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Windows Server 2019 vs. Linux OS Benchmarks vs. FreeBSD On Intel Xeon Server

Tests for a future article by Michael Larabel for Phoronix.

Automated Executive Summary

Clear Linux 26850 had the most wins, coming in first place for 43% of the tests.

Based on the geometric mean of all complete results, the fastest (Clear Linux 26850) was 7.041x the speed of the slowest (FreeBSD 11.2).

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

OSBench (Test: Create Threads) at 1750.819x
ebizzy at 736.294x
OSBench (Test: Create Files) at 79.153x
TTSIOD 3D Renderer (Phong Rendering With Soft-Shadow Mapping) at 30.69x
Perl Benchmarks (Test: Interpreter) at 20.152x
CacheBench (Test: Read / Modify / Write) at 9.216x
Phoronix Test Suite Self Test (Test: List Suites) at 8.475x
GraphicsMagick (Operation: Sharpen) at 7x
SciMark (Computational Test: Composite) at 6.435x
GraphicsMagick (Operation: Enhanced) at 5.6x.

Test Systems:

Windows Server 2016

Processor: 2 x Intel Xeon Gold 6138 @ 2.00GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106, Memory: 12 x 8192 MB 2666MHz Micron 9ASF1G72PZ-2G6B1, Disk: 233GB Samsung SSD 970 EVO 250GB, Graphics: Microsoft Basic Display, Network: Intel I210 Gigabit Connection + Intel I210 Gigabit Connection #2 + Microsoft ISATAP + Microsoft ISATAP #2

OS: Microsoft Windows Server 2016 Essentials Build 14393, Kernel: 10.0 (x86_64), Display Driver: 10.0.14393.0, Compiler: GCC 7.1.0, File-System: NTFS, Screen Resolution: 1024x768

Windows Server 2019

Processor: 2 x Intel Xeon Gold 6138 @ 2.00GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106, Memory: 12 x 8192 MB 2666MHz Micron 9ASF1G72PZ-2G6B1, Disk: 233GB Samsung SSD 970 EVO 250GB, Graphics: Microsoft Basic Display, Network: Intel I210 Gigabit Connection + Intel I210 Gigabit Connection #2

OS: Microsoft Windows Server 2019 Essentials Build 17763, Kernel: 10.0 (x86_64), Display Driver: 10.0.17763.1, Compiler: GCC 7.1.0, File-System: NTFS, Screen Resolution: 1024x768

Python Notes: Python 2.7.15

Windows Server 2019 WSL

Processor: 2 x Intel Xeon Gold 6138 @ 2.00GHz (40 Cores / 80 Threads), Memory: 65536MB, Disk: 233GB

OS: Ubuntu 18.04, Kernel: 4.4.0-17763-Microsoft (x86_64), Compiler: GCC 7.3.0, File-System: wslfs

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

CentOS 7.6

Processor: 2 x Intel Xeon Gold 6138 @ 3.70GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106 (V1.02.B20 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 95232MB, Disk: Samsung SSD 970 EVO 250GB, Graphics: ASPEED Family, Monitor: VE228, Network: Intel I210 Gigabit Connection

OS: CentOS Linux 7, Kernel: 3.10.0-957.1.3.el7.x86_64 (x86_64), Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.20.1, Display Driver: modesetting 1.20.1, OpenGL: 2.1 Mesa 18.0.5 (LLVM 6.0 256 bits), Compiler: GCC 4.8.5 20150623, File-System: xfs, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-redhat-linux --disable-libgcj --disable-libunwind-exceptions --enable-__cxa_atexit --enable-bootstrap --enable-checking=release --enable-gnu-indirect-function --enable-gnu-unique-object --enable-initfini-array --enable-languages=c,c++,objc,obj-c++,java,fortran,ada,go,lto --enable-plugin --enable-shared --enable-threads=posix --mandir=/usr/share/man --with-arch_32=x86-64 --with-linker-hash-style=gnu --with-tune=generic
Disk Notes: NONE / attr2,inode64,noquota,relatime,rw,seclabel
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: SELinux

Clear Linux 26850

Processor: 2 x Intel Xeon Gold 6138 @ 3.70GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106 (V1.02.B20 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 96256MB, Disk: Samsung SSD 970 EVO 250GB, Graphics: llvmpipe 93GB, Monitor: VE228, Network: Intel I210 Gigabit Connection

OS: Clear Linux OS 26850, Kernel: 4.19.11-673.native (x86_64), Desktop: GNOME Shell 3.30.2, Display Server: X Server 1.20.3, Display Driver: modesetting 1.20.3, OpenGL: 3.3 Mesa 19.0.0-devel (LLVM 7.0 256 bits), Compiler: GCC 8.2.1 20180502 + Clang 7.0.0 + LLVM 7.0.0, File-System: ext4, Screen Resolution: 1920x1080

Environment Notes:
CFFLAGS=-g-O3-feliminate-unused-debug-types-pipe-Wall-Wp-D_FORTIFY_SOURCE=2-fexceptions-fstack-protector--param=ssp-buffer-size=32-Wl--copy-dt-needed-entries-m64-fasynchronous-unwind-tables-Wp-D_REENTRANT-ftree-loop-distribute-patterns-Wl-z-Wl now-Wl-z-Wl relro-malign-data=abi-fno-semantic-interposition-ftree-vectorize-ftree-loop-vectorize-Wl-sort-common-Wl--enable-new-dtags MESA_GLSL_CACHE_DISABLE=0
CFLAGS=-g-O3-feliminate-unused-debug-types-pipe-Wall-Wp-D_FORTIFY_SOURCE=2-fexceptions-fstack-protector--param=ssp-buffer-size=32-Wformat-Wformat-security-Wl--copy-dt-needed-entries-m64-fasynchronous-unwind-tables-Wp-D_REENTRANT-ftree-loop-distribute-patterns-Wl-z-Wl
relro-fno-semantic-interposition-ffat-lto-objects-fno-signed-zeros-fno-trapping-math-fassociative-math-Wl-sort-common-Wl--enable-new-dtags-mtune=skylake
CXXFLAGS=-g-O3-feliminate-unused-debug-types-pipe-Wall-Wp-D_FORTIFY_SOURCE=2-fexceptions-fstack-protector--param=ssp-buffer-size=32-Wformat-Wformat-security-Wl--copy-dt-needed-entries-m64-fasynchronous-unwind-tables-Wp-D_REENTRANT-ftree-loop-distribute-patterns-Wl-z-Wl
relro-fno-semantic-interposition-ffat-lto-objects-fno-signed-zeros-fno-trapping-math-fassociative-math-Wl-sort-common-Wl--enable-new-dtags-mtune=skylake-fvisibility-inlines-hidden-Wl--enable-new-dtags
FFLAGS=-g-O3-feliminate-unused-debug-types-pipe-Wall-Wp-D_FORTIFY_SOURCE=2-fexceptions-fstack-protector--param=ssp-buffer-size=32-Wl--copy-dt-needed-entries-m64-fasynchronous-unwind-tables-Wp-D_REENTRANT-ftree-loop-distribute-patterns-Wl-z-Wl
relro-malign-data=abi-fno-semantic-interposition-ftree-vectorize-ftree-loop-vectorize-Wl--enable-new-dtags THEANO_FLAGS=floatX=float32 openmp=true gcc.cxxflags="-ftree-vectorize-mavx"
Compiler Notes: --build=x86_64-generic-linux --disable-libmpx --disable-libunwind-exceptions --disable-multiarch --disable-vtable-verify --enable-__cxa_atexit --enable-bootstrap --enable-clocale=gnu --enable-gnu-indirect-function --enable-languages=c,c++,fortran,go --enable-ld=default --enable-libstdcxx-pch --enable-lto --enable-multilib --enable-plugin --enable-shared --enable-threads=posix --exec-prefix=/usr --includedir=/usr/include --target=x86_64-generic-linux --with-arch=westmere --with-glibc-version=2.19 --with-gnu-ld --with-isl --with-ppl=yes --with-tune=haswell
Disk Notes: MQ-DEADLINE / relatime,rw,stripe=256
Processor Notes: Scaling Governor: intel_pstate performance
Security Notes: KPTI + __user pointer sanitization + Full generic retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

Debian 9.6

Processor: 2 x Intel Xeon Gold 6138 @ 3.70GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106 (V1.02.B20 BIOS), Chipset: Intel Device 2020, Memory: 96256MB, Disk: Samsung SSD 970 EVO 250GB, Graphics: LLVMpipe, Monitor: VE228, Network: Intel I210 Gigabit Connection

OS: Debian 9.6, Kernel: 4.9.0-8-amd64 (x86_64), Desktop: GNOME Shell 3.22.3, Display Server: X Server 1.19.2, Display Driver: modesetting 1.19.2, OpenGL: 3.3 Mesa 13.0.6 Gallium 0.4 (LLVM 3.9 256 bits), Compiler: GCC 6.3.0 20170516, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,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-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-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic -v
Disk Notes: none / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave
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

Fedora Server 29

Processor: 2 x Intel Xeon Gold 6138 @ 3.70GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106 (V1.02.B20 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 96256MB, Disk: Samsung SSD 970 EVO 250GB, Graphics: ASPEED Family, Monitor: VE228, Network: Intel I210 Gigabit Connection

OS: Fedora 29, Kernel: 4.19.10-300.fc29.x86_64 (x86_64), Compiler: GCC 8.2.1 20181215, File-System: xfs, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-redhat-linux --disable-libunwind-exceptions --enable-__cxa_atexit --enable-bootstrap --enable-cet --enable-checking=release --enable-gnu-indirect-function --enable-gnu-unique-object --enable-initfini-array --enable-languages=c,c++,fortran,objc,obj-c++,ada,go,lto --enable-libmpx --enable-multilib

--enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --mandir=/usr/share/man --with-arch_32=i686 --with-gcc-major-version-only --with-isl --with-linker-hash-style=gnu --with-tune=generic --without-cuda-driver
Disk Notes: NONE / attr2,inode64,noquota,relatime,rw,seclabel
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: SELinux + KPTI + __user pointer sanitization + Full generic retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

Ubuntu 18.10

Processor: 2 x Intel Xeon Gold 6138 @ 3.70GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106 (V1.02.B20 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 96256MB, Disk: Samsung SSD 970 EVO 250GB, Graphics: ASPEED Family, Monitor: VE228, Network: Intel I210 Gigabit Connection

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: modesetting 1.20.1, OpenGL: 3.3 Mesa 18.2.2 (LLVM 7.0 256 bits), Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 1920x1080

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
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave
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

openSUSE Leap 15.0

Processor: 2 x Intel Xeon Gold 6138 @ 3.70GHz (40 Cores / 80 Threads), Motherboard: TYAN S7106 (V1.02.B20 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 96256MB, Disk: Samsung SSD 970 EVO 250GB, Graphics: ASPEED Family, Monitor: VE228, Network: Intel I210 Gigabit Connection

OS: openSUSE Leap 15.0, Kernel: 4.12.14-lp150.12.28-default (x86_64), Desktop: KDE Plasma 5.12.6, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.2 (LLVM 5.0 256 bits), Compiler: GCC 7.3.1 20180323 [gcc-7-branch revision 258812], File-System: xfs, Screen Resolution: 1920x1080

Environment Notes: LIBGL_DEBUG=quiet
Compiler Notes: --build=x86_64-suse-linux --disable-libcc1 --disable-libssp --disable-libstdcxx-pch --disable-libvtv --disable-plugin --disable-werror --enable-__cxa_atexit --enable-checking=release --enable-gnu-indirect-function --enable-languages=c,c++,objc,fortran,obj-c++,ada,go --enable-libstdcxx-allocator=new --enable-linux-futex --enable-multilib --enable-offload-targets=hsa,nvptx-none=/usr/nvptx-none, --enable-ssp --enable-version-specific-runtime-libs --host=x86_64-suse-linux --mandir=/usr/share/man --with-arch-32=x86-64 --with-gcc-major-version-only --with-slibdir=/lib64 --with-tune=generic --without-cuda-driver --without-system-libunwind
Disk Notes: NONE / attr2,inode64,noquota,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave
Security Notes: KPTI + __user pointer sanitization + Indirect Branch Restricted Speculation IBPB IBRS_FW + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

FreeBSD 11.2

Processor: Intel Xeon Gold 6138 @ 2.00GHz (80 Cores), Motherboard: TYAN B7106G24EV4HR, Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 97024MB, Disk: Generic NVMe Device, Graphics: ASPEED Family

OS: FreeBSD, Kernel: 11.2-RELEASE (x86_64), Compiler: Clang 6.0.0 (SVN 326565), File-System: zfs, Screen Resolution: 1280x1024

Python Notes: Python 2.7.15 + Python 3.6.6
Security Notes: KPTI

FreeBSD 12.0

Processor: Intel Xeon Gold 6138 @ 2.00GHz (80 Cores), Motherboard: TYAN B7106G24EV4HR, Chipset: Intel Sky

Lake-E DMI3 Registers, Memory: 97024MB, Disk: Generic NVMe Device, Graphics: ASPEED Family

OS: FreeBSD, Kernel: 12.0-RELEASE (x86_64), Compiler: Clang 6.0.1 (SVN 335540), File-System: zfs, Screen Resolution: 800x600

Python Notes: Python 2.7.15 + Python 3.6.6
Security Notes: KPTI

FreeBSD 12.0 - GCC8

Processor: Intel Xeon Gold 6138 @ 2.00GHz (80 Cores), Motherboard: TYAN B7106G24EV4HR, Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 97024MB, Disk: Generic NVMe Device, Graphics: ASPEED Family

OS: FreeBSD, Kernel: 12.0-RELEASE (x86_64), Compiler: GCC 8.2.0 + Clang 6.0.1 (SVN 335540), File-System: zfs, Screen Resolution: 800x600

Compiler Notes: --build=x86_64-portbld-freebsd12.0 --disable-nls --enable-gnu-indirect-function --enable-languages=c,c++,objc,fortran --localstatedir=/var --mandir=/usr/local/man --with-as=/usr/local/bin/as --with-build-config=bootstrap-debug --with-gmp=/usr/local --with-ld=/usr/local/bin/ld
Python Notes: Python 2.7.15 + Python 3.6.6
Security Notes: KPTI

	Windows Server 2016	Windows Server 2019	Windows Server 2019	CentOS 7.6	Clear Linux 26850	Debian 9.6	Fedora Server 29	Ubuntu 18.10	openSUSE Leap 15.0	FreeBSD 11.2	FreeBSD 12.0	FreeBSD 12.0 - GCC8
SQLite - T.S.I (sec)	82.01	90.85	**150.25**	58.78	39.63	40.91	59.12	41.74	41.46	36.91	31.16	**31.15**
Normalized	37.98%	34.29%	20.73%	52.99%	78.6%	76.14%	52.69%	74.63%	75.13%	84.39%	99.97%	100%
Standard Deviation	1.8%	0.7%	0.8%	0.2%	0.1%	0.3%	0.6%	0.8%	0.2%	0.7%	0.2%	0.1%
Flexible IO Tester - Rand Read - AIO - No - Yes - 4KB (IOPS)	129667	**133000**		109000	122000	108000	109000	**107000**	110000			
Normalized	97.49%	100%		81.95%	91.73%	81.2%	81.95%	80.45%	82.71%			
Standard Deviation	0.4%											
Flexible IO Tester - Rand Write - AIO - No - Yes - 4KB (IOPS)	**145333**	147333		180667	277333	**329000**	300083	309250	233000			
Normalized	44.17%	44.78%		54.91%	84.3%	100%	91.21%	94%	70.82%			
Standard Deviation	2.4%	1%		1.3%	0.8%	2.9%	4.3%	3.1%	6.2%			
Flexible IO Tester - Seq Read - AIO - No - Yes - 2MB (MB/s)		**558**		**558**	**1555**	**558**	**558**	560	**558**			
Normalized		35.88%		35.88%	100%	35.88%	35.88%	36.01%	35.88%			
Standard Deviation				0.4%	0.7%		0.1%					

Flexible IO Tester - Seq Write - AIO - No - Yes - 2MB (MB/s)		1467		1469	1468	1468	1468	1467	1469			
Normalized		99.86%		100%	99.93%	99.93%	99.93%	99.86%	100%			
Standard Deviation				0%		0%		0%	0%			
IOzone - 1MB - 8GB - Write Performance (MB/s)	711	710	701	868	405	399		404	885	3199	3129	3070
Normalized	22.23%	22.19%	21.91%	27.13%	12.66%	12.47%		12.63%	27.66%	100%	97.81%	95.97%
Standard Deviation	19.5%	23.5%	16.4%	1.8%	45.3%	41.8%		43.7%	1.6%	1.1%	3.3%	2.5%
Go Benchmarks - json (ns/op)	4349913	4397804	4235566		2839813	2673470	2714132	2478529	3031769	3299666	3255501	3179735
Normalized	56.98%	56.36%	58.52%		87.28%	92.71%	91.32%	100%	81.75%	75.11%	76.13%	77.95%
Standard Deviation	1.8%	0.6%	2.7%		1.7%	1.3%	2.7%	3.2%	1.8%	1.4%	1%	3%
Go Benchmarks - build (ns/op)	3664173600	3603409273	2685992400		1909032026	1384622584	2470530204	2088941138	2231152383	5428939926	3747584889	3752981588
Normalized	37.79%	38.43%	51.55%		72.53%	100%	56.05%	66.28%	62.06%	25.5%	36.95%	36.89%
Standard Deviation	3.4%	9.1%	3.1%		0.3%	0.6%	0.7%	0.9%	1.1%	1.6%	0.4%	0.5%
Go Benchmarks - garbage (ns/op)	9322024	9120904	1018084		1171475	1190018	8728644	8598154	1115094	9648014	9414914	9309444
Normalized	92.23%	94.27%	84.45%		73.4%	72.25%	98.51%	100%	77.11%	89.12%	91.32%	92.36%
Standard Deviation	0.9%	0.7%	1.9%		1.3%	0.7%	1.4%	1.1%	0.9%	1.4%	2.1%	2.3%
Java SciMark - Composite (Mflops)	2130	2182	2217	2156	2257	2222	2201	2242	1860	1225	1235	1228
Normalized	94.37%	96.68%	98.23%	95.53%	100%	98.45%	97.52%	99.34%	82.41%	54.28%	54.72%	54.41%
Standard Deviation	1.1%	0.4%	0.6%	0.7%	0.5%	3.7%	0.8%	0.7%	7.1%	0.8%	0.4%	0.5%
DaCapo Benchmark - Jython (msec)	4677	4609	4482	4415	3567	3784	4443	3922	10999	7034	6342	6350
Normalized	76.27%	77.39%	79.59%	80.79%	100%	94.27%	80.28%	90.95%	32.43%	50.71%	56.24%	56.17%
Standard Deviation	1.4%		11.9%	1.7%	0.7%	2.2%	0.9%	2.5%	3.4%	2.2%	1.9%	2.7%
DaCapo Benchmark - Tradebeans (msec)	10299	4015	4286	12005	3337	9090	13301	12693		9342	7020	7035
Normalized	32.4%	83.11%	77.86%	27.8%	100%	36.71%	25.09%	26.29%		35.72%	47.54%	47.43%
Standard Deviation	1.5%	0.8%	1.8%	5.6%		1.8%	1.9%	3.3%		1.6%	0.7%	0.9%
Fhourstones - C.C.4.S (Kpos / sec)	11923	12109	12348	12984	12804	12663	12865	12730	12086	7720	8237	8210
Normalized	91.83%	93.26%	95.1%	100%	98.61%	97.53%	99.08%	98.04%	93.08%	59.46%	63.44%	63.23%
Standard Deviation	0.1%	0.3%	0.2%	0.4%	7.2%	0.4%	0.1%	0.1%	2.2%	1.2%	1.6%	4.1%
SciMark - Composite (Mflops)	575	579	584	610	2085	610	591	588	529	361	361	324
Normalized	27.58%	27.77%	28.01%	29.26%	100%	29.26%	28.35%	28.2%	25.37%	17.31%	17.31%	15.54%
Standard Deviation	0.3%	0.1%	0.1%	0.2%	0.5%	0%	0.1%	0%	1.6%	0.3%	1.4%	0.6%

Crafty - Elapsed Time (Nodes/s)	7143491	7242616	7287127	7525680	**7852391**	7359965	7710582	7392097	**6351901**			
Normalized	90.97%	92.23%	92.8%	95.84%	100%	93.73%	98.19%	94.14%	80.89%			
Standard Deviation	0.1%	0.1%	0.3%	0.2%	0.6%	0.5%	0.4%	0.1%	0.4%			
x264 - H.2.V.E (FPS)	106.80	116.86	**96.58**		117.43	**124.38**		113.36	98.00	117.42	119.65	
Normalized	85.87%	93.95%	77.65%		94.41%	100%		91.14%	78.79%	94.4%	96.2%	
Standard Deviation	3.2%	0.4%	0.2%		1.6%	2.8%		1.9%	0.4%	8.1%	5.8%	
GraphicsMagick - Rotate (Iterations/min)	157	162	190	219	**236**	215	210	212		126	143	**125**
Normalized	66.53%	68.64%	80.51%	92.8%	100%	91.1%	88.98%	89.83%		53.39%	60.59%	52.97%
GraphicsMagick - Resizing (Iterations/min)	158	161	186	213	202	**214**	186	197		**64**	73	117
Normalized	73.83%	75.23%	86.92%	99.53%	94.39%	100%	86.92%	92.06%		29.91%	34.11%	54.67%
Standard Deviation	0.7%		0.6%	0.5%	0.6%		1.7%	0.8%				
GraphicsMagick - HWB Color Space	183	187	213	226	227	228	**229**	**229**		**81**	89	126
Normalized	79.91%	81.66%	93.01%	98.69%	99.13%	99.56%	100%	100%		35.37%	38.86%	55.02%
Standard Deviation				0.5%		0.3%	0.3%			2.8%		
7-Zip Compression - C.S.T (MIPS)	80309	74687	**59043**	154222	**158228**	151265	137716	146543	151745			95744
Normalized	50.76%	47.2%	37.32%	97.47%	100%	95.6%	87.04%	92.62%	95.9%			60.51%
Standard Deviation	1.4%	1.4%	1.2%	0.7%	0.7%	0.2%	2%	0.3%	1%			3.2%
Stockfish - Total Time (Nodes/s)	68280715	68415431	**36403185**	71962824	71845579	69954534	71680202	67990274	**73598167**		62697440	63230205
Normalized	92.78%	92.96%	49.46%	97.78%	97.62%	95.05%	97.39%	92.38%	100%		85.19%	85.91%
Standard Deviation	2.7%	0.6%	2.1%	1.8%	1.5%	2.4%	0.5%	1.2%	1.4%		1%	1.8%
ebizzy (Records/s)	**1347**	3235	558870	454533	**991788**	928500	943502	984378	951153			
Normalized	0.14%	0.33%	56.35%	45.83%	100%	93.62%	95.13%	99.25%	95.9%			
Standard Deviation	0.6%	0.5%	7%	10.3%	1.7%	5.4%	3.4%	3.3%	4.7%			
Node.js Octane Benchmark (Score)	36994	**39622**	36906		38649		39502	36760	22434	**20377**	21993	22017
Normalized	93.37%	100%	93.15%		97.54%		99.7%	92.78%	56.62%	51.43%	55.51%	55.57%
Standard Deviation	1.7%	0.5%	0.7%		1.7%		0.4%	0.5%	1%	2.5%	1.2%	0.6%
FLAC Audio Encoding - WAV To FLAC (sec)	10.30	9.91	10.53	11.82	9.99	**9.55**	10.22	10.27	10.51	**22.58**	21.96	17.90
Normalized	92.72%	96.37%	90.69%	80.8%	95.6%	100%	93.44%	92.99%	90.87%	42.29%	43.49%	53.35%
Standard Deviation	1.2%	0.5%	0.3%	1.9%	0.5%	0.3%	0.4%	0.2%	0.3%	0.8%	0.2%	0.2%
m-queens - Time To Solve (sec)	**55.41**	55.36	55.12	28.14	28.13	**27.68**	27.97	28.18	28.25			38.39
Normalized	49.95%	50%	50.22%	98.37%	98.4%	100%	98.96%	98.23%	97.98%			72.1%
Standard Deviation	0.1%	0.1%	0.1%	0.3%	0.5%	0.1%	0.4%	1%	0.4%			0.2%
Minion - Graceful (sec)	**58.99**	58.47	55.49	53.93	**53.89**	54.88	54.34	54.42				
Normalized	91.35%	92.17%	97.12%	99.93%	100%	98.2%	99.17%	99.03%				

Standard Deviation	0.2%	0.4%	0.4%	1.6%	0.3%	0.4%	0.1%	0.1%				
Minion - Solitaire (sec)	56.51	55.59	75.73	72.16	72.20	75.14	74.07	75.29				
Normalized	98.37%	100%	73.41%	77.04%	76.99%	73.98%	75.05%	73.83%				
Standard Deviation	0.3%	0.3%	1.2%	0.5%	0.7%	0.5%	0.4%	0.1%				
Minion - Quasigroup	143	141	122	120	115	119	115	120				
Normalized	80.42%	81.56%	94.26%	95.83%	100%	96.64%	100%	95.83%				
Standard Deviation	0.1%	0%	0.1%	0.7%	0.2%	0.4%	0.1%	0.3%				
Perl Benchmarks - Pod2html (sec)	0.18684	0.18264	0.21433	0.13648	0.11578	0.12093	0.11959	0.12032	0.27341	0.30827	0.28068	0.28041
	259	875	206	480	715	206	348	158	609	514	327	235
Normalized	61.97%	63.39%	54.02%	84.84%	100%	95.75%	96.82%	96.23%	42.35%	37.56%	41.25%	41.29%
Standard Deviation	3.4%	0.4%	0.5%	1.3%	0.3%	0.7%	0.1%	0.4%	2.3%	0.2%	0.1%	0.1%
Perl Benchmarks - Interpreter	0.02537	0.01501	0.00820	0.00292	0.00125	0.00256	0.00425	0.00319	0.00415	0.00312	0.00273	0.00275
	739	293	246	759	927	867	515	840	440	916	844	367
Normalized	4.96%	8.39%	15.35%	43.01%	100%	49.02%	29.59%	39.37%	30.31%	40.24%	45.98%	45.73%
Standard Deviation	0.7%	1.6%	8.1%	6.9%	0.3%	0.8%	0.7%	0.1%	0.7%	0.5%	0.1%	0.5%
R Benchmark (sec)	0.7433	0.7360	0.7879		0.4075	0.7889	0.3040	0.7955		1.6705	1.4731	1.4778
Normalized	40.9%	41.3%	38.58%		74.6%	38.53%	100%	38.21%		18.2%	20.64%	20.57%
Standard Deviation	0.6%	0.3%	0.2%		0.6%	2.8%	0.5%	0.1%		2.1%	0.2%	1%
libjpeg-turbo tjbench - D.T (Megapixels/sec)	151	152	152		160	160	160	159	144	79.35	83.13	86.28
Normalized	94.38%	95%	95%		100%	100%	100%	99.38%	90%	49.59%	51.96%	53.93%
Standard Deviation	0.1%	0.2%	0.3%		0.5%	0.1%	0.4%	0.4%	0.1%	0.2%	0.1%	0%
IndigoBench - Bedroom (M samples/s)	3.55	3.55			3.76	3.67		3.63				
Normalized	94.41%	94.41%			100%	97.61%		96.54%				
Standard Deviation	0.9%	0.8%			0.6%	1.4%		1.2%				
IndigoBench - Supercar (M samples/s)	8.28	8.37			7.80	8.12		7.88				
Normalized	98.92%	100%			93.19%	97.01%		94.15%				
Standard Deviation	0.4%	1%			0.3%	0.4%		0.4%				
Blender - BMW27 -	93.13	93.05	144.14	77.22	75.73	76.99	78.43	77.24	80.91			
Normalized	81.32%	81.39%	52.54%	98.07%	100%	98.36%	96.56%	98.05%	93.6%			
Blender - Classroom - CPU-Only (sec)	212	212	325	164	164	169	164	165	170			
Normalized	77.36%	77.36%	50.46%	100%	100%	97.04%	100%	99.39%	96.47%			
Blender - Fishy Cat - CPU-Only (sec)	141	139	213	118	116	117	119	118	120			
Normalized	82.27%	83.45%	54.46%	98.31%	100%	99.15%	97.48%	98.31%	96.67%			
Blender - Barbershop - CPU-Only (sec)	464	461	686	363	364	376	375	374	373			
Normalized	78.23%	78.74%	52.92%	100%	99.73%	96.54%	96.8%	97.06%	97.32%			

Windows Server 2019 vs. Linux OS Benchmarks vs. FreeBSD On Intel Xeon Server

Blender - Pabellon Barcelona - CPU-Only (sec)	236	236	**394**	**201**	**201**	205	203	202	202			
Normalized	85.17%	85.17%	51.02%	100%	100%	98.05%	99.01%	99.5%	99.5%			
PHPBench - P.B.S (Score)	301934	309413	579683	204006	**720713**	481688	584986	593052	**158619**	194244	238285	241691
Normalized	41.89%	42.93%	80.43%	28.31%	100%	66.83%	81.17%	82.29%	22.01%	26.95%	33.06%	33.53%
Standard Deviation	1.8%	1.2%	0.1%	2.1%	0.4%	0.5%	0.1%	0%	1.1%	2%	0.4%	0.1%
Git - T.T.C.C.G.C (sec)	12.01	13.79	**17.29**	6.47	**6.00**	6.10	6.45	6.28	8.46	15.13	12.12	11.83
Normalized	49.96%	43.51%	34.7%	92.74%	100%	98.36%	93.02%	95.54%	70.92%	39.66%	49.5%	50.72%
Standard Deviation	2.3%	5.7%	0.4%	1.4%	0.1%	0.4%	2.6%	0.2%	2.5%	2.3%	2.7%	3.2%
OSBench - Create Files	262	**1234**	1230		15.91	15.67	46.61	**15.59**	44.46	76.57	80.20	84.06
Normalized	5.95%	1.26%	1.27%		97.99%	99.49%	33.45%	100%	35.07%	20.36%	19.44%	18.55%
Standard Deviation	3%	0.5%	1.2%		0.2%	0.9%	2.4%	0.2%	3.4%	1.1%	1%	0.8%
OSBench - Create Threads (us/Event)	81.14	34.86	83.23		18.57	**18.06**	22.90	26.18	20.00	**31620**	51.49	51.81
Normalized	22.26%	51.81%	21.7%		97.25%	100%	78.86%	68.98%	90.3%	0.06%	35.07%	34.86%
Standard Deviation	9.5%	1.4%	0.3%		5%	2%	1.2%	0.1%	2%	0.7%	2.5%	3.1%
PostgreSQL pgbench - Buffer Test - Single Thread - Read Write (TPS)										**374**	**448**	**448**
Normalized										83.48%	100%	100%
Standard Deviation										1.2%	0.3%	0.2%
PostgreSQL pgbench - Buffer Test - Single Thread - Read Only (TPS)										**8865**	**9824**	9521
Normalized										90.24%	100%	96.92%
Standard Deviation										2.7%	3%	4.3%
PostgreSQL pgbench - Buffer Test - Normal Load - Read Write (TPS)										**2162**	2899	**2992**
Normalized										72.26%	96.89%	100%
Standard Deviation										1.9%	5.4%	6.3%

PostgreSQL pgbench - Buffer Test - Normal Load - Read Only (TPS)	**310546**	**357607**	351595
Normalized	86.84%	100%	98.32%
Standard Deviation	0.5%	1.3%	1.4%
Stress-NG - CPU Stress (Bogo Ops/s)	**9646**	9645	**9538**
Normalized	100%	99.99%	98.88%
Standard Deviation	0%	0%	0.1%
Stress-NG - Memory Copying (Bogo Ops/s)	**2585**	**6734**	2792
Normalized	38.39%	100%	41.46%
Standard Deviation	1.1%	3.4%	9.3%
Stress-NG - G.Q.D.S (Bogo Ops/s)	**542**	613	**712**
Normalized	76.12%	86.1%	100%
Standard Deviation	0%	0%	0%
Stress-NG - G.C.S.F (Bogo Ops/s)	**154874**	146928	**146619**
Normalized	100%	94.87%	94.67%
Standard Deviation	0%	0%	0%
Stress-NG - Vector Math (Bogo Ops/s)	**148054**	148021	**53277**
Normalized	100%	99.98%	35.98%
Standard Deviation	0%	0%	0%
Stress-NG - Matrix Math (Bogo Ops/s)	**182980**	182136	**177148**
Normalized	100%	99.54%	96.81%
Standard Deviation	0.4%	0%	0.1%
Stress-NG - Bsearch (Bogo Ops/s)	**6375**	6407	**6771**
Normalized	94.15%	94.62%	100%
Standard Deviation	0%	0%	0.5%
Stress-NG - Hsearch (Bogo Ops/s)	153963	**154399**	**149384**
Normalized	99.72%	100%	96.75%
Standard Deviation	0.1%	0.3%	0.1%

Stress-NG - Lsearch (Bogo Ops/s)	**334**	**296**	298
Normalized	100%	88.62%	89.22%
Standard Deviation	0.1%	0.3%	0.1%
Stress-NG - Tsearch (Bogo Ops/s)	735	**764**	**725**
Normalized	96.2%	100%	94.9%
Standard Deviation	0.1%	0.1%	0.1%
Stress-NG - Forking (Bogo Ops/s)	**8457**	11651	**15252**
Normalized	55.45%	76.39%	100%
Standard Deviation	0.2%	1.3%	0.5%
Stress-NG - Socket Activity (Bogo Ops/s)	**966**	1100	**1104**
Normalized	87.5%	99.64%	100%
Standard Deviation	0.7%	1.2%	1.1%
Stress-NG - Context Switching (Bogo	**10379571**	13228204	**13639616**
Normalized	76.1%	96.98%	100%
Standard Deviation	1.6%	0.8%	0.8%
Flexible IO Tester - Rand Read - POSIX AIO - No - Yes -	**448**	613	**629**
Normalized	71.22%	97.46%	100%
Standard Deviation	1.9%	0.9%	0.7%
Flexible IO Tester - Rand Read - POSIX AIO - No - Yes -	**114667**	156667	**160667**
Normalized	71.37%	97.51%	100%
Standard Deviation	2.2%	1%	0.7%
AOBench - 2048 x 2048 - Total Time (sec)	79.30	**77.95**	**79.68**
Normalized	98.3%	100%	97.83%
Standard Deviation	1.2%	0.1%	0%
BLAKE2 (Cycles/Byte)	4.41	**4.40**	**5.73**
Normalized	99.77%	100%	76.79%
Standard Deviation	0%	0%	0.1%
BlogBench - Read (Final	**765347**	**507409**	514314
Normalized	100%	66.3%	67.2%
Standard Deviation	3.3%	0.6%	1.8%

BlogBench - Write (Final	**7323**	8308	**8309**
Normalized	88.13%	99.99%	100%
Standard Deviation	7.4%	2.6%	0.6%
Bork File Encrypter - F.E.T (sec)	**35.08**	**29.73**	30.45
Normalized	84.75%	100%	97.64%
Standard Deviation	0.2%	0.3%	0.5%
Botan - AES-256 - Encrypt (MiB/s)	**1800**	1835	**1836**
Normalized	98.04%	99.95%	100%
Standard Deviation	0.4%	0%	0%
Botan - AES-256 - Decrypt (MiB/s)	**1799**	**1836**	**1836**
Normalized	97.98%	100%	100%
Standard Deviation	0.4%	0%	0%
Botan - Blowfish - Encrypt (MiB/s)	**133**	**134**	**134**
Normalized	99.25%	100%	100%
Standard Deviation	0.9%	0%	0%
Botan - Blowfish - Decrypt (MiB/s)	**132**	**134**	**134**
Normalized	98.51%	100%	100%
Standard Deviation	0.9%	0.1%	0%
Botan - CAST-256 -	64.54	**64.58**	**64.48**
Normalized	99.94%	100%	99.85%
Standard Deviation	0%	0%	0.1%
Botan - CAST-256 -	**64.65**	**64.86**	64.79
Normalized	99.68%	100%	99.89%
Standard Deviation	0.2%	0%	0.1%
Botan - KASUMI - Encrypt (MiB/s)	**43.08**	43.62	**43.63**
Normalized	98.74%	99.98%	100%
Standard Deviation	0.3%	0%	0%
Botan - KASUMI - Decrypt (MiB/s)	**42.37**	**42.81**	**42.81**
Normalized	98.97%	100%	100%
Standard Deviation	0.4%	0%	0%
Botan - Twofish - Encrypt (MiB/s)	**148**	**150**	**150**
Normalized	98.67%	100%	100%
Standard Deviation	0.5%	0%	0%
Botan - Twofish - Decrypt (MiB/s)	**149**	**152**	**152**
Normalized	98.03%	100%	100%
Standard Deviation	0.8%	0%	0%

Timed LLVM Compilation - Time To Compile (sec)	**220**	175	**170**
Normalized	77.27%	97.14%	100%
Timed PHP Compilation - Time To Compile (sec)	**185**	**109**	
Normalized	58.92%	100%	
Standard Deviation	1.3%	0.3%	
C-Ray - Total Time - 4.1.R.P.P (sec)	42.21	**41.14**	**139.98**
Normalized	97.47%	100%	29.39%
Standard Deviation	0.5%	0.3%	6.8%
CacheBench - Read (MB/s)	**3804**	**3804**	**1382**
Normalized	100%	100%	36.33%
Standard Deviation	0%	0%	0%
CacheBench - Write (MB/s)	28787	**29158**	**13929**
Normalized	98.73%	100%	47.77%
Standard Deviation	0.4%	0.2%	0%
CacheBench - R.M.W (MB/s)	**46050**	43750	**4997**
Normalized	100%	95.01%	10.85%
Standard Deviation	0.3%	0.5%	0%
Compile Bench - Initial Create (MB/s)	159	**161**	**158**
Normalized	98.76%	100%	98.14%
Standard Deviation	0.7%	1.2%	3.3%
Compile Bench - Compile (MB/s)	**1398**	**1404**	1399
Normalized	99.57%	100%	99.64%
Standard Deviation	0.2%	0.3%	0.3%
Compile Bench - Read Compiled Tree (MB/s)	**475**	685	**693**
Normalized	68.54%	98.85%	100%
Standard Deviation	1.8%	0.4%	2.7%
Gzip Compression - L.S.T.A.T.t.g	**77.91**	**74.22**	74.24
Normalized	95.26%	100%	99.97%
Standard Deviation	0.8%	0.5%	0.6%

LZMA Compression - 2.F.C (sec)	459	453	421
Normalized	91.72%	92.94%	100%
Standard Deviation	1.9%	1.9%	0.3%
XZ Compression - C.u.1.0.3.s.i.i.C.L	140	108	113
Normalized	77.14%	100%	95.58%
Standard Deviation	4.1%	0.2%	1.4%
DaCapo Benchmark - Eclipse (msec)	41660	30354	30360
Normalized	72.86%	100%	99.98%
Standard Deviation	3.2%	0.5%	0.8%
DaCapo Benchmark - H2 (msec)	9940	7997	7874
Normalized	79.22%	98.46%	100%
Standard Deviation	2.5%	3.4%	1.4%
DaCapo Benchmark - Tradesoap	9778	8617	8965
Normalized	88.13%	100%	96.12%
Standard Deviation	1%	8.3%	3.1%
dcraw - R.T.P.I.C (sec)	96.59	74.32	83.10
Normalized	76.94%	100%	89.43%
Standard Deviation	0.4%	0%	1%
LAME MP3 Encoding - WAV To MP3 (sec)	20.00	18.28	59.09
Normalized	91.4%	100%	30.94%
Standard Deviation	1%	0.1%	0%
Flexible IO Tester - Rand Write - POSIX AIO - No - Yes -	417	575	622
Normalized	67.04%	92.44%	100%
Standard Deviation		3.4%	3.4%
Flexible IO Tester - Rand Write - POSIX AIO - No - Yes -	107000	147250	159333
Normalized	67.15%	92.42%	100%
Standard Deviation		3.3%	3.5%
Go Benchmarks - http (ns/op)	1133821	175236	173807
Normalized	15.33%	99.18%	100%
Standard Deviation	11%	1.3%	3%

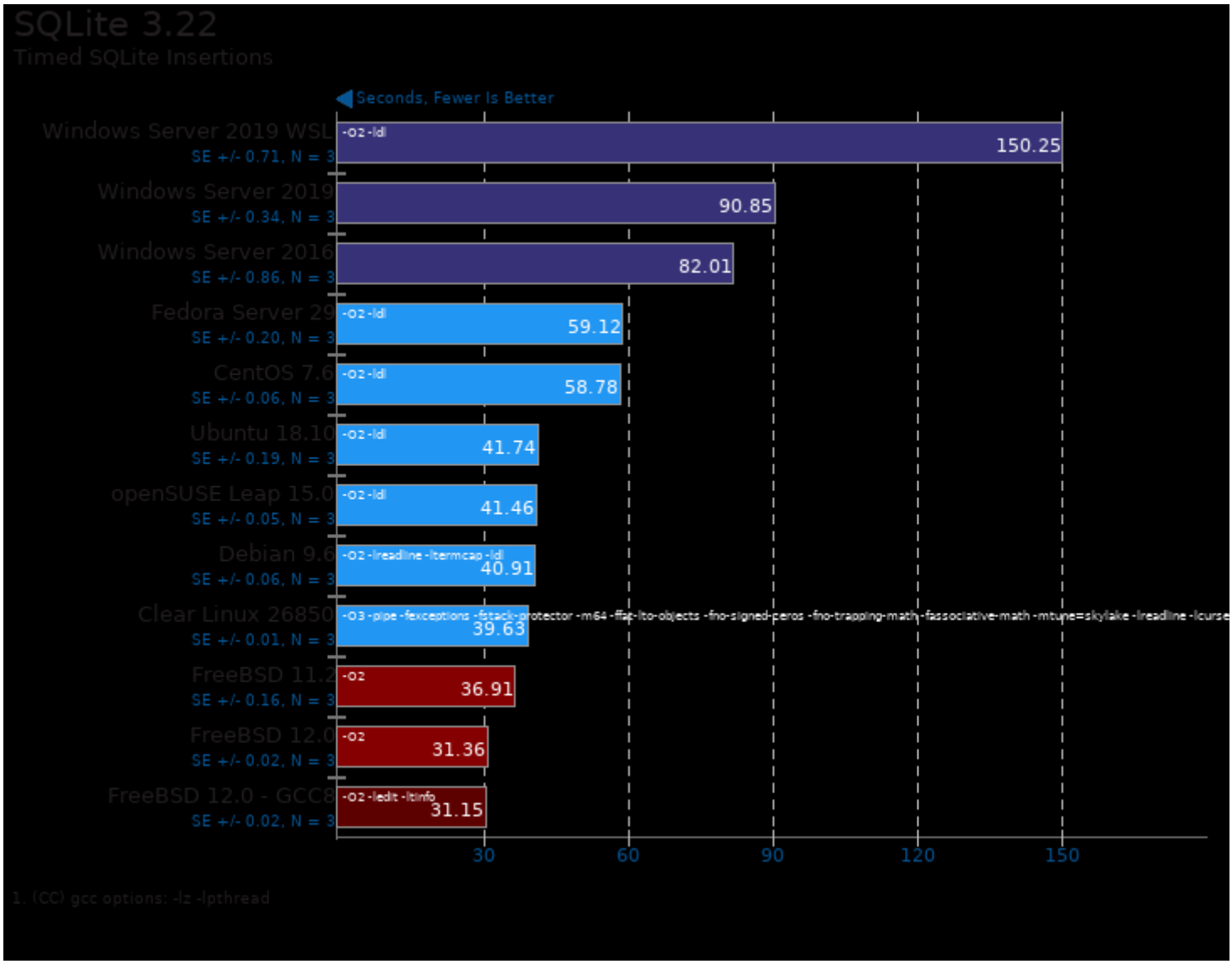
GraphicsMagick - Noise-Gaussian (Iterations/min)	**20**	21	**108**
Normalized	18.52%	19.44%	100%
Standard Deviation			2.1%
GraphicsMagick - Enhanced (Iterations/min)	**20**	22	**112**
Normalized	17.86%	19.64%	100%
Standard Deviation		2.7%	
GraphicsMagick - Sharpen (Iterations/min)	**15**	16	**105**
Normalized	14.29%	15.24%	100%
GraphicsMagick - Swirl (Iterations/min)	**33**	36	**118**
Normalized	27.97%	30.51%	100%
Himeno Benchmark - P.P.S (MFLOPS)	**1071**	1539	**1826**
Normalized	58.65%	84.28%	100%
Standard Deviation	0.4%	0%	0.2%
Hierarchical INTegration - FLOAT (QUIPs)	**157348.711**	157581.817	**196589.323**
Normalized	80.04%	80.16%	100%
Standard Deviation	0.1%	0%	0.1%
Timed HMMer Search - P.D.S (sec)	**12.18**	**29.25**	29.11
Normalized	100%	41.64%	41.84%
Standard Deviation	3.2%	5.9%	2.9%
IOzone - 4Kb - 8GB - Write Performance (MB/s)	444	**421**	**464**
Normalized	95.69%	90.73%	100%
Standard Deviation	0.9%	1.9%	7.1%
Java Gradle Build - Reactor	**52.39**	30.73	**30.52**
Normalized	58.26%	99.32%	100%
Standard Deviation	1.3%	1.4%	1.4%
LuaJIT - Composite (Mflops)	**743**	748	**749**
Normalized	99.2%	99.87%	100%
Standard Deviation	0.4%	0.3%	0.2%

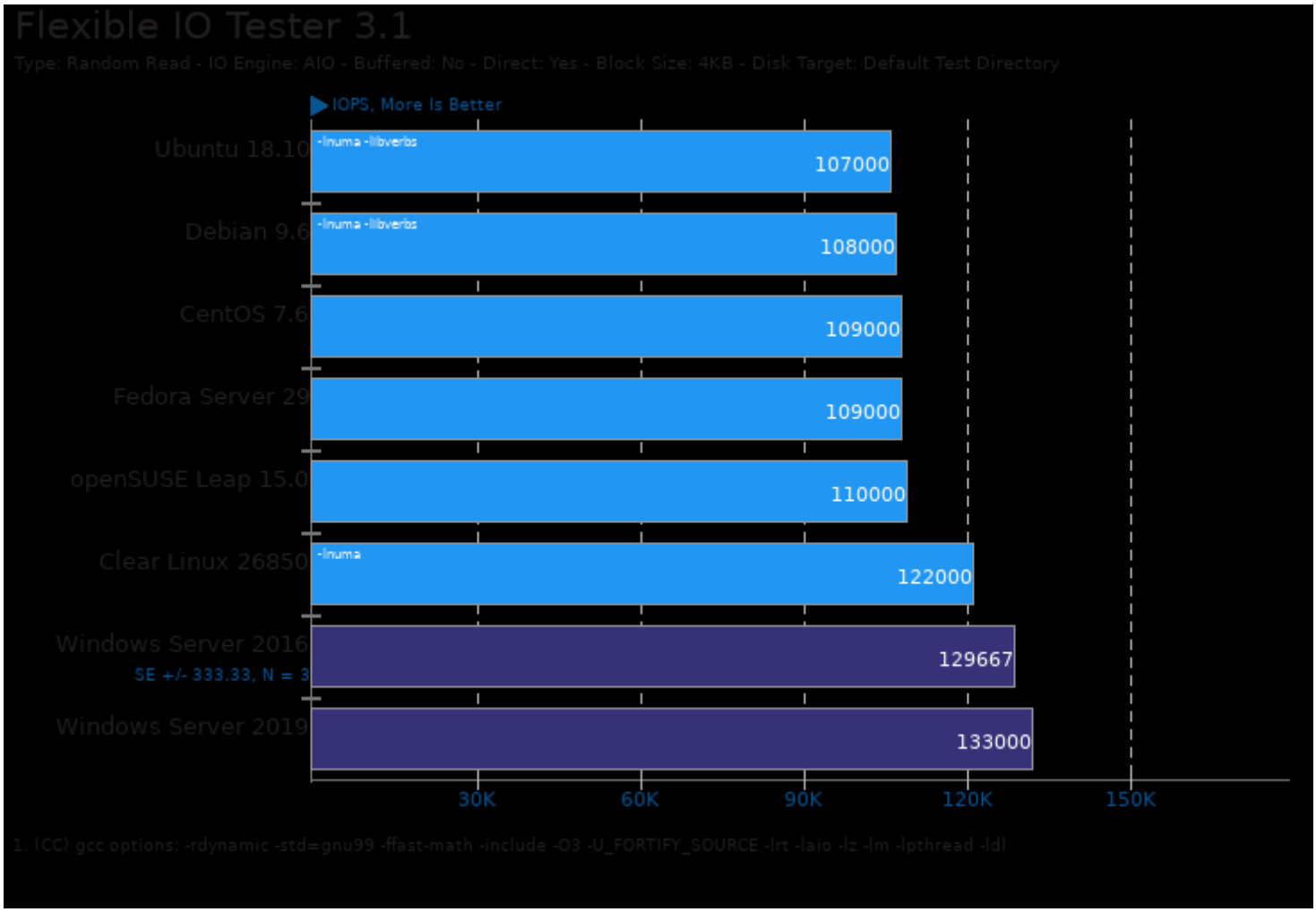
GNU MPC - M.P.B (Global Score)	**4157**	4610	**4733**
Normalized	87.83%	97.4%	100%
Standard Deviation	0.6%		0.1%
OpenSSL - R.4.b.P (Signs/sec)	**6110**	6111	**6119**
Normalized	99.85%	99.87%	100%
Standard Deviation	0%	0%	0%
Optcarrot - O.B (FPS)	**54.84**	**56.31**	55.76
Normalized	97.39%	100%	99.02%
Standard Deviation	0.1%	0.1%	0.6%
OSBench - Create Processes	**88.84**	78.34	**77.60**
Normalized	87.35%	99.06%	100%
Standard Deviation	1.2%	0.9%	3.4%
OSBench - Launch Programs	**195**	161	**141**
Normalized	72.31%	87.58%	100%
Standard Deviation	0.7%	1.3%	2%
OSBench - Memory Allocations (Ns/Event)	**117.12**	**62.65**	62.68
Normalized	53.49%	100%	99.95%
Standard Deviation	0.1%	0.5%	0.1%
PHP Micro Benchmarks - Zend bench	**1.19**	1.16	**1.15**
Normalized	96.64%	99.14%	100%
Standard Deviation	0.3%	0.7%	0.2%
PHP Micro Benchmarks - Zend micro_bench (sec)	**6.22**	5.63	**5.62**
Normalized	90.35%	99.82%	100%
Standard Deviation	5.1%	0.3%	0%
PolyBench-C - 3.M.M (sec)	**5.72**	5.55	**5.51**
Normalized	96.33%	99.28%	100%
Standard Deviation	2.9%	0.3%	0.1%
PolyBench-C - C.C (sec)	**2.40**	**2.36**	**2.36**
Normalized	98.33%	100%	100%
Standard Deviation	0.4%	0.5%	0.2%

