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truenas-20210502fio

KVM testing on Ubuntu 20.04 via the Phoronix Test Suite.

Automated Executive Summary

iSCSI Sync L2ARC No ZIL Again had the most wins, coming in first place for 50% of the tests.

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

Flexible IO Tester (Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory) at 12.209x
Flexible IO Tester (Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory) at 12.12x
Flexible IO Tester (Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 11.758x
Flexible IO Tester (Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 11.723x
Flexible IO Tester (Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory) at 8.36x
Flexible IO Tester (Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory) at 8.067x
Flexible IO Tester (Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk

Target: Default Test Directory) at 1.101x
Flexible IO Tester (Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory) at 1.098x
Flexible IO Tester (Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory) at 1.038x
Flexible IO Tester (Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory) at 1.03x.

Test Systems:

iSCSI Sync L2ARC No ZIL

iSCSI Sync L2ARC No ZIL Again

iSCSI Sync L2ARC No ZIL Retry

iSCSI Sync No L2ARC No ZIL

iSCSI Sync ZIL

iSCSI Sync ZIL Take 2

Processor: Common KVM (2 Cores), Motherboard: QEMU Standard PC (i440FX + PIIX 1996) (rel-1.14.0-0-g155821a1990b-prebuilt.qemu.org BIOS), Chipset: Intel 440FX 82441FX PMC, Memory: 2048MB, Disk: 34GB QEMU HDD + 3427GB iSCSI Disk, Graphics: bochs-drmdrmfb, Monitor: QEMU Monitor, Network: 2 x Red Hat Virtio device

OS: Ubuntu 20.04, Kernel: 5.4.0-72-generic (x86_64), Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 1024x768, System Layer: KVM

Kernel Notes: Transparent Huge Pages: madvise
Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none=/build/gcc-9-HskZEa/gcc-9-9.3.0/debian/tmp-nvptx/usr,hsa --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib=auto --with-tune=generic --without-cuda-driver -v
Disk Notes: MQ-DEADLINE / noatime,rw,stripe=256 / Block Size: 4096
Processor Notes: CPU Microcode: 0x1
Security Notes: itlb_multihit: KVM: Vulnerable + l1tf: Mitigation of PTE Inversion + mds: Vulnerable: Clear buffers attempted no microcode; SMT Host state unknown + meltdown: Mitigation of PTI + spec_store_bypass: Vulnerable + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Full generic retpoline STIBP: disabled RSB filling + srbds: Not affected + tsx_async_abort: Not affected

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	iSCSI Sync L2ARC No ZIL	iSCSI Sync L2ARC No ZIL Again	iSCSI Sync L2ARC No ZIL Retry	iSCSI Sync No L2ARC No ZIL	iSCSI Sync ZIL	iSCSI Sync ZIL Take 2
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 2MB (IOPS)						3
Standard Deviation						43.3%
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 2MB (MB/s)						9.526
Standard Deviation						31.3%
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 2MB (IOPS)						4
Standard Deviation						25%
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 2MB (MB/s)						12.26
Standard Deviation						20.2%
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 1MB (IOPS)		1	3	7	112	
Normalized		0.89%	2.68%	6.25%	100%	
Standard Deviation			94.3%	37.8%	154.6%	
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 1MB (MB/s)		3.096	4.616	9.494	115.2	
Normalized		2.69%	4.01%	8.24%	100%	
Standard Deviation		17.2%	57.9%	22.2%	150.2%	
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 32KB (IOPS)				1570		
Standard Deviation				94.1%		
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 32KB (MB/s)				49.2		
Standard Deviation				94%		
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 1MB (IOPS)		9		274	7	
Normalized		3.28%		100%	2.55%	
Standard Deviation		91.1%		170%	20.8%	
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 1MB (MB/s)		12.494		277.104	9.522	
Normalized		4.51%		100%	3.44%	
Standard Deviation		65.1%		168.4%	15%	

Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 32KB (IOPS)		7234		
Standard Deviation		2.4%		
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 32KB (MB/s)		226		
Standard Deviation		2.3%		
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 64KB (IOPS)	**379**		**78**	
Normalized	100%		20.58%	
Standard Deviation	33.3%		49.4%	
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 64KB (MB/s)	**23.9**		**5.220**	
Normalized	100%		21.84%	
Standard Deviation	32.9%		47.5%	
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 16KB (IOPS)	**13533**	**13933**	13700	
Normalized	97.13%	100%	98.33%	
Standard Deviation	1.5%	2.7%	4.6%	
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 16KB (MB/s)	**212**	218	**220**	
Normalized	96.36%	99.09%	100%	
Standard Deviation	1.5%	3.1%	1.3%	
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 16KB (IOPS)	**12086**	14500	**15533**	
Normalized	77.81%	93.35%	100%	
Standard Deviation	22.4%	3.6%	1.3%	
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 16KB (MB/s)	**189**	227	**243**	
Normalized	77.78%	93.42%	100%	
Standard Deviation	22.5%	3.3%	1.4%	
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 4KB (IOPS)	**25867**	25800	25133	**22233**
Normalized	100%	99.74%	97.16%	85.95%
Standard Deviation	2.6%	1.3%	5.3%	12.7%
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 4KB (MB/s)	**101**	**101**	98.1	**86.5**
Normalized	100%	100%	97.13%	85.64%
Standard Deviation	2.6%	1.1%	5.2%	13.1%

Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 4KB (IOPS)		**33667**		35933	**37067**	36533	
Normalized		90.83%		96.94%	100%	98.56%	
Standard Deviation		2.4%		0.7%	2.6%	3%	
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 4KB (MB/s)		**132**		140	**145**	143	
Normalized		91.03%		96.55%	100%	98.62%	
Standard Deviation				0.7%	2.4%	2.8%	
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 64KB (IOPS)		**3657**			**2588**		
Normalized		100%			70.77%		
Standard Deviation		2%			24.5%		
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 64KB (MB/s)		**229**			**162**		
Normalized		100%			70.74%		
Standard Deviation		2.1%			24.6%		
Flexible IO Tester - Rand Read - Sync - Yes - No - 1MB (IOPS)	191						
Flexible IO Tester - Rand Read - Sync - Yes - No - 1MB	191						
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 1MB (IOPS)		**836**		**100**	275		
Normalized		100%		11.96%	32.89%		
Standard Deviation		3.3%		1.2%	3.5%		
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 1MB (MB/s)		**839**		**104**	279		
Normalized		100%		12.4%	33.25%		
Standard Deviation		3.2%		1%	3.3%		
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 1MB (IOPS)		**556**		**95**	271		
Normalized		100%		17.09%	48.74%		
Standard Deviation		69.9%		9.2%	4.4%		
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 1MB (MB/s)		**560**		**99.0**	274		
Normalized		100%		17.68%	48.93%		
Standard Deviation		69.5%		8.9%	4.1%		
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 2MB (IOPS)						136	
Standard Deviation						1.9%	

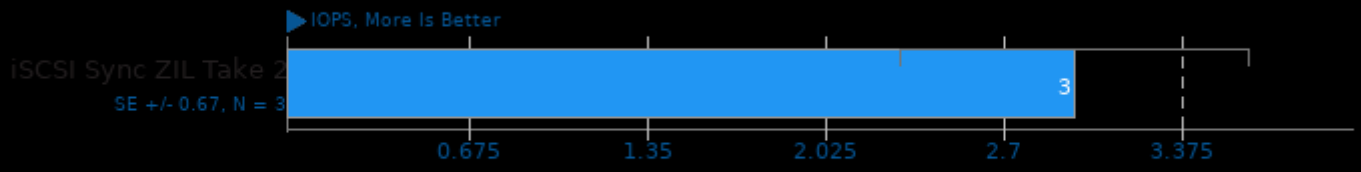
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 2MB (MB/s)				279
Standard Deviation				2%
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 2MB (IOPS)				137
Standard Deviation				0.8%
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 2MB (MB/s)				280
Standard Deviation				0.9%
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 32KB (IOPS)		858		
Standard Deviation		0.4%		
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 32KB (MB/s)		26.9		
Standard Deviation		0.4%		
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 64KB (IOPS)	**7134**		**3962**	
Normalized	100%		55.54%	
Standard Deviation	53%		1.3%	
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 64KB (MB/s)	**446**		**248**	
Normalized	100%		55.61%	
Standard Deviation	52.8%		1.2%	
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 32KB (IOPS)		614		
Standard Deviation		3.6%		
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 32KB (MB/s)		19.3		
Standard Deviation		3.6%		
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 4KB (IOPS)	19000	**1902**	**19200**	19167
Normalized	98.96%	9.91%	100%	99.83%
Standard Deviation	17.8%	7%	5%	8.9%
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 4KB (MB/s)	74.4	**7.625**	**75.0**	74.6
Normalized	99.2%	10.17%	100%	99.47%
Standard Deviation	17.7%	7%	5.1%	8.7%

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Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 16KB (IOPS)	**14333**	**1174**	12767	
Normalized	100%	8.19%	89.07%	
Standard Deviation	0.8%	0.7%	1.2%	
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 16KB (MB/s)	**223**	**18.4**	200	
Normalized	100%	8.25%	89.69%	
Standard Deviation	0.9%	0.5%	1.3%	
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 4KB (IOPS)	**29500**	**2509**	20233	21033
Normalized	100%	8.51%	68.59%	71.3%
Standard Deviation	4.8%	0.4%	1%	2.7%
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 4KB (MB/s)	**115**	**9.81**	80.4	82.2
Normalized	100%	8.53%	69.91%	71.48%
Standard Deviation	4.9%	0.4%	1.8%	2.7%
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 16KB (IOPS)	**22367**	**1460**	12700	
Normalized	100%	6.53%	56.78%	
Standard Deviation	9.9%	1.3%		
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 16KB (MB/s)	**349**	**22.9**	199	
Normalized	100%	6.56%	57.02%	
Standard Deviation	9.8%	1.1%		
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 64KB (IOPS)	**7343**		**4205**	
Normalized	100%		57.27%	
Standard Deviation	57%		1.2%	
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 64KB (MB/s)	**459**		**263**	
Normalized	100%		57.3%	
Standard Deviation	57%		1.3%	

