



## AMD Rembrandt Linux Drivers

AMD Ryzen 7 PRO 6850U Radeon 680M benchmarks by Michael Larabel for a future article.

### Automated Executive Summary

*Linux 5.18 + Mesa 22.0.1 had the most wins, coming in first place for 34% of the tests.*

*Based on the geometric mean of all complete results, the fastest (Linux 5.18 + Mesa 22.0.1) was 1.369x the speed of the slowest (ASUS AMD Radeon RX 560). Linux 5.15 + Mesa 22.0.1 was 0.992x the speed of Linux 5.18 + Mesa 22.0.1, Linux 5.18 + Mesa 22.2-dev was 0.987x the speed of Linux 5.15 + Mesa 22.0.1, Linux 5.15 + Mesa 22.1 was 0.998x the speed of Linux 5.18 + Mesa 22.2-dev, Linux 5.15 + Mesa 22.2-dev was 1x the speed of Linux 5.15 + Mesa 22.1, Linux 5.19 + Mesa 22.2-dev was 0.998x the speed of Linux 5.15 + Mesa 22.2-dev, ASUS AMD Radeon RX 560 was 0.749x the speed of Linux 5.19 + Mesa 22.2-dev.*

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

*OpenArena (Resolution: 1920 x 1080 - Total Frame Time) at 37x*

*DDraceNetwork (Resolution: 1920 x 1080 - Mode: Fullscreen - Renderer: OpenGL 3.3 - Zoom: Default - Demo:*

*RaiNyMore2 - Total Frame Time) at 12.938x*

*DDraceNetwork (Resolution: 1920 x 1080 - Mode: Fullscreen - Renderer: OpenGL 3.3 - Zoom: Default - Demo:*

*Multeasymap - Total Frame Time) at 11.562x*

*VKMark (Resolution: 1920 x 1080 - Present Mode: Mailbox) at 4.982x*

*GpuTest (Test: Triangle - Resolution: 1920 x 1080 - Mode: Fullscreen) at 4.887x*  
*GpuTest (Test: Pixmark Volplosion - Resolution: 1920 x 1080 - Mode: Fullscreen) at 2.269x*  
*GpuTest (Test: Pixmark Piano - Resolution: 1920 x 1080 - Mode: Fullscreen) at 2.138x*  
*ParaView (Test: Many Spheres - Resolution: 1920 x 1080) at 2.017x*  
*GpuTest (Test: Plot3D - Resolution: 1920 x 1080 - Mode: Fullscreen) at 1.872x*  
*yquake2 (Renderer: Vulkan - AF: Off - MSAA: Off - Resolution: 1920 x 1080) at 1.655x.*

## Test Systems:

### Linux 5.19 + Mesa 22.2-dev

Processor: AMD Ryzen 7 PRO 6850U @ 2.70GHz (8 Cores / 16 Threads), Motherboard: LENOVO 21CM0001US (R22ET46W 1.16 BIOS), Chipset: AMD Device 14b5, Memory: 16GB, Disk: 512GB Micron MTFDKBA512TFK, Graphics: AMD Rembrandt 1GB (2200/400MHz), Audio: AMD Rembrandt Radeon HD Audio, Network: Qualcomm Atheros QCNFA765

OS: Ubuntu 22.04, Kernel: 5.19.0-051900rc7-generic (x86\_64), Desktop: GNOME Shell 42.2, Display Server: X Server + Wayland, OpenGL: 4.6 Mesa 22.2.0-devel (git-4ff28bd 2022-07-25 jammy-oibaf-ppa) (LLVM 14.0.6 DRM 3.47), Vulkan: 1.3.219, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 1920x1200

Kernel Notes: Transparent Huge Pages: madvise

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --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-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgc-ahmdhsa=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-gcn/usr --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) - Platform Profile: balanced - CPU Microcode: 0xa404102 - ACPI Profile: balanced

Graphics Notes: BAR1 / Visible vRAM Size: 1024 MB - vBIOS Version: 113-REMBRANDT-X35

Python Notes: Python 3.10.4

Security Notes: itlb\_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + mmio\_stale\_data: Not affected + retbleed: Not affected + spec\_store\_bypass: Mitigation of SSB disabled via prctl + spectre\_v1: Mitigation of usercopy/swaps barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Retpolines IBPB: conditional IBRS\_FW STIBP: always-on RSB filling + srbds: Not affected + tsx\_async\_abort: Not affected

### Linux 5.18 + Mesa 22.2-dev

Processor: AMD Ryzen 7 PRO 6850U @ 2.70GHz (8 Cores / 16 Threads), Motherboard: LENOVO 21CM0001US (R22ET46W 1.16 BIOS), Chipset: AMD Device 14b5, Memory: 16GB, Disk: 512GB Micron MTFDKBA512TFK, Graphics: AMD Rembrandt 1GB (2200/400MHz), Audio: AMD Rembrandt Radeon HD Audio, Network: Qualcomm Atheros QCNFA765

OS: Ubuntu 22.04, Kernel: 5.18.8-051808-generic (x86\_64), Desktop: GNOME Shell 42.2, Display Server: X Server + Wayland, OpenGL: 4.6 Mesa 22.2.0-devel (git-4ff28bd 2022-07-25 jammy-oibaf-ppa) (LLVM 14.0.6 DRM 3.46), Vulkan: 1.3.219, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 1920x1200

Kernel Notes: Transparent Huge Pages: madvise

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --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-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgc-ahmdhsa=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-gcn/usr --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) - Platform Profile: balanced - CPU Microcode: 0xa404102 - ACPI Profile: balanced

Graphics Notes: BAR1 / Visible vRAM Size: 1024 MB - vBIOS Version: 113-REMBRANDT-X35

Python Notes: Python 3.10.4

Security Notes: itlb\_multihit: Not affected + 1tlf: Not affected + mds: Not affected + meltdown: Not affected + mmio\_stale\_data: Not affected + spec\_store\_bypass: Mitigation of SSB disabled via prctl + spectre\_v1: Mitigation of usercopy/swaps barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Retpolines IBPB: conditional IBRS\_FW STIBP: always-on RSB filling + srbds: Not affected + tsx\_async\_abort: Not affected

## Linux 5.18 + Mesa 22.0.1

Processor: AMD Ryzen 7 PRO 6850U @ 2.70GHz (8 Cores / 16 Threads), Motherboard: LENOVO 21CM0001US (R22ET46W 1.16 BIOS), Chipset: AMD Device 14b5, Memory: 16GB, Disk: 512GB Micron MTFDKBA512TFK, Graphics: AMD Rembrandt 1GB (2200/400MHz), Audio: AMD Rembrandt Radeon HD Audio, Network: Qualcomm Atheros QCNFA765

OS: Ubuntu 22.04, Kernel: 5.18.8-051808-generic (x86\_64), Desktop: GNOME Shell 42.2, Display Server: X Server + Wayland, OpenGL: 4.6 Mesa 22.0.1 (LLVM 13.0.1 DRM 3.46), Vulkan: 1.3.204, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 1920x1200

Kernel Notes: Transparent Huge Pages: madvise

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --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-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgc-arch=armv8-a,hsa=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-gcn/usr --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) - Platform Profile: balanced - CPU Microcode: 0xa404102 - ACPI Profile: balanced

Graphics Notes: BAR1 / Visible vRAM Size: 1024 MB - vBIOS Version: 113-REMBRANDT-X35

Python Notes: Python 3.10.4

Security Notes: itlb\_multihit: Not affected + 1tlf: Not affected + mds: Not affected + meltdown: Not affected + mmio\_stale\_data: Not affected + spec\_store\_bypass: Mitigation of SSB disabled via prctl + spectre\_v1: Mitigation of usercopy/swaps barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Retpolines IBPB: conditional IBRS\_FW STIBP: always-on RSB filling + srbds: Not affected + tsx\_async\_abort: Not affected

## Linux 5.15 + Mesa 22.0.1

Processor: AMD Ryzen 7 PRO 6850U @ 4.77GHz (8 Cores / 16 Threads), Motherboard: LENOVO 21CM0001US (R22ET46W 1.16 BIOS), Chipset: AMD Device 14b5, Memory: 16GB, Disk: 512GB Micron MTFDKBA512TFK, Graphics: AMD Rembrandt 1GB, Audio: AMD Rembrandt Radeon HD Audio, Network: Qualcomm Atheros QCNFA765

OS: Ubuntu 22.04, Kernel: 5.15.0-41-generic (x86\_64), Desktop: GNOME Shell 42.2, Display Server: X Server + Wayland, OpenGL: 4.6 Mesa 22.0.1 (LLVM 13.0.1 DRM 3.42), Vulkan: 1.3.204, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 1920x1200

Kernel Notes: Transparent Huge Pages: madvise

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --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-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgc-arch=armv8-a,hsa=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-gcn/usr --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: amd-pstate schedutil (Boost: Enabled) - Platform Profile: balanced - CPU Microcode: 0xa404102 - ACPI Profile: balanced

Graphics Notes: BAR1 / Visible vRAM Size: 1024 MB - vBIOS Version: 113-REMBRANDT-X35

Python Notes: Python 3.10.4

Security Notes: itlb\_multihit: Not affected + 1tlf: Not affected + mds: Not affected + meltdown: Not affected + mmio\_stale\_data: Not affected + spec\_store\_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre\_v1: Mitigation of usercopy/swaps barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Retpolines IBPB: conditional IBRS\_FW STIBP: always-on RSB filling + srbds: Not affected + tsx\_async\_abort: Not affected

## Linux 5.15 + Mesa 22.1

Processor: AMD Ryzen 7 PRO 6850U @ 4.77GHz (8 Cores / 16 Threads), Motherboard: LENOVO 21CM0001US (R22ET46W 1.16 BIOS), Chipset: AMD Device 14b5, Memory: 16GB, Disk: 512GB Micron MTFDKBA512TFK, Graphics: AMD Rembrandt 1GB, Audio: AMD Rembrandt Radeon HD Audio, Network: Qualcomm Atheros QCNFA765

OS: Ubuntu 22.04, Kernel: 5.15.0-41-generic (x86\_64), Desktop: GNOME Shell 42.2, Display Server: X Server + Wayland, OpenGL: 4.6 Mesa 22.1.4 kisak-mesa PPA (LLVM 14.0.6 DRM 3.42), Vulkan: 1.3.211, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 1920x1200

Kernel Notes: Transparent Huge Pages: madvise

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --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-libstdc++-debug --enable-libstdc++-time=yes --enable-link-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgc-nvptx=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-gcn/usr --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-libstdc++-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: amd-pstate schedutil (Boost: Enabled) - Platform Profile: balanced - CPU Microcode: 0xa404102 - ACPI Profile: balanced

Graphics Notes: BAR1 / Visible vRAM Size: 1024 MB - vBIOS Version: 113-REMBRANDT-X35

Python Notes: Python 3.10.4

Security Notes: itlb\_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + mmio\_stale\_data: 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 Retpolines IBPB: conditional IBRS\_FW STIBP: always-on RSB filling + srbds: Not affected + tsx\_async\_abort: Not affected

### Linux 5.15 + Mesa 22.2-dev

Processor: AMD Ryzen 7 PRO 6850U @ 4.77GHz (8 Cores / 16 Threads), Motherboard: LENOVO 21CM0001US (R22ET46W 1.16 BIOS), Chipset: AMD Device 14b5, Memory: 16GB, Disk: 512GB Micron MTFDKBA512TFK, Graphics: AMD Rembrandt 1GB, Audio: AMD Rembrandt Radeon HD Audio, Network: Qualcomm Atheros QCNFA765

OS: Ubuntu 22.04, Kernel: 5.15.0-41-generic (x86\_64), Desktop: GNOME Shell 42.2, Display Server: X Server + Wayland, OpenGL: 4.6 Mesa 22.2.0-devel (git-ba461f8 2022-07-26 jammy-oibaf-ppa) (LLVM 14.0.6 DRM 3.42), Vulkan: 1.3.219, Compiler: GCC 11.2.0, File-System: ext4, Screen Resolution: 1920x1200

Kernel Notes: Transparent Huge Pages: madvise

Compiler Notes: --build=x86\_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-cet --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-libstdc++-debug --enable-libstdc++-time=yes --enable-link-serialization=2 --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-nvptx/usr,amdgc-nvptx=/build/gcc-11-gBFGDP/gcc-11-11.2.0/debian/tmp-gcn/usr --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-libstdc++-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: amd-pstate schedutil (Boost: Enabled) - Platform Profile: balanced - CPU Microcode: 0xa404102 - ACPI Profile: balanced

Graphics Notes: BAR1 / Visible vRAM Size: 1024 MB - vBIOS Version: 113-REMBRANDT-X35

Python Notes: Python 3.10.4

Security Notes: itlb\_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + mmio\_stale\_data: 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 Retpolines IBPB: conditional IBRS\_FW STIBP: always-on RSB filling + srbds: Not affected + tsx\_async\_abort: Not affected

### ASUS AMD Radeon RX 560

Processor: AMD Ryzen 5 3600 6-Core @ 3.60GHz (6 Cores / 12 Threads), Motherboard: Gigabyte B450 AORUS M (F50 BIOS), Chipset: AMD Starship/Matisse, Memory: 16GB, Disk: Samsung SSD 960 EVO 500GB + 0GB SD Card Reader, Graphics: ASUS AMD Radeon RX 560 4GB (1187/1500MHz), Audio: AMD Baffin HDMI/DP, Monitor: 27GL850, Network: Realtek RTL8111/8168/8411 + Intel Wi-Fi 6 AX210/AX211/AX411

OS: Fedora Linux 36, Kernel: 5.18.16-200.fc36.x86\_64 (x86\_64), Desktop: KDE Plasma 5.25.4, Display Server: X Server 1.20.14, OpenGL: 4.6 Mesa 22.1.6 (LLVM 14.0.0 DRM 3.46), Vulkan: 1.3.211, Compiler: GCC 12.1.1 20220507, File-System: btrfs, Screen Resolution: 2560x1440

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-libstdc++-backtrace --enable-link-serialization=1 --enable-multilib --enable-offload-defaulted --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --mandir=/usr/share/man --with-arch=32=i686 --with-build-config=bootstrap-lto --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: 0x8701013

Graphics Notes: GLAMOR - BAR1 / Visible vRAM Size: 256 MB - vBIOS Version: 115-C994PI0-102

Python Notes: Python 3.10.6

Security Notes: SELinux + itlb\_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + mmio\_stale\_data: Not affected + retbleed: Mitigation

of untrained return thunk; SMT enabled with STIBP protection + spec\_store\_bypass: Mitigation of SSB disabled via prctl + spectre\_v1: Mitigation of usercopy/swapgs barriers and \_\_user pointer sanitization + spectre\_v2: Mitigation of Retpolines IBPB: conditional STIBP: always-on RSB filling + srbs: Not affected + tsx\_async\_abort: Not affected

	Linux 5.19 + Mesa 22.2-dev	Linux 5.18 + Mesa 22.2-dev	Linux 5.18 + Mesa 22.0.1	Linux 5.15 + Mesa 22.0.1	Linux 5.15 + Mesa 22.1	Linux 5.15 + Mesa 22.2-dev	ASUS AMD Radeon RX 560
<b>Unigine Heaven - 1920 x 1080 - Fullscreen - OpenGL (FPS)</b>	43.4973	43.8089	45.6321	44.1977	44.3584	44.4568	33.5528
Normalized	95.32%	96%	100%	96.86%	97.21%	97.42%	73.53%
Standard Deviation	1.8%	1.1%	0.8%	2.1%	2.4%	2.4%	0.2%
<b>VKMark - 1920 x 1080 - Mailbox (VKMark Score)</b>	13173	12943	12828	12029	12441	12278	2644
Normalized	100%	98.25%	97.38%	91.32%	94.44%	93.21%	20.07%
Standard Deviation	2.1%	0.9%	1.7%	4.9%	4.8%	4.4%	0.2%
<b>GravityMark - 1920 x 1080 - OpenGL (FPS)</b>	29.4	29.1	29.2	31.5	31.4	31.7	31.5
Normalized	92.74%	91.8%	92.11%	99.37%	99.05%	100%	99.37%
Standard Deviation	3.4%	2.4%	1.4%	1.3%	2.4%	1.6%	0.5%
<b>Unigine Superposition - 1920 x 1080 - Fullscreen - Low - OpenGL (FPS)</b>	53.1	54.3	55.5	53.9	53.1	54.2	43.7
Normalized	95.68%	97.84%	100%	97.12%	95.68%	97.66%	78.74%
Standard Deviation	2.2%	1.5%	1.8%	2.1%	1.9%	1.7%	1%
<b>GravityMark - 1920 x 1080 - Vulkan (FPS)</b>	33.2	32.6	33.7	32.9	32.8	33.3	32.2
Normalized	98.52%	96.74%	100%	97.63%	97.33%	98.81%	95.55%
Standard Deviation	0.6%	0.9%	0.6%	1%	0.5%	0.8%	1.4%
<b>Xonotic - 1920 x 1080 - Ultimate (FPS)</b>	194.5030431	195.7918471	194.6761811	189.7277498	193.2440746	195.5588275	228.4149474
Normalized	85.15%	85.72%	85.23%	83.06%	84.6%	85.62%	100%
Standard Deviation	0.5%	0.4%	0.9%	1.8%	0.9%	0.2%	0.1%
<b>Xonotic - 1920 x 1080 - Ultra (FPS)</b>	272.7836001	272.4358809	271.2674897	270.3610903	267.3767360	275.5728788	326.7994005
Normalized	83.47%	83.36%	83.01%	82.73%	81.82%	84.32%	100%
Standard Deviation	0.8%	1%	0.6%	1.8%	0.7%	1%	0.5%
<b>Xonotic - 1920 x 1080 - High (FPS)</b>	309.0591213	313.5708340	312.7460791	312.6204238	309.2897168	316.5003320	375.7265848
Normalized	82.26%	83.46%	83.24%	83.2%	82.32%	84.24%	100%
Standard Deviation	1.1%	0.5%	1%	1.3%	0.9%	1.2%	0.6%
<b>GpuTest - Furmark - 1920 x 1080 - Fullscreen</b>	2124	2123	2114	2107	2109	2119	1598
Normalized	100%	99.95%	99.53%	99.2%	99.29%	99.76%	75.24%
Standard Deviation	0.2%	0.1%	0.2%	0.2%	0.1%	0.3%	2.5%
<b>GLmark2 - 1920 x 1080 (Score)</b>	5854	5837	5886	5616	5723	5710	
Normalized	99.46%	99.17%	100%	95.41%	97.23%	97.01%	

