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Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests

Btrfs RAID and EXT4 MDADM RAID tests on Linux 4.15 for a future article on Phoronix.

Automated Executive Summary

EXT4 2 MICRON RAID1 had the most wins, coming in first place for 23% of the tests.

Based on the geometric mean of all complete results, the fastest (EXT4 2 MICRON RAID1) was 12.707x the speed of the slowest (EXT4 4 Disk RAID1).

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

PostgreSQL pgbench (Scaling: Mostly RAM - Test: Normal Load - Mode: Read Write) at 17712.3x
FS-Mark (Test: 4000 Files, 32 Sub Dirs, 1MB Size) at 10.659x
Flexible IO Tester (Type: Sequential Read - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 5.298x
Flexible IO Tester (Type: Sequential Read - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 5.298x
Flexible IO Tester (Type: Random Read - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 3.958x
Flexible IO Tester (Type: Random Read - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 3.952x

BlogBench (Test: Read) at 1.823x
SQLite (Test Target: Default Test Directory) at -1x
Flexible IO Tester (Type: Random Write - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at -1x
Flexible IO Tester (Type: Random Write - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at -1x.

Test Systems:

Btrfs 1 Disk

Btrfs 2 Disk RAID0

Btrfs 2 Disk RAID1

Processor: Intel Xeon Silver 4108 @ 3.00GHz (8 Cores / 16 Threads), Motherboard: TYAN S7100AG2NR, Chipset: Intel Device 2020, Memory: 6 x 4096 MB DDR4-2400MHz Micron 9ASF51272PZ-2G6B1, Disk: 4 x 120GB ADATA SU700 + 240GB Force MP500, Graphics: ASPEED ASPEED Family, Audio: Realtek ALC892, Monitor: VE228, Network: Intel I350 Gigabit Connection

OS: Ubuntu 17.04, Kernel: 4.15.0-999-generic (x86_64) 20171212, Desktop: Unity 7.5.0, Display Driver: modesetting 1.19.3, Compiler: GCC 6.3.0 20170406, File-System: btrfs, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic -v
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave

Btrfs 4 Disk RAID0

Processor: Intel Xeon Silver 4108 @ 3.00GHz (8 Cores / 16 Threads), Motherboard: TYAN S7100AG2NR, Chipset: Intel Device 2020, Memory: 6 x 4096 MB DDR4-2400MHz Micron 9ASF51272PZ-2G6B1, Disk: 4 x 120GB ADATA SU700 + 240GB Force MP500, Graphics: ASPEED ASPEED Family, Audio: Realtek ALC892, Monitor: VE228, Network: Intel I350 Gigabit Connection

OS: Ubuntu 17.04, Kernel: 4.15.0-999-generic (x86_64) 20171212, Display Driver: modesetting 1.19.3, Compiler: GCC 6.3.0 20170406, File-System: btrfs, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic -v
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave

Btrfs 4 Disk RAID1

Btrfs 4 Disk RAID10

Btrfs 4 Disk RAID5

Btrfs 4 Disk RAID6

Processor: Intel Xeon Silver 4108 @ 3.00GHz (8 Cores / 16 Threads), Motherboard: TYAN S7100AG2NR, Chipset: Intel Device 2020, Memory: 6 x 4096 MB DDR4-2400MHz Micron 9ASF51272PZ-2G6B1, Disk: 4 x 120GB ADATA SU700 + 240GB Force MP500, Graphics: ASPEED ASPEED Family, Audio: Realtek ALC892, Monitor: VE228, Network: Intel I350 Gigabit Connection

OS: Ubuntu 17.04, Kernel: 4.15.0-999-generic (x86_64) 20171212, Desktop: Unity 7.5.0, Display Driver: modesetting 1.19.3, Compiler: GCC 6.3.0 20170406, File-System: btrfs, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic -v
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave

EXT4 1 Disk

EXT4 2 Disk RAID1

EXT4 2 Disk RAID0

EXT4 4 Disk RAID0

EXT4 4 Disk RAID1

EXT4 4 Disk RAID5

Processor: Intel Xeon Silver 4108 @ 3.00GHz (8 Cores / 16 Threads), Motherboard: TYAN S7100AG2NR, Chipset: Intel Device 2020, Memory: 6 x 4096 MB DDR4-2400MHz Micron 9ASF51272PZ-2G6B1, Disk: 4 x 120GB ADATA SU700 + 240GB Force MP500, Graphics: ASPEED ASPEED Family, Audio: Realtek ALC892, Monitor: VE228, Network: Intel I350 Gigabit Connection

OS: Ubuntu 17.04, Kernel: 4.15.0-999-generic (x86_64) 20171212, Desktop: Unity 7.5.0, Display Driver: modesetting 1.19.3, Compiler: GCC 6.3.0 20170406, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic -v
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave

EXT4 4 Disk RAID6

EXT4 4 Disk RAID10

Processor: Intel Xeon Silver 4108 @ 3.00GHz (8 Cores / 16 Threads), Motherboard: TYAN S7100AG2NR, Chipset: Intel Device 2020, Memory: 6 x 4096 MB DDR4-2400MHz Micron 9ASF51272PZ-2G6B1, Disk: 4 x 120GB ADATA SU700 +

240GB Force MP500, Graphics: ASPEED ASPEED Family, Audio: Realtek ALC892, Monitor: VE228, Network: Intel I350 Gigabit Connection

OS: Ubuntu 17.04, Kernel: 4.15.0-999-generic (x86_64) 20171212, Display Driver: modesetting 1.19.3, Compiler: GCC 6.3.0 20170406, File-System: ext4, Screen Resolution: 1920x1080

Compiler Notes: --build=x86_64-linux-gnu --disable-browser-plugin --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-gtk-cairo --enable-java-awt=gtk --enable-java-home --enable-languages=c,ada,c++,java,go,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-arch-directory=amd64 --with-default-libstdcxx-abi=new --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic -v
Disk Notes: NONE / data=ordered,errors=remount-ro,relatime,rw
Processor Notes: Scaling Governor: intel_pstate powersave

EXT4 2 Kingston RAID1

Processor: Intel Xeon E-2176G @ 4.70GHz (6 Cores / 12 Threads), Motherboard: Supermicro X11SCM-F v1.01 (1.0b BIOS), Chipset: Intel Cannon Lake PCH, Memory: 4 x 32 GB DDR4-2667MT/s Samsung M391A4G43MB1-CTD, Disk: 3840GB MR9260-8i + 6001GB MR9260-8i, Graphics: ASPEED, Network: 2 x Intel I210

OS: Ubuntu 18.04, Kernel: 4.15.0-62-generic (x86_64), Compiler: GCC 7.4.0, File-System: ext4, Screen Resolution: 1024x768

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: CFQ / data=ordered,noatime,rw
Processor Notes: Scaling Governor: intel_pstate performance
Security Notes: l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling

EXT4 2 MICRON RAID1

Processor: 2 x Intel Xeon Gold 6248 @ 2.50GHz (40 Cores / 80 Threads), Motherboard: Supermicro X11DPU v1.10 (3.1 BIOS), Chipset: Intel Sky Lake-E DMI3 Registers, Memory: 12 x 32 GB DDR4-2666MT/s Samsung M393A4K40CB2-CTD, Disk: 7681GB MR9361-8i + 8001GB MR9361-8i, Graphics: ASPEED, Network: 4 x Intel X710/X557-AT

OS: Ubuntu 18.04, Kernel: 4.15.0-60-generic (x86_64), Compiler: GCC 7.4.0, File-System: ext4, Screen Resolution: 1024x768

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: CFQ / data=ordered,errors=remount-ro,noatime,rw,stripe=64
Processor Notes: Scaling Governor: acpi-cpufreq ondemand
Security Notes: l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Enhanced IBRS IBPB: conditional RSB filling

EXT4 2 Kingston 9361 RAID1

Processor: Intel Xeon E-2176G @ 4.70GHz (6 Cores / 12 Threads), Motherboard: Supermicro X11SCM-F v1.01 (1.0b BIOS), Chipset: Intel Cannon Lake PCH, Memory: 4 x 32 GB DDR4-2667MT/s Samsung M391A4G43MB1-CTD, Disk: 3840GB MR9361-8i + 6001GB MR9361-8i, Graphics: ASPEED, Network: 2 x Intel I210

OS: Ubuntu 18.04, Kernel: 4.15.0-64-generic (x86_64), Compiler: GCC 7.4.0, File-System: ext4, Screen Resolution: 1024x768

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: CFQ / data=ordered,relatime,rw,stripe=64
Processor Notes: Scaling Governor: intel_pstate performance
Security Notes: l1tf: Mitigation of PTE Inversion; VMX: conditional cache flushes SMT vulnerable + mds: Mitigation of Clear buffers; SMT vulnerable + meltdown: Mitigation of PTI + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full generic retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling

XFS 2 Kingston/Micron Soft RAID1

Processor: AMD EPYC 7402P 24-Core @ 2.80GHz (24 Cores / 48 Threads), Motherboard: Supermicro H11SSL-i v2.00 (2.1 BIOS), Chipset: AMD Starship/Matisse, Memory: 6 x 32 GB DDR4-2400MT/s Kingston, Disk: 7682GB Micron_5200_MTFD + 7682GB KINGSTON SEDC500 + 2 x 12000GB Seagate ST12000NM0007-2A, Graphics: ASPEED, Network: 2 x Intel I210

OS: Ubuntu 20.04, Kernel: 5.4.0-42-generic (x86_64), Compiler: GCC 9.3.0, File-System: xfs, Screen Resolution: 1024x768

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Disk Notes: MQ-DEADLINE / attr2,inode64,logbsize=32k,logbufs=8,noatime,noquota,rw / raid1 sda2[0] sdb3[1]
Processor Notes: Scaling Governor: acpi-cpufreq ondemand - CPU Microcode: 0x8301034
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full AMD retpoline IBPB: conditional IBRS_FW STIBP: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

	Btrfs 1 Disk	Btrfs 2 Disk RAID 0	Btrfs 2 Disk RAID 1	Btrfs 4 Disk RAID 0	Btrfs 4 Disk RAID 1	Btrfs 4 Disk RAID 10	Btrfs 4 Disk RAID 5	Btrfs 4 Disk RAID 6	EXT 4 1 Disk	EXT 4 2 Disk RAID 1	EXT 4 2 Disk RAID 0	EXT 4 4 Disk RAID 0	EXT 4 4 Disk RAID 1	EXT 4 4 Disk RAID 5	EXT 4 4 Disk RAID 6	EXT 4 4 Disk RAID 10	EXT 4 2 Kingston RAID 1	EXT 4 2 MICRON RAID 1	EXT 4 2 Kingston 9361 RAID 1	XFS 2 Kingston/Micron Soft RAID 1
SQLite - D.T.D (sec)	60.90	59.21	64.93	62.10	66.73	66.91	140.27	139.08	27.74	394.48	37.72	41.22	454.42	418.50	**669.24**	48.21	75.19	**3.01**	68.90	13.911
Normalized	4.94%	5.08%	4.64%	4.85%	4.51%	4.5%	2.15%	2.16%	10.85%	0.76%	7.98%	7.3%	0.66%	0.72%	0.45%	6.24%	4%	100%	4.37%	21.64%
Standard Deviation	1.1%	0.5%	1.6%	0.6%	1.2%	0.4%	3.4%	3.4%	1%	176.4%	21%	32.5%	149%	198.9%	168.3%	26.5%	0.3%	1.6%	0%	1.1%

Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests

Flexible IO Tester - Rand Read - Libaio - No - Yes - 4KB (MB/s)	124	221	124	293	242	222	385	368	124	246	242	456	459	428	417	439	212	308	490
Normalized	25.31%	45.1%	25.31%	59.8%	49.39%	45.31%	78.57%	75.1%	25.31%	50.2%	49.39%	93.06%	93.67%	87.35%	85.1%	89.59%	43.27%	62.86%	100%
Standard Deviation	0%	0.3%	0.6%	0.7%	0.3%	0.4%	0.9%	1.5%	0.2%	0%	0.1%	0.3%	0.3%	1.3%	0.7%	0.4%	0.4%	8.6%	0.1%
Flexible IO Tester - Rand Read - Libaio - No - Yes - 4KB (IOPS)	310 86	551 62	310 21	731 72	603 99	554 06	961 32	918 81	309 36	614 24	605 27	113 870	114 726	106 986	104 198	109 704	529 25	770 15	122 443
Normalized	25.39%	45.05%	25.34%	59.76%	49.33%	45.25%	78.51%	75.04%	25.27%	50.17%	49.43%	93%	93.7%	87.38%	85.1%	89.6%	43.22%	62.9%	100%
Standard Deviation	0%	0.3%	0.6%	0.7%	0.3%	0.4%	0.9%	1.5%	0.2%	0%	0.1%	0.3%	0.3%	1.3%	0.7%	0.4%	0.4%	8.6%	0.1%
Flexible IO Tester - Rand Write - Libaio - No - Yes - 4KB	82.35	64.76	74.21	66.17	40.61	34.41	68.31	68.21	167.24	33.57	245.04	279.03	35.41	25.93	17.09	116.34	114.09	44.64	146.53
Normalized	29.51%	23.21%	26.6%	23.71%	14.55%	12.33%	24.48%	24.45%	59.94%	12.03%	87.82%	100%	12.69%	9.29%	6.12%	41.69%	40.89%	16%	52.51%
Standard Deviation	3.5%	6.2%	5.4%	15.9%	15.9%	9.5%	10.8%	9.7%	0.1%	4.8%	29.6%	29.8%	0.7%	9.1%	1.7%	41.4%	0.4%	2.9%	1.1%
Flexible IO Tester - Rand Write - Libaio - No - Yes - 4KB	205 83	161 86	185 48	165 40	101 49	859 9	170 74	170 49	418 06	838 9	612 57	697 54	885 0	648 0	427 0	290 80	285 18	111 55	366 29
Normalized	29.51%	23.2%	26.59%	23.71%	14.55%	12.33%	24.48%	24.44%	59.93%	12.03%	87.82%	100%	12.69%	9.29%	6.12%	41.69%	40.88%	15.99%	52.51%
Standard Deviation	3.5%	6.2%	5.4%	15.9%	15.9%	9.5%	10.8%	9.7%	0.1%	4.8%	29.6%	29.8%	0.8%	9.1%	1.7%	41.5%	0.4%	2.9%	1.1%

Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests

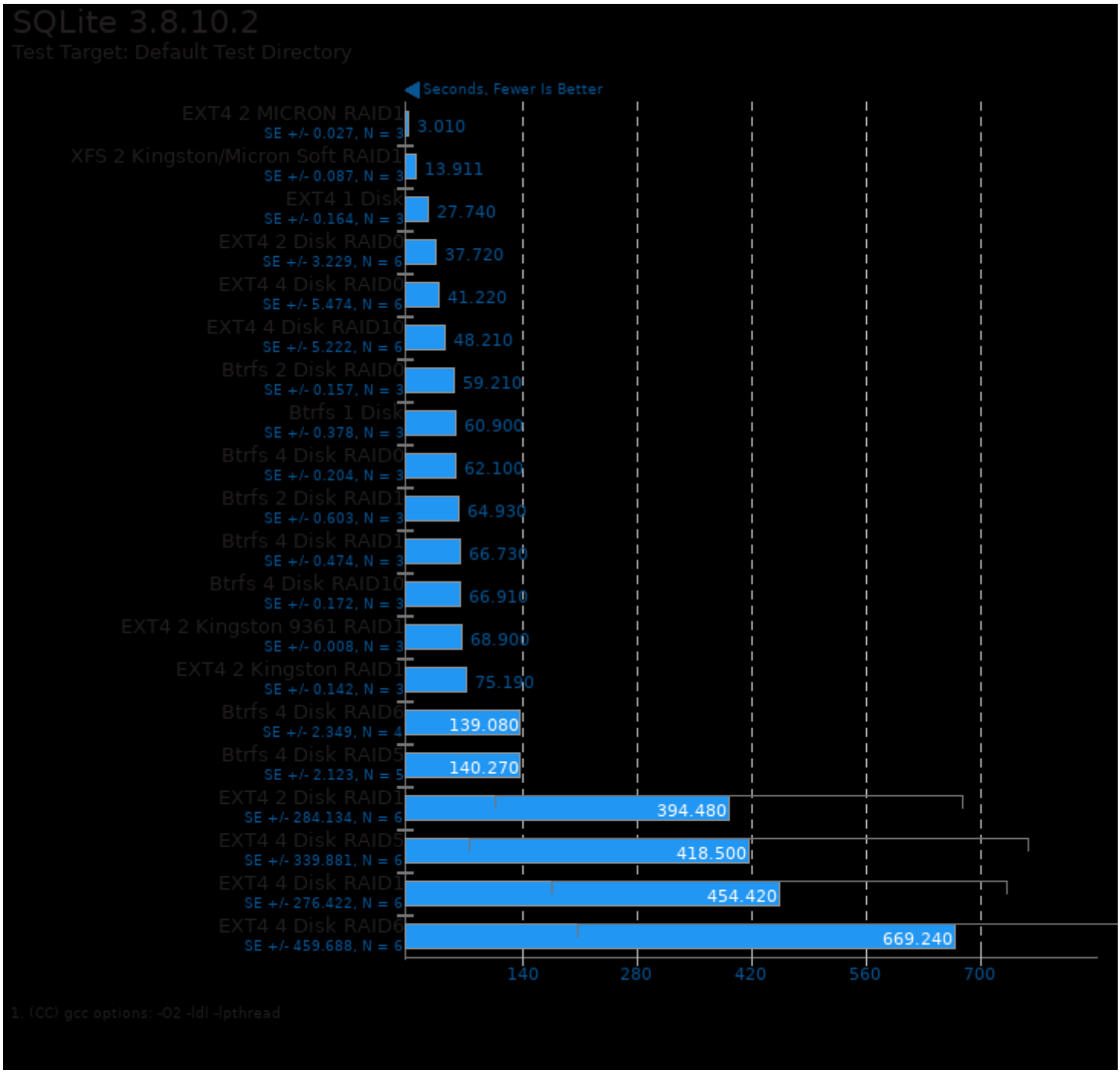
Flexible IO Tester - Seq Read - Libaio - No - Yes - 4KB (MB/s)	109.25	234.64	123.40	302.93	188.29	197.04	**402.86**	323.48	**76.04**	76.70	144.92	143.94	82.30	151.50	196.79	217.34	223.40	208.76	370.58
Normalized	27.12%	58.24%	30.63%	75.19%	46.74%	48.91%	100%	80.3%	18.88%	19.04%	35.97%	35.73%	20.43%	37.61%	48.85%	53.95%	55.45%	51.82%	91.99%
Standard Deviation	0.3%	0.1%	0.3%	0.2%	1.3%	5.6%	2.2%	1.2%	0.1%	0.1%	0%	0.5%	0.1%	1%	0.1%	0.1%	0.2%	4.2%	3%
Flexible IO Tester - Seq Read - Libaio - No - Yes - 4KB (IOPS)	27309	58657	30847	75730	47068	49255	**100711**	80866	**19008**	19071	36226	35981	20571	37872	49194	54331	55847	52186	92641
Normalized	27.12%	58.24%	30.63%	75.2%	46.74%	48.91%	100%	80.3%	18.87%	19.04%	35.97%	35.73%	20.43%	37.6%	48.85%	53.95%	55.45%	51.82%	91.99%
Standard Deviation	0.3%	0.1%	0.3%	0.2%	1.3%	5.6%	2.2%	1.2%	0.1%	0.1%	%	0.5%	0.1%	1%	0.1%	0.1%	0.2%	4.2%	3%
Flexible IO Tester - Seq Write - Libaio - No - Yes - 4KB (MB/s)	81.37	69.23	69.42	61.04	47.71	43.08	72.47	73.17	213.91	36.73	103.37	171.16	33.09	33.22	**16.89**	71.29	120.99	431.03	**478.17**
Normalized	17.02%	14.48%	14.52%	12.77%	9.98%	9.01%	15.16%	15.3%	44.74%	7.68%	21.62%	35.79%	6.92%	6.95%	3.53%	14.91%	25.3%	90.14%	100%
Standard Deviation	1.5%	3.8%	2.7%	25.7%	9.6%	7.6%	23.3%	17%	1%	6.3%	3.9%	2.2%	13.4%	7.8%	8.2%	0.9%	0.3%	1.8%	0.3%
Flexible IO Tester - Seq Write - Libaio - No - Yes - 4KB (IOPS)	20340	17304	17352	15256	11923	10767	18113	18289	53473	9178	25838	42786	8268	8301	**4219**	17818	30244	10754	**11954 0**
Normalized	17.02%	14.48%	14.52%	12.76%	9.97%	9.01%	15.15%	15.3%	44.73%	7.68%	21.61%	35.79%	6.92%	6.94%	3.53%	14.91%	25.3%	90.14%	100%
Standard Deviation	1.5%	3.8%	2.7%	25.7%	9.6%	7.6%	23.3%	17%	1%	6.3%	3.9%	2.2%	13.4%	7.8%	8.2%	0.9%	0.3%	1.8%	0.3%
FS-Mark - 1.F.1.S (Files/s)	133.87	187.30	140.87	189.18	137.77	177.53	124.42	138.18	119.13	28.73	71.93	101.43	**21.93**	28.60	24.88	55.20			113.10	**302.8**
Normalized	44.21%	61.86%	46.52%	62.48%	45.5%	58.63%	41.09%	45.63%	39.34%	9.49%	23.75%	33.5%	7.24%	9.45%	8.22%	18.23%			37.35%	100%
Standard Deviation	1.2%	1.7%	0.8%	28.8%	1.4%	0.3%	24.8%	22.3%	2.4%	1.2%	0.2%	2.2%	2.7%	7.9%	20.1%	2%			0.1%	0.8%

Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests

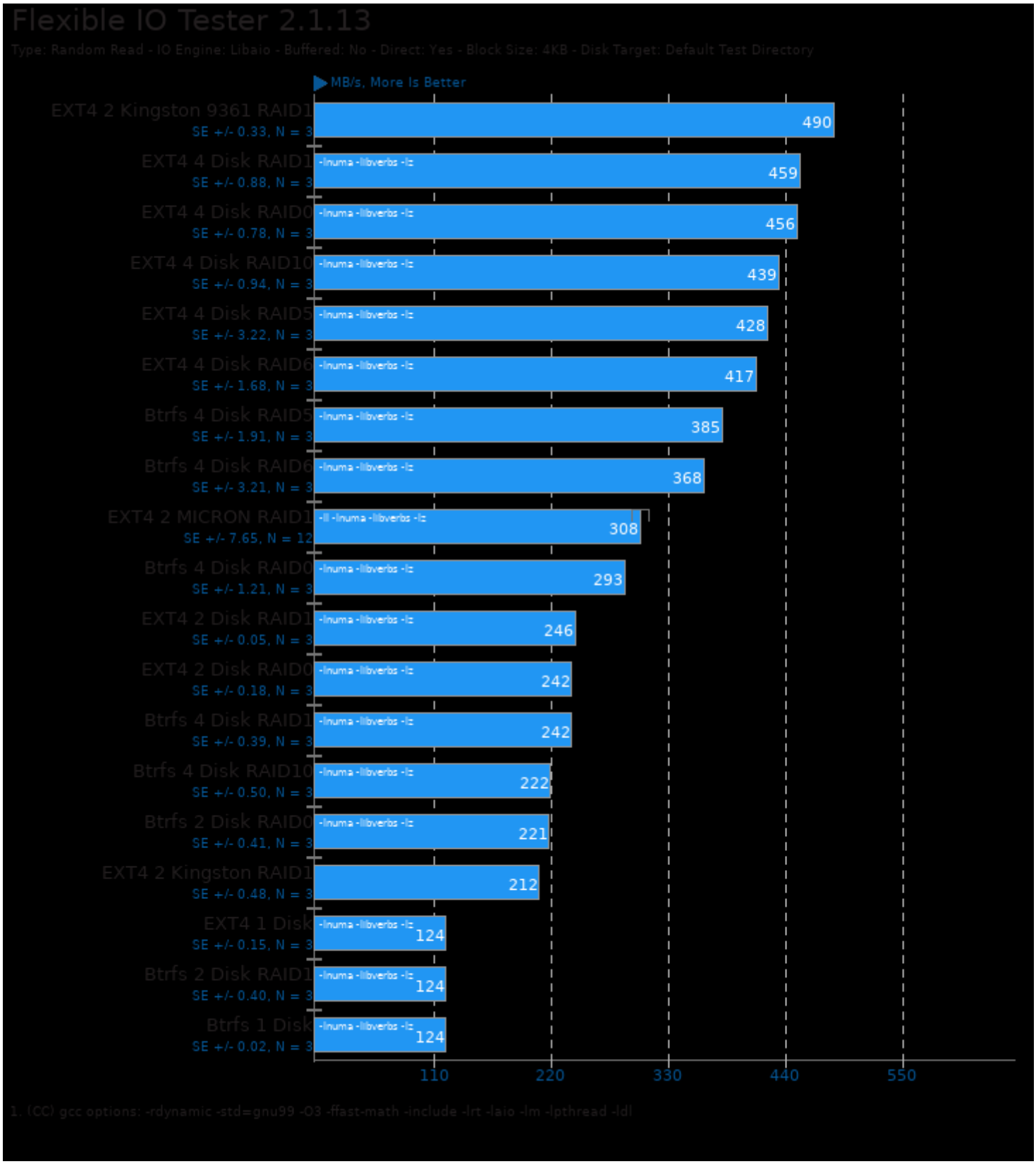
FS-Mark - 5.F.1.S.4.T (Files/s)	148.15	322.97	169.60	**445.50**	190.00	287.30	280.90	258.10	64.67	35.47	79.87	175.33	**27.00**	52.10	32.80	70.27			442.27	403.9
Normalized	33.25%	72.5%	38.07%	100%	42.65%	64.49%	63.05%	57.93%	14.52%	7.96%	17.93%	39.36%	6.06%	11.69%	7.36%	15.77%			99.27%	90.66%
Standard Deviation	31%	0.5%	12.6%	1.3%	0.3%	0.2%	0.5%	0.6%	99.3%	1.3%	16.7%	0.3%	9%	3.2%	15.7%	2.3%			0.2%	0.1%
FS-Mark - 4.F.3.S.D.1.S (Files/s)	131.40	180.03	133.83	206.00	132.33	164.07	135.73	146.93	41.35	29.75	53.13	101.37	**28.23**	29.67	38.43	48.00			113.10	**300.9**
Normalized	43.67%	59.83%	44.48%	68.46%	43.98%	54.53%	45.11%	48.83%	13.74%	9.89%	17.66%	33.69%	9.38%	9.86%	12.77%	15.95%			37.59%	100%
Standard Deviation	1.1%	2%	2%	2.6%	2.4%	3.2%	1.2%	3%	3.4%	4.9%	0.9%	0.6%	3.1%	2.7%	2.3%	3.9%			0%	1%
BlogBench - Read (Final Score)	240239	237273	238822	240067	236303	235910	232634	216211	247751	241760	238909	157787	236166	253477	258548	231488	**150351**	223808	**274054**	159501
Normalized	87.66%	86.58%	87.14%	87.6%	86.23%	86.08%	84.89%	78.89%	90.4%	88.22%	87.18%	57.58%	86.18%	92.49%	94.34%	84.47%	54.86%	81.67%	100%	58.2%
Standard Deviation	0%	1.1%	2.9%	1.7%	1.5%	0.8%	1.4%	0.6%	1.9%	5.4%	1%	8.1%	6.1%	1.4%	1.3%	6.5%	1.1%	2.9%	1.6%	2.7%
BlogBench - Write (Final Score)	5079	5746	4773	5732	5397	5577	5136	4655	**4212**	4825	5610	8724	4692	6243	5135	7769	19948	**30898**	24869	11598
Normalized	16.44%	18.6%	15.45%	18.55%	17.47%	18.05%	16.62%	15.07%	13.63%	15.62%	18.16%	28.23%	15.19%	20.21%	16.62%	25.14%	64.56%	100%	80.49%	37.54%
Standard Deviation	6.4%	1.4%	12.3%	0.2%	1.7%	1.1%	0.4%	0.2%	5.7%	5.9%	2%	4%	27.5%	1.4%	3.8%	8.5%	11.8%	21.4%	1.8%	0.9%
Dbench - 12 (MB/s)	291.84	309.27	289.99	328.55	314.25	348.16	311.67	302.24	218.25	160.56	374.87	605.34	**91.30**	129.00	106.08	302.57	547.32	**341.0**	616.42	1108
Normalized	8.56%	9.07%	8.5%	9.63%	9.22%	10.21%	9.14%	8.86%	6.4%	4.71%	10.99%	17.75%	2.68%	3.78%	3.11%	8.87%	16.05%	100%	18.08%	32.49%
Standard Deviation	9.6%	2.8%	14.1%	1.9%	1.4%	0.5%	1.9%	6.4%	0.8%	0.1%	3.5%	14.8%	4.5%	3.5%	10.9%	4.1%	0.1%	0.3%	0.1%	1%
IOzone - 4Kb - 8GB - Write Performance (MB/s)	**37.97**	76.16	46.52	**900.57**	182.49	142.13	114.48	75.62	48.72	43.68	103.42	168.87	42.09	80.43	59.66	94.16	435.43	396.25	415.71	395.54
Normalized	4.22%	8.46%	5.17%	100%	20.26%	15.78%	12.71%	8.4%	5.41%	4.85%	11.48%	18.75%	4.67%	8.93%	6.62%	10.46%	48.35%	44%	46.16%	43.92%
Standard Deviation	1.4%	0.6%	16.9%	1.3%	96.4%	115.3%	5.9%	2.3%	5.2%	6%	3.3%	16.6%	3.4%	1.7%	6.9%	7.5%	0.6%	0.3%	0.1%	0.2%

