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5x-ssd-btrfs-raid-10-zstd_direct

2 x AMD EPYC 7451 24-Core testing with a Dell 08V001 (1.12.2 BIOS) and Matrox G200eW3 on Guix via the Phoronix Test Suite.

Automated Executive Summary

btrfs+zstd -draid10,-mraid1c4 6x SSDs, node 125 had the most wins, coming in first place for 50% of the tests.

Based on the geometric mean of all complete results, the fastest (ext4 on dell-md34xx-7200rpm, node 125) was 1.846x the speed of the slowest (btrfs+zstd/noatime on SAN, node 129). btrfs+zstd -draid10,-mraid1c4 6x SSDs, node 125 was 0.931x the speed of ext4 on dell-md34xx-7200rpm, node 125, ext4 on SAN, node 129 was 0.622x the speed of btrfs+zstd -draid10,-mraid1c4 6x SSDs, node 125, btrfs on SAN, node 129 was 0.986x the speed of ext4 on SAN, node 129, btrfs+zstd on SAN, node 129 was 0.984x the speed of btrfs on SAN, node 129, 2 x 240GB MZ7LM240HMHQ0D3 was 0.996x the speed of btrfs+zstd on SAN, node 129, btrfs+zstd/noatime on SAN, node 129 was 0.967x the speed of 2 x 240GB MZ7LM240HMHQ0D3.

Test Systems:

2 x 240GB MZ7LM240HMHQ0D3

ext4 on SAN, node 129

btrfs on SAN, node 129

btrfs+zstd on SAN, node 129

btrfs+zstd/noatime on SAN, node 129

Processor: 2 x AMD EPYC 7451 24-Core (48 Cores / 96 Threads), Motherboard: Dell 08V001 (1.17.0 BIOS), Chipset: AMD 17h, Memory: 192GB, Disk: 2 x 240GB MZ7LM240HMHQ0D3 + 3 x 240GB SanDisk SSD PLUS + 4 x 109951GB Compellent Vol + 4 x 10995GB Compellent Vol, Graphics: Matrox G200eW3, Network: 2 x Broadcom BCM57416 NetXtreme-E Dual-Media 10G RDMA + 2 x Broadcom NetXtreme BCM5720 2-port PCIe

OS: Guix, Kernel: 5.17.14-gnu (x86_64), Compiler: GCC 12.1.0, File-System: btrfs

Kernel Notes: Transparent Huge Pages: always
Disk Notes: MQ-DEADLINE / compress-force=zstd:3,degraded,relatime,rw,space_cache=v2,ssd,subvol=/@home,subvolid=259 / RAID10 Block Size: 4096
Processor Notes: CPU Microcode: 0x800126c
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl + 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

btrfs+zstd -draid10,-mraid1c4 6x SSDs, node 125

ext4 on dell-md34xx-7200rpm, node 125

Processor: 2 x AMD EPYC 7451 24-Core (48 Cores / 96 Threads), Motherboard: Dell 08V001 (1.12.2 BIOS), Chipset: AMD 17h, Memory: 192GB, Disk: 6 x 8002GB Samsung SSD 870 + 1000GB PERC H730P Adp + 39978GB MD34xx, Graphics: Matrox G200eW3, Network: 2 x Broadcom BCM57416 NetXtreme-E Dual-Media 10G RDMA + 2 x Broadcom NetXtreme BCM5720 2-port PCIe

