31.85%	41.65%	52.8%	55.26%	98.9%	21.45%	12.35%	66.42%	100%
Standard Deviation	1.7%	1.4%	1.2%	1.1%	2.5%	0.8%	1.4%	0.4%	1.5%	0.9%
asmFish - 1.H.M.2.D (Nodes/s)	1746497 8	3755423 4	4840025 9	6304554 2	6393920 7	1205669 96	2625017 3	**1519149 4**	8143393 3	**1222485 95**
Normalized	14.29%	30.72%	39.59%	51.57%	52.3%	98.62%	21.47%	12.43%	66.61%	100%
Standard Deviation	0.7%	1.3%	0.6%	1.8%	0.8%	0.9%	1.7%	0.7%	1.9%	0.8%
ebizzy (Records/s)	459503	921003	1060201	1072471	1182594	1717436	265125	**210556**	996830	**1769770**
Normalized	25.96%	52.04%	59.91%	60.6%	66.82%	97.04%	14.98%	11.9%	56.33%	100%

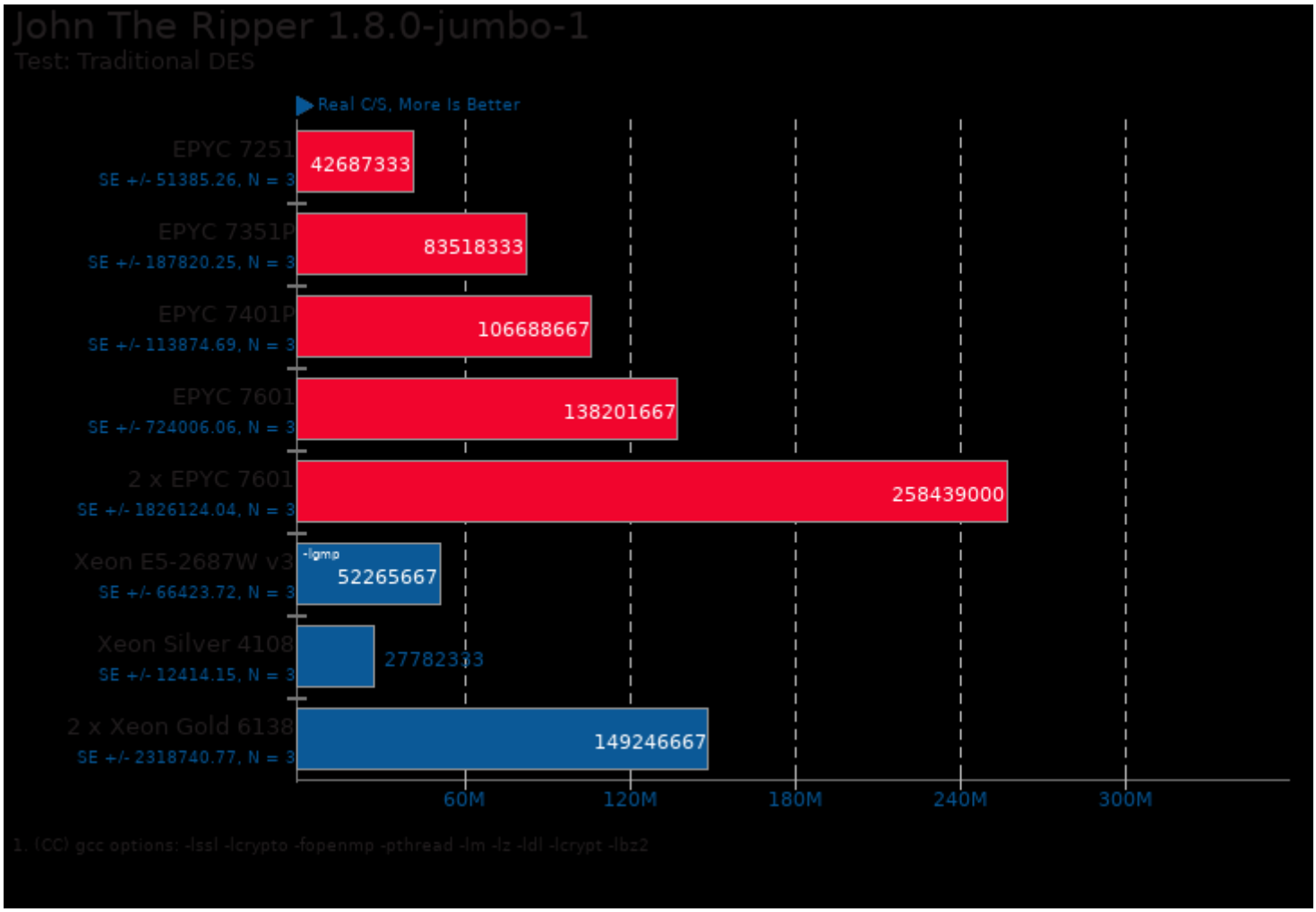
Standard Deviation	1.5%	1.8%	3.2%	1.4%	1.7%	3.6%	1.3%	5.9%	10%	3.1%
Timed Linux Kernel Compilation - Time To Compile (sec)	115.16	61.84	52.95	46.54	42.57	27.27	91.39	133.28	35.33	28.71
Normalized	23.68%	44.1%	51.5%	58.59%	64.06%	100%	29.84%	20.46%	77.19%	94.98%
Standard Deviation	2.2%	3.4%	2.3%	5.6%	3.4%	7.6%	2.6%	2.2%	8.1%	4.6%
Timed LLVM Compilation - Time To Compile (sec)	652	318	284	250	240	151	514	739	176	160
Normalized	23.16%	47.48%	53.17%	60.4%	62.92%	100%	29.38%	20.43%	85.8%	94.38%
POV-Ray - Trace Time (sec)	71.54	36.91	29.33	23.35	22.84	12.75	57.48	109.54	18.99	
Normalized	17.82%	34.54%	43.47%	54.6%	55.82%	100%	22.18%	11.64%	67.14%	
Standard Deviation	0.2%	0.3%	1.4%	0.6%	0.6%	0.9%	0.1%	0.2%	0.5%	
Primesieve - 1.P.N.G (sec)	42.44	20.65	16.86	13.03	12.65	6.35	36.29	48.07	8.81	
Normalized	14.96%	30.75%	37.66%	48.73%	50.2%	100%	17.5%	13.21%	72.08%	
Standard Deviation	0.5%	0.6%	0.9%	0.1%	0.2%	0.8%	0.2%	0.5%	0.7%	
m-queens - Time To Solve (sec)	106.66	54.45	42.04	33.91	32.16	19.00	88.51	176.03	29.38	19.74
Normalized	17.81%	34.89%	45.2%	56.03%	59.08%	100%	21.47%	10.79%	64.67%	96.25%
Standard Deviation	0.5%	0.3%	0.3%	0.5%	0.4%	1%	0.2%	0.1%	0.4%	0.6%
Tachyon - Total Time (sec)	7.81	3.97	3.03	2.57	2.38	1.46	6.05	9.80	2.09	
Normalized	18.69%	36.78%	48.18%	56.81%	61.34%	100%	24.13%	14.9%	69.86%	
Standard Deviation	2.6%	2%	2.5%	0.8%	2.4%	6.4%	0.3%	0.1%	2.3%	
OpenSSL - R.4.b.P (Signs/sec)	1242	2485	3358	4328	4515	9233	1458	1281	7838	8895
Normalized	13.45%	26.91%	36.37%	46.88%	48.9%	100%	15.79%	13.87%	84.89%	96.34%
Standard Deviation	0.1%	0.1%	0.9%	0.9%	0.2%	0.3%	0%	0.2%	1.2%	0.2%
Sysbench - CPU (Events/sec)	12102	24174	34891	42199	44813	89107	16625	9642	60825	
Normalized	13.58%	27.13%	39.16%	47.36%	50.29%	100%	18.66%	10.82%	68.26%	
Standard Deviation	0%	0.1%	0%	0.2%	0.1%	0.5%	0.1%	0%	0.4%	
Blender - BMW27 - CPU-Only (sec)	335.53	164.30	130.82	104.87	101.70	57.80	245.61	407.11	77.91	60.21
Normalized	17.23%	35.18%	44.18%	55.12%	56.83%	100%	23.53%	14.2%	74.19%	96%
Blender - Barbershop - CPU-Only (sec)	1797	851	666	531	504	312	1183	1894	376	304
Normalized	16.92%	35.72%	45.65%	57.25%	60.32%	97.44%	25.7%	16.05%	80.85%	100%
RAR Compression - L.S.T.A.T.R (sec)	186	149	150	157	143	109	97.53	147	116	162.55
Normalized	52.44%	65.46%	65.02%	62.12%	68.2%	89.48%	100%	66.35%	84.08%	60%
Standard Deviation	2.5%	2.5%	2.4%	3.3%	2.3%	2.3%	2.1%	0.2%	1.6%	3.3%
Chaos Group V-RAY - CPU (sec)	116.03	59.25	48.13	40.37	39.32	25.40	93.93	137.93	31.28	
Normalized	21.89%	42.87%	52.77%	62.92%	64.6%	100%	27.04%	18.42%	81.2%	
Standard Deviation	0.1%	0.2%	1.6%	3.4%	1.6%	2.2%	0.5%	0.5%	0.7%	

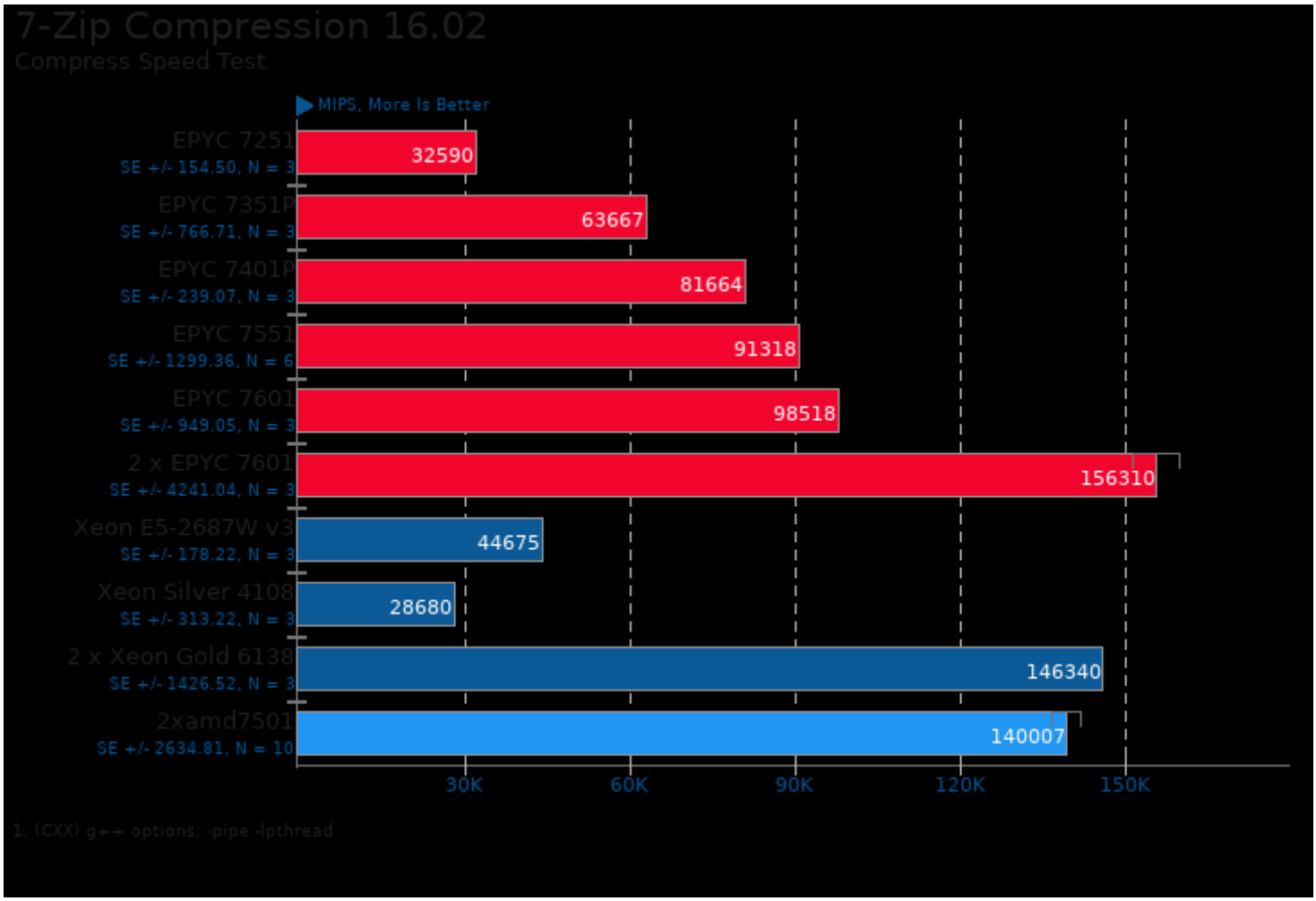
Open Porous Media Git - Flow MPI Extra - 8 (sec)	**460**	371	360	353	**334**	374
Normalized	72.61%	90.03%	92.78%	94.62%	100%	89.3%
Standard Deviation	0.5%	2.3%	0.4%	0.4%	0.5%	0.6%
Open Porous Media Git - Flow MPI Extra - 8 - Solver Time (sec)	**453**	364	354	347	**328**	367
Normalized	72.41%	90.11%	92.66%	94.52%	100%	89.37%
Standard Deviation	0.5%	2.3%	0.5%	0.4%	0.6%	0.6%
Open Porous Media Git - Flow MPI Norne - 8 (sec)	**158**	119	115	**114**	**114**	123
Normalized	72.15%	95.8%	99.13%	100%	100%	92.68%
Standard Deviation	2.3%	3.4%	0.5%	0.1%	2.6%	0.3%
Open Porous Media Git - Flow MPI Norne - 8 - Solver Time (sec)	**155**	118	113	**112**	**112**	121
Normalized	72.26%	94.92%	99.12%	100%	100%	92.56%
Standard Deviation	2.3%	3.5%	0.5%	0.1%	2.6%	0.3%
Open Porous Media Git - Flow MPI Extra - 16 (sec)		**421**	413	415	**294**	360
Normalized		69.83%	71.19%	70.84%	100%	81.67%
Standard Deviation		1%	0.6%	1.4%	0.4%	0.3%
Open Porous Media Git - Flow MPI Extra - 16 - Solver Time (sec)		**415**	407	409	**288**	353
Normalized		69.4%	70.76%	70.42%	100%	81.59%
Standard Deviation		1%	0.6%	1.4%	0.4%	0.3%
Open Porous Media Git - Flow MPI Extra - 32 (sec)				**360**	**219**	258
Normalized				60.83%	100%	84.88%
Standard Deviation				0.7%	0.7%	1.5%
Open Porous Media Git - Flow MPI Extra - 32 - Solver Time (sec)				**353**	**213**	251
Normalized				60.34%	100%	84.86%
Standard Deviation				0.7%	0.7%	1.5%
Open Porous Media Git - Flow MPI Norne - 16 (sec)		**89.66**	84.23	85.46	**61.93**	73.18
Normalized		69.07%	73.52%	72.47%	100%	84.63%
Standard Deviation		1.8%	2.3%	1%	3.9%	0.9%

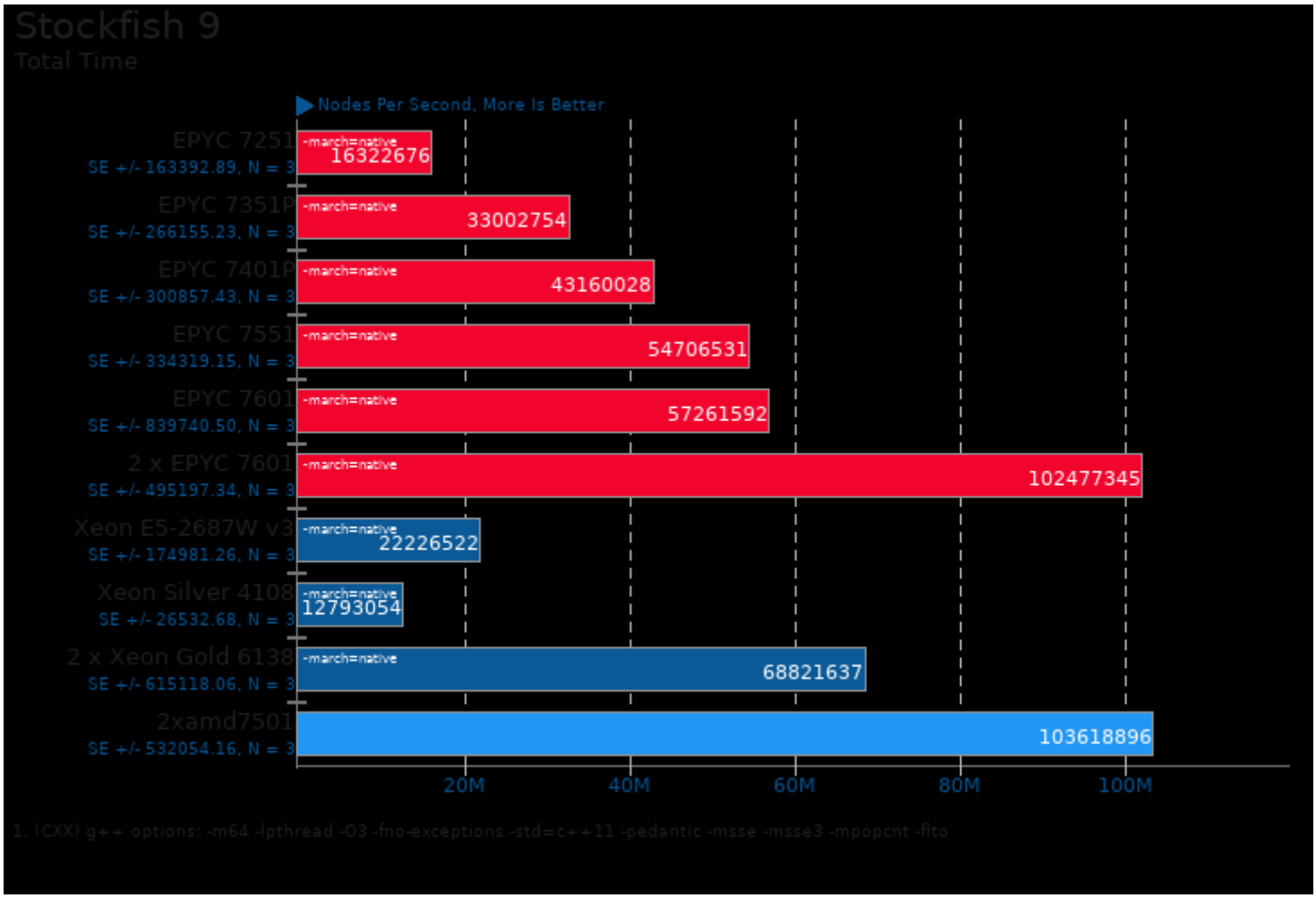
Open Porous Media Git - Flow MPI Norne - 16 - Solver Time (sec)		87.79	82.42		83.62	60.38			71.22	
Normalized		68.78%	73.26%		72.21%	100%			84.78%	
Standard Deviation		1.8%	2.4%		1%	4%			0.9%	
Open Porous Media Git - Flow MPI Norne - 32 (sec)					107.75	72.20			89.21	
Normalized					67.01%	100%			80.93%	
Standard Deviation					1.7%	1.3%			3.2%	
Open Porous Media Git - Flow MPI Norne - 32 - Solver Time (sec)					105.54	70.34			86.86	
Normalized					66.65%	100%			80.98%	
Standard Deviation					1.7%	1.3%			3.3%	
m-queens - Time To Solve (sec)	100.15	49.70	36.96	28.42	27.37	13.67	84.58	177.57	28.11	14.07
Normalized	13.65%	27.51%	36.99%	48.1%	49.95%	100%	16.16%	7.7%	48.63%	97.16%
Standard Deviation	1.7%	0%	1.1%	0.3%	0.3%	0.1%	0%	0%	0.3%	0.7%
John The Ripper - Blowfish (Real C/S/Watt)						202.81			155.38	
Normalized						100%			76.61%	
John The Ripper - Traditional DES (Real C/S/Watt)						637840			421920	
Normalized						100%			66.15%	
7-Zip Compression - C.S.T (MIPS/Watt)						406.85			453.40	
Normalized						89.73%			100%	
Stockfish - Total Time						202014			181794	
Normalized						100%			89.99%	
asmFish - 1.H.M.2.D (Nodes/s/Watt)						232035			219925	
Normalized						100%			94.78%	
ebizzy (Records/s/Watt)						3896			3129	
Normalized						100%			80.31%	
OpenSSL - R.4.b.P (Signs/sec/Watt)						25.14			22.27	
Normalized						100%			88.58%	
Sysbench - CPU (Events/sec/Watt)						300.83			176.90	
Normalized						100%			58.8%	

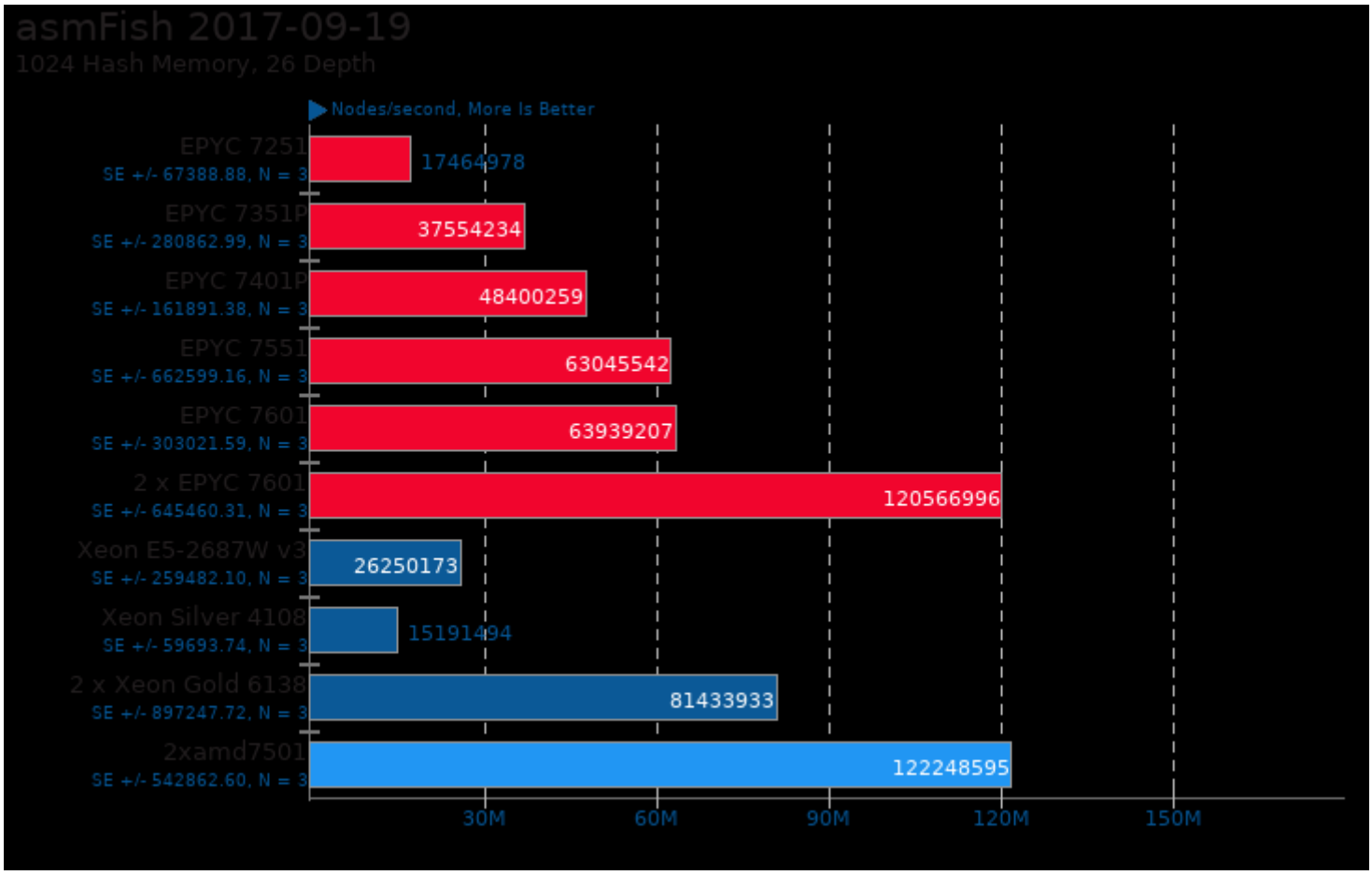

NAMD 2.13b1
ATPase Simulation - 327,506 Atoms
days/ns, Fewer Is Better
EPYC 7251
SE +/- 0.00563, N = 3
3.07634
EPYC 7351P
SE +/- 0.00096, N = 3
1.50532
EPYC 7401P
SE +/- 0.00523, N = 3
1.20652
EPYC 7551
SE +/- 0.00263, N = 3
0.93584
EPYC 7601
SE +/- 0.00656, N = 3
0.91431
2 x EPYC 7601
SE +/- 0.00087, N = 3
0.44749
Xeon E5-2687W v3
SE +/- 0.00399, N = 3
1.93496
Xeon Silver 4108
SE +/- 0.00480, N = 3
3.81056
2 x Xeon Gold 6138
SE +/- 0.00262, N = 3
0.64964
2xamd7501
SE +/- 0.01390, N = 12
0.73511
0.8574
1.7148
2.5722
3.4296
4.287