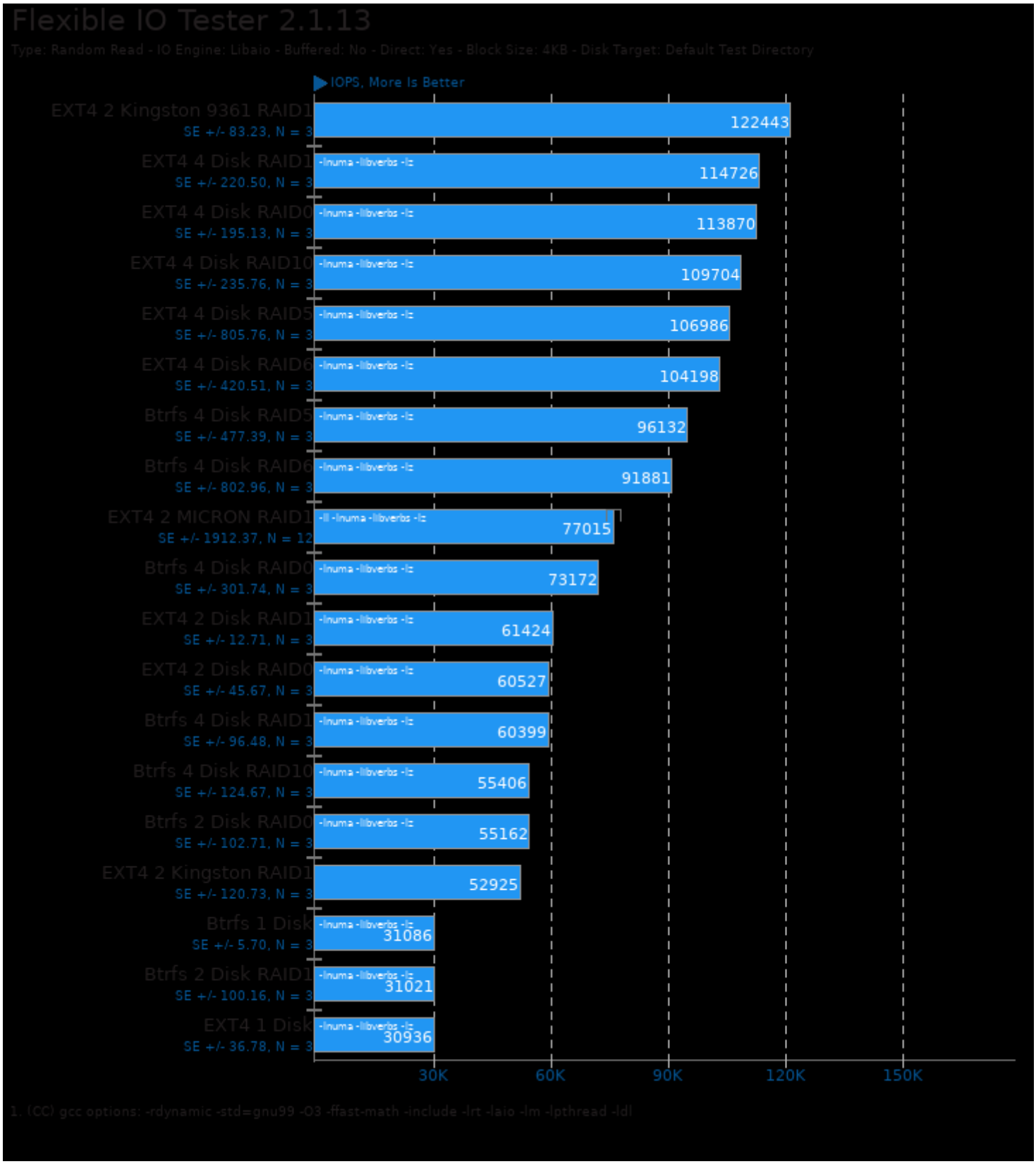
Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests

PostgreSQL pgbench - Mostly RAM - Normal Load - Read	881.08	1134	628.35	1644	1643	1042	1370	684.05	1086	760.78	**1771**	1730	**0.10**	1033	1020	1311
Normalized	49.74%	64%	35.48%	92.81%	92.74%	58.82%	77.37%	38.62%	61.32%	42.95%	100%	97.66%	0.01%	58.35%	57.61%	74.01%
Standard Deviation	13.1%															

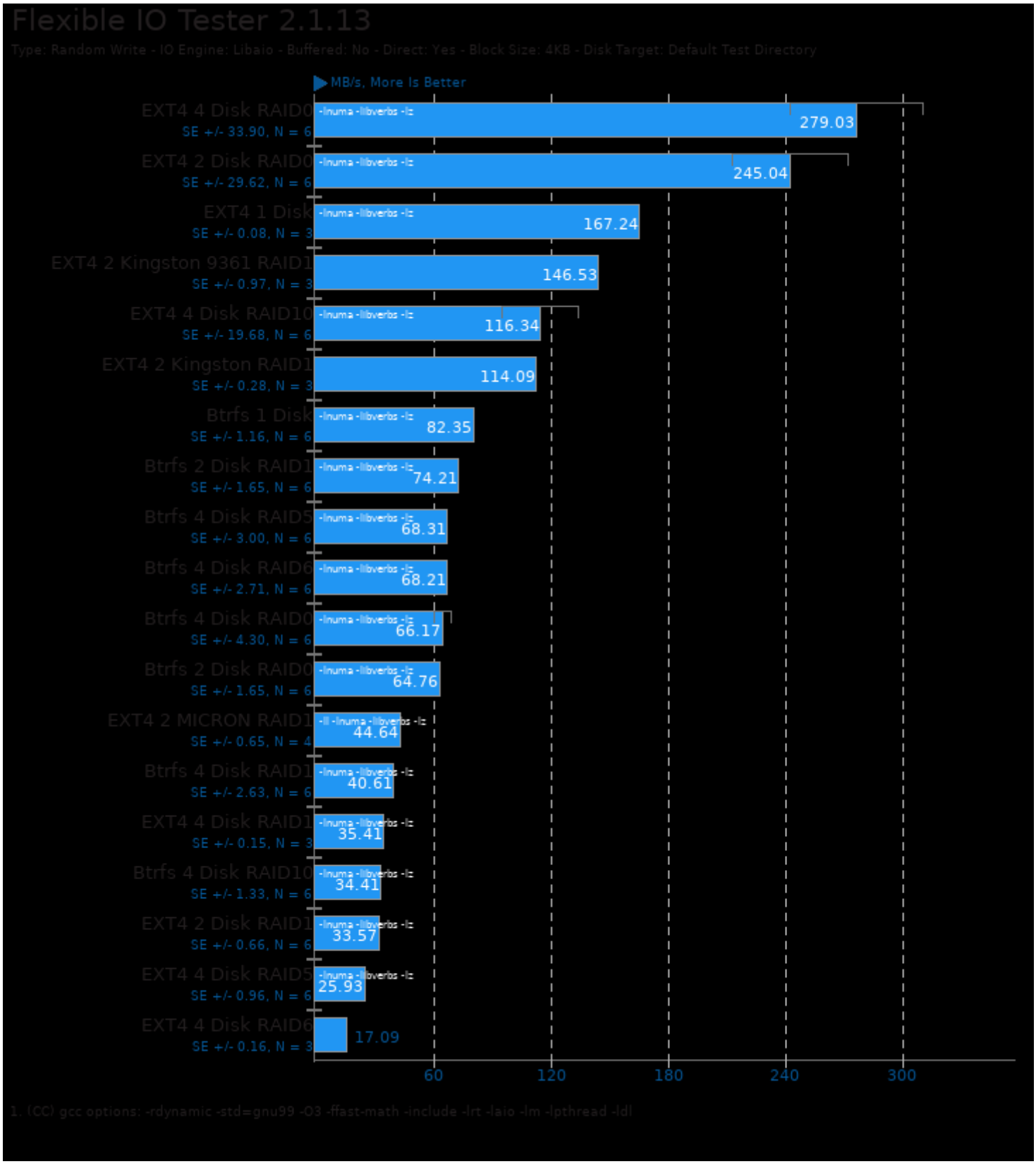

SQLite 3.8.10.2
Test Target: Default Test Directory
Seconds, Fewer Is Better
EXT4 2 MICRON RAID1
SE +/- 0.027, N = 3
3.010
XFS 2 Kingston/Micron Soft RAID1
SE +/- 0.087, N = 3
13.911
EXT4 1 Disk
SE +/- 0.164, N = 3
27.740
EXT4 2 Disk RAID0
SE +/- 3.229, N = 6
37.720
EXT4 4 Disk RAID0
SE +/- 5.474, N = 6
41.220
EXT4 4 Disk RAID10
SE +/- 5.222, N = 6
48.210
Btrfs 2 Disk RAID0
SE +/- 0.157, N = 3
59.210
Btrfs 1 Disk
SE +/- 0.378, N = 3
60.900
Btrfs 4 Disk RAID0
SE +/- 0.204, N = 3
62.100
Btrfs 2 Disk RAID1
SE +/- 0.603, N = 3
64.930
Btrfs 4 Disk RAID1
SE +/- 0.474, N = 3
66.730
Btrfs 4 Disk RAID10
SE +/- 0.172, N = 3
66.910
EXT4 2 Kingston 9361 RAID1
SE +/- 0.008, N = 3
68.900
EXT4 2 Kingston RAID1
SE +/- 0.142, N = 3
75.190
Btrfs 4 Disk RAID6
SE +/- 2.349, N = 4
139.080
Btrfs 4 Disk RAID5
SE +/- 2.123, N = 5
140.270
EXT4 2 Disk RAID1
SE +/- 284.134, N = 6
394.480
EXT4 4 Disk RAID5
SE +/- 339.881, N = 6
418.500
EXT4 4 Disk RAID1
SE +/- 276.422, N = 6
454.420
EXT4 4 Disk RAID6
SE +/- 459.688, N = 6
669.240
140
280
420
560
700
1. (CC) gcc options: -O2 -ldl -lpthread

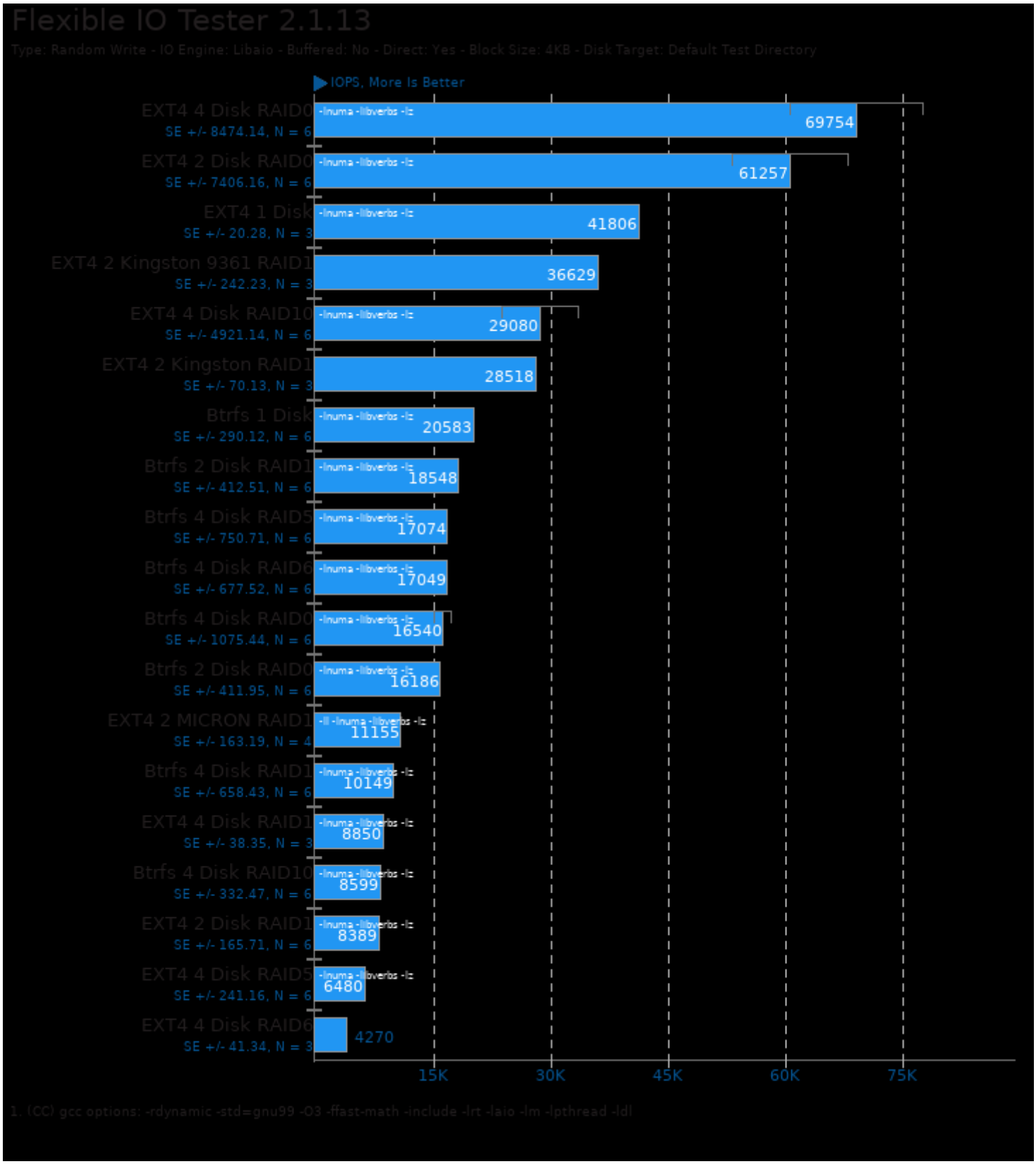
Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests