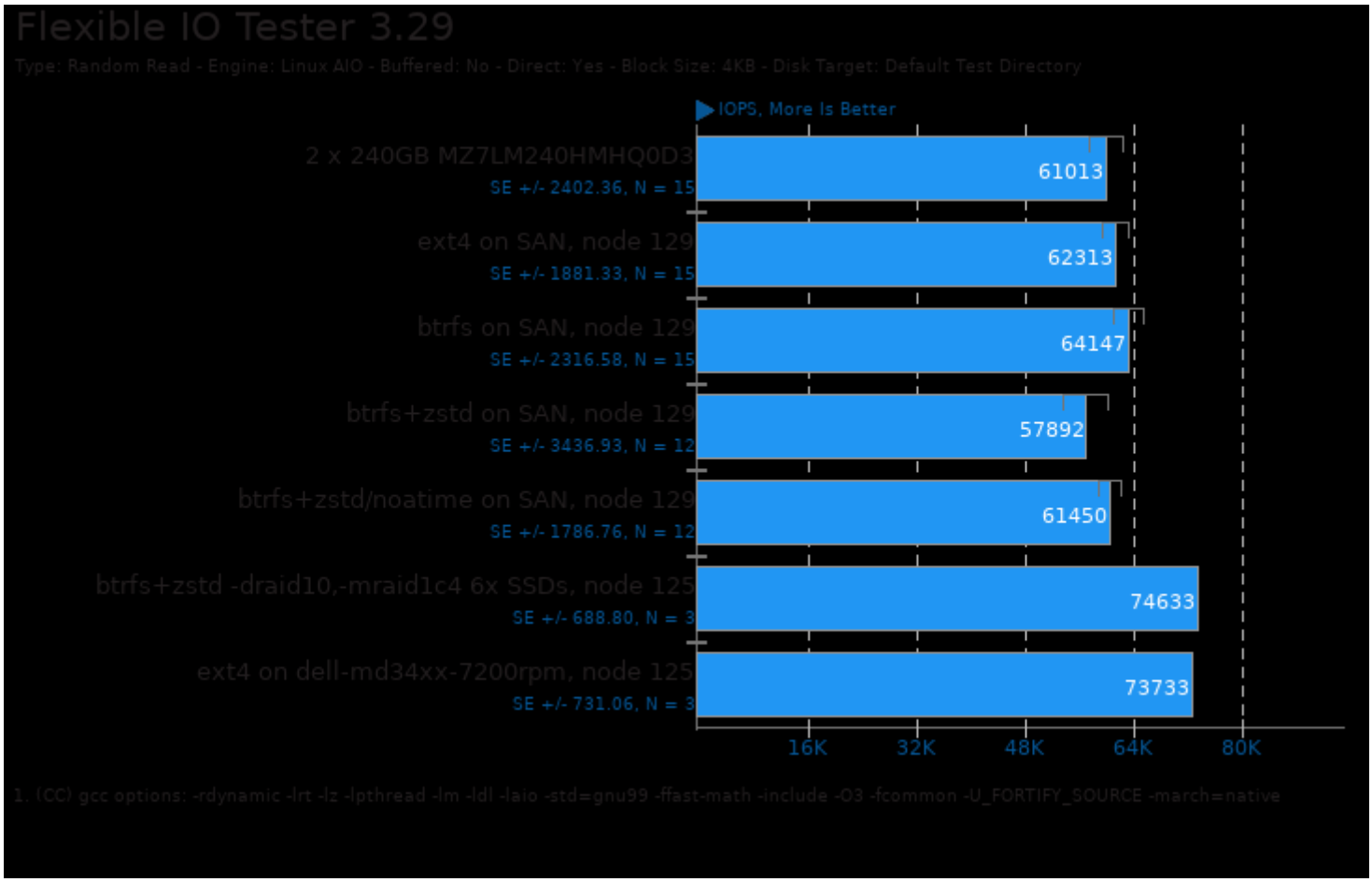
OS: Guix, Kernel: 5.17.6-gnu (x86_64), Compiler: GCC 12.1.0, File-System: btrfs

Kernel Notes: Transparent Huge Pages: always
Disk Notes: MQ-DEADLINE / compress-force=zstd:3,degraded,relatime,rw,space_cache=v2,ssd,subvol=/@home,subvolid=257 / RAID10 Block Size: 4096
Processor Notes: CPU Microcode: 0x8001250
Security Notes: itlb_multihit: Not affected + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl + 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

