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EPYC Tyan Server

AMD EPYC 7543 32-Core testing with a TYAN S8036GM2NE-LE (V2.00.B21 BIOS) and ASPEED on Ubuntu 21.04 via the Phoronix Test Suite.

Automated Executive Summary

Clear Linux 34770 had the most wins, coming in first place for 31% of the tests.

Based on the geometric mean of all complete results, the fastest (Clear Linux 34770) was 1.085x the speed of the slowest (Fedora Server 34). Debian 10.10 was 0.973x the speed of Clear Linux 34770, Ubuntu 20.04.2 LTS was 0.992x the speed of Debian 10.10, Debian Bullseye was 0.982x the speed of Ubuntu 20.04.2 LTS, Ubuntu 21.04 was 0.986x the speed of Debian Bullseye, CentOS Stream was 0.986x the speed of Ubuntu 21.04, Fedora Server 34 was 0.999x the speed of CentOS Stream.

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

NAS Parallel Benchmarks (Test / Class: BT.C) at 4.349x
NAS Parallel Benchmarks (Test / Class: SP.C) at 3.369x
NAS Parallel Benchmarks (Test / Class: EP.D) at 2.947x
NAS Parallel Benchmarks (Test / Class: FT.C) at 2.727x
NAS Parallel Benchmarks (Test / Class: CG.C) at 2.348x
NAS Parallel Benchmarks (Test / Class: IS.D) at 2.273x

VP9 libvpx Encoding (Speed: Speed 5 - Input: Bosphorus 4K) at 1.89x
SVT-AV1 (Encoder Mode: Preset 8 - Input: Bosphorus 4K) at 1.608x
Timed Wasmer Compilation (Time To Compile) at 1.522x
libavif avifenc (Encoder Speed: 10) at 1.463x.

Test Systems:

Ubuntu 20.04.2 LTS

Processor: AMD EPYC 7543 32-Core @ 2.80GHz (32 Cores / 64 Threads), Motherboard: TYAN S8036GM2NE-LE (V2.00.B21 BIOS), Chipset: AMD Starship/Matisse, Memory: 64GB, Disk: 1000GB Western Digital WD_BLACK SN850 1TB, Graphics: ASPEED, Monitor: VE228, Network: 2 x Broadcom NetXtreme BCM5720 2-port PCIe

OS: Ubuntu 20.04, Kernel: 5.8.0-55-generic (x86_64), Desktop: GNOME Shell 3.36.4, Display Server: X Server 1.20.9, OpenGL: 4.5 Mesa 20.2.6 (LLVM 11.0.0 256 bits), Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand (Boost: Enabled) - CPU Microcode: 0xa001119
Python Notes: Python 3.8.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

Fedora Server 34

Processor: AMD EPYC 7543 32-Core @ 2.80GHz (32 Cores / 64 Threads), Motherboard: TYAN S8036GM2NE-LE (V2.00.B21 BIOS), Chipset: AMD Starship/Matisse, Memory: 64GB, Disk: 1000GB Western Digital WD_BLACK SN850 1TB, Graphics: ASPEED, Monitor: VE228, Network: 2 x Broadcom NetXtreme BCM5720 PCIe

OS: Fedora 34, Kernel: 5.12.11-300.fc34.x86_64 (x86_64), Compiler: GCC 11.1.1 20210531, File-System: xfs, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: madvise
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,d,lto --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-linker-hash-style=gnu --with-tune=generic --without-cuda-driver
Processor Notes: Scaling Governor: acpi-cpufreq schedutil (Boost: Enabled) - CPU Microcode: 0xa001119
Python Notes: Python 3.9.5
Security Notes: SELinux + itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

Debian 10.10

Processor: AMD EPYC 7543 32-Core @ 2.80GHz (32 Cores / 64 Threads), Motherboard: TYAN S8036GM2NE-LE (V2.00.B21 BIOS), Chipset: AMD Starship/Matisse, Memory: 64GB, Disk: 1000GB Western Digital WD_BLACK SN850 1TB, Graphics: ASPEED, Monitor: VE228, Network: 2 x Broadcom NetXtreme BCM5720 PCIe

OS: Debian 10, Kernel: 4.19.0-17-amd64 (x86_64), Desktop: GNOME Shell 3.30.2, Display Server: X Server, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: always
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq ondemand (Boost: Enabled) - CPU Microcode: 0xa001119
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

Debian Bullseye

Processor: AMD EPYC 7543 32-Core @ 2.80GHz (32 Cores / 64 Threads), Motherboard: TYAN S8036GM2NE-LE (V2.00.B21 BIOS), Chipset: AMD Starship/Matisse, Memory: 64GB, Disk: 1000GB Western Digital WD_BLACK SN850 1TB, Graphics: ASPEED, Monitor: VE228, Network: 2 x Broadcom NetXtreme BCM5720 2-port PCIe

OS: Debian 11, Kernel: 5.10.0-7-amd64 (x86_64), Desktop: GNOME Shell 3.38.4, Display Server: X Server, Vulkan: 1.0.2, Compiler: GCC 10.2.1 20210110, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: always
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-link-mutex --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-Km9U7s/gcc-10-10.2.1/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-Km9U7s/gcc-10-10.2.1/debian/tmp-gcn/usr, hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-build-config=bootstrap-lto-lean --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq schedutil (Boost: Enabled) - CPU Microcode: 0xa001119
Python Notes: Python 3.9.2
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

CentOS Stream

Processor: AMD EPYC 7543 32-Core @ 2.80GHz (32 Cores / 64 Threads), Motherboard: TYAN S8036GM2NE-LE (V2.00.B21 BIOS), Chipset: AMD Starship/Matisse, Memory: 64GB, Disk: 1000GB Western Digital WD_BLACK SN850 1TB, Graphics: llvmpipe, Monitor: VE228, Network: 2 x Broadcom NetXtreme BCM5720 2-port PCIe

OS: CentOS Stream 8, Kernel: 4.18.0-310.el8.x86_64 (x86_64), Desktop: GNOME Shell 3.32.2, Display Server: X Server + Wayland, OpenGL: 4.5 Mesa 21.1.1 (LLVM 11.0.0 256 bits), Compiler: GCC 8.5.0 20210514, File-System: xfs, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: always
Compiler Notes: --build=x86_64-redhat-linux --disable-libmpx --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,lto --enable-multilib --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --mandir=/usr/share/man --with-arch_32=x86-64 --with-gcc-major-version-only --with-isl --with-linker-hash-style=gnu --with-tune=generic --without-cuda-driver
Processor Notes: Scaling Governor: acpi-cpufreq performance (Boost: Enabled) - CPU Microcode: 0xa001119
Python Notes: Python 3.6.8
Security Notes: SELinux + itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

Clear Linux 34770

Processor: AMD EPYC 7543 32-Core @ 2.80GHz (32 Cores / 64 Threads), Motherboard: TYAN S8036GM2NE-LE (V2.00.B21 BIOS), Chipset: AMD Starship/Matisse, Memory: 64GB, Disk: 1000GB Western Digital WD_BLACK SN850

1TB, Graphics: llvmpipe, Monitor: VE228, Network: 2 x Broadcom NetXtreme BCM5720 2-port PCIe

OS: Clear Linux OS 34770, Kernel: 5.12.8-1045.native (x86_64), Desktop: GNOME Shell 40.2, Display Server: X Server 1.20.11, OpenGL: 4.5 Mesa 21.1.3 (LLVM 11.1.0 256 bits), Compiler: GCC 11.1.1 20210621 releases/gcc-11.1.0-335-g2348a458e1 + Clang 11.1.0 + LLVM 11.1.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: always
Environment Notes: FFLAGS="-g -O3 -feliminate-unused-debug-types -pipe -Wall -Wp,-D_FORTIFY_SOURCE=2 -fexceptions -fstack-protector --param=ssp-buffer-size=32 -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,--enable-new-dtags -Wa,-mbranches-within-32B-boundaries" 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 -m64 -fasynchronous-unwind-tables -Wp,-D_REENTRANT -ftree-loop-distribute-patterns -Wl,-z -Wl,now -Wl,-z -Wl,relro -fno-semantic-interposition -ffat-lto-objects -fno-trapping-math -Wl,-sort-common -Wl,--enable-new-dtags -mtune=skylake -Wa,-mbranches-within-32B-boundaries -fvisibility-inlines-hidden -Wl,--enable-new-dtags" MESA_GLSL_CACHE_DISABLE=0 FCFLAGS="-g -O3 -feliminate-unused-debug-types -pipe -Wall -Wp,-D_FORTIFY_SOURCE=2 -fexceptions -fstack-protector --param=ssp-buffer-size=32 -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" 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 -m64 -fasynchronous-unwind-tables -Wp,-D_REENTRANT -ftree-loop-distribute-patterns -Wl,-z -Wl,now -Wl,-z -Wl,relro -fno-semantic-interposition -ffat-lto-objects -fno-trapping-math -Wl,-sort-common -Wl,--enable-new-dtags -mtune=skylake -Wa,-mbranches-within-32B-boundaries" 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 --disable-werror --enable-__cxa_atexit --enable-bootstrap --enable-cet --enable-clocale=gnu --enable-default-pie --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-gcc-major-version-only --with-glibc-version=2.19 --with-gnu-ld --with-isl --with-ppl=yes --with-tune=skylake-avx512
Processor Notes: Scaling Governor: acpi-cpufreq performance (Boost: Enabled) - CPU Microcode: 0xa001119
Python Notes: Python 3.9.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

Ubuntu 21.04

Processor: AMD EPYC 7543 32-Core @ 2.80GHz (32 Cores / 64 Threads), Motherboard: TYAN S8036GM2NE-LE (V2.00.B21 BIOS), Chipset: AMD Starship/Matisse, Memory: 64GB, Disk: 1000GB Western Digital WD_BLACK SN850 1TB, Graphics: ASPEED, Monitor: VE228, Network: 2 x Broadcom NetXtreme BCM5720 2-port PCIe

OS: Ubuntu 21.04, Kernel: 5.11.0-22-generic (x86_64), Desktop: GNOME Shell 3.38.4, Display Server: X Server + Wayland, Compiler: GCC 10.3.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,m2 --enable-libphobos-checking=release --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-link-mutex --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-10-gDeRY6/gcc-10-10.3.0/debian/tmp-nvptx/usr,amdgcn-amdhsa=/build/gcc-10-gDeRY6/gcc-10-10.3.0/debian/tmp-gcn/usr, hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-build-config=bootstrap-lto-lean --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: acpi-cpufreq schedutil (Boost: Enabled) - CPU Microcode: 0xa001119
Python Notes: Python 3.9.5
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: always-on RSB filling + srbds: Not affected + tsx_async_abort: Not affected

	Ubuntu 20.04.2 LTS	Fedora Server 34	Debian 10.10	Debian Bullseye	CentOS Stream	Clear Linux 34770	Ubuntu 21.04
ASTC Encoder - Exhaustive (sec)	23.6779	23.5167		**23.4605**	**23.9299**	23.5118	23.5801
Normalized	99.08%	99.76%		100%	98.04%	99.78%	99.49%

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Standard Deviation	0.1%	0%		0.1%	0.1%	0%	0.1%
Blender - BMW27 - CPU-Only (sec)	52.85	53.13	52.44	52.55	**52.25**	**52.25**	**53.59**
Normalized	98.86%	98.34%	99.64%	99.43%	100%	100%	97.5%
Standard Deviation	0.2%	0.3%	0.2%	0.2%	0.2%	0.1%	0.3%
Blender - Classroom - CPU-Only (sec)	146.51	146.65	146.09	**145.38**	146.29	145.82	**147.55**
Normalized	99.23%	99.13%	99.51%	100%	99.38%	99.7%	98.53%
Standard Deviation	0.2%	0.1%	0.3%	0.2%	0.2%	0.4%	0.1%
Blender - Barbershop - CPU-Only (sec)	195.79	196.64	192.55	**189.90**	190.76	190.95	**197.52**
Normalized	96.99%	96.57%	98.62%	100%	99.55%	99.45%	96.14%
Standard Deviation	0%	0.3%	0.9%	0.3%	0.1%	0.1%	0.2%
BRL-CAD - V.P.M (VGR Performance Metric)	**422481**	417781	409125	420156	**406823**		419835
Normalized	100%	98.89%	96.84%	99.45%	96.29%		99.37%
Embree - Pathtracer ISPC - Crown (FPS)	33.3187	33.3893	**32.5872**	**33.5204**	33.2960	33.4857	33.2569
Normalized	99.4%	99.61%	97.22%	100%	99.33%	99.9%	99.21%
Standard Deviation	0.1%	0.3%	0.6%	0.4%	0.4%	0.2%	0.2%
Embree - Pathtracer ISPC - Asian Dragon (FPS)	37.1865	**37.3838**	**32.4410**	37.3153	37.2281	37.3454	37.0053
Normalized	99.47%	100%	86.78%	99.82%	99.58%	99.9%	98.99%
Standard Deviation	1.2%	0.7%	7.6%	1%	0.5%	1.2%	1.1%
GROMACS - MPI CPU - water_GMX50_bare (Ns/Day)	3.639	3.640		3.756	**3.801**	3.777	**3.581**
Normalized	95.74%	95.76%		98.82%	100%	99.37%	94.21%
Standard Deviation	0.5%	0.4%		0.2%	0.1%	0.2%	0.3%
High Performance Conjugate Gradient (GFLOP/s)	12.8778	**11.7130**		11.7941	12.4586	**19.4305**	12.6926
Normalized	66.28%	60.28%		60.7%	64.12%	100%	65.32%
Standard Deviation	0.1%	17.8%		16.2%	3.6%	8.2%	19.5%
Intel Open Image Denoise - RT.hdr_alb_nrm.3840x216	0.90	0.96	**0.87**	0.89	0.94	**0.97**	0.89
Normalized	92.78%	98.97%	89.69%	91.75%	96.91%	100%	91.75%
Standard Deviation	0.6%	0.4%	1%	2.2%	0.8%	0.4%	1.3%
Intel Open Image Denoise - RT.ldr_alb_nrm.3840x216	0.90	0.96	**0.87**	0.94	0.95	**0.97**	0.89
Normalized	92.78%	98.97%	89.69%	96.91%	97.94%	100%	91.75%
Standard Deviation	0.7%	0.2%	0.4%	2.5%	0.8%	0.5%	0.2%
Intel Open Image Denoise - RTLightmap.hdr.4096x409	0.45	**0.48**	**0.44**	0.46	0.47	**0.48**	0.45
Normalized	93.75%	100%	91.67%	95.83%	97.92%	100%	93.75%
Standard Deviation	1.2%	0.1%	1.3%	0.5%	1%	2%	0.4%
Kripke (Throughput FoM)	78658979	78470519	78433118	78112133	77631927	**90502153**	**73584941**
Normalized	86.91%	86.71%	86.66%	86.31%	85.78%	100%	81.31%
Standard Deviation	9.5%	11.1%	12.5%	5.9%	5.9%	1.1%	9.8%

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libavif avifenc - 10 (sec)	3.817	3.620	2.785	2.873	2.817	2.609	3.785
Normalized	68.35%	72.07%	93.68%	90.81%	92.62%	100%	68.93%
Standard Deviation	0.8%	2.5%	2.3%	2.8%	3.2%	2.3%	2.3%
libavif avifenc - 6, Lossless (sec)	30.222	27.881	27.237	27.395	27.000	26.150	30.515
Normalized	86.53%	93.79%	96.01%	95.46%	96.85%	100%	85.7%
Standard Deviation	1.2%	0.1%	2%	0.6%	0.7%	0.3%	1.3%
libavif avifenc - 10, Lossless (sec)	6.287	6.185	5.323	5.298	5.188	4.915	6.302
Normalized	78.18%	79.47%	92.34%	92.77%	94.74%	100%	77.99%
Standard Deviation	2.4%	0.2%	5.7%	0.5%	2.1%	1%	2.5%
LuxCoreRender - DLSC - CPU (M samples/sec)	5.45	5.46	5.47	5.45	5.46	5.52	5.47
Normalized	98.73%	98.91%	99.09%	98.73%	98.91%	100%	99.09%
Standard Deviation	0.3%	1.2%	0.6%	0.5%	0.3%	0.2%	0.7%
LuxCoreRender - Danish Mood - CPU (M samples/sec)	4.32	4.39	4.36	4.42	4.40	4.47	4.30
Normalized	96.64%	98.21%	97.54%	98.88%	98.43%	100%	96.2%
Standard Deviation	0.7%	1.6%	1%	0.3%	1.7%	0.3%	0.3%
LuxCoreRender - Orange Juice - CPU (M samples/sec)	8.29	8.29	8.33	8.39	8.25	8.36	8.30
Normalized	98.81%	98.81%	99.28%	100%	98.33%	99.64%	98.93%
Standard Deviation	0.1%	0.3%	0.2%	0.5%	0.5%	0.1%	0.2%
LuxCoreRender - LuxCore Benchmark - CPU (M samples/sec)	4.73	4.68	4.74	4.79	4.74	4.80	4.66
Normalized	98.54%	97.5%	98.75%	99.79%	98.75%	100%	97.08%
Standard Deviation	0.2%	0.3%	0.7%	0.6%	0.5%	0.3%	1%
LuxCoreRender - R.C.a.P - CPU (M samples/sec)	16.38	16.11	17.14	16.75	17.01	17.48	16.29
Normalized	93.71%	92.16%	98.05%	95.82%	97.31%	100%	93.19%
Standard Deviation	4.4%	1.1%	6.9%	5.9%	6.6%	6.9%	4.3%
miniFE - Small (CG	11203	10018	10918	13355	7928	10394	11861
Normalized	83.88%	75.01%	81.75%	100%	59.36%	77.82%	88.81%
Standard Deviation	9%	7%	8.6%	9.7%	16.7%	8.2%	4.5%
Mobile Neural Network - mobilenetV3 (ms)	2.572	2.535	2.906	2.616	2.584	2.264	2.496
Normalized	88.02%	89.31%	77.91%	86.54%	87.62%	100%	90.71%
Standard Deviation	2.3%	4.4%	6.5%	4.9%	1.2%	3%	1.7%
Mobile Neural Network - squeezenetv1.1 (ms)	4.144	4.042	4.720	4.676	4.355	4.409	4.377
Normalized	97.54%	100%	85.64%	86.44%	92.81%	91.68%	92.35%
Standard Deviation	2%	3.4%	3.4%	2.4%	3.3%	4%	1.1%
Mobile Neural Network - resnet-v2-50 (ms)	21.954	18.933	23.736	22.520	22.034	22.347	21.663
Normalized	86.24%	100%	79.76%	84.07%	85.93%	84.72%	87.4%
Standard Deviation	0.9%	5.7%	4.1%	6.6%	3.4%	4.6%	2%
Mobile Neural Network - SqueezeNetV1.0 (ms)	6.094	5.767	6.326	6.204	6.776	6.539	6.900
Normalized	94.63%	100%	91.16%	92.96%	85.11%	88.19%	83.58%
Standard Deviation	3.5%	3.3%	5.4%	5.8%	2.2%	6.9%	0.7%

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Mobile Neural Network - MobileNetV2_224 (ms)	**3.947**	3.975	4.242	4.034	**4.275**	4.026	3.955
Normalized	100%	99.3%	93.05%	97.84%	92.33%	98.04%	99.8%
Standard Deviation	5.4%	4.3%	5.9%	10.3%	2.1%	7.5%	1.1%
Mobile Neural Network - mobilenet-v1-1.0 (ms)	2.849	2.894	3.482	**3.796**	2.932	2.981	**2.734**
Normalized	95.96%	94.47%	78.52%	72.02%	93.25%	91.71%	100%
Standard Deviation	6%	7.7%	8.5%	8.5%	11.5%	10.6%	0.8%
Mobile Neural Network - inception-v3 (ms)	24.361	**22.603**	26.471	**27.651**	27.519	23.754	24.418
Normalized	92.78%	100%	85.39%	81.74%	82.14%	95.15%	92.57%
Standard Deviation	2%	2.4%	3.1%	1.4%	2.1%	3.9%	1.3%
NAMD - ATPase Simulation - 327,506	0.67252	0.67355	0.67193	**0.67131**	0.67415	0.67373	**0.67638**
Normalized	99.82%	99.67%	99.91%	100%	99.58%	99.64%	99.25%
Standard Deviation	0.1%	0.1%	0%	0.1%	0.1%	0%	0.9%
NAS Parallel Benchmarks - BT.C (Mop/s)	87955	**20508**	87888	**89193**	21314	87029	87240
Normalized	98.61%	22.99%	98.54%	100%	23.9%	97.57%	97.81%
Standard Deviation	0.4%	7.1%	0.6%	0.1%	0%	0.2%	0.2%
NAS Parallel Benchmarks - CG.C (Mop/s)	29892	13588		**30352**	**12925**	29640	28970
Normalized	98.48%	44.77%		100%	42.58%	97.65%	95.45%
Standard Deviation	1.6%	0.1%		1.4%	2.1%	1%	2.4%
NAS Parallel Benchmarks - EP.D (Mop/s)	2934	1601		**2965**	**1006**	2844	2930
Normalized	98.96%	54%		100%	33.93%	95.93%	98.8%
Standard Deviation	2.6%	6.7%		0.5%	5.5%	4.3%	2.9%
NAS Parallel Benchmarks - FT.C (Mop/s)	47060	**17996**		**49076**	18870	48460	46811
Normalized	95.89%	36.67%		100%	38.45%	98.74%	95.38%
Standard Deviation	0.2%	0.4%		0.5%	0.5%	1.1%	2.5%
NAS Parallel Benchmarks - IS.D (Mop/s)	1787	1092		1731	**958.16**	**2178**	1985
Normalized	82.05%	50.15%		79.5%	44%	100%	91.14%
Standard Deviation	0.8%	2.2%		1.1%	1.1%	7%	1.7%
NAS Parallel Benchmarks - SP.C (Mop/s)	33234	**10058**	33844	33101	10304	**33882**	32826
Normalized	98.09%	29.69%	99.89%	97.7%	30.41%	100%	96.88%
Standard Deviation	0.3%	0.8%	0.4%	0.4%	0.1%	0.3%	0.2%
Numenta Anomaly Benchmark - Windowed Gaussian (sec)	**6.805**		6.671		6.293	**5.938**	
Normalized	87.26%		89.01%		94.36%	100%	
Standard Deviation	1.8%		0.9%		1.9%	1.9%	
ONNX Runtime - yolov4 - OpenMP CPU (Inferences/min)	**291**	277	**233**	282	242		257
Normalized	100%	95.19%	80.07%	96.91%	83.16%		88.32%
Standard Deviation	5.2%	1.2%	6.9%	5.1%	3.9%		5.9%

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ONNX Runtime - bertsquad-10 - OpenMP CPU (Inferences/min)	**445**	440	432	424	427		**395**
Normalized	100%	98.88%	97.08%	95.28%	95.96%		88.76%
Standard Deviation	2.9%	3.3%	5.1%	3.5%	2%		4%
ONNX Runtime - fcn-resnet101-11 - OpenMP CPU	**93**	84	75	**73**	74		90
Normalized	100%	90.32%	80.65%	78.49%	79.57%		96.77%
Standard Deviation	13.3%	14%	8.9%	13.9%	10.6%		14.3%
ONNX Runtime - shufflenet-v2-10 - OpenMP CPU	10866	10911	11064	**11283**	**9699**		10193
Normalized	96.3%	96.7%	98.06%	100%	85.96%		90.34%
Standard Deviation	0.8%	1.3%	1.7%	0.8%	2.3%		0.7%
ONNX Runtime - super-resolution-10 - OpenMP CPU (Inferences/min)	4775	4884	**5018**	4597	**4475**		4684
Normalized	95.16%	97.33%	100%	91.61%	89.18%		93.34%
Standard Deviation	1.3%	0.9%	6.6%	0.9%	4.3%		1%
OpenVKL - vklBenchmark (Items / Sec)	297	296	**282**	287	293	292	**319**
Normalized	93.1%	92.79%	88.4%	89.97%	91.85%	91.54%	100%
Standard Deviation	4.1%	0.8%	1.4%	2.1%	4.4%	2.4%	2%
OSPray - San Miguel - Path Tracer (FPS)	3.72	**3.70**	3.73	**3.78**	3.74	3.76	**3.70**
Normalized	98.41%	97.88%	98.68%	100%	98.94%	99.47%	97.88%
Standard Deviation	0%	0.6%	0%	0.2%	1.2%	0.2%	0%
OSPray - NASA Streamlines - Path Tracer (FPS)	**12.35**	**12.35**	12.5	**12.66**	12.5	12.5	**12.35**
Normalized	97.55%	97.55%	98.74%	100%	98.74%	98.74%	97.55%
Standard Deviation	0%	0%	0%	0%	0%	0%	0%
OSPray - M.R - Path Tracer (FPS)	**500**	**500**	444.44	**422.22**	**500**	**500**	**500**
Normalized	100%	100%	88.89%	84.44%	100%	100%	100%
Standard Deviation			18.3%	20.4%		0%	
PlaidML - No - Inference - VGG16 - CPU (FPS)	**26.73**	26.96	33.54	33.87	33.59	**34.20**	27.43
Normalized	78.16%	78.83%	98.07%	99.04%	98.22%	100%	80.2%
Standard Deviation	1.5%	1.2%	1.3%	2.4%	1.4%	1.2%	0.7%
PlaidML - No - Inference - VGG19 - CPU (FPS)	22.49	**22.13**	27.95	27.67	27.92	**28.34**	22.86
Normalized	79.36%	78.09%	98.62%	97.64%	98.52%	100%	80.66%
Standard Deviation	1.4%	2.4%	2%	1.5%	1.6%	1.6%	1.1%
PlaidML - No - Inference - ResNet 50 - CPU (FPS)	9.04	8.59	9.60	**9.61**	**7.59**	7.74	9.38
Normalized	94.07%	89.39%	99.9%	100%	78.98%	80.54%	97.61%
Standard Deviation	0.5%	0.5%	1.9%	0.4%	0.4%	1%	2.1%

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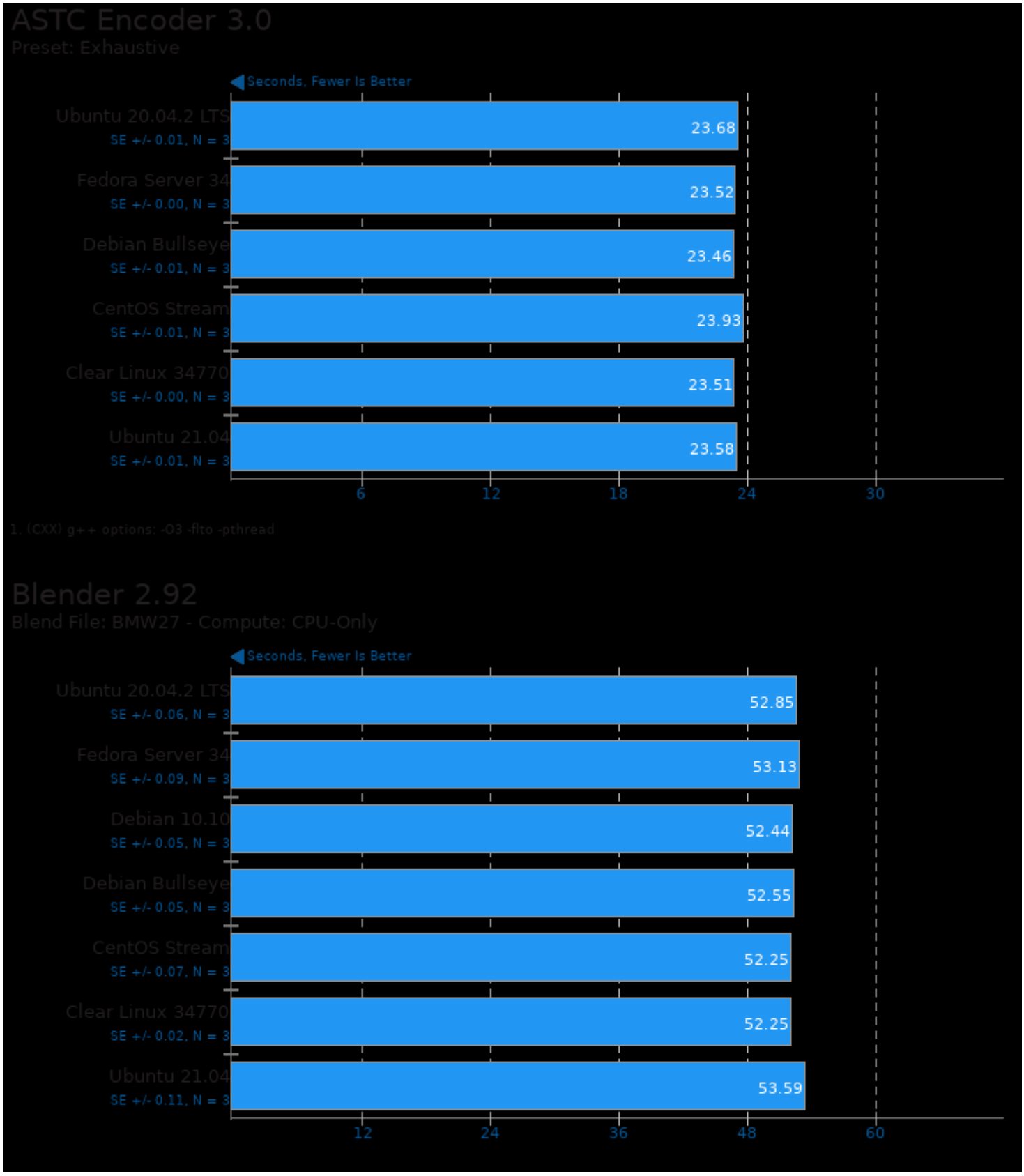
SVT-AV1 - Preset 4 - Bosphorus 4K (FPS)	1.931	1.913	1.852	**1.707**	1.959	**2.071**	1.875
Normalized	93.24%	92.37%	89.43%	82.42%	94.59%	100%	90.54%
Standard Deviation	0.1%	0.3%	0.3%	0.5%	0.7%	0.4%	0.4%
SVT-AV1 - Preset 8 - Bosphorus 4K (FPS)	20.851	18.345	20.716	**14.875**	22.402	**23.919**	17.809
Normalized	87.17%	76.7%	86.61%	62.19%	93.66%	100%	74.46%
Standard Deviation	1%	1%	0.9%	1.4%	0.6%	0.5%	0.6%
SVT-HEVC - 1 - Bosphorus 1080p (FPS)	**24.65**	24.71	**25.19**	24.96	24.76	25.15	24.69
Normalized	97.86%	98.09%	100%	99.09%	98.29%	99.84%	98.02%
Standard Deviation	0.6%	0.7%	0.3%	0.6%	0.4%	0.2%	0.4%
SVT-HEVC - 7 - Bosphorus 1080p (FPS)	282.38	281.37	296.57	**273.70**	285.20	**299.80**	284.09
Normalized	94.19%	93.85%	98.92%	91.29%	95.13%	100%	94.76%
Standard Deviation	2.4%	1.4%	2%	2.2%	1.2%	2.3%	2.5%
SVT-HEVC - 10 - Bosphorus 1080p (FPS)	458.18	434.07	**537.01**	**429.71**	467.20	463.76	470.53
Normalized	85.32%	80.83%	100%	80.02%	87%	86.36%	87.62%
Standard Deviation	10.3%	5.5%	2.3%	7.4%	9%	6.5%	8%
SVT-VP9 - VMAF Optimized - Bosphorus 1080p (FPS)	**349.16**	291.76	344.93	256.35	303.33	298.74	**251.54**
Normalized	100%	83.56%	98.79%	73.42%	86.87%	85.56%	72.04%
Standard Deviation	4.2%	1.1%	2.9%	1.4%	4.4%	2.2%	5.1%
SVT-VP9 - P.S.O - Bosphorus 1080p (FPS)	**353.98**	305.14	353.73	259.56	303.00	302.64	**257.98**
Normalized	100%	86.2%	99.93%	73.33%	85.6%	85.5%	72.88%
Standard Deviation	1.1%	2.8%	0.7%	0.2%	1.4%	2.3%	12.6%
SVT-VP9 - V.Q.O - Bosphorus 1080p (FPS)	264.89	272.55	**297.41**	**236.32**	274.02	273.38	241.51
Normalized	89.07%	91.64%	100%	79.46%	92.14%	91.92%	81.2%
Standard Deviation	1.5%	1.4%	1.7%	2.5%	1.3%	1.7%	0.7%
TensorFlow Lite - SqueezeNet (us)	69193	70454	69846	**69107**	**87581**	72316	83601
Normalized	99.88%	98.09%	98.94%	100%	78.91%	95.56%	82.66%
Standard Deviation	0.5%	1.3%	0.9%	0.7%	9.3%	1.9%	9.7%
TensorFlow Lite - Inception V4 (us)	936694	941892	942408	**932251**	944105	940126	**1052955**
Normalized	99.53%	98.98%	98.92%	100%	98.74%	99.16%	88.54%
Standard Deviation	0.4%	1.1%	0.8%	0.3%	0.9%	0.9%	2.8%
TensorFlow Lite - Mobilenet Float (us)	**43688**	43886	44223	43712	45933	43841	**50144**
Normalized	100%	99.55%	98.79%	99.95%	95.11%	99.65%	87.13%
Standard Deviation	0.6%	0.4%	0.4%	0.4%	7%	0.4%	5.3%
TensorFlow Lite - Mobilenet Quant (us)	46473	46558	46650	46350	47417	**46346**	**52962**
Normalized	99.73%	99.54%	99.35%	99.99%	97.74%	100%	87.51%
Standard Deviation	0.3%	0.6%	0.4%	0.1%	1.7%	0%	3.8%
TensorFlow Lite - I.R.V	835539	837065	834724	**834703**	843780	837254	**943408**
Normalized	99.9%	99.72%	100%	100%	98.92%	99.7%	88.48%
Standard Deviation	0.3%	0.4%	0%	0.3%	0.6%	0.4%	6.8%

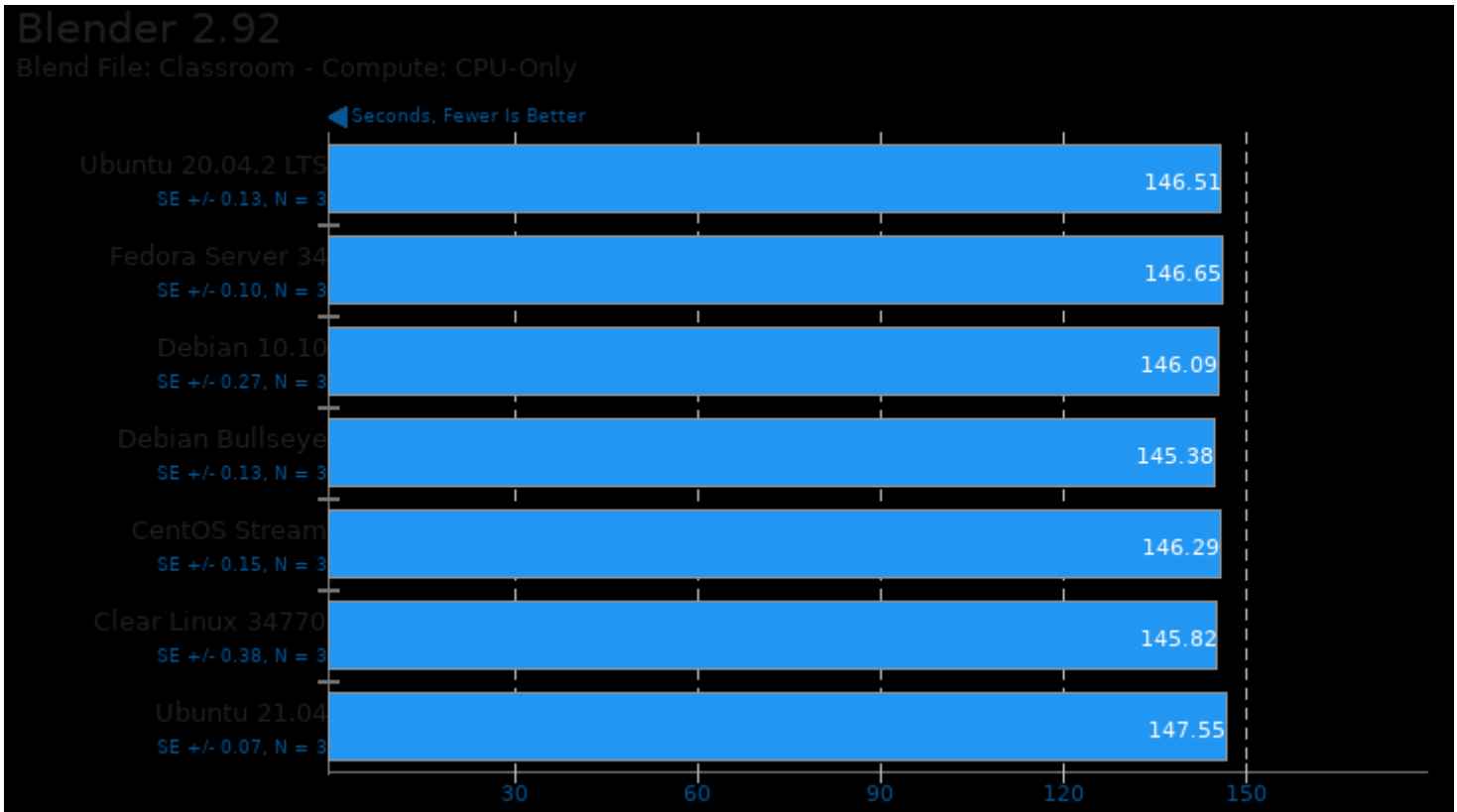
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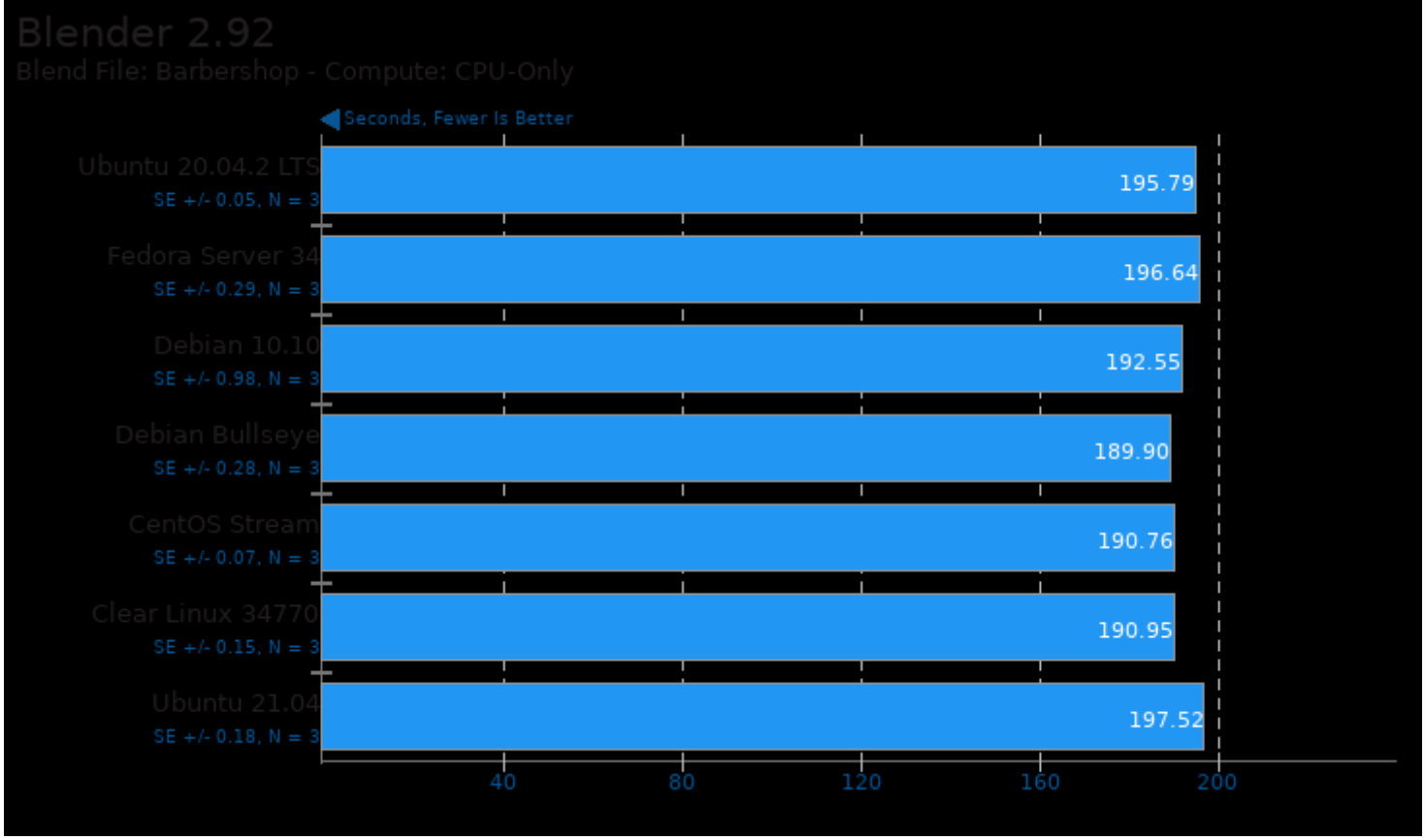
Timed Godot Game Engine Compilation - Time To Compile (sec)	57.907	54.948	**63.293**	**53.426**			54.630
Normalized	92.26%	97.23%	84.41%	100%			97.8%
Standard Deviation	0.8%	0.3%	1%	0.6%			2%
Timed Linux Kernel Compilation - Time To Compile (sec)	**35.137**	34.019	**29.492**	32.031	31.134	31.165	31.450
Normalized	83.93%	86.69%	100%	92.07%	94.73%	94.63%	93.77%
Standard Deviation	2.3%	2.4%	2.4%	2.5%	2.4%	2.4%	2.2%
Timed LLVM Compilation - Ninja (sec)	**232.758**	209.690	**185.201**	202.013	192.197		209.931
Normalized	79.57%	88.32%	100%	91.68%	96.36%		88.22%
Standard Deviation	0.6%	0.6%	0.1%	0.1%	0.6%		0.8%
Timed LLVM Compilation - Unix Makefiles (sec)	**286.375**	257.168	**223.264**	250.573	227.741		250.224
Normalized	77.96%	86.82%	100%	89.1%	98.03%		89.23%
Standard Deviation	0.9%	1.2%	2.5%	1.6%	0.7%		0.4%
Timed Node.js Compilation - Time To	**151.647**	137.588	**123.139**	134.407	127.498		140.352
Normalized	81.2%	89.5%	100%	91.62%	96.58%		87.74%
Standard Deviation	0.1%	0.3%	0.2%	0.2%	0.2%		0.6%
Timed Wasmer Compilation - Time To	**61.241**	41.498		60.641	45.007		**40.231**
Normalized	65.69%	96.95%		66.34%	89.39%		100%
Standard Deviation	1%	0.8%		1.6%	2.4%		1%
TNN - CPU - DenseNet (ms)	2907	3043	**2822**	3098	2957	2895	**3183**
Normalized	97.08%	92.75%	100%	91.09%	95.45%	97.48%	88.68%
Standard Deviation	0%	1.2%	0.2%	0.5%	0.2%	0.2%	5.5%
TNN - CPU - MobileNet v2 (ms)	290.337	296.547	**286.254**	307.534	301.637	289.527	**316.885**
Normalized	98.59%	96.53%	100%	93.08%	94.9%	98.87%	90.33%
Standard Deviation	0.4%	1.5%	1.7%	2.3%	0.3%	0.1%	2.4%
TNN - CPU - SqueezeNet v2 (ms)	62.597	64.811	62.217	**62.165**	62.620	65.828	**66.292**
Normalized	99.31%	95.92%	99.92%	100%	99.27%	94.44%	93.77%
Standard Deviation	0.9%	0.2%	2.4%	1.3%	0.5%	2.4%	0.3%
TNN - CPU - SqueezeNet v1.1 (ms)	269.182	271.391	**268.003**	269.358	269.467	270.350	**277.579**
Normalized	99.56%	98.75%	100%	99.5%	99.46%	99.13%	96.55%
Standard Deviation	0.1%	0.1%	0.2%	0.4%	0.1%	0.1%	0%
VP9 libvpx Encoding - Speed 0 - Bosphorus 4K (FPS)	6.16	6.89	**6.05**	6.52	6.48	**7.25**	6.23
Normalized	84.97%	95.03%	83.45%	89.93%	89.38%	100%	85.93%
Standard Deviation	0.2%	0.9%	0.3%	1.4%	0.9%	0.3%	0.4%
VP9 libvpx Encoding - Speed 5 - Bosphorus 4K (FPS)	13.63	16.23	13.03	**9.31**	14.89	**17.60**	14.60
Normalized	77.44%	92.22%	74.03%	52.9%	84.6%	100%	82.95%
Standard Deviation	0.9%	1.4%	0.7%	0.8%	2.5%	1.1%	1.1%

