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truenasjune2022

Xen HVM domU 4.13 testing on Ubuntu 20.04 via the Phoronix Test Suite.

Automated Executive Summary

TrueNAS Core 13 iSCSI had the most wins, coming in first place for 37% of the tests.

Based on the geometric mean of all complete results, the fastest (TrueNAS Core 13 iSCSI) was 1.495x the speed of the slowest (TrueNAS Scale 22.02.2 NFS). TrueNAS Core 13 ZFS was 0.987x the speed of TrueNAS Core 13 iSCSI, TrueNAS Scale 22.02.2 iSCSI was 0.717x the speed of TrueNAS Core 13 ZFS, TrueNAS Scale 22.02.2 NFS was 0.944x the speed of TrueNAS Scale 22.02.2 iSCSI.

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

Flexible IO Tester (Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory) at 2.669x
Flexible IO Tester (Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory) at 2.667x
Flexible IO Tester (Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory) at 2.213x
Flexible IO Tester (Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory) at 2.211x

Flexible IO Tester (Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory) at 1.599x
Flexible IO Tester (Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory) at 1.599x
Flexible IO Tester (Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory) at 1.226x
Flexible IO Tester (Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory) at 1.226x
Flexible IO Tester (Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 128KB - Disk Target: Default Test Directory) at 1.208x
Flexible IO Tester (Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 128KB - Disk Target: Default Test Directory) at 1.208x.

Test Systems:

TrueNAS Core 13 ZFS

TrueNAS Core 13 iSCSI

TrueNAS Scale 22.02.2 NFS

TrueNAS Scale 22.02.2 iSCSI

Processor: AMD Ryzen 5 5600G (8 Cores), Motherboard: Xen HVM domU v4.13, Chipset: Intel 440FX 82441FX PMC, Memory: 4096MB, Disk: 29GB, Graphics: bochs-drmdrmfb

OS: Ubuntu 20.04, Kernel: 5.4.0-120-generic (x86_64), Vulkan: 1.1.182, Compiler: GCC 9.4.0, File-System: ext4, Screen Resolution: 1024x768, System Layer: Xen HVM domU 4.13

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-Av3uEd/gcc-9-9.4.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Processor Notes: CPU Microcode: 0xa50000b
Disk Mount Options Notes: relatime,rw
Disk Details Notes: Block Size: 4096
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + mmio_stale_data: Not affected + spec_store_bypass: Vulnerable + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Retpolines IBPB: conditional STIBP: disabled RSB filling + srbds: Not affected + tsx_async_abort: Not affected

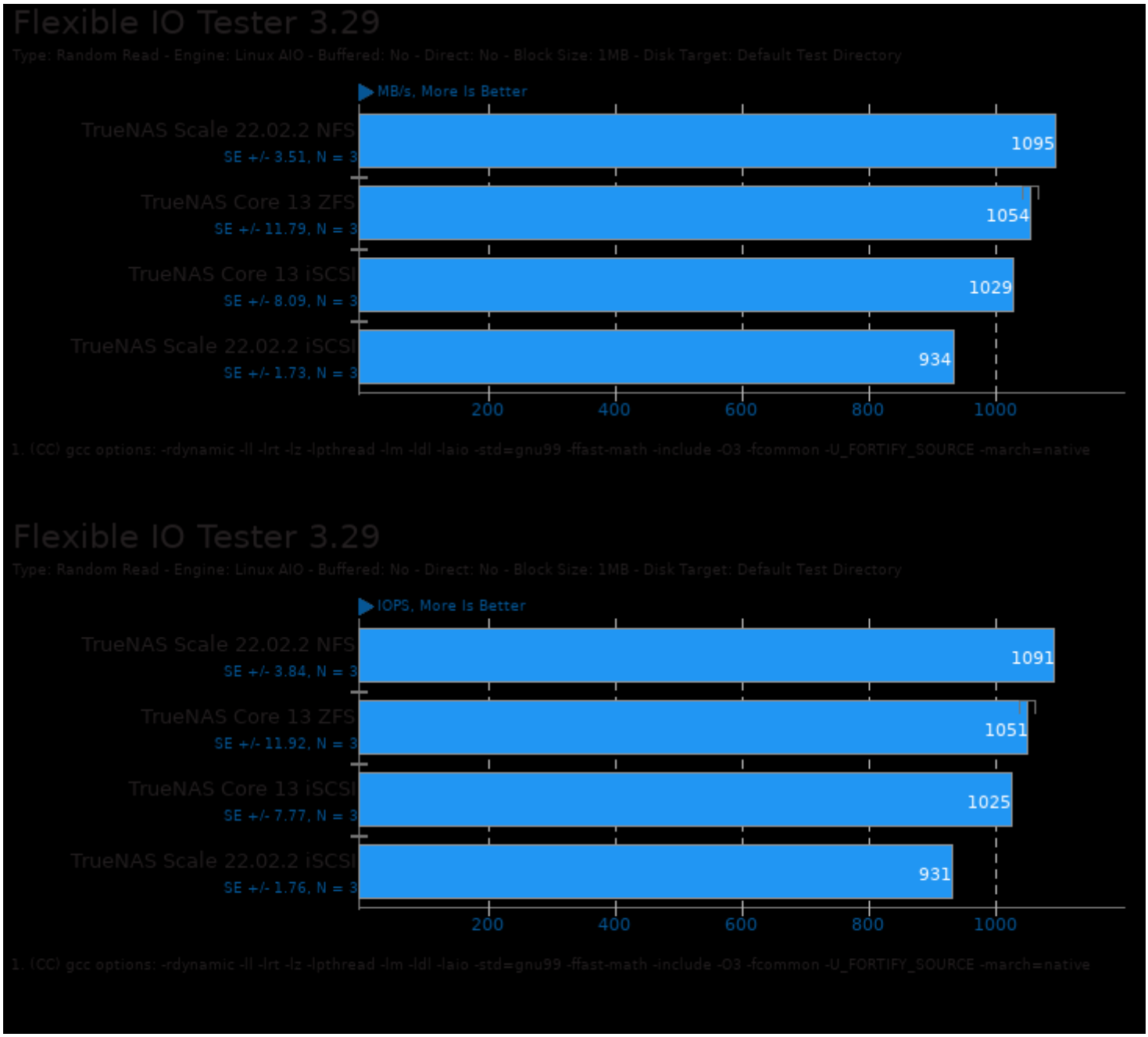
	TrueNAS Core 13 ZFS	TrueNAS Core 13 iSCSI	TrueNAS Scale 22.02.2 NFS	TrueNAS Scale 22.02.2 iSCSI

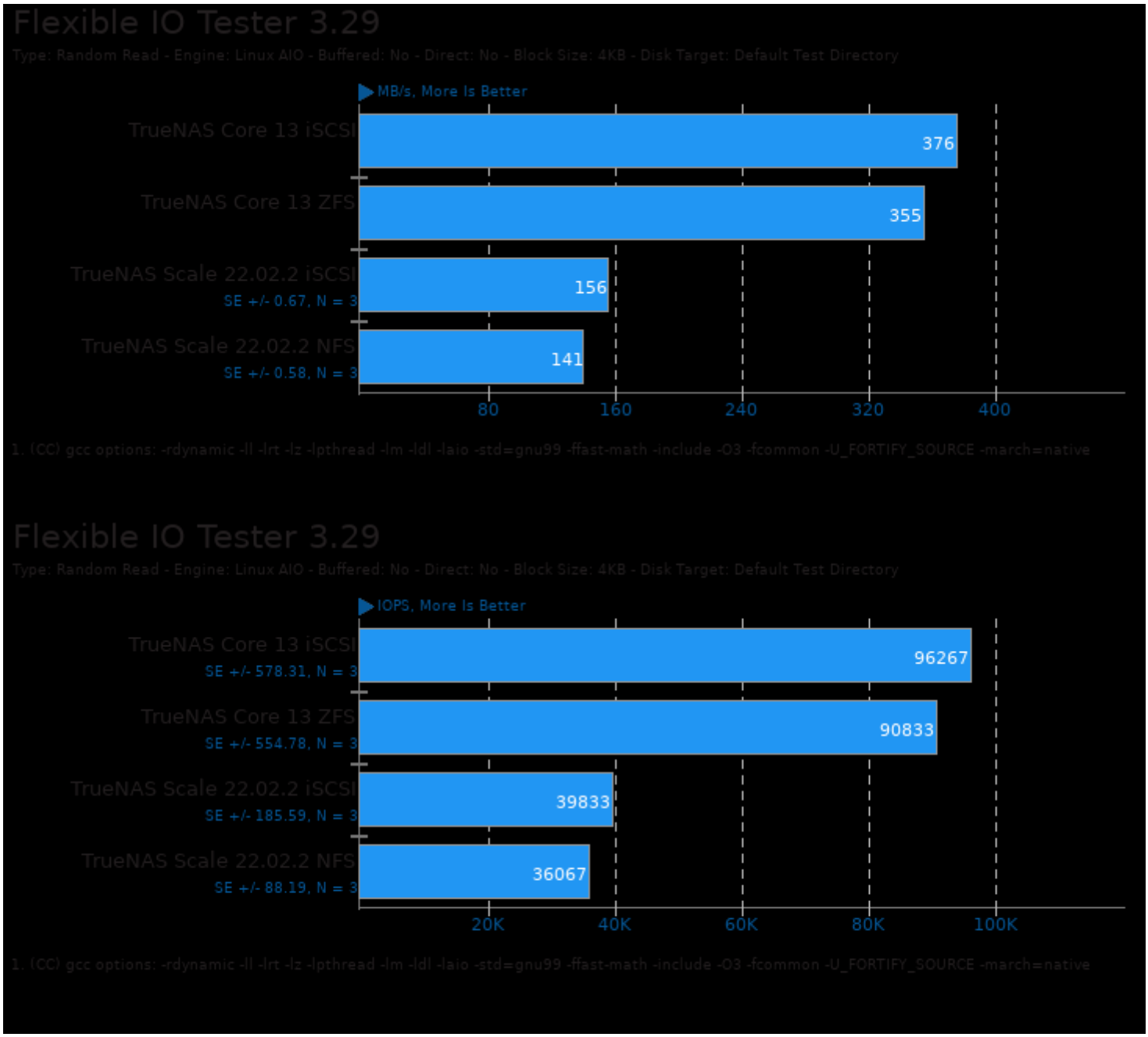
Flexible IO Tester - Rand Read - Linux AIO - No - No - 1MB (MB/s)	1054	1029	**1095**	**934**
Normalized	96.26%	93.97%	100%	85.3%
Standard Deviation	1.9%	1.4%	0.6%	0.3%
Flexible IO Tester - Rand Read - Linux AIO - No - No - 1MB (IOPS)	1051	1025	**1091**	**931**
Normalized	96.33%	93.95%	100%	85.33%
Standard Deviation	2%	1.3%	0.6%	0.3%
Flexible IO Tester - Rand Read - Linux AIO - No - No - 4KB (MB/s)	355	**376**	**141**	156
Normalized	94.41%	100%	37.5%	41.49%
Standard Deviation			0.7%	0.7%
Flexible IO Tester - Rand Read - Linux AIO - No - No - 4KB (IOPS)	90833	**96267**	**36067**	39833
Normalized	94.36%	100%	37.47%	41.38%
Standard Deviation	1.1%	1%	0.4%	0.8%
Flexible IO Tester - Rand Read - Linux AIO - No - No - 8KB (MB/s)	**728**	704	**329**	366
Normalized	100%	96.7%	45.19%	50.27%
Standard Deviation	0.8%	0.8%	2%	0.3%
Flexible IO Tester - Rand Read - Linux AIO - No - No - 8KB (IOPS)	**93167**	90100	**42133**	46833
Normalized	100%	96.71%	45.22%	50.27%
Standard Deviation	0.8%	0.8%	2%	0.3%
Flexible IO Tester - Rand Write - Linux AIO - No - No - 1MB (MB/s)	**802**	855	**891**	824
Normalized	90.01%	95.96%	100%	92.48%
Standard Deviation	16.8%	18%	2.4%	2%
Flexible IO Tester - Rand Write - Linux AIO - No - No - 1MB (IOPS)	**799**	851	**887**	820
Normalized	90.08%	95.94%	100%	92.45%
Standard Deviation	16.8%	18.1%	2.4%	2.1%
Flexible IO Tester - Rand Write - Linux AIO - No - No - 4KB (MB/s)	244	**316**	**42.427**	88.5
Normalized	77.22%	100%	13.43%	28.01%
Standard Deviation	13.4%	20.4%	59%	39.1%
Flexible IO Tester - Rand Write - Linux AIO - No - No - 4KB (IOPS)	62580	**80808**	**10841**	22676
Normalized	77.44%	100%	13.42%	28.06%
Standard Deviation	13.4%	20.4%	59.1%	39.1%
Flexible IO Tester - Rand Write - Linux AIO - No - No - 8KB (MB/s)	430	**533**	**133.9**	233
Normalized	80.68%	100%	25.12%	43.71%
Standard Deviation	12%	13.3%	40.6%	2%
Flexible IO Tester - Rand Write - Linux AIO - No - No - 8KB (IOPS)	54993	**68220**	**17138**	29800
Normalized	80.61%	100%	25.12%	43.68%
Standard Deviation	12%	13.3%	40.6%	1.9%
Flexible IO Tester - Rand Read - Linux AIO - No - No - 128KB (MB/s)	**1094**	1019	1091	**925**
Normalized	100%	93.14%	99.73%	84.55%
Standard Deviation	1.3%	0.3%	0.7%	0.8%

