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SSD February 2019

Samsung SM961 256GB

Automated Executive Summary

Samsung 970 EVO Plus 500GB had the most wins, coming in first place for 20% of the tests.

Based on the geometric mean of all complete results, the fastest (Intel DC P3600 800GB) was 8.143x the speed of the slowest (Samsung 850 PRO 256GB). Intel Optane 900p 280GB was 0.976x the speed of Intel DC P3600 800GB, Samsung 970 PRO 512GB was 0.948x the speed of Intel Optane 900p 280GB, Samsung 970 EVO Plus 500GB was 0.965x the speed of Samsung 970 PRO 512GB, Samsung 970 EVO 500GB was 0.82x the speed of Samsung 970 EVO Plus 500GB, Samsung SM961 256GB was 0.96x the speed of Samsung 970 EVO 500GB, Intel 600p 512GB was 0.796x the speed of Samsung SM961 256GB, Samsung 970 EVO 250GB was 0.998x the speed of Intel 600p 512GB, 240GB Force MP300 was 0.916x the speed of Samsung 970 EVO 250GB, Samsung 850 PRO 256GB was 0.24x the speed of 240GB Force MP300.

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

Flexible IO Tester (Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory) at 62.651x
SQLite (Timed SQLite Insertions) at 50.03x
FS-Mark (Test: 4000 Files, 32 Sub Dirs, 1MB Size) at 27.853x

FS-Mark (Test: 1000 Files, 1MB Size) at 25.123x
PostgreSQL pgbench (Scaling: Mostly RAM - Test: Normal Load - Mode: Read Write) at 20.329x
Flexible IO Tester (Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 17.015x
Flexible IO Tester (Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 16.994x
Flexible IO Tester (Type: Sequential Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory) at 16.238x
SQLite (Performance / Cost - Timed SQLite Insertions) at 15.833x
Application Start-up Time (Background I/O Mix: Only Sequential Reads - Application To Start: LibreOffice Writer - Disk Target: Default Test Directory) at 14.69x.

Test Systems:

Intel 600p 512GB

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1601 BIOS), Chipset: AMD Family 17h, Memory: 4 x 8192 MB DDR4-1600MT/s F4-3200C14-8GFX, Disk: 512GB INTEL SSDPEKNW512G8, Graphics: llvmpipe, Audio: Realtek ALC1220, Network: Intel I211 + Qualcomm Atheros QCA6174 802.11ac + Wilocity Wil6200 802.11ad

OS: Ubuntu 18.04, Kernel: 5.0.0-050000rc6-generic (x86_64) 20190210, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.5 (LLVM 6.0 128 bits), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1280x1024

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB: conditional STIBP: disabled RSB filling + SSB disabled via prctl and seccomp

Intel DC P3600 800GB

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1601 BIOS), Chipset: AMD Family 17h, Memory: 4 x 8192 MB DDR4-1600MT/s F4-3200C14-8GFX, Disk: 800GB INTEL SSDPE2ME800G4, Graphics: llvmpipe, Audio: Realtek ALC1220, Network: Intel I211 + Qualcomm Atheros QCA6174 802.11ac + Wilocity Wil6200 802.11ad

OS: Ubuntu 18.04, Kernel: 5.0.0-050000rc6-generic (x86_64) 20190210, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.5 (LLVM 6.0 128 bits), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1280x1024

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v

Disk Notes: NONE / relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB: conditional STIBP: disabled RSB filling + SSB disabled via prctl and seccomp

Intel Optane 900p 280GB

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1601 BIOS), Chipset: AMD Family 17h, Memory: 4 x 8192 MB DDR4-1600MT/s F4-3200C14-8GFX, Disk: 280GB INTEL SSDPE21D280GA, Graphics: llvmpipe, Audio: Realtek ALC1220, Network: Intel I211 + Qualcomm Atheros QCA6174 802.11ac + Wilocity Wil6200 802.11ad

OS: Ubuntu 18.04, Kernel: 5.0.0-050000rc6-generic (x86_64) 20190210, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.5 (LLVM 6.0 128 bits), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1280x1024

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / relatime,rw,stripe=256
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB: conditional STIBP: disabled RSB filling + SSB disabled via prctl and seccomp

Samsung 850 PRO 256GB

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1601 BIOS), Chipset: AMD Family 17h, Memory: 4 x 8192 MB DDR4-1600MT/s F4-3200C14-8GFX, Disk: 256GB Samsung SSD 850, Graphics: llvmpipe, Audio: Realtek ALC1220, Network: Intel I211 + Qualcomm Atheros QCA6174 802.11ac + Wilocity Wil6200 802.11ad

OS: Ubuntu 18.04, Kernel: 5.0.0-050000rc6-generic (x86_64) 20190210, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.5 (LLVM 6.0 128 bits), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1280x1024

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Disk Notes: MQ-DEADLINE / relatime,rw,stripe=8191
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB: conditional STIBP: disabled RSB filling + SSB disabled via prctl and seccomp

Samsung 970 EVO 250GB

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1601 BIOS), Chipset: AMD Family 17h, Memory: 4 x 8192 MB DDR4-1600MT/s F4-3200C14-8GFX, Disk: Samsung SSD 970 EVO 250GB, Graphics: llvmpipe, Audio: Realtek ALC1220, Network: Intel I211 + Qualcomm Atheros QCA6174 802.11ac + Wilocity Wil6200 802.11ad

OS: Ubuntu 18.04, Kernel: 5.0.0-050000rc6-generic (x86_64) 20190210, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.5 (LLVM 6.0 128 bits), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1280x1024

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie

--enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB: conditional STIBP: disabled RSB filling + SSB disabled via prctl and seccomp

Samsung 970 EVO 500GB

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1601 BIOS), Chipset: AMD Family 17h, Memory: 4 x 8192 MB DDR4-1600MT/s F4-3200C14-8GFX, Disk: Samsung SSD 970 EVO 500GB, Graphics: llvmpipe, Audio: Realtek ALC1220, Network: Intel I211 + Qualcomm Atheros QCA6174 802.11ac + Wilocity Wil6200 802.11ad

OS: Ubuntu 18.04, Kernel: 5.0.0-050000rc6-generic (x86_64) 20190210, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.5 (LLVM 6.0 128 bits), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1280x1024

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB: conditional STIBP: disabled RSB filling + SSB disabled via prctl and seccomp

Samsung 970 EVO Plus 500GB

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1601 BIOS), Chipset: AMD Family 17h, Memory: 4 x 8192 MB DDR4-1600MT/s F4-3200C14-8GFX, Disk: Samsung SSD 970 EVO Plus 500GB, Graphics: llvmpipe, Audio: Realtek ALC1220, Network: Intel I211 + Qualcomm Atheros QCA6174 802.11ac + Wilocity Wil6200 802.11ad

OS: Ubuntu 18.04, Kernel: 5.0.0-050000rc6-generic (x86_64) 20190210, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.5 (LLVM 6.0 128 bits), Compiler: GCC 7.3.0, File-System: ext4, Screen Resolution: 1280x1024

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB: conditional STIBP: disabled RSB filling + SSB disabled via prctl and seccomp

Samsung 970 PRO 512GB

Processor: AMD Ryzen Threadripper 2990WX 32-Core @ 3.00GHz (32 Cores / 64 Threads), Motherboard: ASUS ROG ZENITH EXTREME (1601 BIOS), Chipset: AMD Family 17h, Memory: 4 x 8192 MB DDR4-1600MT/s F4-3200C14-8GFX, Disk: Samsung SSD 970 PRO 512GB, Graphics: llvmpipe, Audio: Realtek ALC1220, Network: Intel I211 + Qualcomm Atheros QCA6174 802.11ac + Wilocity Wil6200 802.11ad

OS: Ubuntu 18.04, Kernel: 5.0.0-050000rc6-generic (x86_64) 20190210, Desktop: GNOME Shell 3.28.3, Display Server: X Server 1.19.6, Display Driver: modesetting 1.19.6, OpenGL: 3.3 Mesa 18.0.5 (LLVM 6.0 128 bits), Compiler:

GCC 7.3.0, File-System: ext4, Screen Resolution: 1280x1024

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Disk Notes: NONE / relatime,rw
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + Full AMD retpoline IBPB: conditional STIBP: disabled RSB filling + SSB disabled via prctl and seccomp

Samsung SM961 256GB

Processor: Intel Core i5-8259U @ 3.80GHz (4 Cores / 8 Threads), Motherboard: Intel NUC8BEB (BECFL357.86A.0056.2018.1128.1717 BIOS), Chipset: Intel Cannon Point-LP Shared SRAM, Memory: 2 x 4096 MB DDR4-2400MT/s PSD44G240041S, Disk: 256GB SAMSUNG MZVPW256HEGL-00000 + 160GB INTEL SSDSA2BW16, Graphics: Intel HD 3GB (1050MHz), Audio: Realtek ALC233, Monitor: Acer E211H, Network: Intel I219-V + Intel Cannon Point-LP CNVi

OS: Fedora 29, Kernel: 4.20.7-200.fc29.x86_64 (x86_64), Desktop: Xfce 4.12, Display Server: X Server 1.20.3, Display Driver: modesetting 1.20.3, OpenGL: 4.5 Mesa 18.2.8, Compiler: GCC 8.2.1 20181215, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-redhat-linux --disable-libunwind-exceptions --enable-__cxa_atexit --enable-bootstrap --enable-cet --enable-checking=release --enable-gnu-indirect-function --enable-gnu-unique-object --enable-initfini-array --enable-languages=c,c++,fortran,objc,obj-c++,ada,go,lto --enable-libmpx --enable-multilib --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --mandir=/usr/share/man --with-arch_32=i686 --with-gcc-major-version-only --with-isl --with-linker-hash-style=gnu --with-tune=generic --without-cuda-driver
Disk Notes: NONE / relatime,rw,seclabel
Processor Notes: Scaling Governor: intel_pstate powersave
Python Notes: Python 2.7.15 + Python 3.7.2
Security Notes: SELinux + KPTI + __user pointer sanitization + Full generic retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling + SSB disabled via prctl and seccomp + PTE Inversion; VMX: conditional cache flushes SMT vulnerable

240GB Force MP300

Processor: Intel Core i7-8086K @ 5.20GHz (6 Cores / 12 Threads), Motherboard: ASRock Z370 Extreme4 (P3.10 BIOS), Chipset: Intel 8th Gen Core, Memory: 16384MB, Disk: 240GB Force MP300 + 1000GB Samsung SSD 970 EVO 1TB + PNY CS900 240GB + 4001GB Western Digital WD40EMRX-82U + 8002GB Backup+ Hub BK + 4001GB Backup+ Desk, Graphics: Zotac NVIDIA GeForce RTX 2080 8GB (1515/8000MHz), Audio: Realtek ALC1220, Monitor: XB271HU, Network: Intel I219-V

OS: LinuxMint 19.1, Kernel: 4.20.0-042000-lowlatency (x86_64), Desktop: Cinnamon 4.0.9, Display Server: X Server 1.19.6, Display Driver: NVIDIA 415.23, OpenGL: 4.6.0, Vulkan: 1.1.84, Compiler: GCC 8.2.0, File-System: ext4, Screen Resolution: 4480x1440

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Disk Notes: BFQ / errors=remount-ro,noatime,rw
Processor Notes: Scaling Governor: intel_pstate performance
Python Notes: Python 2.7.15rc1 + Python 3.6.7
Security Notes: __user pointer sanitization + disabled STIBP: disabled + PTE Inversion; VMX: vulnerable

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	Intel 600p 512GB	Intel DC P3600 800GB	Intel Optane 900p 280GB	Samsung 850 PRO 256GB	Samsung 970 EVO 250GB	Samsung 970 EVO 500GB	Samsung 970 EVO Plus	Samsung 970 PRO 512GB	Samsung SM961 256GB	240GB Force MP300
Application Start-up Time - O.S.R - xterm (sec)	0.73	0.35	0.53	1.89	0.93	0.61	0.36	0.25	0.38	0.35
Normalized	34.25%	71.43%	47.17%	13.23%	26.88%	40.98%	69.44%	100%	65.79%	71.43%
Standard Deviation	1.1%	2.4%	0.4%	2.6%	29.6%	3%	10.7%	3.3%	11.4%	23.4%
Application Start-up Time - O.S.R - GNOME Terminal (sec)	3.16	1.35	2.07	8.28	4.62	2.36	1.50	0.98	1.50	0.59
Normalized	18.67%	43.7%	28.5%	7.13%	12.77%	25%	39.33%	60.2%	39.33%	100%
Standard Deviation	1.3%	0.9%	0.6%	1%	1.4%	0.7%	1.4%	2.3%	1.3%	19.4%
Application Start-up Time - O.S.R - LibreOffice Writer (sec)	2.33	1.16	1.40	6.17	4.04	1.99	1.23	0.86	1.23	0.42
Normalized	18.03%	36.21%	30%	6.81%	10.4%	21.11%	34.15%	48.84%	34.15%	100%
Standard Deviation	0.4%	0.7%	1.1%	0.8%	0.8%	0.9%	1%	0.6%	7.8%	3%
Application Start-up Time - S.R.W - GNOME Terminal (sec)	2.51	2.83	3.62	55.14	3.88	3.22	2.83	3.22	4.55	4.26
Normalized	100%	88.69%	69.34%	4.55%	64.69%	77.95%	88.69%	77.95%	55.16%	58.92%
Standard Deviation	1.4%	1.1%	16.2%	6.8%	0.7%	1.8%	2.5%	0.9%	4.5%	89.1%
Application Start-up Time - S.R.W - LibreOffice Writer (sec)	2.03	2.60	2.08	39.81	3.13	3.03	2.16	2.35	3.39	0.98
Normalized	48.28%	37.69%	47.12%	2.46%	31.31%	32.34%	45.37%	41.7%	28.91%	100%
Standard Deviation	12.9%	3.2%	17.7%	9.4%	1.1%	15.7%	6.1%	2.5%	3%	25.4%
SQLite - T.S.I (sec)	14.57	2.36	2.35	50.60	37.09	36.15	33.59	43.84	117.57	97.64
Normalized	16.13%	99.58%	100%	4.64%	6.34%	6.5%	7%	5.36%	2%	2.41%
Standard Deviation	2.1%	0.3%	1.5%	4.2%	0.6%	0.3%	0.3%	0.2%	0.1%	3%
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 2MB (MB/s)	1608	2379	2338	531	3292	3354	3413	3413	2714	1411
Normalized	47.11%	69.7%	68.5%	15.56%	96.45%	98.27%	100%	100%	79.52%	41.34%
Standard Deviation		0.2%			0.6%				0.8%	5%
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 4KB (MB/s)	321	1005	1081	374	420	702	723	752	1135	473
Normalized	28.28%	88.55%	95.24%	32.95%	37%	61.85%	63.7%	66.26%	100%	41.67%
Standard Deviation		1.8%	0.4%	0.2%		0.4%	0.6%	0.5%	0.8%	0.8%

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Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 4KB (IOPS)	**82200**	257333	276667	95833	108000	179667	185333	192000	**290333**	121000
Normalized	28.31%	88.63%	95.29%	33.01%	37.2%	61.88%	63.83%	66.13%	100%	41.68%
Standard Deviation		1.8%	0.4%	0.1%		0.3%	0.6%	0.5%	0.9%	0.8%
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 2MB (MB/s)	943	890	1302	**49.64**	1464	2372	**3110**	2228	1455	534
Normalized	30.32%	28.62%	41.86%	1.6%	47.07%	76.27%	100%	71.64%	46.78%	17.17%
Standard Deviation	0.1%		0.9%	22.7%	0%	0.1%	0%	0.2%	0.3%	1.7%
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 4KB (MB/s)	833	610	442	**58.08**	974	976	947	984	**987**	495
Normalized	84.4%	61.8%	44.78%	5.88%	98.68%	98.89%	95.95%	99.7%	100%	50.15%
Standard Deviation	1.3%	3.5%	0.1%	3.3%	0.9%	1.6%	2.3%	1.2%	1%	1.3%
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 4KB (IOPS)	213333	156364	113000	**14850**	249333	249667	242667	252000	**252667**	127000
Normalized	84.43%	61.89%	44.72%	5.88%	98.68%	98.81%	96.04%	99.74%	100%	50.26%
Standard Deviation	1.4%	3.5%		3.1%	0.9%	1.6%	2.3%	1.2%	0.9%	1.4%
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 2MB (MB/s)	**236**	1892	**2334**	507	557	1031	912	1381	1648	465
Normalized	10.11%	81.06%	100%	21.72%	23.86%	44.17%	39.07%	59.17%	70.61%	19.92%
Standard Deviation			0%					0.1%	1.6%	0.4%
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 2MB (MB/s)	943	874	1278	**193**	1464	2399	**3134**	2234	1480	569
Normalized	30.09%	27.89%	40.78%	6.16%	46.71%	76.55%	100%	71.28%	47.22%	18.16%
Standard Deviation		5.8%	0%	21.1%		0.3%	0%	0.2%	0.3%	8.7%
FS-Mark - 1.F.1.S (Files/s)	350	**650.93**	594.77	**25.91**	221	231	244.07	197	95	180.54
Normalized	53.77%	100%	91.37%	3.98%	33.95%	35.49%	37.5%	30.26%	14.59%	27.74%
Standard Deviation	1.6%	3.5%	0.9%	6.8%	0.5%	1.4%	1.1%	0.4%	0.6%	40.8%
FS-Mark - 4.F.3.S.D.1.S (Files/s)	360	**707.47**	583.66	**25.40**	219	126	243.70	197	94.57	97.22
Normalized	50.89%	100%	82.5%	3.59%	30.96%	17.81%	34.45%	27.85%	13.37%	13.74%
Standard Deviation	1%	0.8%	3.5%	2%	0.1%	20.7%	0.6%	0.7%	0.1%	9.1%
BlogBench - Write (Final Score)	13165	46360	23826	**4505**	16724	30687	37563	**54241**		4564
Normalized	24.27%	85.47%	43.93%	8.31%	30.83%	56.58%	69.25%	100%		8.41%
Standard Deviation	5.2%	1.1%	2%	1.5%	1.8%	5.6%	4.4%	1.3%		0.9%

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IOzone - 1MB - 8GB - Write Performance (MB/s)	235	744.28	1071	**36.60**	369	643	924.36	**1535**	1342	96.35
Normalized	15.31%	48.49%	69.77%	2.38%	24.04%	41.89%	60.22%	100%	87.45%	6.28%
Standard Deviation	33.2%	7.3%	0.2%	18.3%	27.9%	8.9%	12.1%	2.8%	5.2%	8.8%
Compile Bench - Compile (MB/s)	1474	1895	2041	1327	1688	1937	**2056**	2037	1395	**996**
Normalized	71.69%	92.17%	99.27%	64.54%	82.1%	94.21%	100%	99.08%	67.85%	48.44%
Standard Deviation	6.4%	3%	0.9%	1.1%	9.2%	0.6%	2%	1.4%	3.1%	0.7%
PostgreSQL pgbench - Mostly RAM - Normal Load - Read Write (TPS)	**968**	**19678**	19247	1292	4000	4959	6513	7595	2316	
Normalized	4.92%	100%	97.81%	6.57%	20.33%	25.2%	33.1%	38.6%	11.77%	
Standard Deviation		0.5%	0.8%	1.4%	1.5%	15.7%	2.3%	3.8%	0.3%	
Application Start-up Time - Performance / Cost - O.S.R - xterm (sec			**143.09**		91.84	103.69	**46.80**	57.29		
Normalized			32.71%		50.96%	45.13%	100%	81.69%		
Application Start-up Time - Performance / Cost - O.S.R - GNOME Terminal (sec x			**558.88**		456.23	401.18	**194.99**	224.57		
Normalized			34.89%		42.74%	48.6%	100%	86.83%		
Application Start-up Time - Performance / Cost - O.S.R - LibreOffice Writer			377.99		**398.95**	338.28	**159.89**	197.07		
Normalized			42.3%		40.08%	47.27%	100%	81.13%		
Application Start-up Time - Performance / Cost - S.R.W - GNOME Terminal (sec x			**977.36**		383.15	547.37	**367.87**	737.86		
Normalized			37.64%		96.01%	67.21%	100%	49.86%		
Application Start-up Time - Performance / Cost - S.R.W - LibreOffice Writer			**561.58**		309.09	515.07	**280.78**	538.50		
Normalized			50%		90.84%	54.51%	100%	52.14%		
SQLite - Performance / Cost - T.S.I (sec x Dollar)			**634.48**		3663	6145	4366	**10046**		
Normalized			100%		17.32%	10.32%	14.53%	6.32%		

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Flexible IO Tester - Performance / Cost - Rand Read - Linux AIO - No - Yes - 2MB (MB/s/Dollar)	**8.66**	**33.34**	19.73	26.26	14.89
Normalized	25.97%	100%	59.18%	78.76%	44.66%
Flexible IO Tester - Performance / Cost - Rand Read - Linux AIO - No - Yes - 4KB (MB/s/Dollar)	4.00	4.25	4.13	**5.56**	**3.28**
Normalized	71.94%	76.44%	74.28%	100%	58.99%
Flexible IO Tester - Performance / Cost - Rand Read - Linux AIO - No - Yes - 4KB (IOPS/Dollar)	1025	1094	1057	**1426**	**837.88**
Normalized	71.87%	76.71%	74.13%	100%	58.77%
Flexible IO Tester - Performance / Cost - Rand Write - Linux AIO - No - Yes - 2MB (MB/s/Dollar)	**4.82**	14.83	13.95	**23.92**	9.72
Normalized	20.15%	62%	58.32%	100%	40.64%
Flexible IO Tester - Performance / Cost - Rand Write - Linux AIO - No - Yes - 4KB (MB/s/Dollar)	**1.64**	**9.86**	5.74	7.29	4.29
Normalized	16.63%	100%	58.22%	73.94%	43.51%
Flexible IO Tester - Performance / Cost - Rand Write - Linux AIO - No - Yes - 4KB (IOPS/Dollar)	**418.53**	**2525**	1469	1867	1100
Normalized	16.58%	100%	58.17%	73.94%	43.56%
Flexible IO Tester - Performance / Cost - Seq Read - Linux AIO - No - Yes - 2MB (MB/s/Dollar)	**8.64**	**5.64**	6.07	7.02	6.03
Normalized	100%	65.28%	70.25%	81.25%	69.79%