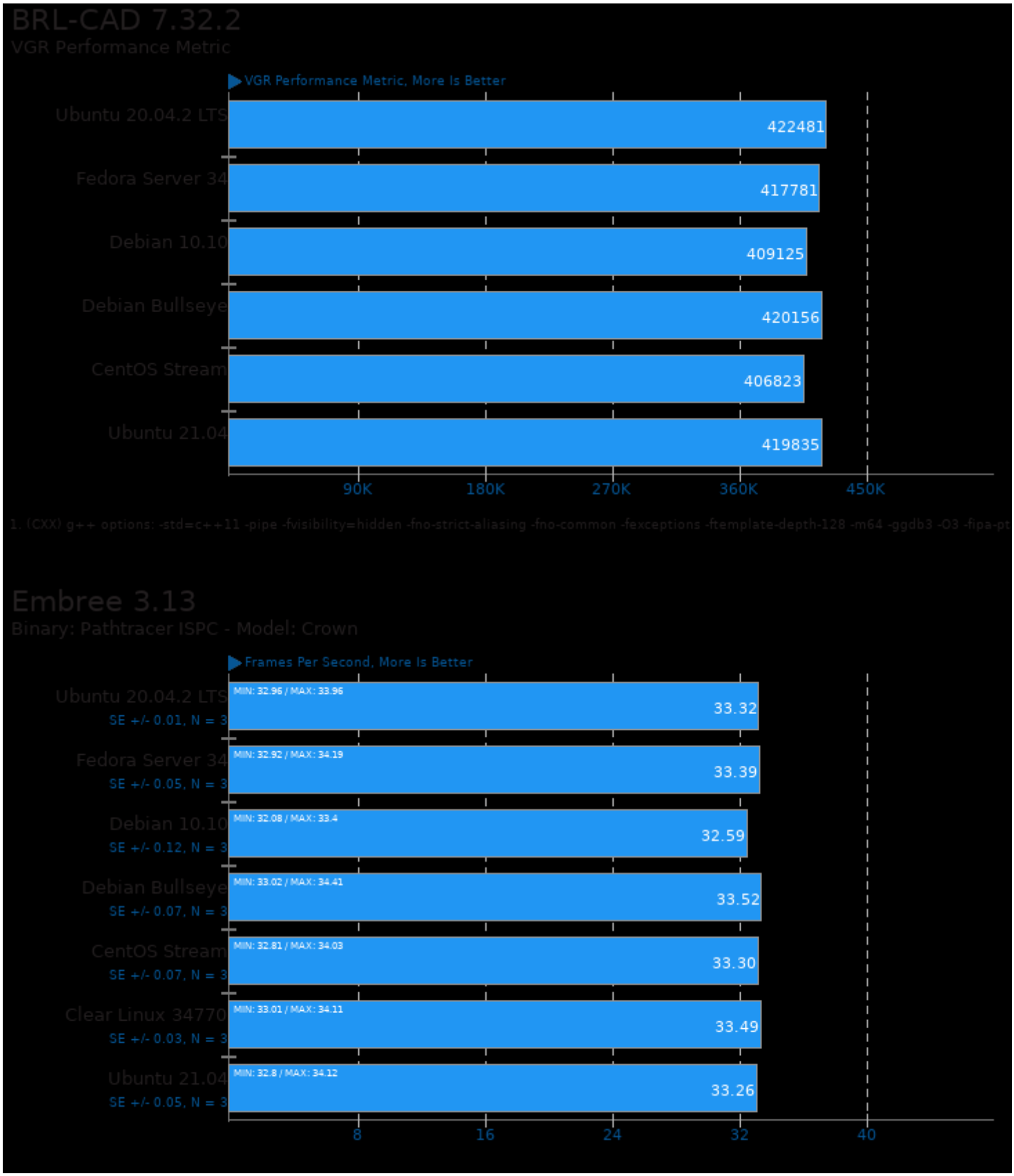
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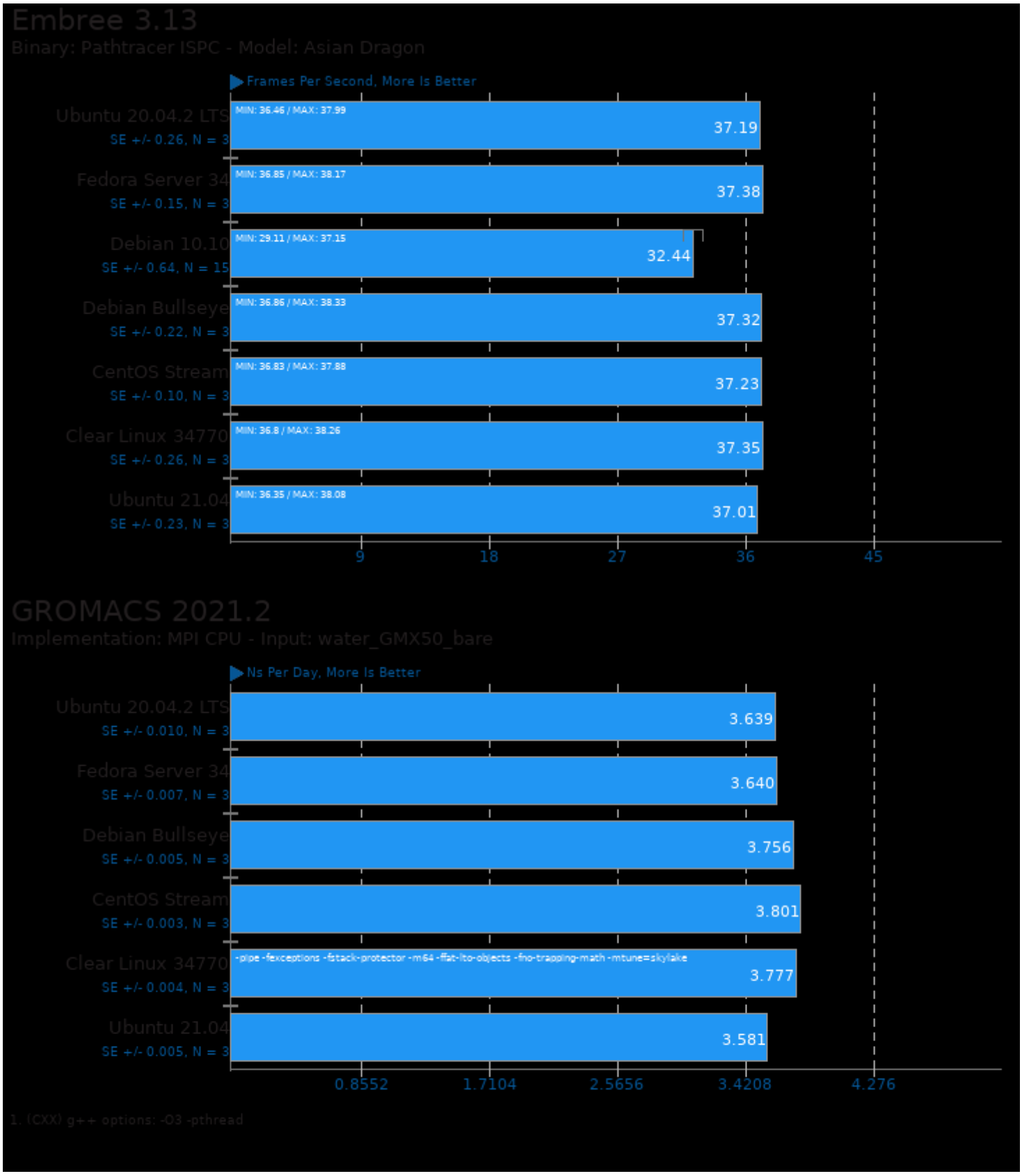
Xcompact3d Incompact3d - i.i.1.C.P.D (sec)	27.8769480	**29.0366478**		27.7018650	28.6477426	**27.1634598**	28.8079955
Normalized	97.44%	93.55%		98.06%	94.82%	100%	94.29%
Standard Deviation	2.5%	0.5%		2.8%	1.1%	1.3%	1.1%
Xmrig - Monero - 1M (H/s)	**21915**		22335	**23576**			
Normalized	92.95%		94.73%	100%			
Standard Deviation	0.3%		0.4%	0.2%			
Xmrig - Wownero - 1M	23123		**23003**	**24478**			
Normalized	94.46%		93.97%	100%			
Standard Deviation	0.3%		0.6%	0.2%			

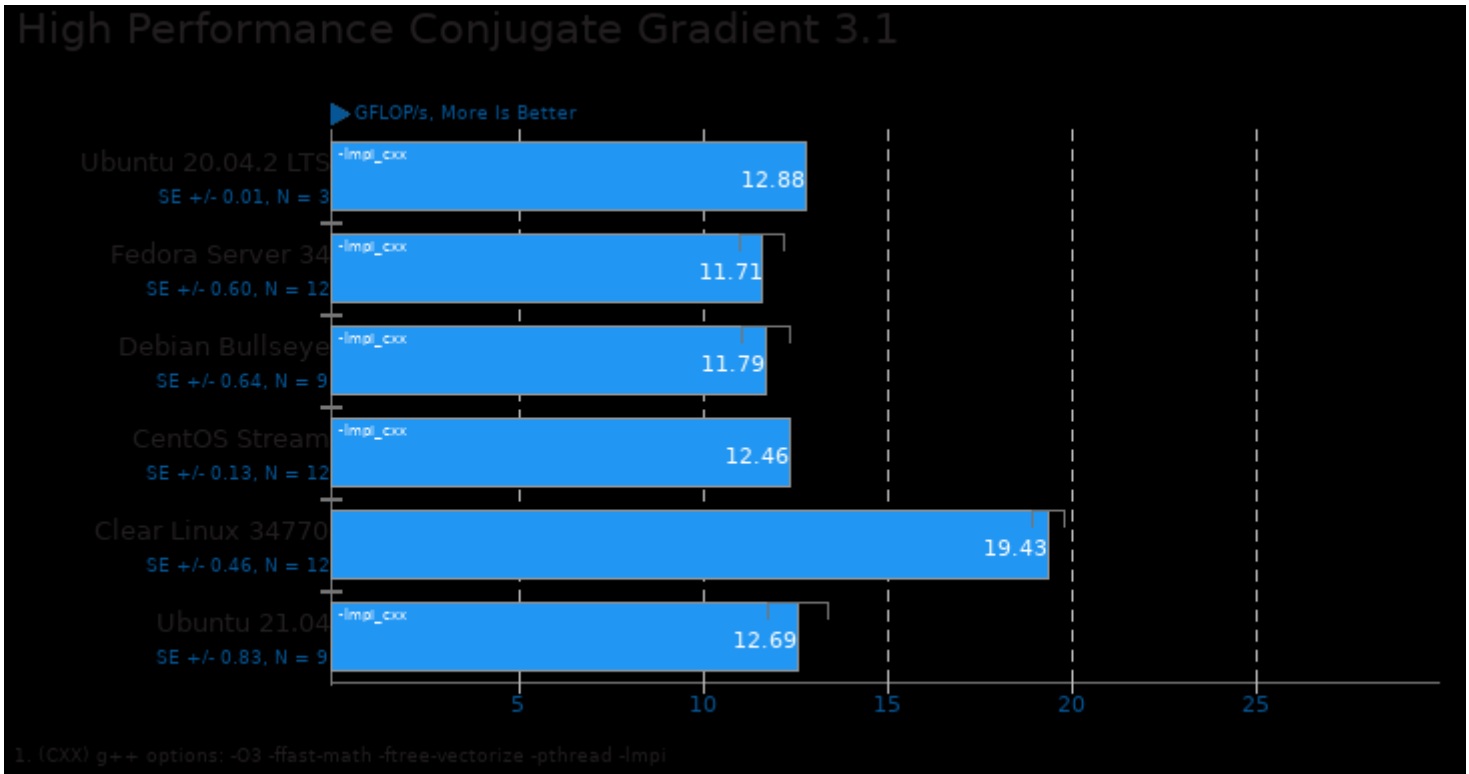

ASTC Encoder 3.0
Preset: Exhaustive
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.01, N = 3
23.68
Fedora Server 34
SE +/- 0.00, N = 3
23.52
Debian Bullseye
SE +/- 0.01, N = 3
23.46
CentOS Stream
SE +/- 0.01, N = 3
23.93
Clear Linux 34770
SE +/- 0.00, N = 3
23.51
Ubuntu 21.04
SE +/- 0.01, N = 3
23.58
6
12
18
24
30
1. (CXX) g++ options: -O3 -flto -pthread
Blender 2.92
Blend File: BMW27 - Compute: CPU-Only
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.06, N = 3
52.85
Fedora Server 34
SE +/- 0.09, N = 3
53.13
Debian 10.10
SE +/- 0.05, N = 3
52.44
Debian Bullseye
SE +/- 0.05, N = 3
52.55
CentOS Stream
SE +/- 0.07, N = 3
52.25
Clear Linux 34770
SE +/- 0.02, N = 3
52.25
Ubuntu 21.04
SE +/- 0.11, N = 3
53.59
12
24
36
48
60

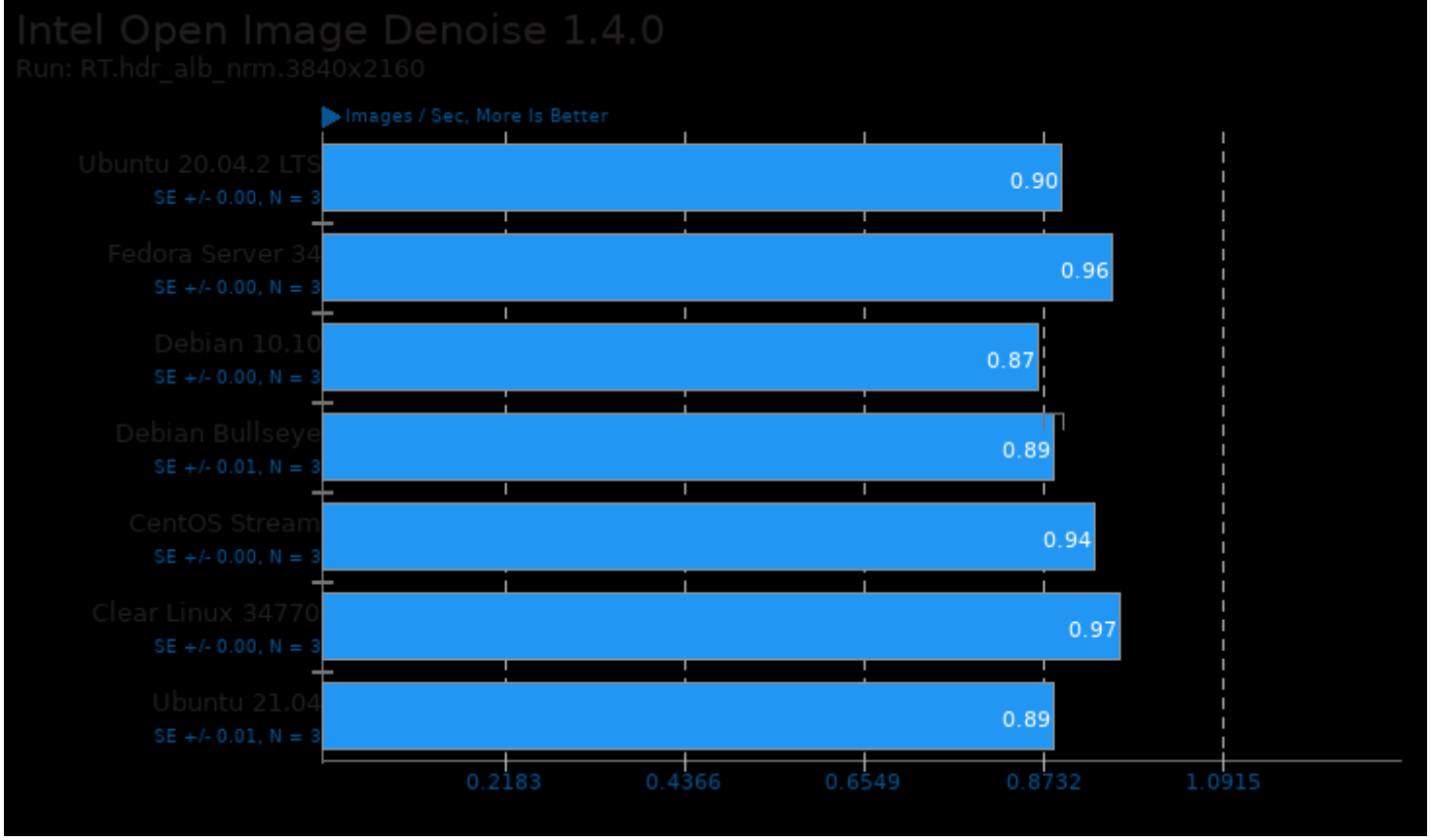

Blender 2.92
Blend File: Classroom - Compute: CPU-Only
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.13, N = 3
146.51
Fedora Server 34
SE +/- 0.10, N = 3
146.65
Debian 10.10
SE +/- 0.27, N = 3
146.09
Debian Bullseye
SE +/- 0.13, N = 3
145.38
CentOS Stream
SE +/- 0.15, N = 3
146.29
Clear Linux 34770
SE +/- 0.38, N = 3
145.82
Ubuntu 21.04
SE +/- 0.07, N = 3
147.55
30
60
90
120
150

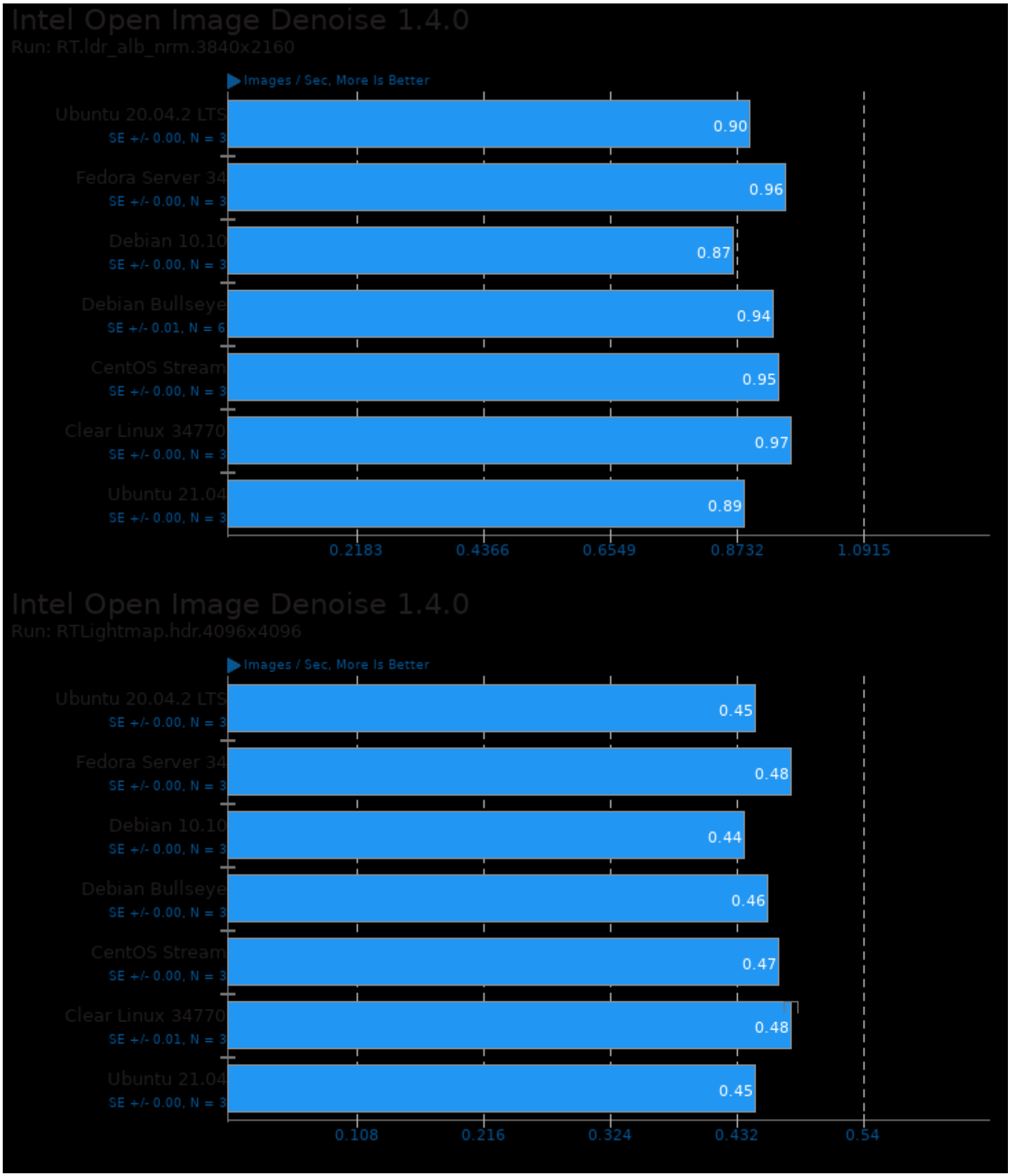

Blender 2.92
Blend File: Barbershop - Compute: CPU-Only
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.05, N = 3
195.79
Fedora Server 34
SE +/- 0.29, N = 3
196.64
Debian 10.10
SE +/- 0.98, N = 3
192.55
Debian Bullseye
SE +/- 0.28, N = 3
189.90
CentOS Stream
SE +/- 0.07, N = 3
190.76
Clear Linux 34770
SE +/- 0.15, N = 3
190.95
Ubuntu 21.04
SE +/- 0.18, N = 3
197.52
40
80
120
160
200

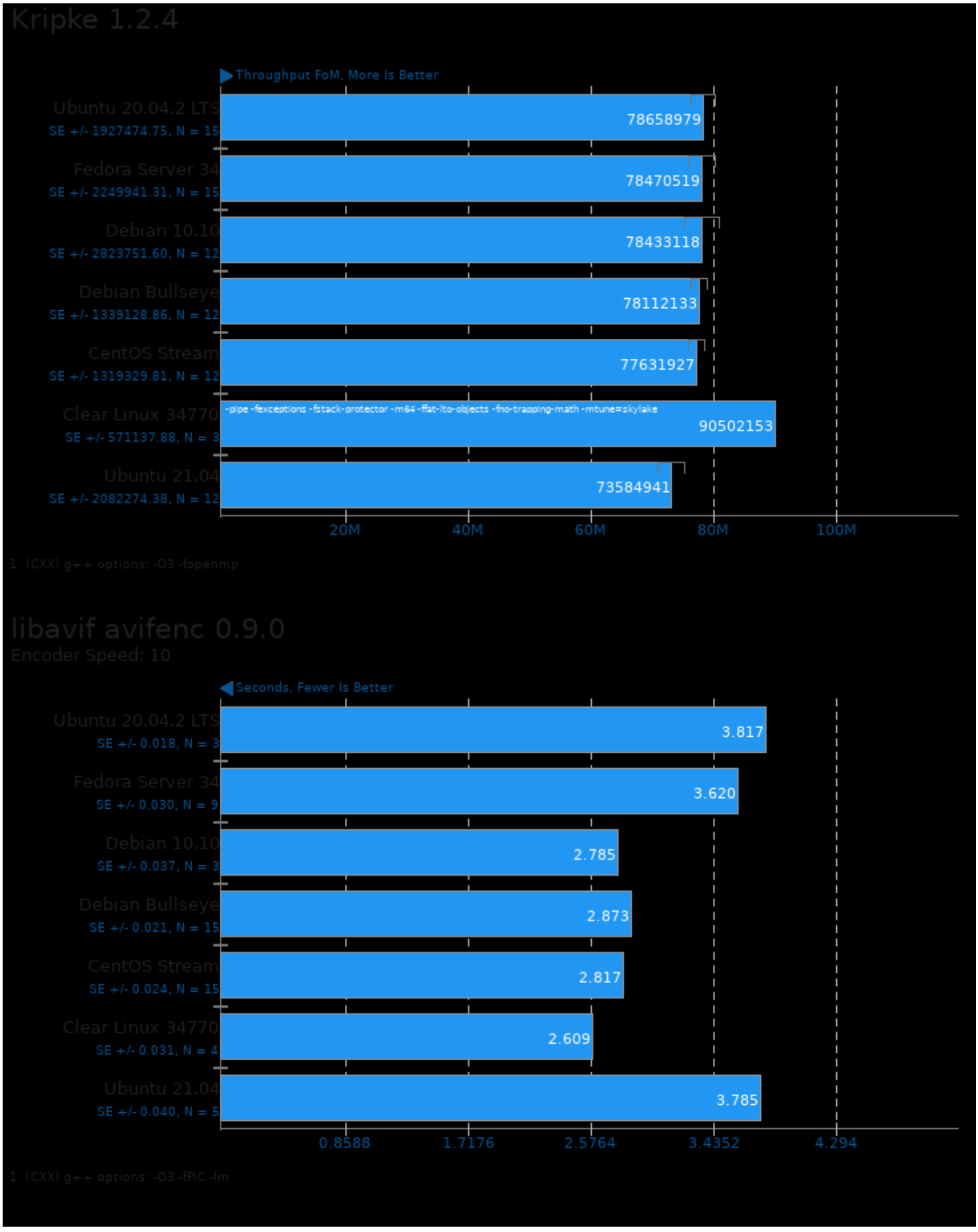

BRL-CAD 7.32.2
VGR Performance Metric
VGR Performance Metric, More Is Better
Ubuntu 20.04.2 LTS
422481
Fedora Server 34
417781
Debian 10.10
409125
Debian Bullseye
420156
CentOS Stream
406823
Ubuntu 21.04
419835
90K
180K
270K
360K
450K
1. (CXX) g++ options: -std=c++11 -pipe -fvisibility=hidden -fno-strict-aliasing -fno-common -fexceptions -ftemplate-depth-128 -m64 -ggdb3 -O3 -fipa-pt
Embree 3.13
Binary: Pathtracer ISPC - Model: Crown
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.01, N = 3
MIN: 32.96 / MAX: 33.96
33.32
Fedora Server 34
SE +/- 0.05, N = 3
MIN: 32.92 / MAX: 34.19
33.39
Debian 10.10
SE +/- 0.12, N = 3
MIN: 32.08 / MAX: 33.4
32.59
Debian Bullseye
SE +/- 0.07, N = 3
MIN: 33.02 / MAX: 34.41
33.52
CentOS Stream
SE +/- 0.07, N = 3
MIN: 32.81 / MAX: 34.03
33.30
Clear Linux 34770
SE +/- 0.03, N = 3
MIN: 33.01 / MAX: 34.11
33.49
Ubuntu 21.04
SE +/- 0.05, N = 3
MIN: 32.8 / MAX: 34.12
33.26
8
16
24
32
40

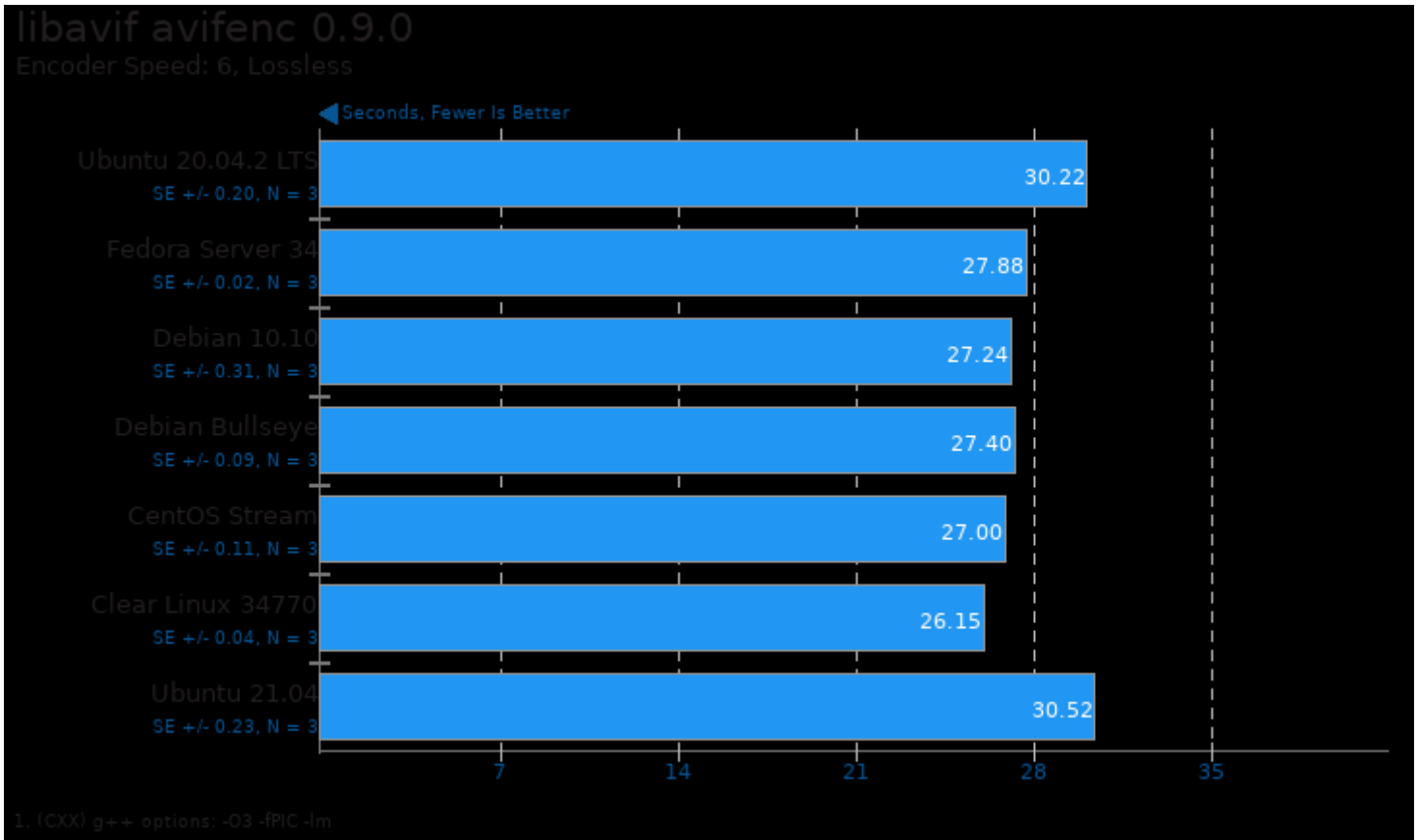

Embree 3.13
Binary: Pathtracer ISPC - Model: Asian Dragon
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.26, N = 3
MIN: 36.46 / MAX: 37.99
37.19
Fedora Server 34
SE +/- 0.15, N = 3
MIN: 36.85 / MAX: 38.17
37.38
Debian 10.10
SE +/- 0.64, N = 15
MIN: 29.11 / MAX: 37.15
32.44
Debian Bullseye
SE +/- 0.22, N = 3
MIN: 36.86 / MAX: 38.33
37.32
CentOS Stream
SE +/- 0.10, N = 3
MIN: 36.83 / MAX: 37.88
37.23
Clear Linux 34770
SE +/- 0.26, N = 3
MIN: 36.8 / MAX: 38.26
37.35
Ubuntu 21.04
SE +/- 0.23, N = 3
MIN: 36.35 / MAX: 38.08
37.01
9
18
27
36
45
GROMACS 2021.2
Implementation: MPI CPU - Input: water_GMX50_bare
Ns Per Day, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.010, N = 3
3.639
Fedora Server 34
SE +/- 0.007, N = 3
3.640
Debian Bullseye
SE +/- 0.005, N = 3
3.756
CentOS Stream
SE +/- 0.003, N = 3
3.801
Clear Linux 34770
SE +/- 0.004, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
3.777
Ubuntu 21.04
SE +/- 0.005, N = 3
3.581
0.8552
1.7104
2.5656
3.4208
4.276
1. (CXX) g++ options: -O3 -pthread

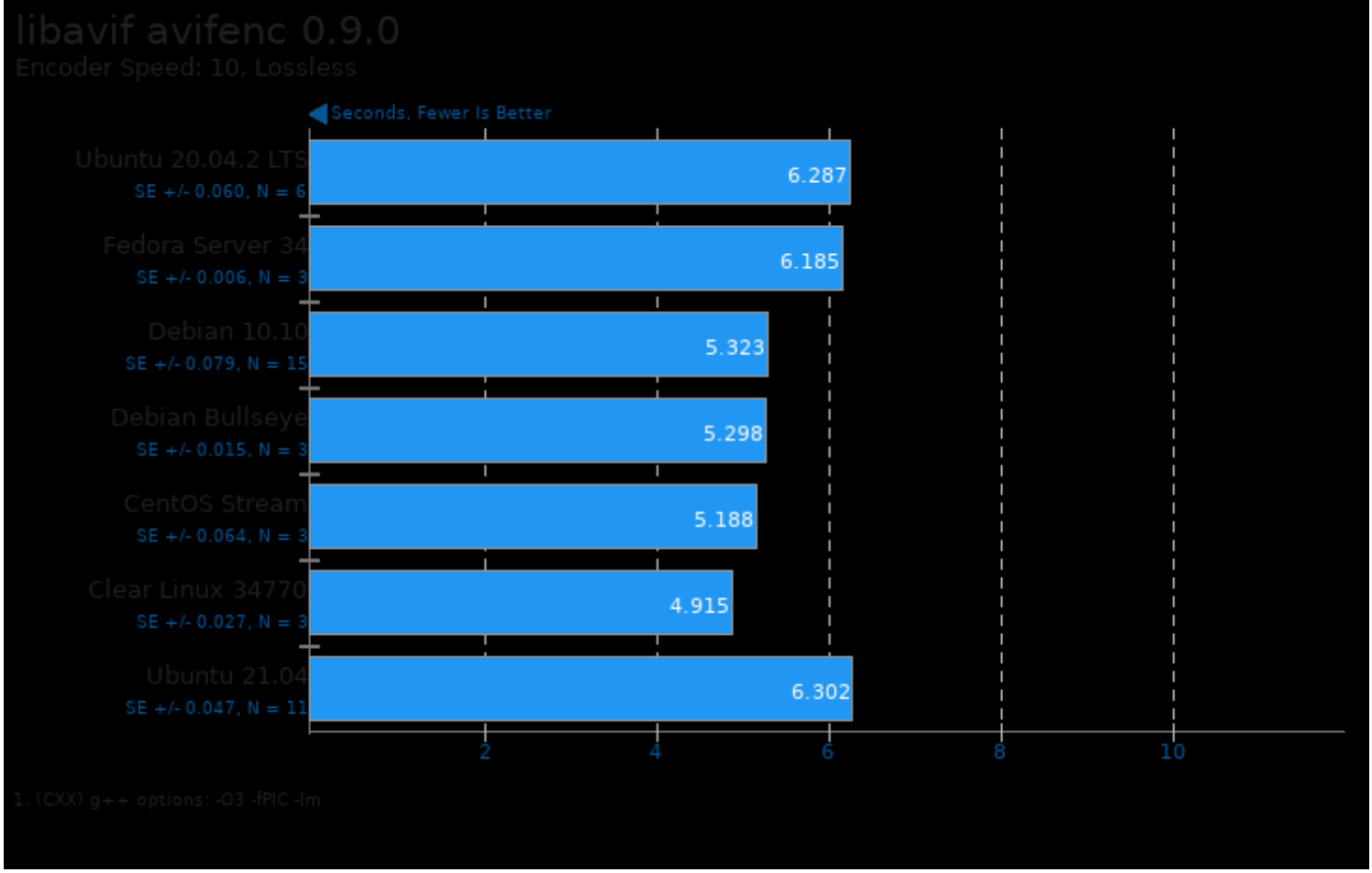

High Performance Conjugate Gradient 3.1
GFLOP/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.01, N = 3
-lmpi_cxx
12.88
Fedora Server 34
SE +/- 0.60, N = 12
-lmpi_cxx
11.71
Debian Bullseye
SE +/- 0.64, N = 9
-lmpi_cxx
11.79
CentOS Stream
SE +/- 0.13, N = 12
-lmpi_cxx
12.46
Clear Linux 34770
SE +/- 0.46, N = 12
19.43
Ubuntu 21.04
SE +/- 0.83, N = 9
-lmpi_cxx
12.69
5
10
15
20
25
1. (CXX) g++ options: -O3 -ffast-math -ftree-vectorize -pthread -lmpi

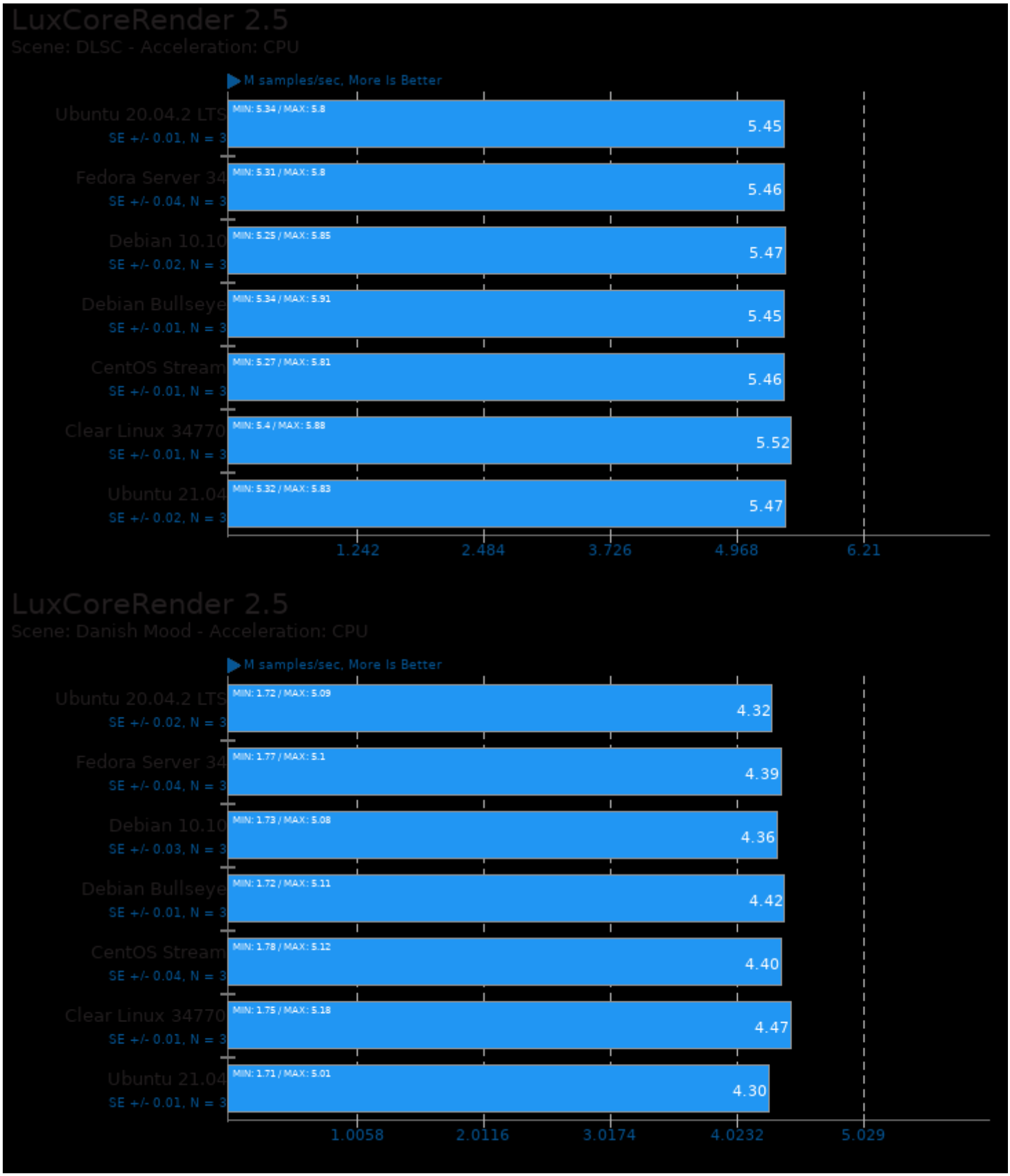

Intel Open Image Denoise 1.4.0
Run: RT.hdr_alb_nrm.3840x2160
Images / Sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.00, N = 3
0.90
Fedora Server 34
SE +/- 0.00, N = 3
0.96
Debian 10.10
SE +/- 0.00, N = 3
0.87
Debian Bullseye
SE +/- 0.01, N = 3
0.89
CentOS Stream
SE +/- 0.00, N = 3
0.94
Clear Linux 34770
SE +/- 0.00, N = 3
0.97
Ubuntu 21.04
SE +/- 0.01, N = 3
0.89
0.2183
0.4366
0.6549
0.8732
1.0915

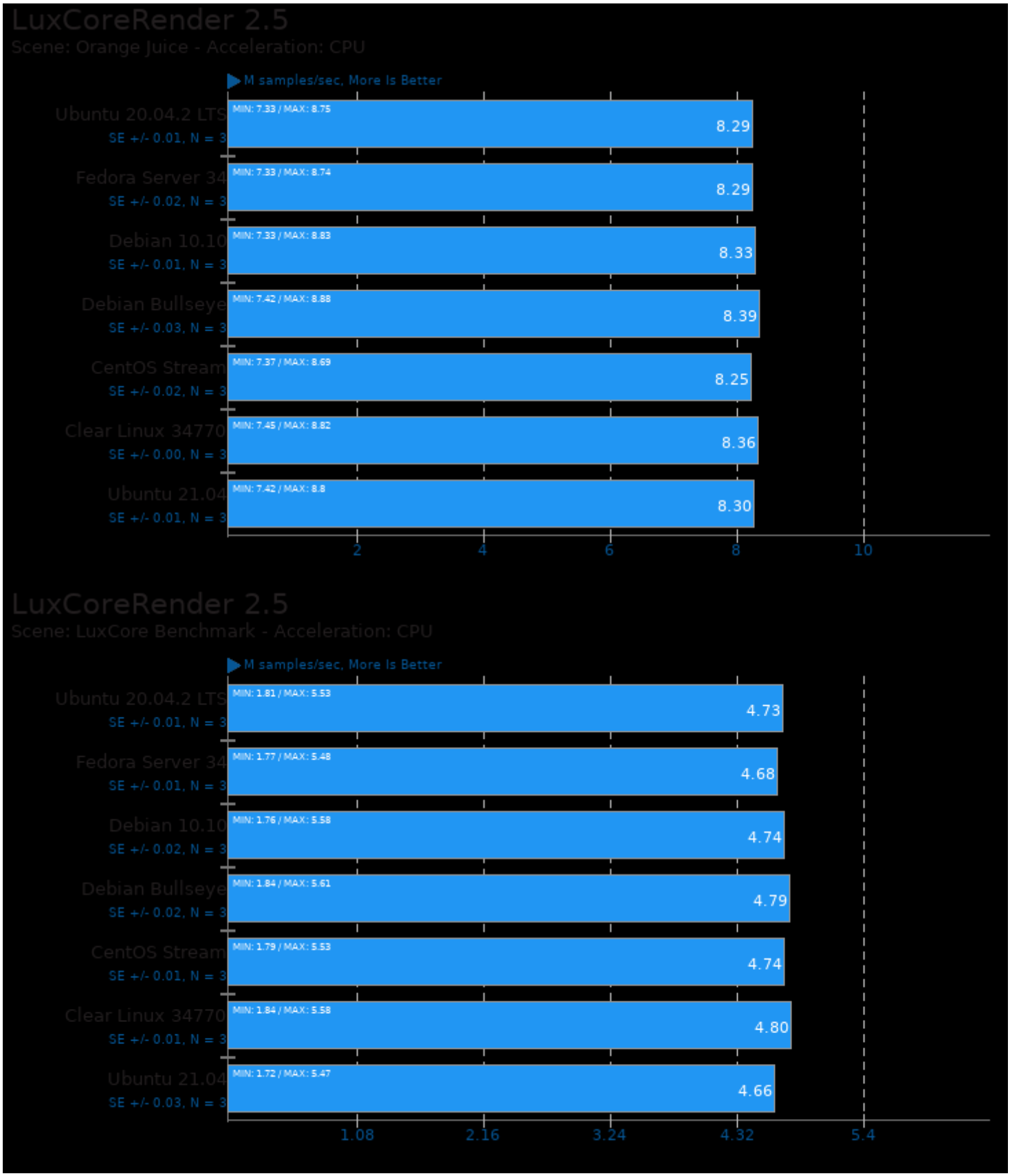

Intel Open Image Denoise 1.4.0
Run: RT.ldr_alb_nrm.3840x2160
Images / Sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.00, N = 3
0.90
Fedora Server 34
SE +/- 0.00, N = 3
0.96
Debian 10.10
SE +/- 0.00, N = 3
0.87
Debian Bullseye
SE +/- 0.01, N = 6
0.94
CentOS Stream
SE +/- 0.00, N = 3
0.95
Clear Linux 34770
SE +/- 0.00, N = 3
0.97
Ubuntu 21.04
SE +/- 0.00, N = 3
0.89
0.2183
0.4366
0.6549
0.8732
1.0915
Intel Open Image Denoise 1.4.0
Run: RTLightmap.hdr.4096x4096
Images / Sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.00, N = 3
0.45
Fedora Server 34
SE +/- 0.00, N = 3
0.48
Debian 10.10
SE +/- 0.00, N = 3
0.44
Debian Bullseye
SE +/- 0.00, N = 3
0.46
CentOS Stream
SE +/- 0.00, N = 3
0.47
Clear Linux 34770
SE +/- 0.01, N = 3
0.48
Ubuntu 21.04
SE +/- 0.00, N = 3
0.45
0.108
0.216
0.324
0.432
0.54