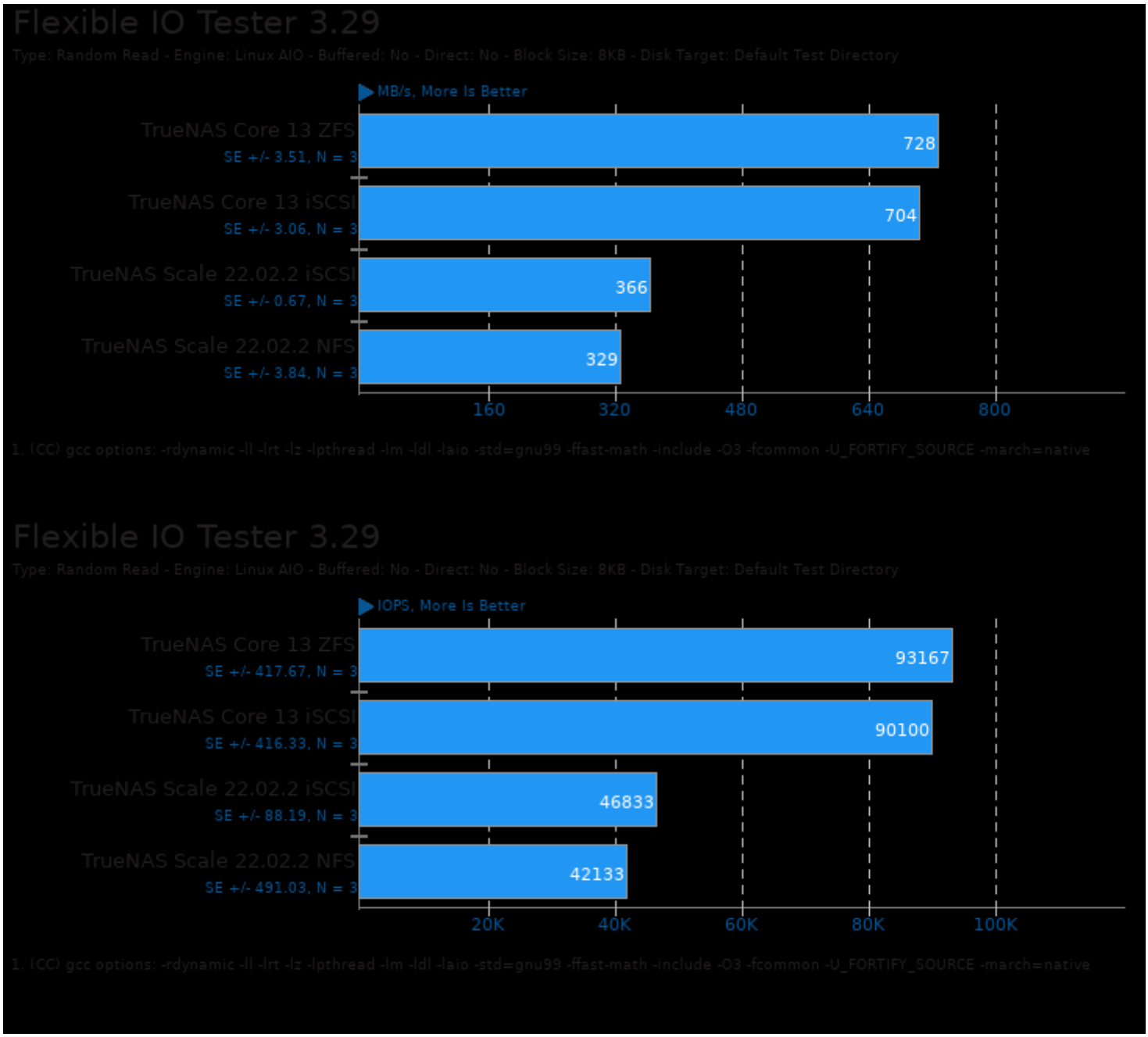
Flexible IO Tester - Rand Read - Linux AIO - No - No - 128KB (IOPS)	**8748**	8147	8722	**7397**
Normalized	100%	93.13%	99.7%	84.56%
Standard Deviation	1.3%	0.4%	0.7%	0.8%
Flexible IO Tester - Rand Write - Linux AIO - No - No - 128KB (MB/s)	**951**	843	**589**	731
Normalized	100%	88.64%	61.93%	76.87%
Standard Deviation	6.4%	25%	27.4%	16.4%
Flexible IO Tester - Rand Write - Linux AIO - No - No - 128KB (IOPS)	**7600**	6741	**4707**	5841
Normalized	100%	88.7%	61.93%	76.86%
Standard Deviation	6.4%	25%	27.5%	16.4%
Flexible IO Tester - Seq Read - Linux AIO - No - No - 1MB (MB/s)	1082	1019	**1092**	**925**
Normalized	99.08%	93.32%	100%	84.71%
Standard Deviation	1.3%	0.9%	0.2%	1.2%
Flexible IO Tester - Seq Read - Linux AIO - No - No - 1MB (IOPS)	1079	1015	**1088**	**921**
Normalized	99.17%	93.29%	100%	84.65%
Standard Deviation	1.3%		0.2%	1.2%
Flexible IO Tester - Seq Read - Linux AIO - No - No - 4KB (MB/s)	**622**	591	414	**389**
Normalized	100%	95.02%	66.56%	62.54%
Standard Deviation	2.3%	2.3%	2.1%	0.8%
Flexible IO Tester - Seq Read - Linux AIO - No - No - 4KB (IOPS)	**159000**	151333	106000	**99433**
Normalized	100%	95.18%	66.67%	62.54%
Standard Deviation	2.3%	2.3%	1.9%	0.6%
Flexible IO Tester - Seq Read - Linux AIO - No - No - 8KB (MB/s)	976	**1003**	912	**818**
Normalized	97.31%	100%	90.93%	81.56%
Standard Deviation	2.3%	0.3%	0.3%	1.3%
Flexible IO Tester - Seq Read - Linux AIO - No - No - 8KB (IOPS)	125000	**128333**	116667	**104667**
Normalized	97.4%	100%	90.91%	81.56%
Standard Deviation	2.5%	0.4%	0.5%	1.5%
Flexible IO Tester - Seq Write - Linux AIO - No - No - 1MB (MB/s)	**669.0**	**764**	687	685
Normalized	87.57%	100%	89.92%	89.66%
Standard Deviation	35.9%	25.4%	34.9%	32.1%
Flexible IO Tester - Seq Write - Linux AIO - No - No - 1MB (IOPS)	**665**	**760**	683	681
Normalized	87.5%	100%	89.87%	89.61%
Standard Deviation	36.1%	25.5%	35%	32.3%
Flexible IO Tester - Seq Write - Linux AIO - No - No - 4KB (MB/s)	**527**	458.9	**239.3**	331
Normalized	100%	87.08%	45.41%	62.81%
Standard Deviation	1.6%	35.8%	21.3%	17%
Flexible IO Tester - Seq Write - Linux AIO - No - No - 4KB (IOPS)	**134667**	117483	**61242**	84747
Normalized	100%	87.24%	45.48%	62.93%
Standard Deviation	1.7%	35.8%	21.3%	17%

