Test system

Test system configuration

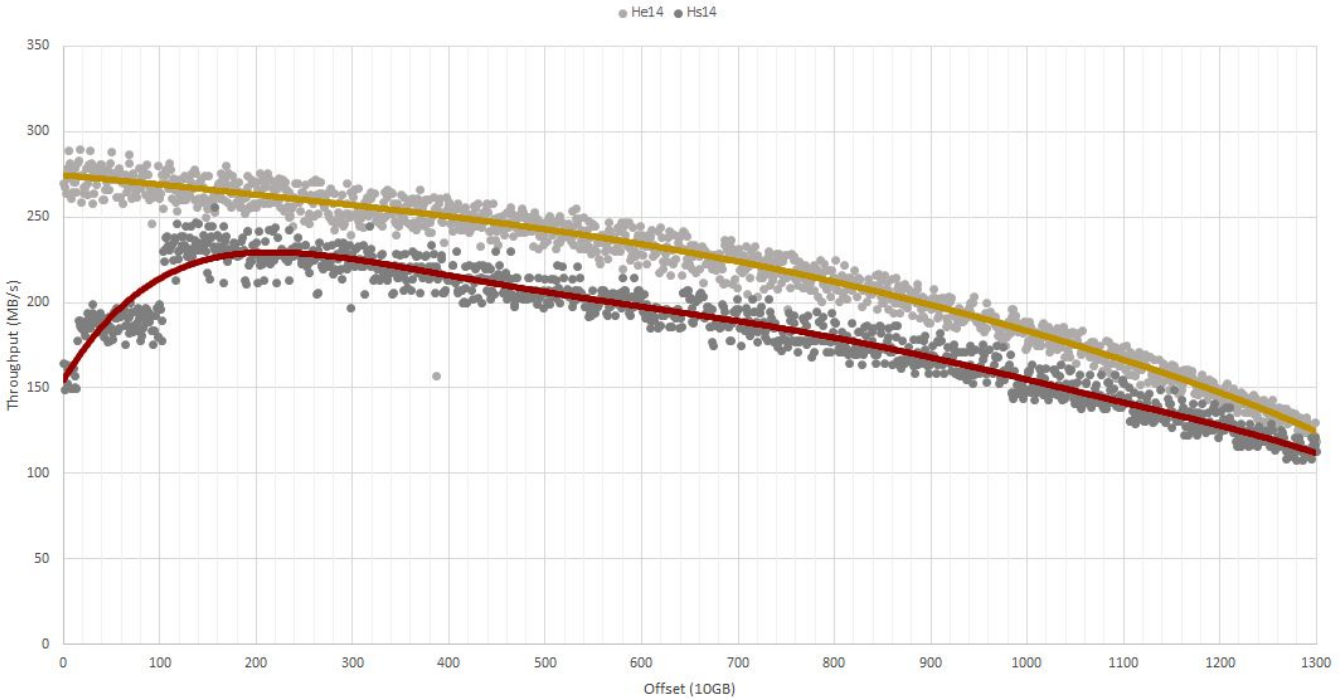
Processor	Intel(R) Core(TM) i7-4771 CPU @ 3.50GHz
Memory	16GiB DDR3 Synchronous 2400 MHz
Storage interface	SATA 3.2, 6.0 Gb/s
OS device	128GB Samsung 840 PRO Series SSD (MZ-7PD128)
Metadata device	480GB Samsung SM843T (MZ-7WD4800/003)