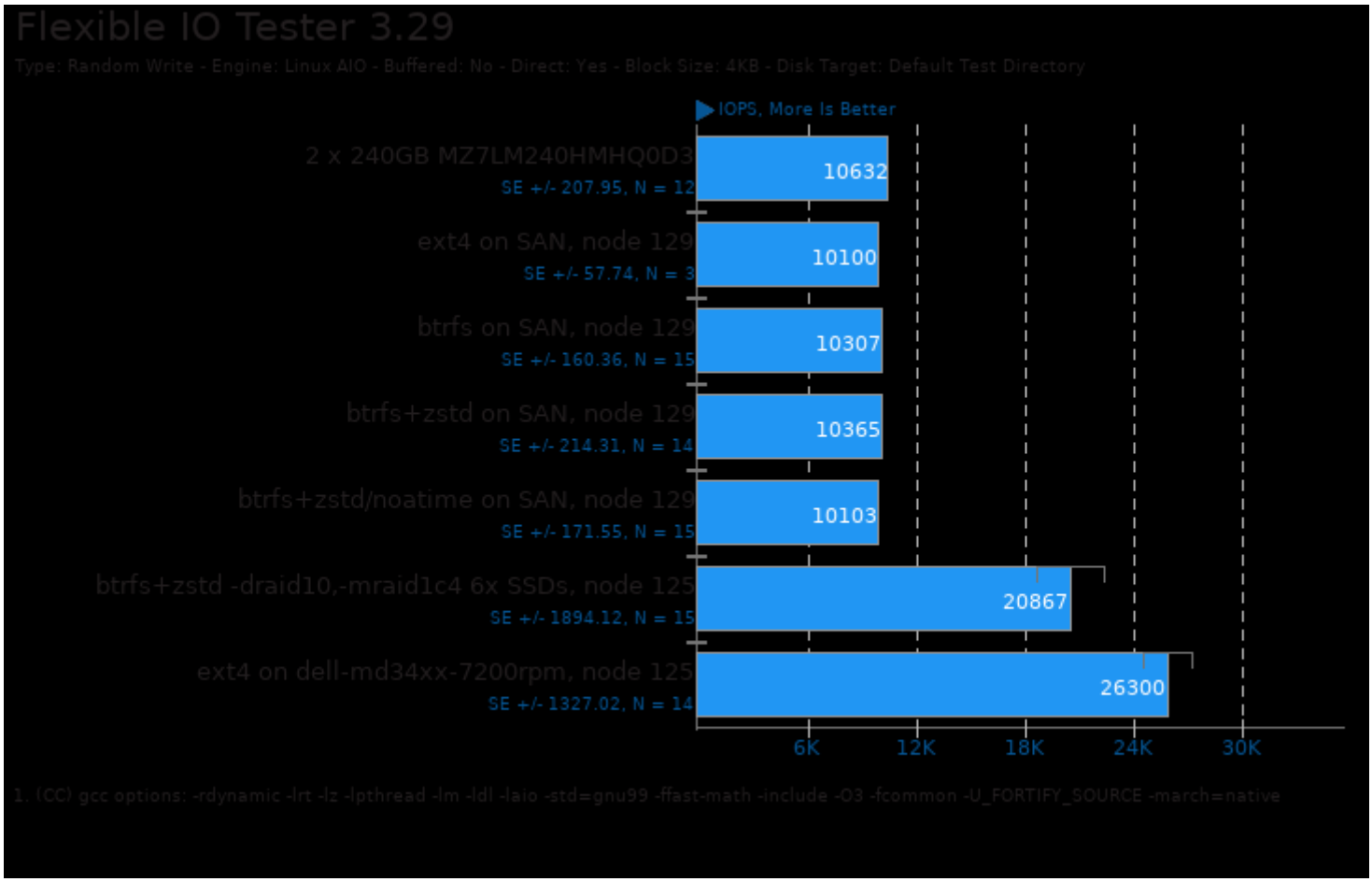
5x-ssd-btrfs-raid-10-zstd_direct

	2 x 240GB MZ7LM240H MHQ0D3	ext4 on SAN, node 129	btrfs on SAN, node 129	btrfs+zstd on SAN, node 129	btrfs+zstd/noatime on SAN, node 129	btrfs+zstd -draid10,-mraid1c4 6x SSDs, node 125	ext4 on dell-md34xx -7200rpm, node 125
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 4KB (IOPS)	61013	62313	64147	**57892**	61450	**74633**	73733
Normalized	81.75%	83.49%	85.95%	77.57%	82.34%	100%	98.79%
Standard Deviation	15.2%	11.7%	14%	20.6%	10.1%	1.6%	1.7%
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 4KB (IOPS)	10632	**10100**	10307	10365	10103	20867	**26300**
Normalized	40.43%	38.4%	39.19%	39.41%	38.41%	79.34%	100%
Standard Deviation	6.8%	1%	6%	7.7%	6.6%	35.2%	18.9%
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 4KB (IOPS)	35827	37860	34220	37380	**32173**	**74017**	73993
Normalized	48.4%	51.15%	46.23%	50.5%	43.47%	100%	99.97%
Standard Deviation	61.9%	59.7%	60.6%	59.1%	67.8%	4.3%	3.5%
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 4KB (IOPS)	**16409**	18312	18193	17227	16678	25280	**26973**
Normalized	60.83%	67.89%	67.45%	63.87%	61.83%	93.72%	100%
Standard Deviation	40.8%	48.1%	46.6%	44.3%	39.6%	11.3%	21.5%
Flexible IO Tester - Rand Read - Linux AIO - No - Yes - 4KB (MB/s)	238	243	251	**226**	240	**291**	288
Normalized	81.79%	83.51%	86.25%	77.66%	82.47%	100%	98.97%
Standard Deviation	15.3%	11.6%	13.9%	20.6%	10%	1.7%	1.8%
Flexible IO Tester - Rand Write - Linux AIO - No - Yes - 4KB (MB/s)	41.5	**39.5**	40.3	40.5	**39.5**	81.5	**103**
Normalized	40.29%	38.35%	39.13%	39.32%	38.35%	79.13%	100%
Standard Deviation	6.8%	1.2%	6%	7.8%	6.6%	35.1%	19%
Flexible IO Tester - Seq Read - Linux AIO - No - Yes - 4KB (MB/s)	139.9	147.9	133.7	146.0	**125.7**	**289**	**289**
Normalized	48.41%	51.18%	46.26%	50.52%	43.49%	100%	100%
Standard Deviation	61.9%	59.7%	60.6%	59%	67.8%	4.3%	3.5%
Flexible IO Tester - Seq Write - Linux AIO - No - Yes - 4KB (MB/s)	**64.1**	71.5	71.1	67.3	65.2	98.7	**105.3**
Normalized	60.87%	67.9%	67.52%	63.91%	61.92%	93.73%	100%
Standard Deviation	40.8%	48.2%	46.6%	44.4%	39.7%	11.4%	21.6%