## AMD Rembrandt Linux Drivers

<b>GpuTest - GiMark - 1920 x 1080 - Fullscreen (Points)</b>	4250	4261	4228	4168	4229	4252	3602
Normalized	99.74%	100%	99.23%	97.82%	99.25%	99.79%	84.53%
Standard Deviation	0.2%	0.2%	0.3%	0.3%	0.2%	0.3%	2%
<b>Xonotic - 1920 x 1080 - Low (FPS)</b>	485.0492809	483.0492810	486.3260778	487.3837634	482.5771501	490.4897503	512.3258567
Normalized	94.68%	94.29%	94.93%	95.13%	94.19%	95.74%	100%
Standard Deviation	1.7%	0.6%	1.5%	0.8%	0.6%	1%	0.7%
<b>GpuTest - Triangle - 1920 x 1080 - Fullscreen</b>	622596	615045	609733	567456	594012	589110	127405
Normalized	100%	98.79%	97.93%	91.14%	95.41%	94.62%	20.46%
Standard Deviation	0.7%	0.7%	0.4%	1.7%	2.3%	0.8%	0%
<b>GpuTest - Plot3D - 1920 x 1080 - Fullscreen (Points)</b>	55772	55936	55670	55782	56169	55915	29998
Normalized	99.29%	99.59%	99.11%	99.31%	100%	99.55%	53.41%
Standard Deviation	0.5%	0.1%	0.5%	0.2%	0.3%	0.4%	0.1%
<b>GpuTest - TessMark - 1920 x 1080 - Fullscreen</b>	8969	9017	8970	8604	8876	8945	6729
Normalized	99.47%	100%	99.48%	95.42%	98.44%	99.2%	74.63%
Standard Deviation	0.2%	0.1%	0.3%	1.1%	0.4%	0.2%	0%
<b>GpuTest - Pixmark - Volplosion - 1920 x 1080 - Fullscreen (Points)</b>	1924	1919	1913	1885	1924	1923	848
Normalized	100%	99.74%	99.43%	97.97%	100%	99.95%	44.07%
Standard Deviation	0.2%	0.7%	0.3%	0.3%	0.3%	0.4%	0%
<b>GpuTest - Pixmark Piano - 1920 x 1080 - Fullscreen (Points)</b>	786	791	787	764	789	785	370
Normalized	99.37%	100%	99.49%	96.59%	99.75%	99.24%	46.78%
Standard Deviation	0.3%	0.2%	0.2%	0.6%	0.1%	0.1%	0%
<b>ParaView - Many Spheres - 1920 x 1080 (MiPolys /</b>	2694	2698	2751	2873	2921	2934	1454
Normalized	91.84%	91.97%	93.78%	97.93%	99.57%	100%	49.57%
Standard Deviation	2.2%	1.3%	3.3%	0.3%	0.3%	0.4%	0.1%
<b>ParaView - Many Spheres - 1920 x 1080 (Frames /</b>	26.88	26.91	27.44	28.66	29.14	29.26	14.51
Normalized	91.87%	91.97%	93.78%	97.95%	99.59%	100%	49.59%
Standard Deviation	2.2%	1.3%	3.3%	0.3%	0.3%	0.4%	0.1%
<b>DDraceNetwork - 1920 x 1080 - Fullscreen - OpenGL 3.3 - Default - Multeasymap (FPS)</b>	751.57	748.93	753.79	720.08	718.87	722.19	627.72
Normalized	99.71%	99.36%	100%	95.53%	95.37%	95.81%	83.28%
Standard Deviation	0.8%	1.2%	1.2%	1.1%	0.9%	1.3%	0.3%
<b>DDraceNetwork - 1920 x 1080 - Fullscreen - OpenGL 3.3 - Default - RaiNyMore2 (FPS)</b>	526.99	516.17	540.78	522.89	523.43	531.99	347.31
Normalized	97.45%	95.45%	100%	96.69%	96.79%	98.37%	64.22%
Standard Deviation	1.4%	0.5%	0.2%	0.7%	0.7%	0.6%	0%



## AMD Rembrandt Linux Drivers

<b>Tesseract - 1920 x 1080 (FPS)</b>	252.8445	255.7188	253.6925	254.2062	252.0219	<b>250.5050</b>	<b>270.3892</b>
Normalized	93.51%	94.57%	93.82%	94.01%	93.21%	92.65%	100%
Standard Deviation	0.4%	0.5%	0.7%	1.6%	1.1%	0.6%	1.3%
<b>ParaView - Wavelet</b>	892.551	955.284	<b>824.103</b>	980.986	992.792	<b>997.437</b>	962.878
<b>Contour - 1920 x 1080 (MiPolys / Sec)</b>							
Normalized	89.48%	95.77%	82.62%	98.35%	99.53%	100%	96.54%
Standard Deviation	7.2%	1.1%	10.3%	0.8%	0.7%	0.8%	0.1%
<b>ParaView - Wavelet</b>	85.65	91.67	<b>79.08</b>	94.13	95.26	<b>95.71</b>	92.40
<b>Contour - 1920 x 1080 (Frames / Sec)</b>							
Normalized	89.49%	95.78%	82.62%	98.35%	99.53%	100%	96.54%
Standard Deviation	7.2%	1.1%	10.3%	0.8%	0.7%	0.8%	0.1%
<b>ParaView - Wavelet</b>	2346	2325	<b>2500</b>	2268	2189	2199	<b>1541</b>
<b>Volume - 1920 x 1080 (MiVoxels / Sec)</b>							
Normalized	93.84%	92.99%	100%	90.73%	87.55%	87.98%	61.65%
Standard Deviation	2.4%	0.8%	2.3%	4.2%	5.2%	4.4%	0.4%
<b>ParaView - Wavelet</b>	146.62	145.29	<b>156.25</b>	141.77	136.79	137.46	<b>96.33</b>
<b>Volume - 1920 x 1080 (Frames / Sec)</b>							
Normalized	93.84%	92.99%	100%	90.73%	87.55%	87.97%	61.65%
Standard Deviation	2.4%	0.8%	2.3%	4.2%	5.2%	4.4%	0.4%
<b>OpenArena - 1920 x 1080 (FPS)</b>	265.6	266.7	<b>273.4</b>	268.3	272.7	264.6	<b>223.6</b>
Normalized	97.15%	97.55%	100%	98.13%	99.74%	96.78%	81.78%
Standard Deviation	1.1%	2%	0.9%	2%	2.4%	1.6%	0.4%
<b>yquake2 - Vulkan - Off - On - 1920 x 1080 (FPS)</b>	277.5	<b>278.0</b>	272.9	267.9	271.0	265.3	<b>186.9</b>
Normalized	99.82%	100%	98.17%	96.37%	97.48%	95.43%	67.23%
Standard Deviation	2.4%	0.6%	1.4%	0.3%	0.7%	0.5%	0.1%
<b>yquake2 - Vulkan - On - On - 1920 x 1080 (FPS)</b>	262.0	<b>268.7</b>	262.6	255.2	258.5	258.5	<b>179.7</b>
Normalized	97.51%	100%	97.73%	94.98%	96.2%	96.2%	66.88%
Standard Deviation	0.8%	2.4%	0.5%	0.8%	1.8%	0.7%	0%
<b>yquake2 - OpenGL 3.x - On - Off - 1920 x 1080</b>	1078	<b>1050</b>	<b>1399</b>	1348	1070	1058	1264
Normalized	77.07%	75.06%	100%	96.42%	76.5%	75.68%	90.39%
Standard Deviation	2.2%	3.2%	1.5%	3.8%	3.2%	3.4%	0.7%
<b>yquake2 - OpenGL 3.x - On - On - 1920 x 1080</b>	792.4	794.4	884.4	<b>886.0</b>	805.6	<b>791.6</b>	851.7
Normalized	89.44%	89.66%	99.82%	100%	90.93%	89.35%	96.13%
Standard Deviation	1.5%	2.7%	1.2%	0.4%	1.7%	2.9%	2.3%
<b>yquake2 - Vulkan - On - Off - 1920 x 1080 (FPS)</b>	1231	<b>1253</b>	1246	1245	1222	1168	<b>772.5</b>
Normalized	98.24%	100%	99.45%	99.35%	97.57%	93.25%	61.67%
Standard Deviation	1.7%	1.7%	3.6%	2.4%	3.9%	2.5%	2.1%
<b>yquake2 - OpenGL 3.x - Off - Off - 1920 x 1080</b>	1118	1096	<b>1398</b>	1395	1098	<b>1082</b>	1267
Normalized	80%	78.4%	100%	99.83%	78.58%	77.43%	90.64%
Standard Deviation	2.2%	2.6%	1.7%	6%	2.2%	3.2%	1.3%

## AMD Rembrandt Linux Drivers

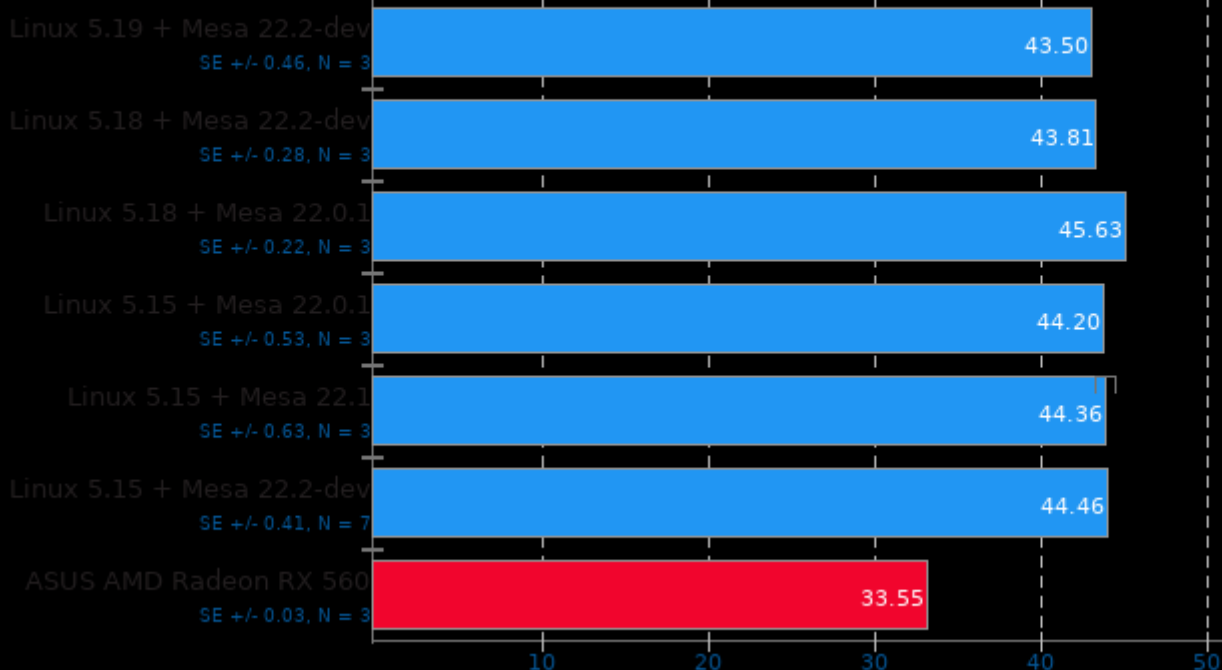
yquake2 - OpenGL 3.x - Off - On - 1920 x 1080	800.4	801.0	892.2	871.8	812.3	816.2	872.9
Normalized	89.71%	89.78%	100%	97.71%	91.04%	91.48%	97.84%
Standard Deviation	1.4%	3.5%	2.4%	1.3%	2.4%	0.5%	0.1%
yquake2 - Vulkan - Off - Off - 1920 x 1080 (FPS)	1259	1289	1287	1251	1230	1189	779.0
Normalized	97.7%	100%	99.85%	97.01%	95.41%	92.22%	60.43%
Standard Deviation	3.4%	1.2%	0.7%	2.3%	2.1%	1.1%	0.1%



