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dellr72012gbpslink

Intel Xeon E5-2650 v2 testing on FreeBSD via the Phoronix Test Suite.

Automated Executive Summary

HDD Fast10 with zil, truenas jail had the most wins, coming in first place for 50% of the tests.

Based on the geometric mean of all complete results, the fastest (HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block) was 1.42x the speed of the slowest (SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block). HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off was 0.96x the speed of HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block, HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off was 0.956x the speed of HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off, HDD Fast10 with zil, truenas jail was 0.923x the speed of HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, SSD Fast10, 24G RAM, Sync Enabled, Atime off was 0.868x the speed of HDD Fast10 with zil, truenas jail, SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block was 0.958x the speed of SSD Fast10, 24G RAM, Sync Enabled, Atime off.

Test Systems:

SSD Fast10, 24G RAM, Sync Enabled, Atime off

HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off

Processor: Intel Xeon E5-2650 v2 (16 Cores), Motherboard: QEMU Standard PC (i440FX + PIIX 1996) (rel-1.14.0-0-g155821a1990b-prebuilt.qemu.org BIOS), Chipset: Intel 440FX 82441FX PMC, Memory: 24GB, Disk: 34GB QEMU HDD, Graphics: bochs-drmdrmfb, Monitor: QEMU Monitor, Network: Red Hat Virtio device

OS: Ubuntu 20.04, Kernel: 5.4.0-92-generic (x86_64), Vulkan: 1.0.2, 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
Processor Notes: CPU Microcode: 0x42e
Security Notes: itlb_multihit: Not affected + l1tf: Mitigation of PTE Inversion; VMX: flush not necessary SMT disabled + mds: Mitigation of Clear buffers; SMT Host state unknown + 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: disabled RSB filling + srbds: Not affected + tsx_async_abort: Not affected

HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off

HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block

SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block

Processor: Intel Xeon E5-2650 v2 (16 Cores), Motherboard: QEMU Standard PC (i440FX + PIIX 1996) (rel-1.14.0-0-g155821a1990b-prebuilt.qemu.org BIOS), Chipset: Intel 440FX 82441FX PMC, Memory: 8GB, Disk: 34GB QEMU HDD, Graphics: bochs-drmdrmfb, Monitor: QEMU Monitor, Network: Red Hat Virtio device

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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
Processor Notes: CPU Microcode: 0x42e
Security Notes: itlb_multihit: Not affected + l1tf: Mitigation of PTE Inversion; VMX: flush not necessary SMT disabled + mds: Mitigation of Clear buffers; SMT Host state unknown + 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: disabled RSB filling + srbds: Not affected + tsx_async_abort: Not affected

HDD Fast10 with zil, truenas jail

Processor: Intel Xeon E5-2650 v2 (32 Cores), Motherboard: QEMU Standard PC (i440FX + PIIX 1996) pc-i440fx-6.1, Memory: 48GB, Disk: 3223GB

OS: FreeBSD, Kernel: 12.2-RELEASE-p11 (x86_64), Compiler: Clang 10.0.1, File-System: zfs