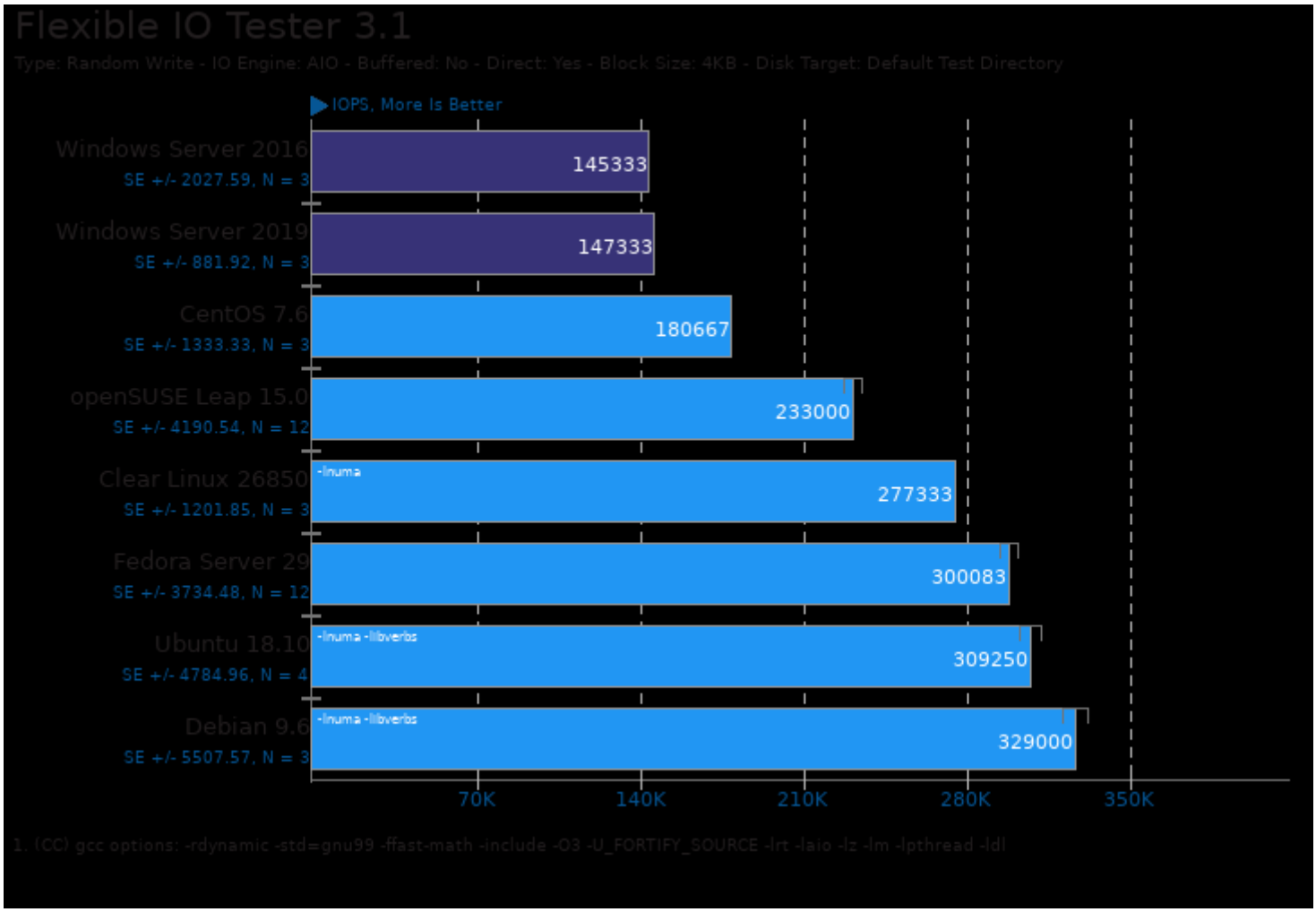
PolyBench-C - C.C (sec)	**2.43**	2.37	**2.35**
Normalized	96.71%	99.16%	100%
Standard Deviation	3.1%	0.2%	0.4%
PostMark - D.T.P (TPS)	**4213**	4438	**4545**
Normalized	92.7%	97.65%	100%
Standard Deviation	1%	1%	
Primesieve - 1.P.N.G (sec)	**13.34**	**15.66**	15.12
Normalized	100%	85.19%	88.23%
Standard Deviation	0.2%	2.8%	3.2%
Phoronix Test Suite Self Test - List Suites (sec)	**11.95**	1.43	**1.41**
Normalized	11.8%	98.6%	100%
Standard Deviation	0.9%	0.3%	0.2%
Phoronix Test Suite Self Test - Info Command (sec)	**1.13**	**3.59**	1.76
Normalized	100%	31.48%	64.2%
Standard Deviation	7.4%	0.3%	0.6%
Phoronix Test Suite Self Test - Render Test	**147**	102	**101**
Normalized	68.71%	99.02%	100%
Standard Deviation	1.2%	0.5%	0.1%
Phoronix Test Suite Self Test - Merge Results (sec)	**10.71**	7.99	**7.98**
Normalized	74.51%	99.87%	100%
Standard Deviation	2.2%	0.2%	0.1%
Phoronix Test Suite Self Test - Total Time (sec)	**542**	374	**360**
Normalized	66.42%	96.26%	100%
Standard Deviation	0.8%	2.4%	0.4%
Phoronix Test Suite Self Test - Peak Memory Usage (MB)	503	503	503
Standard Deviation	0%	0%	0%
PyBench - T.F.A.T.T (Milliseconds)	**3716**	3324	**3320**
Normalized	89.34%	99.88%	100%
Standard Deviation	0.2%	0.4%	0.3%

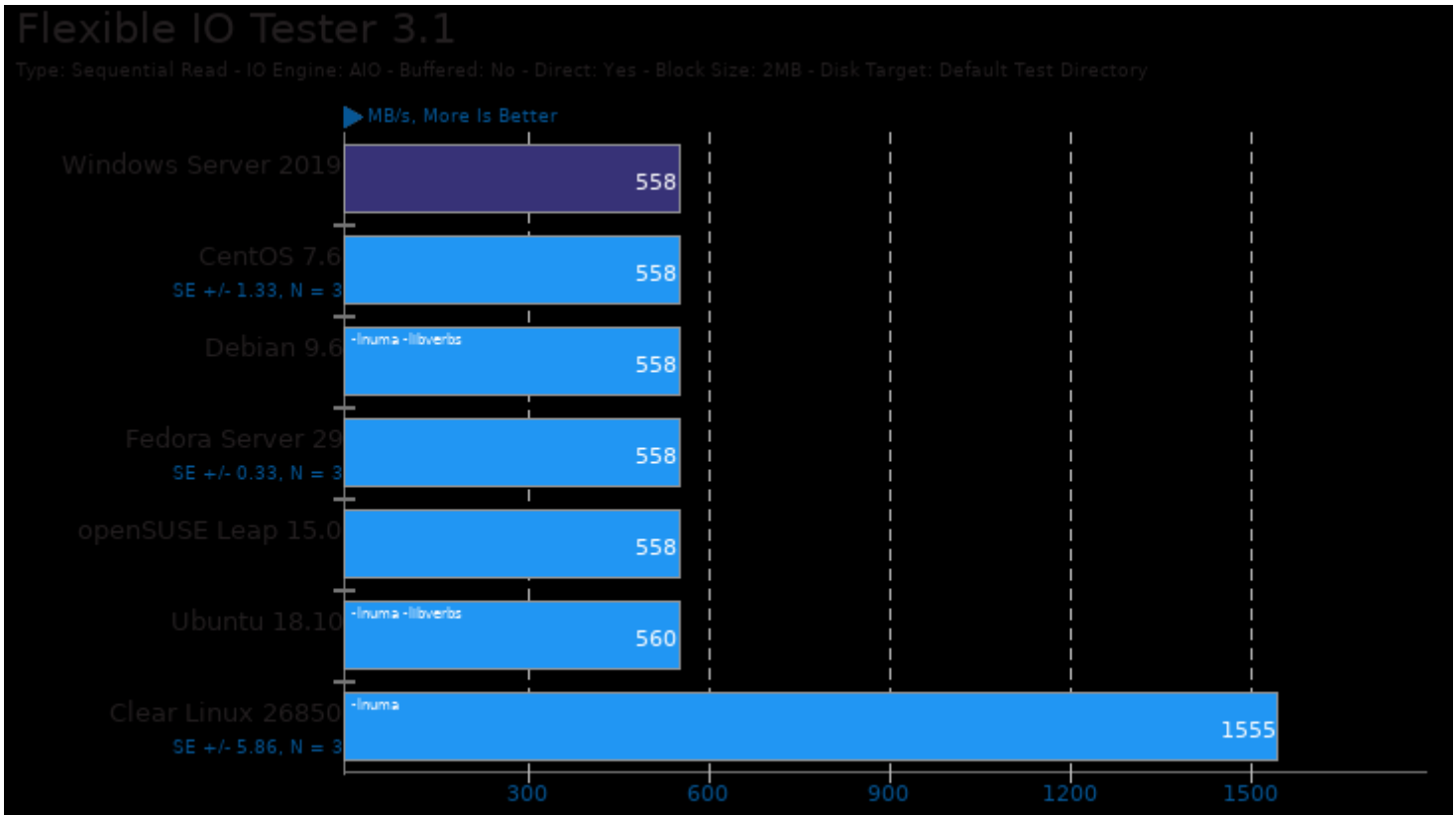
Rust Mandelbrot - T.T.C.S.P.M	**95.37**	**84.29**	**84.29**
Normalized	88.38%	100%	100%
Standard Deviation	0.2%	0%	0%
Rust Prime Benchmark - P.N.T.T.2.0.0 (sec)	**8.16**	6.03	**6.00**
Normalized	73.53%	99.5%	100%
Standard Deviation	0.4%	0%	0%
Sample Pi Program (sec)	**7.29**	**7.61**	**7.61**
Normalized	100%	95.8%	95.8%
Standard Deviation	2.9%	0.2%	0.3%
Scikit-Learn	**313**	295	**293**
Normalized	93.61%	99.32%	100%
Standard Deviation	0.3%	0.3%	0.2%
Smallpt - G.I.R.1.S (sec)	**9.30**	7.74	**5.90**
Normalized	63.44%	76.23%	100%
Standard Deviation	0.3%	1.2%	0.4%
Sunflow Rendering System - G.I.I.S (sec)	**5.96**	1.74	**1.67**
Normalized	28.02%	95.98%	100%
Standard Deviation	0.4%	1.8%	4%
Swet - Average (Operations/sec)	**178788467**	183079187	**339865170**
Normalized	52.61%	53.87%	100%
Standard Deviation	2.3%	0.4%	0.3%
System Libxml2 Parsing - 2 MB (ms)	**3721**	3126	**3121**
Normalized	83.88%	99.84%	100%
Standard Deviation	0.1%	0.3%	
Tachyon - Total Time (sec)	**3.56**	**3.52**	
Normalized	98.88%	100%	
Standard Deviation	1.7%	0.8%	
TTSIOD 3D Renderer - P.R.W.S.S.M (FPS)		**22.13**	**679.17**
Normalized		3.26%	100%
Standard Deviation		0.2%	0.5%

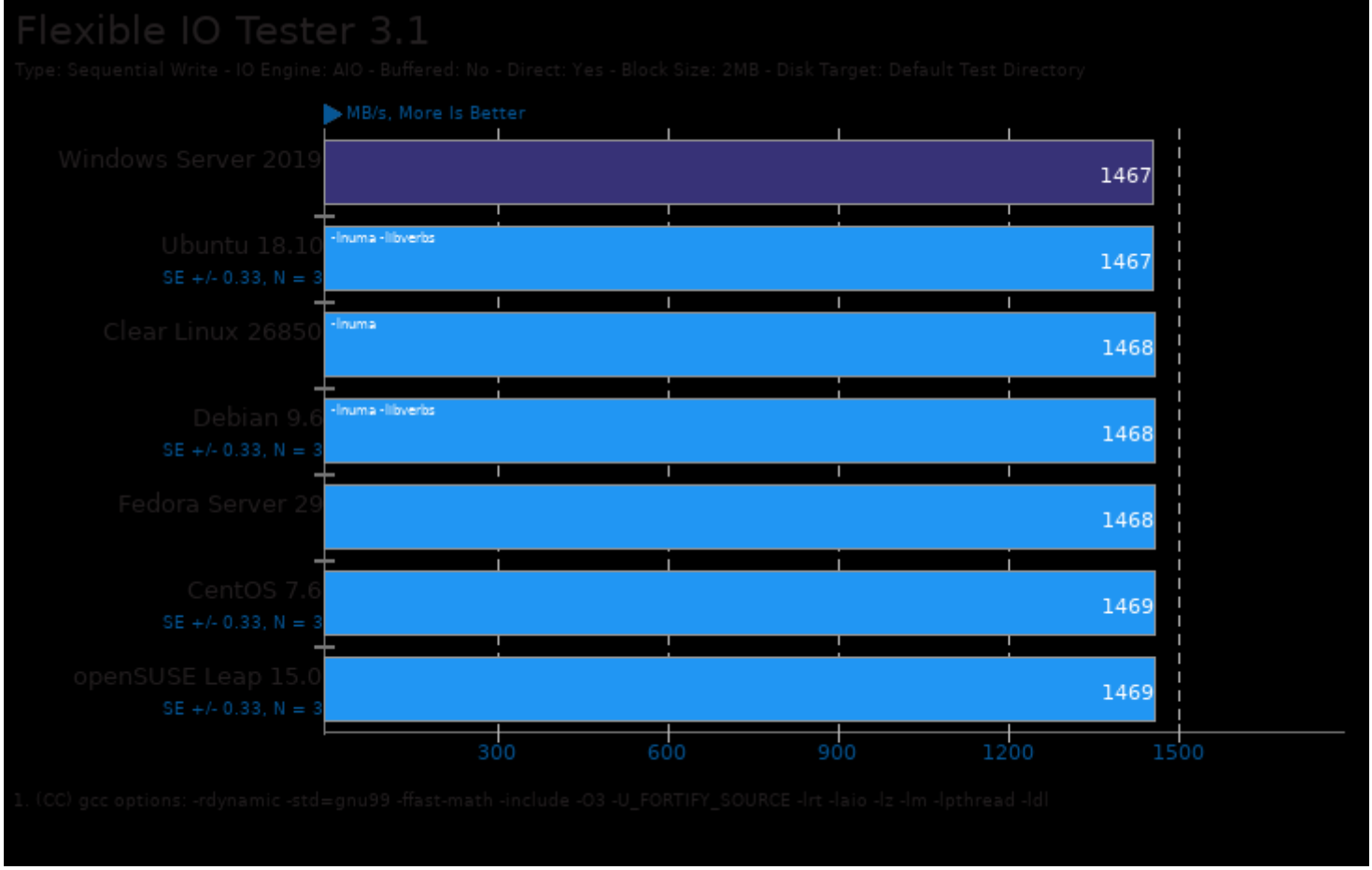
Unpacking The Linux Kernel - linux-4.15.tar.xz (sec)	**19.07**	18.42	**18.36**
Normalized	96.28%	99.67%	100%
Standard Deviation	0.6%	0.3%	0.7%
x265 - H.2.V.E (FPS)	**7.26**	7.63	**8.69**
Normalized	83.54%	87.8%	100%
Standard Deviation	0.5%	0.2%	0.1%

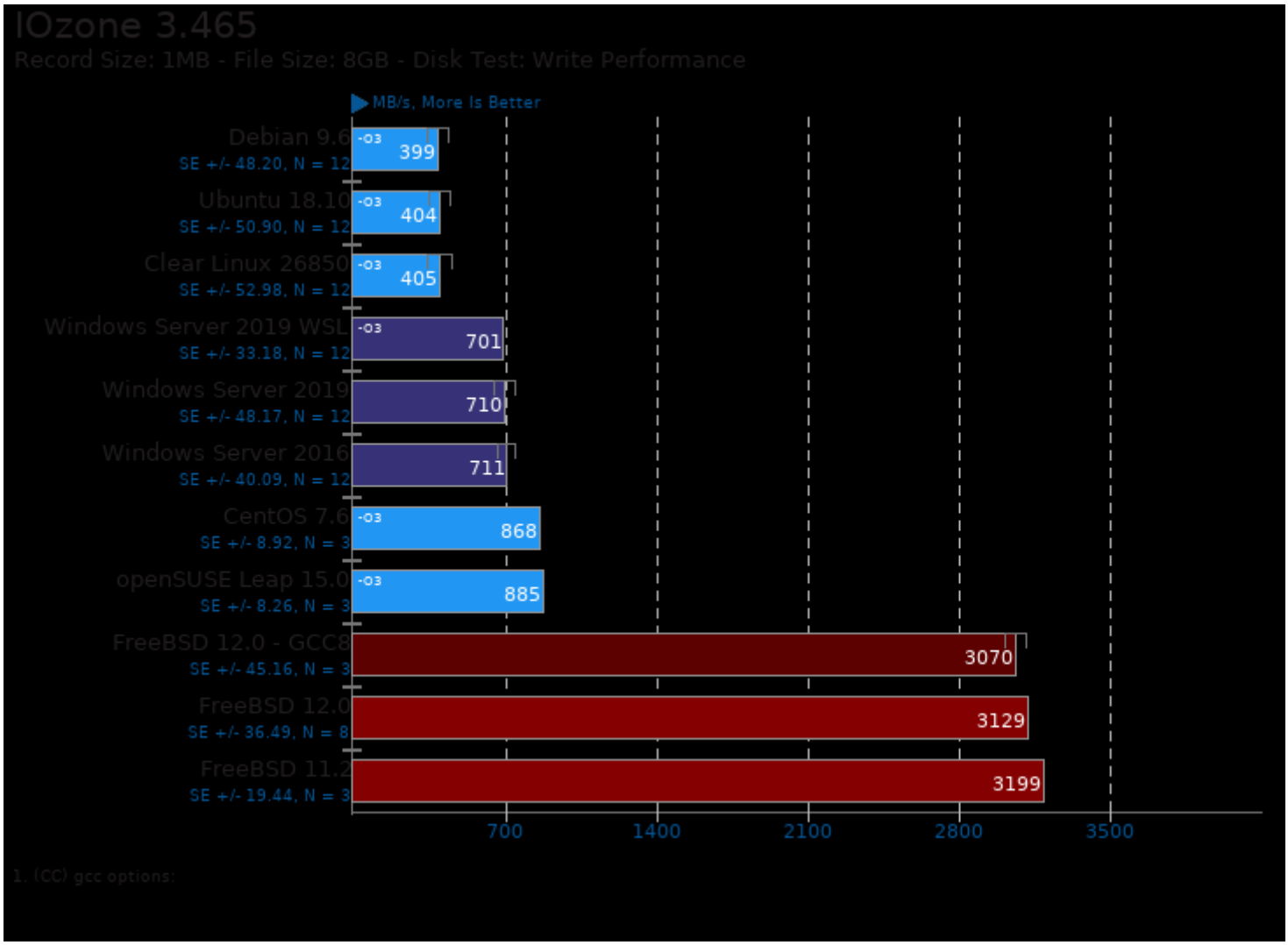

SQLite 3.22
Timed SQLite Insertions
Seconds, Fewer Is Better
Windows Server 2019 WSL
SE +/- 0.71, N = 3
-O2 -ldl
150.25
Windows Server 2019
SE +/- 0.34, N = 3
90.85
Windows Server 2016
SE +/- 0.86, N = 3
82.01
Fedora Server 29
SE +/- 0.20, N = 3
-O2 -ldl
59.12
CentOS 7.6
SE +/- 0.06, N = 3
-O2 -ldl
58.78
Ubuntu 18.10
SE +/- 0.19, N = 3
-O2 -ldl
41.74
openSUSE Leap 15.0
SE +/- 0.05, N = 3
-O2 -ldl
41.46
Debian 9.6
SE +/- 0.06, N = 3
-O2 -lreadline -ltermcap -ldl
40.91
Clear Linux 26850
SE +/- 0.01, N = 3
-O3 -pipe -fexceptions -fstack-protector -m64 -flto-objects -fno-signed-zeros -fno-trapping-math -fassociative-math -mtune=skylake -lreadline -lcurse
39.63
FreeBSD 11.2
SE +/- 0.16, N = 3
-O2
36.91
FreeBSD 12.0
SE +/- 0.02, N = 3
-O2
31.36
FreeBSD 12.0 - GCC 8
SE +/- 0.02, N = 3
-O2 -ledit -ltinfo
31.15
30
60
90
120
150
1. (CC) gcc options: -lz -lpthread

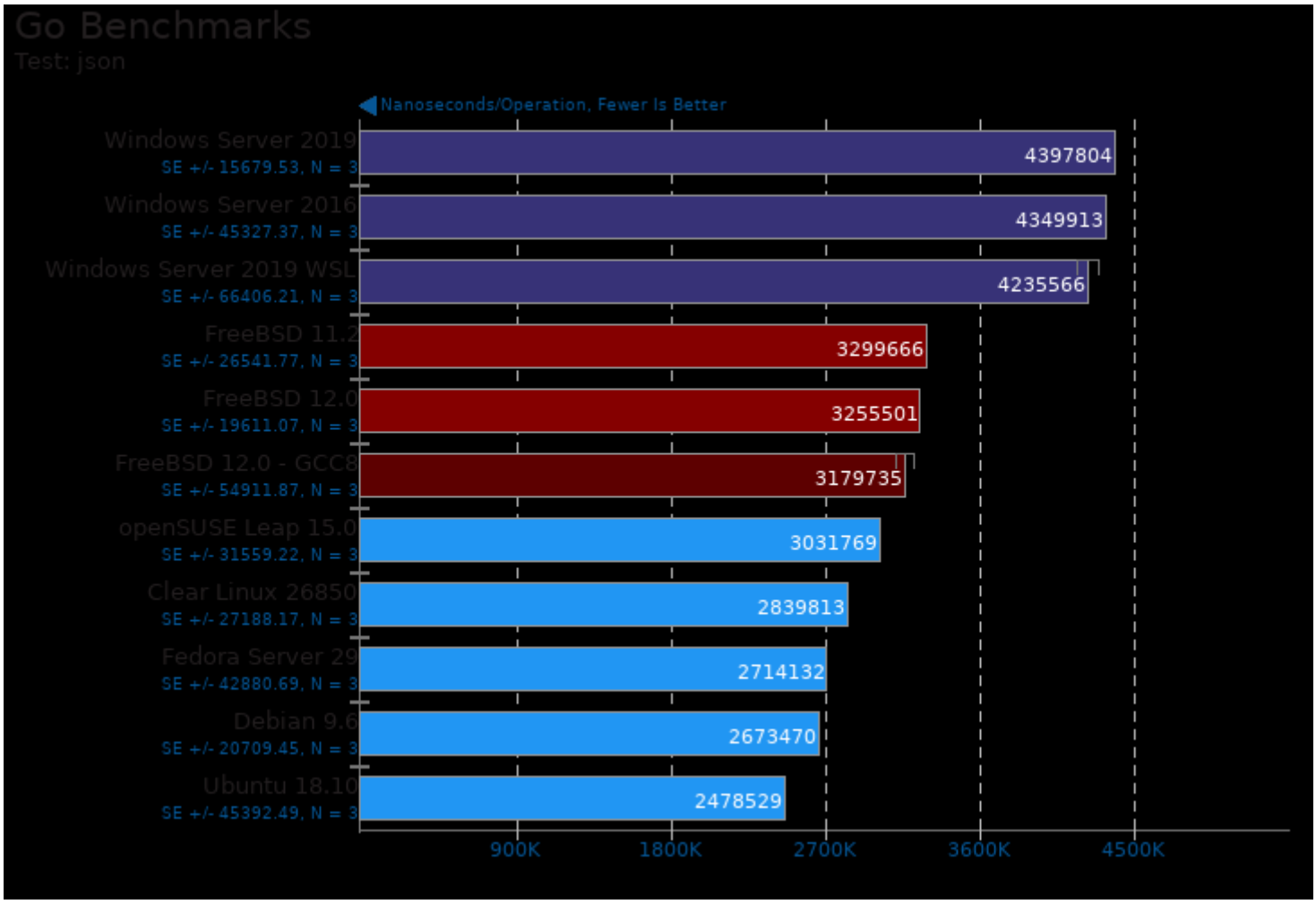

Flexible IO Tester 3.1
Type: Random Read - IO Engine: AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
Ubuntu 18.10
-lnuma -liboverbs
107000
Debian 9.6
-lnuma -liboverbs
108000
CentOS 7.6
109000
Fedora Server 29
109000
openSUSE Leap 15.0
110000
Clear Linux 26850
-lnuma
122000
Windows Server 2016
SE +/- 333.33, N = 3
129667
Windows Server 2019
133000
30K
60K
90K
120K
150K
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lz -lm -lpthread -ldl

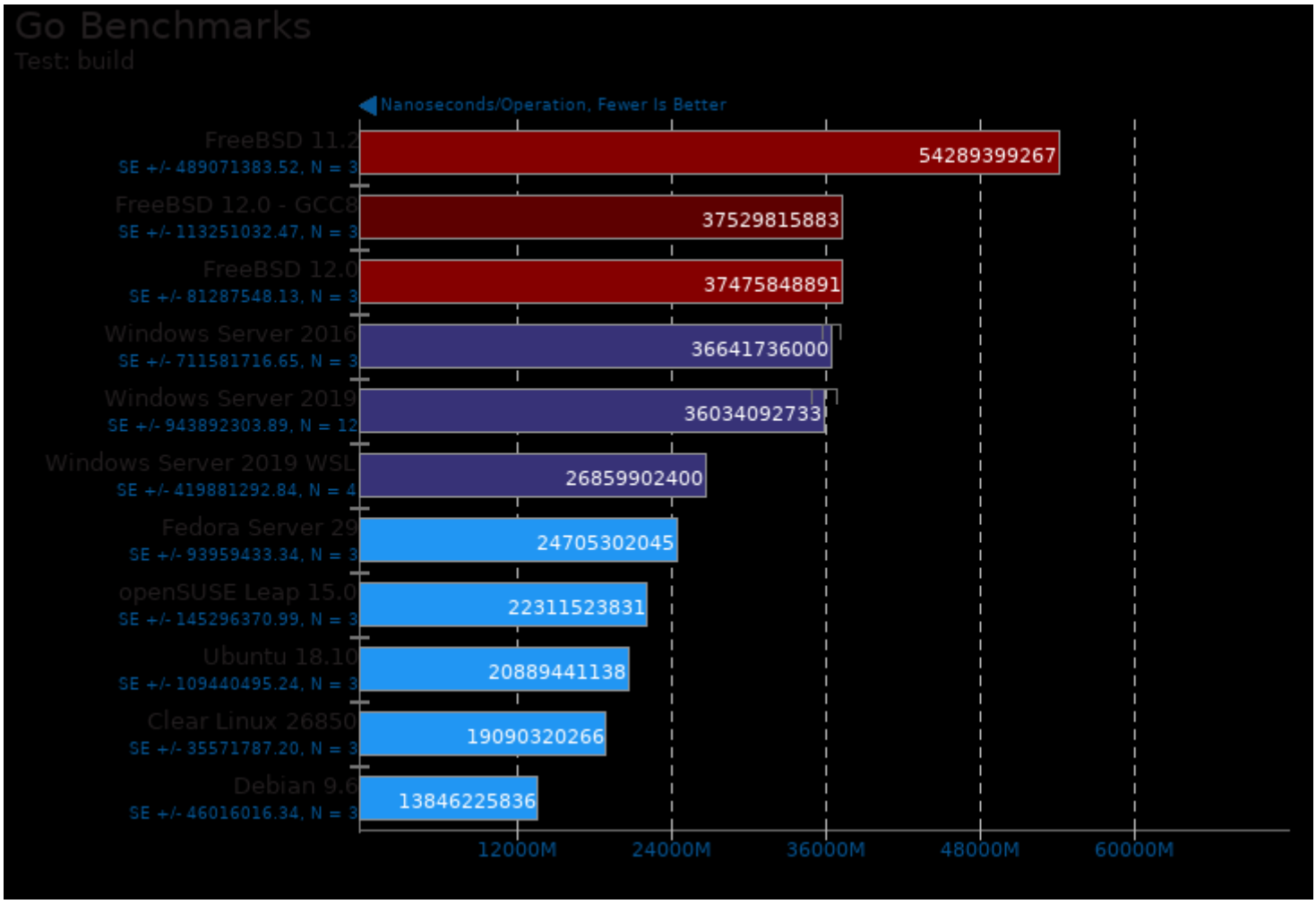

Flexible IO Tester 3.1
Type: Random Write - IO Engine: AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
Windows Server 2016
SE +/- 2027.59, N = 3
145333
Windows Server 2019
SE +/- 881.92, N = 3
147333
CentOS 7.6
SE +/- 1333.33, N = 3
180667
openSUSE Leap 15.0
SE +/- 4190.54, N = 12
233000
Clear Linux 26850
SE +/- 1201.85, N = 3
-linuma
277333
Fedora Server 29
SE +/- 3734.48, N = 12
300083
Ubuntu 18.10
SE +/- 4784.96, N = 4
-linuma -libverbs
309250
Debian 9.6
SE +/- 5507.57, N = 3
-linuma -libverbs
329000
70K
140K
210K
280K
350K
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lz -lm -lpthread -ldl

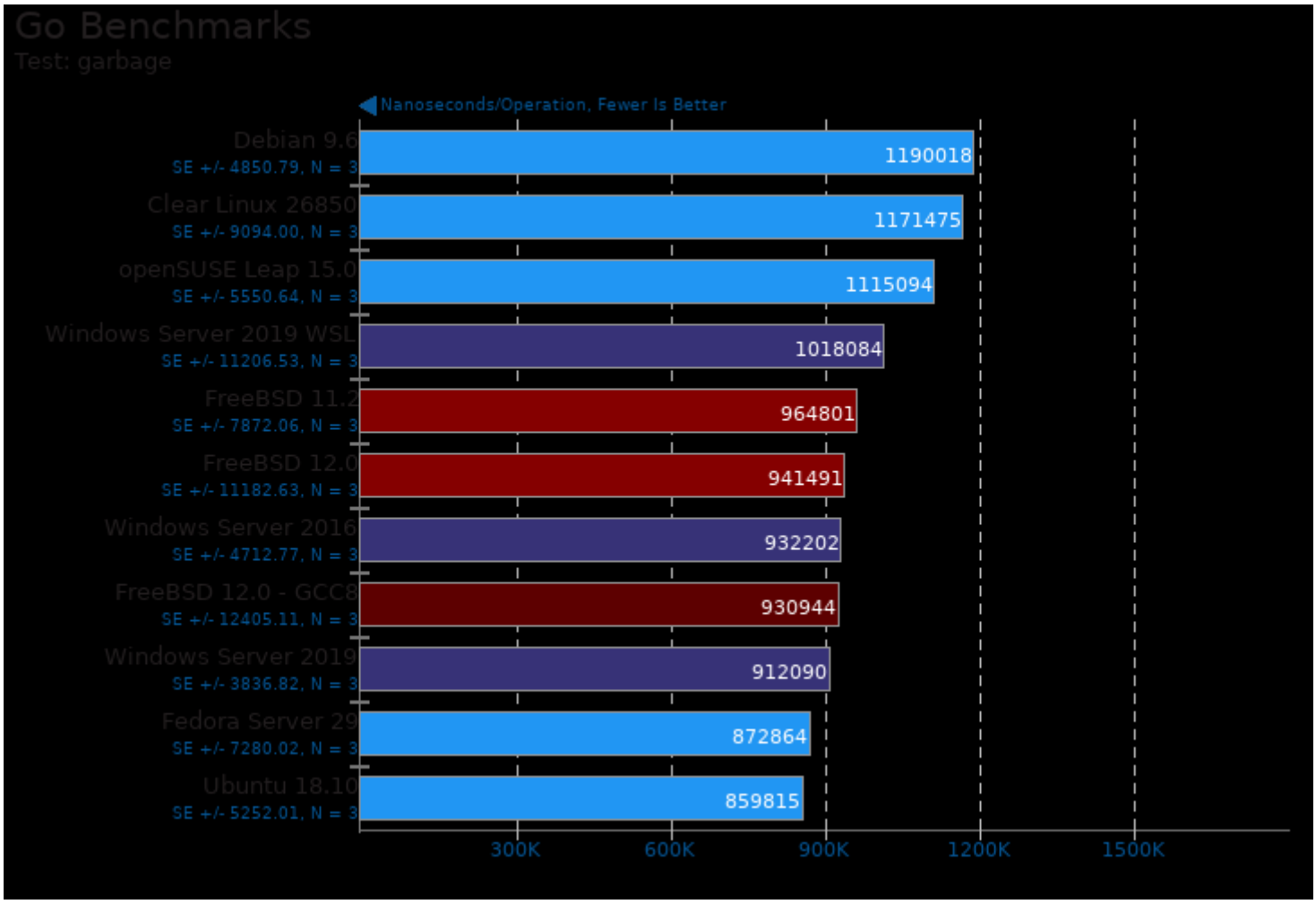

Flexible IO Tester 3.1
Type: Sequential Read - IO Engine: AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s, More Is Better
Windows Server 2019
558
CentOS 7.6
SE +/- 1.33, N = 3
558
Debian 9.6
-lnuma -libverbs
558
Fedora Server 29
SE +/- 0.33, N = 3
558
openSUSE Leap 15.0
558
Ubuntu 18.10
-lnuma -libverbs
560
Clear Linux 26850
-lnuma
SE +/- 5.86, N = 3
1555
300
600
900
1200
1500
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lz -lm -lpthread -ldl

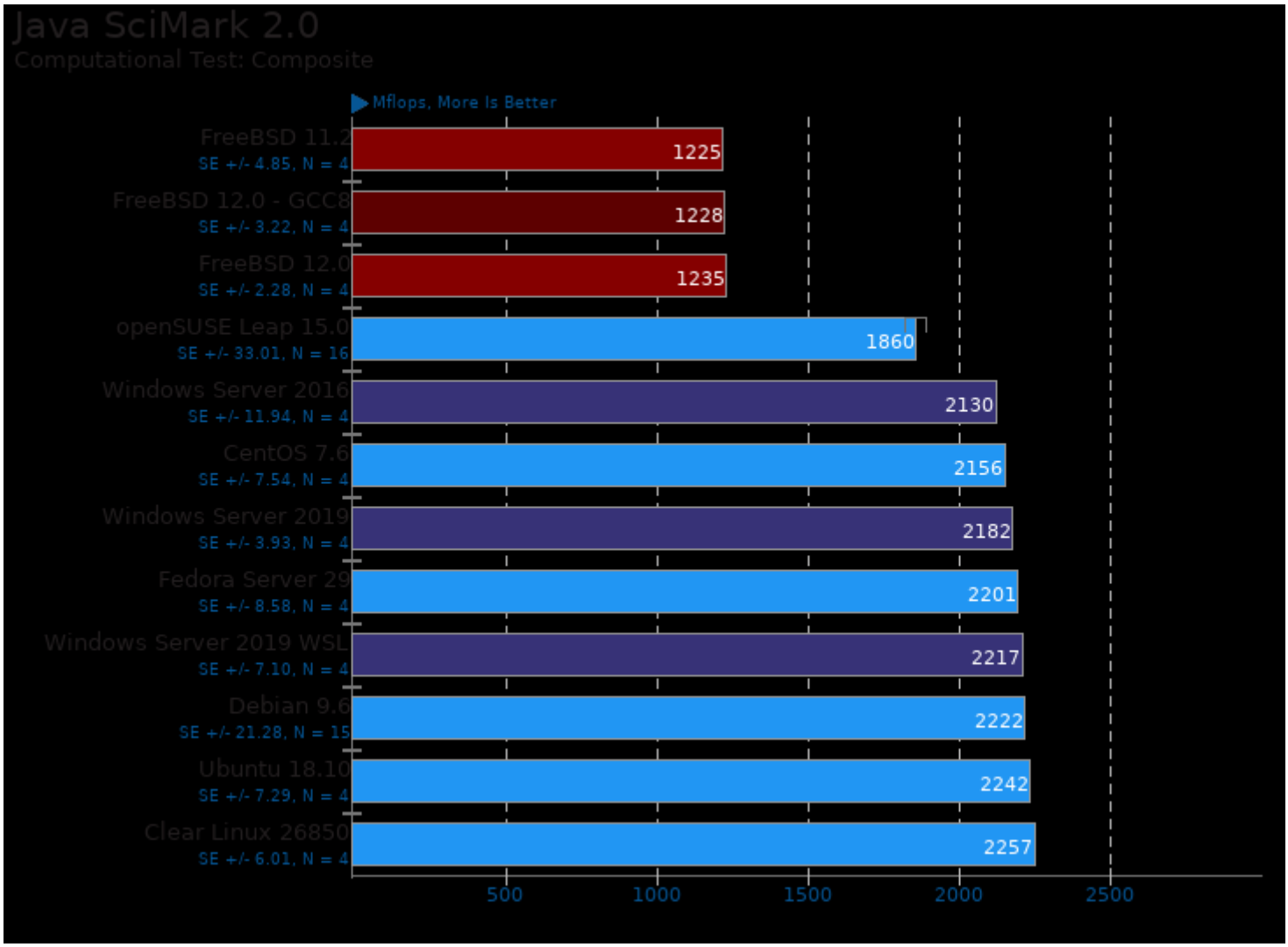

Flexible IO Tester 3.1
Type: Sequential Write - IO Engine: AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s, More Is Better
Windows Server 2019
1467
Ubuntu 18.10
-lnuma -libverbs
SE +/- 0.33, N = 3
1467
Clear Linux 26850
-lnuma
1468
Debian 9.6
-lnuma -libverbs
SE +/- 0.33, N = 3
1468
Fedora Server 29
1468
CentOS 7.6
SE +/- 0.33, N = 3
1469
openSUSE Leap 15.0
SE +/- 0.33, N = 3
1469
300
600
900
1200
1500
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lz -lm -lpthread -ldl

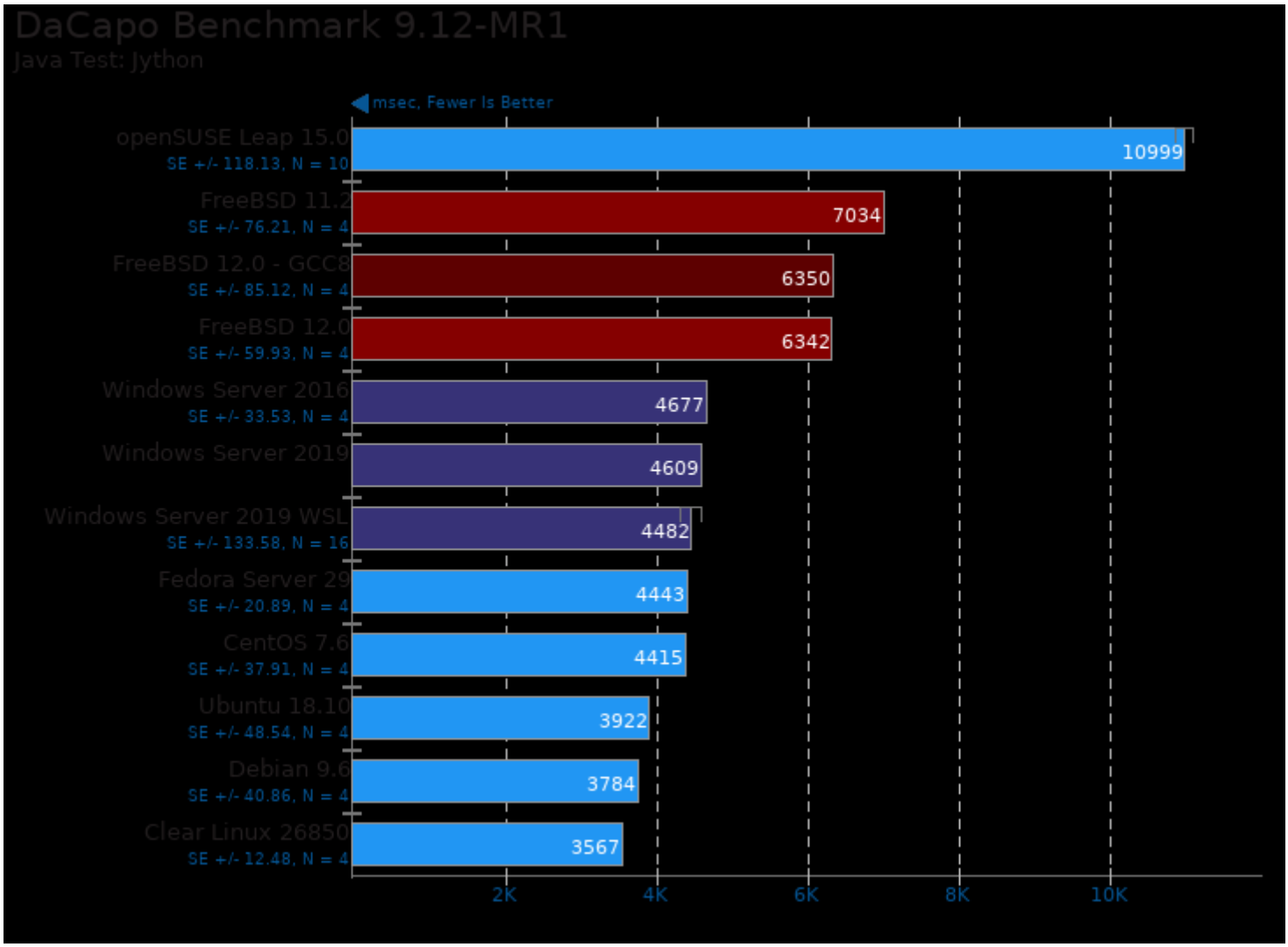

IOzone 3.465
Record Size: 1MB - File Size: 8GB - Disk Test: Write Performance
MB/s, More Is Better
Debian 9.6
SE +/- 48.20, N = 12
-O3
399
Ubuntu 18.10
SE +/- 50.90, N = 12
-O3
404
Clear Linux 26850
SE +/- 52.98, N = 12
-O3
405
Windows Server 2019 WSL
SE +/- 33.18, N = 12
-O3
701
Windows Server 2019
SE +/- 48.17, N = 12
710
Windows Server 2016
SE +/- 40.09, N = 12
711
CentOS 7.6
SE +/- 8.92, N = 3
-O3
868
openSUSE Leap 15.0
SE +/- 8.26, N = 3
-O3
885
FreeBSD 12.0 - GCC8
SE +/- 45.16, N = 3
3070
FreeBSD 12.0
SE +/- 36.49, N = 8
3129
FreeBSD 11.2
SE +/- 19.44, N = 3
3199
700
1400
2100
2800
3500
1. (CC) gcc options:

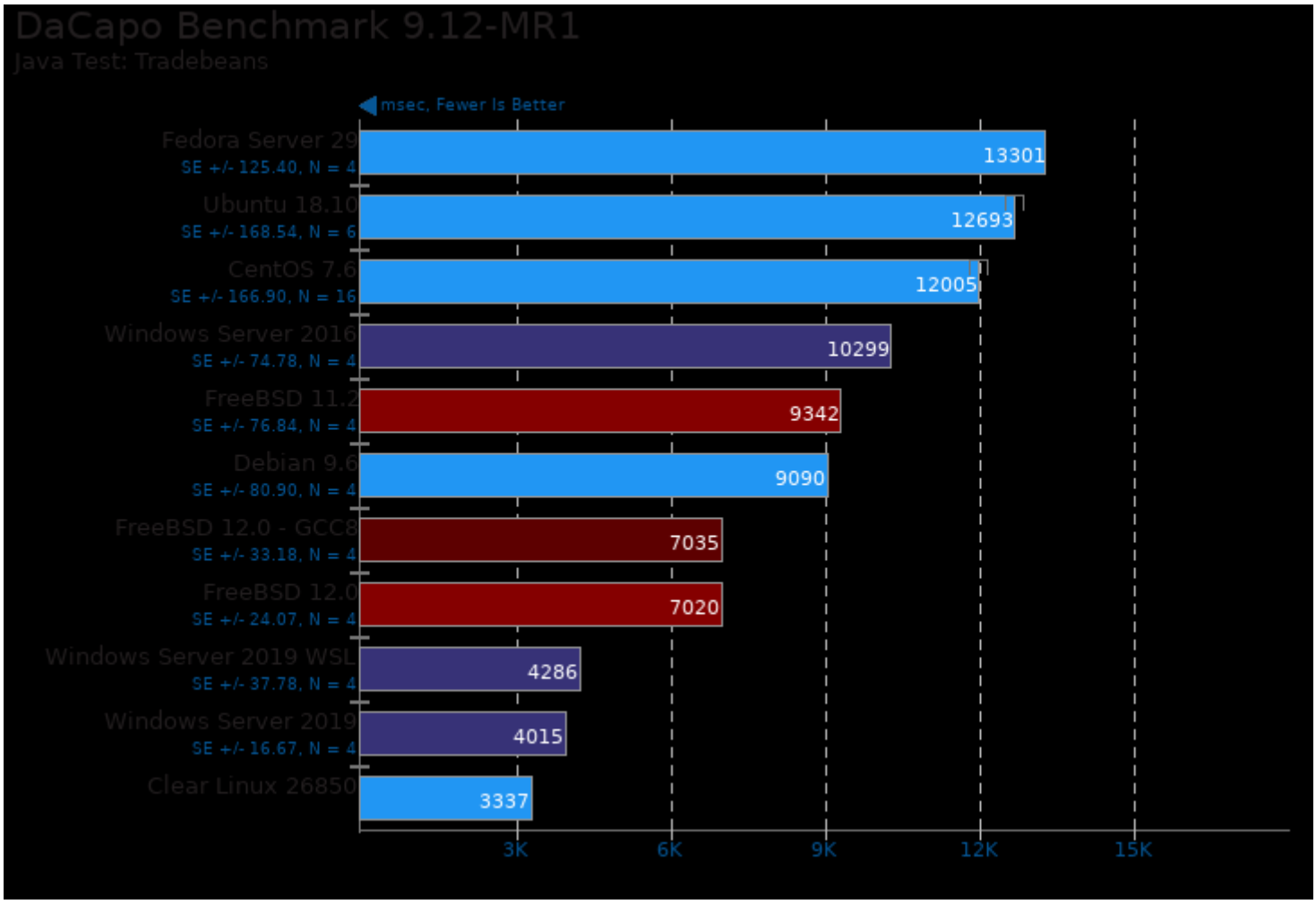

Go Benchmarks
Test: json
Nanoseconds/Operation, Fewer Is Better
Windows Server 2019
SE +/- 15679.53, N = 3
4397804
Windows Server 2016
SE +/- 45327.37, N = 3
4349913
Windows Server 2019 WSL
SE +/- 66406.21, N = 3
4235566
FreeBSD 11.2
SE +/- 26541.77, N = 3
3299666
FreeBSD 12.0
SE +/- 19611.07, N = 3
3255501
FreeBSD 12.0 - GCC8
SE +/- 54911.87, N = 3
3179735
openSUSE Leap 15.0
SE +/- 31559.22, N = 3
3031769
Clear Linux 26850
SE +/- 27188.17, N = 3
2839813
Fedora Server 29
SE +/- 42880.69, N = 3
2714132
Debian 9.6
SE +/- 20709.45, N = 3
2673470
Ubuntu 18.10
SE +/- 45392.49, N = 3
2478529
900K
1800K
2700K
3600K
4500K

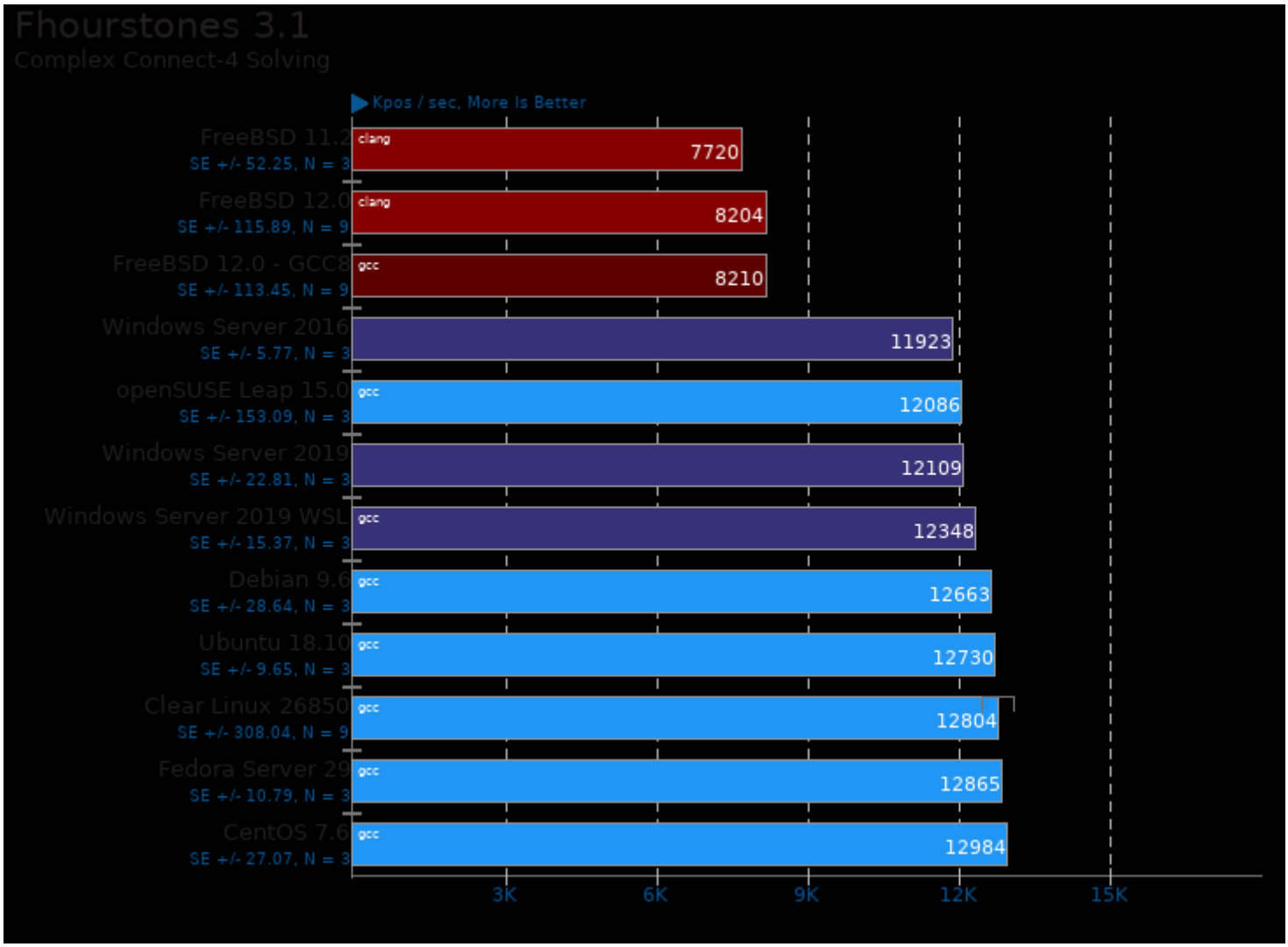

Go Benchmarks
Test: build
Nanoseconds/Operation, Fewer Is Better
FreeBSD 11.2
SE +/- 489071383.52, N = 3
54289399267
FreeBSD 12.0 - GCC8
SE +/- 113251032.47, N = 3
37529815883
FreeBSD 12.0
SE +/- 81287548.13, N = 3
37475848891
Windows Server 2016
SE +/- 711581716.65, N = 3
36641736000
Windows Server 2019
SE +/- 943892303.89, N = 12
36034092733
Windows Server 2019 WSL
SE +/- 419881292.84, N = 4
26859902400
Fedora Server 29
SE +/- 93959433.34, N = 3
24705302045
openSUSE Leap 15.0
SE +/- 145296370.99, N = 3
22311523831
Ubuntu 18.10
SE +/- 109440495.24, N = 3
20889441138
Clear Linux 26850
SE +/- 35571787.20, N = 3
19090320266
Debian 9.6
SE +/- 46016016.34, N = 3
13846225836
12000M
24000M
36000M
48000M
60000M