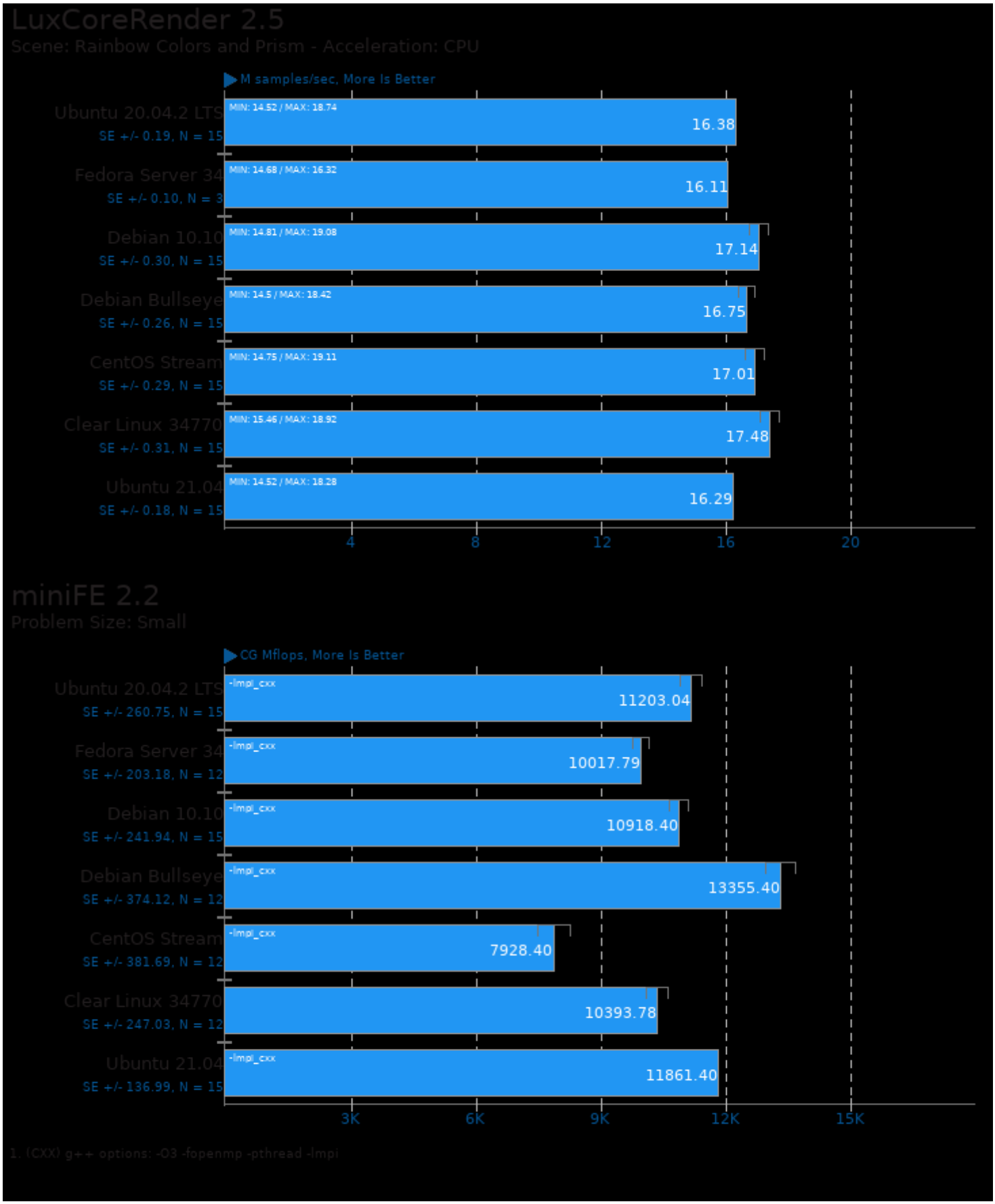

Kripke 1.2.4
Throughput FoM, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 1927474.75, N = 15
78658979
Fedora Server 34
SE +/- 2249941.31, N = 15
78470519
Debian 10.10
SE +/- 2823751.60, N = 12
78433118
Debian Bullseye
SE +/- 1339128.86, N = 12
78112133
CentOS Stream
SE +/- 1319329.81, N = 12
77631927
Clear Linux 34770
SE +/- 571137.88, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
90502153
Ubuntu 21.04
SE +/- 2082274.38, N = 12
73584941
20M
40M
60M
80M
100M
1. (CXX) g++ options: -O3 -fopenmp
libavif avifenc 0.9.0
Encoder Speed: 10
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.018, N = 3
3.817
Fedora Server 34
SE +/- 0.030, N = 9
3.620
Debian 10.10
SE +/- 0.037, N = 3
2.785
Debian Bullseye
SE +/- 0.021, N = 15
2.873
CentOS Stream
SE +/- 0.024, N = 15
2.817
Clear Linux 34770
SE +/- 0.031, N = 4
2.609
Ubuntu 21.04
SE +/- 0.040, N = 5
3.785
0.8588
1.7176
2.5764
3.4352
4.294
1. (CXX) g++ options: -O3 -fPIC -lm

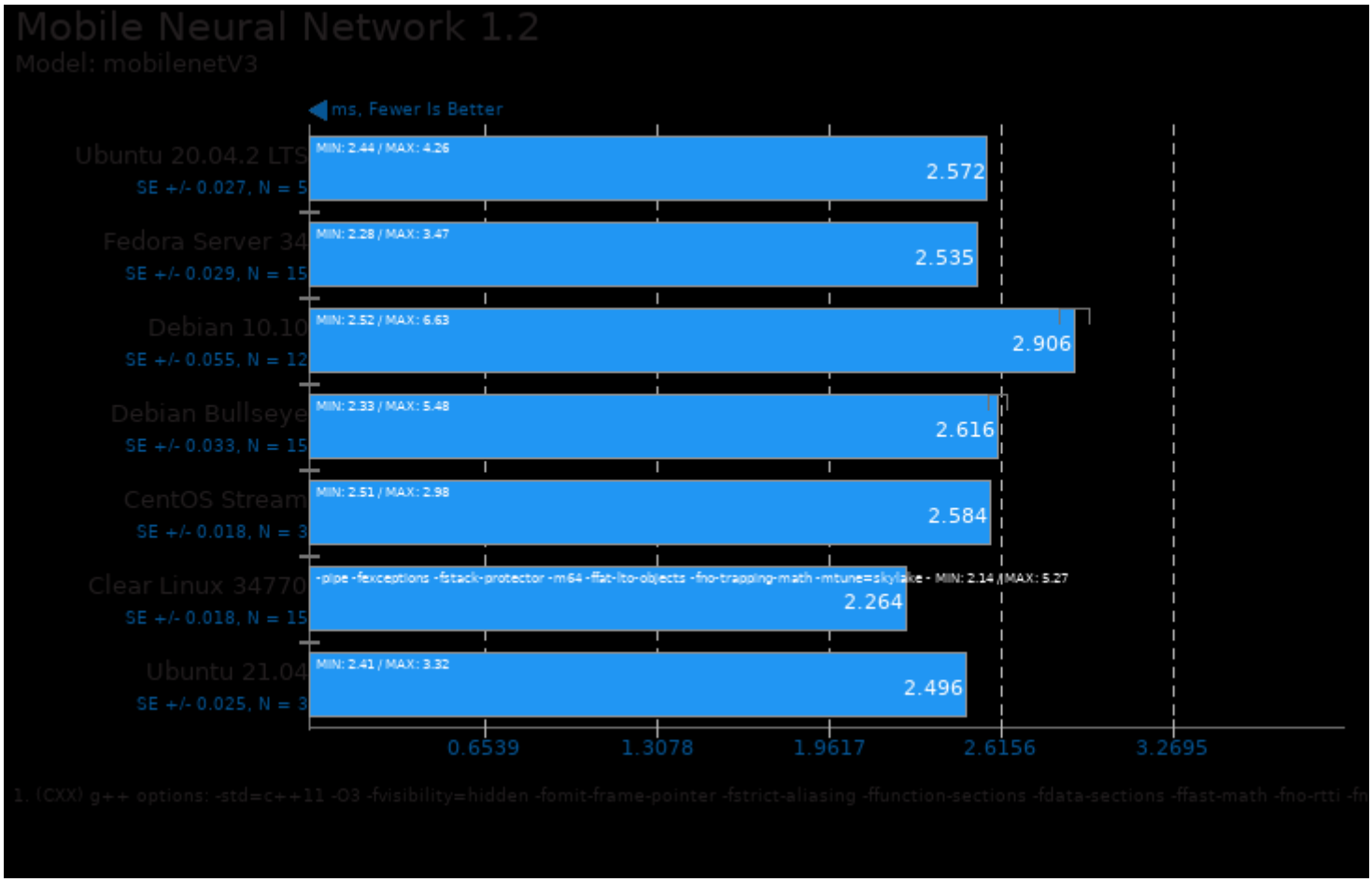

libavif avifenc 0.9.0
Encoder Speed: 6, Lossless
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.20, N = 3
30.22
Fedora Server 34
SE +/- 0.02, N = 3
27.88
Debian 10.10
SE +/- 0.31, N = 3
27.24
Debian Bullseye
SE +/- 0.09, N = 3
27.40
CentOS Stream
SE +/- 0.11, N = 3
27.00
Clear Linux 34770
SE +/- 0.04, N = 3
26.15
Ubuntu 21.04
SE +/- 0.23, N = 3
30.52
7
14
21
28
35
1. (CXX) g++ options: -O3 -fPIC -lm

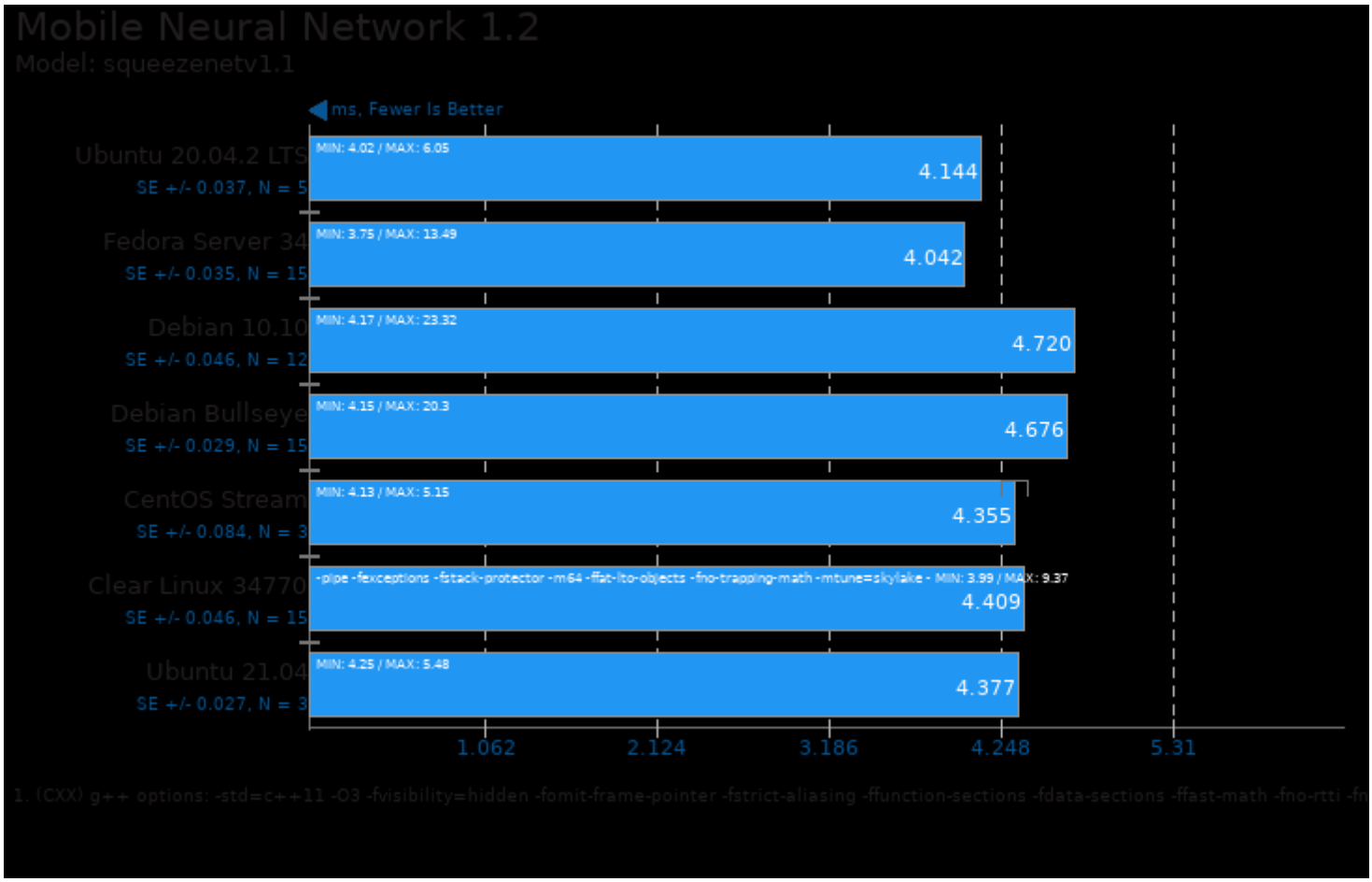

libavif avifenc 0.9.0
Encoder Speed: 10, Lossless
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.060, N = 6
6.287
Fedora Server 34
SE +/- 0.006, N = 3
6.185
Debian 10.10
SE +/- 0.079, N = 15
5.323
Debian Bullseye
SE +/- 0.015, N = 3
5.298
CentOS Stream
SE +/- 0.064, N = 3
5.188
Clear Linux 34770
SE +/- 0.027, N = 3
4.915
Ubuntu 21.04
SE +/- 0.047, N = 11
6.302
2
4
6
8
10
1. (CXX) g++ options: -O3 -fPIC -lm

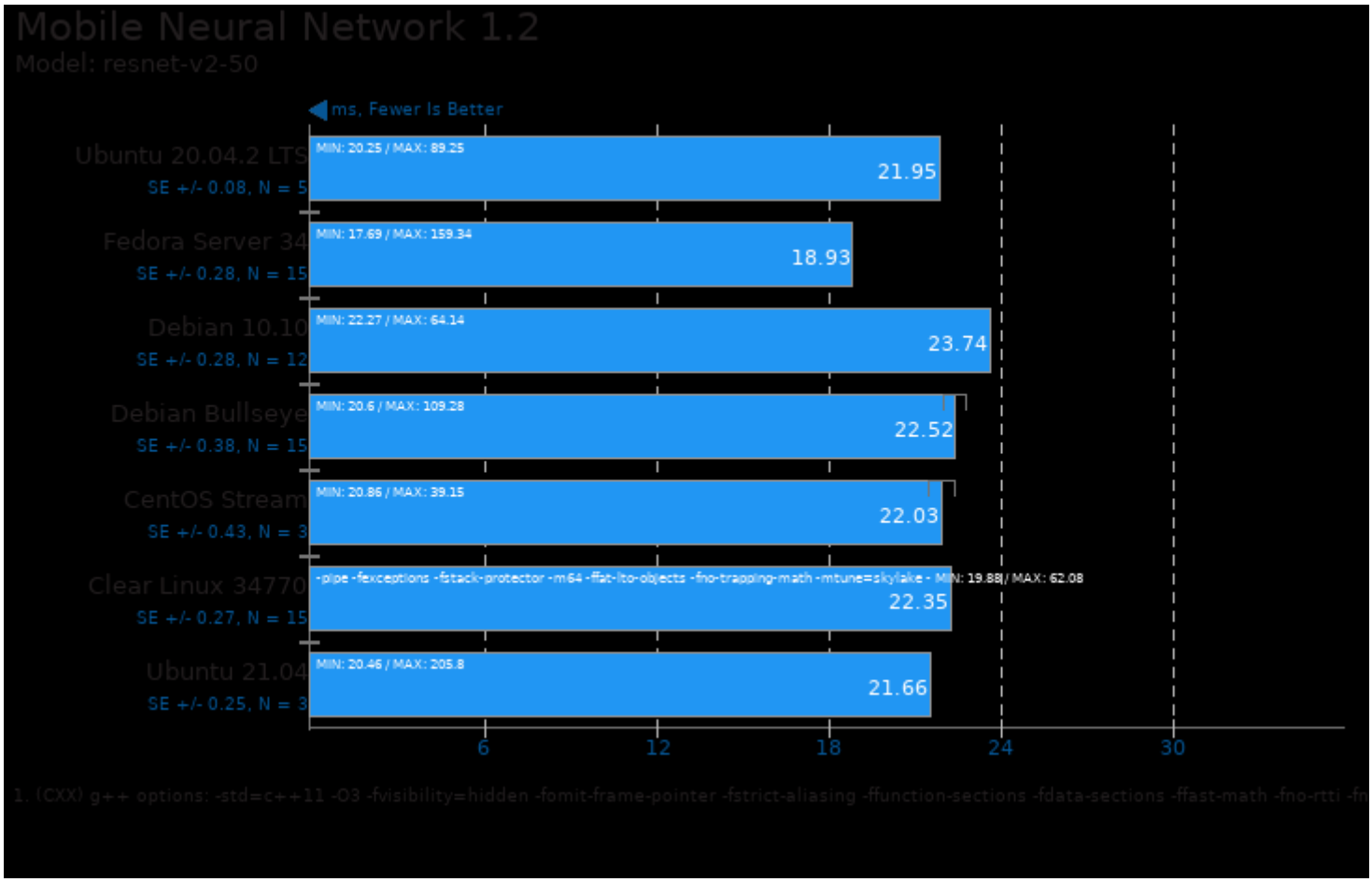

LuxCoreRender 2.5
Scene: DLSC - Acceleration: CPU
M samples/sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.01, N = 3
MIN: 5.34 / MAX: 5.8
5.45
Fedora Server 34
SE +/- 0.04, N = 3
MIN: 5.31 / MAX: 5.8
5.46
Debian 10.10
SE +/- 0.02, N = 3
MIN: 5.25 / MAX: 5.85
5.47
Debian Bullseye
SE +/- 0.01, N = 3
MIN: 5.34 / MAX: 5.91
5.45
CentOS Stream
SE +/- 0.01, N = 3
MIN: 5.27 / MAX: 5.81
5.46
Clear Linux 34770
SE +/- 0.01, N = 3
MIN: 5.4 / MAX: 5.88
5.52
Ubuntu 21.04
SE +/- 0.02, N = 3
MIN: 5.32 / MAX: 5.83
5.47
1.242
2.484
3.726
4.968
6.21
LuxCoreRender 2.5
Scene: Danish Mood - Acceleration: CPU
M samples/sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.02, N = 3
MIN: 1.72 / MAX: 5.09
4.32
Fedora Server 34
SE +/- 0.04, N = 3
MIN: 1.77 / MAX: 5.1
4.39
Debian 10.10
SE +/- 0.03, N = 3
MIN: 1.73 / MAX: 5.08
4.36
Debian Bullseye
SE +/- 0.01, N = 3
MIN: 1.72 / MAX: 5.11
4.42
CentOS Stream
SE +/- 0.04, N = 3
MIN: 1.78 / MAX: 5.12
4.40
Clear Linux 34770
SE +/- 0.01, N = 3
MIN: 1.75 / MAX: 5.18
4.47
Ubuntu 21.04
SE +/- 0.01, N = 3
MIN: 1.71 / MAX: 5.01
4.30
1.0058
2.0116
3.0174
4.0232
5.029

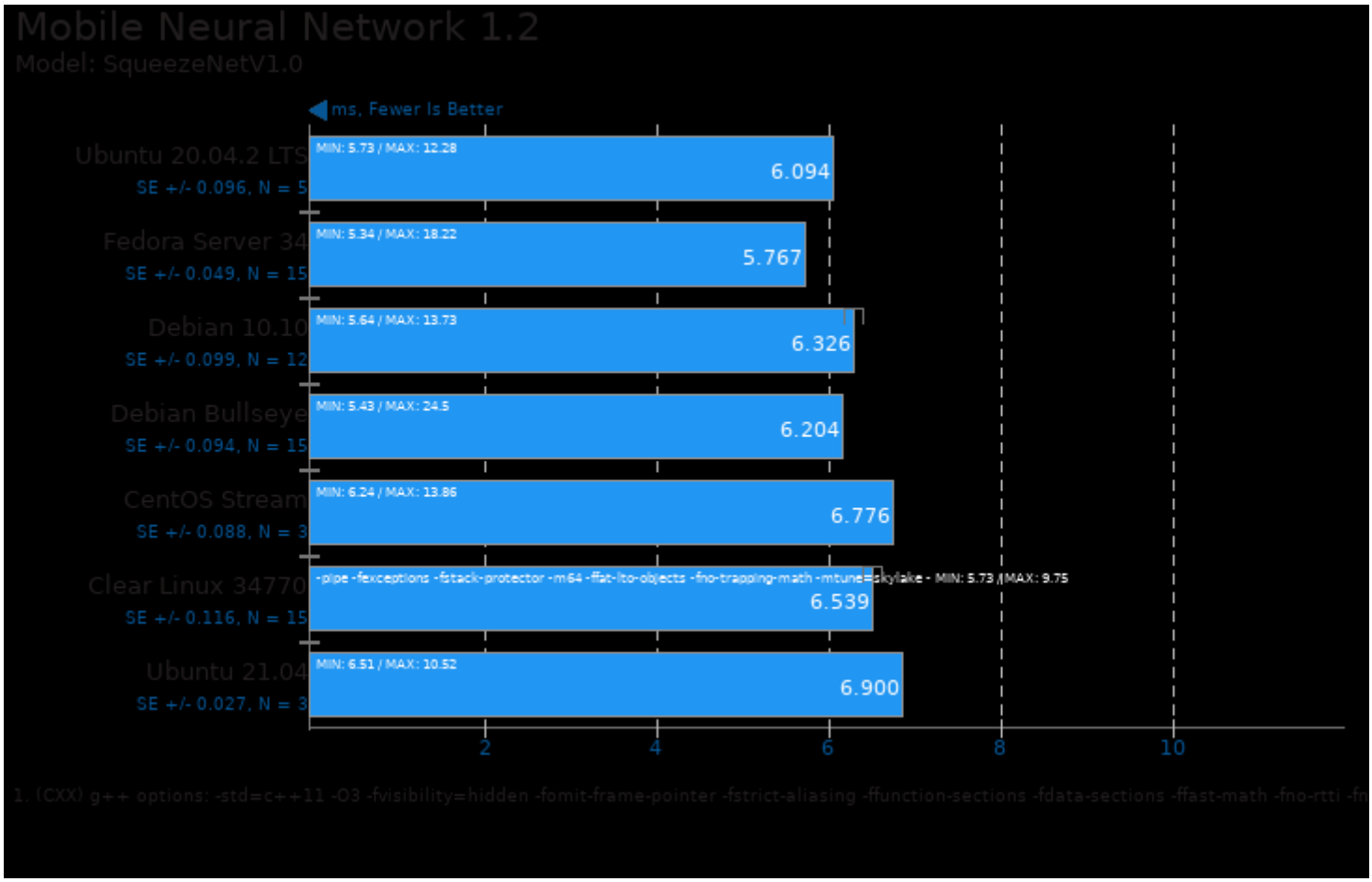

LuxCoreRender 2.5
Scene: Orange Juice - Acceleration: CPU
M samples/sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.01, N = 3
MIN: 7.33 / MAX: 8.75
8.29
Fedora Server 34
SE +/- 0.02, N = 3
MIN: 7.33 / MAX: 8.74
8.29
Debian 10.10
SE +/- 0.01, N = 3
MIN: 7.33 / MAX: 8.83
8.33
Debian Bullseye
SE +/- 0.03, N = 3
MIN: 7.42 / MAX: 8.88
8.39
CentOS Stream
SE +/- 0.02, N = 3
MIN: 7.37 / MAX: 8.69
8.25
Clear Linux 34770
SE +/- 0.00, N = 3
MIN: 7.45 / MAX: 8.82
8.36
Ubuntu 21.04
SE +/- 0.01, N = 3
MIN: 7.42 / MAX: 8.8
8.30
2
4
6
8
10
LuxCoreRender 2.5
Scene: LuxCore Benchmark - Acceleration: CPU
M samples/sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.01, N = 3
MIN: 1.81 / MAX: 5.53
4.73
Fedora Server 34
SE +/- 0.01, N = 3
MIN: 1.77 / MAX: 5.48
4.68
Debian 10.10
SE +/- 0.02, N = 3
MIN: 1.76 / MAX: 5.58
4.74
Debian Bullseye
SE +/- 0.02, N = 3
MIN: 1.84 / MAX: 5.61
4.79
CentOS Stream
SE +/- 0.01, N = 3
MIN: 1.79 / MAX: 5.53
4.74
Clear Linux 34770
SE +/- 0.01, N = 3
MIN: 1.84 / MAX: 5.58
4.80
Ubuntu 21.04
SE +/- 0.03, N = 3
MIN: 1.72 / MAX: 5.47
4.66
1.08
2.16
3.24
4.32
5.4

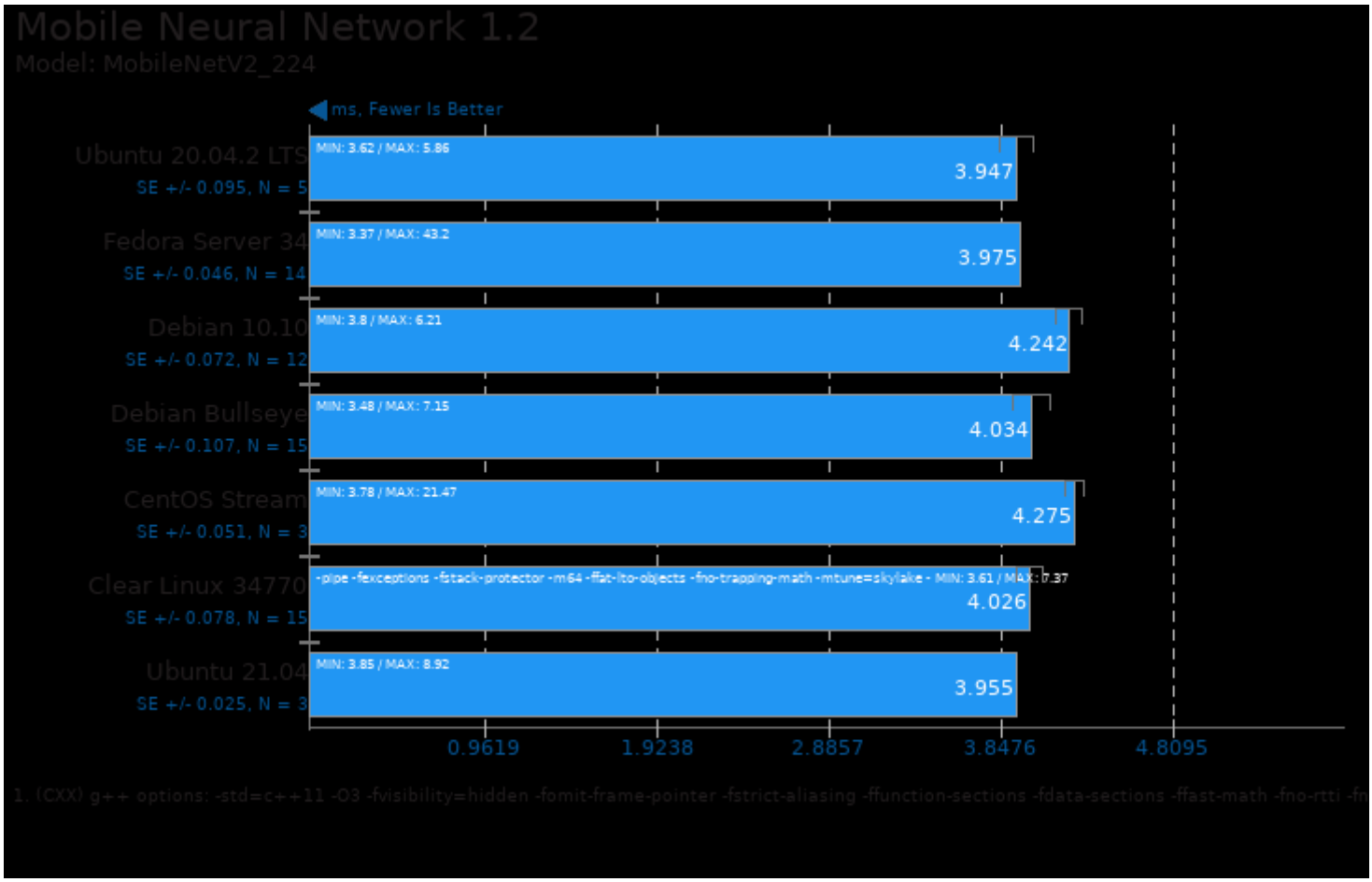

LuxCoreRender 2.5
Scene: Rainbow Colors and Prism - Acceleration: CPU
M samples/sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.19, N = 15
MIN: 14.52 / MAX: 18.74
16.38
Fedora Server 34
SE +/- 0.10, N = 3
MIN: 14.68 / MAX: 16.32
16.11
Debian 10.10
SE +/- 0.30, N = 15
MIN: 14.81 / MAX: 19.08
17.14
Debian Bullseye
SE +/- 0.26, N = 15
MIN: 14.5 / MAX: 18.42
16.75
CentOS Stream
SE +/- 0.29, N = 15
MIN: 14.75 / MAX: 19.11
17.01
Clear Linux 34770
SE +/- 0.31, N = 15
MIN: 15.46 / MAX: 18.92
17.48
Ubuntu 21.04
SE +/- 0.18, N = 15
MIN: 14.52 / MAX: 18.28
16.29
4
8
12
16
20
miniFE 2.2
Problem Size: Small
CG Mflops, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 260.75, N = 15
-lmpi_cxx
11203.04
Fedora Server 34
SE +/- 203.18, N = 12
-lmpi_cxx
10017.79
Debian 10.10
SE +/- 241.94, N = 15
-lmpi_cxx
10918.40
Debian Bullseye
SE +/- 374.12, N = 12
-lmpi_cxx
13355.40
CentOS Stream
SE +/- 381.69, N = 12
-lmpi_cxx
7928.40
Clear Linux 34770
SE +/- 247.03, N = 12
10393.78
Ubuntu 21.04
SE +/- 136.99, N = 15
-lmpi_cxx
11861.40
3K
6K
9K
12K
15K
1. (CXX) g++ options: -O3 -fopenmp -pthread -lmpi

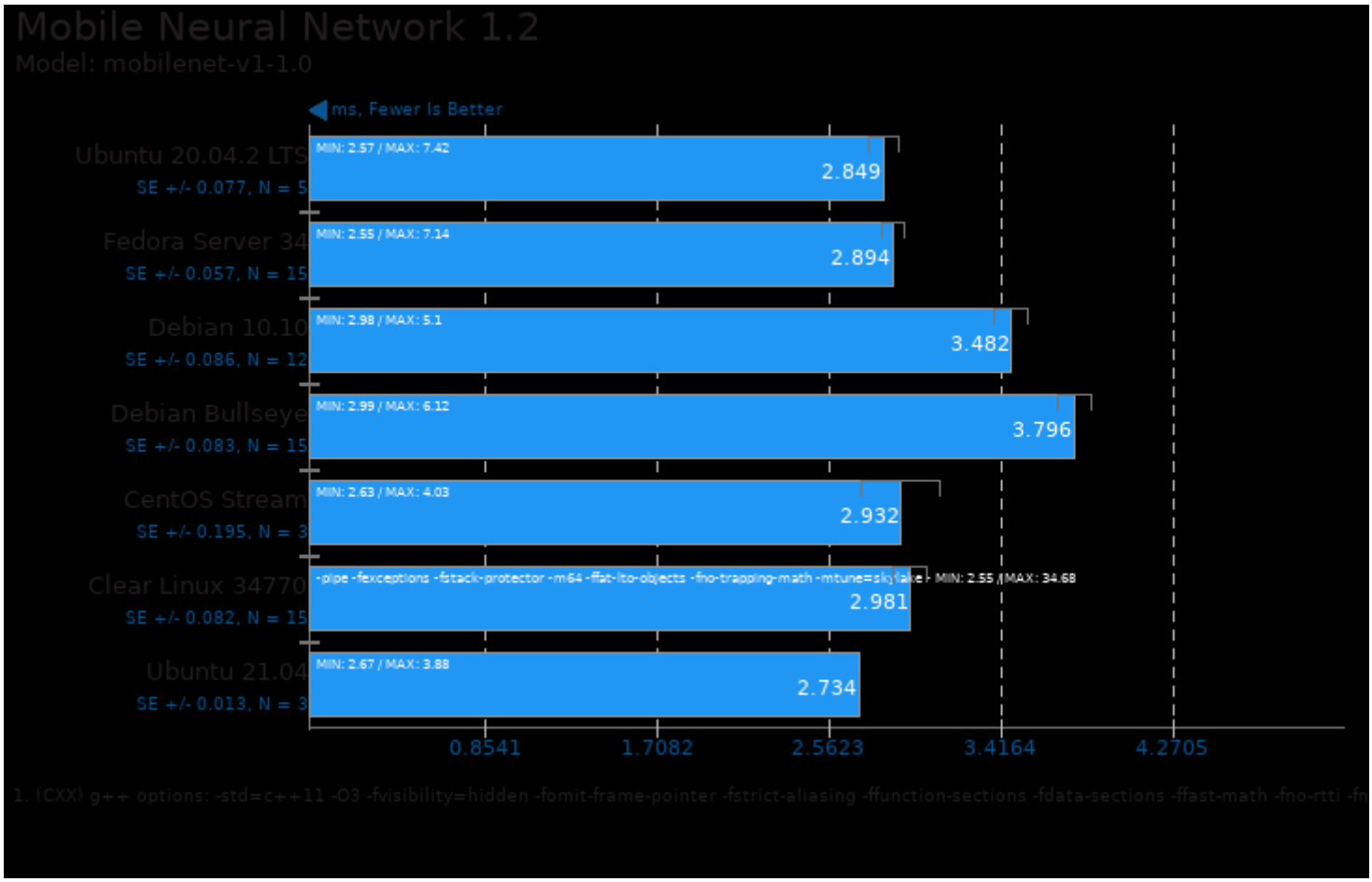

Mobile Neural Network 1.2
Model: mobilenetV3
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.027, N = 5
MIN: 2.44 / MAX: 4.26
2.572
Fedora Server 34
SE +/- 0.029, N = 15
MIN: 2.28 / MAX: 3.47
2.535
Debian 10.10
SE +/- 0.055, N = 12
MIN: 2.52 / MAX: 6.63
2.906
Debian Bullseye
SE +/- 0.033, N = 15
MIN: 2.33 / MAX: 5.48
2.616
CentOS Stream
SE +/- 0.018, N = 3
MIN: 2.51 / MAX: 2.98
2.584
Clear Linux 34770
SE +/- 0.018, N = 15
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake - MIN: 2.14 / MAX: 5.27
2.264
Ubuntu 21.04
SE +/- 0.025, N = 3
MIN: 2.41 / MAX: 3.32
2.496
0.6539
1.3078
1.9617
2.6156
3.2695
1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fn

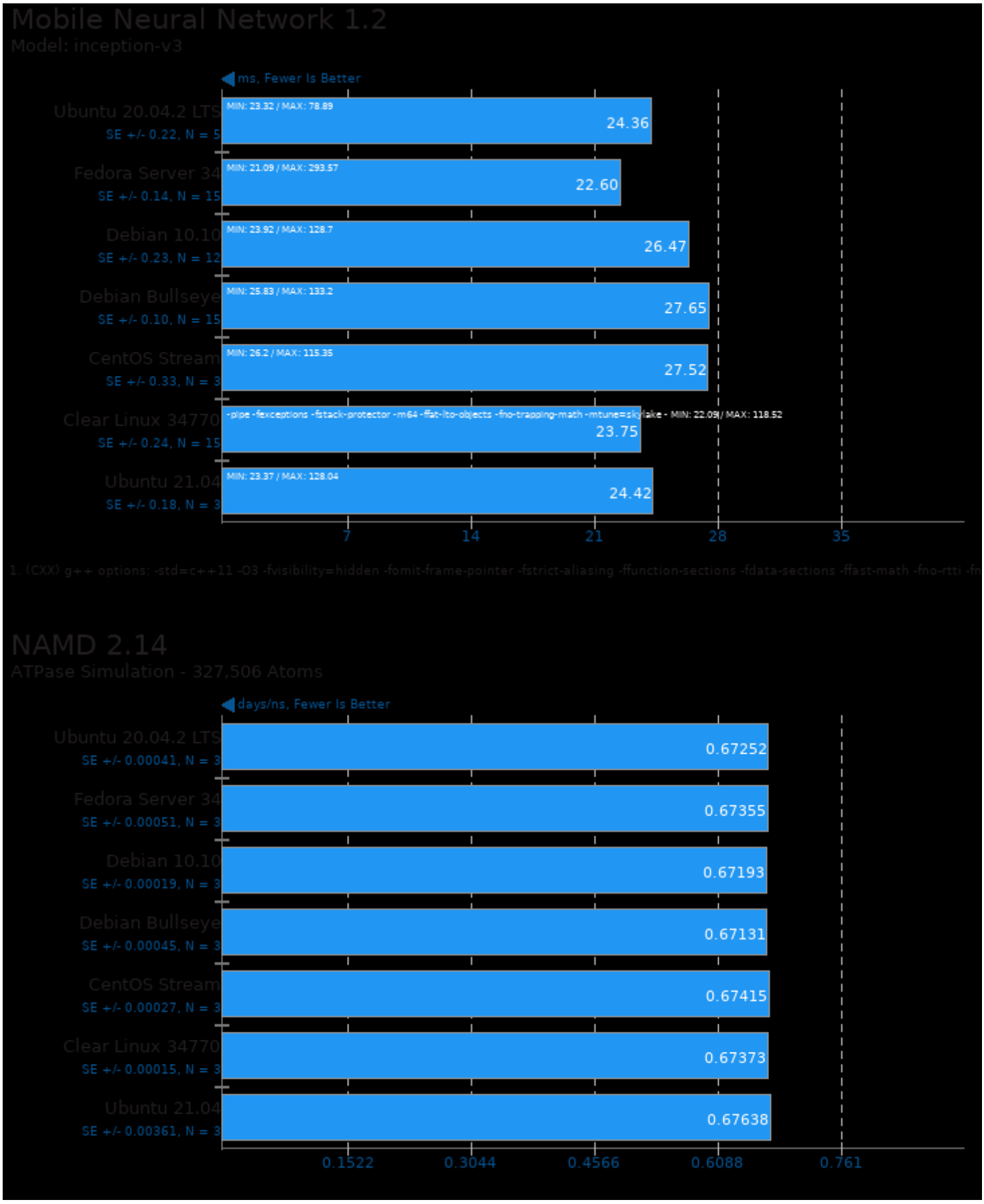

Mobile Neural Network 1.2
Model: squeezenetv1.1
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.037, N = 5
MIN: 4.02 / MAX: 6.05
4.144
Fedora Server 34
SE +/- 0.035, N = 15
MIN: 3.75 / MAX: 13.49
4.042
Debian 10.10
SE +/- 0.046, N = 12
MIN: 4.17 / MAX: 23.32
4.720
Debian Bullseye
SE +/- 0.029, N = 15
MIN: 4.15 / MAX: 20.3
4.676
CentOS Stream
SE +/- 0.084, N = 3
MIN: 4.13 / MAX: 5.15
4.355
Clear Linux 34770
SE +/- 0.046, N = 15
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake - MIN: 3.99 / MAX: 9.37
4.409
Ubuntu 21.04
SE +/- 0.027, N = 3
MIN: 4.25 / MAX: 5.48
4.377
1.062
2.124
3.186
4.248
5.31
1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fn

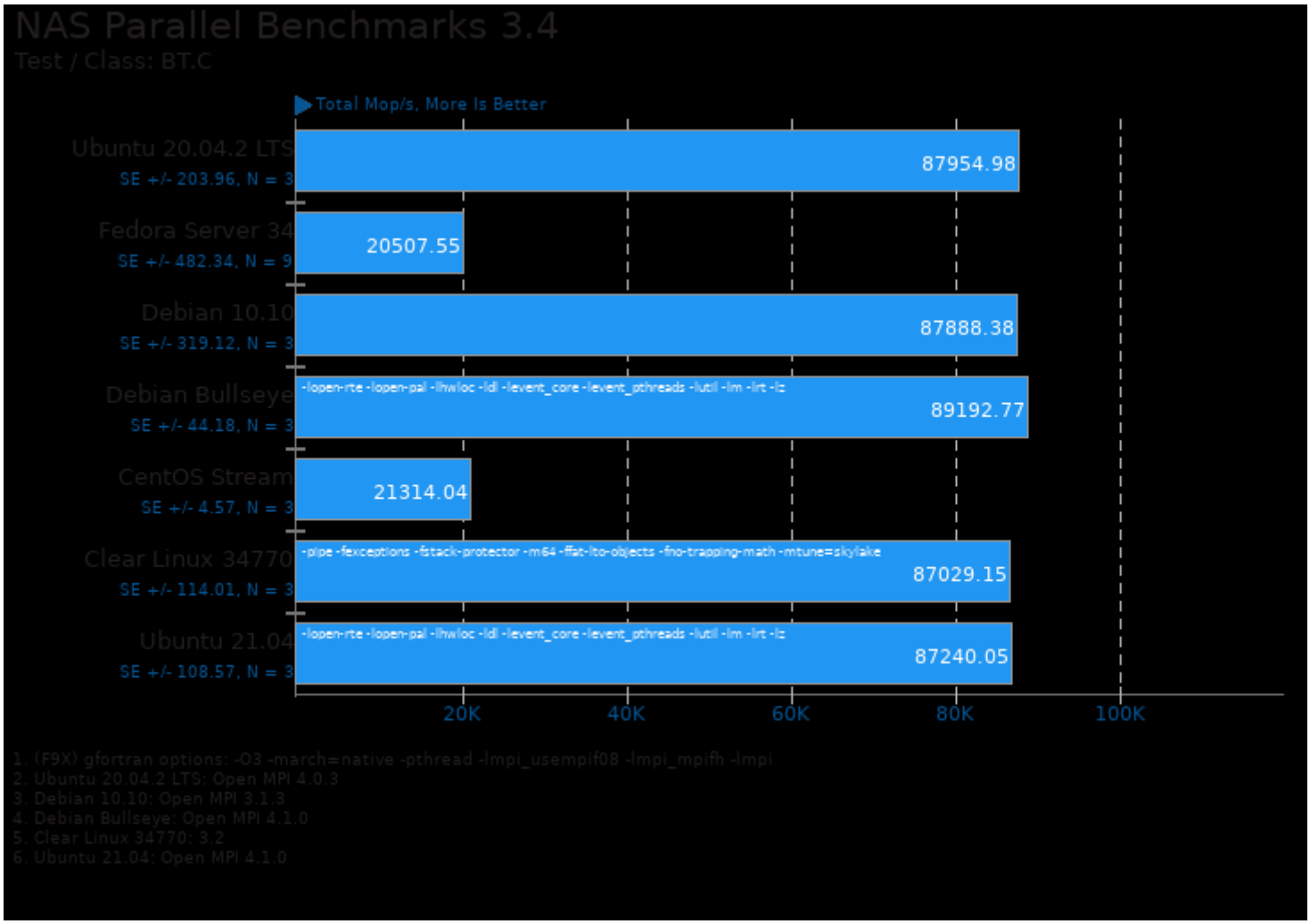

Mobile Neural Network 1.2
Model: resnet-v2-50
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.08, N = 5
MIN: 20.25 / MAX: 89.25
21.95
Fedora Server 34
SE +/- 0.28, N = 15
MIN: 17.69 / MAX: 159.34
18.93
Debian 10.10
SE +/- 0.28, N = 12
MIN: 22.27 / MAX: 64.14
23.74
Debian Bullseye
SE +/- 0.38, N = 15
MIN: 20.6 / MAX: 109.28
22.52
CentOS Stream
SE +/- 0.43, N = 3
MIN: 20.86 / MAX: 39.15
22.03
Clear Linux 34770
SE +/- 0.27, N = 15
-pipe -fexceptions -fstack-protector -m64 -flto=4 -flto-odr-type-merging -fno-trapping-math -mtune=skylake
MIN: 19.88 / MAX: 62.08
22.35
Ubuntu 21.04
SE +/- 0.25, N = 3
MIN: 20.46 / MAX: 205.8
21.66
6
12
18
24
30
1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fn