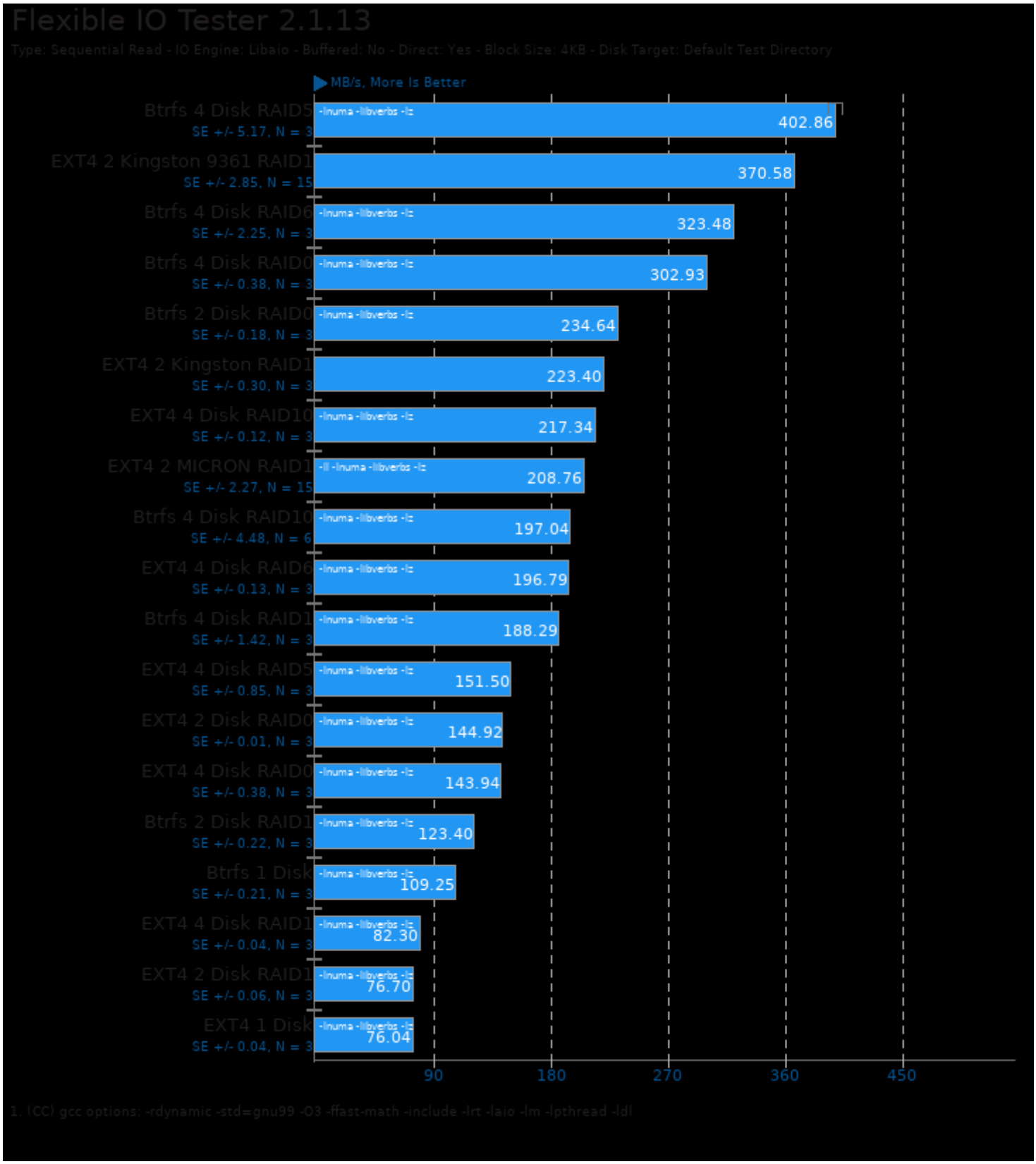



Flexible IO Tester 2.1.13
Type: Random Read - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
EXT4 2 Kingston 9361 RAID1
SE +/- 83.23, N = 3
122443
EXT4 4 Disk RAID1
SE +/- 220.50, N = 3
114726
EXT4 4 Disk RAID0
SE +/- 195.13, N = 3
113870
EXT4 4 Disk RAID10
SE +/- 235.76, N = 3
109704
EXT4 4 Disk RAID5
SE +/- 805.76, N = 3
106986
EXT4 4 Disk RAID6
SE +/- 420.51, N = 3
104198
Btrfs 4 Disk RAID5
SE +/- 477.39, N = 3
96132
Btrfs 4 Disk RAID6
SE +/- 802.96, N = 3
91881
EXT4 2 MICRON RAID1
SE +/- 1912.37, N = 12
77015
Btrfs 4 Disk RAID0
SE +/- 301.74, N = 3
73172
EXT4 2 Disk RAID1
SE +/- 12.71, N = 3
61424
EXT4 2 Disk RAID0
SE +/- 45.67, N = 3
60527
Btrfs 4 Disk RAID1
SE +/- 96.48, N = 3
60399
Btrfs 4 Disk RAID10
SE +/- 124.67, N = 3
55406
Btrfs 2 Disk RAID0
SE +/- 102.71, N = 3
55162
EXT4 2 Kingston RAID1
SE +/- 120.73, N = 3
52925
Btrfs 1 Disk
SE +/- 5.70, N = 3
31086
Btrfs 2 Disk RAID1
SE +/- 100.16, N = 3
31021
EXT4 1 Disk
SE +/- 36.78, N = 3
30936
30K
60K
90K
120K
150K
1. (CC) gcc options: -rdynamic -std=gnu99 -O3 -ffast-math -include -lrt -laio -lm -lpthread -ldl

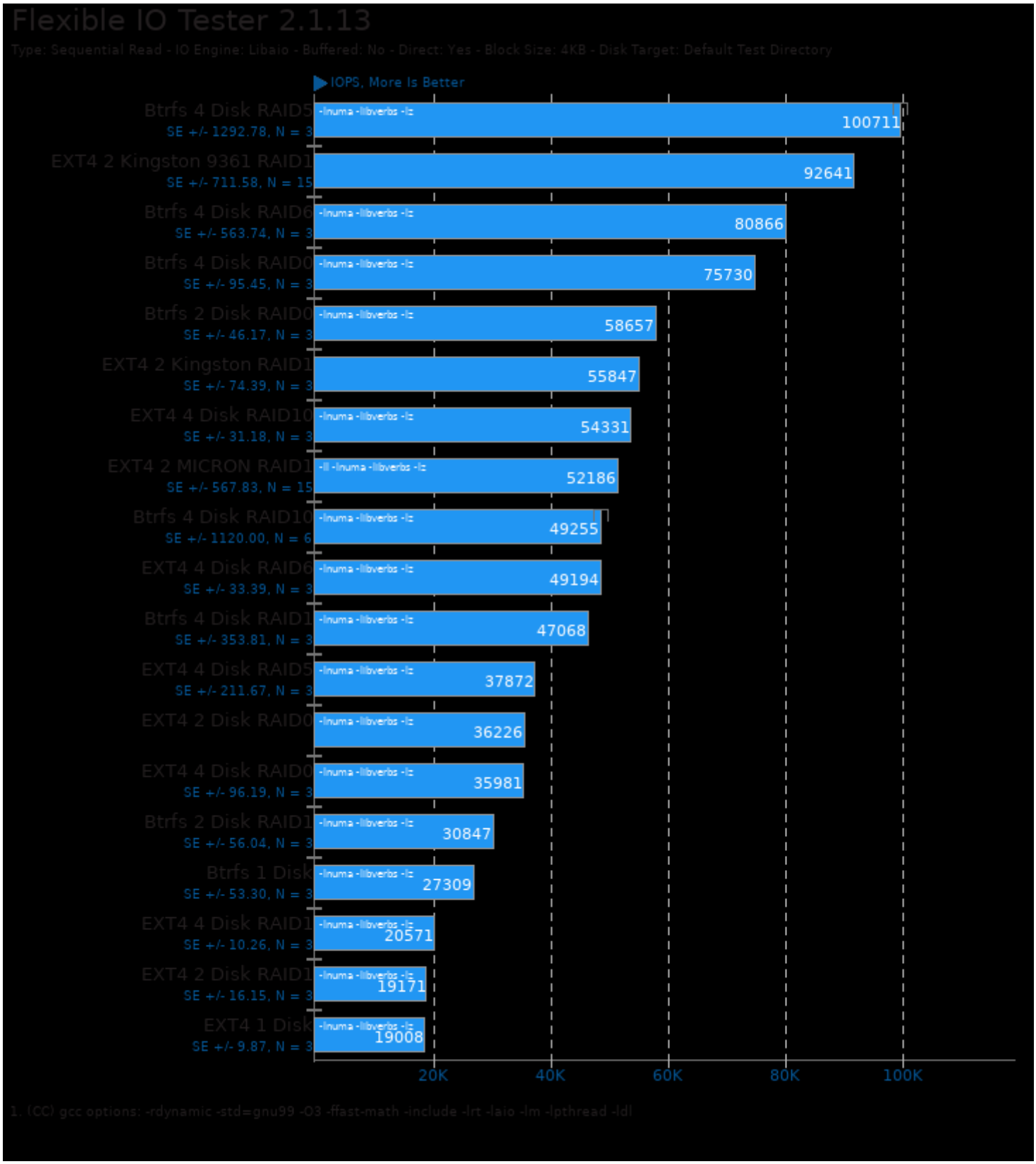
Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests

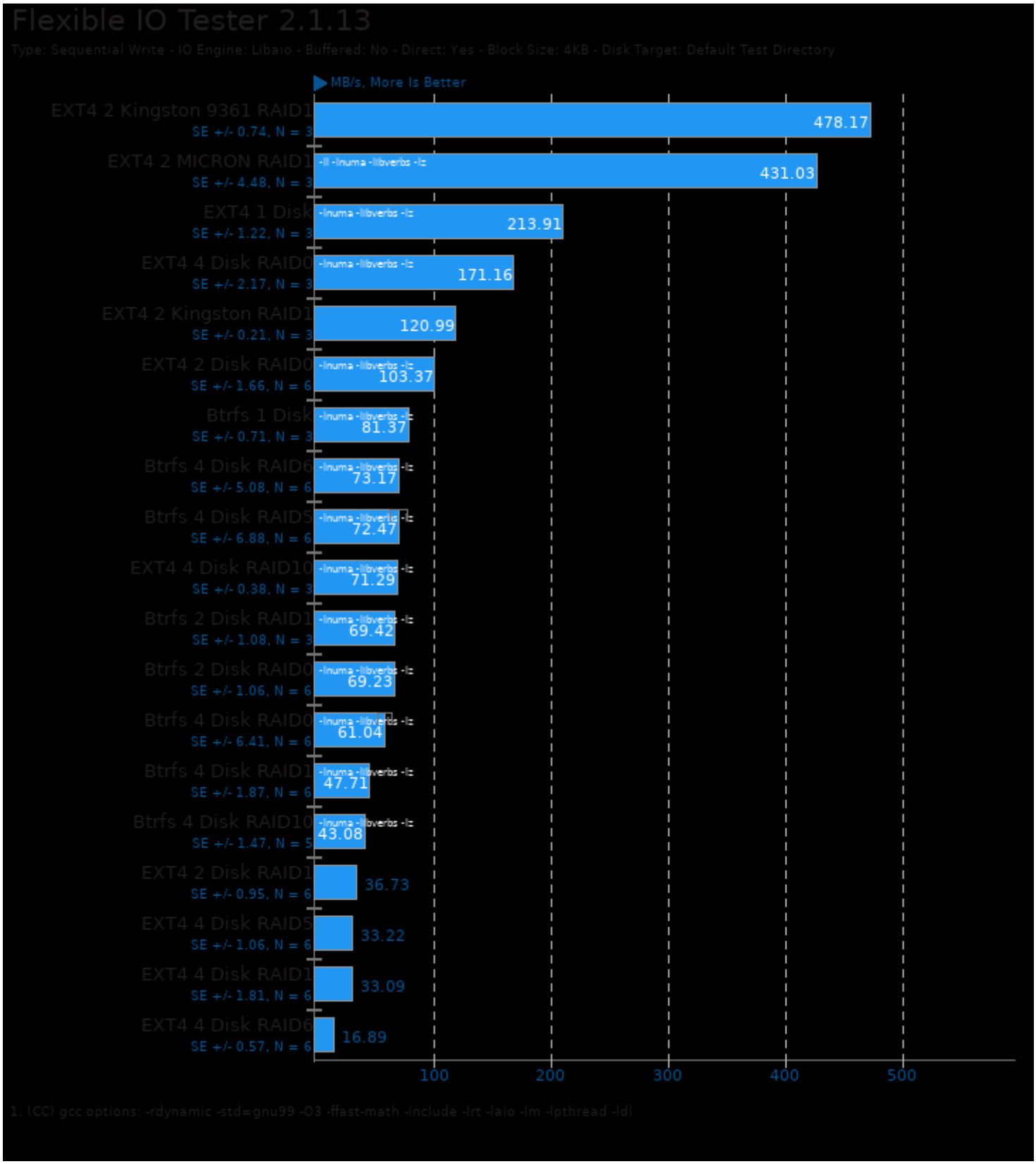



Flexible IO Tester 2.1.13
Type: Random Write - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
EXT4 4 Disk RAID0
SE +/- 8474.14, N = 6
69754
EXT4 2 Disk RAID0
SE +/- 7406.16, N = 6
61257
EXT4 1 Disk
SE +/- 20.28, N = 3
41806
EXT4 2 Kingston 9361 RAID1
SE +/- 242.23, N = 3
36629
EXT4 4 Disk RAID10
SE +/- 4921.14, N = 6
29080
EXT4 2 Kingston RAID1
SE +/- 70.13, N = 3
28518
Btrfs 1 Disk
SE +/- 290.12, N = 6
20583
Btrfs 2 Disk RAID1
SE +/- 412.51, N = 6
18548
Btrfs 4 Disk RAID5
SE +/- 750.71, N = 6
17074
Btrfs 4 Disk RAID6
SE +/- 677.52, N = 6
17049
Btrfs 4 Disk RAID0
SE +/- 1075.44, N = 6
16540
Btrfs 2 Disk RAID0
SE +/- 411.95, N = 6
16186
EXT4 2 MICRON RAID1
SE +/- 163.19, N = 4
11155
Btrfs 4 Disk RAID1
SE +/- 658.43, N = 6
10149
EXT4 4 Disk RAID1
SE +/- 38.35, N = 3
8850
Btrfs 4 Disk RAID10
SE +/- 332.47, N = 6
8599
EXT4 2 Disk RAID1
SE +/- 165.71, N = 6
8389
EXT4 4 Disk RAID5
SE +/- 241.16, N = 6
6480
EXT4 4 Disk RAID6
SE +/- 41.34, N = 3
4270
15K
30K
45K
60K
75K
1. (CC) gcc options: -rdynamic -std=gnu99 -O3 -ffast-math -include -lrt -laio -lm -lpthread -ldl