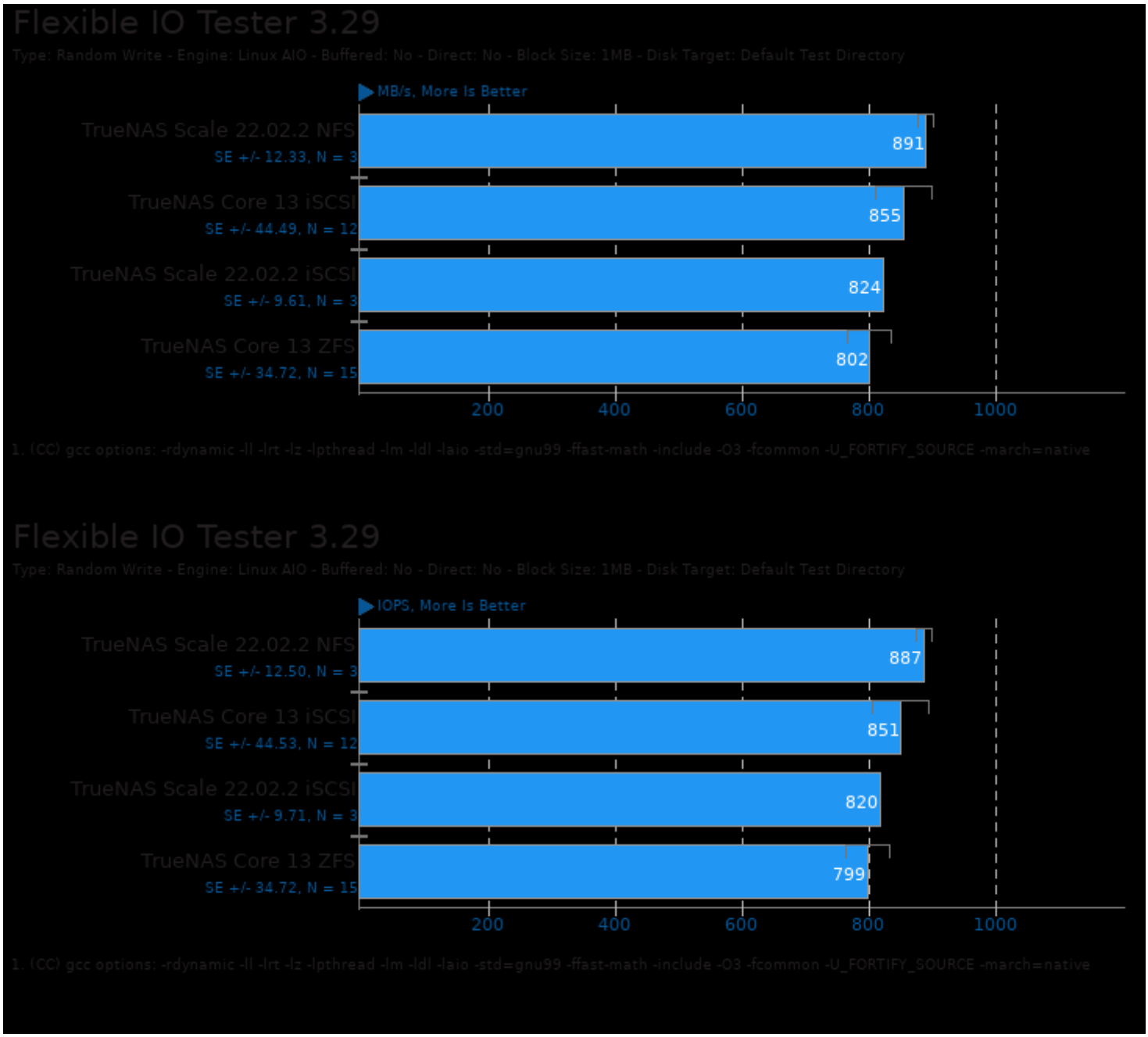
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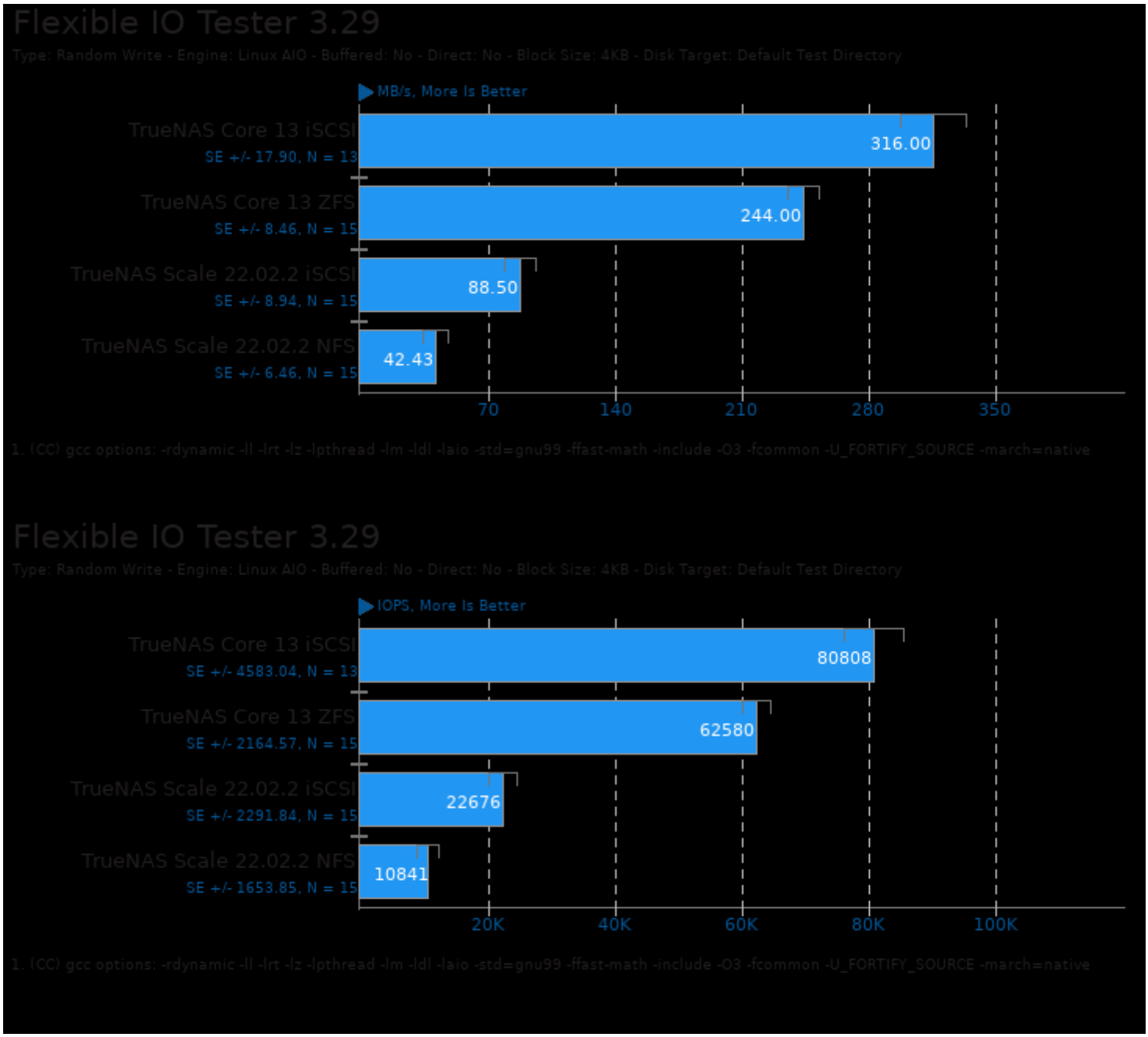
Flexible IO Tester - Seq Write - Linux AIO - No - No - 8KB (MB/s)	631	**641**	613	**560**
Normalized	98.44%	100%	95.63%	87.36%
Standard Deviation	10.6%	10.9%	5.9%	12.5%
Flexible IO Tester - Seq Write - Linux AIO - No - No - 8KB (IOPS)	80725	**82033**	78420	**71708**
Normalized	98.41%	100%	95.6%	87.41%
Standard Deviation	10.5%	10.9%	5.9%	12.5%
Flexible IO Tester - Seq Read - Linux AIO - No - No - 128KB (MB/s)	1070	1014	**1098**	**909**
Normalized	97.45%	92.35%	100%	82.79%
Standard Deviation	0.4%	0.8%		4.5%
Flexible IO Tester - Seq Read - Linux AIO - No - No - 128KB (IOPS)	8554	8111	**8783**	**7268**
Normalized	97.39%	92.35%	100%	82.75%
Standard Deviation	0.4%	0.8%	0.1%	4.5%
Flexible IO Tester - Seq Write - Linux AIO - No - No - 128KB (MB/s)	**795**	784.4	776	**703**
Normalized	100%	98.67%	97.61%	88.43%
Standard Deviation	10.1%	35%	20.8%	24.8%
Flexible IO Tester - Seq Write - Linux AIO - No - No - 128KB (IOPS)	**6356**	6271	6203	**5623**
Normalized	100%	98.66%	97.59%	88.47%
Standard Deviation	10.1%	35%	20.8%	24.8%