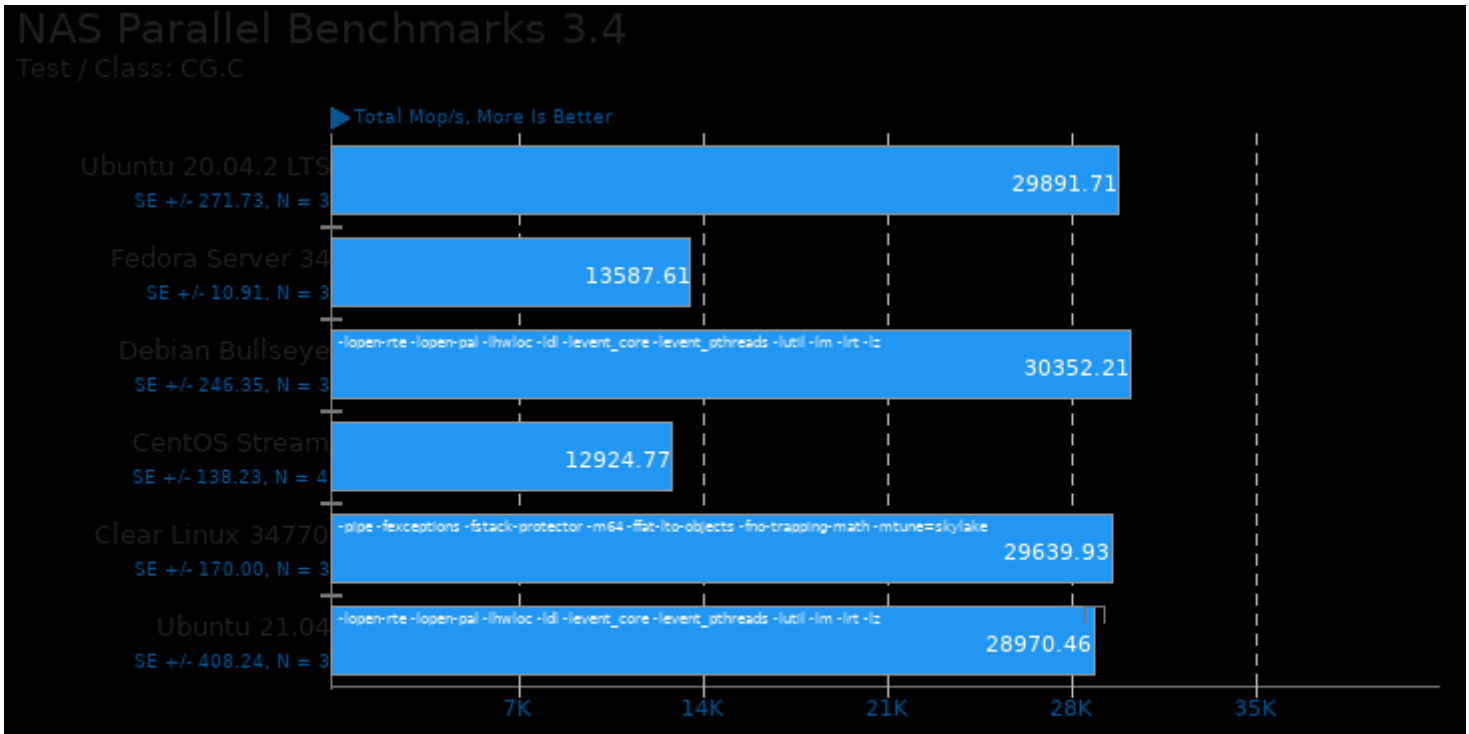

Mobile Neural Network 1.2
Model: SqueezeNetV1.0
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.096, N = 5
MIN: 5.73 / MAX: 12.28
6.094
Fedora Server 34
SE +/- 0.049, N = 15
MIN: 5.34 / MAX: 18.22
5.767
Debian 10.10
SE +/- 0.099, N = 12
MIN: 5.64 / MAX: 13.73
6.326
Debian Bullseye
SE +/- 0.094, N = 15
MIN: 5.43 / MAX: 24.5
6.204
CentOS Stream
SE +/- 0.088, N = 3
MIN: 6.24 / MAX: 13.86
6.776
Clear Linux 34770
SE +/- 0.116, N = 15
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake - MIN: 5.73 / MAX: 9.75
6.539
Ubuntu 21.04
SE +/- 0.027, N = 3
MIN: 6.51 / MAX: 10.52
6.900
2
4
6
8
10
1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fn

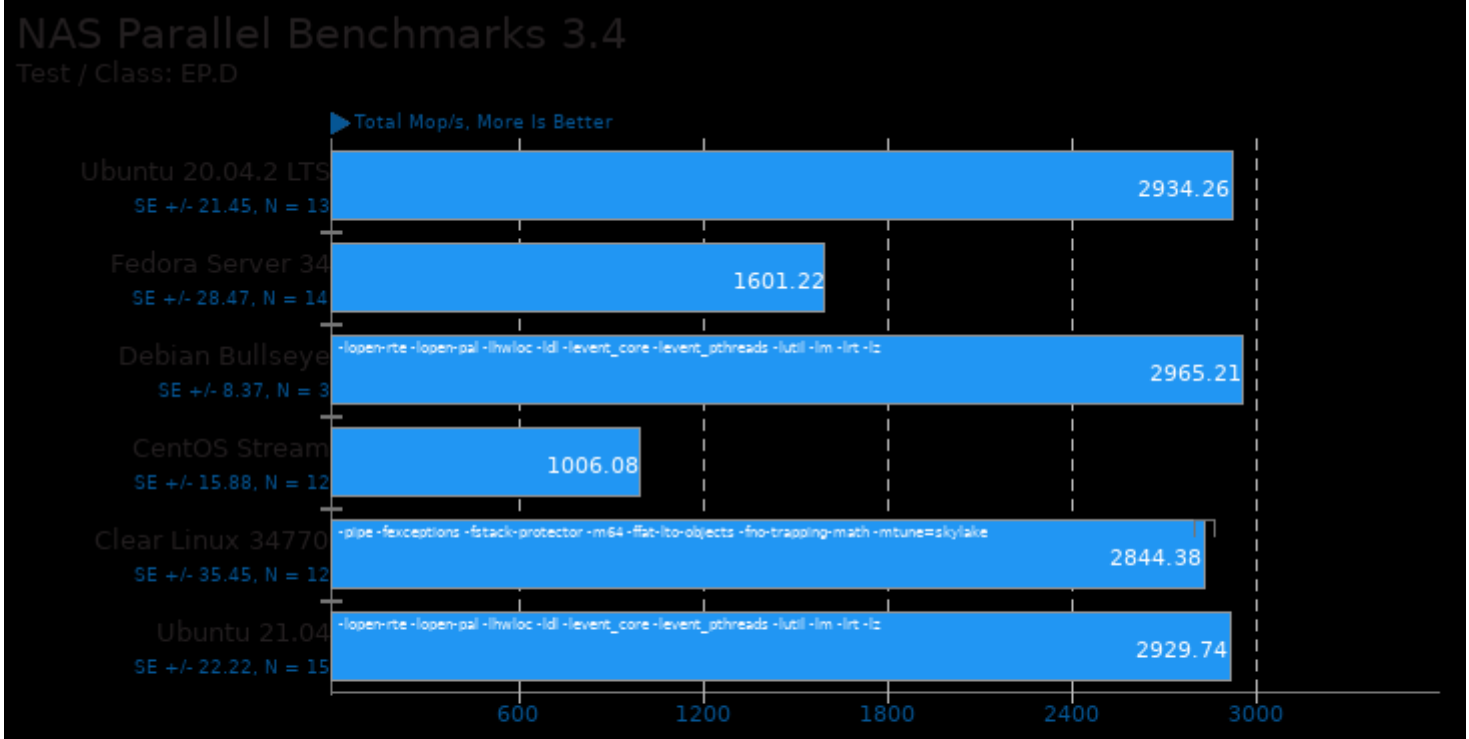

Mobile Neural Network 1.2
Model: MobileNetV2_224
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.095, N = 5
MIN: 3.62 / MAX: 5.86
3.947
Fedora Server 34
SE +/- 0.046, N = 14
MIN: 3.37 / MAX: 43.2
3.975
Debian 10.10
SE +/- 0.072, N = 12
MIN: 3.8 / MAX: 6.21
4.242
Debian Bullseye
SE +/- 0.107, N = 15
MIN: 3.48 / MAX: 7.15
4.034
CentOS Stream
SE +/- 0.051, N = 3
MIN: 3.78 / MAX: 21.47
4.275
Clear Linux 34770
SE +/- 0.078, N = 15
-pipe -fexceptions -fstack-protector -m64 -flto=auto -ffat-lto-objects -fno-trapping-math -mtune=skylake -
4.026
Ubuntu 21.04
SE +/- 0.025, N = 3
MIN: 3.85 / MAX: 8.92
3.955
0.9619
1.9238
2.8857
3.8476
4.8095
1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti

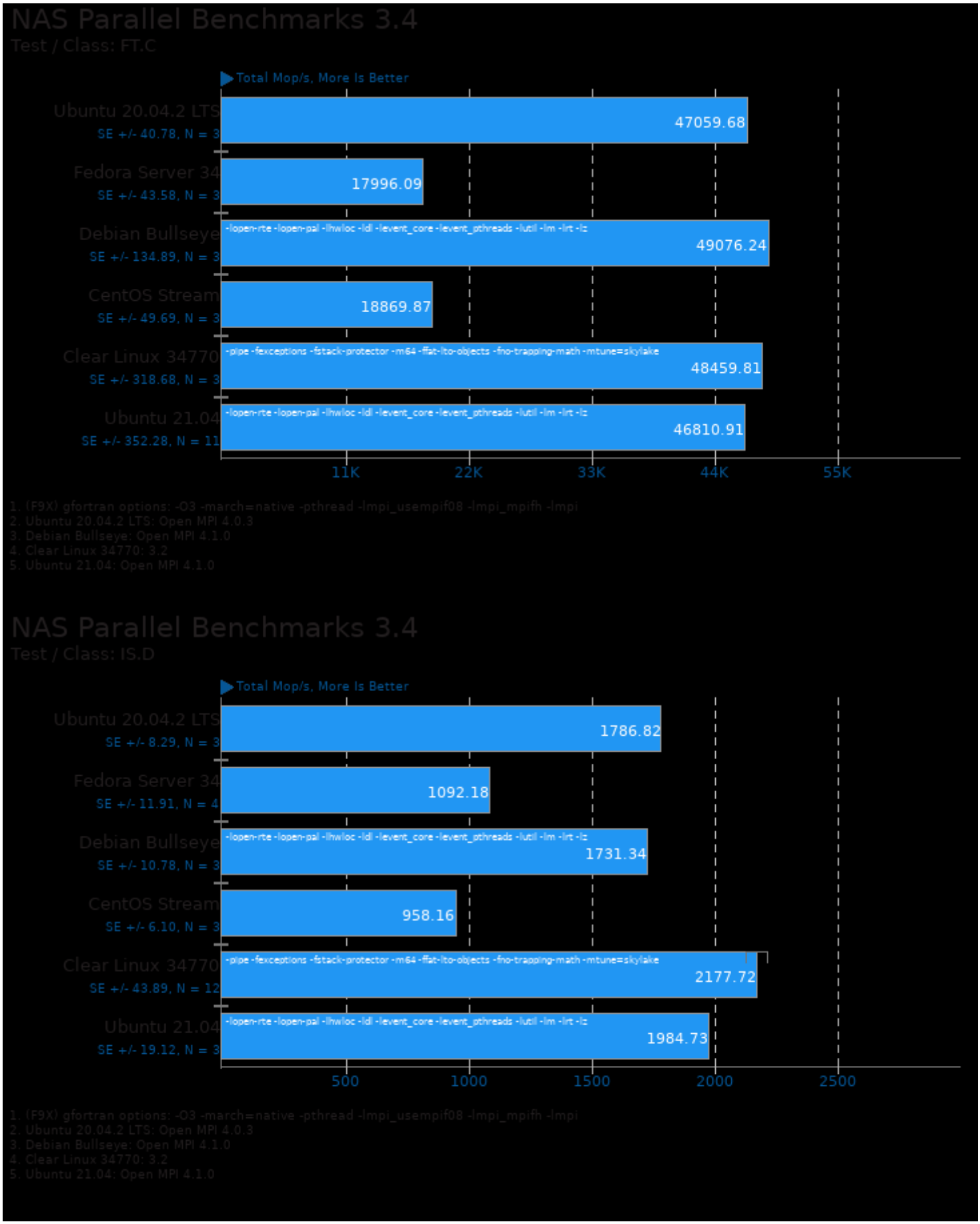

Mobile Neural Network 1.2
Model: mobilenet-v1-1.0
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.077, N = 5
MIN: 2.57 / MAX: 7.42
2.849
Fedora Server 34
SE +/- 0.057, N = 15
MIN: 2.55 / MAX: 7.14
2.894
Debian 10.10
SE +/- 0.086, N = 12
MIN: 2.98 / MAX: 5.1
3.482
Debian Bullseye
SE +/- 0.083, N = 15
MIN: 2.99 / MAX: 6.12
3.796
CentOS Stream
SE +/- 0.195, N = 3
MIN: 2.63 / MAX: 4.03
2.932
Clear Linux 34770
SE +/- 0.082, N = 15
-pipe -fexceptions -fstack-protector -m64 -flto=4 -flto-odr-type-merging -fno-trapping-math -mtune=skylake
MIN: 2.55 / MAX: 34.68
2.981
Ubuntu 21.04
SE +/- 0.013, N = 3
MIN: 2.67 / MAX: 3.88
2.734
0.8541
1.7082
2.5623
3.4164
4.2705
1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fn

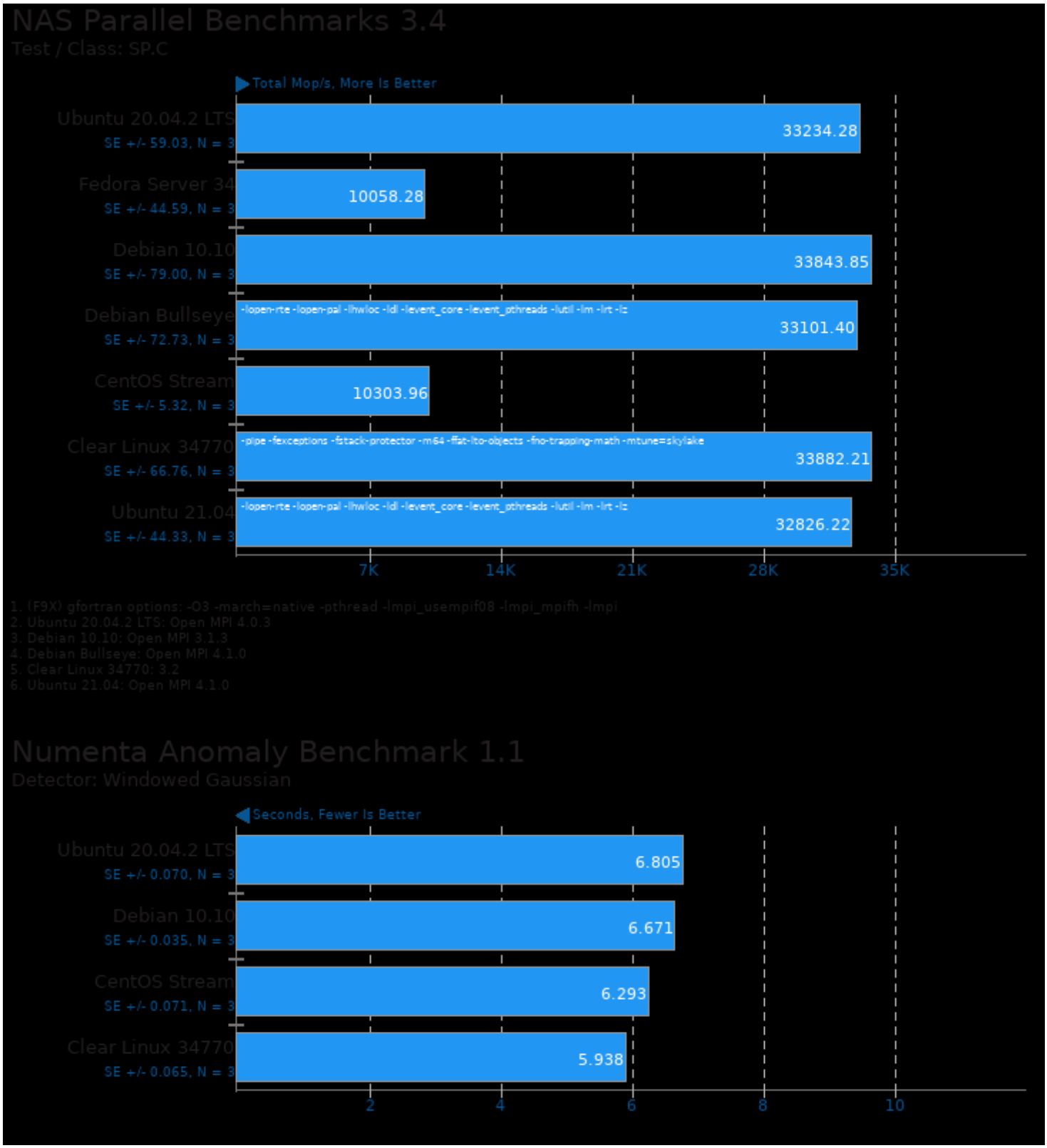

Mobile Neural Network 1.2
Model: inception-v3
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.22, N = 5
MIN: 23.32 / MAX: 78.89
24.36
Fedora Server 34
SE +/- 0.14, N = 15
MIN: 21.09 / MAX: 293.57
22.60
Debian 10.10
SE +/- 0.23, N = 12
MIN: 23.92 / MAX: 128.7
26.47
Debian Bullseye
SE +/- 0.10, N = 15
MIN: 25.83 / MAX: 133.2
27.65
CentOS Stream
SE +/- 0.33, N = 3
MIN: 26.2 / MAX: 115.35
27.52
Clear Linux 34770
SE +/- 0.24, N = 15
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake - MIN: 22.09 / MAX: 118.52
23.75
Ubuntu 21.04
SE +/- 0.18, N = 3
MIN: 23.37 / MAX: 128.04
24.42
7
14
21
28
35
1. (CXX) g++ options: -std=c++11 -O3 -fvisibility=hidden -fomit-frame-pointer -fstrict-aliasing -ffunction-sections -fdata-sections -ffast-math -fno-rtti -fn
NAMD 2.14
ATPase Simulation - 327,506 Atoms
days/ns, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.00041, N = 3
0.67252
Fedora Server 34
SE +/- 0.00051, N = 3
0.67355
Debian 10.10
SE +/- 0.00019, N = 3
0.67193
Debian Bullseye
SE +/- 0.00045, N = 3
0.67131
CentOS Stream
SE +/- 0.00027, N = 3
0.67415
Clear Linux 34770
SE +/- 0.00015, N = 3
0.67373
Ubuntu 21.04
SE +/- 0.00361, N = 3
0.67638
0.1522
0.3044
0.4566
0.6088
0.761

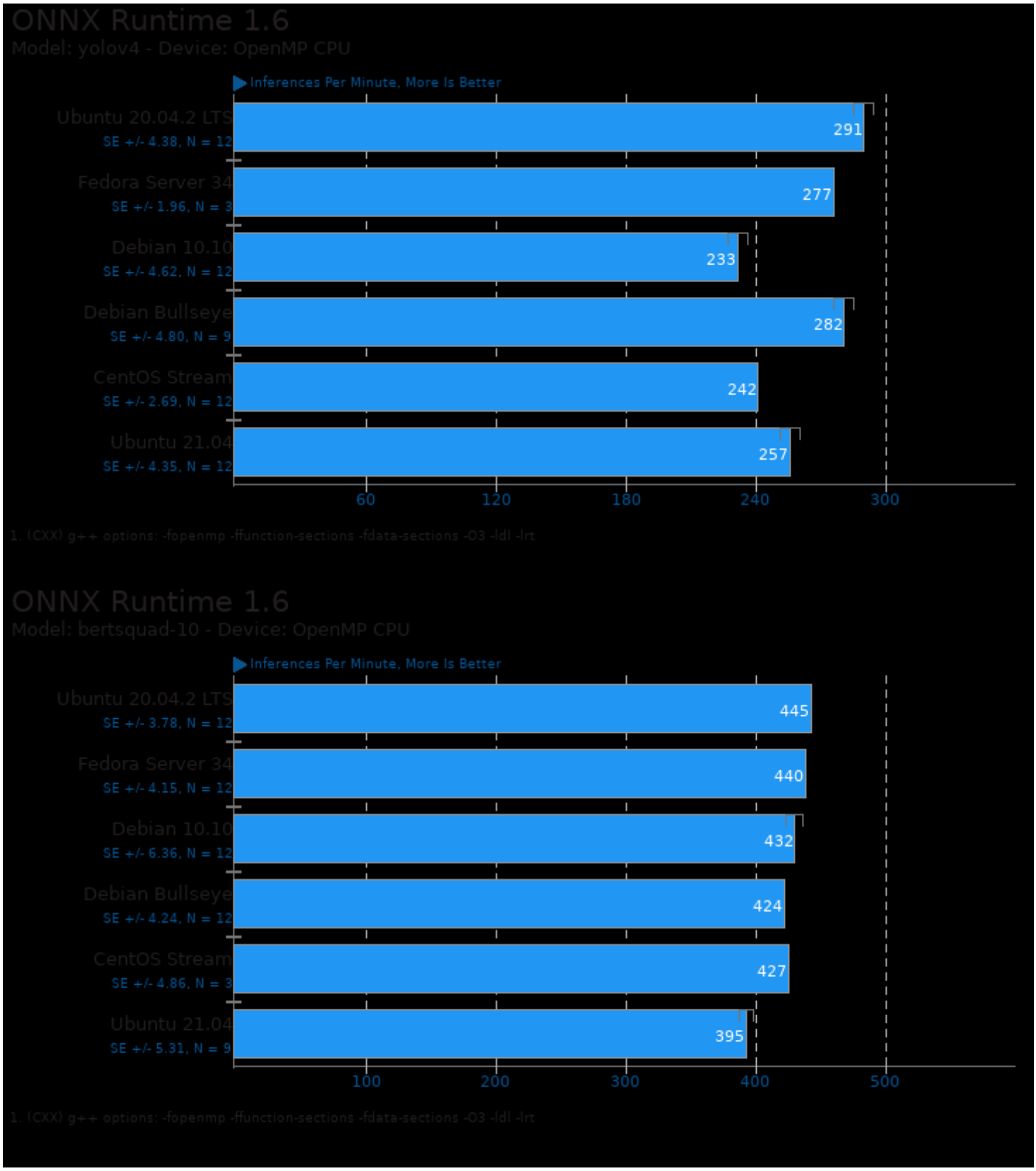

NAS Parallel Benchmarks 3.4
Test / Class: BT.C
Total Mop/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 203.96, N = 3
87954.98
Fedora Server 34
SE +/- 482.34, N = 9
20507.55
Debian 10.10
SE +/- 319.12, N = 3
87888.38
Debian Bullseye
SE +/- 44.18, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
89192.77
CentOS Stream
SE +/- 4.57, N = 3
21314.04
Clear Linux 34770
SE +/- 114.01, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
87029.15
Ubuntu 21.04
SE +/- 108.57, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
87240.05
20K
40K
60K
80K
100K
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Ubuntu 20.04.2 LTS: Open MPI 4.0.3
3. Debian 10.10: Open MPI 3.1.3
4. Debian Bullseye: Open MPI 4.1.0
5. Clear Linux 34770: 3.2
6. Ubuntu 21.04: Open MPI 4.1.0

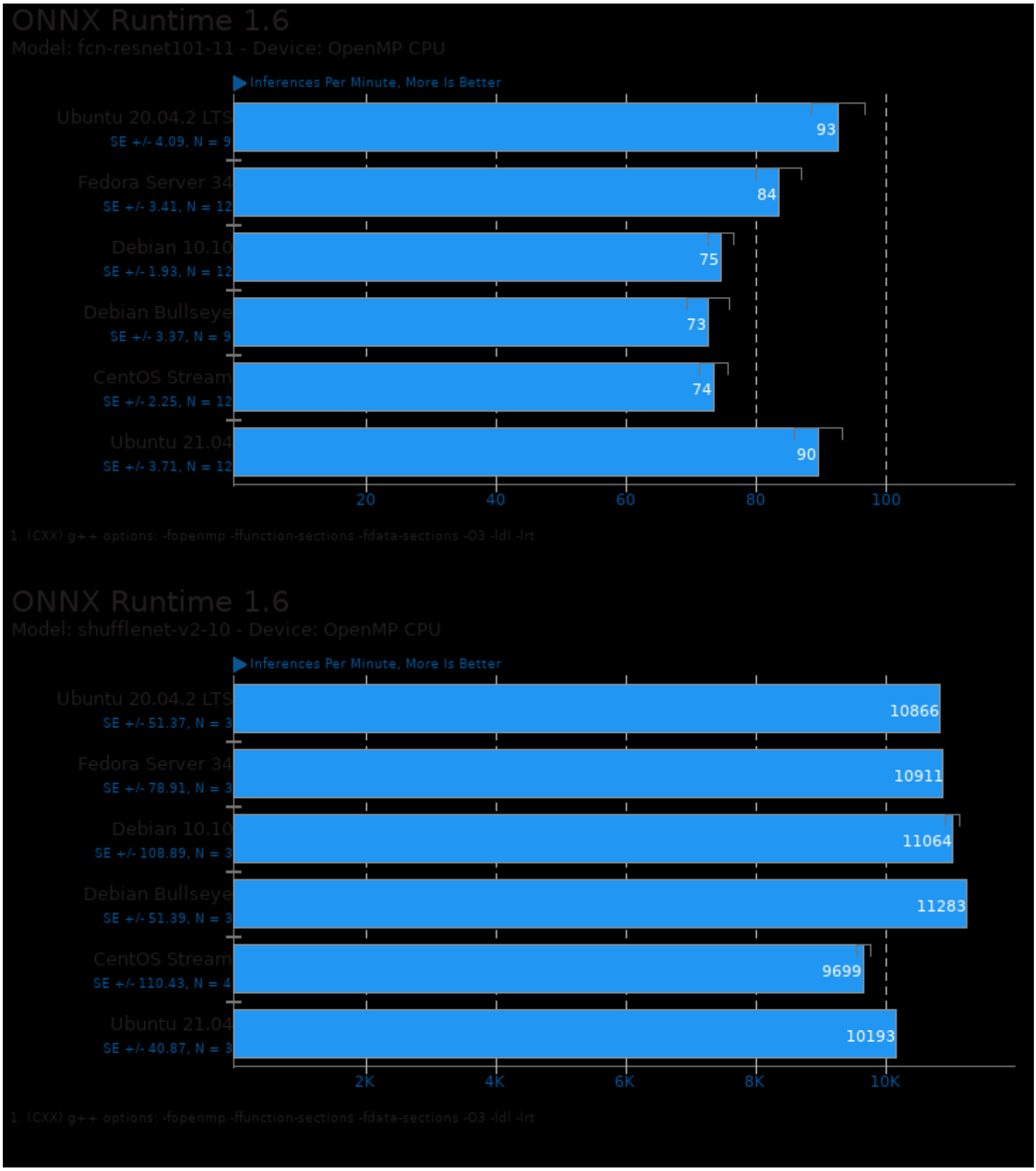

NAS Parallel Benchmarks 3.4
Test / Class: CG.C
Total Mop/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 271.73, N = 3
29891.71
Fedora Server 34
SE +/- 10.91, N = 3
13587.61
Debian Bullseye
SE +/- 246.35, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
30352.21
CentOS Stream
SE +/- 138.23, N = 4
12924.77
Clear Linux 34770
SE +/- 170.00, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
29639.93
Ubuntu 21.04
SE +/- 408.24, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
28970.46
7K
14K
21K
28K
35K
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Ubuntu 20.04.2 LTS: Open MPI 4.0.3
3. Debian Bullseye: Open MPI 4.1.0
4. Clear Linux 34770: 3.2
5. Ubuntu 21.04: Open MPI 4.1.0

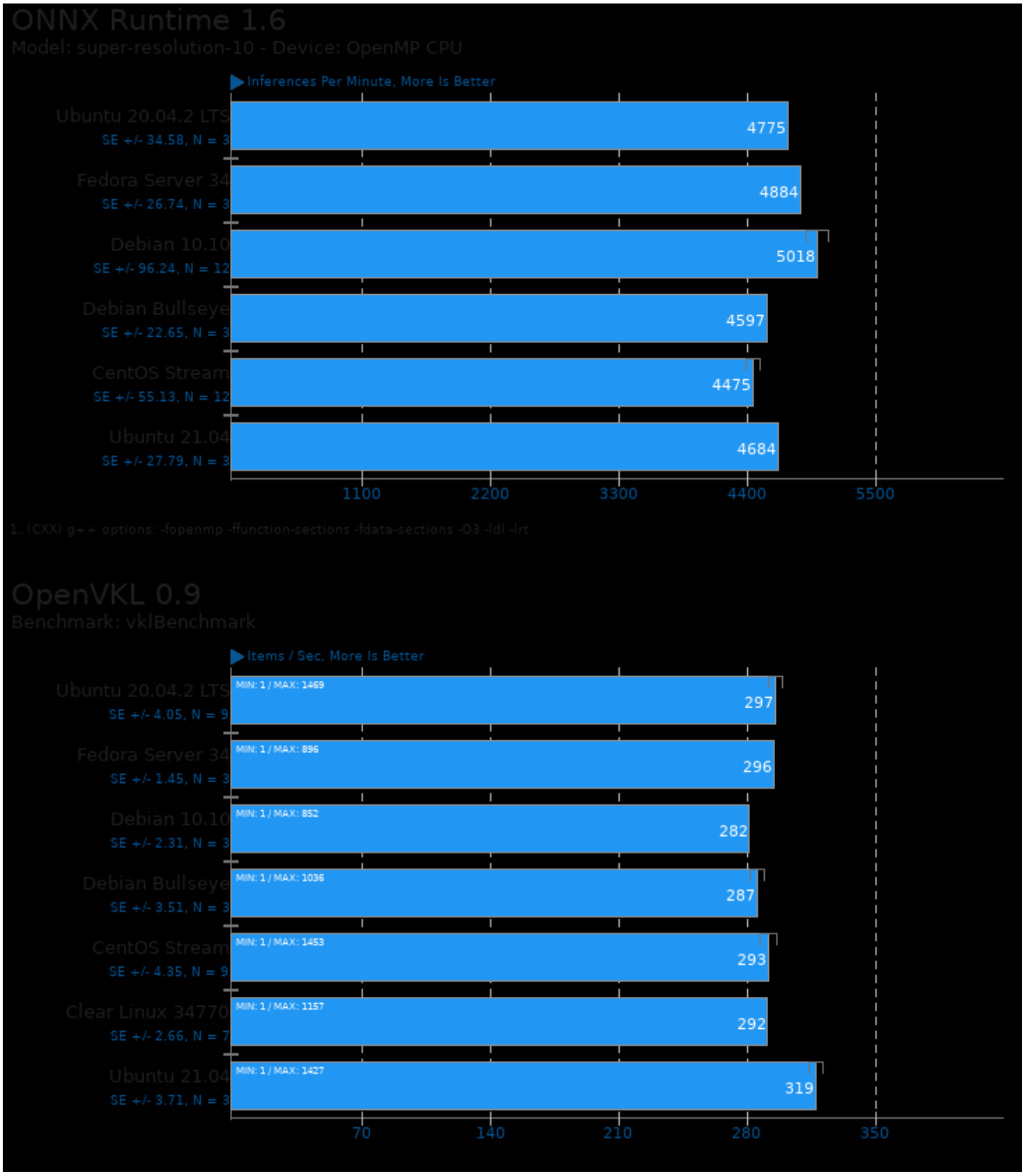

NAS Parallel Benchmarks 3.4
Test / Class: EP.D
Total Mop/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 21.45, N = 13
2934.26
Fedora Server 34
SE +/- 28.47, N = 14
1601.22
Debian Bullseye
SE +/- 8.37, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
2965.21
CentOS Stream
SE +/- 15.88, N = 12
1006.08
Clear Linux 34770
SE +/- 35.45, N = 12
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
2844.38
Ubuntu 21.04
SE +/- 22.22, N = 15
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
2929.74
600
1200
1800
2400
3000
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Ubuntu 20.04.2 LTS: Open MPI 4.0.3
3. Debian Bullseye: Open MPI 4.1.0
4. Clear Linux 34770: 3.2
5. Ubuntu 21.04: Open MPI 4.1.0

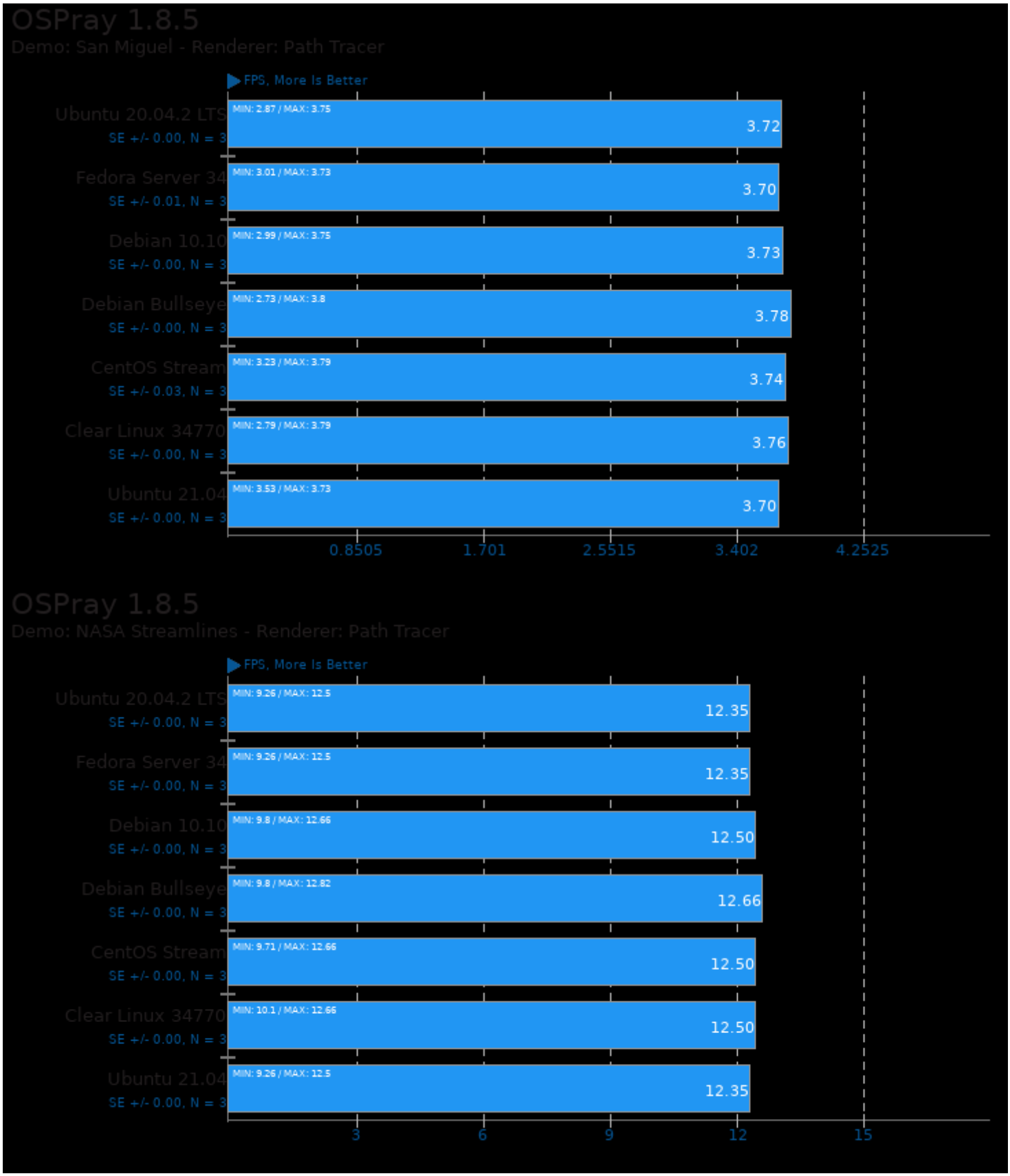

NAS Parallel Benchmarks 3.4
Test / Class: FT.C
Total Mop/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 40.78, N = 3
47059.68
Fedora Server 34
SE +/- 43.58, N = 3
17996.09
Debian Bullseye
SE +/- 134.89, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
49076.24
CentOS Stream
SE +/- 49.69, N = 3
18869.87
Clear Linux 34770
SE +/- 318.68, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
48459.81
Ubuntu 21.04
SE +/- 352.28, N = 11
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
46810.91
11K
22K
33K
44K
55K
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Ubuntu 20.04.2 LTS: Open MPI 4.0.3
3. Debian Bullseye: Open MPI 4.1.0
4. Clear Linux 34770: 3.2
5. Ubuntu 21.04: Open MPI 4.1.0
NAS Parallel Benchmarks 3.4
Test / Class: IS.D
Total Mop/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 8.29, N = 3
1786.82
Fedora Server 34
SE +/- 11.91, N = 4
1092.18
Debian Bullseye
SE +/- 10.78, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
1731.34
CentOS Stream
SE +/- 6.10, N = 3
958.16
Clear Linux 34770
SE +/- 43.89, N = 12
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
2177.72
Ubuntu 21.04
SE +/- 19.12, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
1984.73
500
1000
1500
2000
2500
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Ubuntu 20.04.2 LTS: Open MPI 4.0.3
3. Debian Bullseye: Open MPI 4.1.0
4. Clear Linux 34770: 3.2
5. Ubuntu 21.04: Open MPI 4.1.0

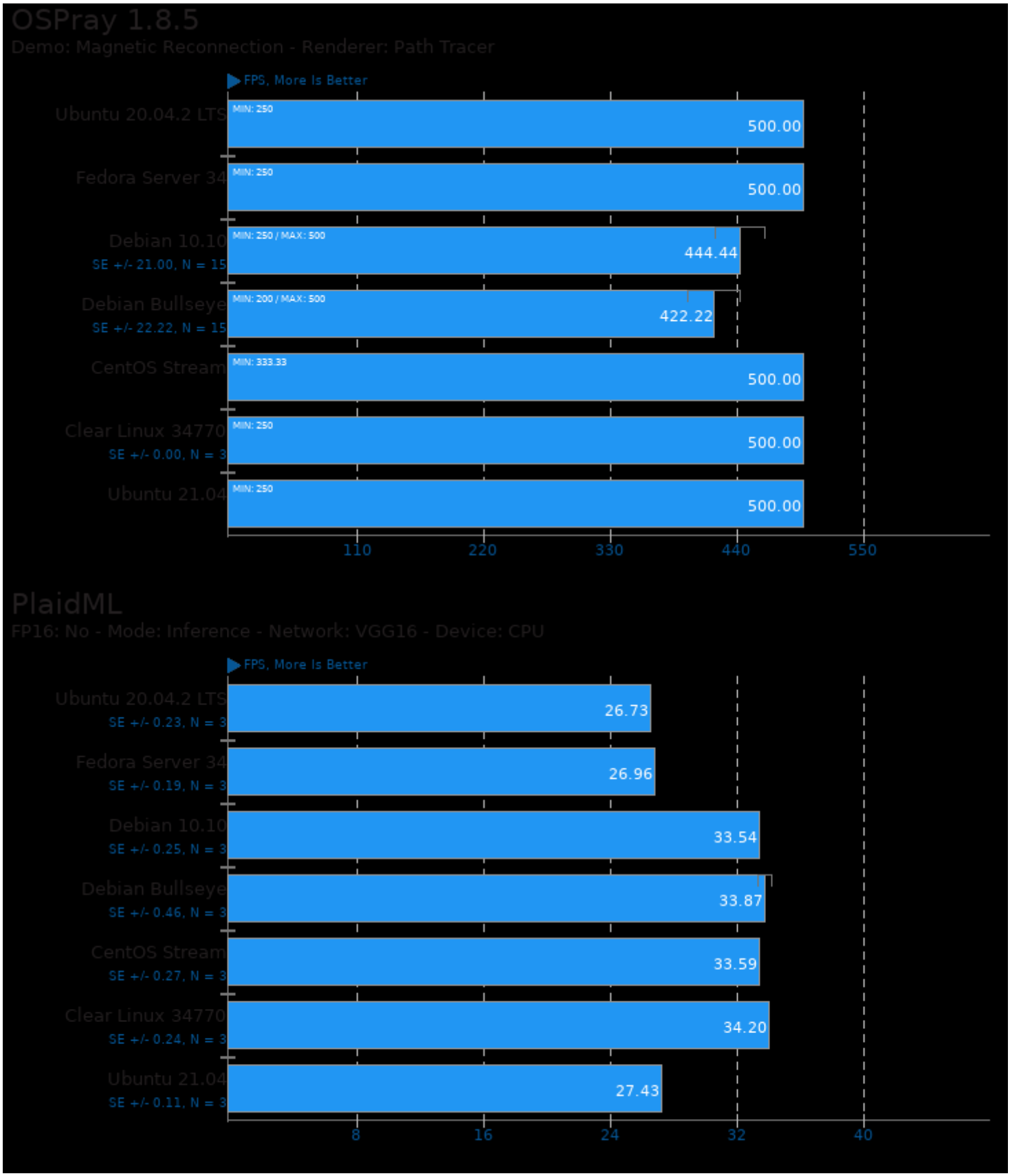

NAS Parallel Benchmarks 3.4
Test / Class: SP.C
Total Mop/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 59.03, N = 3
33234.28
Fedora Server 34
SE +/- 44.59, N = 3
10058.28
Debian 10.10
SE +/- 79.00, N = 3
33843.85
Debian Bullseye
SE +/- 72.73, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
33101.40
CentOS Stream
SE +/- 5.32, N = 3
10303.96
Clear Linux 34770
SE +/- 66.76, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
33882.21
Ubuntu 21.04
SE +/- 44.33, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
32826.22
7K
14K
21K
28K
35K
1. (F9X) gfortran options: -O3 -march=native -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi
2. Ubuntu 20.04.2 LTS: Open MPI 4.0.3
3. Debian 10.10: Open MPI 3.1.3
4. Debian Bullseye: Open MPI 4.1.0
5. Clear Linux 34770: 3.2
6. Ubuntu 21.04: Open MPI 4.1.0
Numenta Anomaly Benchmark 1.1
Detector: Windowed Gaussian
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.070, N = 3
6.805
Debian 10.10
SE +/- 0.035, N = 3
6.671
CentOS Stream
SE +/- 0.071, N = 3
6.293
Clear Linux 34770
SE +/- 0.065, N = 3
5.938
2
4
6
8
10

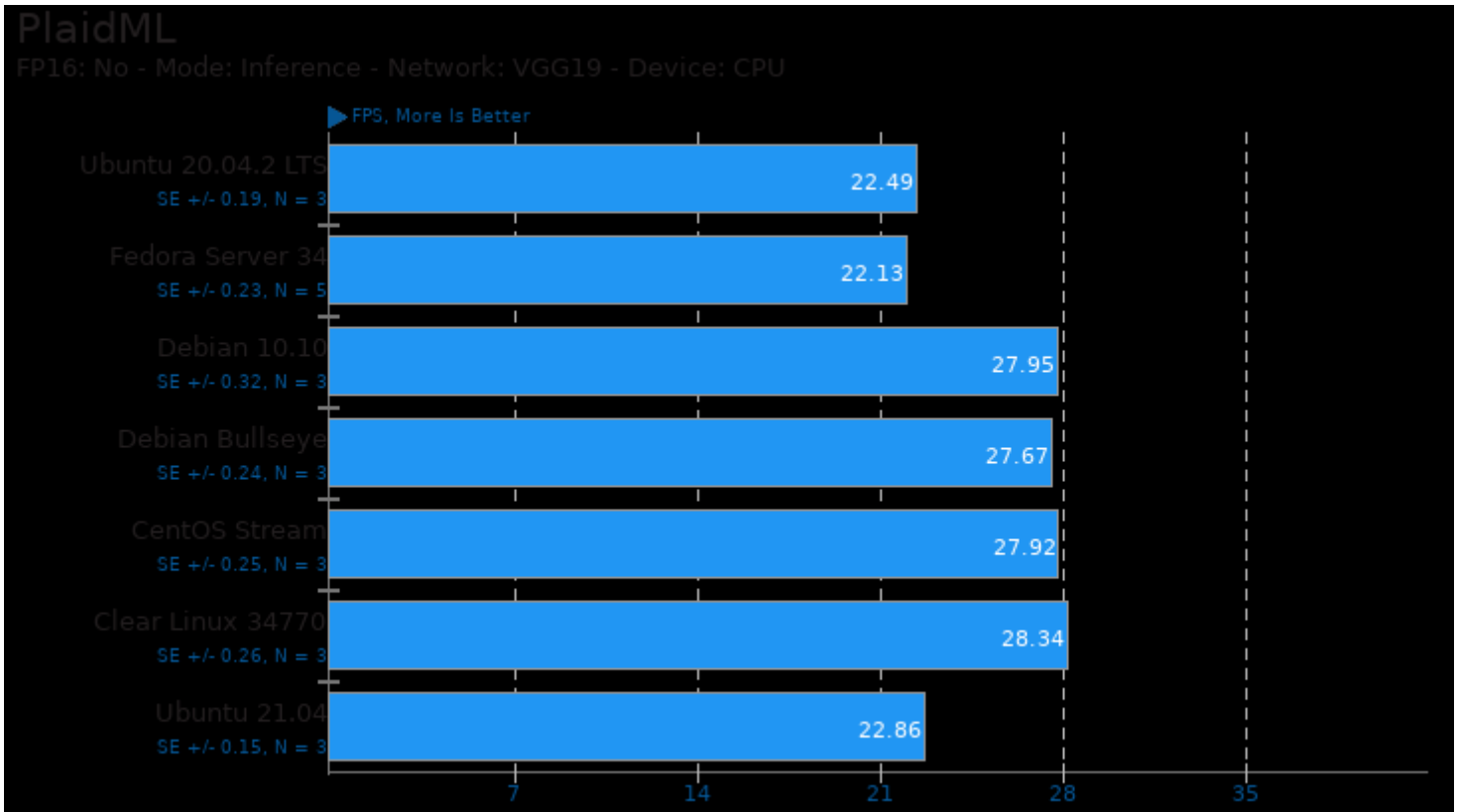

ONNX Runtime 1.6
Model: yolov4 - Device: OpenMP CPU
Inferences Per Minute, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 4.38, N = 12
291
Fedora Server 34
SE +/- 1.96, N = 3
277
Debian 10.10
SE +/- 4.62, N = 12
233
Debian Bullseye
SE +/- 4.80, N = 9
282
CentOS Stream
SE +/- 2.69, N = 12
242
Ubuntu 21.04
SE +/- 4.35, N = 12
257
60
120
180
240
300
1. (CXX) g++ options: -fopenmp -ffunction-sections -fdata-sections -O3 -ldl -lrt
ONNX Runtime 1.6
Model: bertsquad-10 - Device: OpenMP CPU
Inferences Per Minute, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 3.78, N = 12
445
Fedora Server 34
SE +/- 4.15, N = 12
440
Debian 10.10
SE +/- 6.36, N = 12
432
Debian Bullseye
SE +/- 4.24, N = 12
424
CentOS Stream
SE +/- 4.86, N = 3
427
Ubuntu 21.04
SE +/- 5.31, N = 9
395
100
200
300
400
500
1. (CXX) g++ options: -fopenmp -ffunction-sections -fdata-sections -O3 -ldl -lrt

