



Improve storage throughput
34% faster throughput



Process more storage I/O
35% more IOPS

Get more VMware vSAN database performance with Intel Optane SSDs and HPE ProLiant DL380 Gen10 servers

HPE ProLiant DL380 Gen10 servers with Intel Optane NVMe SSDs processed 35% more IOPS and provided 34% faster throughput on a write-heavy workload versus a solution with only NAND flash NVMe SSDs

Using a workload I/O generator for Oracle databases

If your organization depends on write-intensive workloads like online transaction processing to generate revenue, you need a storage solution that can keep up. For the past few years, NAND flash NVMe™ SSDs have represented the forefront of data center storage technology. Now, Intel has introduced Intel® Optane™ NVMe SSDs. In hands-on testing, Principled Technologies compared the storage performance of these two options.

We set up a VMware vSAN™ cluster on four HPE ProLiant DL380 Gen10 servers with NAND flash NVMe drives and ran a write-intensive workload. When we replaced the two NAND flash NVMe SSDs in the vSAN cache tier with two Intel Optane NVMe SSDs, the Intel Optane-HPE solution delivered 34 percent faster throughput and 35 percent more input/output operations per second (IOPS) than the NAND flash NVMe-only configuration.

For enterprises seeking to boost storage throughput and IOPS on write-intensive workloads, HPE ProLiant DL380 Gen10 servers with Intel Optane drives represent a compelling option.

What can Intel Optane SSDs deliver to your business?

For demanding, write-intensive storage environments, sluggish throughput and slow transaction processing can impact a company's bottom line. That's why enterprises are increasingly using NVMe SSDs, which support higher bandwidths than SATA or SAS SSDs.¹ By 2020, IDC expects NVMe to become "the mainstream foundation technology for enterprise storage."² As more businesses integrate write-intensive workloads into their operations, they will be looking for ways to accelerate storage—perhaps even beyond traditional NAND flash NVMe SSDs.

To meet this need, Intel has introduced the Intel Optane SSD P4800X, designed for high endurance and fast speeds. Intel positions its Optane technology as being ideal for write-intensive applications like online transaction processing and high-performance computing.³ According to Intel, the architecture of Intel Optane NVMe SSDs allows for fast access to read and write data because it places data dynamically.⁴

We tested Intel Optane SSDs in HPE ProLiant DL380 Gen10 servers to see what Intel Optane technology could deliver to businesses using write-intensive workloads.

About the Intel Optane SSD P4800X

According to Intel, the Optane SSD P4800X is "the first product to combine the attributes of memory and storage."⁵ Intel designed its Intel Optane NVMe SSDs to deliver high throughput, low latency, predictably fast service, and high endurance.⁶ Learn more at <https://www.intel.com/content/www/us/en/architecture-and-technology/optane-technology/optane-for-data-centers.html>.



HPE ProLiant DL380 Gen10 servers

The HPE ProLiant DL380 Gen10 two-socket server has an adaptable chassis with modular drive bay configuration options. Featuring CPUs from the Intel Xeon Scalable processor family, the ProLiant DL380 Gen10 is compatible with Intel Optane drives and supports up to 20 NVMe drives. Its 24 DIMM slots can support anywhere from 128 GB to 3 TB of memory. According to HPE, the ProLiant DL380 Gen10 server “delivers the latest in security, performance and expandability.”⁷ To learn more about the HPE ProLiant DL380 Gen10 server, visit <https://www.hpe.com/us/en/product-catalog/servers/proliant-servers/pip.hpe-proliant-dl380-gen10-server.1010026818.html>.

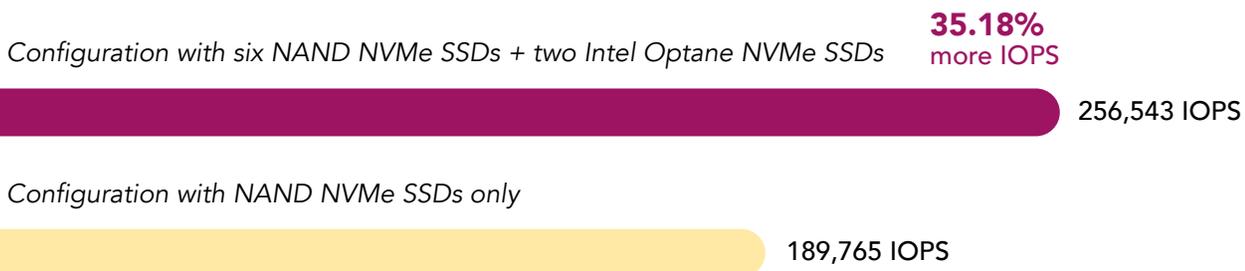
Process more IOPS with this Intel-HPE solution

To measure the storage performance of NAND flash NVMe SSDs versus Intel Optane SSDs, we set up a four-node VMware vSAN cluster with HPE ProLiant DL380 Gen10 servers, Intel Xeon Scalable processors, and eight NAND flash NVMe SSDs per server—six for the vSAN capacity tier and two for the vSAN cache tier. We assessed storage performance using the Silly Little Oracle Benchmark (SLOB) tool. For the second configuration we tested, we left the six NAND NVMe capacity tier SSDs in place, but modified the vSAN cache tier. On each of the four servers, we replaced the two NAND NVMe SSDs used for the vSAN cache tier with two Intel Optane drives. (For more details about the configuration we used, see the [science behind the report](#).)