Flexible IO Tester 3.25

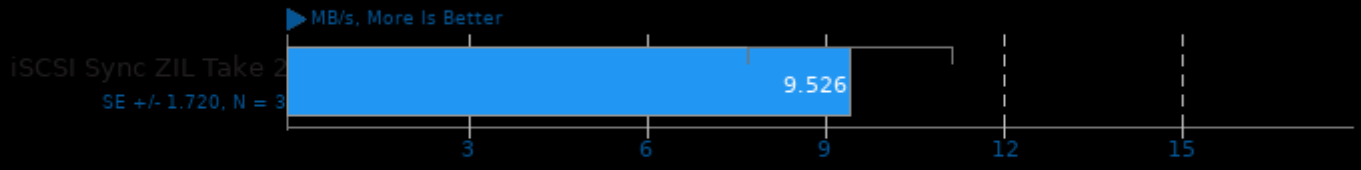
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory



1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

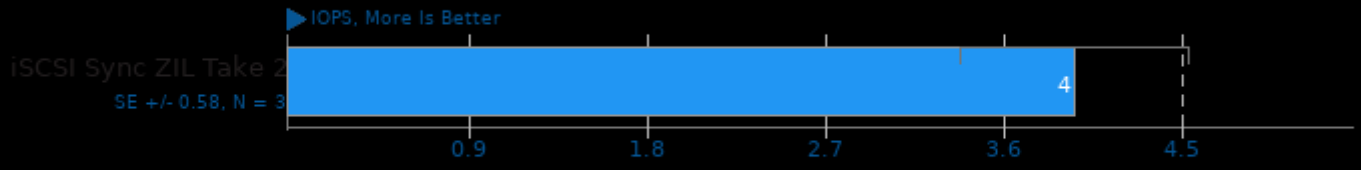
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Flexible IO Tester 3.25

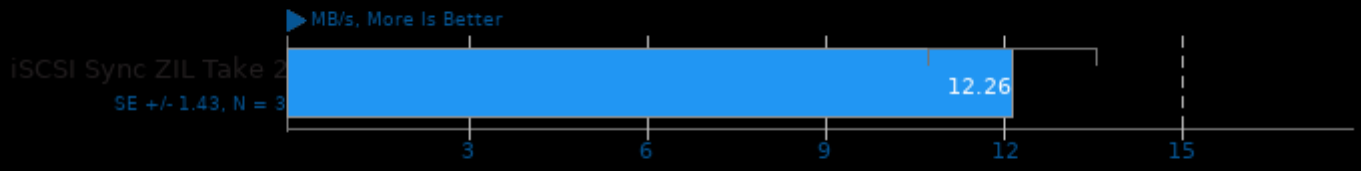
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory



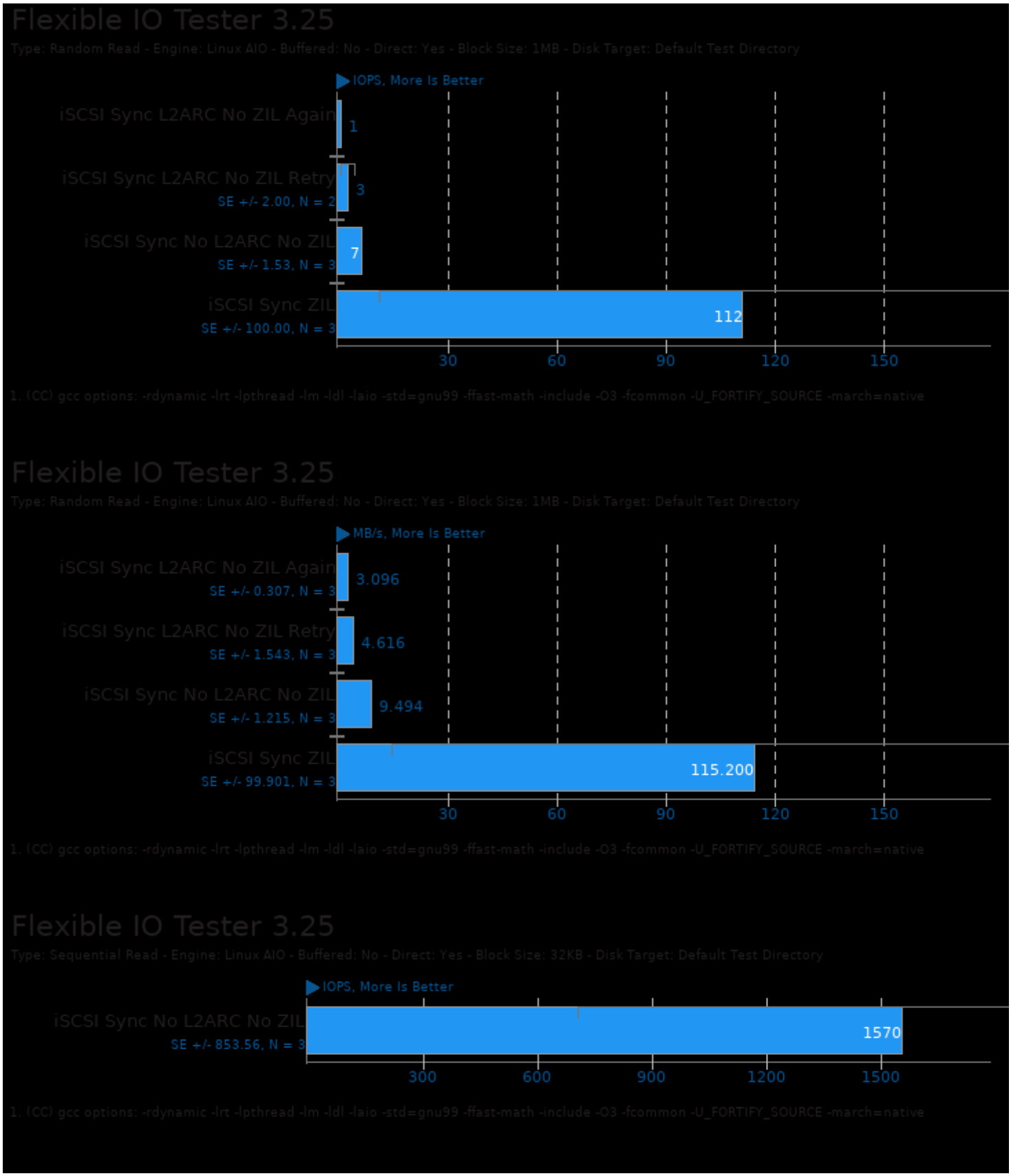
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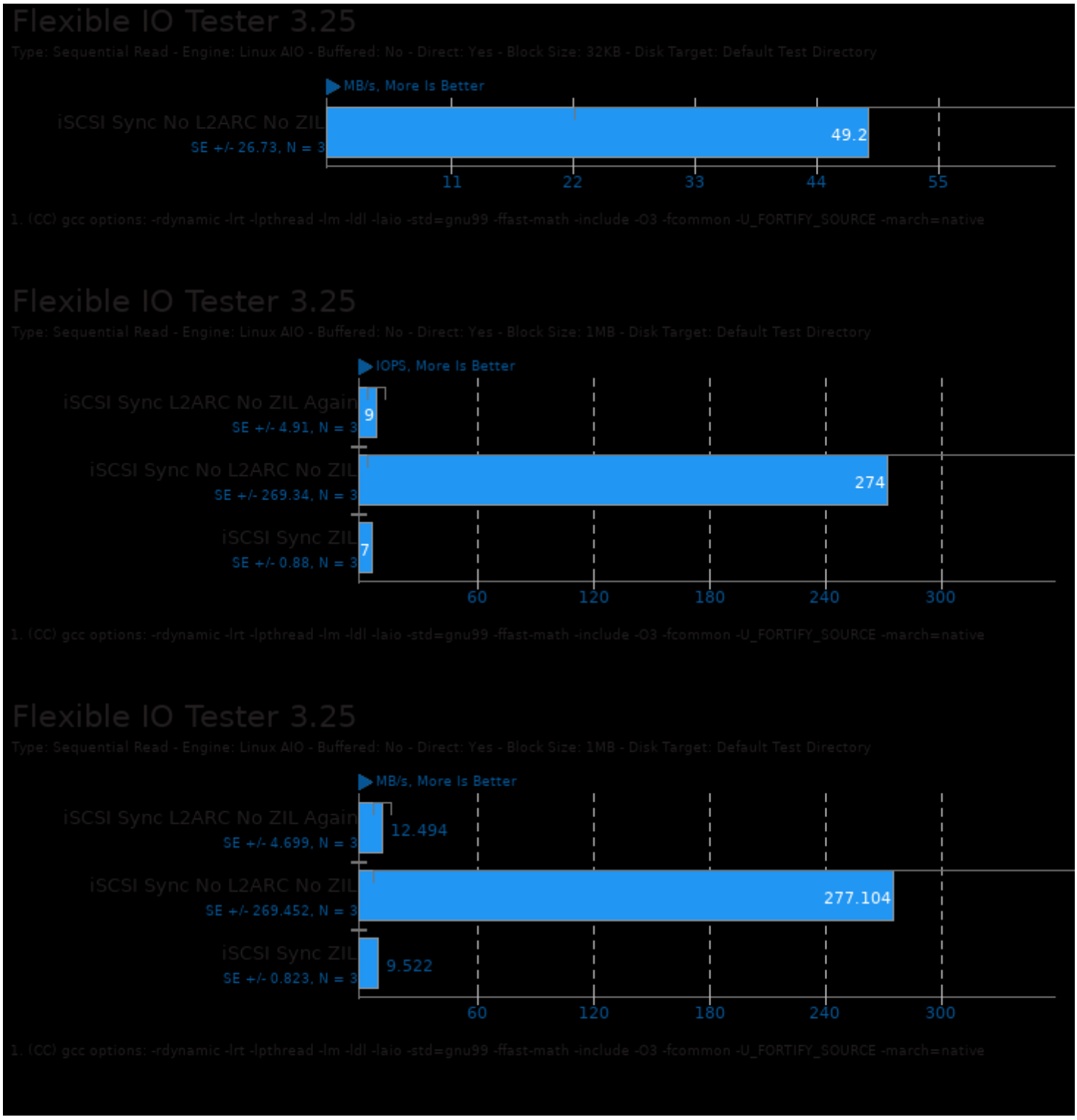
Flexible IO Tester 3.25

Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory



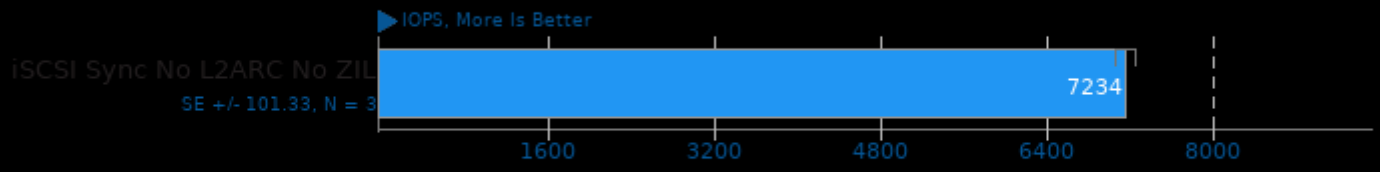
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Flexible IO Tester 3.25
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
1
iSCSI Sync L2ARC No ZIL Retry
SE +/- 2.00, N = 2
3
iSCSI Sync No L2ARC No ZIL
SE +/- 1.53, N = 3
7
iSCSI Sync ZIL
SE +/- 100.00, N = 3
112
30
60
90
120
150
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 0.307, N = 3
3.096
iSCSI Sync L2ARC No ZIL Retry
SE +/- 1.543, N = 3
4.616
iSCSI Sync No L2ARC No ZIL
SE +/- 1.215, N = 3
9.494
iSCSI Sync ZIL
SE +/- 99.901, N = 3
115.200
30
60
90
120
150
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 32KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync No L2ARC No ZIL
SE +/- 853.56, N = 3
1570
300
600
900
1200
1500
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 32KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync No L2ARC No ZIL
SE +/- 26.73, N = 3
49.2
11
22
33
44
55
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 4.91, N = 3
9
iSCSI Sync No L2ARC No ZIL
SE +/- 269.34, N = 3
274
iSCSI Sync ZIL
SE +/- 0.88, N = 3
7
60
120
180
240
300
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 4.699, N = 3
12.494
iSCSI Sync No L2ARC No ZIL
SE +/- 269.452, N = 3
277.104
iSCSI Sync ZIL
SE +/- 0.823, N = 3
9.522
60
120
180
240
300
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

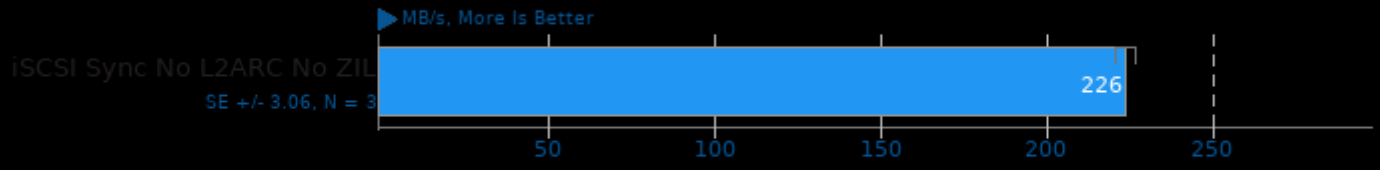
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 32KB - Disk Target: Default Test Directory



1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

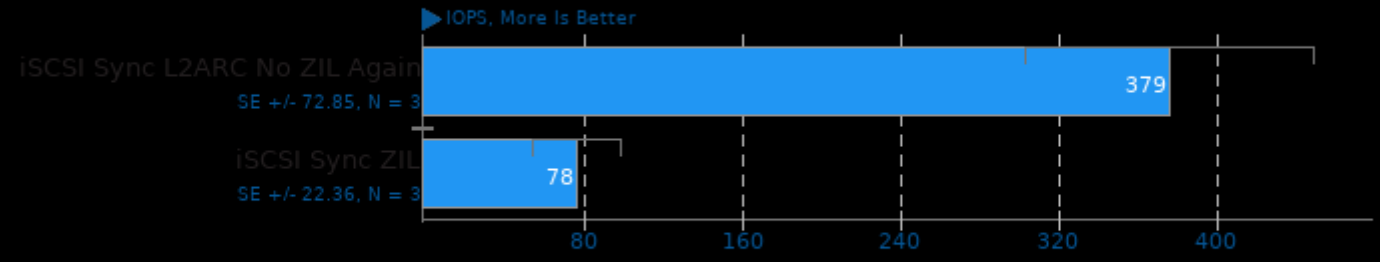
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 32KB - Disk Target: Default Test Directory



1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

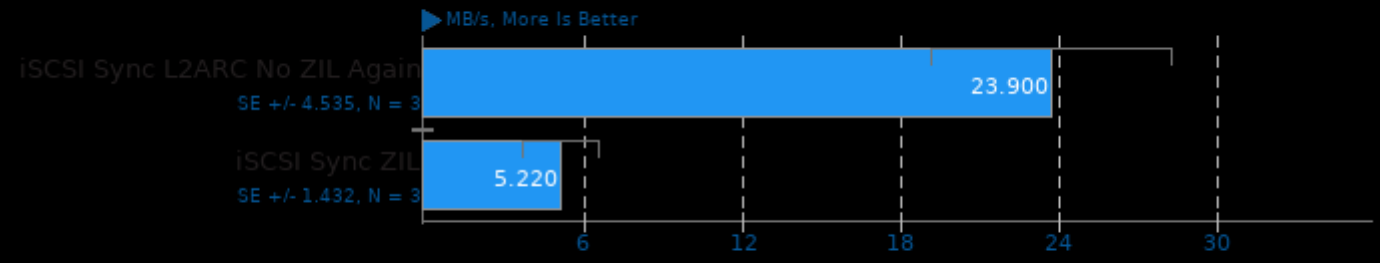
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 64KB - Disk Target: Default Test Directory



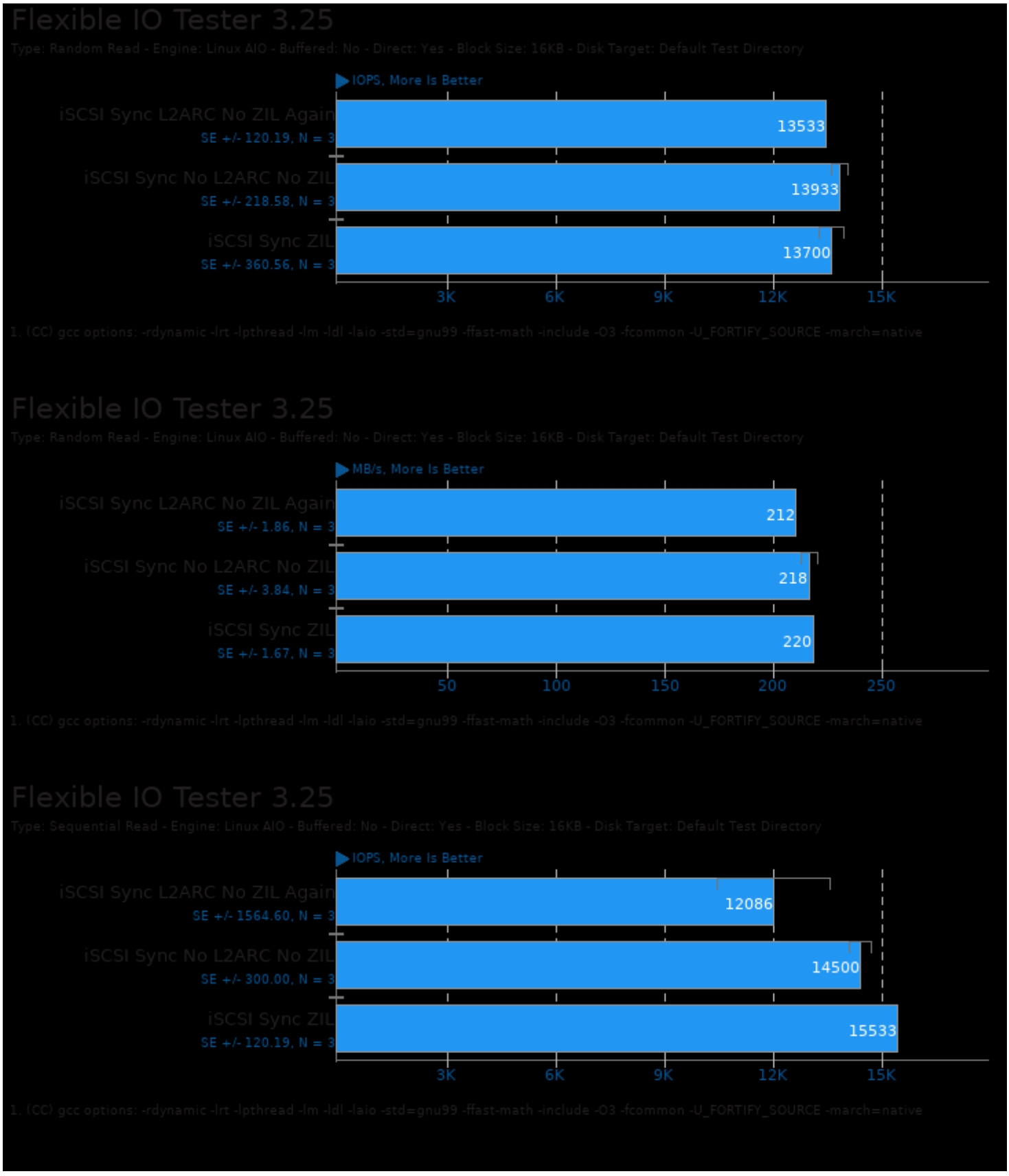
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