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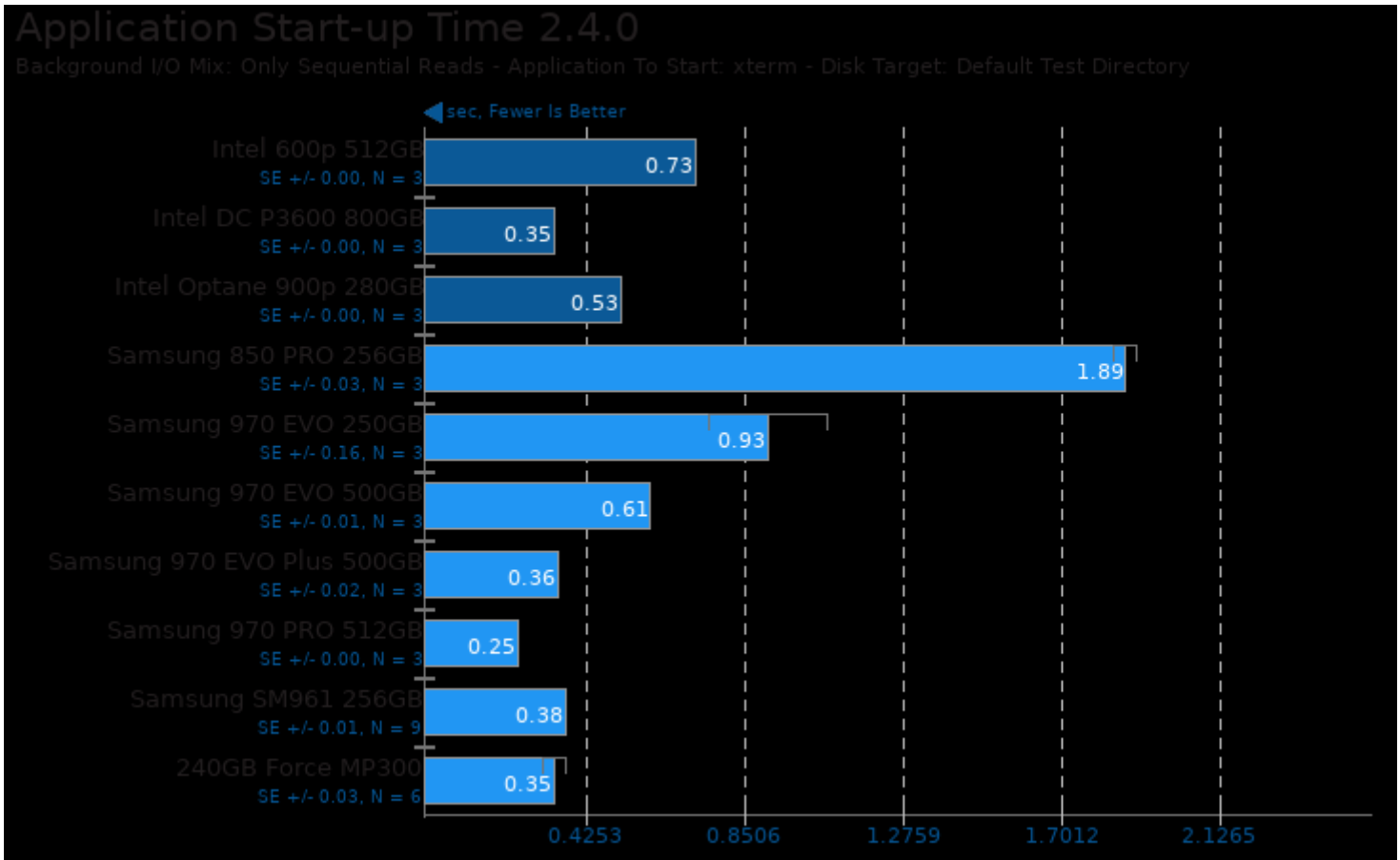
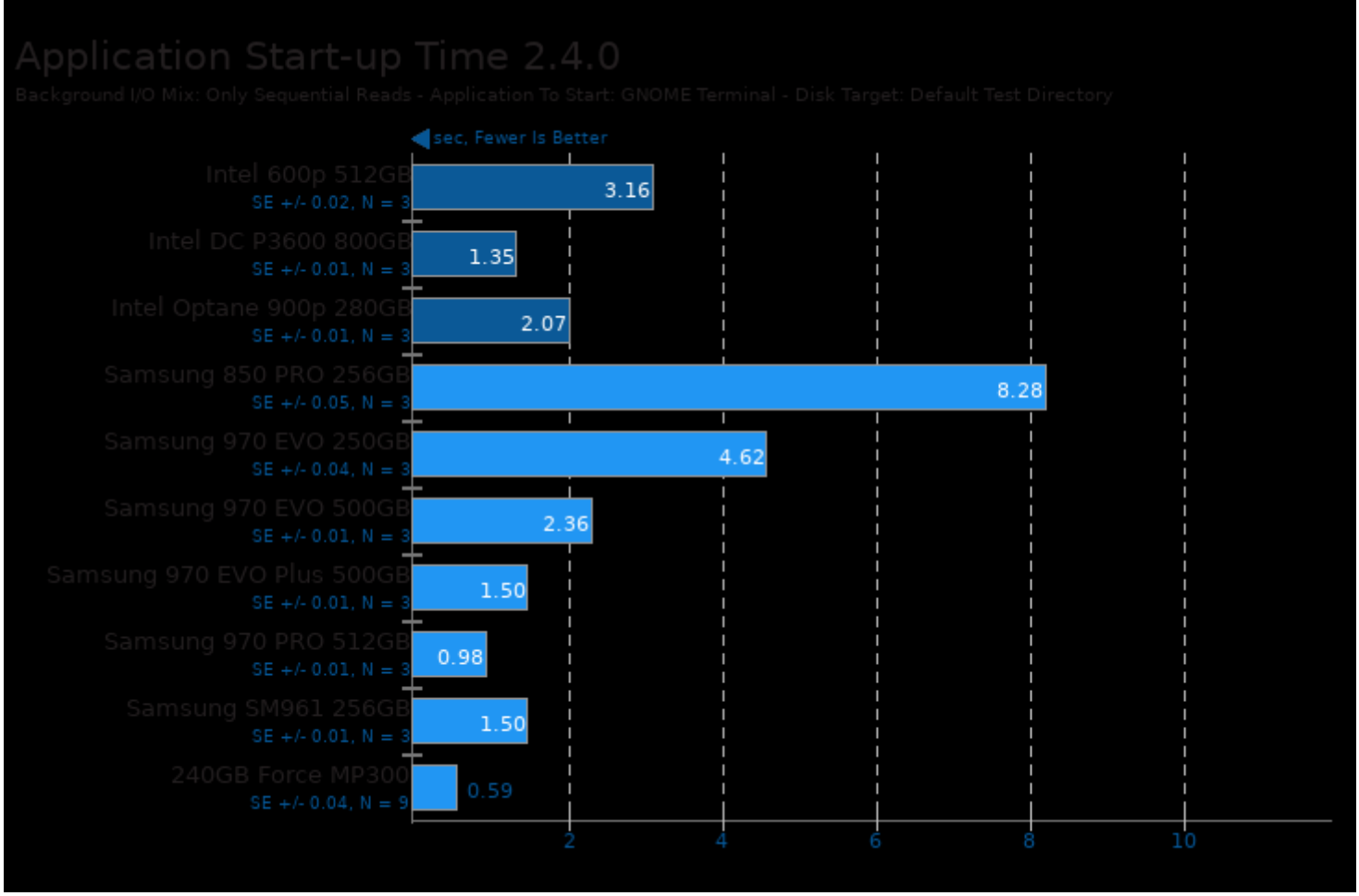
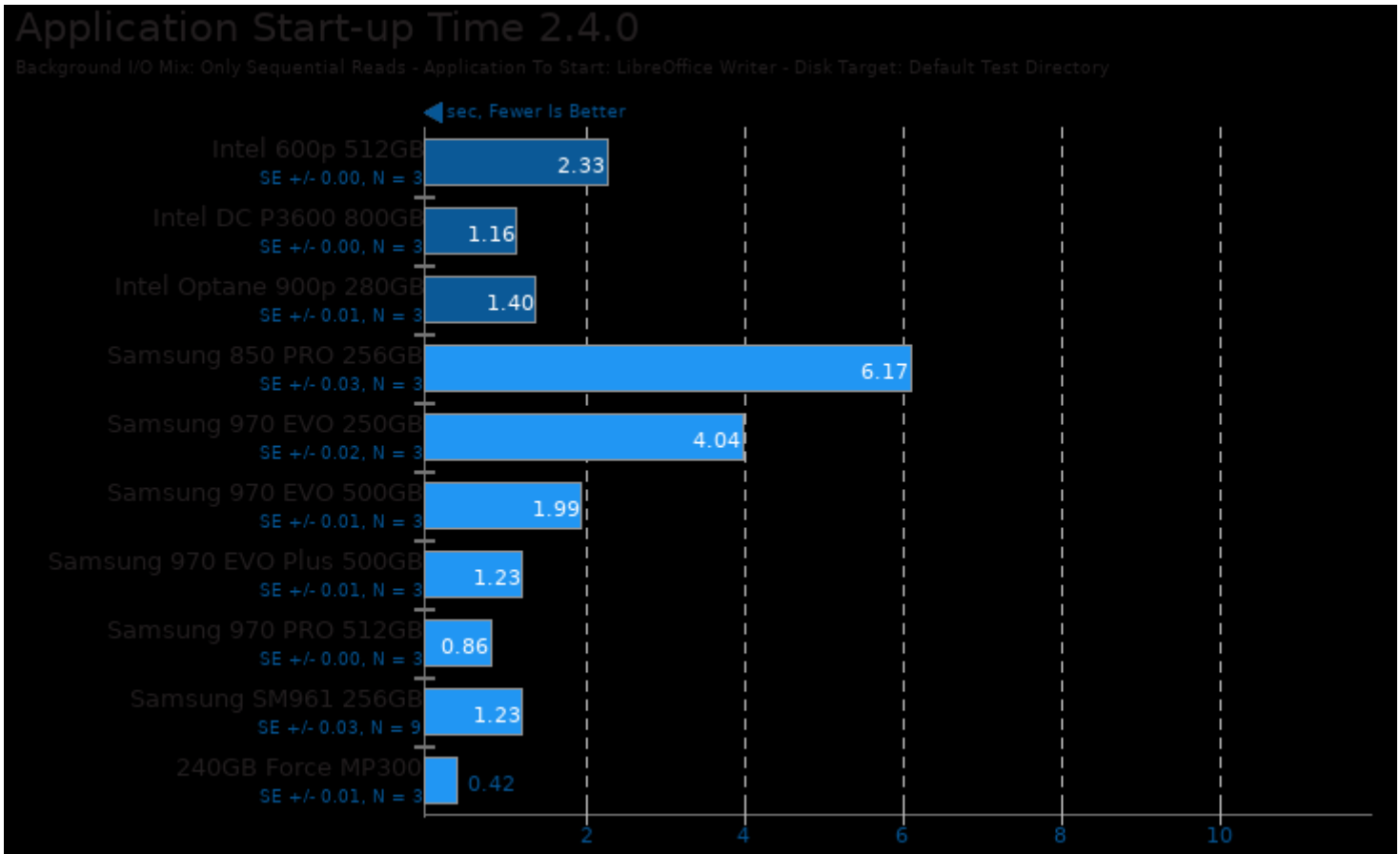
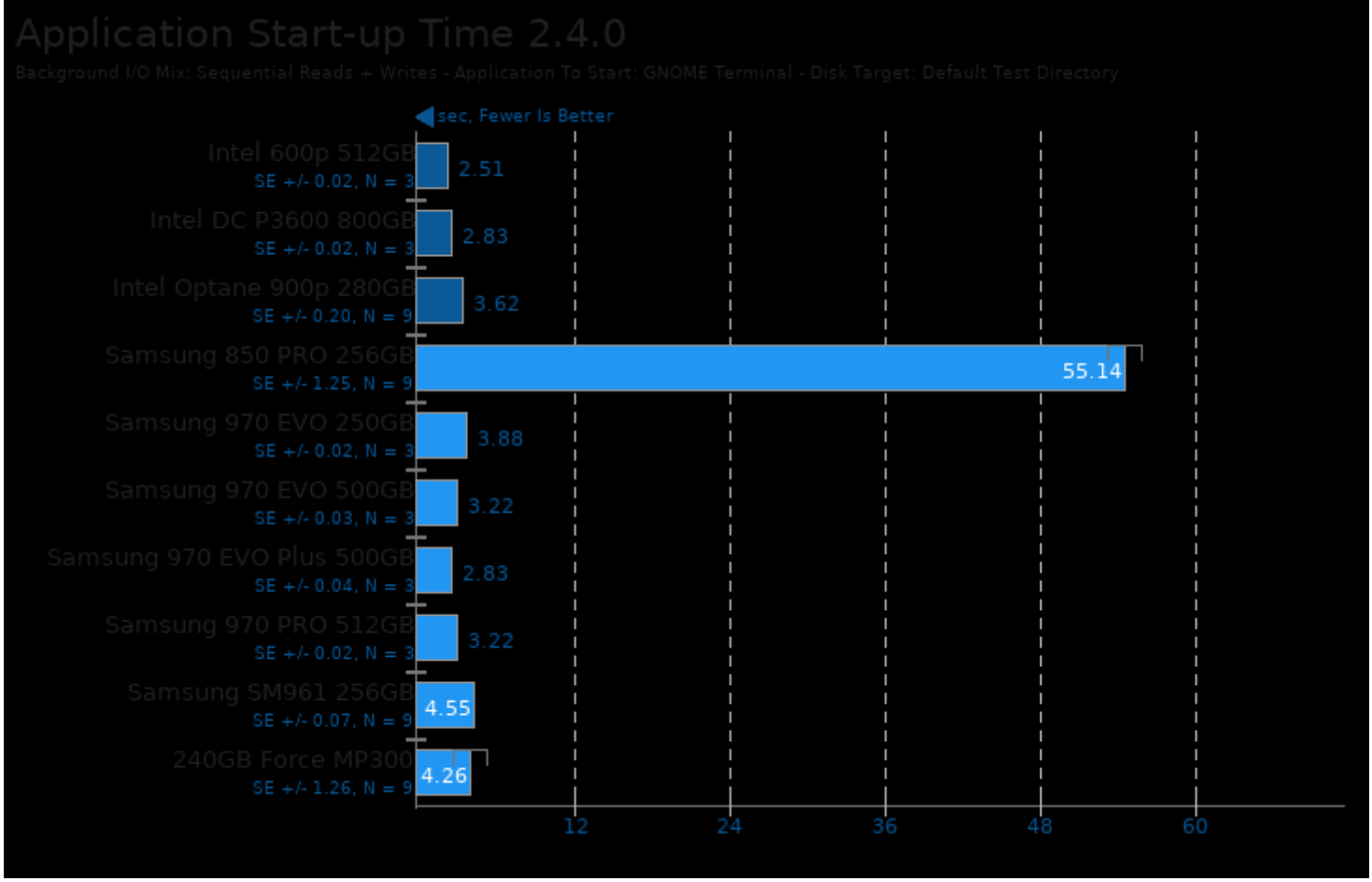
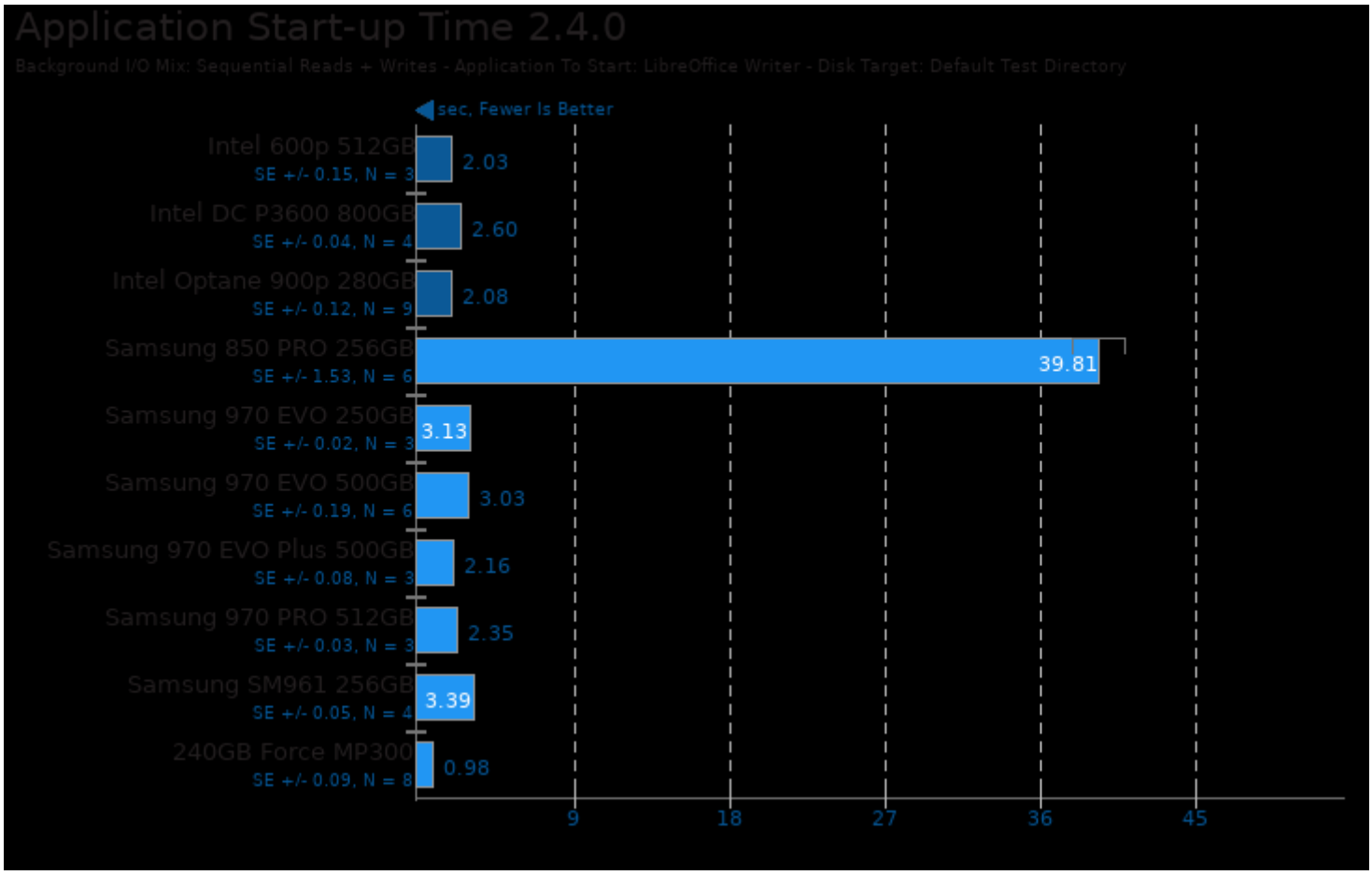
Flexible IO Tester - Performance / Cost - Seq Write - Linux AIO - No - Yes - 2MB (MB/s/Dollar)	**4.73**	14.83	14.11	**24.11**	9.75
Normalized	19.62%	61.51%	58.52%	100%	40.44%
FS-Mark - Performance / Cost - 1.F.1.S (Files/s/Dollar)	2.20	**2.24**	1.36	1.88	**0.86**
Normalized	98.21%	100%	60.71%	83.93%	38.39%
FS-Mark - Performance / Cost - 4.F.3.S.D.1.S (Files/s/Dollar)	2.16	**2.22**	**0.74**	1.87	0.86
Normalized	97.3%	100%	33.33%	84.23%	38.74%
BlogBench - Performance / Cost - Write (Final Score/Dollar)	**88.25**	169.36	180.52	**288.97**	236.71
Normalized	30.54%	58.61%	62.47%	100%	81.92%
IOzone - Performance / Cost - 1MB - 8GB - Write Performance (MB/s/Dollar)	3.97	**3.74**	3.78	**7.11**	6.70
Normalized	55.84%	52.6%	53.16%	100%	94.23%
Compile Bench - Performance / Cost - Compile (MB/s/Dollar)	**7.56**	**17.09**	11.39	15.82	8.89
Normalized	44.24%	100%	66.65%	92.57%	52.02%
PostgreSQL pgbench - Performance / Cost - Mostly RAM - Normal Load - Read Write (TPS/Dollar)	**71.29**	40.51	**29.17**	50.10	33.14
Normalized	100%	56.82%	40.92%	70.28%	46.49%

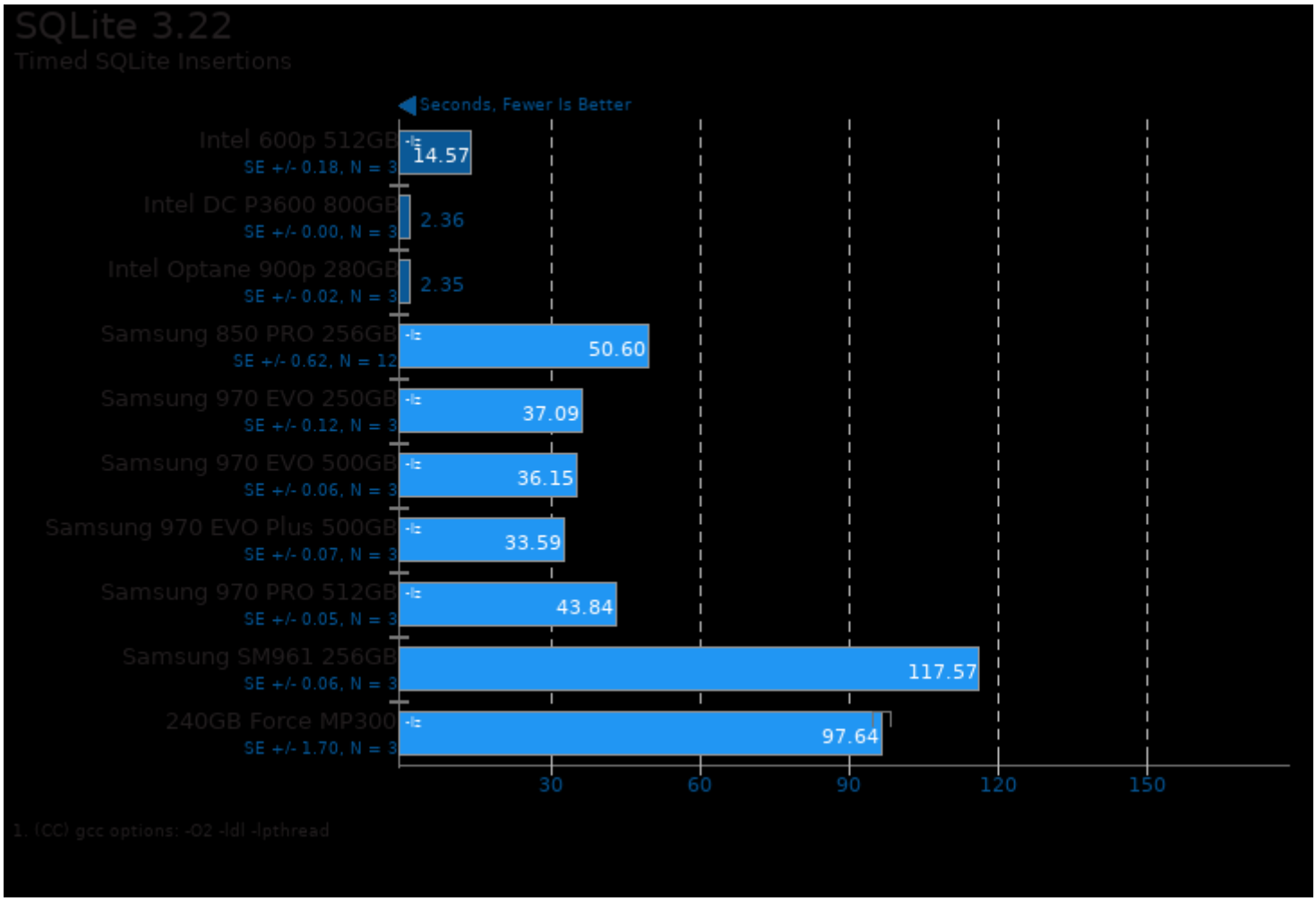

Application Start-up Time 2.4.0
Background I/O Mix: Only Sequential Reads - Application To Start: xterm - Disk Target: Default Test Directory
sec, Fewer Is Better
Intel 600p 512GB
SE +/- 0.00, N = 3
0.73
Intel DC P3600 800GB
SE +/- 0.00, N = 3
0.35
Intel Optane 900p 280GB
SE +/- 0.00, N = 3
0.53
Samsung 850 PRO 256GB
SE +/- 0.03, N = 3
1.89
Samsung 970 EVO 250GB
SE +/- 0.16, N = 3
0.93
Samsung 970 EVO 500GB
SE +/- 0.01, N = 3
0.61
Samsung 970 EVO Plus 500GB
SE +/- 0.02, N = 3
0.36
Samsung 970 PRO 512GB
SE +/- 0.00, N = 3
0.25
Samsung SM961 256GB
SE +/- 0.01, N = 9
0.38
240GB Force MP300
SE +/- 0.03, N = 6
0.35
0.4253
0.8506
1.2759
1.7012
2.1265