## Unigine Heaven 4.0

Resolution: 1920 x 1080 - Mode: Fullscreen - Renderer: OpenGL

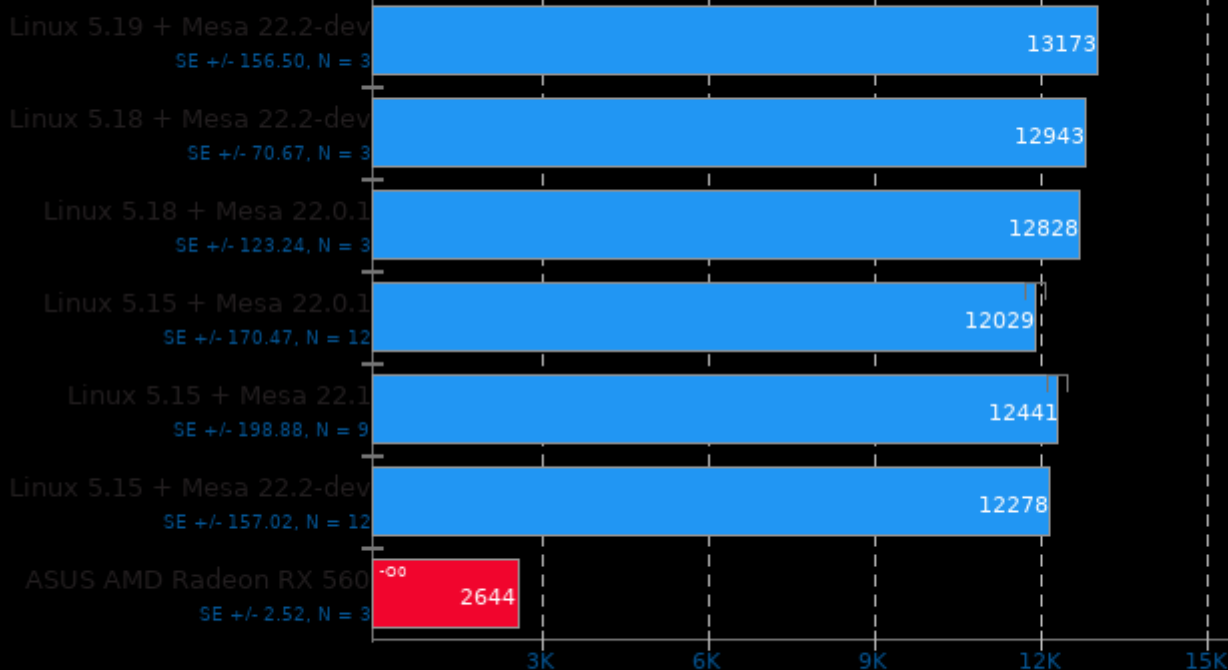
► Frames Per Second, More Is Better



## VKMark 2022-05-16

Resolution: 1920 x 1080 - Present Mode: Mailbox

► VKMark Score, More Is Better

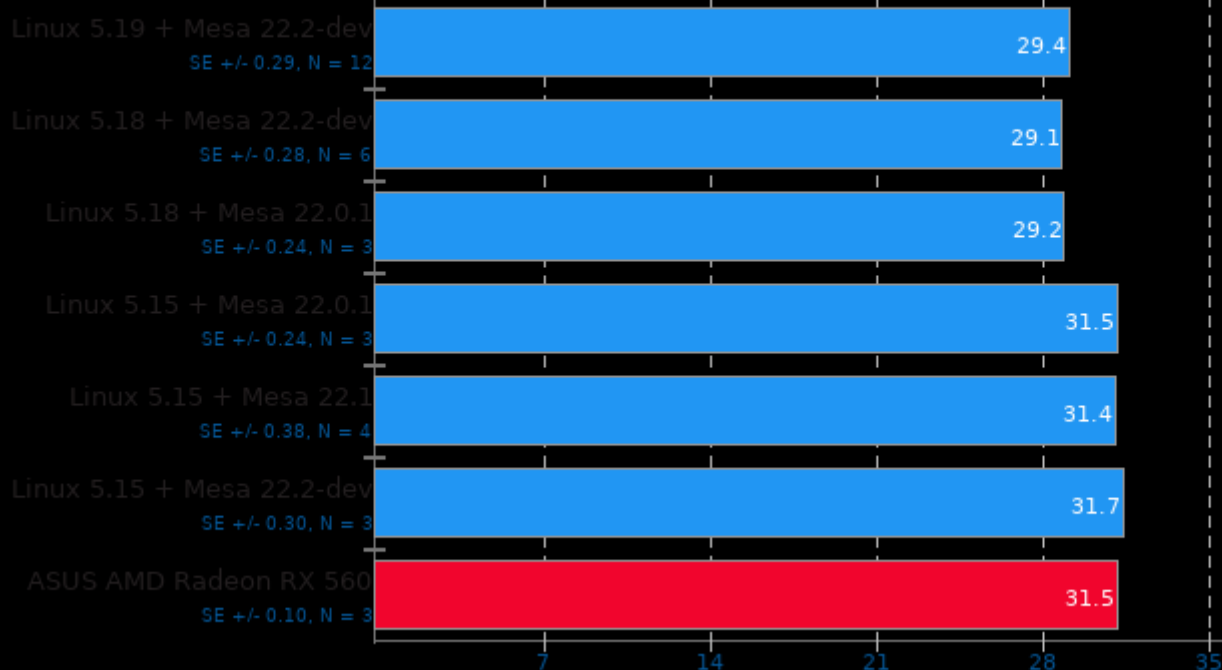


1. (CXX) g++ options: -pthread -ldl -std=c++14 -MD -MQ -MF

## GravityMark 1.53

Resolution: 1920 x 1080 - Renderer: OpenGL

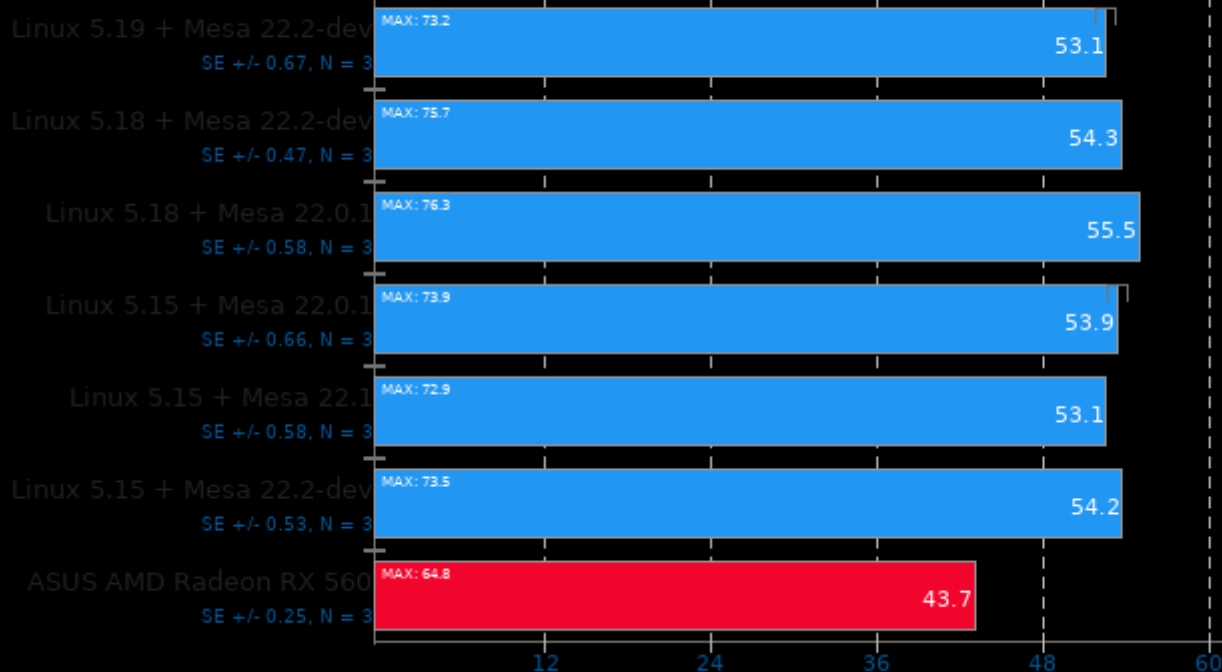
► Frames Per Second, More Is Better



## Unigine Superposition 1.0

Resolution: 1920 x 1080 - Mode: Fullscreen - Quality: Low - Renderer: OpenGL

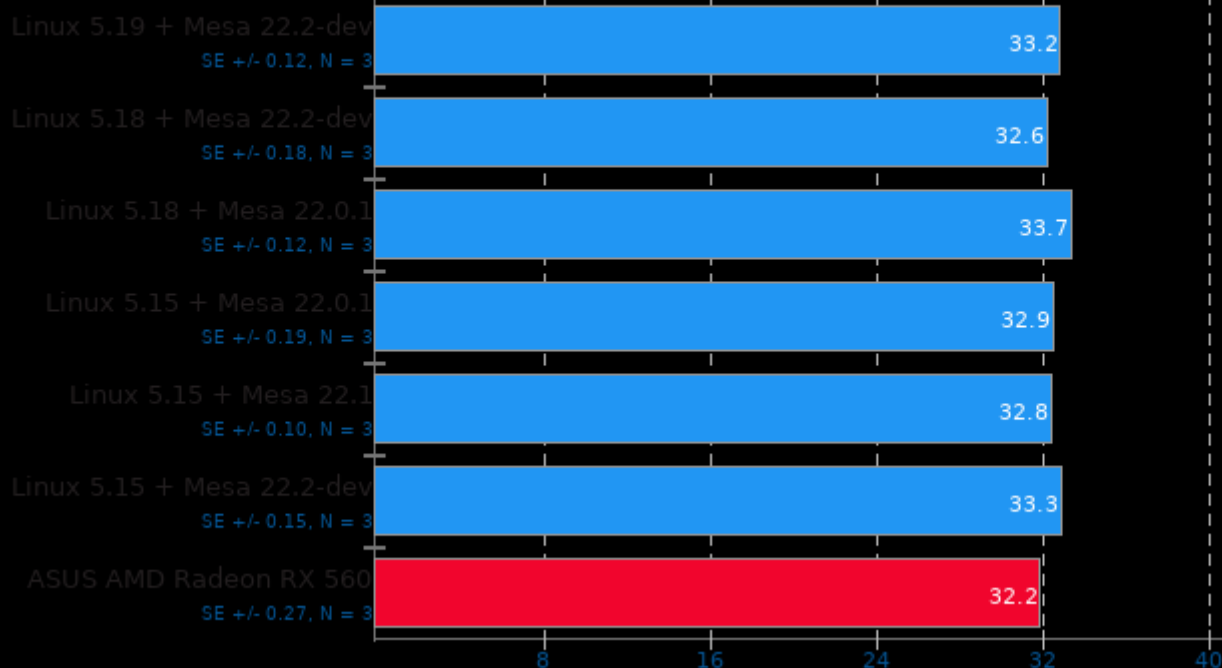
► Frames Per Second, More Is Better



## GravityMark 1.53

Resolution: 1920 x 1080 - Renderer: Vulkan

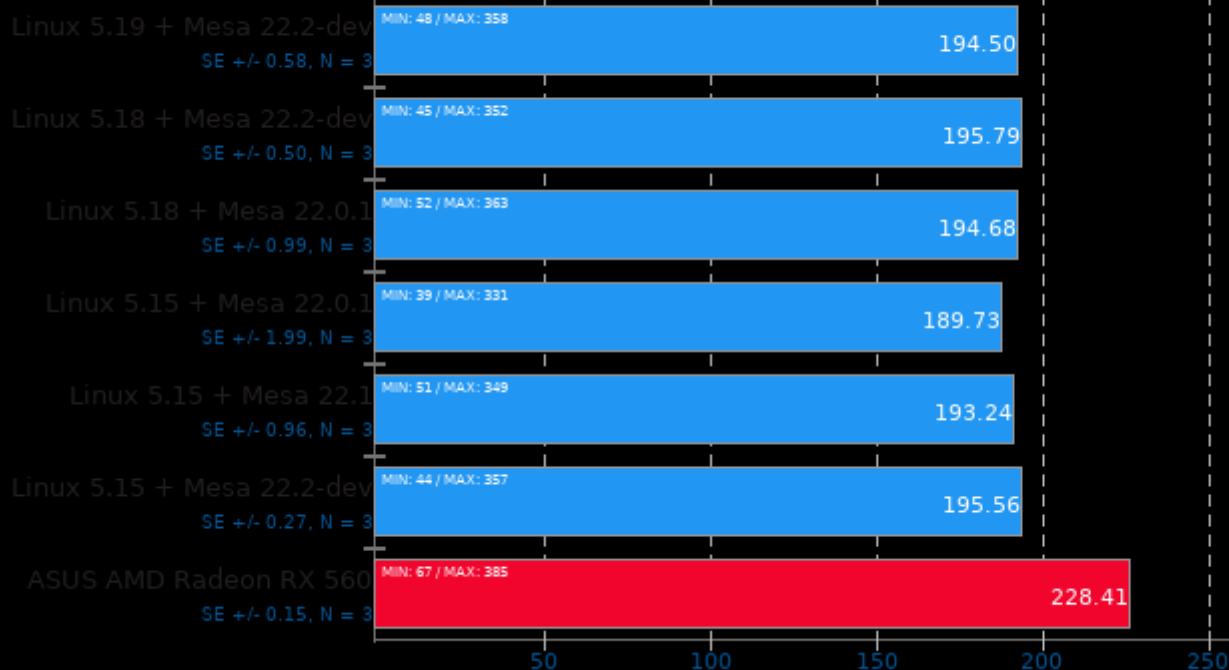
► Frames Per Second, More Is Better



## Xonotic 0.8.5

Resolution: 1920 x 1080 - Effects Quality: Ultimate

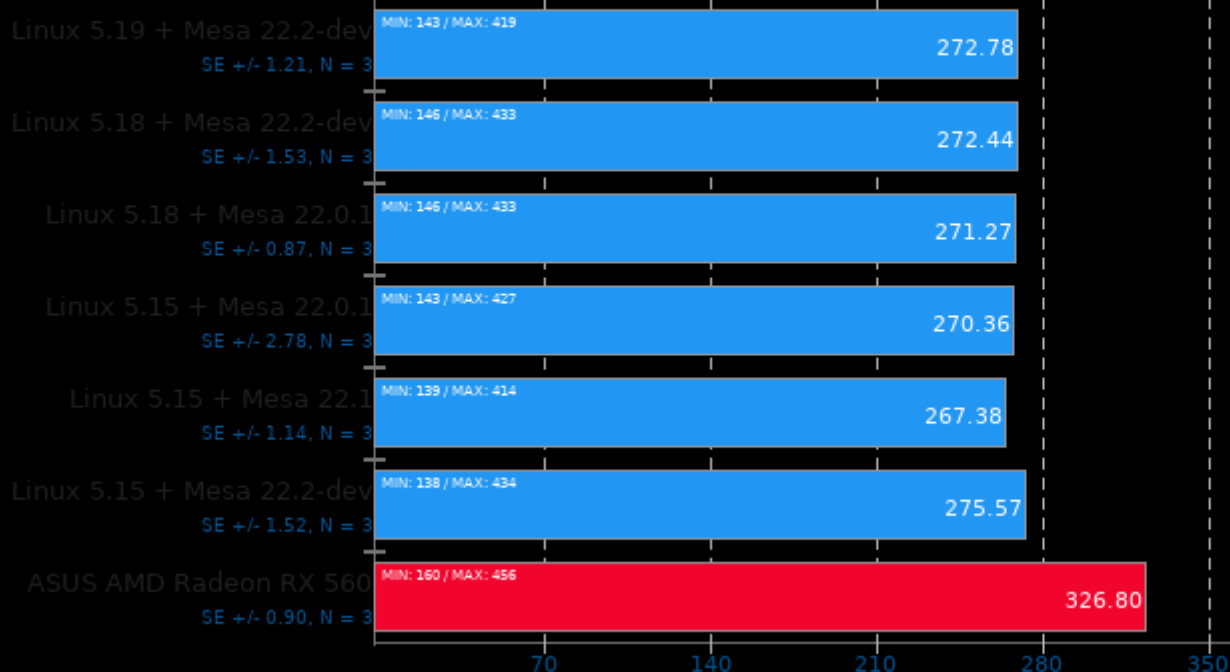
► Frames Per Second, More Is Better



## Xonotic 0.8.5

Resolution: 1920 x 1080 - Effects Quality: Ultra

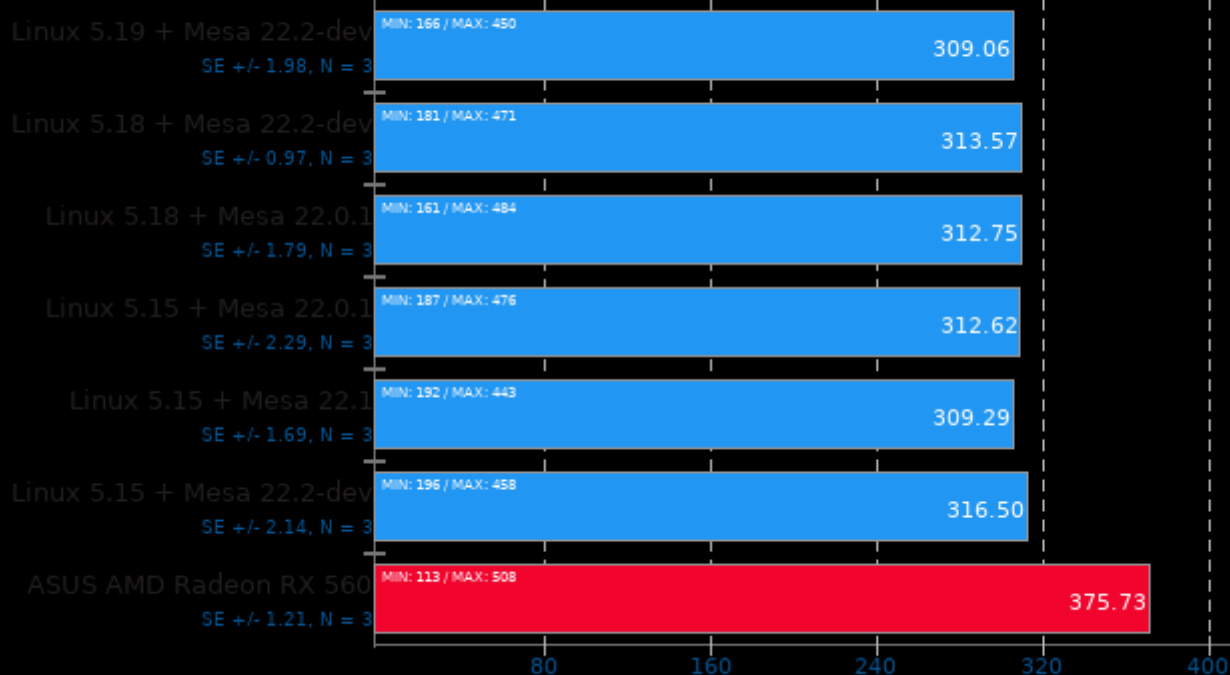
► Frames Per Second, More Is Better



## Xonotic 0.8.5

Resolution: 1920 x 1080 - Effects Quality: High