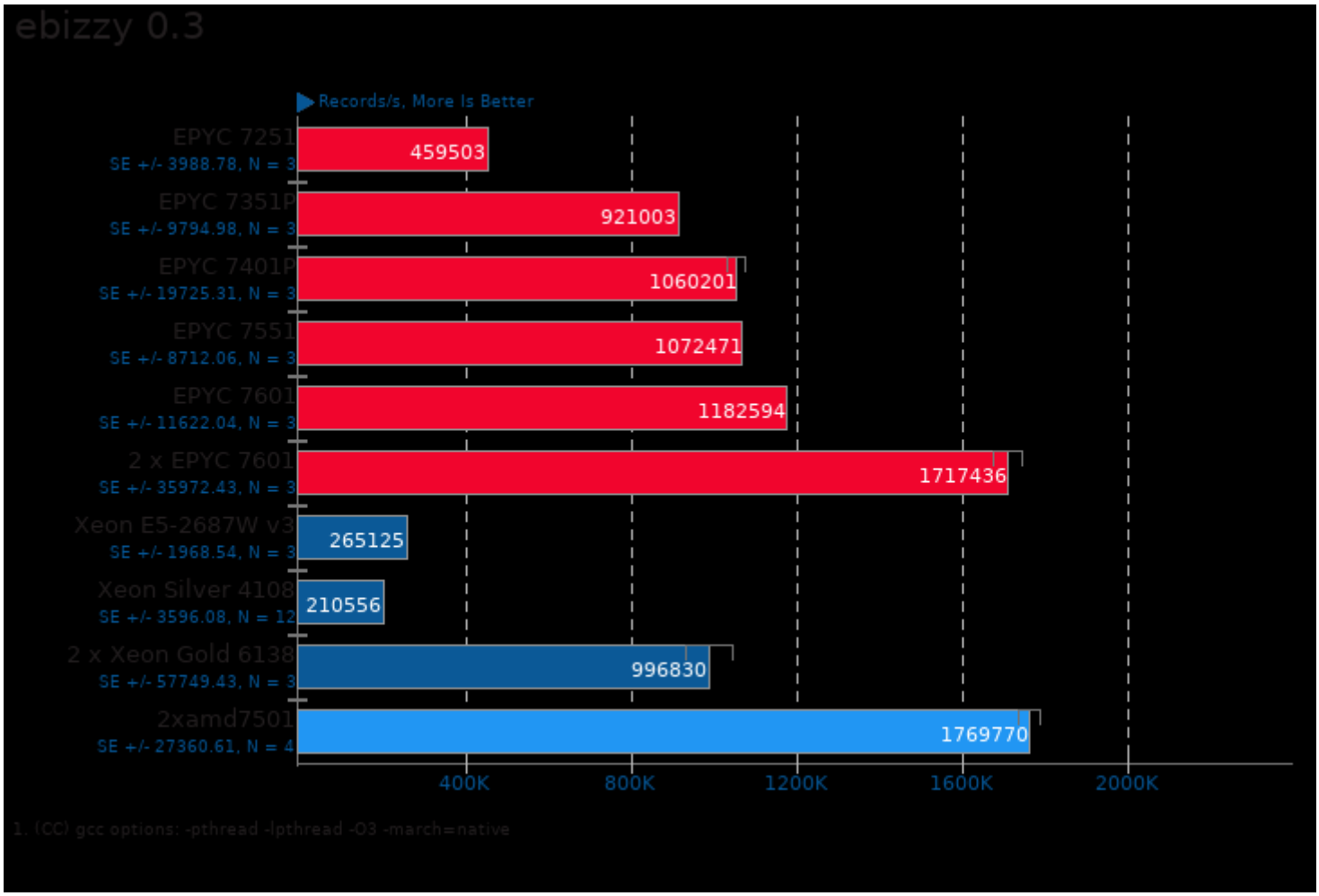

John The Ripper 1.8.0-jumbo-1
Test: Blowfish
Real C/S, More Is Better
EPYC 7251
SE +/- 52.09, N = 3
10132
EPYC 7351P
SE +/- 193.98, N = 3
19846
EPYC 7401P
SE +/- 608.03, N = 12
22754
EPYC 7601
SE +/- 37.60, N = 3
27682
2 x EPYC 7601
SE +/- 746.57, N = 3
70223
Xeon E5-2687W v3
SE +/- 19.67, N = 3
-lgmp
13802
Xeon Silver 4108
-lgmp
8006
2 x Xeon Gold 6138
SE +/- 346.62, N = 3
49183
15K
30K
45K
60K
75K
1. (CC) gcc options: -lssl -lcrypto -fopenmp -pthread -lm -lz -ldl -lcrypt -lbz2

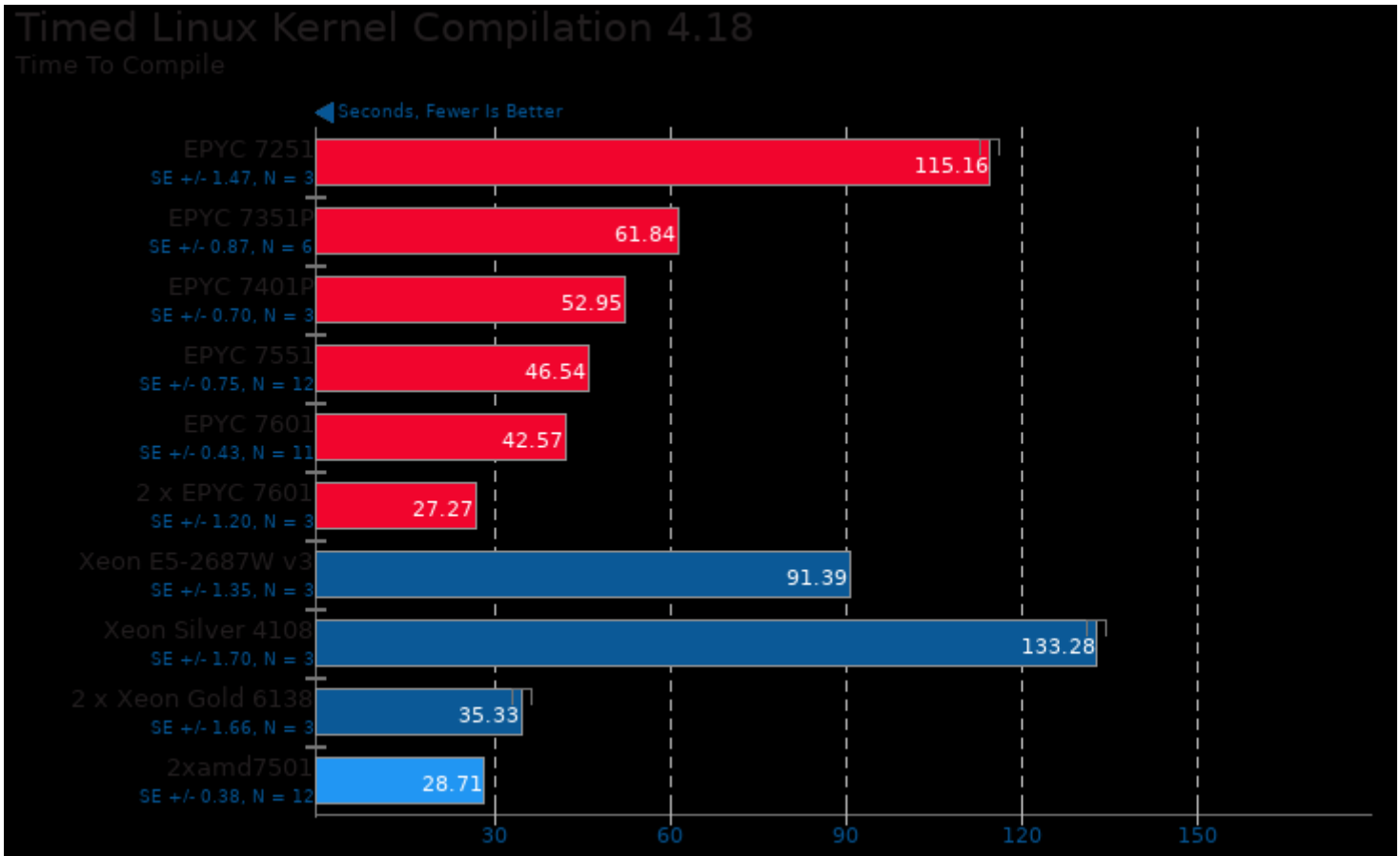

John The Ripper 1.8.0-jumbo-1
Test: Traditional DES
Real C/S, More Is Better
EPYC 7251
SE +/- 51385.26, N = 3
42687333
EPYC 7351P
SE +/- 187820.25, N = 3
83518333
EPYC 7401P
SE +/- 113874.69, N = 3
106688667
EPYC 7601
SE +/- 724006.06, N = 3
138201667
2 x EPYC 7601
SE +/- 1826124.04, N = 3
258439000
Xeon E5-2687W v3
SE +/- 66423.72, N = 3
-lgmp
52265667
Xeon Silver 4108
SE +/- 12414.15, N = 3
27782333
2 x Xeon Gold 6138
SE +/- 2318740.77, N = 3
149246667
60M
120M
180M
240M
300M
1. (CC) gcc options: -lssl -lcrypto -fopenmp -pthread -lm -lz -ldl -lcrypt -lbz2

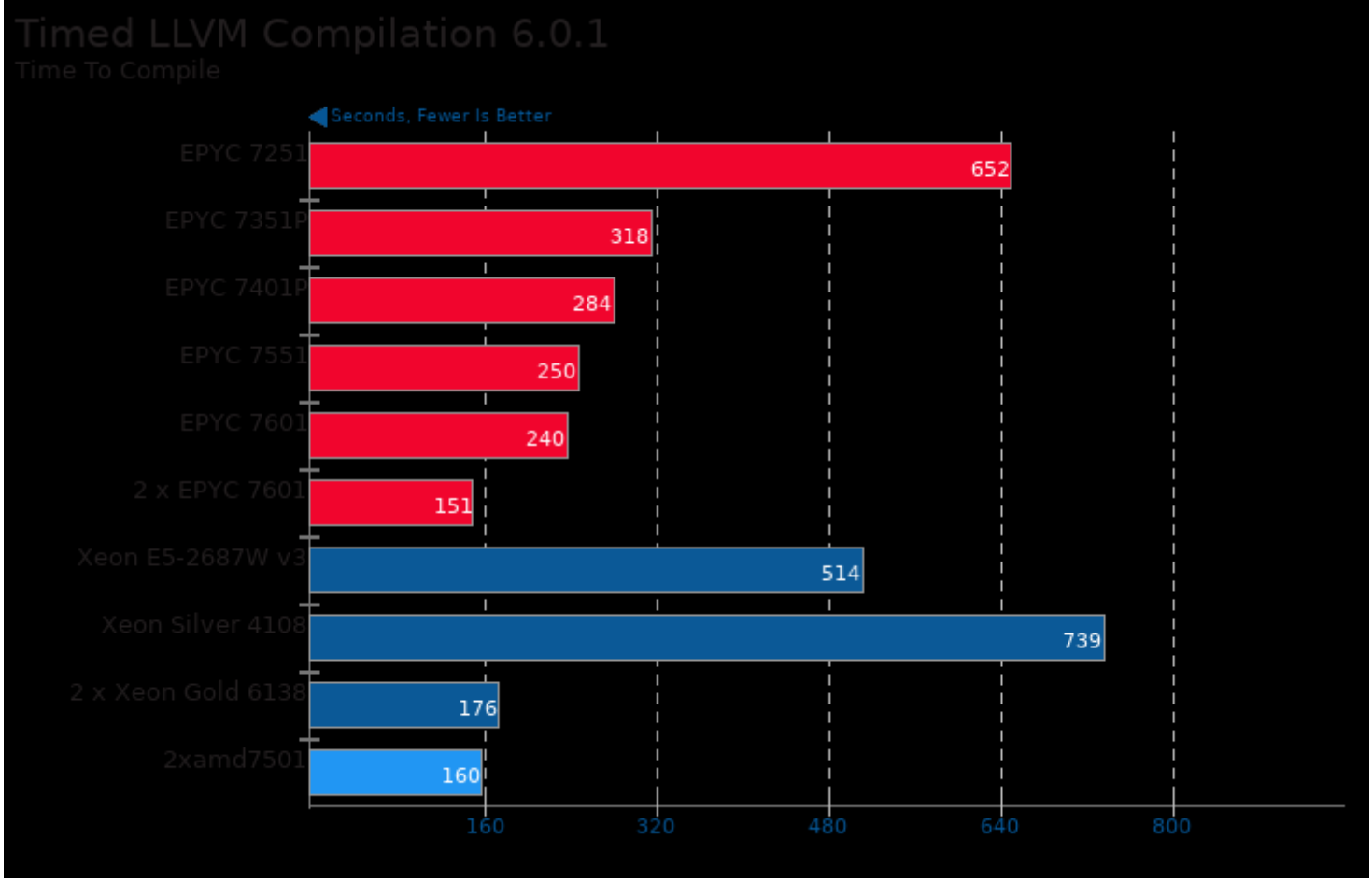

7-Zip Compression 16.02
Compress Speed Test
MIPS, More Is Better
EPYC 7251
SE +/- 154.50, N = 3
32590
EPYC 7351P
SE +/- 766.71, N = 3
63667
EPYC 7401P
SE +/- 239.07, N = 3
81664
EPYC 7551
SE +/- 1299.36, N = 6
91318
EPYC 7601
SE +/- 949.05, N = 3
98518
2 x EPYC 7601
SE +/- 4241.04, N = 3
156310
Xeon E5-2687W v3
SE +/- 178.22, N = 3
44675
Xeon Silver 4108
SE +/- 313.22, N = 3
28680
2 x Xeon Gold 6138
SE +/- 1426.52, N = 3
146340
2xamd7501
SE +/- 2634.81, N = 10
140007
30K
60K
90K
120K
150K
1. (CXX) g++ options: -pipe -lpthread

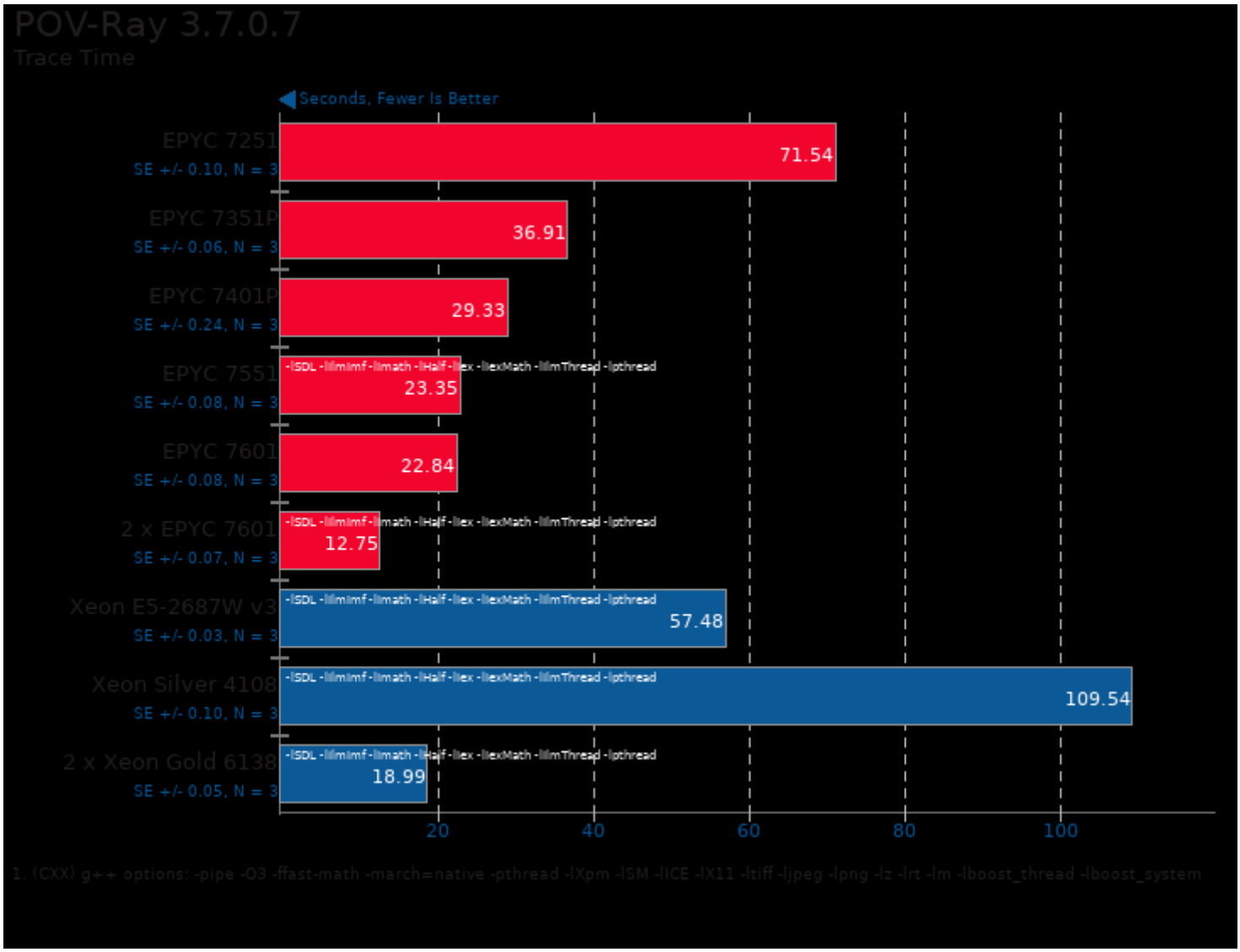

Stockfish 9
Total Time
Nodes Per Second, More Is Better
EPYC 7251
SE +/- 163392.89, N = 3
-march=native
16322676
EPYC 7351P
SE +/- 266155.23, N = 3
-march=native
33002754
EPYC 7401P
SE +/- 300857.43, N = 3
-march=native
43160028
EPYC 7551
SE +/- 334319.15, N = 3
-march=native
54706531
EPYC 7601
SE +/- 839740.50, N = 3
-march=native
57261592
2 x EPYC 7601
SE +/- 495197.34, N = 3
-march=native
102477345
Xeon E5-2687W v3
SE +/- 174981.26, N = 3
-march=native
22226522
Xeon Silver 4108
SE +/- 26532.68, N = 3
-march=native
12793054
2 x Xeon Gold 6138
SE +/- 615118.06, N = 3
-march=native
68821637
2xamd7501
SE +/- 532054.16, N = 3
103618896
20M
40M
60M
80M
100M
1. (CXX) g++ options: -m64 -lpthread -O3 -fno-exceptions -std=c++11 -pedantic -msse -msse3 -mpopcnt -flto

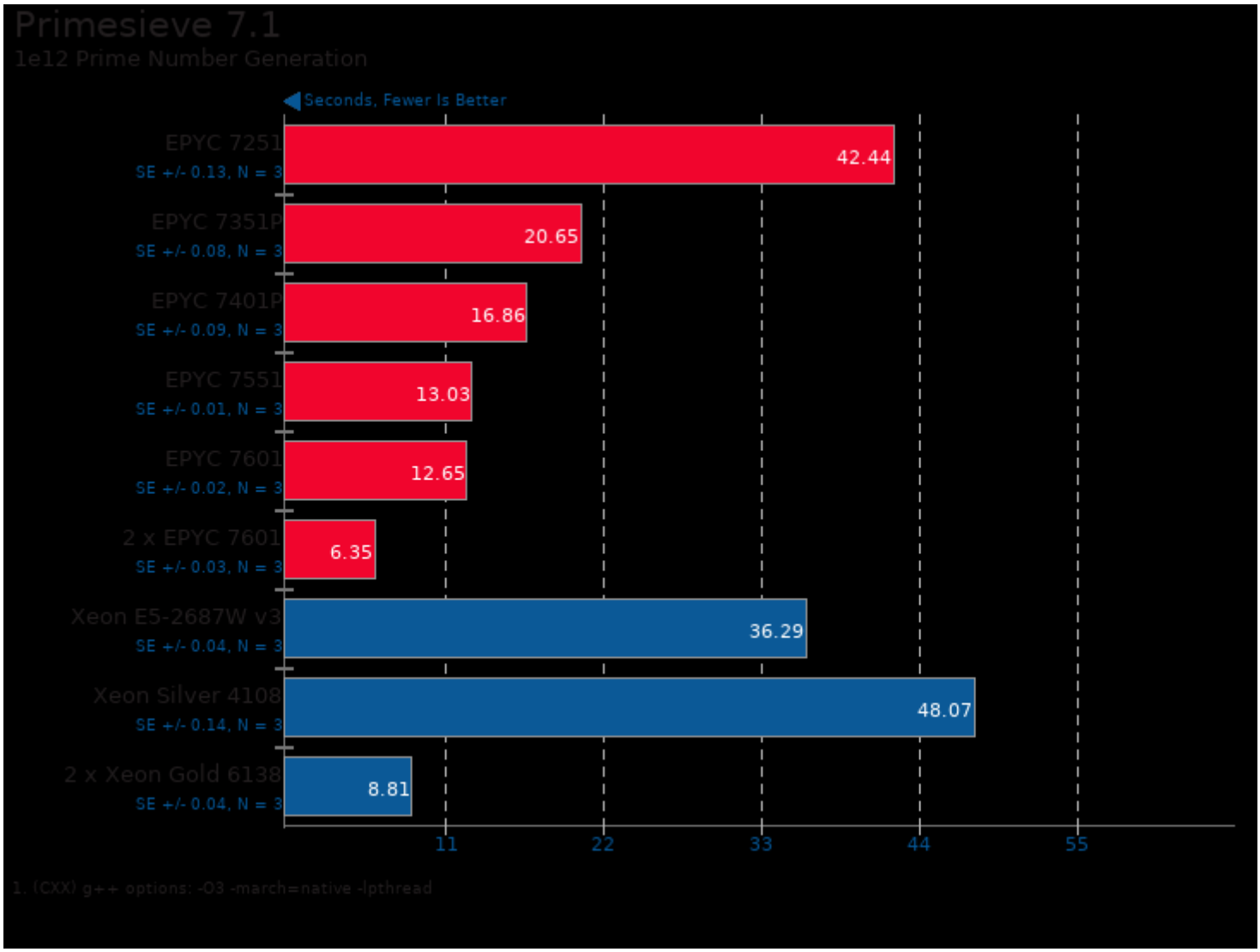

asmFish 2017-09-19
1024 Hash Memory, 26 Depth
Nodes/second, More Is Better
EPYC 7251
SE +/- 67388.88, N = 3
17464978
EPYC 7351P
SE +/- 280862.99, N = 3
37554234
EPYC 7401P
SE +/- 161891.38, N = 3
48400259
EPYC 7551
SE +/- 662599.16, N = 3
63045542
EPYC 7601
SE +/- 303021.59, N = 3
63939207
2 x EPYC 7601
SE +/- 645460.31, N = 3
120566996
Xeon E5-2687W v3
SE +/- 259482.10, N = 3
26250173
Xeon Silver 4108
SE +/- 59693.74, N = 3
15191494
2 x Xeon Gold 6138
SE +/- 897247.72, N = 3
81433933
2xamd7501
SE +/- 542862.60, N = 3
122248595
30M
60M
90M
120M
150M

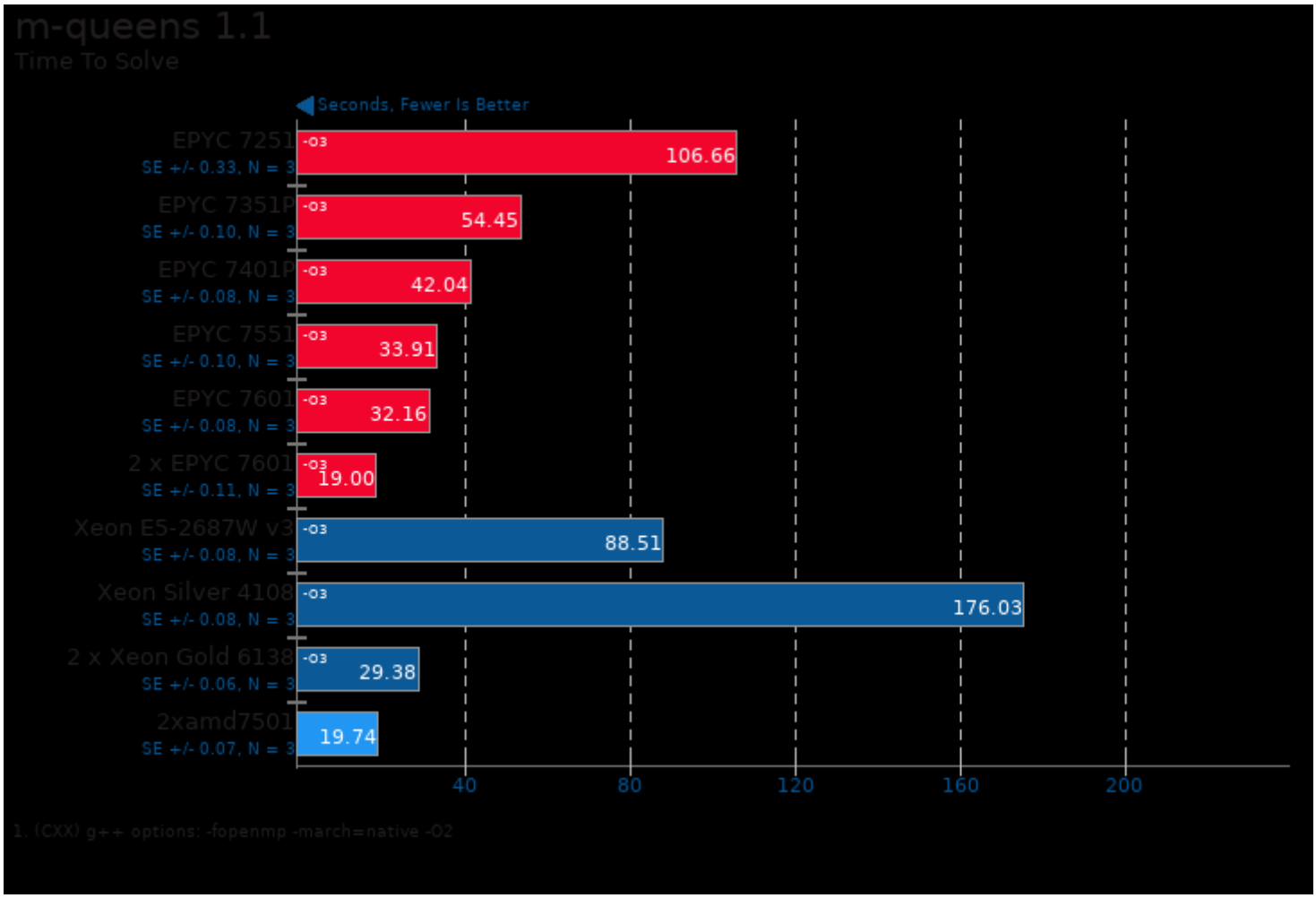

ebizzy 0.3
Records/s, More Is Better
EPYC 7251
SE +/- 3988.78, N = 3
459503
EPYC 7351P
SE +/- 9794.98, N = 3
921003
EPYC 7401P
SE +/- 19725.31, N = 3
1060201
EPYC 7551
SE +/- 8712.06, N = 3
1072471
EPYC 7601
SE +/- 11622.04, N = 3
1182594
2 x EPYC 7601
SE +/- 35972.43, N = 3
1717436
Xeon E5-2687W v3
SE +/- 1968.54, N = 3
265125
Xeon Silver 4108
SE +/- 3596.08, N = 12
210556
2 x Xeon Gold 6138
SE +/- 57749.43, N = 3
996830
2xamd7501
SE +/- 27360.61, N = 4
1769770
400K
800K
1200K
1600K
2000K
1. (CC) gcc options: -pthread -lpthread -O3 -march=native