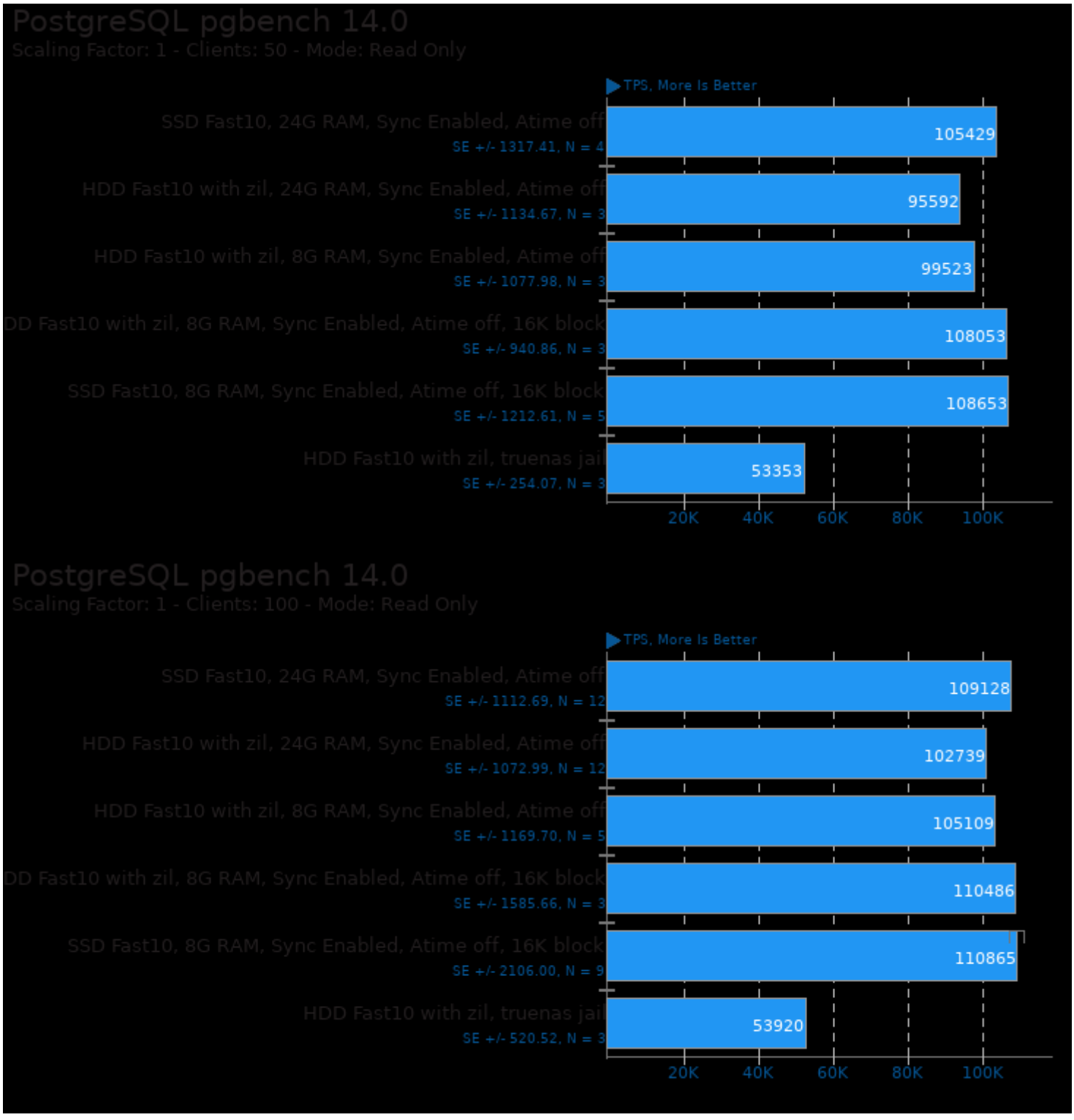
Security Notes: KPTI

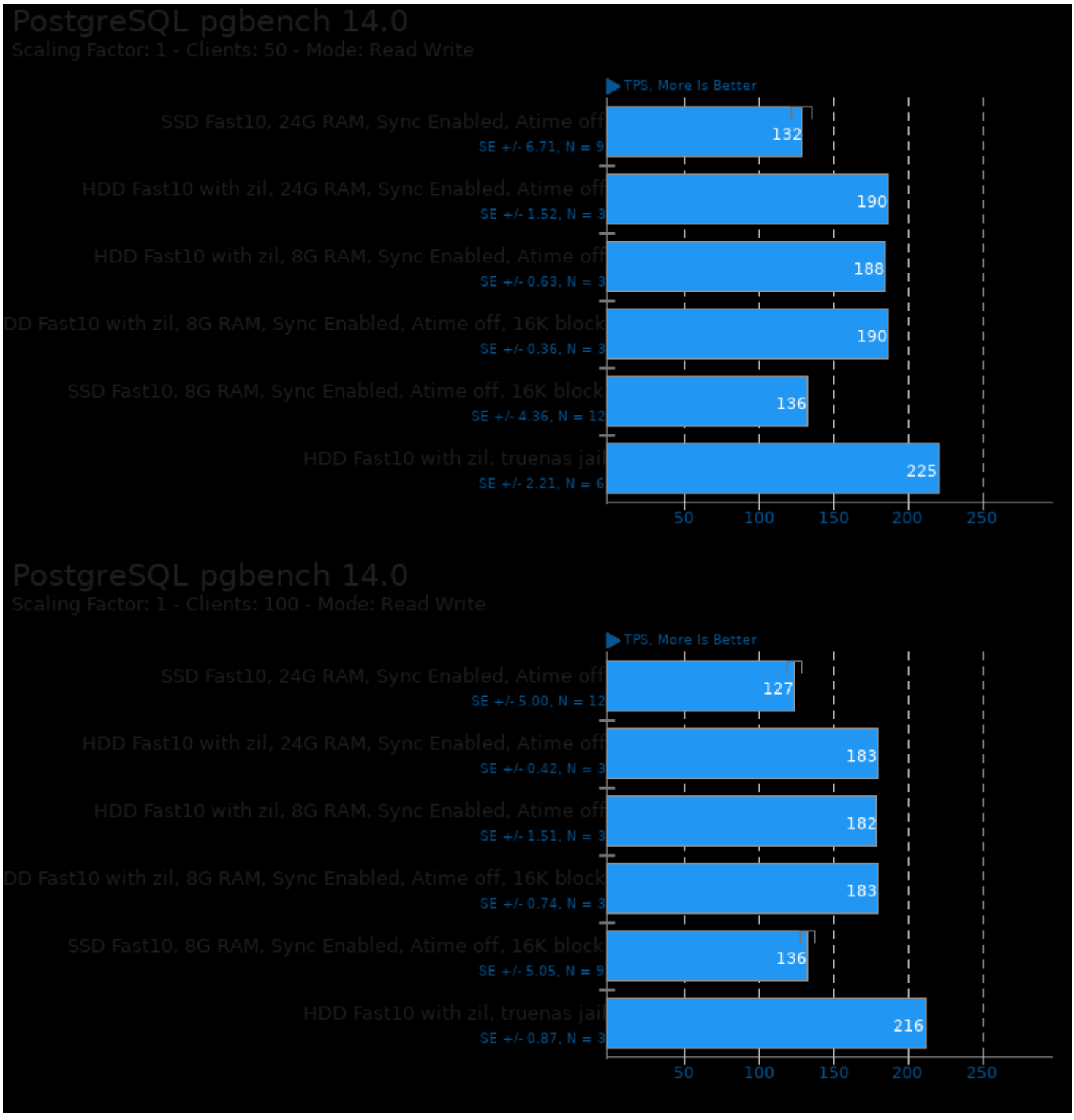
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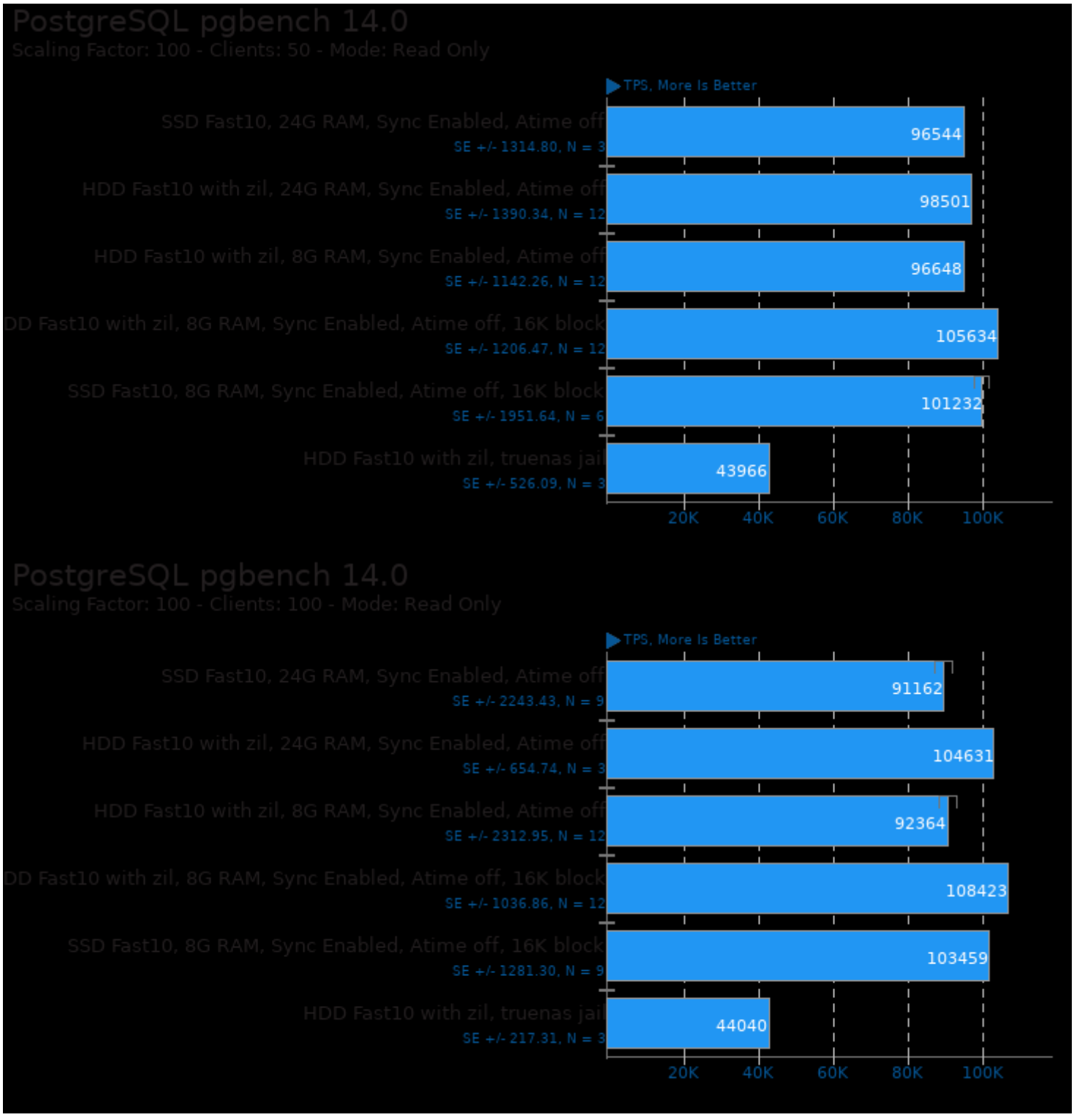
	SSD Fast10, 24G RAM, Sync Enabled, Atime off	HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off	HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off	HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block	SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block	HDD Fast10 with zil, truenas jail
PostgreSQL pgbench - 1 - 50 - Read Only (TPS)	105429	95592	99523	108053	**108653**	**53353**
Normalized	97.03%	87.98%	91.6%	99.45%	100%	49.1%
Standard Deviation	2.5%	2.1%	1.9%	1.5%	2.5%	0.8%
PostgreSQL pgbench - 1 - 100 - Read Only (TPS)	109128	102739	105109	110486	**110865**	**53920**
Normalized	98.43%	92.67%	94.81%	99.66%	100%	48.64%
Standard Deviation	3.5%	3.6%	2.5%	2.5%	5.7%	1.7%
PostgreSQL pgbench - 1 - 50 - Read Write (TPS)	**132**	190	188	190	136	**225**
Normalized	58.67%	84.44%	83.56%	84.44%	60.44%	100%
Standard Deviation	15.2%	1.4%	0.6%	0.3%	11.1%	2.4%
PostgreSQL pgbench - 1 - 100 - Read Write (TPS)	**127**	183	182	183	136	**216**
Normalized	58.8%	84.72%	84.26%	84.72%	62.96%	100%
