Dell EMC™ PowerMax 8000

Store data more efficiently and increase I/O performance with lower latency with a Dell EMC PowerMax 8000 array

Compared to an array from another vendor, the PowerMax 8000 offered a better inline data reduction ratio and better performance during simulated OLTP and data extraction workloads

A recent IDC survey anticipates that average enterprise data volumes will grow by over 42 percent from 2020 to 2022.[1] Storing an increasing volume of data can present challenges, especially when users consistently need fast access to it. The Dell EMC PowerMax 8000 storage array can store large amounts of data while helping enterprise-grade organizations limit data center sprawl, meet transactional database performance milestones, and satisfy user demands.

At Principled Technologies, we ran multiple tests on two all-NVMe® storage arrays with 48 TB of usable capacity: a Dell EMC PowerMax 8000 and an array from another company we'll call Vendor B. Compared to the Vendor B array, the PowerMax 8000 used less storage capacity to store the same amount of data and handled more input/output operations per second (IOPS) with lower storage latency on simulated database online transaction processing (OLTP) workloads. In addition, the PowerMax 8000 supported higher throughput during the extraction phase of an extract, transform, and load (ETL) workload. With the Dell EMC PowerMax 8000 storage array, enterprise-level organizations can maximize storage capacity and increase storage performance while maintaining fast response times.

Use less storage capacity for the same amount of data

29% less logical storage used

Handle more simulated transactional database work

65% more max IOPS

Move more data quickly and effectively

3.6X greater throughput during data extraction

About the Dell EMC PowerMax 8000 array

According to Dell Technologies, the Dell EMC PowerMax 8000 storage array "supports 32Gb/s FC-NVMe to deliver on the promise of end-to-end NVMe, along with Storage Class Memory Drives (SCM) powered by dual port Intel® Optane™ drives used as persistent storage." It offers up to 4.5 petabytes of effective storage that can also extend to public and private cloud with Cloud Mobility for Dell EMC PowerMax.[2]

In 2019, a PT study found that the PowerMax 8000 delivered more IOPS for an OLTP-like workload, stored data more efficiently, and made it easier to provision new storage compared to an array from another vendor.[3]

To learn more about the PowerMax 8000, visit DellEMC.com/PowerMax.

How we tested

During our testing, both the Dell EMC PowerMax 8000 array and the Vendor B array were located in an offsite data center lab. We performed all testing remotely after traveling to the lab to inspect the server clients, the network implementation, and the storage arrays. We had full control over and unfettered access to the testbeds.

We began our test setup by creating 64 1TB volumes (also known as logical unit numbers or LUNs) on each array and mapped them to four VMware® ESXi™ servers connected to the arrays. We then added four raw device mapping (RDM) disks to sixteen Linux®-based virtual machines on both test beds. We tuned the hosts according to each storage vendor's best practices and prefilled the volumes.

We tested each array in three phases and ran each test separately three times. We use the median results for each phase for this report.

- **Phase 1: Data reduction.** We started the test with each array containing empty volumes. Using Vdbench, we simulated a data migration into the arrays; the 64TB dataset, which Vdbench created, had a sequential write input/output (I/O) profile using 128KB blocks, 2:1 compression and 2:1 deduplication ratios, and a single thread per volume. We collected capacity and data reduction information prior to and immediately after each test iteration to assess the inline data reduction capabilities of both storage arrays.
- **Phase 2: Simulated OLTP performance.** We used Vdbench to allocate data to all logical space on the volumes using a sequential write I/O workload, a 2:1 compression ratio, and a 1:1 deduplication ratio (those ratios are representative of real world database datasets). We then performed a long, fixed-rate OLTP simulation to precondition the arrays. Finally, we ran a simulated OLTP workload with multiple I/O blocks to collect IOPS and latency data from the two storage solutions.
- **Phase 3: Data extraction by simulated ETL process.** To simulate the data extraction from a transactional database by an ETL process, we used Vdbench with a heavy-read workload. We ran the test to achieve maximum performance, collecting IOPS and throughput data from both storage solutions.

We unmapped RDM disks and deleted volumes between testing phases 1 and 2. After deleting the volumes, we let the storage arrays sit idle so they could reclaim space, and then we restarted the process of creating volumes and mapping RDM disks. Testing phases 2 and 3 used the same volumes and RDM disks.

Store data more efficiently

Efficient deduplication and compression free up space on storage arrays, allowing you to store more data on demand and potentially delaying your need to purchase new hardware. The more usable storage capacity your array offers, the more you get out of your investment.