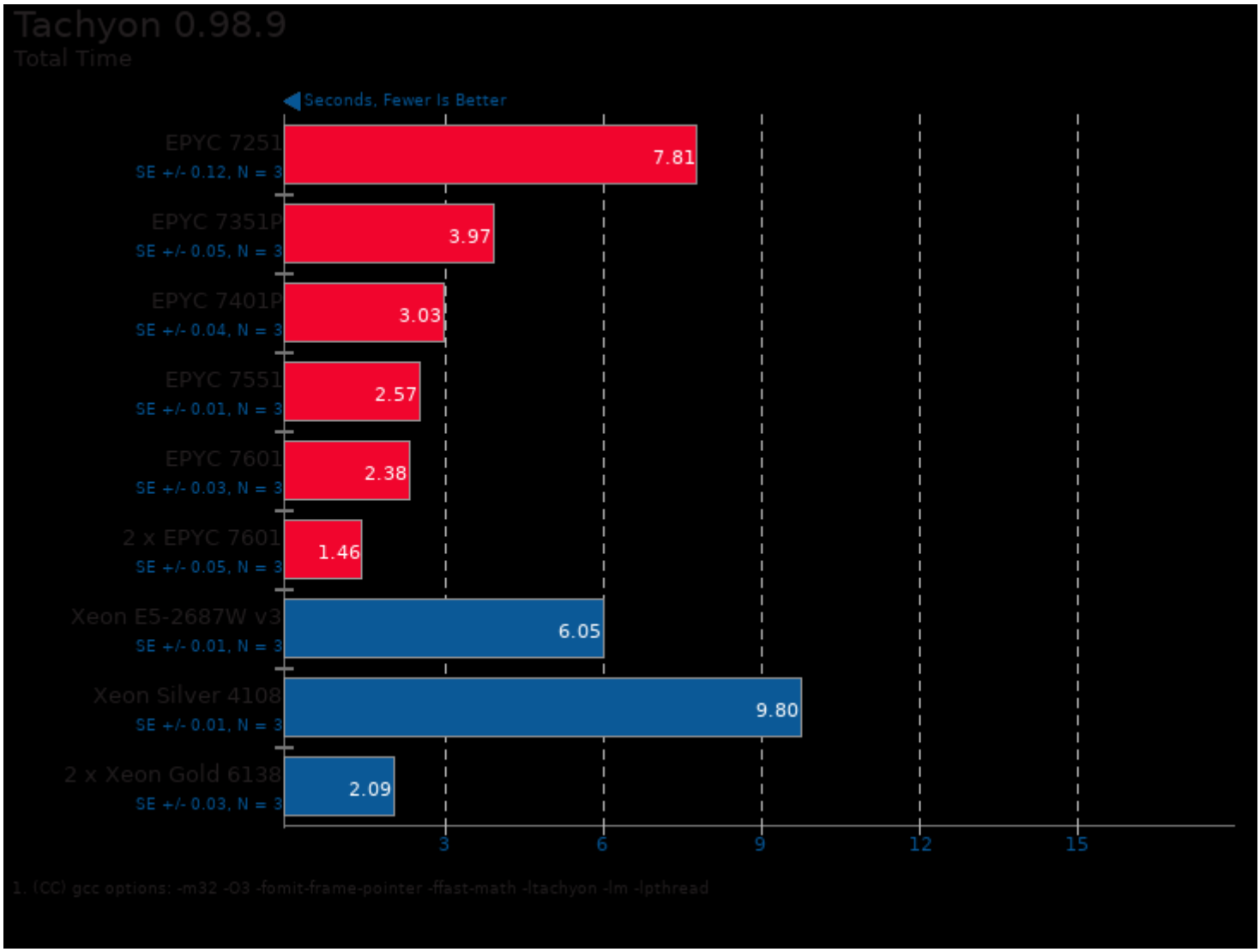

Timed Linux Kernel Compilation 4.18
Time To Compile
Seconds, Fewer Is Better
EPYC 7251
SE +/- 1.47, N = 3
115.16
EPYC 7351P
SE +/- 0.87, N = 6
61.84
EPYC 7401P
SE +/- 0.70, N = 3
52.95
EPYC 7551
SE +/- 0.75, N = 12
46.54
EPYC 7601
SE +/- 0.43, N = 11
42.57
2 x EPYC 7601
SE +/- 1.20, N = 3
27.27
Xeon E5-2687W v3
SE +/- 1.35, N = 3
91.39
Xeon Silver 4108
SE +/- 1.70, N = 3
133.28
2 x Xeon Gold 6138
SE +/- 1.66, N = 3
35.33
2xamd7501
SE +/- 0.38, N = 12
28.71
30
60
90
120
150

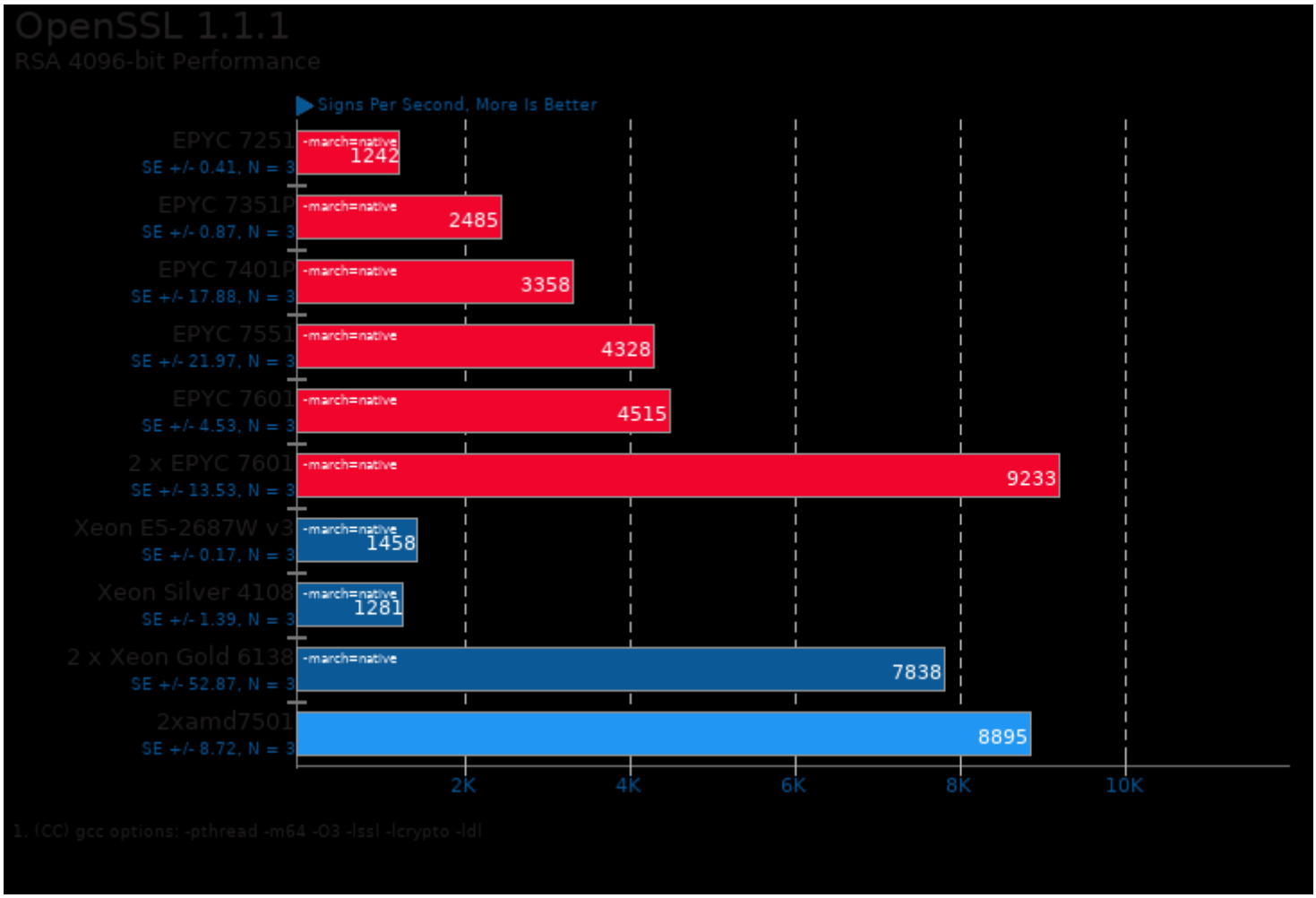

Timed LLVM Compilation 6.0.1
Time To Compile
Seconds, Fewer Is Better
EPYC 7251
652
EPYC 7351P
318
EPYC 7401P
284
EPYC 7551
250
EPYC 7601
240
2 x EPYC 7601
151
Xeon E5-2687W v3
514
Xeon Silver 4108
739
2 x Xeon Gold 6138
176
2xamd7501
160
160
320
480
640
800

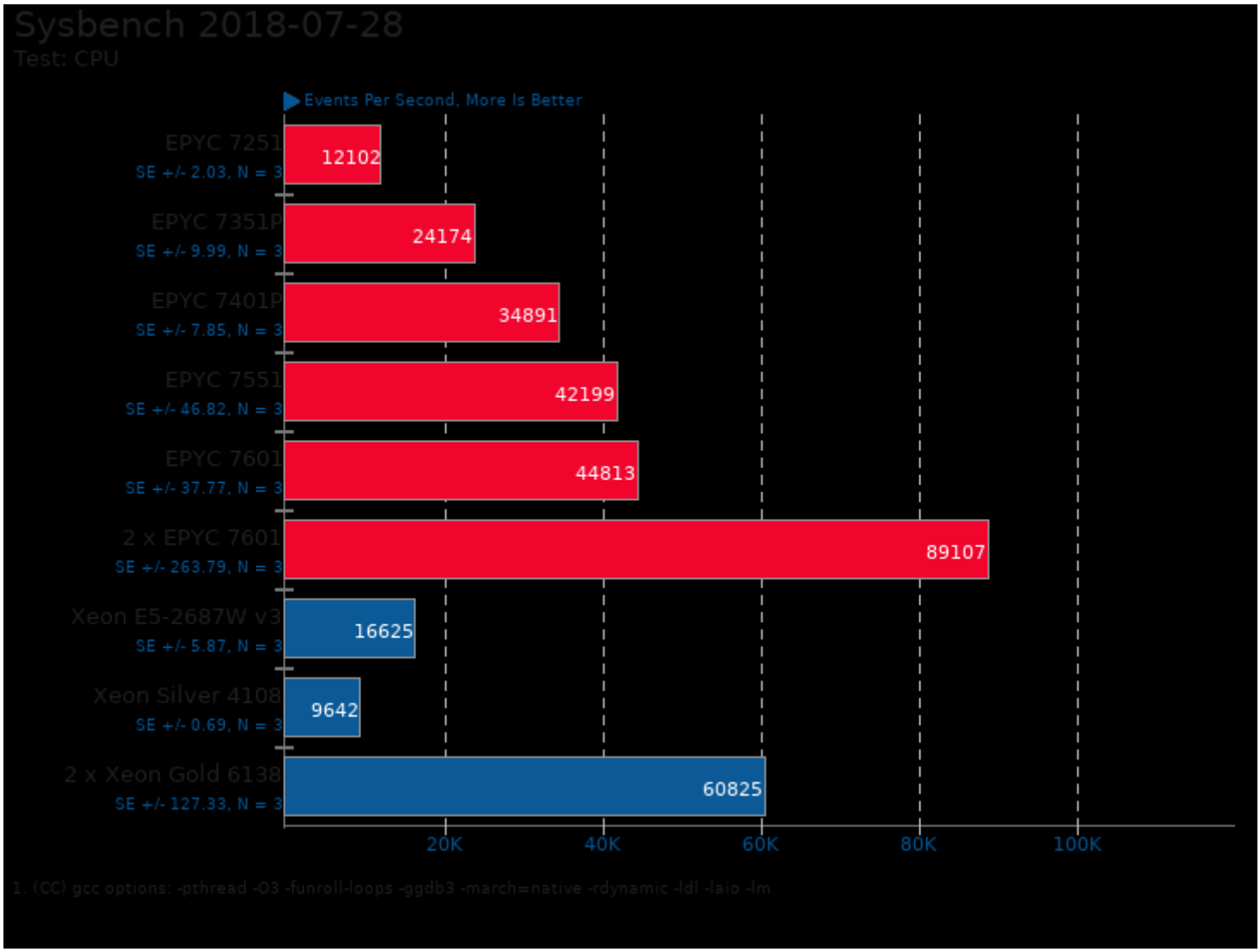

POV-Ray 3.7.0.7
Trace Time
Seconds, Fewer Is Better
EPYC 7251
SE +/- 0.10, N = 3
71.54
EPYC 7351P
SE +/- 0.06, N = 3
36.91
EPYC 7401P
SE +/- 0.24, N = 3
29.33
EPYC 7551
SE +/- 0.08, N = 3
-lSDL -lIlmImf -lImath -lHalf -lIex -lIexMath -lIlmThread -lpthread
23.35
EPYC 7601
SE +/- 0.08, N = 3
22.84
2 x EPYC 7601
SE +/- 0.07, N = 3
-lSDL -lIlmImf -lImath -lHalf -lIex -lIexMath -lIlmThread -lpthread
12.75
Xeon E5-2687W v3
SE +/- 0.03, N = 3
-lSDL -lIlmImf -lImath -lHalf -lIex -lIexMath -lIlmThread -lpthread
57.48
Xeon Silver 4108
SE +/- 0.10, N = 3
-lSDL -lIlmImf -lImath -lHalf -lIex -lIexMath -lIlmThread -lpthread
109.54
2 x Xeon Gold 6138
SE +/- 0.05, N = 3
-lSDL -lIlmImf -lImath -lHalf -lIex -lIexMath -lIlmThread -lpthread
18.99
20
40
60
80
100
1. (CXX) g++ options: -pipe -O3 -ffast-math -march=native -pthread -lXpm -lSM -lICE -lX11 -ltiff -ljpeg -lpng -lz -lrt -lm -lboost_thread -lboost_system

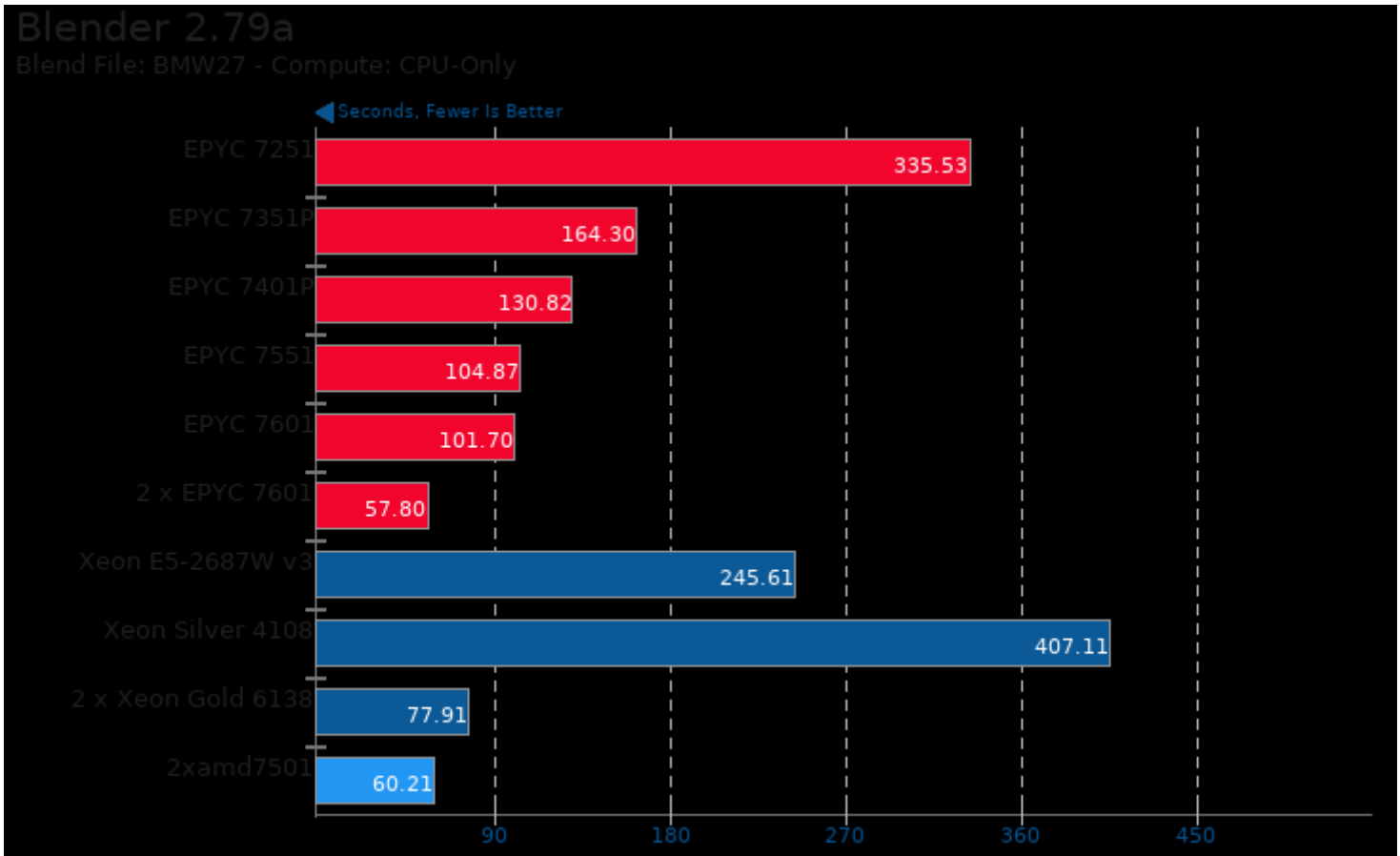

Primesieve 7.1
1e12 Prime Number Generation
Seconds, Fewer Is Better
EPYC 7251
SE +/- 0.13, N = 3
42.44
EPYC 7351P
SE +/- 0.08, N = 3
20.65
EPYC 7401P
SE +/- 0.09, N = 3
16.86
EPYC 7551
SE +/- 0.01, N = 3
13.03
EPYC 7601
SE +/- 0.02, N = 3
12.65
2 x EPYC 7601
SE +/- 0.03, N = 3
6.35
Xeon E5-2687W v3
SE +/- 0.04, N = 3
36.29
Xeon Silver 4108
SE +/- 0.14, N = 3
48.07
2 x Xeon Gold 6138
SE +/- 0.04, N = 3
8.81
11
22
33
44
55
1. (CXX) g++ options: -O3 -march=native -lpthread

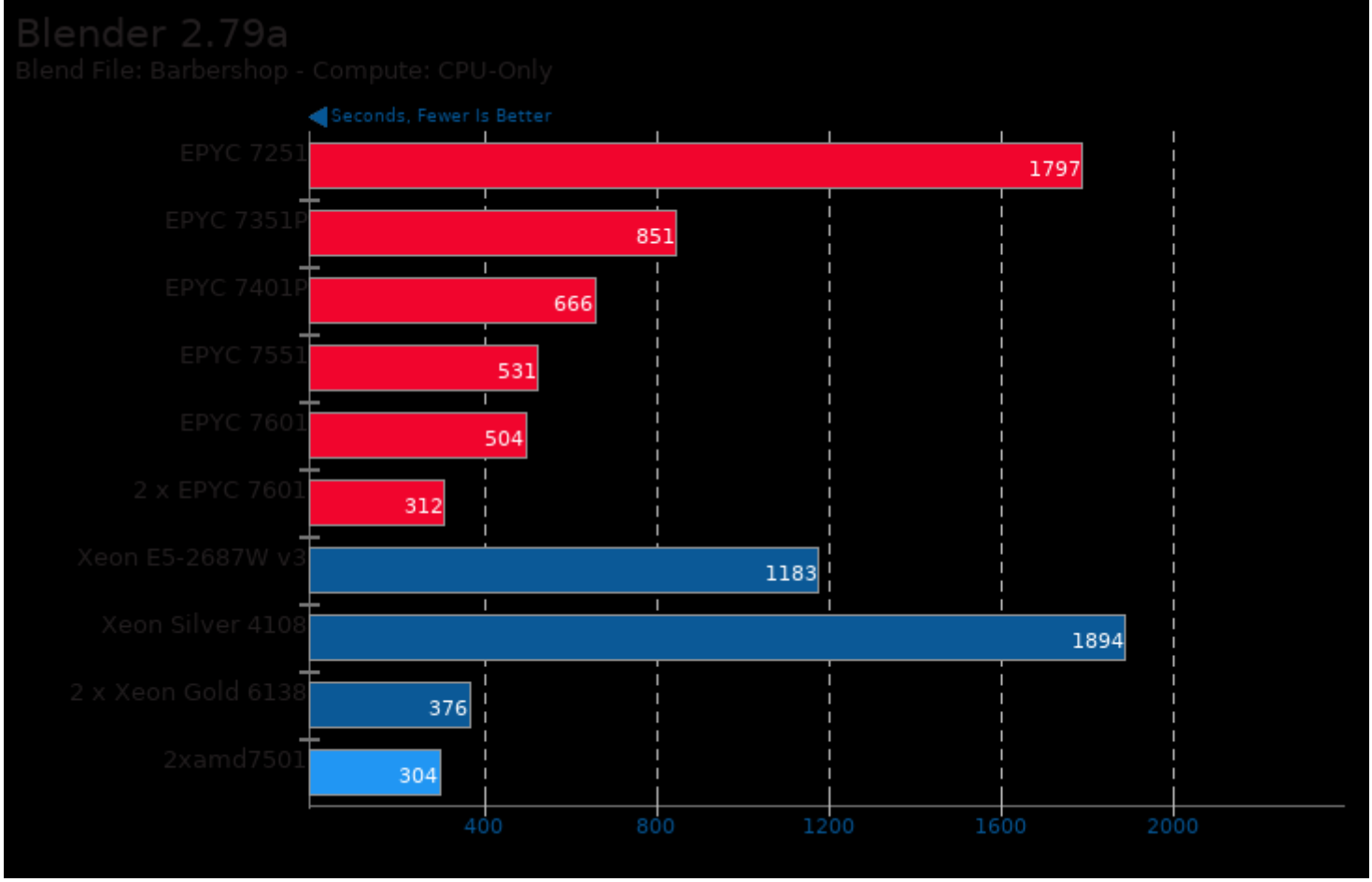

m-queens 1.1
Time To Solve
Seconds, Fewer Is Better
EPYC 7251
SE +/- 0.33, N = 3
-O3
106.66
EPYC 7351P
SE +/- 0.10, N = 3
-O3
54.45
EPYC 7401P
SE +/- 0.08, N = 3
-O3
42.04
EPYC 7551
SE +/- 0.10, N = 3
-O3
33.91
EPYC 7601
SE +/- 0.08, N = 3
-O3
32.16
2 x EPYC 7601
SE +/- 0.11, N = 3
-O3
19.00
Xeon E5-2687W v3
SE +/- 0.08, N = 3
-O3
88.51
Xeon Silver 4108
SE +/- 0.08, N = 3
-O3
176.03
2 x Xeon Gold 6138
SE +/- 0.06, N = 3
-O3
29.38
2xamd7501
SE +/- 0.07, N = 3
19.74
40
80
120
160
200
1. (CXX) g++ options: -fopenmp -march=native -O2

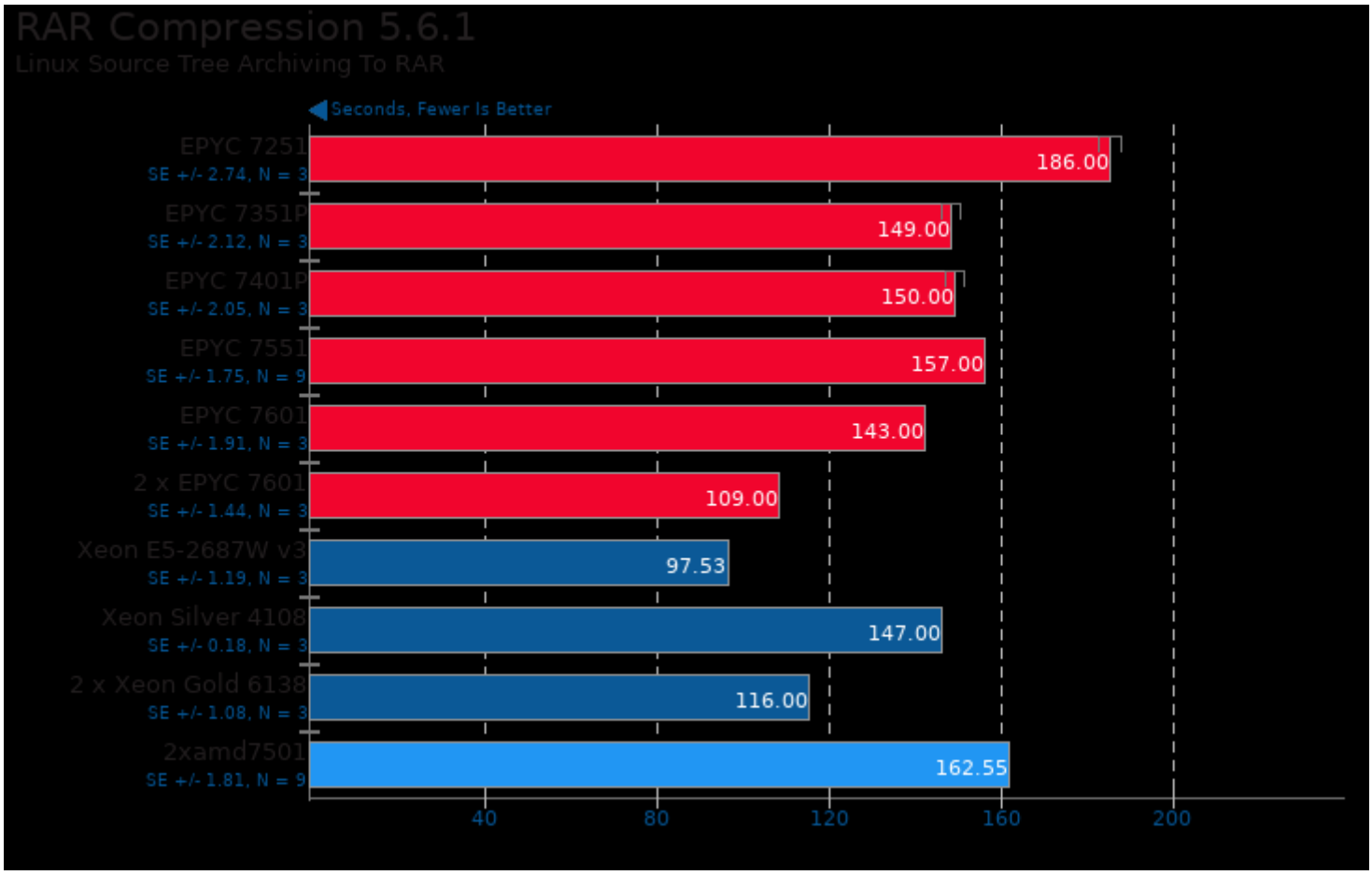

Tachyon 0.98.9
Total Time
Seconds, Fewer Is Better
EPYC 7251
SE +/- 0.12, N = 3
7.81
EPYC 7351P
SE +/- 0.05, N = 3
3.97
EPYC 7401P
SE +/- 0.04, N = 3
3.03
EPYC 7551
SE +/- 0.01, N = 3
2.57
EPYC 7601
SE +/- 0.03, N = 3
2.38
2 x EPYC 7601
SE +/- 0.05, N = 3
1.46
Xeon E5-2687W v3
SE +/- 0.01, N = 3
6.05
Xeon Silver 4108
SE +/- 0.01, N = 3
9.80
2 x Xeon Gold 6138
SE +/- 0.03, N = 3
2.09
3
6
9
12
15
1. (CC) gcc options: -m32 -O3 -fomit-frame-pointer -ffast-math -ltachyon -lm -lpthread