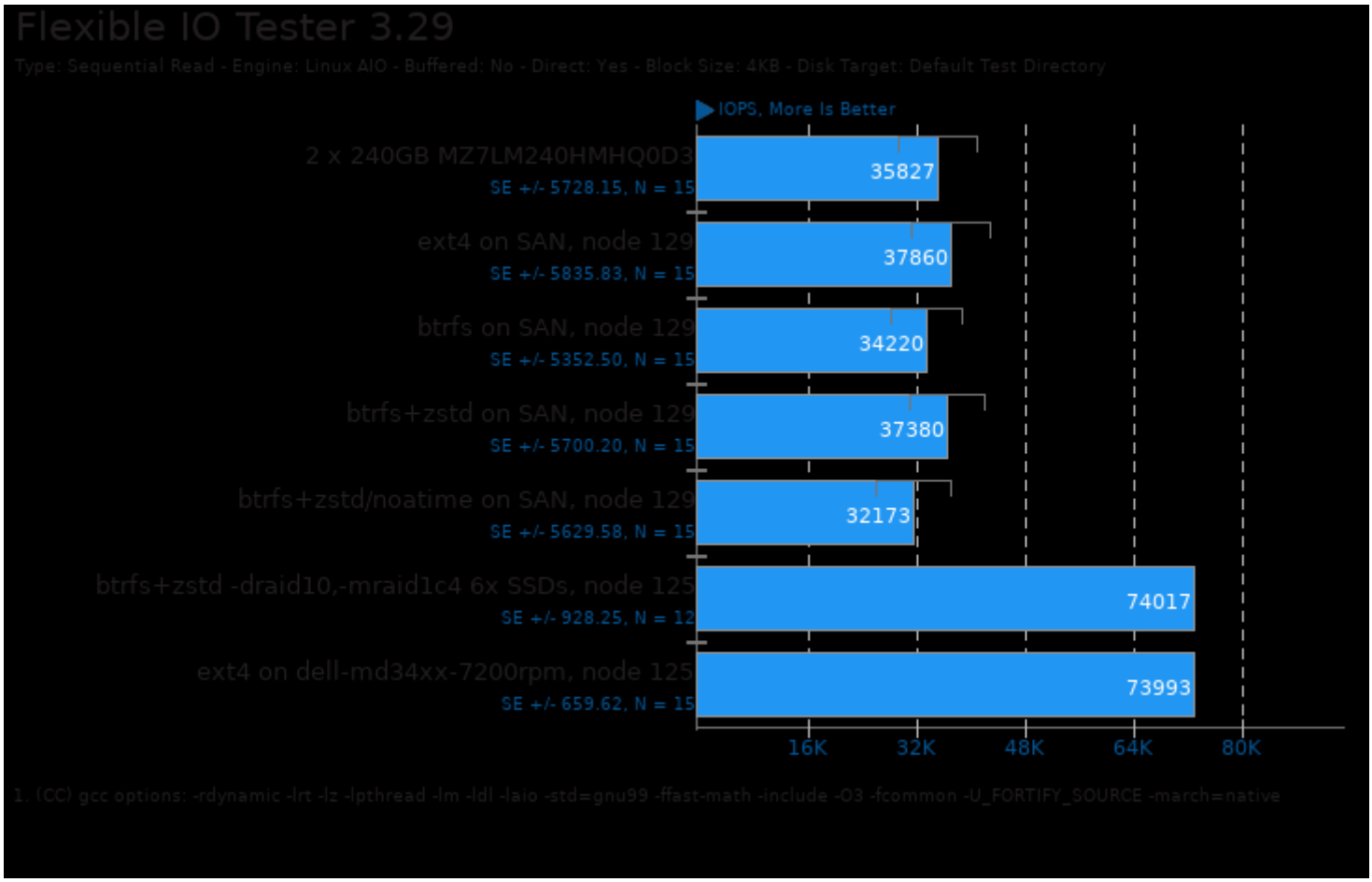
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