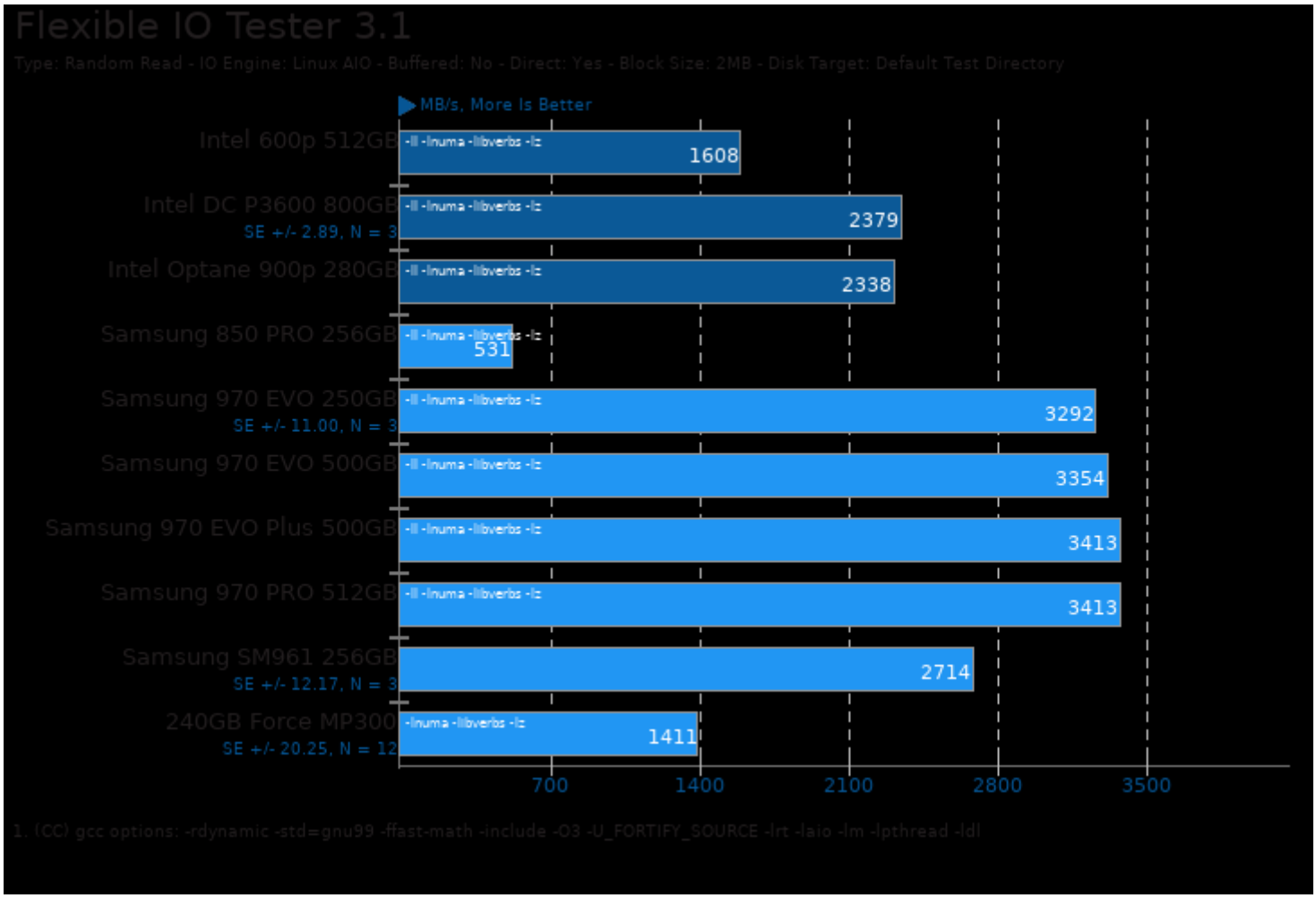

Application Start-up Time 2.4.0
Background I/O Mix: Only Sequential Reads - Application To Start: GNOME Terminal - Disk Target: Default Test Directory
sec, Fewer Is Better
Intel 600p 512GB
SE +/- 0.02, N = 3
3.16
Intel DC P3600 800GB
SE +/- 0.01, N = 3
1.35
Intel Optane 900p 280GB
SE +/- 0.01, N = 3
2.07
Samsung 850 PRO 256GB
SE +/- 0.05, N = 3
8.28
Samsung 970 EVO 250GB
SE +/- 0.04, N = 3
4.62
Samsung 970 EVO 500GB
SE +/- 0.01, N = 3
2.36
Samsung 970 EVO Plus 500GB
SE +/- 0.01, N = 3
1.50
Samsung 970 PRO 512GB
SE +/- 0.01, N = 3
0.98
Samsung SM961 256GB
SE +/- 0.01, N = 3
1.50
240GB Force MP300
SE +/- 0.04, N = 9
0.59
2
4
6
8
10

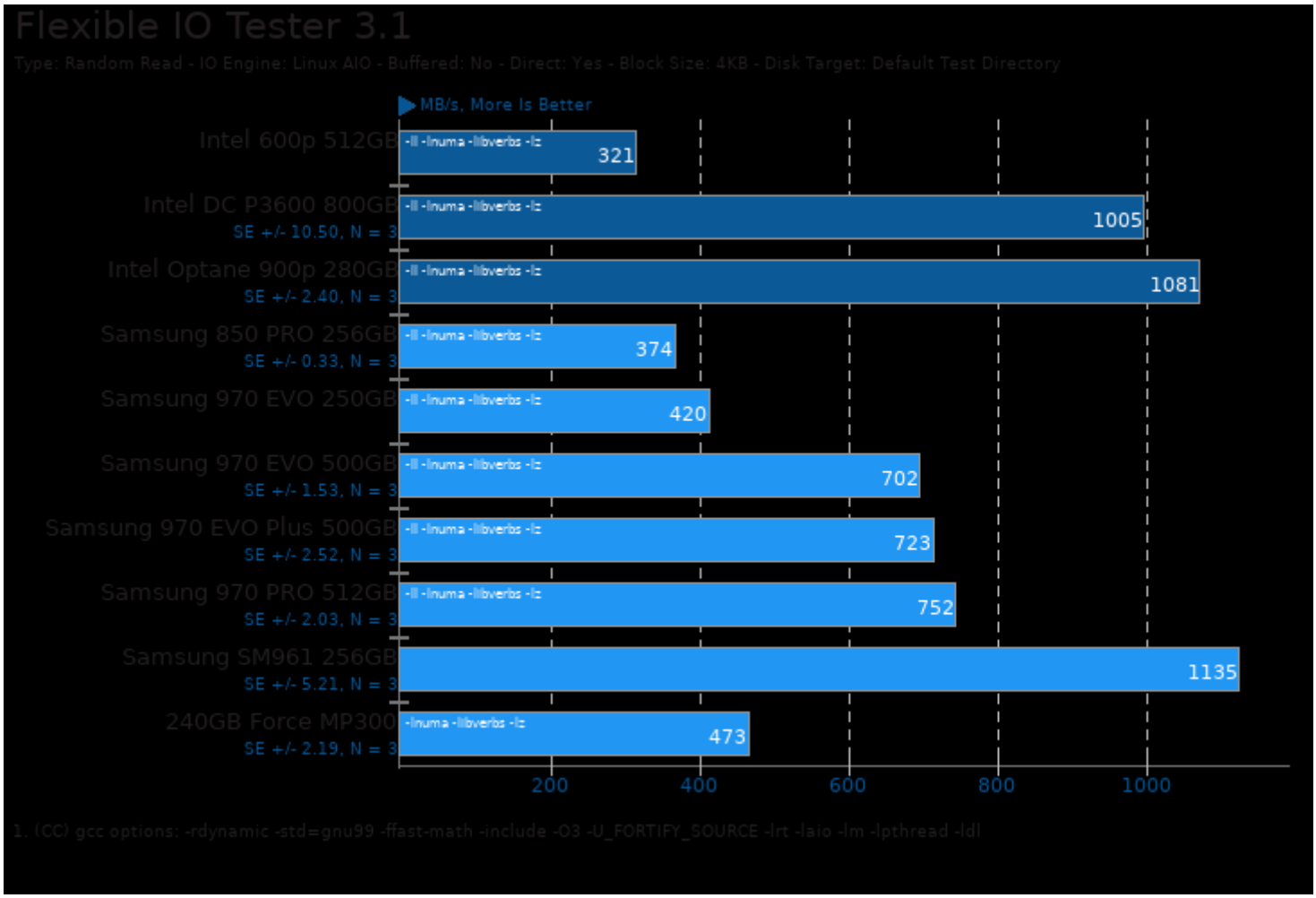

Application Start-up Time 2.4.0
Background I/O Mix: Only Sequential Reads - Application To Start: LibreOffice Writer - Disk Target: Default Test Directory
sec, Fewer Is Better
Intel 600p 512GB
SE +/- 0.00, N = 3
2.33
Intel DC P3600 800GB
SE +/- 0.00, N = 3
1.16
Intel Optane 900p 280GB
SE +/- 0.01, N = 3
1.40
Samsung 850 PRO 256GB
SE +/- 0.03, N = 3
6.17
Samsung 970 EVO 250GB
SE +/- 0.02, N = 3
4.04
Samsung 970 EVO 500GB
SE +/- 0.01, N = 3
1.99
Samsung 970 EVO Plus 500GB
SE +/- 0.01, N = 3
1.23
Samsung 970 PRO 512GB
SE +/- 0.00, N = 3
0.86
Samsung SM961 256GB
SE +/- 0.03, N = 9
1.23
240GB Force MP300
SE +/- 0.01, N = 3
0.42
2
4
6
8
10


Application Start-up Time 2.4.0
Background I/O Mix: Sequential Reads + Writes - Application To Start: GNOME Terminal - Disk Target: Default Test Directory
sec, Fewer Is Better
Intel 600p 512GB
SE +/- 0.02, N = 3
2.51
Intel DC P3600 800GB
SE +/- 0.02, N = 3
2.83
Intel Optane 900p 280GB
SE +/- 0.20, N = 9
3.62
Samsung 850 PRO 256GB
SE +/- 1.25, N = 9
55.14
Samsung 970 EVO 250GB
SE +/- 0.02, N = 3
3.88
Samsung 970 EVO 500GB
SE +/- 0.03, N = 3
3.22
Samsung 970 EVO Plus 500GB
SE +/- 0.04, N = 3
2.83
Samsung 970 PRO 512GB
SE +/- 0.02, N = 3
3.22
Samsung SM961 256GB
SE +/- 0.07, N = 9
4.55
240GB Force MP300
SE +/- 1.26, N = 9
4.26
12
24
36
48
60


Application Start-up Time 2.4.0
Background I/O Mix: Sequential Reads + Writes - Application To Start: LibreOffice Writer - Disk Target: Default Test Directory
sec, Fewer Is Better
Intel 600p 512GB
SE +/- 0.15, N = 3
2.03
Intel DC P3600 800GB
SE +/- 0.04, N = 4
2.60
Intel Optane 900p 280GB
SE +/- 0.12, N = 9
2.08
Samsung 850 PRO 256GB
SE +/- 1.53, N = 6
39.81
Samsung 970 EVO 250GB
SE +/- 0.02, N = 3
3.13
Samsung 970 EVO 500GB
SE +/- 0.19, N = 6
3.03
Samsung 970 EVO Plus 500GB
SE +/- 0.08, N = 3
2.16
Samsung 970 PRO 512GB
SE +/- 0.03, N = 3
2.35
Samsung SM961 256GB
SE +/- 0.05, N = 4
3.39
240GB Force MP300
SE +/- 0.09, N = 8
0.98
9
18
27
36
45


SQLite 3.22
Timed SQLite Insertions
Seconds, Fewer Is Better
Intel 600p 512GB
SE +/- 0.18, N = 3
14.57
Intel DC P3600 800GB
SE +/- 0.00, N = 3
2.36
Intel Optane 900p 280GB
SE +/- 0.02, N = 3
2.35
Samsung 850 PRO 256GB
SE +/- 0.62, N = 12
50.60
Samsung 970 EVO 250GB
SE +/- 0.12, N = 3
37.09
Samsung 970 EVO 500GB
SE +/- 0.06, N = 3
36.15
Samsung 970 EVO Plus 500GB
SE +/- 0.07, N = 3
33.59
Samsung 970 PRO 512GB
SE +/- 0.05, N = 3
43.84
Samsung SM961 256GB
SE +/- 0.06, N = 3
117.57
240GB Force MP300
SE +/- 1.70, N = 3
97.64
30
60
90
120
150
1. (CC) gcc options: -O2 -ldl -lpthread


Flexible IO Tester 3.1
Type: Random Read - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s, More Is Better
Intel 600p 512GB
1608
Intel DC P3600 800GB
SE +/- 2.89, N = 3
2379
Intel Optane 900p 280GB
2338
Samsung 850 PRO 256GB
531
Samsung 970 EVO 250GB
SE +/- 11.00, N = 3
3292
Samsung 970 EVO 500GB
3354
Samsung 970 EVO Plus 500GB
3413
Samsung 970 PRO 512GB
3413
Samsung SM961 256GB
SE +/- 12.17, N = 3
2714
240GB Force MP300
SE +/- 20.25, N = 12
1411
700
1400
2100
2800
3500
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lm -lpthread -ldl


Flexible IO Tester 3.1
Type: Random Read - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
Intel 600p 512GB
321
Intel DC P3600 800GB
SE +/- 10.50, N = 3
1005
Intel Optane 900p 280GB
SE +/- 2.40, N = 3
1081
Samsung 850 PRO 256GB
SE +/- 0.33, N = 3
374
Samsung 970 EVO 250GB
420
Samsung 970 EVO 500GB
SE +/- 1.53, N = 3
702
Samsung 970 EVO Plus 500GB
SE +/- 2.52, N = 3
723
Samsung 970 PRO 512GB
SE +/- 2.03, N = 3
752
Samsung SM961 256GB
SE +/- 5.21, N = 3
1135
240GB Force MP300
SE +/- 2.19, N = 3
473
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lm -lpthread -ldl