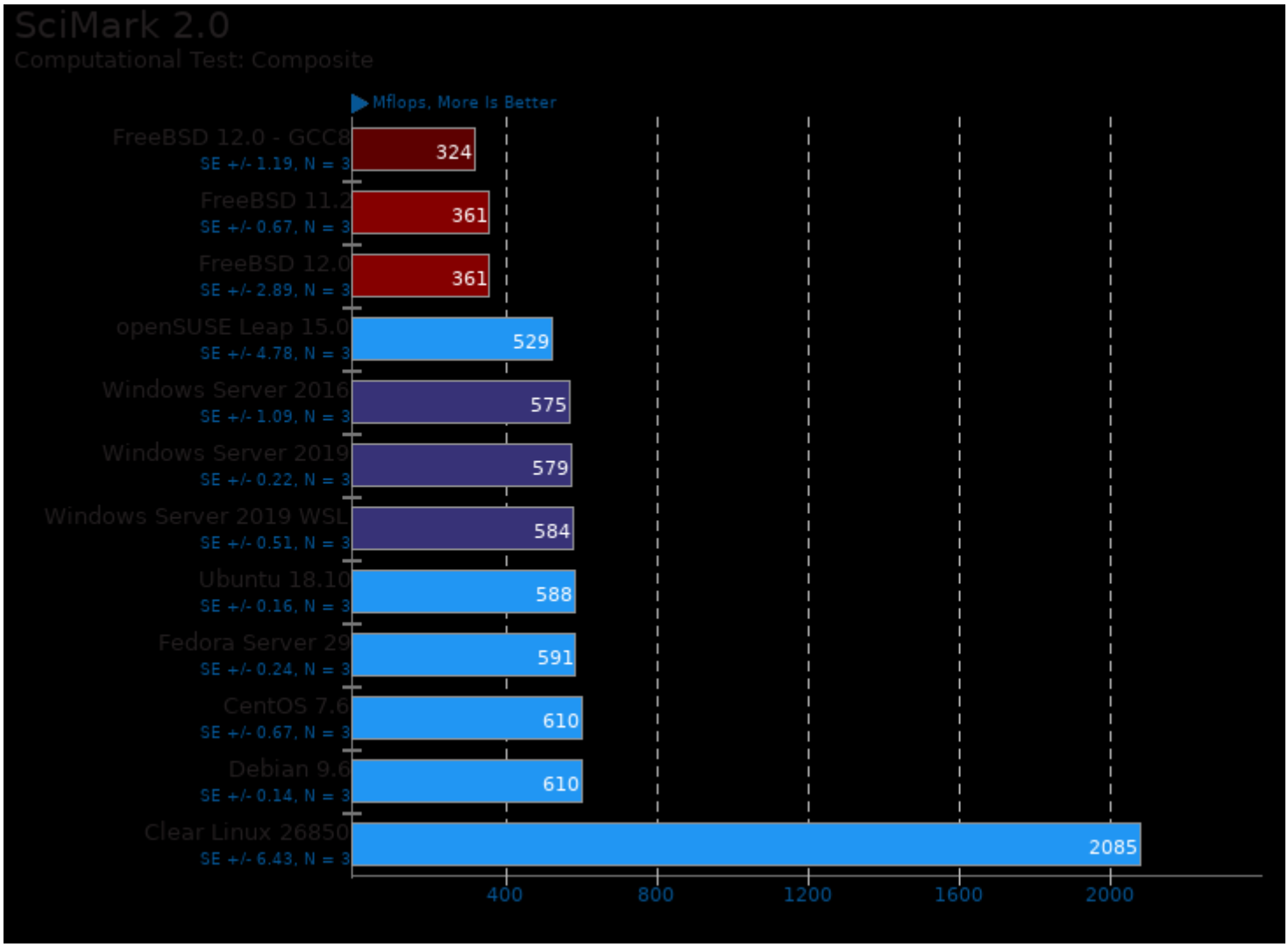

Go Benchmarks
Test: garbage
Nanoseconds/Operation, Fewer Is Better
Debian 9.6
SE +/- 4850.79, N = 3
1190018
Clear Linux 26850
SE +/- 9094.00, N = 3
1171475
openSUSE Leap 15.0
SE +/- 5550.64, N = 3
1115094
Windows Server 2019 WSL
SE +/- 11206.53, N = 3
1018084
FreeBSD 11.2
SE +/- 7872.06, N = 3
964801
FreeBSD 12.0
SE +/- 11182.63, N = 3
941491
Windows Server 2016
SE +/- 4712.77, N = 3
932202
FreeBSD 12.0 - GCC8
SE +/- 12405.11, N = 3
930944
Windows Server 2019
SE +/- 3836.82, N = 3
912090
Fedora Server 29
SE +/- 7280.02, N = 3
872864
Ubuntu 18.10
SE +/- 5252.01, N = 3
859815
300K
600K
900K
1200K
1500K

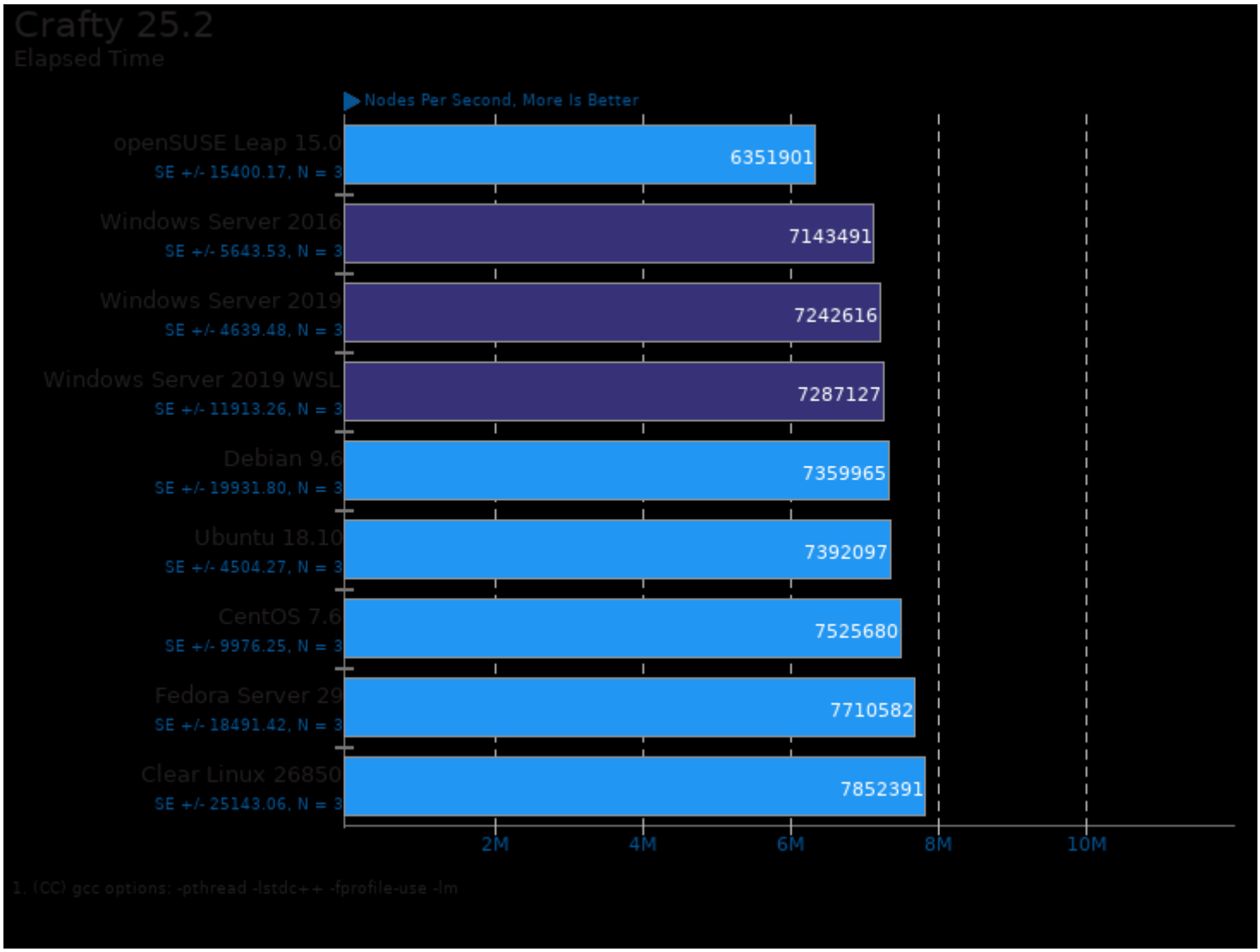

Java SciMark 2.0
Computational Test: Composite
Mflops, More Is Better
FreeBSD 11.2
SE +/- 4.85, N = 4
1225
FreeBSD 12.0 - GCC8
SE +/- 3.22, N = 4
1228
FreeBSD 12.0
SE +/- 2.28, N = 4
1235
openSUSE Leap 15.0
SE +/- 33.01, N = 16
1860
Windows Server 2016
SE +/- 11.94, N = 4
2130
CentOS 7.6
SE +/- 7.54, N = 4
2156
Windows Server 2019
SE +/- 3.93, N = 4
2182
Fedora Server 29
SE +/- 8.58, N = 4
2201
Windows Server 2019 WSL
SE +/- 7.10, N = 4
2217
Debian 9.6
SE +/- 21.28, N = 15
2222
Ubuntu 18.10
SE +/- 7.29, N = 4
2242
Clear Linux 26850
SE +/- 6.01, N = 4
2257
500
1000
1500
2000
2500

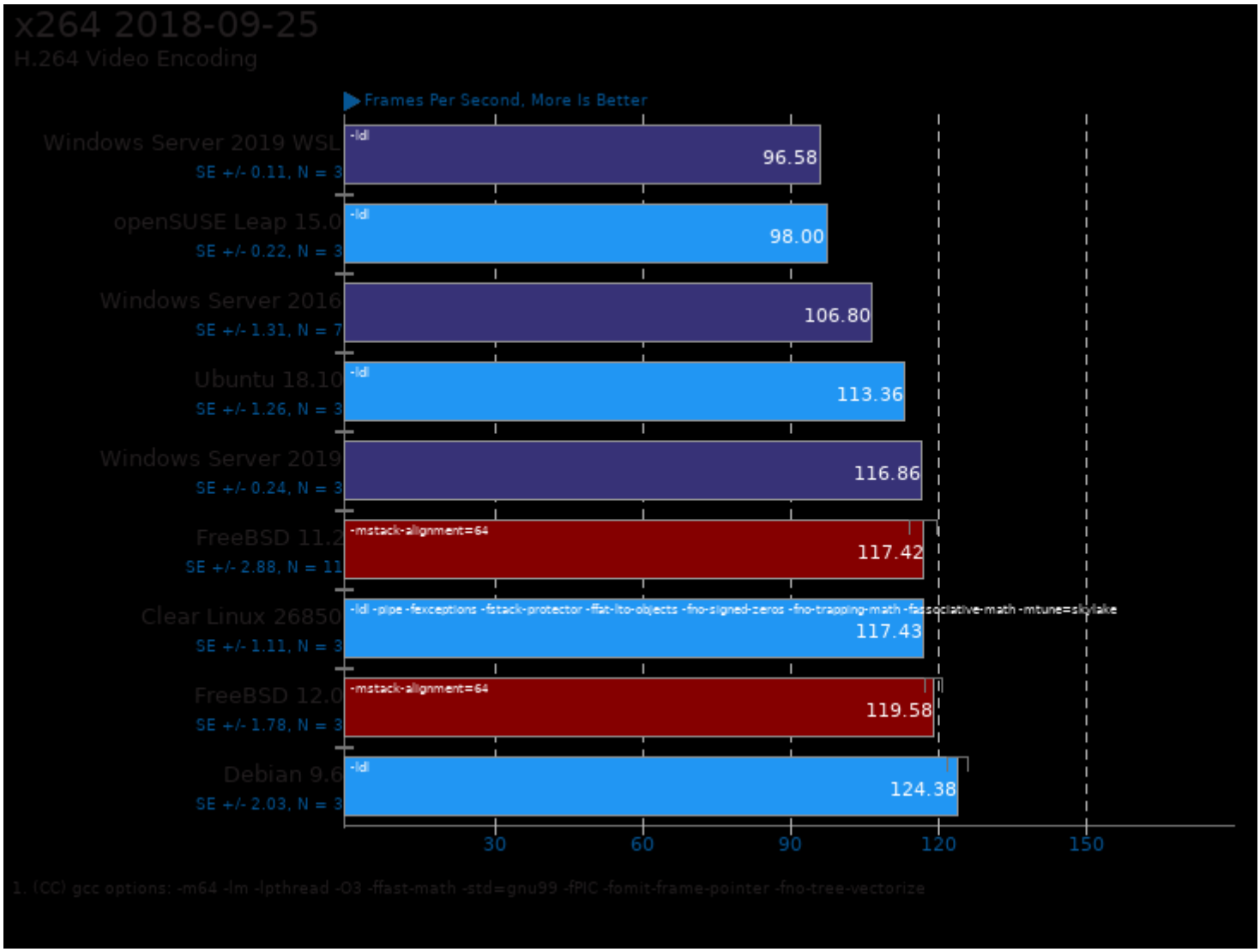

DaCapo Benchmark 9.12-MR1
Java Test: Jython
msec, Fewer Is Better
openSUSE Leap 15.0
SE +/- 118.13, N = 10
10999
FreeBSD 11.2
SE +/- 76.21, N = 4
7034
FreeBSD 12.0 - GCC8
SE +/- 85.12, N = 4
6350
FreeBSD 12.0
SE +/- 59.93, N = 4
6342
Windows Server 2016
SE +/- 33.53, N = 4
4677
Windows Server 2019
4609
Windows Server 2019 WSL
SE +/- 133.58, N = 16
4482
Fedora Server 29
SE +/- 20.89, N = 4
4443
CentOS 7.6
SE +/- 37.91, N = 4
4415
Ubuntu 18.10
SE +/- 48.54, N = 4
3922
Debian 9.6
SE +/- 40.86, N = 4
3784
Clear Linux 26850
SE +/- 12.48, N = 4
3567
2K
4K
6K
8K
10K

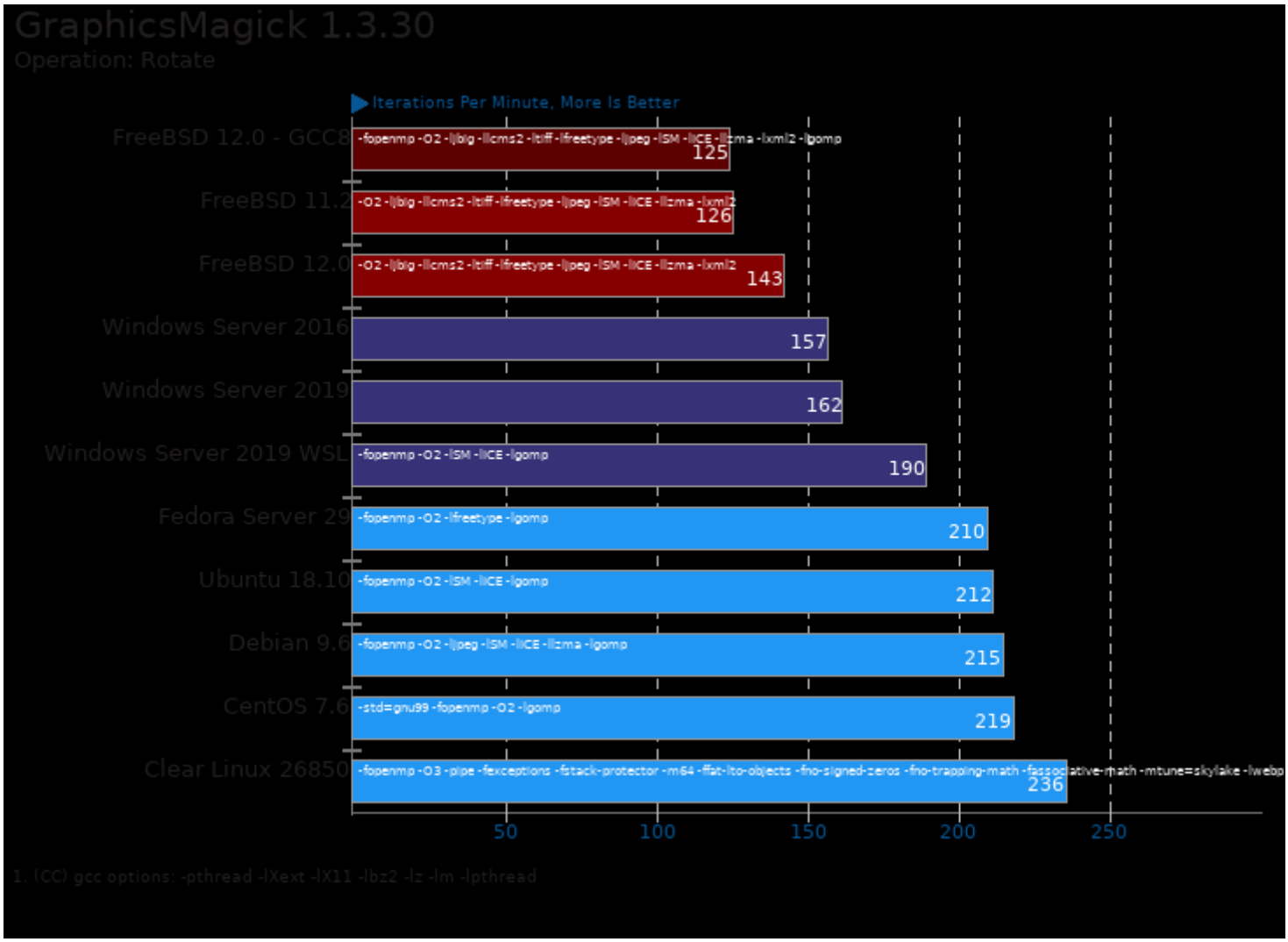

DaCapo Benchmark 9.12-MR1
Java Test: Tradebeans
msec, Fewer Is Better
Fedora Server 29
SE +/- 125.40, N = 4
13301
Ubuntu 18.10
SE +/- 168.54, N = 6
12693
CentOS 7.6
SE +/- 166.90, N = 16
12005
Windows Server 2016
SE +/- 74.78, N = 4
10299
FreeBSD 11.2
SE +/- 76.84, N = 4
9342
Debian 9.6
SE +/- 80.90, N = 4
9090
FreeBSD 12.0 - GCC8
SE +/- 33.18, N = 4
7035
FreeBSD 12.0
SE +/- 24.07, N = 4
7020
Windows Server 2019 WSL
SE +/- 37.78, N = 4
4286
Windows Server 2019
SE +/- 16.67, N = 4
4015
Clear Linux 26850
3337
3K
6K
9K
12K
15K

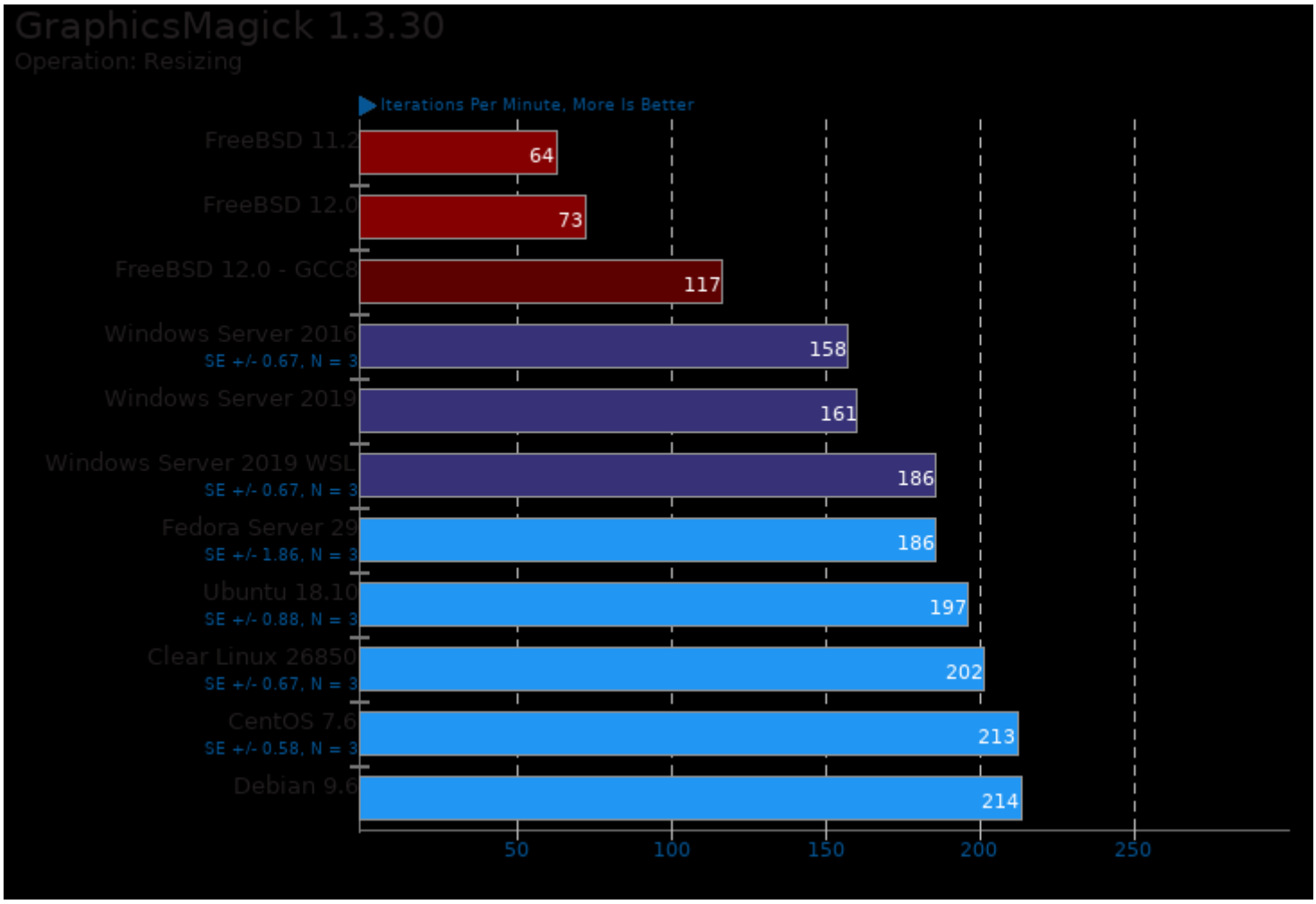

Fhourstones 3.1
Complex Connect-4 Solving
Kpos / sec, More Is Better
FreeBSD 11.2
SE +/- 52.25, N = 3
clang
7720
FreeBSD 12.0
SE +/- 115.89, N = 9
clang
8204
FreeBSD 12.0 - GCC8
SE +/- 113.45, N = 9
gcc
8210
Windows Server 2016
SE +/- 5.77, N = 3
11923
openSUSE Leap 15.0
SE +/- 153.09, N = 3
gcc
12086
Windows Server 2019
SE +/- 22.81, N = 3
12109
Windows Server 2019 WSL
SE +/- 15.37, N = 3
gcc
12348
Debian 9.6
SE +/- 28.64, N = 3
gcc
12663
Ubuntu 18.10
SE +/- 9.65, N = 3
gcc
12730
Clear Linux 26850
SE +/- 308.04, N = 9
gcc
12804
Fedora Server 29
SE +/- 10.79, N = 3
gcc
12865
CentOS 7.6
SE +/- 27.07, N = 3
gcc
12984
3K
6K
9K
12K
15K

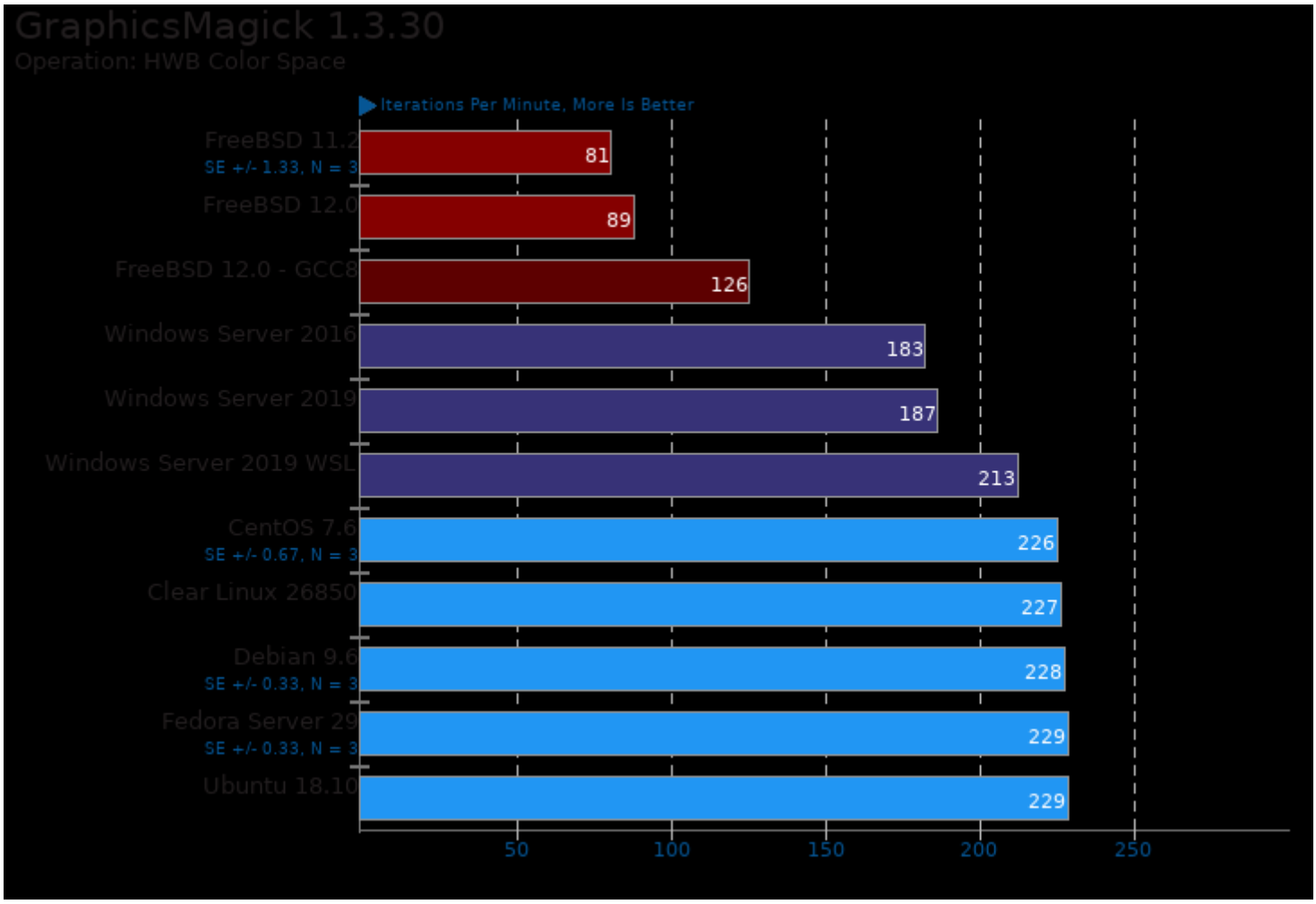

SciMark 2.0
Computational Test: Composite
Mflops, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 1.19, N = 3
324
FreeBSD 11.2
SE +/- 0.67, N = 3
361
FreeBSD 12.0
SE +/- 2.89, N = 3
361
openSUSE Leap 15.0
SE +/- 4.78, N = 3
529
Windows Server 2016
SE +/- 1.09, N = 3
575
Windows Server 2019
SE +/- 0.22, N = 3
579
Windows Server 2019 WSL
SE +/- 0.51, N = 3
584
Ubuntu 18.10
SE +/- 0.16, N = 3
588
Fedora Server 29
SE +/- 0.24, N = 3
591
CentOS 7.6
SE +/- 0.67, N = 3
610
Debian 9.6
SE +/- 0.14, N = 3
610
Clear Linux 26850
SE +/- 6.43, N = 3
2085
400
800
1200
1600
2000

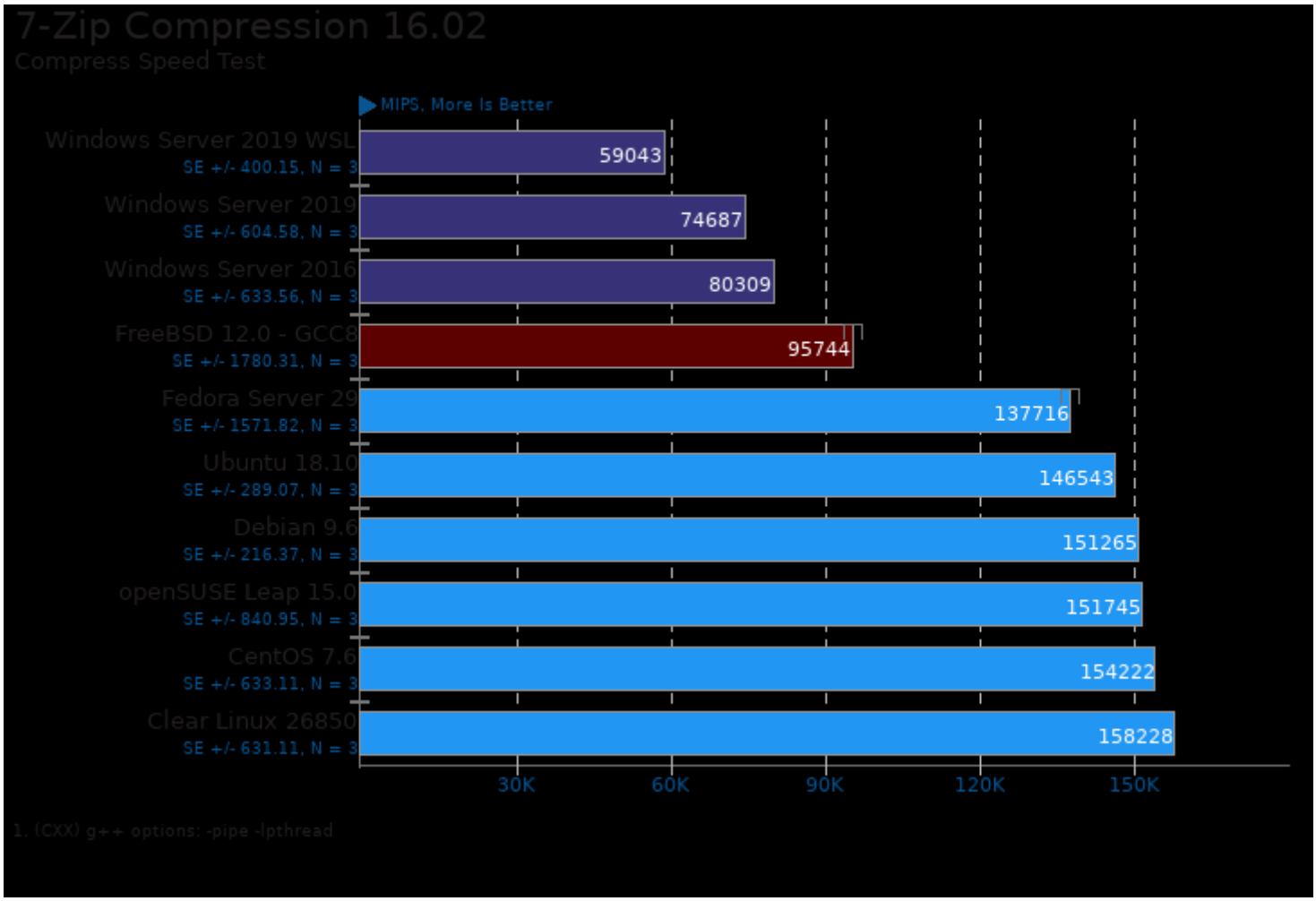

Crafty 25.2
Elapsed Time
Nodes Per Second, More Is Better
openSUSE Leap 15.0
SE +/- 15400.17, N = 3
6351901
Windows Server 2016
SE +/- 5643.53, N = 3
7143491
Windows Server 2019
SE +/- 4639.48, N = 3
7242616
Windows Server 2019 WSL
SE +/- 11913.26, N = 3
7287127
Debian 9.6
SE +/- 19931.80, N = 3
7359965
Ubuntu 18.10
SE +/- 4504.27, N = 3
7392097
CentOS 7.6
SE +/- 9976.25, N = 3
7525680
Fedora Server 29
SE +/- 18491.42, N = 3
7710582
Clear Linux 26850
SE +/- 25143.06, N = 3
7852391
2M
4M
6M
8M
10M
1. (CC) gcc options: -pthread -lstdc++ -fprofile-use -lm

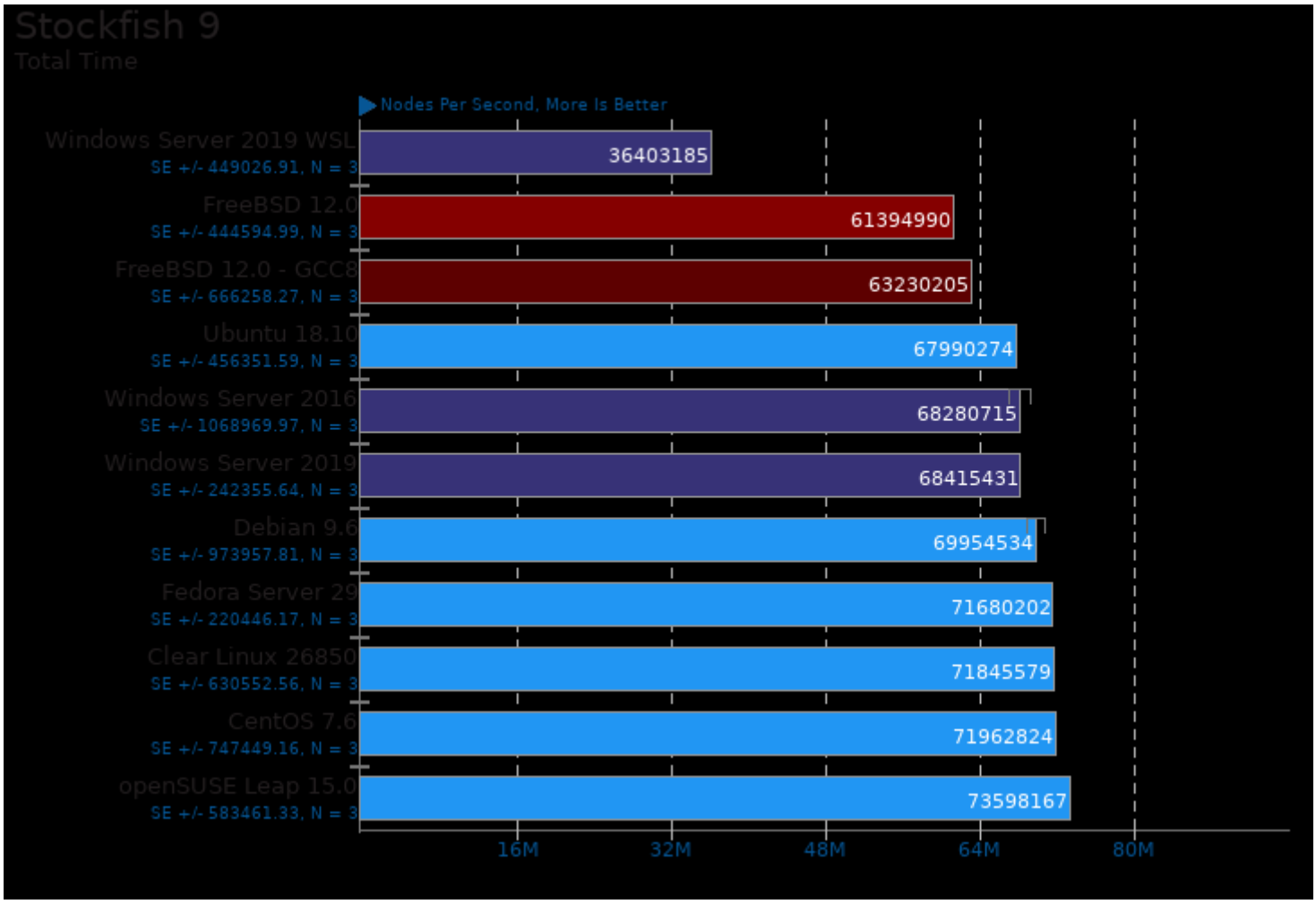

x264 2018-09-25
H.264 Video Encoding
Frames Per Second, More Is Better
Windows Server 2019 WSL
SE +/- 0.11, N = 3
-ldl
96.58
openSUSE Leap 15.0
SE +/- 0.22, N = 3
-ldl
98.00
Windows Server 2016
SE +/- 1.31, N = 7
106.80
Ubuntu 18.10
SE +/- 1.26, N = 3
-ldl
113.36
Windows Server 2019
SE +/- 0.24, N = 3
116.86
FreeBSD 11.2
SE +/- 2.88, N = 11
-mstack-alignment=64
117.42
Clear Linux 26850
SE +/- 1.11, N = 3
-ldl -pipe -fexceptions -fstack-protector -ffat-lto-objects -fno-signed-zeros -fno-trapping-math -fassociative-math -mtune=skylake
117.43
FreeBSD 12.0
SE +/- 1.78, N = 3
-mstack-alignment=64
119.58
Debian 9.6
SE +/- 2.03, N = 3
-ldl
124.38
30
60
90
120
150
1. (CC) gcc options: -m64 -lm -lpthread -O3 -ffast-math -std=gnu99 -fPIC -fomit-frame-pointer -fno-tree-vectorize

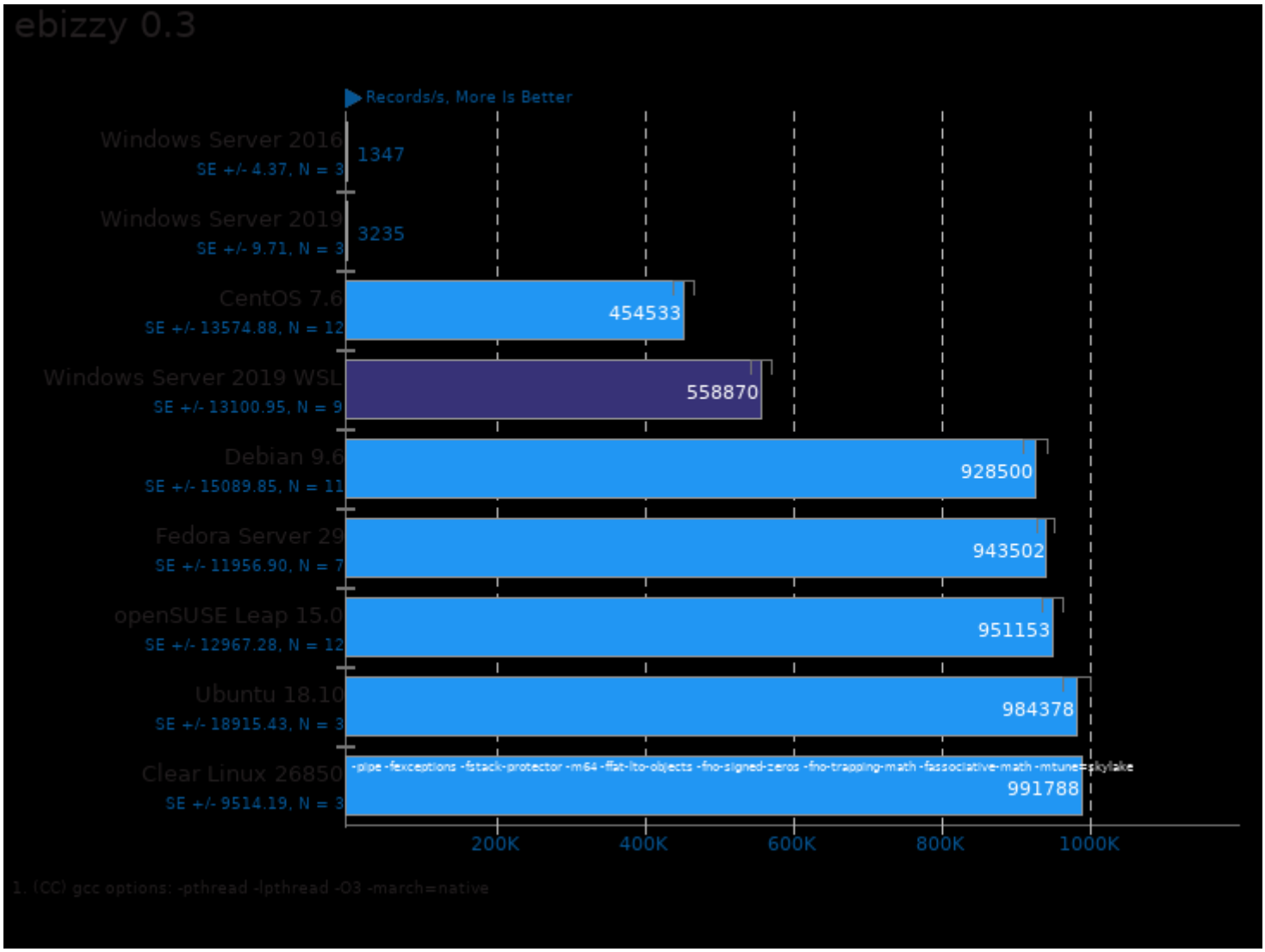

GraphicsMagick 1.3.30
Operation: Rotate
Iterations Per Minute, More Is Better
FreeBSD 12.0 - GCC8
-fopenmp -O2 -ljbig -llcms2 -ltiff -lfreetype -ljpeg -lSM -lICE -llzma -lxml2 -lgomp
125
FreeBSD 11.2
-O2 -ljbig -llcms2 -ltiff -lfreetype -ljpeg -lSM -lICE -llzma -lxml2
126
FreeBSD 12.0
-O2 -ljbig -llcms2 -ltiff -lfreetype -ljpeg -lSM -lICE -llzma -lxml2
143
Windows Server 2016
157
Windows Server 2019
162
Windows Server 2019 WSL
-fopenmp -O2 -lSM -lICE -lgomp
190
Fedora Server 29
-fopenmp -O2 -lfreetype -lgomp
210
Ubuntu 18.10
-fopenmp -O2 -lSM -lICE -lgomp
212
Debian 9.6
-fopenmp -O2 -ljpeg -lSM -lICE -llzma -lgomp
215
CentOS 7.6
-std=gnu99 -fopenmp -O2 -lgomp
219
Clear Linux 26850
-fopenmp -O3 -pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-signed-zeros -fno-trapping-math -fassociative-math -mtune=skylake -lwebp
236
50
100
150
200
250
1. (CC) gcc options: -pthread -lXext -lX11 -lbz2 -lz -lm -lpthread

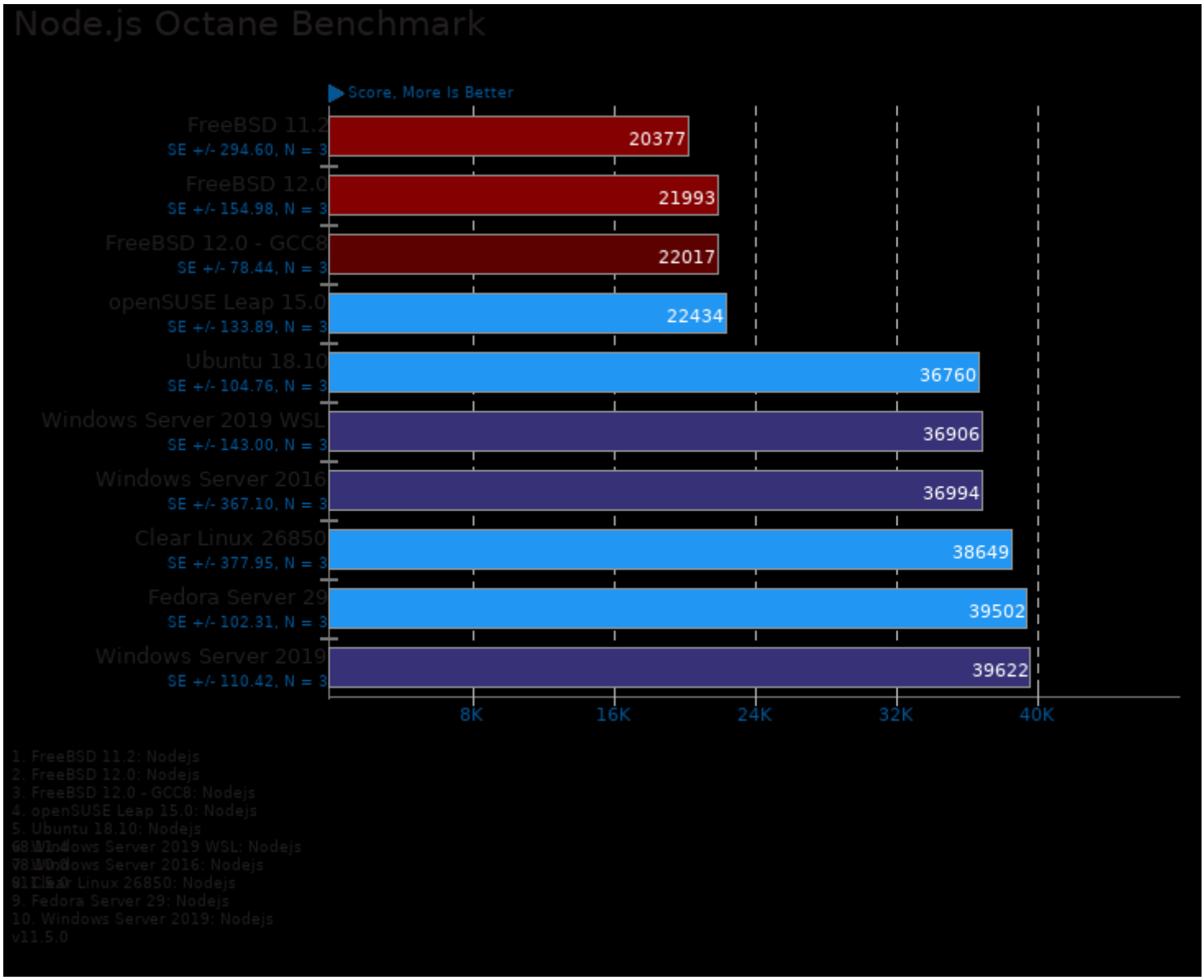

GraphicsMagick 1.3.30
Operation: Resizing
Iterations Per Minute, More Is Better
FreeBSD 11.2
64
FreeBSD 12.0
73
FreeBSD 12.0 - GCC8
117
Windows Server 2016
SE +/- 0.67, N = 3
158
Windows Server 2019
161
Windows Server 2019 WSL
SE +/- 0.67, N = 3
186
Fedora Server 29
SE +/- 1.86, N = 3
186
Ubuntu 18.10
SE +/- 0.88, N = 3
197
Clear Linux 26850
SE +/- 0.67, N = 3
202
CentOS 7.6
SE +/- 0.58, N = 3
213
Debian 9.6
214
50
100
150
200
250

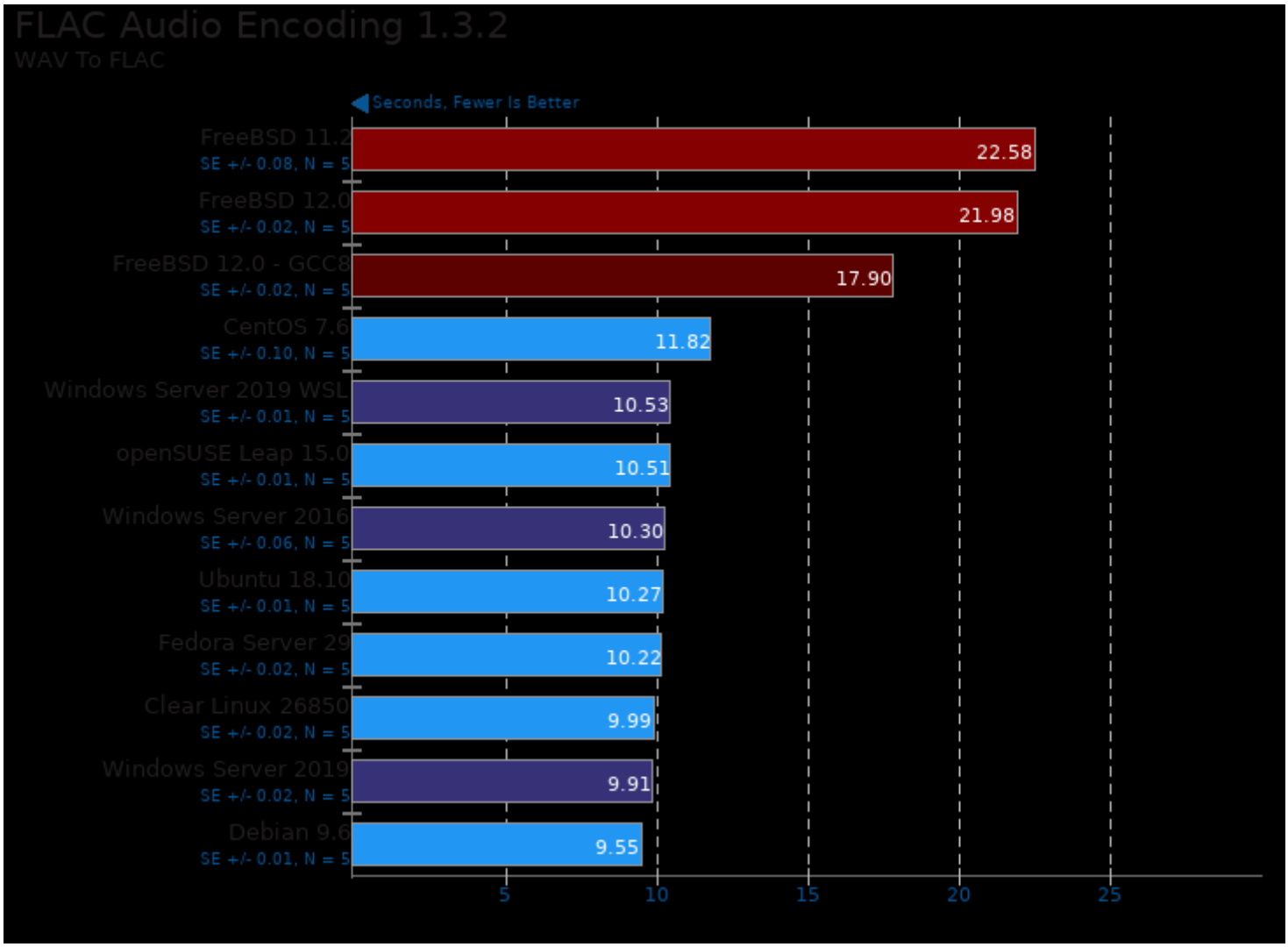

GraphicsMagick 1.3.30
Operation: HWB Color Space
Iterations Per Minute, More Is Better
FreeBSD 11.2
SE +/- 1.33, N = 3
81
FreeBSD 12.0
89
FreeBSD 12.0 - GCC8
126
Windows Server 2016
183
Windows Server 2019
187
Windows Server 2019 WSL
213
CentOS 7.6
SE +/- 0.67, N = 3
226
Clear Linux 26850
227
Debian 9.6
SE +/- 0.33, N = 3
228
Fedora Server 29
SE +/- 0.33, N = 3
229
Ubuntu 18.10
229
50
100
150
200
250