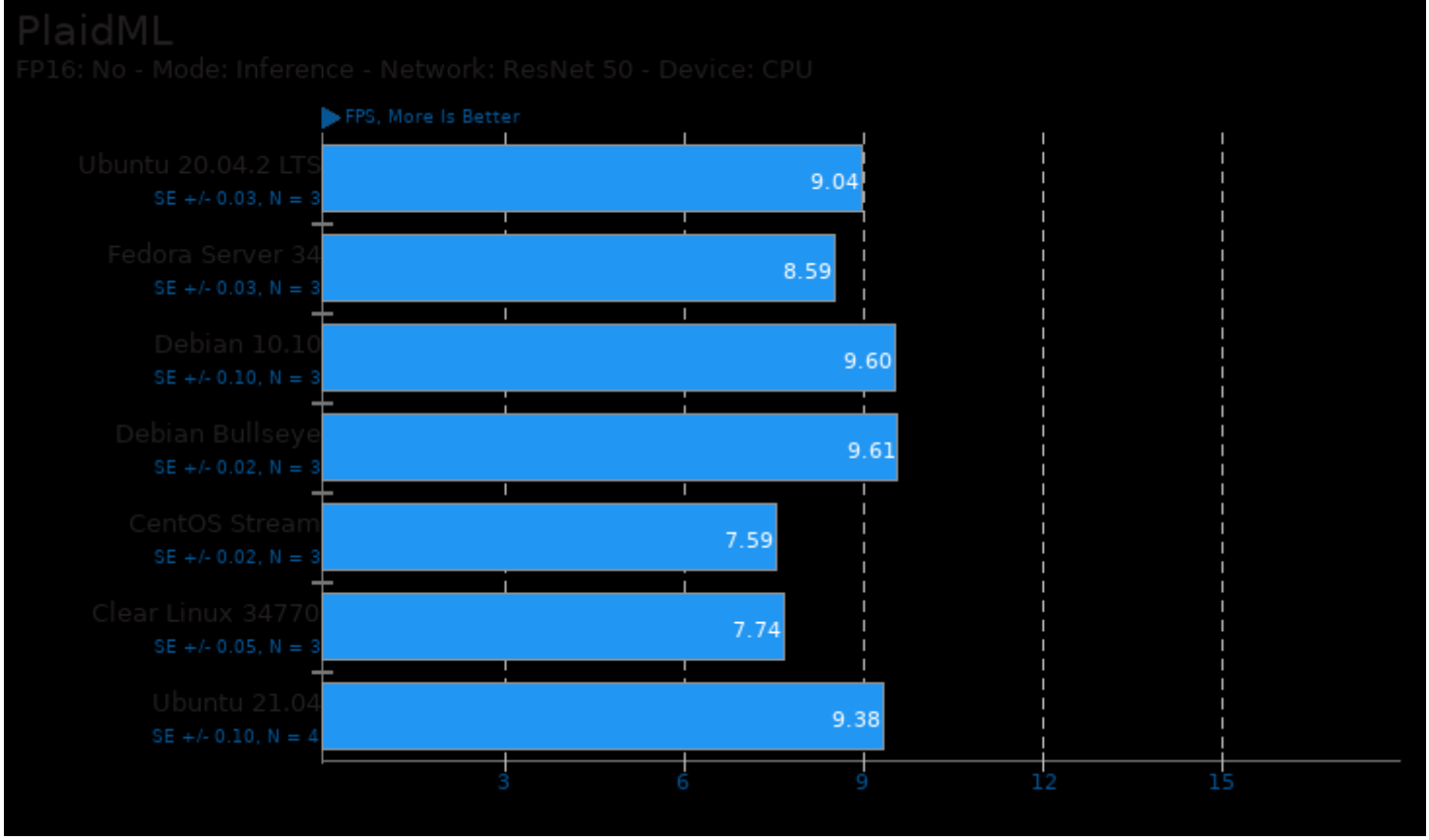

ONNX Runtime 1.6
Model: fcn-resnet101-11 - Device: OpenMP CPU
Inferences Per Minute, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 4.09, N = 9
93
Fedora Server 34
SE +/- 3.41, N = 12
84
Debian 10.10
SE +/- 1.93, N = 12
75
Debian Bullseye
SE +/- 3.37, N = 9
73
CentOS Stream
SE +/- 2.25, N = 12
74
Ubuntu 21.04
SE +/- 3.71, N = 12
90
20
40
60
80
100
1. (CXX) g++ options: -fopenmp -ffunction-sections -fdata-sections -O3 -ldl -lrt
ONNX Runtime 1.6
Model: shufflenet-v2-10 - Device: OpenMP CPU
Inferences Per Minute, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 51.37, N = 3
10866
Fedora Server 34
SE +/- 78.91, N = 3
10911
Debian 10.10
SE +/- 108.89, N = 3
11064
Debian Bullseye
SE +/- 51.39, N = 3
11283
CentOS Stream
SE +/- 110.43, N = 4
9699
Ubuntu 21.04
SE +/- 40.87, N = 3
10193
2K
4K
6K
8K
10K
1. (CXX) g++ options: -fopenmp -ffunction-sections -fdata-sections -O3 -ldl -lrt

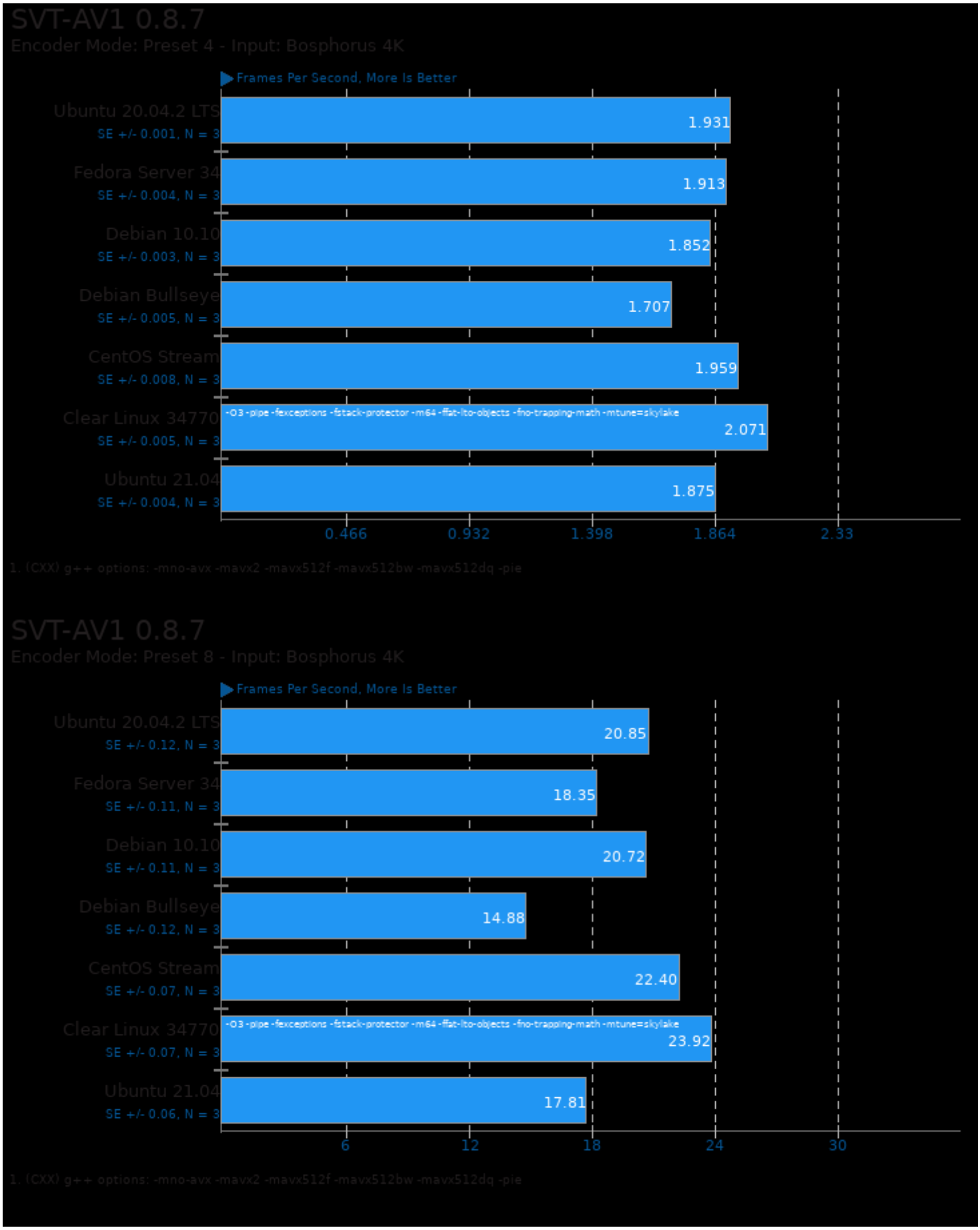

ONNX Runtime 1.6
Model: super-resolution-10 - Device: OpenMP CPU
Inferences Per Minute, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 34.58, N = 3
4775
Fedora Server 34
SE +/- 26.74, N = 3
4884
Debian 10.10
SE +/- 96.24, N = 12
5018
Debian Bullseye
SE +/- 22.65, N = 3
4597
CentOS Stream
SE +/- 55.13, N = 12
4475
Ubuntu 21.04
SE +/- 27.79, N = 3
4684
1100
2200
3300
4400
5500
1. (CXX) g++ options: -fopenmp -ffunction-sections -fdata-sections -O3 -ldl -lrt
OpenVKL 0.9
Benchmark: vklBenchmark
Items / Sec, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 4.05, N = 9
MIN: 1 / MAX: 1469
297
Fedora Server 34
SE +/- 1.45, N = 3
MIN: 1 / MAX: 896
296
Debian 10.10
SE +/- 2.31, N = 3
MIN: 1 / MAX: 852
282
Debian Bullseye
SE +/- 3.51, N = 3
MIN: 1 / MAX: 1036
287
CentOS Stream
SE +/- 4.35, N = 9
MIN: 1 / MAX: 1453
293
Clear Linux 34770
SE +/- 2.66, N = 7
MIN: 1 / MAX: 1157
292
Ubuntu 21.04
SE +/- 3.71, N = 3
MIN: 1 / MAX: 1427
319
70
140
210
280
350

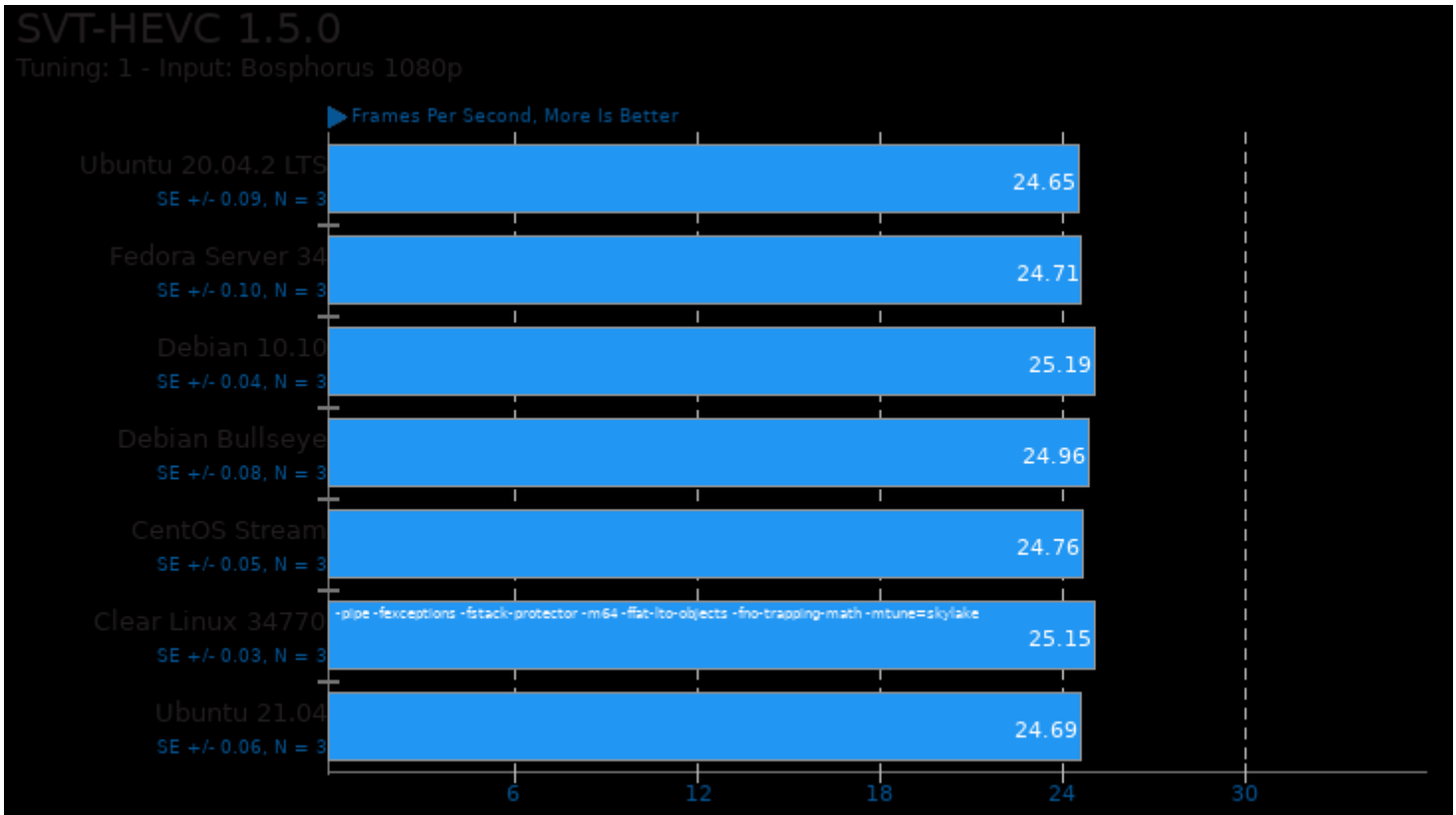

OSPray 1.8.5
Demo: San Miguel - Renderer: Path Tracer
FPS, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.00, N = 3
MIN: 2.87 / MAX: 3.75
3.72
Fedora Server 34
SE +/- 0.01, N = 3
MIN: 3.01 / MAX: 3.73
3.70
Debian 10.10
SE +/- 0.00, N = 3
MIN: 2.99 / MAX: 3.75
3.73
Debian Bullseye
SE +/- 0.00, N = 3
MIN: 2.73 / MAX: 3.8
3.78
CentOS Stream
SE +/- 0.03, N = 3
MIN: 3.23 / MAX: 3.79
3.74
Clear Linux 34770
SE +/- 0.00, N = 3
MIN: 2.79 / MAX: 3.79
3.76
Ubuntu 21.04
SE +/- 0.00, N = 3
MIN: 3.53 / MAX: 3.73
3.70
0.8505
1.701
2.5515
3.402
4.2525
OSPray 1.8.5
Demo: NASA Streamlines - Renderer: Path Tracer
FPS, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.00, N = 3
MIN: 9.26 / MAX: 12.5
12.35
Fedora Server 34
SE +/- 0.00, N = 3
MIN: 9.26 / MAX: 12.5
12.35
Debian 10.10
SE +/- 0.00, N = 3
MIN: 9.8 / MAX: 12.66
12.50
Debian Bullseye
SE +/- 0.00, N = 3
MIN: 9.8 / MAX: 12.82
12.66
CentOS Stream
SE +/- 0.00, N = 3
MIN: 9.71 / MAX: 12.66
12.50
Clear Linux 34770
SE +/- 0.00, N = 3
MIN: 10.1 / MAX: 12.66
12.50
Ubuntu 21.04
SE +/- 0.00, N = 3
MIN: 9.26 / MAX: 12.5
12.35
3
6
9
12
15

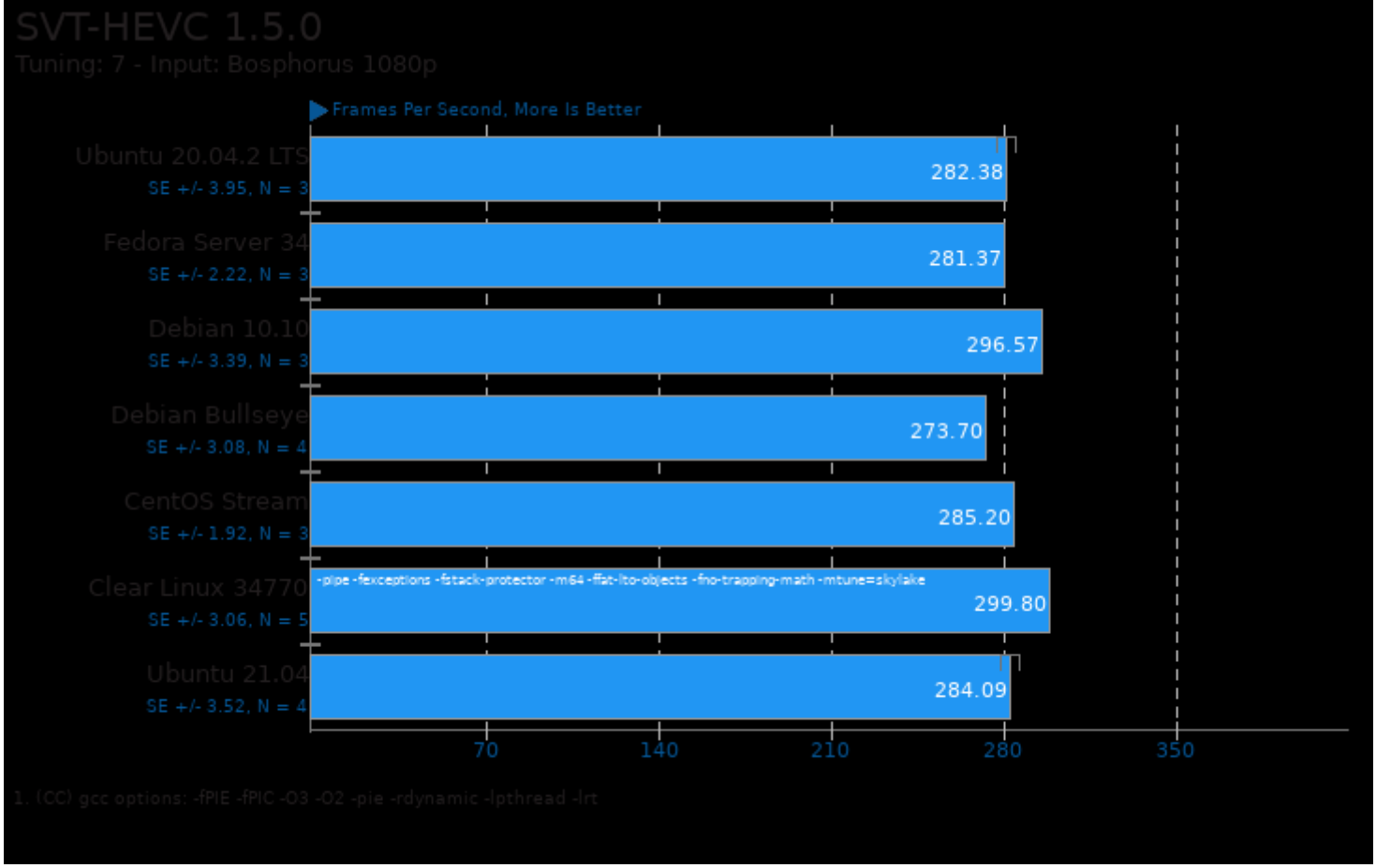

OSPray 1.8.5
Demo: Magnetic Reconnection - Renderer: Path Tracer
FPS, More Is Better
Ubuntu 20.04.2 LTS
MIN: 250
500.00
Fedora Server 34
MIN: 250
500.00
Debian 10.10
SE +/- 21.00, N = 15
MIN: 250 / MAX: 500
444.44
Debian Bullseye
SE +/- 22.22, N = 15
MIN: 200 / MAX: 500
422.22
CentOS Stream
MIN: 333.33
500.00
Clear Linux 34770
SE +/- 0.00, N = 3
MIN: 250
500.00
Ubuntu 21.04
MIN: 250
500.00
110
220
330
440
550
PlaidML
FP16: No - Mode: Inference - Network: VGG16 - Device: CPU
FPS, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.23, N = 3
26.73
Fedora Server 34
SE +/- 0.19, N = 3
26.96
Debian 10.10
SE +/- 0.25, N = 3
33.54
Debian Bullseye
SE +/- 0.46, N = 3
33.87
CentOS Stream
SE +/- 0.27, N = 3
33.59
Clear Linux 34770
SE +/- 0.24, N = 3
34.20
Ubuntu 21.04
SE +/- 0.11, N = 3
27.43
8
16
24
32
40

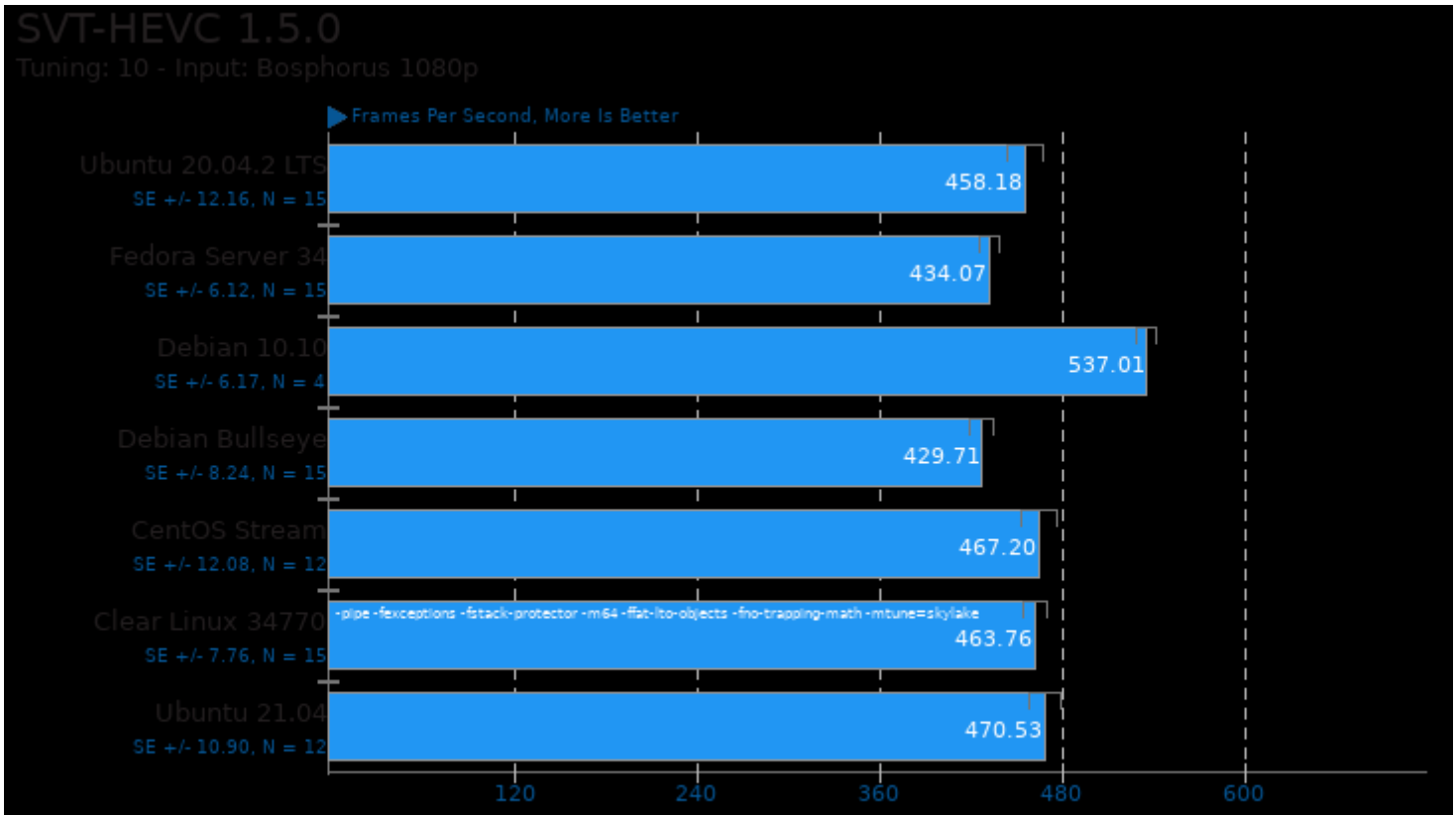

PlaidML
FP16: No - Mode: Inference - Network: VGG19 - Device: CPU
FPS, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.19, N = 3
22.49
Fedora Server 34
SE +/- 0.23, N = 5
22.13
Debian 10.10
SE +/- 0.32, N = 3
27.95
Debian Bullseye
SE +/- 0.24, N = 3
27.67
CentOS Stream
SE +/- 0.25, N = 3
27.92
Clear Linux 34770
SE +/- 0.26, N = 3
28.34
Ubuntu 21.04
SE +/- 0.15, N = 3
22.86
7
14
21
28
35

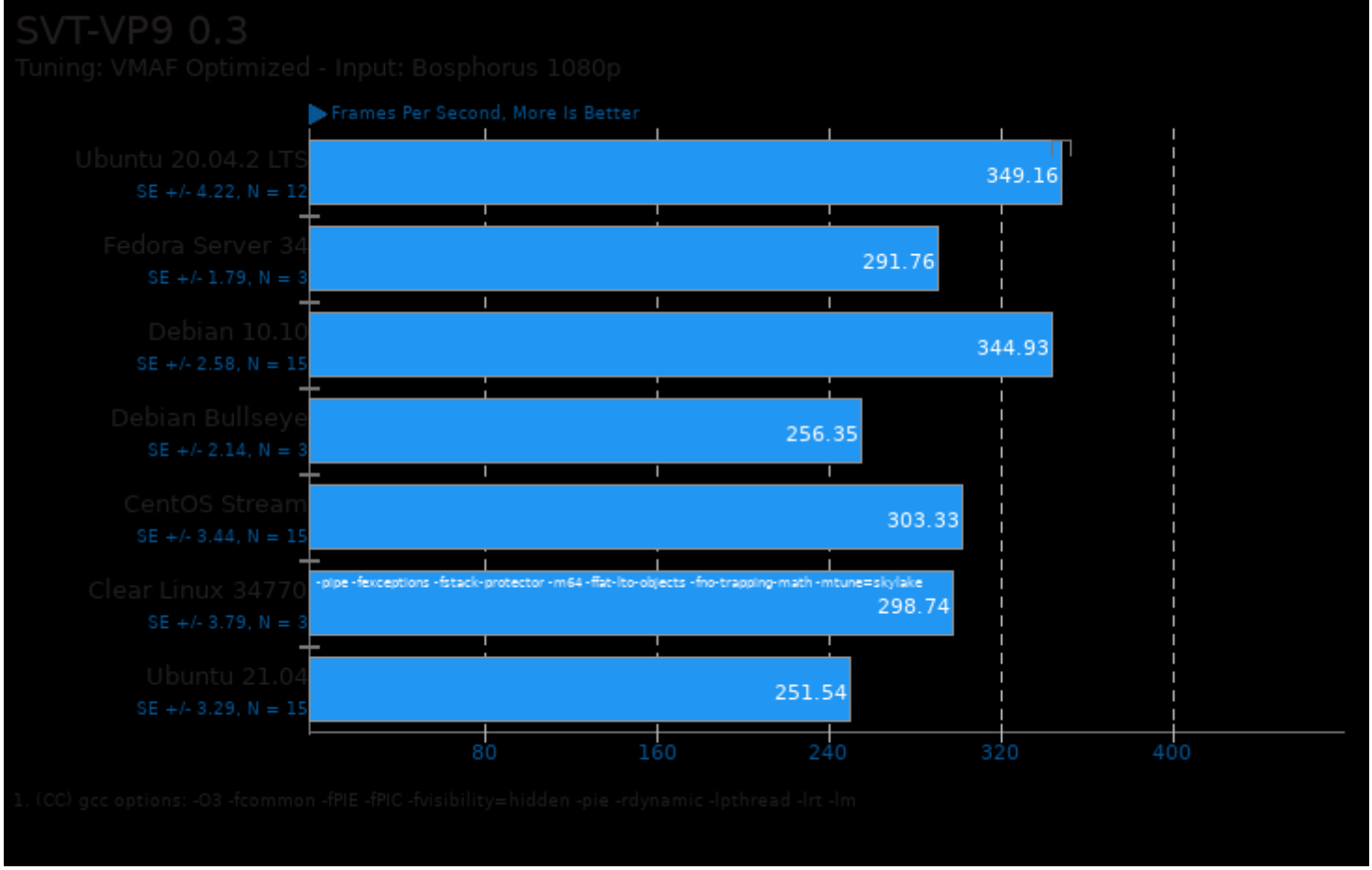

PlaidML
FP16: No - Mode: Inference - Network: ResNet 50 - Device: CPU
FPS, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.03, N = 3
9.04
Fedora Server 34
SE +/- 0.03, N = 3
8.59
Debian 10.10
SE +/- 0.10, N = 3
9.60
Debian Bullseye
SE +/- 0.02, N = 3
9.61
CentOS Stream
SE +/- 0.02, N = 3
7.59
Clear Linux 34770
SE +/- 0.05, N = 3
7.74
Ubuntu 21.04
SE +/- 0.10, N = 4
9.38
3
6
9
12
15

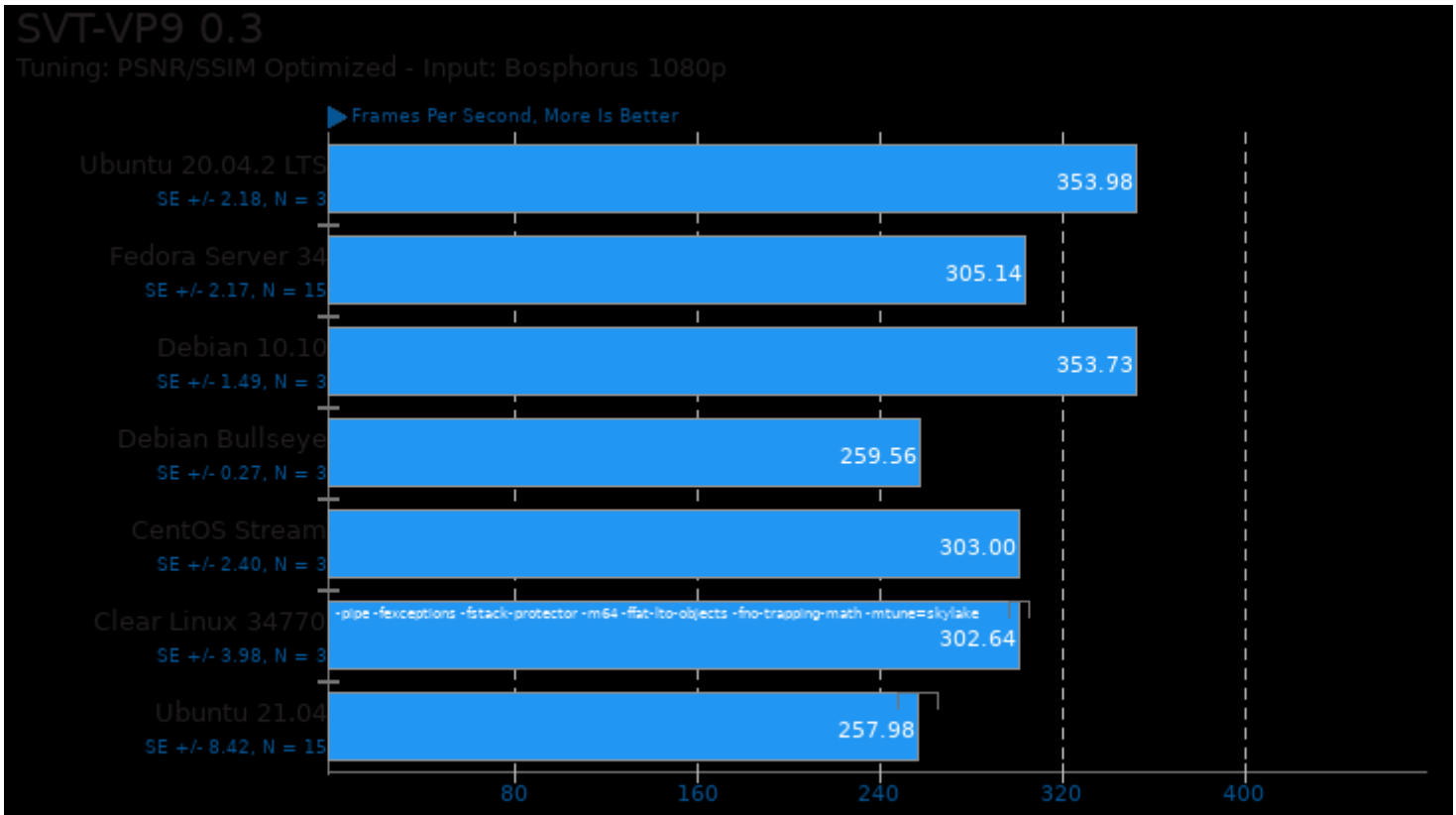

SVT-AV1 0.8.7
Encoder Mode: Preset 4 - Input: Bosphorus 4K
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.001, N = 3
1.931
Fedora Server 34
SE +/- 0.004, N = 3
1.913
Debian 10.10
SE +/- 0.003, N = 3
1.852
Debian Bullseye
SE +/- 0.005, N = 3
1.707
CentOS Stream
SE +/- 0.008, N = 3
1.959
Clear Linux 34770
SE +/- 0.005, N = 3
-O3 -pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
2.071
Ubuntu 21.04
SE +/- 0.004, N = 3
1.875
0.466
0.932
1.398
1.864
2.33
1. (CXX) g++ options: -mno-avx -mavx2 -mavx512f -mavx512bw -mavx512dq -pie
SVT-AV1 0.8.7
Encoder Mode: Preset 8 - Input: Bosphorus 4K
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.12, N = 3
20.85
Fedora Server 34
SE +/- 0.11, N = 3
18.35
Debian 10.10
SE +/- 0.11, N = 3
20.72
Debian Bullseye
SE +/- 0.12, N = 3
14.88
CentOS Stream
SE +/- 0.07, N = 3
22.40
Clear Linux 34770
SE +/- 0.07, N = 3
-O3 -pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
23.92
Ubuntu 21.04
SE +/- 0.06, N = 3
17.81
6
12
18
24
30
1. (CXX) g++ options: -mno-avx -mavx2 -mavx512f -mavx512bw -mavx512dq -pie

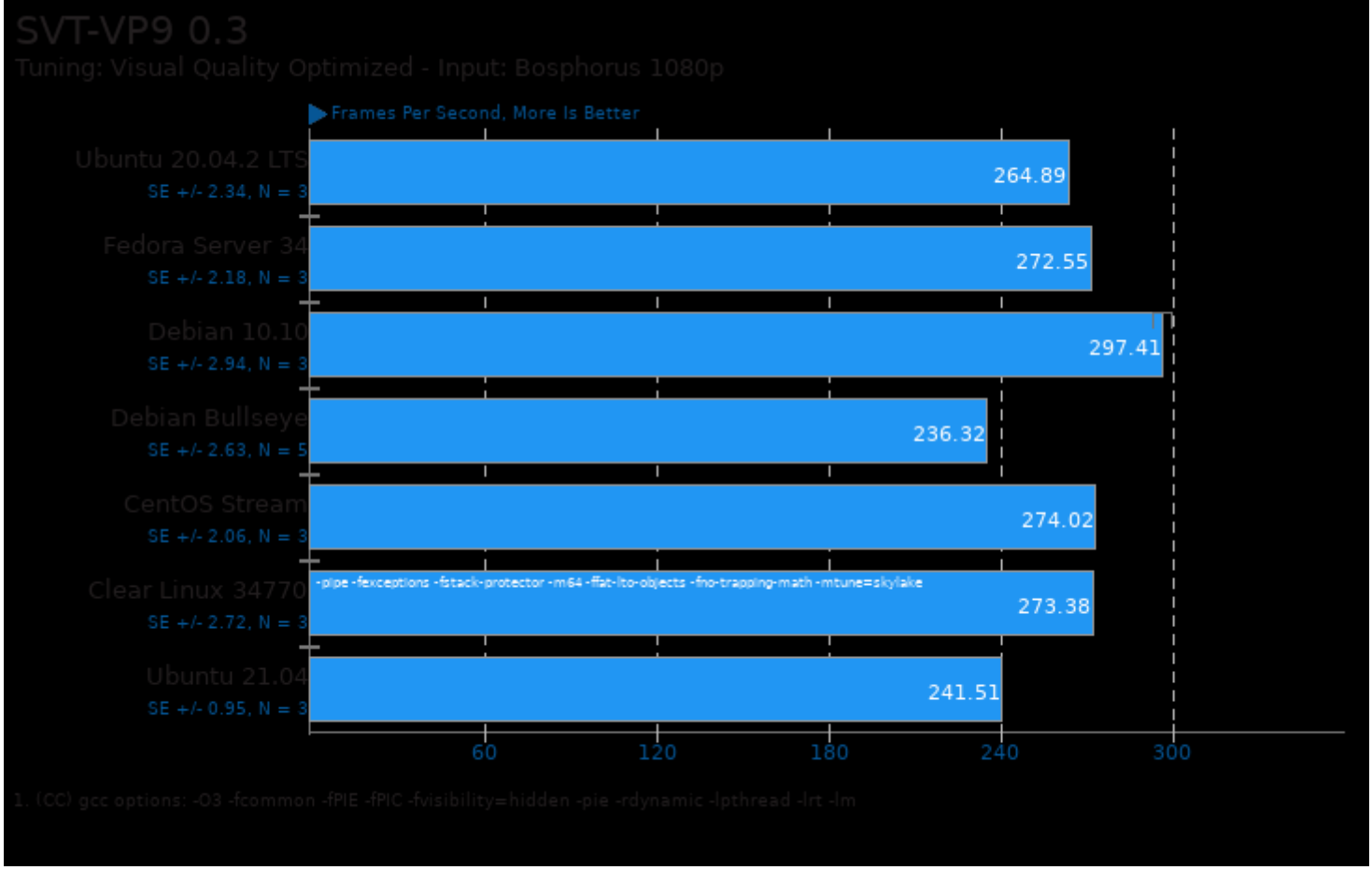

SVT-HEVC 1.5.0
Tuning: 1 - Input: Bosphorus 1080p
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.09, N = 3
24.65
Fedora Server 34
SE +/- 0.10, N = 3
24.71
Debian 10.10
SE +/- 0.04, N = 3
25.19
Debian Bullseye
SE +/- 0.08, N = 3
24.96
CentOS Stream
SE +/- 0.05, N = 3
24.76
Clear Linux 34770
SE +/- 0.03, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
25.15
Ubuntu 21.04
SE +/- 0.06, N = 3
24.69
6
12
18
24
30
1. (CC) gcc options: -fPIE -fPIC -O3 -O2 -pie -rdynamic -lpthread -lrt

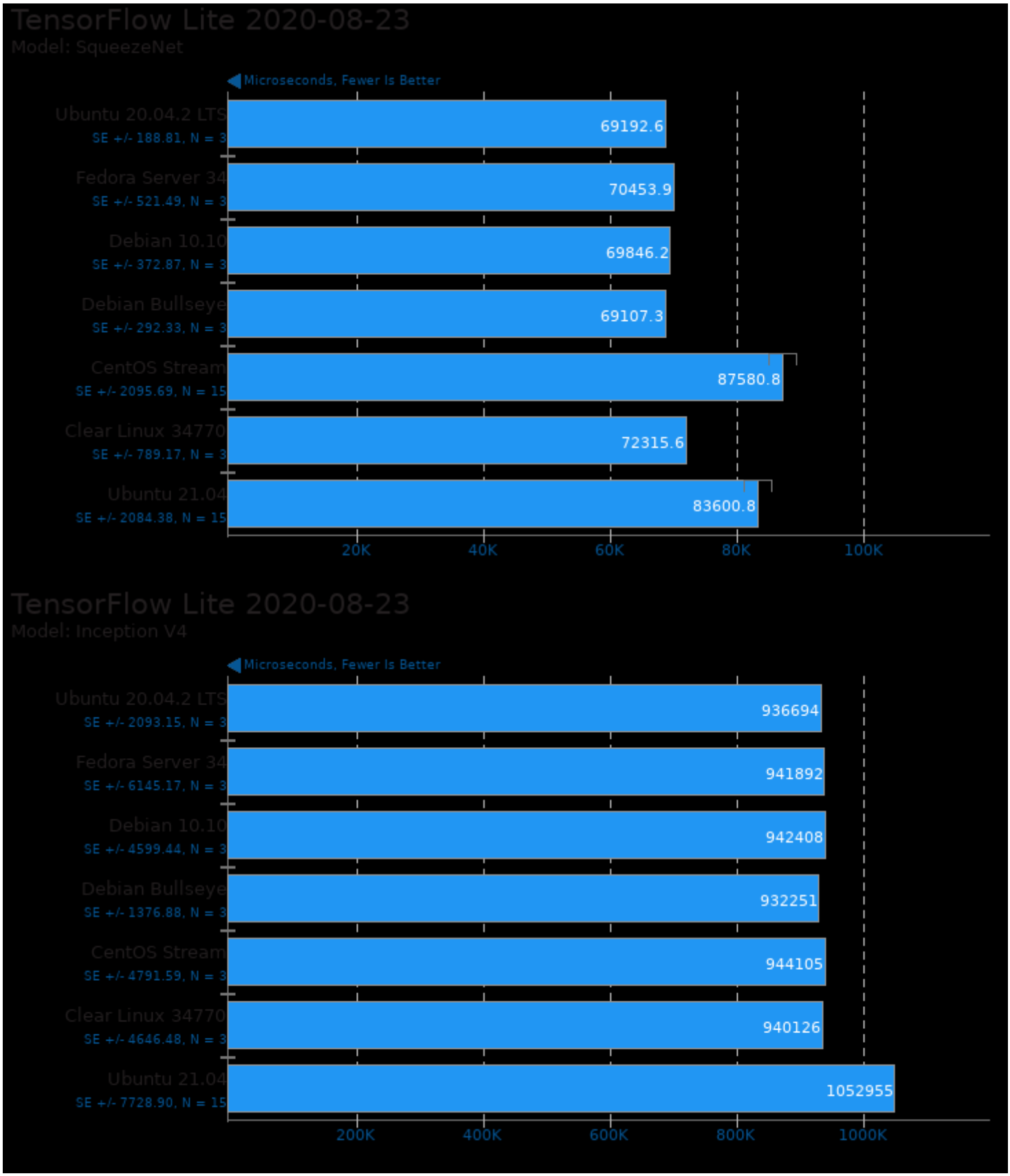

SVT-HEVC 1.5.0
Tuning: 7 - Input: Bosphorus 1080p
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 3.95, N = 3
282.38
Fedora Server 34
SE +/- 2.22, N = 3
281.37
Debian 10.10
SE +/- 3.39, N = 3
296.57
Debian Bullseye
SE +/- 3.08, N = 4
273.70
CentOS Stream
SE +/- 1.92, N = 3
285.20
Clear Linux 34770
SE +/- 3.06, N = 5
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
299.80
Ubuntu 21.04
SE +/- 3.52, N = 4
284.09
70
140
210
280
350
1. (CC) gcc options: -fPIE -fPIC -O3 -O2 -pie -rdynamic -lpthread -lrt