Storage devices

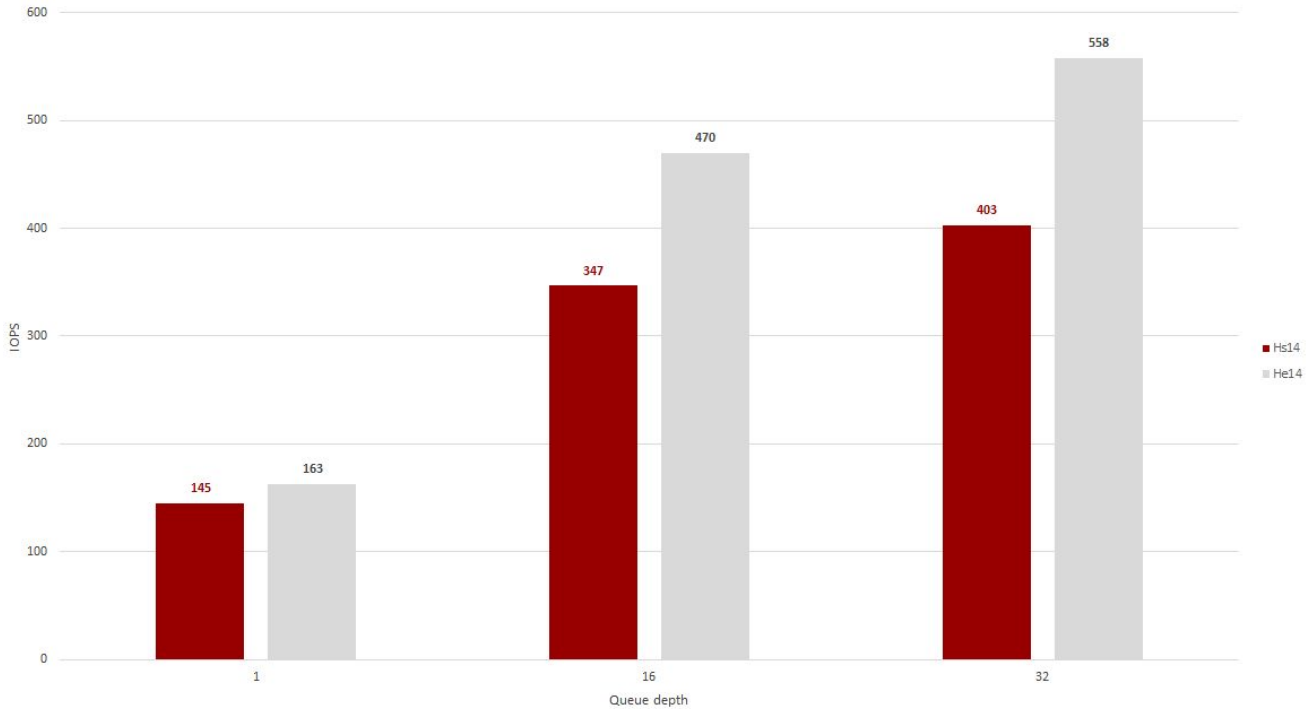
Device info

Model number	HSH721414ALN6M0 (Hs14)	WUH721414ALE6L4 (He14)
Firmware revision	L4GMT240	LDGNW07G
Drive type	Host managed SMR	CMR

Disk throughput at different LBA offsets Hs14 vs He14



4KB random read IOPS Hs14 vs He14 (0 to 128GB from OD)



Flexible I/O tester (fio)

Fio was written by Jens Axboe <axboe@kernel.dk> to enable flexible testing of the Linux I/O subsystem and schedulers.

Fio spawns a number of threads or processes doing a particular type of I/O action as specified by the user. fio takes a number of global parameters, each inherited by the thread unless otherwise parameters given to them overriding that setting is given.

https://github.com/axboe/fio

Methodology and SW versions

Methodology

Each test executed 3 times to capture average and standard deviation values

XFS and ext4 initialized and benchmarked with He14

Phalanx initialized and benchmarked with Hs14 (data) and Samsung SM843T (metadata)