The number of input/output operations per second (IOPS) delivered by a solution helps show its capacity to process real-world transactions. Our testing found that a configuration using Intel Optane SSDs in the cache tier delivered 256,543 total IOPS versus the 189,765 that the NVMe-only configuration processed—an increase of 35 percent. With more transactions processed every second, your business could serve more customers, boosting your ability to generate revenue.

IOPS

higher is better



About the benchmark

SLOB is a workload I/O generator for Oracle databases that measures how many IOPS a solution can handle. The ability to process more IOPS while still supporting high throughput indicates a solution’s ability to support periods of heavy user activity.

Improve your users' experience with faster throughput

Throughput indicates a solution's ability to transfer data. In our hands-on testing, the configuration with all NAND flash NVMe drives achieved a throughput of 2,025 total megabytes per second (MB/s). When we replaced the NAND flash NVMe SSDs used for the vSAN cache tier with Intel Optane NVMe SSDs, throughput increased to a total of 2,728 MB/s, an improvement of 34 percent. With a solution that delivers higher throughput, like the Intel Optane-based configuration, your business could get data to customers sooner, potentially allowing you to provide a better user experience.

Intel Xeon Scalable processors

Intel Xeon Scalable processors feature four configurations designed for various workloads: Platinum, Gold, Silver, and Bronze. In our tests with the HPE ProLiant solution, the HPE ProLiant DL380 Gen10 nodes used two Intel Xeon Gold 6154 processors. The Intel Xeon Gold 6154 processor contains 18 cores running at 3.00GHz frequency, with a max turbo frequency of 3.70 GHz. To learn more about Intel Xeon Scalable processors, visit <https://www.intel.com/content/www/us/en/products/processors/xeon/scalable.html>.

Throughput (MB/s)

higher is better

Configuration with six NAND NVMe SSDs + two Intel Optane NVMe SSDs

34.71%
more MB/s

2,728 MB/s

Configuration with NAND NVMe SSDs only

2,025 MB/s

What is vSAN?

VMware vSAN makes storage a virtual resource for your applications, reducing the need for external storage arrays. Embedded in the hypervisor of VMware Hyper-Converged Software solutions, vSAN clusters server-attached storage to create a shared datastore. For more information, visit <https://www.vmware.com/products/vsan.html>.



Conclusion

If your business operations depend on write-intensive workloads, a solution with high throughput and IOPS could make a difference to your bottom line. In our hands-on testing, HPE ProLiant DL380 Gen10 servers using Intel Xeon scalable processors and Intel Optane SSDs for the vSAN cache tier boosted IOPS by 35 percent and delivered 34 percent more throughput than the same server solution configured only with NAND flash NVMe SSDs. The ability to transfer more data and process more IOPS could help you serve more customers and provide a better user experience. With Intel Optane SSDs and HPE ProLiant DL380 Gen10 servers, your business could continue to operate at the cutting edge.

- 1 NVM Express, accessed April 29, 2019, https://www.nvmexpress.org/wp-content/uploads/NVMe_Overview.pdf.
- 2 Eric Burgener, "NVMe in Enterprise Storage Systems," accessed April 29, 2019, https://www.flashmemorysummit.com/English/Collaterals/Proceedings/2018/20180808_MRES-201B-1_Burgener.pdf.
- 3 Intel, "Breakthrough Performance Expands Datasets, Eliminates Bottlenecks," accessed February 26, 2019, <https://www.intel.com/content/dam/www/public/us/en/documents/product-briefs/optane-ssd-dc-p4800x-p4801x-brief.pdf>.
- 4 Intel, "Breakthrough Performance Expands Datasets, Eliminates Bottlenecks."
- 5 Intel, "Breakthrough Performance Expands Datasets, Eliminates Bottlenecks."
- 6 Intel, "Breakthrough Performance Expands Datasets, Eliminates Bottlenecks."
- 7 HPE, accessed February 26, 2019, <https://www.hpe.com/us/en/product-catalog/servers/proliant-servers/pip.hpe-proliant-dl380-gen10-server.1010026818.html>.

Read the science behind this report at <http://facts.pt/4rceuyq> ►



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This project was commissioned by HPE.