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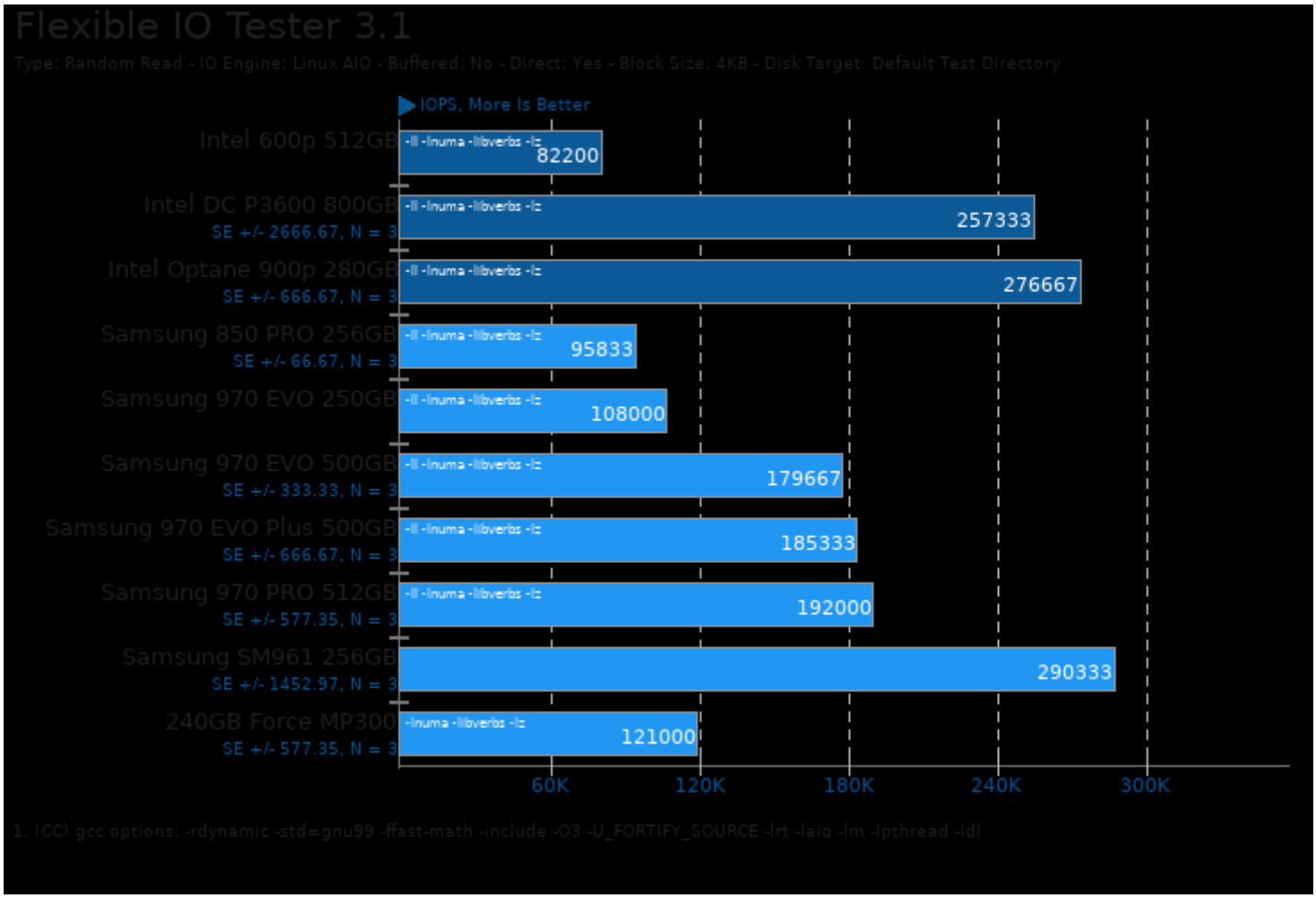
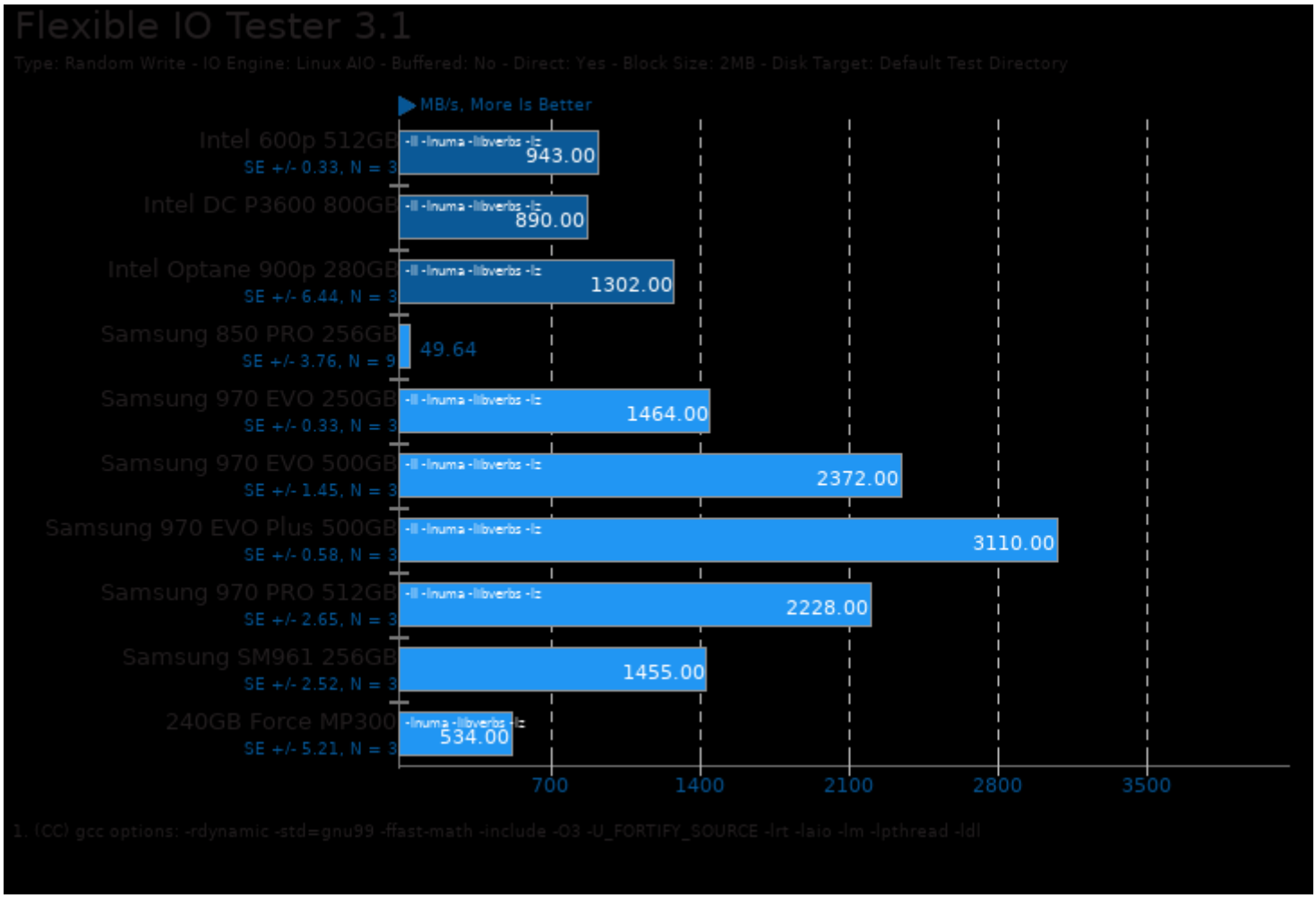
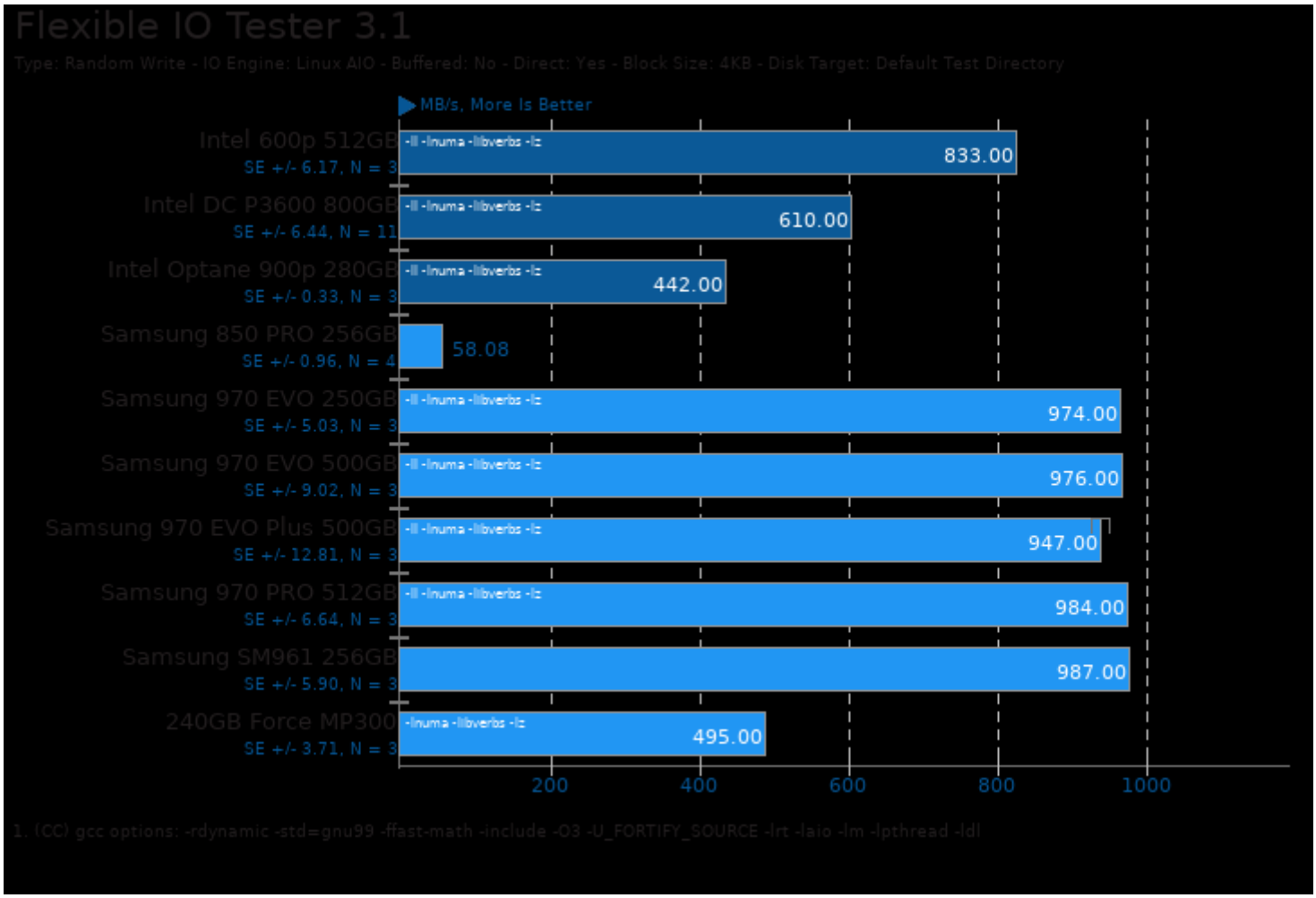
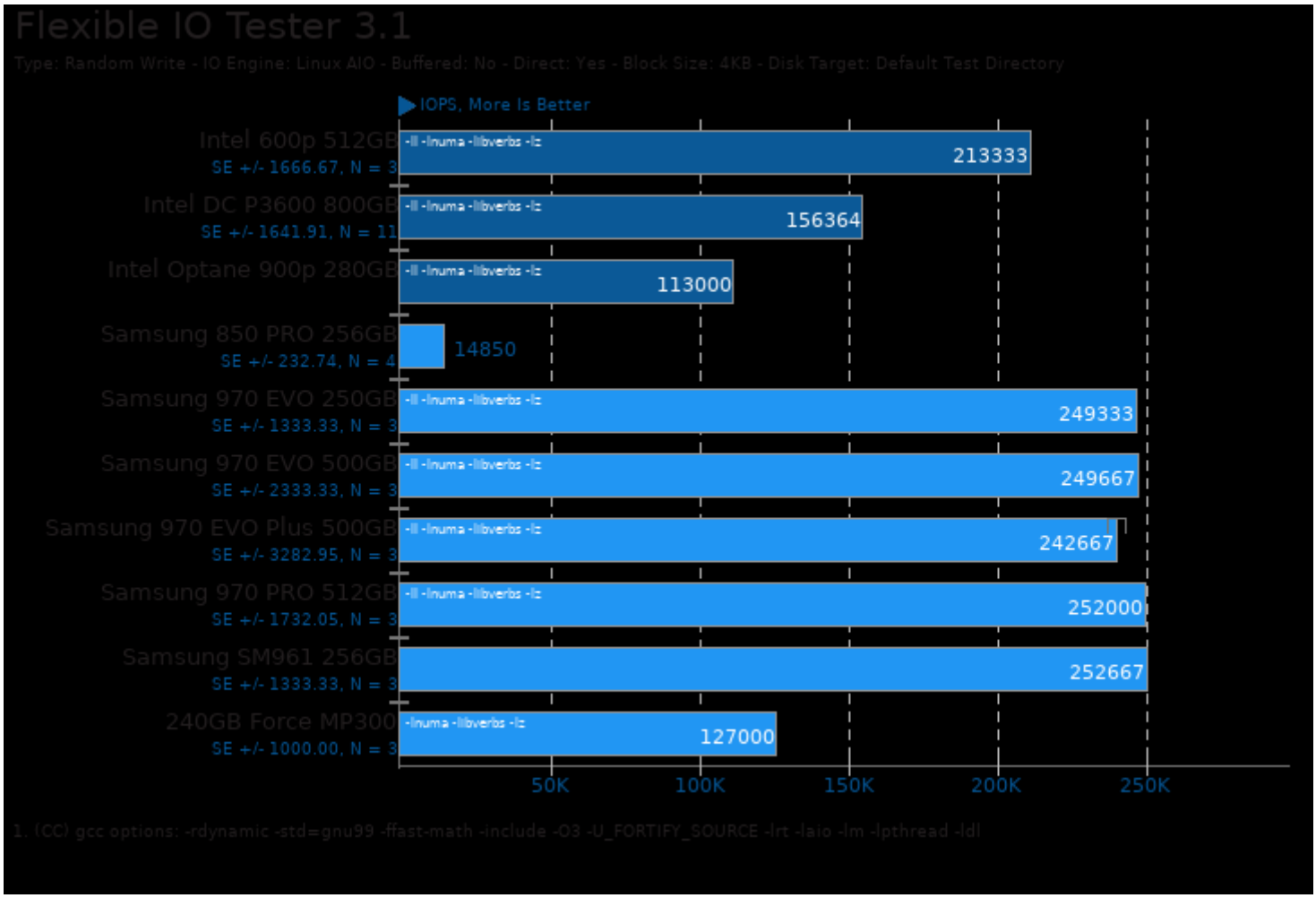
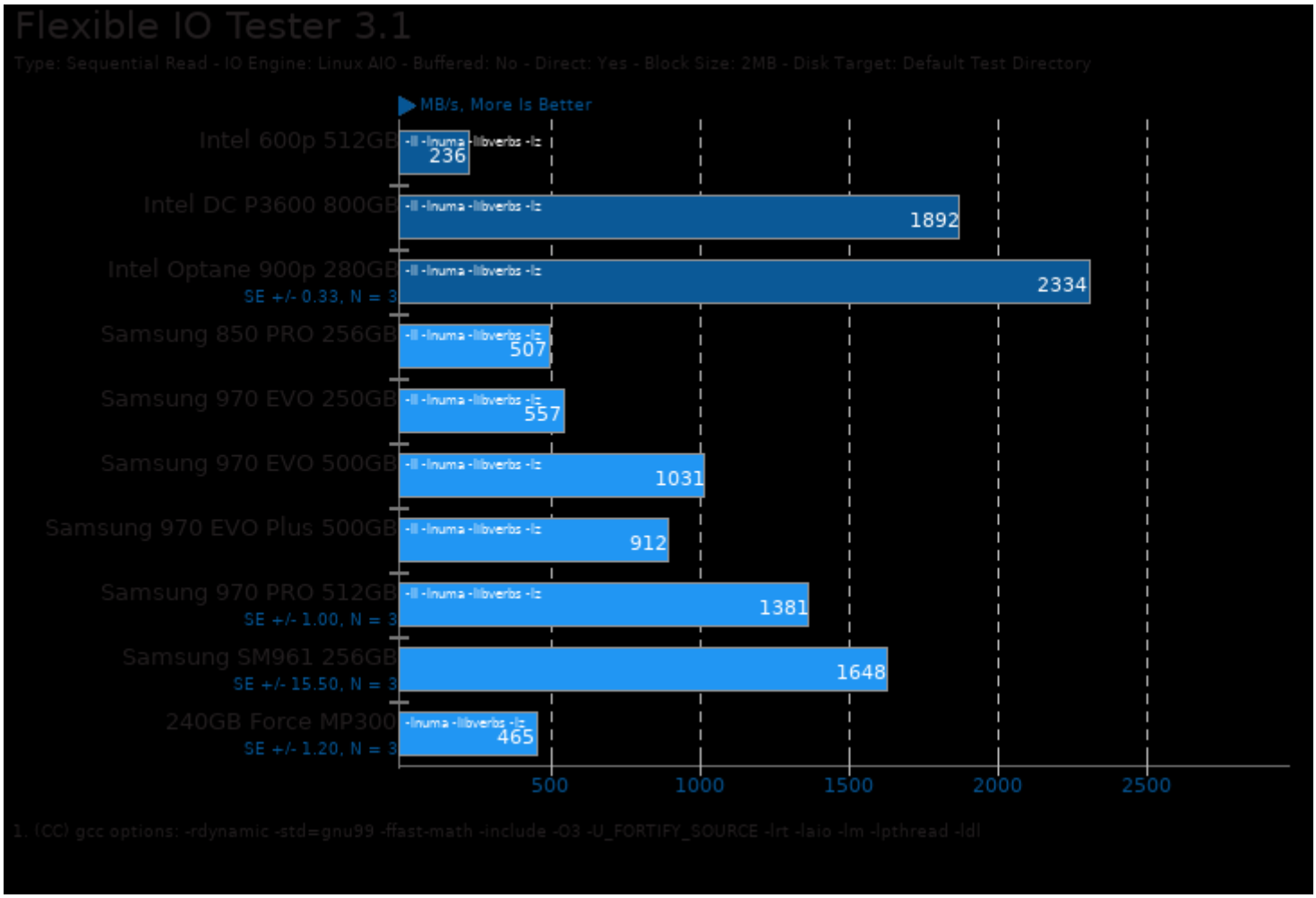
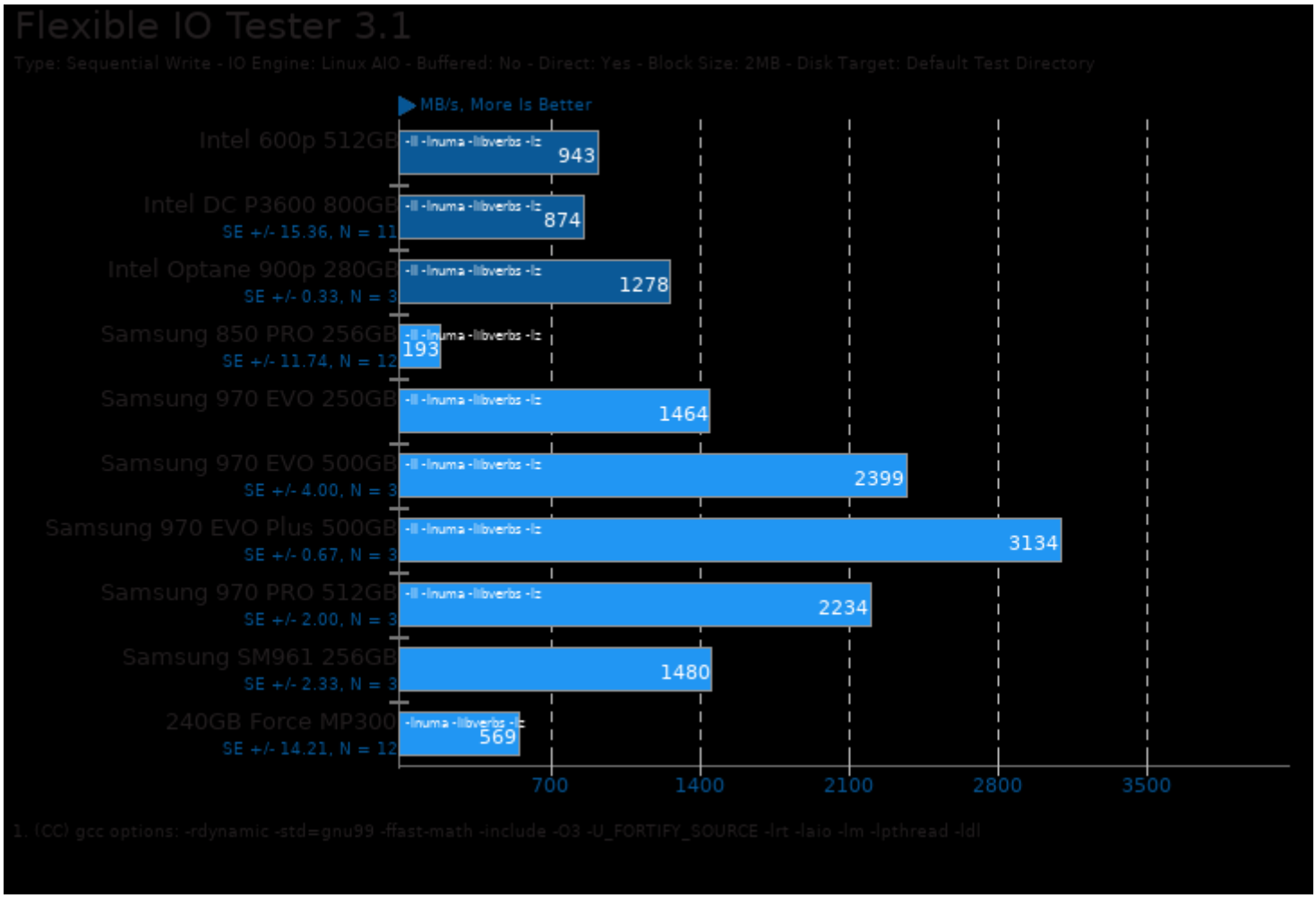


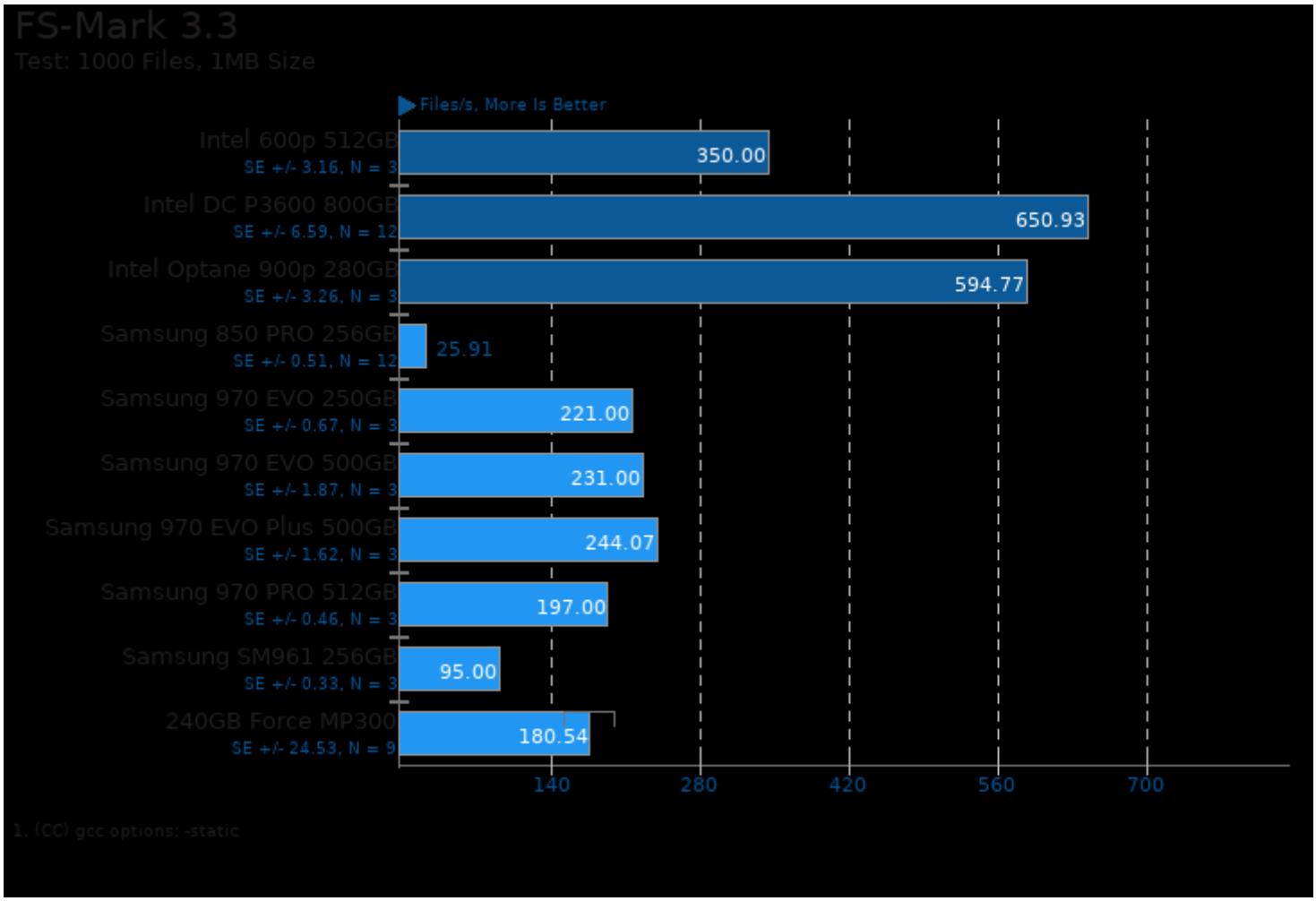

Flexible IO Tester 3.1
Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s, More Is Better
Intel 600p 512GB
SE +/- 0.33, N = 3
943.00
Intel DC P3600 800GB
890.00
Intel Optane 900p 280GB
SE +/- 6.44, N = 3
1302.00
Samsung 850 PRO 256GB
SE +/- 3.76, N = 9
49.64
Samsung 970 EVO 250GB
SE +/- 0.33, N = 3
1464.00
Samsung 970 EVO 500GB
SE +/- 1.45, N = 3
2372.00
Samsung 970 EVO Plus 500GB
SE +/- 0.58, N = 3
3110.00
Samsung 970 PRO 512GB
SE +/- 2.65, N = 3
2228.00
Samsung SM961 256GB
SE +/- 2.52, N = 3
1455.00
240GB Force MP300
SE +/- 5.21, N = 3
534.00
700
1400
2100
2800
3500
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lm -lpthread -ldl

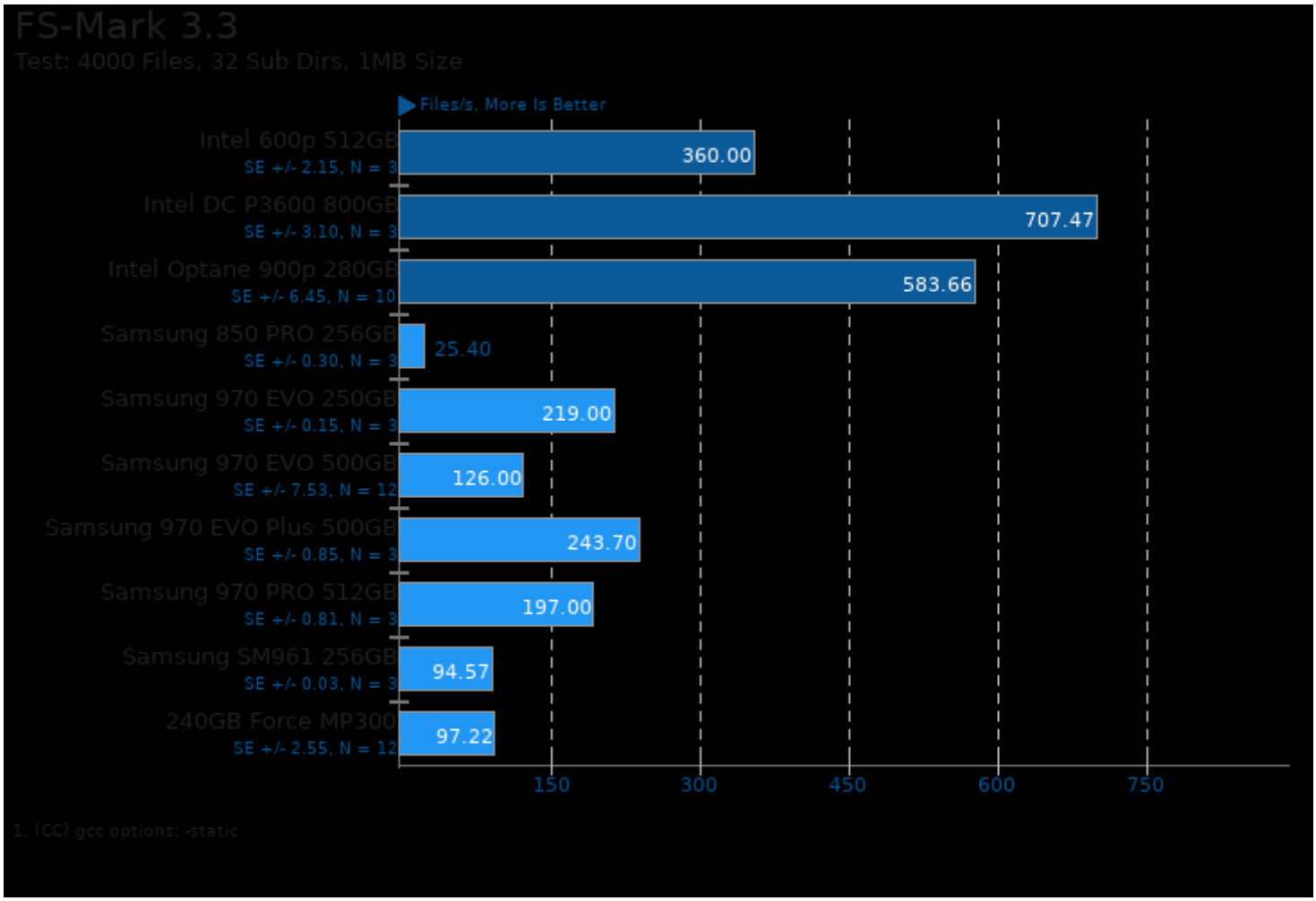

Flexible IO Tester 3.1
Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
Intel 600p 512GB
SE +/- 6.17, N = 3
833.00
Intel DC P3600 800GB
SE +/- 6.44, N = 11
610.00
Intel Optane 900p 280GB
SE +/- 0.33, N = 3
442.00
Samsung 850 PRO 256GB
SE +/- 0.96, N = 4
58.08
Samsung 970 EVO 250GB
SE +/- 5.03, N = 3
974.00
Samsung 970 EVO 500GB
SE +/- 9.02, N = 3
976.00
Samsung 970 EVO Plus 500GB
SE +/- 12.81, N = 3
947.00
Samsung 970 PRO 512GB
SE +/- 6.64, N = 3
984.00
Samsung SM961 256GB
SE +/- 5.90, N = 3
987.00
240GB Force MP300
SE +/- 3.71, N = 3
495.00
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lm -lpthread -ldl

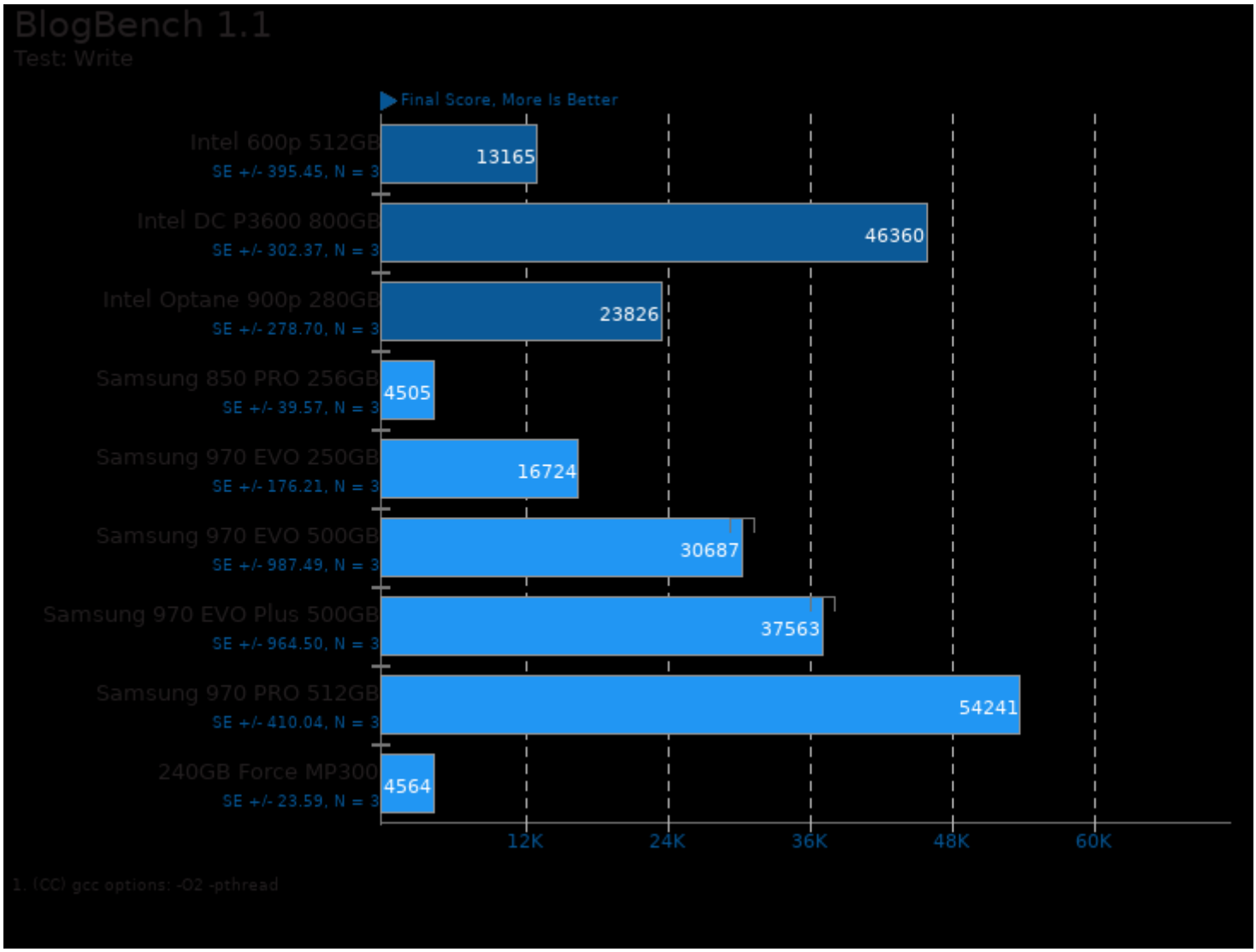

Flexible IO Tester 3.1
Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
Intel 600p 512GB
SE +/- 1666.67, N = 3
213333
Intel DC P3600 800GB
SE +/- 1641.91, N = 11
156364
Intel Optane 900p 280GB
113000
Samsung 850 PRO 256GB
SE +/- 232.74, N = 4
14850
Samsung 970 EVO 250GB
SE +/- 1333.33, N = 3
249333
Samsung 970 EVO 500GB
SE +/- 2333.33, N = 3
249667
Samsung 970 EVO Plus 500GB
SE +/- 3282.95, N = 3
242667
Samsung 970 PRO 512GB
SE +/- 1732.05, N = 3
252000
Samsung SM961 256GB
SE +/- 1333.33, N = 3
252667
240GB Force MP300
SE +/- 1000.00, N = 3
127000
50K
100K
150K
200K
250K
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lm -lpthread -ldl