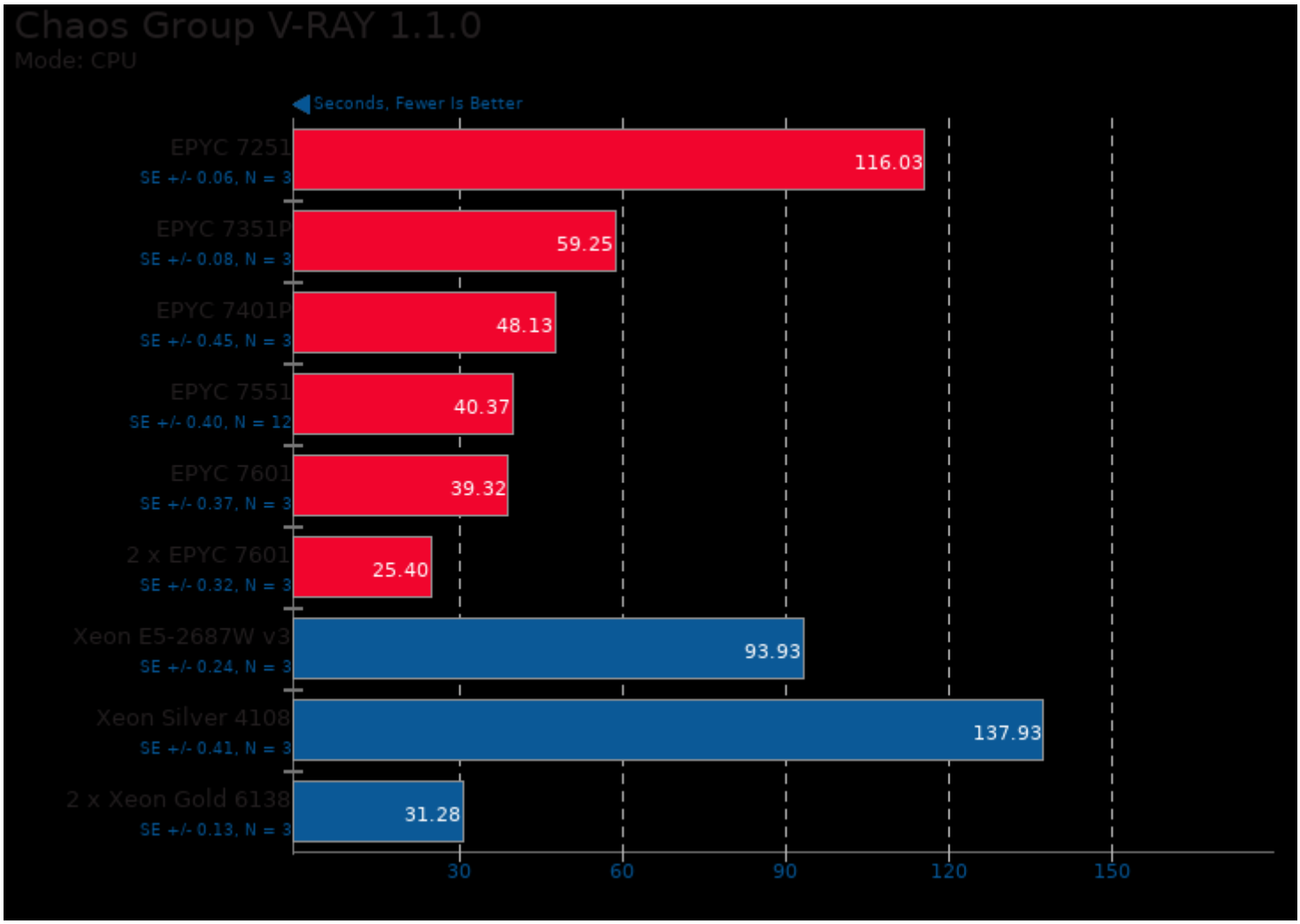

OpenSSL 1.1.1
RSA 4096-bit Performance
Signs Per Second, More Is Better
EPYC 7251
SE +/- 0.41, N = 3
-march=native
1242
EPYC 7351P
SE +/- 0.87, N = 3
-march=native
2485
EPYC 7401P
SE +/- 17.88, N = 3
-march=native
3358
EPYC 7551
SE +/- 21.97, N = 3
-march=native
4328
EPYC 7601
SE +/- 4.53, N = 3
-march=native
4515
2 x EPYC 7601
SE +/- 13.53, N = 3
-march=native
9233
Xeon E5-2687W v3
SE +/- 0.17, N = 3
-march=native
1458
Xeon Silver 4108
SE +/- 1.39, N = 3
-march=native
1281
2 x Xeon Gold 6138
SE +/- 52.87, N = 3
-march=native
7838
2xamd7501
SE +/- 8.72, N = 3
8895
2K
4K
6K
8K
10K
1. (CC) gcc options: -pthread -m64 -O3 -lssl -lcrypto -ldl

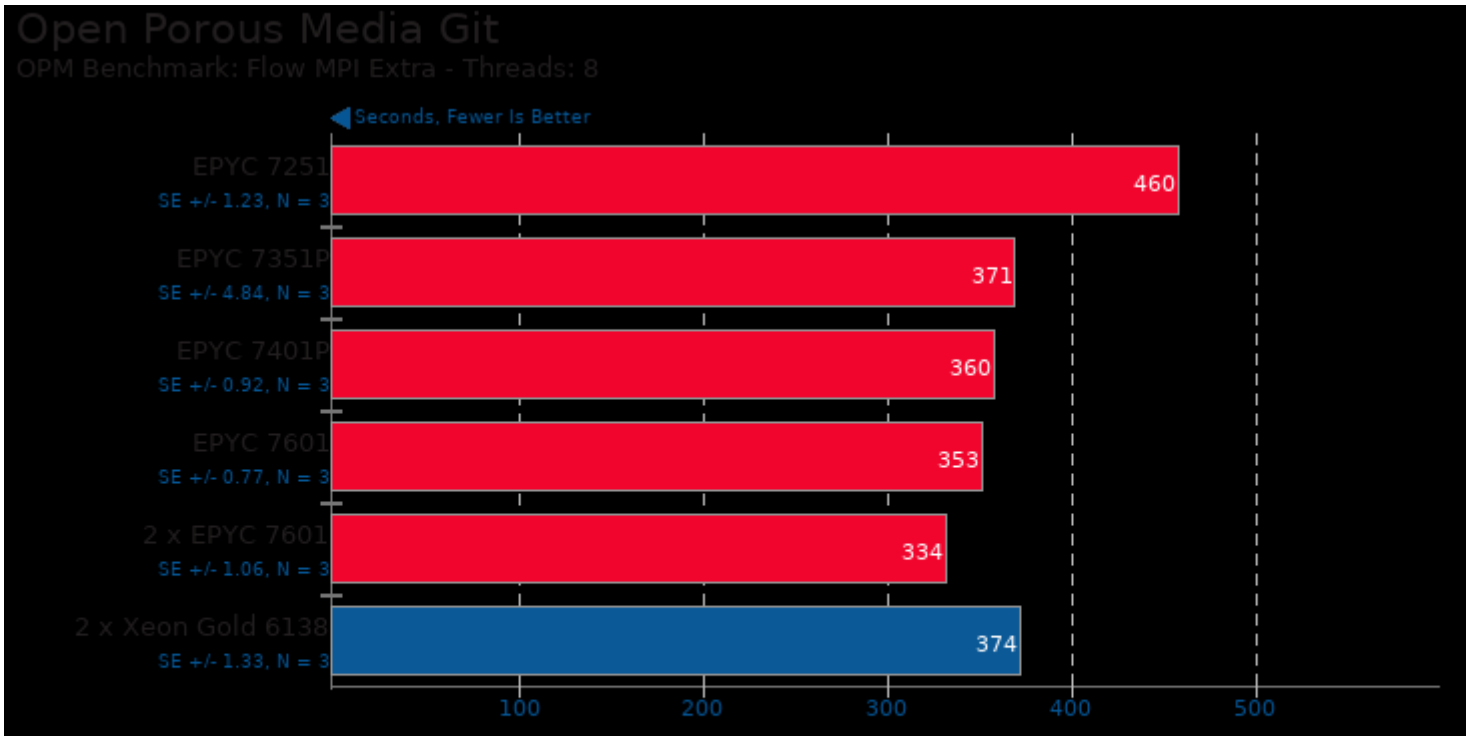

Sysbench 2018-07-28
Test: CPU
Events Per Second, More Is Better
EPYC 7251
SE +/- 2.03, N = 3
12102
EPYC 7351P
SE +/- 9.99, N = 3
24174
EPYC 7401P
SE +/- 7.85, N = 3
34891
EPYC 7551
SE +/- 46.82, N = 3
42199
EPYC 7601
SE +/- 37.77, N = 3
44813
2 x EPYC 7601
SE +/- 263.79, N = 3
89107
Xeon E5-2687W v3
SE +/- 5.87, N = 3
16625
Xeon Silver 4108
SE +/- 0.69, N = 3
9642
2 x Xeon Gold 6138
SE +/- 127.33, N = 3
60825
20K
40K
60K
80K
100K
1. (CC) gcc options: -pthread -O3 -funroll-loops -ggdb3 -march=native -rdynamic -ldl -laio -lm

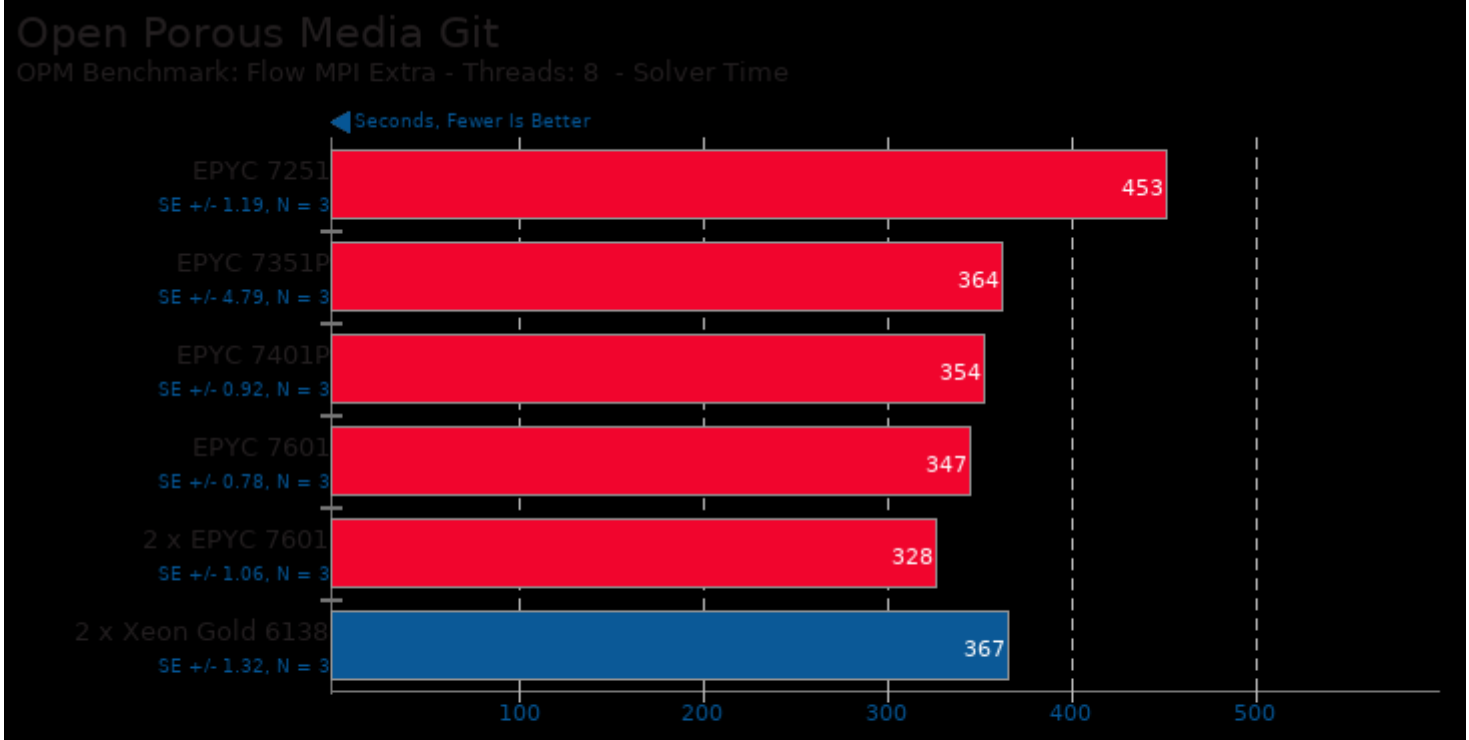

Blender 2.79a
Blend File: BMW27 - Compute: CPU-Only
Seconds, Fewer Is Better
EPYC 7251
335.53
EPYC 7351P
164.30
EPYC 7401P
130.82
EPYC 7551
104.87
EPYC 7601
101.70
2 x EPYC 7601
57.80
Xeon E5-2687W v3
245.61
Xeon Silver 4108
407.11
2 x Xeon Gold 6138
77.91
2xamd7501
60.21
90
180
270
360
450

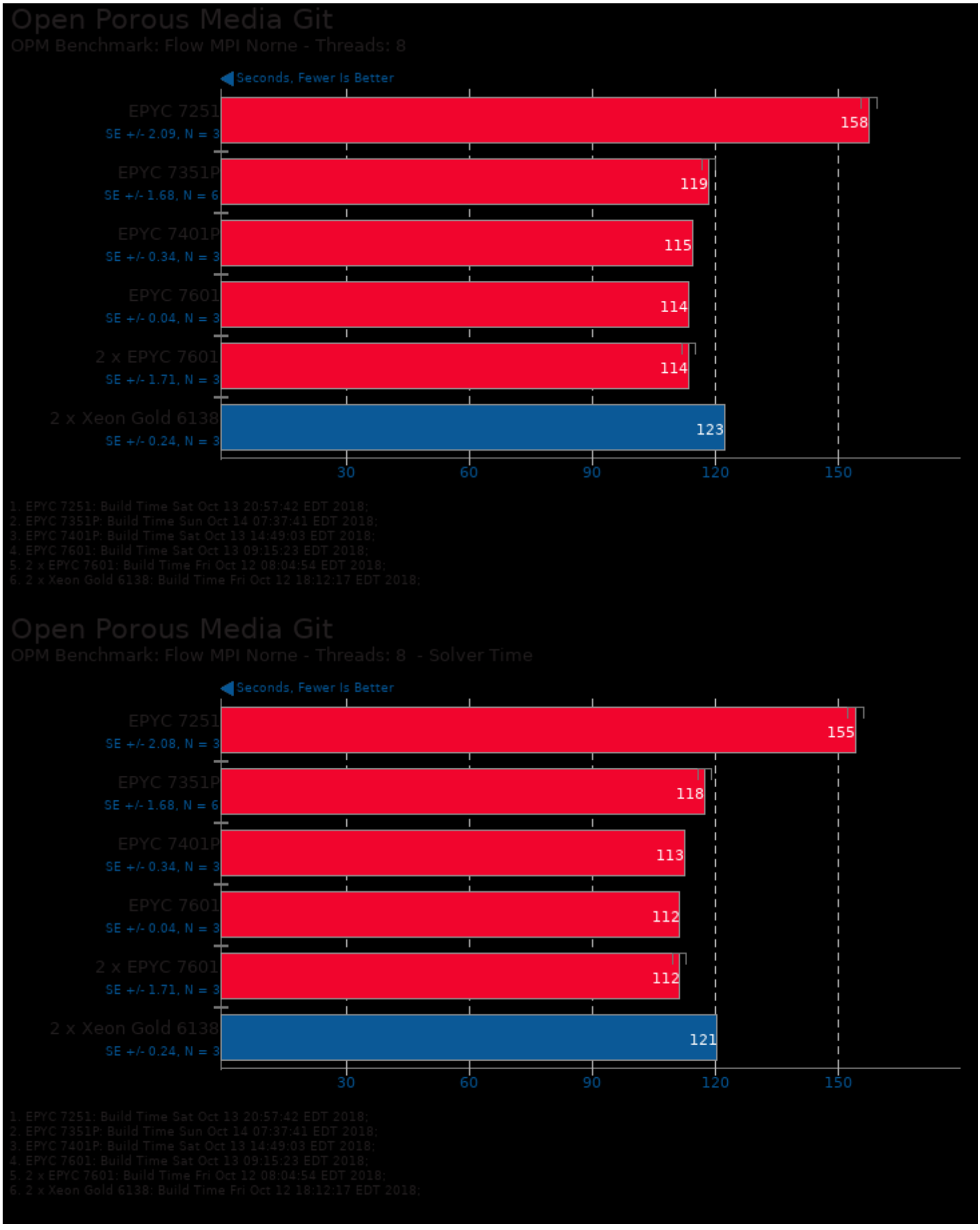

Blender 2.79a
Blend File: Barbershop - Compute: CPU-Only
Seconds, Fewer Is Better
EPYC 7251
1797
EPYC 7351P
851
EPYC 7401P
666
EPYC 7551
531
EPYC 7601
504
2 x EPYC 7601
312
Xeon E5-2687W v3
1183
Xeon Silver 4108
1894
2 x Xeon Gold 6138
376
2xamd7501
304
400
800
1200
1600
2000

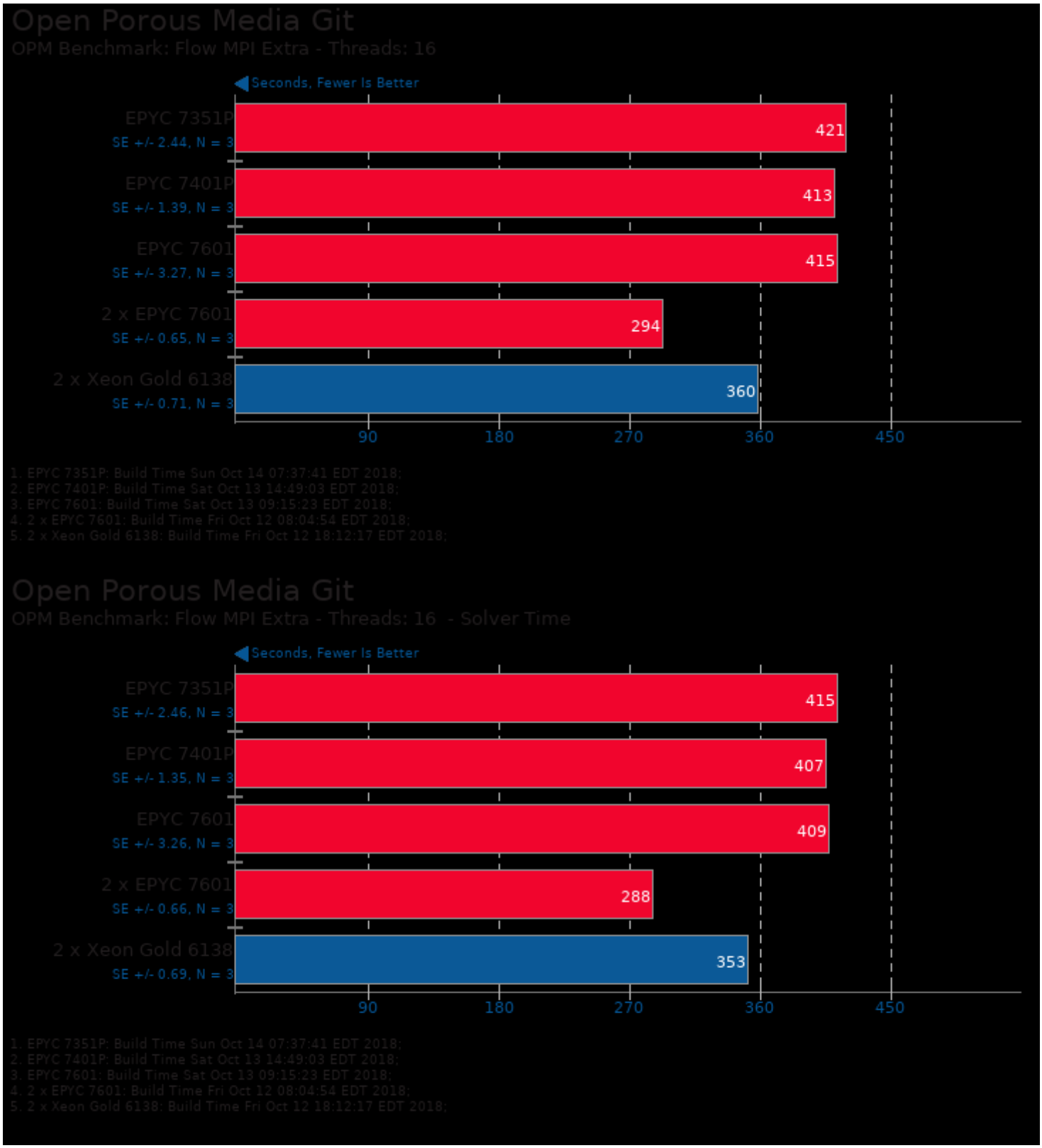

RAR Compression 5.6.1
Linux Source Tree Archiving To RAR
Seconds, Fewer Is Better
EPYC 7251
SE +/- 2.74, N = 3
186.00
EPYC 7351P
SE +/- 2.12, N = 3
149.00
EPYC 7401P
SE +/- 2.05, N = 3
150.00
EPYC 7551
SE +/- 1.75, N = 9
157.00
EPYC 7601
SE +/- 1.91, N = 3
143.00
2 x EPYC 7601
SE +/- 1.44, N = 3
109.00
Xeon E5-2687W v3
SE +/- 1.19, N = 3
97.53
Xeon Silver 4108
SE +/- 0.18, N = 3
147.00
2 x Xeon Gold 6138
SE +/- 1.08, N = 3
116.00
2xamd7501
SE +/- 1.81, N = 9
162.55
40
80
120
160
200

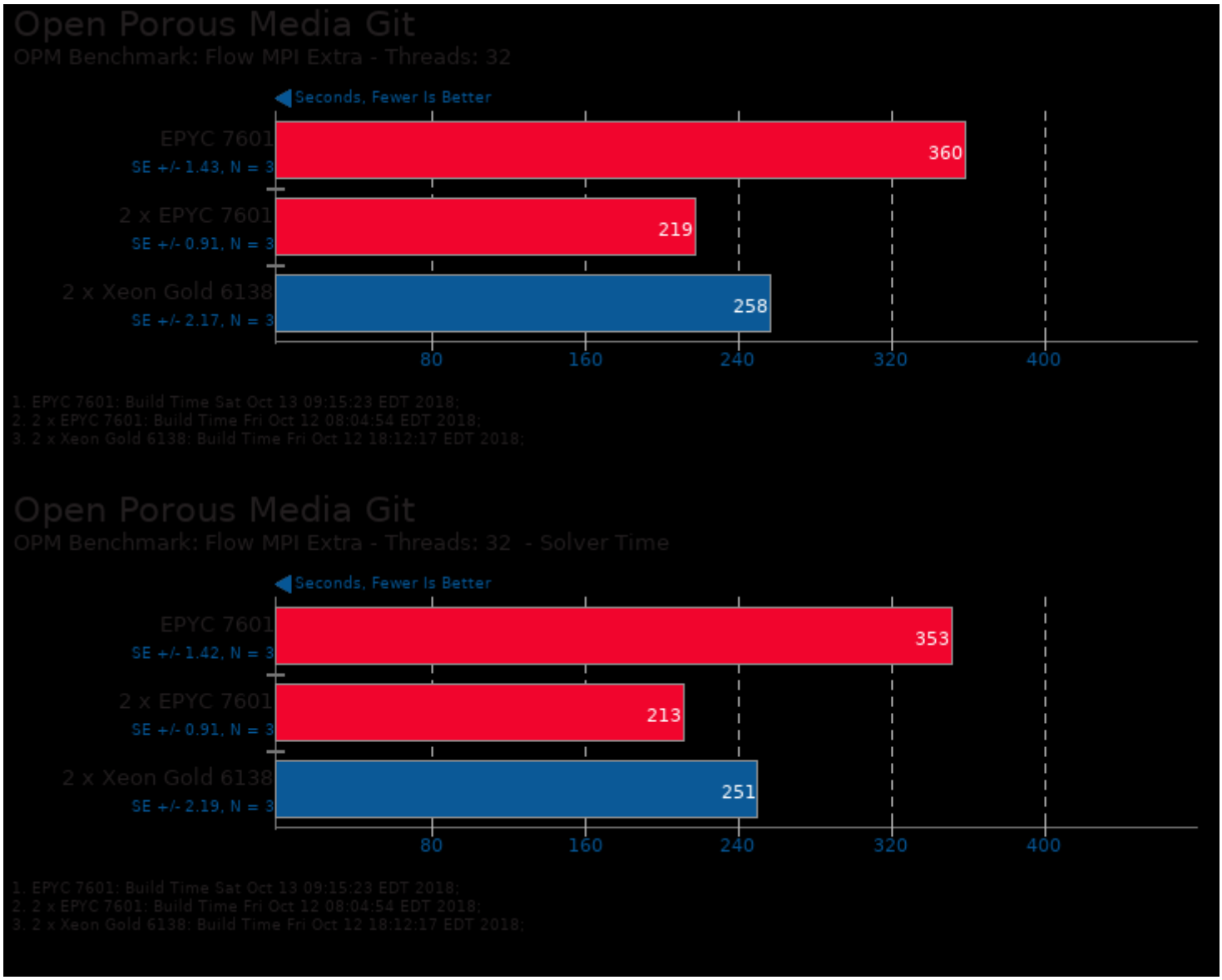

Chaos Group V-RAY 1.1.0
Mode: CPU
Seconds, Fewer Is Better
EPYC 7251
SE +/- 0.06, N = 3
116.03
EPYC 7351P
SE +/- 0.08, N = 3
59.25
EPYC 7401P
SE +/- 0.45, N = 3
48.13
EPYC 7551
SE +/- 0.40, N = 12
40.37
EPYC 7601
SE +/- 0.37, N = 3
39.32
2 x EPYC 7601
SE +/- 0.32, N = 3
25.40
Xeon E5-2687W v3
SE +/- 0.24, N = 3
93.93
Xeon Silver 4108
SE +/- 0.41, N = 3
137.93
2 x Xeon Gold 6138
SE +/- 0.13, N = 3
31.28
30
60
90
120
150

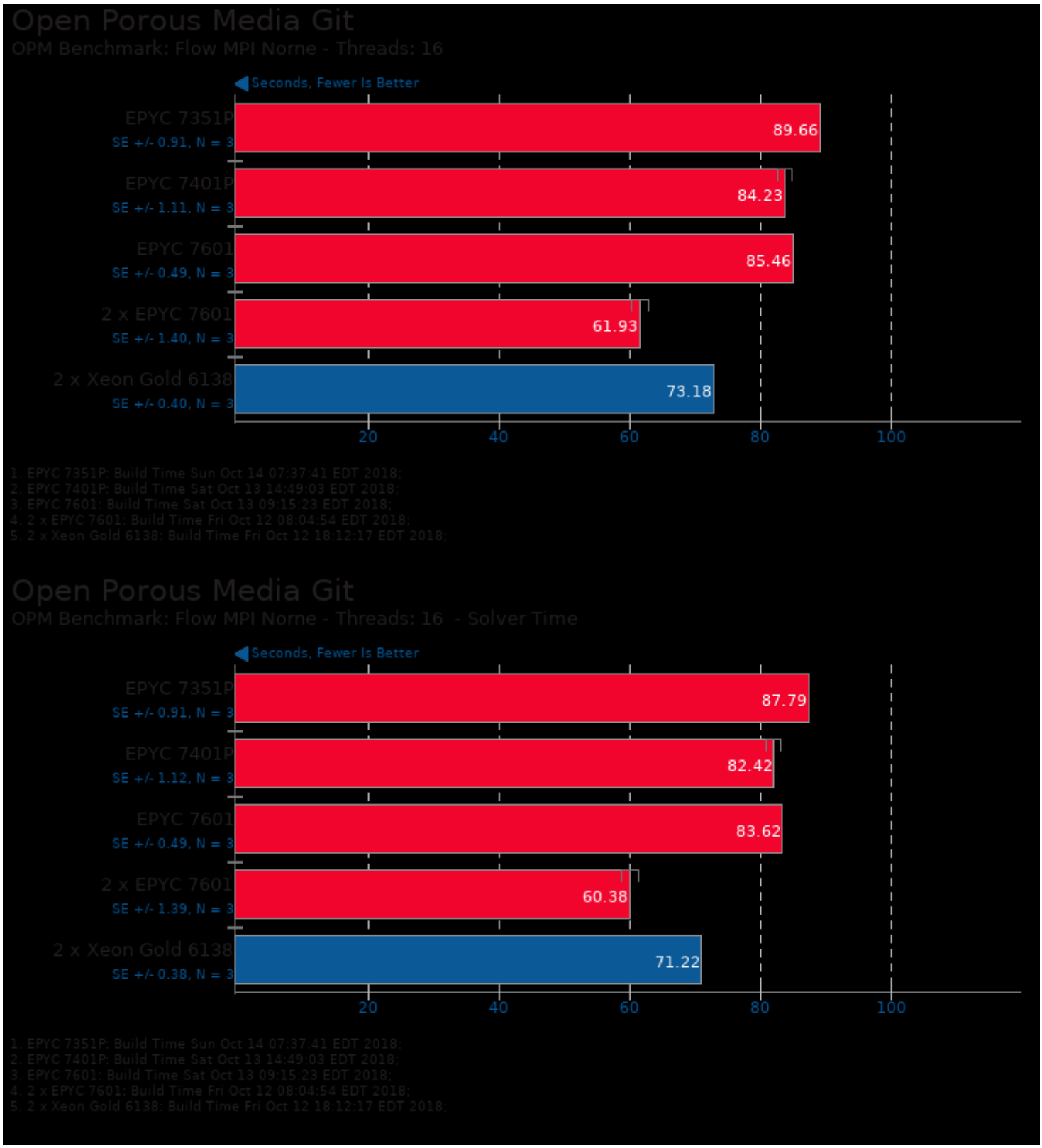

Open Porous Media Git
OPM Benchmark: Flow MPI Extra - Threads: 8
Seconds, Fewer Is Better
EPYC 7251
SE +/- 1.23, N = 3
460
EPYC 7351P
SE +/- 4.84, N = 3
371
EPYC 7401P
SE +/- 0.92, N = 3
360
EPYC 7601
SE +/- 0.77, N = 3
353
2 x EPYC 7601
SE +/- 1.06, N = 3
334
2 x Xeon Gold 6138
SE +/- 1.33, N = 3
374
100
200
300
400
500
1. EPYC 7251: Build Time Sat Oct 13 20:57:42 EDT 2018;
2. EPYC 7351P: Build Time Sun Oct 14 07:37:41 EDT 2018;
3. EPYC 7401P: Build Time Sat Oct 13 14:49:03 EDT 2018;
4. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
5. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
6. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;