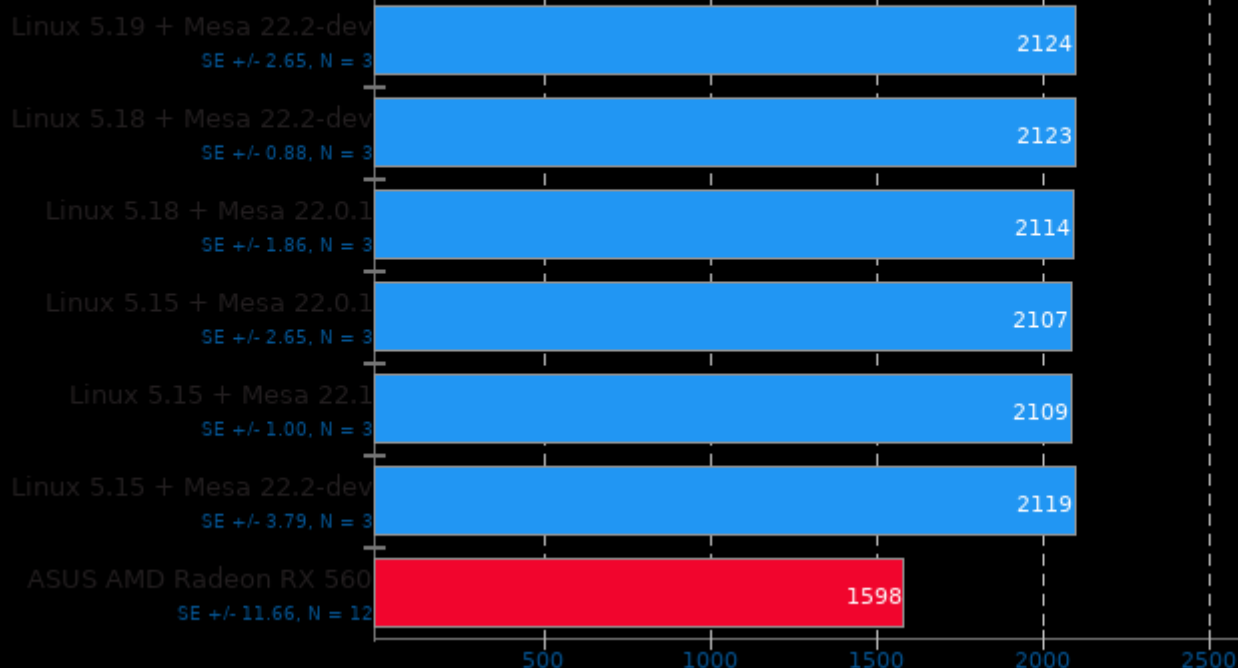
► Frames Per Second, More Is Better



## GpuTest 0.7.0

Test: Furmark - Resolution: 1920 x 1080 - Mode: Fullscreen

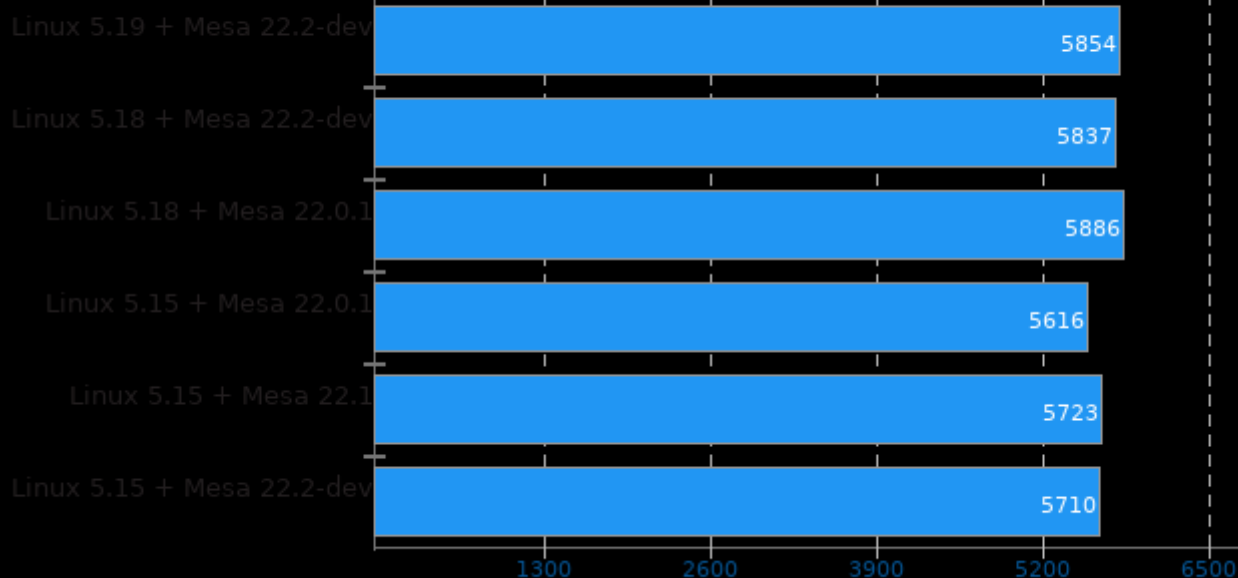
► Points, More Is Better



## GLmark2 2021.08.30

Resolution: 1920 x 1080

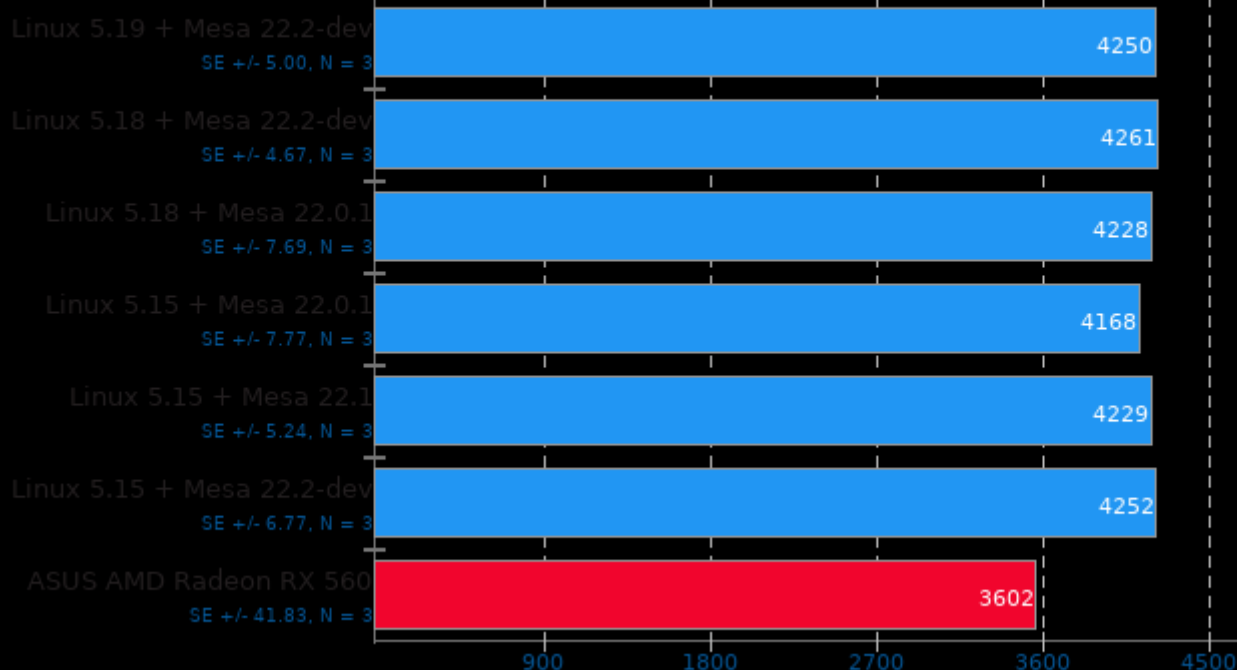
► Score, More Is Better



## GpuTest 0.7.0

Test: GiMark - Resolution: 1920 x 1080 - Mode: Fullscreen

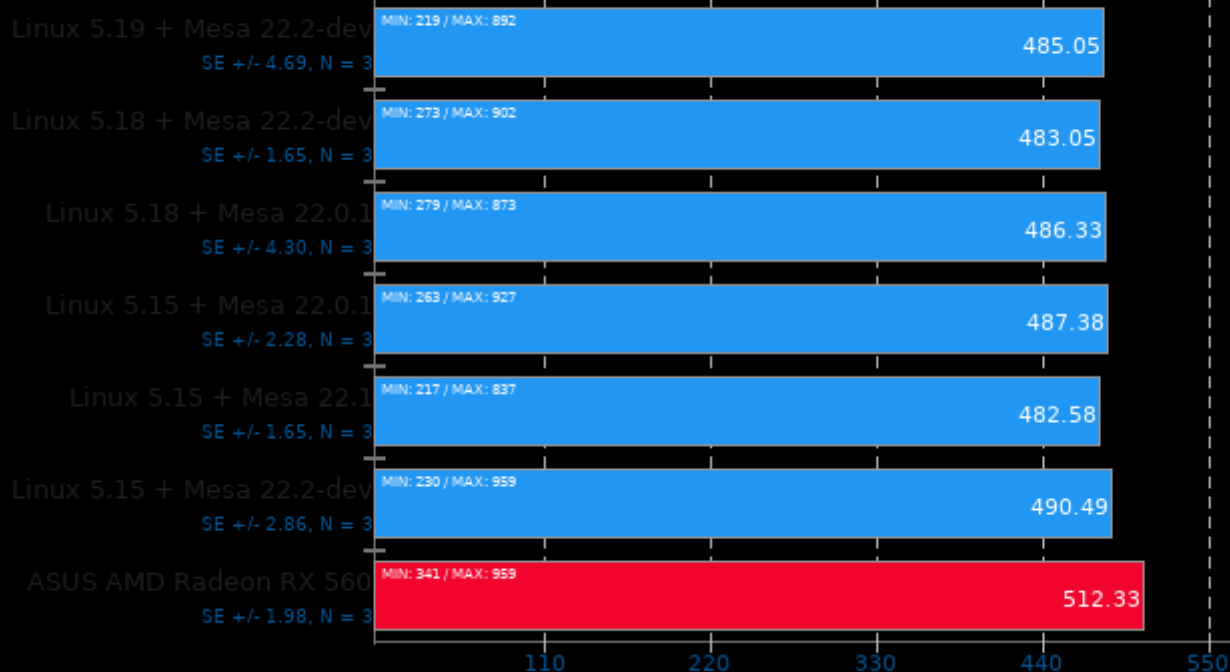
► Points, More Is Better



## Xonotic 0.8.5

Resolution: 1920 x 1080 - Effects Quality: Low

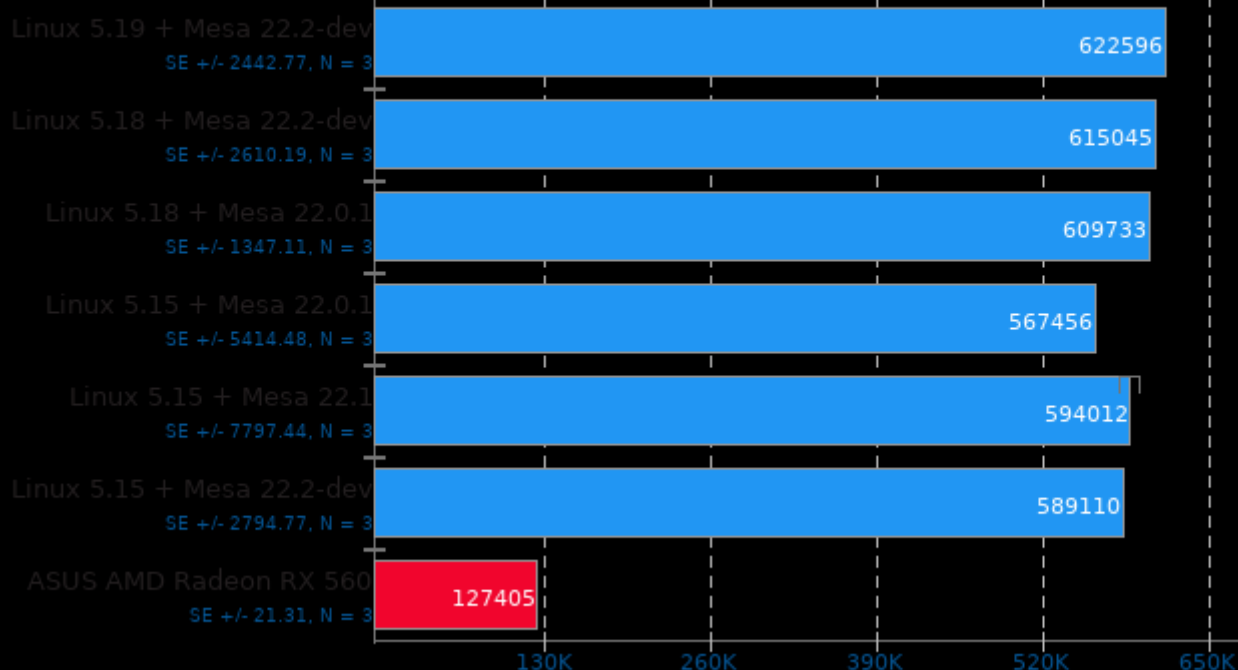
► Frames Per Second, More Is Better



## GpuTest 0.7.0

Test: Triangle - Resolution: 1920 x 1080 - Mode: Fullscreen

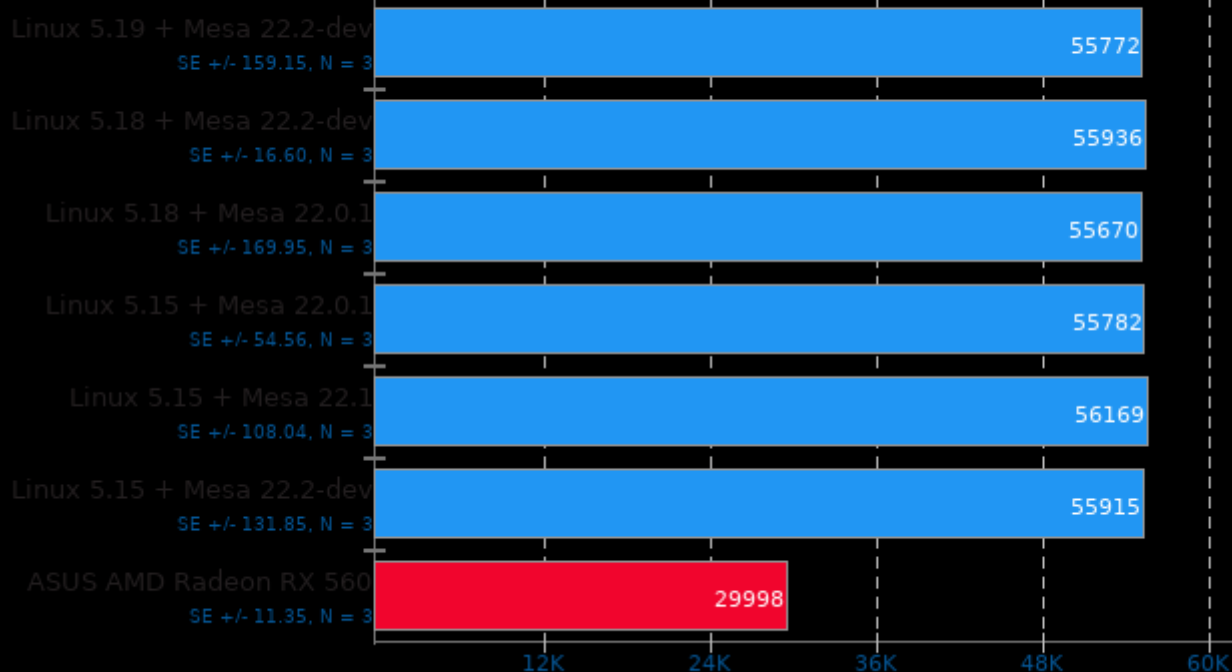
► Points, More Is Better



## GpuTest 0.7.0

Test: Plot3D - Resolution: 1920 x 1080 - Mode: Fullscreen

► Points, More Is Better





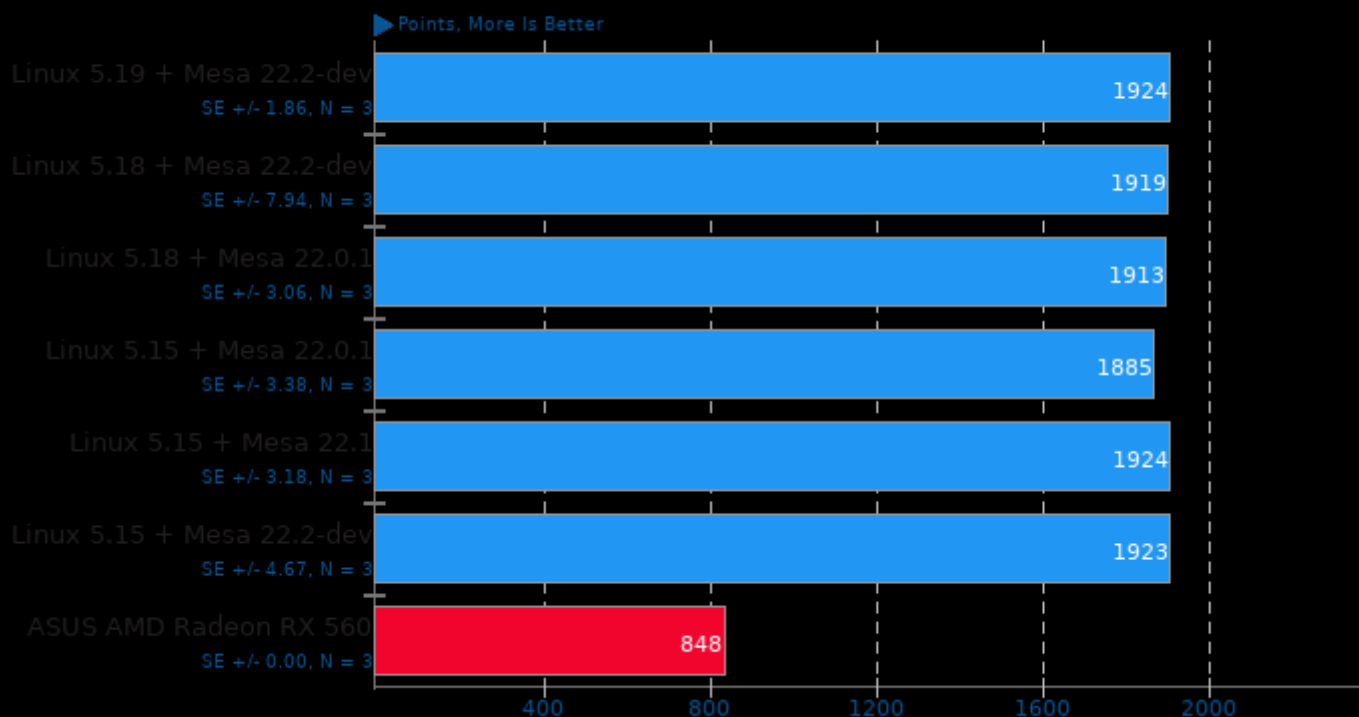
## GpuTest 0.7.0

Test: TessMark - Resolution: 1920 x 1080 - Mode: Fullscreen



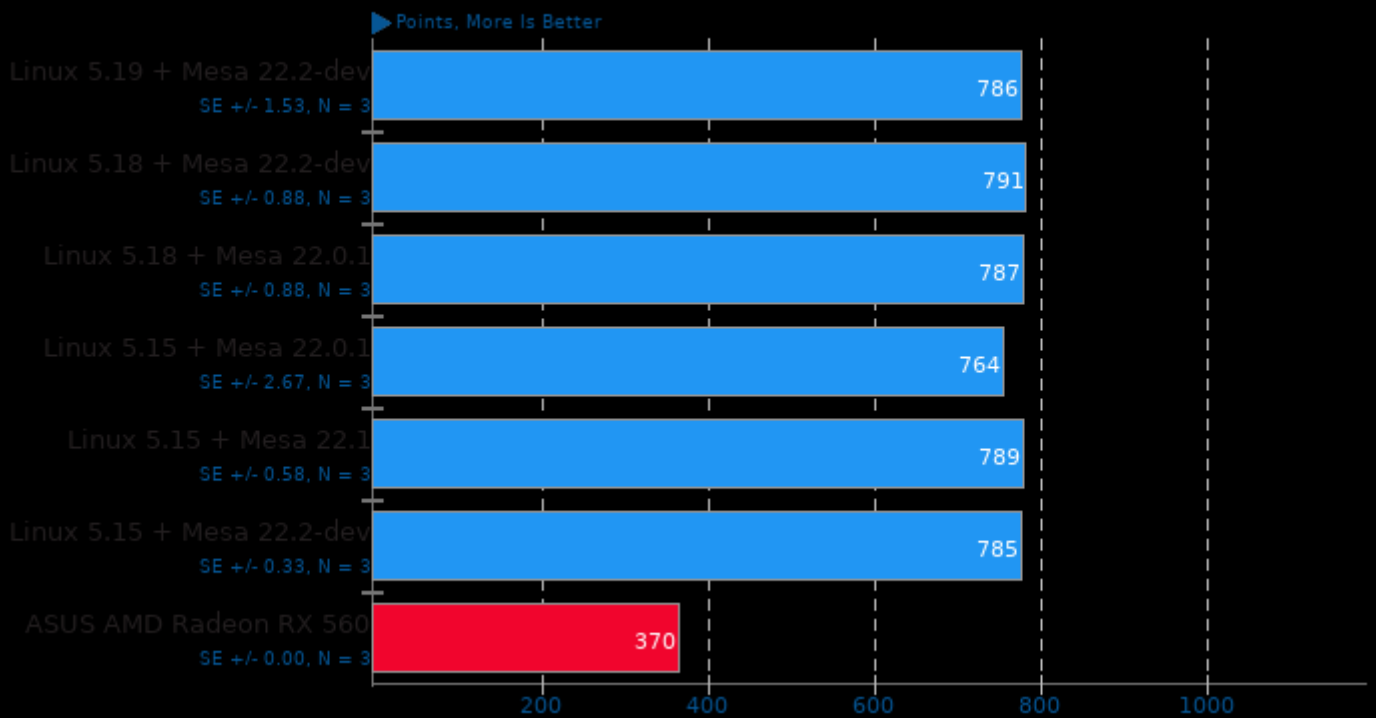
## GpuTest 0.7.0

Test: Pixmark Volplosion - Resolution: 1920 x 1080 - Mode: Fullscreen



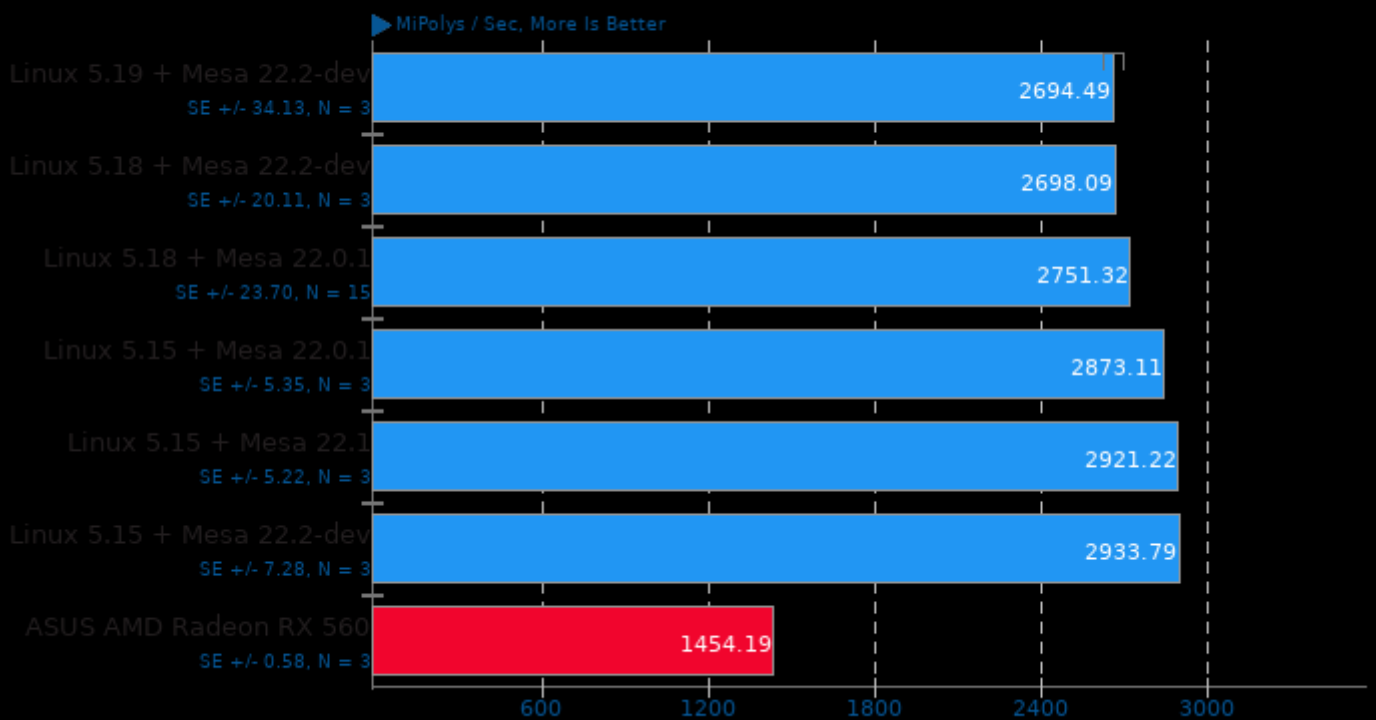
## GpuTest 0.7.0

Test: Pixmark Piano - Resolution: 1920 x 1080 - Mode: Fullscreen