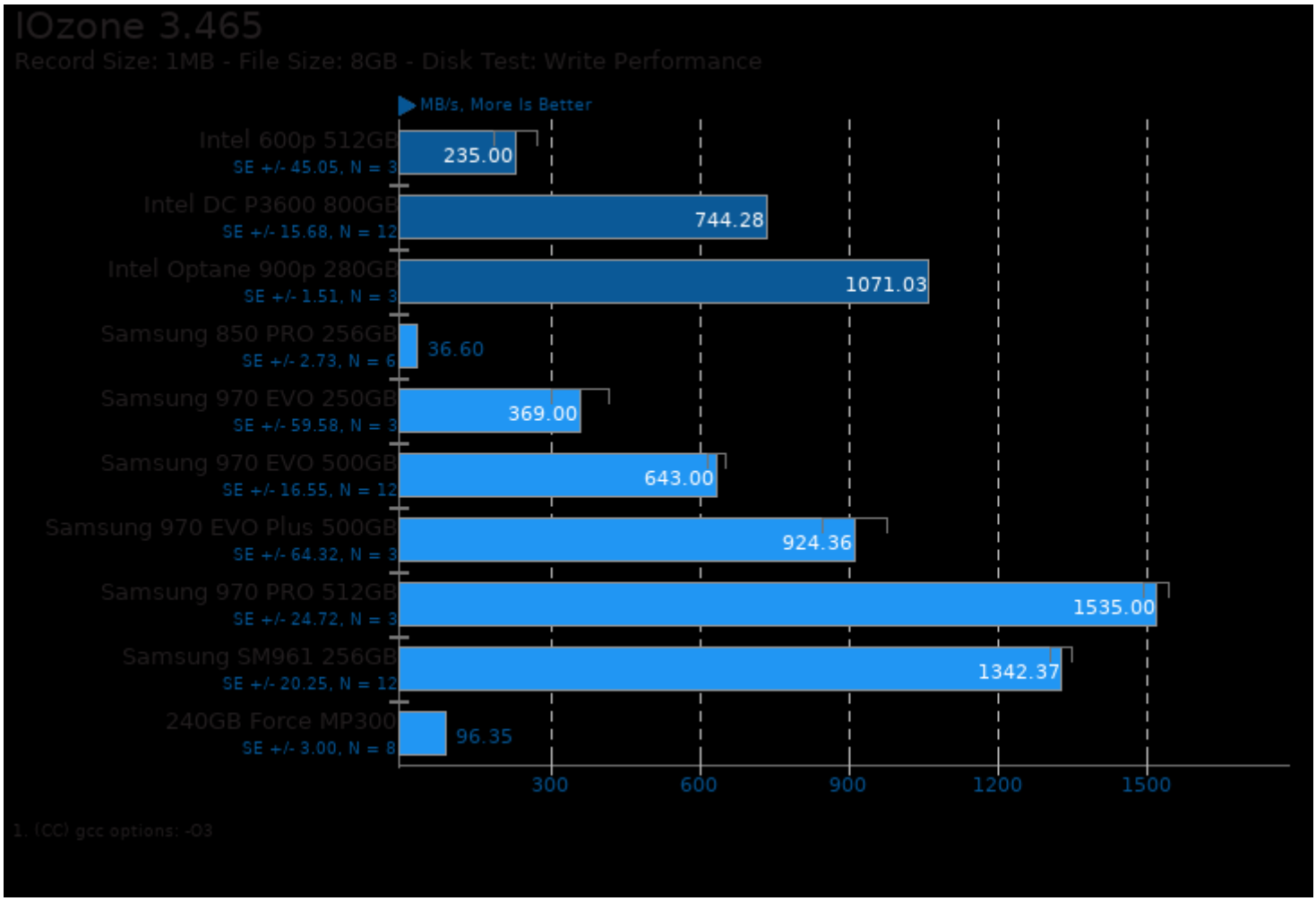

Flexible IO Tester 3.1
Type: Sequential Read - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s, More Is Better
Intel 600p 512GB
236
Intel DC P3600 800GB
1892
Intel Optane 900p 280GB
SE +/- 0.33, N = 3
2334
Samsung 850 PRO 256GB
507
Samsung 970 EVO 250GB
557
Samsung 970 EVO 500GB
1031
Samsung 970 EVO Plus 500GB
912
Samsung 970 PRO 512GB
SE +/- 1.00, N = 3
1381
Samsung SM961 256GB
SE +/- 15.50, N = 3
1648
240GB Force MP300
SE +/- 1.20, N = 3
465
500
1000
1500
2000
2500
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lm -lpthread -ldl

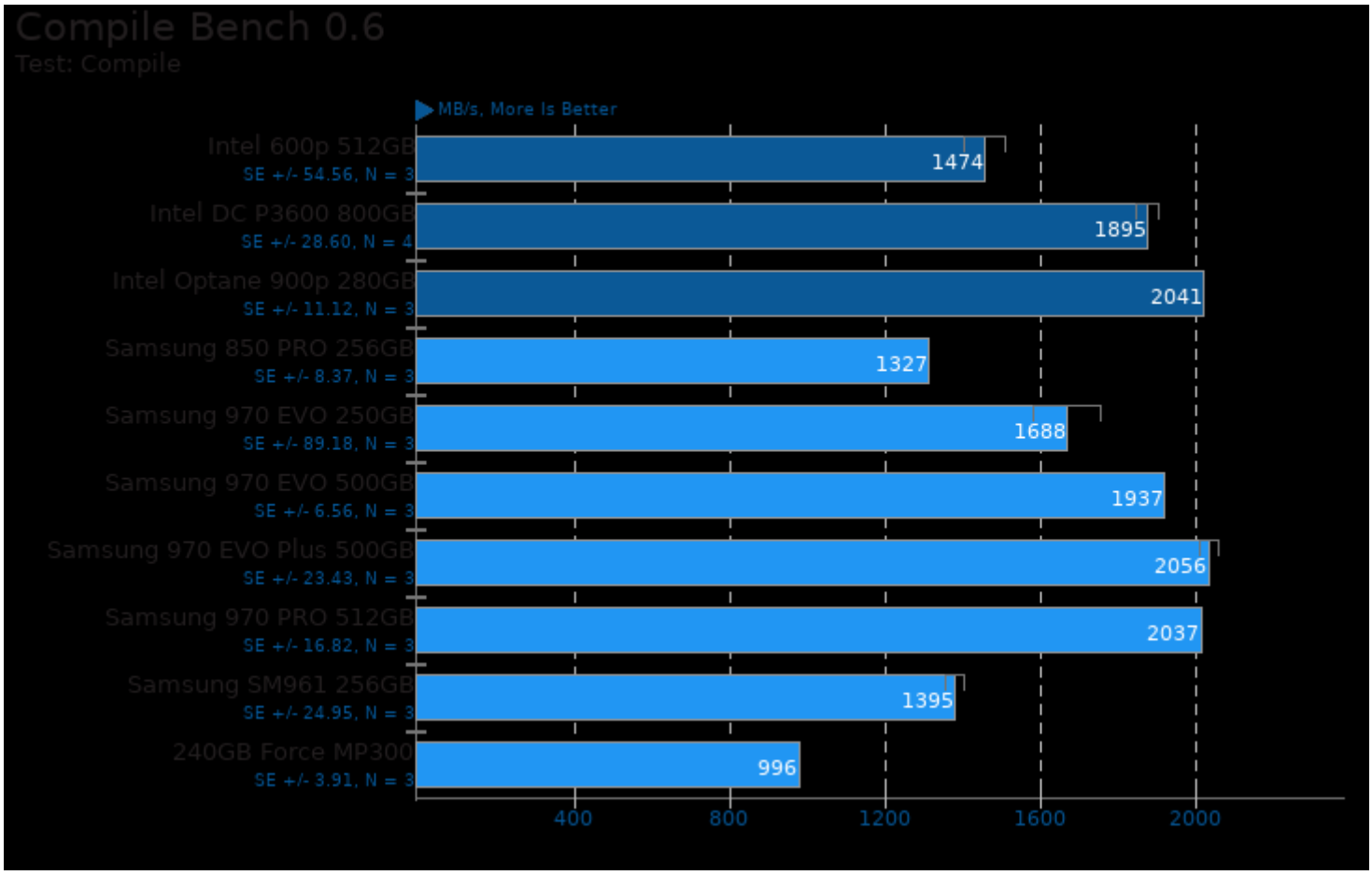

Flexible IO Tester 3.1
Type: Sequential Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s, More Is Better
Intel 600p 512GB
943
Intel DC P3600 800GB
SE +/- 15.36, N = 11
874
Intel Optane 900p 280GB
SE +/- 0.33, N = 3
1278
Samsung 850 PRO 256GB
SE +/- 11.74, N = 12
193
Samsung 970 EVO 250GB
1464
Samsung 970 EVO 500GB
SE +/- 4.00, N = 3
2399
Samsung 970 EVO Plus 500GB
SE +/- 0.67, N = 3
3134
Samsung 970 PRO 512GB
SE +/- 2.00, N = 3
2234
Samsung SM961 256GB
SE +/- 2.33, N = 3
1480
240GB Force MP300
SE +/- 14.21, N = 12
569
700
1400
2100
2800
3500
1. (CC) gcc options: -rdynamic -std=gnu99 -ffast-math -include -O3 -U_FORTIFY_SOURCE -lrt -laio -lm -lpthread -ldl

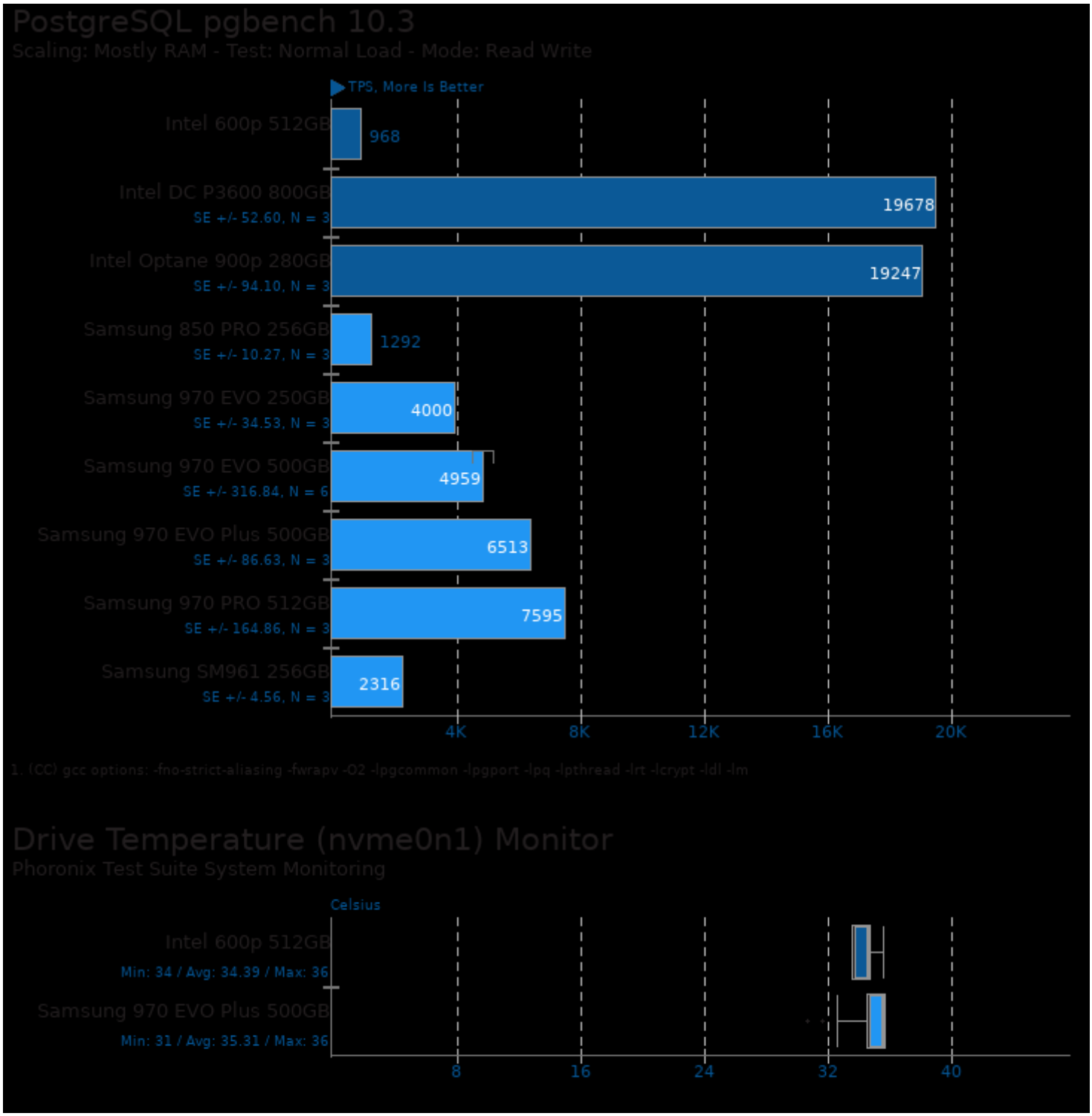

FS-Mark 3.3
Test: 1000 Files, 1MB Size
Files/s, More Is Better
Intel 600p 512GB
SE +/- 3.16, N = 3
350.00
Intel DC P3600 800GB
SE +/- 6.59, N = 12
650.93
Intel Optane 900p 280GB
SE +/- 3.26, N = 3
594.77
Samsung 850 PRO 256GB
SE +/- 0.51, N = 12
25.91
Samsung 970 EVO 250GB
SE +/- 0.67, N = 3
221.00
Samsung 970 EVO 500GB
SE +/- 1.87, N = 3
231.00
Samsung 970 EVO Plus 500GB
SE +/- 1.62, N = 3
244.07
Samsung 970 PRO 512GB
SE +/- 0.46, N = 3
197.00
Samsung SM961 256GB
SE +/- 0.33, N = 3
95.00
240GB Force MP300
SE +/- 24.53, N = 9
180.54
140
280
420
560
700
1. (CC) gcc options: -static

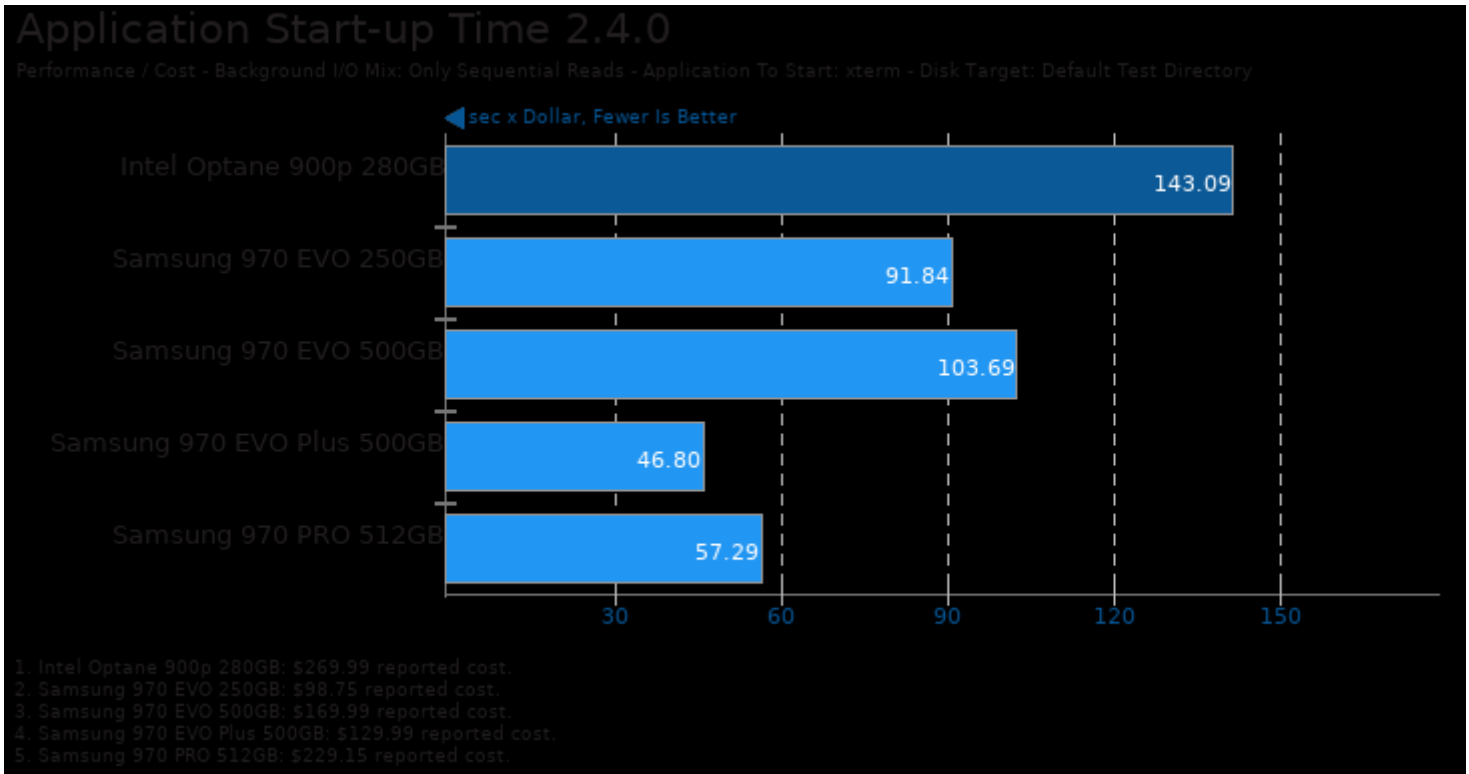

FS-Mark 3.3
Test: 4000 Files, 32 Sub Dirs, 1MB Size
Files/s, More Is Better
Intel 600p 512GB
SE +/- 2.15, N = 3
360.00
Intel DC P3600 800GB
SE +/- 3.10, N = 3
707.47
Intel Optane 900p 280GB
SE +/- 6.45, N = 10
583.66
Samsung 850 PRO 256GB
SE +/- 0.30, N = 3
25.40
Samsung 970 EVO 250GB
SE +/- 0.15, N = 3
219.00
Samsung 970 EVO 500GB
SE +/- 7.53, N = 12
126.00
Samsung 970 EVO Plus 500GB
SE +/- 0.85, N = 3
243.70
Samsung 970 PRO 512GB
SE +/- 0.81, N = 3
197.00
Samsung SM961 256GB
SE +/- 0.03, N = 3
94.57
240GB Force MP300
SE +/- 2.55, N = 12
97.22
150
300
450
600
750
1. (CC) gcc options: -static

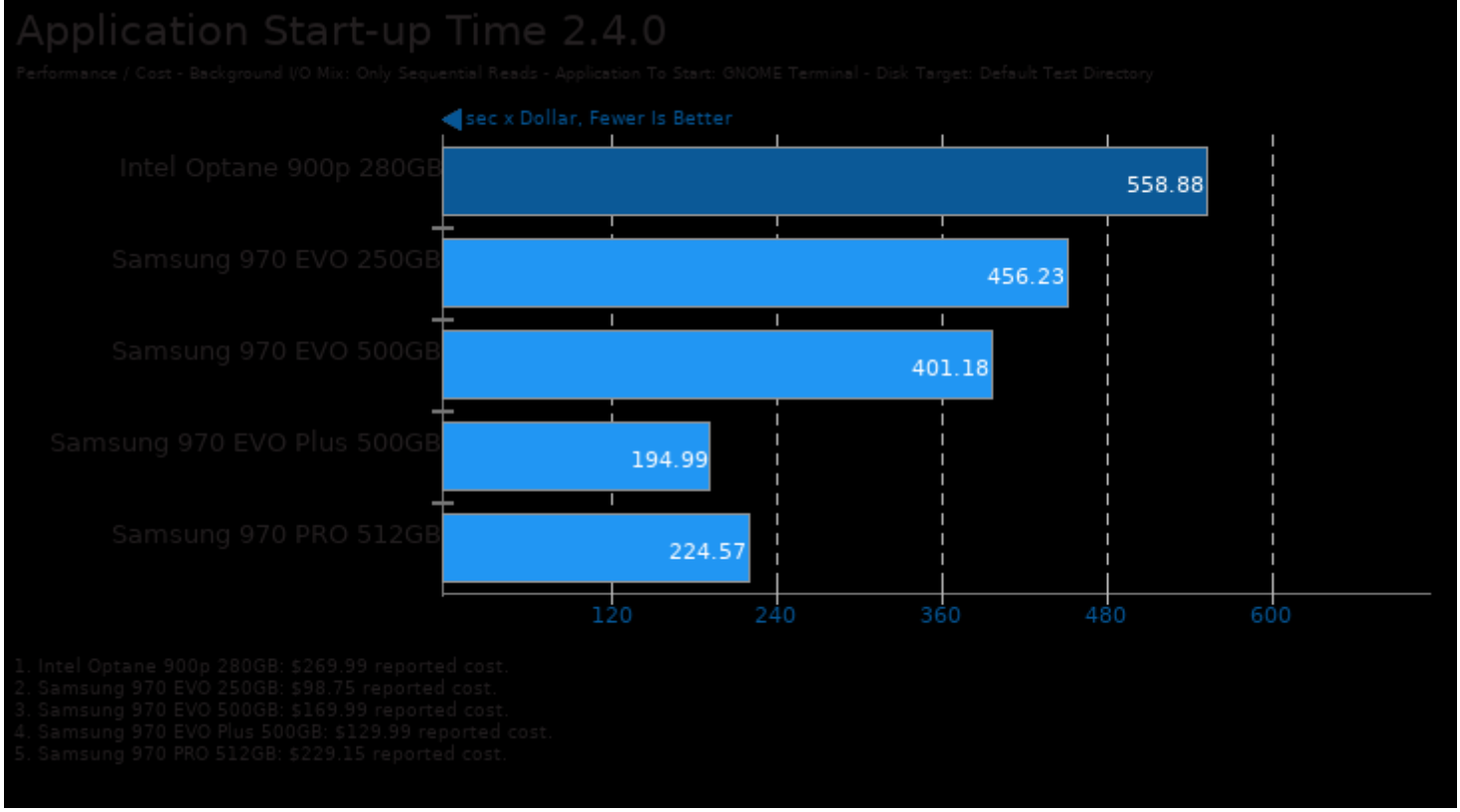

BlogBench 1.1
Test: Write
Final Score, More Is Better
Intel 600p 512GB
SE +/- 395.45, N = 3
13165
Intel DC P3600 800GB
SE +/- 302.37, N = 3
46360
Intel Optane 900p 280GB
SE +/- 278.70, N = 3
23826
Samsung 850 PRO 256GB
SE +/- 39.57, N = 3
4505
Samsung 970 EVO 250GB
SE +/- 176.21, N = 3
16724
Samsung 970 EVO 500GB
SE +/- 987.49, N = 3
30687
Samsung 970 EVO Plus 500GB
SE +/- 964.50, N = 3
37563
Samsung 970 PRO 512GB
SE +/- 410.04, N = 3
54241
240GB Force MP300
SE +/- 23.59, N = 3
4564
12K
24K
36K
48K
60K
1. (CC) gcc options: -O2 -pthread