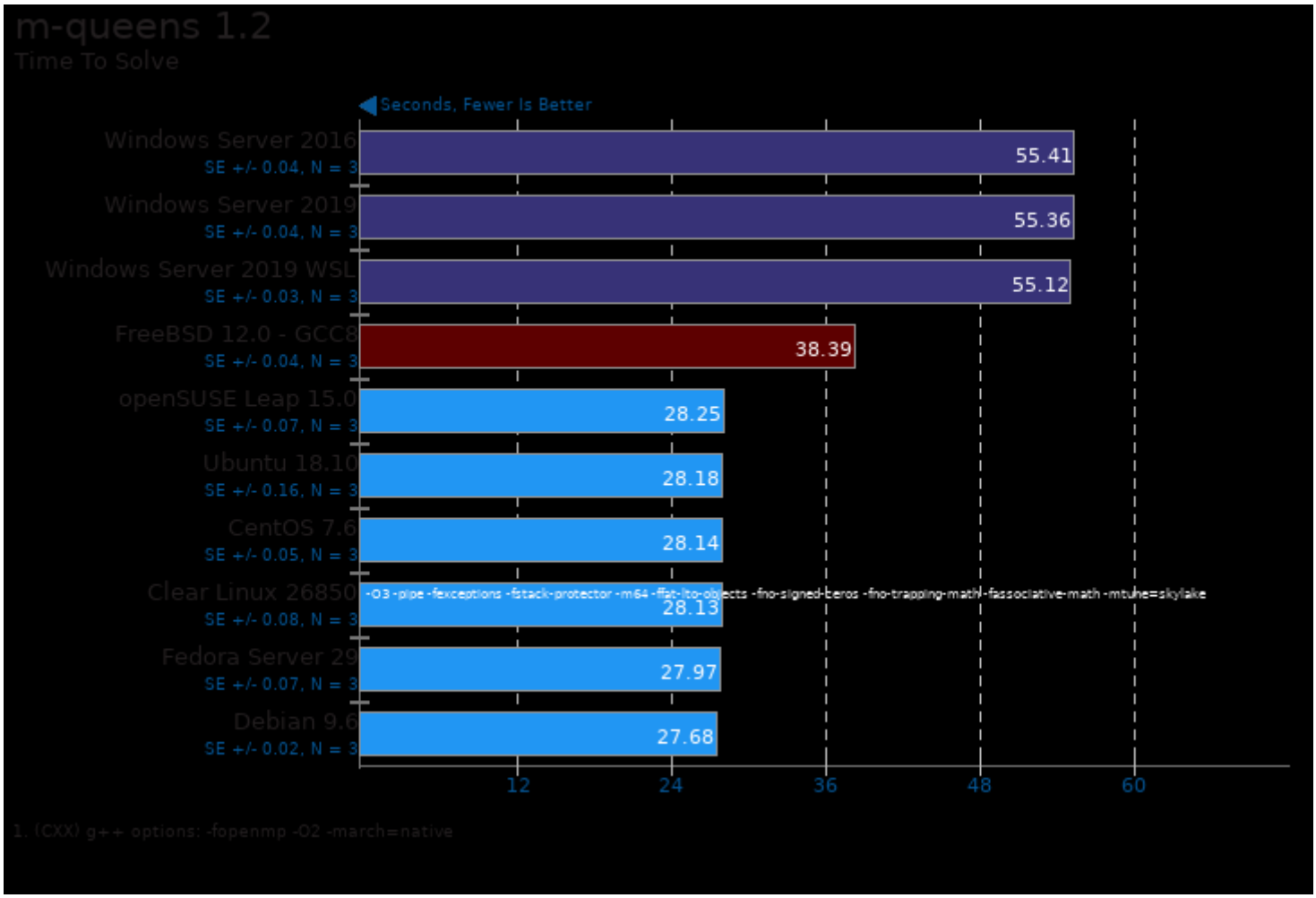

7-Zip Compression 16.02
Compress Speed Test
MIPS, More Is Better
Windows Server 2019 WSL
SE +/- 400.15, N = 3
59043
Windows Server 2019
SE +/- 604.58, N = 3
74687
Windows Server 2016
SE +/- 633.56, N = 3
80309
FreeBSD 12.0 - GCC8
SE +/- 1780.31, N = 3
95744
Fedora Server 29
SE +/- 1571.82, N = 3
137716
Ubuntu 18.10
SE +/- 289.07, N = 3
146543
Debian 9.6
SE +/- 216.37, N = 3
151265
openSUSE Leap 15.0
SE +/- 840.95, N = 3
151745
CentOS 7.6
SE +/- 633.11, N = 3
154222
Clear Linux 26850
SE +/- 631.11, N = 3
158228
30K
60K
90K
120K
150K
1. (CXX) g++ options: -pipe -lpthread

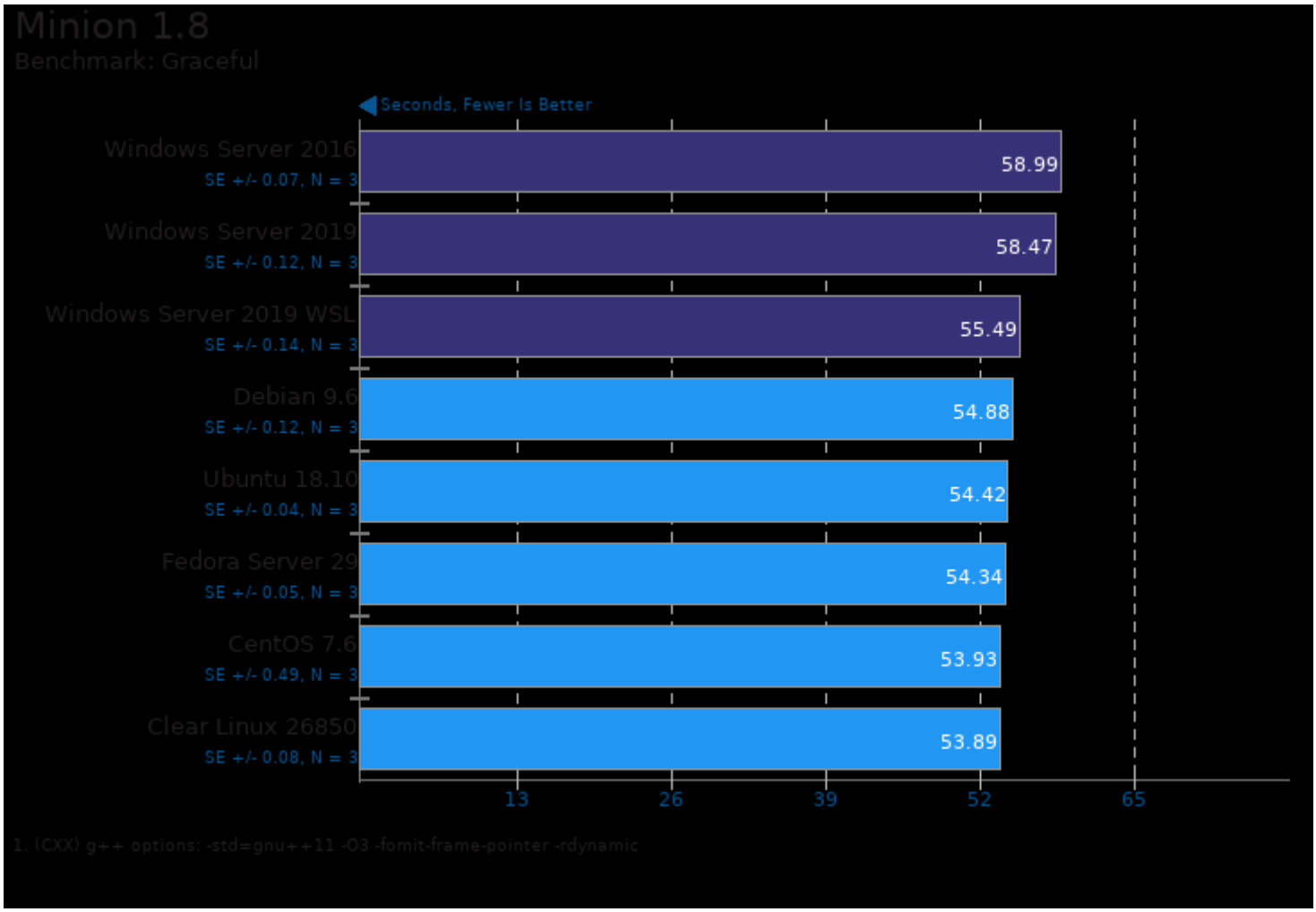

Stockfish 9
Total Time
Nodes Per Second, More Is Better
Windows Server 2019 WSL
SE +/- 449026.91, N = 3
36403185
FreeBSD 12.0
SE +/- 444594.99, N = 3
61394990
FreeBSD 12.0 - GCC8
SE +/- 666258.27, N = 3
63230205
Ubuntu 18.10
SE +/- 456351.59, N = 3
67990274
Windows Server 2016
SE +/- 1068969.97, N = 3
68280715
Windows Server 2019
SE +/- 242355.64, N = 3
68415431
Debian 9.6
SE +/- 973957.81, N = 3
69954534
Fedora Server 29
SE +/- 220446.17, N = 3
71680202
Clear Linux 26850
SE +/- 630552.56, N = 3
71845579
CentOS 7.6
SE +/- 747449.16, N = 3
71962824
openSUSE Leap 15.0
SE +/- 583461.33, N = 3
73598167
16M
32M
48M
64M
80M

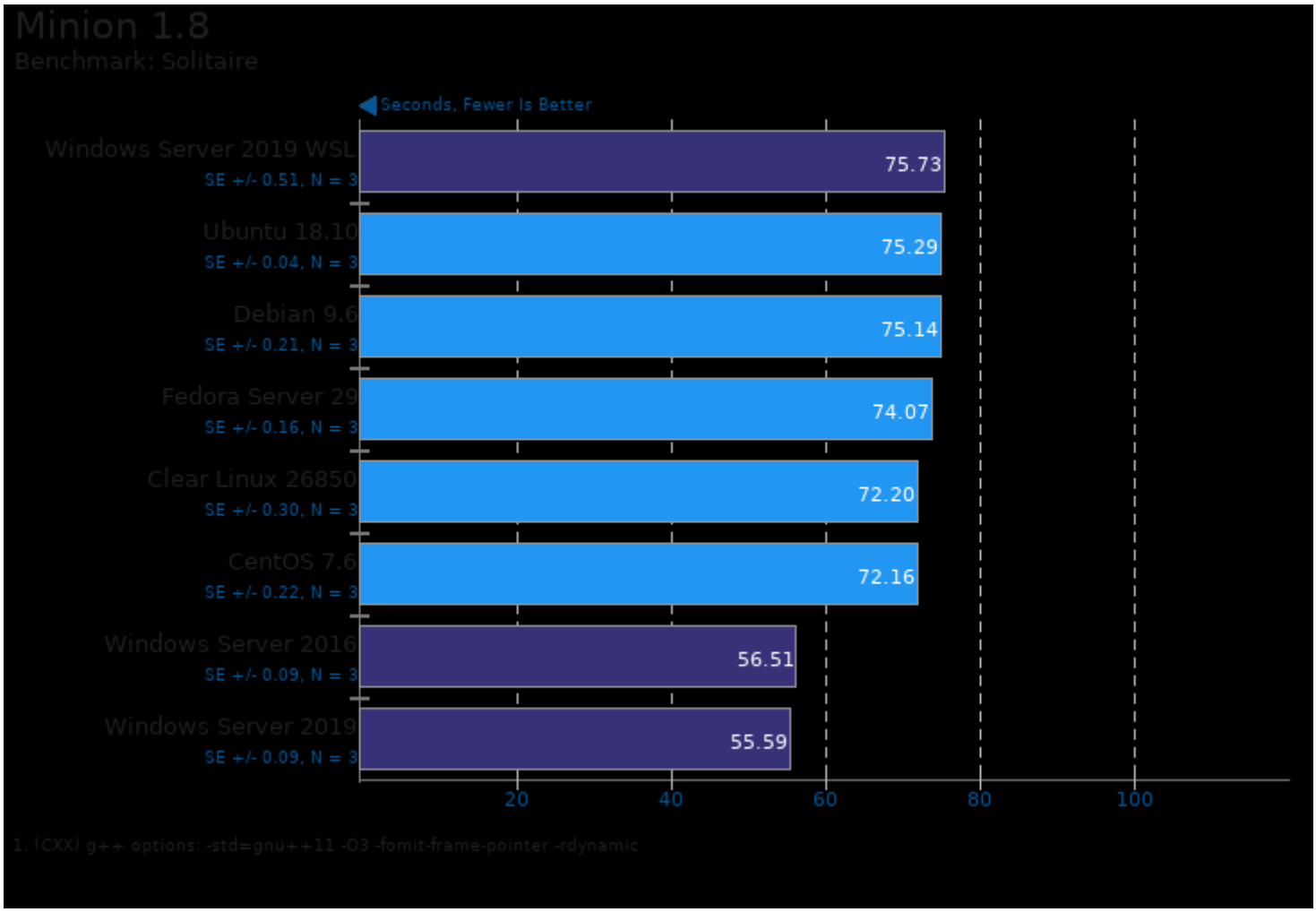

ebizzy 0.3
Records/s, More Is Better
Windows Server 2016
SE +/- 4.37, N = 3
1347
Windows Server 2019
SE +/- 9.71, N = 3
3235
CentOS 7.6
SE +/- 13574.88, N = 12
454533
Windows Server 2019 WSL
SE +/- 13100.95, N = 9
558870
Debian 9.6
SE +/- 15089.85, N = 11
928500
Fedora Server 29
SE +/- 11956.90, N = 7
943502
openSUSE Leap 15.0
SE +/- 12967.28, N = 12
951153
Ubuntu 18.10
SE +/- 18915.43, N = 3
984378
Clear Linux 26850
SE +/- 9514.19, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-signed-zeros -fno-trapping-math -fassociative-math -mtune=skylake
991788
200K
400K
600K
800K
1000K
1. (CC) gcc options: -pthread -lpthread -O3 -march=native

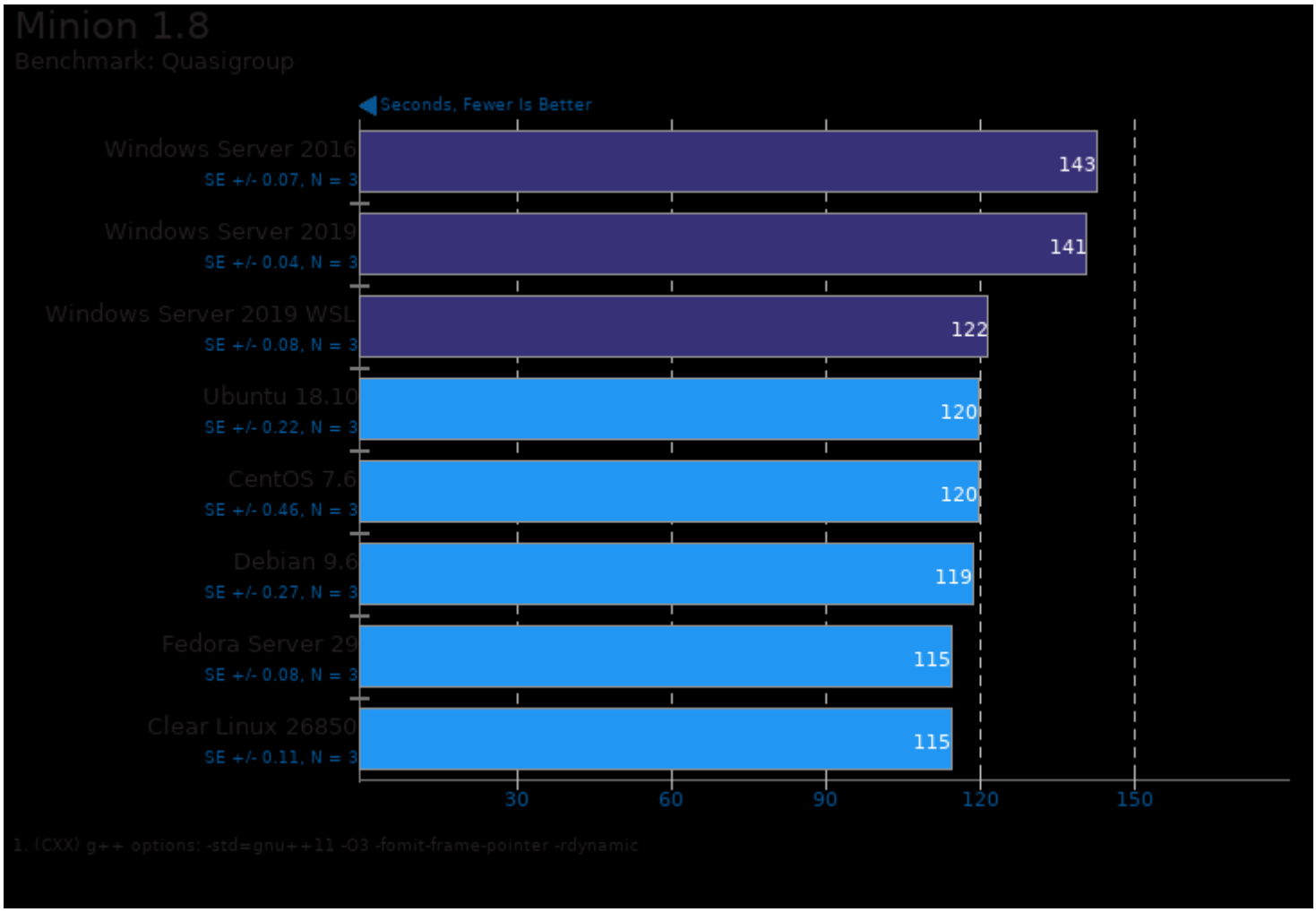

Node.js Octane Benchmark
Score, More Is Better
FreeBSD 11.2
SE +/- 294.60, N = 3
20377
FreeBSD 12.0
SE +/- 154.98, N = 3
21993
FreeBSD 12.0 - GCC8
SE +/- 78.44, N = 3
22017
openSUSE Leap 15.0
SE +/- 133.89, N = 3
22434
Ubuntu 18.10
SE +/- 104.76, N = 3
36760
Windows Server 2019 WSL
SE +/- 143.00, N = 3
36906
Windows Server 2016
SE +/- 367.10, N = 3
36994
Clear Linux 26850
SE +/- 377.95, N = 3
38649
Fedora Server 29
SE +/- 102.31, N = 3
39502
Windows Server 2019
SE +/- 110.42, N = 3
39622
8K
16K
24K
32K
40K
1. FreeBSD 11.2: Nodejs
2. FreeBSD 12.0: Nodejs
3. FreeBSD 12.0 - GCC8: Nodejs
4. openSUSE Leap 15.0: Nodejs
5. Ubuntu 18.10: Nodejs
9. Fedora Server 29: Nodejs
10. Windows Server 2019: Nodejs
v11.5.0

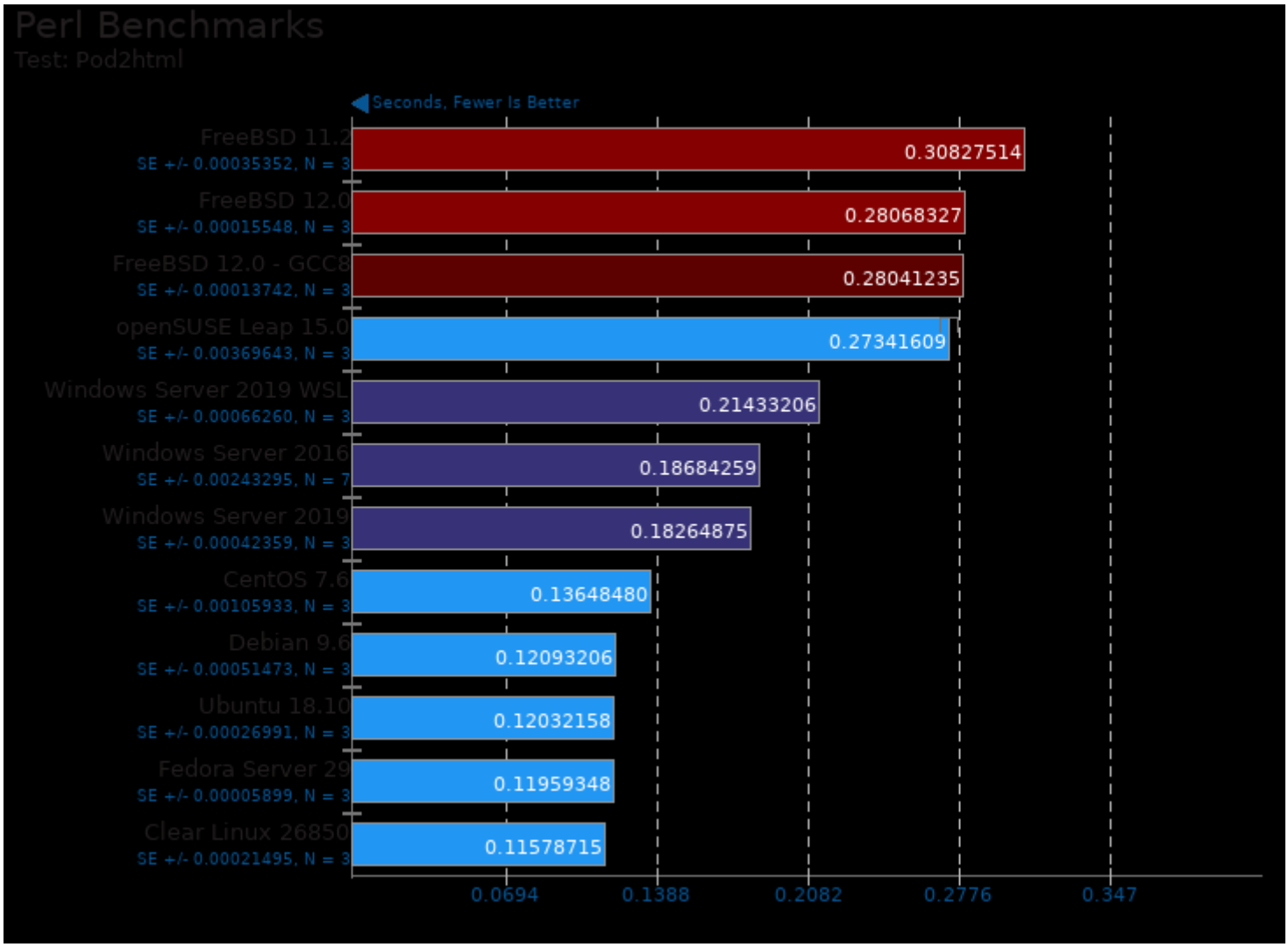

FLAC Audio Encoding 1.3.2
WAV To FLAC
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.08, N = 5
22.58
FreeBSD 12.0
SE +/- 0.02, N = 5
21.98
FreeBSD 12.0 - GCC8
SE +/- 0.02, N = 5
17.90
CentOS 7.6
SE +/- 0.10, N = 5
11.82
Windows Server 2019 WSL
SE +/- 0.01, N = 5
10.53
openSUSE Leap 15.0
SE +/- 0.01, N = 5
10.51
Windows Server 2016
SE +/- 0.06, N = 5
10.30
Ubuntu 18.10
SE +/- 0.01, N = 5
10.27
Fedora Server 29
SE +/- 0.02, N = 5
10.22
Clear Linux 26850
SE +/- 0.02, N = 5
9.99
Windows Server 2019
SE +/- 0.02, N = 5
9.91
Debian 9.6
SE +/- 0.01, N = 5
9.55
5
10
15
20
25

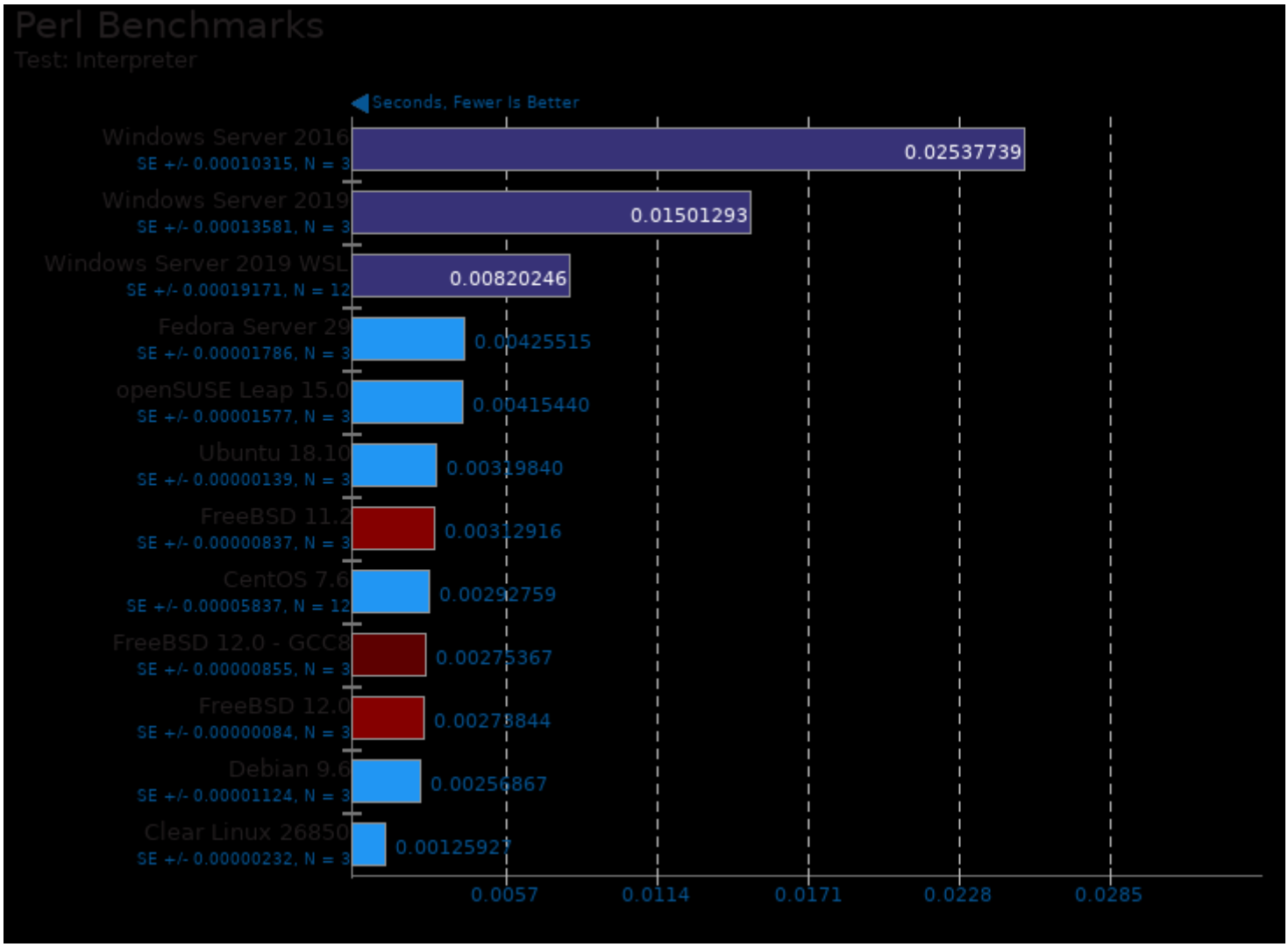

m-queens 1.2
Time To Solve
Seconds, Fewer Is Better
Windows Server 2016
SE +/- 0.04, N = 3
55.41
Windows Server 2019
SE +/- 0.04, N = 3
55.36
Windows Server 2019 WSL
SE +/- 0.03, N = 3
55.12
FreeBSD 12.0 - GCC8
SE +/- 0.04, N = 3
38.39
openSUSE Leap 15.0
SE +/- 0.07, N = 3
28.25
Ubuntu 18.10
SE +/- 0.16, N = 3
28.18
CentOS 7.6
SE +/- 0.05, N = 3
28.14
Clear Linux 26850
SE +/- 0.08, N = 3
28.13
-O3 -pipe -fexceptions -fstack-protector -m64 -flto-odr-type-merging -fno-signed-zeros -fno-trapping-math -fassociative-math -mtune=skylake
Fedora Server 29
SE +/- 0.07, N = 3
27.97
Debian 9.6
SE +/- 0.02, N = 3
27.68
12
24
36
48
60
1. (CXX) g++ options: -fopenmp -O2 -march=native

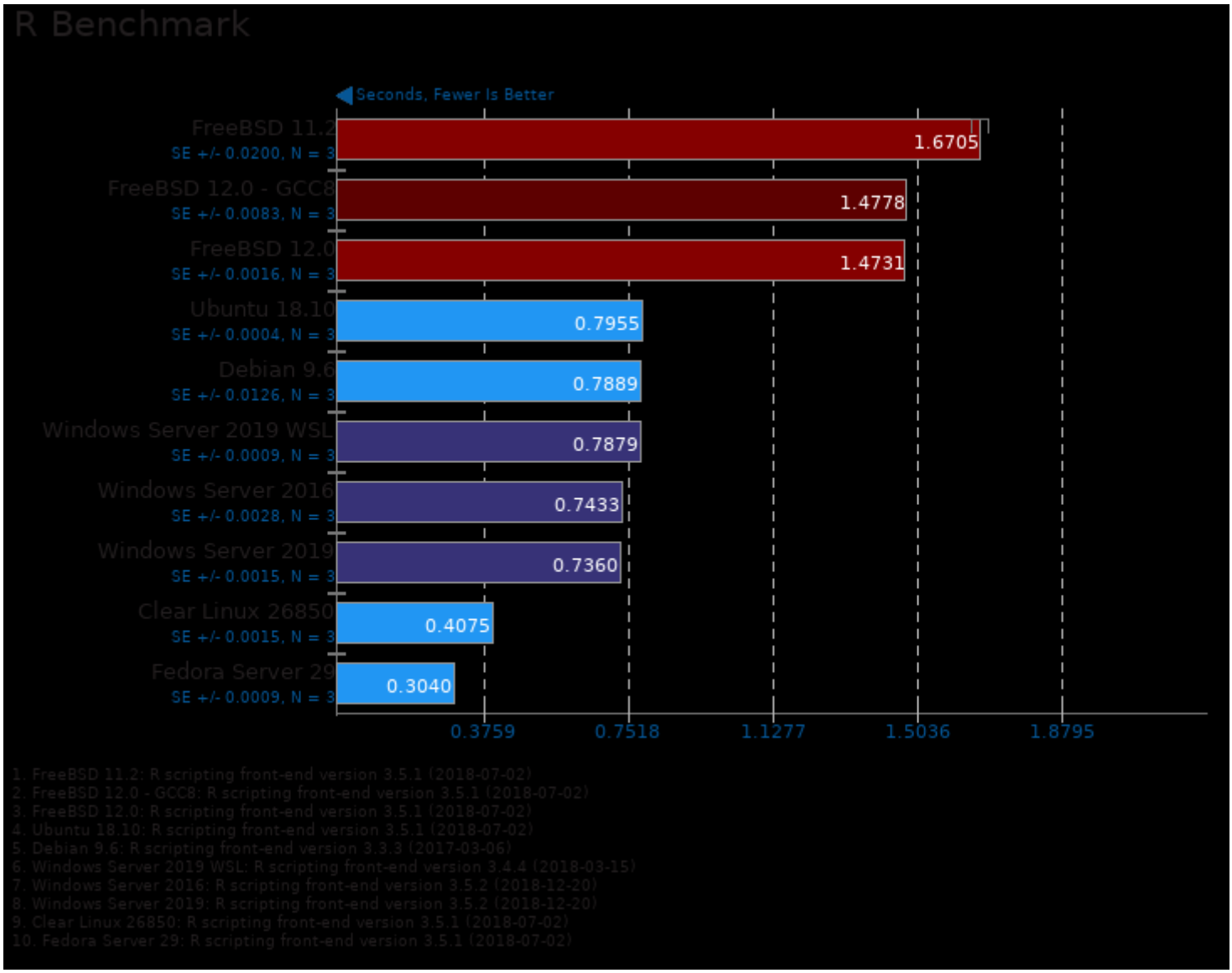

Minion 1.8
Benchmark: Graceful
Seconds, Fewer Is Better
Windows Server 2016
SE +/- 0.07, N = 3
58.99
Windows Server 2019
SE +/- 0.12, N = 3
58.47
Windows Server 2019 WSL
SE +/- 0.14, N = 3
55.49
Debian 9.6
SE +/- 0.12, N = 3
54.88
Ubuntu 18.10
SE +/- 0.04, N = 3
54.42
Fedora Server 29
SE +/- 0.05, N = 3
54.34
CentOS 7.6
SE +/- 0.49, N = 3
53.93
Clear Linux 26850
SE +/- 0.08, N = 3
53.89
13
26
39
52
65
1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

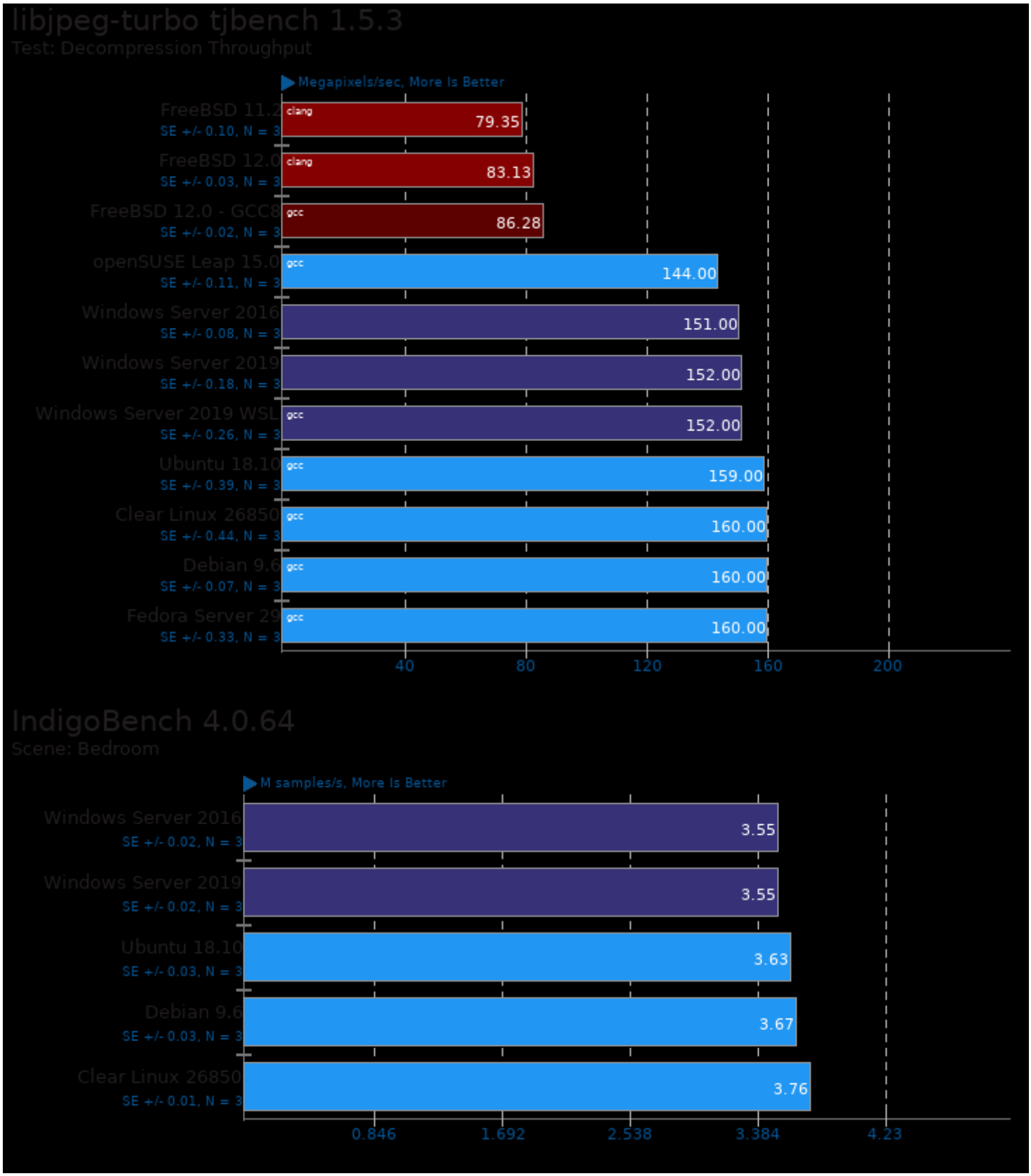

Minion 1.8
Benchmark: Solitaire
Seconds, Fewer Is Better
Windows Server 2019 WSL
SE +/- 0.51, N = 3
75.73
Ubuntu 18.10
SE +/- 0.04, N = 3
75.29
Debian 9.6
SE +/- 0.21, N = 3
75.14
Fedora Server 29
SE +/- 0.16, N = 3
74.07
Clear Linux 26850
SE +/- 0.30, N = 3
72.20
CentOS 7.6
SE +/- 0.22, N = 3
72.16
Windows Server 2016
SE +/- 0.09, N = 3
56.51
Windows Server 2019
SE +/- 0.09, N = 3
55.59
20
40
60
80
100
1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

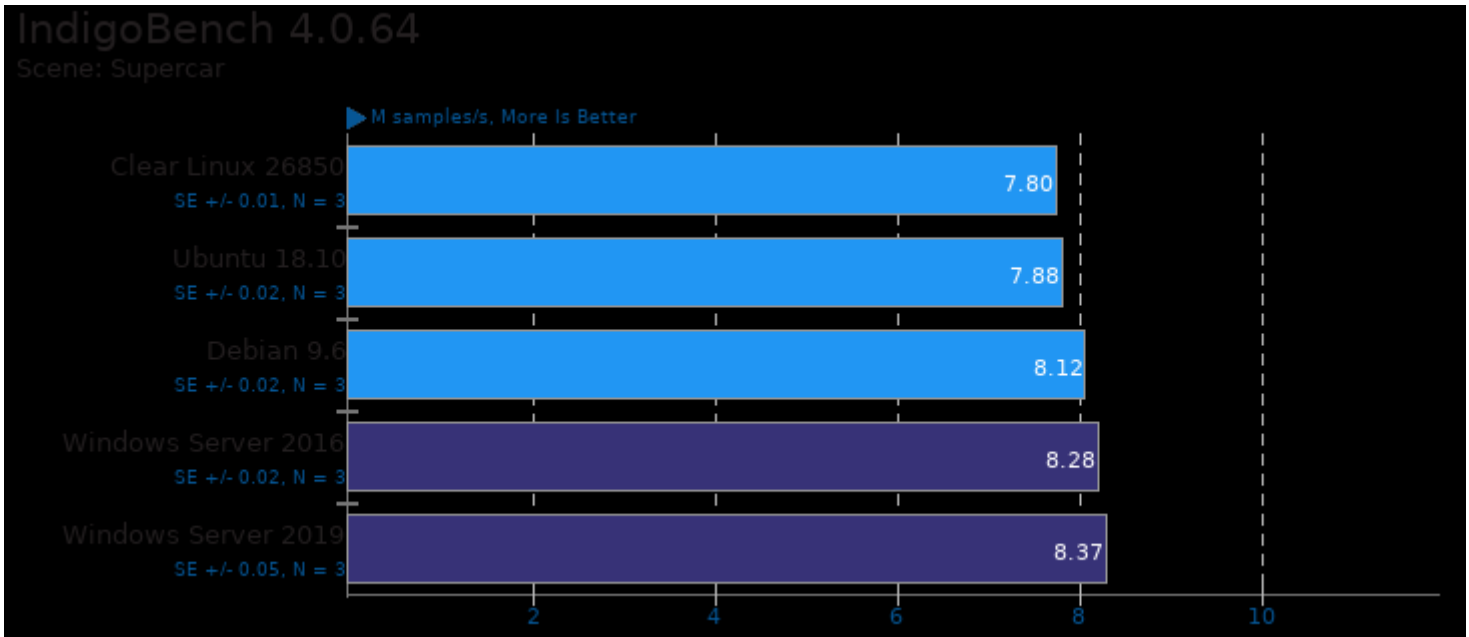

Minion 1.8
Benchmark: Quasigroup
Seconds, Fewer Is Better
Windows Server 2016
SE +/- 0.07, N = 3
143
Windows Server 2019
SE +/- 0.04, N = 3
141
Windows Server 2019 WSL
SE +/- 0.08, N = 3
122
Ubuntu 18.10
SE +/- 0.22, N = 3
120
CentOS 7.6
SE +/- 0.46, N = 3
120
Debian 9.6
SE +/- 0.27, N = 3
119
Fedora Server 29
SE +/- 0.08, N = 3
115
Clear Linux 26850
SE +/- 0.11, N = 3
115
30
60
90
120
150
1. (CXX) g++ options: -std=gnu++11 -O3 -fomit-frame-pointer -rdynamic

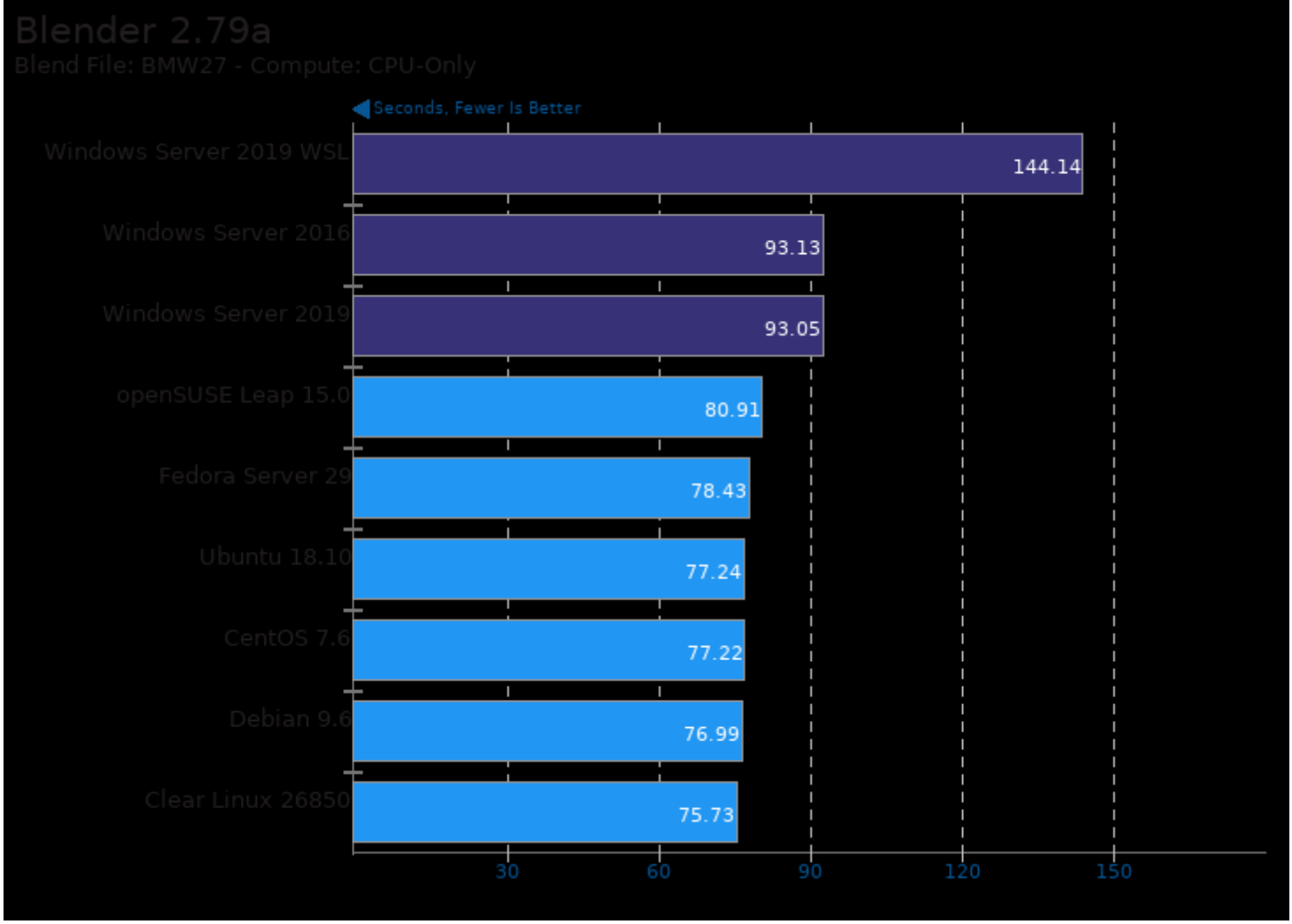

Perl Benchmarks
Test: Pod2html
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.00035352, N = 3
0.30827514
FreeBSD 12.0
SE +/- 0.00015548, N = 3
0.28068327
FreeBSD 12.0 - GCC8
SE +/- 0.00013742, N = 3
0.28041235
openSUSE Leap 15.0
SE +/- 0.00369643, N = 3
0.27341609
Windows Server 2019 WSL
SE +/- 0.00066260, N = 3
0.21433206
Windows Server 2016
SE +/- 0.00243295, N = 7
0.18684259
Windows Server 2019
SE +/- 0.00042359, N = 3
0.18264875
CentOS 7.6
SE +/- 0.00105933, N = 3
0.13648480
Debian 9.6
SE +/- 0.00051473, N = 3
0.12093206
Ubuntu 18.10
SE +/- 0.00026991, N = 3
0.12032158
Fedora Server 29
SE +/- 0.00005899, N = 3
0.11959348
Clear Linux 26850
SE +/- 0.00021495, N = 3
0.11578715
0.0694
0.1388
0.2082
0.2776
0.347

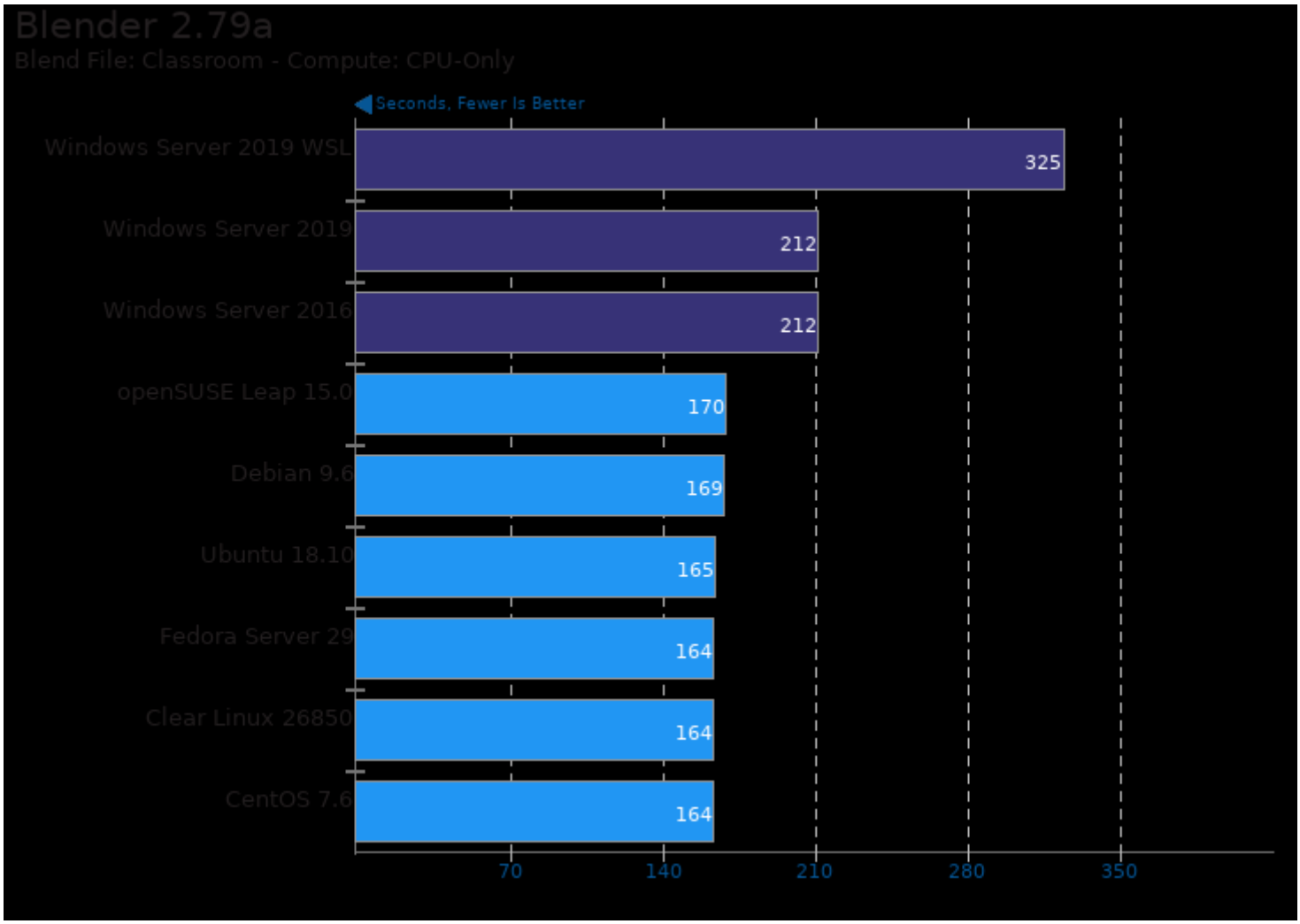

Perl Benchmarks
Test: Interpreter
Seconds, Fewer Is Better
Windows Server 2016
SE +/- 0.00010315, N = 3
0.02537739
Windows Server 2019
SE +/- 0.00013581, N = 3
0.01501293
Windows Server 2019 WSL
SE +/- 0.00019171, N = 12
0.00820246
Fedora Server 29
SE +/- 0.00001786, N = 3
0.00425515
openSUSE Leap 15.0
SE +/- 0.00001577, N = 3
0.00415440
Ubuntu 18.10
SE +/- 0.00000139, N = 3
0.00319840
FreeBSD 11.2
SE +/- 0.00000837, N = 3
0.00312916
CentOS 7.6
SE +/- 0.00005837, N = 12
0.00292759
FreeBSD 12.0 - GCC 8
SE +/- 0.00000855, N = 3
0.00275367
FreeBSD 12.0
SE +/- 0.00000084, N = 3
0.00273844
Debian 9.6
SE +/- 0.00001124, N = 3
0.00256867
Clear Linux 26850
SE +/- 0.00000232, N = 3
0.00125927
0.0057
0.0114
0.0171
0.0228
0.0285

