napp-it

ZFS Epyc ESXi/ Storage Server

Some short performance tests to compare

- Xeon Silver 4110 vs Epyc 7302
- Disk vs Flash vs Optane
- OmniOS 151034 vs 151036
- barebone vs virtualized

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1.0 Intel Xeon vs AMD Epyc

This benchmark sequence was intended to answer some basic questions about how the new Epyc platform performs my current Intel Xeon silver on a disk pool vs Optane/Flash pool. Additionally we check encryption performance and OmniOS 151036 vs 151036 with FPU accelerated raid-Z. The Xeon system was my typical VM and storage server up to this year (without disks typically from the 3000 Euro region), the Epyc may become my next standard platform in this price range. While it is clear that a system from this year will always outperform one from last year at same price, I want to know how much and especially how fast is ZFS encryption now as encryption is a mandatory feature under the European data protection rules.

All tests are done via a filebench run that checks random io vs sequential io with sync and enc on/off and barebone vs virtualised in napp-it menu Pools > Benchmark. Intension is to get a feeling about behaviours.

Intel Hardware: SuperMicro X11SPH-NCTF, Xeon Silver 4110, 64 GB RAM, SAS 3008 7 x WD Ultrastar 8TB, 3 x Optane 900, 3 x Intel DC 750 (traditional Flash NVMe)

AMD Hardware: SuperMicro H12SSL-C, Epyc 7302 128 GB RAM, SAS 3008 (BTO system) 7 x WD Ultrastar 8TB, 3 x Optane 900, 3 x Intel DC 750 (traditional Flash NVMe)

2.0: TLDR

First write results on Intel

151034	async	sync	sync+slog	async/enc	sync/enc	sync+slog/enc
Disk Pool	770-1195MB/s	40-50MB/s	640-783MB/s	907-935MB/s	22-24MB/s	19-24MB/s
Flash pool	1112-1388MB/s	430-613MB/s	-	950-954MB/s	112-129MB/s	-
Optane pool	1600-2000MB/s	550-770MB/s	-	930-960MB/s	118-130MB/s	-
151036	async	sync	sync+slog	async/enc	sync/enc	sync+slog/enc
Disk Pool	930-1170MB/s	48-50MB/s	779-1195MB/s	907-935MB/s	34-36MB/s	22-24MB/s
Flash pool	1112-1388MB/s	430-613MB/s	-	950-954MB/s	112-129MB/s	-
Optane pool	1600-2000MB/s	550-750MB/s	-	930-960MB/s	107-130MB/s	-

First result on AMD

151036	async	sync	sync+slog	async/enc	sync/enc	sync+slog/enc
Disk Pool	1178-1197 MB/s	51-55 MB/s	908-956 MB/s	1203-1230 MB/s	36-40 MB/s	31-32 MB/s
Flash pool Optane pool	1591-1877 MB/s 3339-3707 MB/s	943-1134 MB/s 1445-1471 MB/s	-	1541-1592 MB/s 1720-1730 MB/s		-

Some principles Encryption is much faster than on my last tests Storage + Encryption is perfect up to 10G, Storage + sync is perfect up to 10G, Storage + encryption + sync is much slower due encryption OmniOS 1510034/36 perform quite similar (despite hardware accelerated Raid-Z)

Improvements due a faster CPU (Epyc): 150-200%

2.1: Disk pool, Intel Xeon on OmniOS 151034

Disk Pool: without slog, enc off

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I startet the write benchmark multiple times: sync was between 40 MB/s and 50 MB/s non-sync between 770 MB/s and 1195 MB/s

Disk Pool: with Optane 900 slog, enc off

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without slog, enc on (aes-256ccm) nopp-itewal omniosce_034 275 coptance v 25 dov 12 okt 2020 Nopp-itewal omniosce_034 275 coptance v 25 dov 12 okt 2020

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pri/sec cache-all		6 HB/S		0 PB/S		88.0 HE/			

sync was between 22 MB/s and 24 MB/s and non-sync was between 907 MB/s and 935 MB/s

with Optane 900 slog, enc on (aes-256ccm)

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I startet the write benchmark multiple times: sync was between 640 MB/s and 783 MB/s non-sync was between 1002 MB/s and 1195 MB/s

sync was between 19 MB/s and 24 MB/s and non-sync was between 745 MB/s and 767 MB/s $\,$

A Xeon SMB filer with sync=disabled is a perfect solution for a 10G network.