Single device configuration with disk read & write cache enabled

Each job/thread running with queue depth of 1

Read tests: 30 mins run time, 128GB address space, libaio, non-buffered I/O

Write tests: 30 mins run time, 12.5TB address space, libaio, non-buffered I/O*

Software

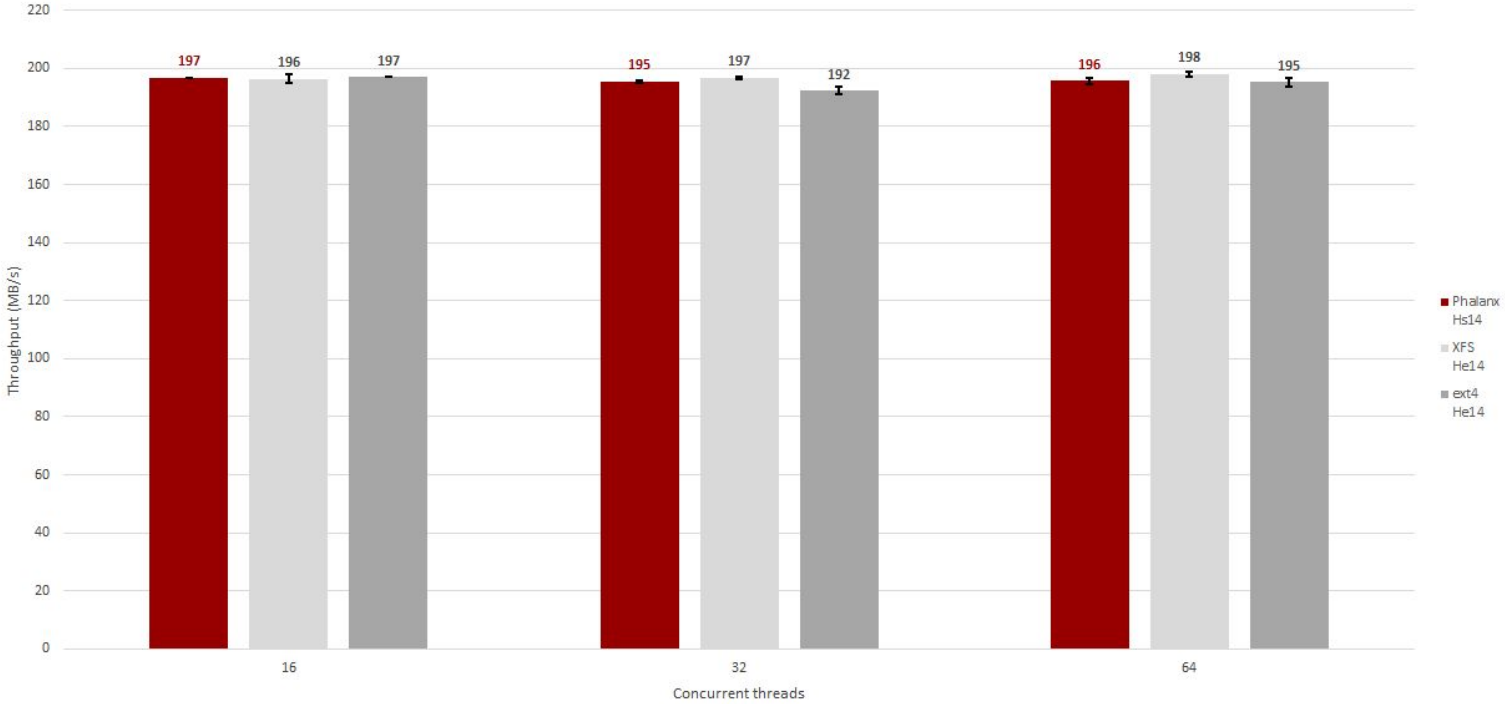
	Version
fio	3.14-11-g308a
Operating system	Ubuntu 18.04.2 LTS (4.18.0-25-generic)

Reads

fio sequential read configurations

Threads	File size / thread	Access size	Queue depth / thread	IO type
16	8GB	128KB	1	Direct
32	4GB	128KB	1	Direct
64	2GB	128KB	1	Direct