Standard Deviation	13.7%	0.4%	1.4%	0.7%	11.1%	0.7%
PostgreSQL pgbench - 100 - 50 - Read Only (TPS)	96544	98501	96648	**105634**	101232	**43966**
Normalized	91.39%	93.25%	91.49%	100%	95.83%	41.62%
Standard Deviation	2.4%	4.9%	4.1%	4%	4.7%	2.1%
PostgreSQL pgbench - 100 - 100 - Read Only (TPS)	91162	104631	92364	**108423**	103459	**44040**
Normalized	84.08%	96.5%	85.19%	100%	95.42%	40.62%
Standard Deviation	7.4%	1.1%	8.7%	3.3%	3.7%	0.9%
PostgreSQL pgbench - 100 - 50 - Read Write (TPS)	427	940	791	1037	**310**	**1601**
Normalized	26.67%	58.71%	49.41%	64.77%	19.36%	100%
Standard Deviation	23.4%	1.9%	9.2%	2.9%	27.3%	2.5%
PostgreSQL pgbench - 100 - 100 - Read Write (TPS)	565	998	915	964	**401**	**2777**
Normalized	20.35%	35.94%	32.95%	34.71%	14.44%	100%
Standard Deviation	11.2%	0.5%	6.9%	23.3%	5.7%	5.3%
PostgreSQL pgbench - 1 - 50 - Read Only - Average Latency (ms)	0.474	0.523	0.502	0.463	**0.460**	**0.937**
Normalized	97.05%	87.95%	91.63%	99.35%	100%	49.09%
Standard Deviation	2.5%	2.1%	1.8%	1.5%	2.4%	0.8%
PostgreSQL pgbench - 1 - 100 - Read Only - Average Latency (ms)	0.918	0.975	0.952	0.906	**0.905**	**1.855**
Normalized	98.58%	92.82%	95.06%	99.89%	100%	48.79%
Standard Deviation	3.5%	3.6%	2.4%	2.5%	5.9%	1.7%