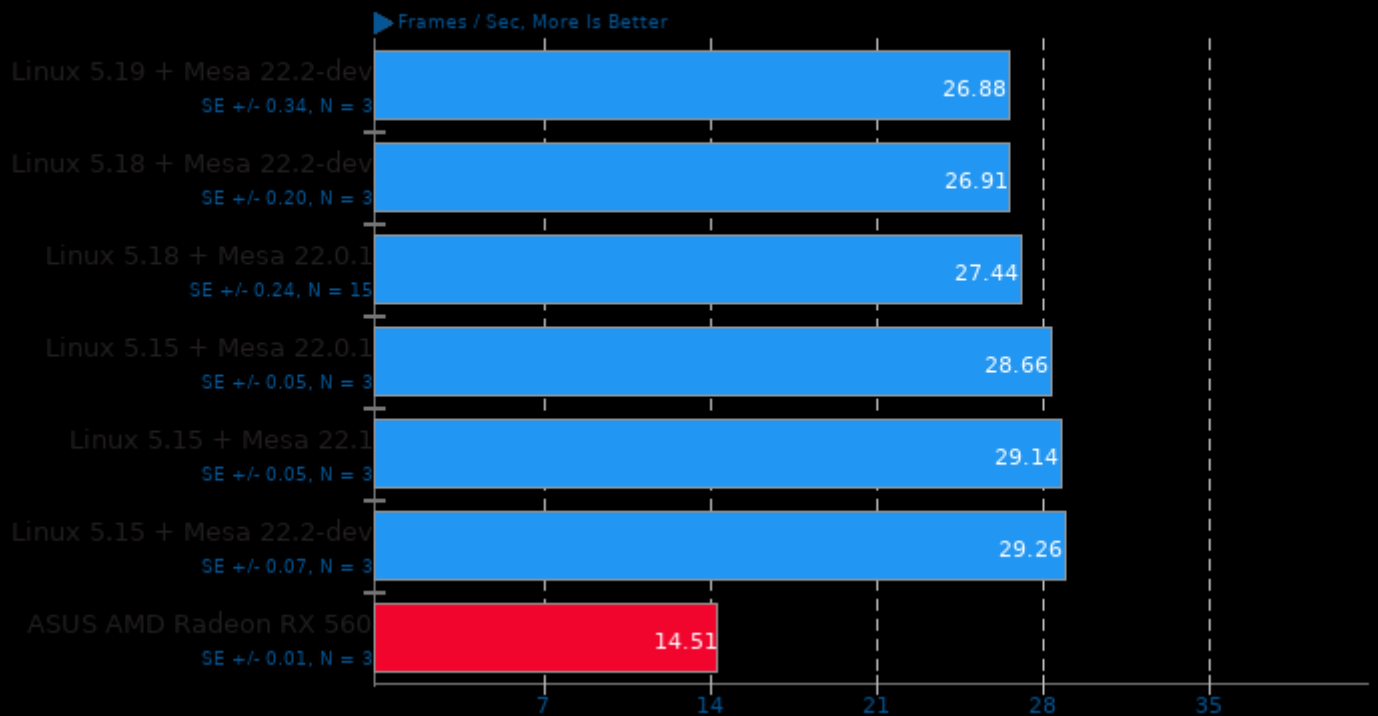
## ParaView 5.10.1

Test: Many Spheres - Resolution: 1920 x 1080



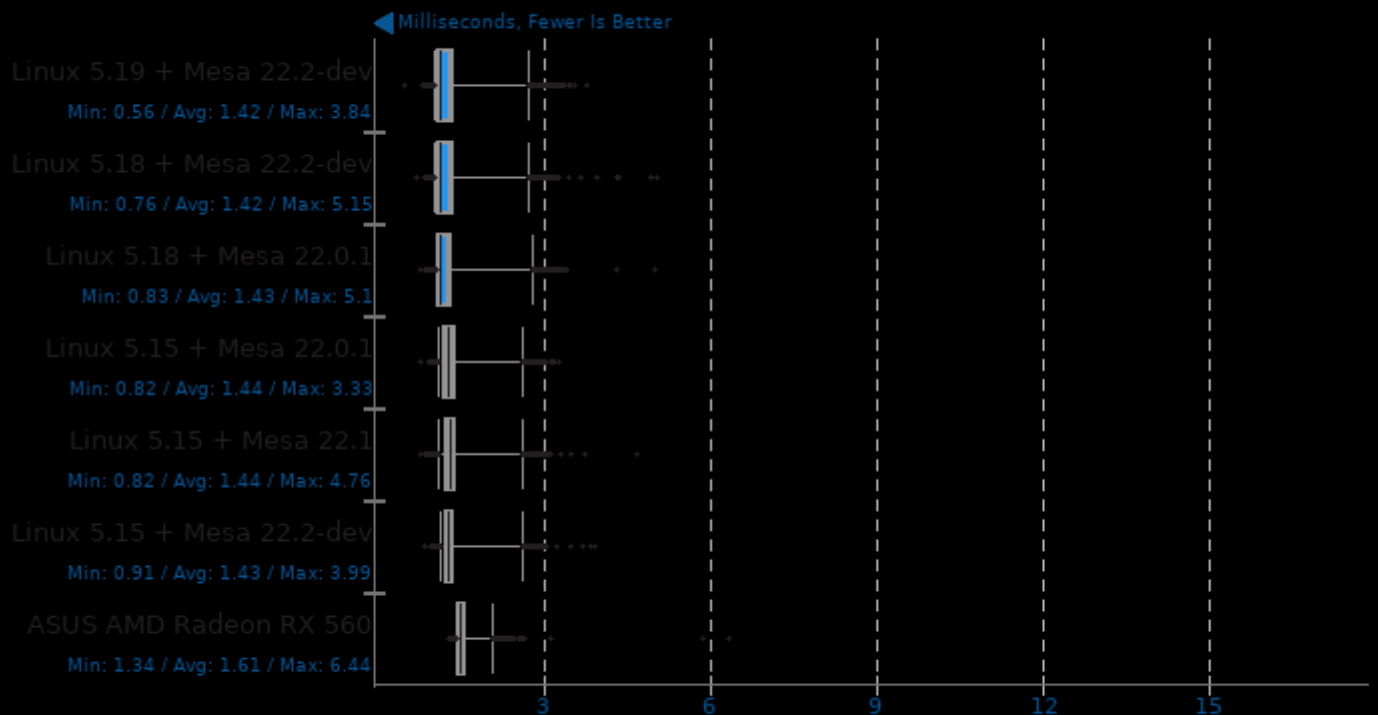
## ParaView 5.10.1

Test: Many Spheres - Resolution: 1920 x 1080



## DDRaceNetwork 15.8.1

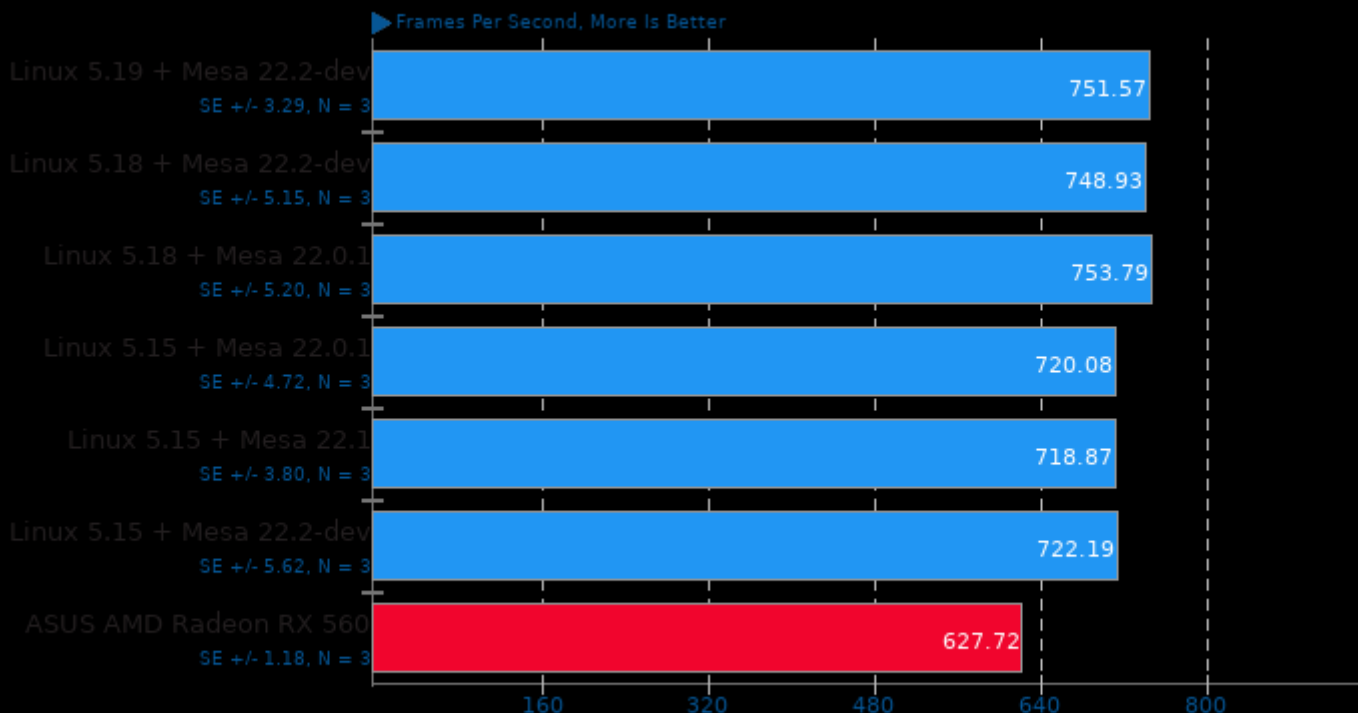
Resolution: 1920 x 1080 - Mode: Fullscreen - Renderer: OpenGL 3.3 - Zoom: Default - Demo: Multeasymap - Total Frame Time



1. (CXX) g++ options: -O3 -lrt -lnotify -lgdk\_pixbuf-2.0 -lgio-2.0 -lgobject-2.0 -lglib-2.0

## DDRaceNetwork 15.8.1

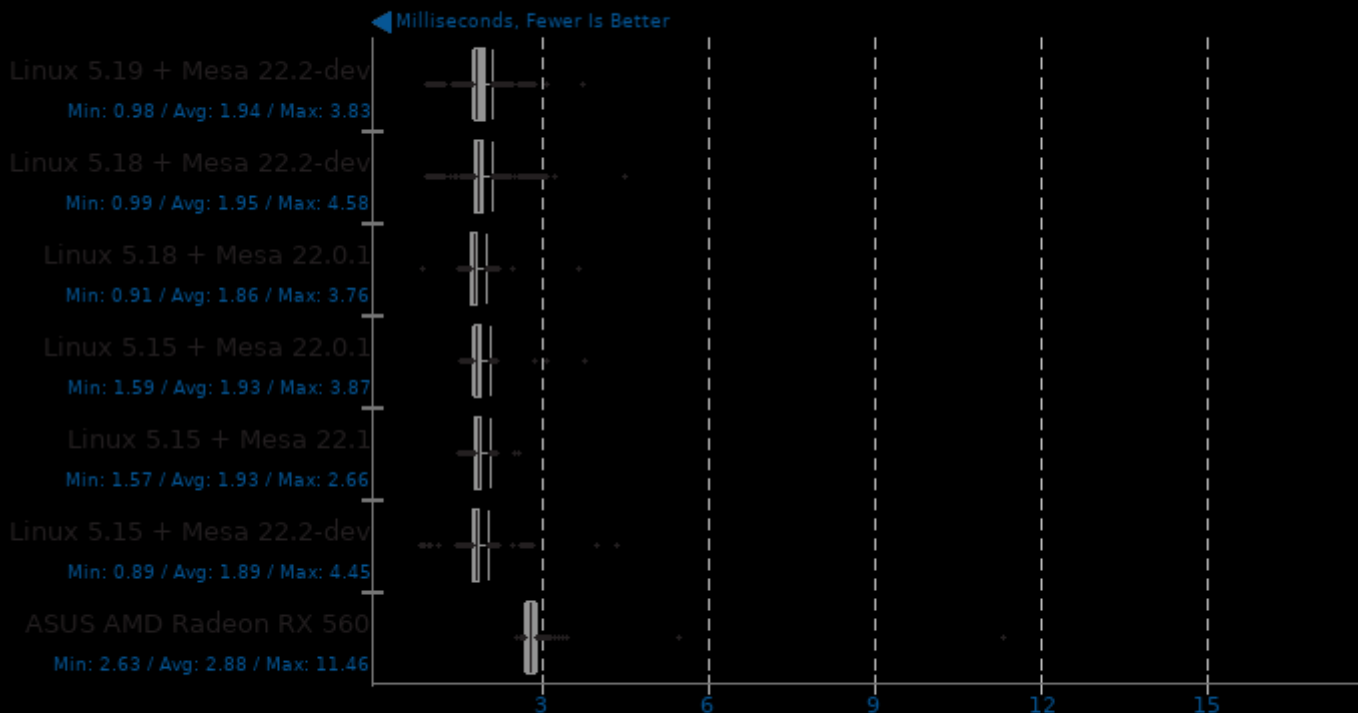
Resolution: 1920 x 1080 - Mode: Fullscreen - Renderer: OpenGL 3.3 - Zoom: Default - Demo: Multeasymap



1. (CXX) g++ options: -O3 -lrt -lnotify -lgdk\_pixbuf-2.0 -lgio-2.0 -lgobject-2.0 -lglib-2.0

## DDRaceNetwork 15.8.1

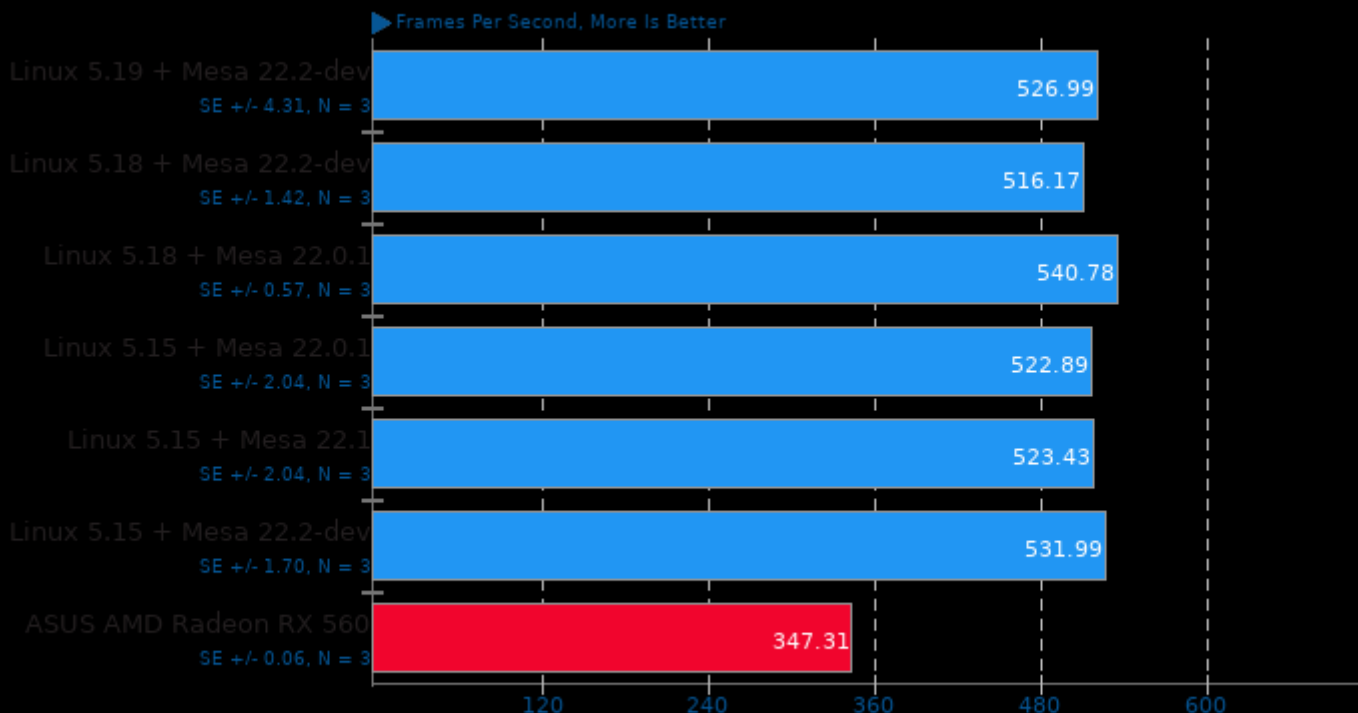
Resolution: 1920 x 1080 - Mode: Fullscreen - Renderer: OpenGL 3.3 - Zoom: Default - Demo: RainyMore2 - Total Frame Time



1. (CXX) g++ options: -O3 -lrt -lnotify -lgdk\_pixbuf-2.0 -lgio-2.0 -lgobject-2.0 -lglib-2.0

## DDRaceNetwork 15.8.1

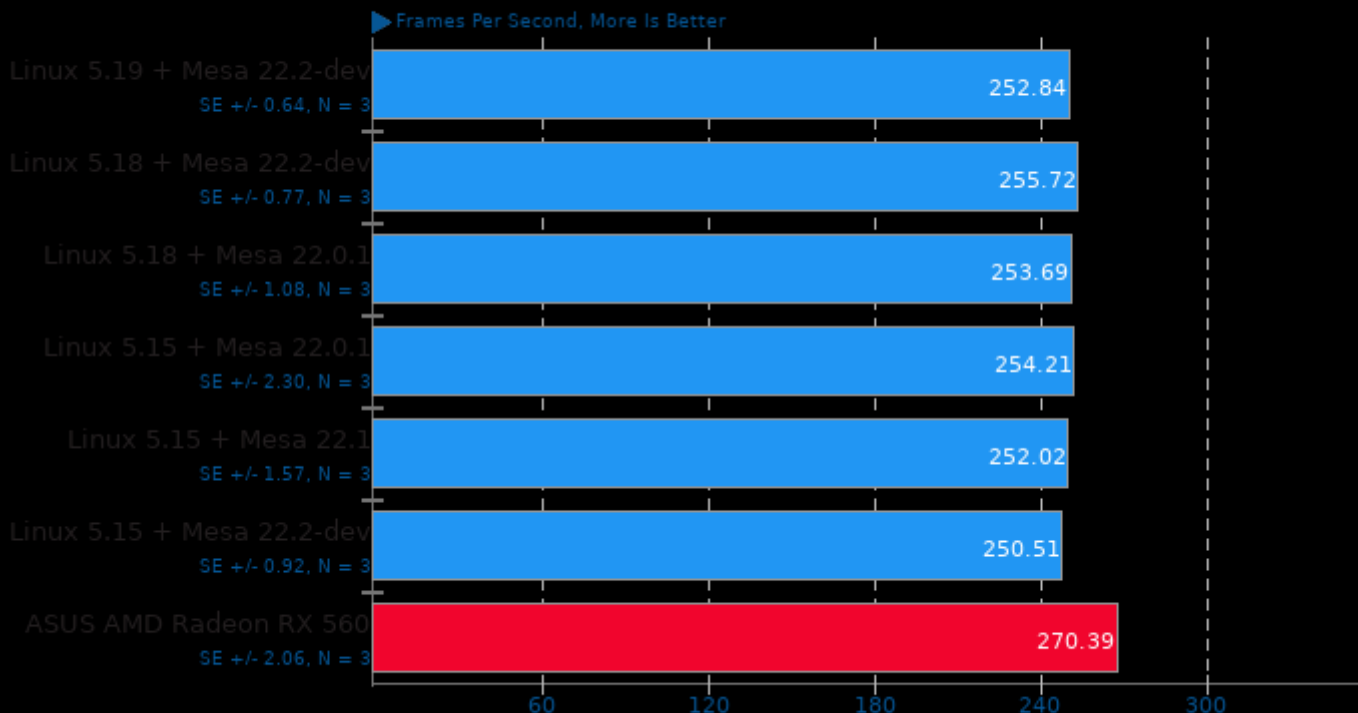
Resolution: 1920 x 1080 - Mode: Fullscreen - Renderer: OpenGL 3.3 - Zoom: Default - Demo: RaiNyMore2