Using its data reduction technology, which combines inline compression and inline deduplication,[4] the PowerMax 8000 solution needed 17 TB of logical space to store 64 TB of data. The Vendor B solution also used its data reduction technology but needed 24 TB of logical space to store the same 64 TB of data. The data reduction ratio for the Dell EMC solution was 3.6:1; the Vendor B solution offered a data reduction ratio of 2.5:1. Figure 1 shows the results from our data reduction testing.

29%
better data reduction

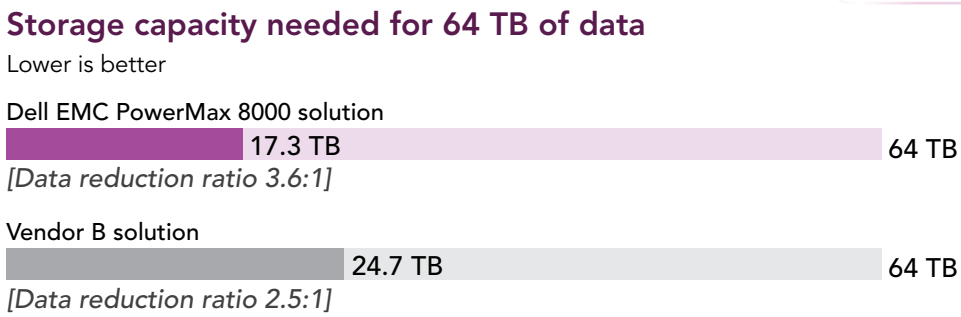


Figure 1: Data reduction results after the Dell EMC PowerMax 8000 and Vendor B storage array solutions stored 64 TB of data.

About Vdbench

Vdbench is an open-source benchmarking tool that generates input/output loads to stress storage arrays and simulate real-world workloads. It shows the maximum rate of IOPS a solution can handle along with the latency and bandwidth it delivers while processing those IOPS. For details on the workloads we configured and used in our testing, see the science behind the report.

Handle more transactional database work

If your company relies on OLTP databases for critical operations—as do many retail, financial, and customer service organizations—your storage array must be able to keep up with the demands of high-performing databases quickly. Fast OLTP databases can help your business grow, while slowdowns in those databases risk frustrating users, causing delays, and affecting your business.

Running a 32-thread Vdbench workload, the Dell EMC PowerMax 8000 solution achieved a max IOPS of 661,543 (262K more than the Vendor B solution achieved). Figure 2 shows the IOPS results from that workload.

Running a 4-thread Vdbench workload, the PowerMax solution's max IOPS was over 200K greater than the Vendor B solution's max IOPS. The PowerMax solution also had a 25 percent lower latency than the Vendor B solution for that workload. Figure 3 shows the IOPS results from the 4-thread workload, and Figure 4 shows the latency results.

Overall, these wins indicate that the Dell EMC PowerMax 8000 could better support heavy I/O activity in the two thread count configurations than the Vendor B array.

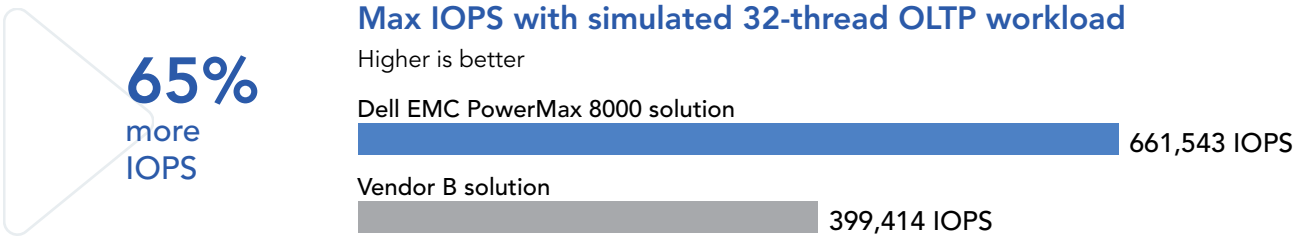


Figure 2: IOPS results for the Dell EMC PowerMax 8000 and Vendor B storage array solutions running our simulated OLTP 32-thread workload.