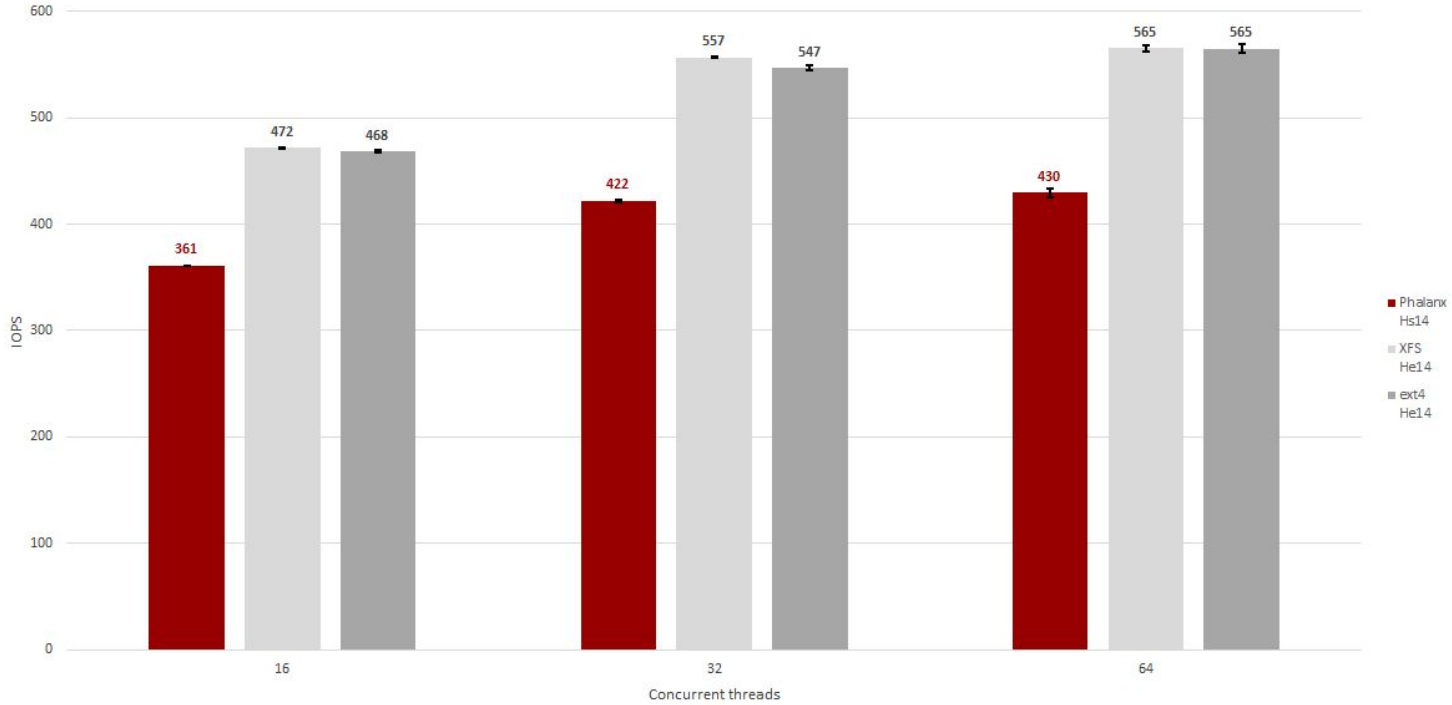
fio sequential read results



fio random read configurations

Threads	File size / thread	Access size	Queue depth / thread	IO type
16	8GB	4KB	1	Direct
32	4GB	4KB	1	Direct
64	2GB	4KB	1	Direct