1. (CXX) g++ options: -O3 -lrt -lnotify -lgdk\_pixbuf-2.0 -lgio-2.0 -lgobject-2.0 -lglib-2.0

## Tesseract 2014-05-12

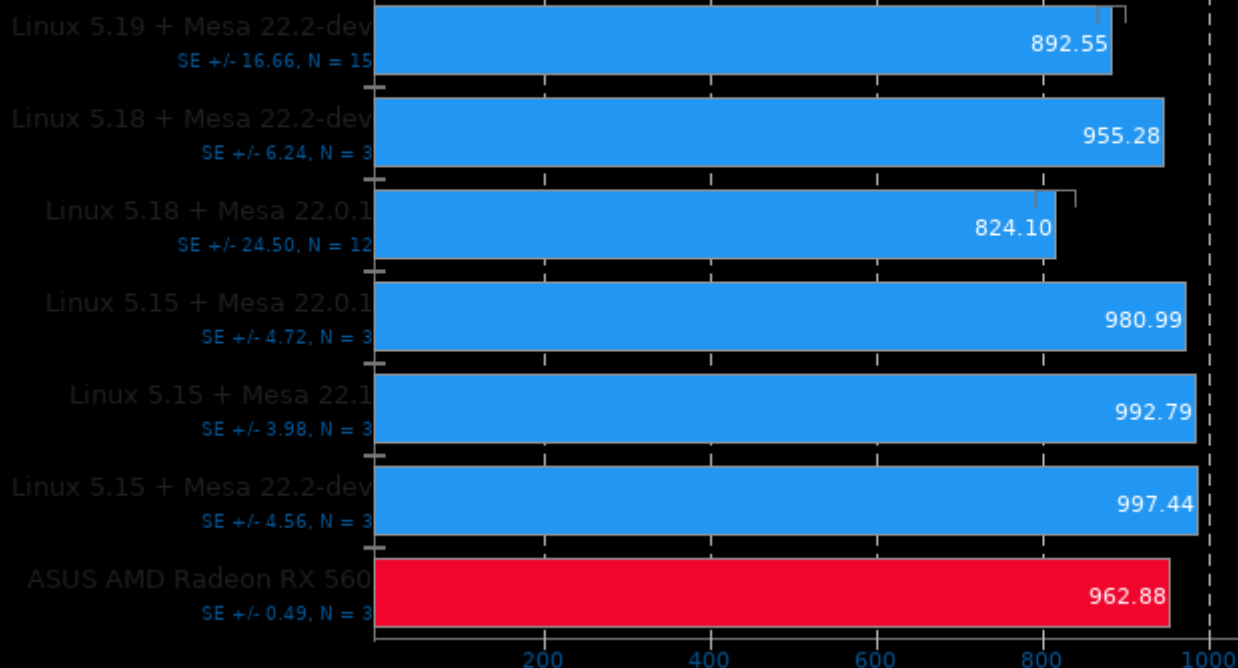
Resolution: 1920 x 1080



## ParaView 5.10.1

Test: Wavelet Contour - Resolution: 1920 x 1080

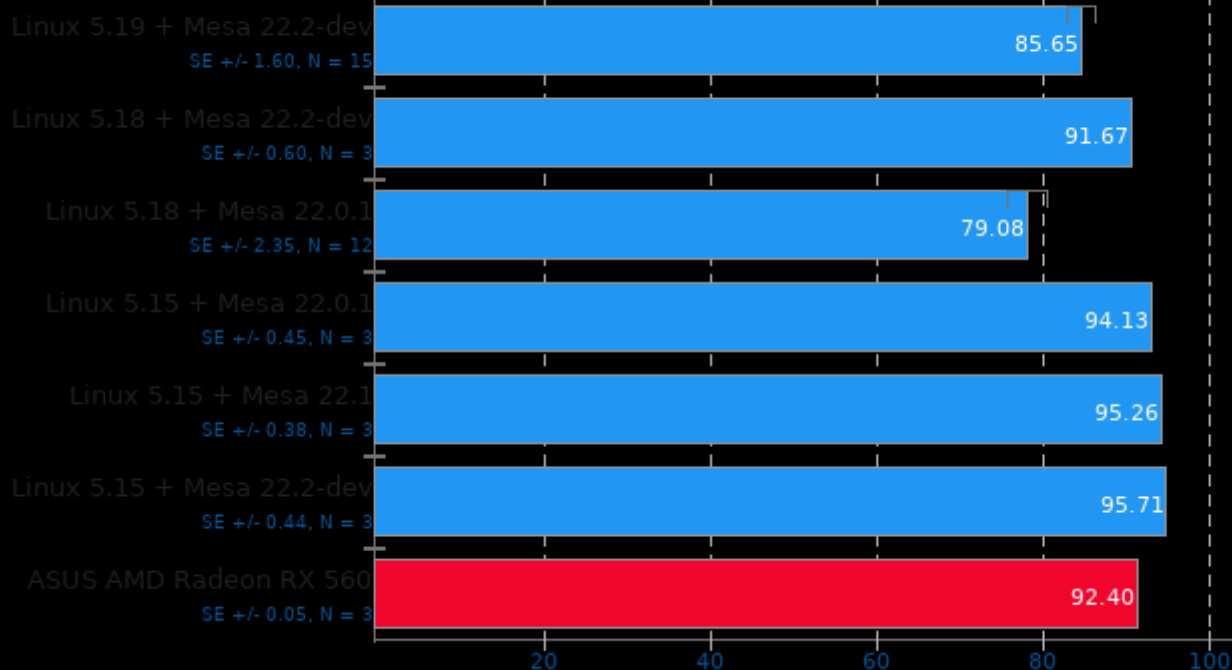
► MiPolys / Sec, More Is Better



## ParaView 5.10.1

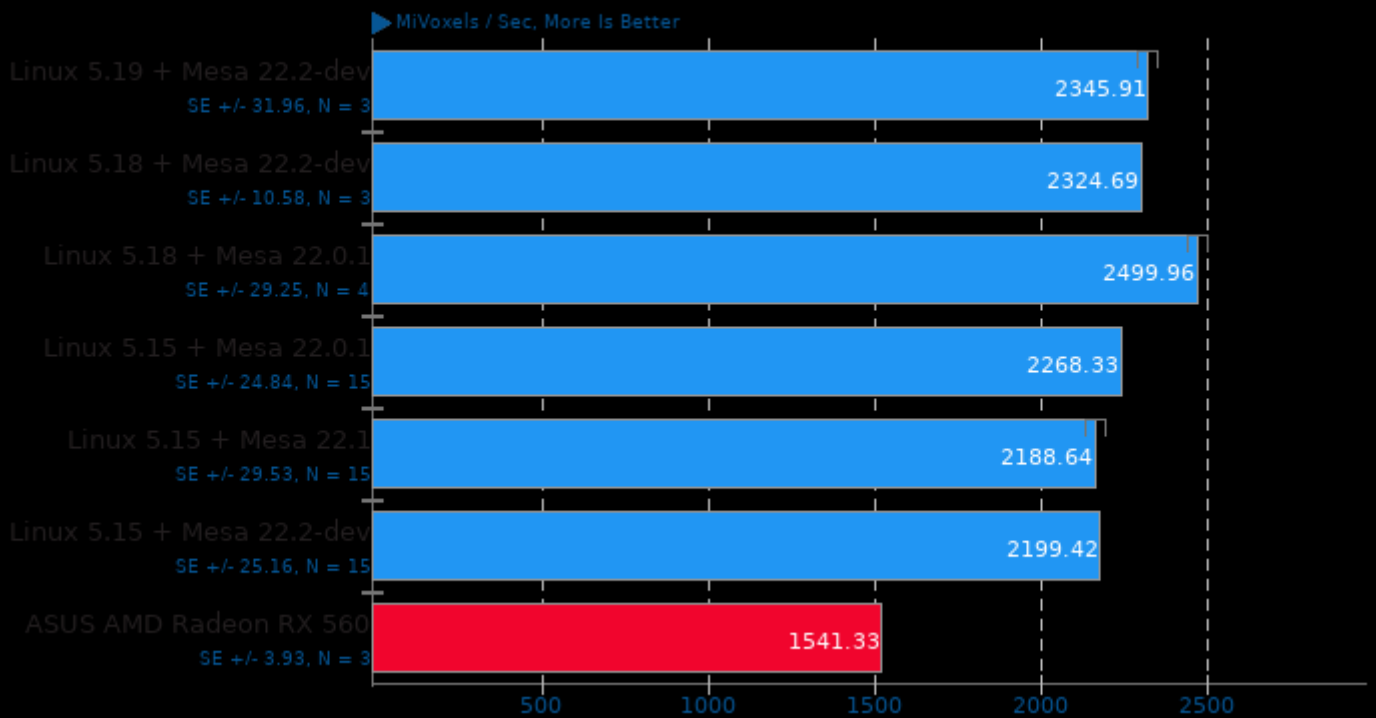
Test: Wavelet Contour - Resolution: 1920 x 1080

► Frames / Sec, More Is Better



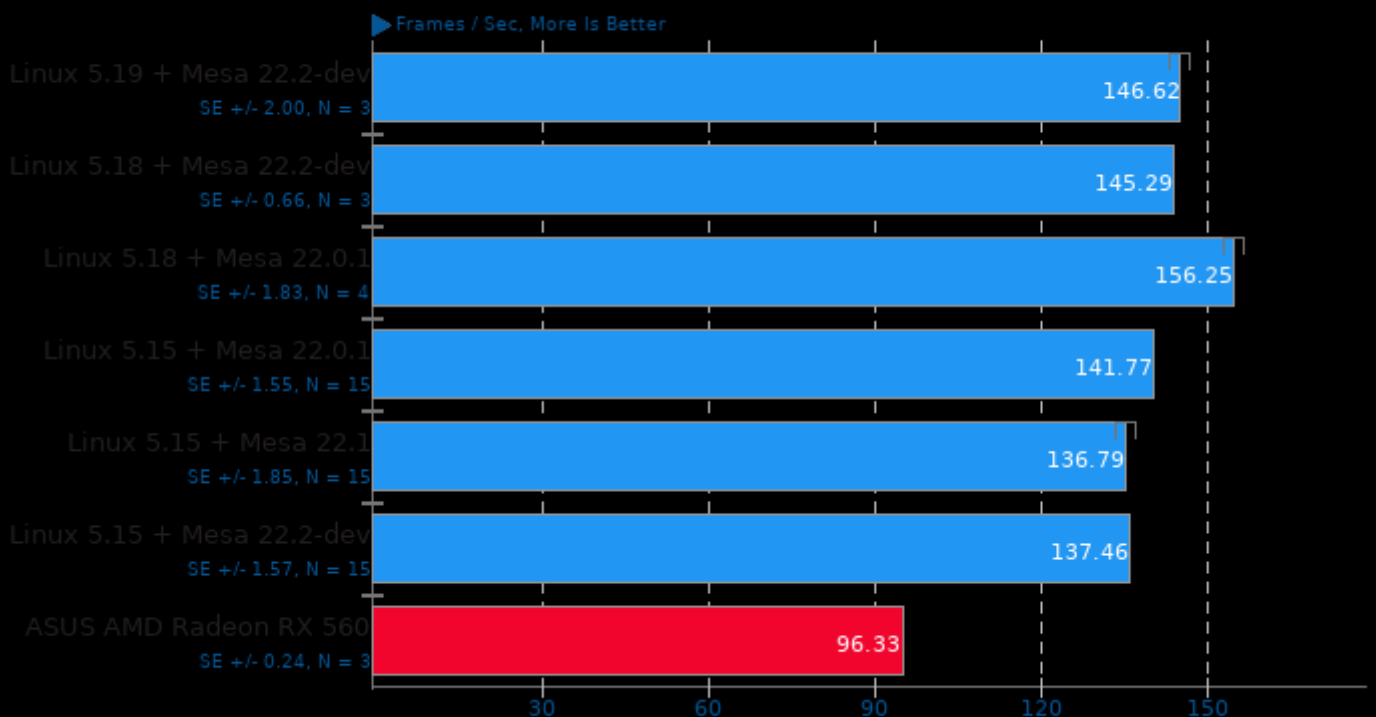
## ParaView 5.10.1

Test: Wavelet Volume - Resolution: 1920 x 1080



## ParaView 5.10.1

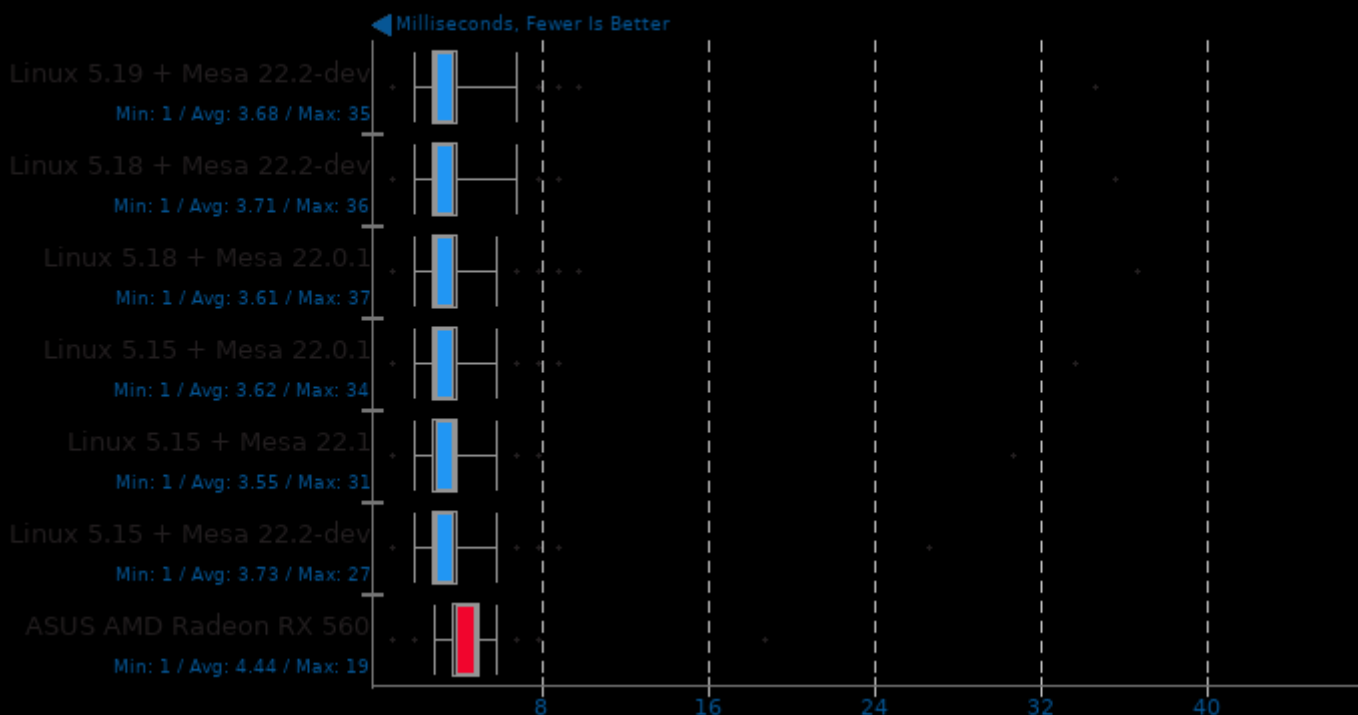
Test: Wavelet Volume - Resolution: 1920 x 1080