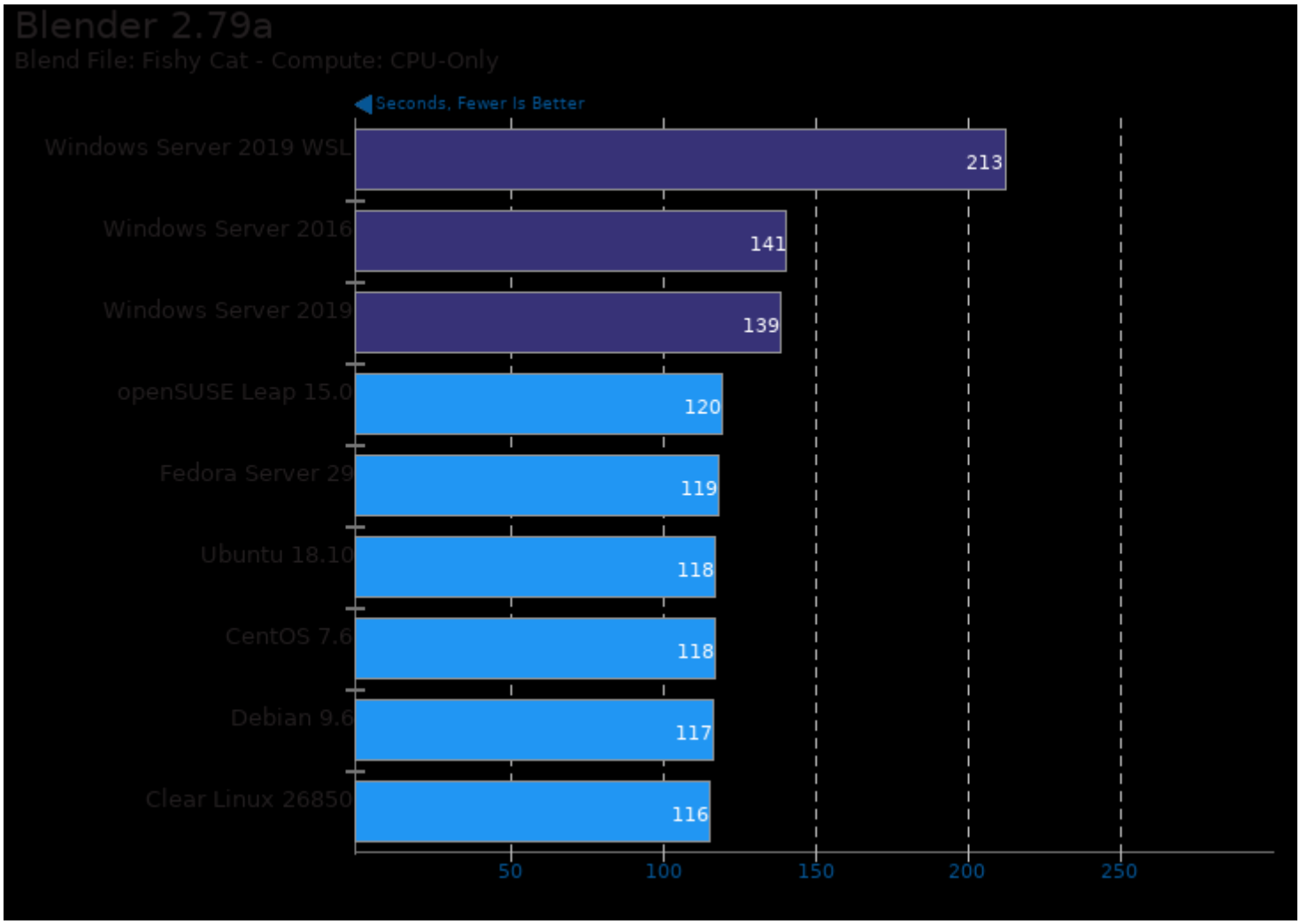

R Benchmark
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.0200, N = 3
1.6705
FreeBSD 12.0 - GCC8
SE +/- 0.0083, N = 3
1.4778
FreeBSD 12.0
SE +/- 0.0016, N = 3
1.4731
Ubuntu 18.10
SE +/- 0.0004, N = 3
0.7955
Debian 9.6
SE +/- 0.0126, N = 3
0.7889
Windows Server 2019 WSL
SE +/- 0.0009, N = 3
0.7879
Windows Server 2016
SE +/- 0.0028, N = 3
0.7433
Windows Server 2019
SE +/- 0.0015, N = 3
0.7360
Clear Linux 26850
SE +/- 0.0015, N = 3
0.4075
Fedora Server 29
SE +/- 0.0009, N = 3
0.3040
0.3759
0.7518
1.1277
1.5036
1.8795
1. FreeBSD 11.2: R scripting front-end version 3.5.1 (2018-07-02)
2. FreeBSD 12.0 - GCC8: R scripting front-end version 3.5.1 (2018-07-02)
3. FreeBSD 12.0: R scripting front-end version 3.5.1 (2018-07-02)
4. Ubuntu 18.10: R scripting front-end version 3.5.1 (2018-07-02)
5. Debian 9.6: R scripting front-end version 3.3.3 (2017-03-06)
6. Windows Server 2019 WSL: R scripting front-end version 3.4.4 (2018-03-15)
7. Windows Server 2016: R scripting front-end version 3.5.2 (2018-12-20)
8. Windows Server 2019: R scripting front-end version 3.5.2 (2018-12-20)
9. Clear Linux 26850: R scripting front-end version 3.5.1 (2018-07-02)
10. Fedora Server 29: R scripting front-end version 3.5.1 (2018-07-02)

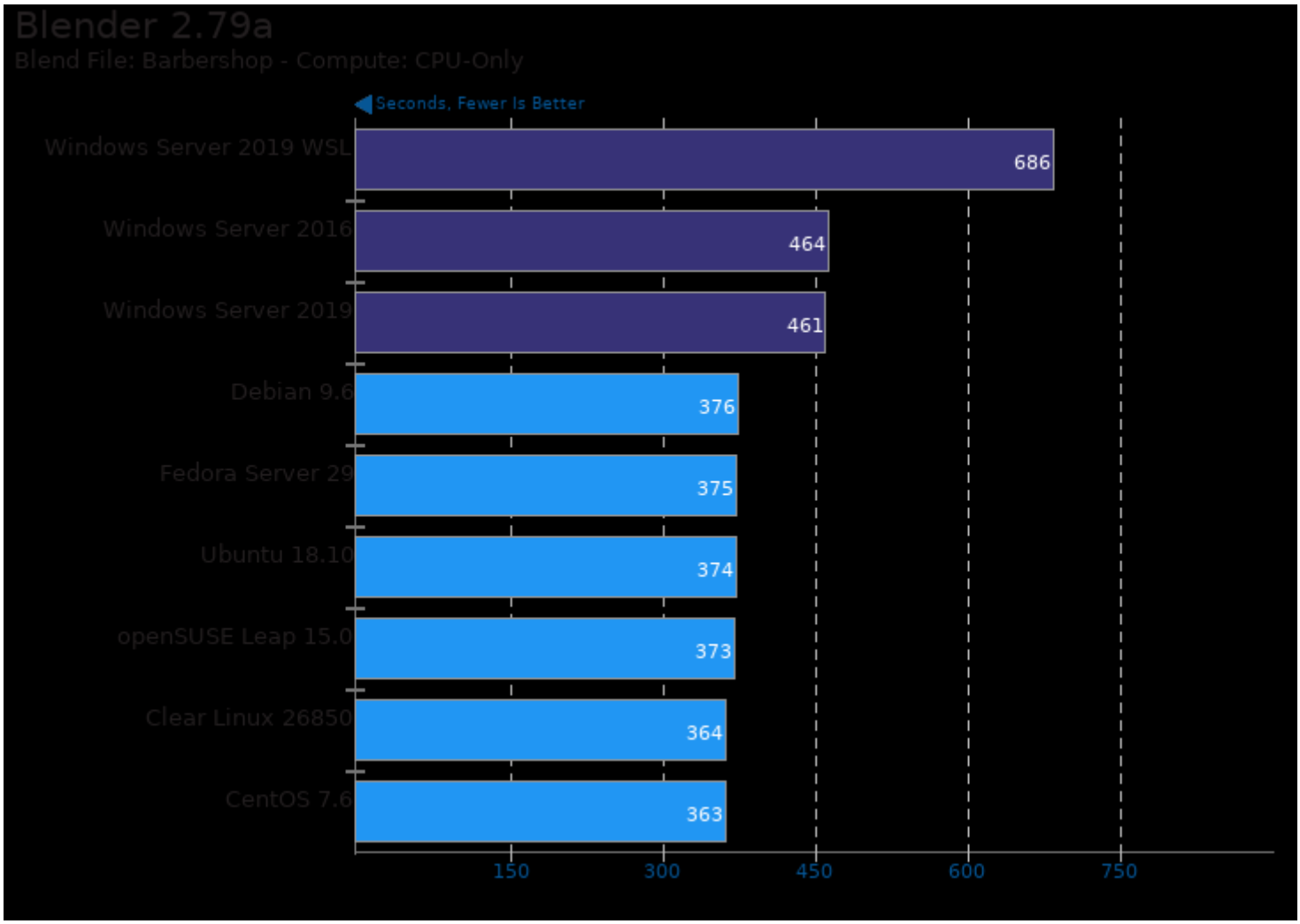

libjpeg-turbo tjbench 1.5.3
Test: Decompression Throughput
Megapixels/sec, More Is Better
FreeBSD 11.2
SE +/- 0.10, N = 3
clang
79.35
FreeBSD 12.0
SE +/- 0.03, N = 3
clang
83.13
FreeBSD 12.0 - GCC 8
SE +/- 0.02, N = 3
gcc
86.28
openSUSE Leap 15.0
SE +/- 0.11, N = 3
gcc
144.00
Windows Server 2016
SE +/- 0.08, N = 3
151.00
Windows Server 2019
SE +/- 0.18, N = 3
152.00
Windows Server 2019 WSL
SE +/- 0.26, N = 3
gcc
152.00
Ubuntu 18.10
SE +/- 0.39, N = 3
gcc
159.00
Clear Linux 26850
SE +/- 0.44, N = 3
gcc
160.00
Debian 9.6
SE +/- 0.07, N = 3
gcc
160.00
Fedora Server 29
SE +/- 0.33, N = 3
gcc
160.00
40
80
120
160
200
IndigoBench 4.0.64
Scene: Bedroom
M samples/s, More Is Better
Windows Server 2016
SE +/- 0.02, N = 3
3.55
Windows Server 2019
SE +/- 0.02, N = 3
3.55
Ubuntu 18.10
SE +/- 0.03, N = 3
3.63
Debian 9.6
SE +/- 0.03, N = 3
3.67
Clear Linux 26850
SE +/- 0.01, N = 3
3.76
0.846
1.692
2.538
3.384
4.23

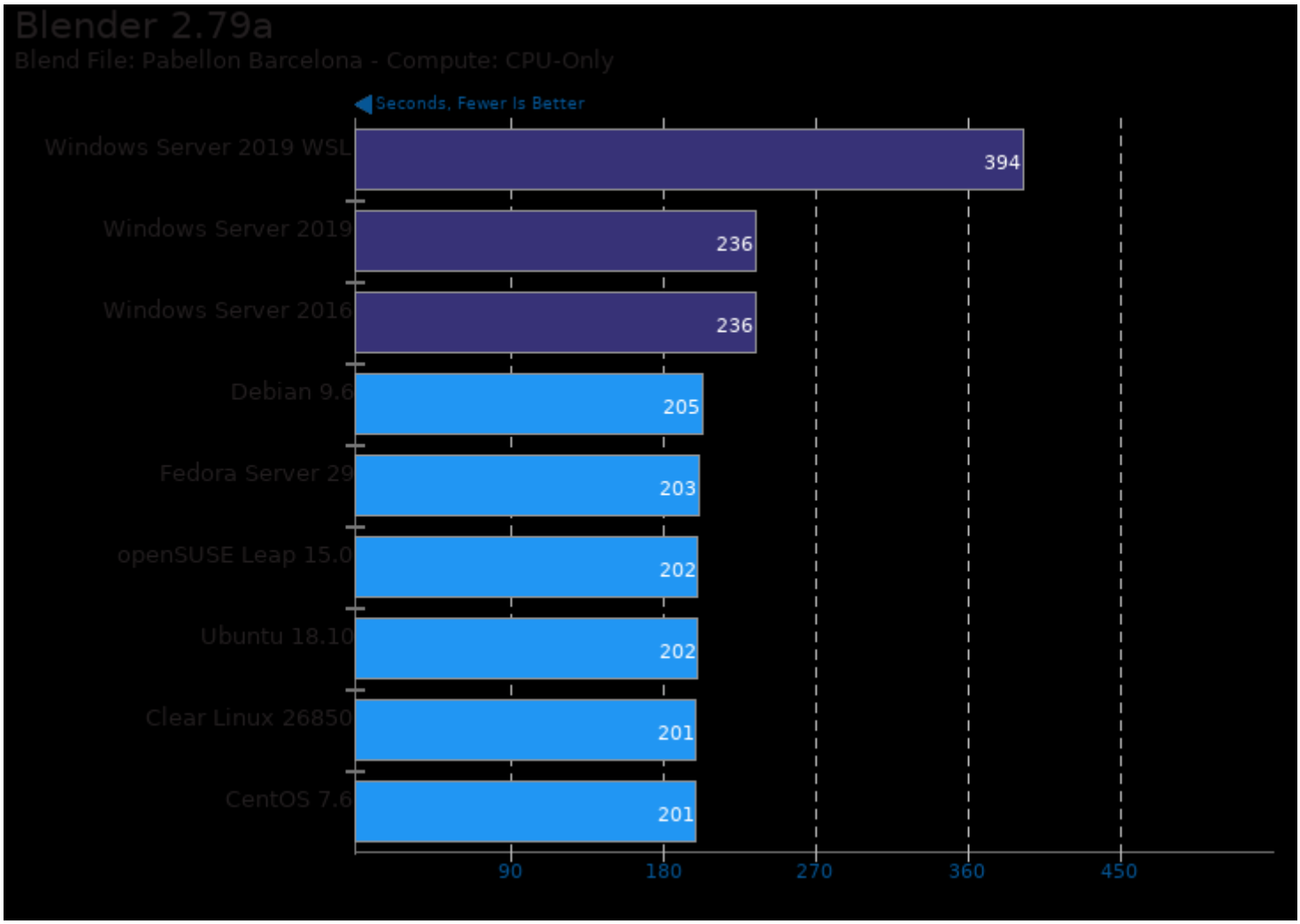

IndigoBench 4.0.64
Scene: Supercar
M samples/s, More Is Better
Clear Linux 26850
SE +/- 0.01, N = 3
7.80
Ubuntu 18.10
SE +/- 0.02, N = 3
7.88
Debian 9.6
SE +/- 0.02, N = 3
8.12
Windows Server 2016
SE +/- 0.02, N = 3
8.28
Windows Server 2019
SE +/- 0.05, N = 3
8.37
2
4
6
8
10

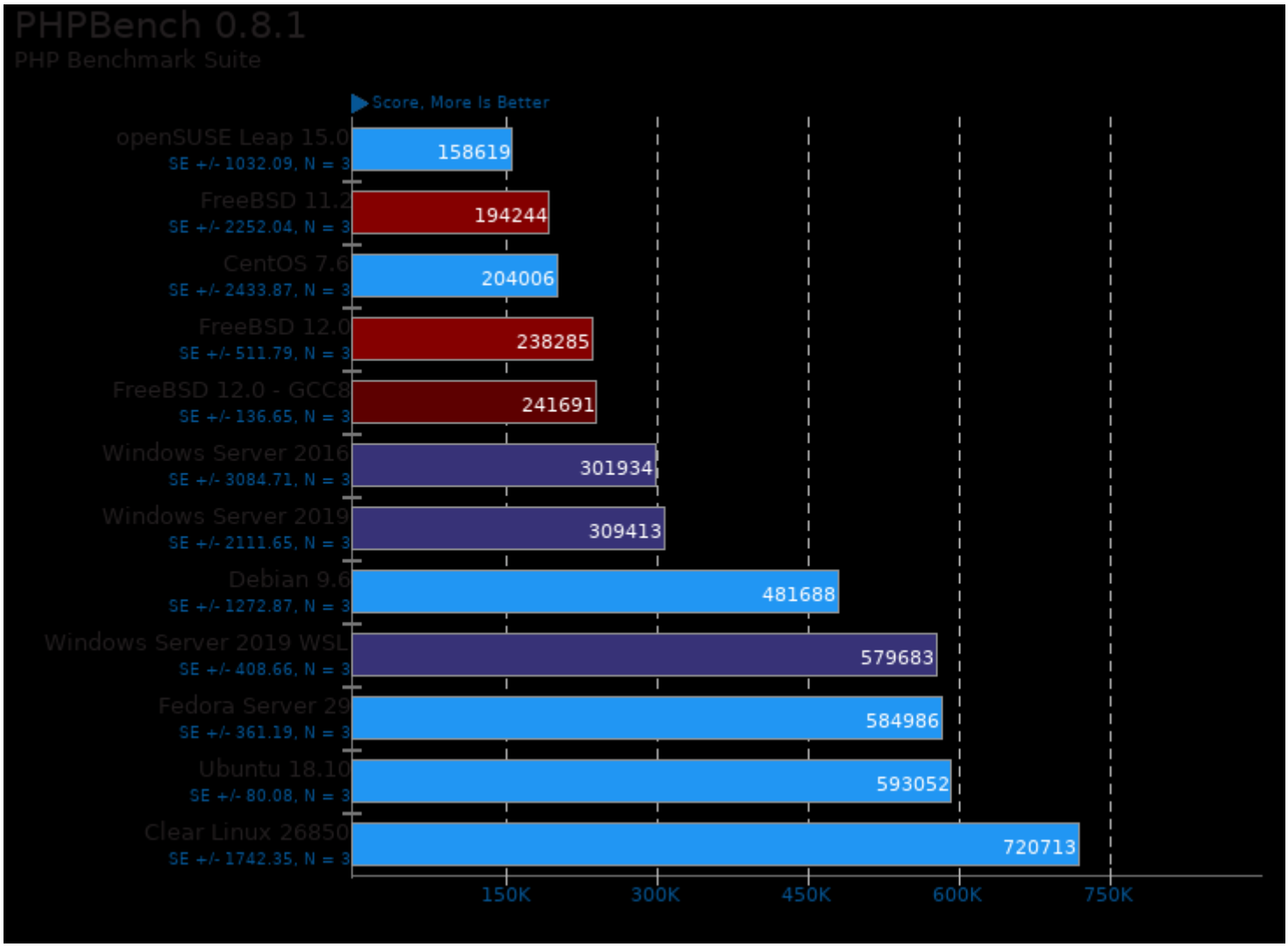

Blender 2.79a
Blend File: BMW27 - Compute: CPU-Only
Seconds, Fewer Is Better
Windows Server 2019 WSL
144.14
Windows Server 2016
93.13
Windows Server 2019
93.05
openSUSE Leap 15.0
80.91
Fedora Server 29
78.43
Ubuntu 18.10
77.24
CentOS 7.6
77.22
Debian 9.6
76.99
Clear Linux 26850
75.73
30
60
90
120
150

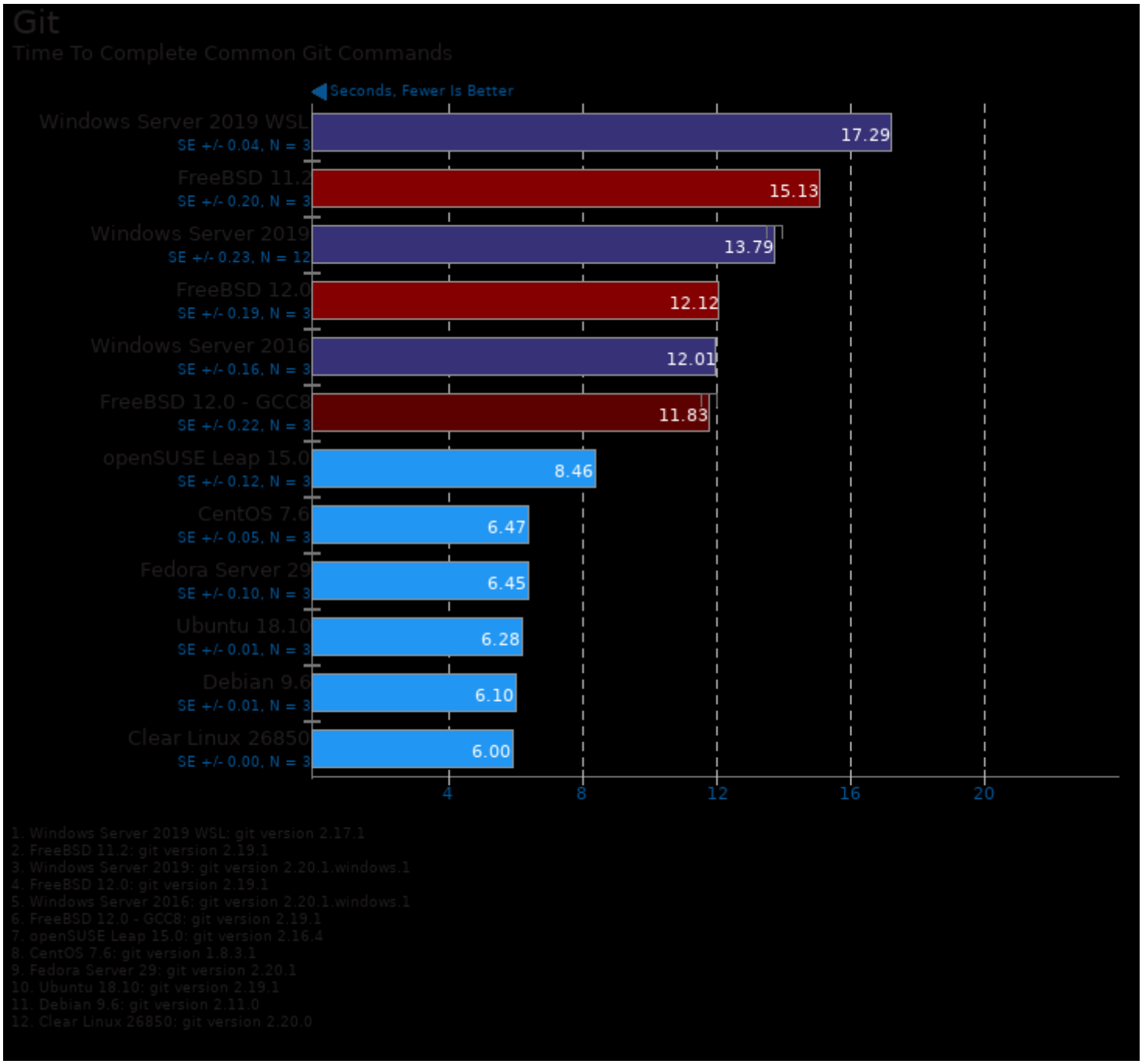

Blender 2.79a
Blend File: Classroom - Compute: CPU-Only
Seconds, Fewer Is Better
Windows Server 2019 WSL
325
Windows Server 2019
212
Windows Server 2016
212
openSUSE Leap 15.0
170
Debian 9.6
169
Ubuntu 18.10
165
Fedora Server 29
164
Clear Linux 26850
164
CentOS 7.6
164
70
140
210
280
350

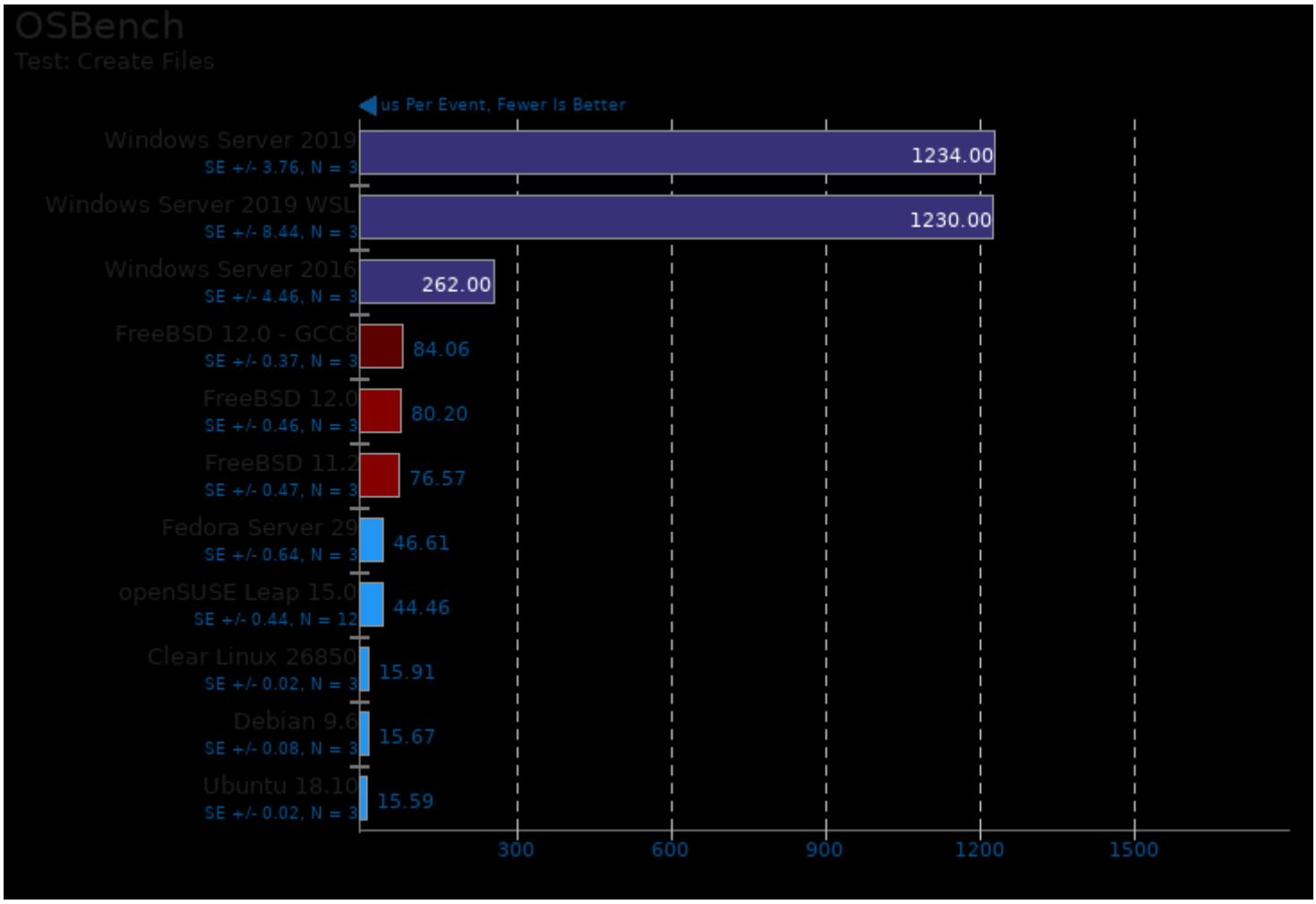

Blender 2.79a
Blend File: Fishy Cat - Compute: CPU-Only
Seconds, Fewer Is Better
Windows Server 2019 WSL
213
Windows Server 2016
141
Windows Server 2019
139
openSUSE Leap 15.0
120
Fedora Server 29
119
Ubuntu 18.10
118
CentOS 7.6
118
Debian 9.6
117
Clear Linux 26850
116
50
100
150
200
250

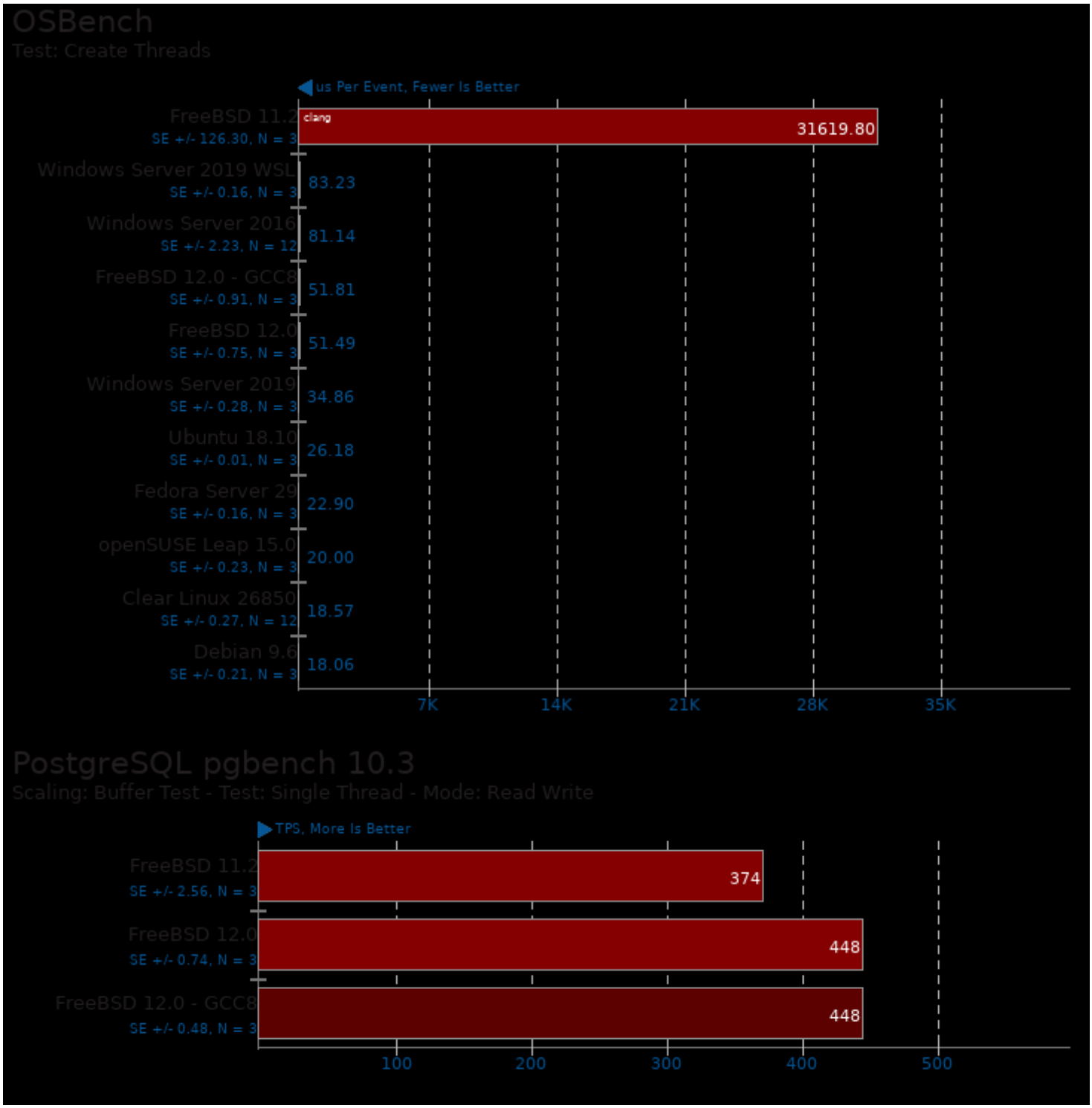

Blender 2.79a
Blend File: Barbershop - Compute: CPU-Only
Seconds, Fewer Is Better
Windows Server 2019 WSL
686
Windows Server 2016
464
Windows Server 2019
461
Debian 9.6
376
Fedora Server 29
375
Ubuntu 18.10
374
openSUSE Leap 15.0
373
Clear Linux 26850
364
CentOS 7.6
363
150
300
450
600
750

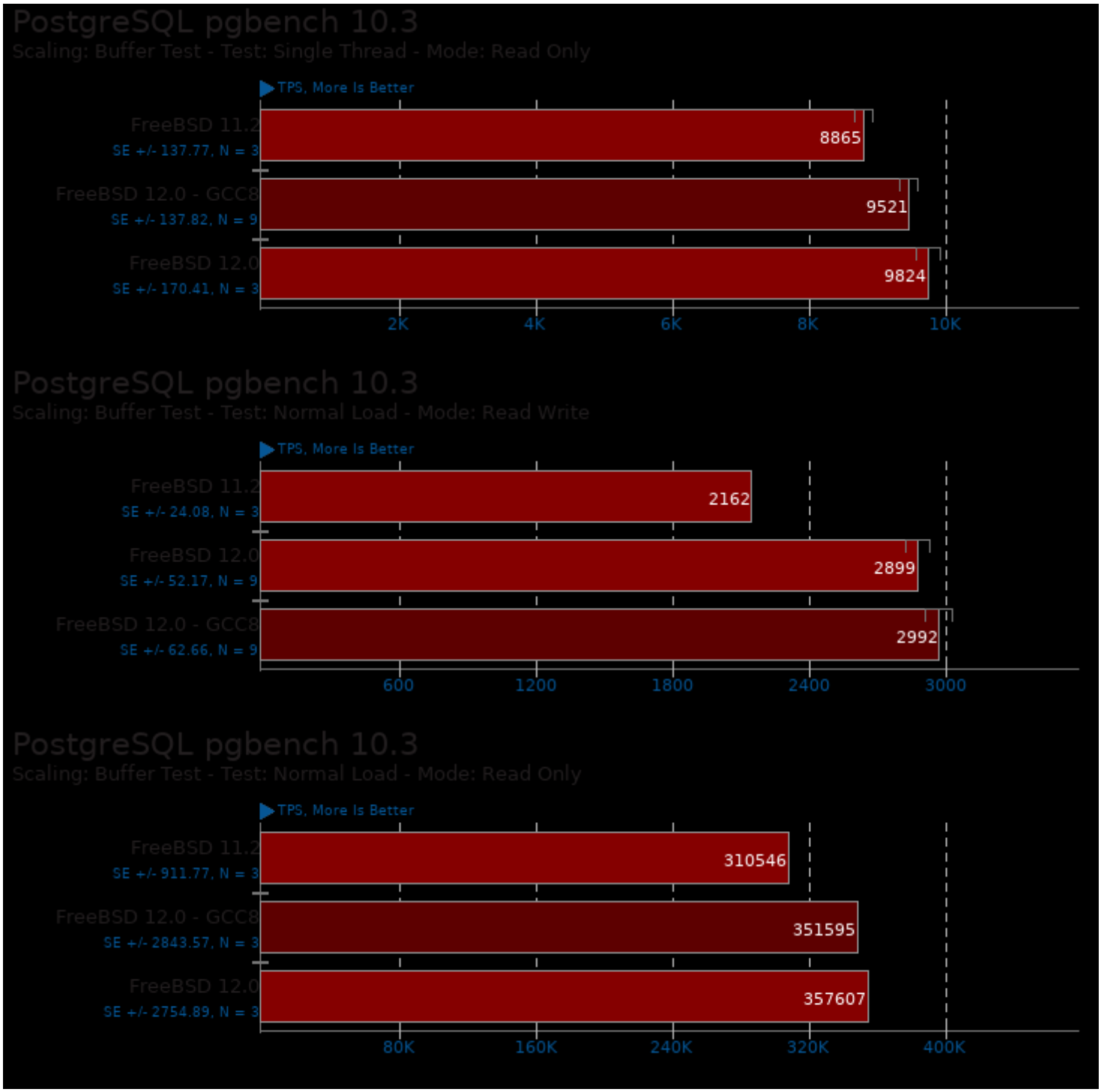

Blender 2.79a
Blend File: Pabellon Barcelona - Compute: CPU-Only
Seconds, Fewer Is Better
Windows Server 2019 WSL
394
Windows Server 2019
236
Windows Server 2016
236
Debian 9.6
205
Fedora Server 29
203
openSUSE Leap 15.0
202
Ubuntu 18.10
202
Clear Linux 26850
201
CentOS 7.6
201
90
180
270
360
450

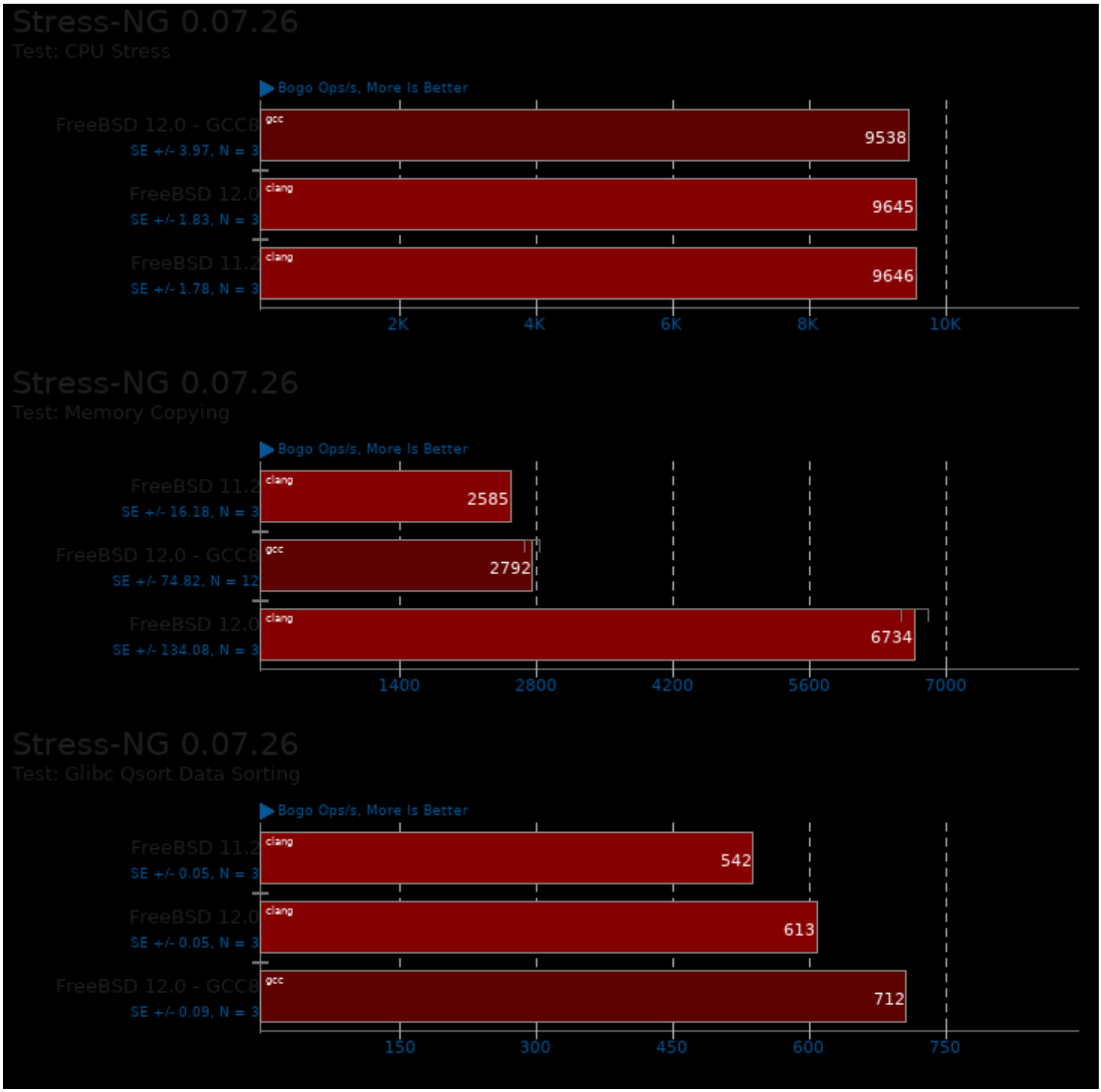

PHPBench 0.8.1
PHP Benchmark Suite
Score, More Is Better
openSUSE Leap 15.0
SE +/- 1032.09, N = 3
158619
FreeBSD 11.2
SE +/- 2252.04, N = 3
194244
CentOS 7.6
SE +/- 2433.87, N = 3
204006
FreeBSD 12.0
SE +/- 511.79, N = 3
238285
FreeBSD 12.0 - GCC 8
SE +/- 136.65, N = 3
241691
Windows Server 2016
SE +/- 3084.71, N = 3
301934
Windows Server 2019
SE +/- 2111.65, N = 3
309413
Debian 9.6
SE +/- 1272.87, N = 3
481688
Windows Server 2019 WSL
SE +/- 408.66, N = 3
579683
Fedora Server 29
SE +/- 361.19, N = 3
584986
Ubuntu 18.10
SE +/- 80.08, N = 3
593052
Clear Linux 26850
SE +/- 1742.35, N = 3
720713
150K
300K
450K
600K
750K

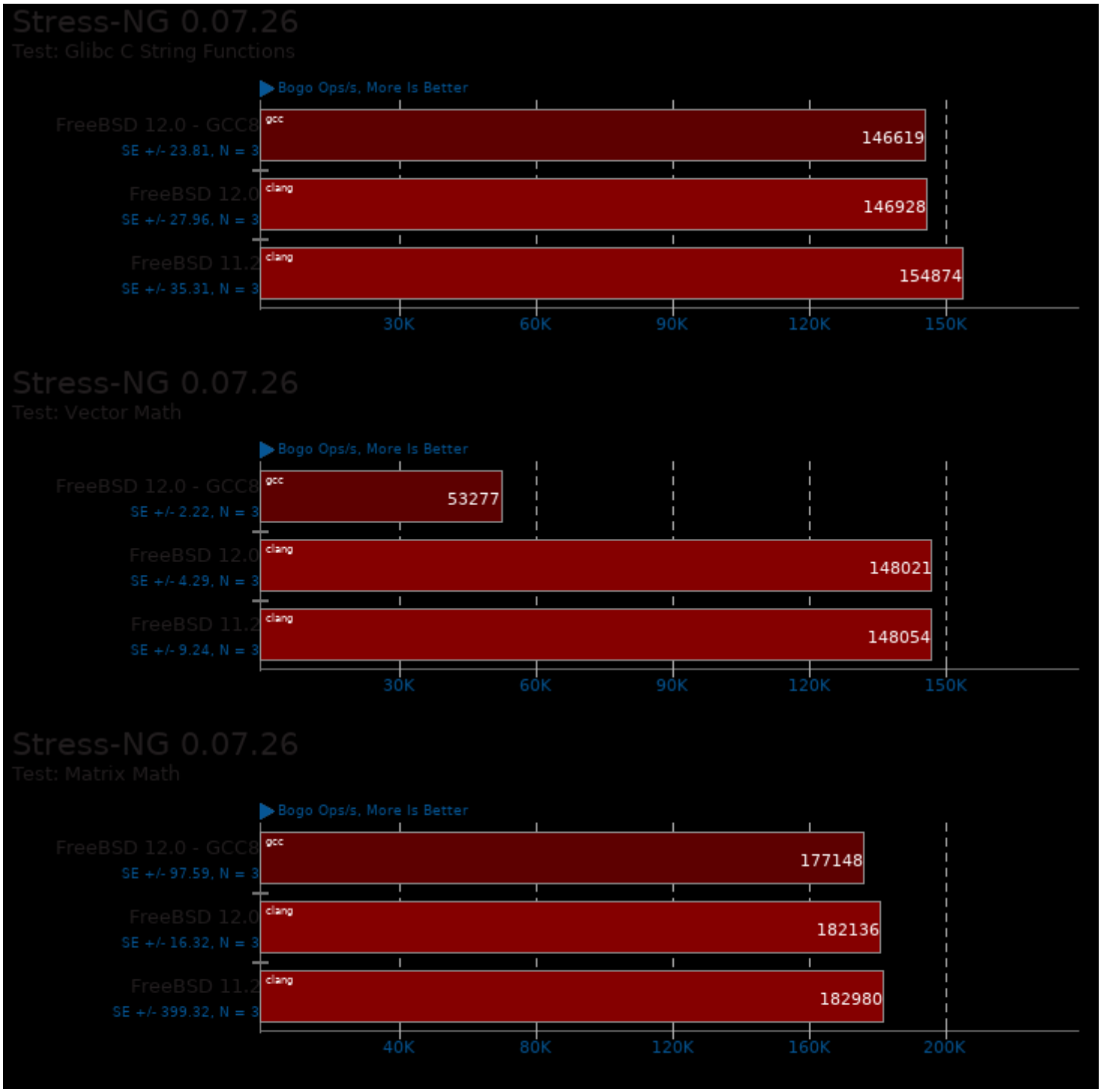

Git
Time To Complete Common Git Commands
Seconds, Fewer Is Better
Windows Server 2019 WSL
SE +/- 0.04, N = 3
17.29
FreeBSD 11.2
SE +/- 0.20, N = 3
15.13
Windows Server 2019
SE +/- 0.23, N = 12
13.79
FreeBSD 12.0
SE +/- 0.19, N = 3
12.12
Windows Server 2016
SE +/- 0.16, N = 3
12.01
FreeBSD 12.0 - GCC8
SE +/- 0.22, N = 3
11.83
openSUSE Leap 15.0
SE +/- 0.12, N = 3
8.46
CentOS 7.6
SE +/- 0.05, N = 3
6.47
Fedora Server 29
SE +/- 0.10, N = 3
6.45
Ubuntu 18.10
SE +/- 0.01, N = 3
6.28
Debian 9.6
SE +/- 0.01, N = 3
6.10
Clear Linux 26850
SE +/- 0.00, N = 3
6.00
4
8
12
16
20
1. Windows Server 2019 WSL: git version 2.17.1
2. FreeBSD 11.2: git version 2.19.1
3. Windows Server 2019: git version 2.20.1.windows.1
4. FreeBSD 12.0: git version 2.19.1
5. Windows Server 2016: git version 2.20.1.windows.1
6. FreeBSD 12.0 - GCC8: git version 2.19.1
7. openSUSE Leap 15.0: git version 2.16.4
8. CentOS 7.6: git version 1.8.3.1
9. Fedora Server 29: git version 2.20.1
10. Ubuntu 18.10: git version 2.19.1
11. Debian 9.6: git version 2.11.0
12. Clear Linux 26850: git version 2.20.0

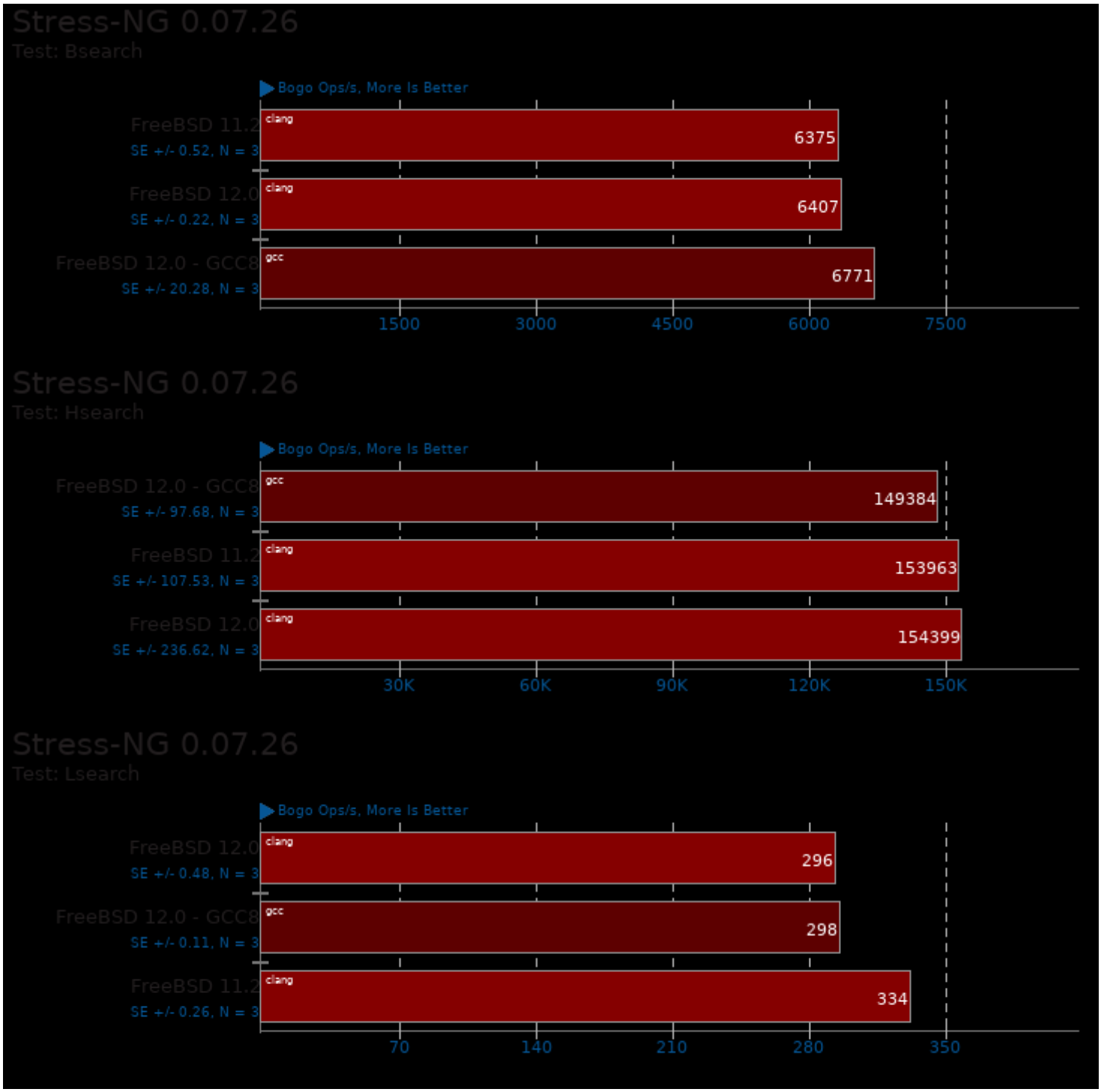

OSBench
Test: Create Files
us Per Event, Fewer Is Better
Windows Server 2019
SE +/- 3.76, N = 3
1234.00
Windows Server 2019 WSL
SE +/- 8.44, N = 3
1230.00
Windows Server 2016
SE +/- 4.46, N = 3
262.00
FreeBSD 12.0 - GCC8
SE +/- 0.37, N = 3
84.06
FreeBSD 12.0
SE +/- 0.46, N = 3
80.20
FreeBSD 11.2
SE +/- 0.47, N = 3
76.57
Fedora Server 29
SE +/- 0.64, N = 3
46.61
openSUSE Leap 15.0
SE +/- 0.44, N = 12
44.46
Clear Linux 26850
SE +/- 0.02, N = 3
15.91
Debian 9.6
SE +/- 0.08, N = 3
15.67
Ubuntu 18.10
SE +/- 0.02, N = 3
15.59
300
600
900
1200
1500