fio random read results

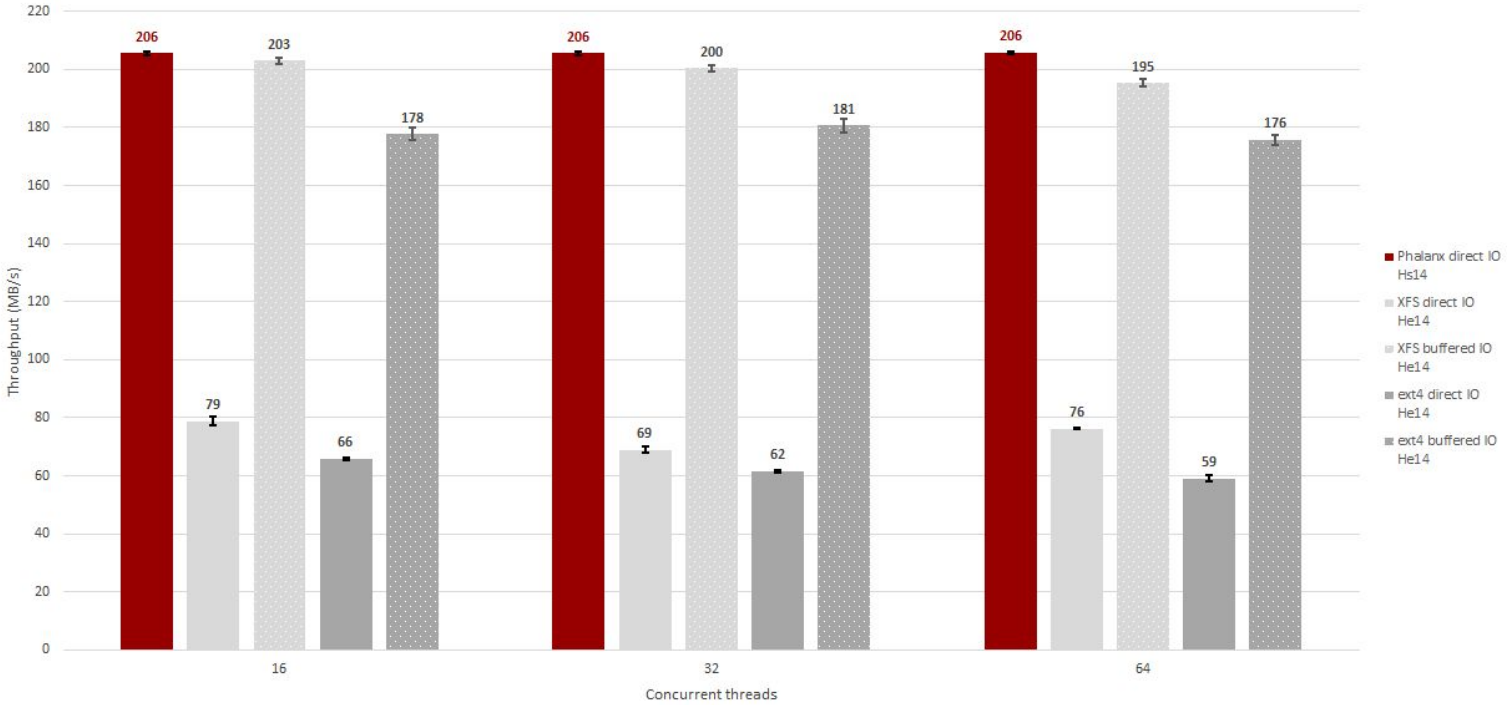


Writes

fio sequential write configurations

Threads	File size / thread	Block size	Queue depth / thread	IO type
16	800GB	128KB	1	Direct + buffered
32	400GB	128KB	1	Direct + buffered
64	200GB	128KB	1	Direct + buffered

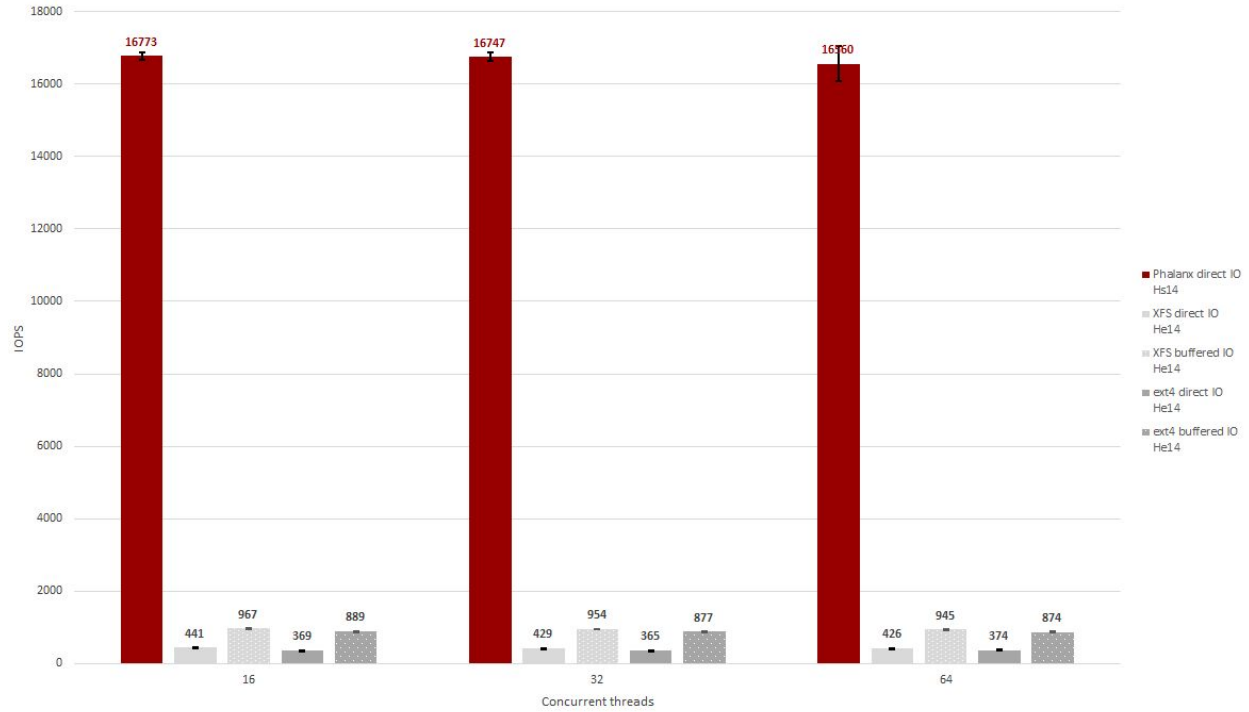
fio sequential write results



fio random write configurations

Threads	File size / thread	Access size	Queue depth / thread	IO type
16	800GB	4KB	1	Direct
32	400GB	4KB	1	Direct
64	200GB	4KB	1	Direct

fio random write results



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