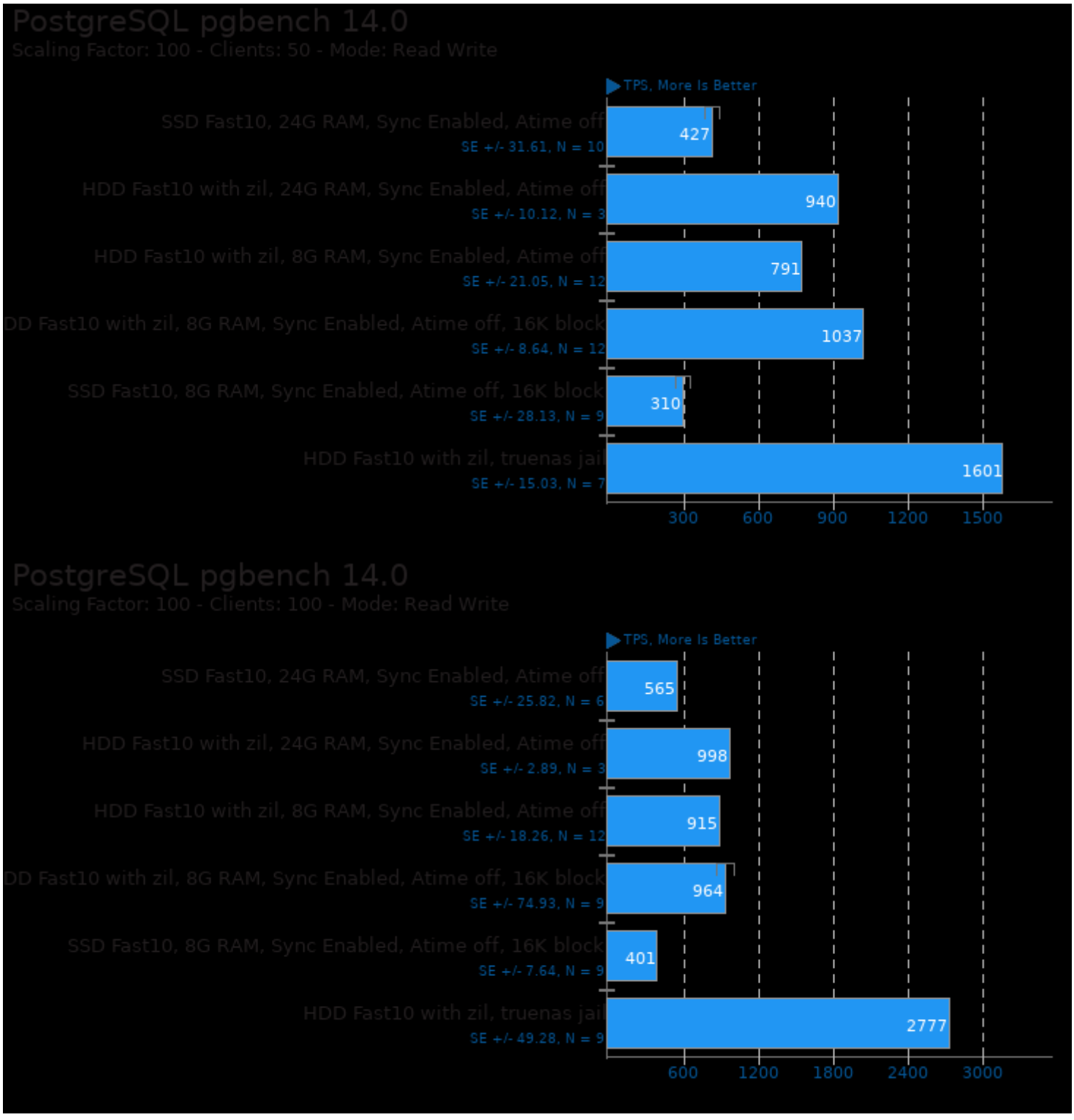
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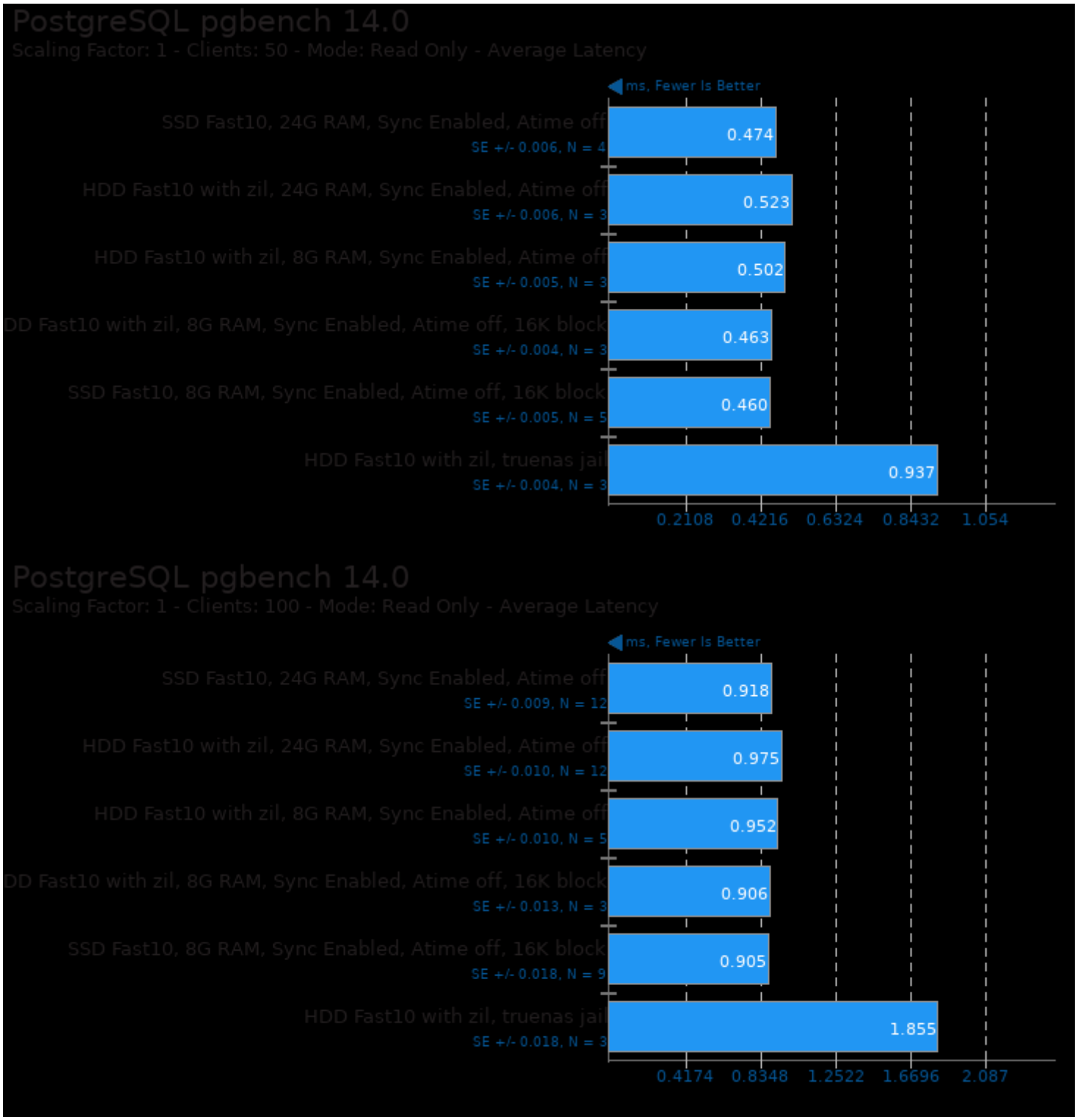
PostgreSQL pgbench - 1 - 50 - Read Write - Average Latency (ms)	387.402	263.390	265.494	262.939	372.194	221.931
Normalized	57.29%	84.26%	83.59%	84.4%	59.63%	100%
Standard Deviation	16.6%	1.4%	0.6%	0.3%	13%	2.3%
PostgreSQL pgbench - 1 - 100 - Read Write - Average Latency (ms)	804.620	545.634	548.114	545.280	743.077	462.022
Normalized	57.42%	84.68%	84.29%	84.73%	62.18%	100%
Standard Deviation	14.7%	0.4%	1.4%	0.7%	12.7%	0.7%
PostgreSQL pgbench - 100 - 50 - Read Only - Average Latency (ms)	0.518	0.509	0.518	0.474	0.495	1.137
Normalized	91.51%	93.12%	91.51%	100%	95.76%	41.69%
Standard Deviation	2.4%	5%	4%	4%	4.6%	2%
PostgreSQL pgbench - 100 - 100 - Read Only - Average Latency (ms)	1.102	0.956	1.090	0.923	0.968	2.271
Normalized	83.76%	96.55%	84.68%	100%	95.35%	40.64%
Standard Deviation	7%	1.1%	8.8%	3.3%	3.7%	0.9%
PostgreSQL pgbench - 100 - 50 - Read Write - Average Latency (ms)	122.149	53.227	63.702	48.238	173.070	31.243
Normalized	25.58%	58.7%	49.05%	64.77%	18.05%	100%
Standard Deviation	21%	1.9%	8.4%	3.1%	28.1%	2.5%
PostgreSQL pgbench - 100 - 100 - Read Write - Average Latency (ms)	178.850	100.245	109.796	113.111	249.884	36.096
Normalized	20.18%	36.01%	32.88%	31.91%	14.45%	100%
Standard Deviation	10.6%	0.5%	7%	40.7%	5.6%	5.2%

