



Intel Technologies Unlock Storage Performance

Unleash application performance using Intel® Optane™ technology, Intel® QLC technology, and Intel® Cache Acceleration Software

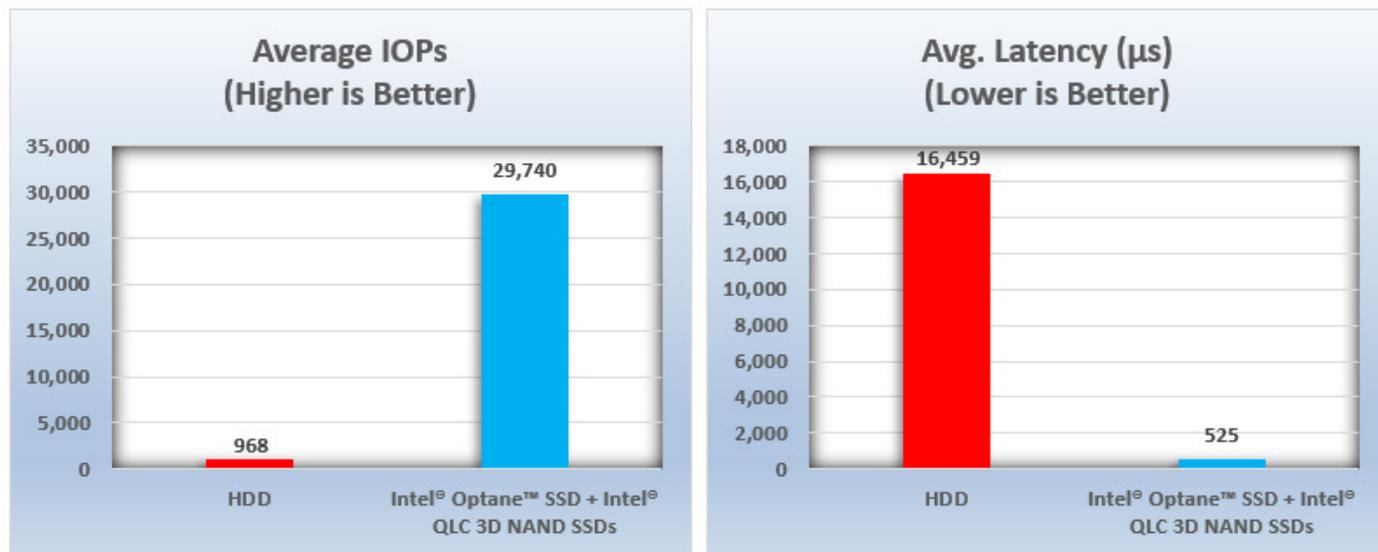
Challenge: Commonly utilized HDD media lacks the performance required for high-speed storage applications

Even in today's many modern datacenters, HDDs are still a common storage type used by numerous end-users for various storage applications. However, due to increased demand for faster storage performance, these traditional storage types may no longer be suitable for many storage system infrastructures. To solve the performance concerns of datacenter users, Intel designed a novel solution implementing Intel® Optane™ technology, Intel® QLC Technology, and Intel® Cache Acceleration Software (Intel® CAS) to significantly increase storage application throughput.

Solution: A combination of Intel Optane technology and Intel® QLC 3D NAND SSDs delivers up to 30x increase in IOPS and 31x decrease in average latency compared to traditional HDDs¹

All configurations were tested with the FIO tool, using a 70/30 mix of random reads and writes in a Zipfian distribution pattern, 64KB block size, and queue depth of 16. By replacing a flat HDD-based storage infrastructure with a complete storage solution consisting of an Intel Optane SSD cache powered by Intel CAS, and a back-end RAID5 array of Intel QLC 3D NAND SSDs powered by Intel® Virtual RAID on CPU (Intel® VROC), Intel demonstrated up to a 30x increase in IOPS performance as well as a 31x decrease in average latency.¹ Intel CAS merges the unparalleled performance of Intel Optane technology with the economical, high-capacity nature of Intel QLC Technology, enabling performance-minded storage solution deployments.

Unleash the power of Intel® Optane™ technology with Intel® Cache Acceleration Software (Intel® CAS) to deliver up to 30x increase in IOPS and 31x decrease in average latency compared to traditional HDDs.¹



Conclusion

Intel is focused on replacing dated and basic storage infrastructures with storage solutions that use hardware and software innovations to create a better experience within the data center. Intel CAS and an Intel Optane SSD work together to absorb the incoming I/O and leverage the faster media of Intel Optane technology. Then, Intel QLC 3D NAND SSDs provide economic back end storage to meet capacity requirements. The solution provided here has the necessary foundation to improve the performance and responsiveness of your I/O-bound applications.



For more information about solutions with Intel® CAS, visit: <http://www.intel.com/cas>

1. Source: Intel Tested. System configuration/Test Details: Server model: SYS-6029U-TR4T; MB: X11DPU; CPU: Intel® Xeon® Platinum 8180 CPU @ 2.50GHz, 28C/56T, 38.5 MB L3 Cache, Turbo, HT (205W); Mem: 8x32GB Hynix HMA84GR7AFR4N-VK DIMMs (256GB), DDR4-2666; NICs: 4x Embedded Intel X710/X557 10GbE LAN; BIOS Version: 1.10; Operating System: Red Hat Enterprise Linux Server release 7.4; Kernel Version: 3.10.0-693.43.1.el7.x86_64. HDD config: 4x Seagate Exos Enterprise HDD model ST8000NM0055 8TB in 4-disk RAID5 (4DR5) for capacity storage; Optane+QLC Config: 4x Intel SSD DC P4320 7.68TB in 4DR5 for capacity storage and 1x Intel® Optane™ SSD DC P4800X 375GB for caching; Intel CAS Software Setup: Version 03.08.00.01601108, SSD DC P4800X used for write-back caching, cache size is 10% of the 750GB fio workload (~75GB). Workload: FIO, 3 trials, each trial with: size=750GiB, block size 64KB, time-based 4-hr test (after a single 2 hr ramp runtime), zipf random distribution (theta = 1.1), random readwrites, 70/30 rw mix, 16 IO depth, 1 job. Optane+QLC config achieved 29,740 TPS and 525us average latency while HDD-only config achieved 968 TPS and 16,459us average latency.

Performance results are based on testing as of January 19, 2019 and may not reflect the publicly available security updates. See configuration disclosure for details. No product can be absolutely secure

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit intel.com/benchmarks.

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

Cost reduction scenarios described are intended as examples of how a given Intel-based product, in the specified circumstances and configurations, may affect future costs and provide cost savings. Circumstances will vary. Intel does not guarantee any costs or cost reduction.

Intel, the Intel logo, Intel Optane, are trademarks of Intel Corporation or its subsidiaries in the U.S. and/or other countries.

*Other names and brands may be claimed as the property of others.