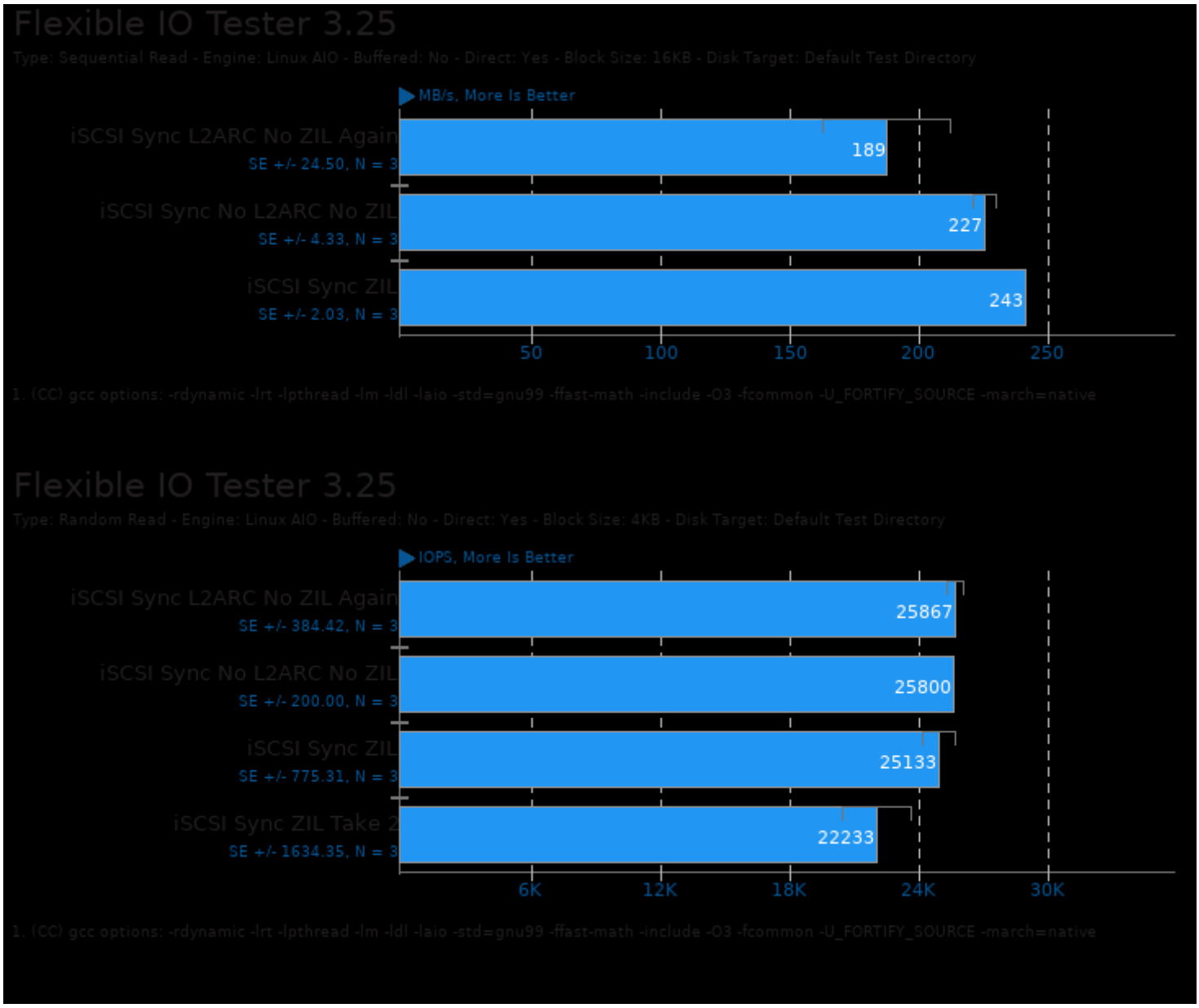
Flexible IO Tester 3.25

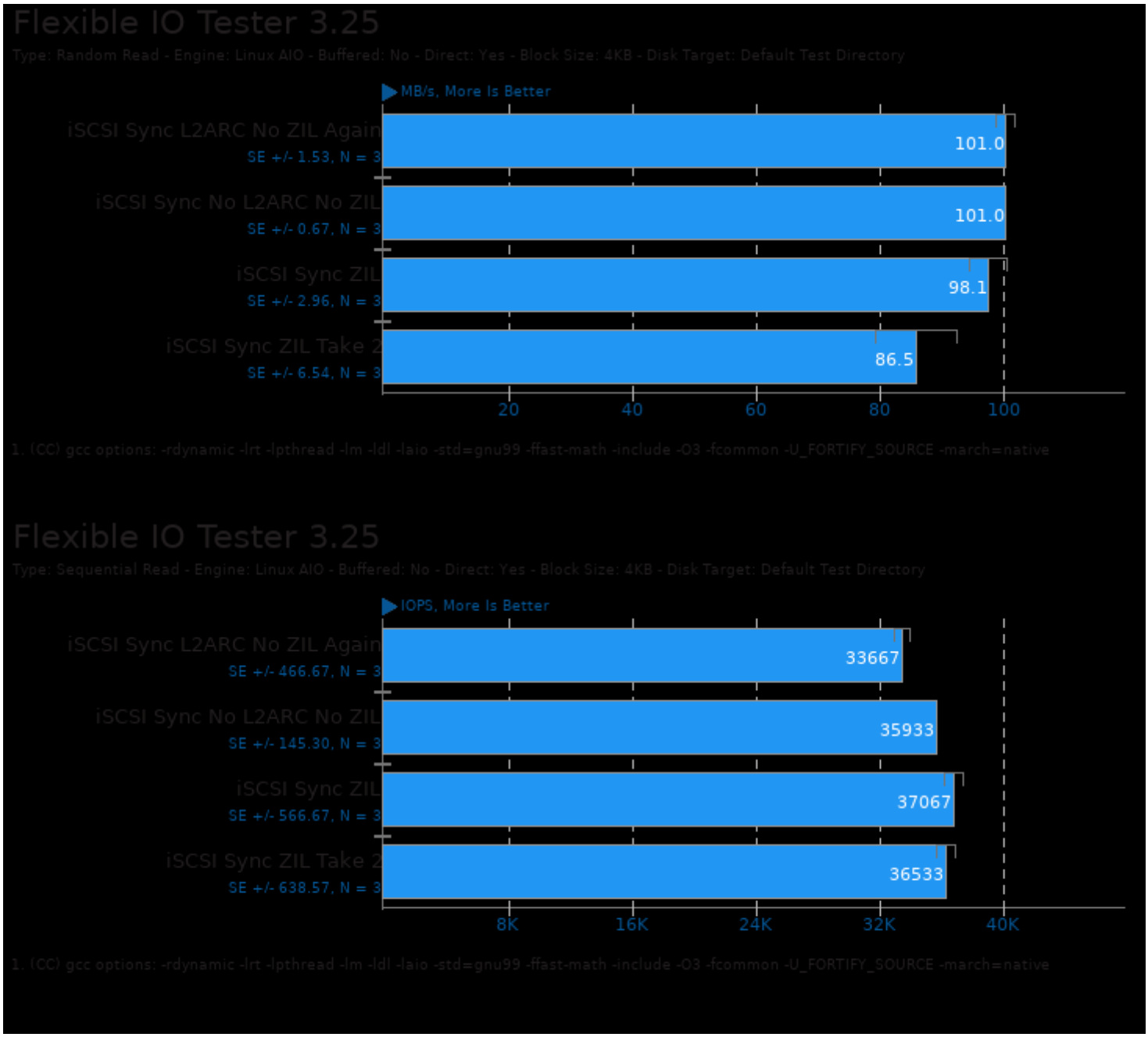
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 64KB - Disk Target: Default Test Directory

