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45_Drives_XL60

Intel Xeon Silver 4216 testing on FreeBSD via the Phoronix Test Suite.

Automated Executive Summary

6 VDEVs with Ten Drives Per RaidZ2 had the most wins, coming in first place for 57% of the tests.

Based on the geometric mean of all complete results, the fastest (10 VDEV with Six Drives Per VDEV RaidZ2) was 1.07x the speed of the slowest (6 VDEV with Ten Drives Per VDEV RaidZ2). 6 VDEVs with Ten Drives Per RaidZ2 was 0.952x the speed of 10 VDEV with Six Drives Per VDEV RaidZ2 and 6 VDEV with Ten Drives Per VDEV RaidZ2 was 0.981x the speed of 6 VDEVs with Ten Drives Per RaidZ2.

Test Systems:

10 VDEV with Six Drives Per VDEV RaidZ2

6 VDEV with Ten Drives Per VDEV RaidZ2

Processor: Intel Xeon Silver 4216 (32 Cores), Motherboard: 45Drives XL60 0123456789, Memory: 256GB, Disk: 648814GB

OS: FreeBSD, Kernel: 12.2-RELEASE-p10 (x86_64), Compiler: Clang 10.0.1, File-System: zfs

6 VDEVs with Ten Drives Per RaidZ2

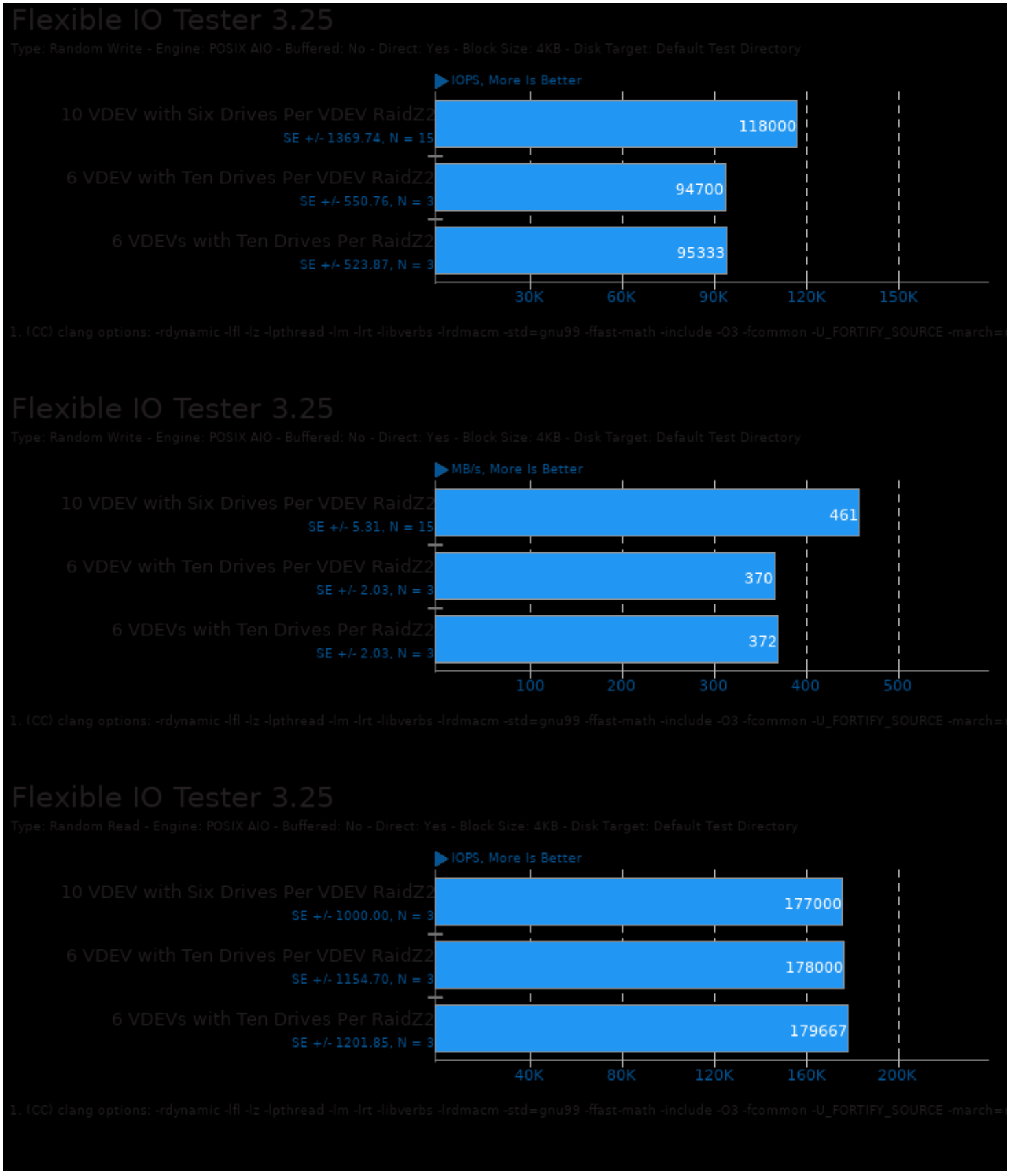
Processor: Intel Xeon Silver 4216 (32 Cores), Motherboard: 45Drives XL60 0123456789, Memory: 256GB, Disk: 742118GB