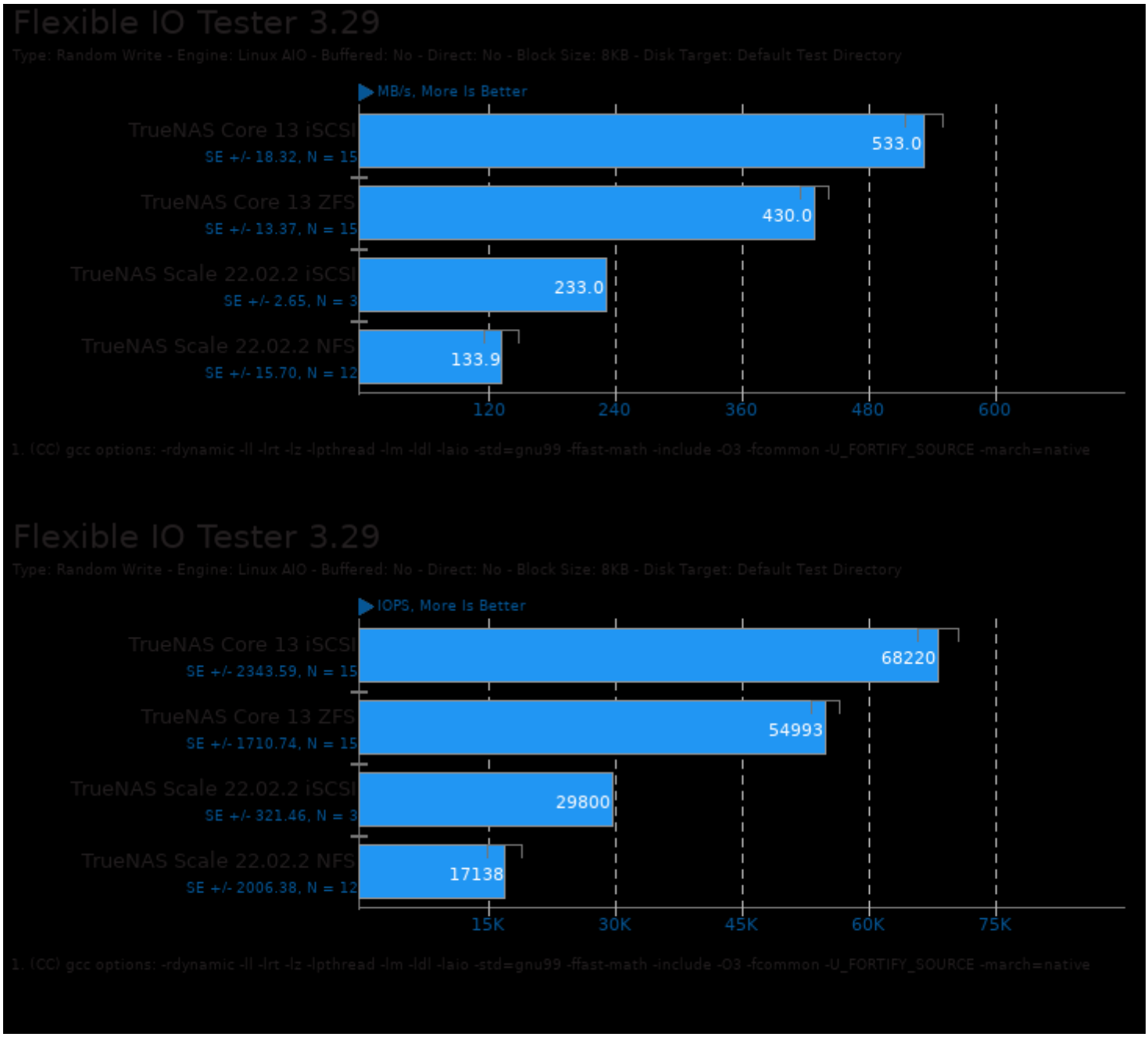

Flexible IO Tester 3.29
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Scale 22.02.2 NFS
SE +/- 3.51, N = 3
1095
TrueNAS Core 13 ZFS
SE +/- 11.79, N = 3
1054
TrueNAS Core 13 iSCSI
SE +/- 8.09, N = 3
1029
TrueNAS Scale 22.02.2 iSCSI
SE +/- 1.73, N = 3
934
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Scale 22.02.2 NFS
SE +/- 3.84, N = 3
1091
TrueNAS Core 13 ZFS
SE +/- 11.92, N = 3
1051
TrueNAS Core 13 iSCSI
SE +/- 7.77, N = 3
1025
TrueNAS Scale 22.02.2 iSCSI
SE +/- 1.76, N = 3
931
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

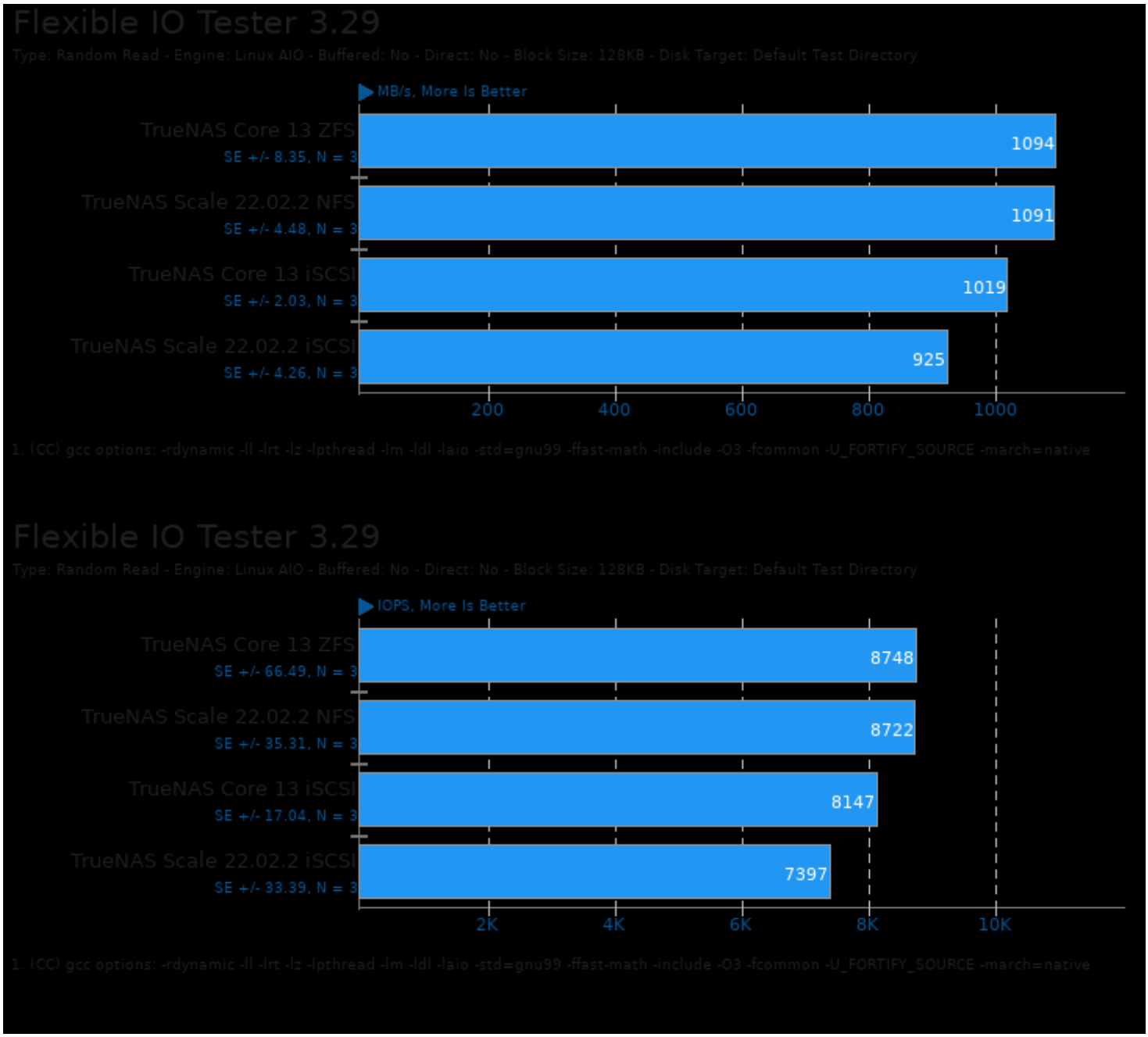

Flexible IO Tester 3.29
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 iSCSI
376
TrueNAS Core 13 ZFS
355
TrueNAS Scale 22.02.2 iSCSI
SE +/- 0.67, N = 3
156
TrueNAS Scale 22.02.2 NFS
SE +/- 0.58, N = 3
141
80
160
240
320
400
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 578.31, N = 3
96267
TrueNAS Core 13 ZFS
SE +/- 554.78, N = 3
90833
TrueNAS Scale 22.02.2 iSCSI
SE +/- 185.59, N = 3
39833
TrueNAS Scale 22.02.2 NFS
SE +/- 88.19, N = 3
36067
20K
40K
60K
80K
100K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