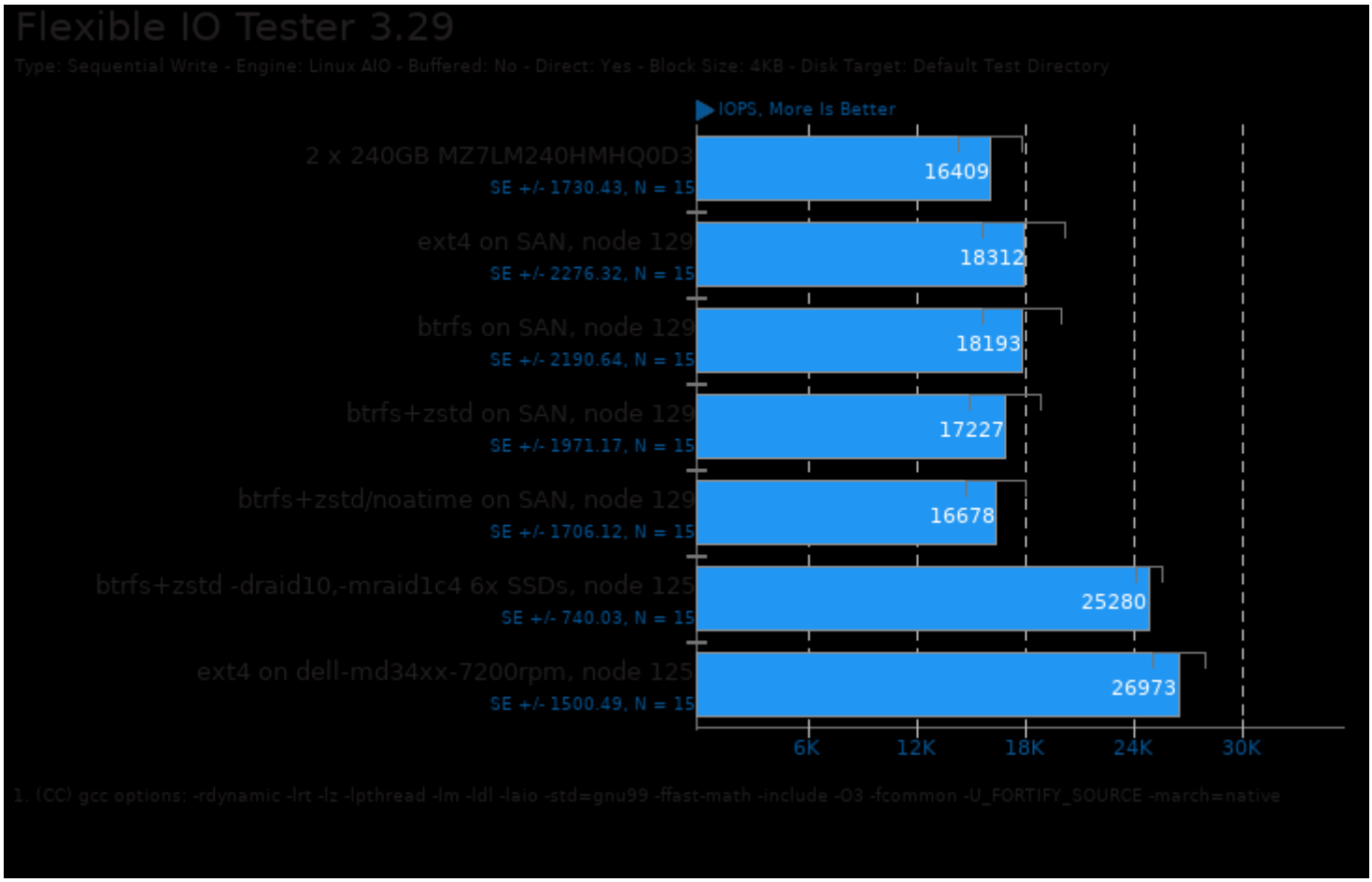
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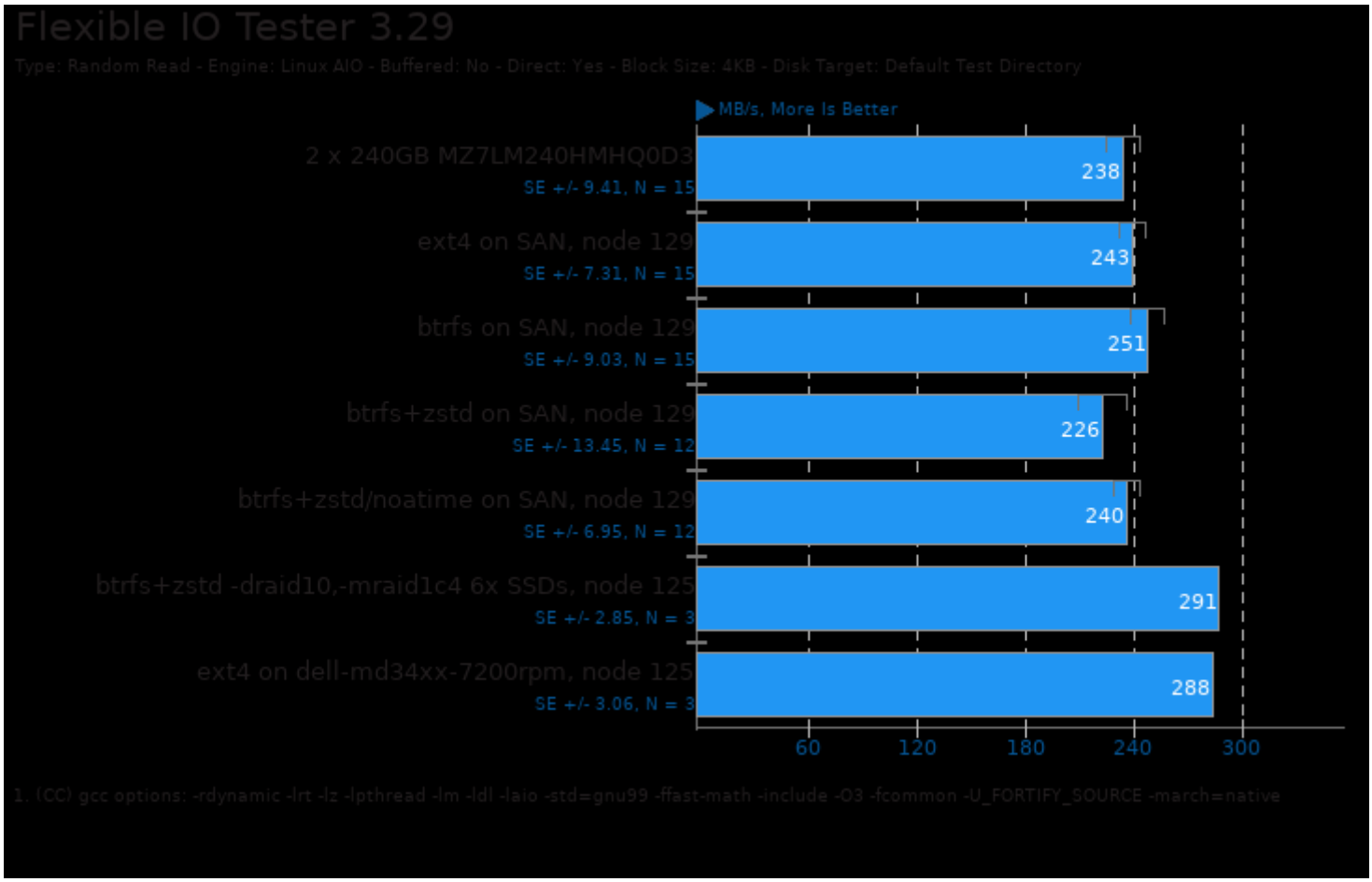