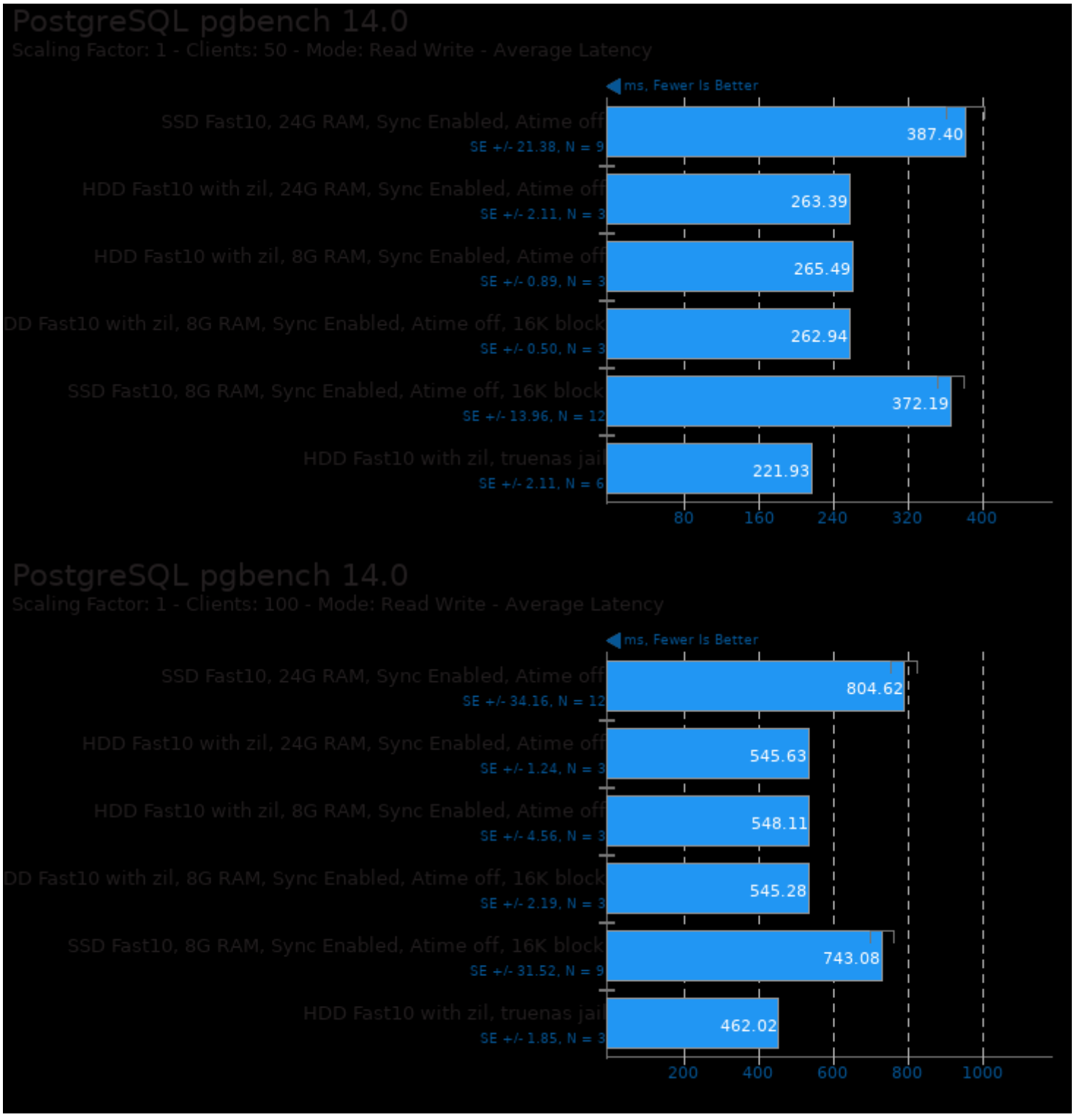

PostgreSQL pgbench 14.0
Scaling Factor: 1 - Clients: 50 - Mode: Read Only
TPS, More Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 1317.41, N = 4
105429
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 1134.67, N = 3
95592
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 1077.98, N = 3
99523
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 940.86, N = 3
108053
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 1212.61, N = 5
108653
HDD Fast10 with zil, truenas jai
SE +/- 254.07, N = 3
53353
20K
40K
60K
80K
100K
PostgreSQL pgbench 14.0
Scaling Factor: 1 - Clients: 100 - Mode: Read Only
TPS, More Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 1112.69, N = 12
109128
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 1072.99, N = 12
102739
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 1169.70, N = 5
105109
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 1585.66, N = 3
110486
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 2106.00, N = 9
110865
HDD Fast10 with zil, truenas jai
SE +/- 520.52, N = 3
53920
20K
40K
60K
80K
100K