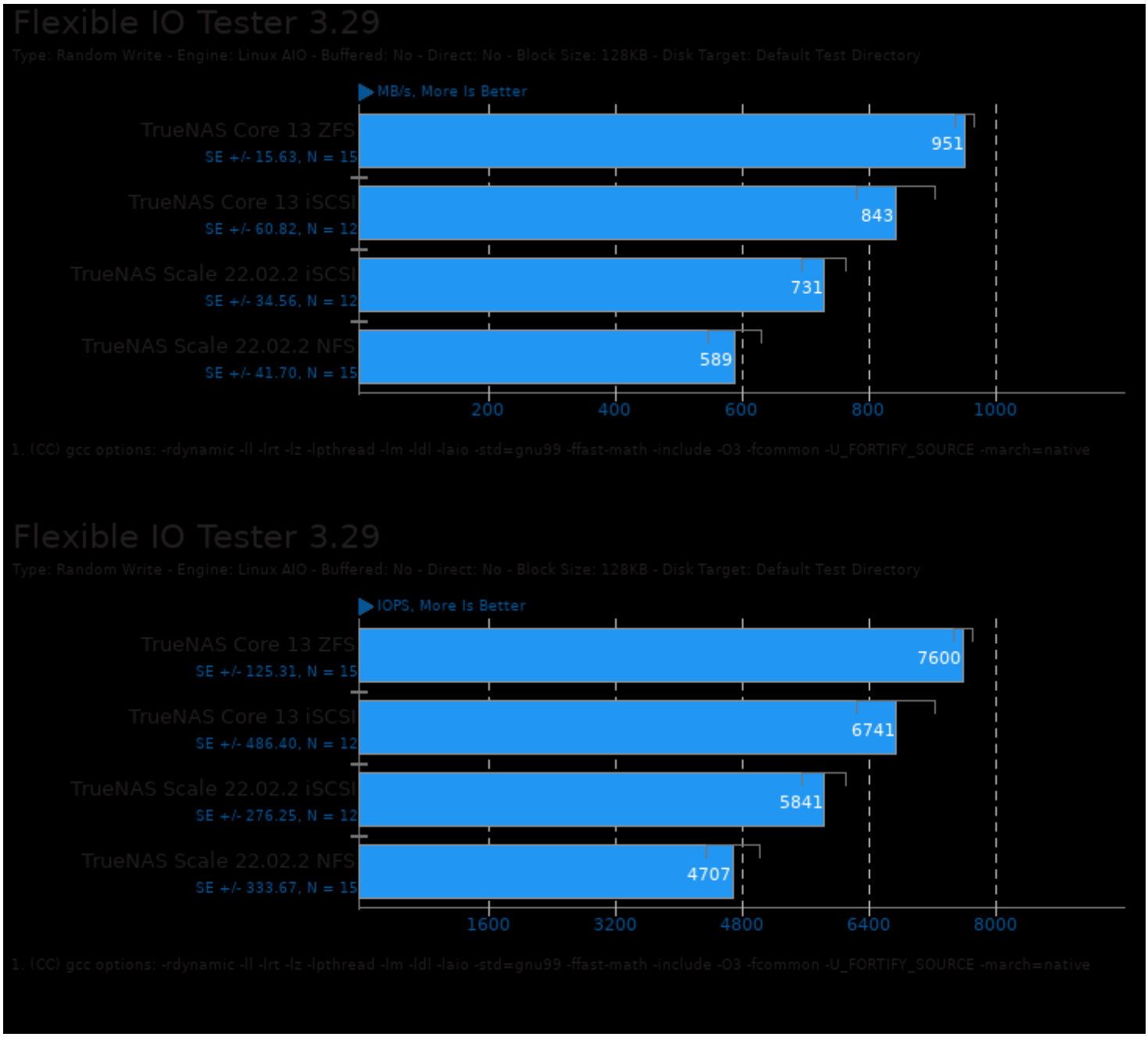

Flexible IO Tester 3.29
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 ZFS
SE +/- 3.51, N = 3
728
TrueNAS Core 13 iSCSI
SE +/- 3.06, N = 3
704
TrueNAS Scale 22.02.2 iSCSI
SE +/- 0.67, N = 3
366
TrueNAS Scale 22.02.2 NFS
SE +/- 3.84, N = 3
329
160
320
480
640
800
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 ZFS
SE +/- 417.67, N = 3
93167
TrueNAS Core 13 iSCSI
SE +/- 416.33, N = 3
90100
TrueNAS Scale 22.02.2 iSCSI
SE +/- 88.19, N = 3
46833
TrueNAS Scale 22.02.2 NFS
SE +/- 491.03, N = 3
42133
20K
40K
60K
80K
100K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

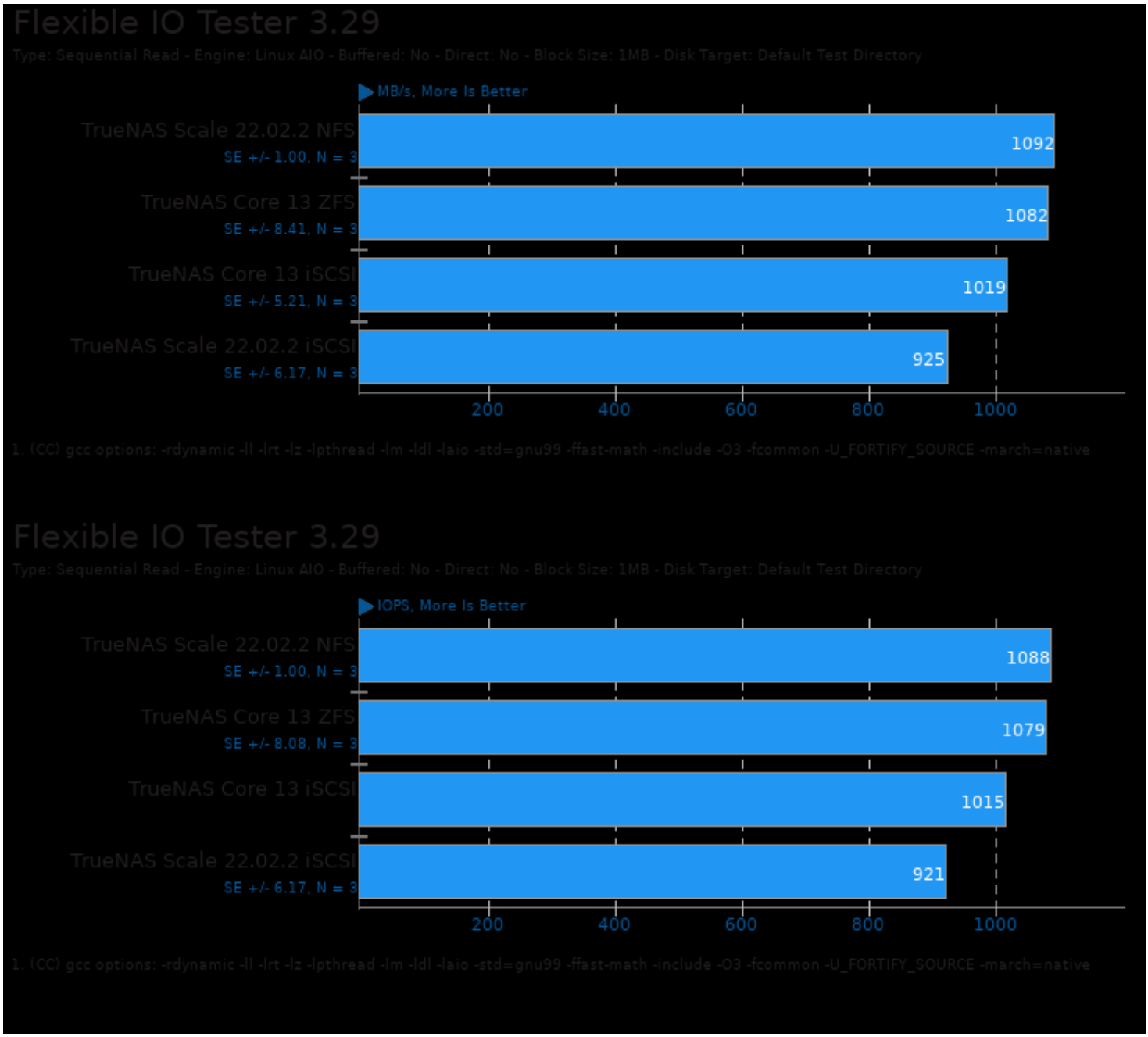

Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Scale 22.02.2 NFS
SE +/- 12.33, N = 3
891
TrueNAS Core 13 iSCSI
SE +/- 44.49, N = 12
855
TrueNAS Scale 22.02.2 iSCSI
SE +/- 9.61, N = 3
824
TrueNAS Core 13 ZFS
SE +/- 34.72, N = 15
802
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Scale 22.02.2 NFS
SE +/- 12.50, N = 3
887
TrueNAS Core 13 iSCSI
SE +/- 44.53, N = 12
851
TrueNAS Scale 22.02.2 iSCSI
SE +/- 9.71, N = 3
820
TrueNAS Core 13 ZFS
SE +/- 34.72, N = 15
799
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

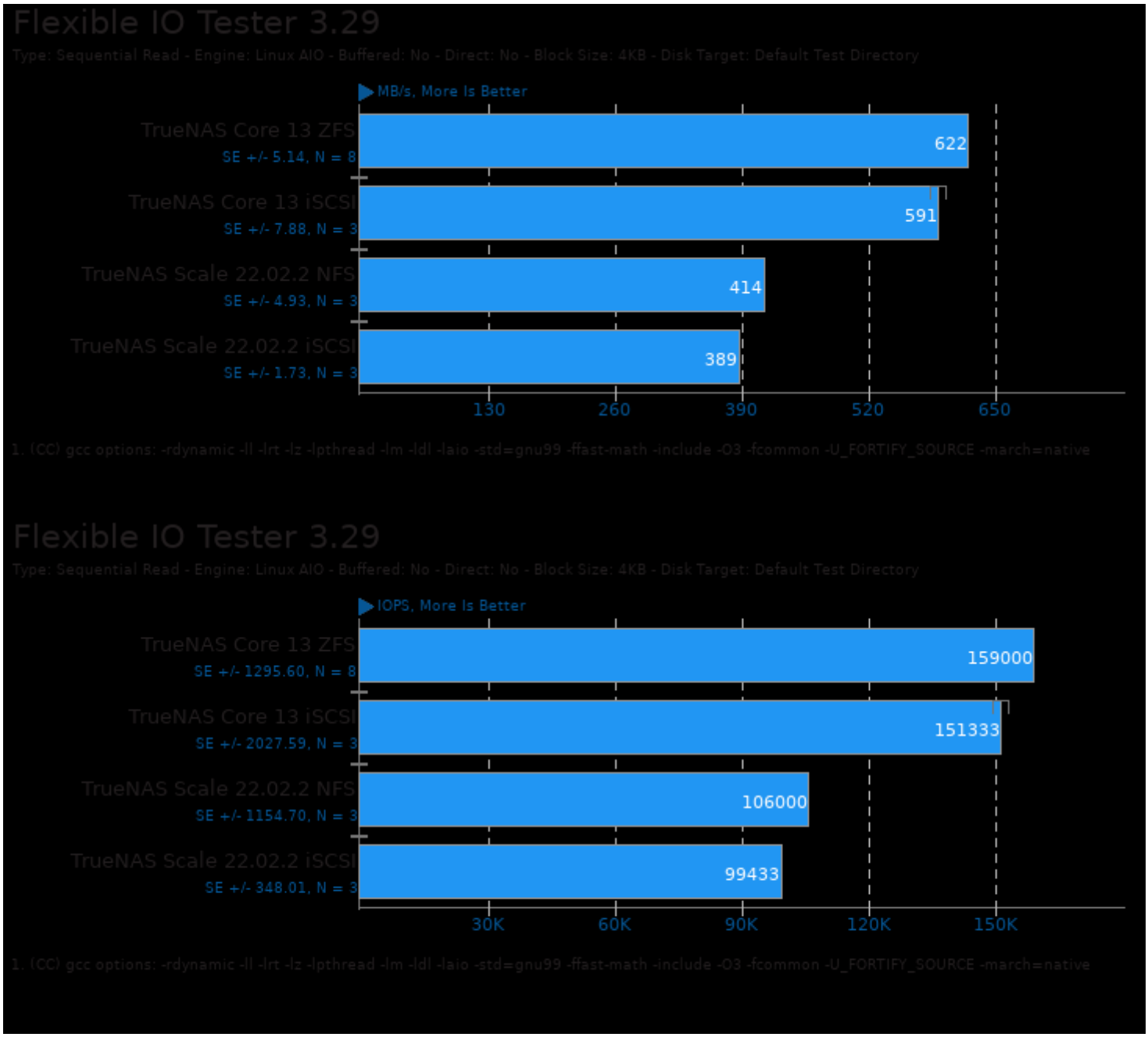

Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 17.90, N = 13
316.00
TrueNAS Core 13 ZFS
SE +/- 8.46, N = 15
244.00
TrueNAS Scale 22.02.2 iSCSI
SE +/- 8.94, N = 15
88.50
TrueNAS Scale 22.02.2 NFS
SE +/- 6.46, N = 15
42.43
70
140
210
280
350
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 4583.04, N = 13
80808
TrueNAS Core 13 ZFS
SE +/- 2164.57, N = 15
62580
TrueNAS Scale 22.02.2 iSCSI
SE +/- 2291.84, N = 15
22676
TrueNAS Scale 22.02.2 NFS
SE +/- 1653.85, N = 15
10841
20K
40K
60K
80K
100K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

