Lenovo® ThinkSystem™ SR650 with Intel® Optane™ DC persistent memory and Intel Optane NVMe™ SSDs

Improve database performance by adding Intel Optane DC persistent memory and Intel Optane NVMe SSDs to the Lenovo ThinkSystem SR650

versus a legacy server with legacy storage

Don't be left behind with outdated servers and storage. By moving your legacy systems to the new Lenovo ThinkSystem SR650 with Intel Optane DC persistent memory and Intel Optane NVMe SSDs, your business could see a dramatic performance improvement that lets you serve more customers faster.

In the PT data center, we compared the database performance of a four-year-old, two-socket server with Intel Xeon® Broadwell processors and mechanical hard disk drives (HDDs) to a new Lenovo ThinkSystem SR650 with new 2nd Generation Intel Xeon Scalable processors using two levels of storage: 1) Intel SATA SSDs and 2) Intel Optane DC persistent memory and Intel Optane NVMe SSDs. Upgrading to the ThinkSystem SR650 with SATA SSDs improved performance significantly over the legacy solution. We then found that upgrading to Intel Optane DC persistent memory and Intel Optane NVMe SSDs took database performance to an even higher level, delivering up to 28.2 times the orders per minute of the legacy solution.

So, if you last purchased servers several years ago, you might be selling your e-commerce business short. The new Lenovo ThinkSystem SR650 rack server offers multiple advanced storage options that, together with the server itself, can help you maximize database performance.

MAXIMIZE PERFORMANCE

Up to 28x the orders per minute (OPM) upgrading to Intel Optane DC persistent memory and Intel Optane NVMe SSDs*

UPGRADE AND DO MORE

23x the OPM with 2nd Generation Intel Xeon Scalable processors and Intel SATA SSDs*

vs. legacy server and storage

Using persistent memory modules and NVMe SSDs to boost database performance

All data that you store is valuable to your organization, but some of it employees or customers may not access frequently. Think years of HR records, payroll data, or payment records. This rarely accessed information is called cold data. Cold data doesn't require lightning-fast retrieval speeds because users don't urgently need it on a regular basis. Data that gets used more frequently is warm data, while critical workloads that are accessed constantly are hot data.

Knowing where data falls on this spectrum lets IT admins plan for the appropriate storage budget: not all workloads require investment in the fastest storage. But, many workloads, such as the hot data of e-commerce databases, do. By placing database workloads on NVMe SSDs alongside persistent memory, admins can ensure that customers have fast access when they're browsing or making a purchase, which is good for repeat business. Intel Optane DC persistent memory and Intel Optane NVMe SSDs combine capacity, non-volatility, and low-latency storage, allowing admins to store important workloads on extremely fast storage for accelerated application performance.

At a glance: The Intel Optane SSD DC P4800X Series

The NVMe SSDs in the Intel Optane SSD DC P4800X Series come in multiple capacities and form factors including Add-In-Cards (AIC) ranging from 375GB to 1.5TB. Intel Optane SSDs are designed to speed up performance for retrieving frequently accessed data. According to Intel, "an Intel Optane SSD [can] extend memory, offering bigger or more affordable memory by participating in a shared memory pool with DRAM at either the OS or application level."

To learn more about the potential benefits of the Intel Optane SSD DC P4800X Series, visit https://www.intel.com/content/www/us/en/products/memory-storage/solid-state-drives/data-center-ssds/optane-dc-p4800x-series.html.

At a glance: Intel Optane DC persistent memory

A new tier of memory and storage technology, Intel Optane DC persistent memory is non-volatile, high-capacity memory that lets you place more data on faster storage to speed application performance. According to Intel, "[d]elivered with the next-generation Intel Xeon® Scalable processor, this technology will transform critical data workloads – from cloud and databases, to in-memory analytics, and content delivery networks."[2]

To learn more about the potential benefits of Intel Optane DC persistent memory, visit https://www.intel.com/content/www/us/en/architecture-and-technology/optane-dc-persistent-memory.html.

Fulfill more database orders by upgrading servers and storage

Upgrading to the Lenovo ThinkSystem SR650 with 2nd Generation Intel Xeon Scalable processors and Intel SATA SSDs provided a massive performance boost over the legacy server with HDDs, handling 23.9 times the orders per minute (OPM).