If you need to force sync either because you use it for VM/databases or want an SMB filer with a perfect behaviour in a crash/ power outage scenario, you need a good Slog like the Optane or a WD SS530 (12G SAS).

If you need encryption

This is ok for a SMB filer without sync. If you need sync, do not pair with encryption.

2.2: Disk pool, Intel Xeon on OmniOS 151036

Disk Pool: without slog, enc off

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I startet the write benchmark multiple times: sync was between 48 MB/s and 50 MB/s non-sync between 930 MB/s and 1170 MB/s

Disk Pool: with Optane 900 slog, enc off

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ommiosce_036 hd-a1 (recslaes128K, ssbn-, comprooff, readcacherall)

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syncedisabled

sync-disabled 4513 ops 902.573 ops/s 12731des cpu/s 1.1ms latency 902.4 MB/s

singlestream 87.2 MB/S

without slog, enc on (aes-256ccm)

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host pool slog encrypti remark

Fb3

Fbi singlestreamwrite.f

pr1/sec cache-all

sync was between 34 MB/s and 36 MB/s non-sync was between 890 MB/s and 924 MB/s

aes-256-con

synceshays

sync-sluays 174 ops 34.797 ops/s 457913us opu 28.6ms Laten 34.6 MB/s

randomread.f 42.2 MB/S

with Optane 900 slog, enc on (aes-256ccm)

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				adoare		rando			singlest			

I startet the write benchmark multiple times: sync was between 359 MB/s and 435 MB/s non-sync between 770 MB/s and 1195 MB/s

sync was between 22 MB/s and 24 MB/s and non-sync was between 907 MB/s and 935 MB/s

2.3: Optane pool, Intel Xeon on OmniOS 151034 vs 151036

Optane Pool: 151034, enc off

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I startet the write benchmark multiple times: sync was between 550 and 770 MB/s non-sync between 1600 and 2000 MB/s

Optane Pool: 151034, enc on (aes-256ccm)

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		11			6 C MB	1.	29.4	ALC: NO	46.0			
pri/am	C CACER											

sync was between 118 and 130 MB/s non-sync was between 930 and 960 MB/s

Optane Pool: 151036 enc off

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I startet the write benchmark multiple times: sync was between 550 and 770 MB/s non-sync between 1600 and 2000 MB/s Optane Pool: 151036, enc on (aes-256ccm)

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sync was between 107 and 130 MB/s non-sync was between 930 and 960 MB/s

2.4: Traditional Flash NVMe (Intel DC750) pool, Intel Xeon on OmniOS 151034 vs 151036

DC 750 Pool: 151034, enc off

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I startet the write benchmark multiple times: sync was between 359 and 570 MB/s non-sync between 1320 and 1490 MB/s

DC 750 Pool: 151036, enc off

nopp-if eval omniosce_036 275 appliance v 20 dev 12 okt 2020 |logout: admin | sol | Edit | Mon | Acc | About Help Services System User Disks Pools ZFS Filesystems Snapshots Comstar me >> Pools >> Benchmarks Pro Monitor: 21:06 Sills Pool @ Cap @ Disk@ Net @ CPU@ Job @ > filebench > iozone examples > iozone Ig > bonnie > dd bench test done and Benchmark: Write: filebench_sequential, Read: filebench, date: 11.11.2020 pool: dc750-z1 STATE ONLIME ONLIME ONLIME ONLIME AME 1750-21 raidzi READ MRITE CKSUM 0000 c1711d0 ommiesce_006 dc750-z1 (recsize=118%, ssb=-, compr=off, readcache=all) Fb3 syncializeys synciclisabled sync-disabled 5563 ops 1112.061 opd/s 21180us opw/op 0.0ms latency 1112.8 MB/s sync-always 3066 ops 513.186 ops/s 41200ws cpu/op Fbs singlestreamwrite.f 1.6ms latency 613.0 MB/s randomrs.f 349.6 88/s singlestream 1.9 68/s randomread.f 228.2 MB/s pri/sec cachemall

I startet the write benchmark multiple times: sync was between 430 and 613 MB/s non-sync between 1112 and 1388 MB/s