OS: FreeBSD, Kernel: 12.2-RELEASE-p10 (x86_64), Compiler: Clang 10.0.1, File-System: zfs

	10 VDEV with Six Drives Per VDEV RaidZ2	6 VDEV with Ten Drives Per VDEV RaidZ2	6 VDEVs with Ten Drives Per RaidZ2
Flexible IO Tester - Rand Write - POSIX AIO - No - Yes - 4KB (IOPS)	**118000**	**94700**	95333
Normalized	100%	80.25%	80.79%
Standard Deviation	4.5%	1%	1%
Flexible IO Tester - Rand Write - POSIX AIO - No - Yes - 4KB (MB/s)	**461**	**370**	372
Normalized	100%	80.26%	80.69%
Standard Deviation	4.5%	1%	0.9%
Flexible IO Tester - Rand Read - POSIX AIO - No - Yes - 4KB (IOPS)	**177000**	178000	**179667**
Normalized	98.52%	99.07%	100%
Standard Deviation	1%	1.1%	1.2%
Flexible IO Tester - Rand Read - POSIX AIO - No - Yes - 4KB (MB/s)	**693**	696	**702**
Normalized	98.72%	99.15%	100%
Standard Deviation	0.9%	1.2%	1%
Flexible IO Tester - Seq Read - POSIX AIO - No - Yes - 4KB (IOPS)	193667	**193000**	**197000**
Normalized	98.31%	97.97%	100%
Standard Deviation	1.2%	0.9%	
Flexible IO Tester - Seq Read - POSIX AIO - No - Yes - 4KB (MB/s)	756	**754**	**770**
Normalized	98.18%	97.92%	100%
Standard Deviation	1.1%	0.9%	0.5%
Flexible IO Tester - Rand Read - POSIX AIO - No - Yes - 128KB (IOPS)	**140333**	158667	**161667**
Normalized	86.8%	98.14%	100%
Standard Deviation	0.4%	0.7%	0.4%