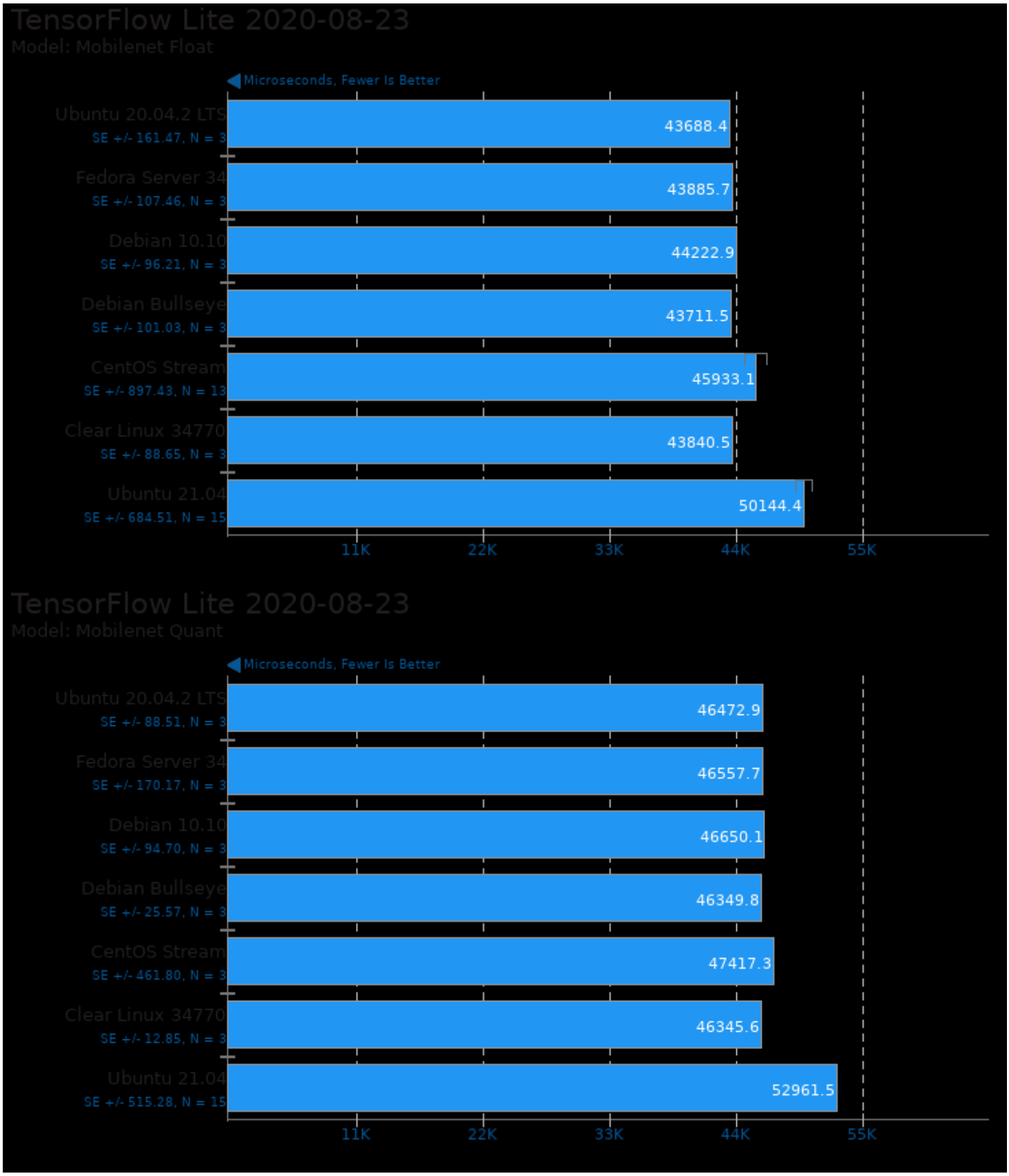

SVT-HEVC 1.5.0
Tuning: 10 - Input: Bosphorus 1080p
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 12.16, N = 15
458.18
Fedora Server 34
SE +/- 6.12, N = 15
434.07
Debian 10.10
SE +/- 6.17, N = 4
537.01
Debian Bullseye
SE +/- 8.24, N = 15
429.71
CentOS Stream
SE +/- 12.08, N = 12
467.20
Clear Linux 34770
SE +/- 7.76, N = 15
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
463.76
Ubuntu 21.04
SE +/- 10.90, N = 12
470.53
120
240
360
480
600
1. (CC) gcc options: -fPIE -fPIC -O3 -O2 -pie -rdynamic -lpthread -lrt

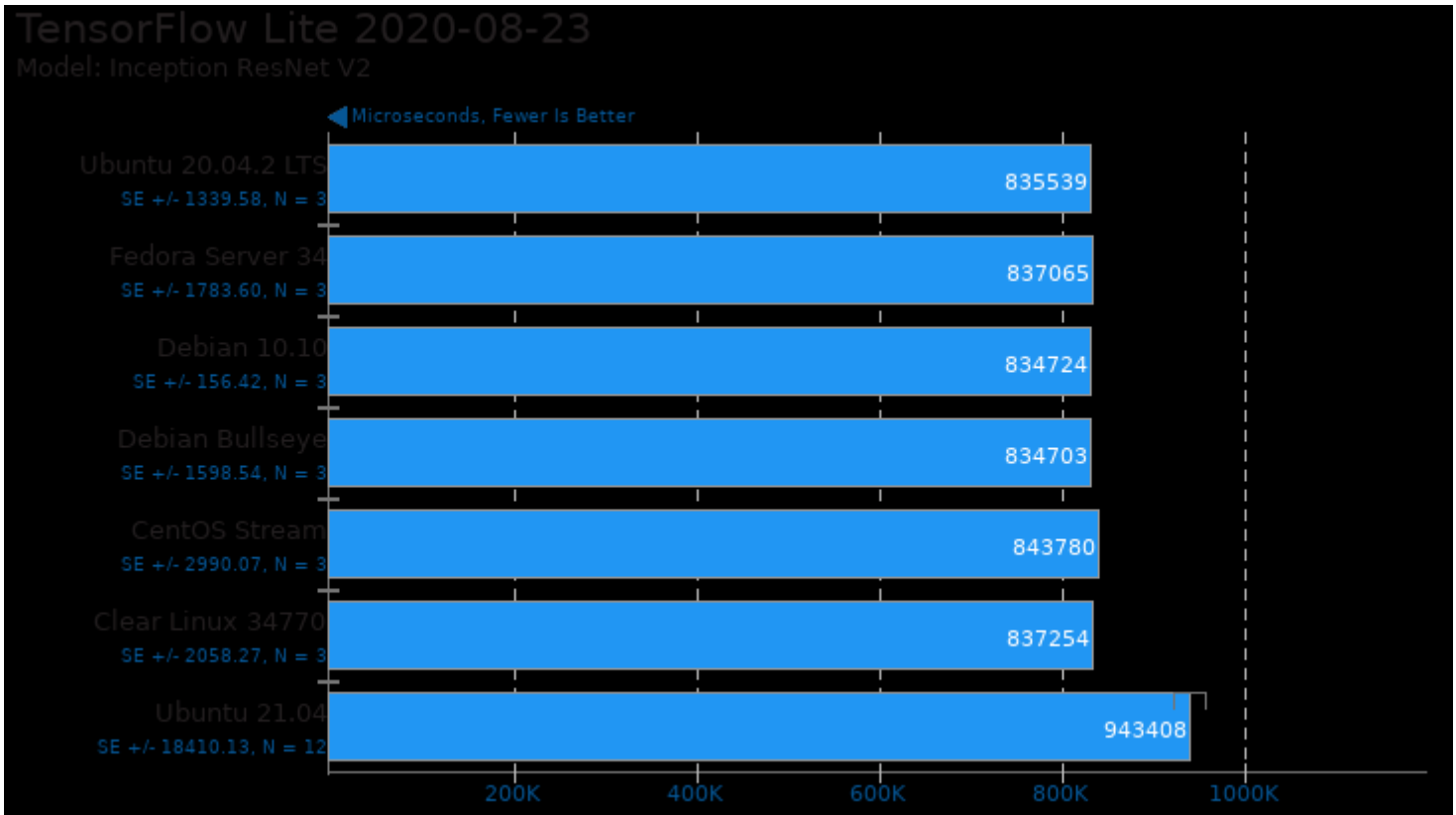

SVT-VP9 0.3
Tuning: VMAF Optimized - Input: Bosphorus 1080p
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 4.22, N = 12
349.16
Fedora Server 34
SE +/- 1.79, N = 3
291.76
Debian 10.10
SE +/- 2.58, N = 15
344.93
Debian Bullseye
SE +/- 2.14, N = 3
256.35
CentOS Stream
SE +/- 3.44, N = 15
303.33
Clear Linux 34770
SE +/- 3.79, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
298.74
Ubuntu 21.04
SE +/- 3.29, N = 15
251.54
80
160
240
320
400
1. (CC) gcc options: -O3 -fcommon -fPIE -fPIC -fvisibility=hidden -pie -rdynamic -lpthread -lrt -lm

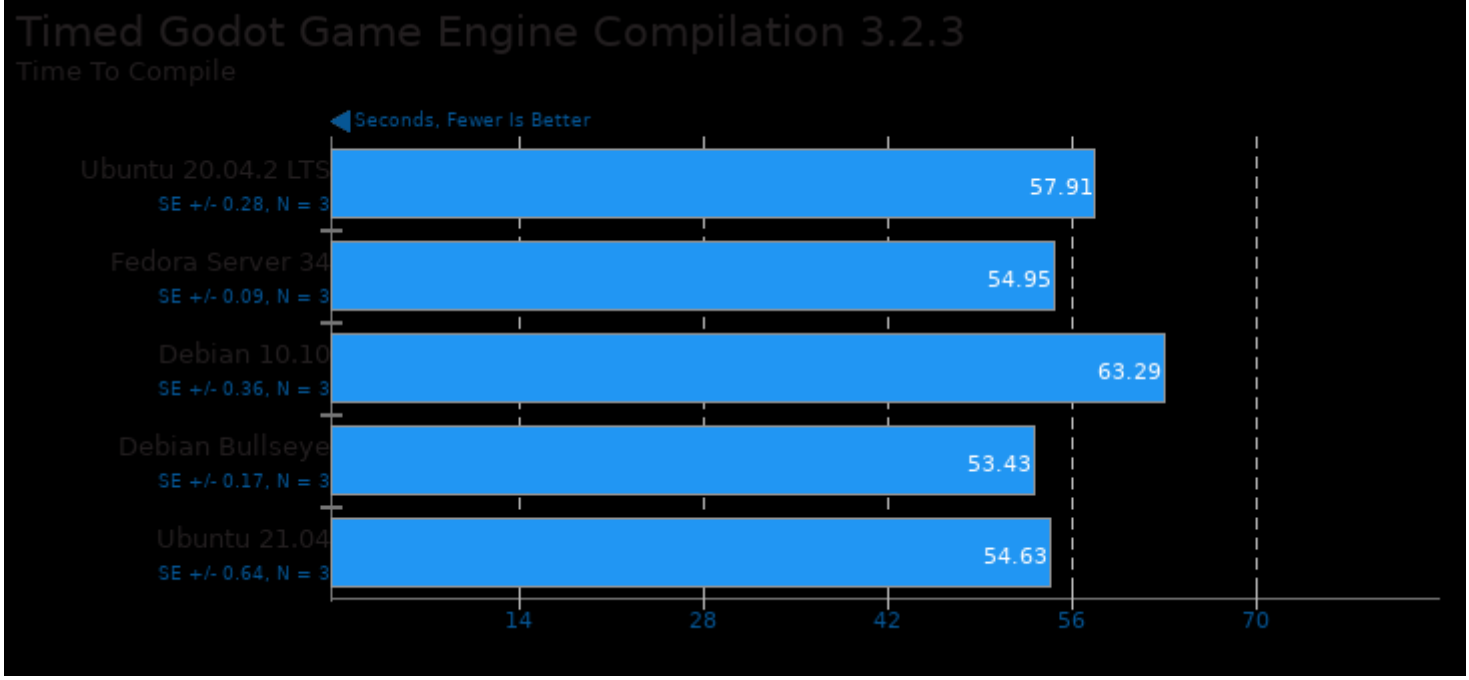

SVT-VP9 0.3
Tuning: PSNR/SSIM Optimized - Input: Bosphorus 1080p
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 2.18, N = 3
353.98
Fedora Server 34
SE +/- 2.17, N = 15
305.14
Debian 10.10
SE +/- 1.49, N = 3
353.73
Debian Bullseye
SE +/- 0.27, N = 3
259.56
CentOS Stream
SE +/- 2.40, N = 3
303.00
Clear Linux 34770
SE +/- 3.98, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
302.64
Ubuntu 21.04
SE +/- 8.42, N = 15
257.98
80
160
240
320
400
1. (CC) gcc options: -O3 -fcommon -fPIE -fPIC -fvisibility=hidden -pie -rdynamic -lpthread -lrt -lm

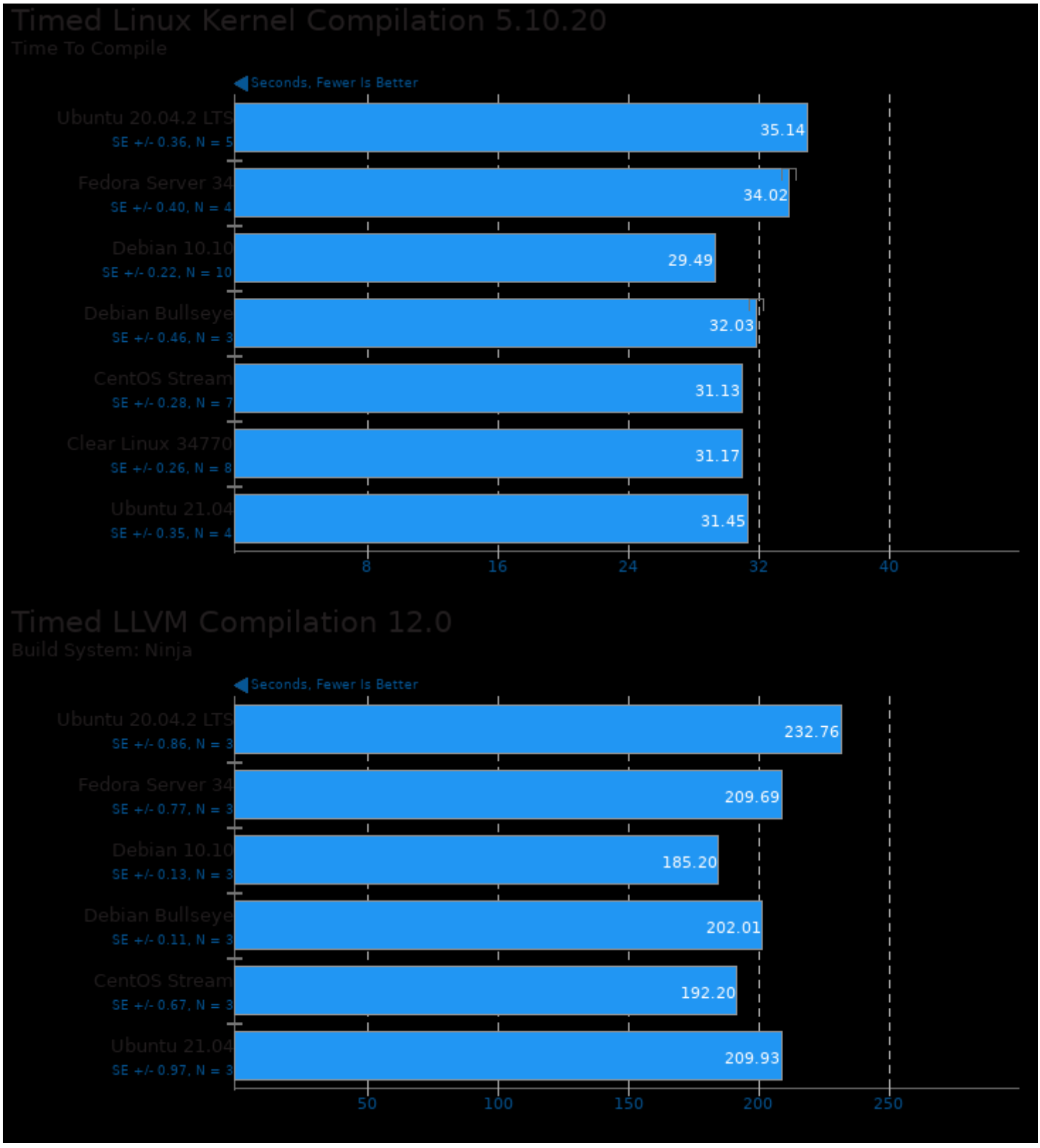

SVT-VP9 0.3
Tuning: Visual Quality Optimized - Input: Bosphorus 1080p
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 2.34, N = 3
264.89
Fedora Server 34
SE +/- 2.18, N = 3
272.55
Debian 10.10
SE +/- 2.94, N = 3
297.41
Debian Bullseye
SE +/- 2.63, N = 5
236.32
CentOS Stream
SE +/- 2.06, N = 3
274.02
Clear Linux 34770
SE +/- 2.72, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake
273.38
Ubuntu 21.04
SE +/- 0.95, N = 3
241.51
60
120
180
240
300
1. (CC) gcc options: -O3 -fcommon -fPIE -fPIC -fvisibility=hidden -pie -rdynamic -lpthread -lrt -lm

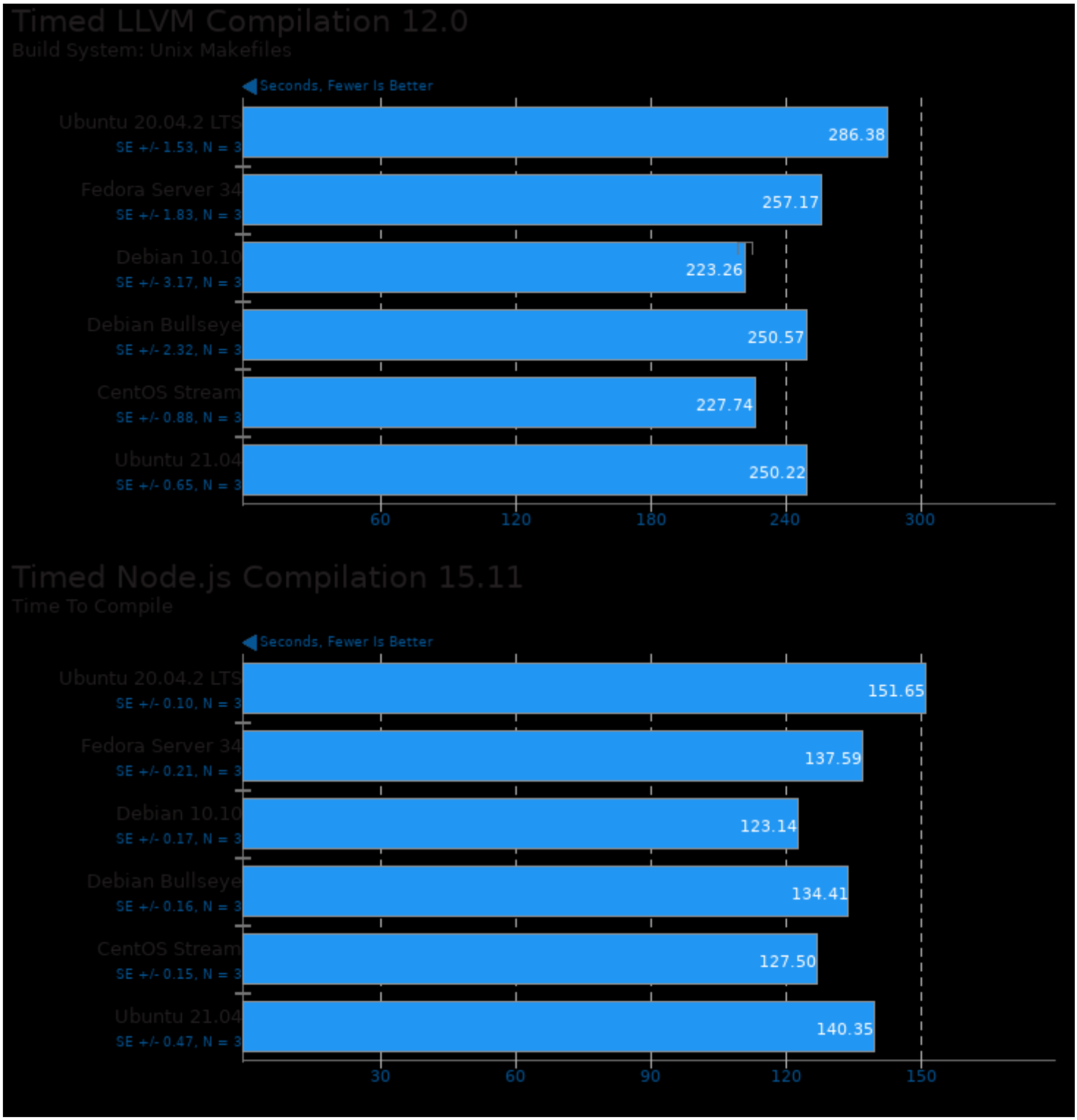

TensorFlow Lite 2020-08-23
Model: SqueezeNet
Microseconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 188.81, N = 3
69192.6
Fedora Server 34
SE +/- 521.49, N = 3
70453.9
Debian 10.10
SE +/- 372.87, N = 3
69846.2
Debian Bullseye
SE +/- 292.33, N = 3
69107.3
CentOS Stream
SE +/- 2095.69, N = 15
87580.8
Clear Linux 34770
SE +/- 789.17, N = 3
72315.6
Ubuntu 21.04
SE +/- 2084.38, N = 15
83600.8
20K
40K
60K
80K
100K
TensorFlow Lite 2020-08-23
Model: Inception V4
Microseconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 2093.15, N = 3
936694
Fedora Server 34
SE +/- 6145.17, N = 3
941892
Debian 10.10
SE +/- 4599.44, N = 3
942408
Debian Bullseye
SE +/- 1376.88, N = 3
932251
CentOS Stream
SE +/- 4791.59, N = 3
944105
Clear Linux 34770
SE +/- 4646.48, N = 3
940126
Ubuntu 21.04
SE +/- 7728.90, N = 15
1052955
200K
400K
600K
800K
1000K

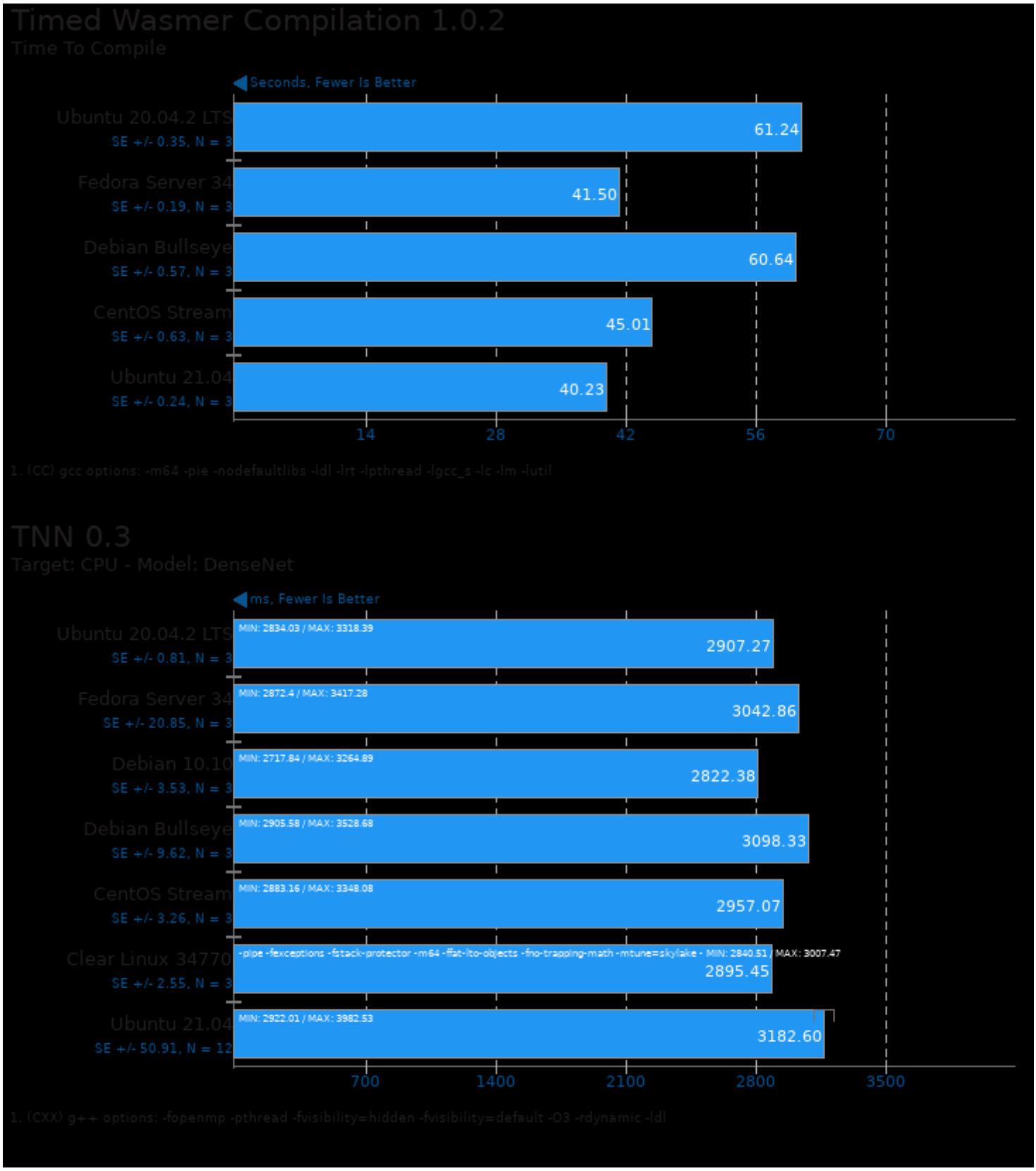

TensorFlow Lite 2020-08-23
Model: Mobilenet Float
Microseconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 161.47, N = 3
43688.4
Fedora Server 34
SE +/- 107.46, N = 3
43885.7
Debian 10.10
SE +/- 96.21, N = 3
44222.9
Debian Bullseye
SE +/- 101.03, N = 3
43711.5
CentOS Stream
SE +/- 897.43, N = 13
45933.1
Clear Linux 34770
SE +/- 88.65, N = 3
43840.5
Ubuntu 21.04
SE +/- 684.51, N = 15
50144.4
11K
22K
33K
44K
55K
TensorFlow Lite 2020-08-23
Model: Mobilenet Quant
Microseconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 88.51, N = 3
46472.9
Fedora Server 34
SE +/- 170.17, N = 3
46557.7
Debian 10.10
SE +/- 94.70, N = 3
46650.1
Debian Bullseye
SE +/- 25.57, N = 3
46349.8
CentOS Stream
SE +/- 461.80, N = 3
47417.3
Clear Linux 34770
SE +/- 12.85, N = 3
46345.6
Ubuntu 21.04
SE +/- 515.28, N = 15
52961.5
11K
22K
33K
44K
55K

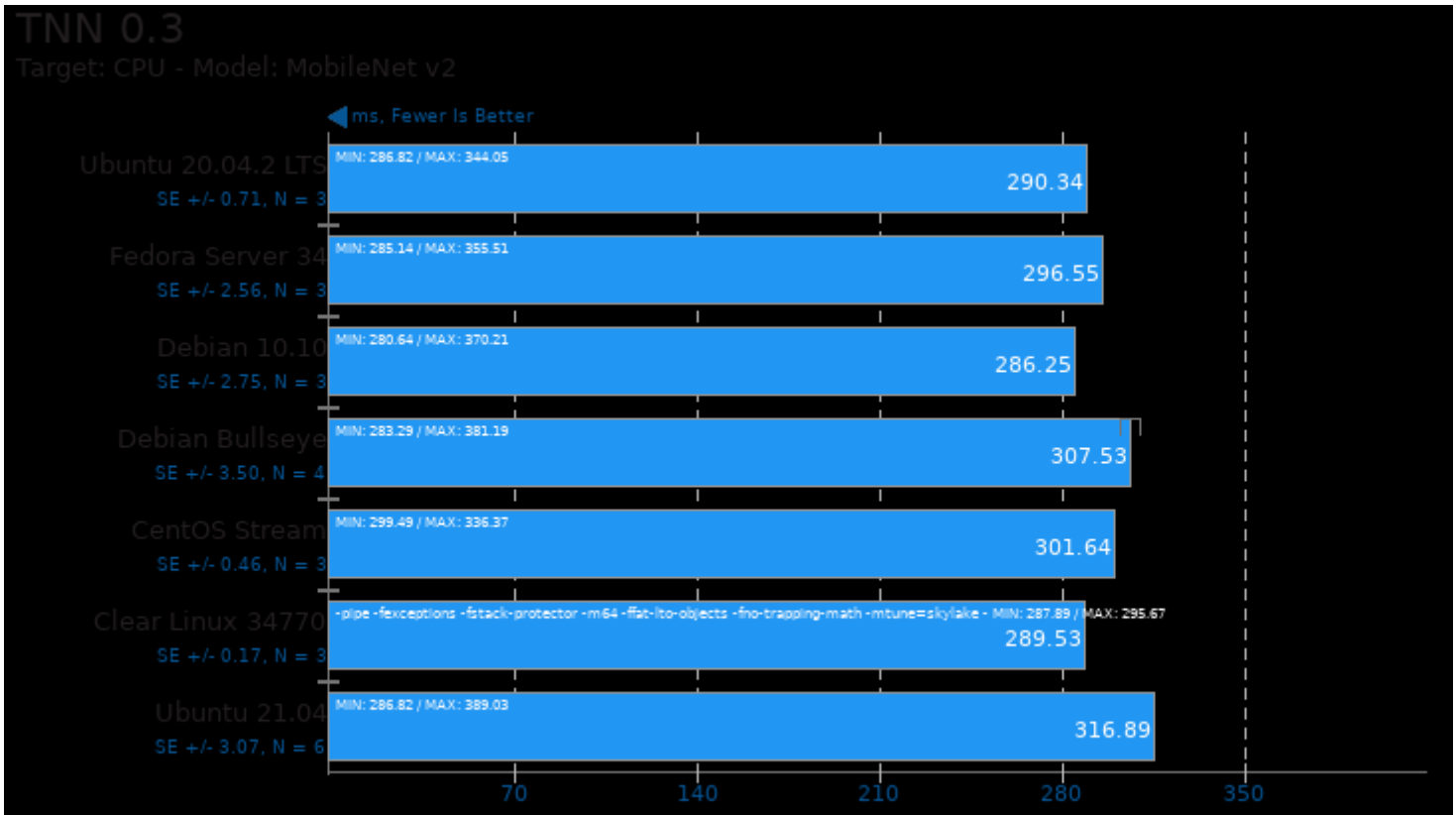

TensorFlow Lite 2020-08-23
Model: Inception ResNet V2
Microseconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 1339.58, N = 3
835539
Fedora Server 34
SE +/- 1783.60, N = 3
837065
Debian 10.10
SE +/- 156.42, N = 3
834724
Debian Bullseye
SE +/- 1598.54, N = 3
834703
CentOS Stream
SE +/- 2990.07, N = 3
843780
Clear Linux 34770
SE +/- 2058.27, N = 3
837254
Ubuntu 21.04
SE +/- 18410.13, N = 12
943408
200K
400K
600K
800K
1000K

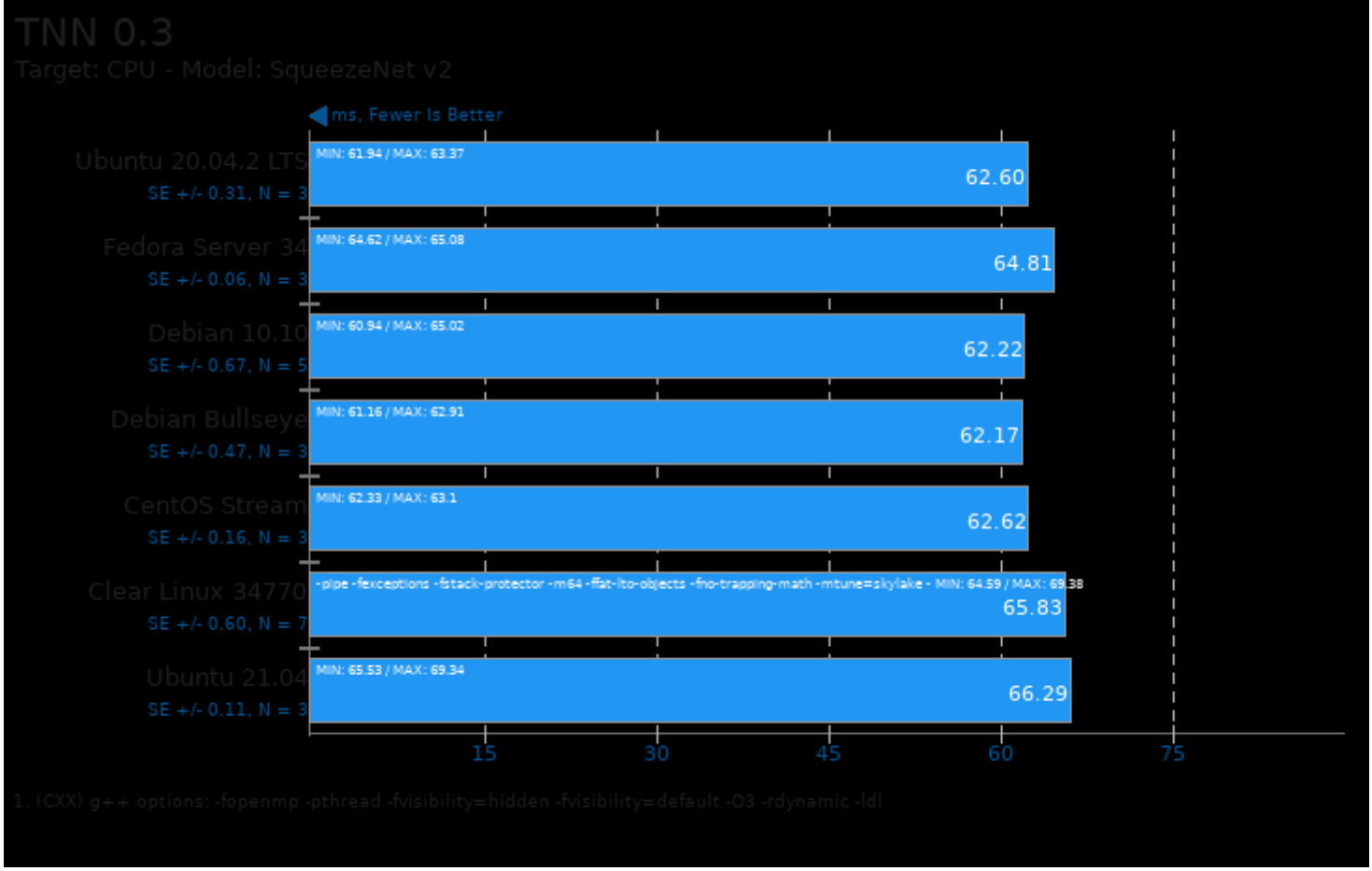

Timed Godot Game Engine Compilation 3.2.3
Time To Compile
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.28, N = 3
57.91
Fedora Server 34
SE +/- 0.09, N = 3
54.95
Debian 10.10
SE +/- 0.36, N = 3
63.29
Debian Bullseye
SE +/- 0.17, N = 3
53.43
Ubuntu 21.04
SE +/- 0.64, N = 3
54.63
14
28
42
56
70

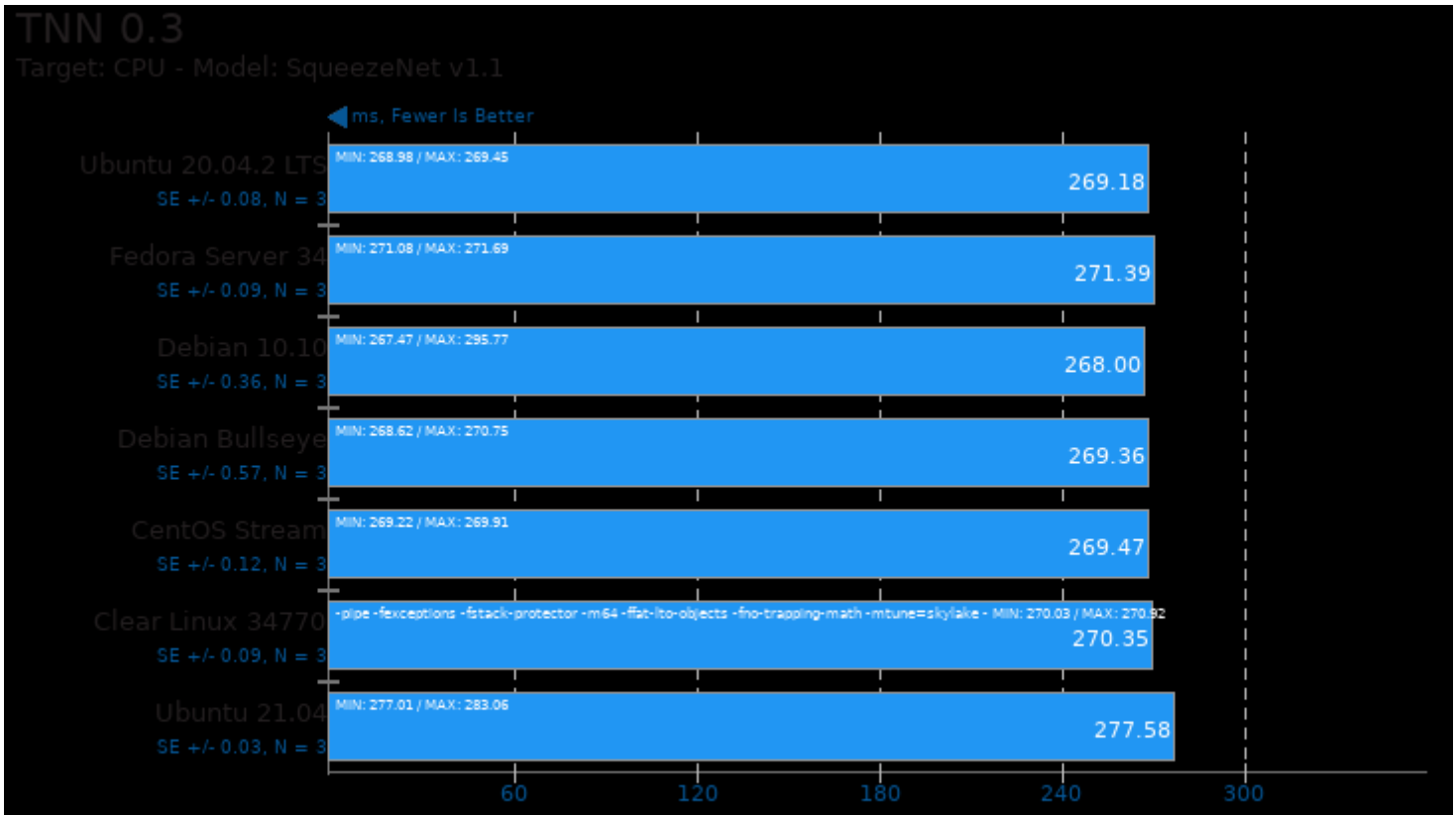

Timed Linux Kernel Compilation 5.10.20
Time To Compile
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.36, N = 5
35.14
Fedora Server 34
SE +/- 0.40, N = 4
34.02
Debian 10.10
SE +/- 0.22, N = 10
29.49
Debian Bullseye
SE +/- 0.46, N = 3
32.03
CentOS Stream
SE +/- 0.28, N = 7
31.13
Clear Linux 34770
SE +/- 0.26, N = 8
31.17
Ubuntu 21.04
SE +/- 0.35, N = 4
31.45
8
16
24
32
40
Timed LLVM Compilation 12.0
Build System: Ninja
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.86, N = 3
232.76
Fedora Server 34
SE +/- 0.77, N = 3
209.69
Debian 10.10
SE +/- 0.13, N = 3
185.20
Debian Bullseye
SE +/- 0.11, N = 3
202.01
CentOS Stream
SE +/- 0.67, N = 3
192.20
Ubuntu 21.04
SE +/- 0.97, N = 3
209.93
50
100
150
200
250

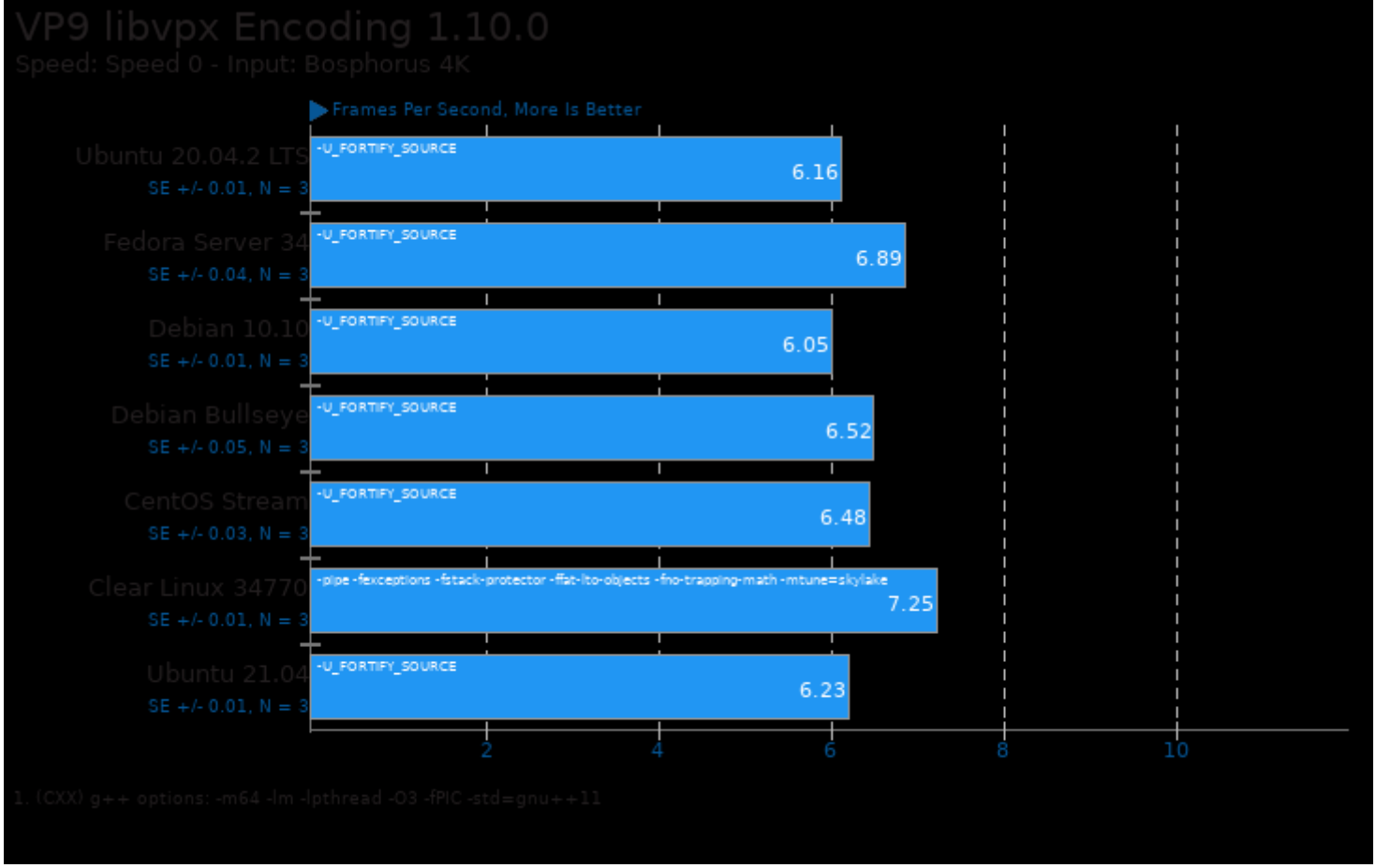

Timed LLVM Compilation 12.0
Build System: Unix Makefiles
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 1.53, N = 3
286.38
Fedora Server 34
SE +/- 1.83, N = 3
257.17
Debian 10.10
SE +/- 3.17, N = 3
223.26
Debian Bullseye
SE +/- 2.32, N = 3
250.57
CentOS Stream
SE +/- 0.88, N = 3
227.74
Ubuntu 21.04
SE +/- 0.65, N = 3
250.22
60
120
180
240
300
Timed Node.js Compilation 15.11
Time To Compile
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.10, N = 3
151.65
Fedora Server 34
SE +/- 0.21, N = 3
137.59
Debian 10.10
SE +/- 0.17, N = 3
123.14
Debian Bullseye
SE +/- 0.16, N = 3
134.41
CentOS Stream
SE +/- 0.15, N = 3
127.50
Ubuntu 21.04
SE +/- 0.47, N = 3
140.35
30
60
90
120
150