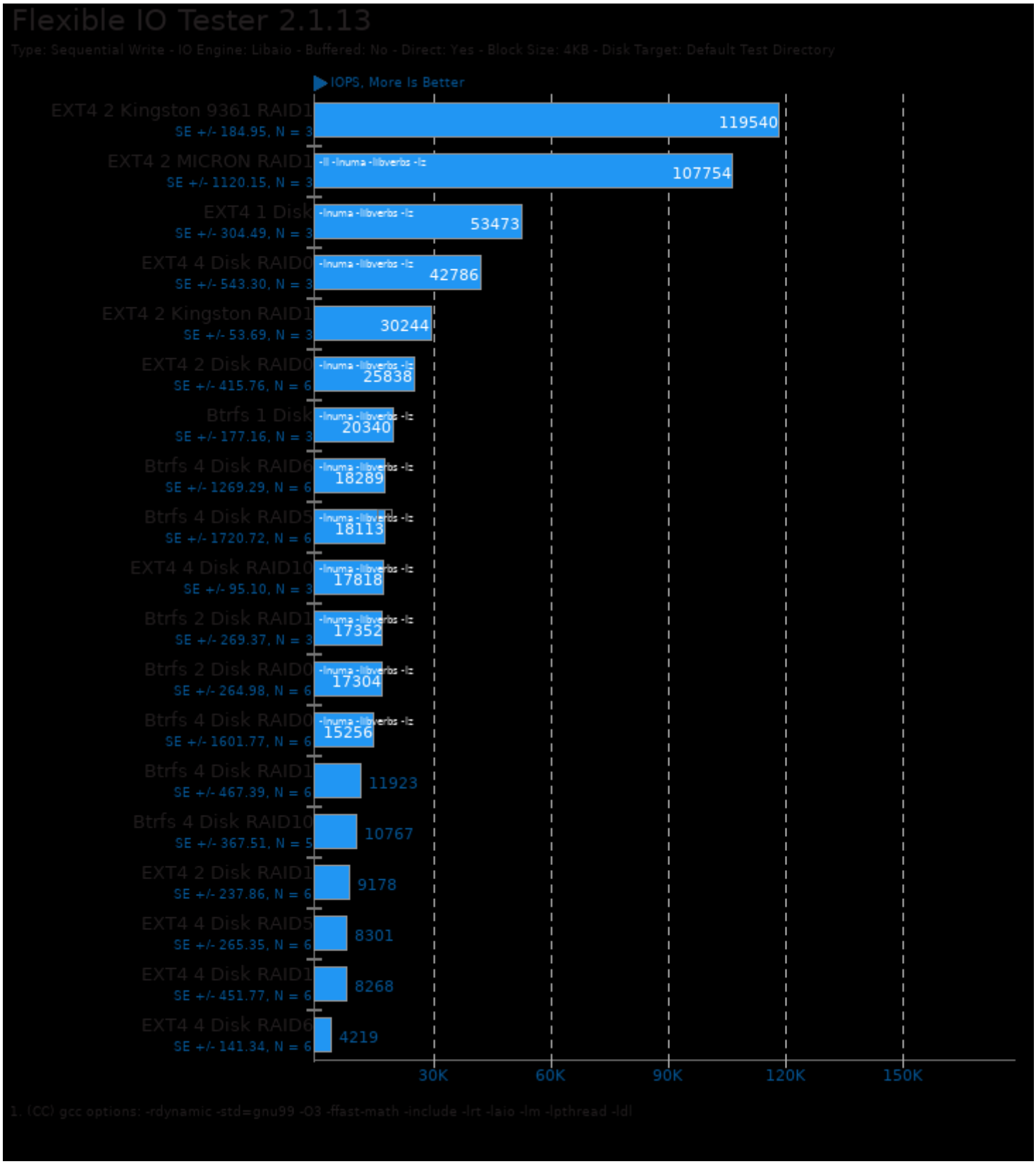

Flexible IO Tester 2.1.13
Type: Sequential Read - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
Btrfs 4 Disk RAID5
SE +/- 5.17, N = 3
402.86
EXT4 2 Kingston 9361 RAID1
SE +/- 2.85, N = 15
370.58
Btrfs 4 Disk RAID6
SE +/- 2.25, N = 3
323.48
Btrfs 4 Disk RAID0
SE +/- 0.38, N = 3
302.93
Btrfs 2 Disk RAID0
SE +/- 0.18, N = 3
234.64
EXT4 2 Kingston RAID1
SE +/- 0.30, N = 3
223.40
EXT4 4 Disk RAID10
SE +/- 0.12, N = 3
217.34
EXT4 2 MICRON RAID1
SE +/- 2.27, N = 15
208.76
Btrfs 4 Disk RAID10
SE +/- 4.48, N = 6
197.04
EXT4 4 Disk RAID6
SE +/- 0.13, N = 3
196.79
Btrfs 4 Disk RAID1
SE +/- 1.42, N = 3
188.29
EXT4 4 Disk RAID5
SE +/- 0.85, N = 3
151.50
EXT4 2 Disk RAID0
SE +/- 0.01, N = 3
144.92
EXT4 4 Disk RAID0
SE +/- 0.38, N = 3
143.94
Btrfs 2 Disk RAID1
SE +/- 0.22, N = 3
123.40
Btrfs 1 Disk
SE +/- 0.21, N = 3
109.25
EXT4 4 Disk RAID1
SE +/- 0.04, N = 3
82.30
EXT4 2 Disk RAID1
SE +/- 0.06, N = 3
76.70
EXT4 1 Disk
SE +/- 0.04, N = 3
76.04
90
180
270
360
450
1. (CC) gcc options: -rdynamic -std=gnu99 -O3 -ffast-math -include -lrt -laio -lm -lpthread -ldl

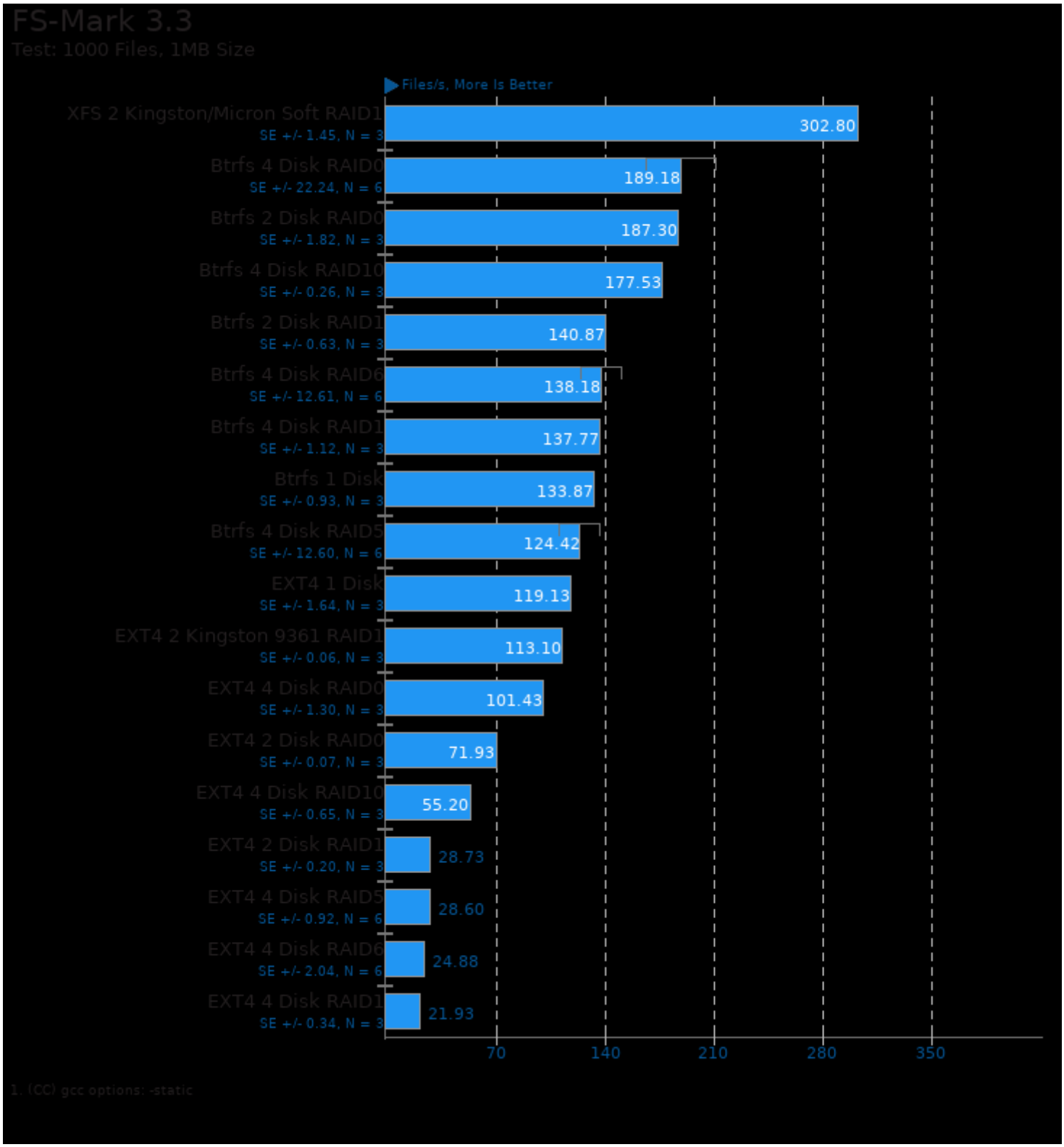
Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests



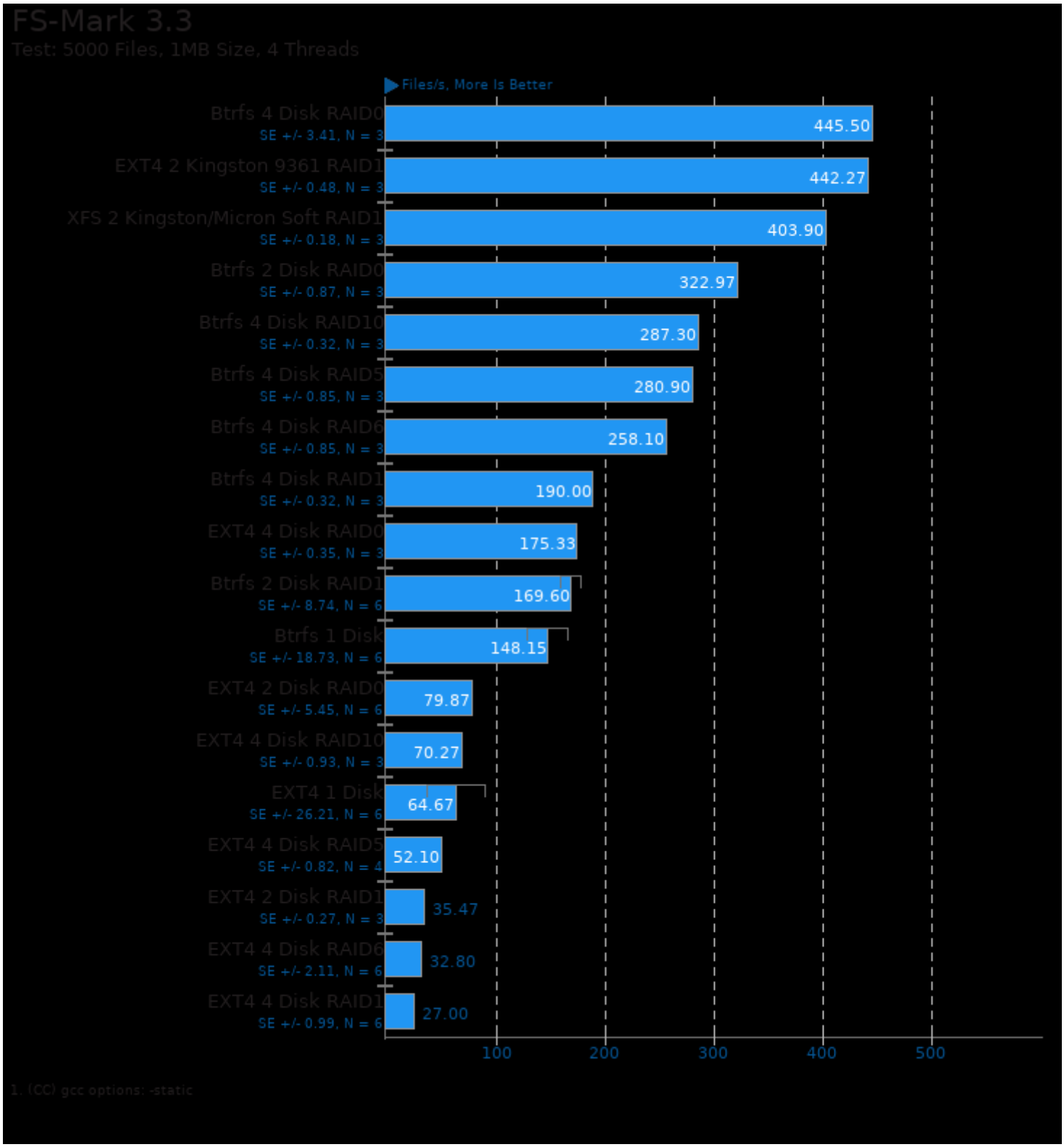

Flexible IO Tester 2.1.13
Type: Sequential Write - IO Engine: Libaio - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
EXT4 2 Kingston 9361 RAID1
SE +/- 0.74, N = 3
478.17
EXT4 2 MICRON RAID1
SE +/- 4.48, N = 3
431.03
EXT4 1 Disk
SE +/- 1.22, N = 3
213.91
EXT4 4 Disk RAID0
SE +/- 2.17, N = 3
171.16
EXT4 2 Kingston RAID1
SE +/- 0.21, N = 3
120.99
EXT4 2 Disk RAID0
SE +/- 1.66, N = 6
103.37
Btrfs 1 Disk
SE +/- 0.71, N = 3
81.37
Btrfs 4 Disk RAID6
SE +/- 5.08, N = 6
73.17
Btrfs 4 Disk RAID5
SE +/- 6.88, N = 6
72.47
EXT4 4 Disk RAID10
SE +/- 0.38, N = 3
71.29
Btrfs 2 Disk RAID1
SE +/- 1.08, N = 3
69.42
Btrfs 2 Disk RAID0
SE +/- 1.06, N = 6
69.23
Btrfs 4 Disk RAID0
SE +/- 6.41, N = 6
61.04
Btrfs 4 Disk RAID1
SE +/- 1.87, N = 6
47.71
Btrfs 4 Disk RAID10
SE +/- 1.47, N = 5
43.08
EXT4 2 Disk RAID1
SE +/- 0.95, N = 6
36.73
EXT4 4 Disk RAID5
SE +/- 1.06, N = 6
33.22
EXT4 4 Disk RAID1
SE +/- 1.81, N = 6
33.09
EXT4 4 Disk RAID6
SE +/- 0.57, N = 6
16.89
100
200
300
400
500
1. (CC) gcc options: -rdynamic -std=gnu99 -O3 -ffast-math -include -lrt -laio -lm -lpthread -ldl

