TECHNOLOGY BRIEF

Data Center Storage Optimization
Intel® Optane™ Technology

Boost Storage Performance Using Intel® Optane™ SSDs and Intel® QLC SSDs

Boost storage performance using Intel® Optane™ technology and Intel® QLC SSDs with Intel® Cache Acceleration Software.

Challenge: Applications require fast and responsive storage systems at a low cost

Storage applications are responsible for servicing millions of requests every day. Many enterprise storage solutions are run on hard-disk drive media. In order to meet high-speed application needs, many users have migrated to TLC SSD back-end infrastructures for added performance boosts. For others, a more economical alternative is preferred. In response, Intel introduces a unique solution implementing Intel® SSD D5-P4320 + QLC, Intel® Optane™ SSD DC P4800X, and Intel® Cache Acceleration Software (Intel® CAS) to increase storage application performance in a cost-effective manner.

Solution: Intel® Optane™ Technology and QLC deliver up to 1.9x increase in IOPS[1]

In this reference solution an I/O workload was generated using the FIO tool with a 70:30 read/write ratio, 4KB block size, and random reads/writes. Under this workload, the Intel® Optane™ SSD DC P4800X caching for a back-end Intel® Virtual RAID on CPU (Intel® VROC) RAID5 array of SSD D5-P4320 + QLC yielded a 1.9x increase in IOPS performance along with a 3.1x decrease in average latency relative to a TLC configuration composed of Intel® SSD DC P4510 + TLC in an Intel VROC RAID5 array.[1] Additionally, these improvements were attained at a reduced economic price point.[2] This enables storage solution deployment at lower cost and higher performance with an Intel® Optane™ technology-driven solution.[1]

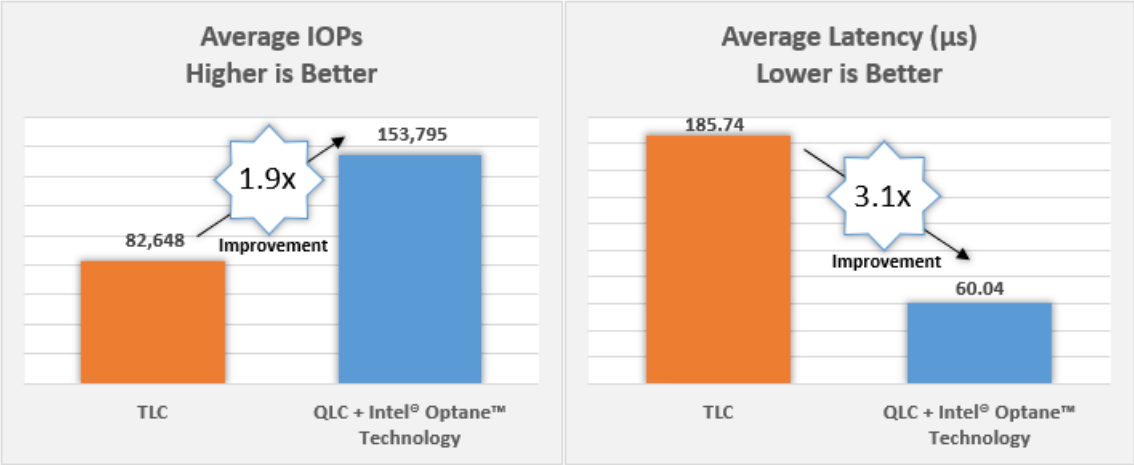

Figure 1: IOPS and latency improvements for Intel® Optane™ Technology + Intel® QLC SSDs vs. TLC

Conclusion

This reference solution utilizing Intel® QLC SSDs, Intel® Optane™ Technology and Intel® CAS allows users to unleash the higher performance and predictable latency of Intel® Optane™ Technology while leveraging the cost-effectiveness of Intel® QLC SSDs.

1. System configuration: Server model: Intel® Wolf Pass S2600WFT (R2208WFTZS); MB: H48104-710; CPU: Dual Intel(R) Xeon(R) Platinum 8160T CPU @ 2.10GHz, 24C/48T, 10.4GT/s, 33 MB L3 Cache, Turbo, HT (150W) DDR4-2666; Mem: 4x32GB RDIMM (128GB), 2400MT/s, DDR4-19200; NICs: Intel® 10-Gigabit x540-AT2 (Rev. 01) and Embedded Intel® X722 10GbE LAN; TLC config: 4x Intel® SSD DC P4510 8TB in VROC RAID5 for capacity storage; QLC config: 4x Intel® SSD DC P4320 8TB in VROC RAID5 for capacity storage and 1x Intel® Optane SSD DC P4800X 375GB for caching; Workload: FIO, size=760G, 3000 files (individual filesize ~ 256MB), test block size 4kb, time-based two-hour sequential write conditioning (block size 128kb), time-based 20-min test (20-min runtime, 30-second ramptime), zipf random distribution (theta = 1.1). TLC system obtained 82,648 IOPs and 185.74 µs latency on average. QLC system obtained 153,795 IOPS and 60.04 µs on average. Performance results are based on testing as of July 19, 2018 and may not reflect the publicly available security updates. See configuration disclosure for details. No product can be absolutely secure.

2. Cost reduction based on $0.37/GB for TLC SSDs, $0.29/GB for QLC SSDs, $2.87/GB for Intel® Optane™ SSDs. Total TLC capacity 4x8000GB. Total QLC capacity 4x7680GB. Total Intel Optane SSD capacity 1x375GB. Sources: https://www.cdw.com/product/intel-solid-state-drive-dc-p4510-series-solid-state-drive-8-tb-pci-ex/5101252; https://colfaxdirect.com/store/pc/viewPrd.asp?idproduct=3223&idcategory=0; https://www.cdw.com/product/intel-solid-state-drive-d5-p4320-series-solid-state-drive-7.6-tb-pci/5400292?enkwrd=p4320