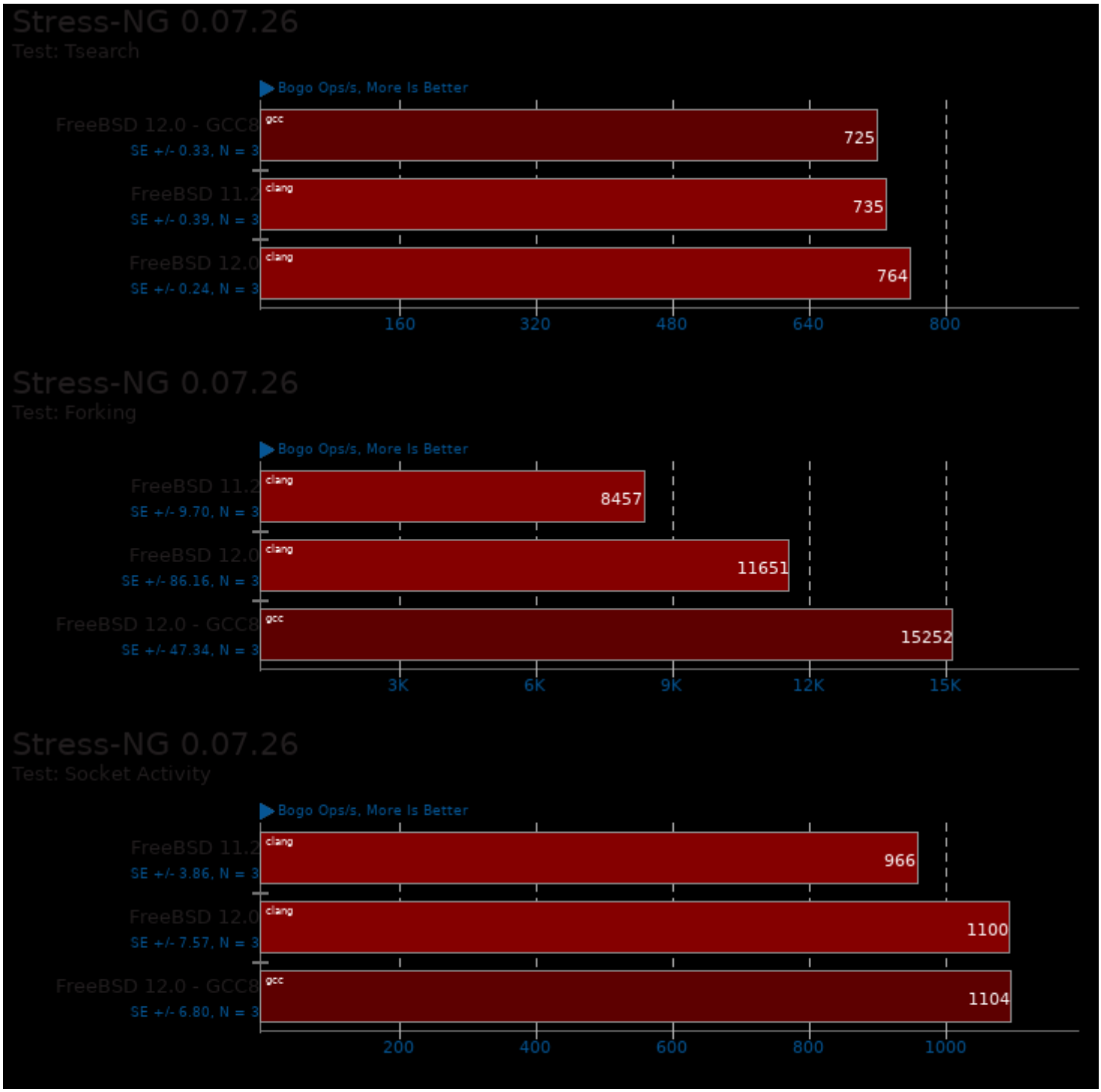

OSBench
Test: Create Threads
us Per Event, Fewer Is Better
FreeBSD 11.2
SE +/- 126.30, N = 3
clang
31619.80
Windows Server 2019 WSL
SE +/- 0.16, N = 3
83.23
Windows Server 2016
SE +/- 2.23, N = 12
81.14
FreeBSD 12.0 - GCC8
SE +/- 0.91, N = 3
51.81
FreeBSD 12.0
SE +/- 0.75, N = 3
51.49
Windows Server 2019
SE +/- 0.28, N = 3
34.86
Ubuntu 18.10
SE +/- 0.01, N = 3
26.18
Fedora Server 29
SE +/- 0.16, N = 3
22.90
openSUSE Leap 15.0
SE +/- 0.23, N = 3
20.00
Clear Linux 26850
SE +/- 0.27, N = 12
18.57
Debian 9.6
SE +/- 0.21, N = 3
18.06
7K
14K
21K
28K
35K
PostgreSQL pgbench 10.3
Scaling: Buffer Test - Test: Single Thread - Mode: Read Write
TPS, More Is Better
FreeBSD 11.2
SE +/- 2.56, N = 3
374
FreeBSD 12.0
SE +/- 0.74, N = 3
448
FreeBSD 12.0 - GCC8
SE +/- 0.48, N = 3
448
100
200
300
400
500

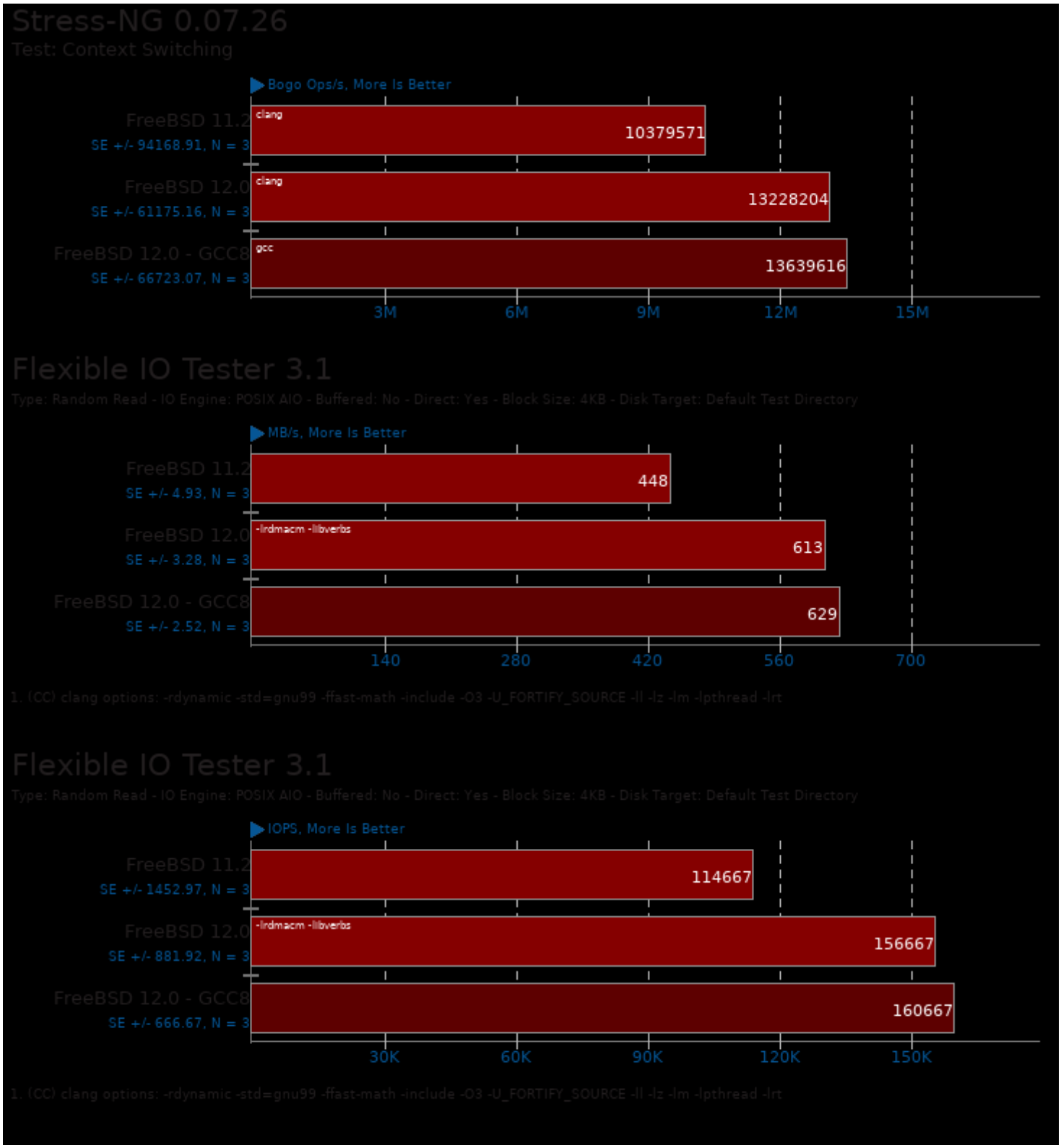

PostgreSQL pgbench 10.3
Scaling: Buffer Test - Test: Single Thread - Mode: Read Only
TPS, More Is Better
FreeBSD 11.2
SE +/- 137.77, N = 3
8865
FreeBSD 12.0 - GCC8
SE +/- 137.82, N = 9
9521
FreeBSD 12.0
SE +/- 170.41, N = 3
9824
2K
4K
6K
8K
10K
PostgreSQL pgbench 10.3
Scaling: Buffer Test - Test: Normal Load - Mode: Read Write
TPS, More Is Better
FreeBSD 11.2
SE +/- 24.08, N = 3
2162
FreeBSD 12.0
SE +/- 52.17, N = 9
2899
FreeBSD 12.0 - GCC8
SE +/- 62.66, N = 9
2992
600
1200
1800
2400
3000
PostgreSQL pgbench 10.3
Scaling: Buffer Test - Test: Normal Load - Mode: Read Only
TPS, More Is Better
FreeBSD 11.2
SE +/- 911.77, N = 3
310546
FreeBSD 12.0 - GCC8
SE +/- 2843.57, N = 3
351595
FreeBSD 12.0
SE +/- 2754.89, N = 3
357607
80K
160K
240K
320K
400K

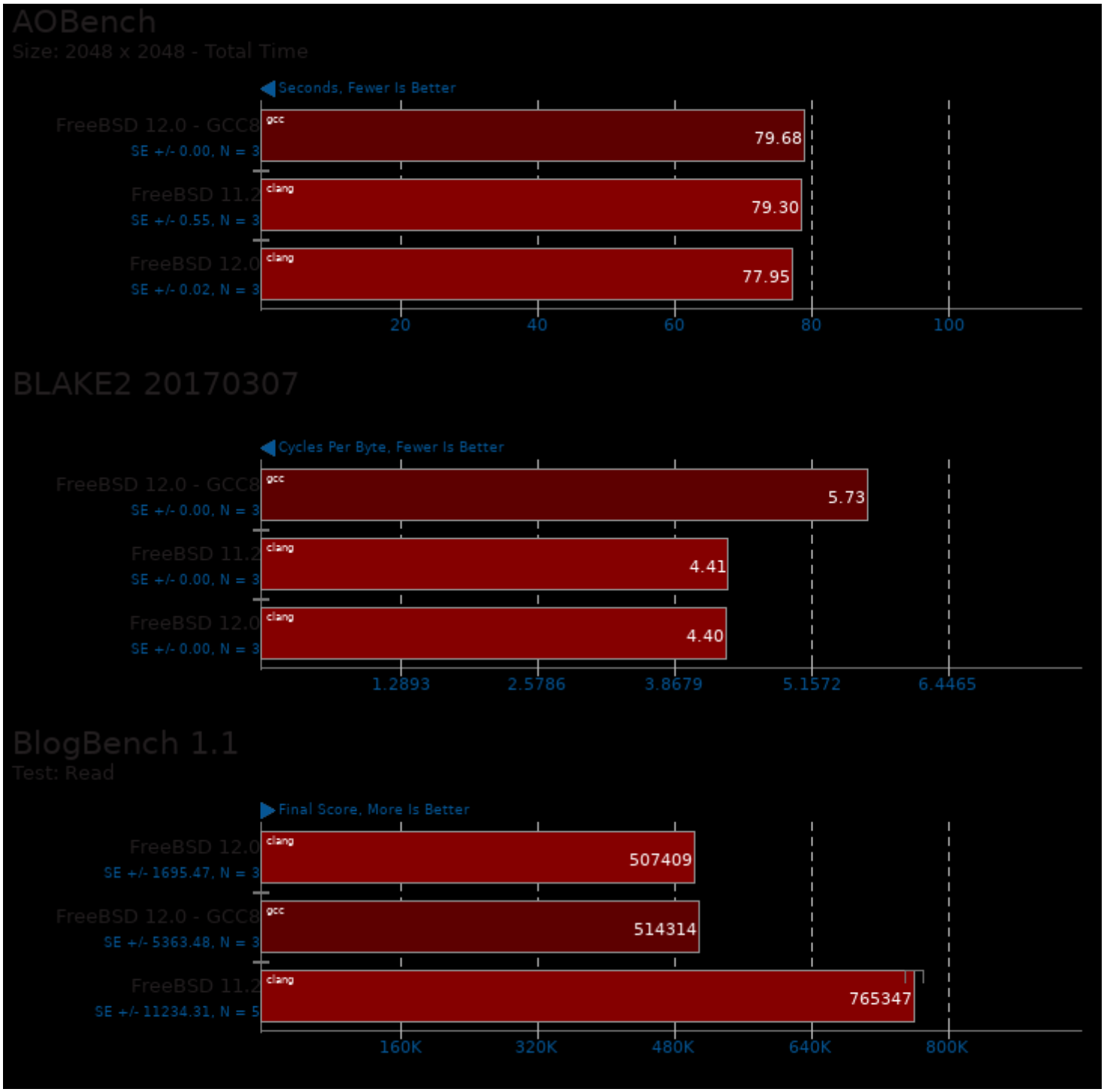

Stress-NG 0.07.26
Test: CPU Stress
Bogo Ops/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 3.97, N = 3
gcc
9538
FreeBSD 12.0
SE +/- 1.83, N = 3
clang
9645
FreeBSD 11.2
SE +/- 1.78, N = 3
clang
9646
2K
4K
6K
8K
10K
Stress-NG 0.07.26
Test: Memory Copying
Bogo Ops/s, More Is Better
FreeBSD 11.2
SE +/- 16.18, N = 3
clang
2585
FreeBSD 12.0 - GCC8
SE +/- 74.82, N = 12
gcc
2792
FreeBSD 12.0
SE +/- 134.08, N = 3
clang
6734
1400
2800
4200
5600
7000
Stress-NG 0.07.26
Test: Glibc Qsort Data Sorting
Bogo Ops/s, More Is Better
FreeBSD 11.2
SE +/- 0.05, N = 3
clang
542
FreeBSD 12.0
SE +/- 0.05, N = 3
clang
613
FreeBSD 12.0 - GCC8
SE +/- 0.09, N = 3
gcc
712
150
300
450
600
750

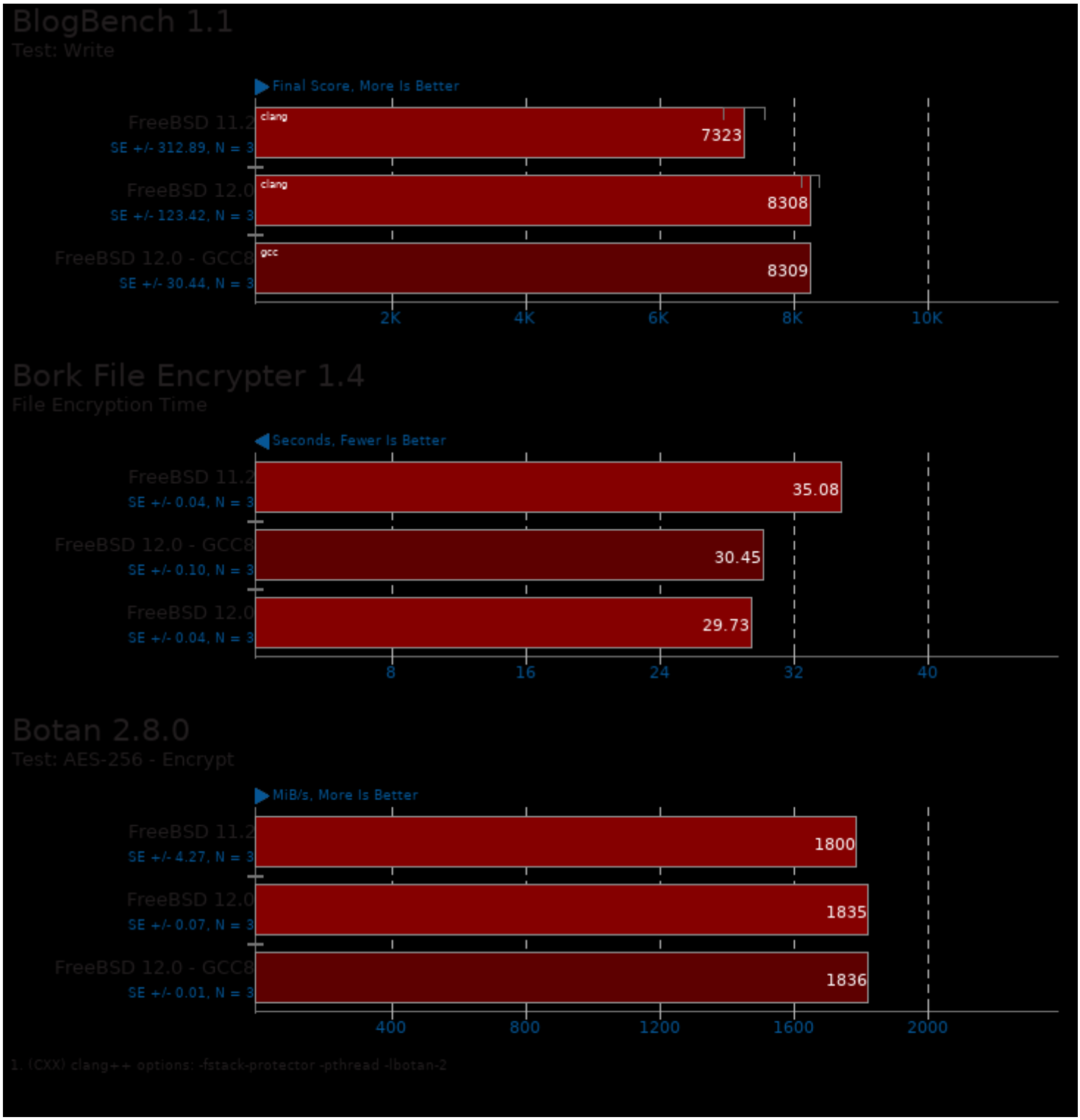

Stress-NG 0.07.26
Test: Glibc C String Functions
Bogo Ops/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 23.81, N = 3
gcc
146619
FreeBSD 12.0
SE +/- 27.96, N = 3
clang
146928
FreeBSD 11.2
SE +/- 35.31, N = 3
clang
154874
30K
60K
90K
120K
150K
Stress-NG 0.07.26
Test: Vector Math
Bogo Ops/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 2.22, N = 3
gcc
53277
FreeBSD 12.0
SE +/- 4.29, N = 3
clang
148021
FreeBSD 11.2
SE +/- 9.24, N = 3
clang
148054
30K
60K
90K
120K
150K
Stress-NG 0.07.26
Test: Matrix Math
Bogo Ops/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 97.59, N = 3
gcc
177148
FreeBSD 12.0
SE +/- 16.32, N = 3
clang
182136
FreeBSD 11.2
SE +/- 399.32, N = 3
clang
182980
40K
80K
120K
160K
200K

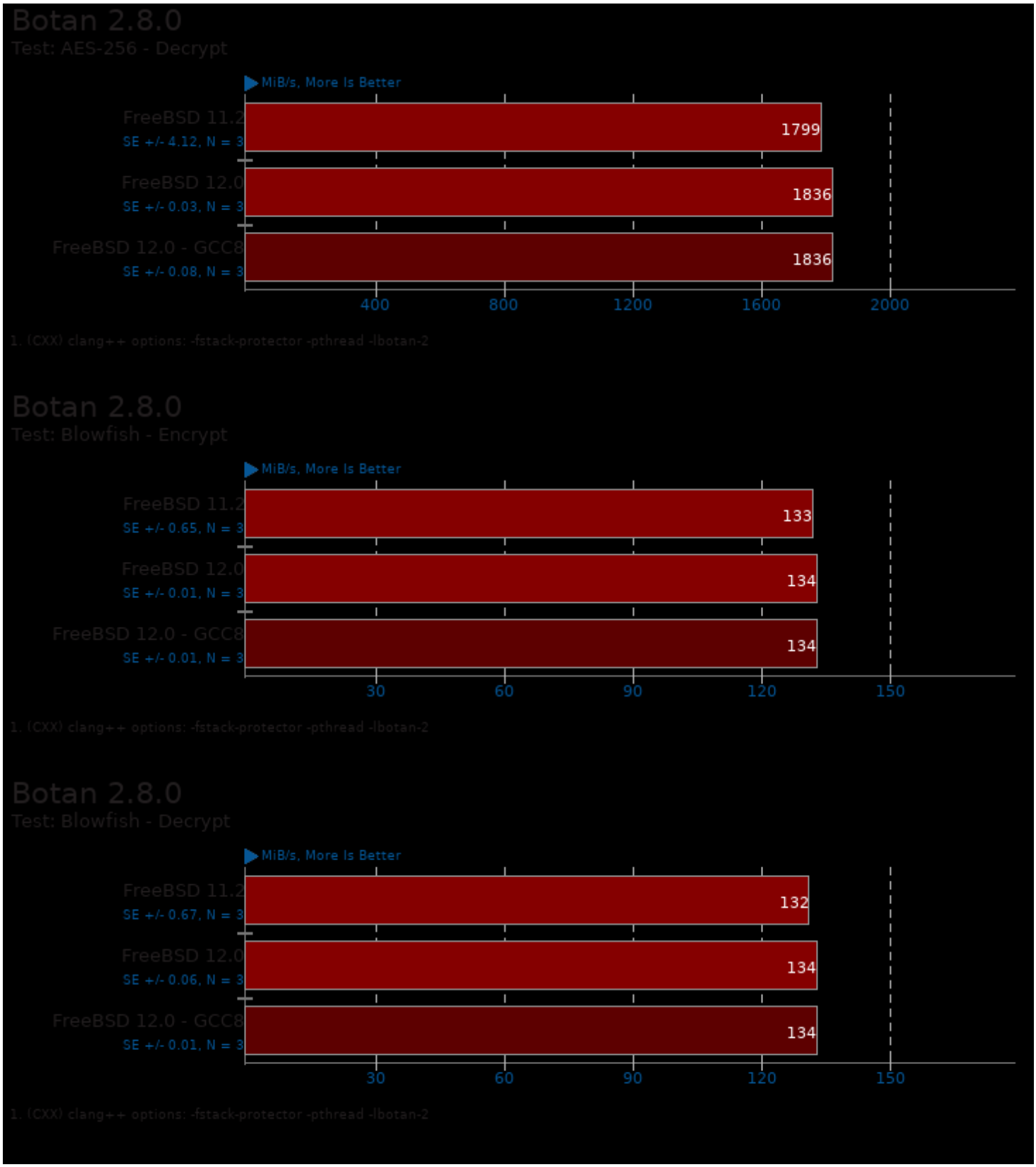

Stress-NG 0.07.26
Test: Bsearch
Bogo Ops/s, More Is Better
FreeBSD 11.2
SE +/- 0.52, N = 3
clang
6375
FreeBSD 12.0
SE +/- 0.22, N = 3
clang
6407
FreeBSD 12.0 - GCC8
SE +/- 20.28, N = 3
gcc
6771
1500
3000
4500
6000
7500
Stress-NG 0.07.26
Test: Hsearch
Bogo Ops/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 97.68, N = 3
gcc
149384
FreeBSD 11.2
SE +/- 107.53, N = 3
clang
153963
FreeBSD 12.0
SE +/- 236.62, N = 3
clang
154399
30K
60K
90K
120K
150K
Stress-NG 0.07.26
Test: Lsearch
Bogo Ops/s, More Is Better
FreeBSD 12.0
SE +/- 0.48, N = 3
clang
296
FreeBSD 12.0 - GCC8
SE +/- 0.11, N = 3
gcc
298
FreeBSD 11.2
SE +/- 0.26, N = 3
clang
334
70
140
210
280
350

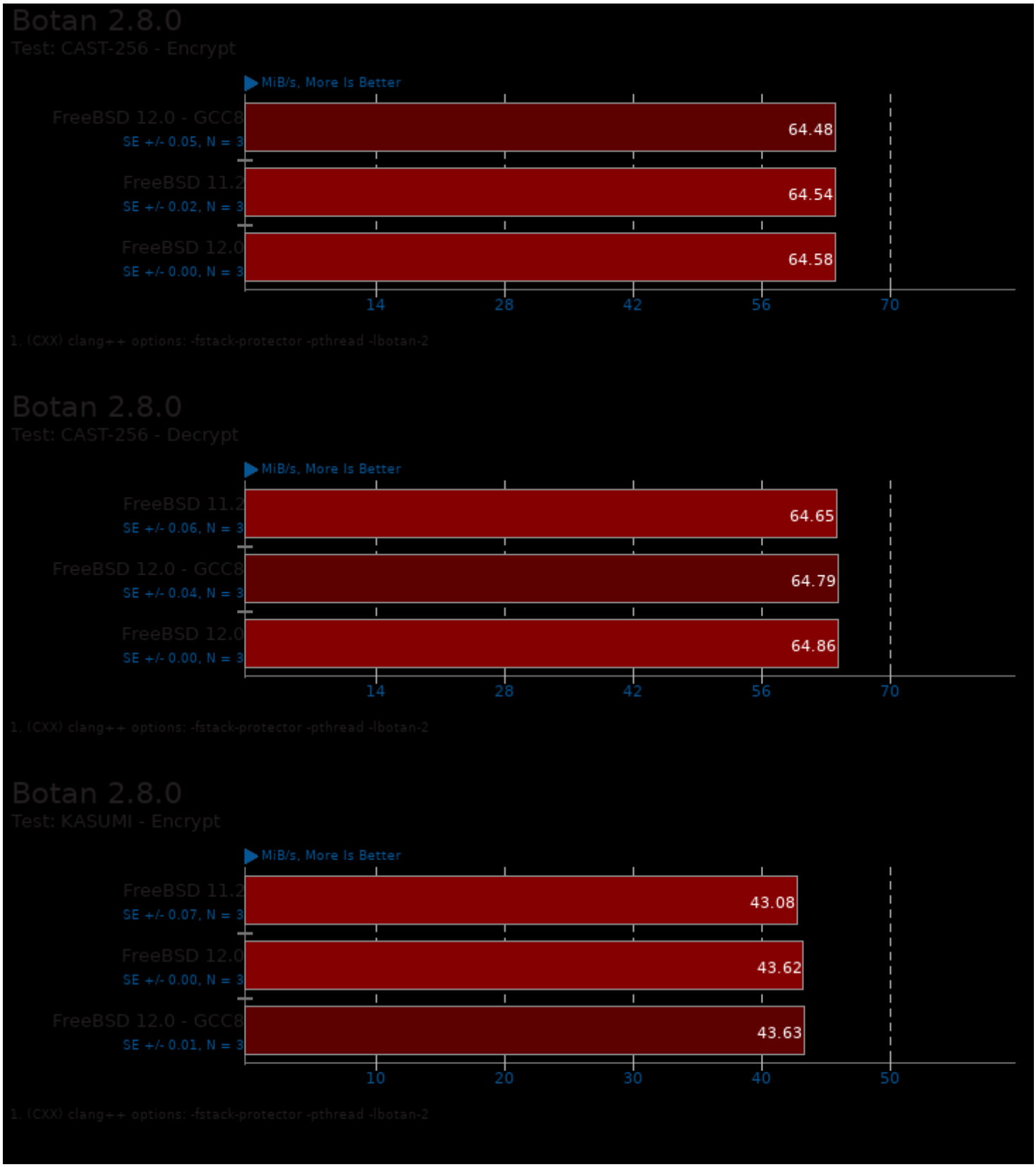

Stress-NG 0.07.26
Test: Tsearch
Bogo Ops/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.33, N = 3
gcc
725
FreeBSD 11.2
SE +/- 0.39, N = 3
clang
735
FreeBSD 12.0
SE +/- 0.24, N = 3
clang
764
160
320
480
640
800
Stress-NG 0.07.26
Test: Forking
Bogo Ops/s, More Is Better
FreeBSD 11.2
SE +/- 9.70, N = 3
clang
8457
FreeBSD 12.0
SE +/- 86.16, N = 3
clang
11651
FreeBSD 12.0 - GCC8
SE +/- 47.34, N = 3
gcc
15252
3K
6K
9K
12K
15K
Stress-NG 0.07.26
Test: Socket Activity
Bogo Ops/s, More Is Better
FreeBSD 11.2
SE +/- 3.86, N = 3
clang
966
FreeBSD 12.0
SE +/- 7.57, N = 3
clang
1100
FreeBSD 12.0 - GCC8
SE +/- 6.80, N = 3
gcc
1104
200
400
600
800
1000

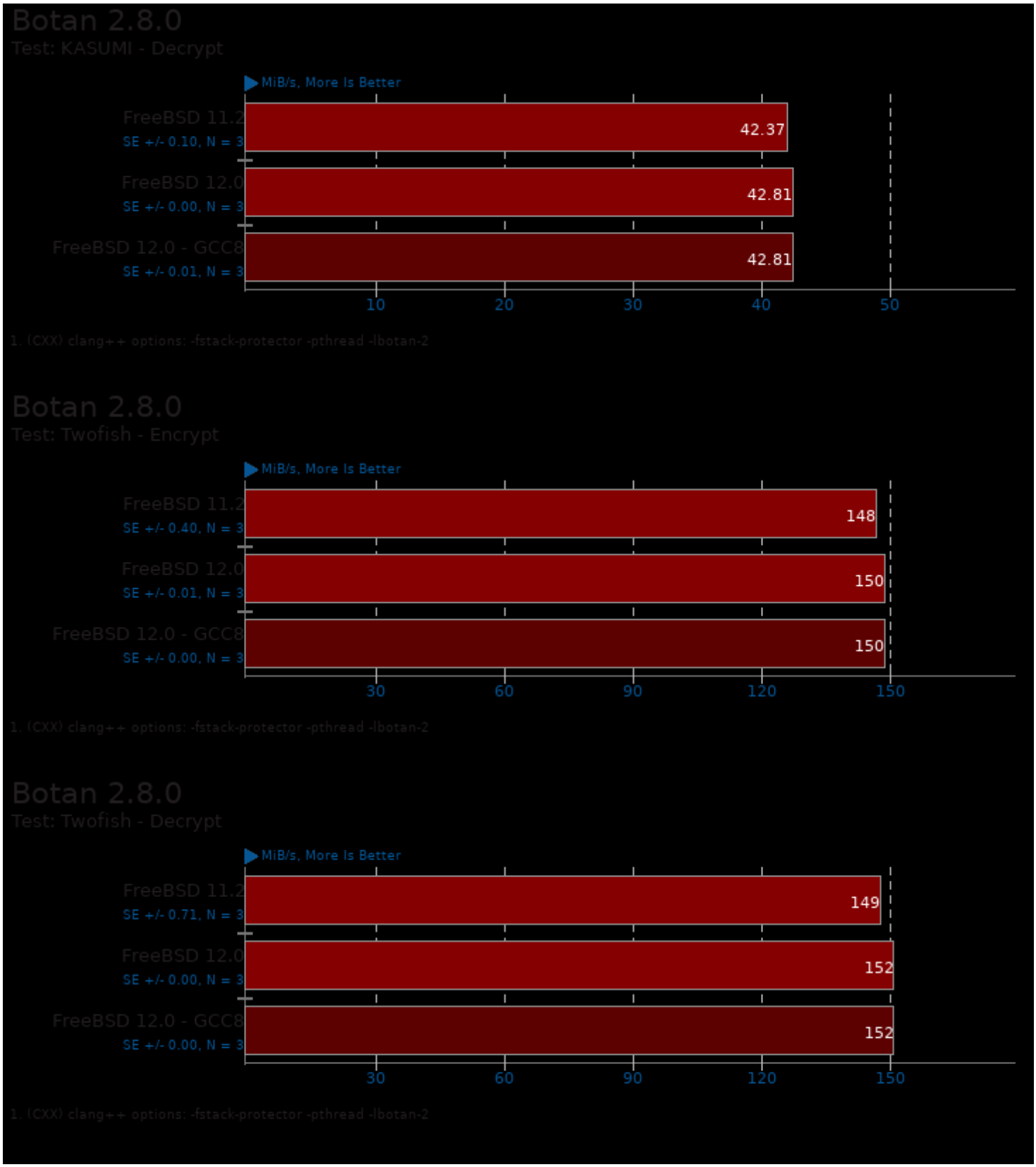

Stress-NG 0.07.26
Test: Context Switching
Bogo Ops/s, More Is Better
FreeBSD 11.2
SE +/- 94168.91, N = 3
clang
10379571
FreeBSD 12.0
SE +/- 61175.16, N = 3
clang
13228204
FreeBSD 12.0 - GCC8
SE +/- 66723.07, N = 3
gcc
13639616
3M
6M
9M
12M
15M
Flexible IO Tester 3.1
Type: Random Read - IO Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
FreeBSD 11.2
SE +/- 4.93, N = 3
448
FreeBSD 12.0
SE +/- 3.28, N = 3
-lrdmacm -libverbs
613
FreeBSD 12.0 - GCC8
SE +/- 2.52, N = 3
629
140
280
420
560
700
1. (CC) clang options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -ll -lz -lm -lpthread -lrt
Flexible IO Tester 3.1
Type: Random Read - IO Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
FreeBSD 11.2
SE +/- 1452.97, N = 3
114667
FreeBSD 12.0
SE +/- 881.92, N = 3
-lrdmacm -libverbs
156667
FreeBSD 12.0 - GCC8
SE +/- 666.67, N = 3
160667
30K
60K
90K
120K
150K
1. (CC) clang options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -ll -lz -lm -lpthread -lrt

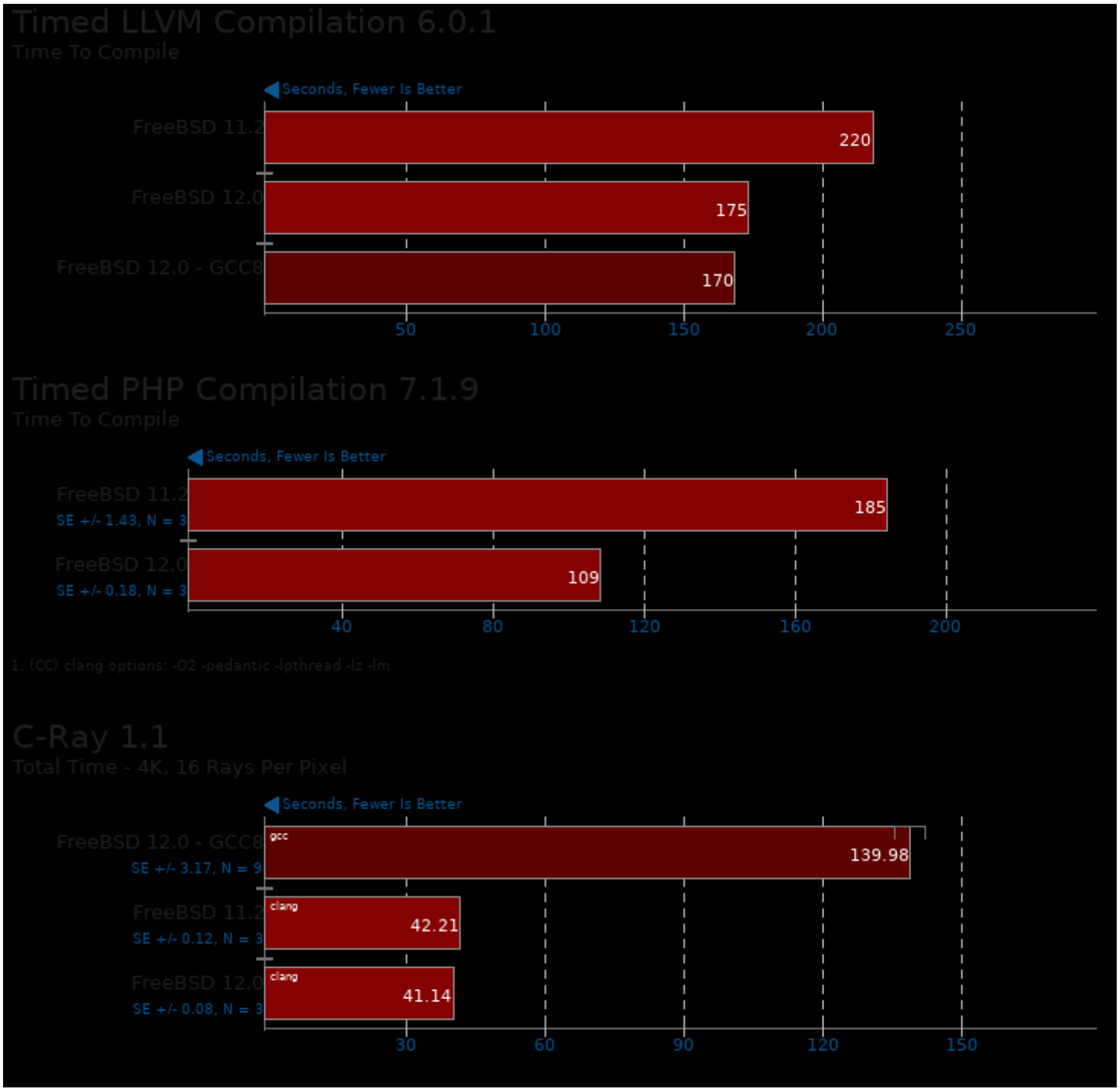

AOBench
Size: 2048 x 2048 - Total Time
Seconds, Fewer Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
gcc
79.68
FreeBSD 11.2
SE +/- 0.55, N = 3
clang
79.30
FreeBSD 12.0
SE +/- 0.02, N = 3
clang
77.95
20
40
60
80
100
BLAKE2 20170307
Cycles Per Byte, Fewer Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
gcc
5.73
FreeBSD 11.2
SE +/- 0.00, N = 3
clang
4.41
FreeBSD 12.0
SE +/- 0.00, N = 3
clang
4.40
1.2893
2.5786
3.8679
5.1572
6.4465
BlogBench 1.1
Test: Read
Final Score, More Is Better
FreeBSD 12.0
SE +/- 1695.47, N = 3
clang
507409
FreeBSD 12.0 - GCC8
SE +/- 5363.48, N = 3
gcc
514314
FreeBSD 11.2
SE +/- 11234.31, N = 5
clang
765347
160K
320K
480K
640K
800K

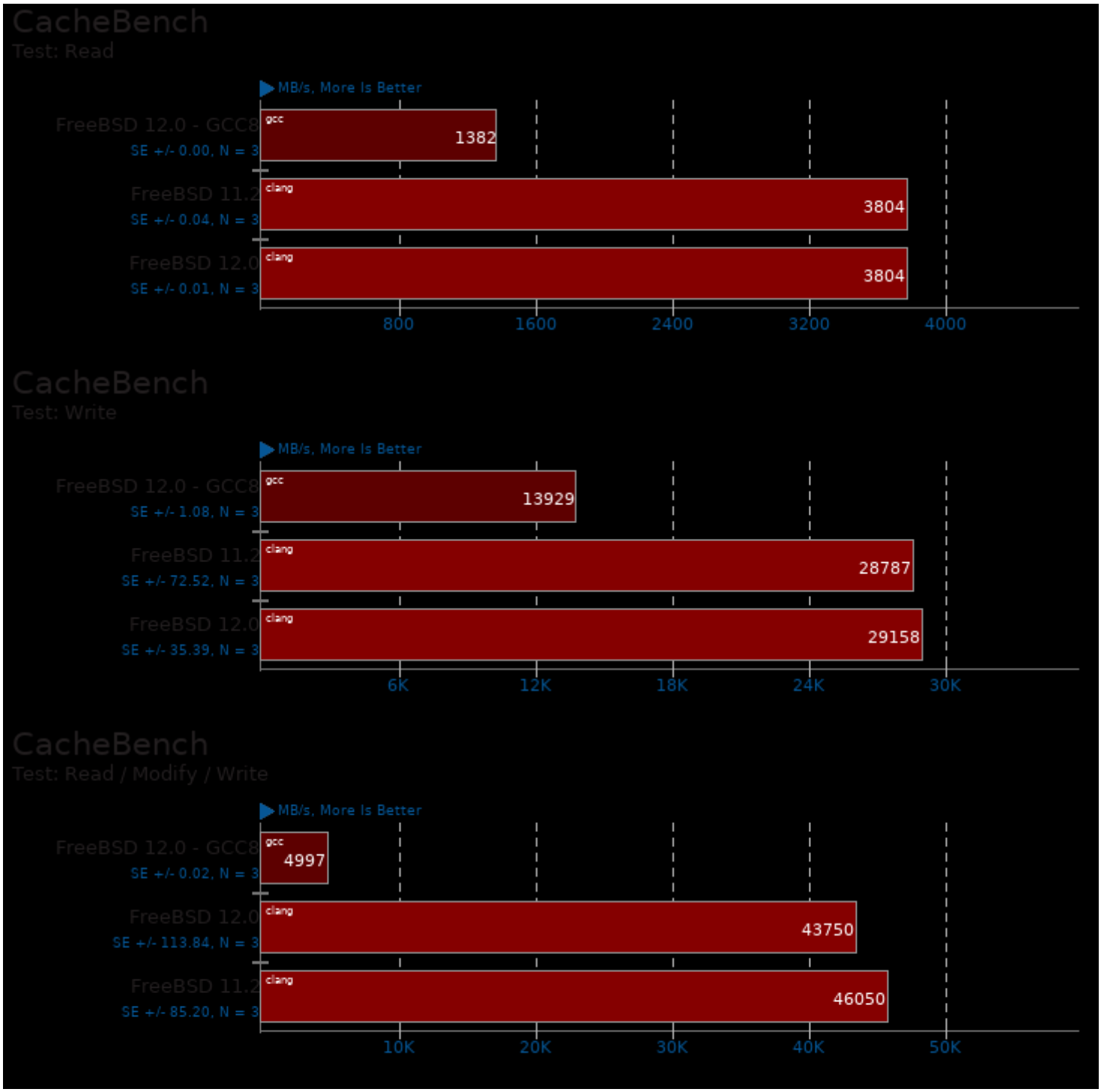

BlogBench 1.1
Test: Write
Final Score, More Is Better
FreeBSD 11.2
SE +/- 312.89, N = 3
clang
7323
FreeBSD 12.0
SE +/- 123.42, N = 3
clang
8308
FreeBSD 12.0 - GCC8
SE +/- 30.44, N = 3
gcc
8309
2K
4K
6K
8K
10K
Bork File Encrypter 1.4
File Encryption Time
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.04, N = 3
35.08
FreeBSD 12.0 - GCC8
SE +/- 0.10, N = 3
30.45
FreeBSD 12.0
SE +/- 0.04, N = 3
29.73
8
16
24
32
40
Botan 2.8.0
Test: AES-256 - Encrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 4.27, N = 3
1800
FreeBSD 12.0
SE +/- 0.07, N = 3
1835
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
1836
400
800
1200
1600
2000
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2

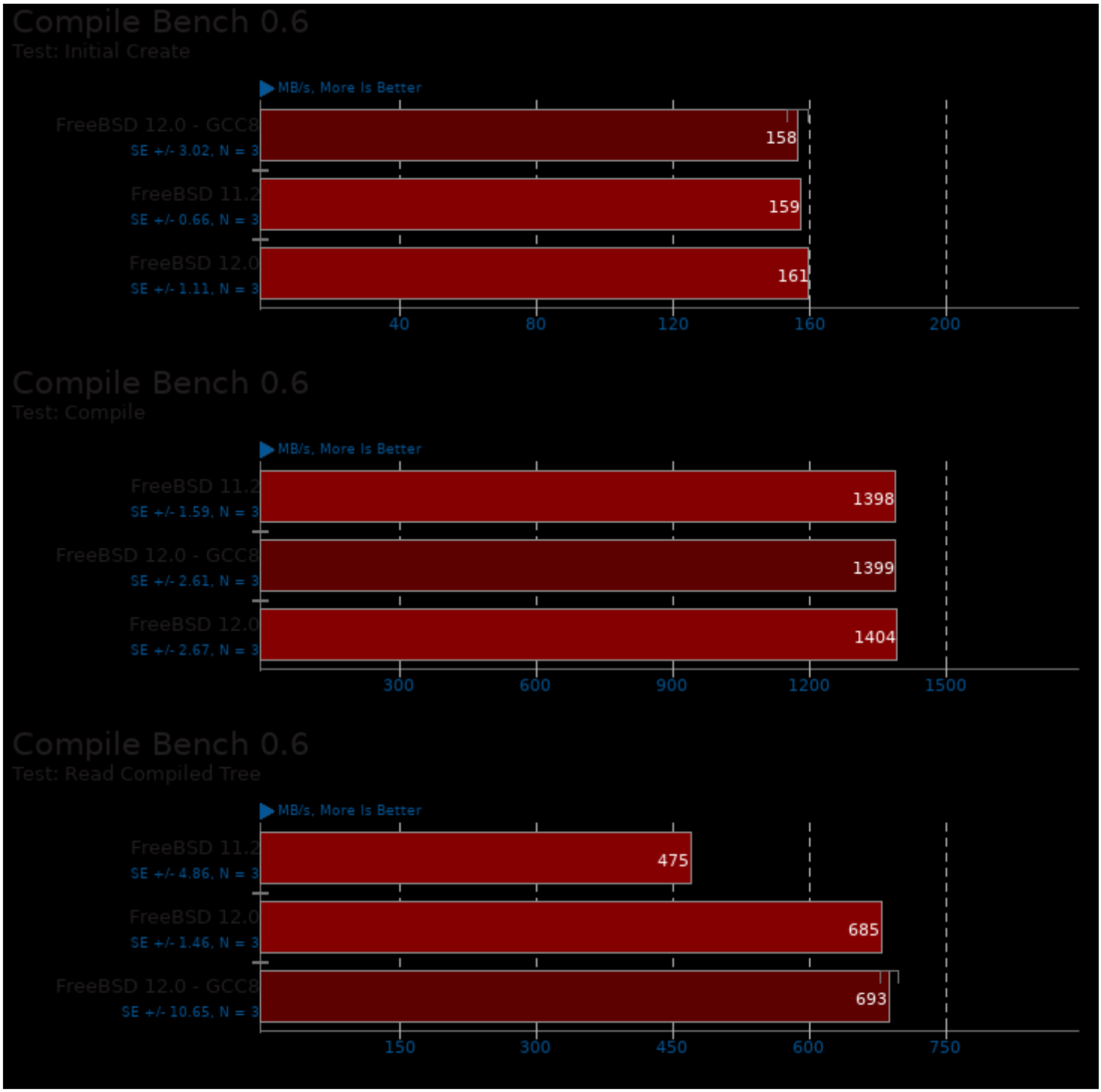

Botan 2.8.0
Test: AES-256 - Decrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 4.12, N = 3
1799
FreeBSD 12.0
SE +/- 0.03, N = 3
1836
FreeBSD 12.0 - GCC8
SE +/- 0.08, N = 3
1836
400
800
1200
1600
2000
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2
Botan 2.8.0
Test: Blowfish - Encrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 0.65, N = 3
133
FreeBSD 12.0
SE +/- 0.01, N = 3
134
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
134
30
60
90
120
150
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2
Botan 2.8.0
Test: Blowfish - Decrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 0.67, N = 3
132
FreeBSD 12.0
SE +/- 0.06, N = 3
134
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
134
30
60
90
120
150
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2