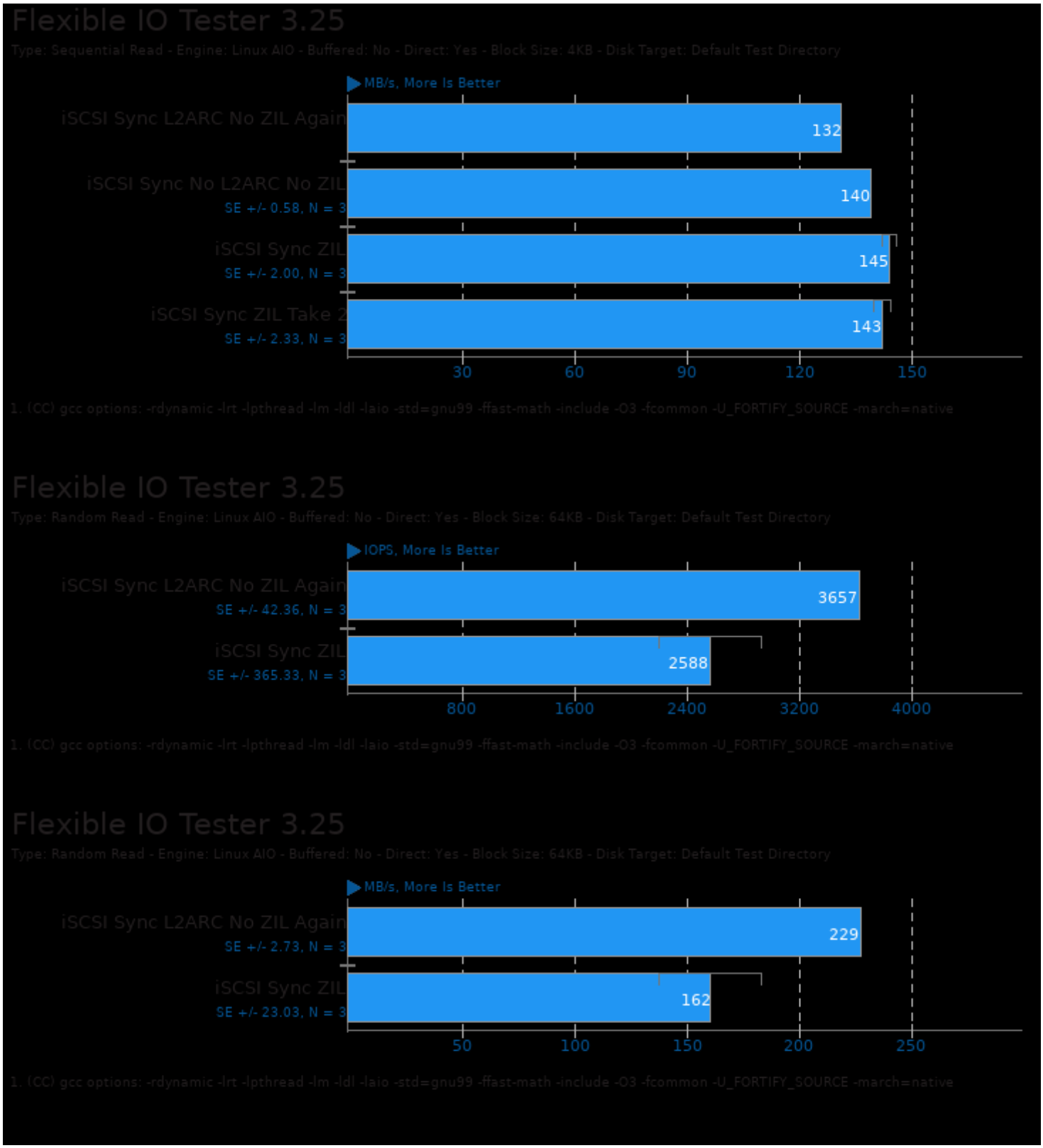


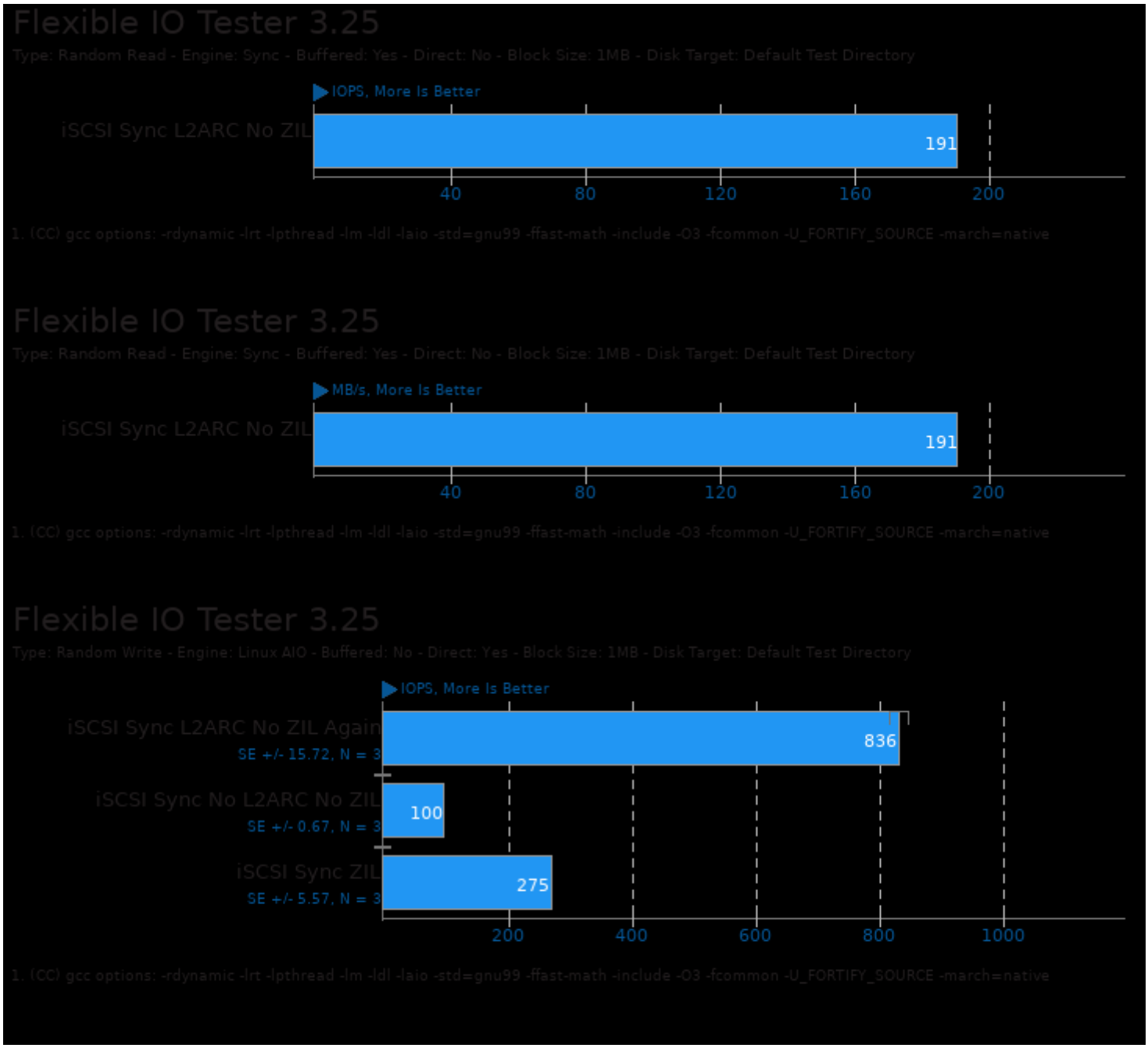
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 120.19, N = 3
13533
iSCSI Sync No L2ARC No ZIL
SE +/- 218.58, N = 3
13933
iSCSI Sync ZIL
SE +/- 360.56, N = 3
13700
3K
6K
9K
12K
15K
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 1.86, N = 3
212
iSCSI Sync No L2ARC No ZIL
SE +/- 3.84, N = 3
218
iSCSI Sync ZIL
SE +/- 1.67, N = 3
220
50
100
150
200
250
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 1564.60, N = 3
12086
iSCSI Sync No L2ARC No ZIL
SE +/- 300.00, N = 3
14500
iSCSI Sync ZIL
SE +/- 120.19, N = 3
15533
3K
6K
9K
12K
15K
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 24.50, N = 3
189
iSCSI Sync No L2ARC No ZIL
SE +/- 4.33, N = 3
227
iSCSI Sync ZIL
SE +/- 2.03, N = 3
243
50
100
150
200
250
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 384.42, N = 3
25867
iSCSI Sync No L2ARC No ZIL
SE +/- 200.00, N = 3
25800
iSCSI Sync ZIL
SE +/- 775.31, N = 3
25133
iSCSI Sync ZIL Take 2
SE +/- 1634.35, N = 3
22233
6K
12K
18K
24K
30K
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

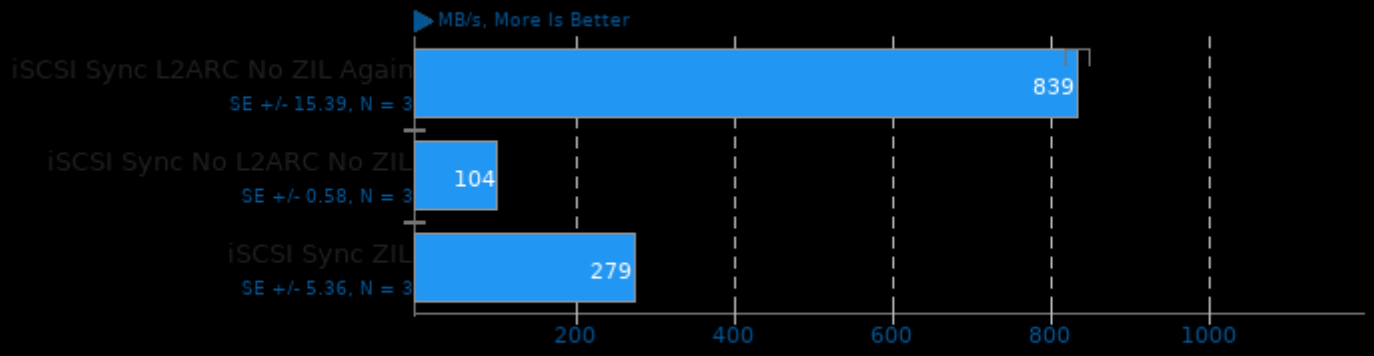

Flexible IO Tester 3.25
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 1.53, N = 3
101.0
iSCSI Sync No L2ARC No ZIL
SE +/- 0.67, N = 3
101.0
iSCSI Sync ZIL
SE +/- 2.96, N = 3
98.1
iSCSI Sync ZIL Take 2
SE +/- 6.54, N = 3
86.5
20
40
60
80
100
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 466.67, N = 3
33667
iSCSI Sync No L2ARC No ZIL
SE +/- 145.30, N = 3
35933
iSCSI Sync ZIL
SE +/- 566.67, N = 3
37067
iSCSI Sync ZIL Take 2
SE +/- 638.57, N = 3
36533
8K
16K
24K
32K
40K
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Sequential Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
132
iSCSI Sync No L2ARC No ZIL
SE +/- 0.58, N = 3
140
iSCSI Sync ZIL
SE +/- 2.00, N = 3
145
iSCSI Sync ZIL Take 2
SE +/- 2.33, N = 3
143
30
60
90
120
150
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 64KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 42.36, N = 3
3657
iSCSI Sync ZIL
SE +/- 365.33, N = 3
2588
800
1600
2400
3200
4000
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Read - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 64KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 2.73, N = 3
229
iSCSI Sync ZIL
SE +/- 23.03, N = 3
162
50
100
150
200
250
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Random Read - Engine: Sync - Buffered: Yes - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL
191
40
80
120
160
200
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Read - Engine: Sync - Buffered: Yes - Direct: No - Block Size: 1MB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL
191
40
80
120
160
200
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 15.72, N = 3
836
iSCSI Sync No L2ARC No ZIL
SE +/- 0.67, N = 3
100
iSCSI Sync ZIL
SE +/- 5.57, N = 3
275
200
400
600
800
1000
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

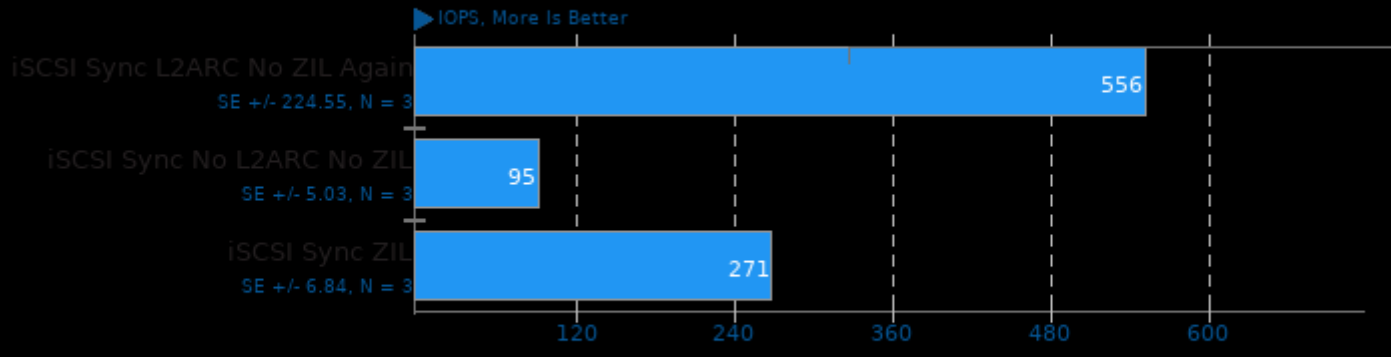
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory