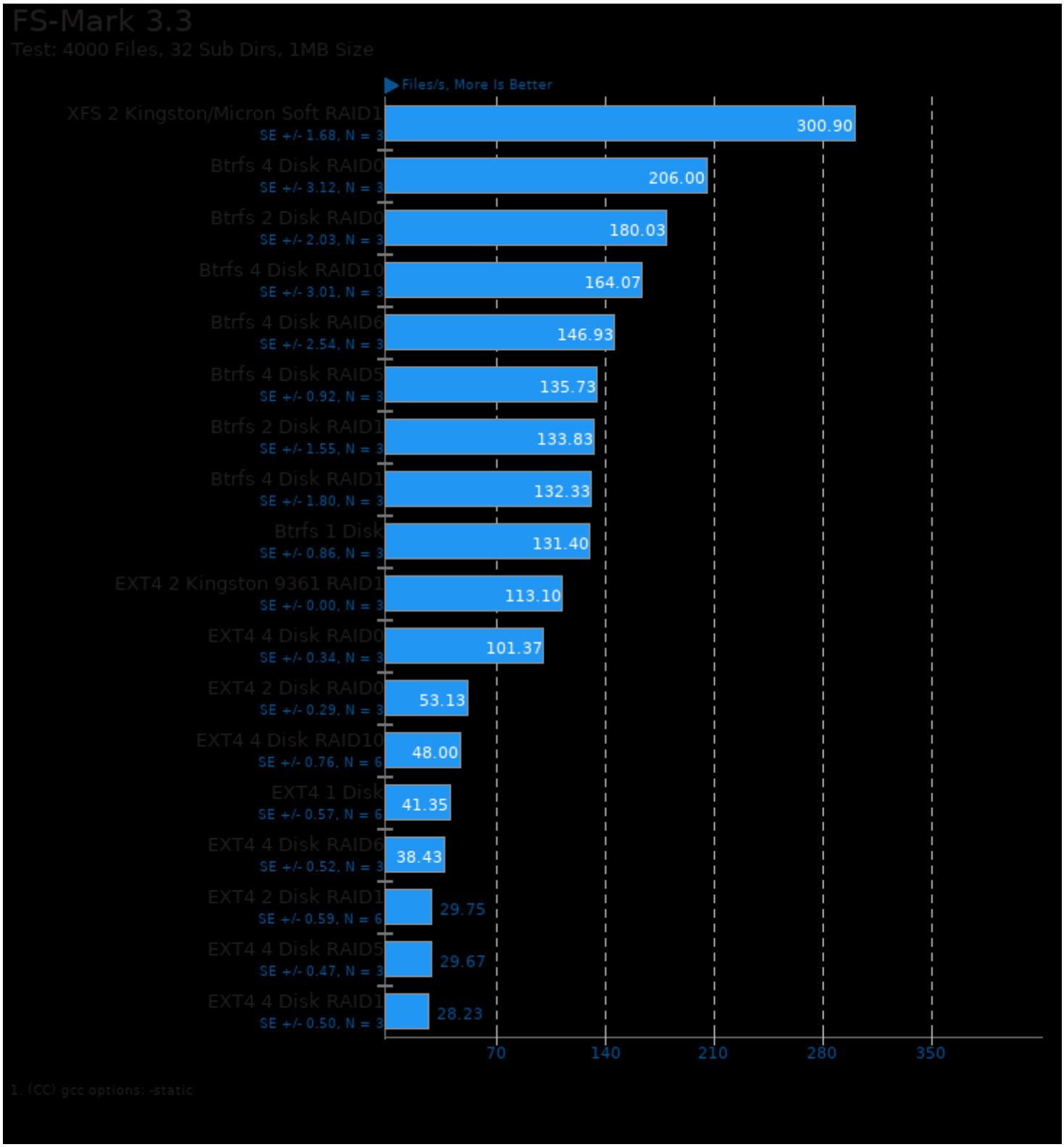
Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests

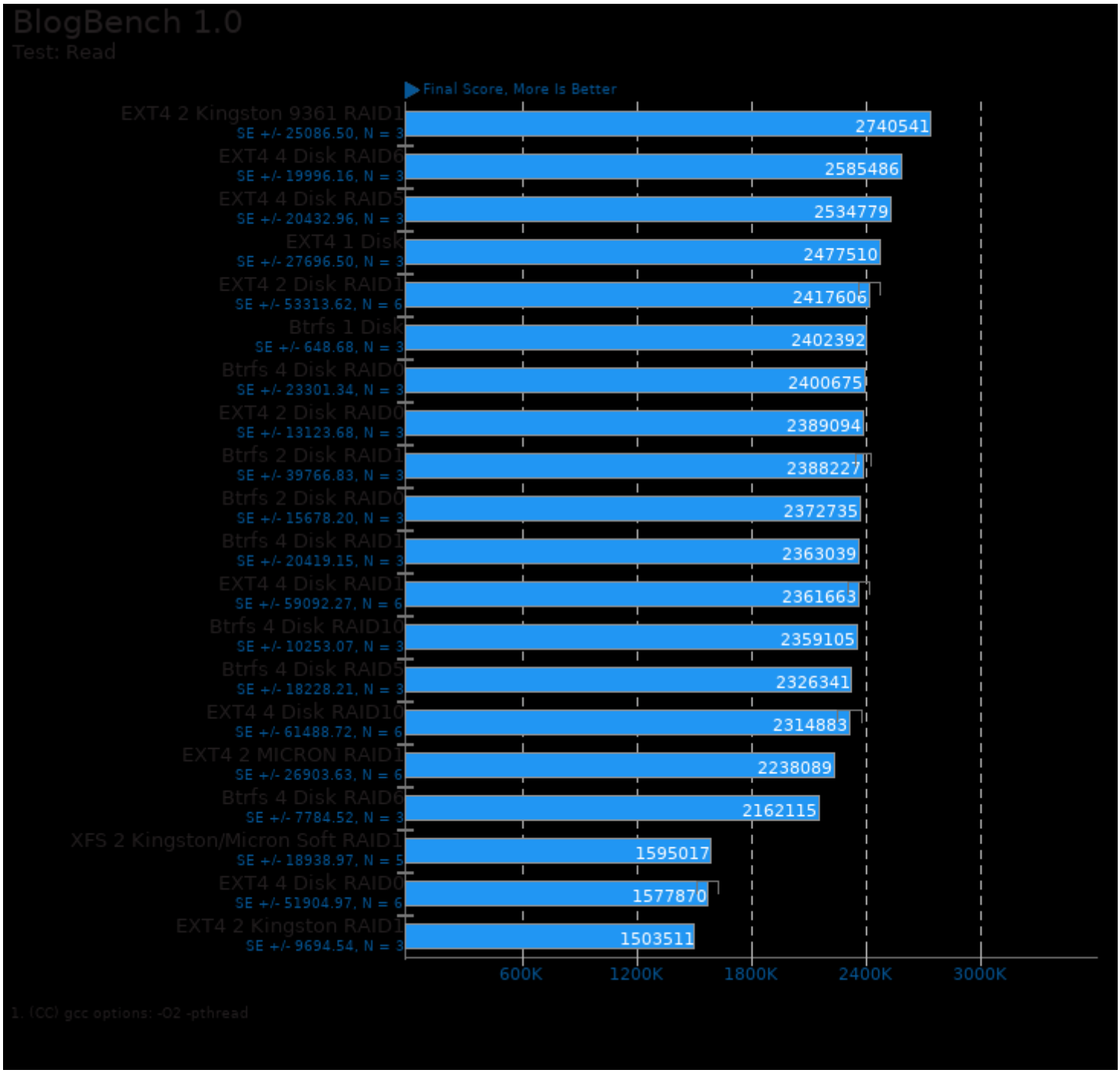



FS-Mark 3.3
Test: 1000 Files, 1MB Size
Files/s, More Is Better
XFS 2 Kingston/Micron Soft RAID1
SE +/- 1.45, N = 3
302.80
Btrfs 4 Disk RAID0
SE +/- 22.24, N = 6
189.18
Btrfs 2 Disk RAID0
SE +/- 1.82, N = 3
187.30
Btrfs 4 Disk RAID10
SE +/- 0.26, N = 3
177.53
Btrfs 2 Disk RAID1
SE +/- 0.63, N = 3
140.87
Btrfs 4 Disk RAID6
SE +/- 12.61, N = 6
138.18
Btrfs 4 Disk RAID1
SE +/- 1.12, N = 3
137.77
Btrfs 1 Disk
SE +/- 0.93, N = 3
133.87
Btrfs 4 Disk RAID5
SE +/- 12.60, N = 6
124.42
EXT4 1 Disk
SE +/- 1.64, N = 3
119.13
EXT4 2 Kingston 9361 RAID1
SE +/- 0.06, N = 3
113.10
EXT4 4 Disk RAID0
SE +/- 1.30, N = 3
101.43
EXT4 2 Disk RAID0
SE +/- 0.07, N = 3
71.93
EXT4 4 Disk RAID10
SE +/- 0.65, N = 3
55.20
EXT4 2 Disk RAID1
SE +/- 0.20, N = 3
28.73
EXT4 4 Disk RAID5
SE +/- 0.92, N = 6
28.60
EXT4 4 Disk RAID6
SE +/- 2.04, N = 6
24.88
EXT4 4 Disk RAID1
SE +/- 0.34, N = 3
21.93
70
140
210
280
350
1. (CC) gcc options: -static

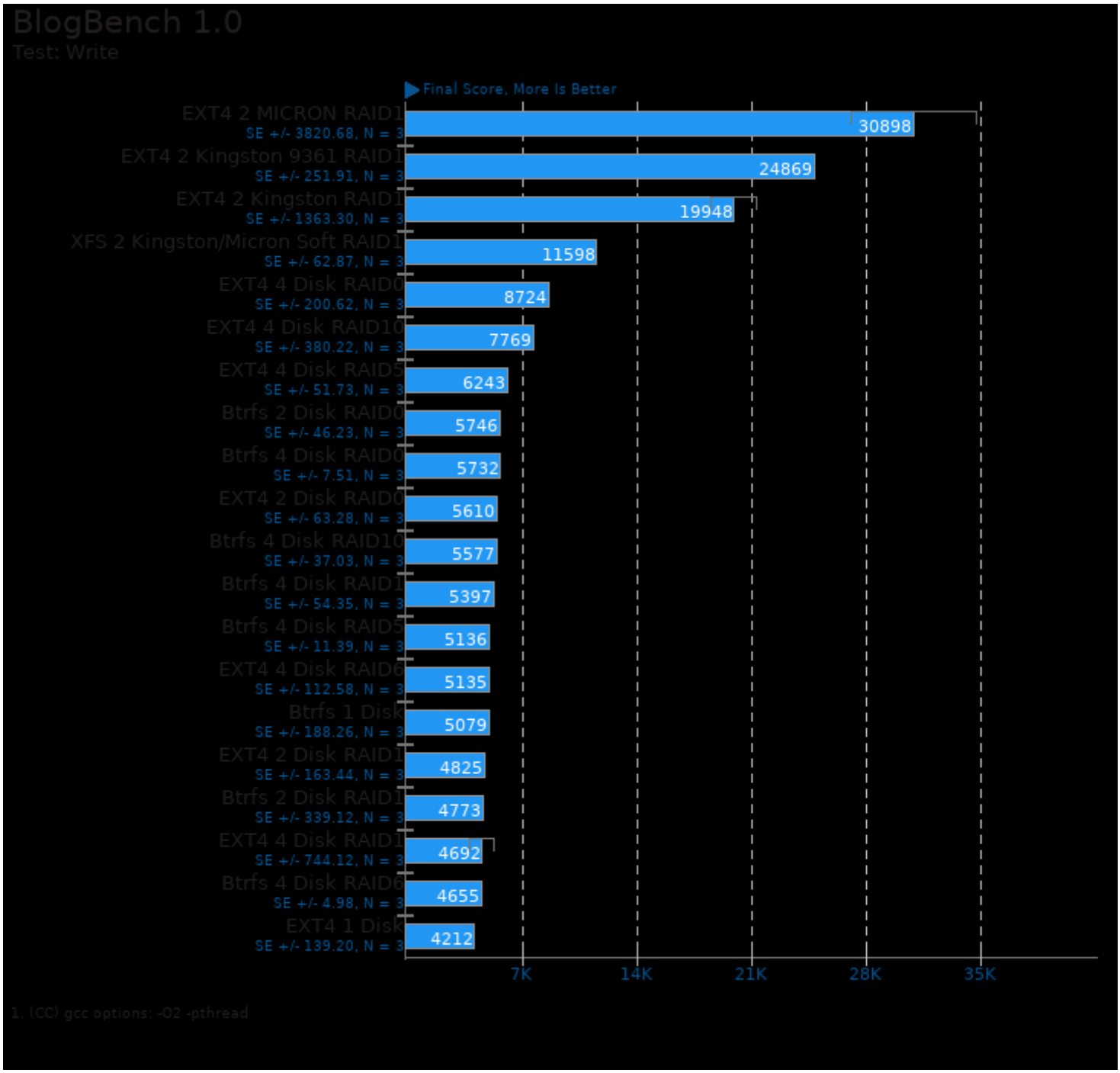
Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests