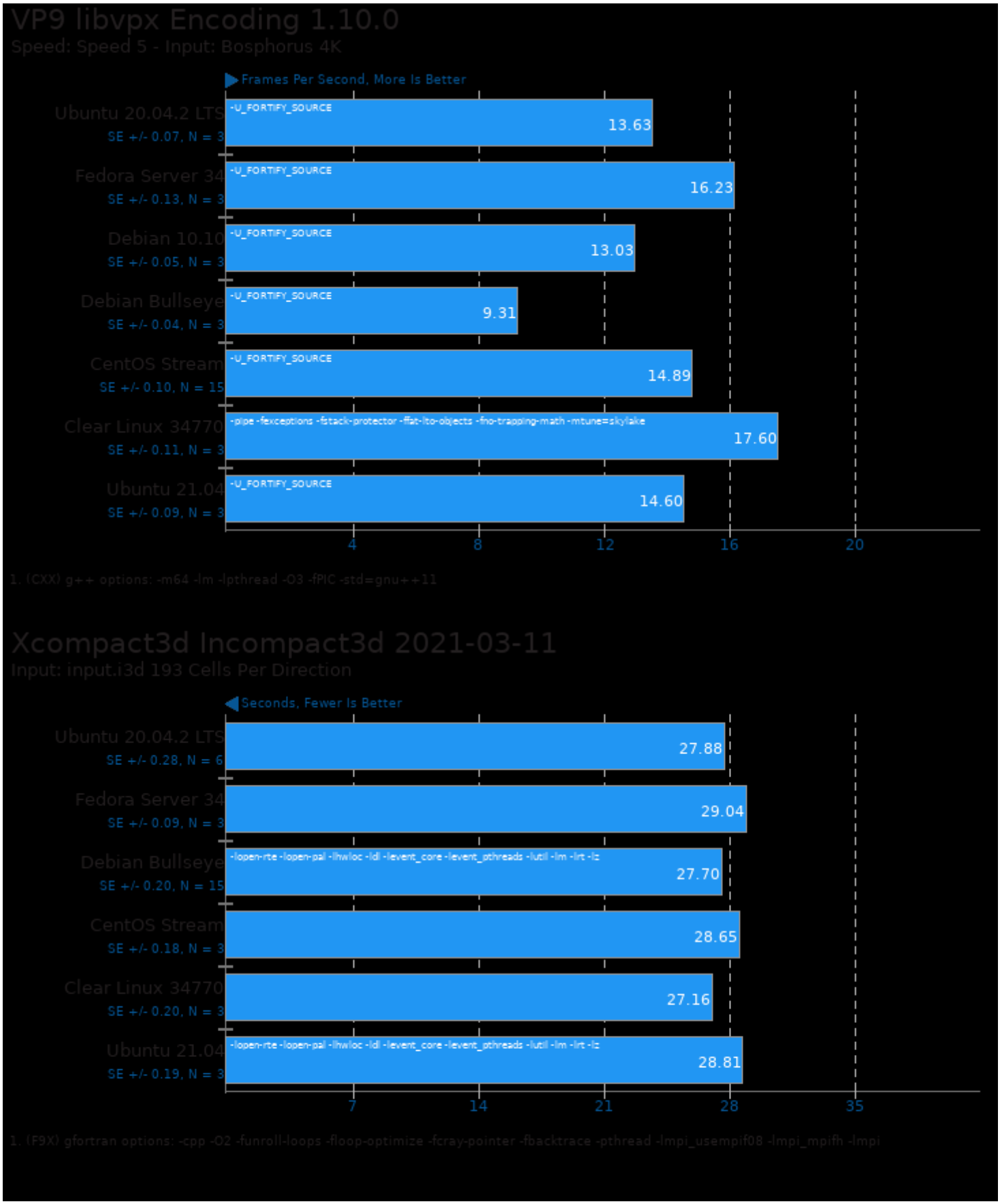

Timed Wasmer Compilation 1.0.2
Time To Compile
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.35, N = 3
61.24
Fedora Server 34
SE +/- 0.19, N = 3
41.50
Debian Bullseye
SE +/- 0.57, N = 3
60.64
CentOS Stream
SE +/- 0.63, N = 3
45.01
Ubuntu 21.04
SE +/- 0.24, N = 3
40.23
14
28
42
56
70
1. (CC) gcc options: -m64 -pie -nodefaultlibs -ldl -lrt -lpthread -lgcc_s -lc -lm -lutil
TNN 0.3
Target: CPU - Model: DenseNet
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.81, N = 3
MIN: 2834.03 / MAX: 3318.39
2907.27
Fedora Server 34
SE +/- 20.85, N = 3
MIN: 2872.4 / MAX: 3417.28
3042.86
Debian 10.10
SE +/- 3.53, N = 3
MIN: 2717.84 / MAX: 3264.89
2822.38
Debian Bullseye
SE +/- 9.62, N = 3
MIN: 2905.58 / MAX: 3528.68
3098.33
CentOS Stream
SE +/- 3.26, N = 3
MIN: 2883.16 / MAX: 3348.08
2957.07
Clear Linux 34770
SE +/- 2.55, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake - MIN: 2840.51 / MAX: 3007.47
2895.45
Ubuntu 21.04
SE +/- 50.91, N = 12
MIN: 2922.01 / MAX: 3982.53
3182.60
700
1400
2100
2800
3500
1. (CXX) g++ options: -fopenmp -pthread -fvisibility=hidden -fvisibility=default -O3 -rdynamic -ldl

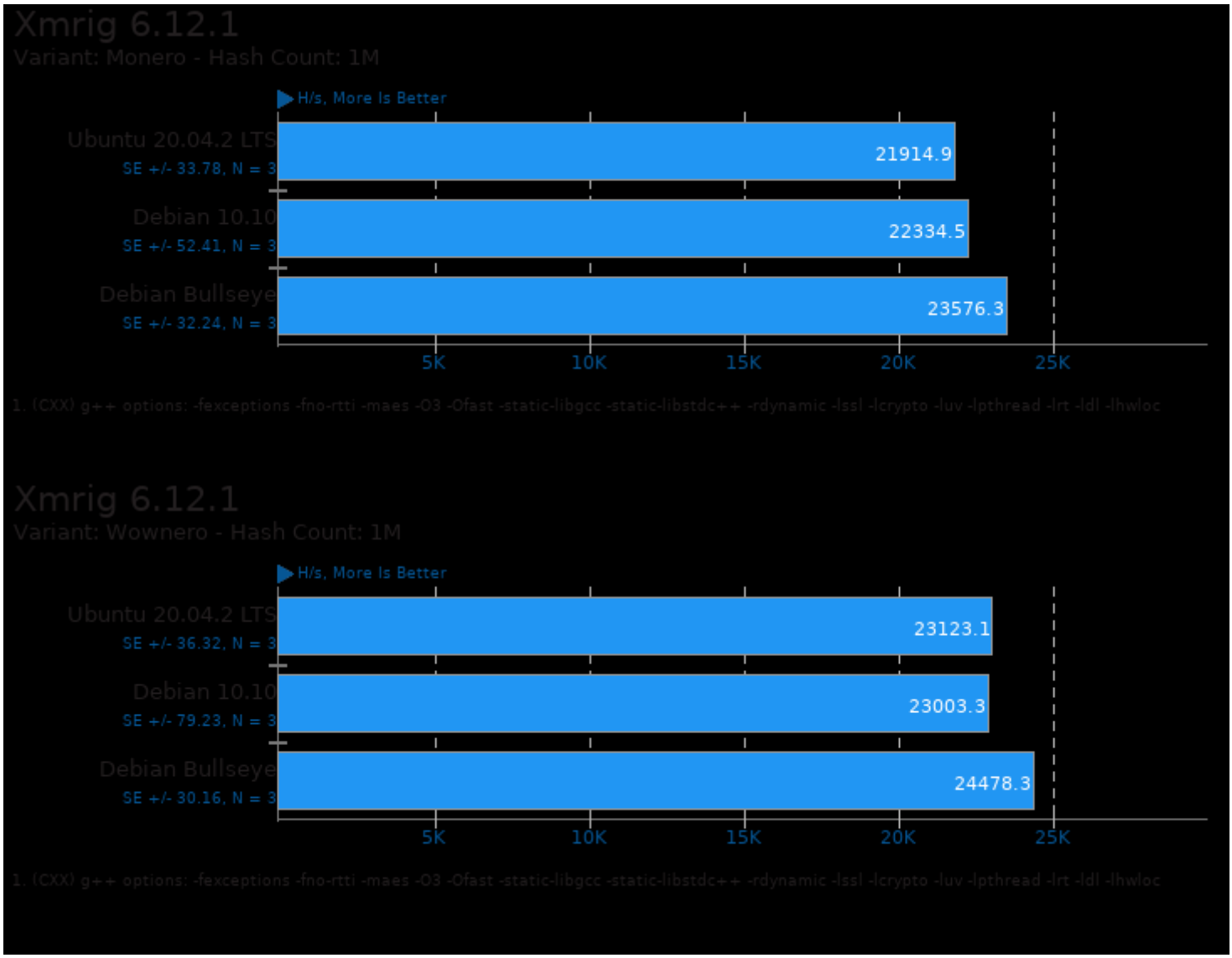

TNN 0.3
Target: CPU - Model: MobileNet v2
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.71, N = 3
MIN: 286.82 / MAX: 344.05
290.34
Fedora Server 34
SE +/- 2.56, N = 3
MIN: 285.14 / MAX: 355.51
296.55
Debian 10.10
SE +/- 2.75, N = 3
MIN: 280.64 / MAX: 370.21
286.25
Debian Bullseye
SE +/- 3.50, N = 4
MIN: 283.29 / MAX: 381.19
307.53
CentOS Stream
SE +/- 0.46, N = 3
MIN: 299.49 / MAX: 336.37
301.64
Clear Linux 34770
SE +/- 0.17, N = 3
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake - MIN: 287.89 / MAX: 295.67
289.53
Ubuntu 21.04
SE +/- 3.07, N = 6
MIN: 286.82 / MAX: 389.03
316.89
70
140
210
280
350
1. (CXX) g++ options: -fopenmp -pthread -fvisibility=hidden -fvisibility=default -O3 -rdynamic -ldl


TNN 0.3
Target: CPU - Model: SqueezeNet v2
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.31, N = 3
MIN: 61.94 / MAX: 63.37
62.60
Fedora Server 34
SE +/- 0.06, N = 3
MIN: 64.62 / MAX: 65.08
64.81
Debian 10.10
SE +/- 0.67, N = 5
MIN: 60.94 / MAX: 65.02
62.22
Debian Bullseye
SE +/- 0.47, N = 3
MIN: 61.16 / MAX: 62.91
62.17
CentOS Stream
SE +/- 0.16, N = 3
MIN: 62.33 / MAX: 63.1
62.62
Clear Linux 34770
SE +/- 0.60, N = 7
-pipe -fexceptions -fstack-protector -m64 -flat-lto-objects -fno-trapping-math -mtune=skylake - MIN: 64.59 / MAX: 69.38
65.83
Ubuntu 21.04
SE +/- 0.11, N = 3
MIN: 65.53 / MAX: 69.34
66.29
15
30
45
60
75
1. (CXX) g++ options: -fopenmp -pthread -fvisibility=hidden -fvisibility=default -O3 -rdynamic -ldl

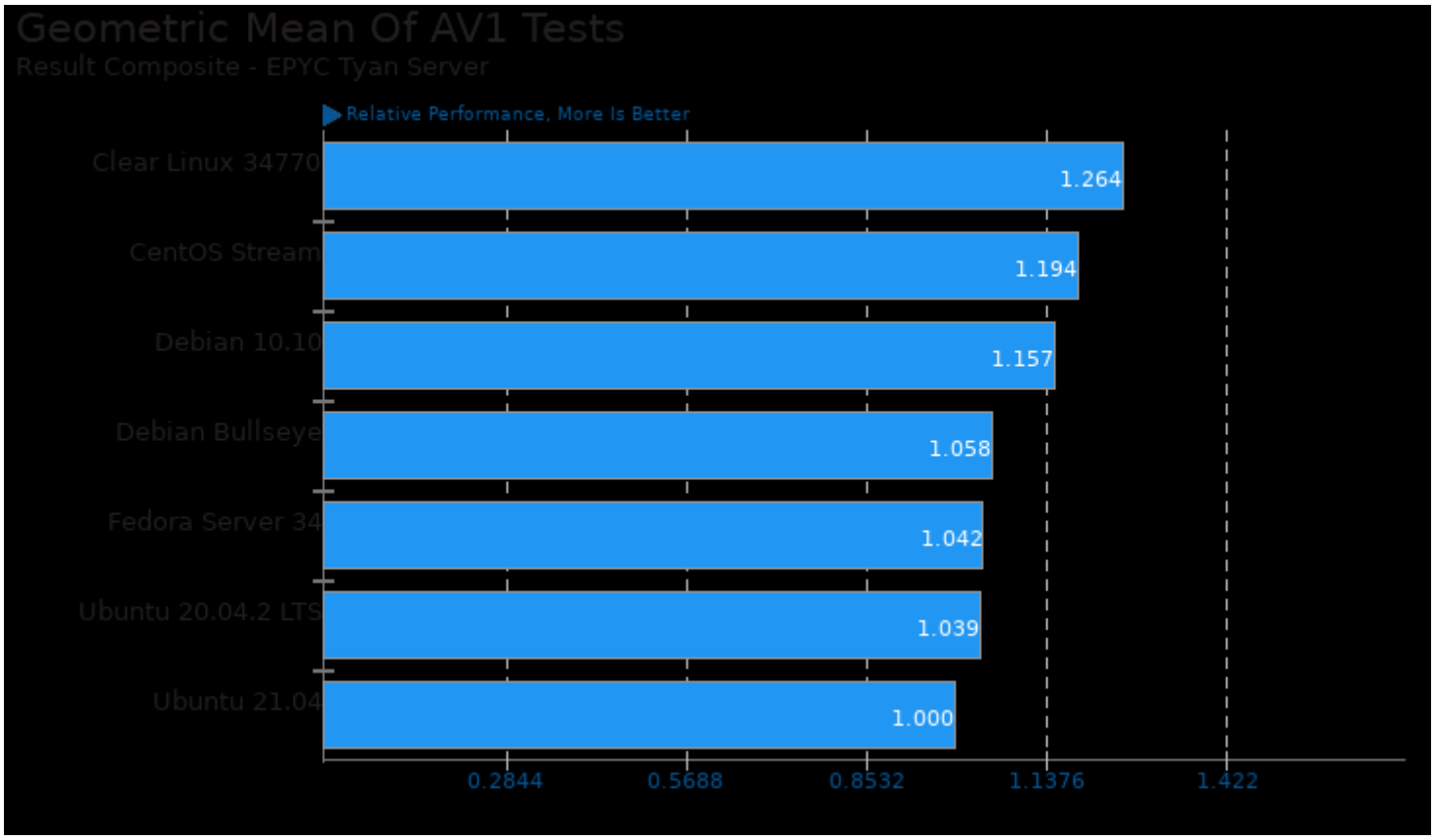

TNN 0.3
Target: CPU - Model: SqueezeNet v1.1
ms, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.08, N = 3
MIN: 268.98 / MAX: 269.45
269.18
Fedora Server 34
SE +/- 0.09, N = 3
MIN: 271.08 / MAX: 271.69
271.39
Debian 10.10
SE +/- 0.36, N = 3
MIN: 267.47 / MAX: 295.77
268.00
Debian Bullseye
SE +/- 0.57, N = 3
MIN: 268.62 / MAX: 270.75
269.36
CentOS Stream
SE +/- 0.12, N = 3
MIN: 269.22 / MAX: 269.91
269.47
Clear Linux 34770
SE +/- 0.09, N = 3
-pipe -fexceptions -fstack-protector -m64 -flto=auto -flto-objects -fno-trapping-math -mtune=skylake - MIN: 270.03 / MAX: 270.92
270.35
Ubuntu 21.04
SE +/- 0.03, N = 3
MIN: 277.01 / MAX: 283.06
277.58
60
120
180
240
300
1. (CXX) g++ options: -fopenmp -pthread -fvisibility=hidden -fvisibility=default -O3 -rdynamic -ldl


VP9 libvpx Encoding 1.10.0
Speed: Speed 0 - Input: Bosphorus 4K
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.01, N = 3
-U_FORTIFY_SOURCE
6.16
Fedora Server 34
SE +/- 0.04, N = 3
-U_FORTIFY_SOURCE
6.89
Debian 10.10
SE +/- 0.01, N = 3
-U_FORTIFY_SOURCE
6.05
Debian Bullseye
SE +/- 0.05, N = 3
-U_FORTIFY_SOURCE
6.52
CentOS Stream
SE +/- 0.03, N = 3
-U_FORTIFY_SOURCE
6.48
Clear Linux 34770
SE +/- 0.01, N = 3
-pipe -fexceptions -fstack-protector -flto=auto -flto-objects -fno-trapping-math -mtune=skylake
7.25
Ubuntu 21.04
SE +/- 0.01, N = 3
-U_FORTIFY_SOURCE
6.23
2
4
6
8
10
1. (CXX) g++ options: -m64 -lm -lpthread -O3 -fPIC -std=gnu++11

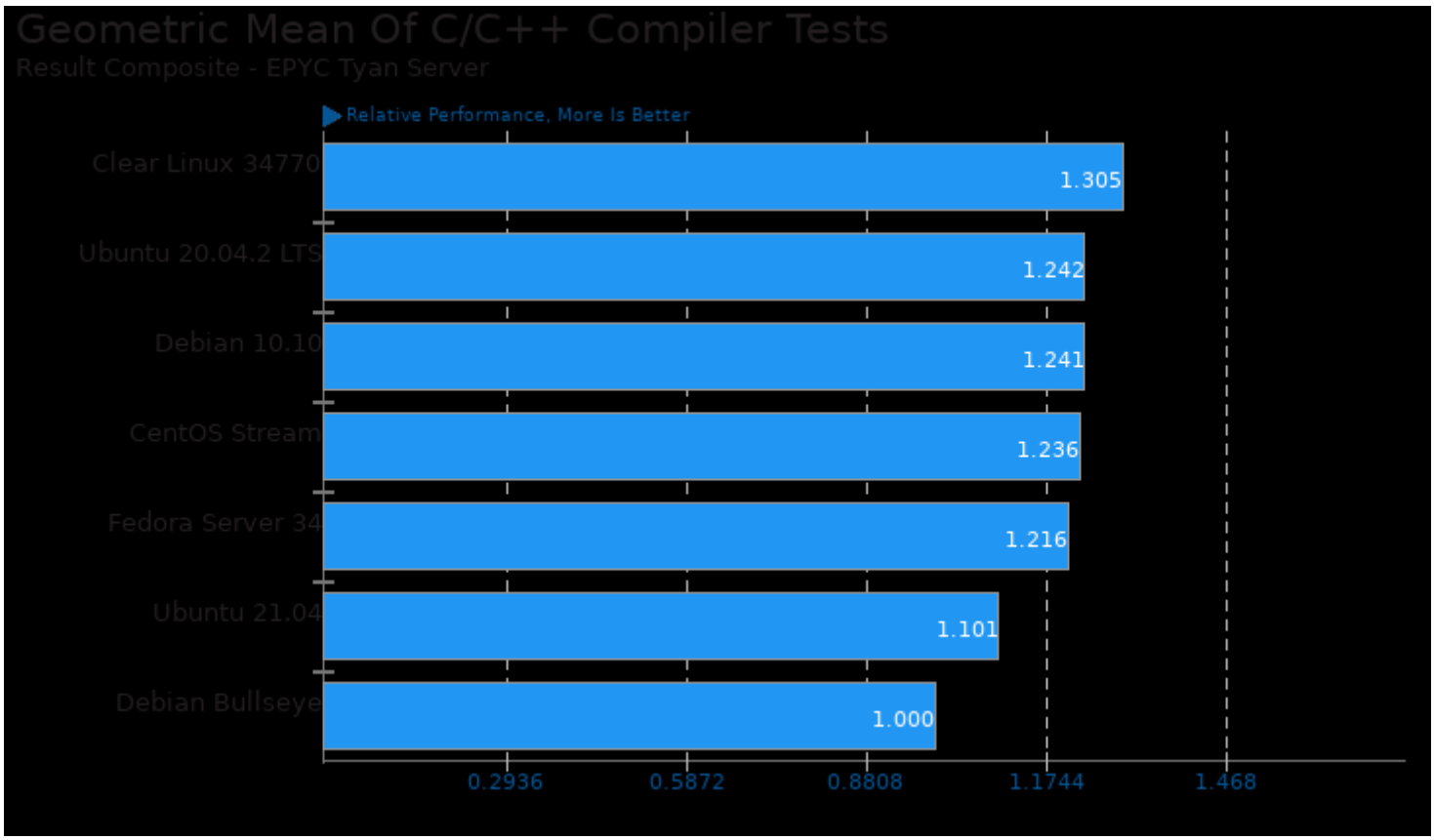

VP9 libvpx Encoding 1.10.0
Speed: Speed 5 - Input: Bosphorus 4K
Frames Per Second, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.07, N = 3
-U_FORTIFY_SOURCE
13.63
Fedora Server 34
SE +/- 0.13, N = 3
-U_FORTIFY_SOURCE
16.23
Debian 10.10
SE +/- 0.05, N = 3
-U_FORTIFY_SOURCE
13.03
Debian Bullseye
SE +/- 0.04, N = 3
-U_FORTIFY_SOURCE
9.31
CentOS Stream
SE +/- 0.10, N = 15
-U_FORTIFY_SOURCE
14.89
Clear Linux 34770
SE +/- 0.11, N = 3
-pipe -fexceptions -fstack-protector -ffat-lto-objects -fno-trapping-math -mtune=skylake
17.60
Ubuntu 21.04
SE +/- 0.09, N = 3
-U_FORTIFY_SOURCE
14.60
4
8
12
16
20
1. (CXX) g++ options: -m64 -lm -lpthread -O3 -fPIC -std=gnu++11
Xcompact3d Incompact3d 2021-03-11
Input: input.i3d 193 Cells Per Direction
Seconds, Fewer Is Better
Ubuntu 20.04.2 LTS
SE +/- 0.28, N = 6
27.88
Fedora Server 34
SE +/- 0.09, N = 3
29.04
Debian Bullseye
SE +/- 0.20, N = 15
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
27.70
CentOS Stream
SE +/- 0.18, N = 3
28.65
Clear Linux 34770
SE +/- 0.20, N = 3
27.16
Ubuntu 21.04
SE +/- 0.19, N = 3
-lopen-rte -lopen-pal -lhwloc -ldl -levent_core -levent_pthreads -lutil -lm -lrt -lz
28.81
7
14
21
28
35
1. (F9X) gfortran options: -cpp -O2 -funroll-loops -floop-optimize -fcray-pointer -fbacktrace -pthread -lmpi_usempif08 -lmpi_mpifh -lmpi


Xmrig 6.12.1
Variant: Monero - Hash Count: 1M
H/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 33.78, N = 3
21914.9
Debian 10.10
SE +/- 52.41, N = 3
22334.5
Debian Bullseye
SE +/- 32.24, N = 3
23576.3
5K
10K
15K
20K
25K
1. (CXX) g++ options: -fexceptions -fno-rtti -maes -O3 -Ofast -static-libgcc -static-libstdc++ -rdynamic -lssl -lcrypto -luv -lpthread -lrt -ldl -lhwloc
Xmrig 6.12.1
Variant: Wownero - Hash Count: 1M
H/s, More Is Better
Ubuntu 20.04.2 LTS
SE +/- 36.32, N = 3
23123.1
Debian 10.10
SE +/- 79.23, N = 3
23003.3
Debian Bullseye
SE +/- 30.16, N = 3
24478.3
5K
10K
15K
20K
25K
1. (CXX) g++ options: -fexceptions -fno-rtti -maes -O3 -Ofast -static-libgcc -static-libstdc++ -rdynamic -lssl -lcrypto -luv -lpthread -lrt -ldl -lhwloc

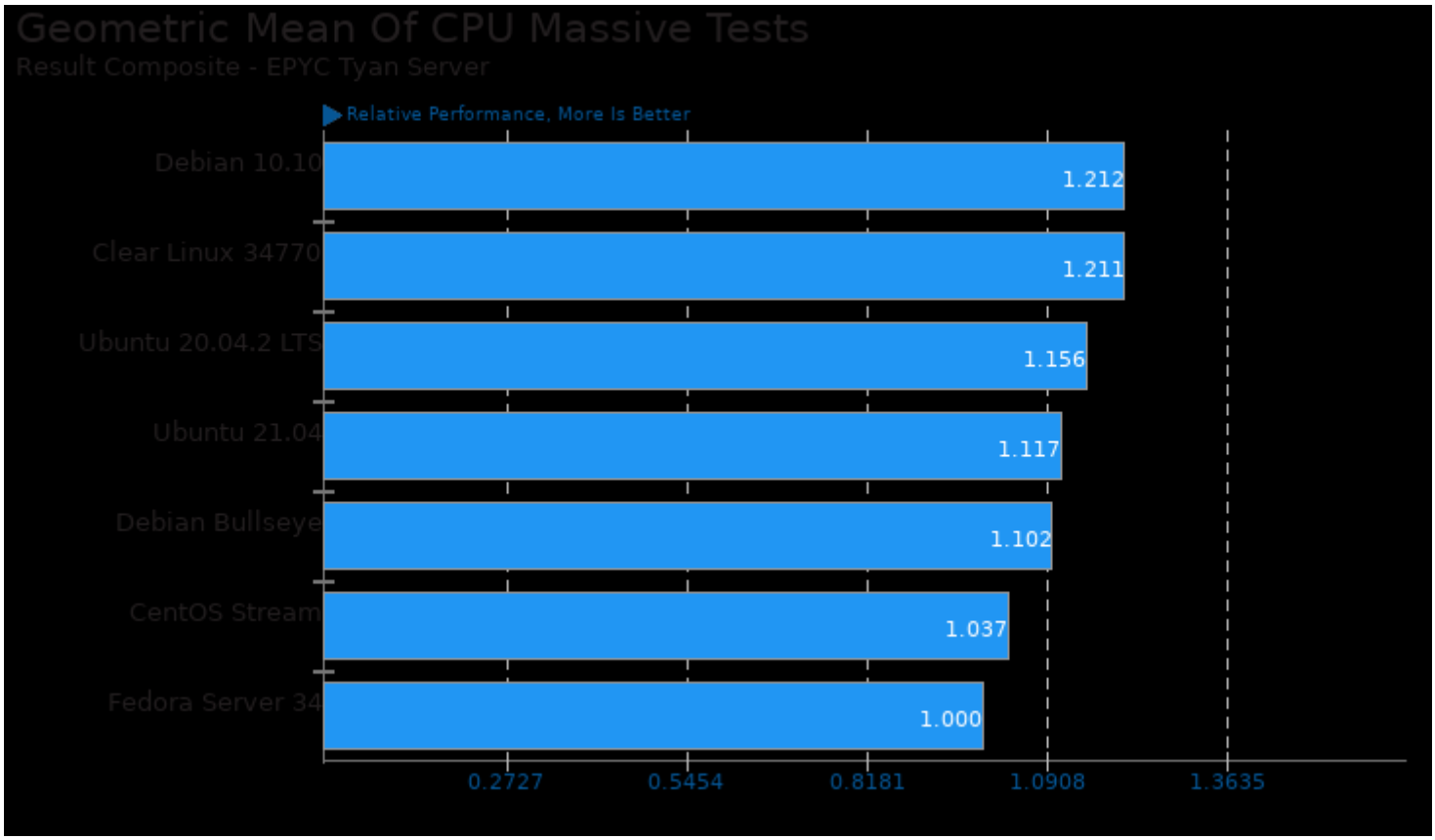
These geometric means are based upon test groupings / test suites for this result file.



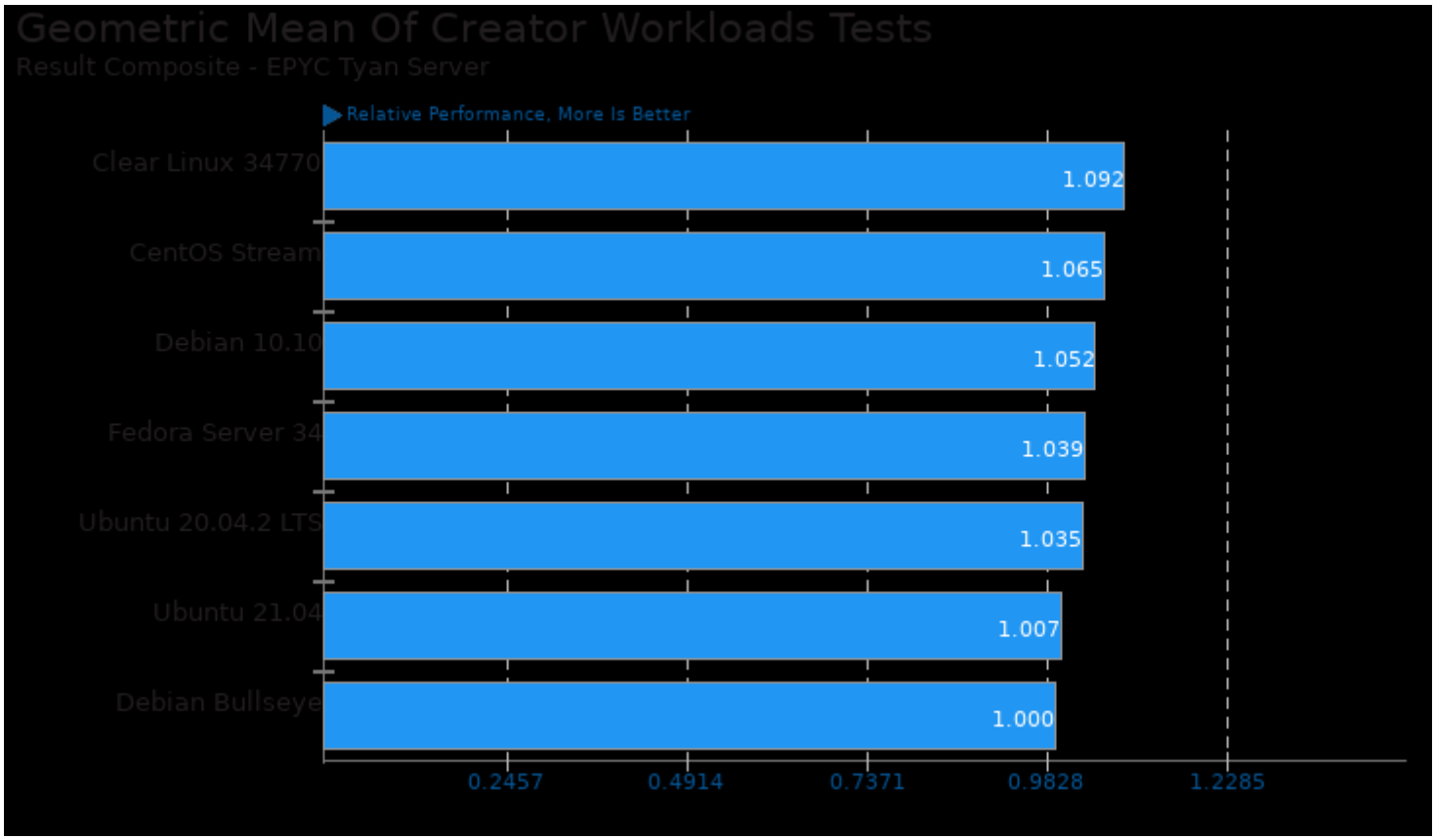
Geometric mean based upon tests: pts/svt-av1 and pts/avifenc



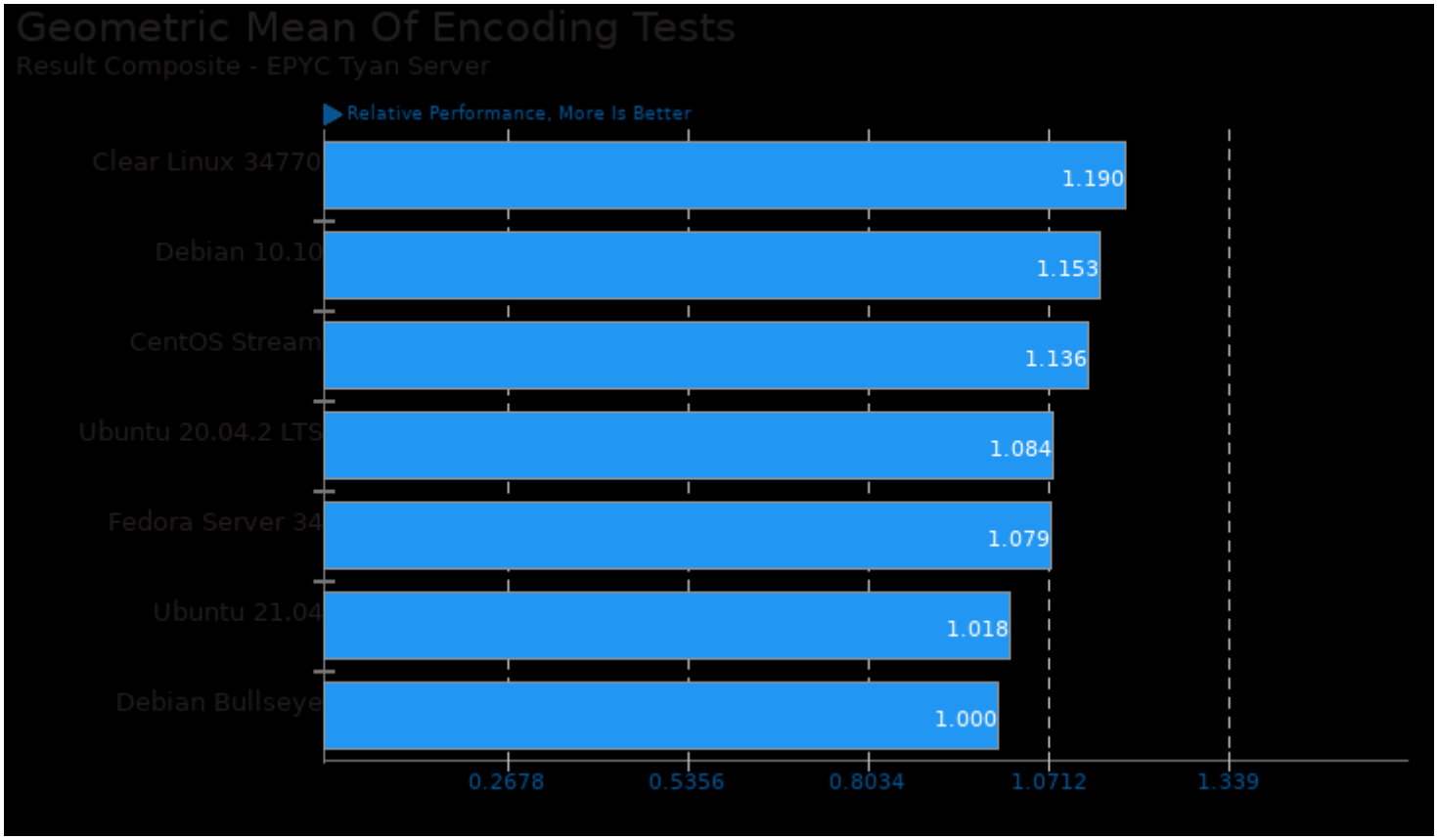
Geometric mean based upon tests: pts/vpxenc, pts/build-llvm, pts/svt-av1, pts/svt-vp9 and pts/gromacs



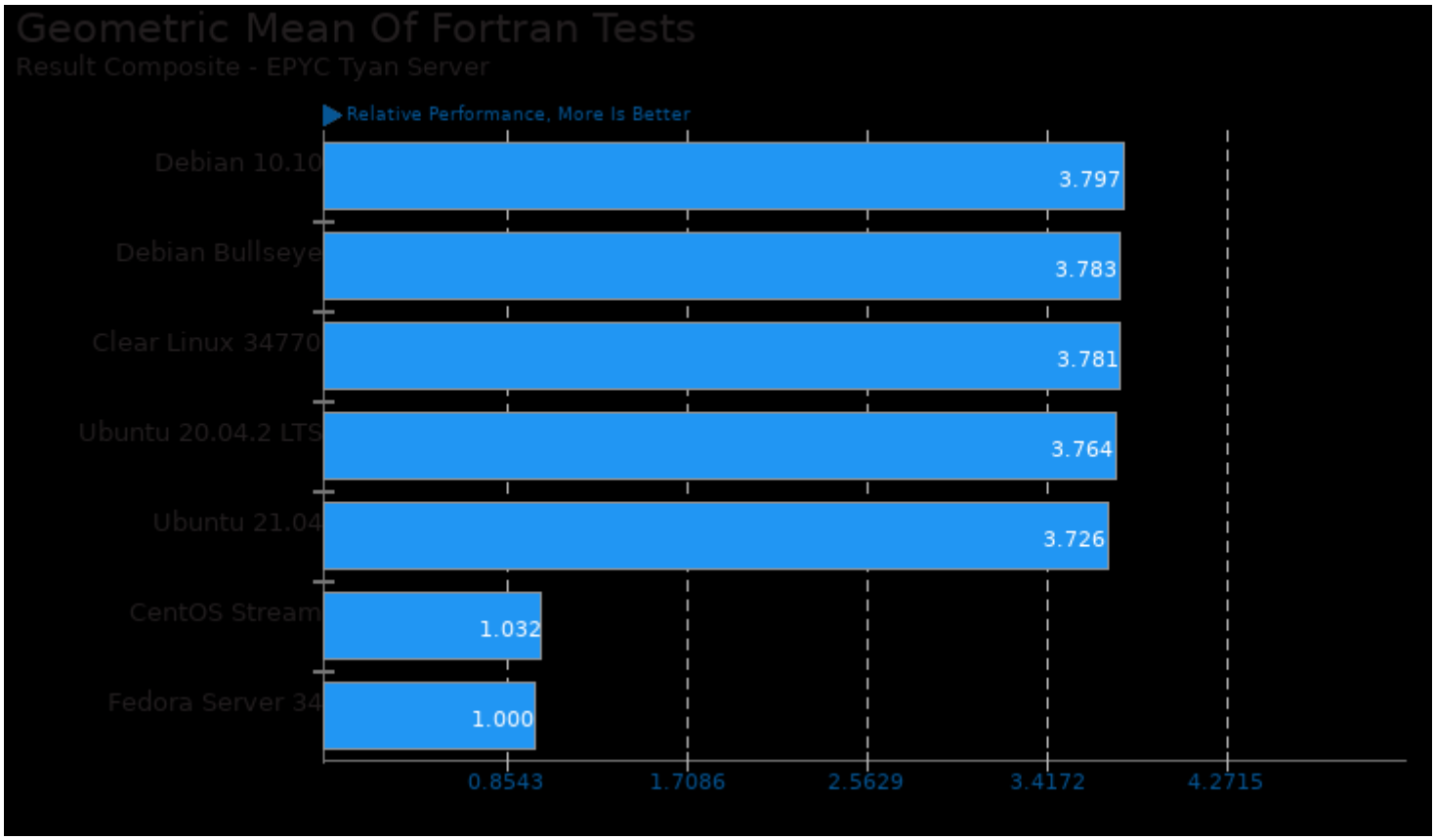
Geometric mean based upon tests: pts/brl-cad, pts/build-llvm, pts/build-linux-kernel, pts/svt-av1, pts/svt-hevc, pts/svt-vp9, pts/vpxenc, pts/hpcg, pts/namd, pts/npb, pts/numenta-nab, pts/plaidml and pts/blender



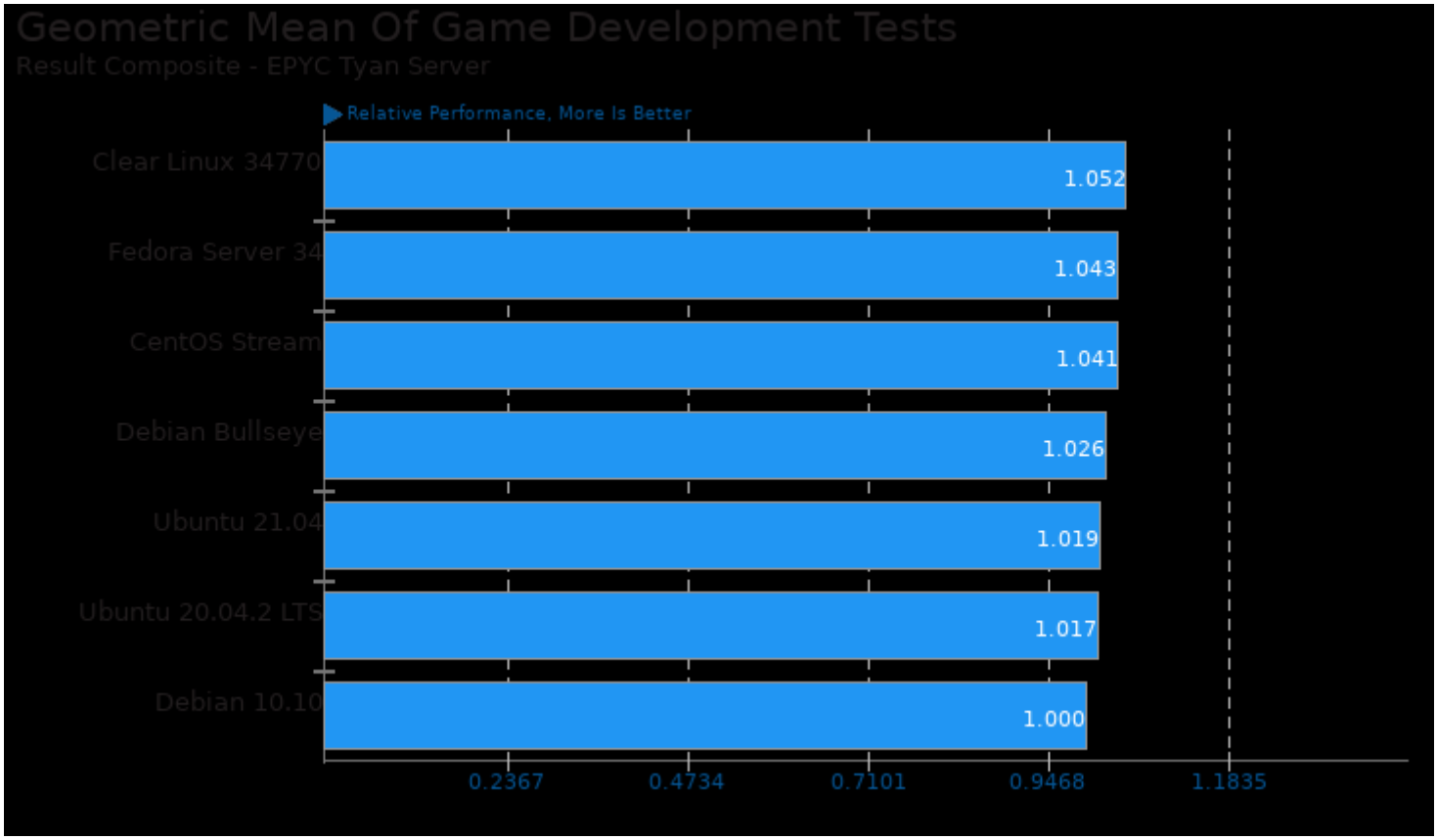
Geometric mean based upon tests: pts/ospray, pts/blender, pts/luxcorerender, pts/svt-vp9, pts/svt-hevc, pts/vpxenc, pts/svt-av1, pts/avifenc, pts/embree, pts/oidn, pts/openvkl, pts/astcenc, pts/build-godot and pts/brl-cad



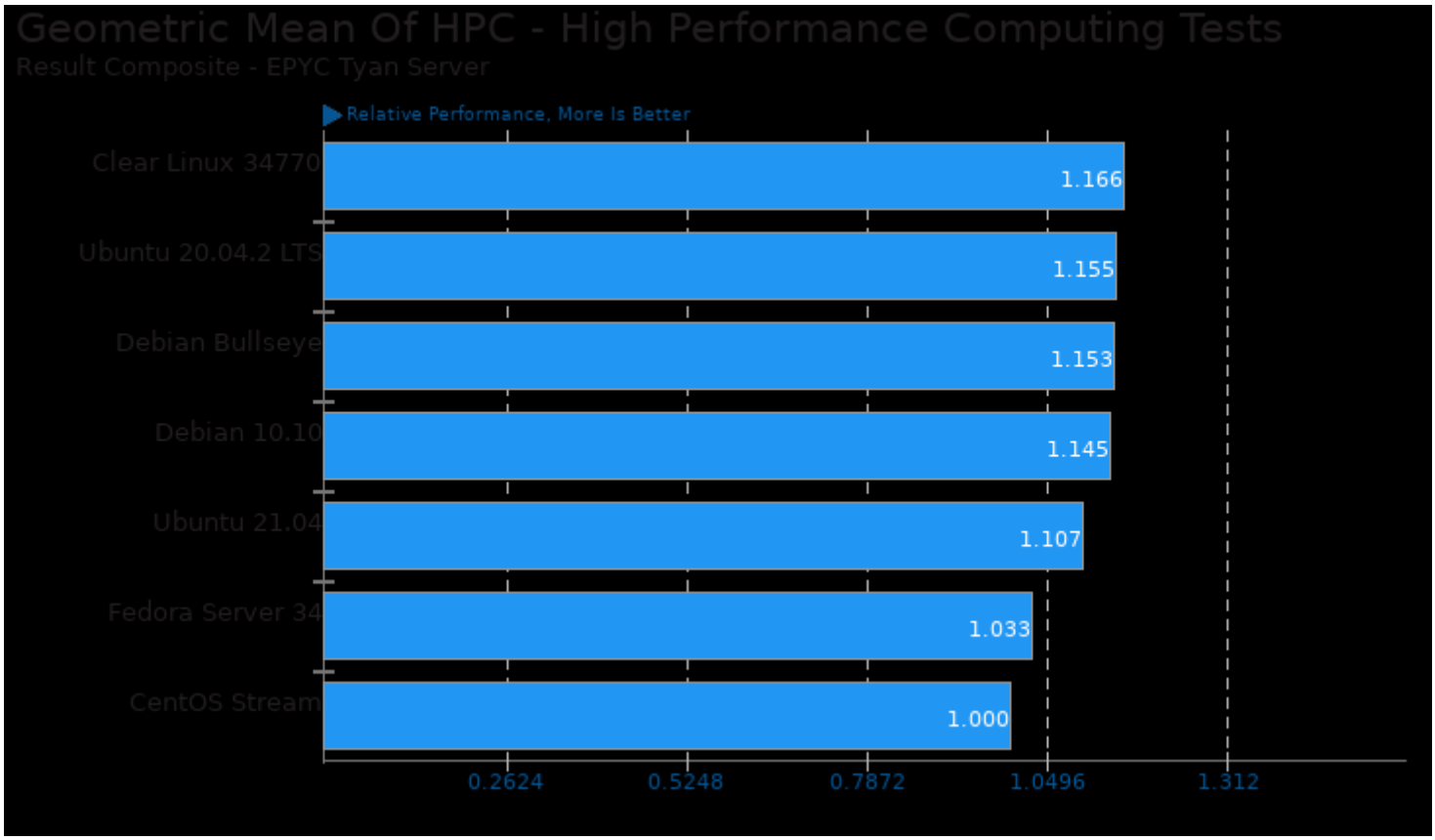
Geometric mean based upon tests: pts/svt-vp9, pts/svt-hevc, pts/vpxenc, pts/svt-av1 and pts/avifenc