Orders per minute

Lenovo ThinkSystem SR650 with Intel Optane DC persistent memory and Intel Optane NVMe SSDs	243,501
Lenovo ThinkSystem SR650 with Intel SATA SSDs	206,770
Four-year-old, two-socket server with Intel Broadwell processors and mechanical hard drives	8,616

Upgrading the storage in the Lenovo ThinkSystem SR650 to Intel Optane NVMe SSDs and adding Intel Optane DC persistent memory delivered 17.8 percent more OPM than the new server with SATA SSDs, an impressive 28.6x boost over the legacy solution. This means that upgrading from your legacy solution to the 2nd Generation Intel Xeon Scalable processor-powered Lenovo ThinkSystem SR650 with Intel Optane NVMe SSDs and Intel Optane DC persistent memory could enable you to serve more customers per server, provide a faster customer experience, and even consolidate many older servers onto fewer new systems, saving in power, cooling, and data center space costs.

How we tested

In our testing, we used an OLTP workload, generated by DVD Store 2, on Microsoft® SQL Server® 2017 to measure database performance. DVD Store 2 reports performance in orders per minute (see chart above for results).

For the legacy HDD and SATA SSD environments, we placed the SQL Server data onto a four-drive RAID10 volume, and the SQL Server logs onto a two-drive RAID1 volume. For the Intel Optane environment, we placed the SQL Server data onto a single Intel Optane NVMe SSD and placed the SQL Server logs onto the Intel Optane DC persistent memory, using Non-Interleaved App Direct Mode. The database was fully cached and running at steady state. To learn more about our testing, see the science behind the report.

What the Lenovo ThinkSystem SR650 offers

The Lenovo ThinkSystem SR650 is a sleek 2U rack server powered by up to two 2nd Generation Intel Xeon Scalable processors. It can support up to 2TB of memory in 24 slots (using 128GB DIMMs) and up to 24 NVMe drives. According to Lenovo, the ThinkSystem SR650 features AnyBay technology, which "provides the flexibility to mix-and-match SAS/SATA HDDs/SSDs and NVMe SSDs in the same drive bay."[3] Like other servers in the ThinkSystem line, the SR650 incorporates an embedded management feature, the Lenovo XClarity Controller, that can manage servers, storage, and networking from a single location.

To learn more about the Lenovo ThinkSystem SR650 server, visit https://www.lenovo.com/us/en/data-center/servers/racks/ThinkSystem-SR650/p/77XX7SRSR65.

Conclusion

Businesses that require the most from their databases know that choosing the correct storage type is crucial to meeting performance goals. We tested mutiple storage configurations to see how upgrading servers, storage, and memory technology affected performance. Upgrading from a legacy server and HDDs to a new Lenovo ThinkSystem SR650 with 2nd Generation Intel Xeon Scalable processors and Intel SATA SSDs provided an enormous boost to database performance vs. the legacy configuration. Moving to the Lenovo ThinkSystem SR650 with Intel Optane DC persistent memory and Intel Optane NVMe SSDs boosted performance even higher, showing that customers looking to maximize database performance such as e-commerce workloads can handle more work by making these upgrades.

1   Ray Kurzweil, "The Law of Accelerating Returns," accessed March 26, 2019, http://www.kurzweilai.net/the-law-of-accelerating-returns.

2   Intel, "Intel Optane DC Persistent Memory," accessed March 28, 2019, https://www.intel.com/content/www/us/en/architecture-and-technology/optane-dc-persistent-memory.html.

3   Lenovo, "ThinkSystem SR650 Rack Server," accessed March 27, 2019, https://www.lenovo.com/us/en/data-center/servers/racks/ThinkSystem-SR650/p/77XX7SRSR65.

Simulating an e-commerce workload with DVD Store 2

To create a real-world database workload, we used DVD Store Version 2.1 (DS2). DS2 models an online store where customers log in, search for products, and make purchases. It reports these actions by showing how many orders per minute the system can handle, which in turn demonstrates the kind of performance you could expect for your customers. DS2 also performs other actions, such as adding new customers, to exercise the wide range of database functions you might need. To download DS2, see https://github.com/dvdstore.

Read the science behind this report at http://facts.pt/00zh4oh ▶

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