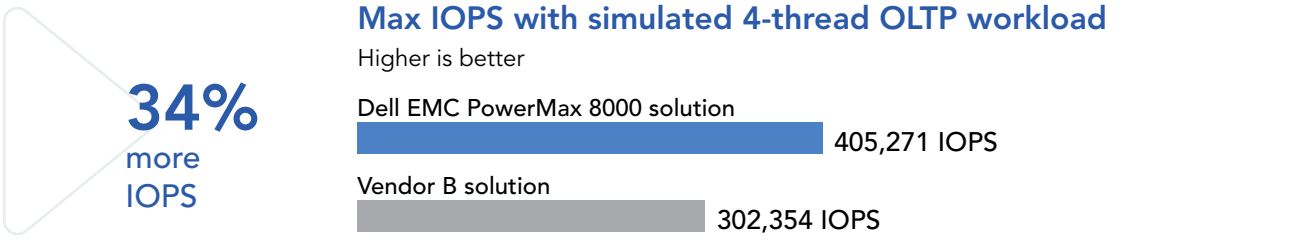


Figure 3: IOPS results for the Dell EMC PowerMax 8000 and Vendor B storage array solutions running our simulated OLTP 4-thread workload.

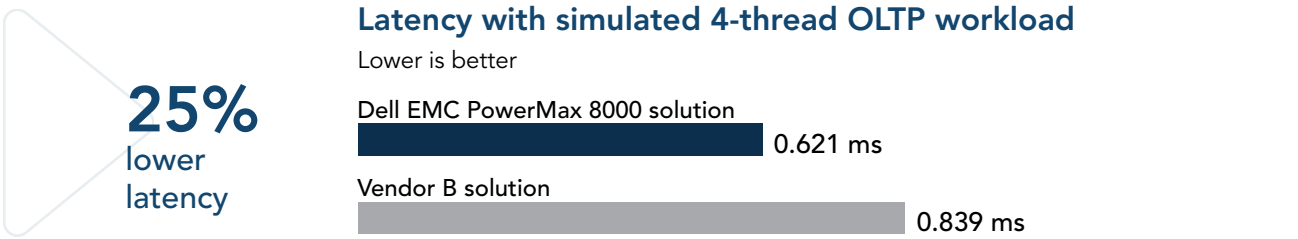


Figure 4: Latency for the Dell EMC PowerMax 8000 and Vendor B storage array solutions running our simulated OLTP 4-thread workload.

Extract data more quickly to get data analysis sooner

The output of ETL workflows is essential for data analysis. Boosting those workflows with faster data access or extraction can lead to more opportune decision making, helping a business gain or keep a competitive edge.

We simulated the extraction phase of an ETL workflow by running a 64-thread Vdbench heavy-read workload. The Dell EMC solution achieved 3.6 times the throughput of the Vendor B solution. Figure 5 shows the throughput during that time.