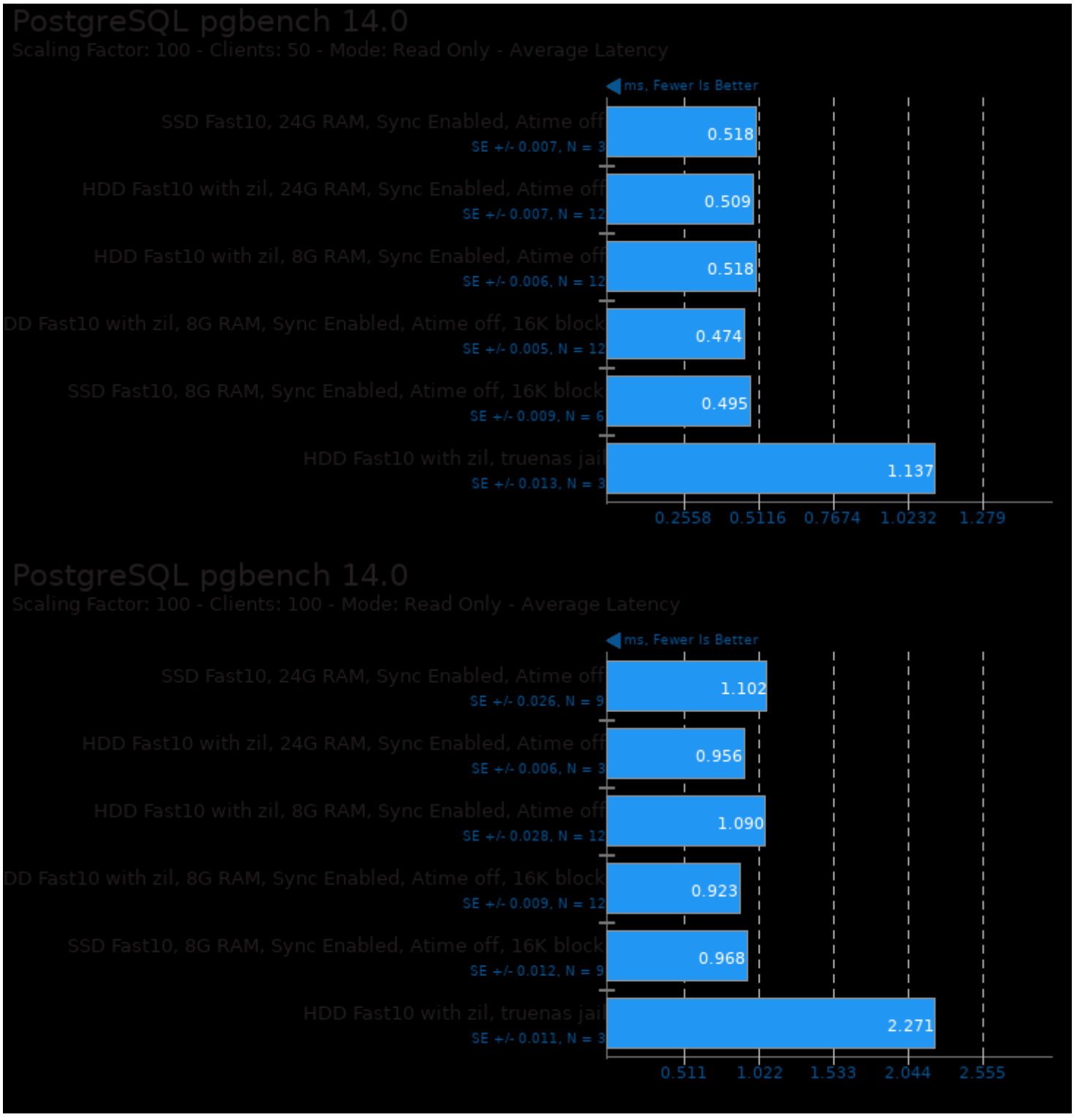

PostgreSQL pgbench 14.0
Scaling Factor: 1 - Clients: 50 - Mode: Read Write
TPS, More Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 6.71, N = 9
132
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 1.52, N = 3
190
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 0.63, N = 3
188
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.36, N = 3
190
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 4.36, N = 12
136
HDD Fast10 with zil, truenas jai
SE +/- 2.21, N = 6
225
50
100
150
200
250
PostgreSQL pgbench 14.0
Scaling Factor: 1 - Clients: 100 - Mode: Read Write
TPS, More Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 5.00, N = 12
127
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 0.42, N = 3
183
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 1.51, N = 3
182
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.74, N = 3
183
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 5.05, N = 9
136
HDD Fast10 with zil, truenas jai
SE +/- 0.87, N = 3
216
50
100
150
200
250