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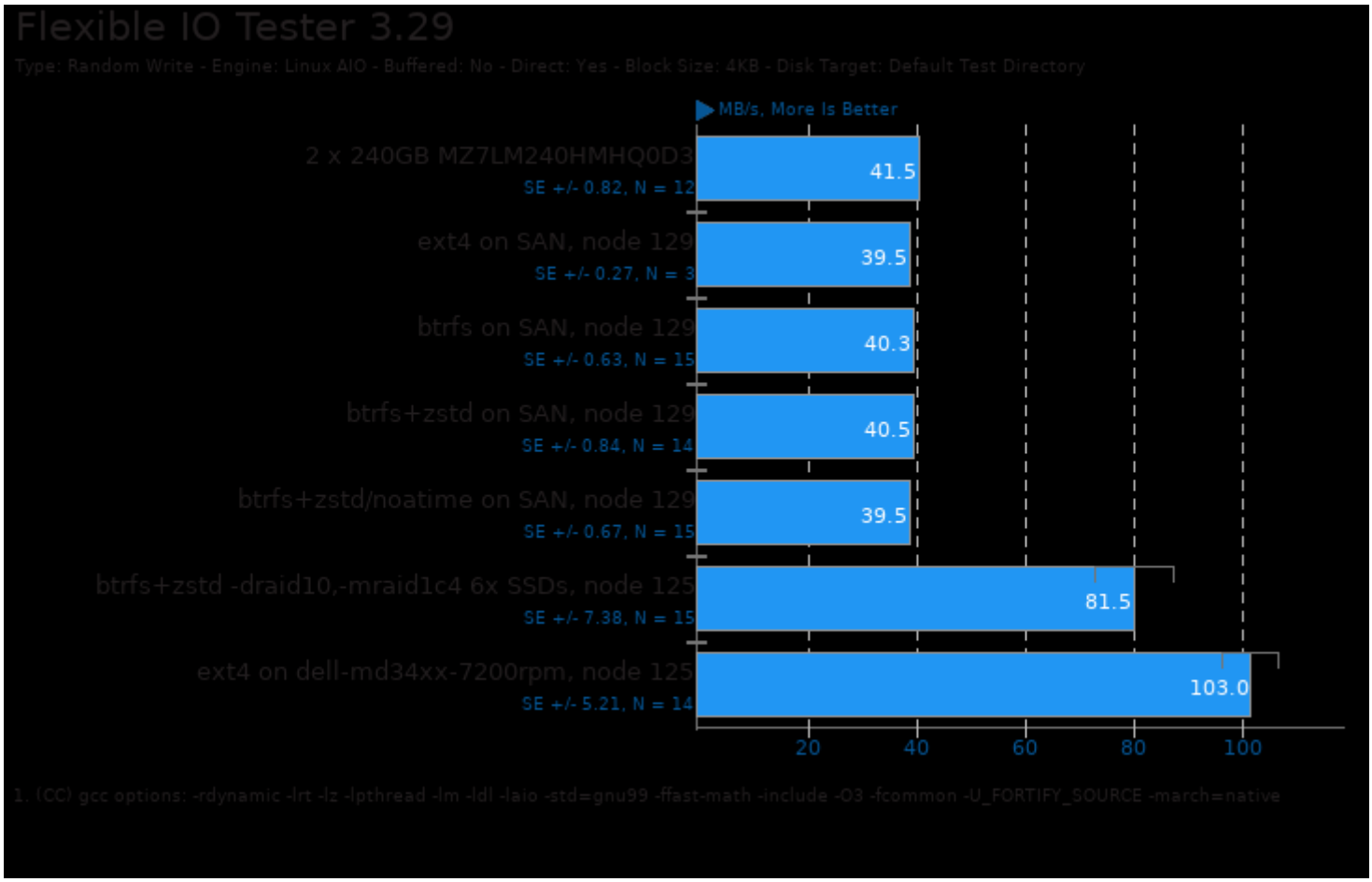