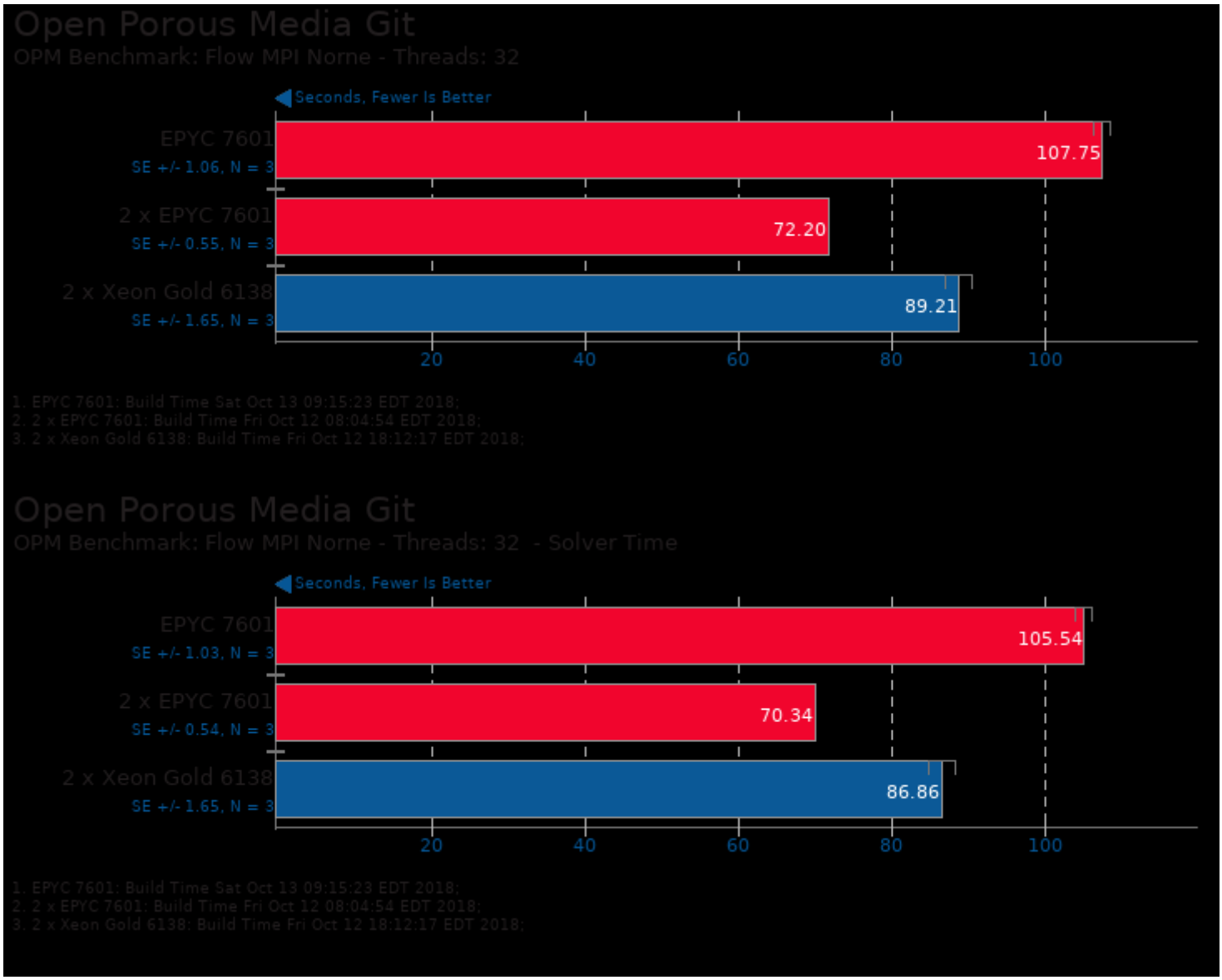

Open Porous Media Git
OPM Benchmark: Flow MPI Extra - Threads: 8 - Solver Time
Seconds, Fewer Is Better
EPYC 7251
SE +/- 1.19, N = 3
453
EPYC 7351P
SE +/- 4.79, N = 3
364
EPYC 7401P
SE +/- 0.92, N = 3
354
EPYC 7601
SE +/- 0.78, N = 3
347
2 x EPYC 7601
SE +/- 1.06, N = 3
328
2 x Xeon Gold 6138
SE +/- 1.32, N = 3
367
100
200
300
400
500
1. EPYC 7251: Build Time Sat Oct 13 20:57:42 EDT 2018;
2. EPYC 7351P: Build Time Sun Oct 14 07:37:41 EDT 2018;
3. EPYC 7401P: Build Time Sat Oct 13 14:49:03 EDT 2018;
4. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
5. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
6. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;


Open Porous Media Git
OPM Benchmark: Flow MPI Norne - Threads: 8
Seconds, Fewer Is Better
EPYC 7251
SE +/- 2.09, N = 3
158
EPYC 7351P
SE +/- 1.68, N = 6
119
EPYC 7401P
SE +/- 0.34, N = 3
115
EPYC 7601
SE +/- 0.04, N = 3
114
2 x EPYC 7601
SE +/- 1.71, N = 3
114
2 x Xeon Gold 6138
SE +/- 0.24, N = 3
123
30
60
90
120
150
1. EPYC 7251: Build Time Sat Oct 13 20:57:42 EDT 2018;
2. EPYC 7351P: Build Time Sun Oct 14 07:37:41 EDT 2018;
3. EPYC 7401P: Build Time Sat Oct 13 14:49:03 EDT 2018;
4. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
5. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
6. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;
Open Porous Media Git
OPM Benchmark: Flow MPI Norne - Threads: 8 - Solver Time
Seconds, Fewer Is Better
EPYC 7251
SE +/- 2.08, N = 3
155
EPYC 7351P
SE +/- 1.68, N = 6
118
EPYC 7401P
SE +/- 0.34, N = 3
113
EPYC 7601
SE +/- 0.04, N = 3
112
2 x EPYC 7601
SE +/- 1.71, N = 3
112
2 x Xeon Gold 6138
SE +/- 0.24, N = 3
121
30
60
90
120
150
1. EPYC 7251: Build Time Sat Oct 13 20:57:42 EDT 2018;
2. EPYC 7351P: Build Time Sun Oct 14 07:37:41 EDT 2018;
3. EPYC 7401P: Build Time Sat Oct 13 14:49:03 EDT 2018;
4. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
5. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
6. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;


Open Porous Media Git
OPM Benchmark: Flow MPI Extra - Threads: 16
Seconds, Fewer Is Better
EPYC 7351P
SE +/- 2.44, N = 3
421
EPYC 7401P
SE +/- 1.39, N = 3
413
EPYC 7601
SE +/- 3.27, N = 3
415
2 x EPYC 7601
SE +/- 0.65, N = 3
294
2 x Xeon Gold 6138
SE +/- 0.71, N = 3
360
90
180
270
360
450
1. EPYC 7351P: Build Time Sun Oct 14 07:37:41 EDT 2018;
2. EPYC 7401P: Build Time Sat Oct 13 14:49:03 EDT 2018;
3. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
4. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
5. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;
Open Porous Media Git
OPM Benchmark: Flow MPI Extra - Threads: 16 - Solver Time
Seconds, Fewer Is Better
EPYC 7351P
SE +/- 2.46, N = 3
415
EPYC 7401P
SE +/- 1.35, N = 3
407
EPYC 7601
SE +/- 3.26, N = 3
409
2 x EPYC 7601
SE +/- 0.66, N = 3
288
2 x Xeon Gold 6138
SE +/- 0.69, N = 3
353
90
180
270
360
450
1. EPYC 7351P: Build Time Sun Oct 14 07:37:41 EDT 2018;
2. EPYC 7401P: Build Time Sat Oct 13 14:49:03 EDT 2018;
3. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
4. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
5. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;

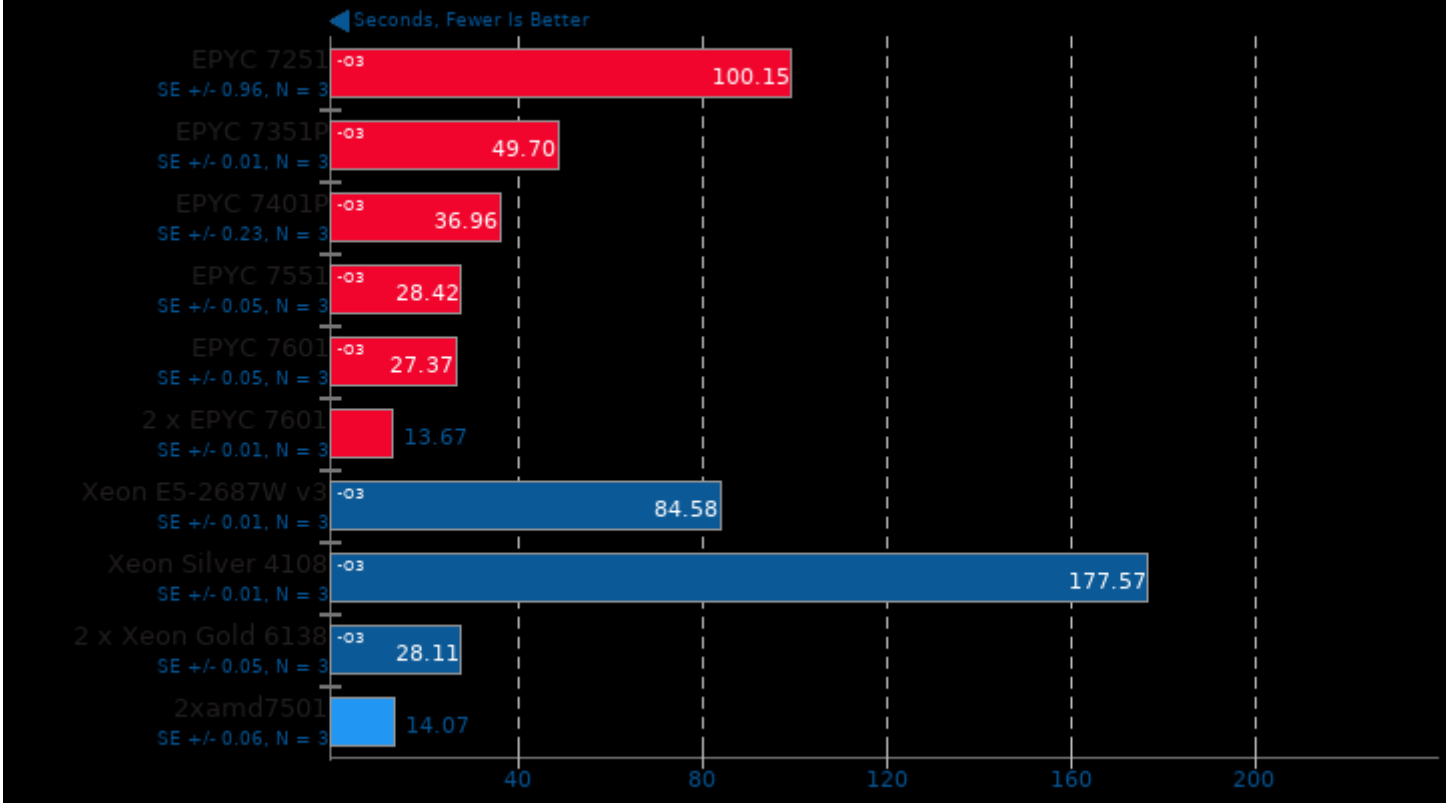

Open Porous Media Git
OPM Benchmark: Flow MPI Extra - Threads: 32
Seconds, Fewer Is Better
EPYC 7601
SE +/- 1.43, N = 3
360
2 x EPYC 7601
SE +/- 0.91, N = 3
219
2 x Xeon Gold 6138
SE +/- 2.17, N = 3
258
80
160
240
320
400
1. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
2. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
3. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;
Open Porous Media Git
OPM Benchmark: Flow MPI Extra - Threads: 32 - Solver Time
Seconds, Fewer Is Better
EPYC 7601
SE +/- 1.42, N = 3
353
2 x EPYC 7601
SE +/- 0.91, N = 3
213
2 x Xeon Gold 6138
SE +/- 2.19, N = 3
251
80
160
240
320
400
1. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
2. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
3. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;


Open Porous Media Git
OPM Benchmark: Flow MPI Norne - Threads: 16
Seconds, Fewer Is Better
EPYC 7351P
SE +/- 0.91, N = 3
89.66
EPYC 7401P
SE +/- 1.11, N = 3
84.23
EPYC 7601
SE +/- 0.49, N = 3
85.46
2 x EPYC 7601
SE +/- 1.40, N = 3
61.93
2 x Xeon Gold 6138
SE +/- 0.40, N = 3
73.18
20
40
60
80
100
1. EPYC 7351P: Build Time Sun Oct 14 07:37:41 EDT 2018;
2. EPYC 7401P: Build Time Sat Oct 13 14:49:03 EDT 2018;
3. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
4. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
5. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;
Open Porous Media Git
OPM Benchmark: Flow MPI Norne - Threads: 16 - Solver Time
Seconds, Fewer Is Better
EPYC 7351P
SE +/- 0.91, N = 3
87.79
EPYC 7401P
SE +/- 1.12, N = 3
82.42
EPYC 7601
SE +/- 0.49, N = 3
83.62
2 x EPYC 7601
SE +/- 1.39, N = 3
60.38
2 x Xeon Gold 6138
SE +/- 0.38, N = 3
71.22
20
40
60
80
100
1. EPYC 7351P: Build Time Sun Oct 14 07:37:41 EDT 2018;
2. EPYC 7401P: Build Time Sat Oct 13 14:49:03 EDT 2018;
3. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
4. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
5. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;


Open Porous Media Git
OPM Benchmark: Flow MPI Norne - Threads: 32
Seconds, Fewer Is Better
EPYC 7601
SE +/- 1.06, N = 3
107.75
2 x EPYC 7601
SE +/- 0.55, N = 3
72.20
2 x Xeon Gold 6138
SE +/- 1.65, N = 3
89.21
20
40
60
80
100
1. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
2. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
3. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;
Open Porous Media Git
OPM Benchmark: Flow MPI Norne - Threads: 32 - Solver Time
Seconds, Fewer Is Better
EPYC 7601
SE +/- 1.03, N = 3
105.54
2 x EPYC 7601
SE +/- 0.54, N = 3
70.34
2 x Xeon Gold 6138
SE +/- 1.65, N = 3
86.86
20
40
60
80
100
1. EPYC 7601: Build Time Sat Oct 13 09:15:23 EDT 2018;
2. 2 x EPYC 7601: Build Time Fri Oct 12 08:04:54 EDT 2018;
3. 2 x Xeon Gold 6138: Build Time Fri Oct 12 18:12:17 EDT 2018;