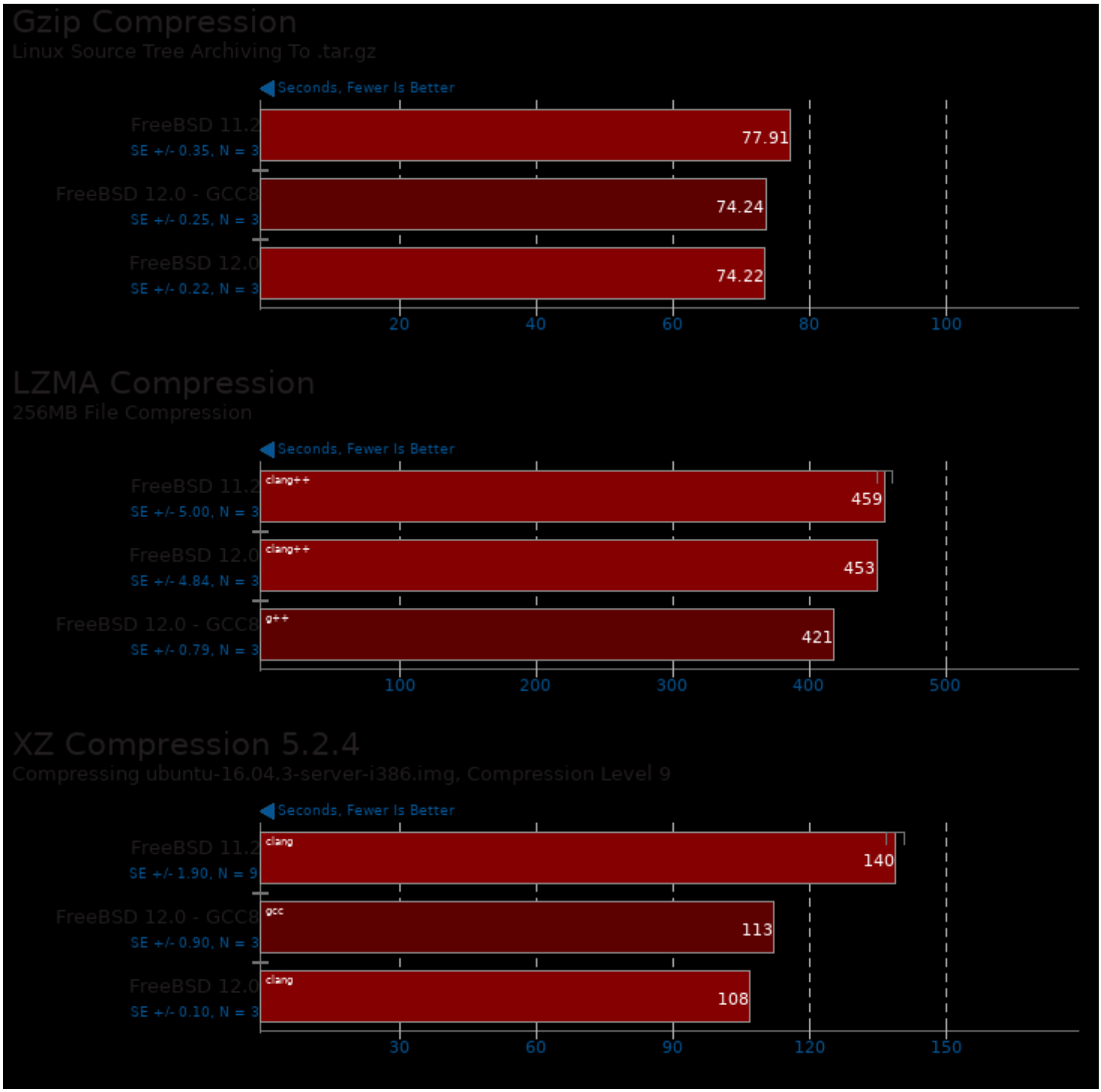

Botan 2.8.0
Test: CAST-256 - Encrypt
MiB/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.05, N = 3
64.48
FreeBSD 11.2
SE +/- 0.02, N = 3
64.54
FreeBSD 12.0
SE +/- 0.00, N = 3
64.58
14
28
42
56
70
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2
Botan 2.8.0
Test: CAST-256 - Decrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 0.06, N = 3
64.65
FreeBSD 12.0 - GCC8
SE +/- 0.04, N = 3
64.79
FreeBSD 12.0
SE +/- 0.00, N = 3
64.86
14
28
42
56
70
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2
Botan 2.8.0
Test: KASUMI - Encrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 0.07, N = 3
43.08
FreeBSD 12.0
SE +/- 0.00, N = 3
43.62
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
43.63
10
20
30
40
50
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2

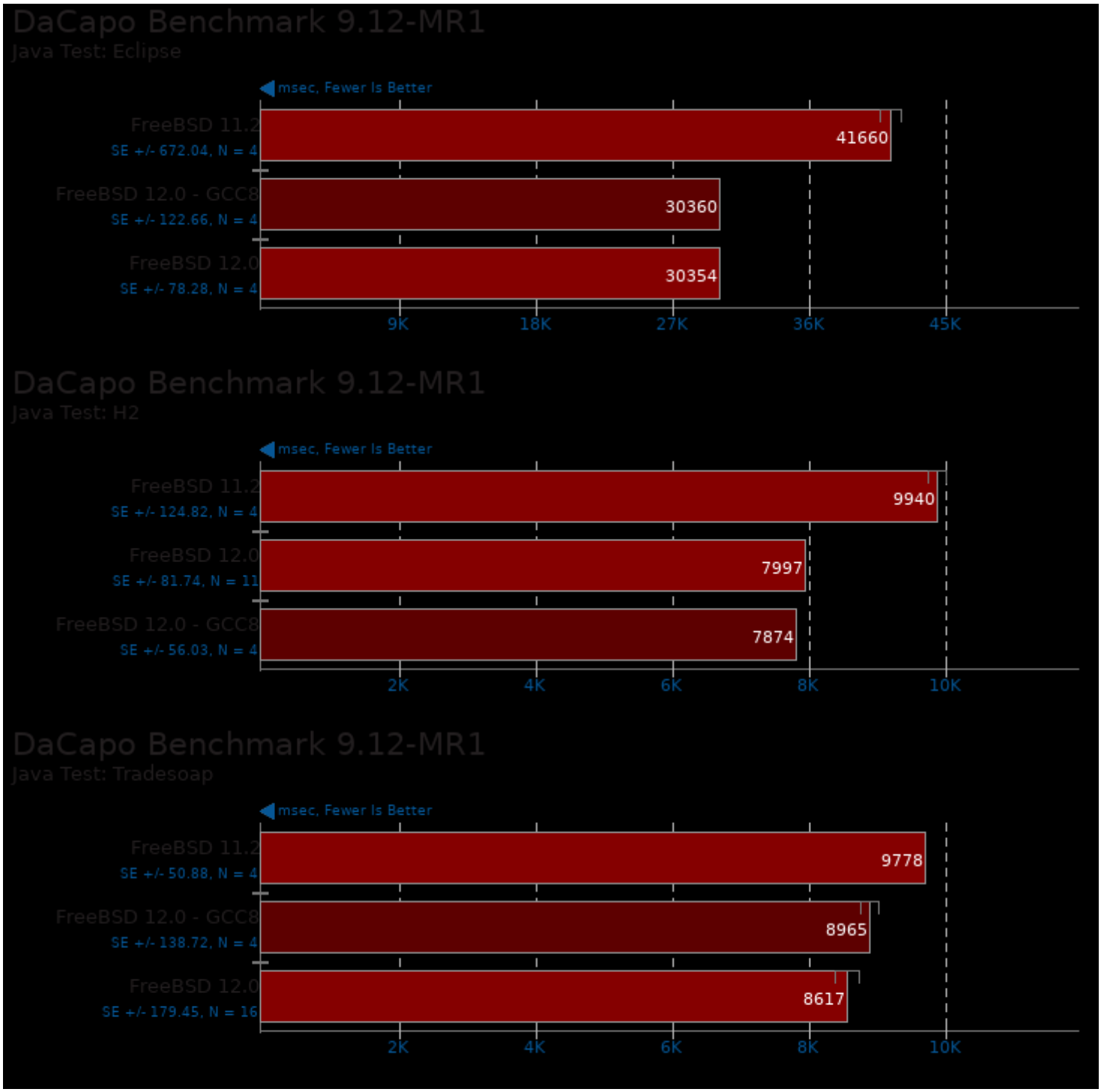

Botan 2.8.0
Test: KASUMI - Decrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 0.10, N = 3
42.37
FreeBSD 12.0
SE +/- 0.00, N = 3
42.81
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
42.81
10
20
30
40
50
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2
Botan 2.8.0
Test: Twofish - Encrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 0.40, N = 3
148
FreeBSD 12.0
SE +/- 0.01, N = 3
150
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
150
30
60
90
120
150
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2
Botan 2.8.0
Test: Twofish - Decrypt
MiB/s, More Is Better
FreeBSD 11.2
SE +/- 0.71, N = 3
149
FreeBSD 12.0
SE +/- 0.00, N = 3
152
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
152
30
60
90
120
150
1. (CXX) clang++ options: -fstack-protector -pthread -lbotan-2

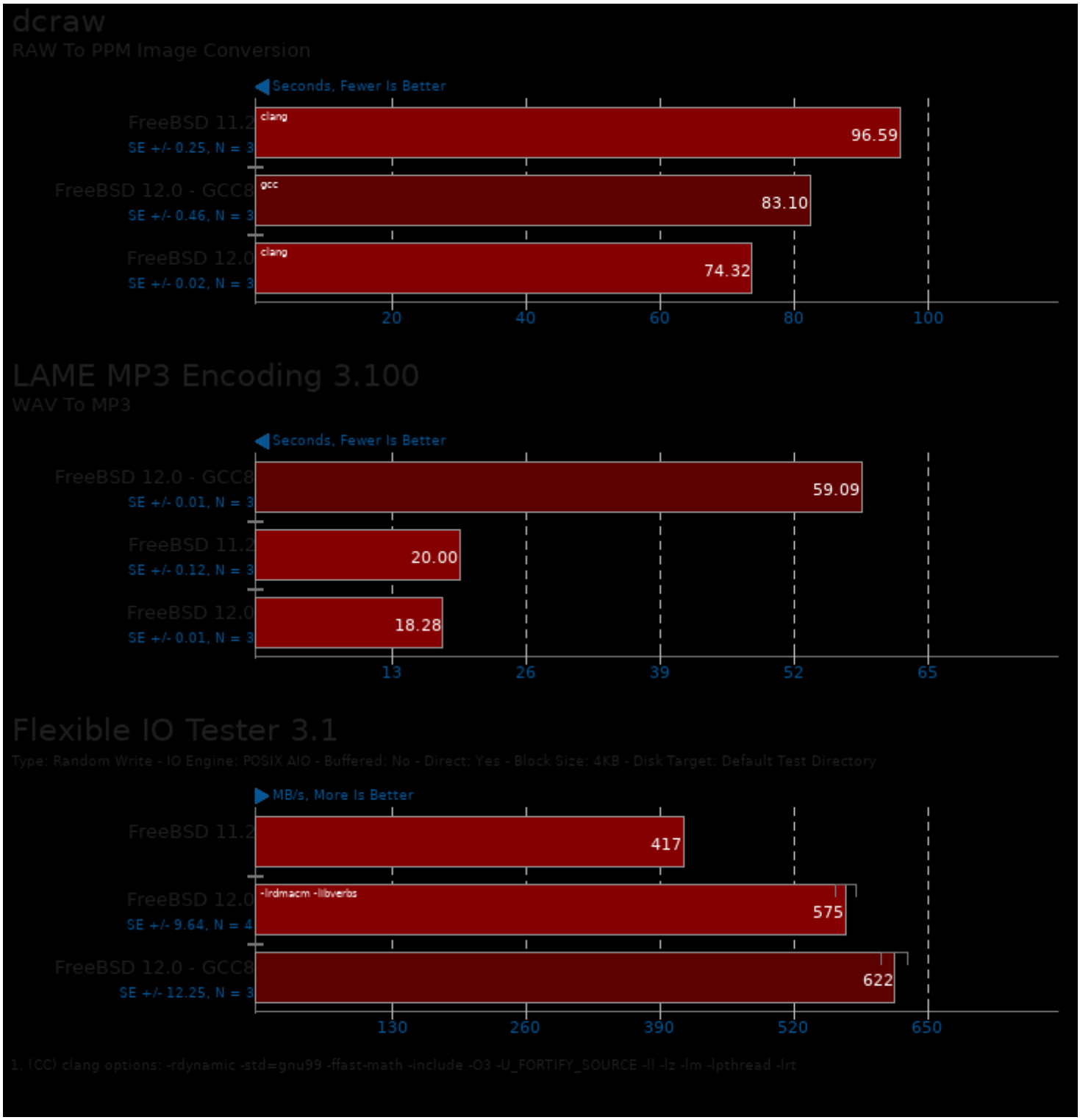

Timed LLVM Compilation 6.0.1
Time To Compile
Seconds, Fewer Is Better
FreeBSD 11.2
220
FreeBSD 12.0
175
FreeBSD 12.0 - GCC8
170
50
100
150
200
250
Timed PHP Compilation 7.1.9
Time To Compile
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 1.43, N = 3
185
FreeBSD 12.0
SE +/- 0.18, N = 3
109
40
80
120
160
200
1. (CC) clang options: -O2 -pedantic -lpthread -lz -lm
C-Ray 1.1
Total Time - 4K, 16 Rays Per Pixel
Seconds, Fewer Is Better
FreeBSD 12.0 - GCC8
SE +/- 3.17, N = 9
gcc
139.98
FreeBSD 11.2
SE +/- 0.12, N = 3
clang
42.21
FreeBSD 12.0
SE +/- 0.08, N = 3
clang
41.14
30
60
90
120
150

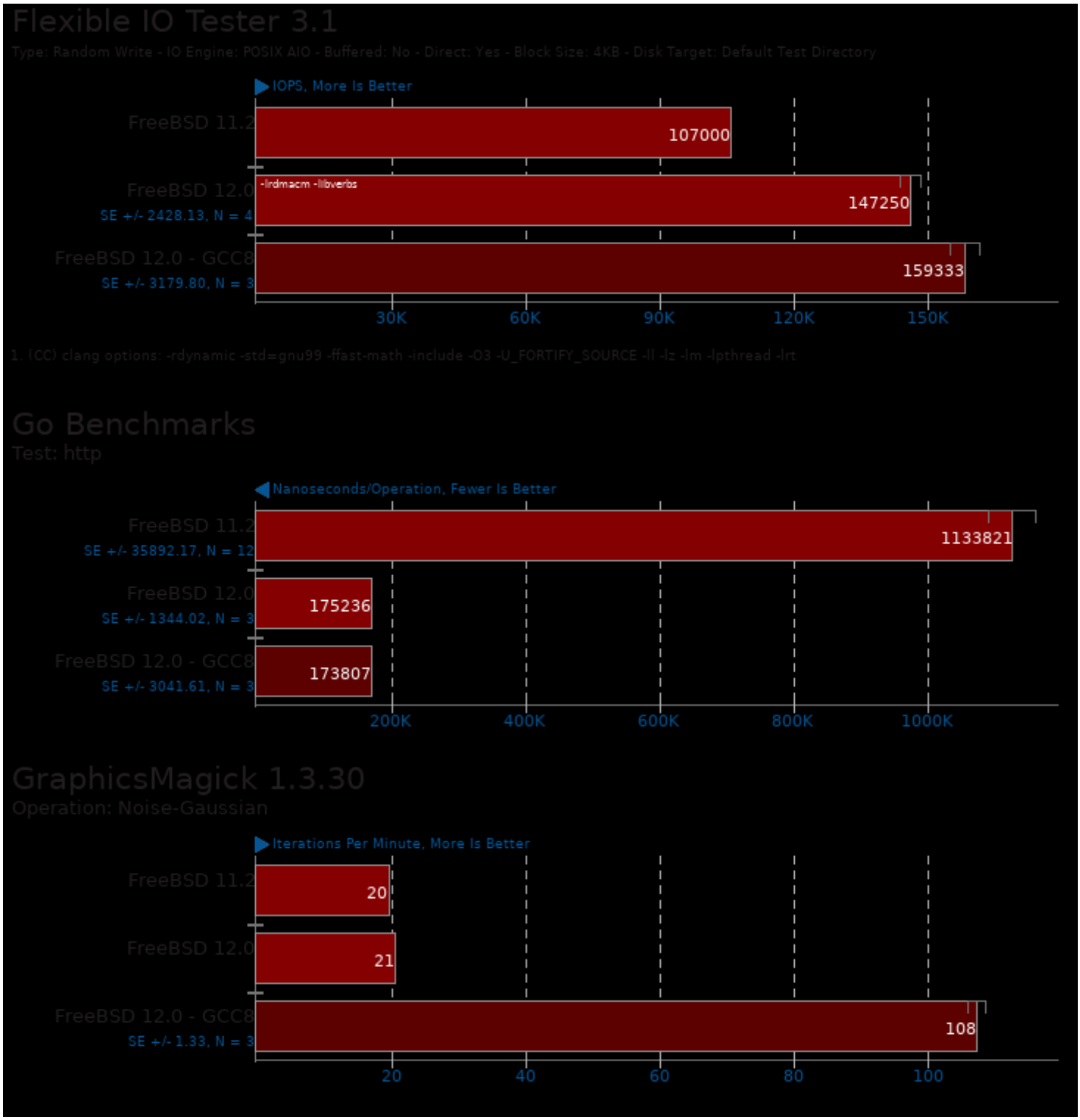

CacheBench
Test: Read
MB/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
gcc
1382
FreeBSD 11.2
SE +/- 0.04, N = 3
clang
3804
FreeBSD 12.0
SE +/- 0.01, N = 3
clang
3804
800
1600
2400
3200
4000
CacheBench
Test: Write
MB/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 1.08, N = 3
gcc
13929
FreeBSD 11.2
SE +/- 72.52, N = 3
clang
28787
FreeBSD 12.0
SE +/- 35.39, N = 3
clang
29158
6K
12K
18K
24K
30K
CacheBench
Test: Read / Modify / Write
MB/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.02, N = 3
gcc
4997
FreeBSD 12.0
SE +/- 113.84, N = 3
clang
43750
FreeBSD 11.2
SE +/- 85.20, N = 3
clang
46050
10K
20K
30K
40K
50K

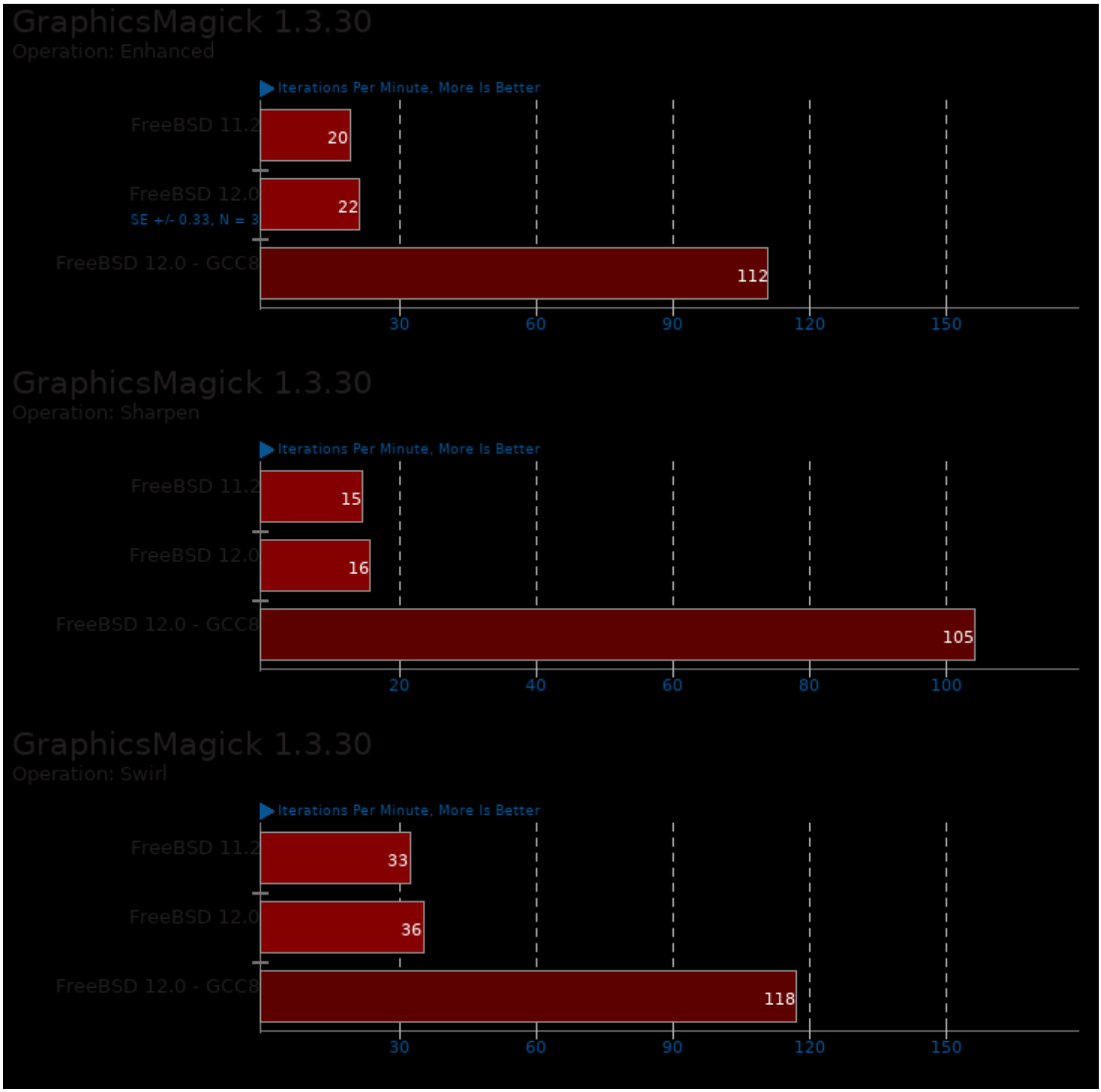

Compile Bench 0.6
Test: Initial Create
MB/s, More Is Better
FreeBSD 12.0 - GCC8
SE +/- 3.02, N = 3
158
FreeBSD 11.2
SE +/- 0.66, N = 3
159
FreeBSD 12.0
SE +/- 1.11, N = 3
161
40
80
120
160
200
Compile Bench 0.6
Test: Compile
MB/s, More Is Better
FreeBSD 11.2
SE +/- 1.59, N = 3
1398
FreeBSD 12.0 - GCC8
SE +/- 2.61, N = 3
1399
FreeBSD 12.0
SE +/- 2.67, N = 3
1404
300
600
900
1200
1500
Compile Bench 0.6
Test: Read Compiled Tree
MB/s, More Is Better
FreeBSD 11.2
SE +/- 4.86, N = 3
475
FreeBSD 12.0
SE +/- 1.46, N = 3
685
FreeBSD 12.0 - GCC8
SE +/- 10.65, N = 3
693
150
300
450
600
750

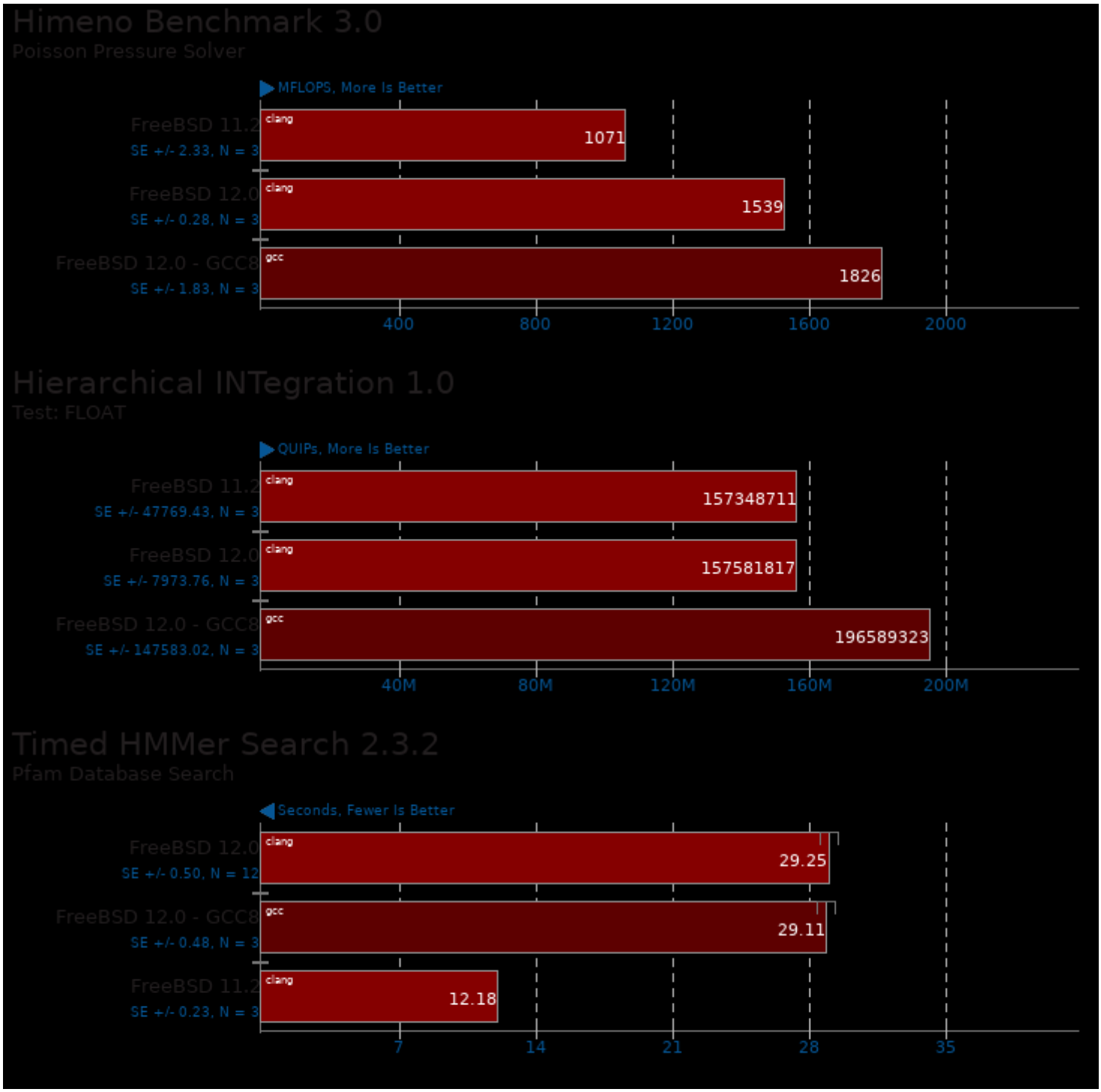

Gzip Compression
Linux Source Tree Archiving To .tar.gz
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.35, N = 3
77.91
FreeBSD 12.0 - GCC8
SE +/- 0.25, N = 3
74.24
FreeBSD 12.0
SE +/- 0.22, N = 3
74.22
20
40
60
80
100
LZMA Compression
256MB File Compression
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 5.00, N = 3
clang++
459
FreeBSD 12.0
SE +/- 4.84, N = 3
clang++
453
FreeBSD 12.0 - GCC8
SE +/- 0.79, N = 3
g++
421
100
200
300
400
500
XZ Compression 5.2.4
Compressing ubuntu-16.04.3-server-i386.img, Compression Level 9
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 1.90, N = 9
clang
140
FreeBSD 12.0 - GCC8
SE +/- 0.90, N = 3
gcc
113
FreeBSD 12.0
SE +/- 0.10, N = 3
clang
108
30
60
90
120
150

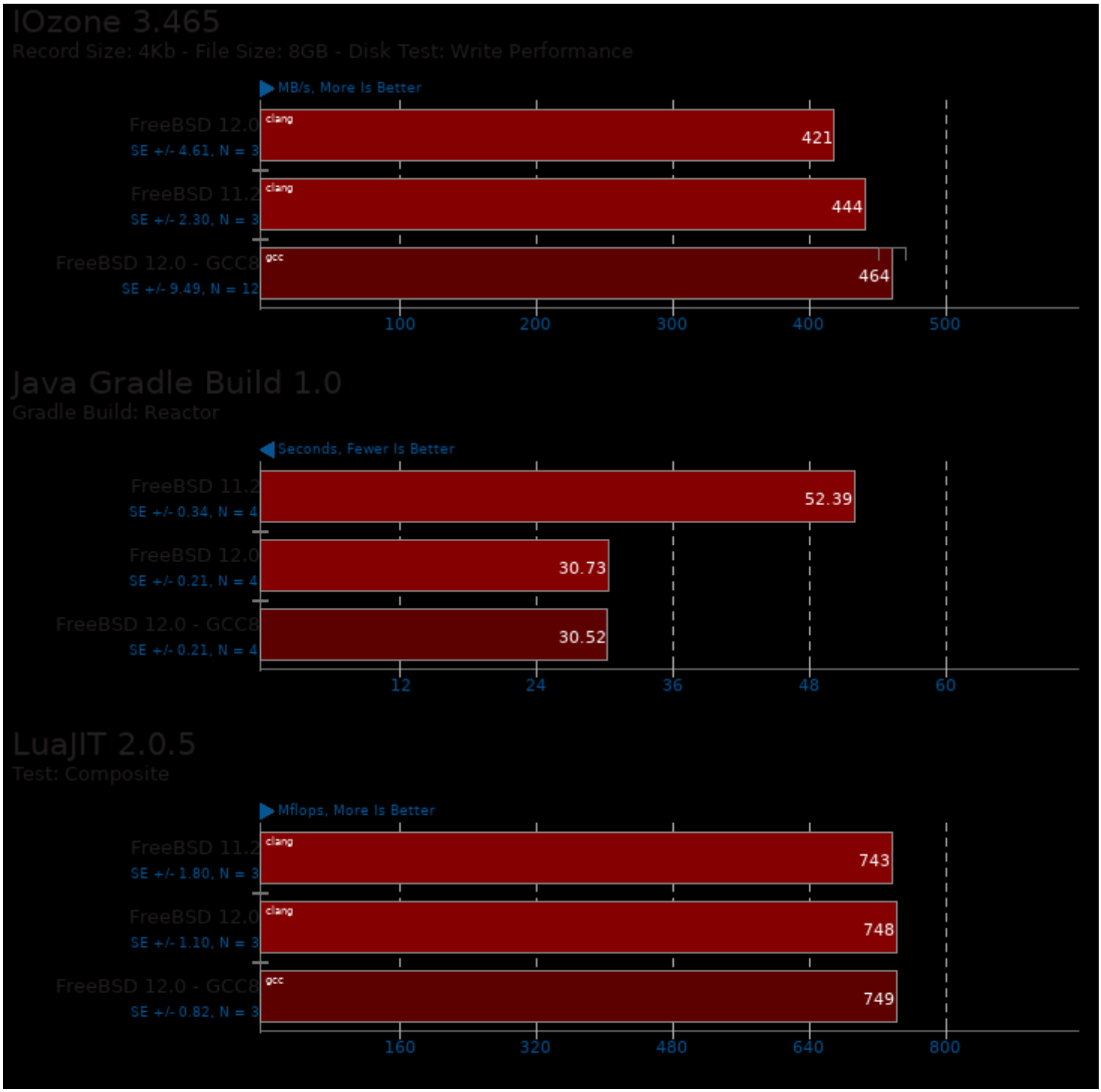

DaCapo Benchmark 9.12-MR1
Java Test: Eclipse
msec, Fewer Is Better
FreeBSD 11.2
SE +/- 672.04, N = 4
41660
FreeBSD 12.0 - GCC8
SE +/- 122.66, N = 4
30360
FreeBSD 12.0
SE +/- 78.28, N = 4
30354
9K
18K
27K
36K
45K
DaCapo Benchmark 9.12-MR1
Java Test: H2
msec, Fewer Is Better
FreeBSD 11.2
SE +/- 124.82, N = 4
9940
FreeBSD 12.0
SE +/- 81.74, N = 11
7997
FreeBSD 12.0 - GCC8
SE +/- 56.03, N = 4
7874
2K
4K
6K
8K
10K
DaCapo Benchmark 9.12-MR1
Java Test: Tradesoap
msec, Fewer Is Better
FreeBSD 11.2
SE +/- 50.88, N = 4
9778
FreeBSD 12.0 - GCC8
SE +/- 138.72, N = 4
8965
FreeBSD 12.0
SE +/- 179.45, N = 16
8617
2K
4K
6K
8K
10K

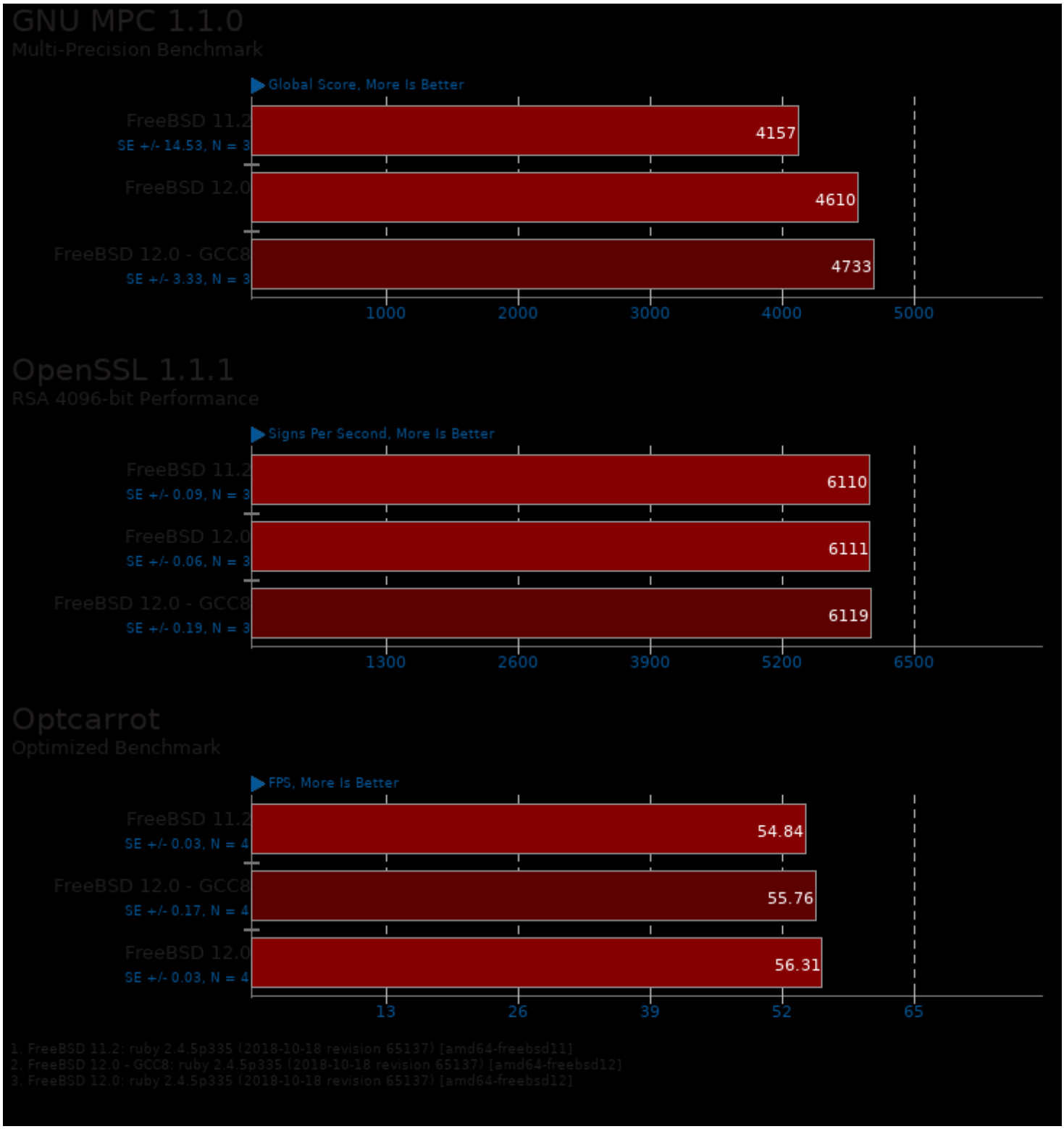

dcraw
RAW To PPM Image Conversion
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.25, N = 3
clang
96.59
FreeBSD 12.0 - GCC8
SE +/- 0.46, N = 3
gcc
83.10
FreeBSD 12.0
SE +/- 0.02, N = 3
clang
74.32
20
40
60
80
100
LAME MP3 Encoding 3.100
WAV To MP3
Seconds, Fewer Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
59.09
FreeBSD 11.2
SE +/- 0.12, N = 3
20.00
FreeBSD 12.0
SE +/- 0.01, N = 3
18.28
13
26
39
52
65
Flexible IO Tester 3.1
Type: Random Write - IO Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
FreeBSD 11.2
417
FreeBSD 12.0
SE +/- 9.64, N = 4
-lrdmacm -libverbs
575
FreeBSD 12.0 - GCC8
SE +/- 12.25, N = 3
622
130
260
390
520
650
1. (CC) clang options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -ll -lz -lm -lpthread -lrt

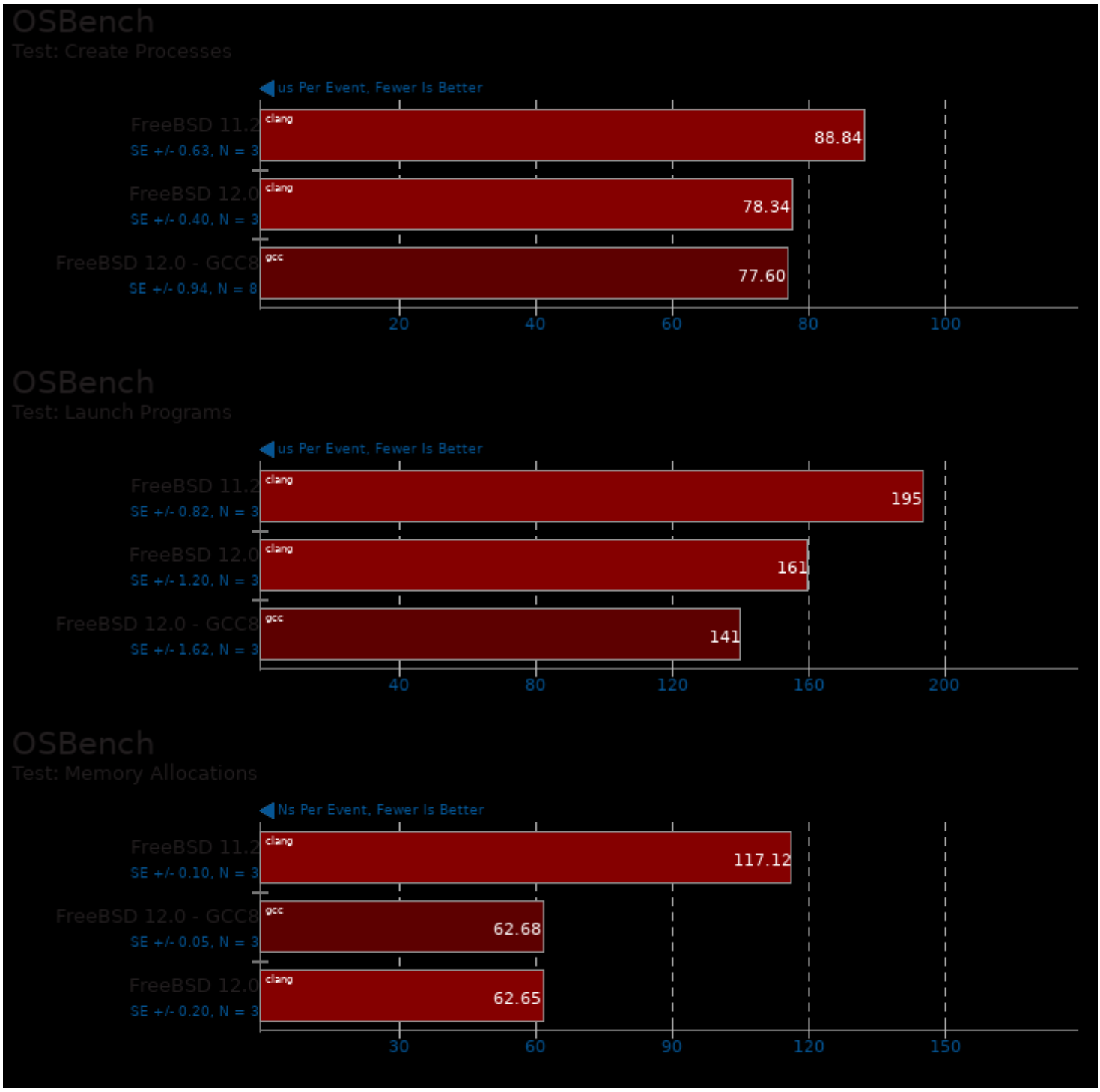

Flexible IO Tester 3.1
Type: Random Write - IO Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
FreeBSD 11.2
107000
FreeBSD 12.0
-lrdmacm -libverbs
147250
SE +/- 2428.13, N = 4
FreeBSD 12.0 - GCC8
159333
SE +/- 3179.80, N = 3
30K
60K
90K
120K
150K
1. (CC) clang options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -ll -lz -lm -lpthread -lrt
Go Benchmarks
Test: http
Nanoseconds/Operation, Fewer Is Better
FreeBSD 11.2
1133821
SE +/- 35892.17, N = 12
FreeBSD 12.0
175236
SE +/- 1344.02, N = 3
FreeBSD 12.0 - GCC8
173807
SE +/- 3041.61, N = 3
200K
400K
600K
800K
1000K
GraphicsMagick 1.3.30
Operation: Noise-Gaussian
Iterations Per Minute, More Is Better
FreeBSD 11.2
20
FreeBSD 12.0
21
FreeBSD 12.0 - GCC8
108
SE +/- 1.33, N = 3
20
40
60
80
100

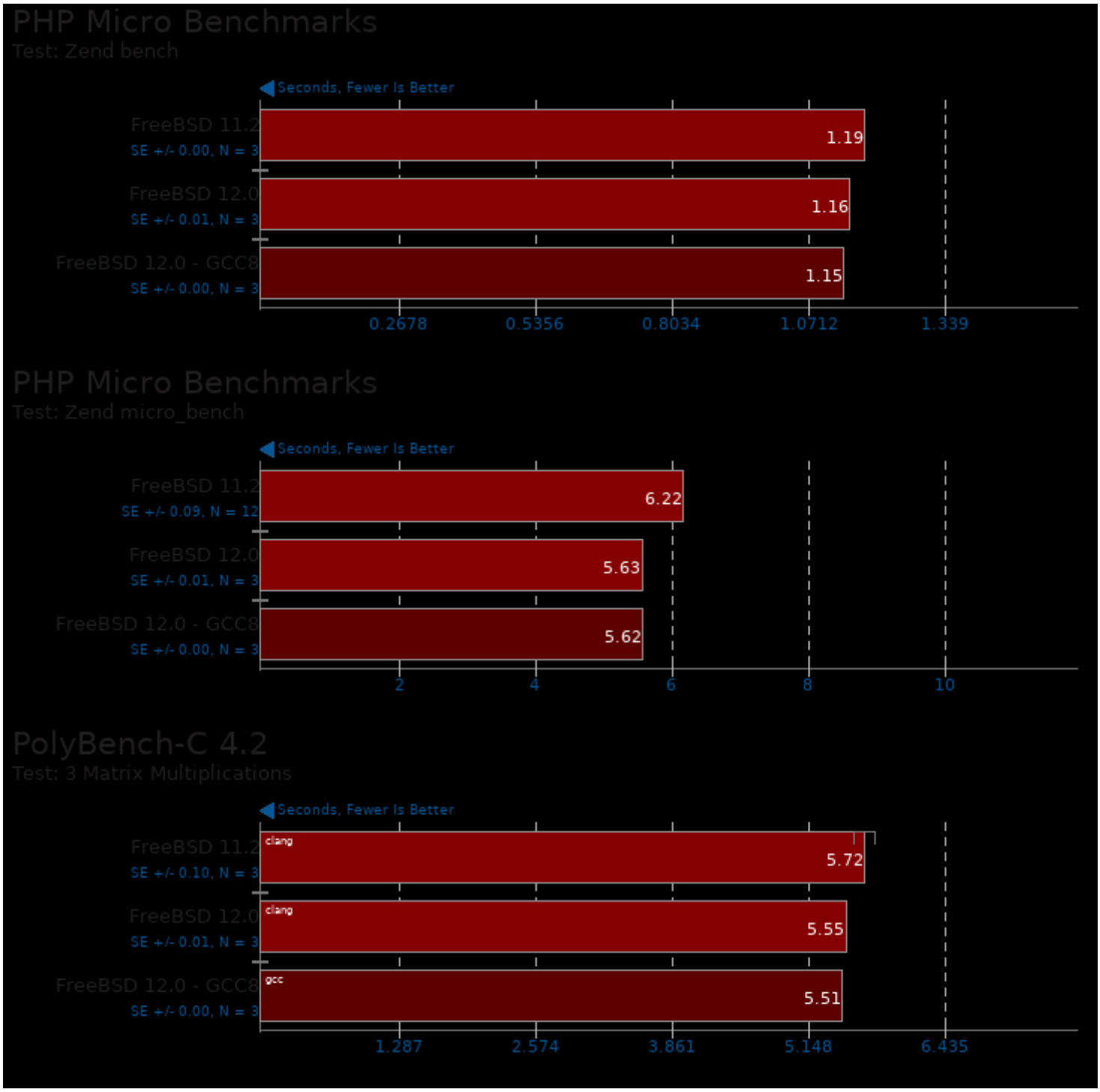

GraphicsMagick 1.3.30
Operation: Enhanced
Iterations Per Minute, More Is Better
FreeBSD 11.2
20
FreeBSD 12.0
22
SE +/- 0.33, N = 3
FreeBSD 12.0 - GCC8
112
30
60
90
120
150
GraphicsMagick 1.3.30
Operation: Sharpen
Iterations Per Minute, More Is Better
FreeBSD 11.2
15
FreeBSD 12.0
16
FreeBSD 12.0 - GCC8
105
20
40
60
80
100
GraphicsMagick 1.3.30
Operation: Swirl
Iterations Per Minute, More Is Better
FreeBSD 11.2
33
FreeBSD 12.0
36
FreeBSD 12.0 - GCC8
118
30
60
90
120
150

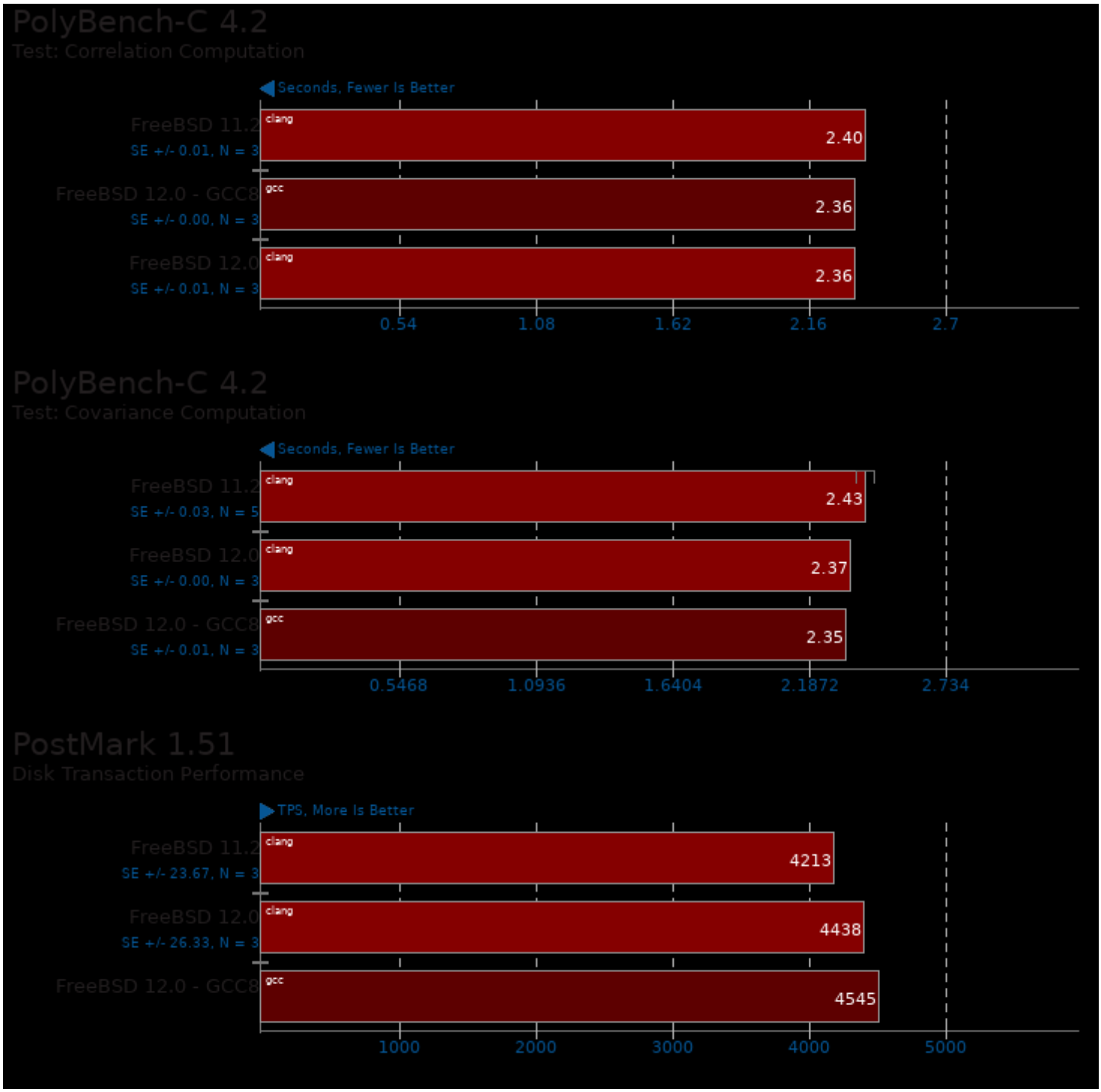

Himeno Benchmark 3.0
Poisson Pressure Solver
MFLOPS, More Is Better
FreeBSD 11.2
SE +/- 2.33, N = 3
clang
1071
FreeBSD 12.0
SE +/- 0.28, N = 3
clang
1539
FreeBSD 12.0 - GCC8
SE +/- 1.83, N = 3
gcc
1826
400
800
1200
1600
2000
Hierarchical INTegration 1.0
Test: FLOAT
QUIPs, More Is Better
FreeBSD 11.2
SE +/- 47769.43, N = 3
clang
157348711
FreeBSD 12.0
SE +/- 7973.76, N = 3
clang
157581817
FreeBSD 12.0 - GCC8
SE +/- 147583.02, N = 3
gcc
196589323
40M
80M
120M
160M
200M
Timed HMMer Search 2.3.2
Pfam Database Search
Seconds, Fewer Is Better
FreeBSD 12.0
SE +/- 0.50, N = 12
clang
29.25
FreeBSD 12.0 - GCC8
SE +/- 0.48, N = 3
gcc
29.11
FreeBSD 11.2
SE +/- 0.23, N = 3
clang
12.18
7
14
21
28
35