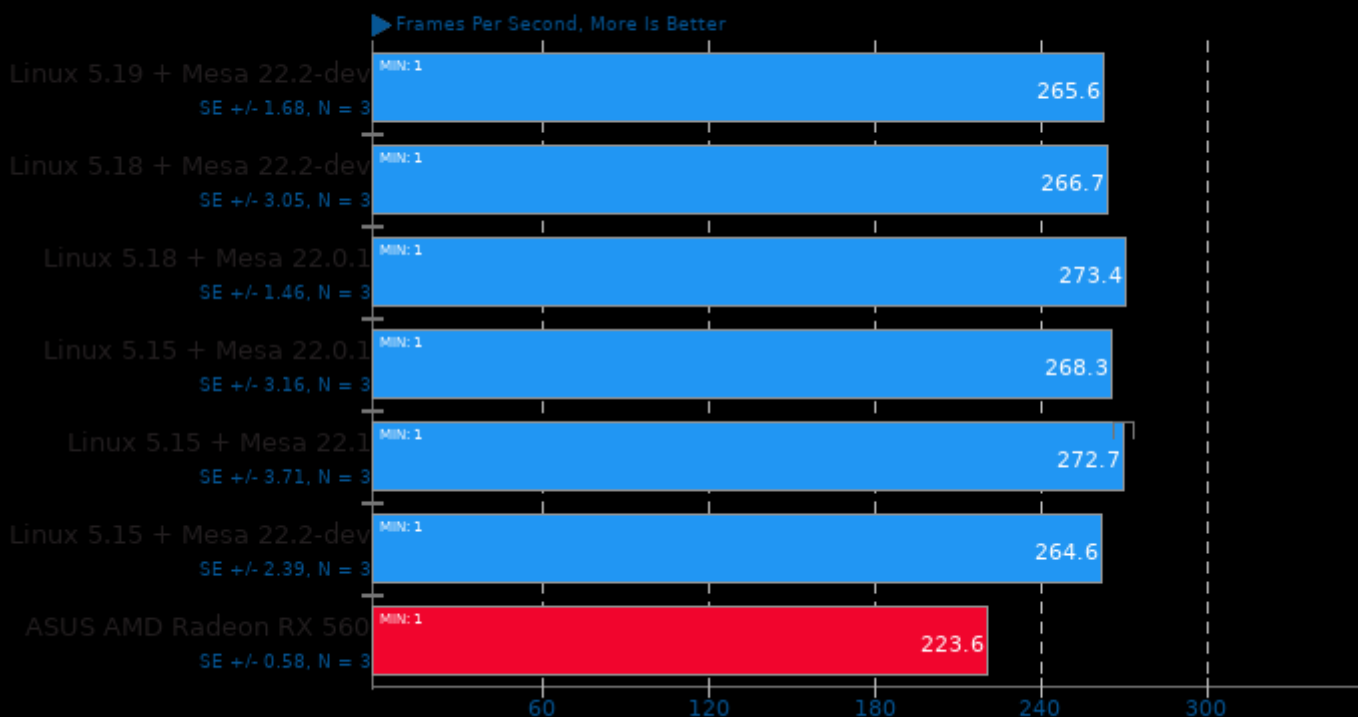
## OpenArena 0.8.8

Resolution: 1920 x 1080 - Total Frame Time



## OpenArena 0.8.8

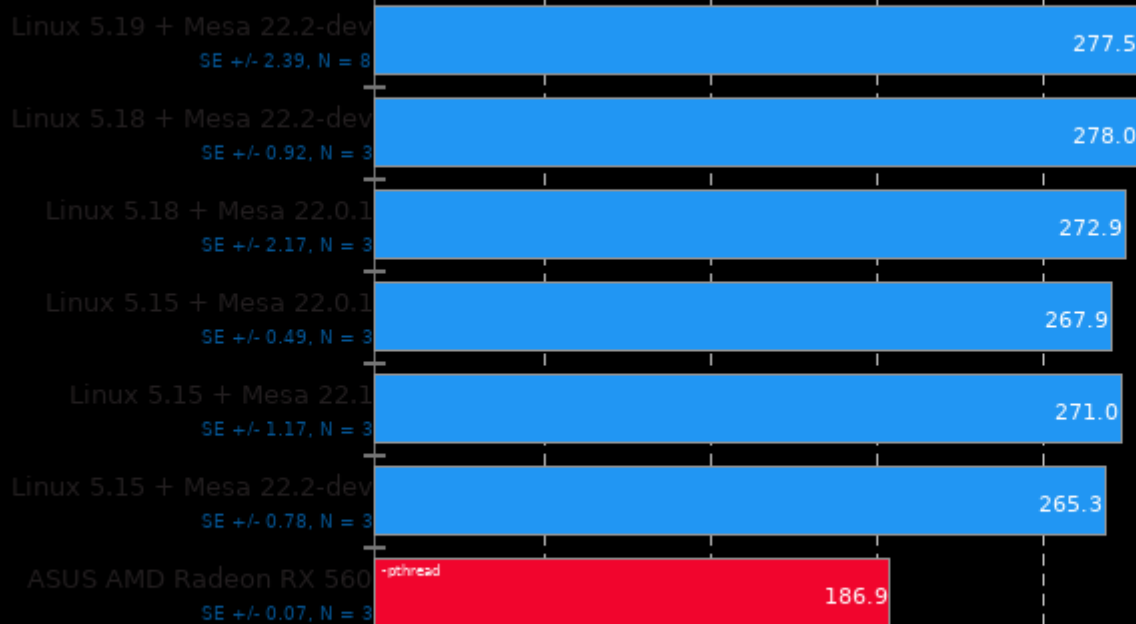
Resolution: 1920 x 1080



## yquake2 8.10

Renderer: Vulkan - AF: Off - MSAA: On - Resolution: 1920 x 1080

► Frames Per Second, More Is Better

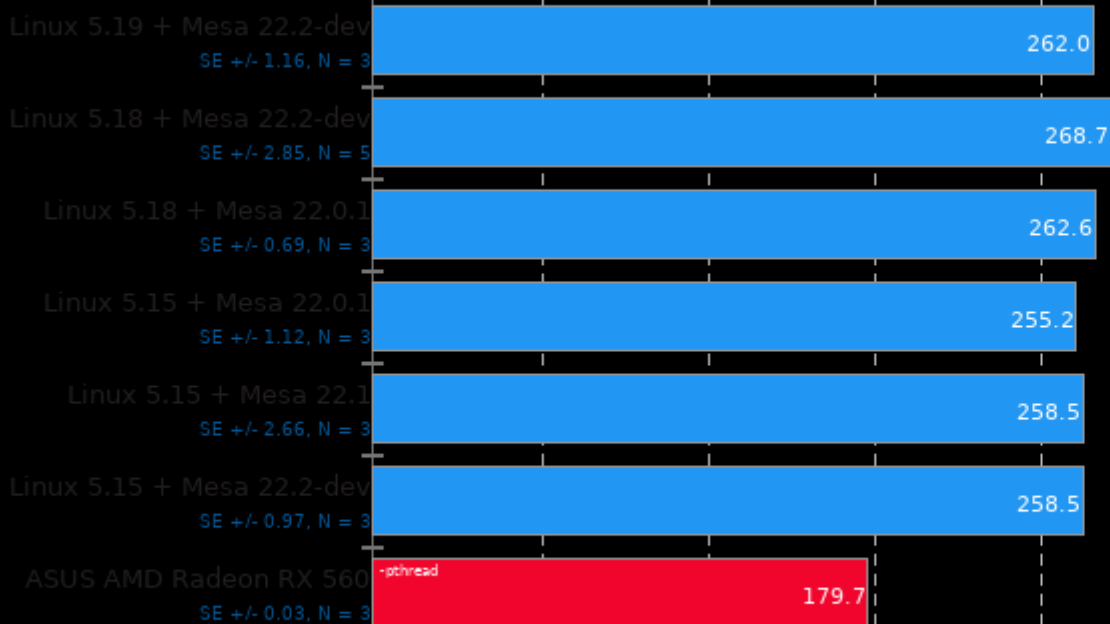


1. (GCC) gcc options: -shared -lm -ldl -rdynamic -lsdl2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfp

## yquake2 8.10

Renderer: Vulkan - AF: On - MSAA: On - Resolution: 1920 x 1080

► Frames Per Second, More Is Better

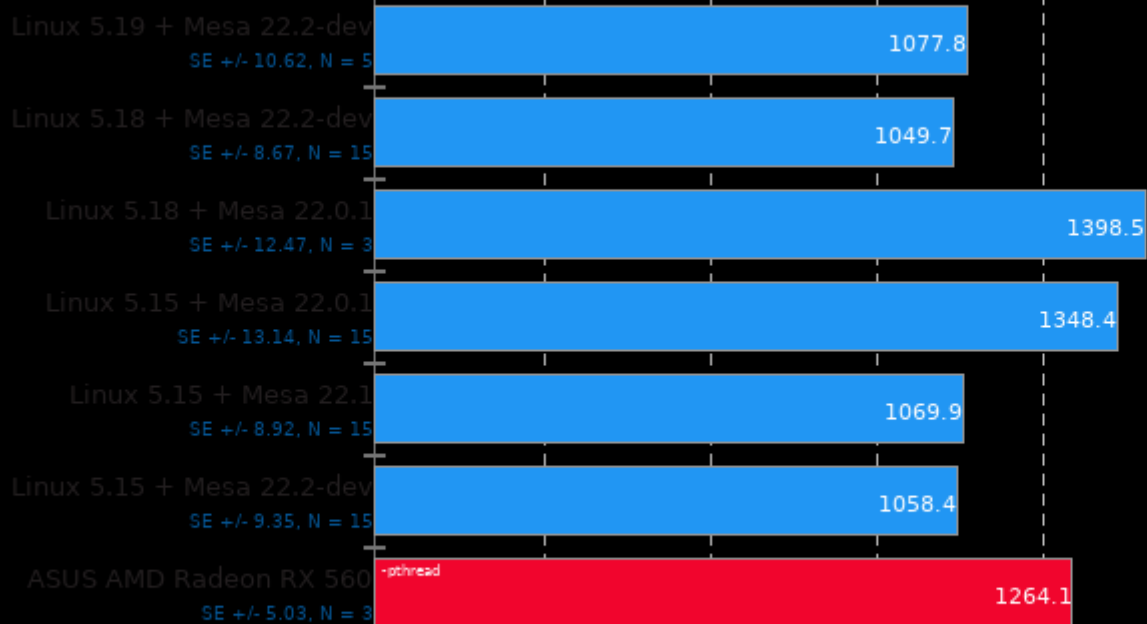


1. (GCC) gcc options: -shared -lm -ldl -rdynamic -lSDL2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfp

## yquake2 8.10

Renderer: OpenGL 3.x - AF: On - MSAA: Off - Resolution: 1920 x 1080

► Frames Per Second, More Is Better

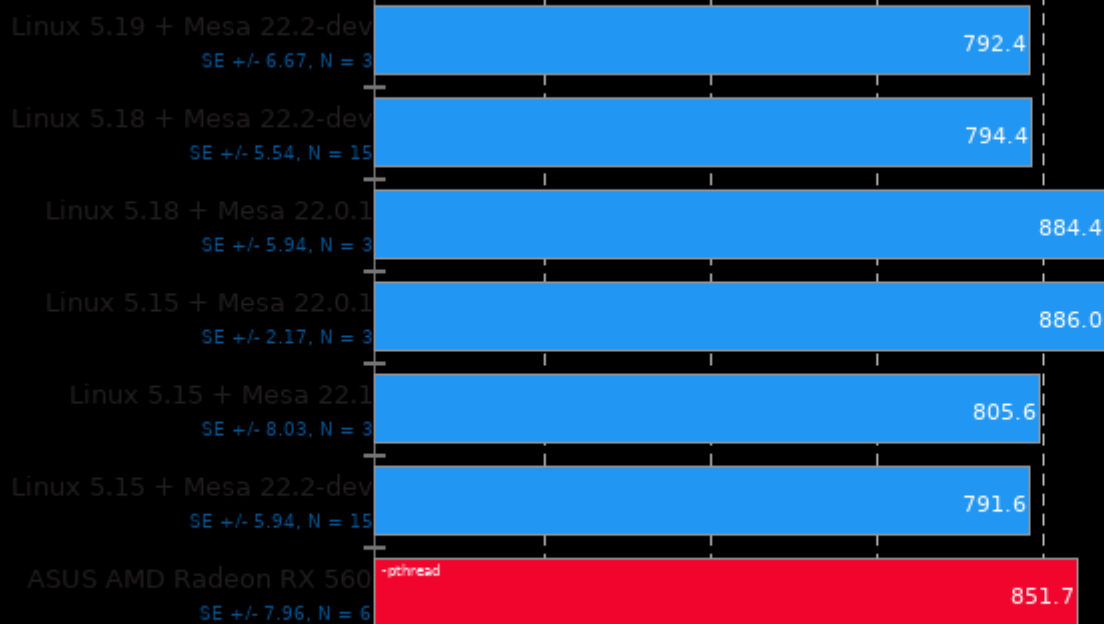


1. (CC) gcc options: -shared -lm -ldl -rdynamic -ISDL2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfp

## yquake2 8.10

Renderer: OpenGL 3.x - AF: On - MSAA: On - Resolution: 1920 x 1080

► Frames Per Second, More Is Better

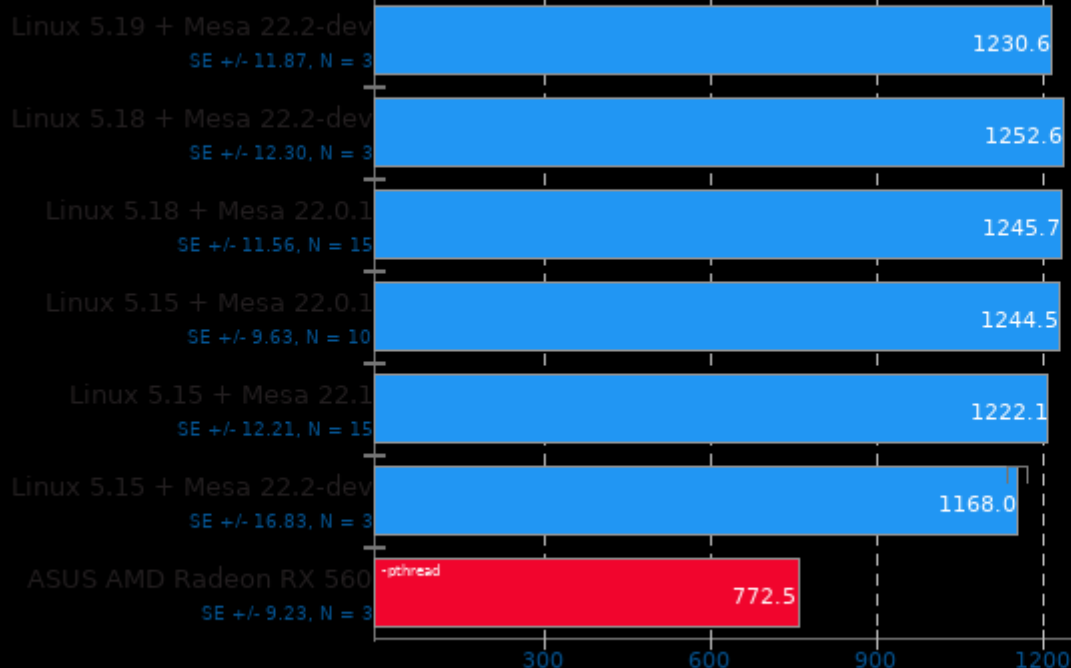


1. (GCC) gcc options: -shared -lm -ldl -rdynamic -lsdl2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfp

## yquake2 8.10

Renderer: Vulkan - AF: On - MSAA: Off - Resolution: 1920 x 1080

► Frames Per Second, More Is Better

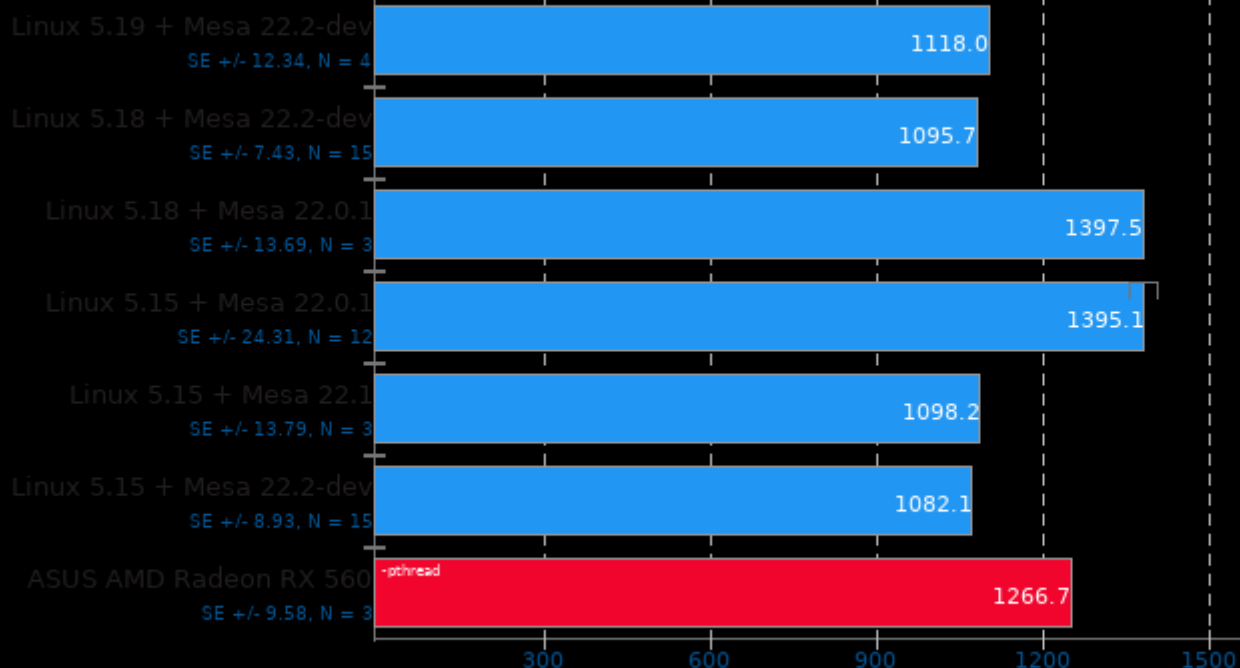


1. (GCC) gcc options: -shared -lm -ldl -rdynamic -lSDL2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfp

## yquake2 8.10

Renderer: OpenGL 3.x - AF: Off - MSAA: Off - Resolution: 1920 x 1080

► Frames Per Second, More Is Better



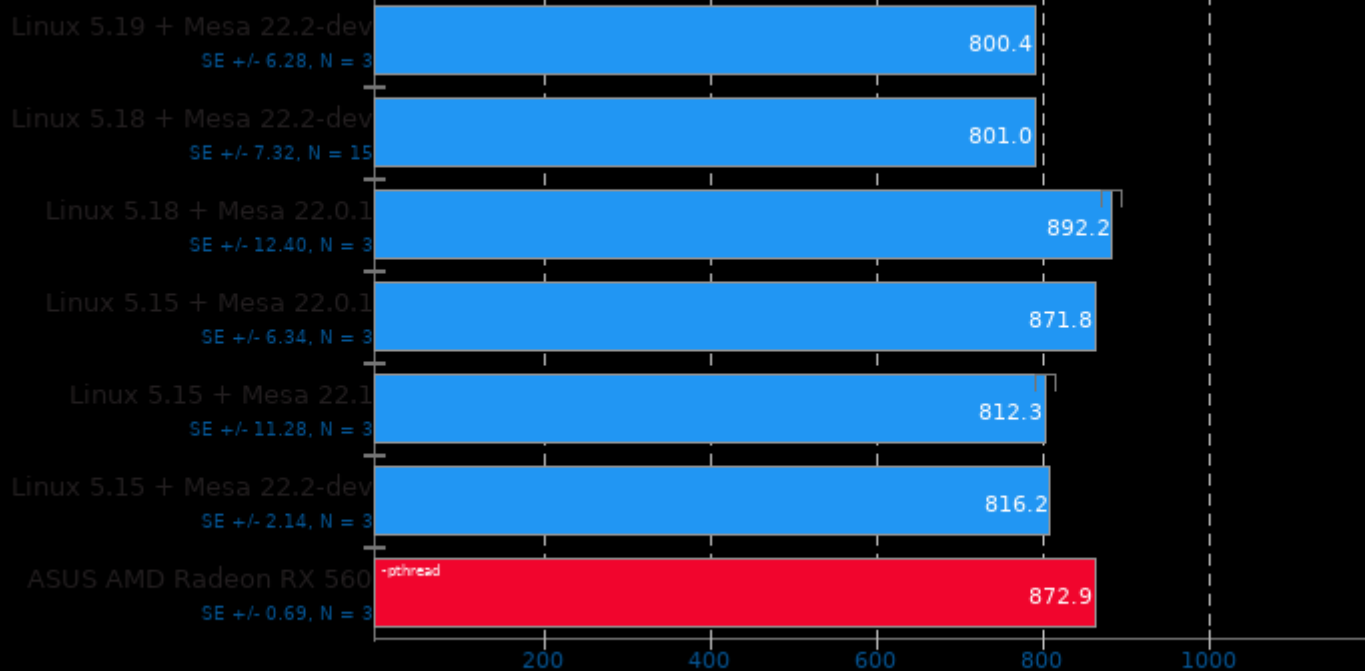
1. (GCC) gcc options: -shared -lm -ldl -rdynamic -lsdl2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfp