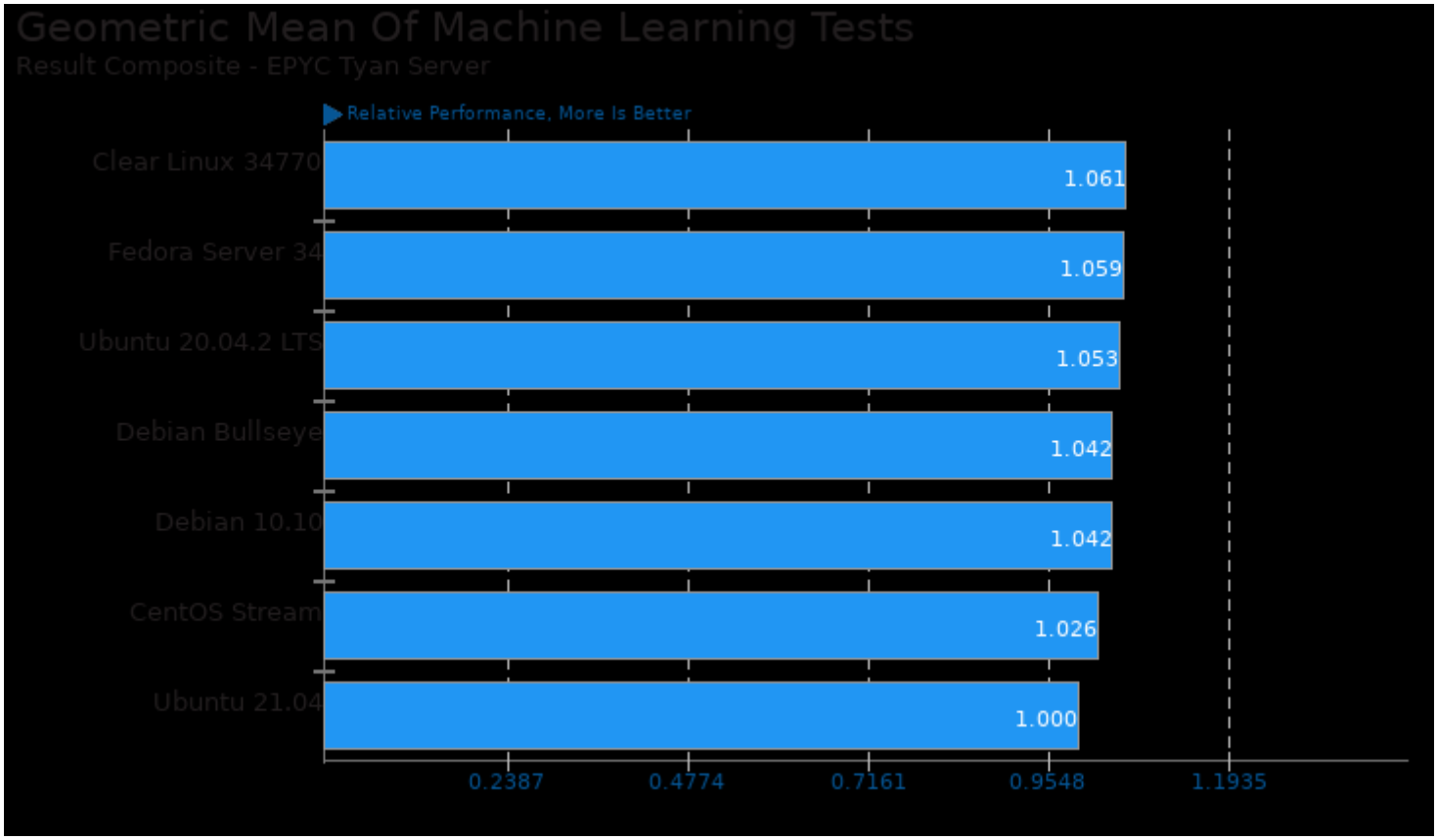
Geometric mean based upon tests: pts/hpcg, pts/npb and pts/incompact3d



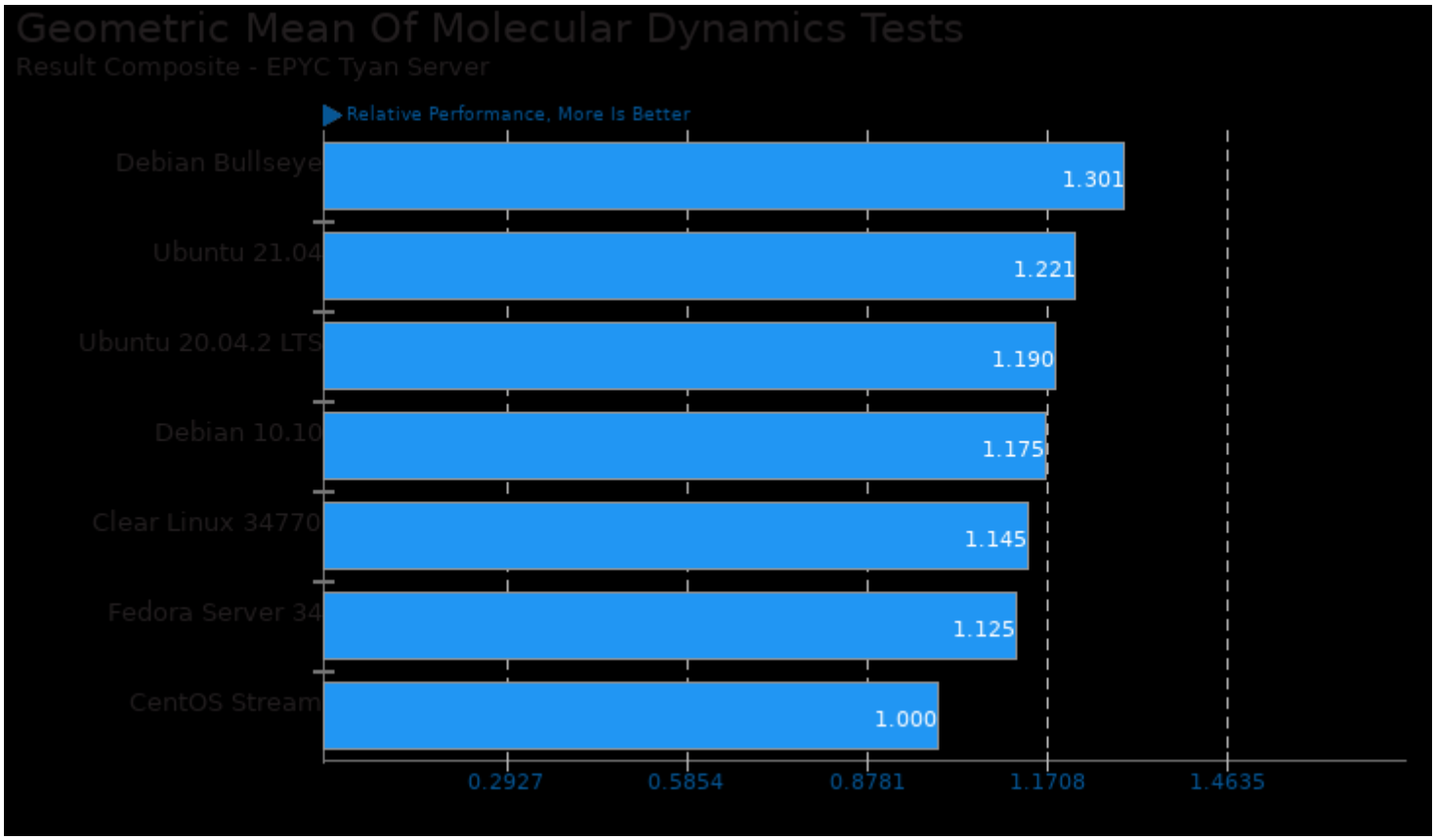
Geometric mean based upon tests: pts/astcenc, pts/build-godot, pts/blender, pts/oidn and pts/openvkl



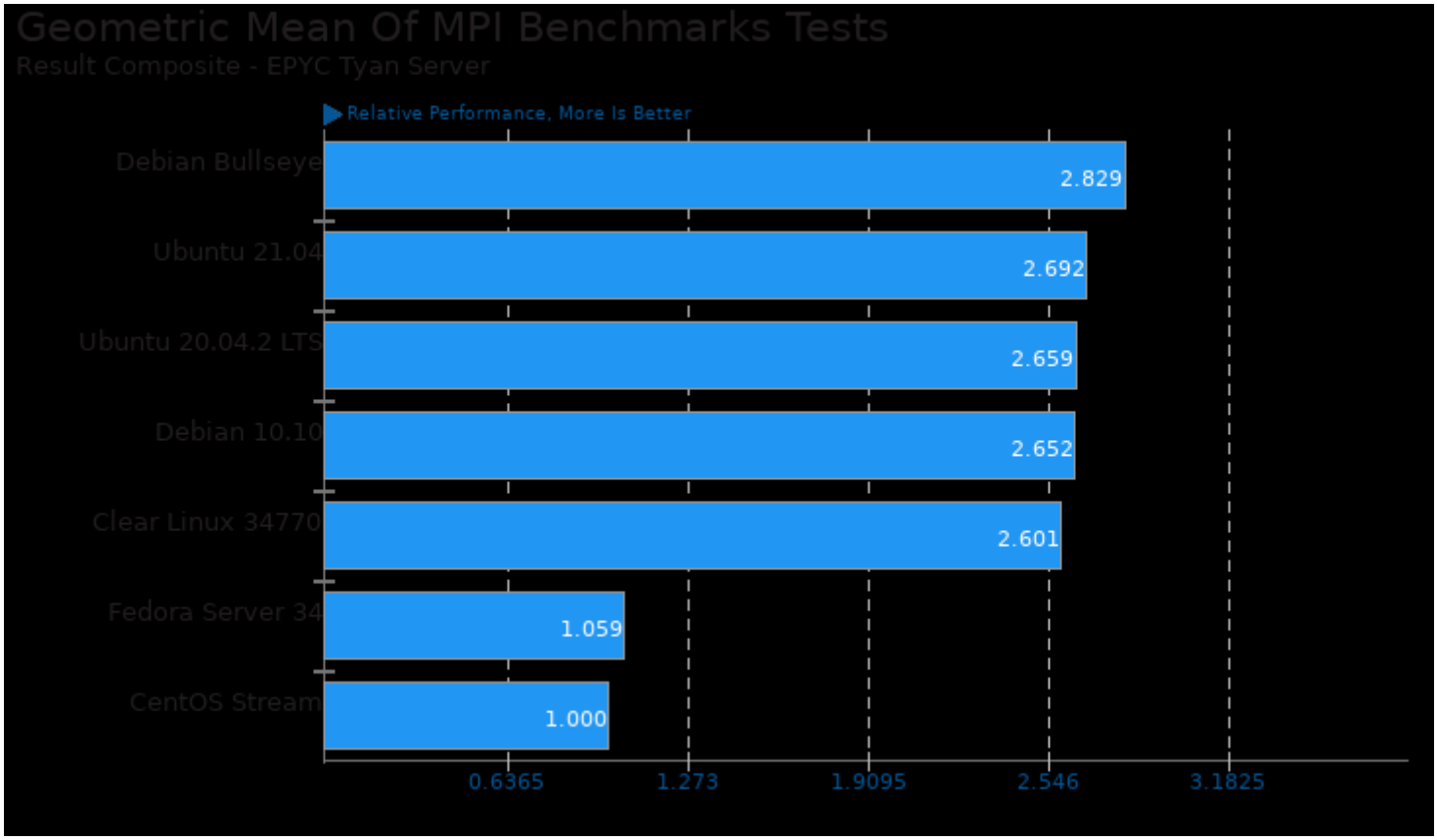
Geometric mean based upon tests: pts/npb, pts/hpcg, pts/namd, pts/gromacs, pts/minife, pts/incompact3d, pts/kripke, pts/mnn, pts/tnn, pts/numenta-nab, pts/tensorflow-lite, pts/onnx and pts/plaidml



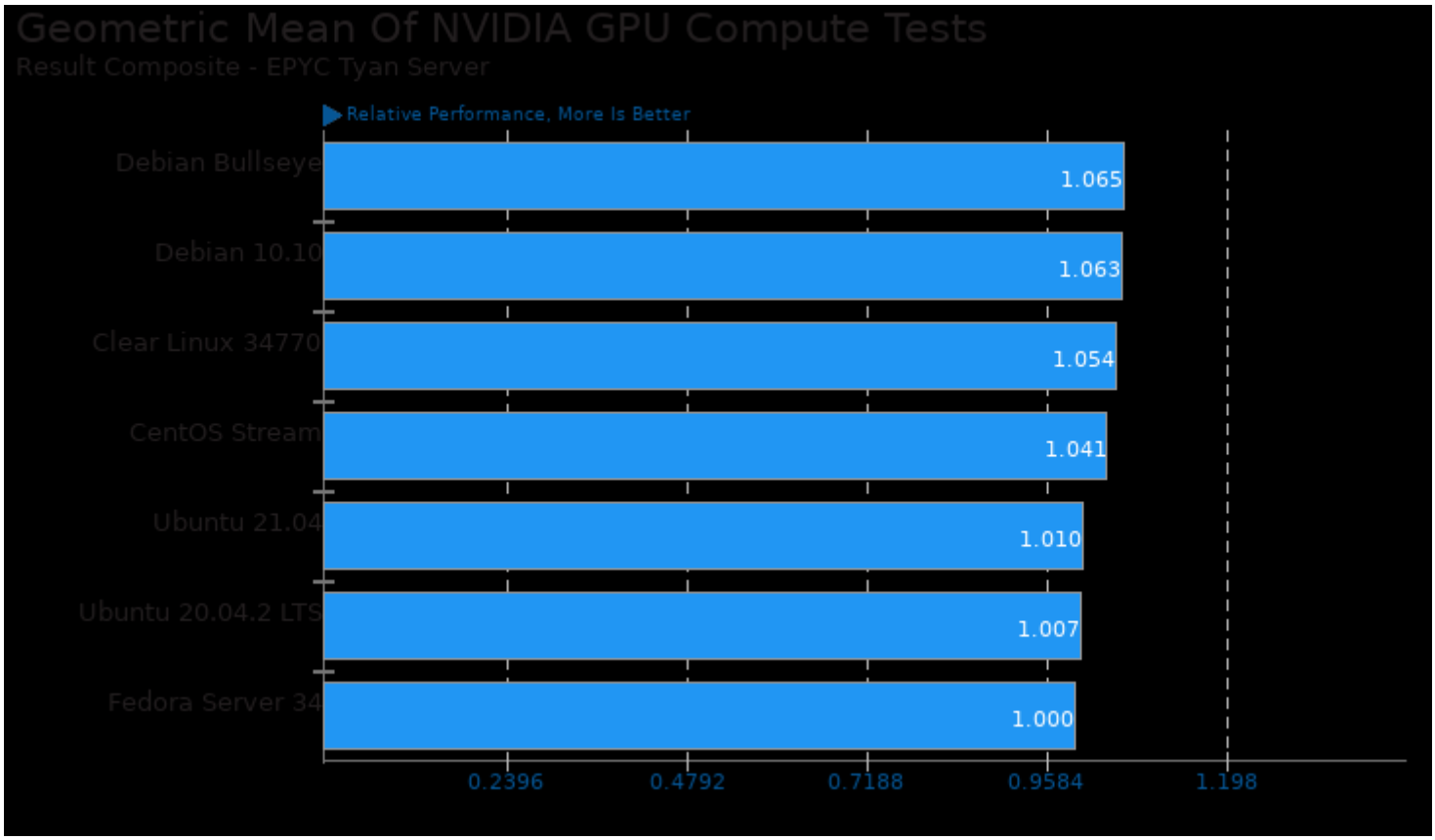
Geometric mean based upon tests: pts/mnn, pts/tnn, pts/numenta-nab, pts/tensorflow-lite, pts/onnx and pts/plaidml



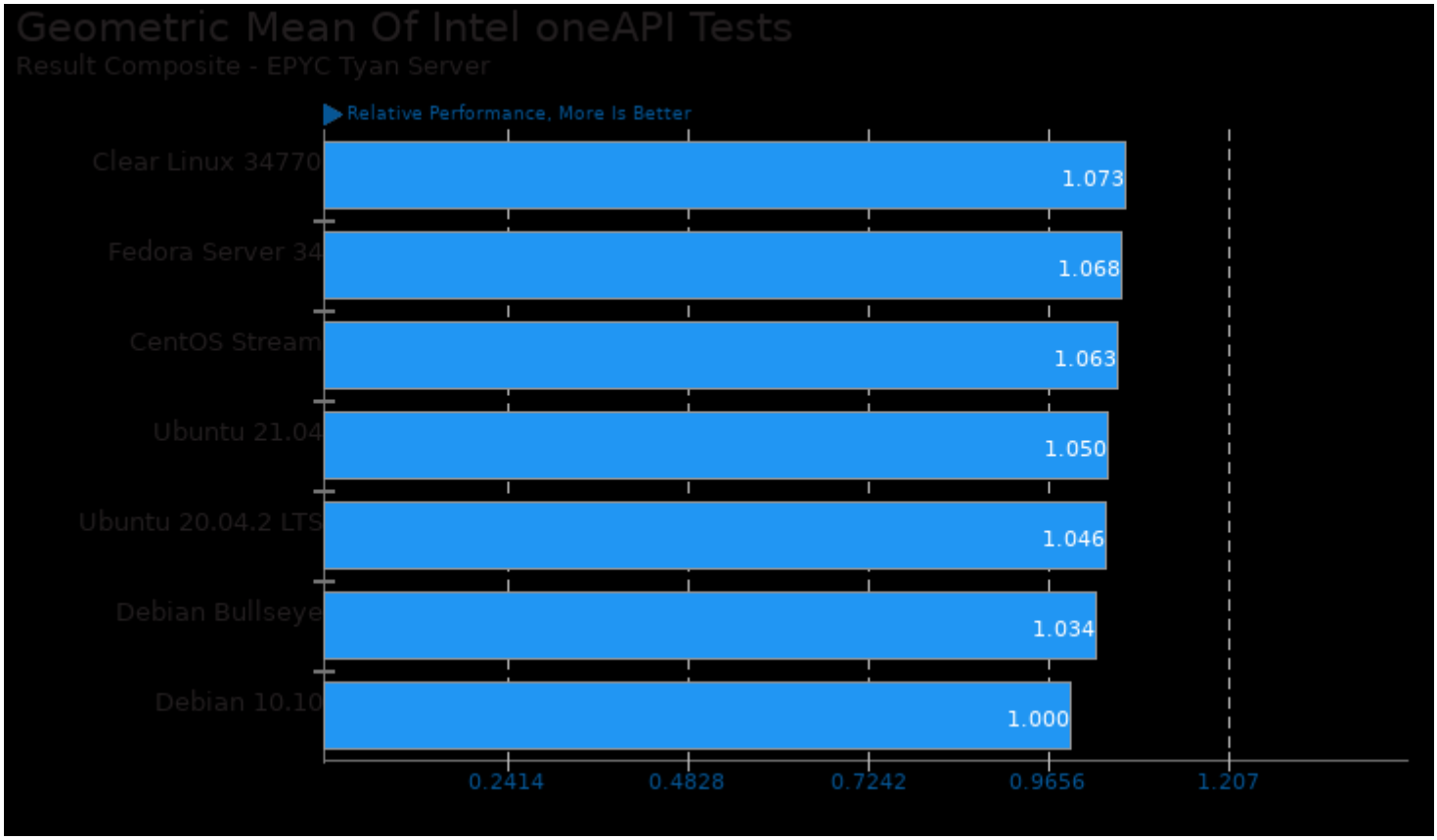
Geometric mean based upon tests: pts/namd, pts/gromacs, pts/minife and pts/incompact3d



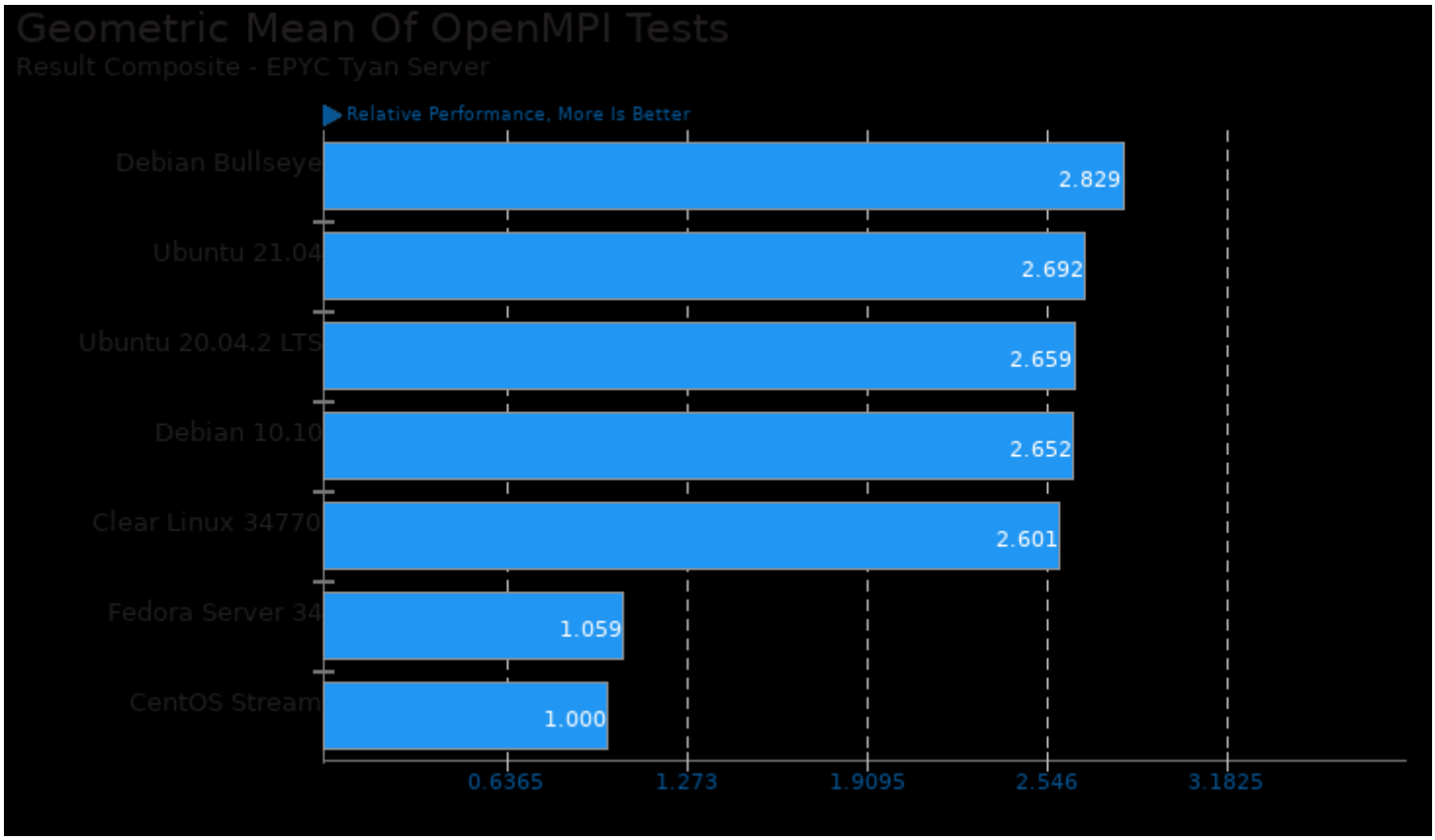
Geometric mean based upon tests: pts/incompact3d, pts/gromacs, pts/hpcg, pts/npb and pts/minife



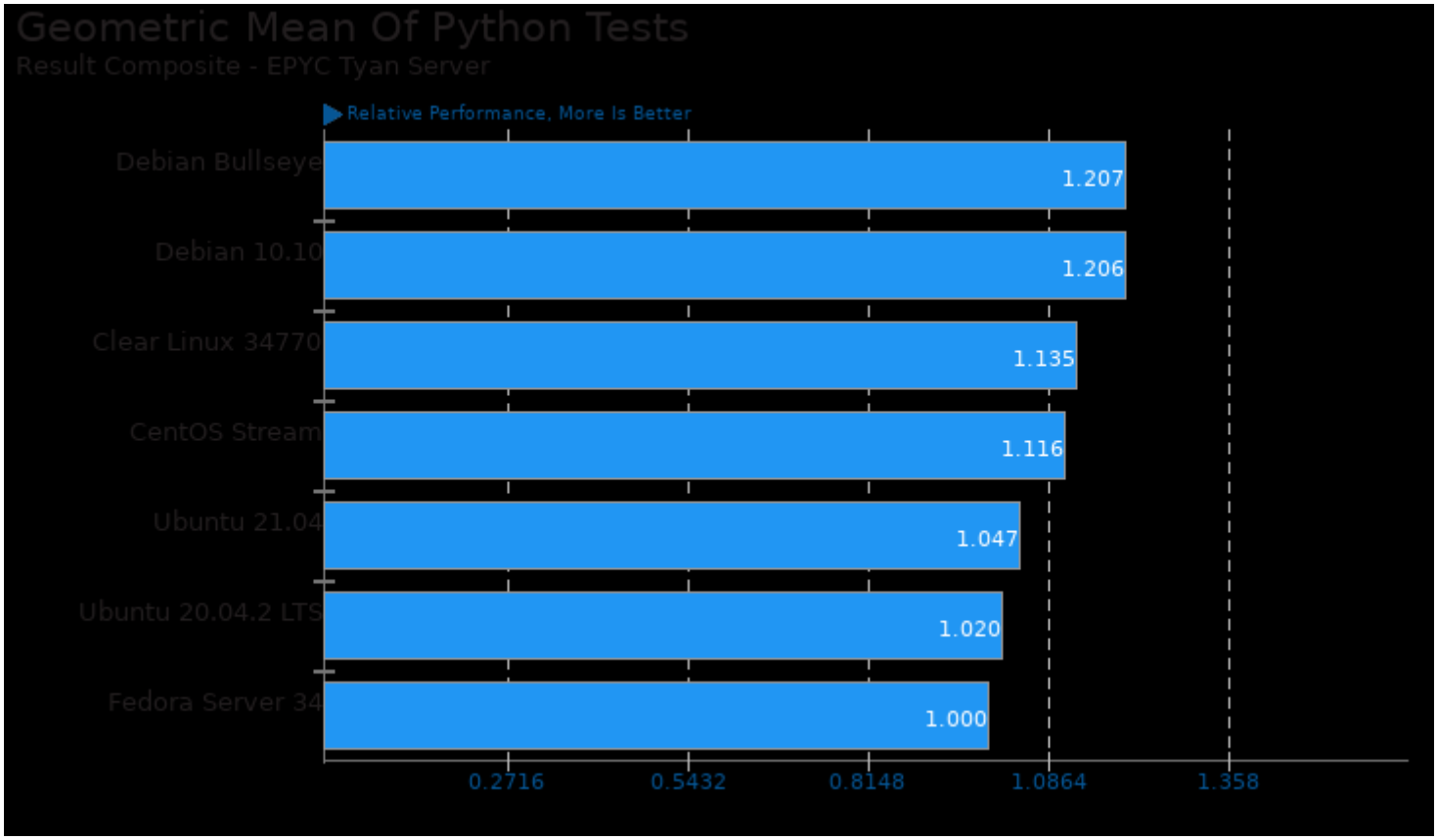
Geometric mean based upon tests: pts/gromacs, pts/luxcorerender, pts/plaidml and pts/blender



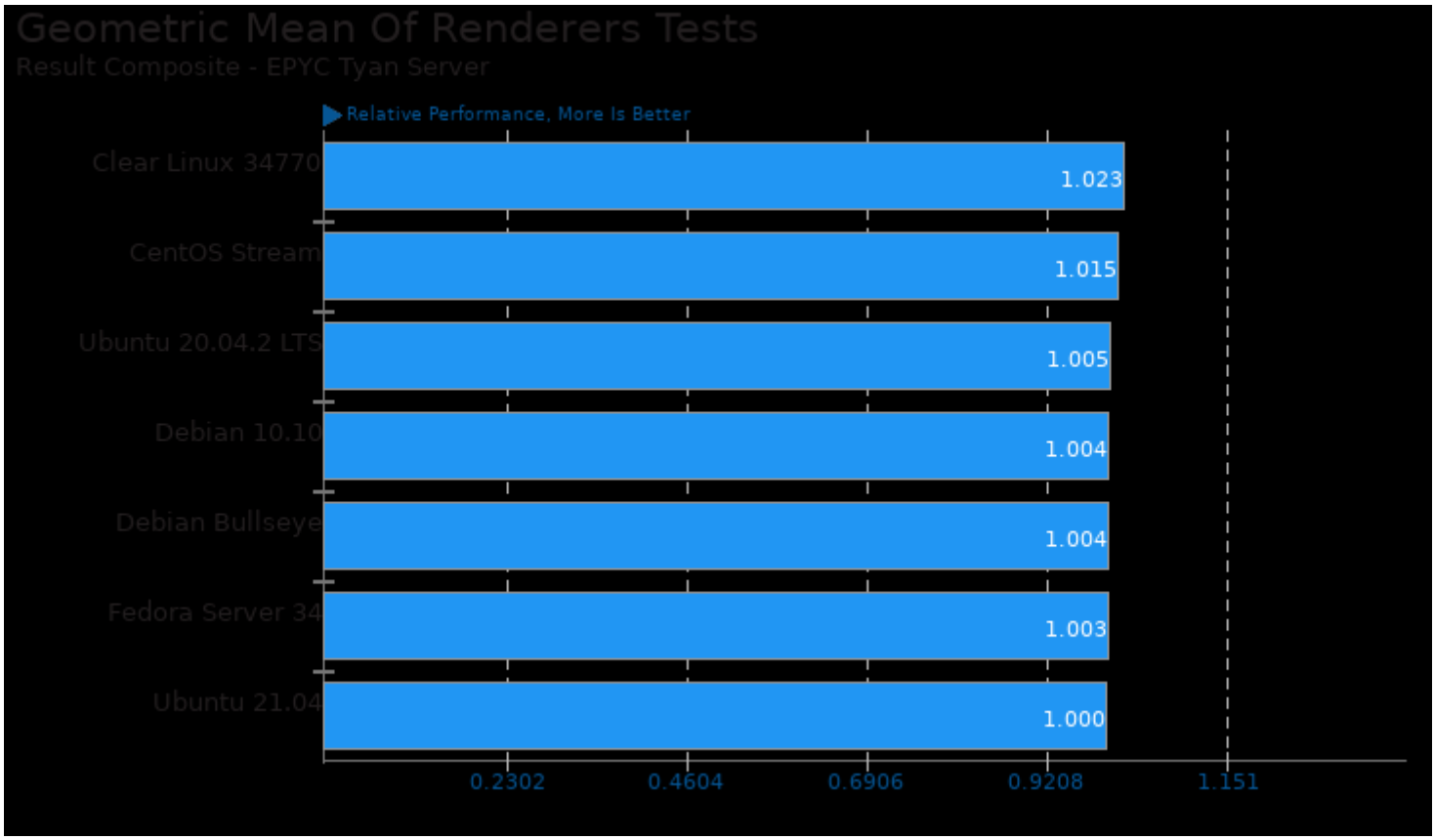
Geometric mean based upon tests: pts/embree, pts/oidn, pts/ospray and pts/openvkl



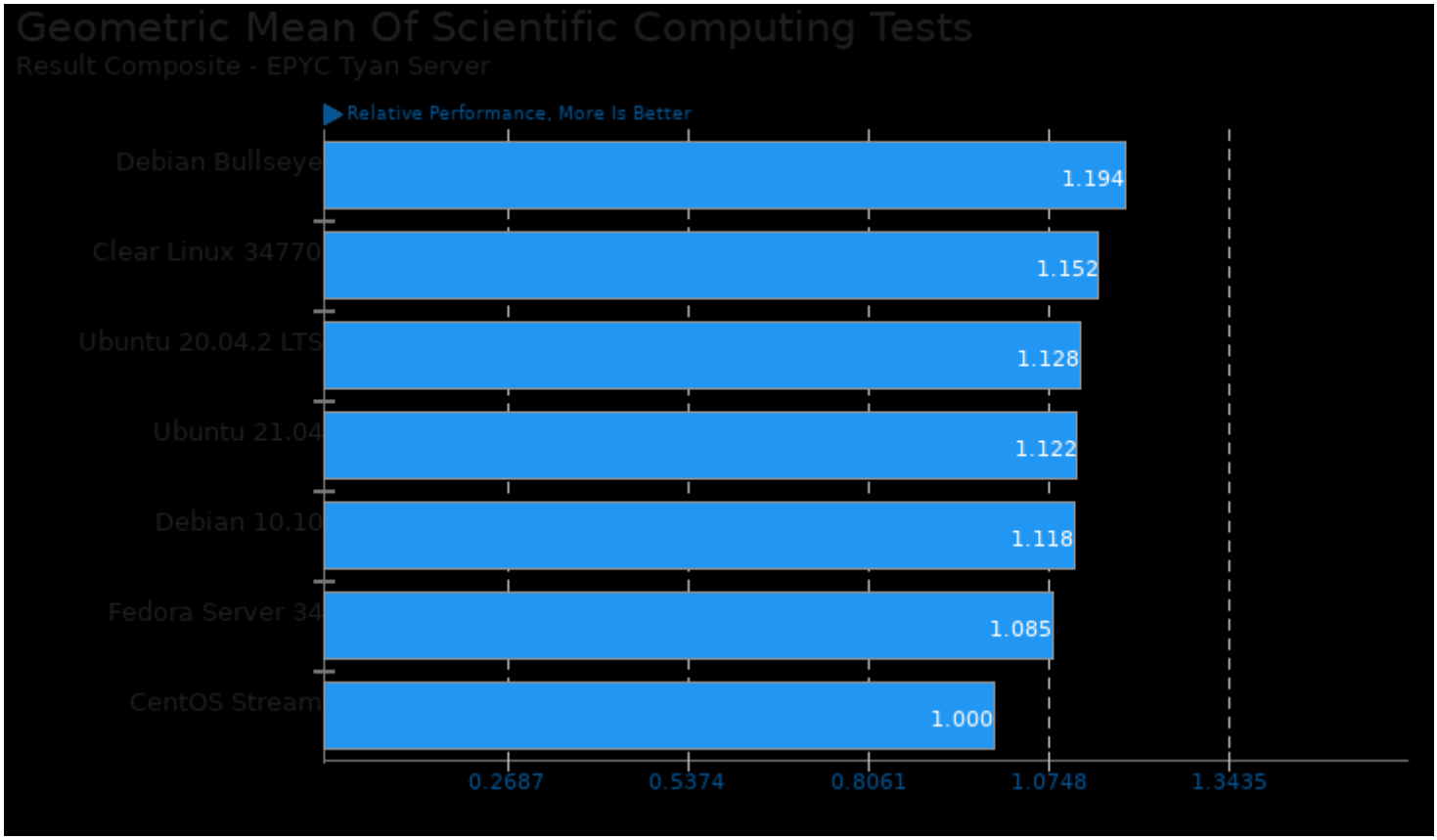
Geometric mean based upon tests: pts/gromacs, pts/hpcg, pts/minife, pts/npb and pts/incompact3d



Geometric mean based upon tests: pts/numenta-nab, pts/onnx, pts/plaidml, pts/build-godot, pts/build-llvm and pts/build-nodejs



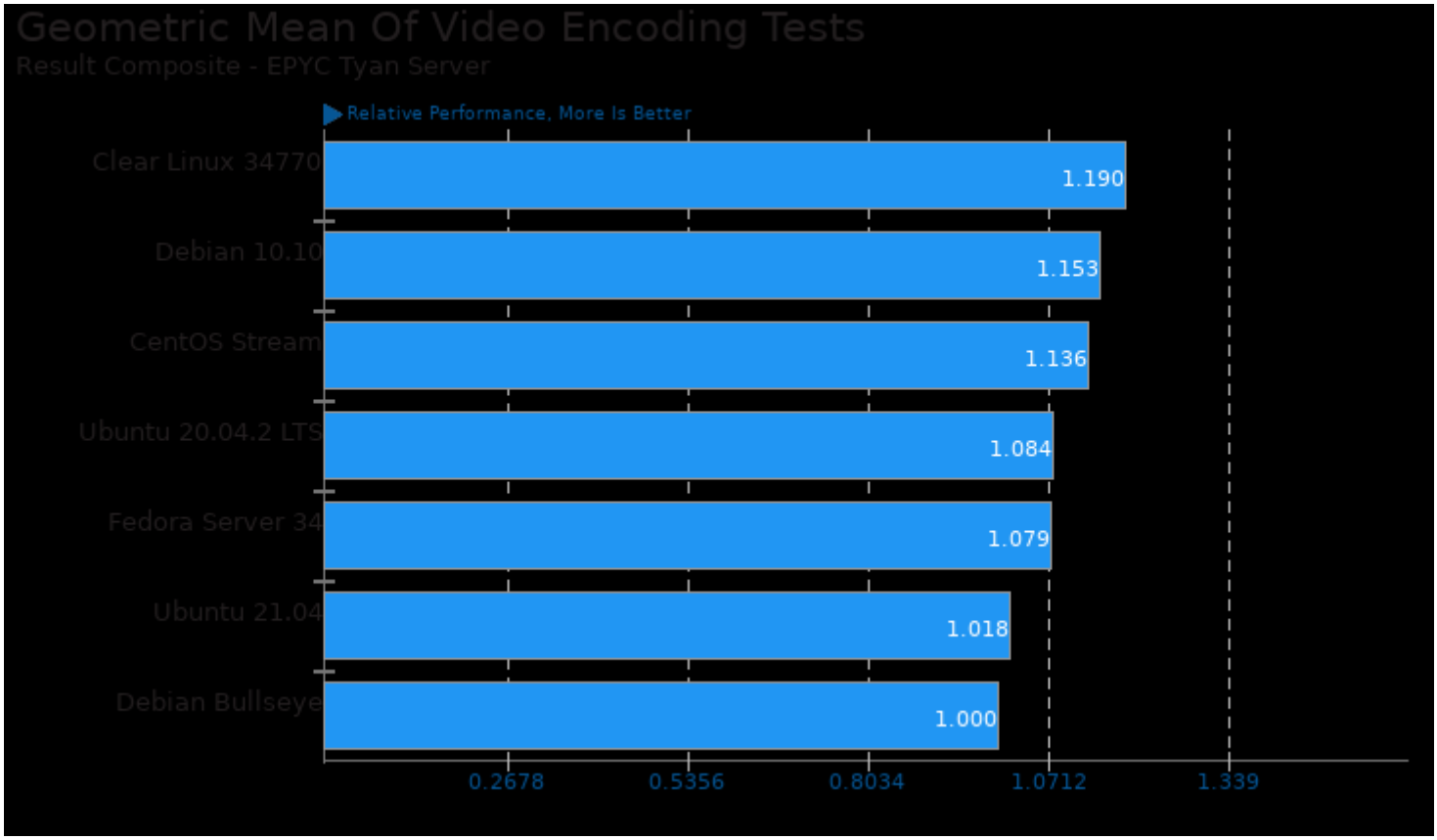
Geometric mean based upon tests: pts/ospray, pts/blender and pts/luxcorerender



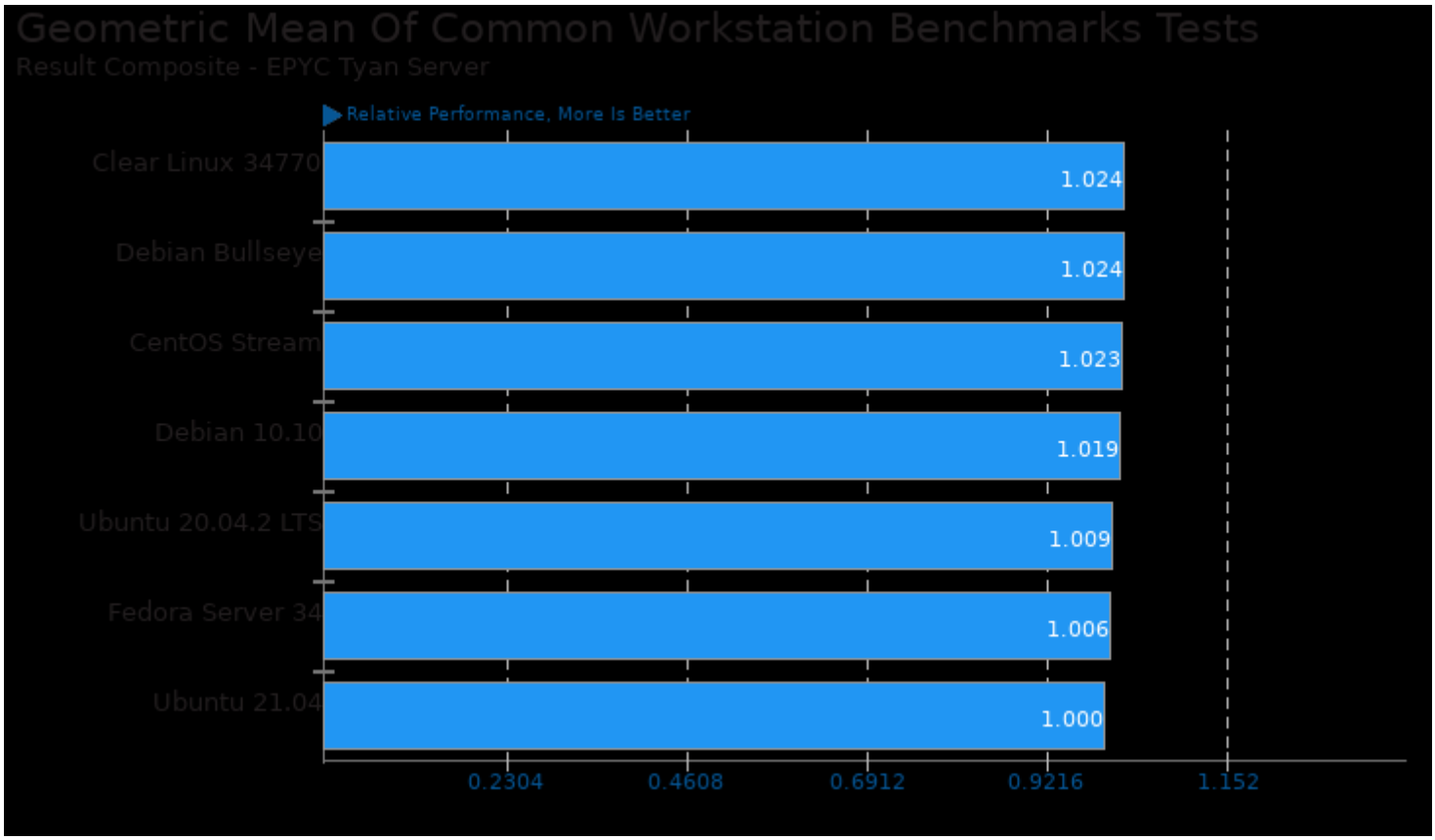
Geometric mean based upon tests: pts/namd, pts/gromacs, pts/minife, pts/incompact3d and pts/kripke



Geometric mean based upon tests: pts/npb, pts/namd, pts/svt-av1, pts/svt-hevc, pts/svt-vp9, pts/build-linux-kernel, pts/build-llvm, pts/blender and pts/numenta-nab



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



Geometric mean based upon tests: pts/blender and pts/brl-cad

This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 08:30.