1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

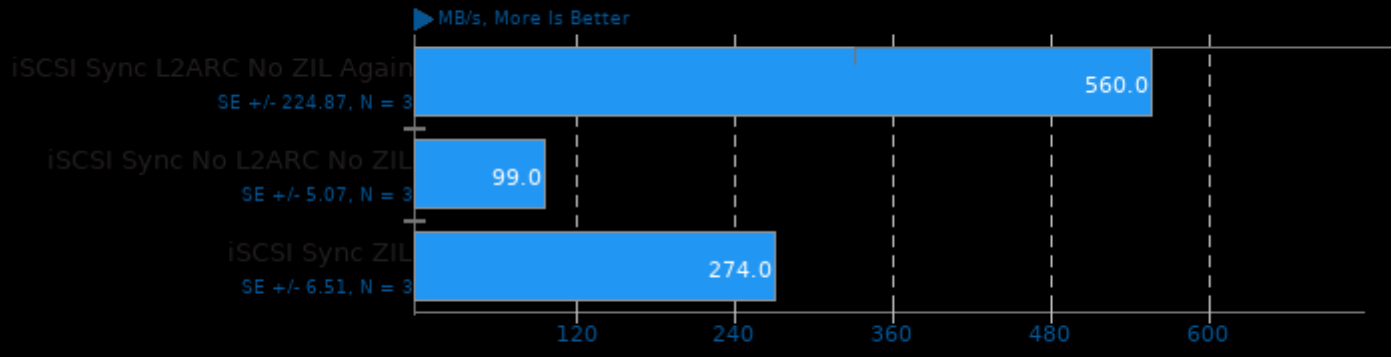
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory



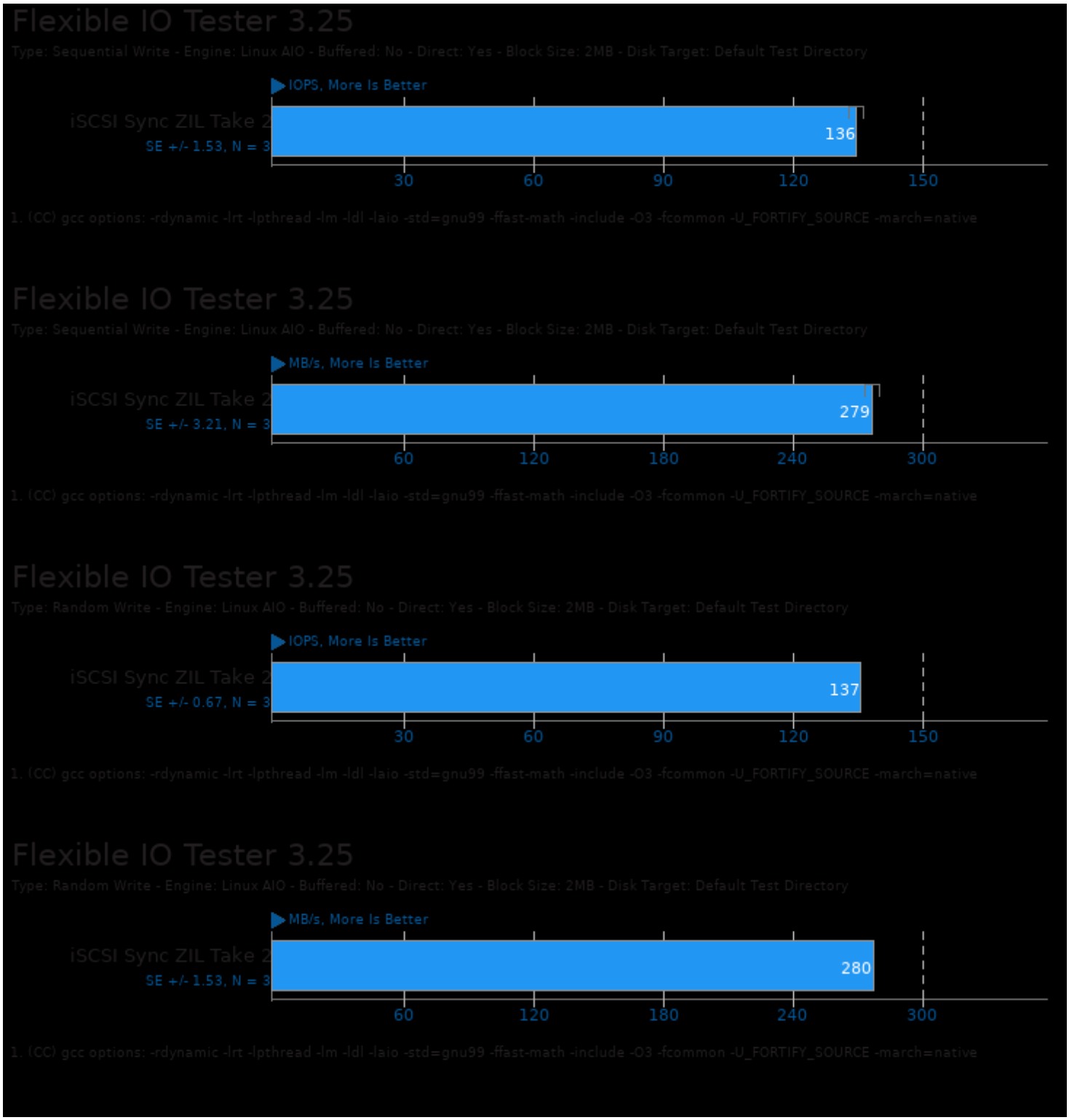
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 1MB - Disk Target: Default Test Directory

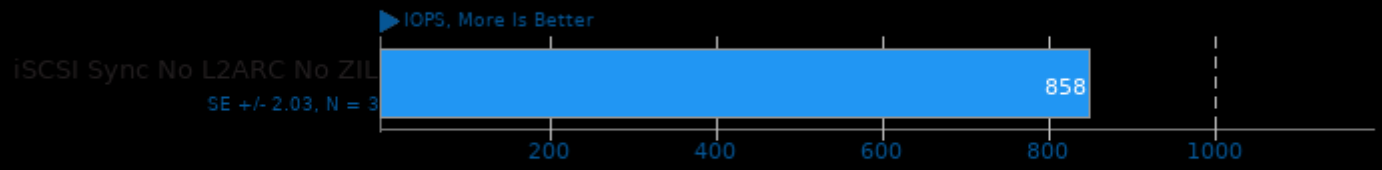


1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync ZIL Take 2
SE +/- 1.53, N = 3
136
30
60
90
120
150
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync ZIL Take 2
SE +/- 3.21, N = 3
279
60
120
180
240
300
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync ZIL Take 2
SE +/- 0.67, N = 3
137
30
60
90
120
150
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 2MB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync ZIL Take 2
SE +/- 1.53, N = 3
280
60
120
180
240
300
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

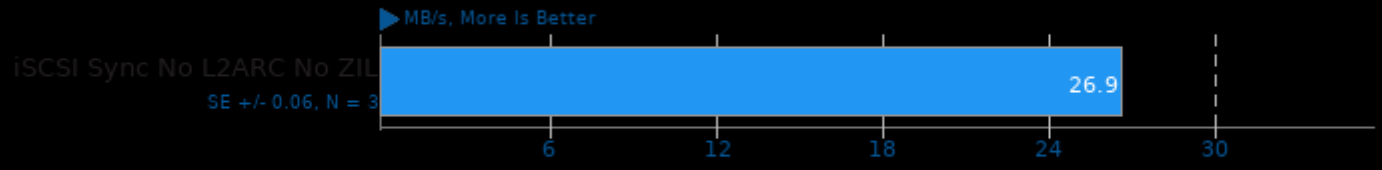
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 32KB - Disk Target: Default Test Directory



1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

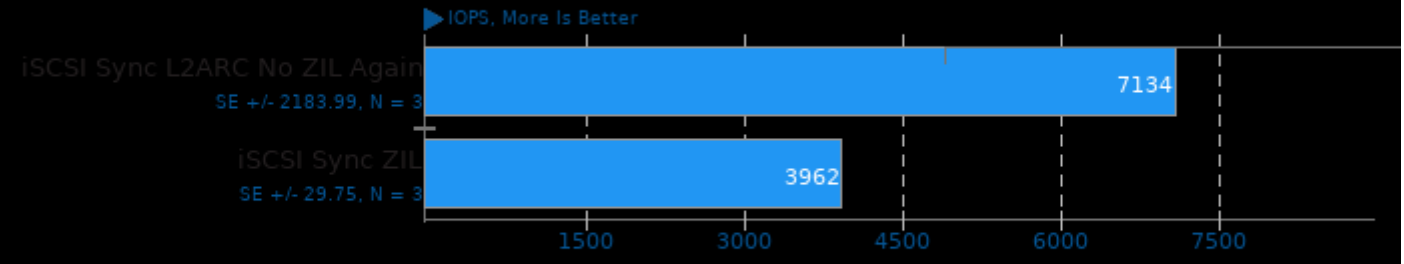
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 32KB - Disk Target: Default Test Directory



1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

Flexible IO Tester 3.25

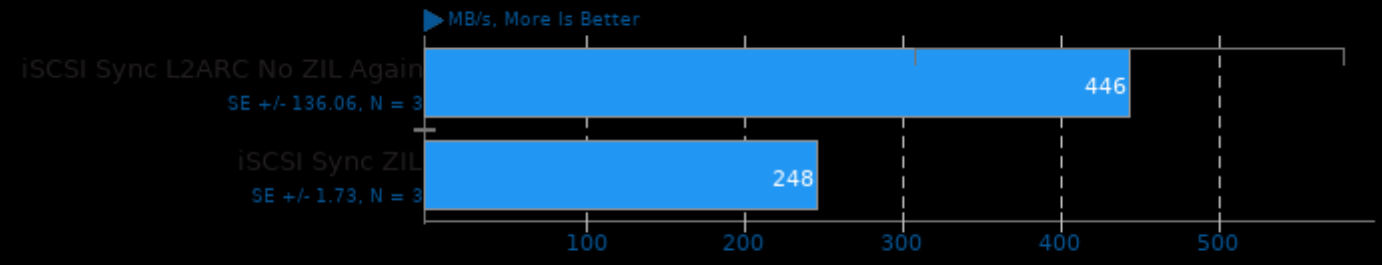
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 64KB - Disk Target: Default Test Directory