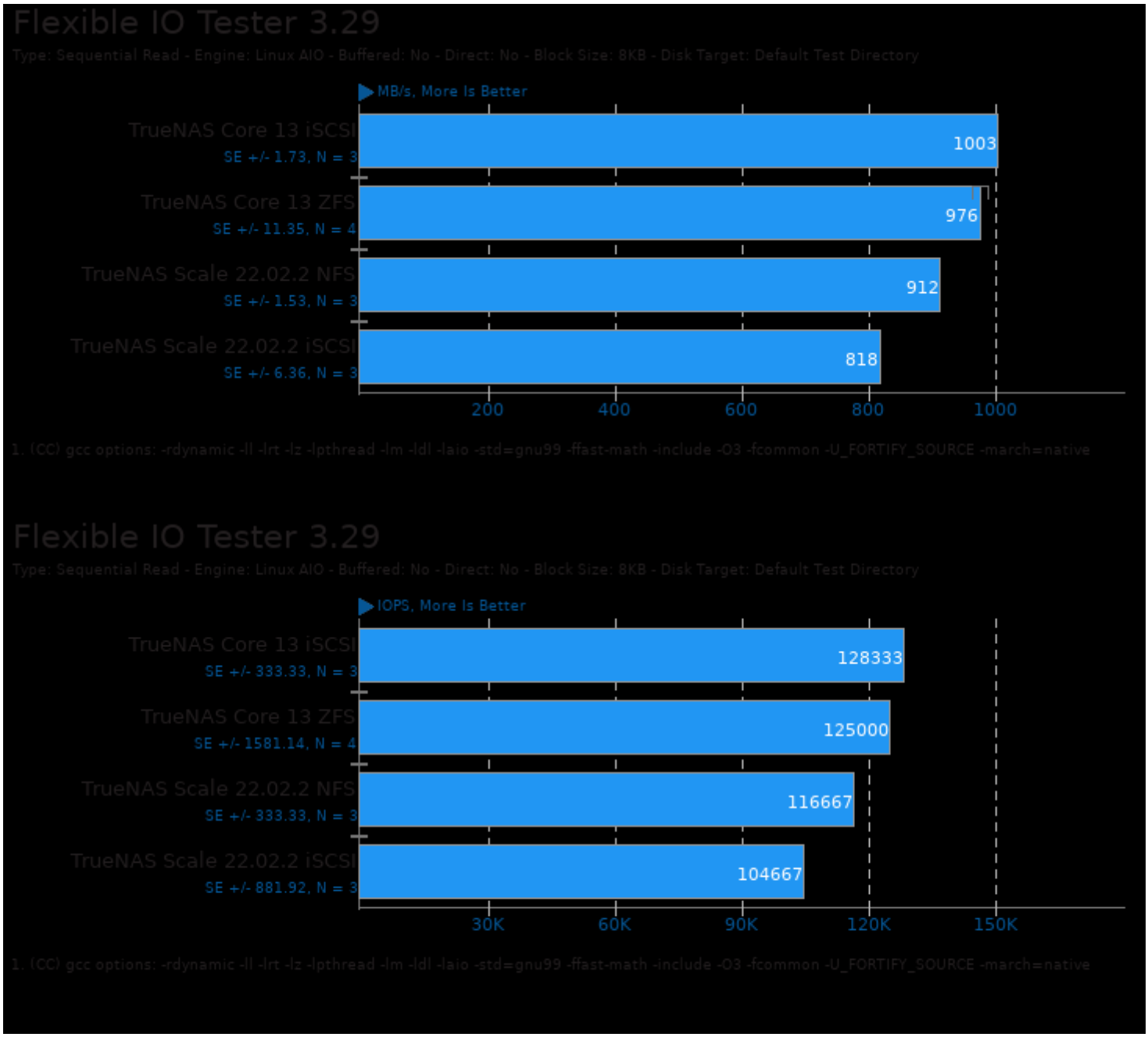

Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 18.32, N = 15
533.0
TrueNAS Core 13 ZFS
SE +/- 13.37, N = 15
430.0
TrueNAS Scale 22.02.2 iSCSI
SE +/- 2.65, N = 3
233.0
TrueNAS Scale 22.02.2 NFS
SE +/- 15.70, N = 12
133.9
120
240
360
480
600
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 2343.59, N = 15
68220
TrueNAS Core 13 ZFS
SE +/- 1710.74, N = 15
54993
TrueNAS Scale 22.02.2 iSCSI
SE +/- 321.46, N = 3
29800
TrueNAS Scale 22.02.2 NFS
SE +/- 2006.38, N = 12
17138
15K
30K
45K
60K
75K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

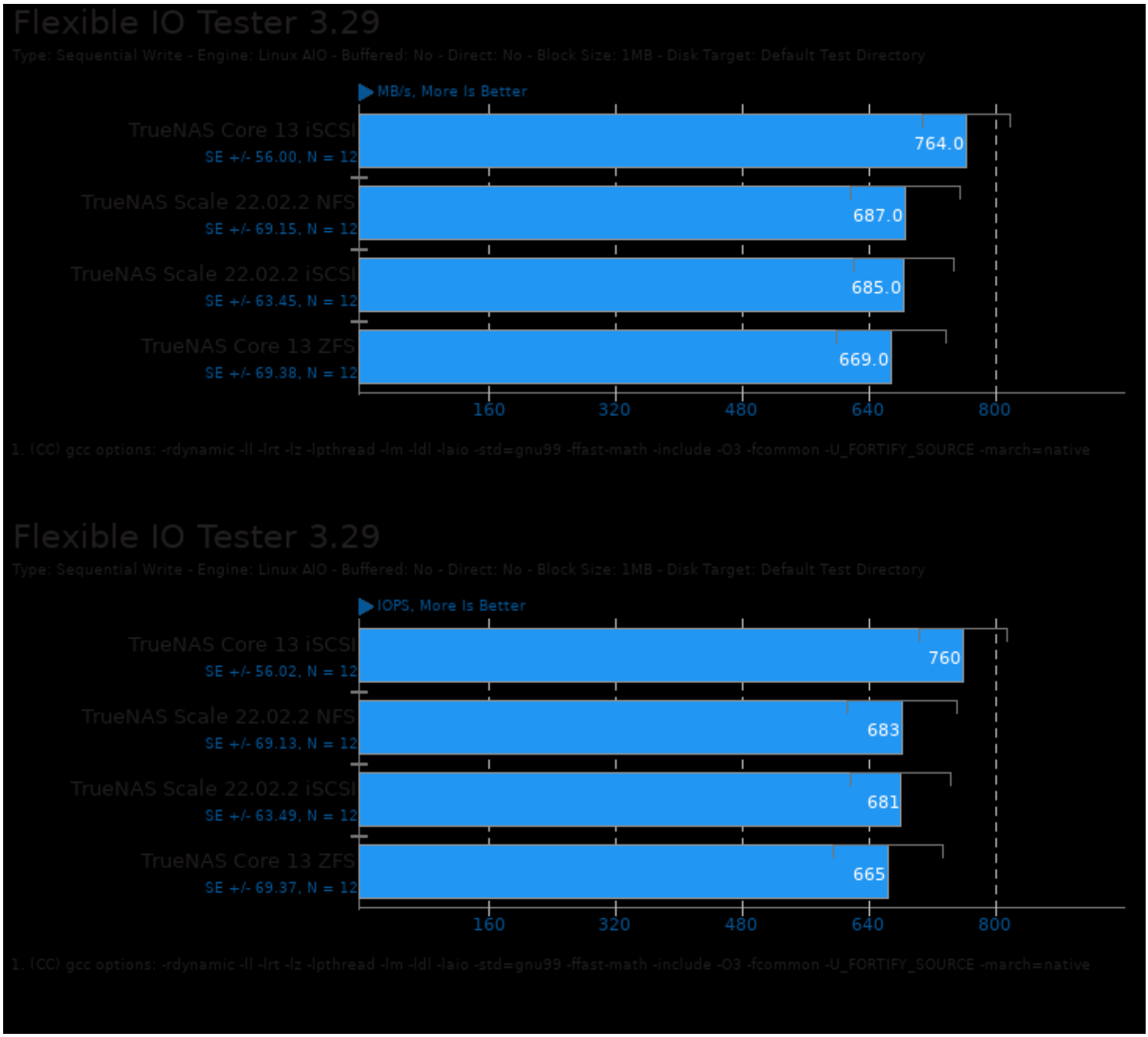

Flexible IO Tester 3.29
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 128KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 ZFS
SE +/- 8.35, N = 3
1094
TrueNAS Scale 22.02.2 NFS
SE +/- 4.48, N = 3
1091
TrueNAS Core 13 iSCSI
SE +/- 2.03, N = 3
1019
TrueNAS Scale 22.02.2 iSCSI
SE +/- 4.26, N = 3
925
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 128KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 ZFS
SE +/- 66.49, N = 3
8748
TrueNAS Scale 22.02.2 NFS
SE +/- 35.31, N = 3
8722
TrueNAS Core 13 iSCSI
SE +/- 17.04, N = 3
8147
TrueNAS Scale 22.02.2 iSCSI
SE +/- 33.39, N = 3
7397
2K
4K
6K
8K
10K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