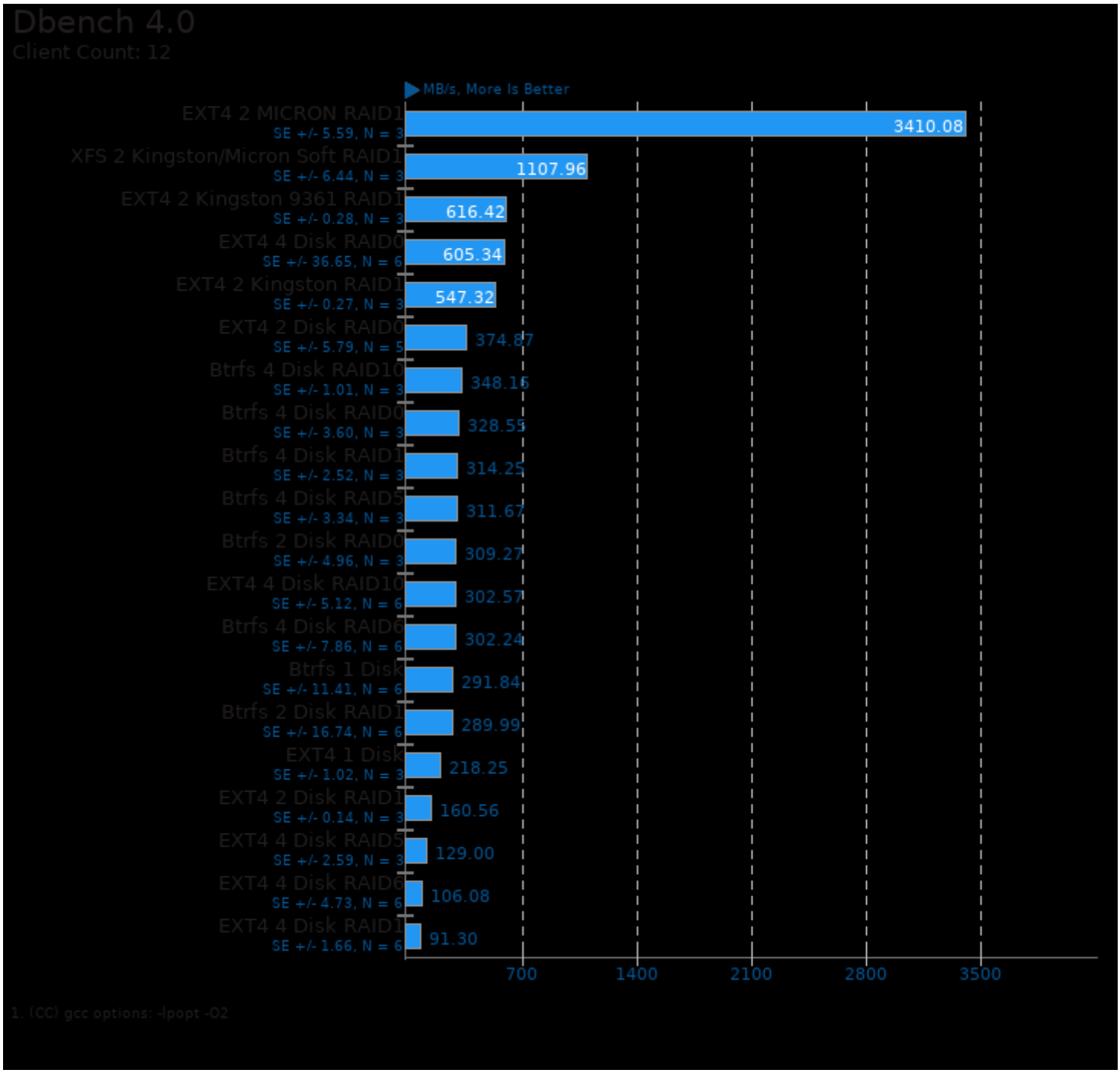

FS-Mark 3.3
Test: 4000 Files, 32 Sub Dirs, 1MB Size
Files/s, More Is Better
XFS 2 Kingston/Micron Soft RAID1
SE +/- 1.68, N = 3
300.90
Btrfs 4 Disk RAID0
SE +/- 3.12, N = 3
206.00
Btrfs 2 Disk RAID0
SE +/- 2.03, N = 3
180.03
Btrfs 4 Disk RAID10
SE +/- 3.01, N = 3
164.07
Btrfs 4 Disk RAID6
SE +/- 2.54, N = 3
146.93
Btrfs 4 Disk RAID5
SE +/- 0.92, N = 3
135.73
Btrfs 2 Disk RAID1
SE +/- 1.55, N = 3
133.83
Btrfs 4 Disk RAID1
SE +/- 1.80, N = 3
132.33
Btrfs 1 Disk
SE +/- 0.86, N = 3
131.40
EXT4 2 Kingston 9361 RAID1
SE +/- 0.00, N = 3
113.10
EXT4 4 Disk RAID0
SE +/- 0.34, N = 3
101.37
EXT4 2 Disk RAID0
SE +/- 0.29, N = 3
53.13
EXT4 4 Disk RAID10
SE +/- 0.76, N = 6
48.00
EXT4 1 Disk
SE +/- 0.57, N = 6
41.35
EXT4 4 Disk RAID6
SE +/- 0.52, N = 3
38.43
EXT4 2 Disk RAID1
SE +/- 0.59, N = 6
29.75
EXT4 4 Disk RAID5
SE +/- 0.47, N = 3
29.67
EXT4 4 Disk RAID1
SE +/- 0.50, N = 3
28.23
70
140
210
280
350
1. (CC) gcc options: -static

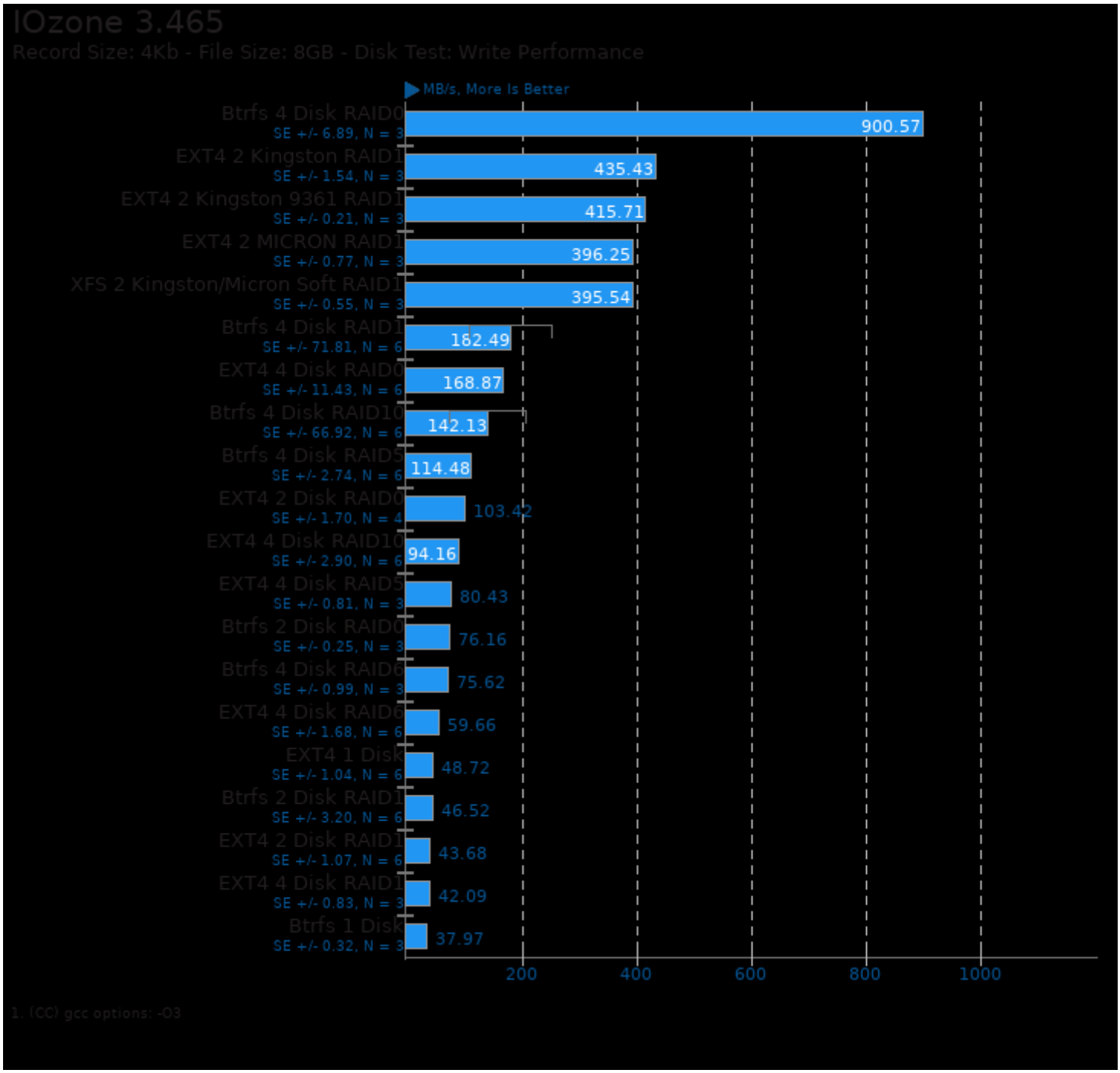

BlogBench 1.0
Test: Read
Final Score, More Is Better
EXT4 2 Kingston 9361 RAID1
SE +/- 25086.50, N = 3
2740541
EXT4 4 Disk RAID0
SE +/- 19996.16, N = 3
2585486
EXT4 4 Disk RAID5
SE +/- 20432.96, N = 3
2534779
EXT4 1 Disk
SE +/- 27696.50, N = 3
2477510
EXT4 2 Disk RAID1
SE +/- 53313.62, N = 6
2417606
Btrfs 1 Disk
SE +/- 648.68, N = 3
2402392
Btrfs 4 Disk RAID0
SE +/- 23301.34, N = 3
2400675
EXT4 2 Disk RAID0
SE +/- 13123.68, N = 3
2389094
Btrfs 2 Disk RAID1
SE +/- 39766.83, N = 3
2388227
Btrfs 2 Disk RAID0
SE +/- 15678.20, N = 3
2372735
Btrfs 4 Disk RAID1
SE +/- 20419.15, N = 3
2363039
EXT4 4 Disk RAID1
SE +/- 59092.27, N = 6
2361663
Btrfs 4 Disk RAID10
SE +/- 10253.07, N = 3
2359105
Btrfs 4 Disk RAID5
SE +/- 18228.21, N = 3
2326341
EXT4 4 Disk RAID10
SE +/- 61488.72, N = 6
2314883
EXT4 2 MICRON RAID1
SE +/- 26903.63, N = 6
2238089
Btrfs 4 Disk RAID6
SE +/- 7784.52, N = 3
2162115
XFS 2 Kingston/Micron Soft RAID1
SE +/- 18938.97, N = 5
1595017
EXT4 4 Disk RAID0
SE +/- 51904.97, N = 6
1577870
EXT4 2 Kingston RAID1
SE +/- 9694.54, N = 3
1503511
600K
1200K
1800K
2400K
3000K
1. (CC) gcc options: -O2 -pthread

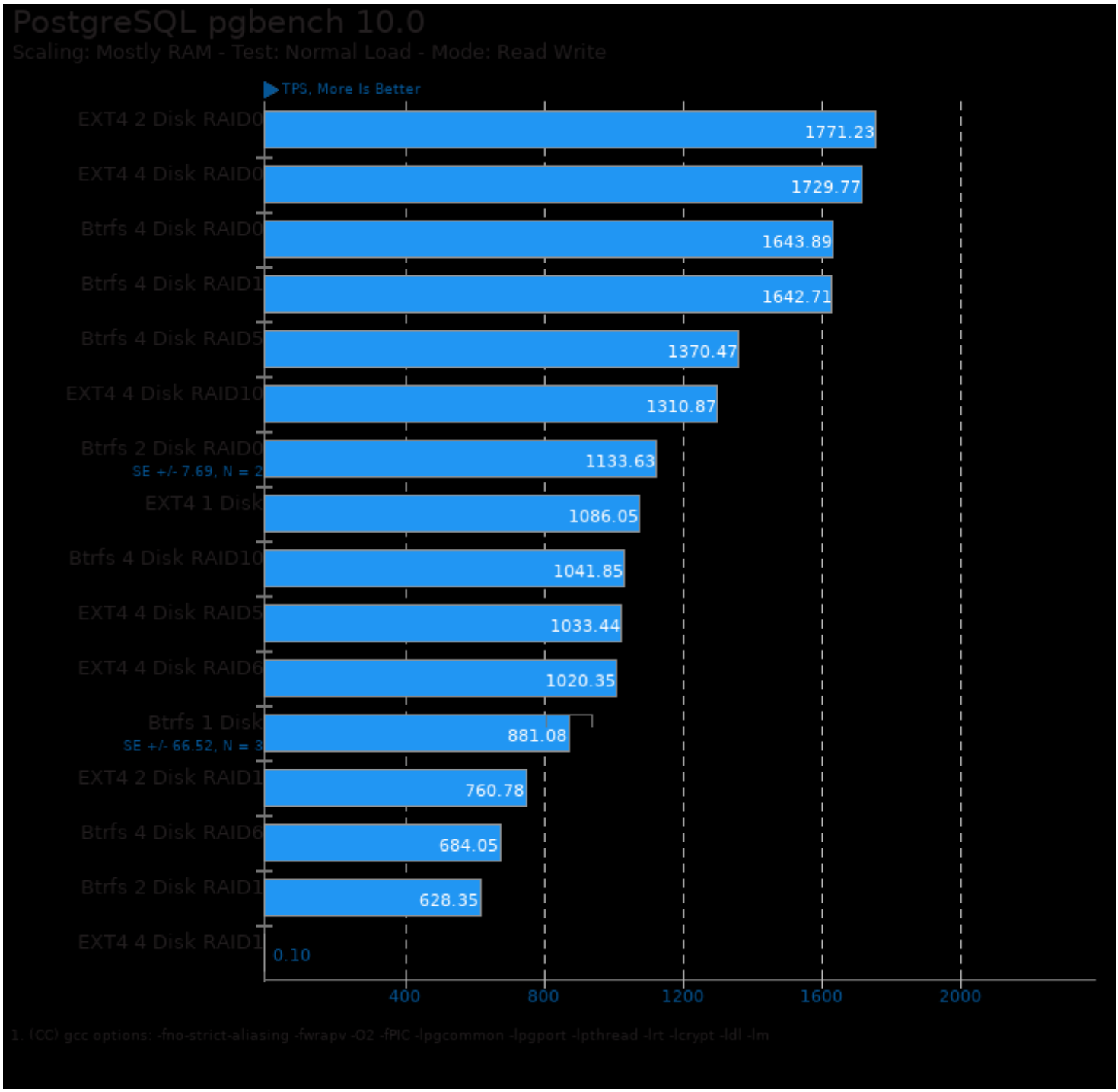
Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests