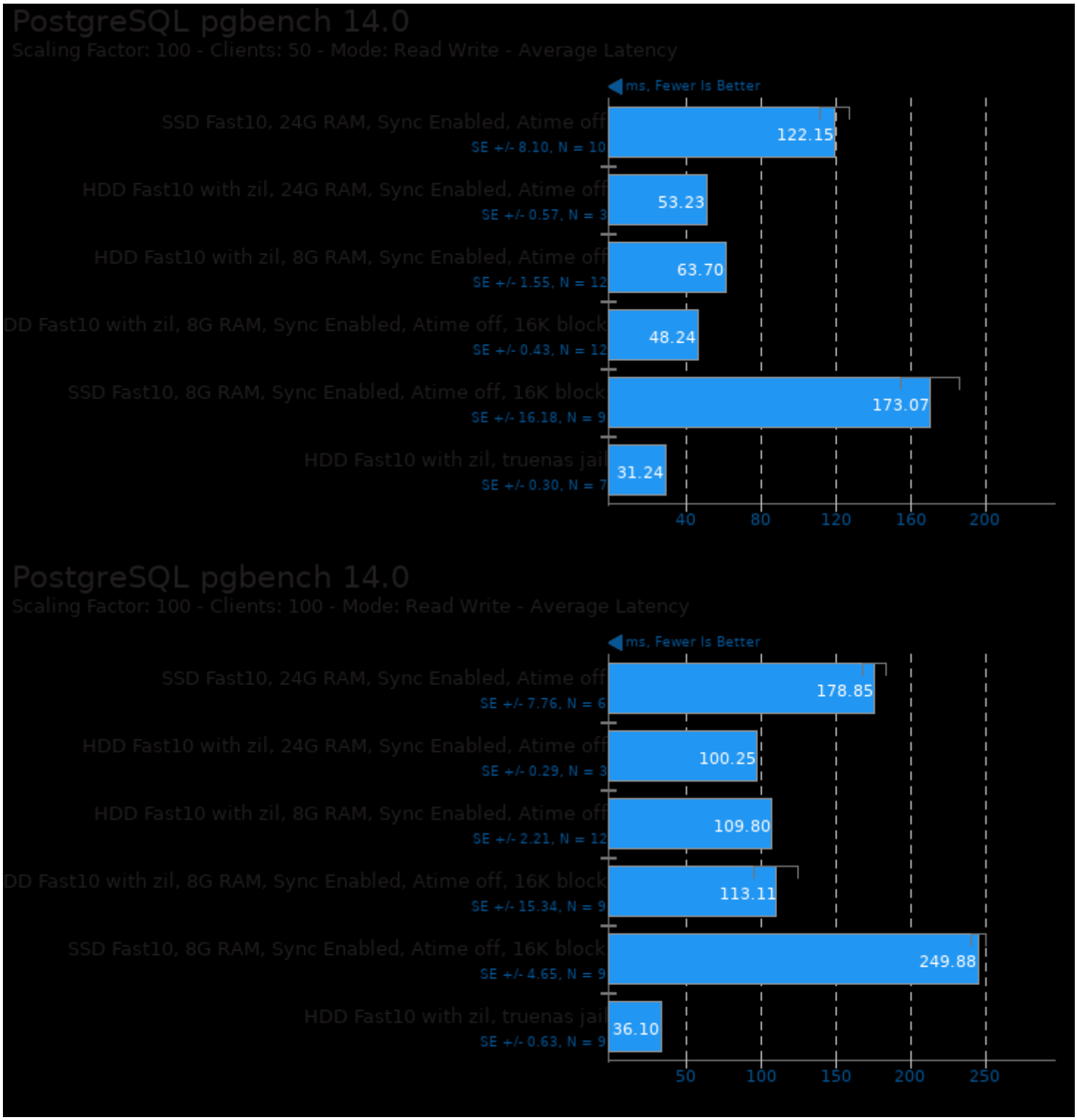

PostgreSQL pgbench 14.0
Scaling Factor: 100 - Clients: 50 - Mode: Read Only
TPS, More Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 1314.80, N = 3
96544
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 1390.34, N = 12
98501
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 1142.26, N = 12
96648
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 1206.47, N = 12
105634
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 1951.64, N = 6
101232
HDD Fast10 with zil, truenas jai
SE +/- 526.09, N = 3
43966
20K
40K
60K
80K
100K
PostgreSQL pgbench 14.0
Scaling Factor: 100 - Clients: 100 - Mode: Read Only
TPS, More Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 2243.43, N = 9
91162
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 654.74, N = 3
104631
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 2312.95, N = 12
92364
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 1036.86, N = 12
108423
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 1281.30, N = 9
103459
HDD Fast10 with zil, truenas jai
SE +/- 217.31, N = 3
44040
20K
40K
60K
80K
100K


PostgreSQL pgbench 14.0
Scaling Factor: 100 - Clients: 50 - Mode: Read Write
TPS, More Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 31.61, N = 10
427
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 10.12, N = 3
940
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 21.05, N = 12
791
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 8.64, N = 12
1037
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 28.13, N = 9
310
HDD Fast10 with zil, truenas jai
SE +/- 15.03, N = 7
1601
300
600
900
1200
1500
PostgreSQL pgbench 14.0
Scaling Factor: 100 - Clients: 100 - Mode: Read Write
TPS, More Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 25.82, N = 6
565
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 2.89, N = 3
998
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 18.26, N = 12
915
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 74.93, N = 9
964
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 7.64, N = 9
401
HDD Fast10 with zil, truenas jai
SE +/- 49.28, N = 9
2777
600
1200
1800
2400
3000


PostgreSQL pgbench 14.0
Scaling Factor: 1 - Clients: 50 - Mode: Read Only - Average Latency
ms, Fewer Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 0.006, N = 4
0.474
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 0.006, N = 3
0.523
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 0.005, N = 3
0.502
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.004, N = 3
0.463
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.005, N = 5
0.460
HDD Fast10 with zil, truenas jai
SE +/- 0.004, N = 3
0.937
0.2108
0.4216
0.6324
0.8432
1.054
PostgreSQL pgbench 14.0
Scaling Factor: 1 - Clients: 100 - Mode: Read Only - Average Latency
ms, Fewer Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 0.009, N = 12
0.918
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 0.010, N = 12
0.975
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 0.010, N = 5
0.952
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.013, N = 3
0.906
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.018, N = 9
0.905
HDD Fast10 with zil, truenas jai
SE +/- 0.018, N = 3
1.855
0.4174
0.8348
1.2522
1.6696
2.087


PostgreSQL pgbench 14.0
Scaling Factor: 1 - Clients: 50 - Mode: Read Write - Average Latency
ms, Fewer Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 21.38, N = 9
387.40
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 2.11, N = 3
263.39
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 0.89, N = 3
265.49
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.50, N = 3
262.94
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 13.96, N = 12
372.19
HDD Fast10 with zil, truenas jai
SE +/- 2.11, N = 6
221.93
80
160
240
320
400
PostgreSQL pgbench 14.0
Scaling Factor: 1 - Clients: 100 - Mode: Read Write - Average Latency
ms, Fewer Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 34.16, N = 12
804.62
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 1.24, N = 3
545.63
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 4.56, N = 3
548.11
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 2.19, N = 3
545.28
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 31.52, N = 9
743.08
HDD Fast10 with zil, truenas jai
SE +/- 1.85, N = 3
462.02
200
400
600
800
1000


PostgreSQL pgbench 14.0
Scaling Factor: 100 - Clients: 50 - Mode: Read Only - Average Latency
ms, Fewer Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 0.007, N = 3
0.518
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 0.007, N = 12
0.509
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 0.006, N = 12
0.518
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.005, N = 12
0.474
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.009, N = 6
0.495
HDD Fast10 with zil, truenas jai
SE +/- 0.013, N = 3
1.137
0.2558
0.5116
0.7674
1.0232
1.279
PostgreSQL pgbench 14.0
Scaling Factor: 100 - Clients: 100 - Mode: Read Only - Average Latency
ms, Fewer Is Better
SSD Fast10, 24G RAM, Sync Enabled, Atime off
SE +/- 0.026, N = 9
1.102
HDD Fast10 with zil, 24G RAM, Sync Enabled, Atime off
SE +/- 0.006, N = 3
0.956
HDD Fast10 with zil, 8G RAM, Sync Enabled, Atime off
SE +/- 0.028, N = 12
1.090
DD Fast10 with zil, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.009, N = 12
0.923
SSD Fast10, 8G RAM, Sync Enabled, Atime off, 16K block
SE +/- 0.012, N = 9
0.968
HDD Fast10 with zil, truenas jai
SE +/- 0.011, N = 3
2.271
0.511
1.022
1.533
2.044
2.555



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