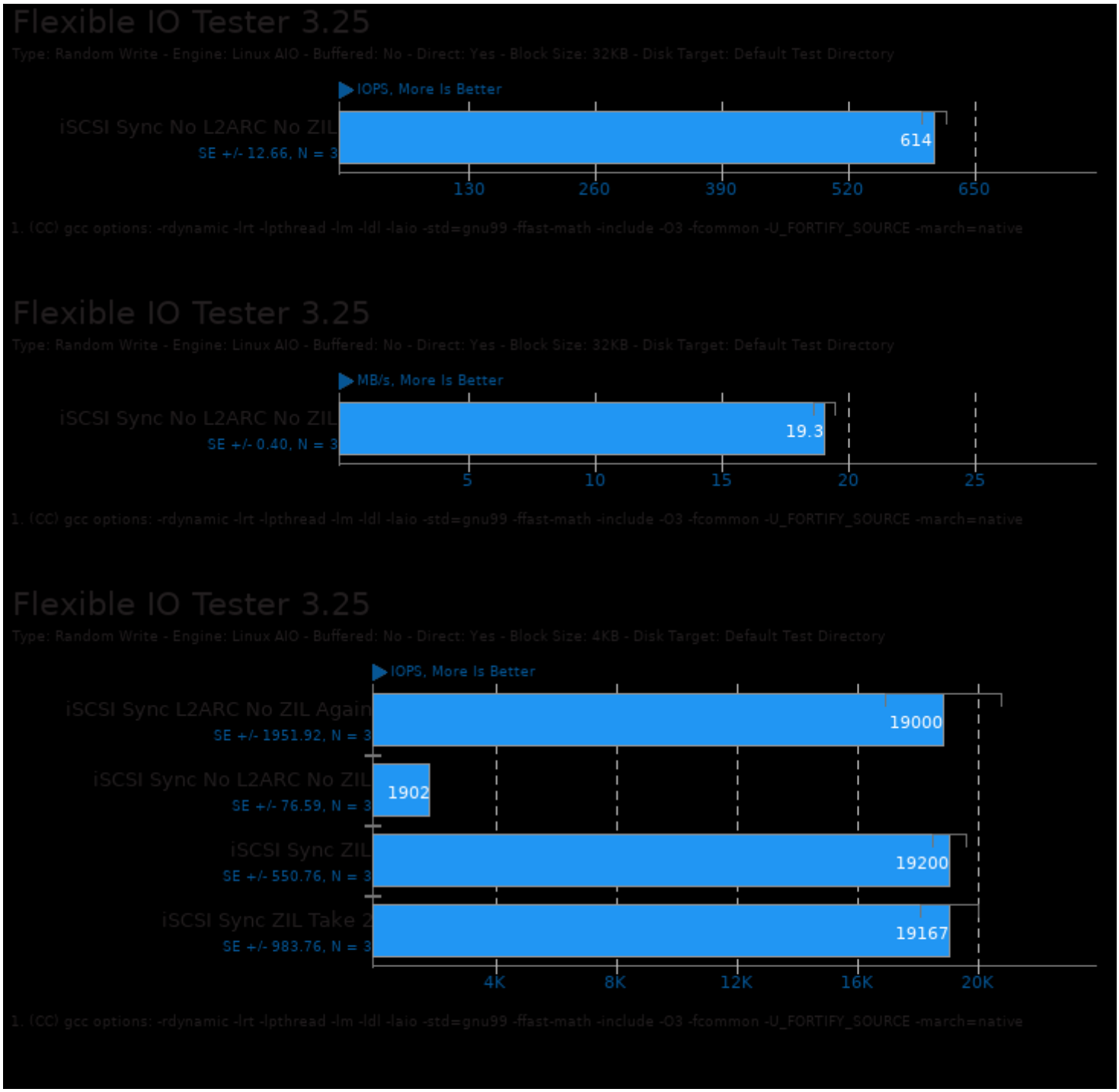
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

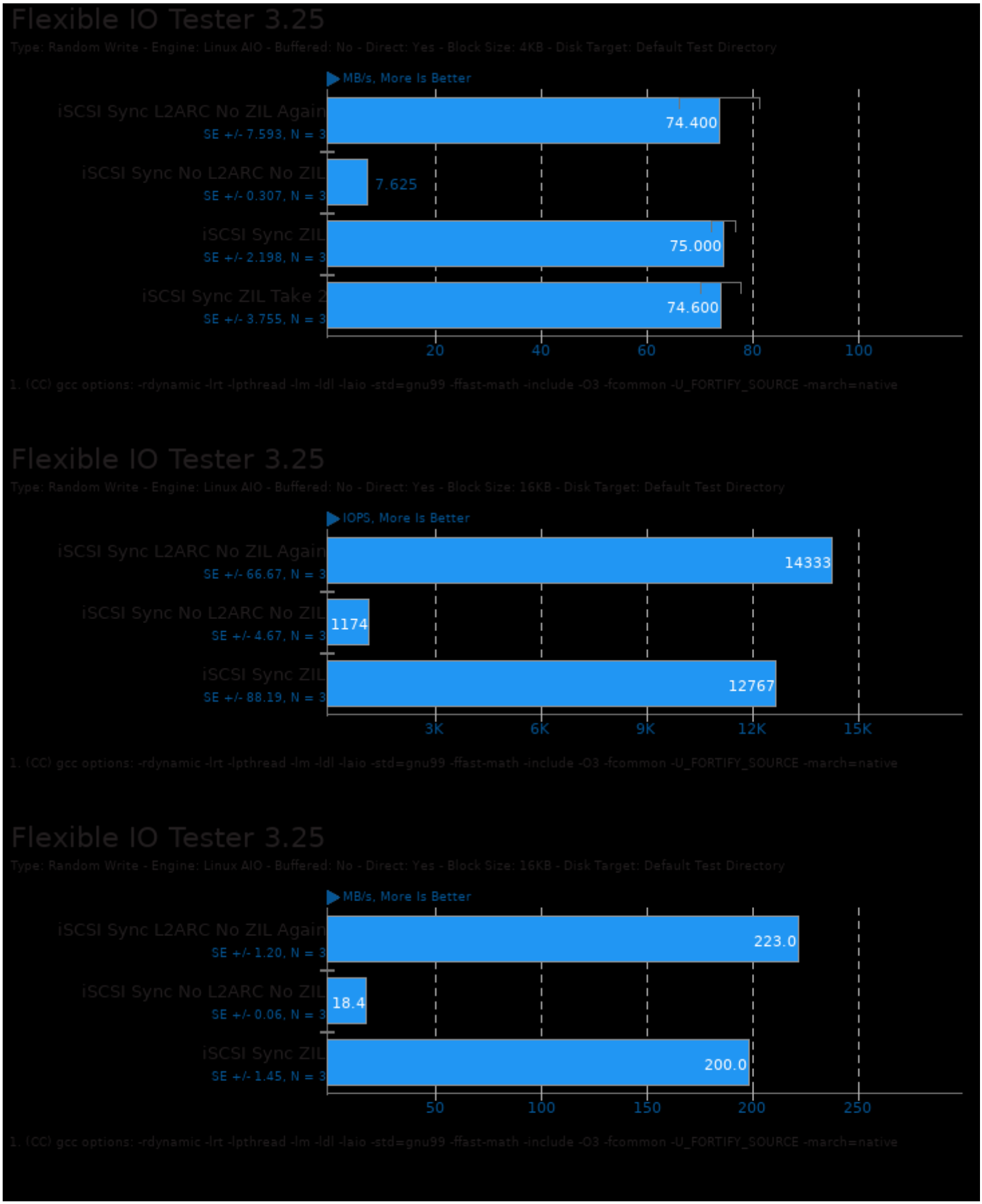
Flexible IO Tester 3.25

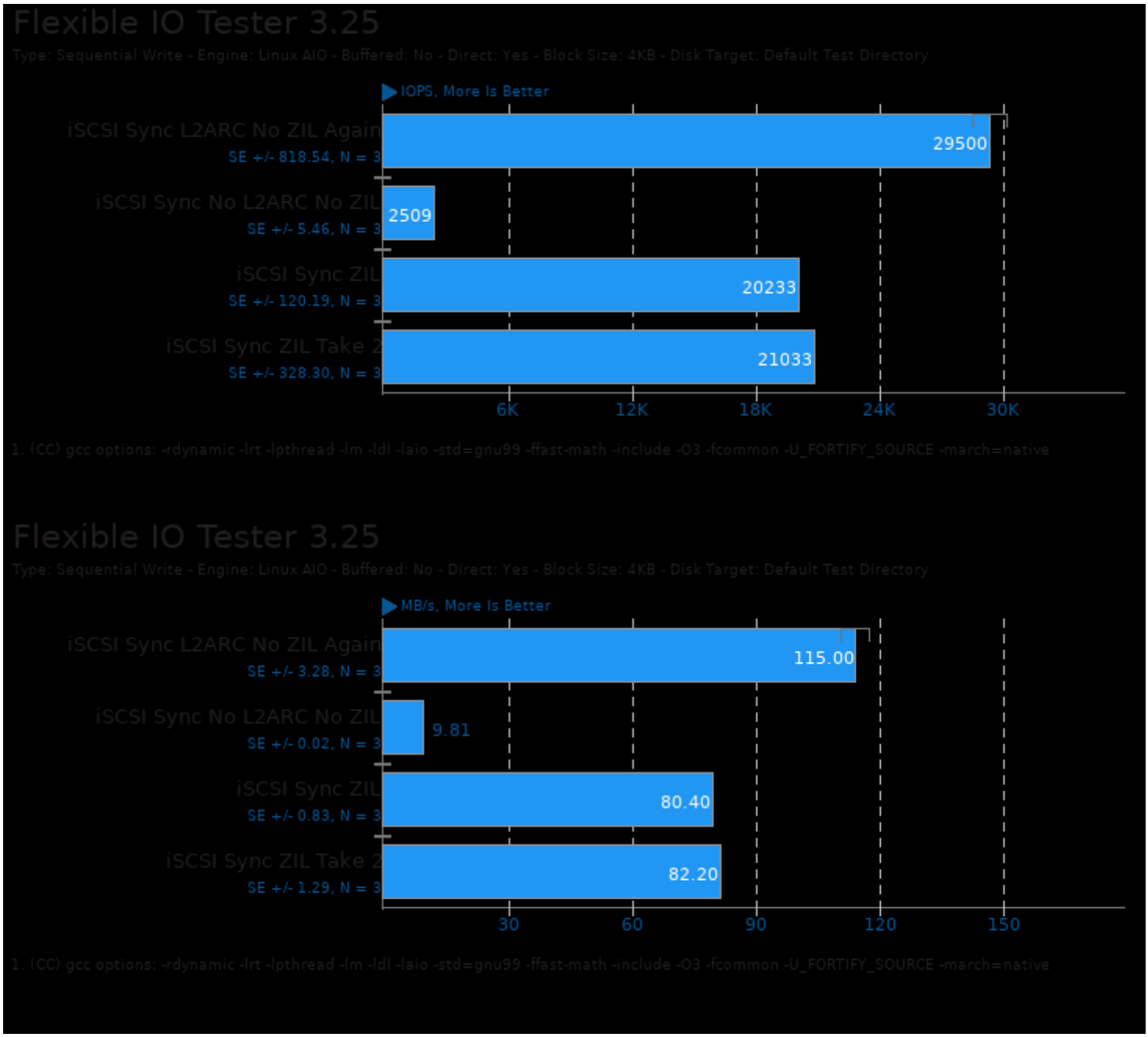
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 64KB - Disk Target: Default Test Directory