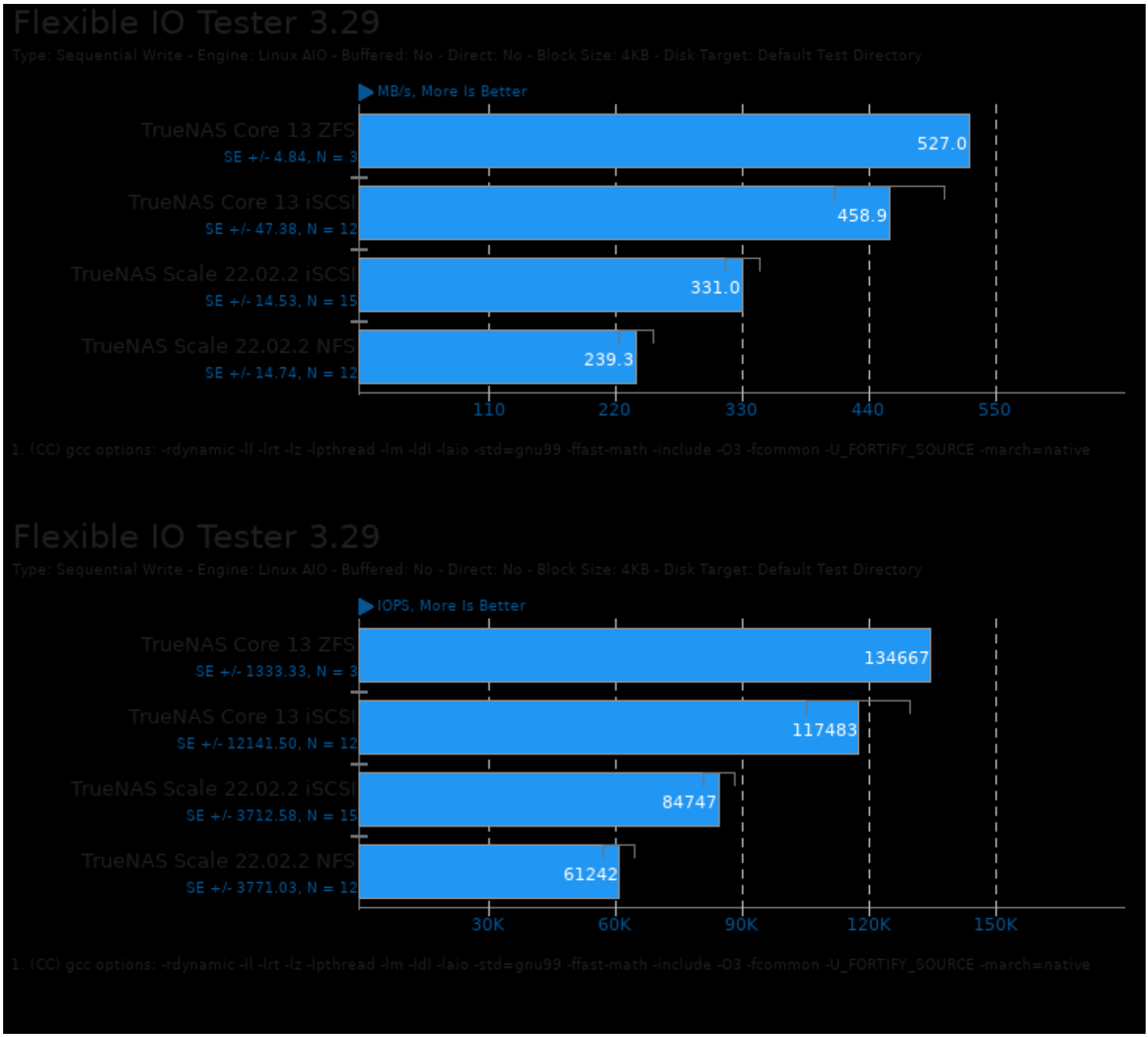

Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 128KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 ZFS
SE +/- 15.63, N = 15
951
TrueNAS Core 13 iSCSI
SE +/- 60.82, N = 12
843
TrueNAS Scale 22.02.2 iSCSI
SE +/- 34.56, N = 12
731
TrueNAS Scale 22.02.2 NFS
SE +/- 41.70, N = 15
589
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 128KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 ZFS
SE +/- 125.31, N = 15
7600
TrueNAS Core 13 iSCSI
SE +/- 486.40, N = 12
6741
TrueNAS Scale 22.02.2 iSCSI
SE +/- 276.25, N = 12
5841
TrueNAS Scale 22.02.2 NFS
SE +/- 333.67, N = 15
4707
1600
3200
4800
6400
8000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

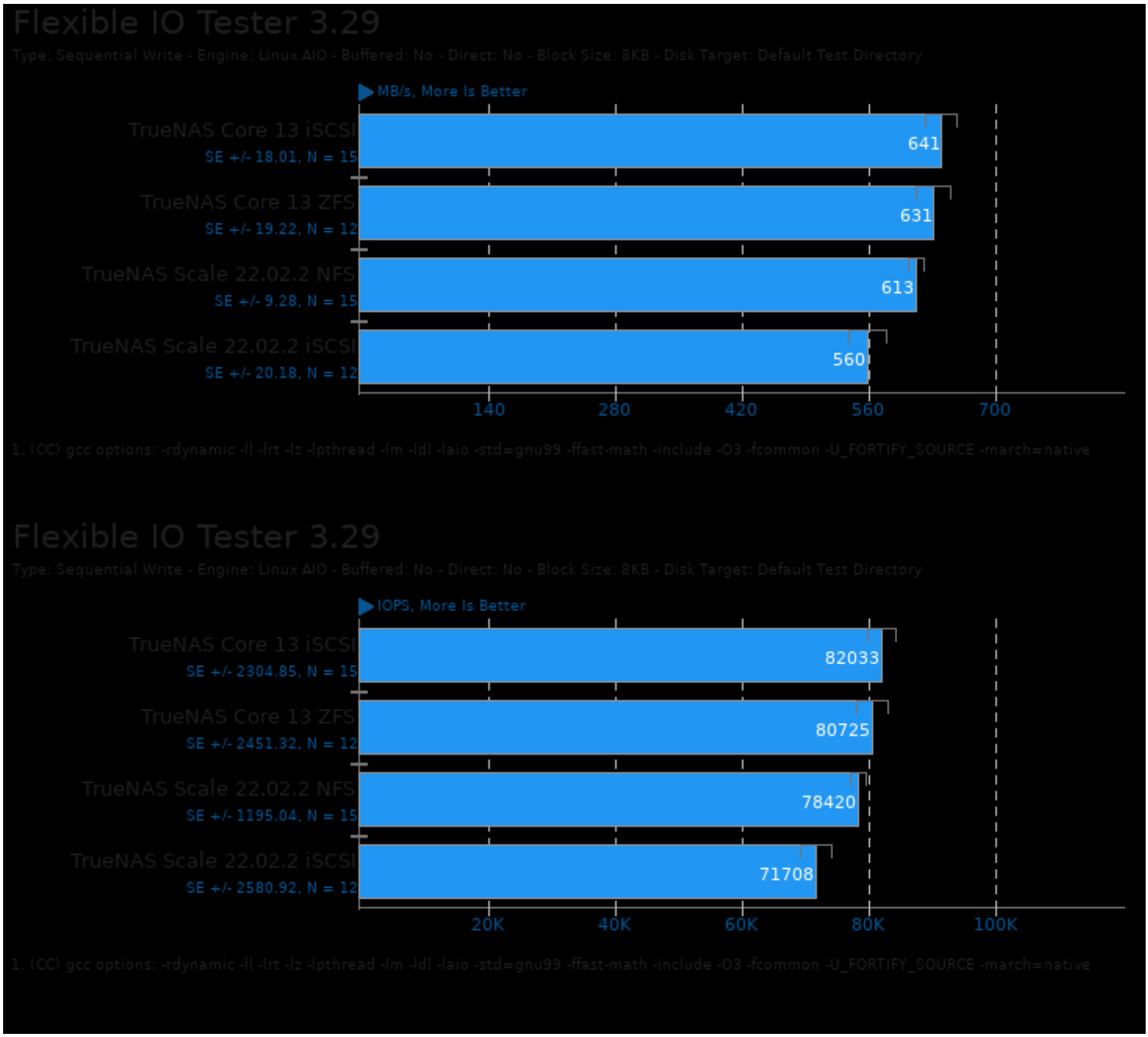

Flexible IO Tester 3.29
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Scale 22.02.2 NFS
SE +/- 1.00, N = 3
1092
TrueNAS Core 13 ZFS
SE +/- 8.41, N = 3
1082
TrueNAS Core 13 iSCSI
SE +/- 5.21, N = 3
1019
TrueNAS Scale 22.02.2 iSCSI
SE +/- 6.17, N = 3
925
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Scale 22.02.2 NFS
SE +/- 1.00, N = 3
1088
TrueNAS Core 13 ZFS
SE +/- 8.08, N = 3
1079
TrueNAS Core 13 iSCSI
1015
TrueNAS Scale 22.02.2 iSCSI
SE +/- 6.17, N = 3
921
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