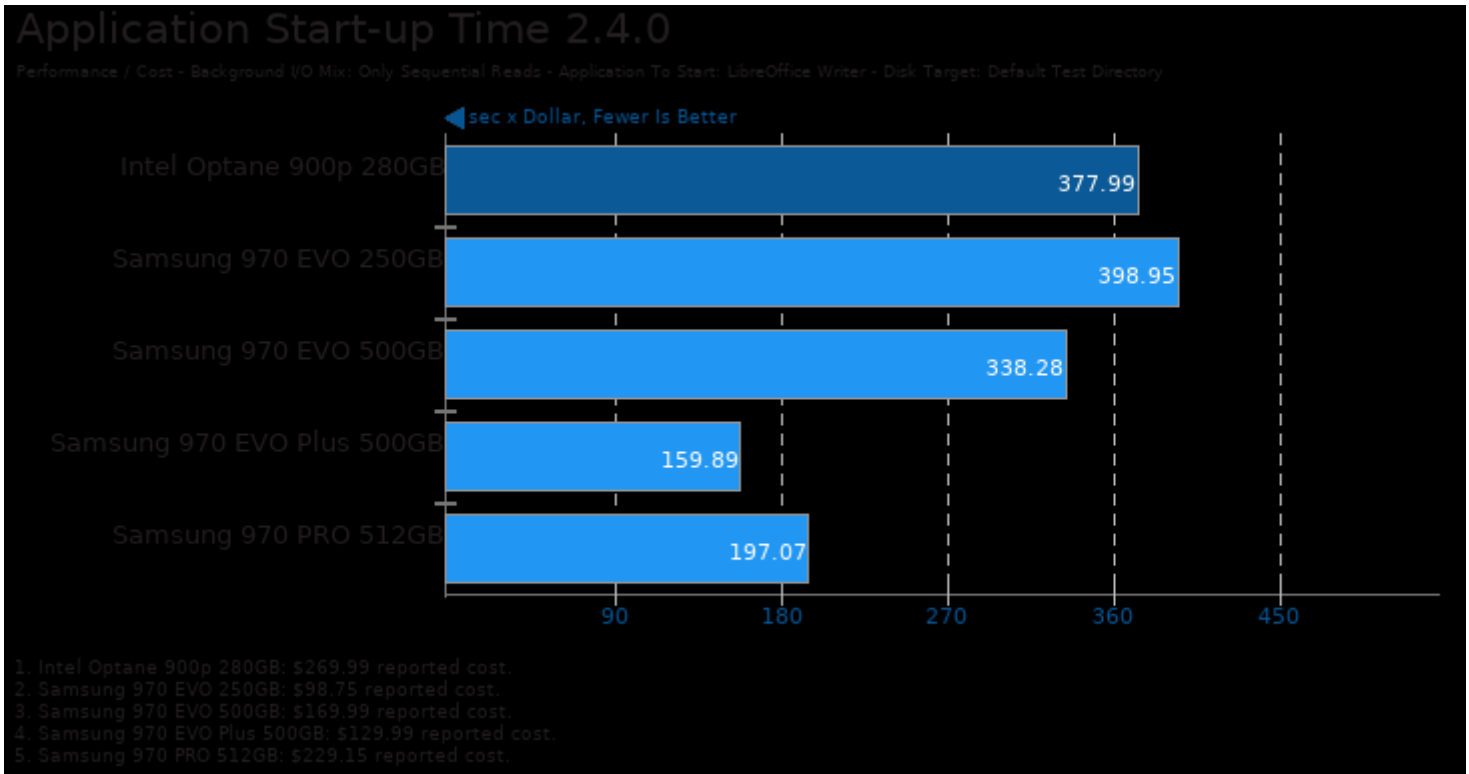

IOzone 3.465
Record Size: 1MB - File Size: 8GB - Disk Test: Write Performance
MB/s, More Is Better
Intel 600p 512GB
SE +/- 45.05, N = 3
235.00
Intel DC P3600 800GB
SE +/- 15.68, N = 12
744.28
Intel Optane 900p 280GB
SE +/- 1.51, N = 3
1071.03
Samsung 850 PRO 256GB
SE +/- 2.73, N = 6
36.60
Samsung 970 EVO 250GB
SE +/- 59.58, N = 3
369.00
Samsung 970 EVO 500GB
SE +/- 16.55, N = 12
643.00
Samsung 970 EVO Plus 500GB
SE +/- 64.32, N = 3
924.36
Samsung 970 PRO 512GB
SE +/- 24.72, N = 3
1535.00
Samsung SM961 256GB
SE +/- 20.25, N = 12
1342.37
240GB Force MP300
SE +/- 3.00, N = 8
96.35
300
600
900
1200
1500
1. (CC) gcc options: -O3

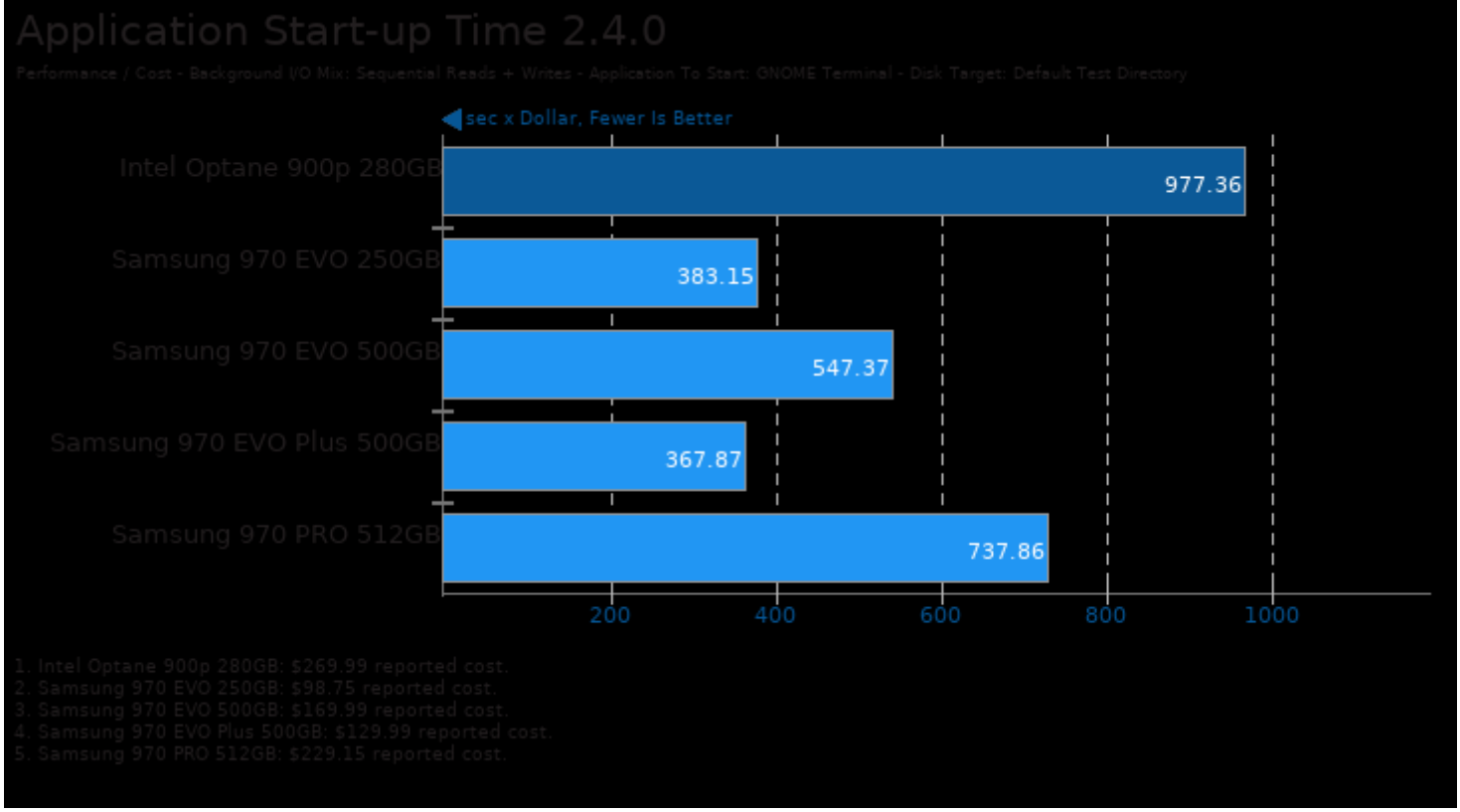

Compile Bench 0.6
Test: Compile
MB/s, More Is Better
Intel 600p 512GB
SE +/- 54.56, N = 3
1474
Intel DC P3600 800GB
SE +/- 28.60, N = 4
1895
Intel Optane 900p 280GB
SE +/- 11.12, N = 3
2041
Samsung 850 PRO 256GB
SE +/- 8.37, N = 3
1327
Samsung 970 EVO 250GB
SE +/- 89.18, N = 3
1688
Samsung 970 EVO 500GB
SE +/- 6.56, N = 3
1937
Samsung 970 EVO Plus 500GB
SE +/- 23.43, N = 3
2056
Samsung 970 PRO 512GB
SE +/- 16.82, N = 3
2037
Samsung SM961 256GB
SE +/- 24.95, N = 3
1395
240GB Force MP300
SE +/- 3.91, N = 3
996
400
800
1200
1600
2000


PostgreSQL pgbench 10.3
Scaling: Mostly RAM - Test: Normal Load - Mode: Read Write
TPS, More Is Better
Intel 600p 512GB
968
Intel DC P3600 800GB
SE +/- 52.60, N = 3
19678
Intel Optane 900p 280GB
SE +/- 94.10, N = 3
19247
Samsung 850 PRO 256GB
SE +/- 10.27, N = 3
1292
Samsung 970 EVO 250GB
SE +/- 34.53, N = 3
4000
Samsung 970 EVO 500GB
SE +/- 316.84, N = 6
4959
Samsung 970 EVO Plus 500GB
SE +/- 86.63, N = 3
6513
Samsung 970 PRO 512GB
SE +/- 164.86, N = 3
7595
Samsung SM961 256GB
SE +/- 4.56, N = 3
2316
4K
8K
12K
16K
20K
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -lpgcommon -lpgport -lpq -lpthread -lrt -lcrypt -ldl -lm
Drive Temperature (nvme0n1) Monitor
Phoronix Test Suite System Monitoring
Celsius
Intel 600p 512GB
Min: 34 / Avg: 34.39 / Max: 36
Samsung 970 EVO Plus 500GB
Min: 31 / Avg: 35.31 / Max: 36
8
16
24
32
40


Application Start-up Time 2.4.0
Performance / Cost - Background I/O Mix: Only Sequential Reads - Application To Start: xterm - Disk Target: Default Test Directory
sec x Dollar, Fewer Is Better
Intel Optane 900p 280GB
143.09
Samsung 970 EVO 250GB
91.84
Samsung 970 EVO 500GB
103.69
Samsung 970 EVO Plus 500GB
46.80
Samsung 970 PRO 512GB
57.29
30
60
90
120
150
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

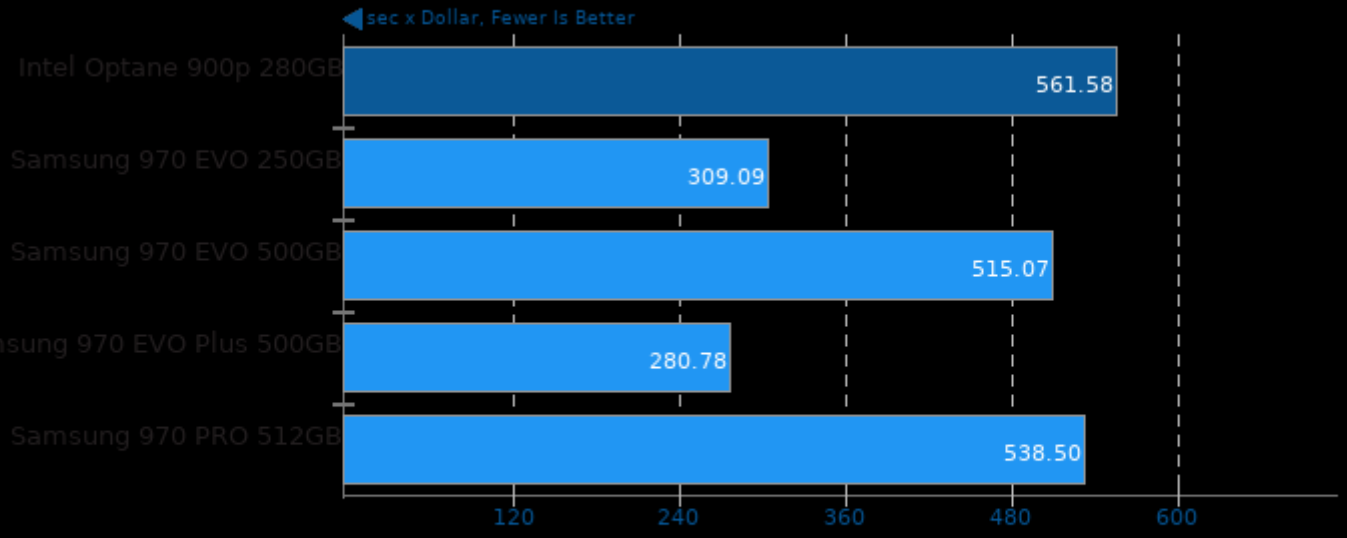

Application Start-up Time 2.4.0
Performance / Cost - Background I/O Mix: Only Sequential Reads - Application To Start: GNOME Terminal - Disk Target: Default Test Directory
sec x Dollar, Fewer Is Better
Intel Optane 900p 280GB
558.88
Samsung 970 EVO 250GB
456.23
Samsung 970 EVO 500GB
401.18
Samsung 970 EVO Plus 500GB
194.99
Samsung 970 PRO 512GB
224.57
120
240
360
480
600
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.


Application Start-up Time 2.4.0
Performance / Cost - Background I/O Mix: Only Sequential Reads - Application To Start: LibreOffice Writer - Disk Target: Default Test Directory
sec x Dollar, Fewer Is Better
Intel Optane 900p 280GB
377.99
Samsung 970 EVO 250GB
398.95
Samsung 970 EVO 500GB
338.28
Samsung 970 EVO Plus 500GB
159.89
Samsung 970 PRO 512GB
197.07
90
180
270
360
450
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.


Application Start-up Time 2.4.0
Performance / Cost - Background I/O Mix: Sequential Reads + Writes - Application To Start: GNOME Terminal - Disk Target: Default Test Directory
sec x Dollar, Fewer Is Better
Intel Optane 900p 280GB
977.36
Samsung 970 EVO 250GB
383.15
Samsung 970 EVO 500GB
547.37
Samsung 970 EVO Plus 500GB
367.87
Samsung 970 PRO 512GB
737.86
200
400
600
800
1000
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

Application Start-up Time 2.4.0

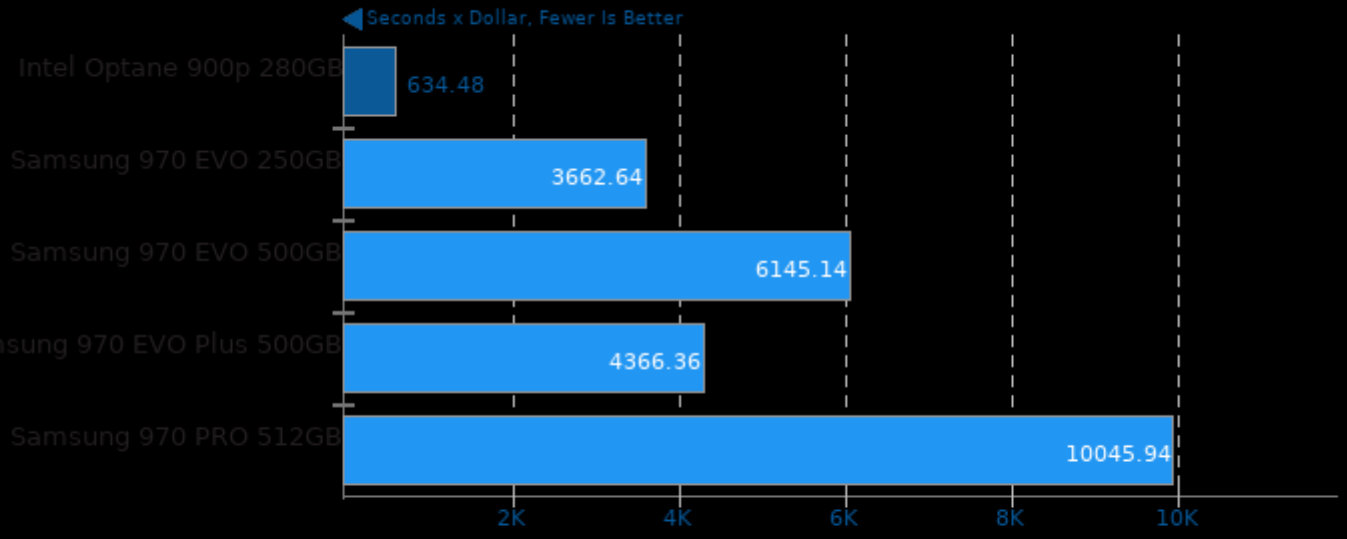
Performance / Cost - Background I/O Mix: Sequential Reads + Writes - Application To Start: LibreOffice Writer - Disk Target: Default Test Directory



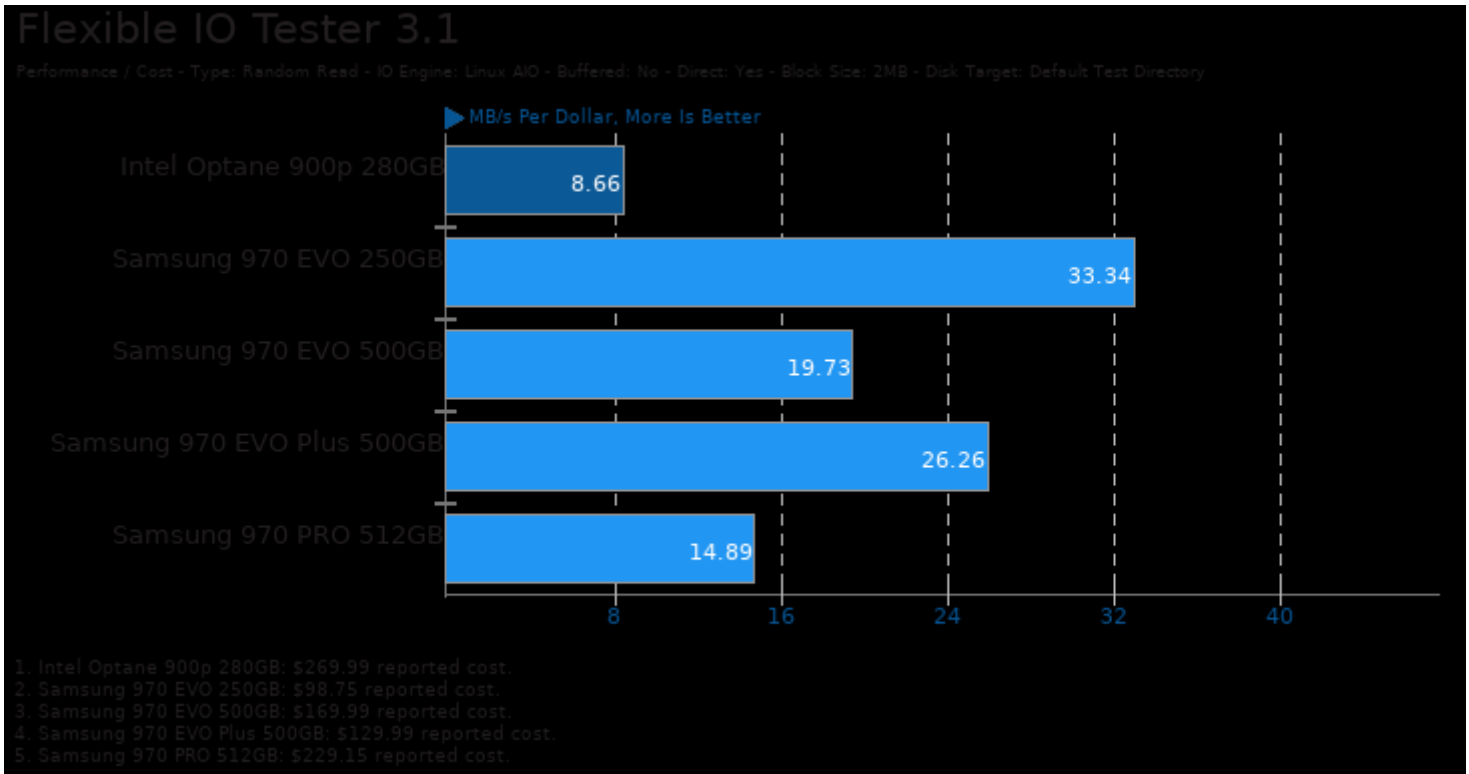
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

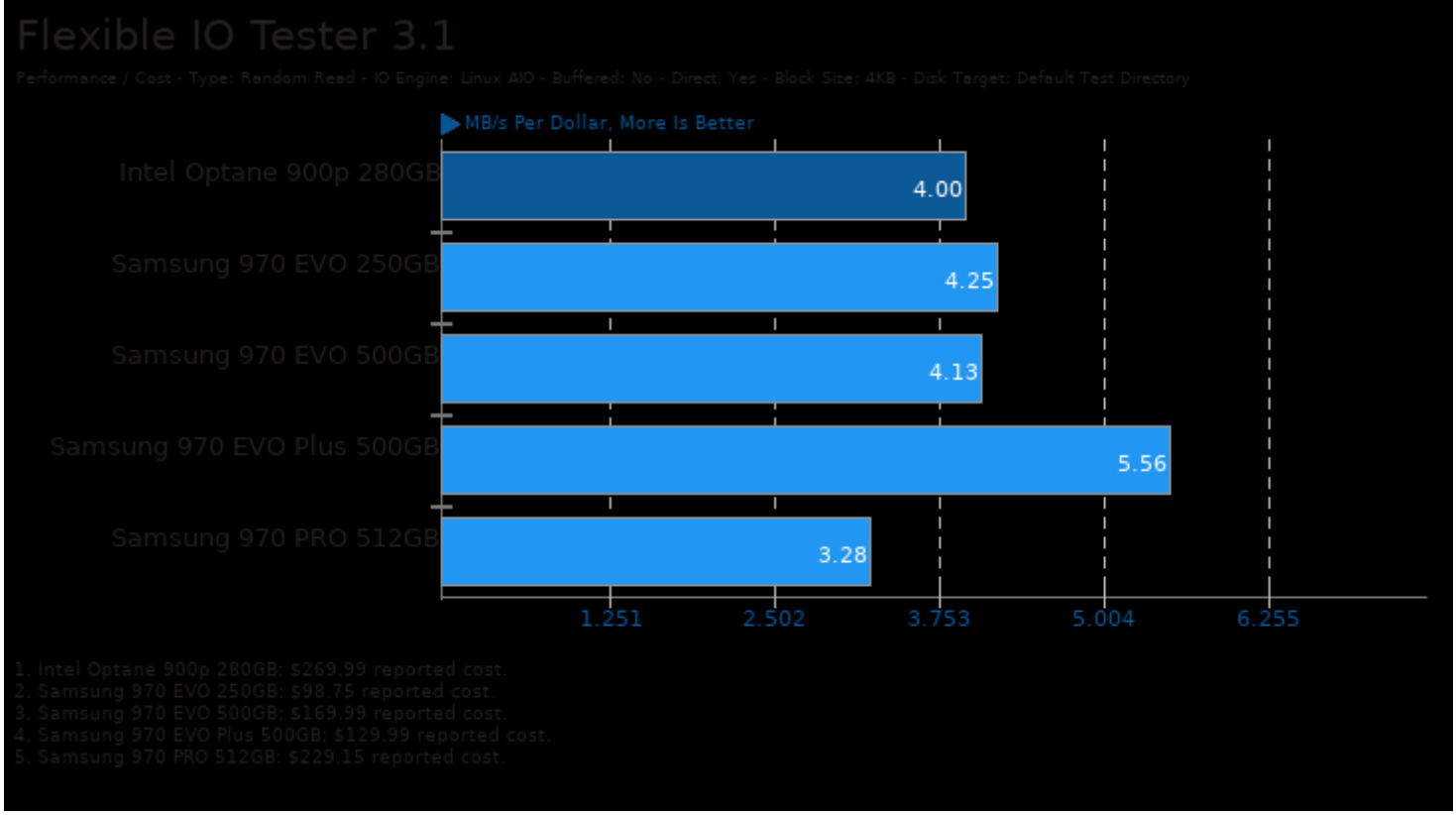
SQLite 3.22

Performance / Cost - Timed SQLite Insertions



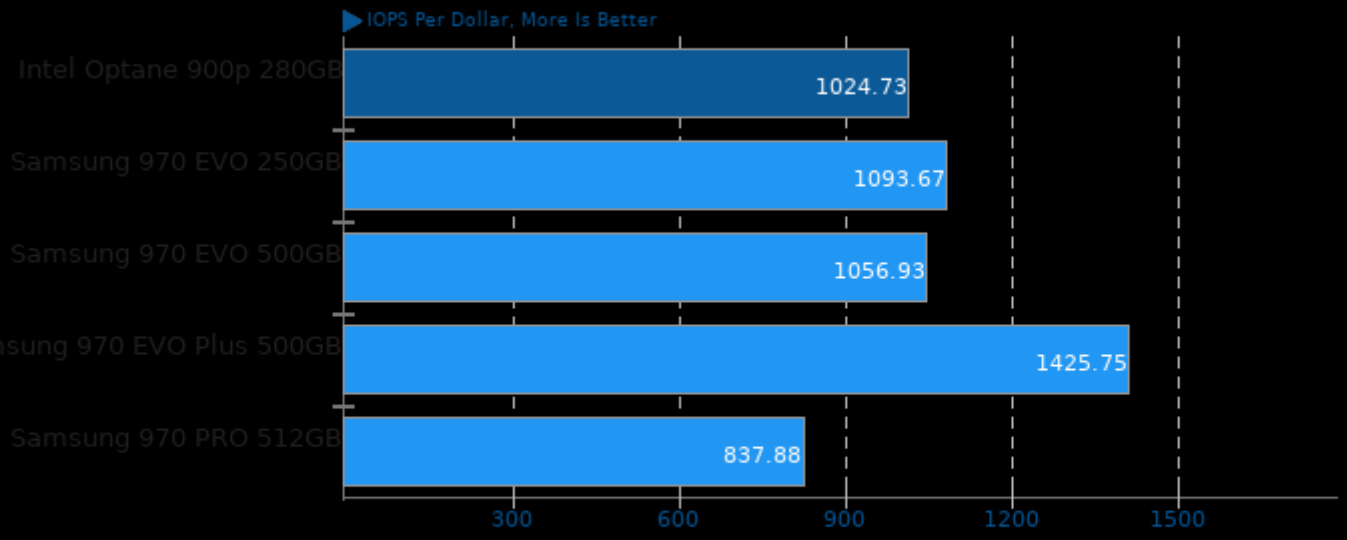
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.