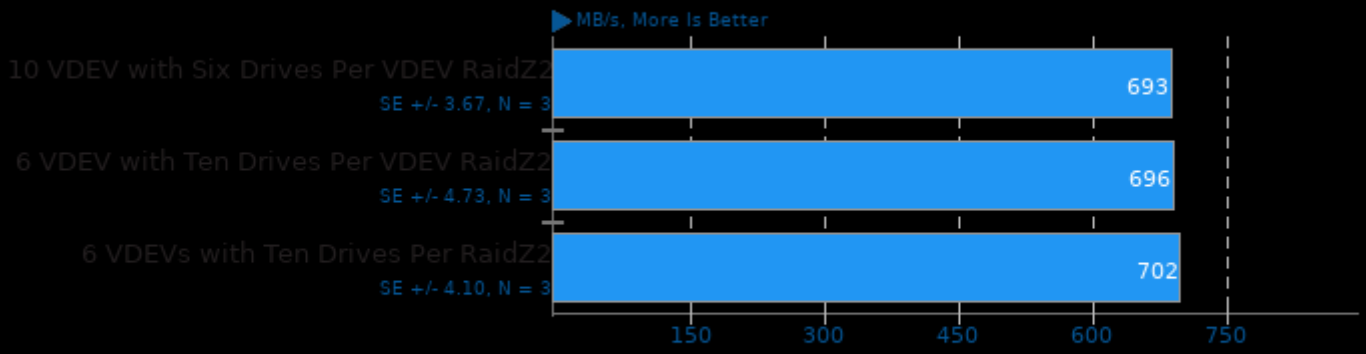
45_Drives_XL60

Flexible IO Tester - Seq Read - POSIX AIO - No - Yes - 128KB (IOPS)	**134667**	153667	**156333**
Normalized	86.14%	98.29%	100%
Standard Deviation	0.9%	0.4%	0.4%
Flexible IO Tester - Seq Write - POSIX AIO - No - Yes - 4KB (IOPS)	**132000**	128667	**126667**
Normalized	100%	97.48%	95.96%
Standard Deviation		0.4%	0.5%
Flexible IO Tester - Seq Write - POSIX AIO - No - Yes - 4KB (MB/s)	**515**	503	**494**
Normalized	100%	97.67%	95.92%
Standard Deviation	0.3%	0.2%	0.1%
Flexible IO Tester - Rand Write - POSIX AIO - No - Yes - 128KB (MB/s)		**8858**	**9524**
Normalized		93.01%	100%
Standard Deviation		1.6%	0.9%
Flexible IO Tester - Rand Write - POSIX AIO - No - Yes - 128KB (IOPS)	**95400**	**70867**	76167
Normalized	100%	74.28%	79.84%
Standard Deviation	2.3%	1.6%	0.9%
Flexible IO Tester - Seq Write - POSIX AIO - No - Yes - 128KB (IOPS)	**94133**	**70633**	76767
Normalized	100%	75.04%	81.55%
Standard Deviation	1.5%	1%	0.2%
Flexible IO Tester - Seq Write - POSIX AIO - No - Yes - 128KB (MB/s)		**8832**	**9593**
Normalized		92.07%	100%
Standard Deviation		1%	0.1%


Flexible IO Tester 3.25
Type: Random Write - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
10 VDEV with Six Drives Per VDEV RaidZ2
SE +/- 1369.74, N = 15
118000
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 550.76, N = 3
94700
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 523.87, N = 3
95333
30K
60K
90K
120K
150K
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=
Flexible IO Tester 3.25
Type: Random Write - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
10 VDEV with Six Drives Per VDEV RaidZ2
SE +/- 5.31, N = 15
461
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 2.03, N = 3
370
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 2.03, N = 3
372
100
200
300
400
500
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=
Flexible IO Tester 3.25
Type: Random Read - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
10 VDEV with Six Drives Per VDEV RaidZ2
SE +/- 1000.00, N = 3
177000
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 1154.70, N = 3
178000
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 1201.85, N = 3
179667
40K
80K
120K
160K
200K
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=