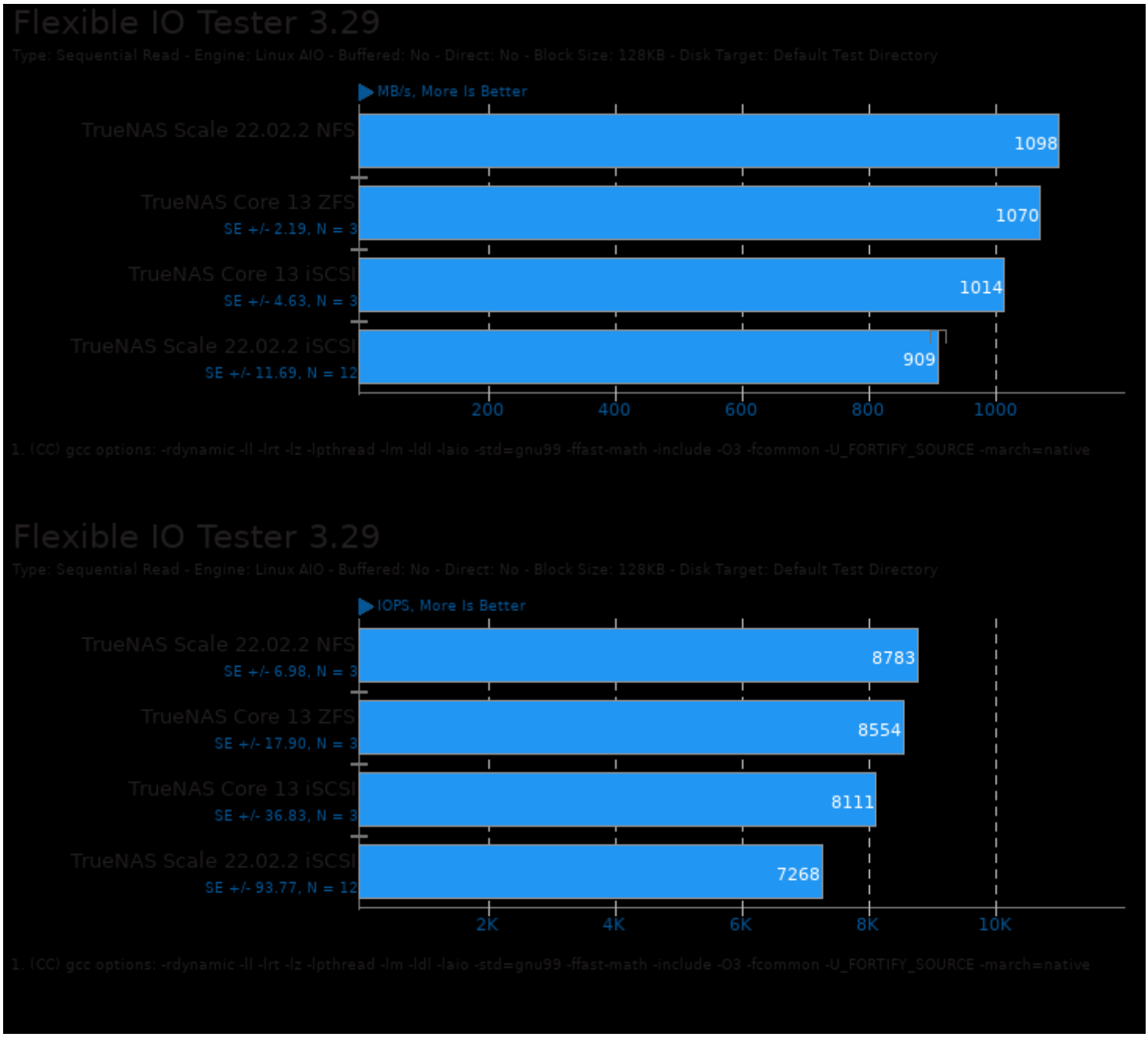

Flexible IO Tester 3.29
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 ZFS
SE +/- 5.14, N = 8
622
TrueNAS Core 13 iSCSI
SE +/- 7.88, N = 3
591
TrueNAS Scale 22.02.2 NFS
SE +/- 4.93, N = 3
414
TrueNAS Scale 22.02.2 iSCSI
SE +/- 1.73, N = 3
389
130
260
390
520
650
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 ZFS
SE +/- 1295.60, N = 8
159000
TrueNAS Core 13 iSCSI
SE +/- 2027.59, N = 3
151333
TrueNAS Scale 22.02.2 NFS
SE +/- 1154.70, N = 3
106000
TrueNAS Scale 22.02.2 iSCSI
SE +/- 348.01, N = 3
99433
30K
60K
90K
120K
150K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

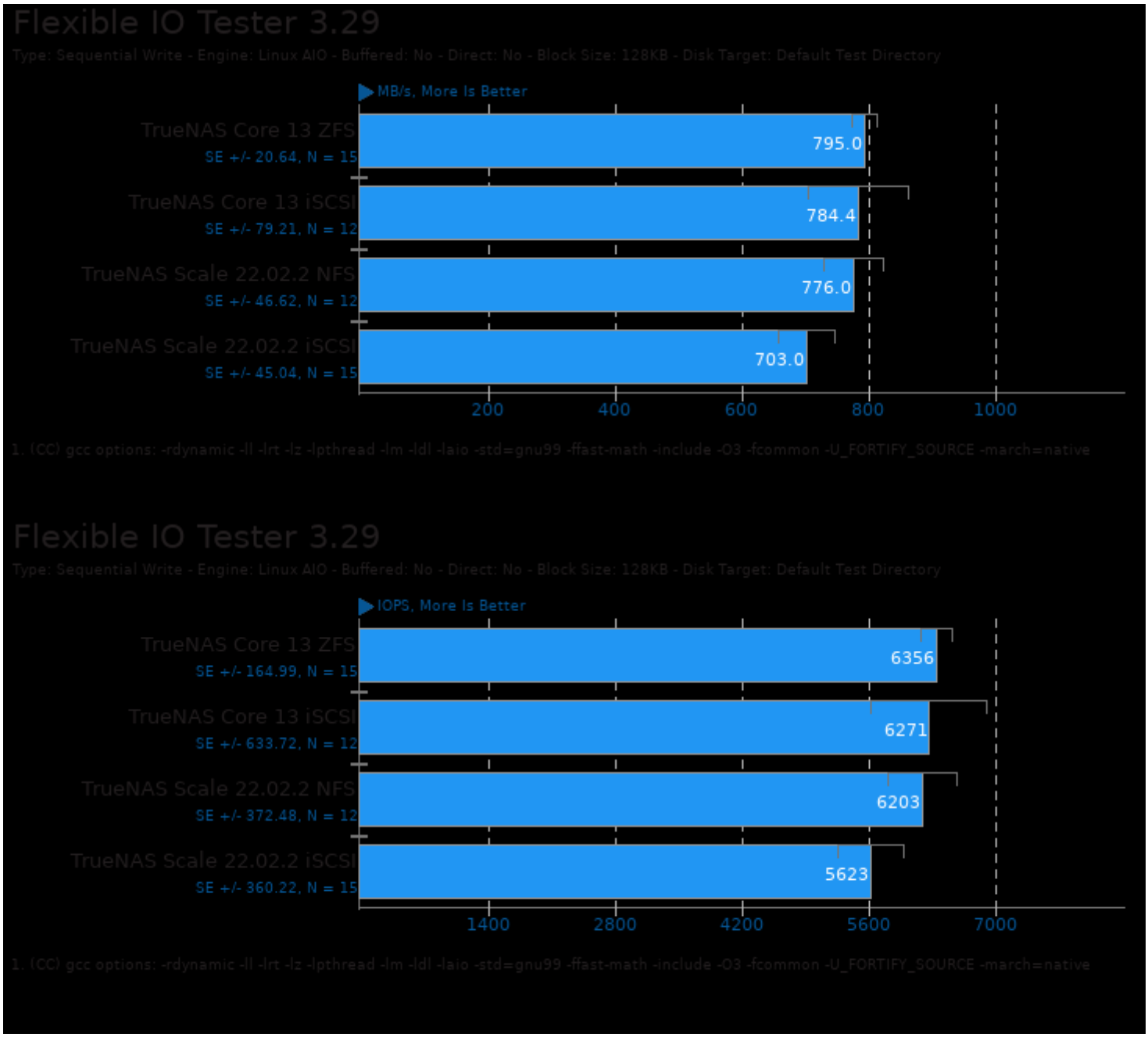

Flexible IO Tester 3.29
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 1.73, N = 3
1003
TrueNAS Core 13 ZFS
SE +/- 11.35, N = 4
976
TrueNAS Scale 22.02.2 NFS
SE +/- 1.53, N = 3
912
TrueNAS Scale 22.02.2 iSCSI
SE +/- 6.36, N = 3
818
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 333.33, N = 3
128333
TrueNAS Core 13 ZFS
SE +/- 1581.14, N = 4
125000
TrueNAS Scale 22.02.2 NFS
SE +/- 333.33, N = 3
116667
TrueNAS Scale 22.02.2 iSCSI
SE +/- 881.92, N = 3
104667
30K
60K
90K
120K
150K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.29
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 56.00, N = 12
764.0
TrueNAS Scale 22.02.2 NFS
SE +/- 69.15, N = 12
687.0
TrueNAS Scale 22.02.2 iSCSI
SE +/- 63.45, N = 12
685.0
TrueNAS Core 13 ZFS
SE +/- 69.38, N = 12
669.0
160
320
480
640
800
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 56.02, N = 12
760
TrueNAS Scale 22.02.2 NFS
SE +/- 69.13, N = 12
683
TrueNAS Scale 22.02.2 iSCSI
SE +/- 63.49, N = 12
681
TrueNAS Core 13 ZFS
SE +/- 69.37, N = 12
665
160
320
480
640
800
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.29
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 ZFS
SE +/- 4.84, N = 3
527.0
TrueNAS Core 13 iSCSI
SE +/- 47.38, N = 12
458.9
TrueNAS Scale 22.02.2 iSCSI
SE +/- 14.53, N = 15
331.0
TrueNAS Scale 22.02.2 NFS
SE +/- 14.74, N = 12
239.3
110
220
330
440
550
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 ZFS
SE +/- 1333.33, N = 3
134667
TrueNAS Core 13 iSCSI
SE +/- 12141.50, N = 12
117483
TrueNAS Scale 22.02.2 iSCSI
SE +/- 3712.58, N = 15
84747
TrueNAS Scale 22.02.2 NFS
SE +/- 3771.03, N = 12
61242
30K
60K
90K
120K
150K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.29
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 18.01, N = 15
641
TrueNAS Core 13 ZFS
SE +/- 19.22, N = 12
631
TrueNAS Scale 22.02.2 NFS
SE +/- 9.28, N = 15
613
TrueNAS Scale 22.02.2 iSCSI
SE +/- 20.18, N = 12
560
140
280
420
560
700
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 8KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Core 13 iSCSI
SE +/- 2304.85, N = 15
82033
TrueNAS Core 13 ZFS
SE +/- 2451.32, N = 12
80725
TrueNAS Scale 22.02.2 NFS
SE +/- 1195.04, N = 15
78420
TrueNAS Scale 22.02.2 iSCSI
SE +/- 2580.92, N = 12
71708
20K
40K
60K
80K
100K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.29
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 128KB - Disk Target: Default Test Directory
MB/s, More Is Better
TrueNAS Scale 22.02.2 NFS
1098
TrueNAS Core 13 ZFS
SE +/- 2.19, N = 3
1070
TrueNAS Core 13 iSCSI
SE +/- 4.63, N = 3
1014
TrueNAS Scale 22.02.2 iSCSI
SE +/- 11.69, N = 12
909
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.29
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: No - Block Size: 128KB - Disk Target: Default Test Directory
IOPS, More Is Better
TrueNAS Scale 22.02.2 NFS
SE +/- 6.98, N = 3
8783
TrueNAS Core 13 ZFS
SE +/- 17.90, N = 3
8554
TrueNAS Core 13 iSCSI
SE +/- 36.83, N = 3
8111
TrueNAS Scale 22.02.2 iSCSI
SE +/- 93.77, N = 12
7268
2K
4K
6K
8K
10K
1. (CC) gcc options: -rdynamic -ll -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native



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