m-queens 1.2

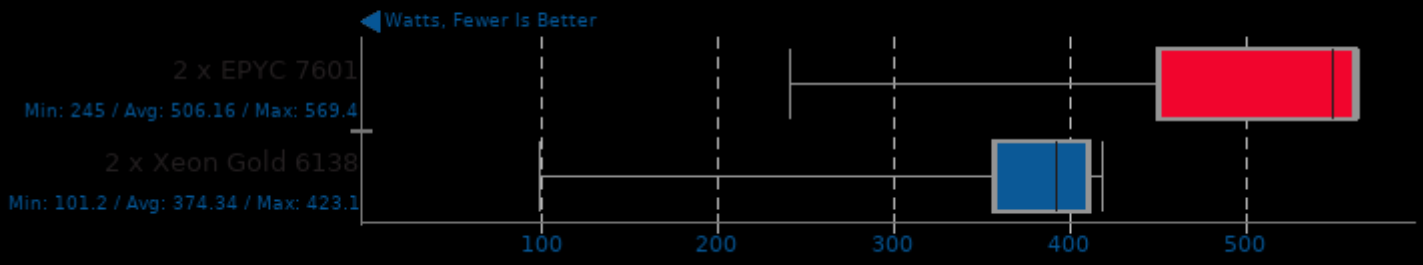
Time To Solve



1. (CXX) g++ options: -fopenmp -march=native -O2

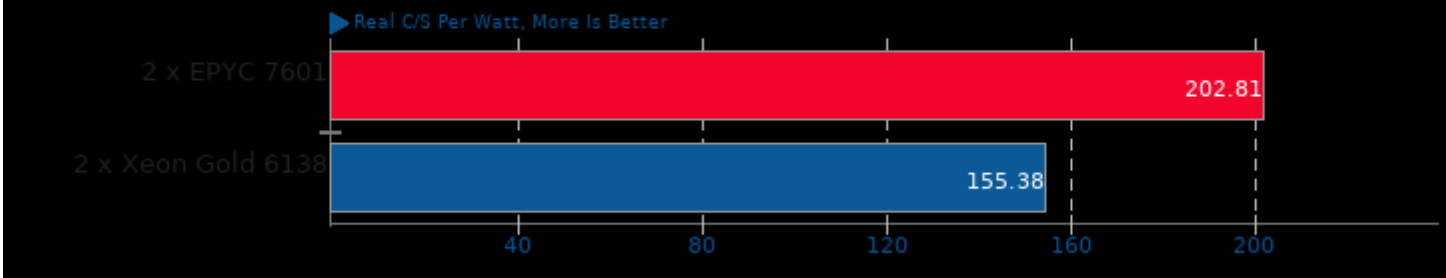
NAMD 2.13b1

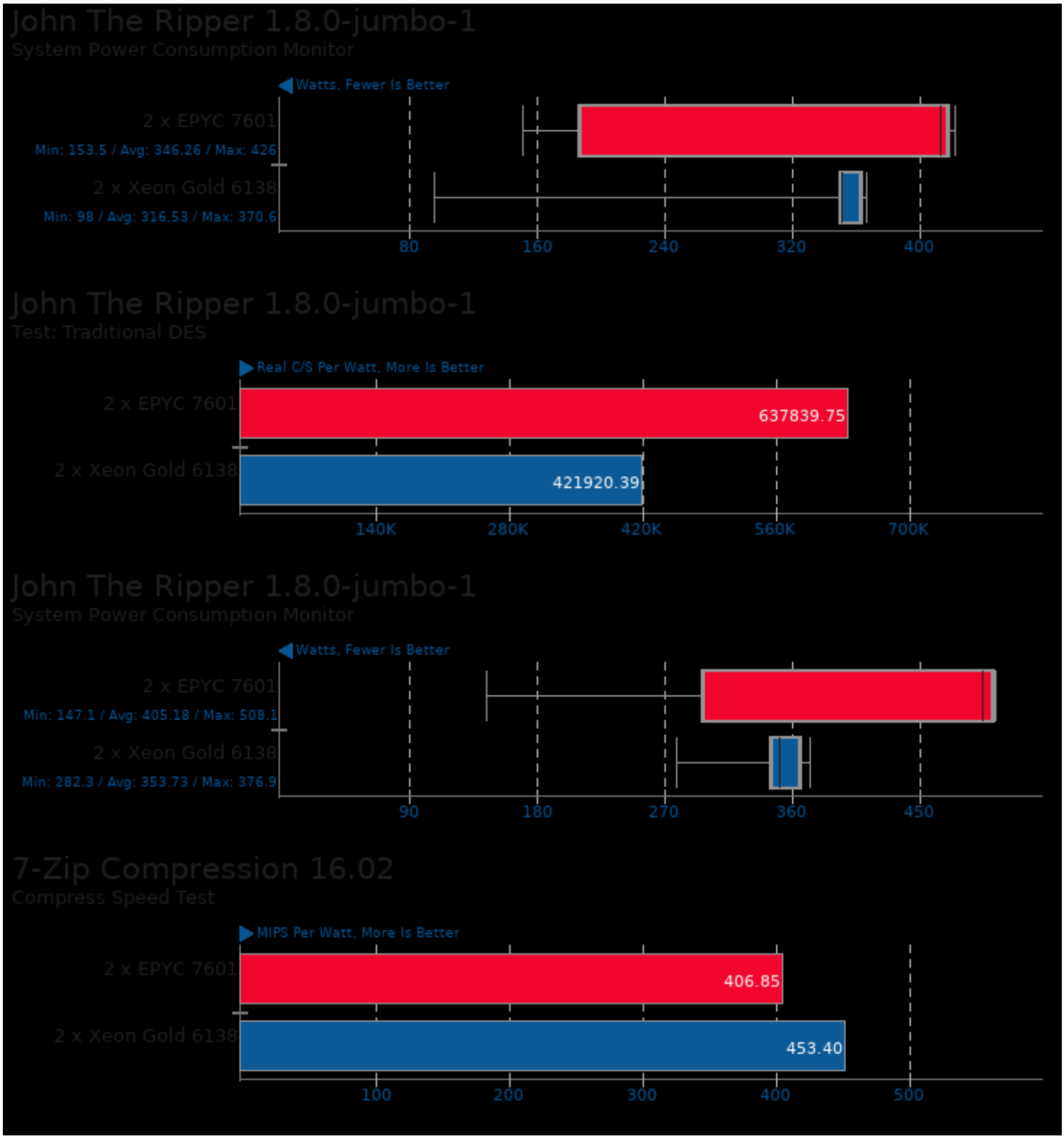
System Power Consumption Monitor

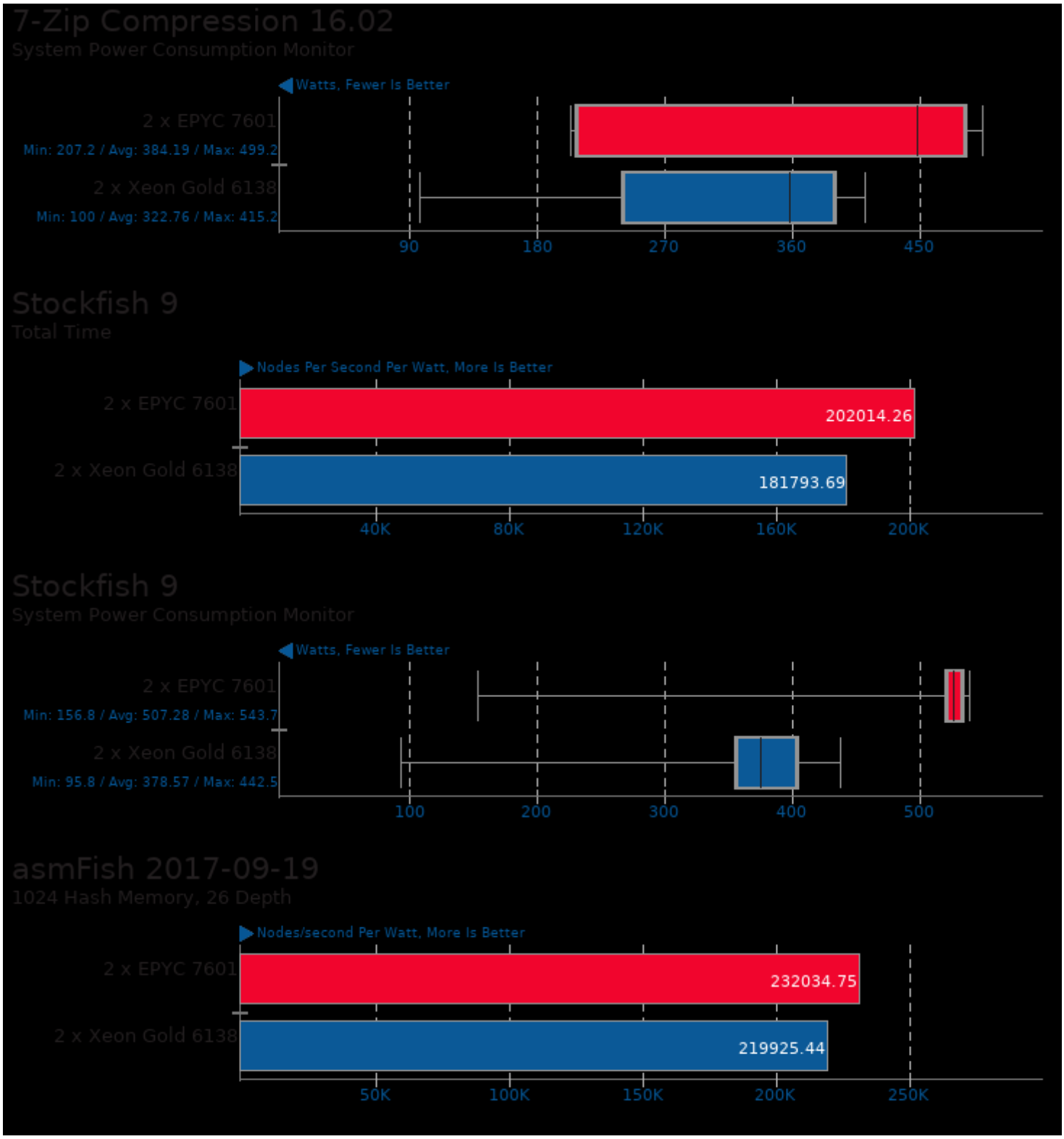


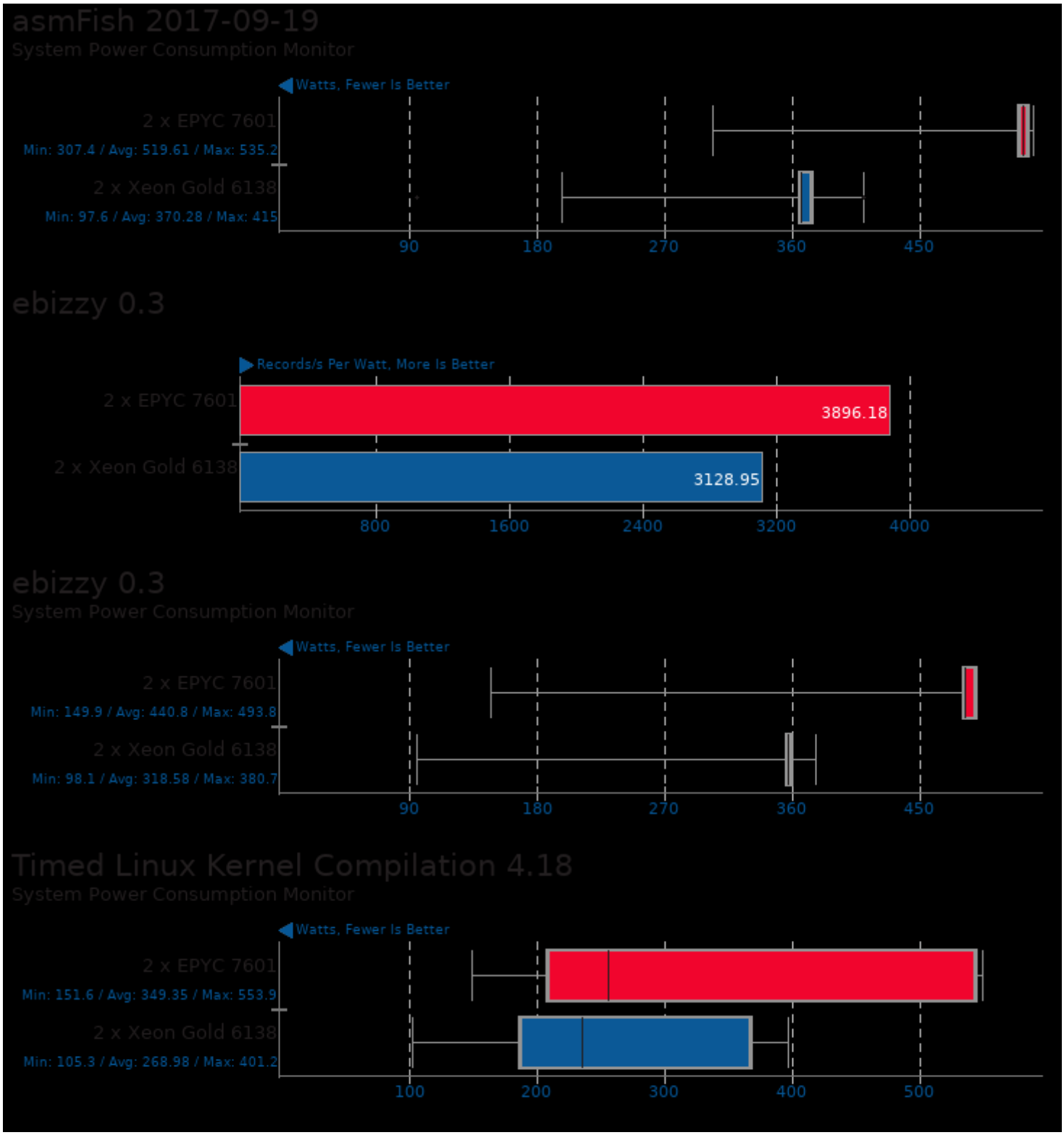
John The Ripper 1.8.0-jumbo-1

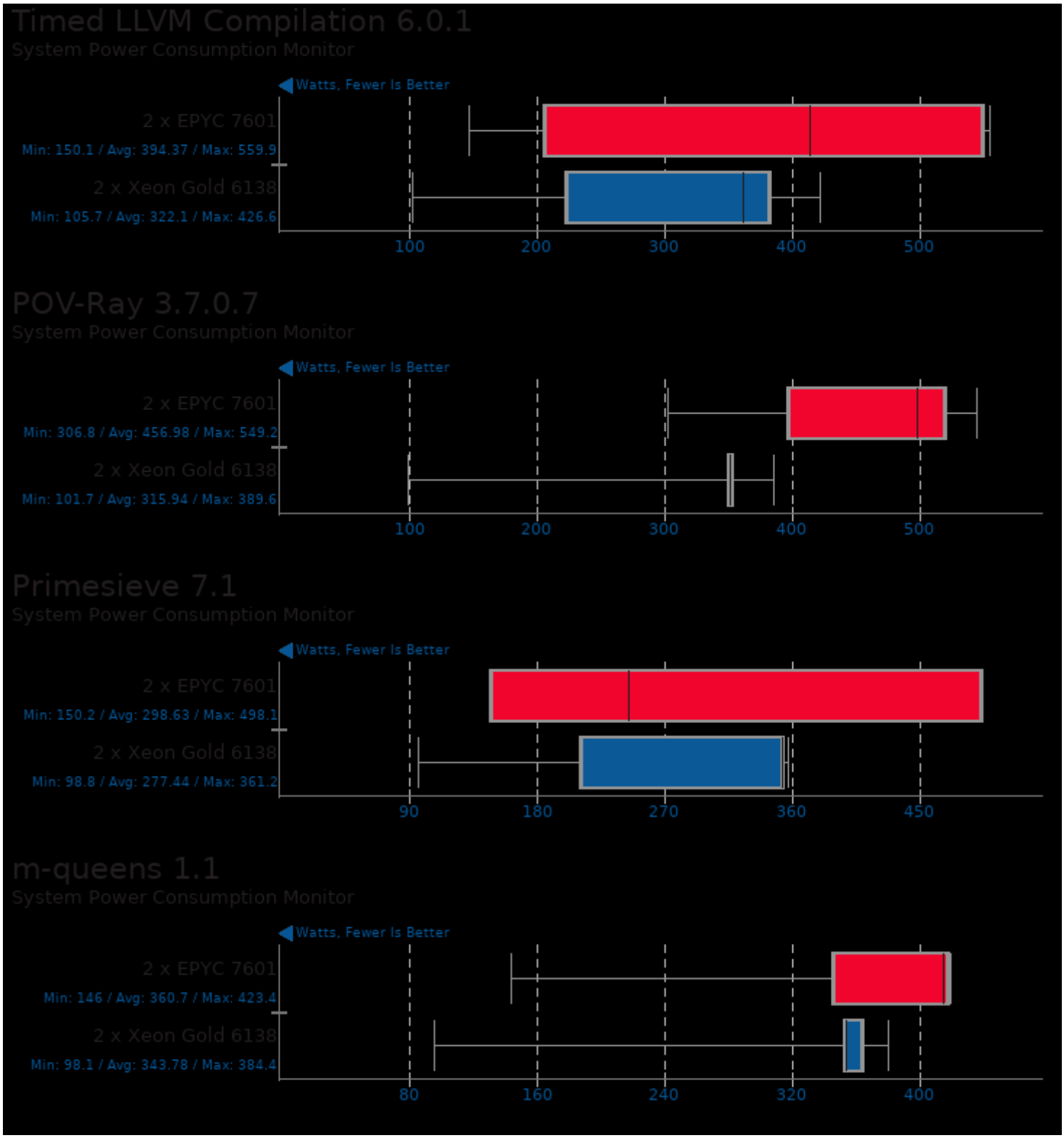
Test: Blowfish

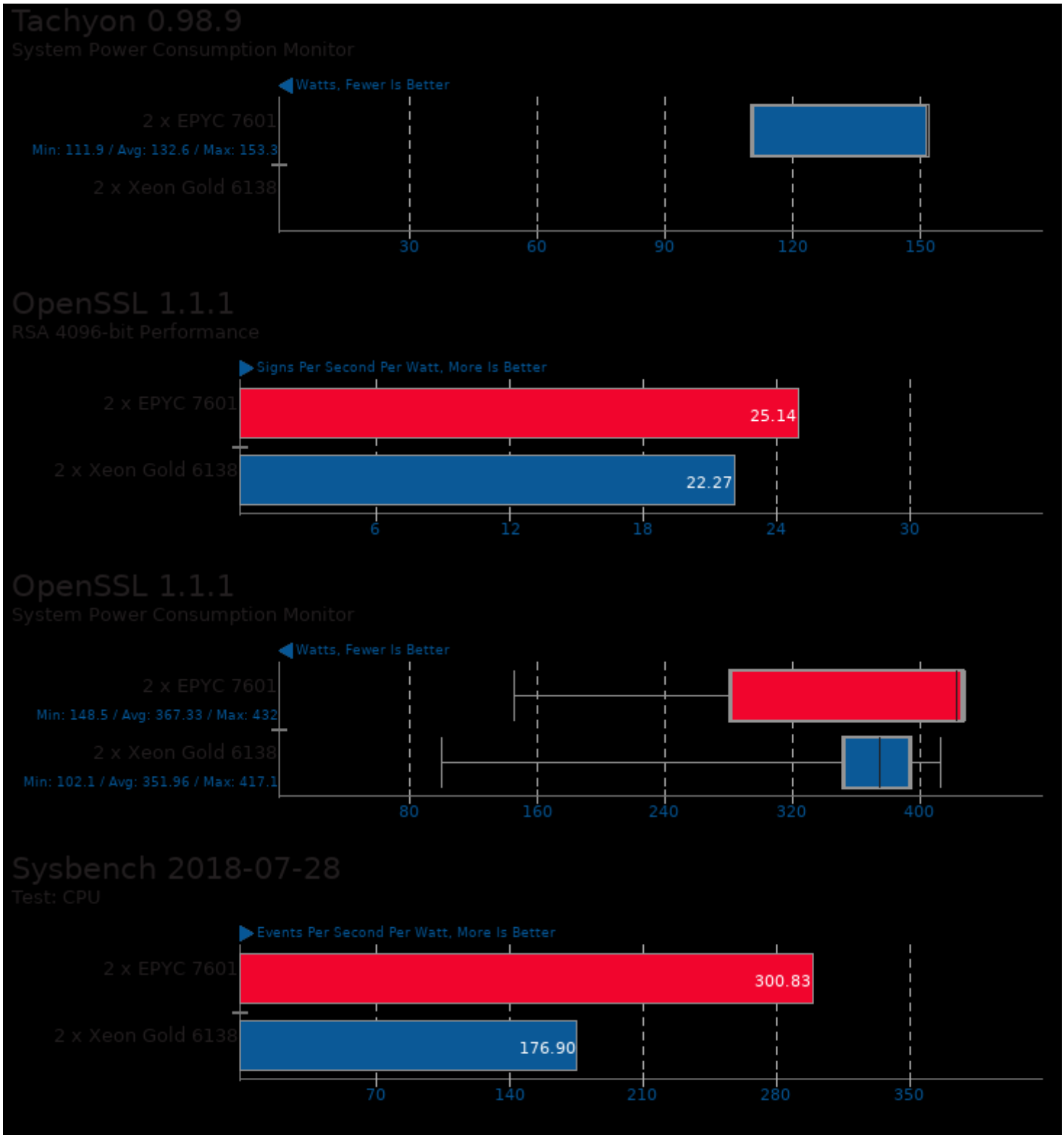


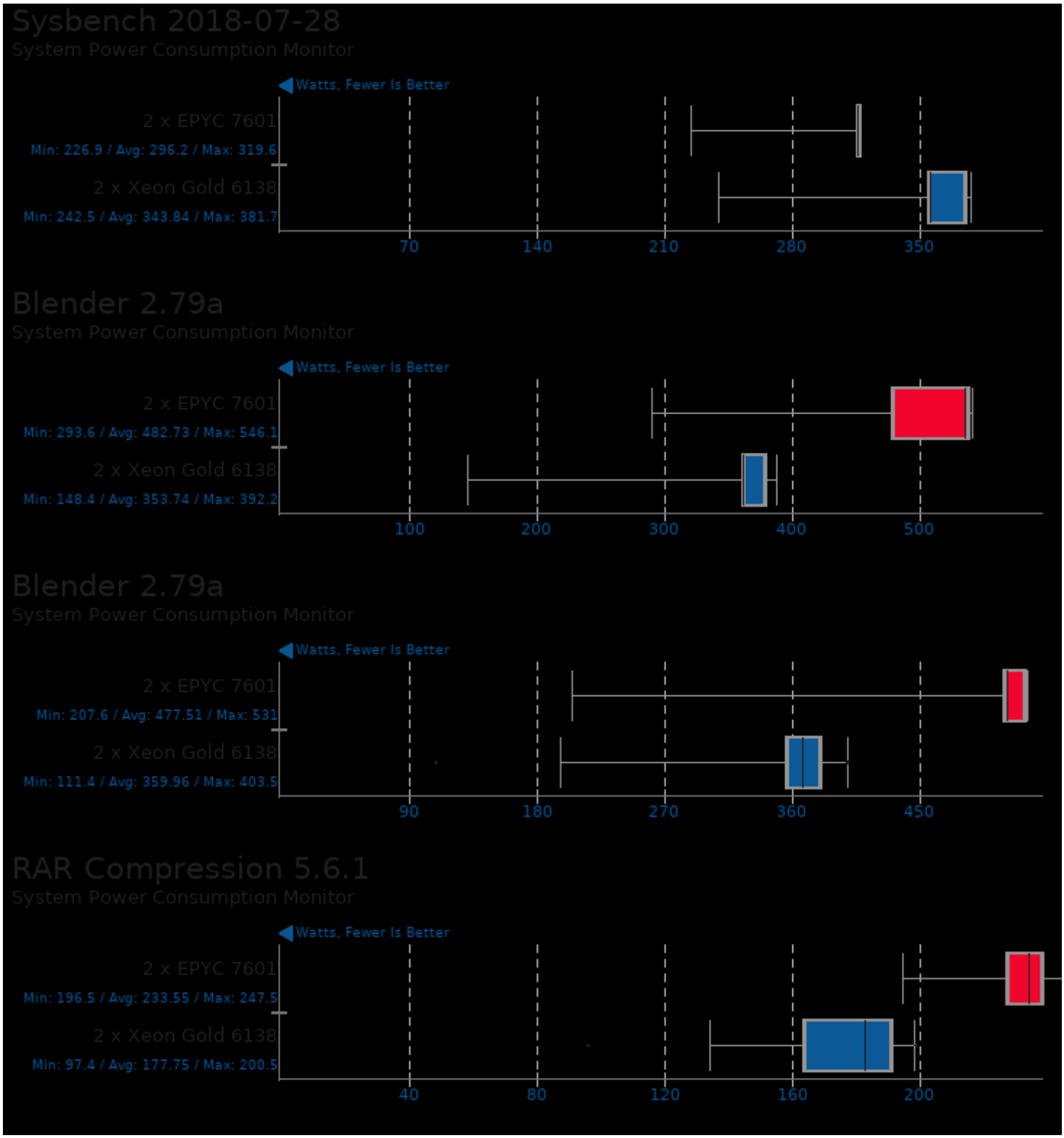

John The Ripper 1.8.0-jumbo-1
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 153.5 / Avg: 346.26 / Max: 426
2 x Xeon Gold 6138
Min: 98 / Avg: 316.53 / Max: 370.6
80
160
240
320
400
John The Ripper 1.8.0-jumbo-1
Test: Traditional DES
Real C/S Per Watt, More Is Better
2 x EPYC 7601
637839.75
2 x Xeon Gold 6138
421920.39
140K
280K
420K
560K
700K
John The Ripper 1.8.0-jumbo-1
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 147.1 / Avg: 405.18 / Max: 508.1
2 x Xeon Gold 6138
Min: 282.3 / Avg: 353.73 / Max: 376.9
90
180
270
360
450
7-Zip Compression 16.02
Compress Speed Test
MIPS Per Watt, More Is Better
2 x EPYC 7601
406.85
2 x Xeon Gold 6138
453.40
100
200
300
400
500

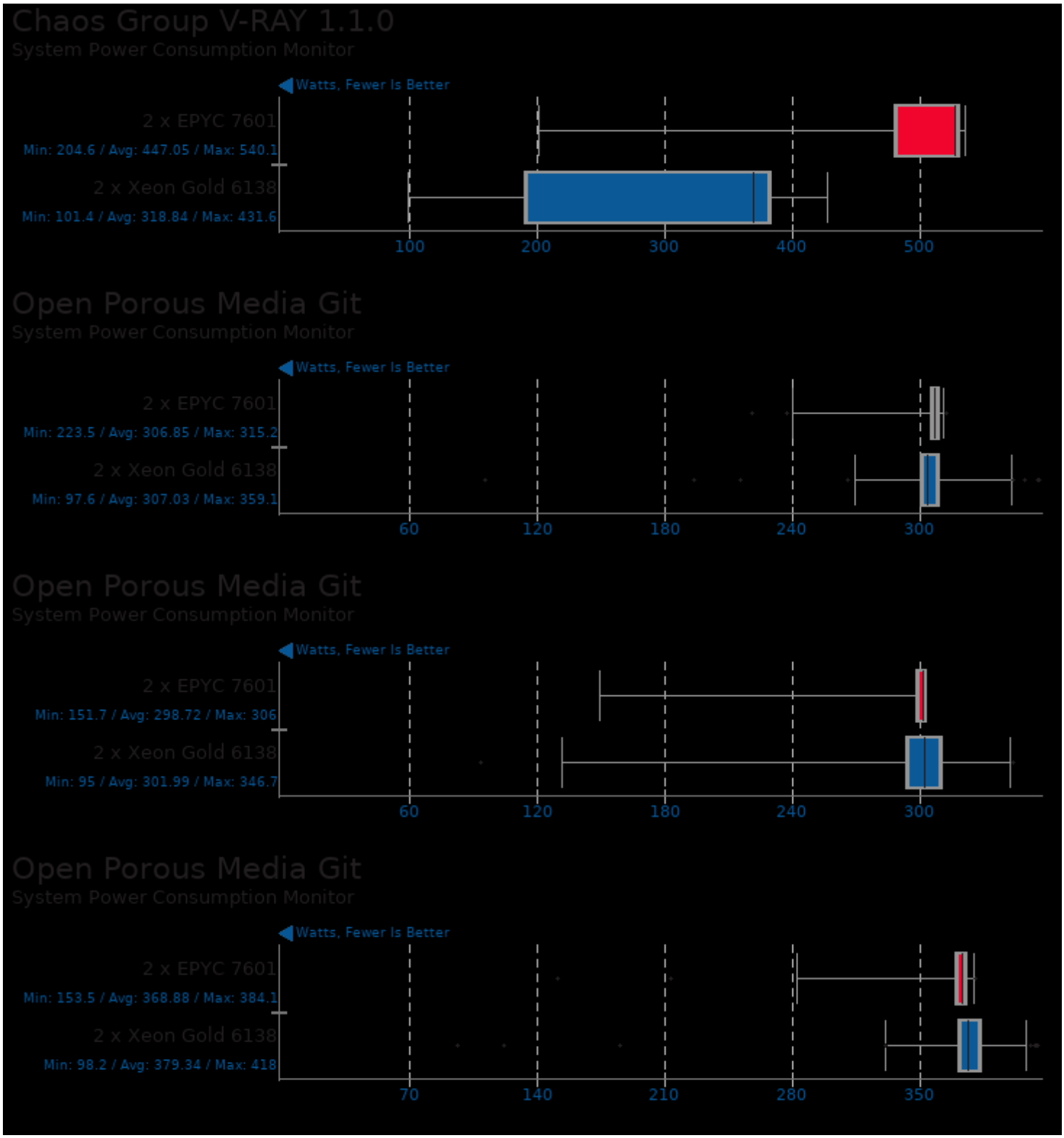

7-Zip Compression 16.02
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 207.2 / Avg: 384.19 / Max: 499.2
2 x Xeon Gold 6138
Min: 100 / Avg: 322.76 / Max: 415.2
90
180
270
360
450
Stockfish 9
Total Time
Nodes Per Second Per Watt, More Is Better
2 x EPYC 7601
202014.26
2 x Xeon Gold 6138
181793.69
40K
80K
120K
160K
200K
Stockfish 9
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 156.8 / Avg: 507.28 / Max: 543.7
2 x Xeon Gold 6138
Min: 95.8 / Avg: 378.57 / Max: 442.5
100
200
300
400
500
asmFish 2017-09-19
1024 Hash Memory, 26 Depth
Nodes/second Per Watt, More Is Better
2 x EPYC 7601
232034.75
2 x Xeon Gold 6138
219925.44
50K
100K
150K
200K
250K

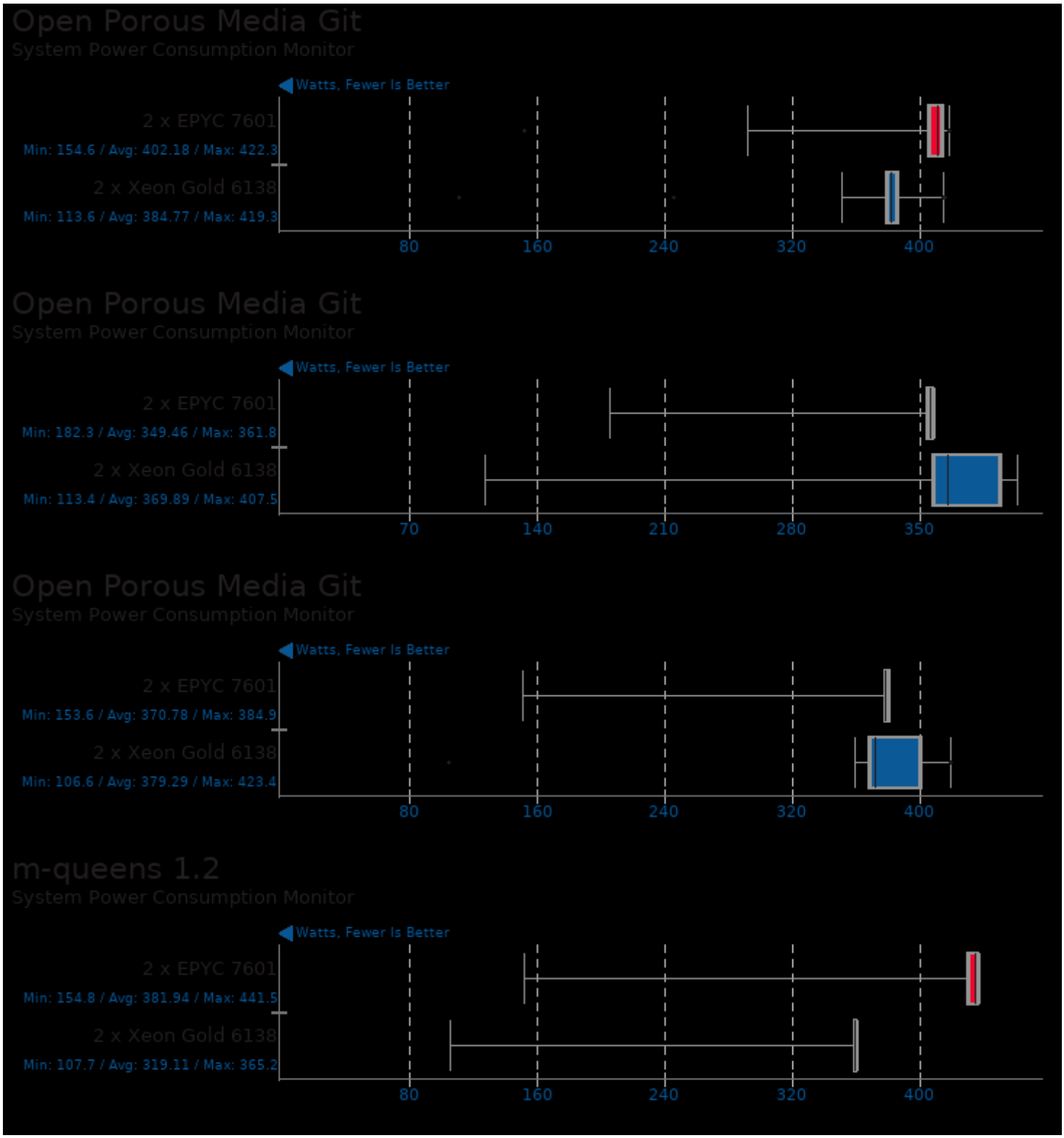

asmFish 2017-09-19
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 307.4 / Avg: 519.61 / Max: 535.2
2 x Xeon Gold 6138
Min: 97.6 / Avg: 370.28 / Max: 415
90
180
270
360
450
ebizzy 0.3
Records/s Per Watt, More Is Better
2 x EPYC 7601
3896.18
2 x Xeon Gold 6138
3128.95
800
1600
2400
3200
4000
ebizzy 0.3
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 149.9 / Avg: 440.8 / Max: 493.8
2 x Xeon Gold 6138
Min: 98.1 / Avg: 318.58 / Max: 380.7
90
180
270
360
450
Timed Linux Kernel Compilation 4.18
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 151.6 / Avg: 349.35 / Max: 553.9
2 x Xeon Gold 6138
Min: 105.3 / Avg: 268.98 / Max: 401.2
100
200
300
400
500

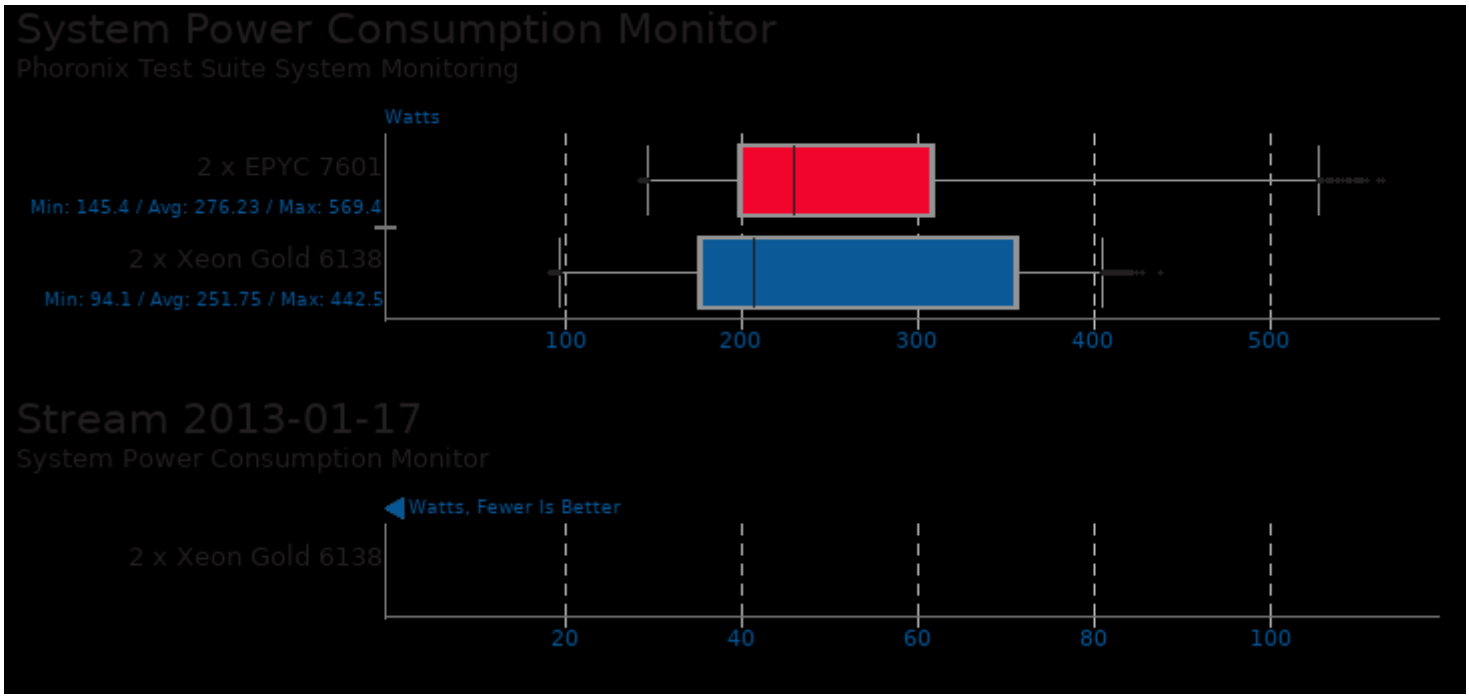

Timed LLVM Compilation 6.0.1
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 150.1 / Avg: 394.37 / Max: 559.9
2 x Xeon Gold 6138
Min: 105.7 / Avg: 322.1 / Max: 426.6
100
200
300
400
500
POV-Ray 3.7.0.7
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 306.8 / Avg: 456.98 / Max: 549.2
2 x Xeon Gold 6138
Min: 101.7 / Avg: 315.94 / Max: 389.6
100
200
300
400
500
Primesieve 7.1
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 150.2 / Avg: 298.63 / Max: 498.1
2 x Xeon Gold 6138
Min: 98.8 / Avg: 277.44 / Max: 361.2
90
180
270
360
450
m-queens 1.1
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 146 / Avg: 360.7 / Max: 423.4
2 x Xeon Gold 6138
Min: 98.1 / Avg: 343.78 / Max: 384.4
80
160
240
320
400