Flexible IO Tester 3.25

Type: Random Read - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory



1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=

Flexible IO Tester 3.25

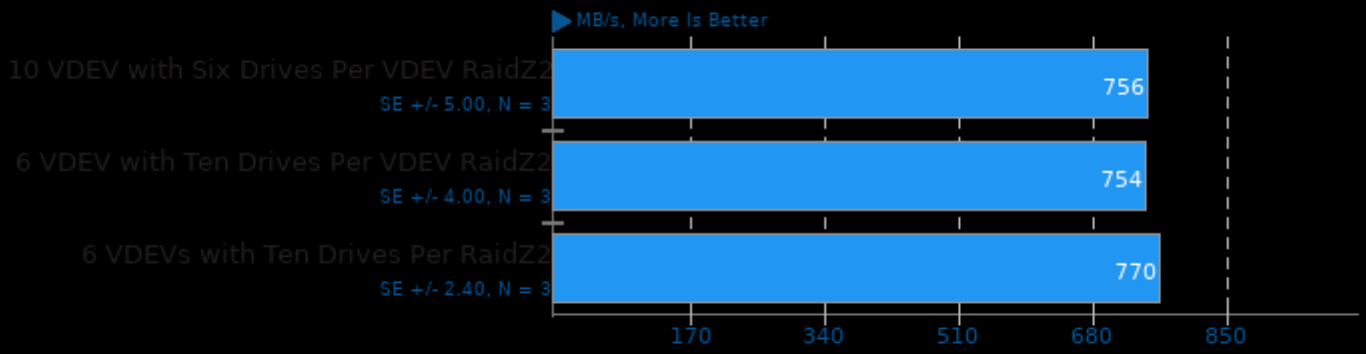
Type: Sequential Read - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory



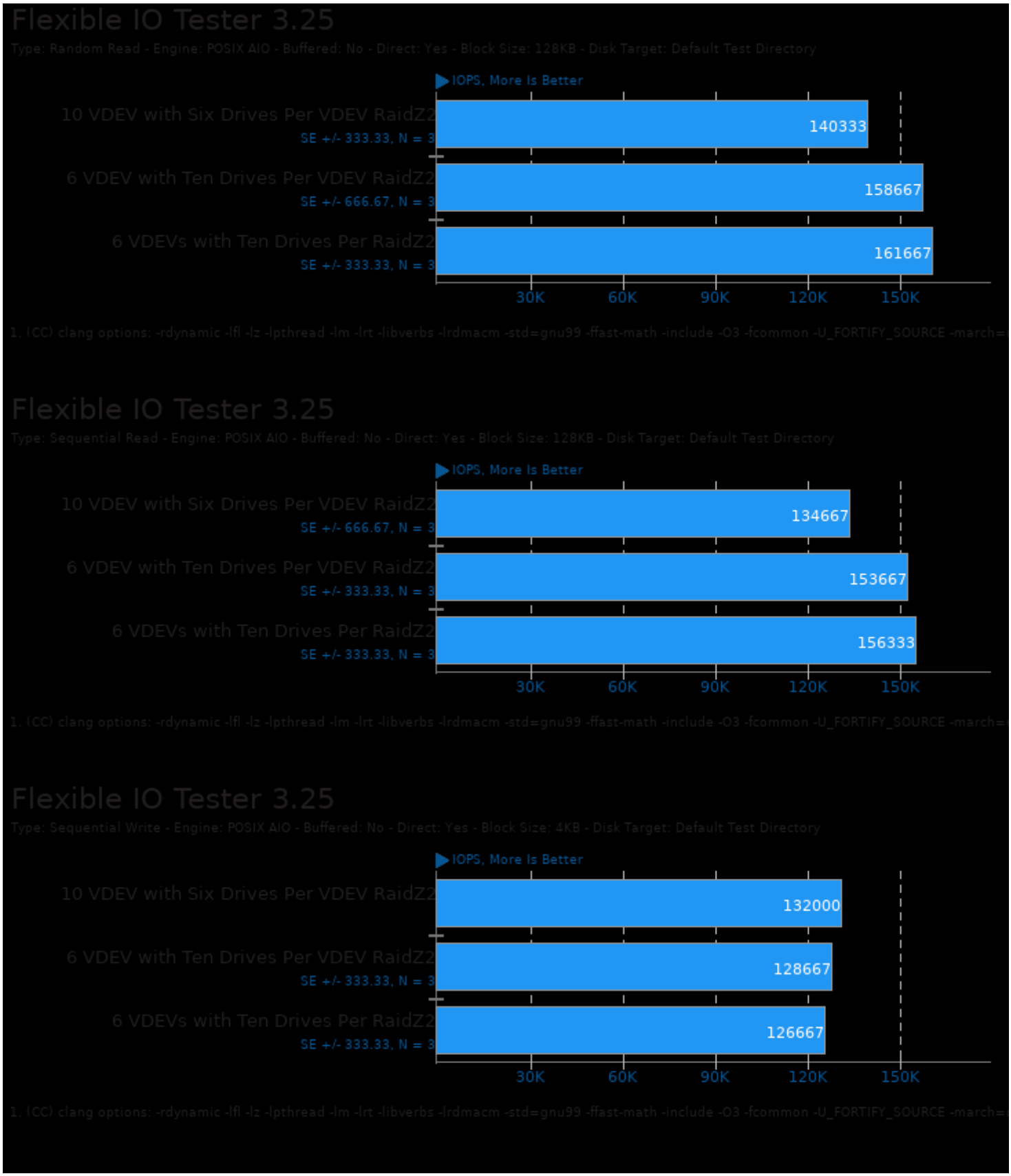
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=