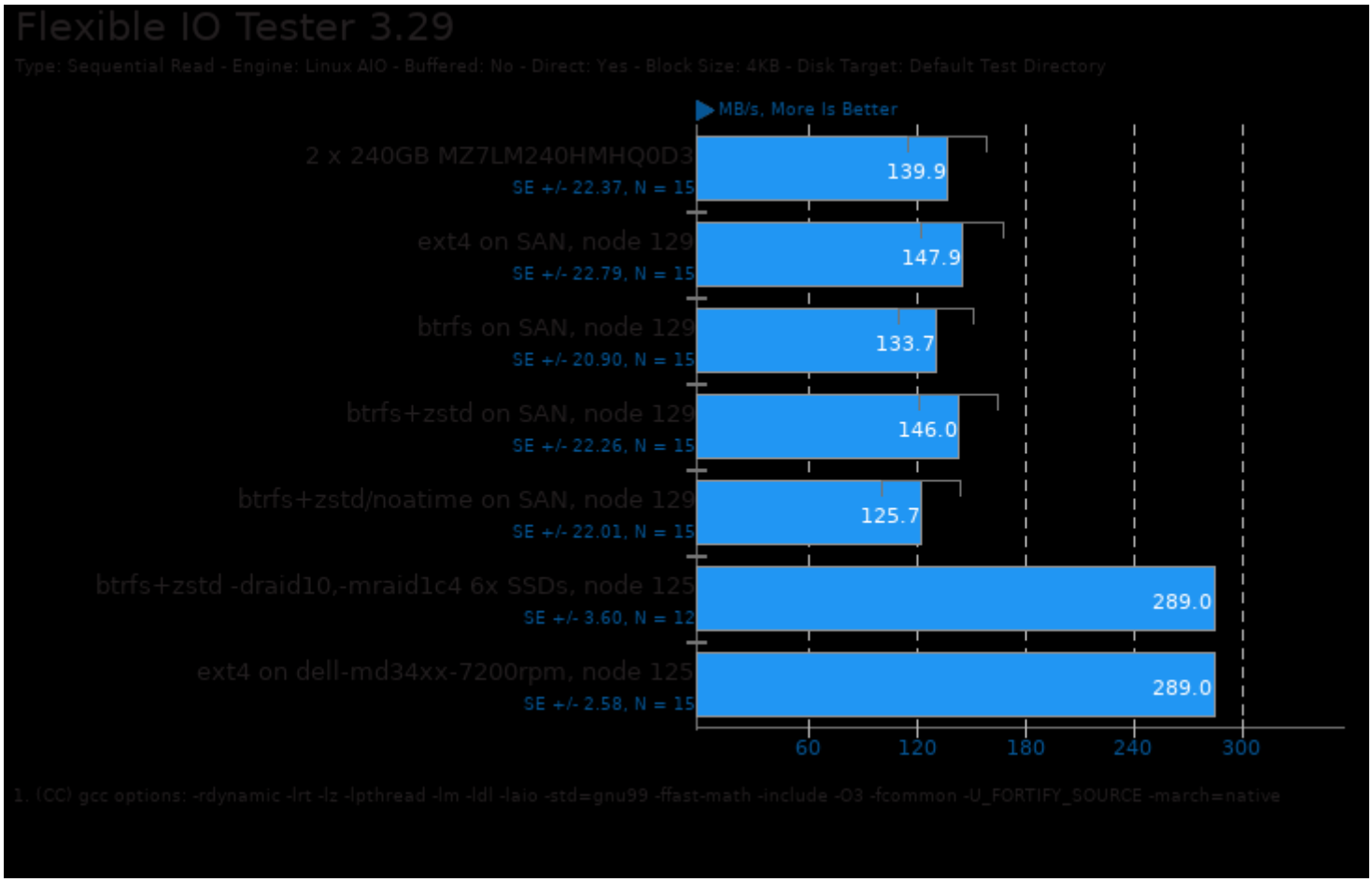
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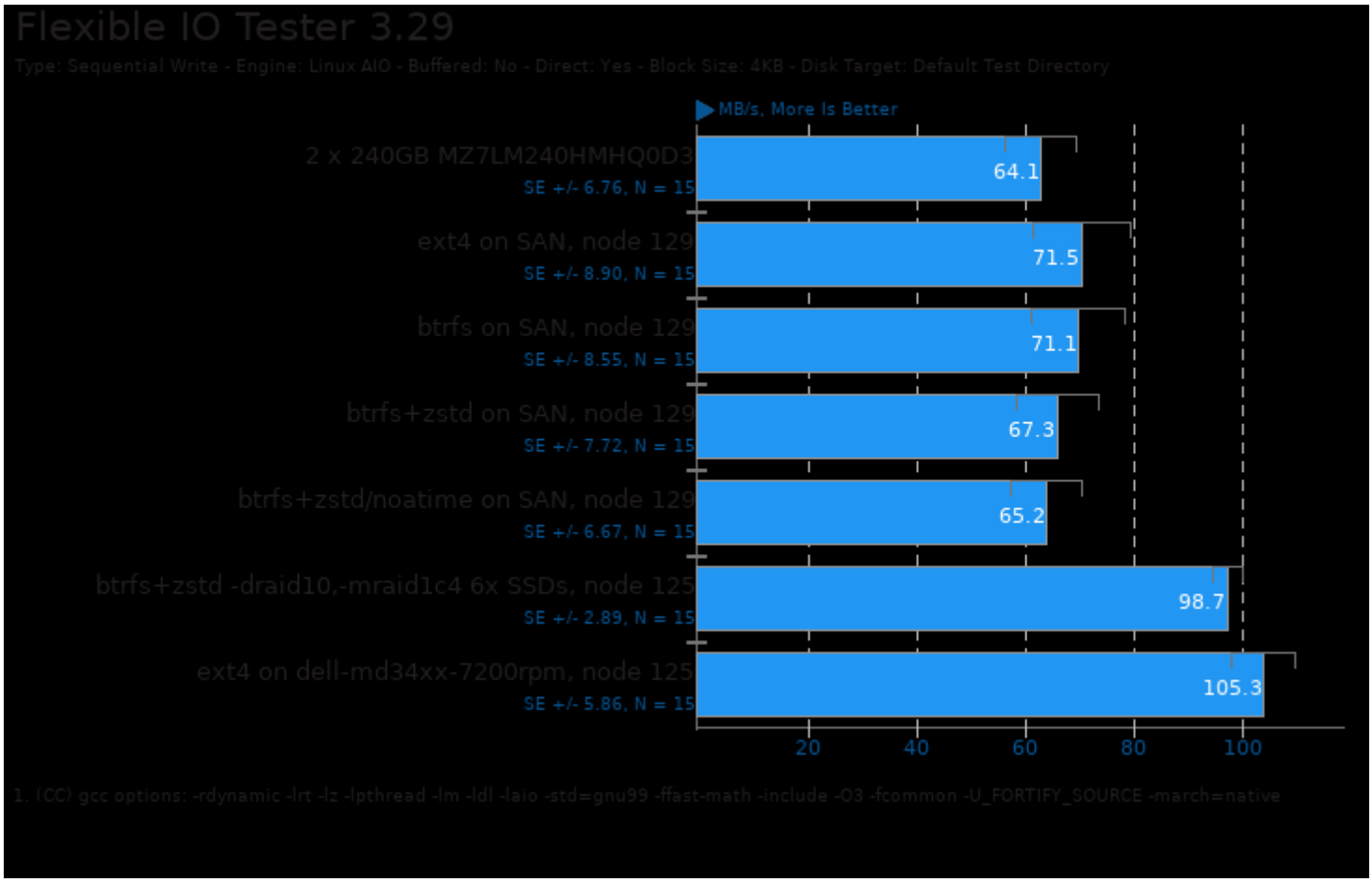
5x-ssd-btrfs-raid-10-zstd_direct