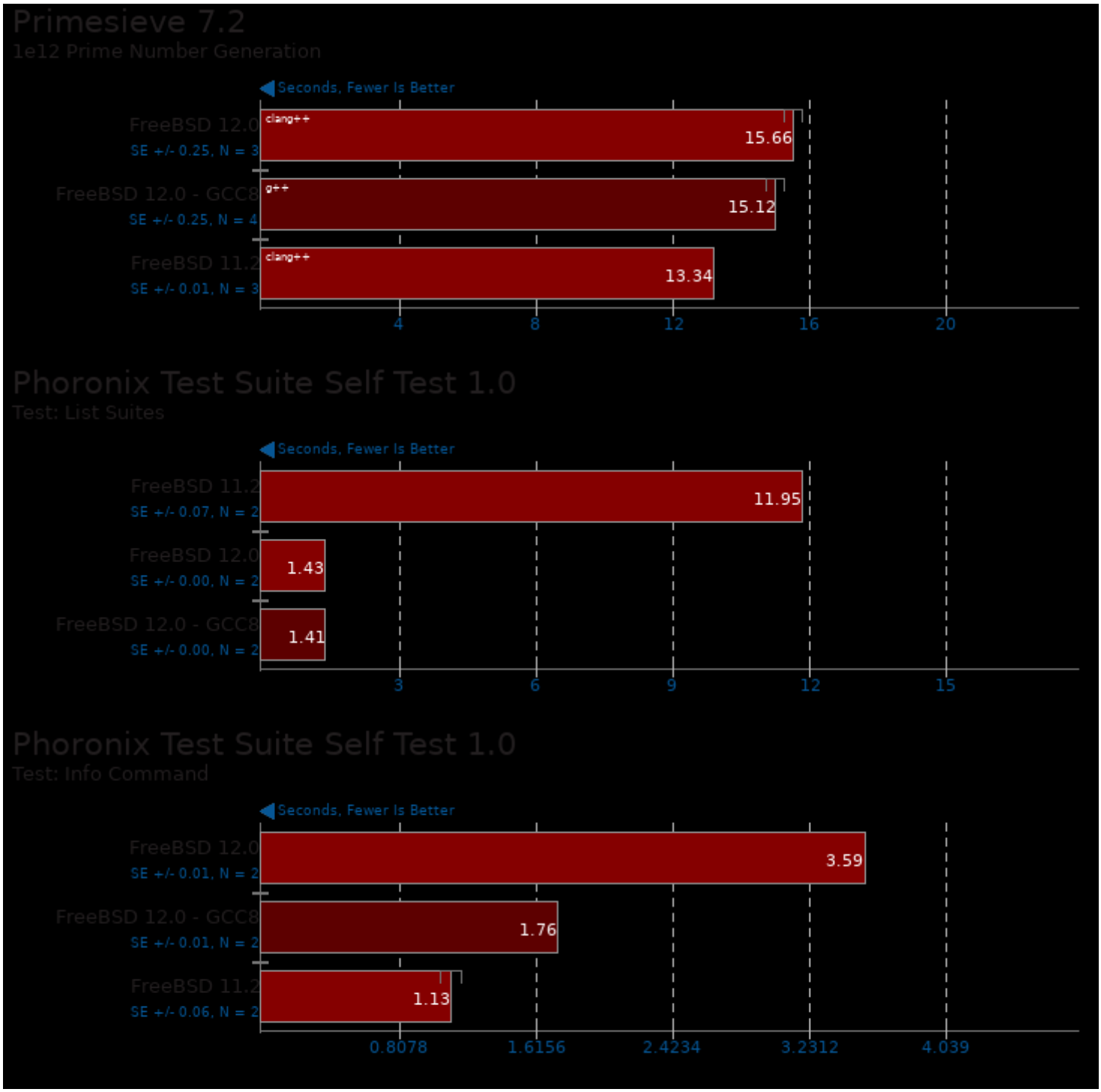

IOzone 3.465
Record Size: 4Kb - File Size: 8GB - Disk Test: Write Performance
MB/s, More Is Better
FreeBSD 12.0
SE +/- 4.61, N = 3
clang
421
FreeBSD 11.2
SE +/- 2.30, N = 3
clang
444
FreeBSD 12.0 - GCC8
SE +/- 9.49, N = 12
gcc
464
100
200
300
400
500
Java Gradle Build 1.0
Gradle Build: Reactor
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.34, N = 4
52.39
FreeBSD 12.0
SE +/- 0.21, N = 4
30.73
FreeBSD 12.0 - GCC8
SE +/- 0.21, N = 4
30.52
12
24
36
48
60
LuaJIT 2.0.5
Test: Composite
Mflops, More Is Better
FreeBSD 11.2
SE +/- 1.80, N = 3
clang
743
FreeBSD 12.0
SE +/- 1.10, N = 3
clang
748
FreeBSD 12.0 - GCC8
SE +/- 0.82, N = 3
gcc
749
160
320
480
640
800

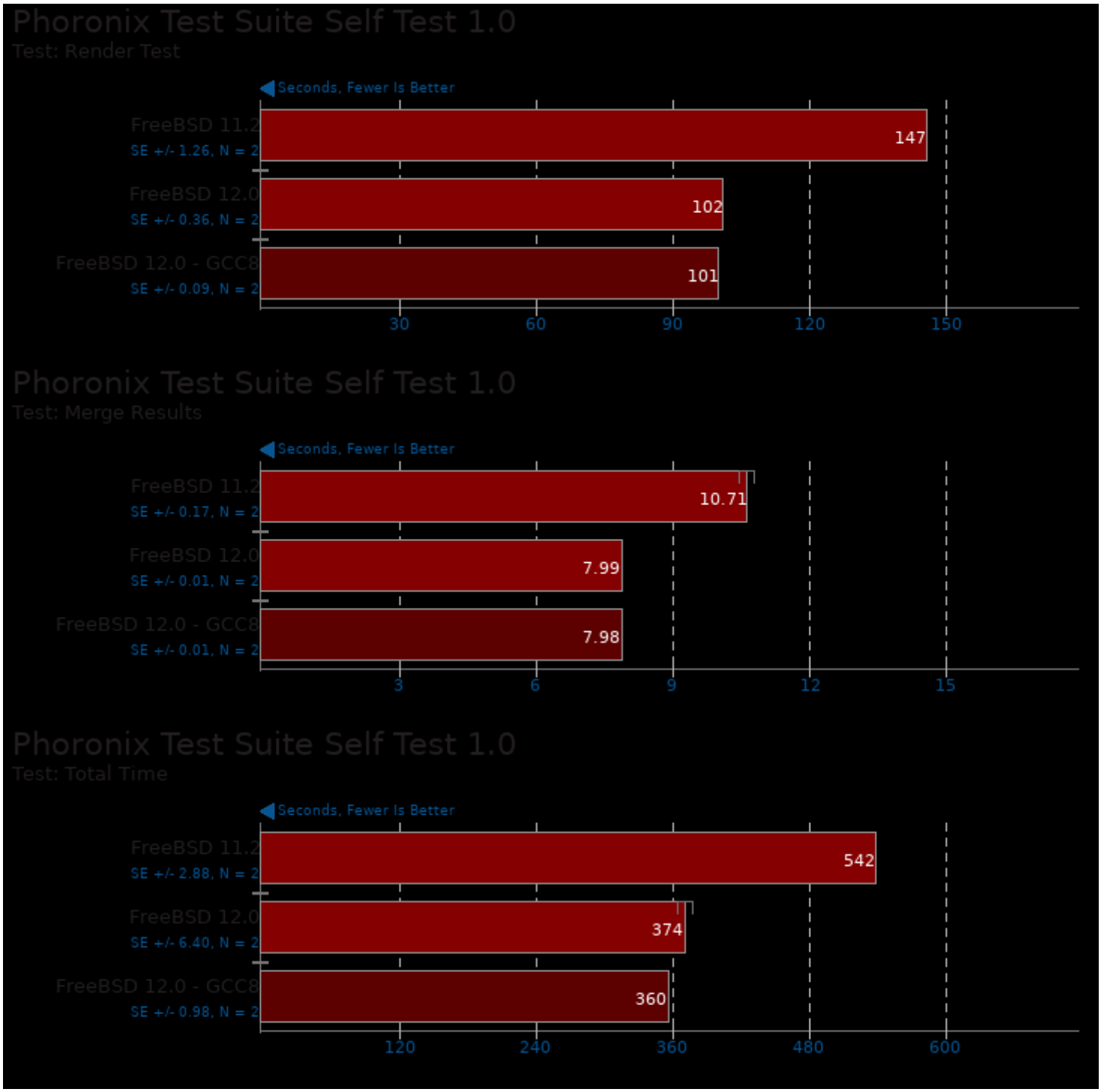

GNU MPC 1.1.0
Multi-Precision Benchmark
Global Score, More Is Better
FreeBSD 11.2
SE +/- 14.53, N = 3
4157
FreeBSD 12.0
4610
FreeBSD 12.0 - GCC8
SE +/- 3.33, N = 3
4733
1000
2000
3000
4000
5000
OpenSSL 1.1.1
RSA 4096-bit Performance
Signs Per Second, More Is Better
FreeBSD 11.2
SE +/- 0.09, N = 3
6110
FreeBSD 12.0
SE +/- 0.06, N = 3
6111
FreeBSD 12.0 - GCC8
SE +/- 0.19, N = 3
6119
1300
2600
3900
5200
6500
Optcarrot
Optimized Benchmark
FPS, More Is Better
FreeBSD 11.2
SE +/- 0.03, N = 4
54.84
FreeBSD 12.0 - GCC8
SE +/- 0.17, N = 4
55.76
FreeBSD 12.0
SE +/- 0.03, N = 4
56.31
13
26
39
52
65
1. FreeBSD 11.2: ruby 2.4.5p335 (2018-10-18 revision 65137) [amd64-freebsd11]
2. FreeBSD 12.0 - GCC8: ruby 2.4.5p335 (2018-10-18 revision 65137) [amd64-freebsd12]
3. FreeBSD 12.0: ruby 2.4.5p335 (2018-10-18 revision 65137) [amd64-freebsd12]

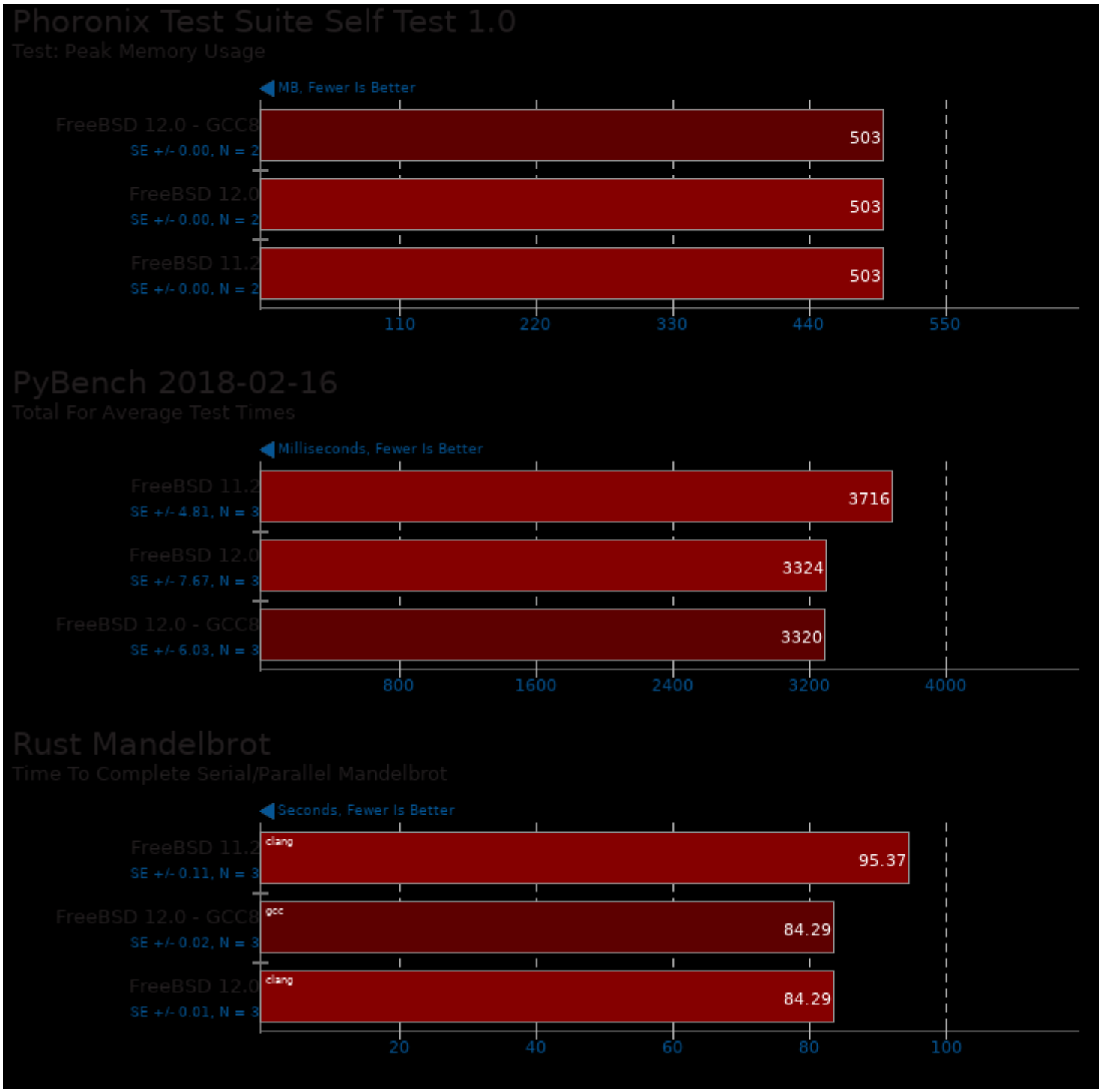

OSBench
Test: Create Processes
us Per Event, Fewer Is Better
FreeBSD 11.2
SE +/- 0.63, N = 3
clang
88.84
FreeBSD 12.0
SE +/- 0.40, N = 3
clang
78.34
FreeBSD 12.0 - GCC8
SE +/- 0.94, N = 8
gcc
77.60
20
40
60
80
100
OSBench
Test: Launch Programs
us Per Event, Fewer Is Better
FreeBSD 11.2
SE +/- 0.82, N = 3
clang
195
FreeBSD 12.0
SE +/- 1.20, N = 3
clang
161
FreeBSD 12.0 - GCC8
SE +/- 1.62, N = 3
gcc
141
40
80
120
160
200
OSBench
Test: Memory Allocations
Ns Per Event, Fewer Is Better
FreeBSD 11.2
SE +/- 0.10, N = 3
clang
117.12
FreeBSD 12.0 - GCC8
SE +/- 0.05, N = 3
gcc
62.68
FreeBSD 12.0
SE +/- 0.20, N = 3
clang
62.65
30
60
90
120
150

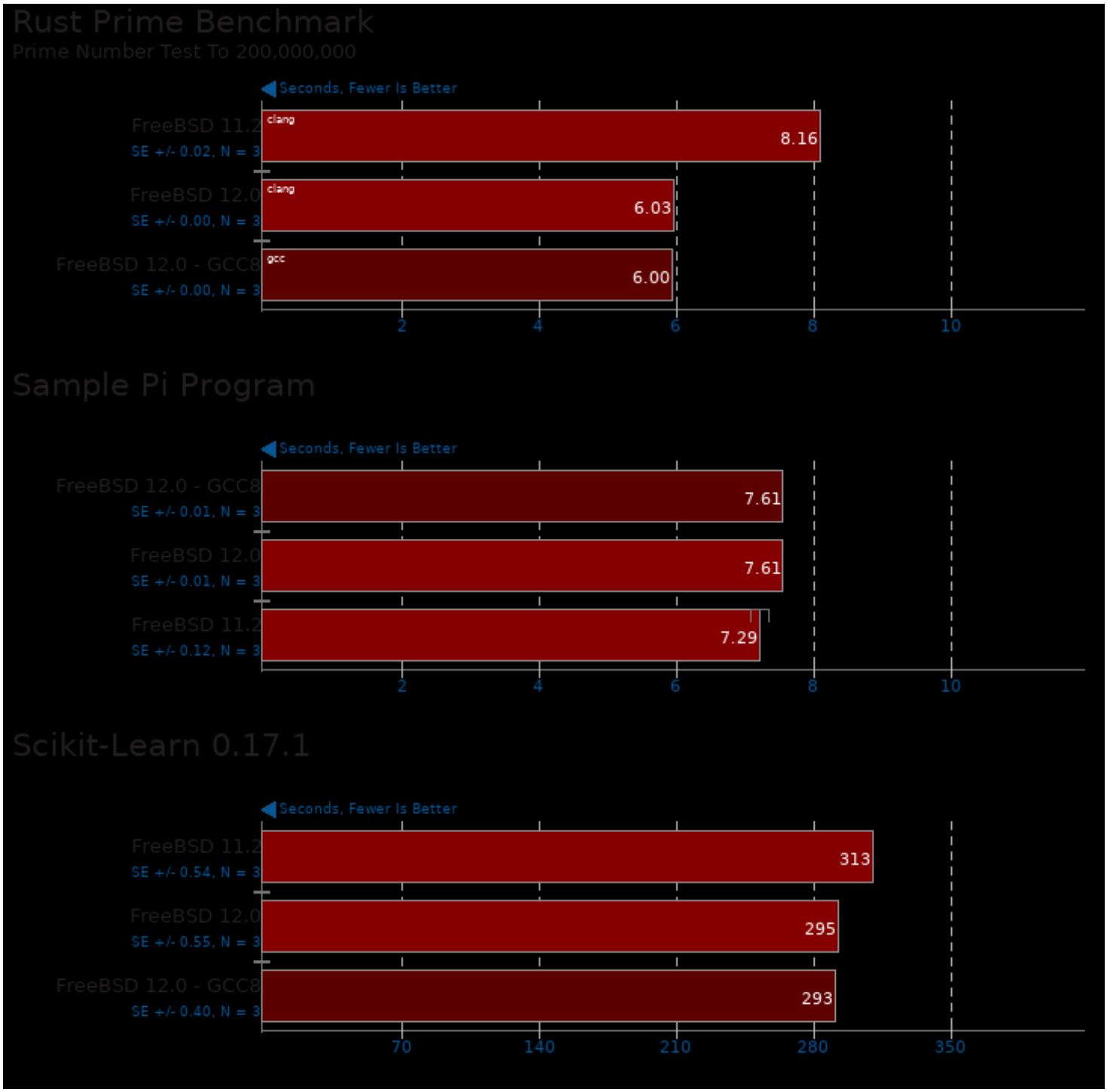

PHP Micro Benchmarks
Test: Zend bench
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.00, N = 3
1.19
FreeBSD 12.0
SE +/- 0.01, N = 3
1.16
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
1.15
0.2678
0.5356
0.8034
1.0712
1.339
PHP Micro Benchmarks
Test: Zend micro_bench
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.09, N = 12
6.22
FreeBSD 12.0
SE +/- 0.01, N = 3
5.63
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
5.62
2
4
6
8
10
PolyBench-C 4.2
Test: 3 Matrix Multiplications
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.10, N = 3
clang
5.72
FreeBSD 12.0
SE +/- 0.01, N = 3
clang
5.55
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
gcc
5.51
1.287
2.574
3.861
5.148
6.435

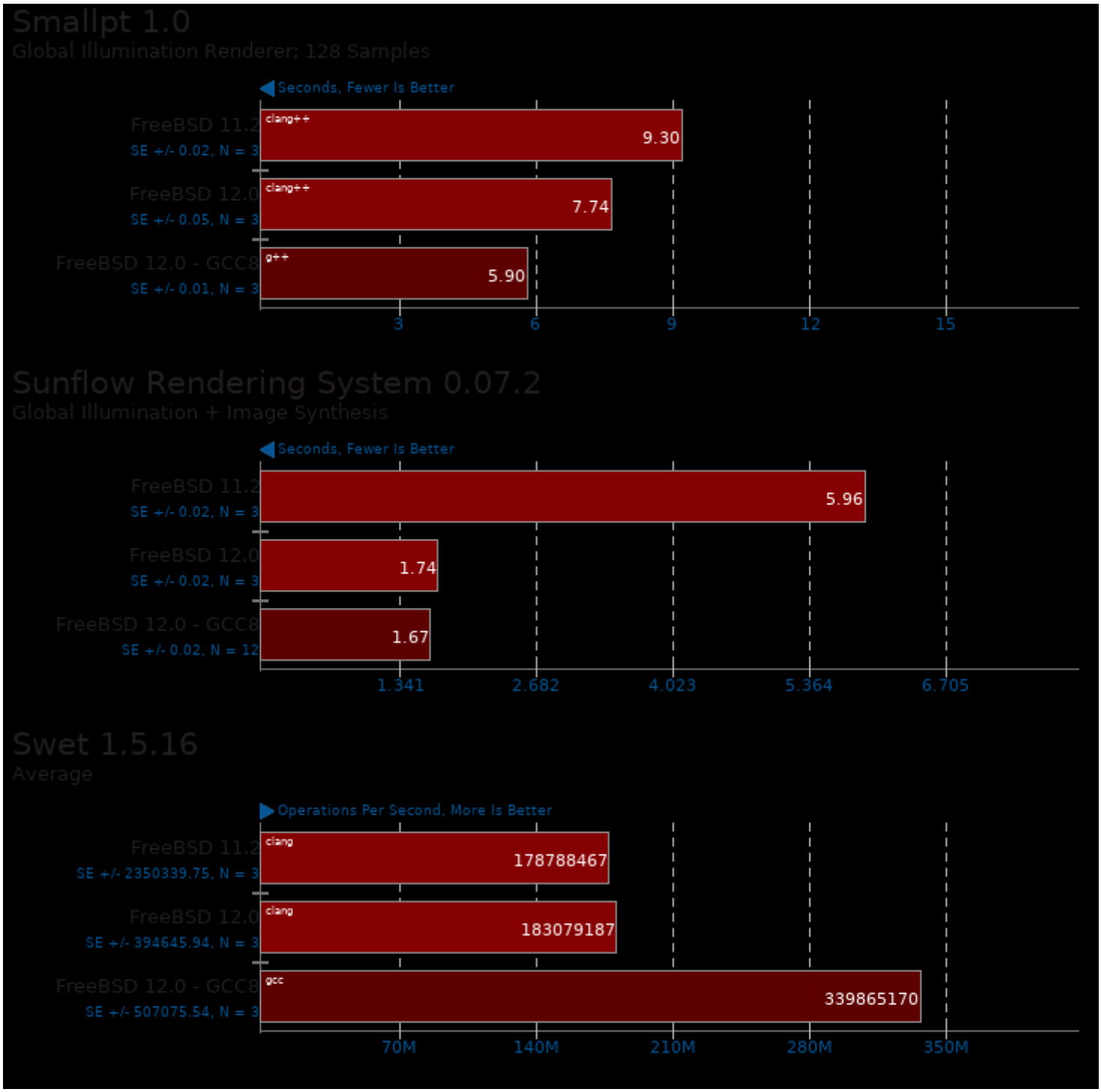

PolyBench-C 4.2
Test: Correlation Computation
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.01, N = 3
clang
2.40
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
gcc
2.36
FreeBSD 12.0
SE +/- 0.01, N = 3
clang
2.36
0.54
1.08
1.62
2.16
2.7
PolyBench-C 4.2
Test: Covariance Computation
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.03, N = 5
clang
2.43
FreeBSD 12.0
SE +/- 0.00, N = 3
clang
2.37
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
gcc
2.35
0.5468
1.0936
1.6404
2.1872
2.734
PostMark 1.51
Disk Transaction Performance
TPS, More Is Better
FreeBSD 11.2
SE +/- 23.67, N = 3
clang
4213
FreeBSD 12.0
SE +/- 26.33, N = 3
clang
4438
FreeBSD 12.0 - GCC8
gcc
4545
1000
2000
3000
4000
5000

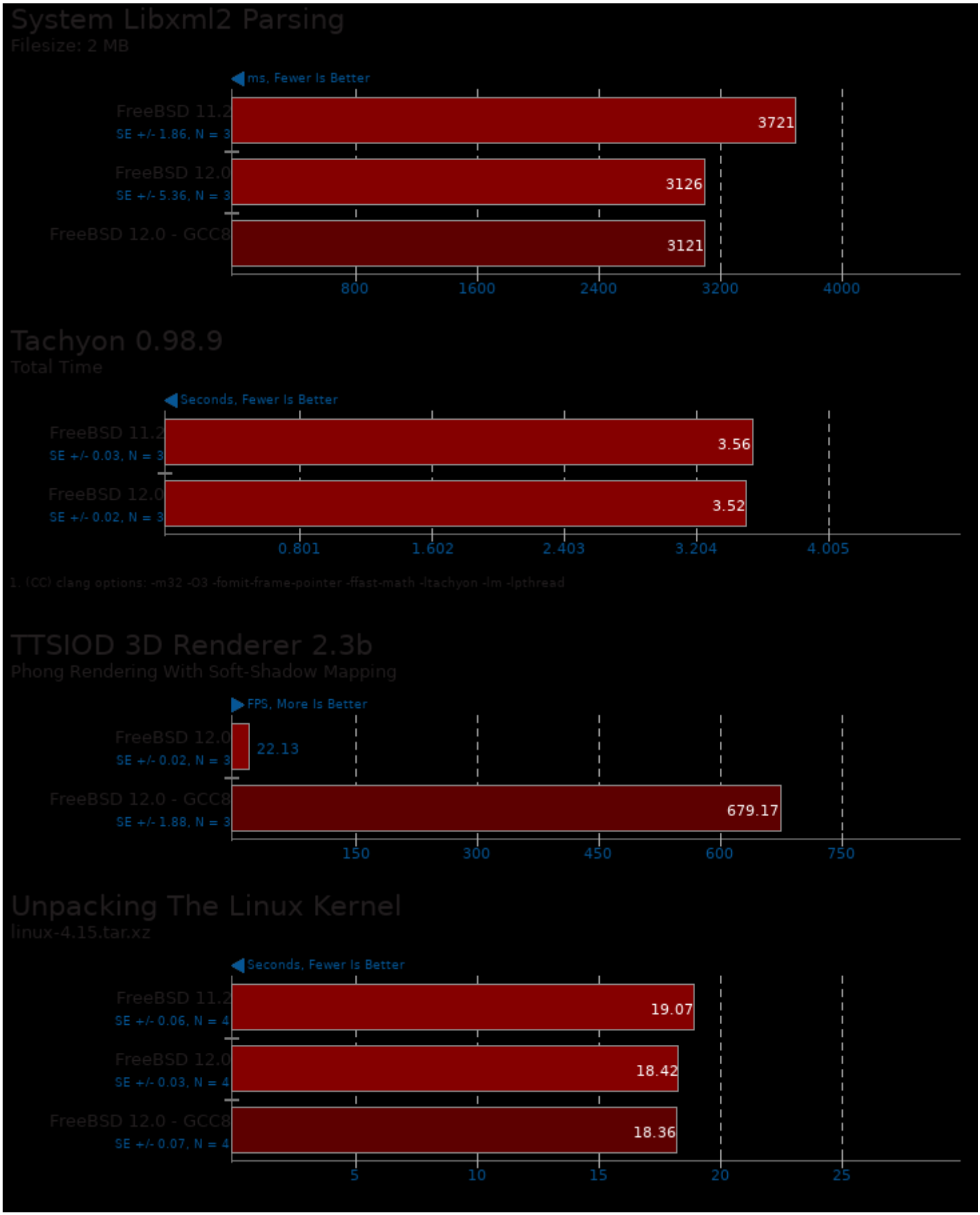

Primesieve 7.2
1e12 Prime Number Generation
Seconds, Fewer Is Better
FreeBSD 12.0
SE +/- 0.25, N = 3
clang++
15.66
FreeBSD 12.0 - GCC8
SE +/- 0.25, N = 4
g++
15.12
FreeBSD 11.2
SE +/- 0.01, N = 3
clang++
13.34
4
8
12
16
20
Phoronix Test Suite Self Test 1.0
Test: List Suites
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.07, N = 2
11.95
FreeBSD 12.0
SE +/- 0.00, N = 2
1.43
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 2
1.41
3
6
9
12
15
Phoronix Test Suite Self Test 1.0
Test: Info Command
Seconds, Fewer Is Better
FreeBSD 12.0
SE +/- 0.01, N = 2
3.59
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 2
1.76
FreeBSD 11.2
SE +/- 0.06, N = 2
1.13
0.8078
1.6156
2.4234
3.2312
4.039

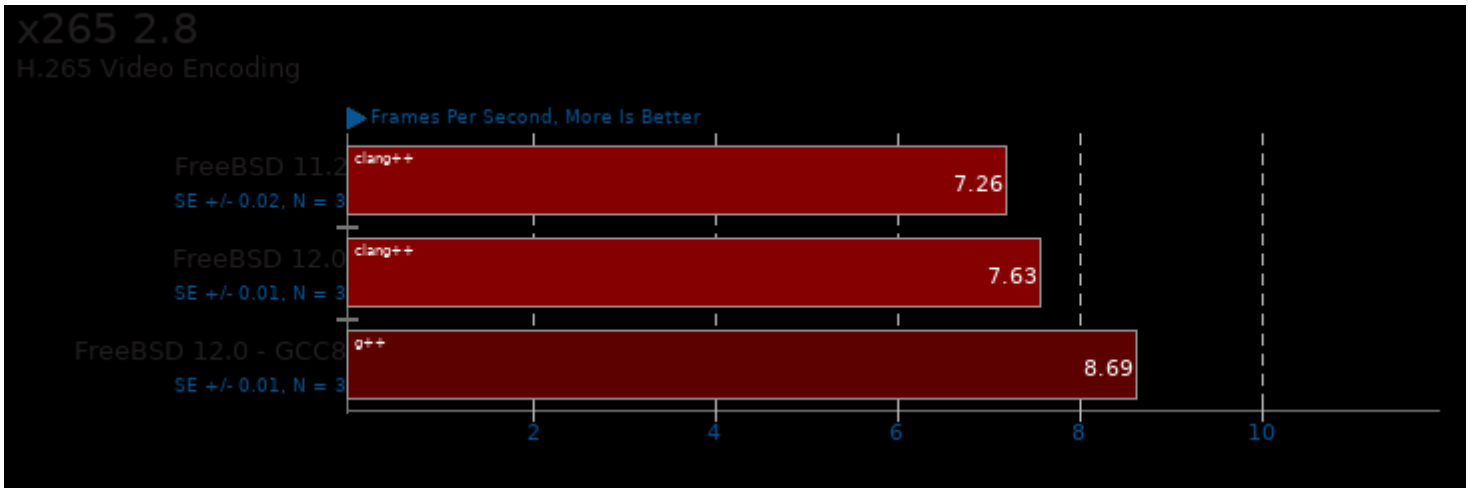

Phoronix Test Suite Self Test 1.0
Test: Render Test
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 1.26, N = 2
147
FreeBSD 12.0
SE +/- 0.36, N = 2
102
FreeBSD 12.0 - GCC8
SE +/- 0.09, N = 2
101
30
60
90
120
150
Phoronix Test Suite Self Test 1.0
Test: Merge Results
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.17, N = 2
10.71
FreeBSD 12.0
SE +/- 0.01, N = 2
7.99
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 2
7.98
3
6
9
12
15
Phoronix Test Suite Self Test 1.0
Test: Total Time
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 2.88, N = 2
542
FreeBSD 12.0
SE +/- 6.40, N = 2
374
FreeBSD 12.0 - GCC8
SE +/- 0.98, N = 2
360
120
240
360
480
600


Phoronix Test Suite Self Test 1.0
Test: Peak Memory Usage
MB, Fewer Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 2
503
FreeBSD 12.0
SE +/- 0.00, N = 2
503
FreeBSD 11.2
SE +/- 0.00, N = 2
503
110
220
330
440
550
PyBench 2018-02-16
Total For Average Test Times
Milliseconds, Fewer Is Better
FreeBSD 11.2
SE +/- 4.81, N = 3
3716
FreeBSD 12.0
SE +/- 7.67, N = 3
3324
FreeBSD 12.0 - GCC8
SE +/- 6.03, N = 3
3320
800
1600
2400
3200
4000
Rust Mandelbrot
Time To Complete Serial/Parallel Mandelbrot
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.11, N = 3
clang
95.37
FreeBSD 12.0 - GCC8
SE +/- 0.02, N = 3
gcc
84.29
FreeBSD 12.0
SE +/- 0.01, N = 3
clang
84.29
20
40
60
80
100

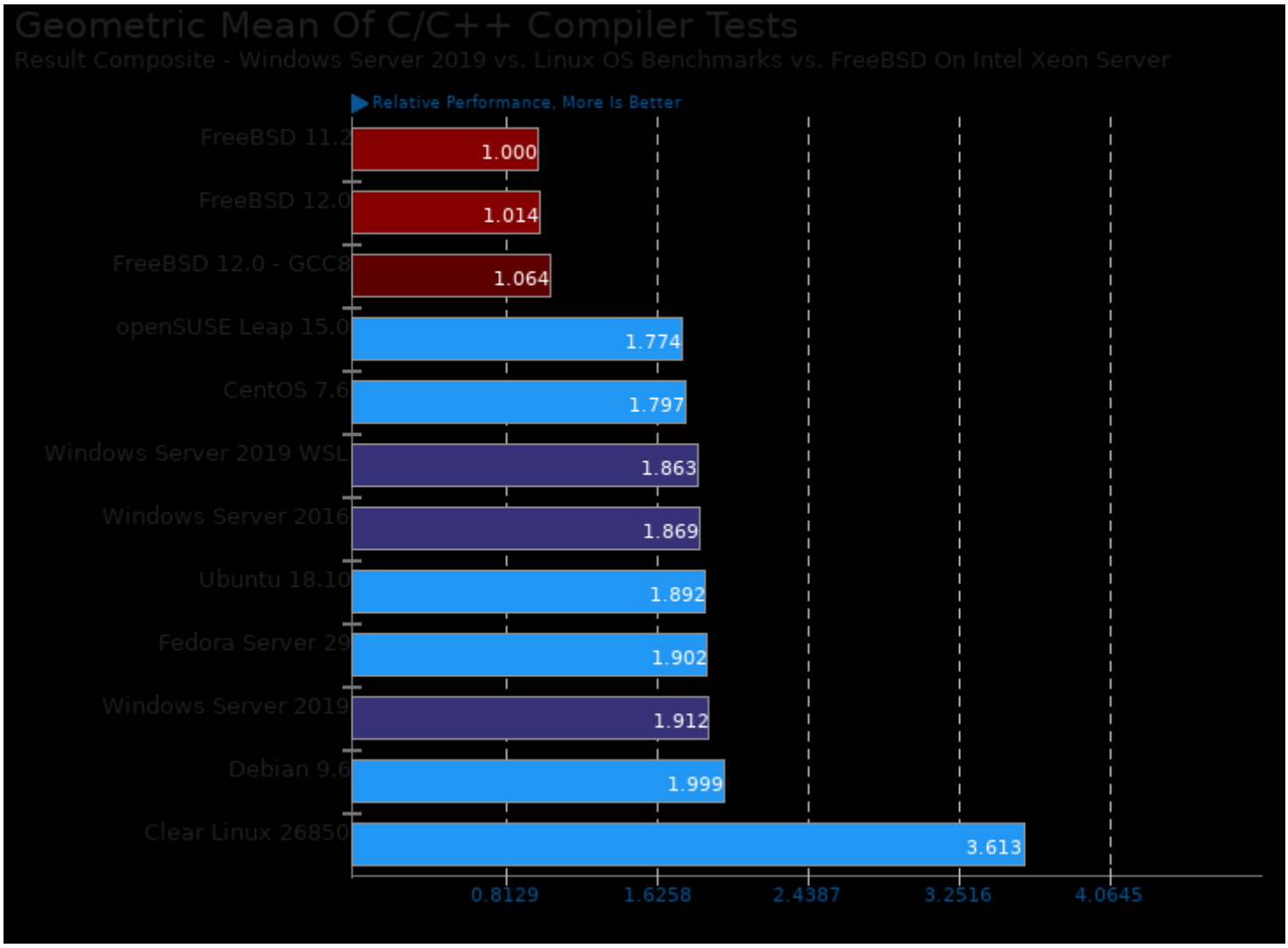

Rust Prime Benchmark
Prime Number Test To 200,000,000
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.02, N = 3
clang
8.16
FreeBSD 12.0
SE +/- 0.00, N = 3
clang
6.03
FreeBSD 12.0 - GCC8
SE +/- 0.00, N = 3
gcc
6.00
2
4
6
8
10
Sample Pi Program
Seconds, Fewer Is Better
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
7.61
FreeBSD 12.0
SE +/- 0.01, N = 3
7.61
FreeBSD 11.2
SE +/- 0.12, N = 3
7.29
2
4
6
8
10
Scikit-Learn 0.17.1
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.54, N = 3
313
FreeBSD 12.0
SE +/- 0.55, N = 3
295
FreeBSD 12.0 - GCC8
SE +/- 0.40, N = 3
293
70
140
210
280
350


Smallpt 1.0
Global Illumination Renderer; 128 Samples
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.02, N = 3
clang++
9.30
FreeBSD 12.0
SE +/- 0.05, N = 3
clang++
7.74
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
g++
5.90
3
6
9
12
15
Sunflow Rendering System 0.07.2
Global Illumination + Image Synthesis
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.02, N = 3
5.96
FreeBSD 12.0
SE +/- 0.02, N = 3
1.74
FreeBSD 12.0 - GCC8
SE +/- 0.02, N = 12
1.67
1.341
2.682
4.023
5.364
6.705
Swet 1.5.16
Average
Operations Per Second, More Is Better
FreeBSD 11.2
SE +/- 2350339.75, N = 3
clang
178788467
FreeBSD 12.0
SE +/- 394645.94, N = 3
clang
183079187
FreeBSD 12.0 - GCC8
SE +/- 507075.54, N = 3
gcc
339865170
70M
140M
210M
280M
350M

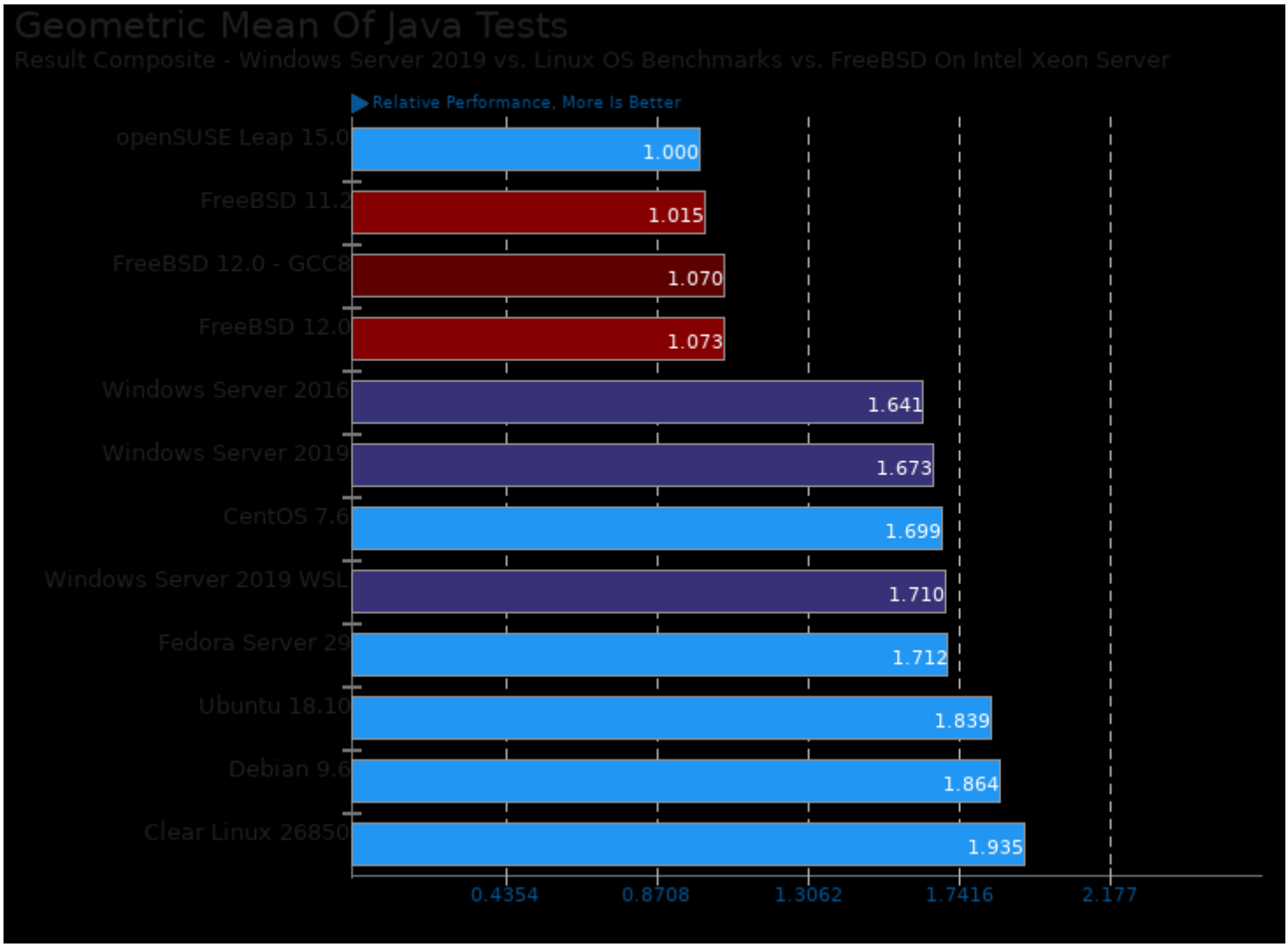

System Libxml2 Parsing
Filesize: 2 MB
ms, Fewer Is Better
FreeBSD 11.2
SE +/- 1.86, N = 3
3721
FreeBSD 12.0
SE +/- 5.36, N = 3
3126
FreeBSD 12.0 - GCC8
3121
800
1600
2400
3200
4000
Tachyon 0.98.9
Total Time
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.03, N = 3
3.56
FreeBSD 12.0
SE +/- 0.02, N = 3
3.52
0.801
1.602
2.403
3.204
4.005
1. (CC) clang options: -m32 -O3 -fomit-frame-pointer -ffast-math -ltachyon -lm -lpthread
TTSIOD 3D Renderer 2.3b
Phong Rendering With Soft-Shadow Mapping
FPS, More Is Better
FreeBSD 12.0
SE +/- 0.02, N = 3
22.13
FreeBSD 12.0 - GCC8
SE +/- 1.88, N = 3
679.17
150
300
450
600
750
Unpacking The Linux Kernel
linux-4.15.tar.xz
Seconds, Fewer Is Better
FreeBSD 11.2
SE +/- 0.06, N = 4
19.07
FreeBSD 12.0
SE +/- 0.03, N = 4
18.42
FreeBSD 12.0 - GCC8
SE +/- 0.07, N = 4
18.36
5
10
15
20
25


x265 2.8
H.265 Video Encoding
Frames Per Second, More Is Better
FreeBSD 11.2
SE +/- 0.02, N = 3
clang++
7.26
FreeBSD 12.0
SE +/- 0.01, N = 3
clang++
7.63
FreeBSD 12.0 - GCC8
SE +/- 0.01, N = 3
g++
8.69
2
4
6
8
10

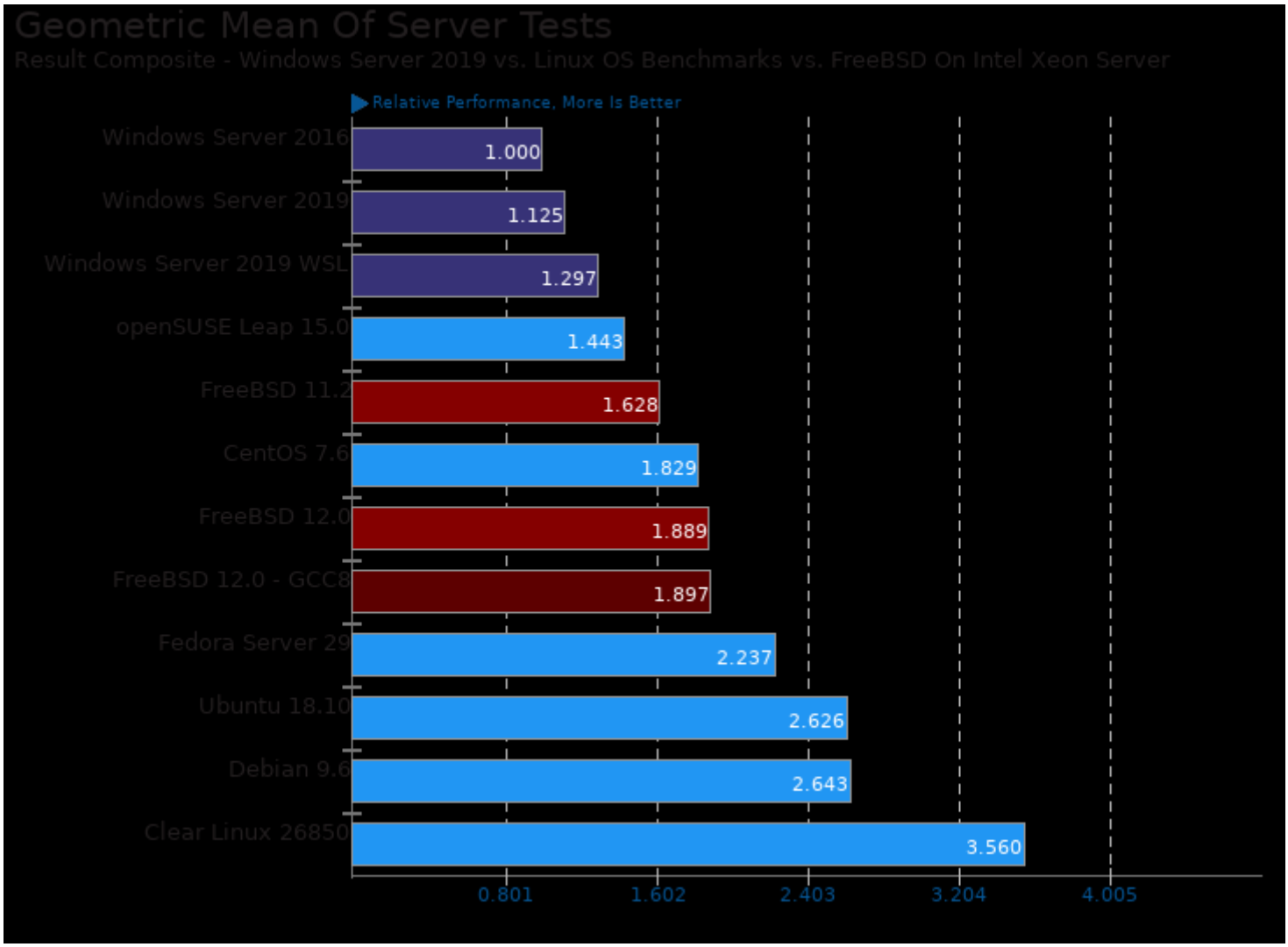
These geometric means are based upon test groupings / test suites for this result file.



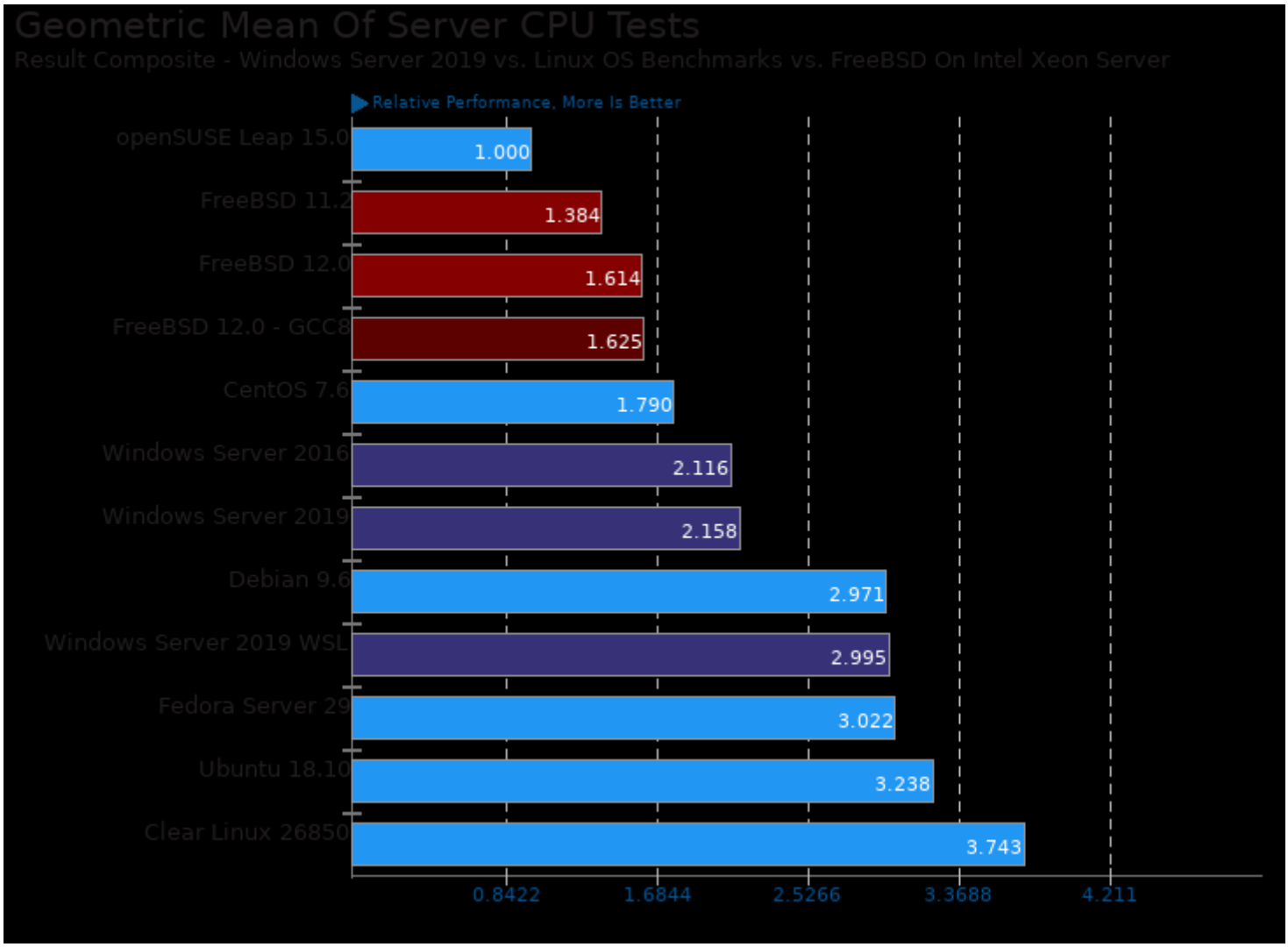
Geometric mean based upon tests: pts/scimark2, pts/aobench, pts/graphics-magick, pts/himeno, pts/stockfish, pts/hmmer, pts/build-php, pts/build-llvm, pts/c-ray, pts/compress-7zip, pts/encode-mp3, pts/encode-flac, pts/pgbench, pts/x264, pts/x265, pts/compress-xz, pts/openssl and pts/tachyon



Geometric mean based upon tests: pts/sunflow, pts/bork, pts/java-scimark2, pts/dacapobench and pts/java-gradle-perf



Geometric mean based upon tests: pts/blogbench, pts/ebizzy, pts/pgbench, pts/php, pts/phpbench, pts/openssl, pts/perl-benchmark and pts/sqlite



Geometric mean based upon tests: pts/dacapobench, pts/x264, pts/x265, pts/himeno, pts/compress-7zip, pts/stockfish, pts/build-php, pts/build-llvm, pts/c-ray, pts/rust-mandel, pts/m-queens, pts/openssl, pts/tjbench, pts/stress-ng, pts/blender, pts/pybench, pts/phpbench and pts/scikit-learn

This file was automatically generated via the Phoronix Test Suite benchmarking software on Thursday, 28 March 2024 17:30.