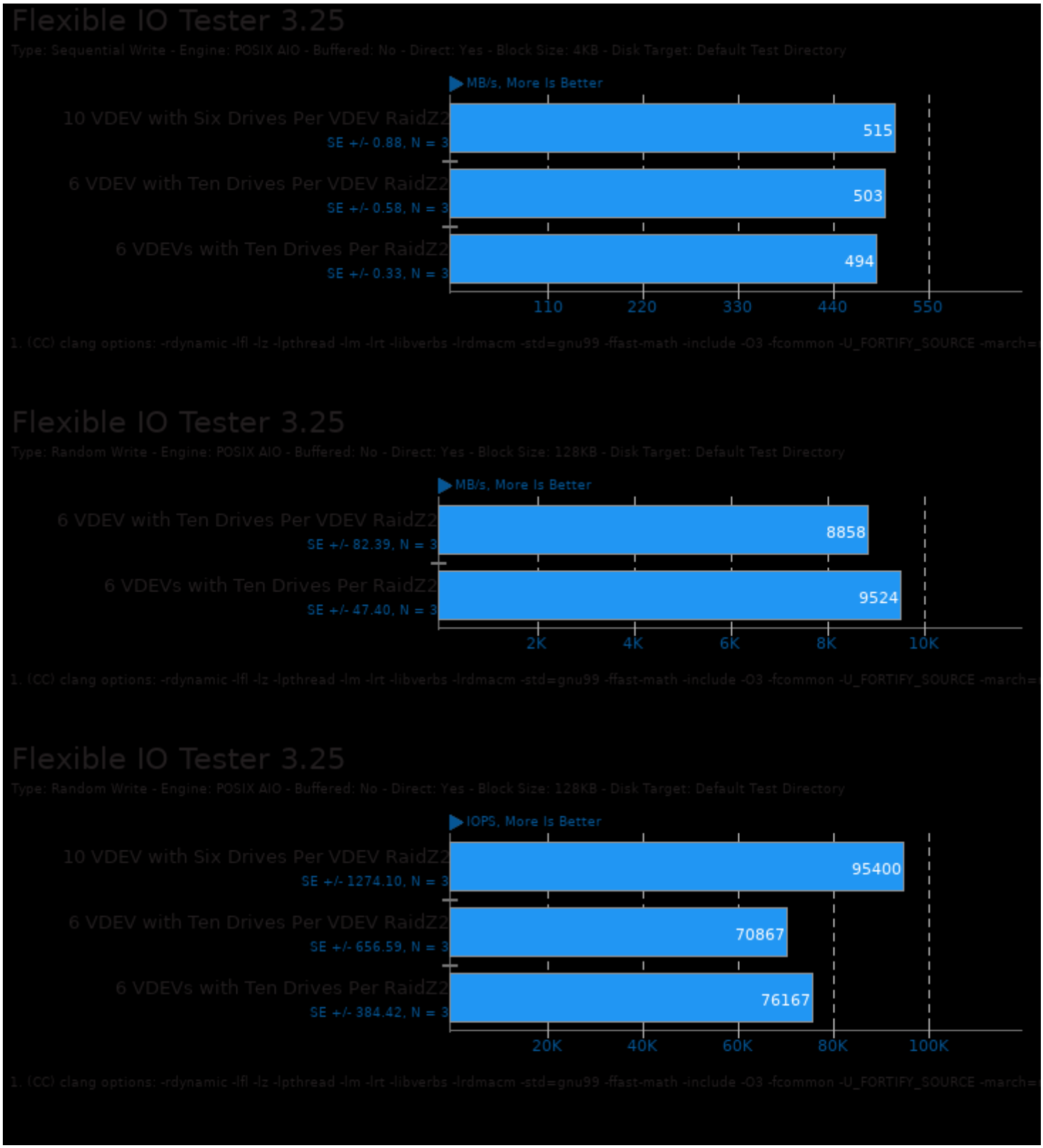
Flexible IO Tester 3.25

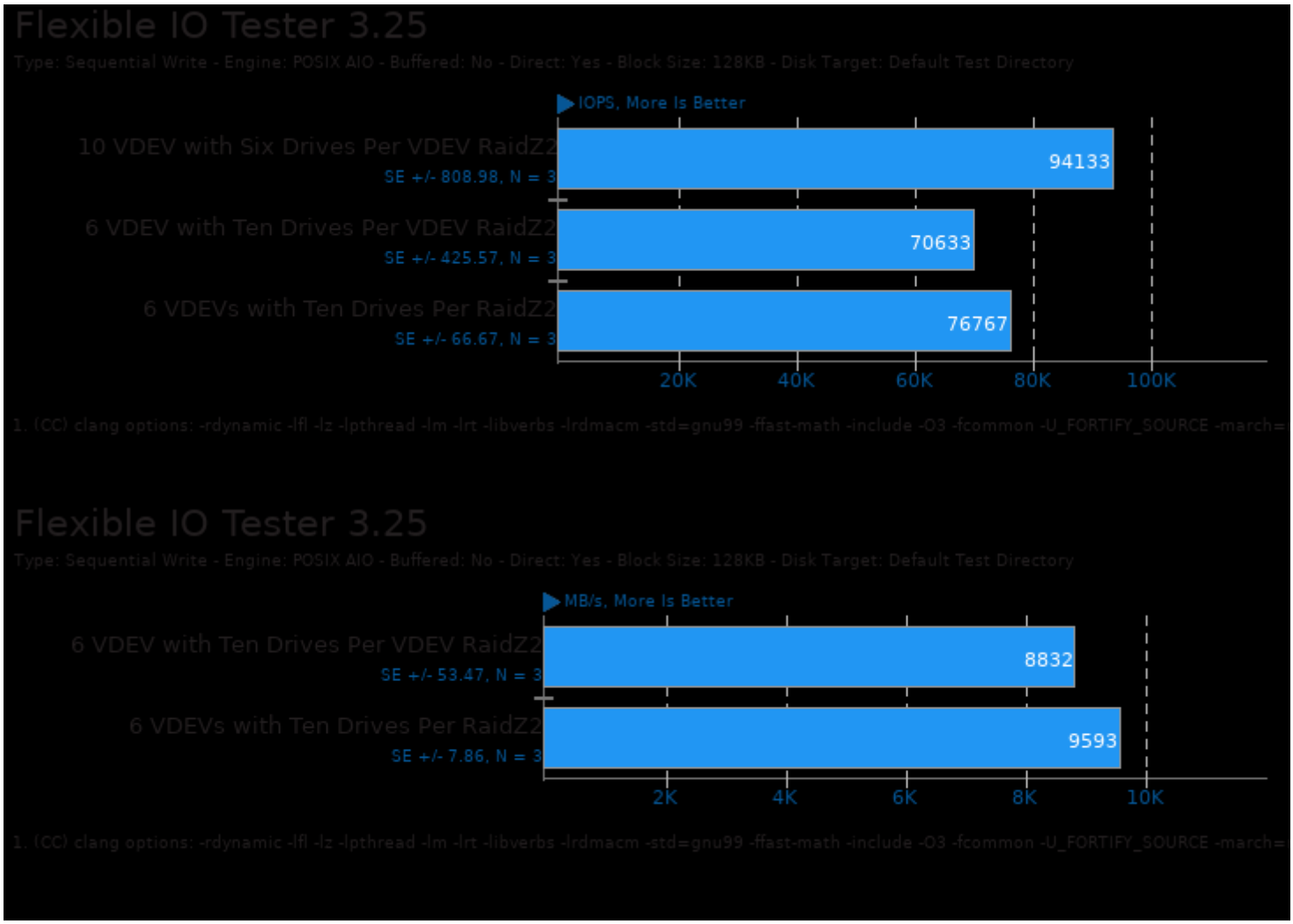
Type: Sequential Read - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory



1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=


Flexible IO Tester 3.25
Type: Random Read - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 128KB - Disk Target: Default Test Directory
IOPS, More Is Better
10 VDEV with Six Drives Per VDEV RaidZ2
SE +/- 333.33, N = 3
140333
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 666.67, N = 3
158667
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 333.33, N = 3
161667
30K
60K
90K
120K
150K
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=
Flexible IO Tester 3.25
Type: Sequential Read - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 128KB - Disk Target: Default Test Directory
IOPS, More Is Better
10 VDEV with Six Drives Per VDEV RaidZ2
SE +/- 666.67, N = 3
134667
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 333.33, N = 3
153667
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 333.33, N = 3
156333
30K
60K
90K
120K
150K
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=
Flexible IO Tester 3.25
Type: Sequential Write - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
IOPS, More Is Better
10 VDEV with Six Drives Per VDEV RaidZ2
SE +/- 333.33, N = 3
132000
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 333.33, N = 3
128667
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 333.33, N = 3
126667
30K
60K
90K
120K
150K
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=


Flexible IO Tester 3.25
Type: Sequential Write - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
10 VDEV with Six Drives Per VDEV RaidZ2
SE +/- 0.88, N = 3
515
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 0.58, N = 3
503
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 0.33, N = 3
494
110
220
330
440
550
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=
Flexible IO Tester 3.25
Type: Random Write - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 128KB - Disk Target: Default Test Directory
MB/s, More Is Better
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 82.39, N = 3
8858
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 47.40, N = 3
9524
2K
4K
6K
8K
10K
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=
Flexible IO Tester 3.25
Type: Random Write - Engine: POSIX AIO - Buffered: No - Direct: Yes - Block Size: 128KB - Disk Target: Default Test Directory
IOPS, More Is Better
10 VDEV with Six Drives Per VDEV RaidZ2
SE +/- 1274.10, N = 3
95400
6 VDEV with Ten Drives Per VDEV RaidZ2
SE +/- 656.59, N = 3
70867
6 VDEVs with Ten Drives Per RaidZ2
SE +/- 384.42, N = 3
76167
20K
40K
60K
80K
100K
1. (CC) clang options: -rdynamic -lfl -lz -lpthread -lm -lrt -libverbs -lrdmacm -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=



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