Flexible IO Tester 3.29
Type: Random Write - Engine: Linux AIO - Buffered: No - Direct: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
2 x 240GB MZ7LM240HMHQ0D3
SE +/- 0.82, N = 12
41.5
ext4 on SAN, node 129
SE +/- 0.27, N = 3
39.5
btrfs on SAN, node 129
SE +/- 0.63, N = 15
40.3
btrfs+zstd on SAN, node 129
SE +/- 0.84, N = 14
40.5
btrfs+zstd/noatime on SAN, node 129
SE +/- 0.67, N = 15
39.5
btrfs+zstd -draid10,-mraid1c4 6x SSDs, node 125
SE +/- 7.38, N = 15
81.5
ext4 on dell-md34xx-7200rpm, node 125
SE +/- 5.21, N = 14
103.0
20
40
60
80
100
1. (CC) gcc options: -rdynamic -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: Yes - Block Size: 4KB - Disk Target: Default Test Directory
MB/s, More Is Better
2 x 240GB MZ7LM240HMHQ0D3
SE +/- 22.37, N = 15
139.9
ext4 on SAN, node 129
SE +/- 22.79, N = 15
147.9
btrfs on SAN, node 129
SE +/- 20.90, N = 15
133.7
btrfs+zstd on SAN, node 129
SE +/- 22.26, N = 15
146.0
btrfs+zstd/noatime on SAN, node 129
SE +/- 22.01, N = 15
125.7
btrfs+zstd -draid10,-mraid1c4 6x SSDs, node 125
SE +/- 3.60, N = 12
289.0
ext4 on dell-md34xx-7200rpm, node 125
SE +/- 2.58, N = 15
289.0
60
120
180
240
300
1. (CC) gcc options: -rdynamic -lrt -lz -lpthread -lm -ldl -laio -std=gnu99 -ffast-math -include -O3 -fcommon -U_FORTIFY_SOURCE -march=native

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