Tachyon 0.98.9
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 111.9 / Avg: 132.6 / Max: 153.3
2 x Xeon Gold 6138
30
60
90
120
150
OpenSSL 1.1.1
RSA 4096-bit Performance
Signs Per Second Per Watt, More Is Better
2 x EPYC 7601
25.14
2 x Xeon Gold 6138
22.27
6
12
18
24
30
OpenSSL 1.1.1
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 148.5 / Avg: 367.33 / Max: 432
2 x Xeon Gold 6138
Min: 102.1 / Avg: 351.96 / Max: 417.1
80
160
240
320
400
Sysbench 2018-07-28
Test: CPU
Events Per Second Per Watt, More Is Better
2 x EPYC 7601
300.83
2 x Xeon Gold 6138
176.90
70
140
210
280
350

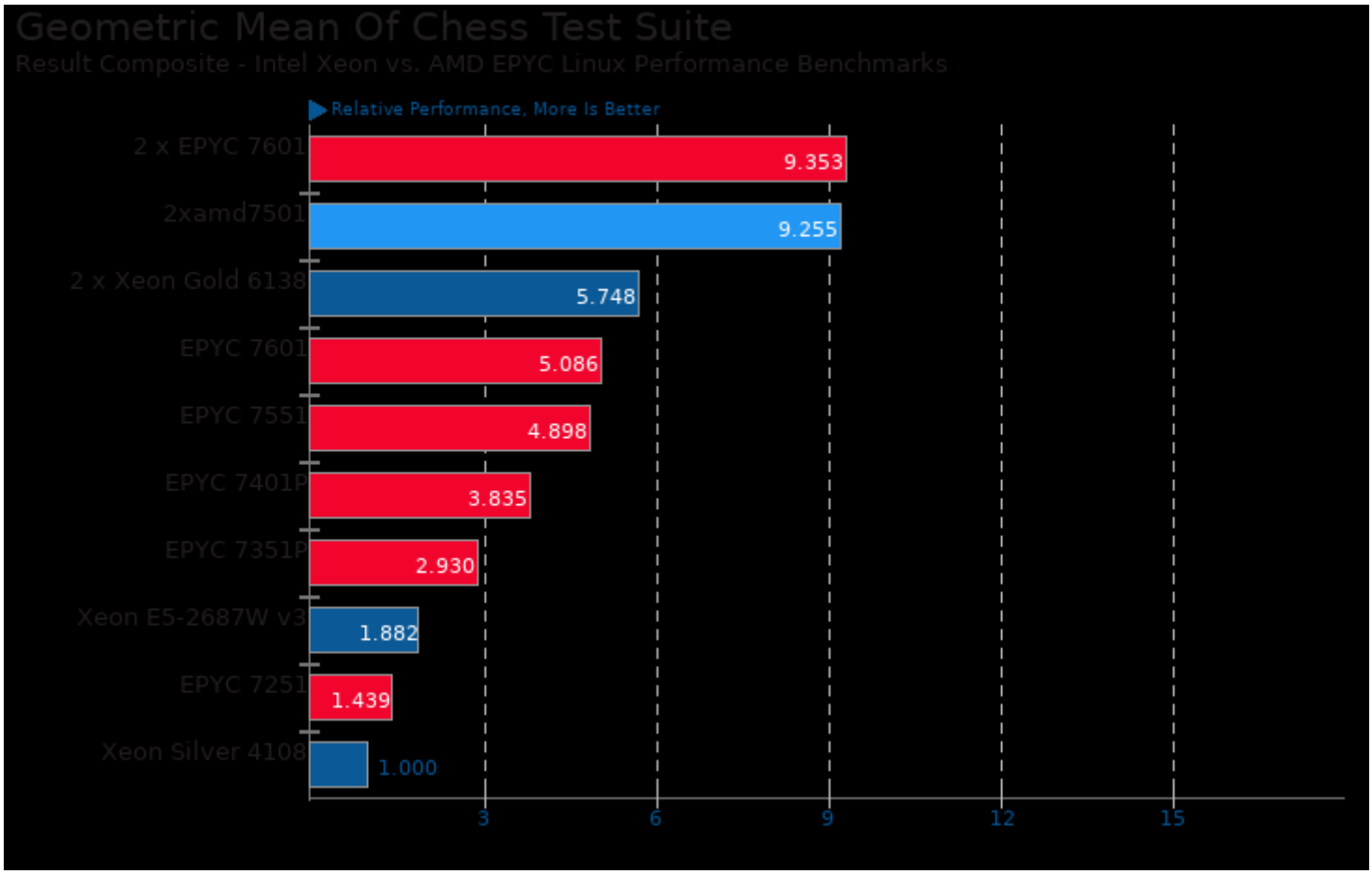

Sysbench 2018-07-28
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 226.9 / Avg: 296.2 / Max: 319.6
2 x Xeon Gold 6138
Min: 242.5 / Avg: 343.84 / Max: 381.7
70
140
210
280
350
Blender 2.79a
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 293.6 / Avg: 482.73 / Max: 546.1
2 x Xeon Gold 6138
Min: 148.4 / Avg: 353.74 / Max: 392.2
100
200
300
400
500
Blender 2.79a
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 207.6 / Avg: 477.51 / Max: 531
2 x Xeon Gold 6138
Min: 111.4 / Avg: 359.96 / Max: 403.5
90
180
270
360
450
RAR Compression 5.6.1
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 196.5 / Avg: 233.55 / Max: 247.5
2 x Xeon Gold 6138
Min: 97.4 / Avg: 177.75 / Max: 200.5
40
80
120
160
200


Chaos Group V-RAY 1.1.0
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 204.6 / Avg: 447.05 / Max: 540.1
2 x Xeon Gold 6138
Min: 101.4 / Avg: 318.84 / Max: 431.6
100
200
300
400
500
Open Porous Media Git
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 223.5 / Avg: 306.85 / Max: 315.2
2 x Xeon Gold 6138
Min: 97.6 / Avg: 307.03 / Max: 359.1
60
120
180
240
300
Open Porous Media Git
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 151.7 / Avg: 298.72 / Max: 306
2 x Xeon Gold 6138
Min: 95 / Avg: 301.99 / Max: 346.7
60
120
180
240
300
Open Porous Media Git
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 153.5 / Avg: 368.88 / Max: 384.1
2 x Xeon Gold 6138
Min: 98.2 / Avg: 379.34 / Max: 418
70
140
210
280
350

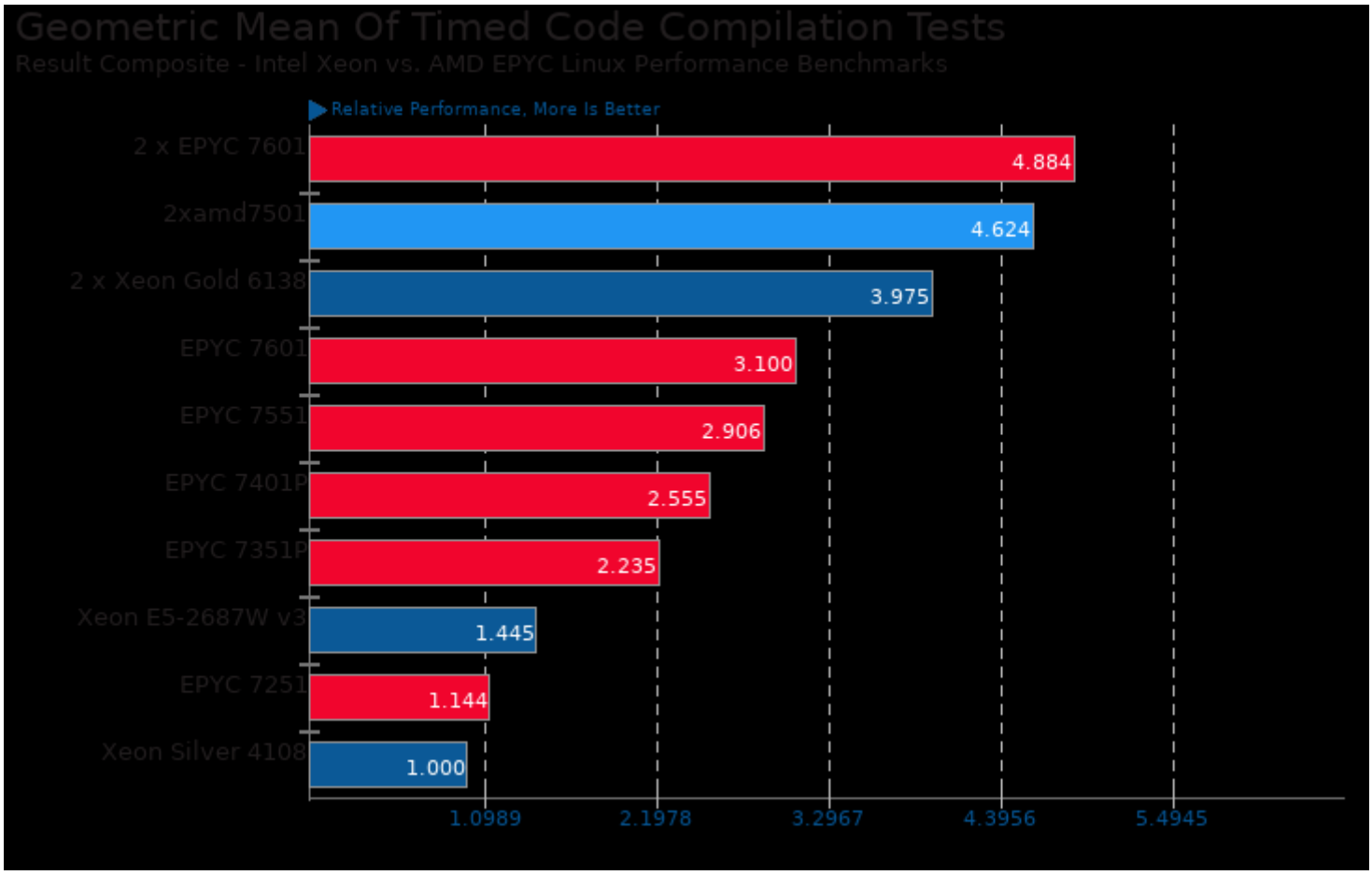

Open Porous Media Git
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 154.6 / Avg: 402.18 / Max: 422.3
2 x Xeon Gold 6138
Min: 113.6 / Avg: 384.77 / Max: 419.3
80
160
240
320
400
Open Porous Media Git
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 182.3 / Avg: 349.46 / Max: 361.8
2 x Xeon Gold 6138
Min: 113.4 / Avg: 369.89 / Max: 407.5
70
140
210
280
350
Open Porous Media Git
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 153.6 / Avg: 370.78 / Max: 384.9
2 x Xeon Gold 6138
Min: 106.6 / Avg: 379.29 / Max: 423.4
80
160
240
320
400
m-queens 1.2
System Power Consumption Monitor
Watts, Fewer Is Better
2 x EPYC 7601
Min: 154.8 / Avg: 381.94 / Max: 441.5
2 x Xeon Gold 6138
Min: 107.7 / Avg: 319.11 / Max: 365.2
80
160
240
320
400


System Power Consumption Monitor
Phoronix Test Suite System Monitoring
Watts
2 x EPYC 7601
Min: 145.4 / Avg: 276.23 / Max: 569.4
2 x Xeon Gold 6138
Min: 94.1 / Avg: 251.75 / Max: 442.5
100
200
300
400
500
Stream 2013-01-17
System Power Consumption Monitor
Watts, Fewer Is Better
2 x Xeon Gold 6138
20
40
60
80
100

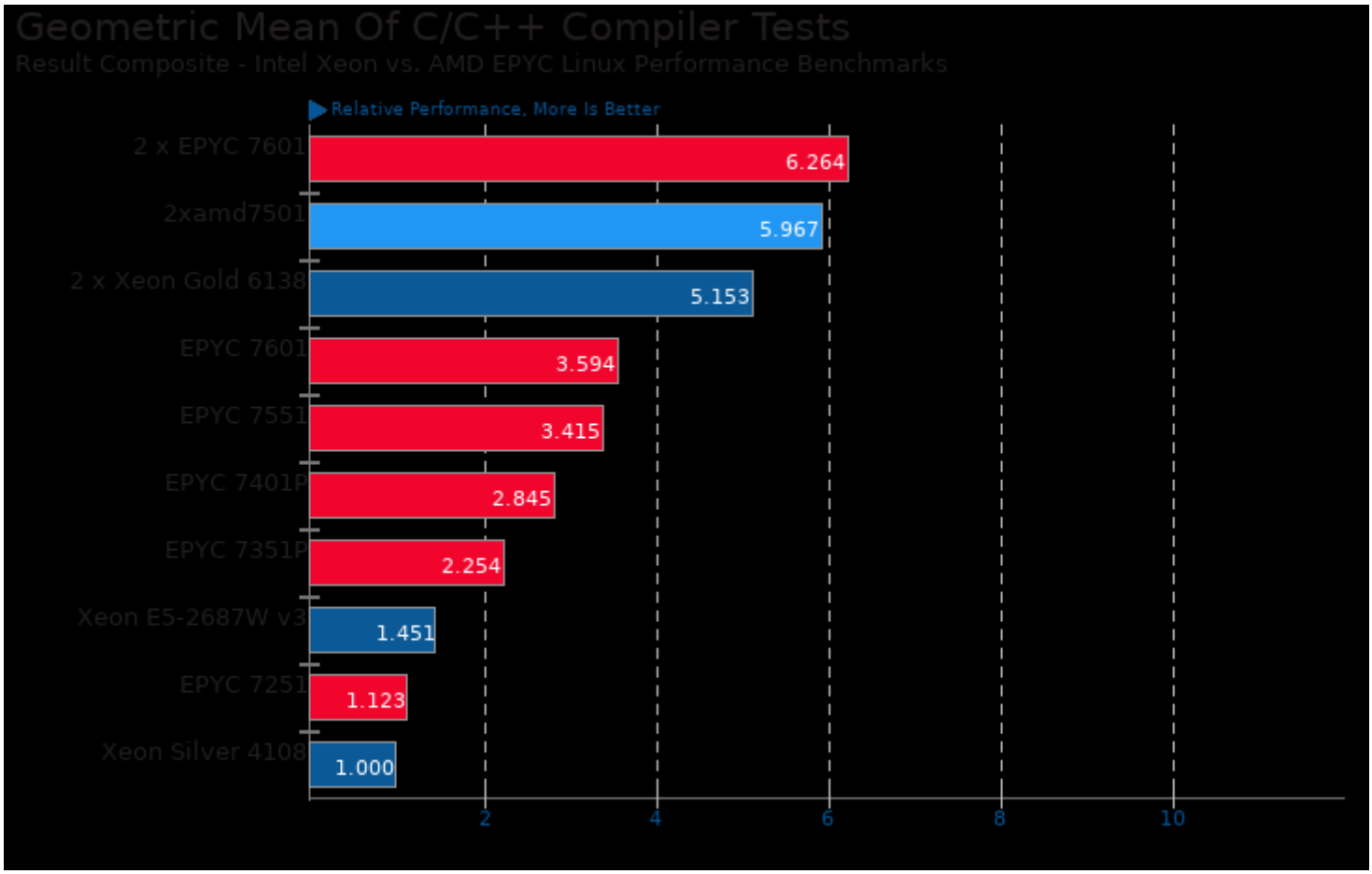
These geometric means are based upon test groupings / test suites for this result file.



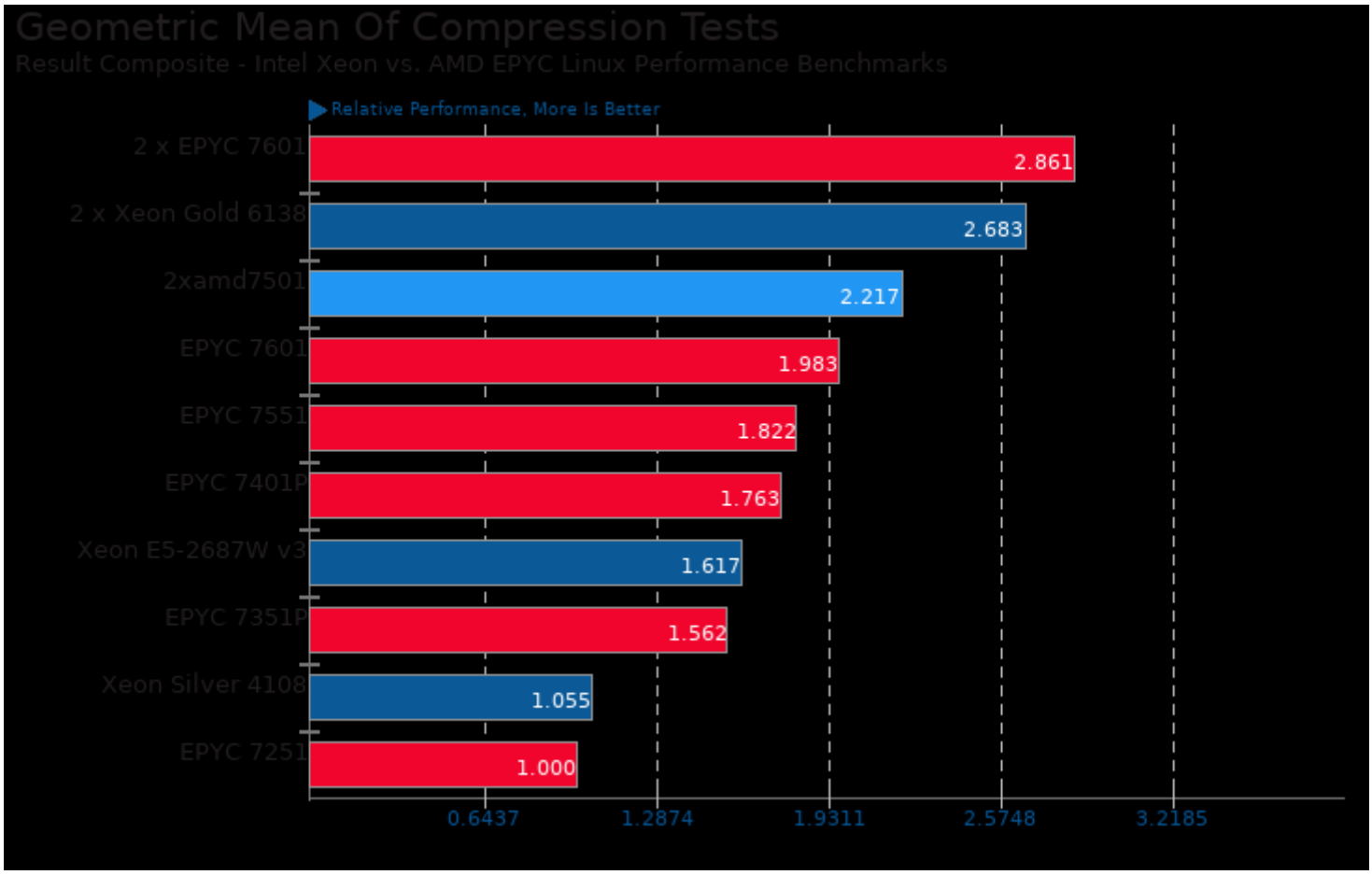
Geometric mean based upon tests: pts/stockfish, pts/asmfish and pts/m-queens



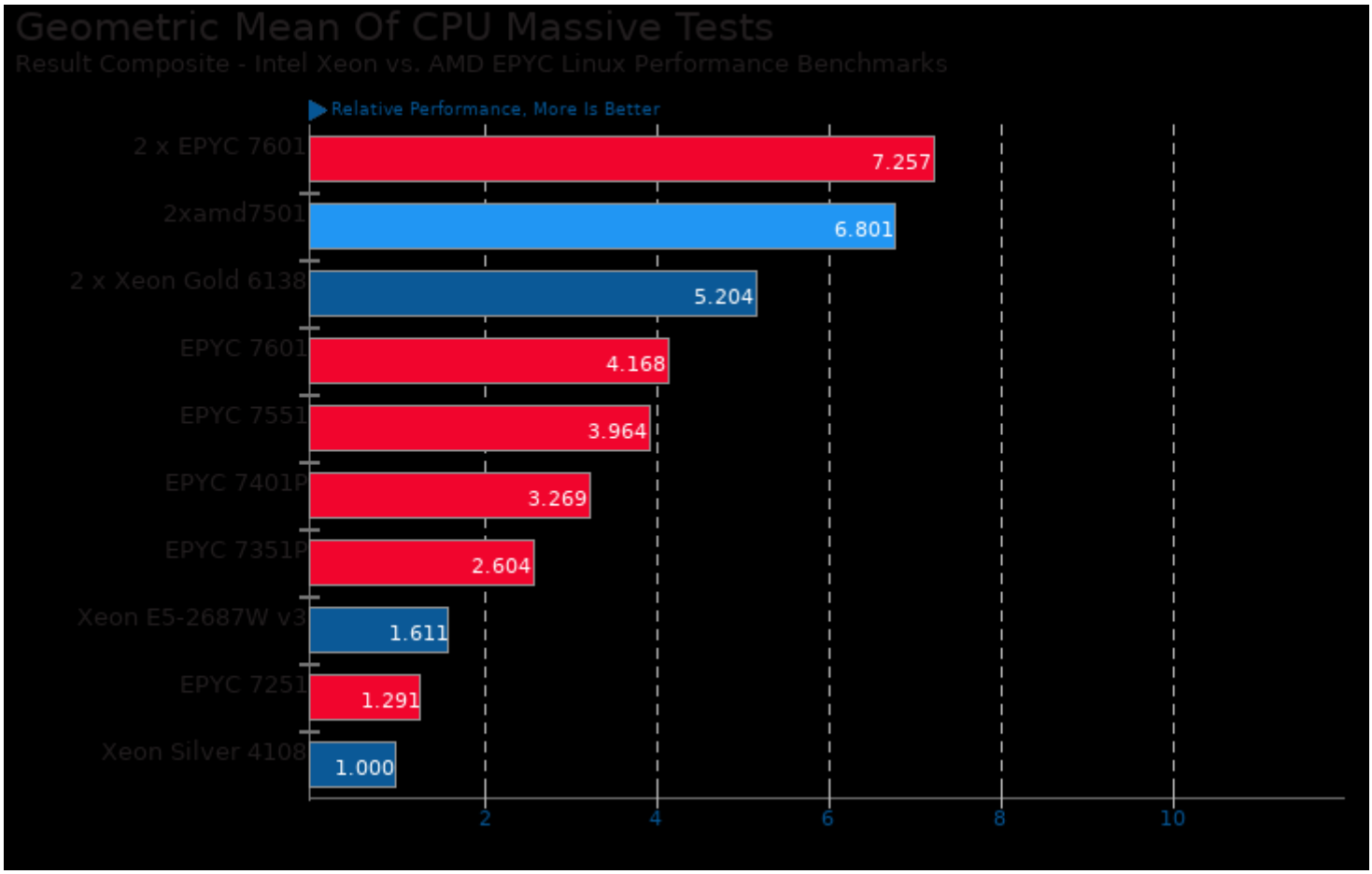
Geometric mean based upon tests: pts/build-linux-kernel and pts/build-llvm



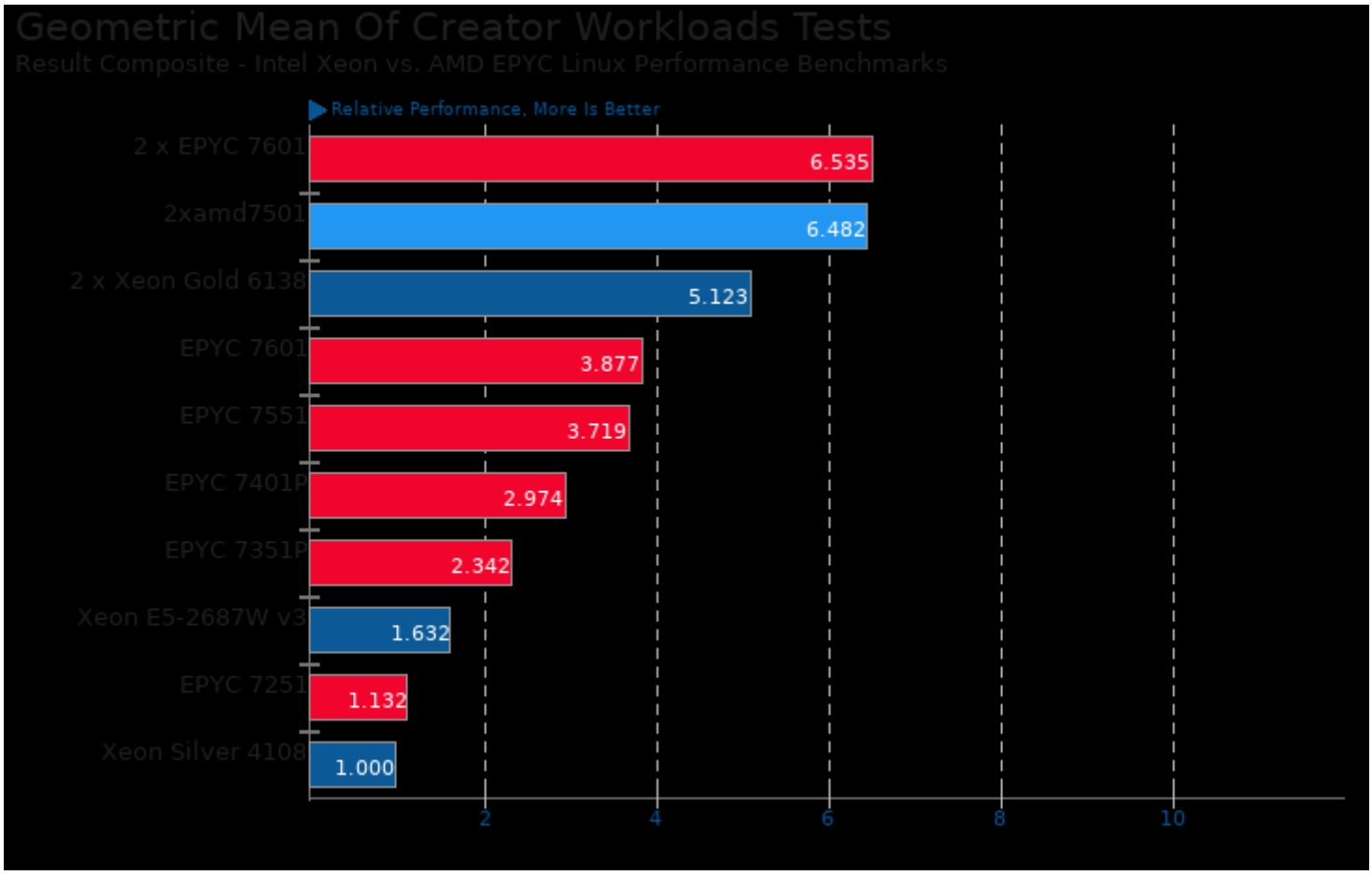
Geometric mean based upon tests: pts/stockfish, pts/build-llvm, pts/compress-7zip, pts/john-the-ripper, pts/openssl and pts/tachyon