3.6X
more
MB/s

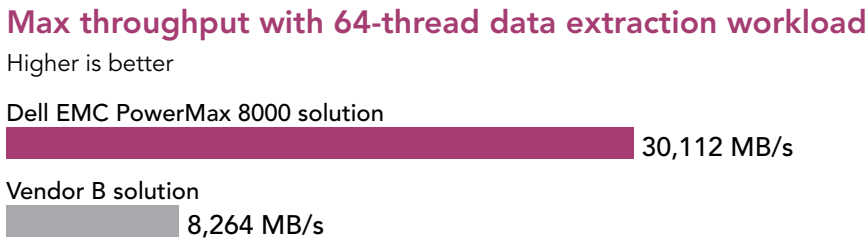
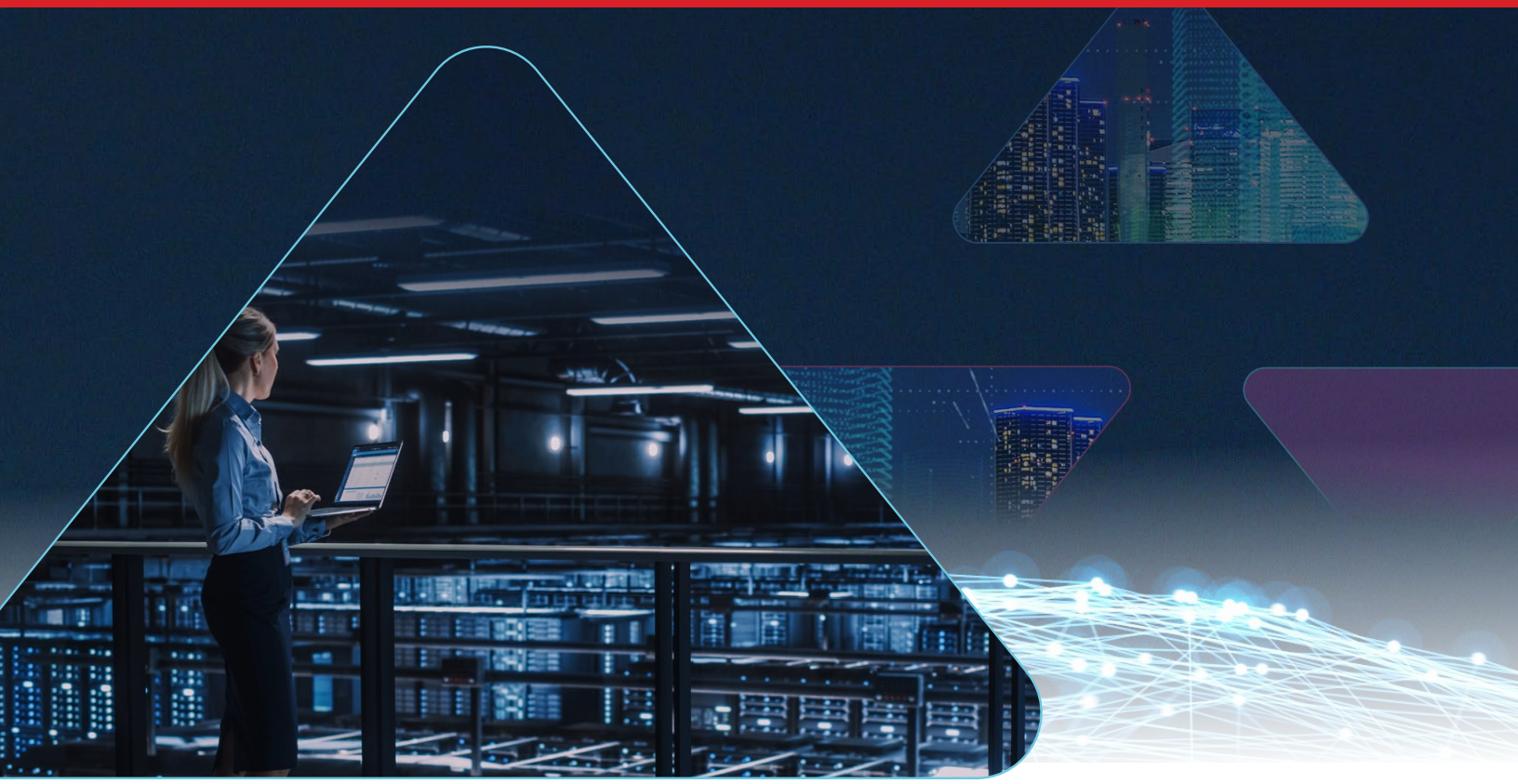


Figure 5: Throughput results, in MB per second, for the Dell EMC PowerMax 8000 and Vendor B storage array solutions running a 64-thread simulated data extraction phase of an ETL workload.



Conclusion

Critical data can impact your organization's revenue streams and daily operations, but storing it for continued use and growth can require significant storage capacity. Enterprise-grade storage arrays can meet your raw capacity needs, but they offer varied data reduction capabilities and levels of performance. In a head-to-head comparison against a similar all-NVMe solution from Vendor B, the Dell EMC PowerMax 8000 solution offered better inline data reduction capabilities. It also supported better simulated OLTP database performance than the Vendor B solution, including up to 3.6 times the throughput during the data extraction phase of a simulated ETL workload. Choosing the Dell EMC solution could allow you to make better use of your storage, better support ecommerce and similar transactional database workloads, and help control data center sprawl.

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1 Stephanie Condon, "Enterprises are collecting more data, but do they know what to do with it?" accessed August 25, 2021, https://www.zdnet.com/article/enterprises-are-collecting-more-data-but-do-they-know-what-to-do-with-it/.

2 Dell Technologies, "PowerMax Family Spec-Sheet," accessed August 25, 2021, https://www.delltechnologies.com/asset/en-us/products/storage/technical-support/h16739-powermax-2000-8000-ss.pdf.

3 Principled Technologies, "The Dell EMC PowerMax 8000 outperformed another vendor's array on an OLTP-like workload," accessed August 25, 2021, https://www.principledtechnologies.com/Dell/PowerMax-8000-0219.

4 Dell Technologies, "Dell EMC PowerMax: Data Reduction," accessed August 25, 2021, https://www.delltechnologies.com/asset/el-gr/products/storage/industry-market/h17072-data-reduction-with-dell-emc-powermax.pdf.

Read the science behind this report at http://facts.pt/CBHTLyA ▶

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