Flexible IO Tester 3.1
Performance / Cost - Type: Random Read - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s Per Dollar, More Is Better
Intel Optane 900p 280GB
8.66
Samsung 970 EVO 250GB
33.34
Samsung 970 EVO 500GB
19.73
Samsung 970 EVO Plus 500GB
26.26
Samsung 970 PRO 512GB
14.89
8
16
24
32
40
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.


Flexible IO Tester 3.1
Performance / Cost - Type: Random Read - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s Per Dollar, More Is Better
Intel Optane 900p 280GB
4.00
Samsung 970 EVO 250GB
4.25
Samsung 970 EVO 500GB
4.13
Samsung 970 EVO Plus 500GB
5.56
Samsung 970 PRO 512GB
3.28
1.251
2.502
3.753
5.004
6.255
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

Flexible IO Tester 3.1

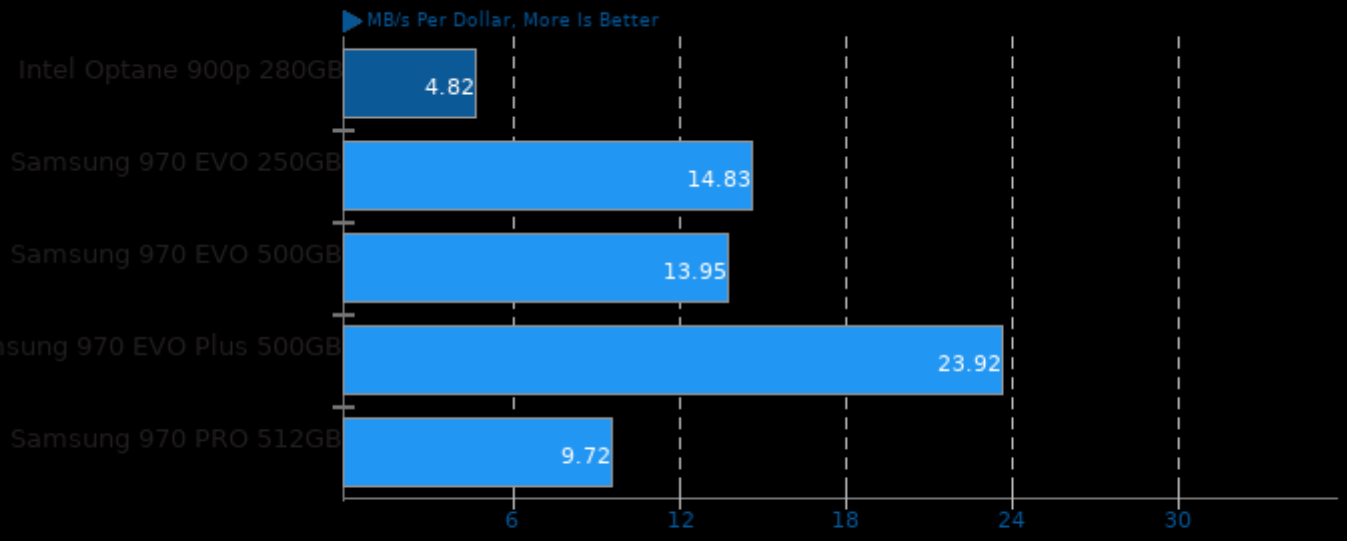
Performance / Cost - Type: Random Read - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory



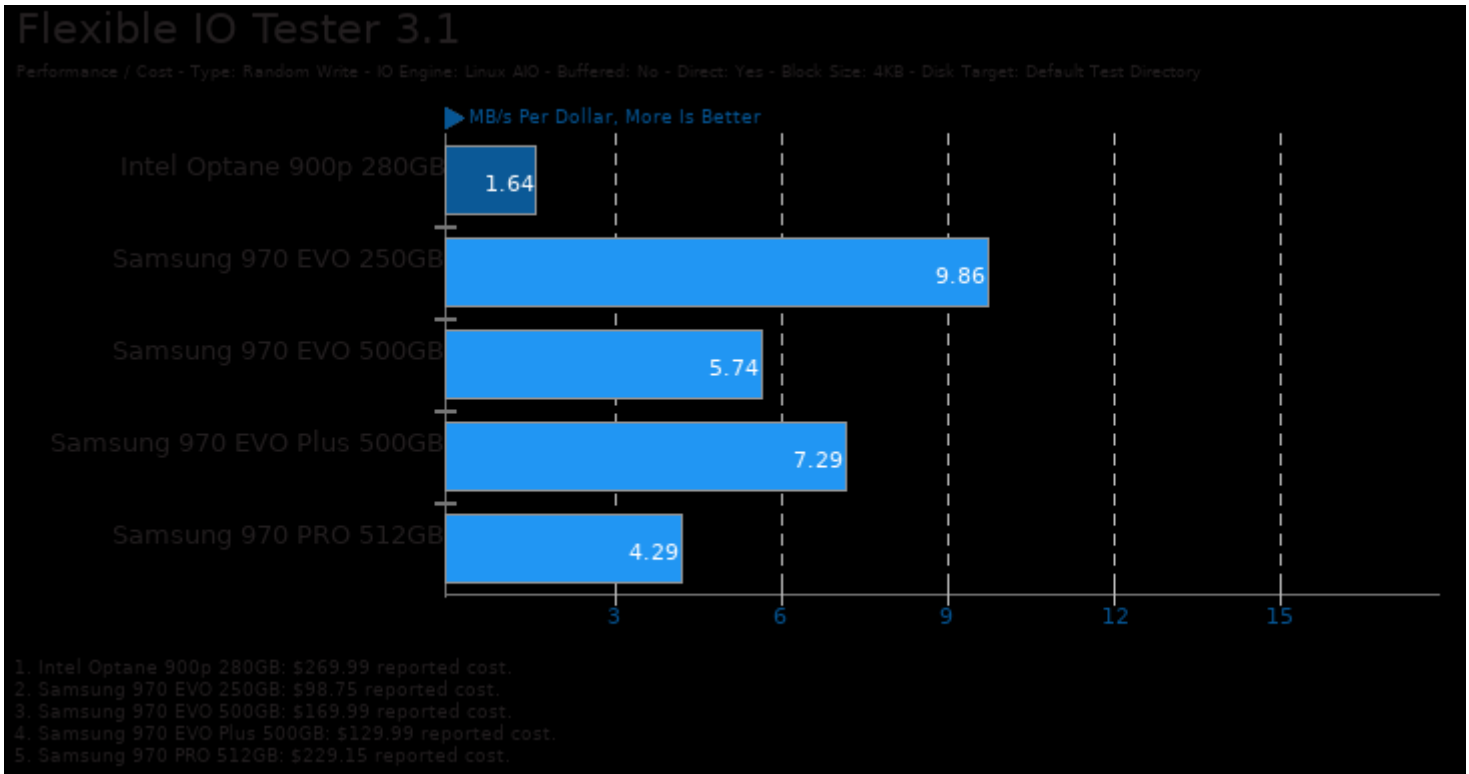
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

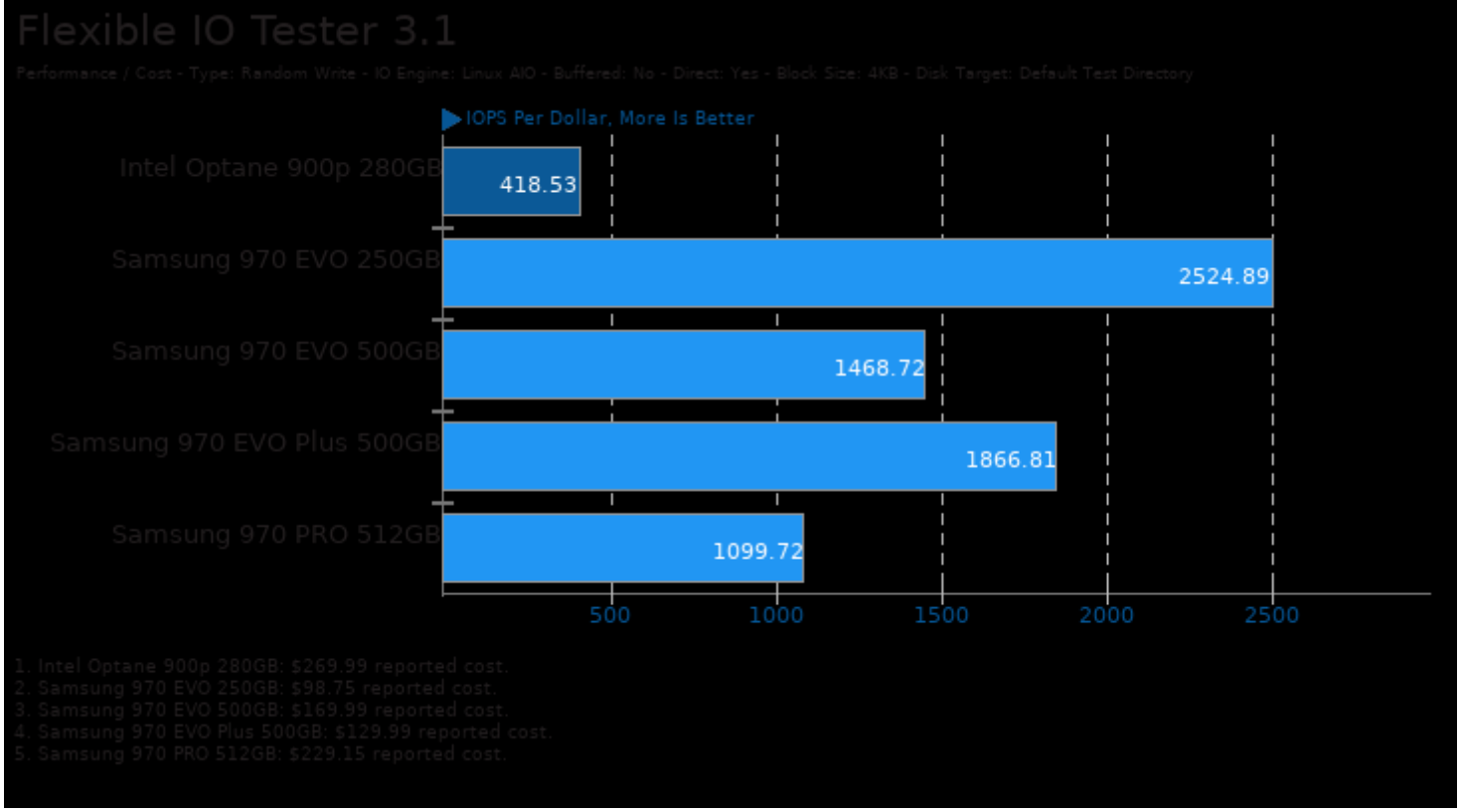
Flexible IO Tester 3.1

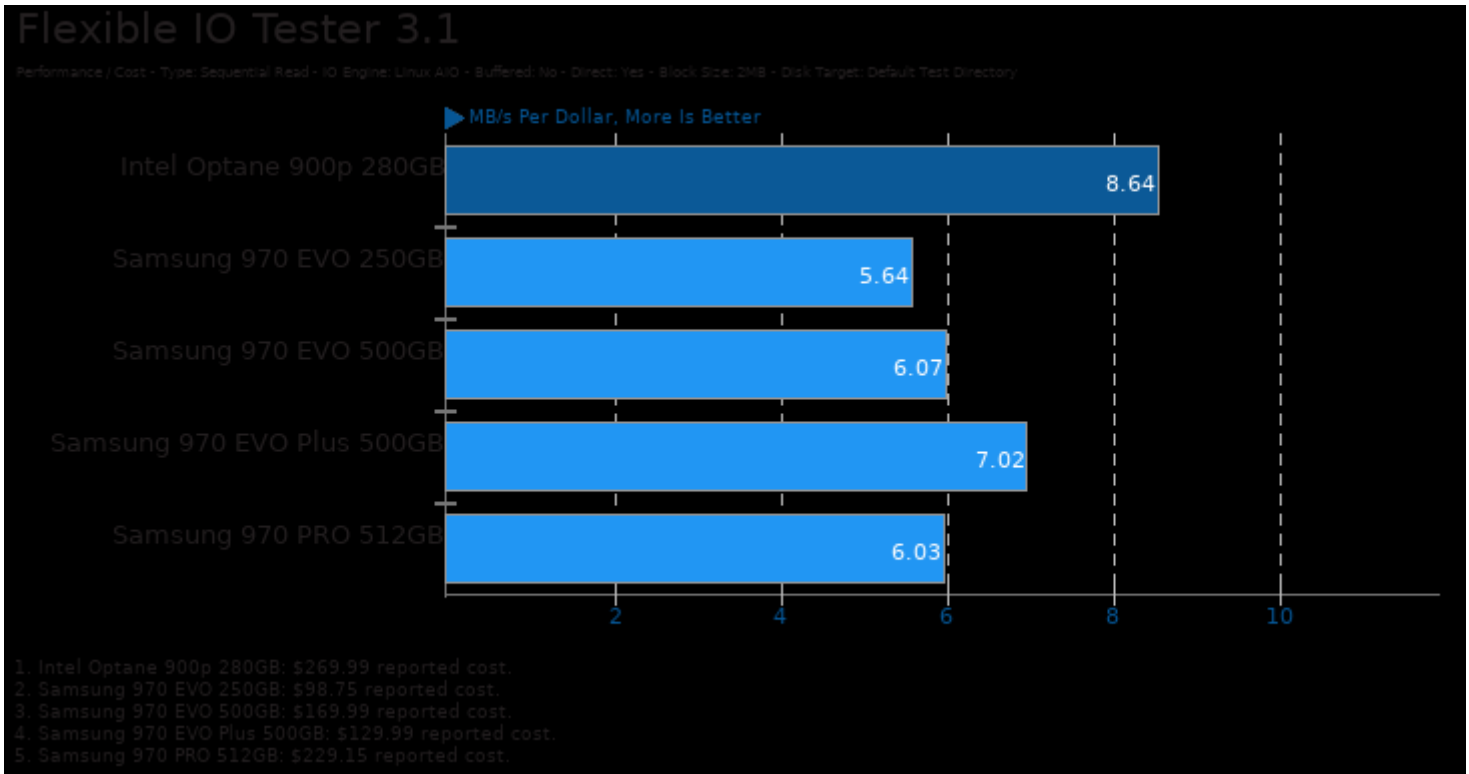
Performance / Cost - Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory

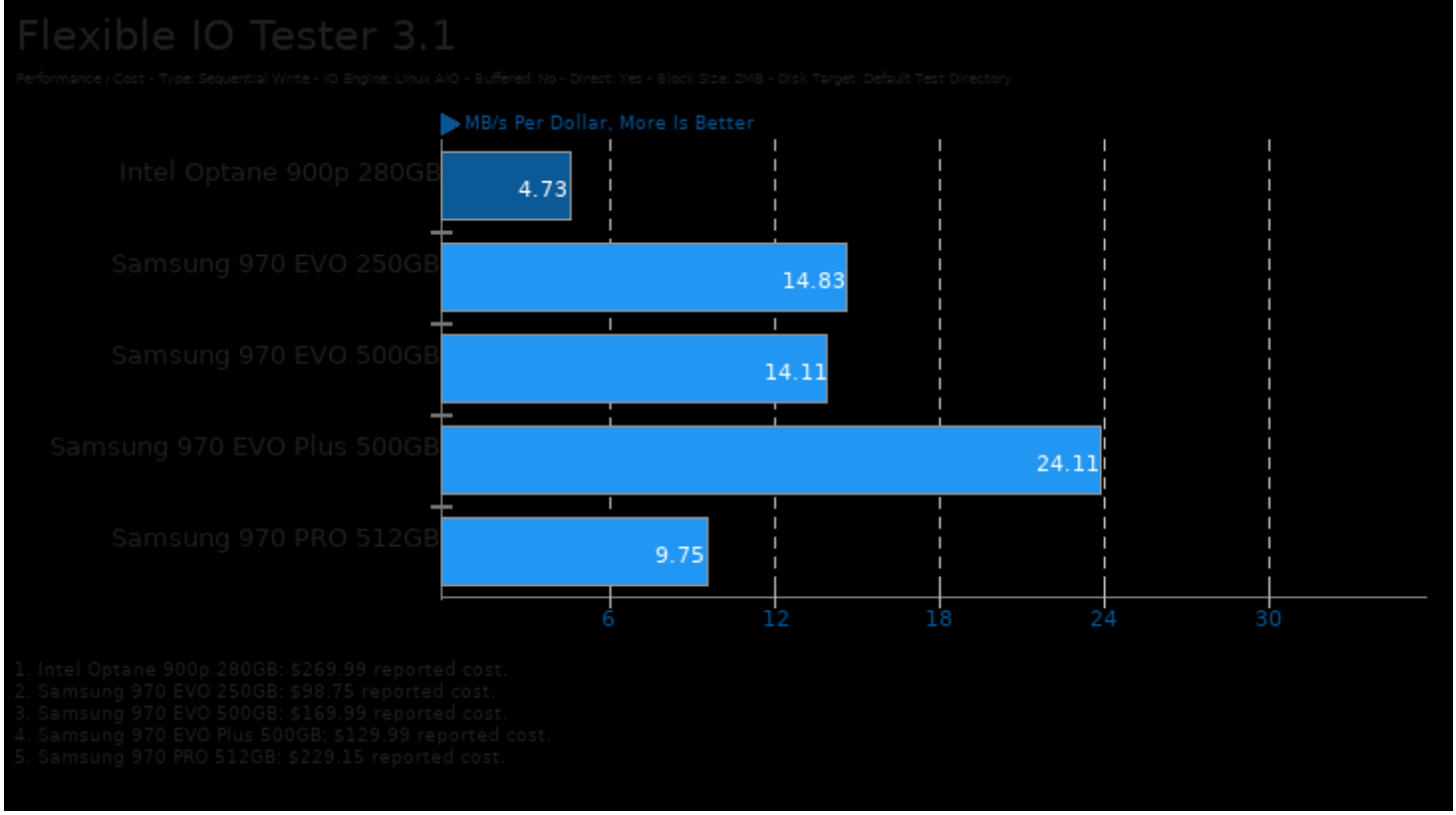


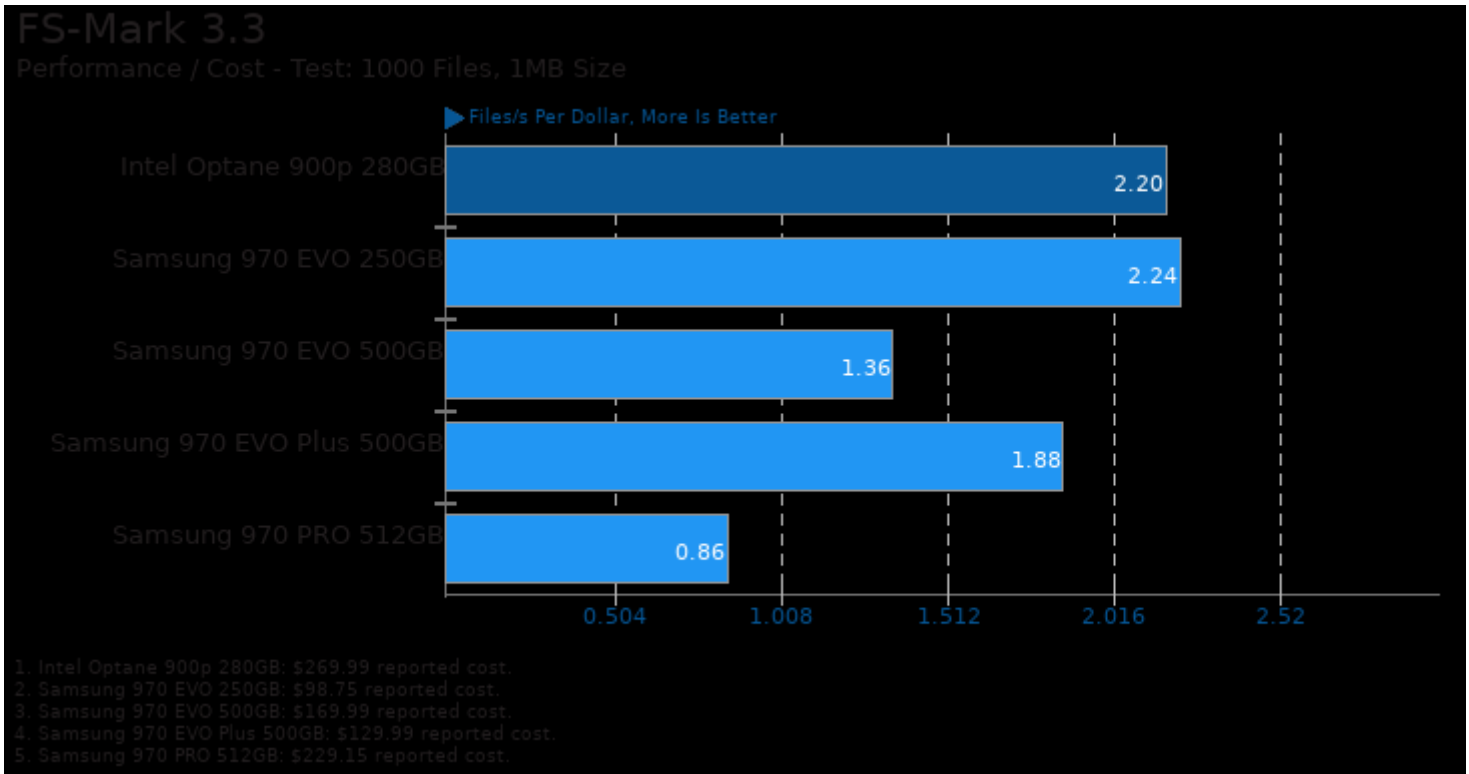
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