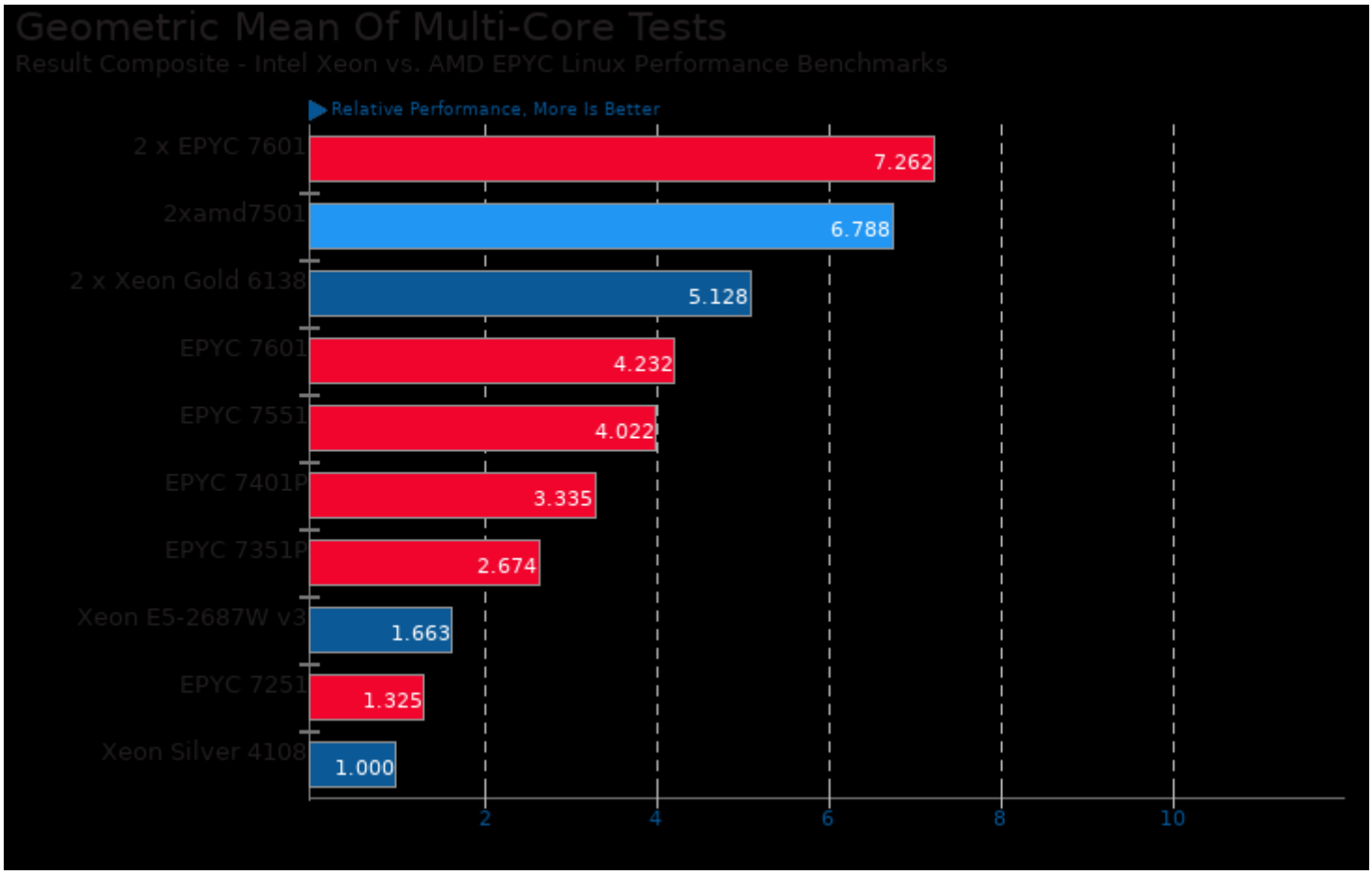
Geometric mean based upon tests: pts/compress-7zip and pts/compress-rar



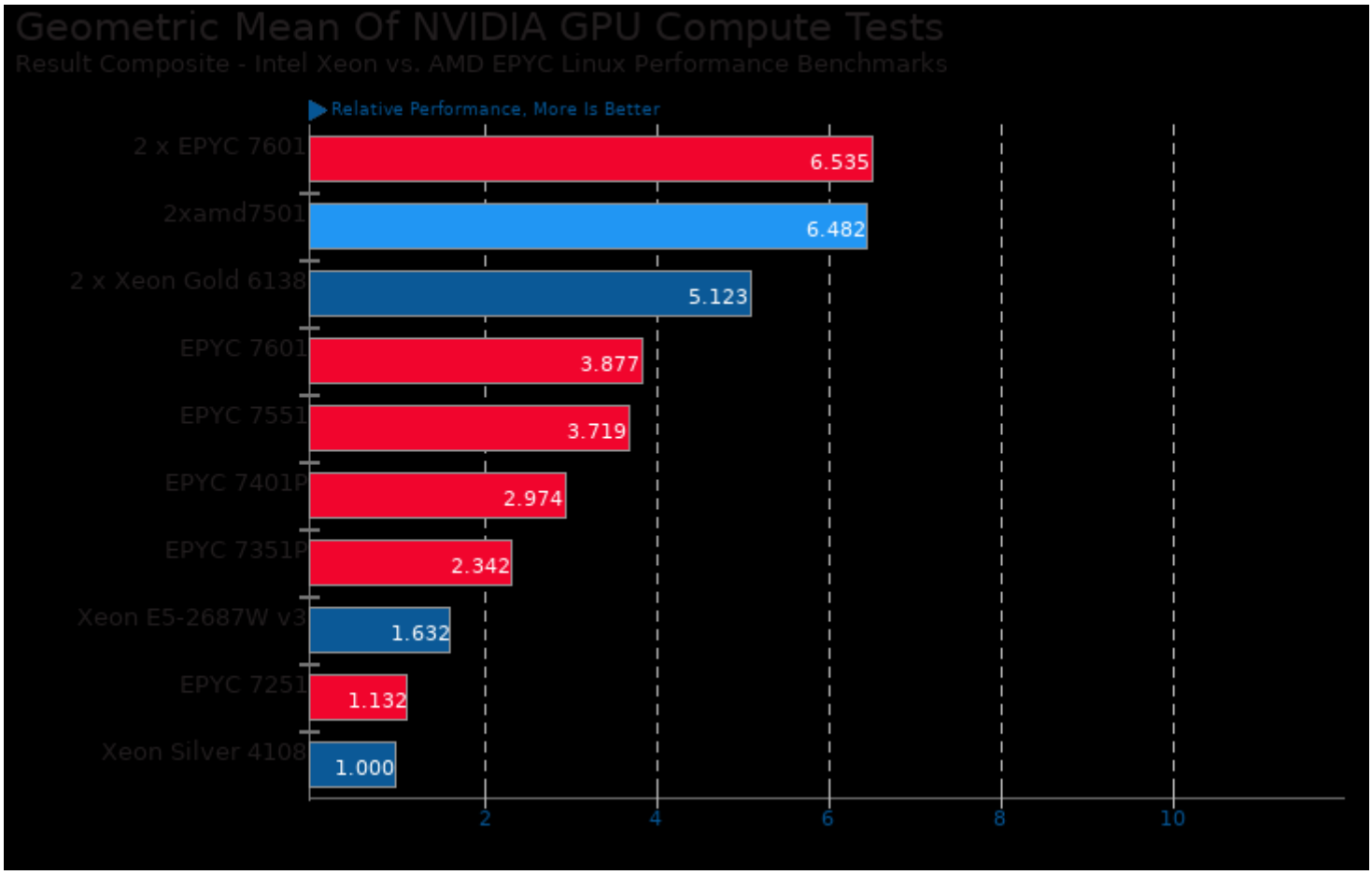
Geometric mean based upon tests: pts/asmfish, pts/build-llvm, pts/build-linux-kernel, pts/compress-7zip, pts/ebizzy, pts/john-the-ripper, pts/openssl, pts/m-queens, pts/namd, pts/povray, pts/primesieve, pts/stockfish, pts/sysbench, pts/tachyon, pts/v-ray and pts/blender



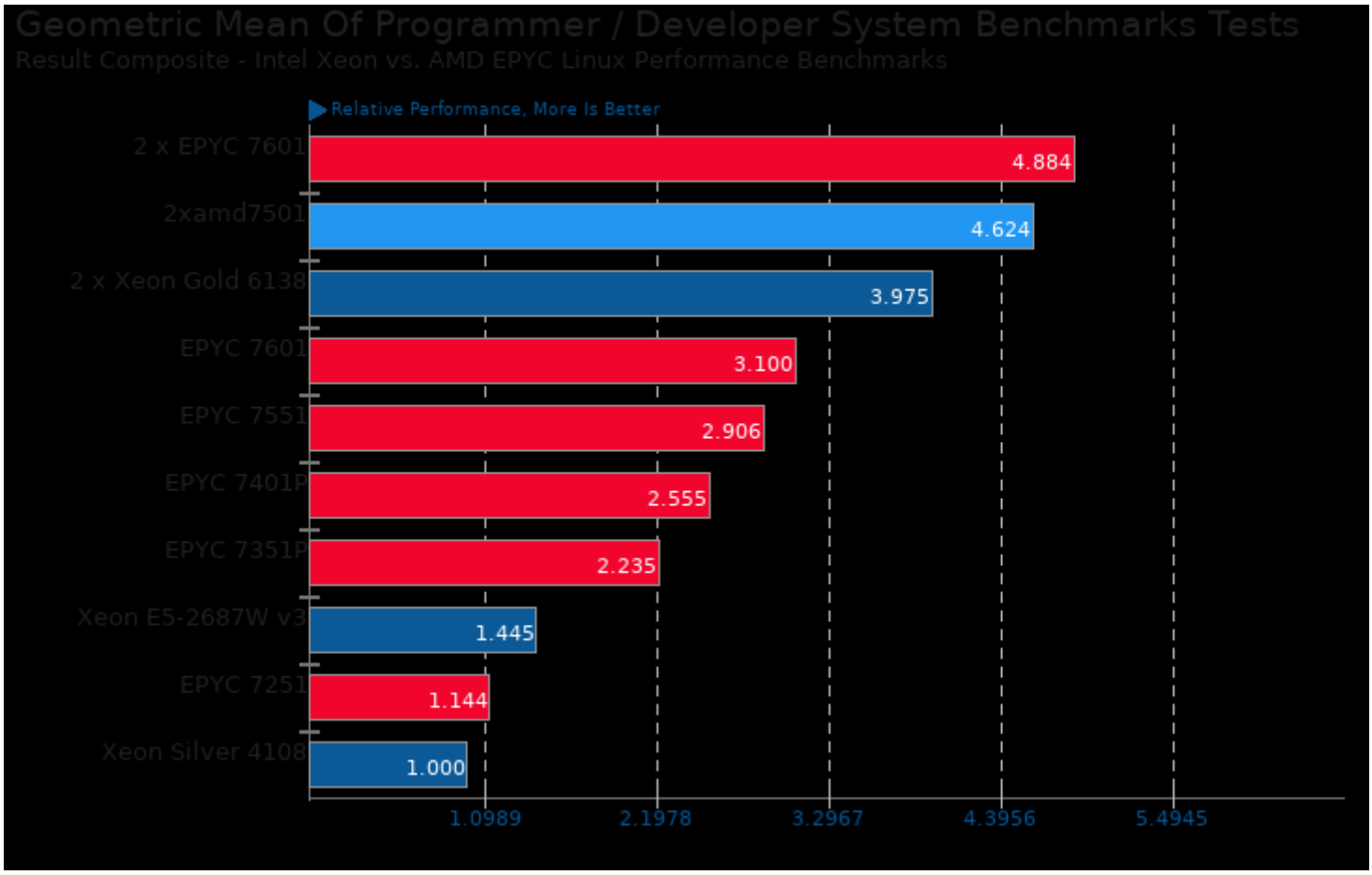
Geometric mean based upon tests: pts/tachyon, pts/povray, pts/blender and pts/v-ray



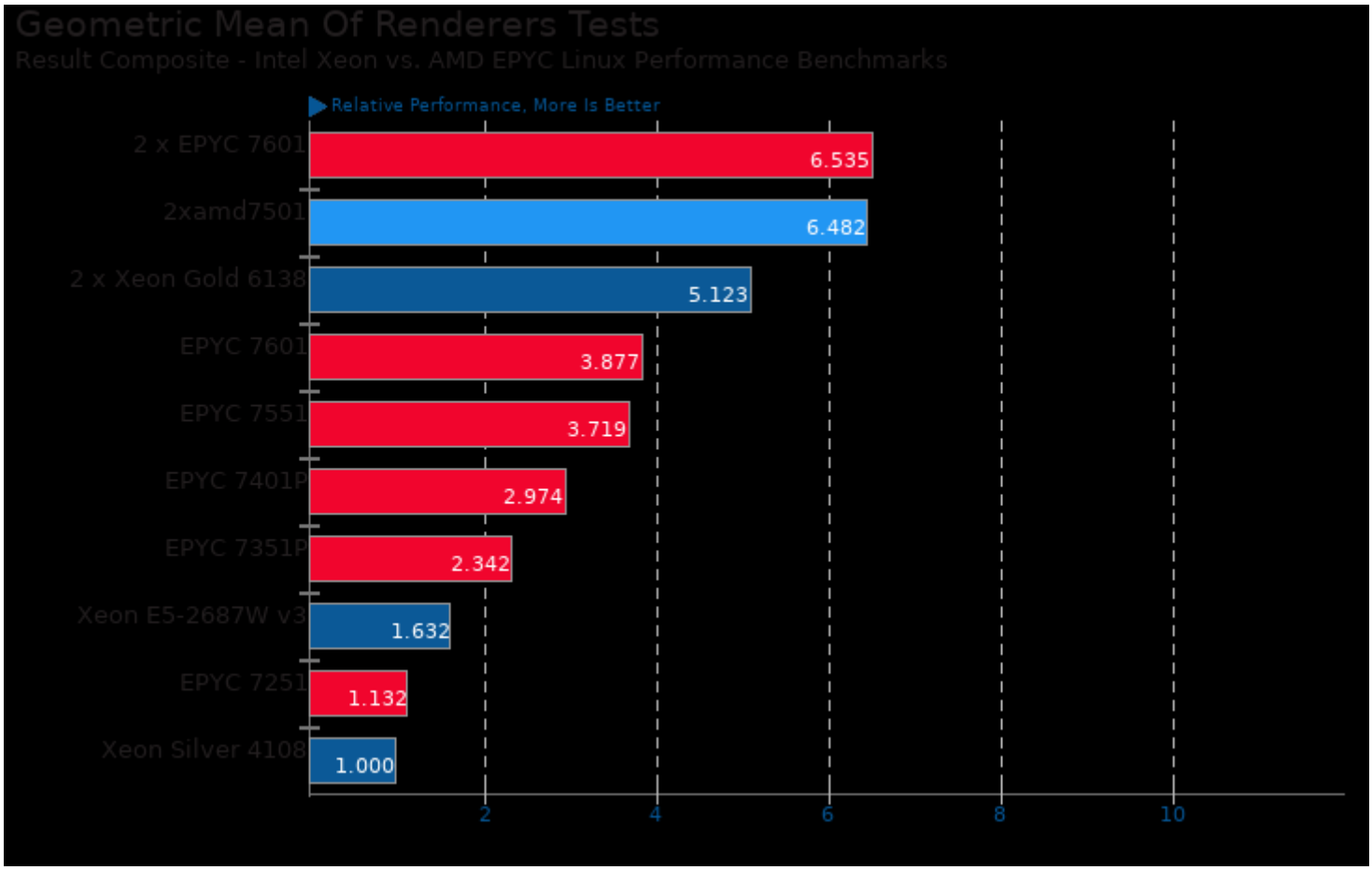
Geometric mean based upon tests: pts/blender, pts/sysbench, pts/tachyon, pts/povray, pts/stockfish, pts/m-queens, pts/primesieve, pts/john-the-ripper, pts/namd, pts/asmfish, pts/ebizzy, pts/compress-7zip, pts/build-linux-kernel, pts/build-llvm and pts/v-ray



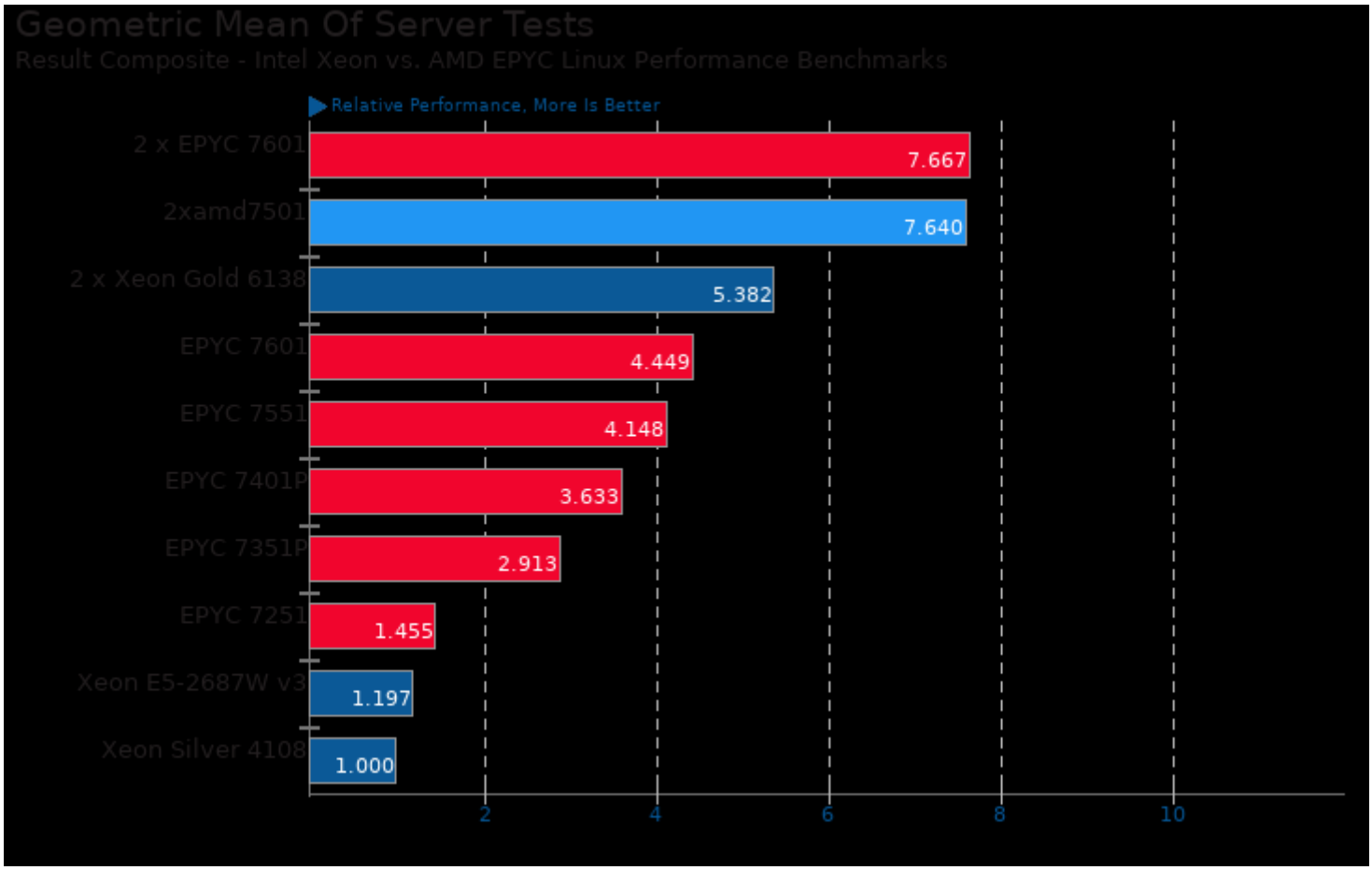
Geometric mean based upon tests: pts/v-ray and pts/blender



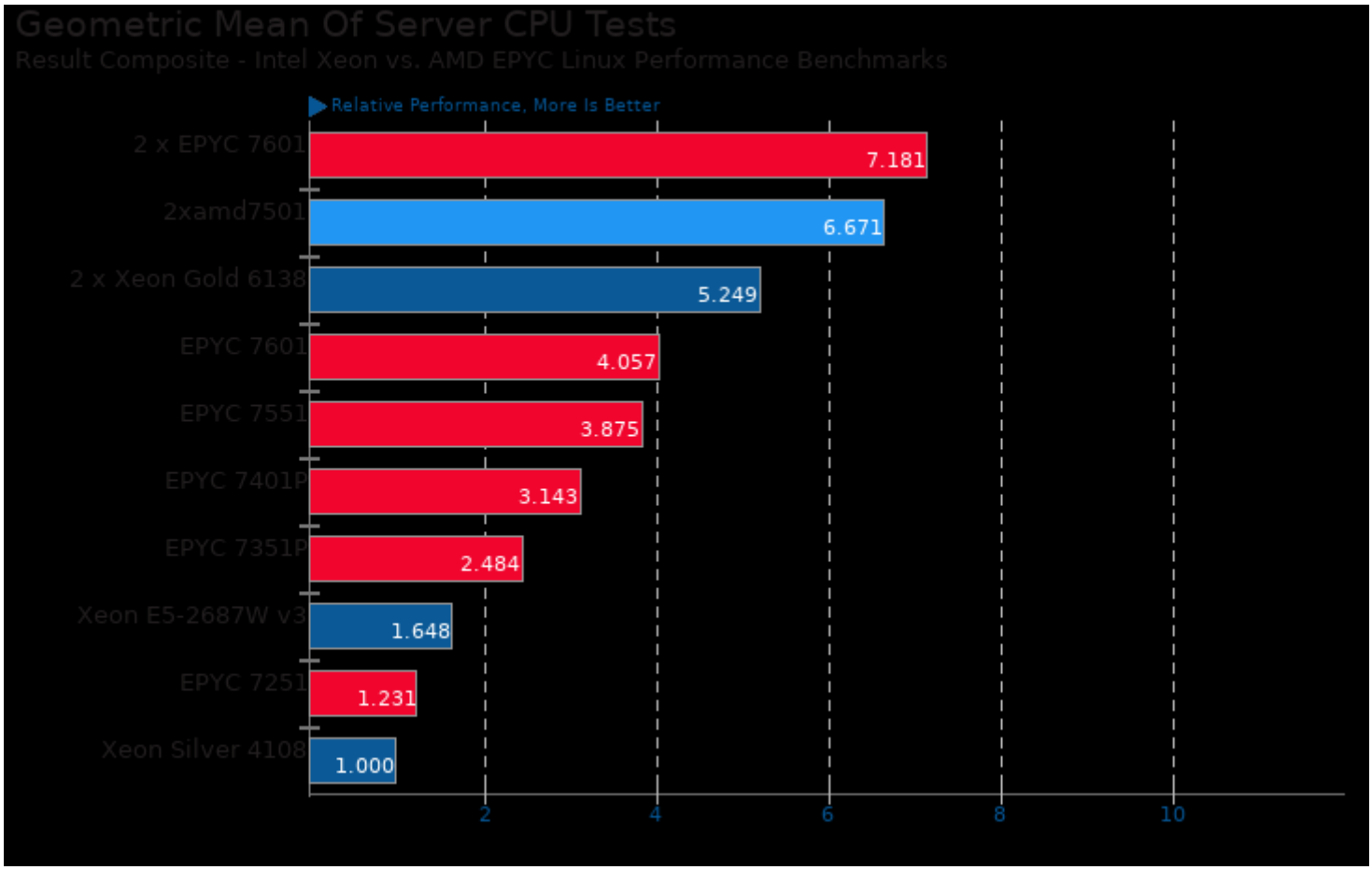
Geometric mean based upon tests: pts/build-linux-kernel and pts/build-llvm



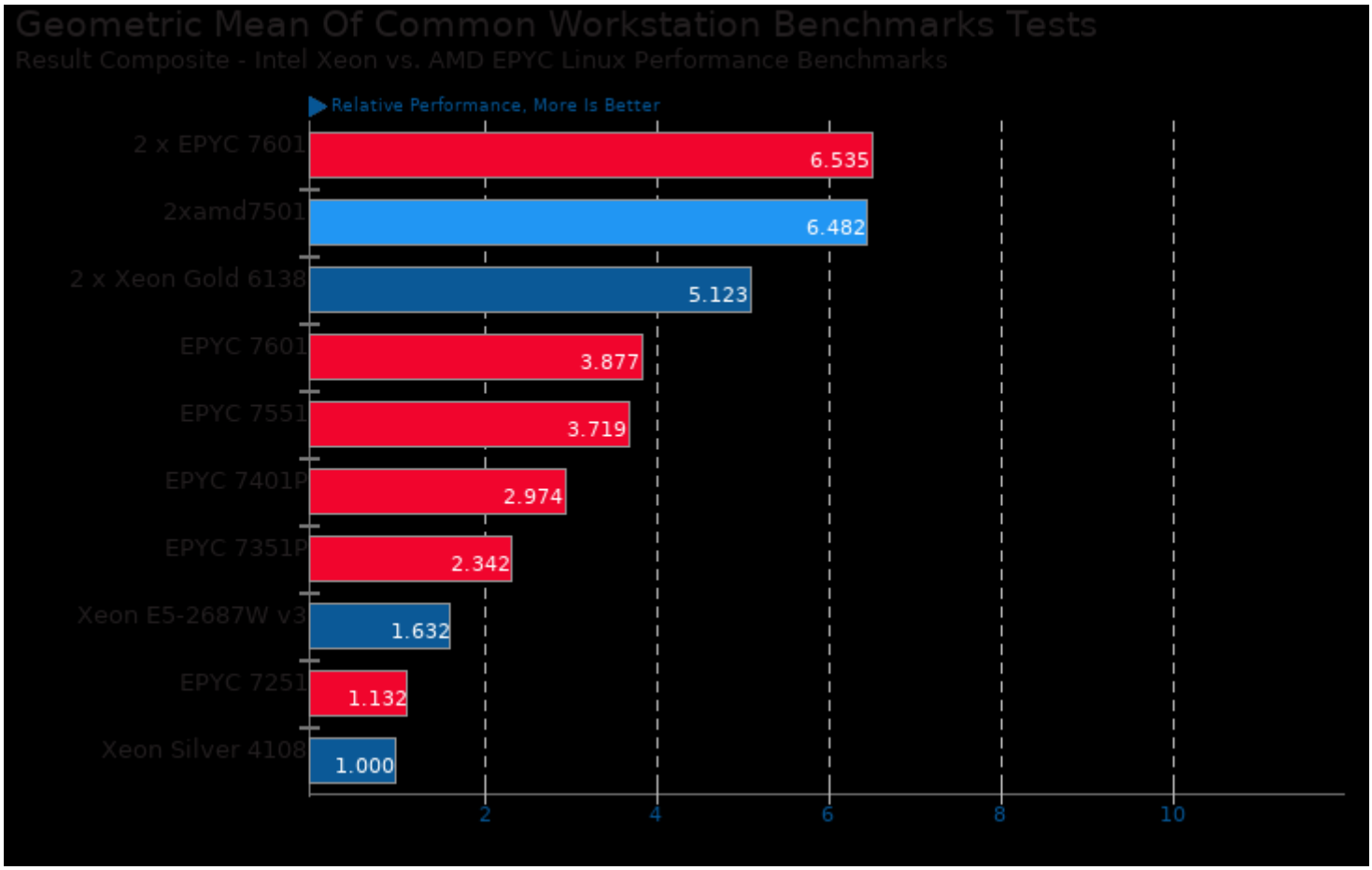
Geometric mean based upon tests: pts/tachyon, pts/povray, pts/blender and pts/v-ray



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



Geometric mean based upon tests: pts/namd, pts/john-the-ripper, pts/compress-7zip, pts/stockfish, pts/asmfish, pts/build-linux-kernel, pts/build-llvm, pts/povray, pts/m-queens, pts/openssl, pts/sysbench and pts/blender



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

This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 05:57.