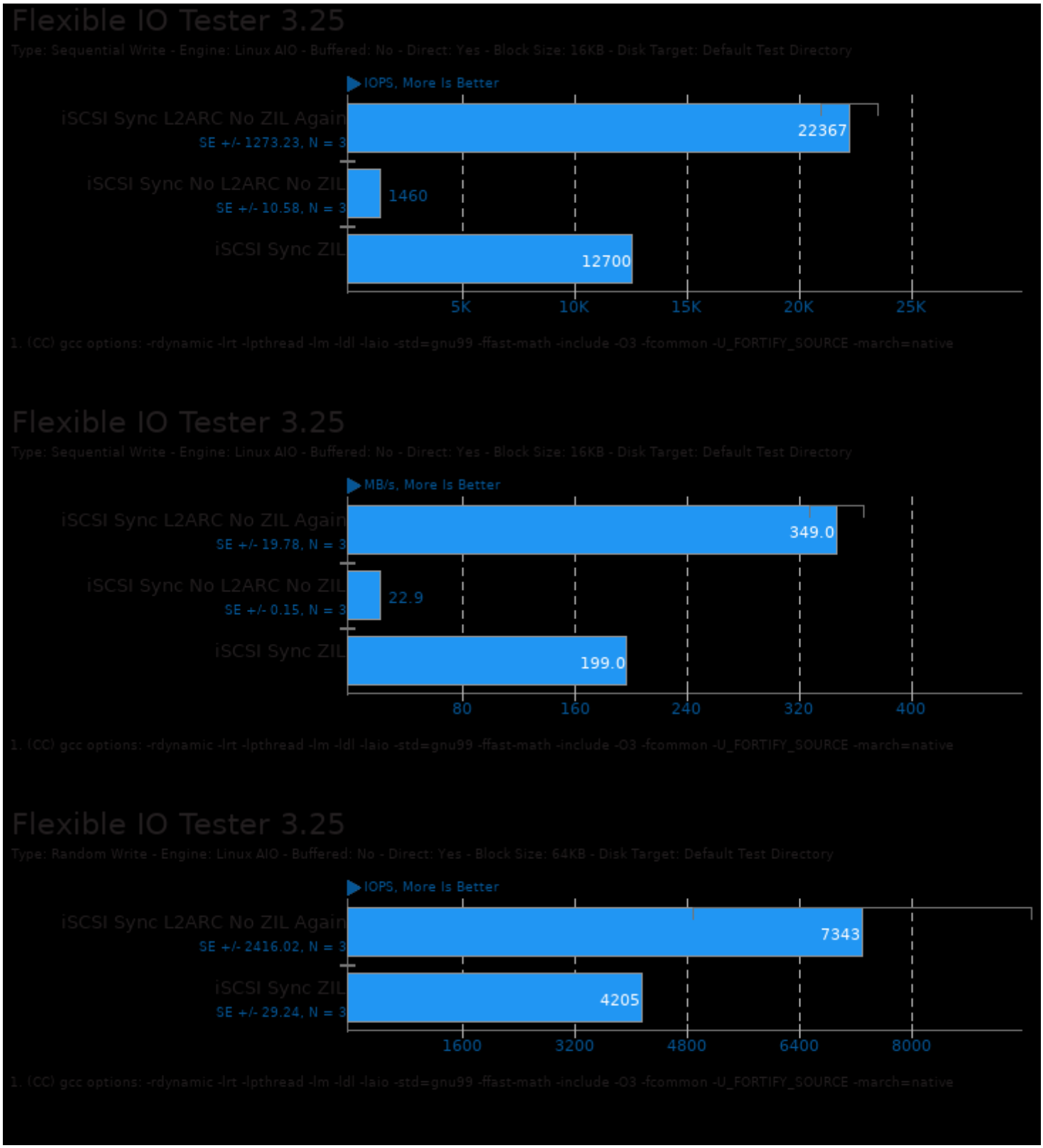


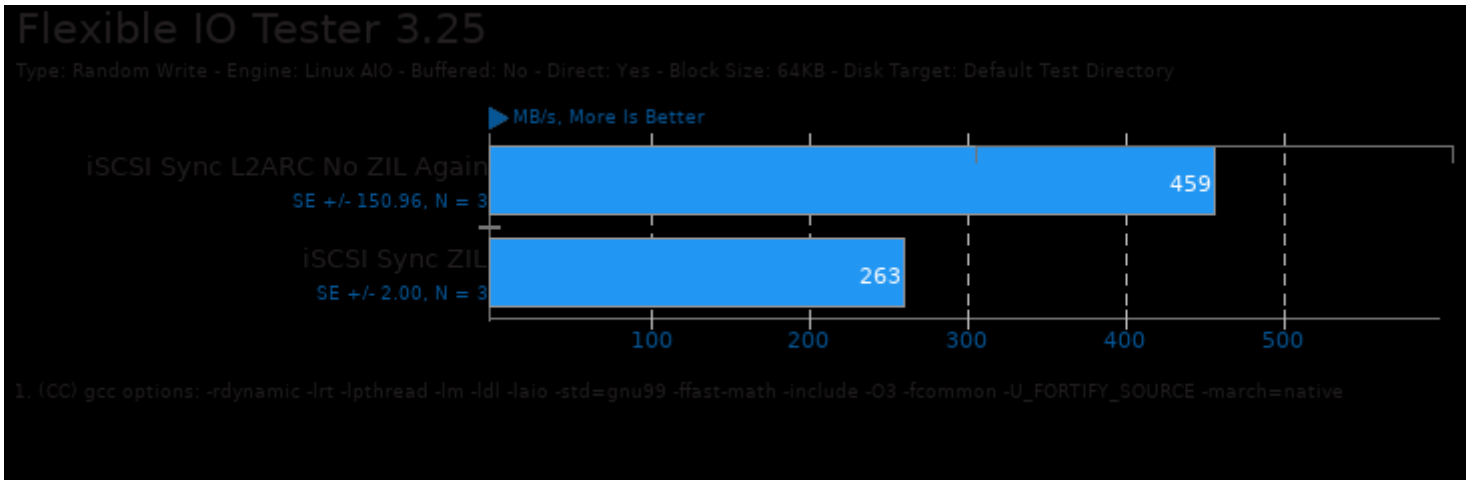
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 32KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync No L2ARC No ZIL
SE +/- 12.66, N = 3
614
130
260
390
520
650
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 32KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync No L2ARC No ZIL
SE +/- 0.40, N = 3
19.3
5
10
15
20
25
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 1951.92, N = 3
19000
iSCSI Sync No L2ARC No ZIL
SE +/- 76.59, N = 3
1902
iSCSI Sync ZIL
SE +/- 550.76, N = 3
19200
iSCSI Sync ZIL Take 2
SE +/- 983.76, N = 3
19167
4K
8K
12K
16K
20K
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 7.593, N = 3
74.400
iSCSI Sync No L2ARC No ZIL
SE +/- 0.307, N = 3
7.625
iSCSI Sync ZIL
SE +/- 2.198, N = 3
75.000
iSCSI Sync ZIL Take 2
SE +/- 3.755, N = 3
74.600
20
40
60
80
100
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 66.67, N = 3
14333
iSCSI Sync No L2ARC No ZIL
SE +/- 4.67, N = 3
1174
iSCSI Sync ZIL
SE +/- 88.19, N = 3
12767
3K
6K
9K
12K
15K
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 1.20, N = 3
223.0
iSCSI Sync No L2ARC No ZIL
SE +/- 0.06, N = 3
18.4
iSCSI Sync ZIL
SE +/- 1.45, N = 3
200.0
50
100
150
200
250
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 818.54, N = 3
29500
iSCSI Sync No L2ARC No ZIL
SE +/- 5.46, N = 3
2509
iSCSI Sync ZIL
SE +/- 120.19, N = 3
20233
iSCSI Sync ZIL Take 2
SE +/- 328.30, N = 3
21033
6K
12K
18K
24K
30K
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 3.28, N = 3
115.00
iSCSI Sync No L2ARC No ZIL
SE +/- 0.02, N = 3
9.81
iSCSI Sync ZIL
SE +/- 0.83, N = 3
80.40
iSCSI Sync ZIL Take 2
SE +/- 1.29, N = 3
82.20
30
60
90
120
150
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native


Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 1273.23, N = 3
22367
iSCSI Sync No L2ARC No ZIL
SE +/- 10.58, N = 3
1460
iSCSI Sync ZIL
12700
5K
10K
15K
20K
25K
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Sequential Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 16KB - Disk Target: Default Test Directory
MB/s, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 19.78, N = 3
349.0
iSCSI Sync No L2ARC No ZIL
SE +/- 0.15, N = 3
22.9
iSCSI Sync ZIL
199.0
80
160
240
320
400
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native
Flexible IO Tester 3.25
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 64KB - Disk Target: Default Test Directory
IOPS, More Is Better
iSCSI Sync L2ARC No ZIL Again
SE +/- 2416.02, N = 3
7343
iSCSI Sync ZIL
SE +/- 29.24, N = 3
4205
1600
3200
4800
6400
8000
1. (CC) gcc options: -rdynamic -lrt -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native



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