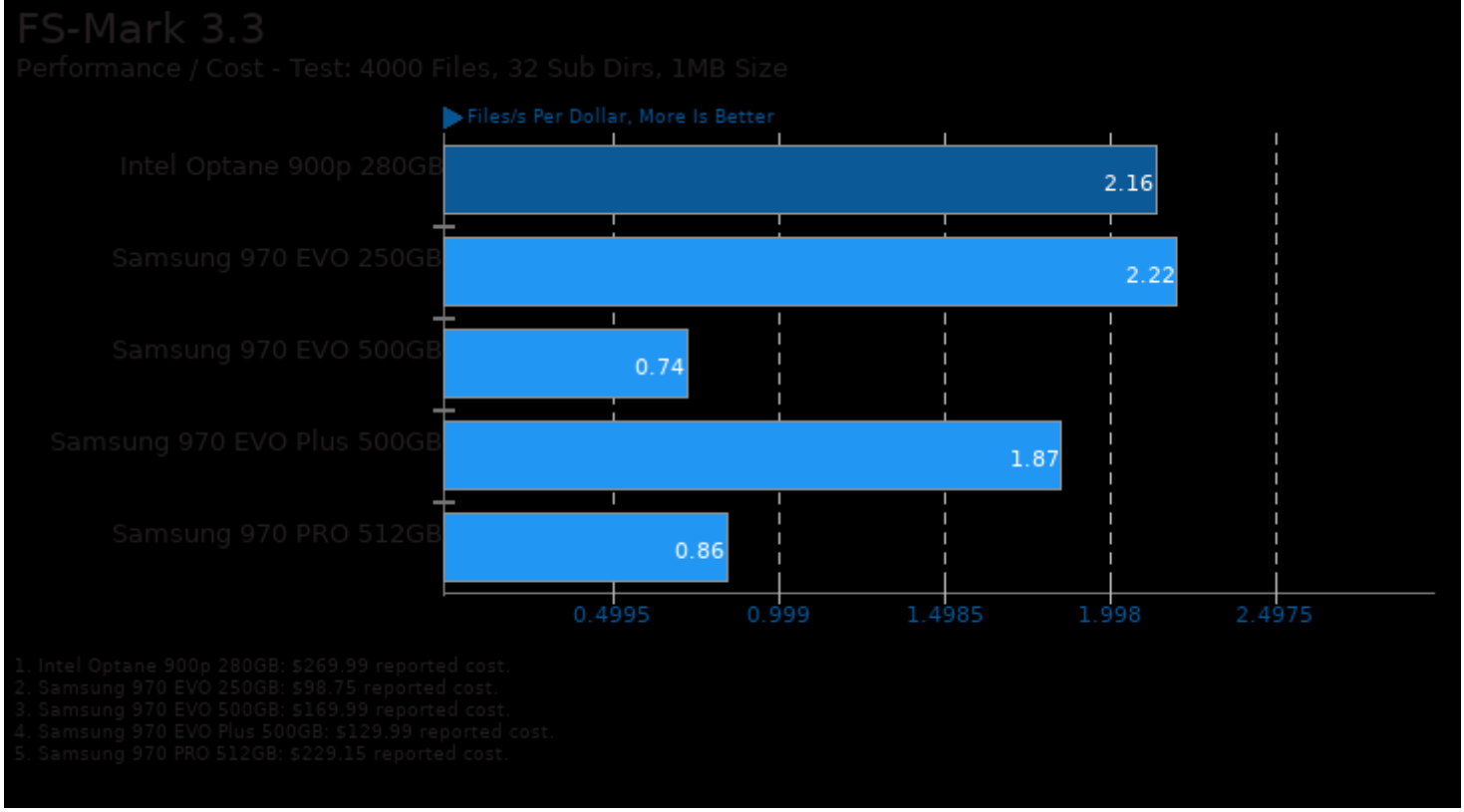

Flexible IO Tester 3.1
Performance / Cost - Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s Per Dollar, More Is Better
Intel Optane 900p 280GB
1.64
Samsung 970 EVO 250GB
9.86
Samsung 970 EVO 500GB
5.74
Samsung 970 EVO Plus 500GB
7.29
Samsung 970 PRO 512GB
4.29
3
6
9
12
15
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

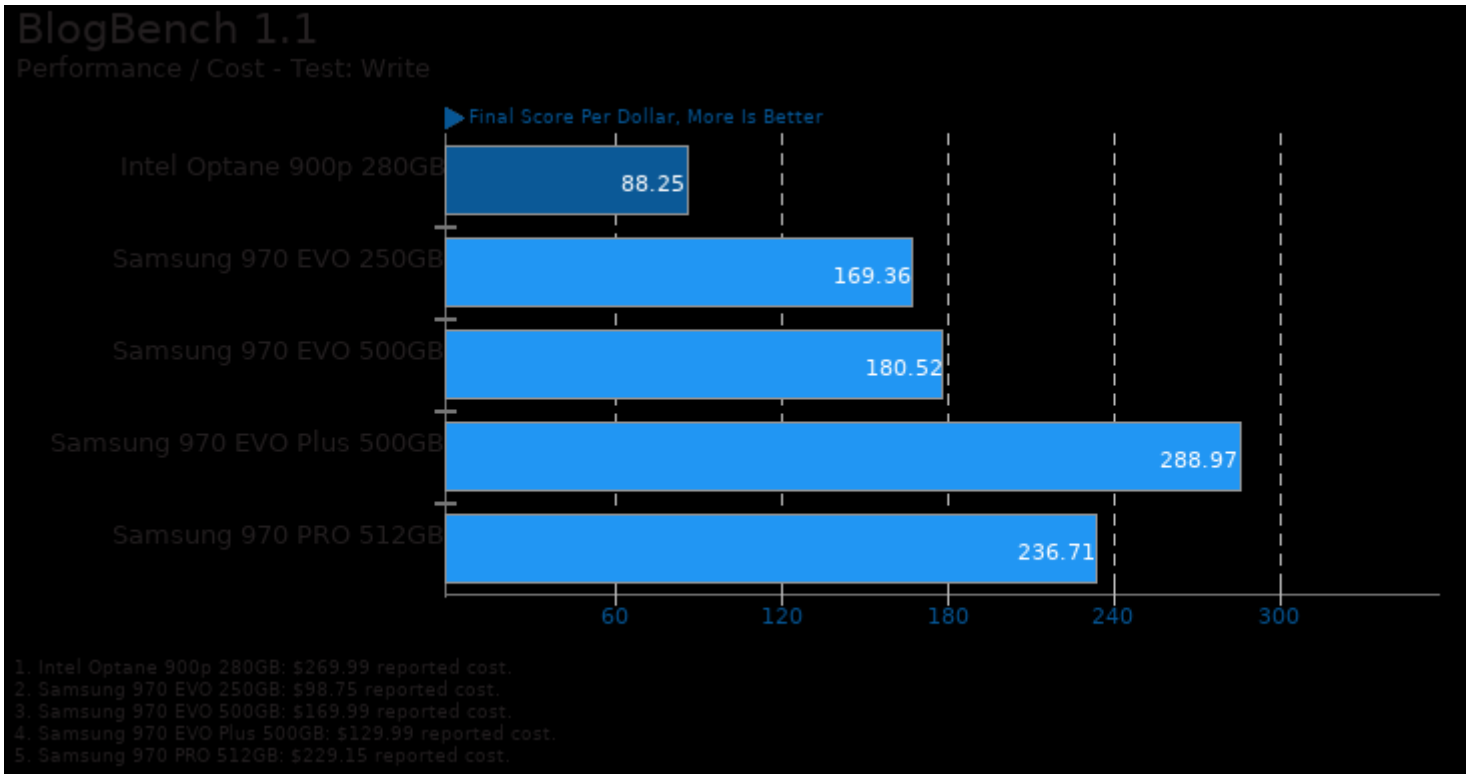

Flexible IO Tester 3.1
Performance / Cost - Type: Random Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS Per Dollar, More Is Better
Intel Optane 900p 280GB
418.53
Samsung 970 EVO 250GB
2524.89
Samsung 970 EVO 500GB
1468.72
Samsung 970 EVO Plus 500GB
1866.81
Samsung 970 PRO 512GB
1099.72
500
1000
1500
2000
2500
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

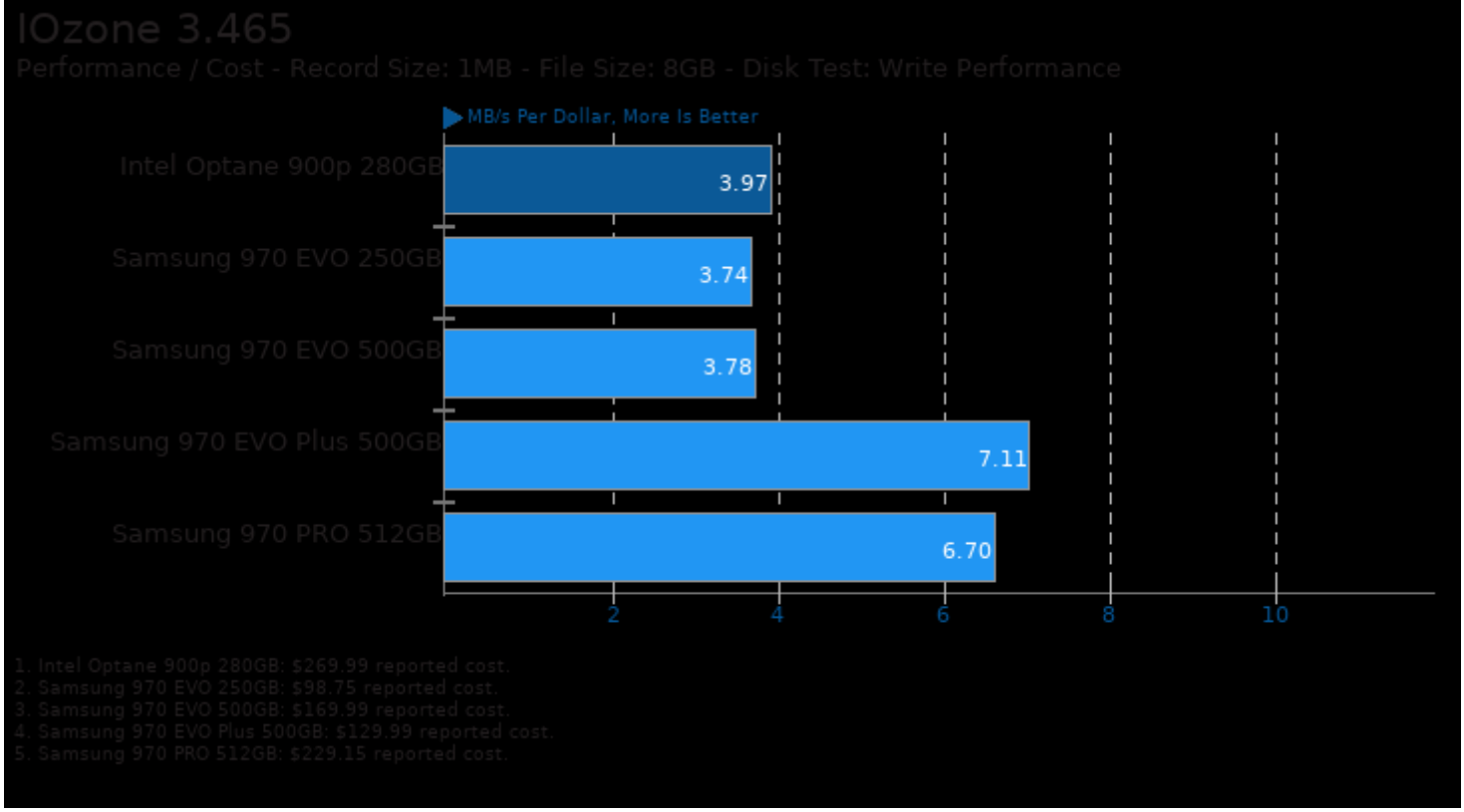

Flexible IO Tester 3.1
Performance / Cost - Type: Sequential Read - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s Per Dollar, More Is Better
Intel Optane 900p 280GB
8.64
Samsung 970 EVO 250GB
5.64
Samsung 970 EVO 500GB
6.07
Samsung 970 EVO Plus 500GB
7.02
Samsung 970 PRO 512GB
6.03
2
4
6
8
10
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.


Flexible IO Tester 3.1
Performance / Cost - Type: Sequential Write - IO Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s Per Dollar, More Is Better
Intel Optane 900p 280GB
4.73
Samsung 970 EVO 250GB
14.83
Samsung 970 EVO 500GB
14.11
Samsung 970 EVO Plus 500GB
24.11
Samsung 970 PRO 512GB
9.75
6
12
18
24
30
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.


FS-Mark 3.3
Performance / Cost - Test: 1000 Files, 1MB Size
Files/s Per Dollar, More Is Better
Intel Optane 900p 280GB
2.20
Samsung 970 EVO 250GB
2.24
Samsung 970 EVO 500GB
1.36
Samsung 970 EVO Plus 500GB
1.88
Samsung 970 PRO 512GB
0.86
0.504
1.008
1.512
2.016
2.52
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

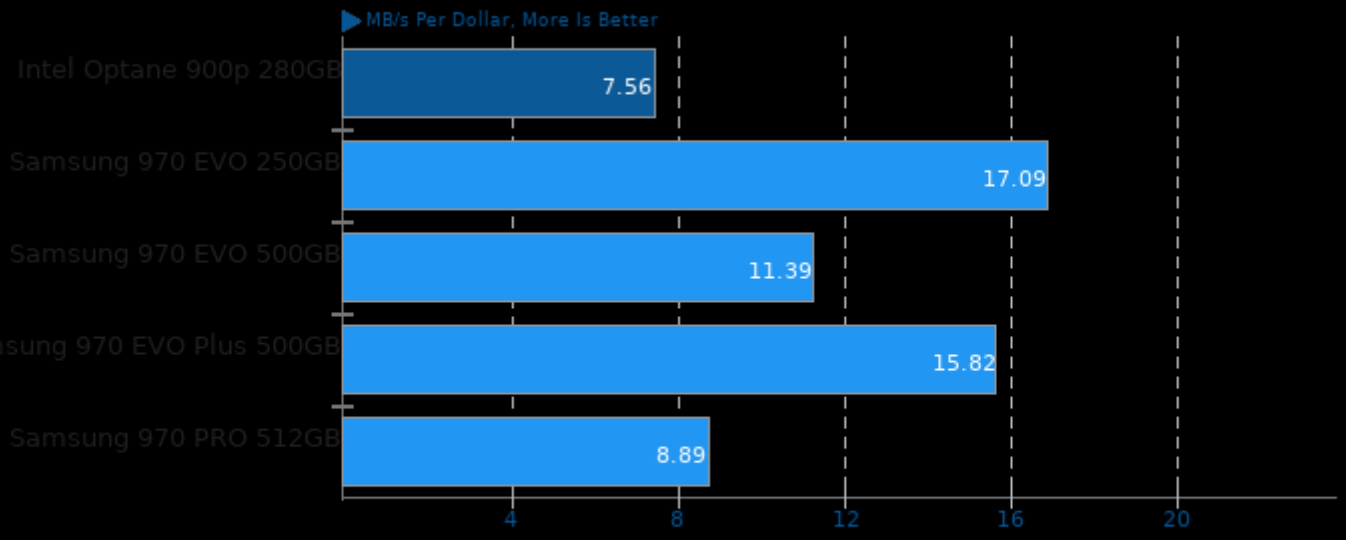

FS-Mark 3.3
Performance / Cost - Test: 4000 Files, 32 Sub Dirs, 1MB Size
Files/s Per Dollar, More Is Better
Intel Optane 900p 280GB
2.16
Samsung 970 EVO 250GB
2.22
Samsung 970 EVO 500GB
0.74
Samsung 970 EVO Plus 500GB
1.87
Samsung 970 PRO 512GB
0.86
0.4995
0.999
1.4985
1.998
2.4975
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.


BlogBench 1.1
Performance / Cost - Test: Write
Final Score Per Dollar, More Is Better
Intel Optane 900p 280GB
88.25
Samsung 970 EVO 250GB
169.36
Samsung 970 EVO 500GB
180.52
Samsung 970 EVO Plus 500GB
288.97
Samsung 970 PRO 512GB
236.71
60
120
180
240
300
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.


IOzone 3.465
Performance / Cost - Record Size: 1MB - File Size: 8GB - Disk Test: Write Performance
MB/s Per Dollar, More Is Better
Intel Optane 900p 280GB
3.97
Samsung 970 EVO 250GB
3.74
Samsung 970 EVO 500GB
3.78
Samsung 970 EVO Plus 500GB
7.11
Samsung 970 PRO 512GB
6.70
2
4
6
8
10
1. Intel Optane 900p 280GB: $269.99 reported cost.
2. Samsung 970 EVO 250GB: $98.75 reported cost.
3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
5. Samsung 970 PRO 512GB: $229.15 reported cost.

Compile Bench 0.6

Performance / Cost - Test: Compile



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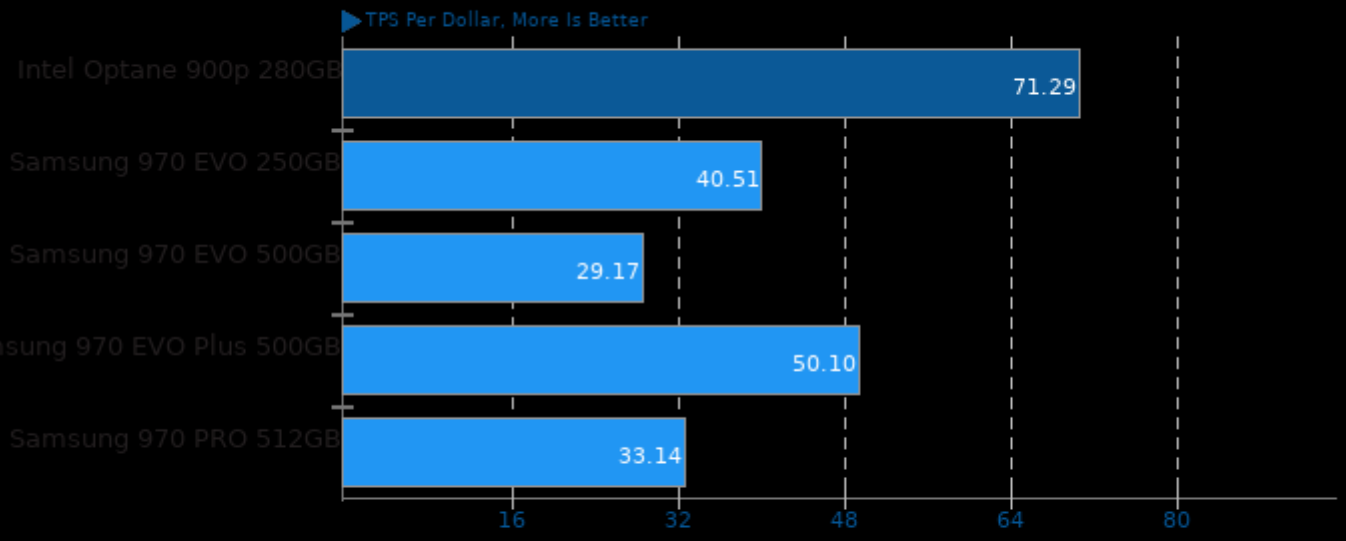
5. Samsung 970 PRO 512GB: $229.15 reported cost.

PostgreSQL pgbench 10.3

Performance / Cost - Scaling: Mostly RAM - Test: Normal Load - Mode: Read Write



1. Intel Optane 900p 280GB: $269.99 reported cost.
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3. Samsung 970 EVO 500GB: $169.99 reported cost.
4. Samsung 970 EVO Plus 500GB: $129.99 reported cost.
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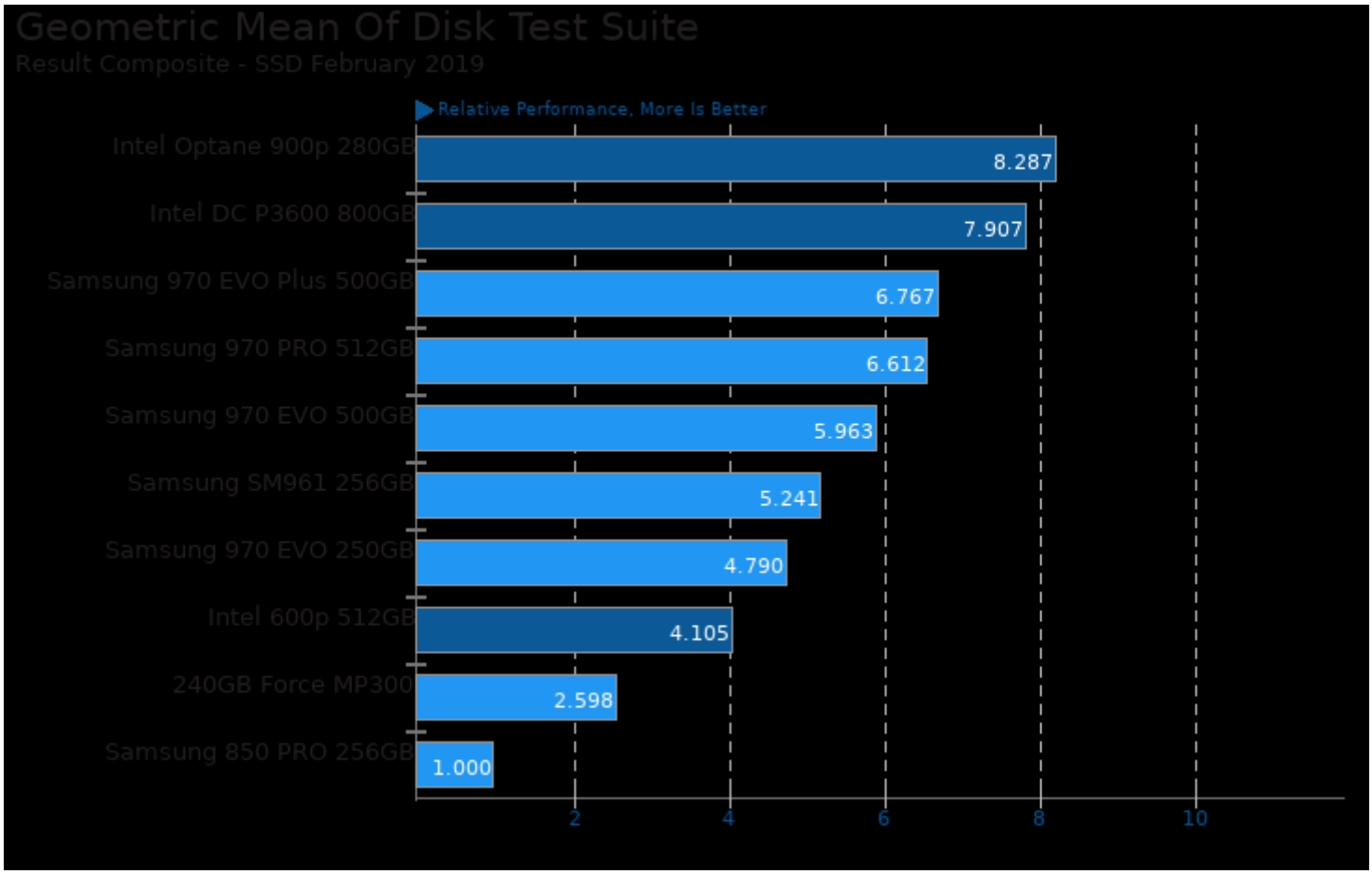
These geometric means are based upon test groupings / test suites for this result file.



Geometric mean based upon tests: pts/sqlite, pts/fs-mark, pts/compilebench, pts/iozone and pts/fio

This file was automatically generated via the Phoronix Test Suite benchmarking software on Tuesday, 7 May 2024 15:06.