DC 750 Pool: 151034, enc on (aes-256ccm)

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	c cache+all			Landomr 5.6 MB/		24.6 1		82.6 PB		

sync was between 52 and 56 MB/s non-sync was between 1086 and 1093 MB/s

DC 750 Pool: 151036, enc on (aes-256ccm)

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sync was between 112 and 129 MB/s non-sync was between 950 and 954 MB/s

3.0 Disk pool, Epyc on OmniOS 151036

I had to switch mpio off in menu Disk > Details > SAS, test date was Dec 03, 2020

Disk Pool: without slog, enc off

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I startet the write benchmark multiple times: sync was between 51 and 55 MB/s non-sync between 1178 and 1197 MB/s

Disk Pool: with Optane 900 slog, enc off

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without slog, enc on (aes-256ccm)

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sync was between 36 and 40 MB/s non-sync was between 1203 and 1230 MB/s

with Optane 900 slog, enc on (aes-256ccm)

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pri/sec cache+a			53.2 N			-4 ME		2.2 68/		

I startet the write benchmark multiple times: sync was between 908 MB/s and 956 MB/s non-sync between 1151 MB/s and 1212 MB/s

sync was between 31 MB/s and 32 MB/s and non-sync was between 1166 MB/s and 1213 MB/s

3.1: Traditional Flash NVMe (Intel DC750) pool, Epyc on OmniOS 151036

DC 750 Pool: 151036, enc off

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I startet the write benchmark multiple times: sync was between 943 and 1134 MB/s non-sync between 1591 and 1877 MB/s

3.2: Optane 900 pool, Epyc on OmniOS 151036

Optane Pool: 151036, enc off



I startet the write benchmark multiple times: sync was between 1445 and 1471 MB/s non-sync between 3339 and 3707MB/s

DC 750 Pool: 151036, enc on (aes-256ccm)

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sync was between 201 and 206 MB/s non-sync was between 1541 and 1592MB/s

Optane Pool: 151036, enc on (aes-256ccm)

	-If pro omnio	sce_036 z	PS appliance	x 20 dev 12	okt.2020		logout	: admin sol E	dit Mon- Ac
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sync was between 202 and 207 MB/s non-sync was between 1720 -1730 MB/s

4.0 Virtualized NAS, ESXi 7.0u1, 8Core, 64GB RAM, SAS HBA and NVMe pass-through

Disk Pool: without slog, enc off

nopp-lit pro) omnios36	2PS appliance	e x. 20.06	A3 Pro				logout	admin	I SOU EA	and Milde	+ AIX
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I startet the write benchmark multiple times: sync was between 47 and 52 MB/s non-sync between 1178 and 1225 MB/s

Disk Pool: with Optane 900 slog, enc off

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without slog, enc on (aes-256ccm)

			-									
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			3	7.2 HB	ſs				963.6 8			
				and an e			foerw.t		singles	treaser		

sync was between 37 and 40 MB/s non-sync was between 901 and 905 MB/s

with Optane 900 slog, enc on (aes-256ccm)

nopp-lit pro omnios36 275 apple	nce x 20.00	al Peo				1	logout	: admin	sol E	dit Mo	n- Acc
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I startet the write benchmark multiple times: sync was between 163 and 281 MB/s non-sync between 1091 and 1176 MB/s

sync was between 33 and 36 MB/s and non-sync was between 901 and 902 MB/s

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Needed steps for Optane 900 or DC750 and Passthrough/ ESXi

- ssh to ESXi

- edit /etc/vmware/passthru.map
- add following lines at the end of the file:

Intel Optane 900P pci-e device
8086 2700 d3d0 false
Intel DC750 pci-e device
8086 370D d3d0 false
- restart hypervisor and add the pci device to OmniOS

check device id ex 2700 in ESXi > Management >PCI devices Either try id ex 2700 or sub id ex 3900 (Optane 900) on problems with passhrough

more device id ex Optane 900 2,5", Intel DC 750 etc, see https://pci-ids.ucw.cz/read/PC/8086

more

For some NVMe there is another hint on problems: add the following to the .vmx file of a VM: pciPassthru0.msiEnabled = "FALSE"

https://tinkertry.com/search?s=passhrough#gsc.tab=0&gsc. q=passthrough&gsc.sort= https://kb.vmware.com/s/article/2142307