## yquake2 8.10

Renderer: OpenGL 3.x - AF: Off - MSAA: On - Resolution: 1920 x 1080

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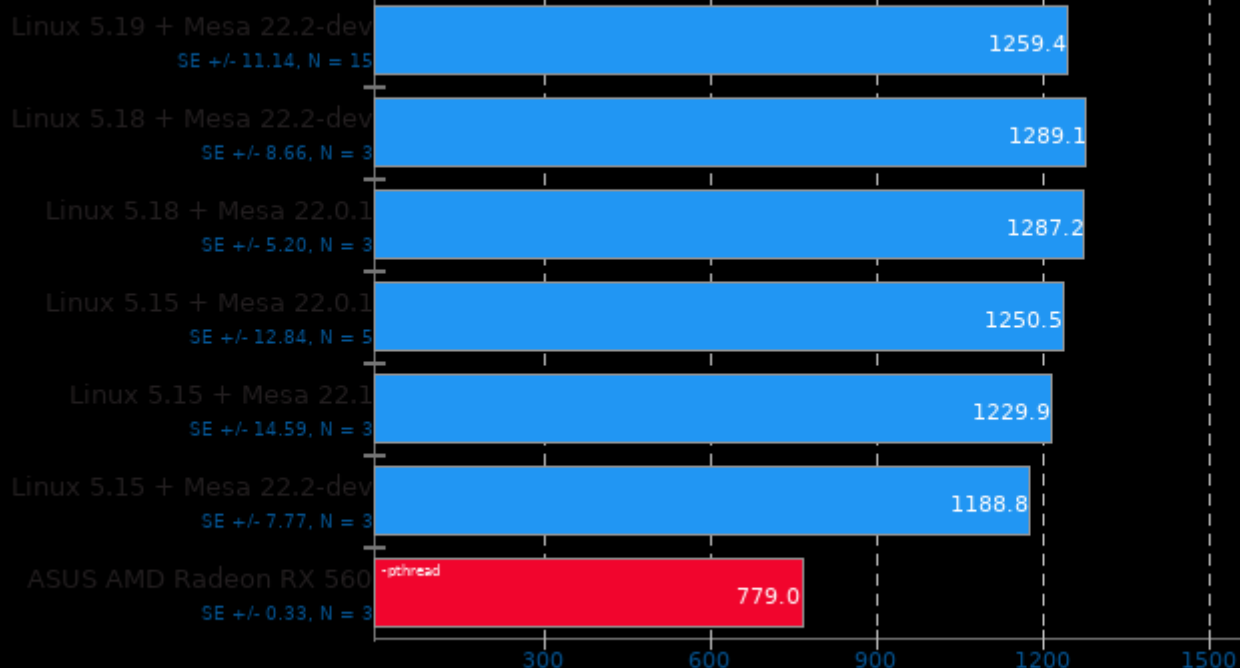


1. (GCC) gcc options: -shared -lm -ldl -rdynamic -lsdl2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfp

## yquake2 8.10

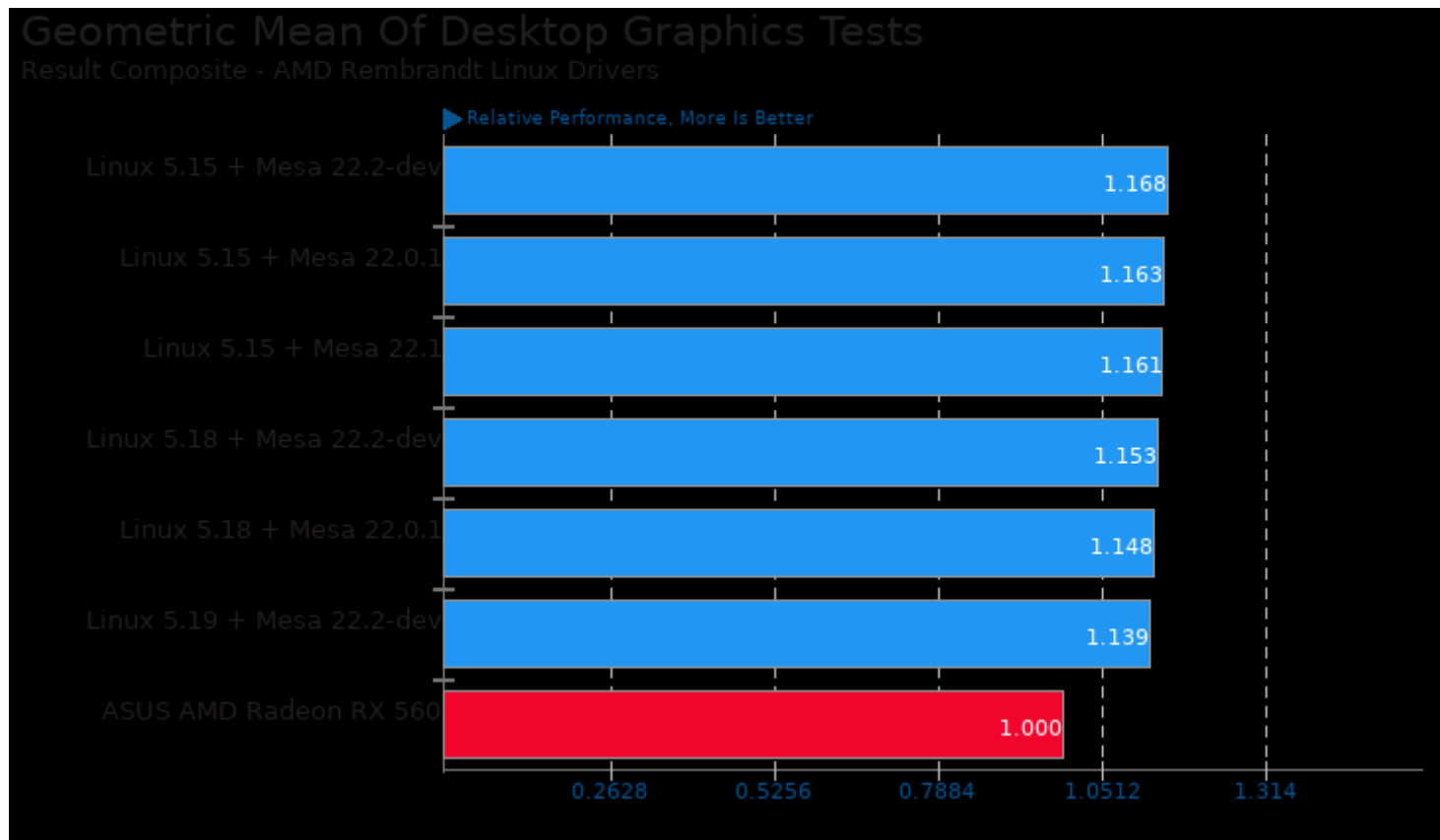
Renderer: Vulkan - AF: Off - MSAA: Off - Resolution: 1920 x 1080

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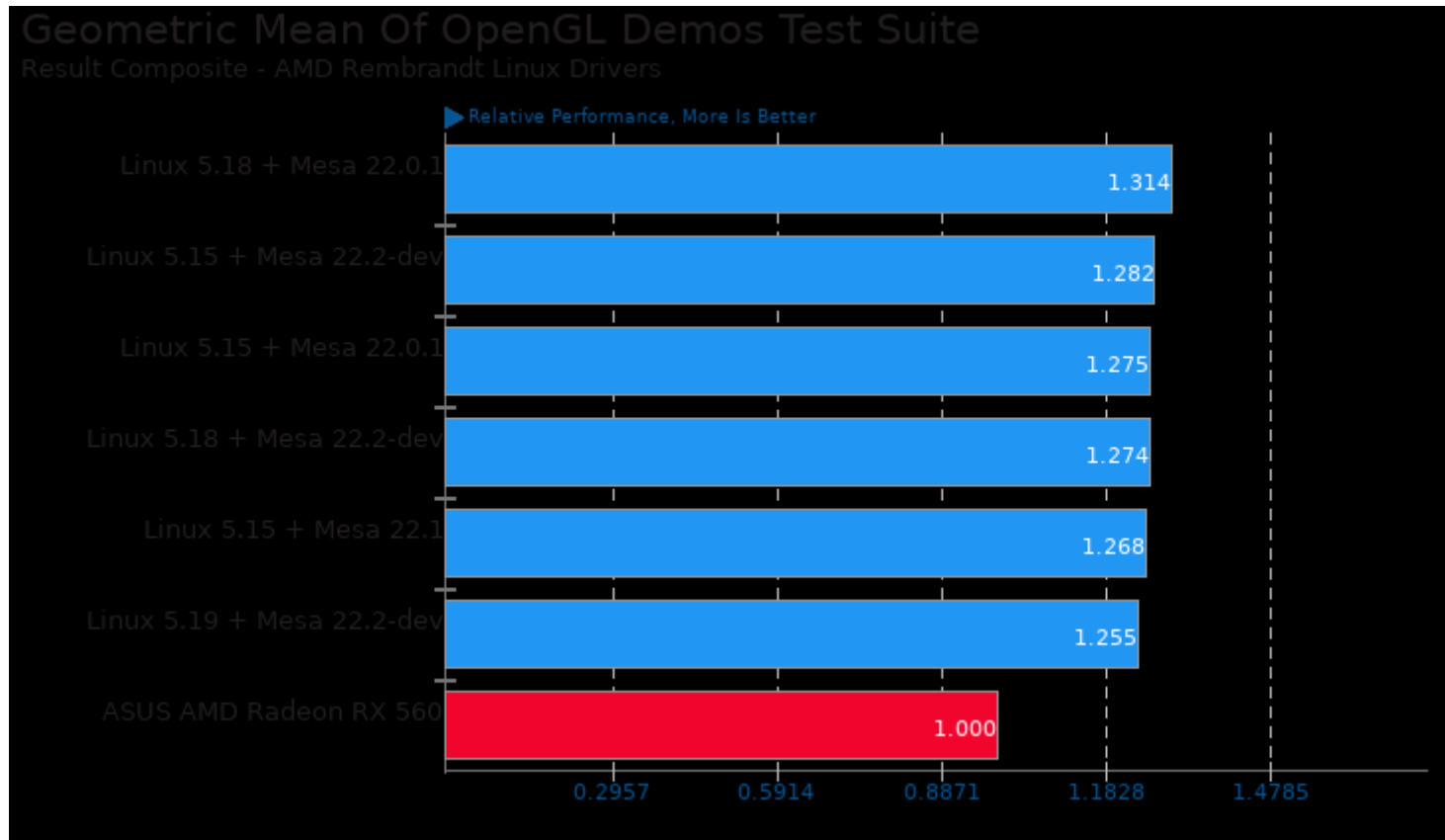


1. (GCC) gcc options: -shared -lm -ldl -rdynamic -lsdl2 -O2 -pipe -fomit-frame-pointer -std=gnu99 -fno-strict-aliasing -fwrapv -fvisibility=hidden -MMD -mfp

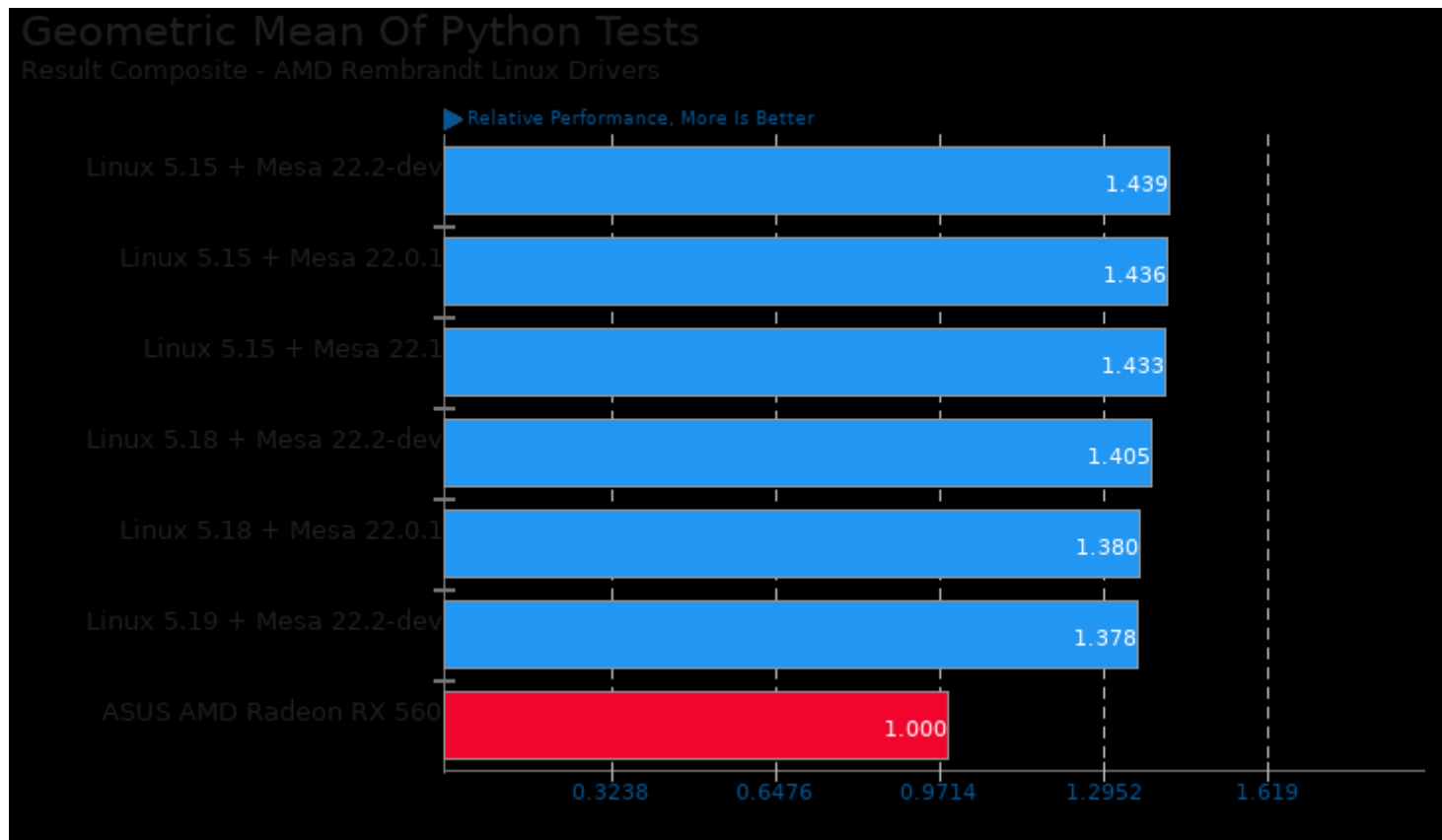
These geometric means are based upon test groupings / test suites for this result file.



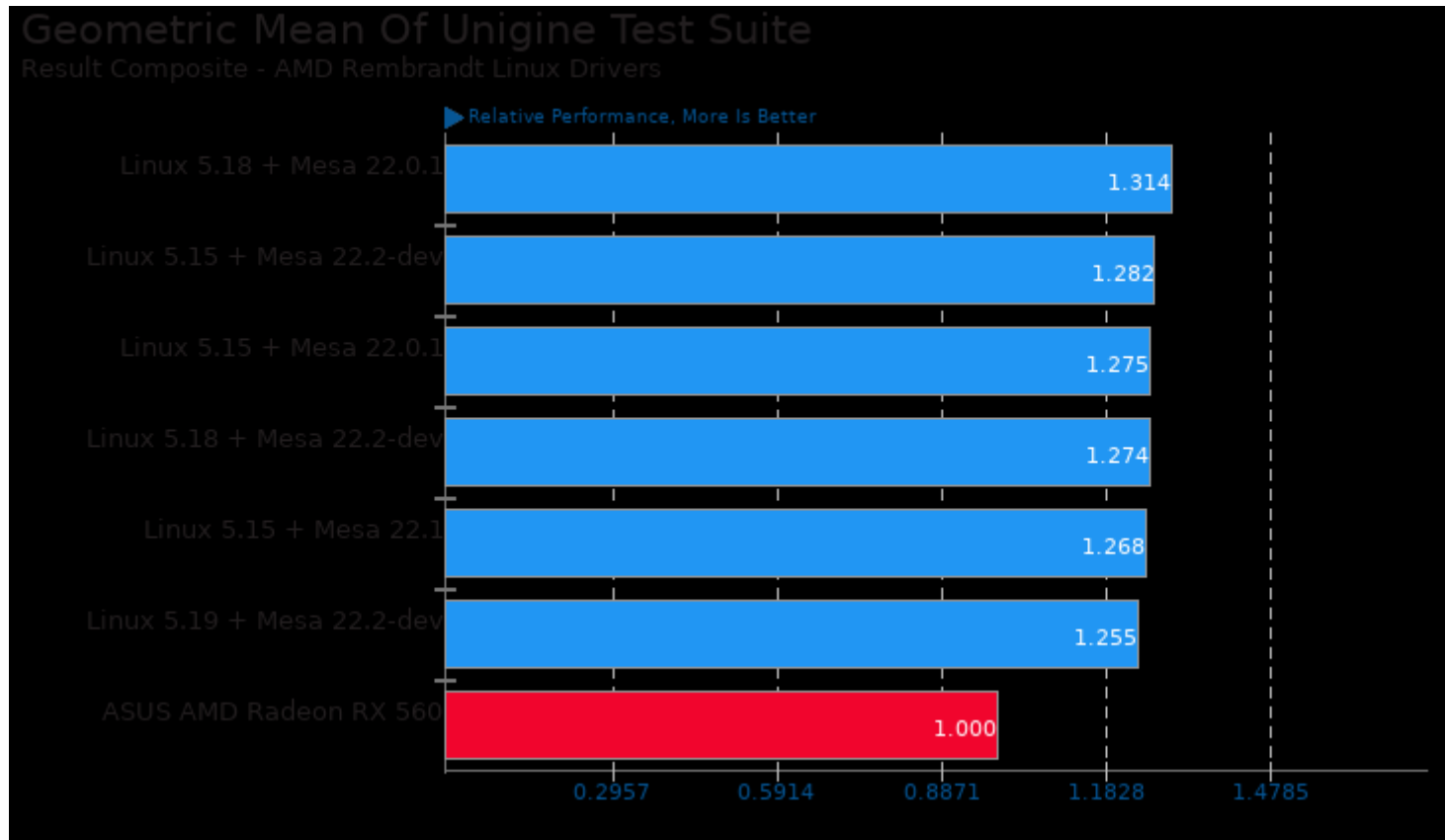
Geometric mean based upon tests: pts/xonotic, pts/openarena, pts/tesseract, pts/paraview, pts/unigine-heaven and pts/glmark2



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



Geometric mean based upon tests: pts/glmark2 and pts/paraview



*This file was automatically generated via the Phoronix Test Suite benchmarking software on Saturday, 21 December 2024 12:19.*