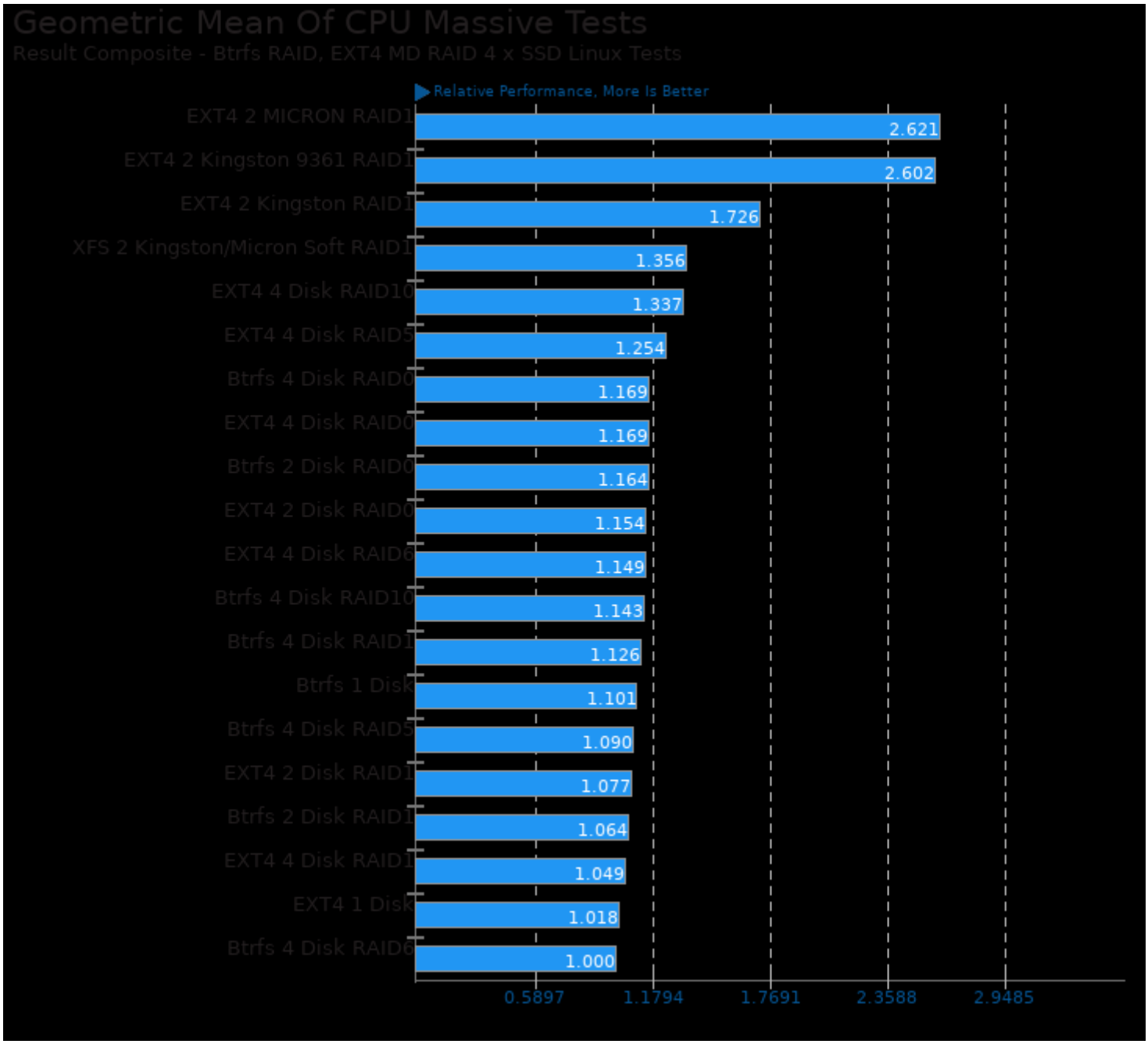
Btrfs RAID, EXT4 MD RAID 4 x SSD Linux Tests



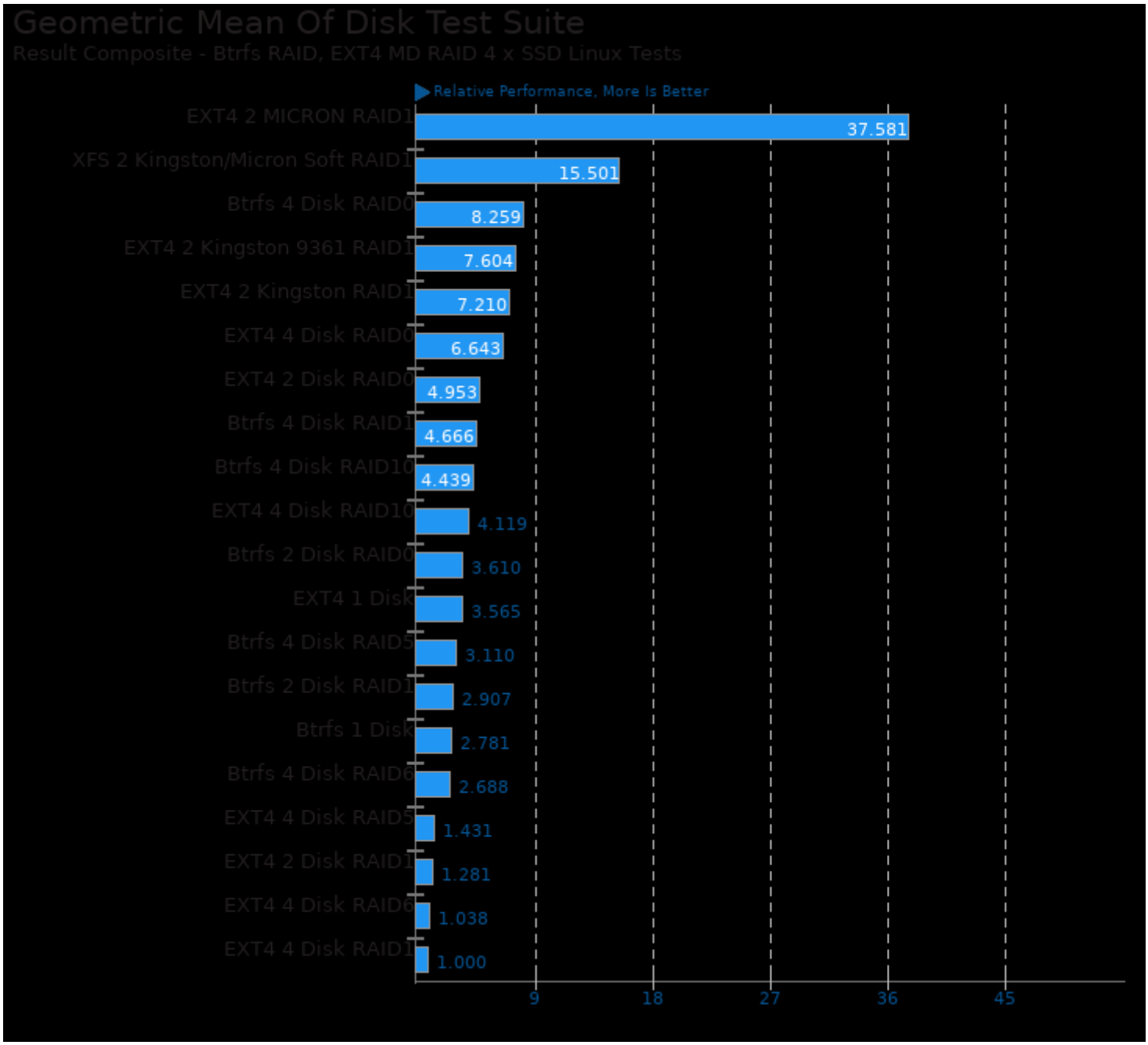

IOzone 3.465
Record Size: 4Kb - File Size: 8GB - Disk Test: Write Performance
MB/s, More Is Better
Btrfs 4 Disk RAID0
SE +/- 6.89, N = 3
900.57
EXT4 2 Kingston RAID1
SE +/- 1.54, N = 3
435.43
EXT4 2 Kingston 9361 RAID1
SE +/- 0.21, N = 3
415.71
EXT4 2 MICRON RAID1
SE +/- 0.77, N = 3
396.25
XFS 2 Kingston/Micron Soft RAID1
SE +/- 0.55, N = 3
395.54
Btrfs 4 Disk RAID1
SE +/- 71.81, N = 6
182.49
EXT4 4 Disk RAID0
SE +/- 11.43, N = 6
168.87
Btrfs 4 Disk RAID10
SE +/- 66.92, N = 6
142.13
Btrfs 4 Disk RAID5
SE +/- 2.74, N = 6
114.48
EXT4 2 Disk RAID0
SE +/- 1.70, N = 4
103.42
EXT4 4 Disk RAID10
SE +/- 2.90, N = 6
94.16
EXT4 4 Disk RAID5
SE +/- 0.81, N = 3
80.43
Btrfs 2 Disk RAID0
SE +/- 0.25, N = 3
76.16
Btrfs 4 Disk RAID6
SE +/- 0.99, N = 3
75.62
EXT4 4 Disk RAID6
SE +/- 1.68, N = 6
59.66
EXT4 1 Disk
SE +/- 1.04, N = 6
48.72
Btrfs 2 Disk RAID1
SE +/- 3.20, N = 6
46.52
EXT4 2 Disk RAID1
SE +/- 1.07, N = 6
43.68
EXT4 4 Disk RAID1
SE +/- 0.83, N = 3
42.09
Btrfs 1 Disk
SE +/- 0.32, N = 3
37.97
200
400
600
800
1000
1. (CC) gcc options: -O3


PostgreSQL pgbench 10.0
Scaling: Mostly RAM - Test: Normal Load - Mode: Read Write
TPS, More Is Better
EXT4 2 Disk RAID0
1771.23
EXT4 4 Disk RAID0
1729.77
Btrfs 4 Disk RAID0
1643.89
Btrfs 4 Disk RAID1
1642.71
Btrfs 4 Disk RAID5
1370.47
EXT4 4 Disk RAID10
1310.87
Btrfs 2 Disk RAID0
1133.63
SE +/- 7.69, N = 2
EXT4 1 Disk
1086.05
Btrfs 4 Disk RAID10
1041.85
EXT4 4 Disk RAID5
1033.44
EXT4 4 Disk RAID6
1020.35
Btrfs 1 Disk
881.08
SE +/- 66.52, N = 3
EXT4 2 Disk RAID1
760.78
Btrfs 4 Disk RAID6
684.05
Btrfs 2 Disk RAID1
628.35
EXT4 4 Disk RAID1
0.10
400
800
1200
1600
2000
1. (CC) gcc options: -fno-strict-aliasing -fwrapv -O2 -fPIC -lpgcommon -lpgport -lpthread -lrt -lcrypt -ldl -lm

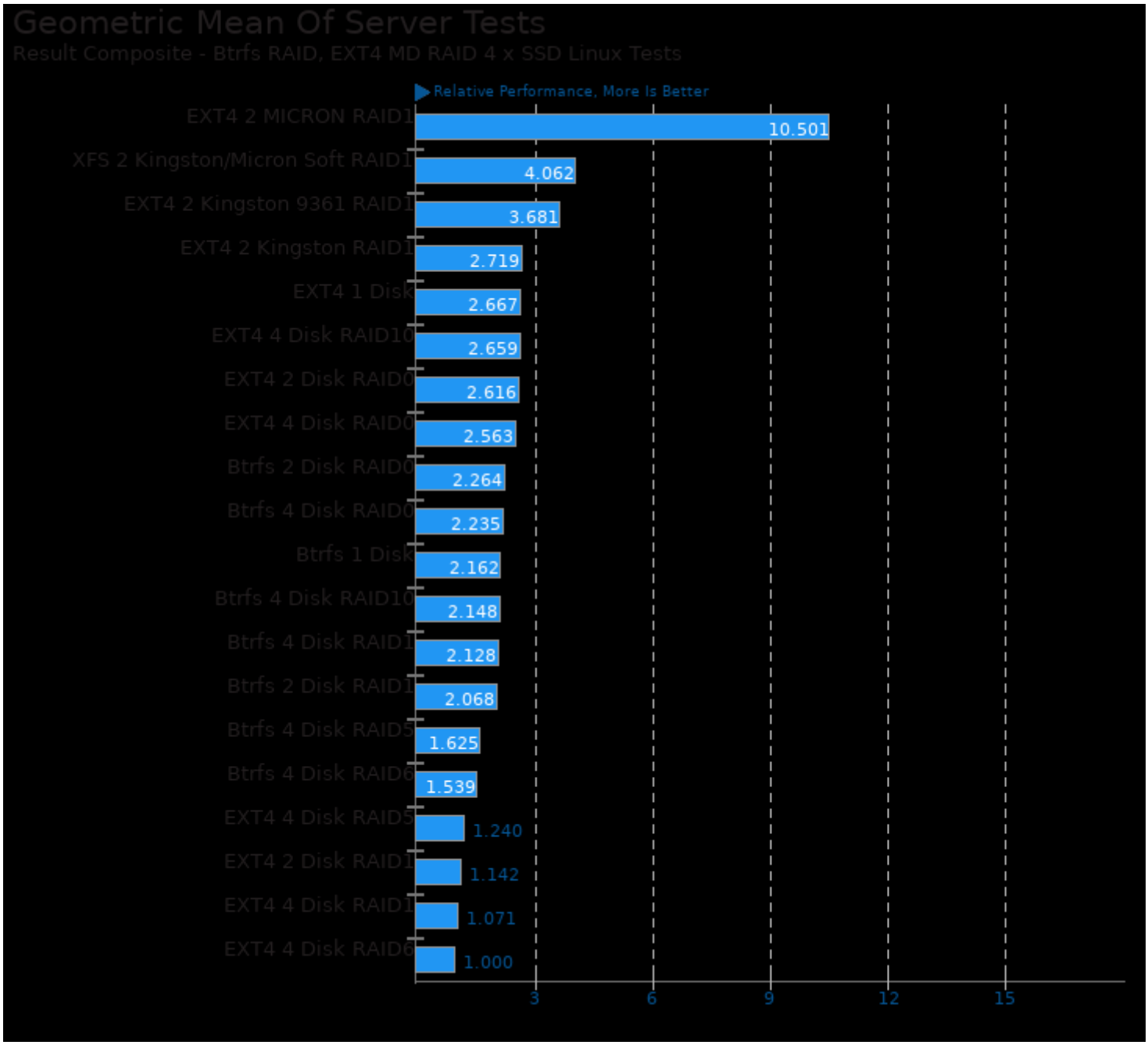
These geometric means are based upon test groupings / test suites for this result file.



Geometric mean based upon tests: pts/blogbench and pts/pgbench



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



Geometric mean based upon tests: pts/blogbench, pts/pgbench and pts/sqlite

This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 11:57.