Dell EMC™ PowerEdge™ studies

Dell EMC PowerEdge R650 servers running VMware vSphere 7.0 Update 2 can boost transactional database performance to help you become future ready

In a VMware vSAN cluster, the latest-generation servers powered by 3rd Generation Intel Xeon Scalable processors completed more orders per minute (OPM) than clusters of older servers

Older servers can expose workload performance issues that in turn can create obstacles for your organization. Even if the servers deliver consistent performance year after year, they might not have the innovations or resources to help keep up with growth. By replacing aging servers in VMware® vSAN™ clusters with latest-generation Dell EMC™ PowerEdge™ R650 servers powered by 3rd Generation Intel® Xeon® Scalable processors, you could boost performance of online transaction processing (OLTP) workloads to meet today's demand and potentially hit more aggressive revenue or usage targets for increased demand of the future.

We found that latest-generation Dell EMC PowerEdge R650 servers processed more transactions for Microsoft SQL Server OLTP workloads running on vSAN clusters. Compared to the performance of older Dell EMC PowerEdge R640 or R630 servers in vSAN clusters, the performance of the latest-generation servers could help your organization generate more revenue and expand your user base.

Dell EMC PowerEdge R650

Process more OPM

More than 5X the OPM of the vSAN cluster using PowerEdge R630 servers

More than 1.9X the OPM of the vSAN cluster using PowerEdge R640 servers

About the Dell EMC PowerEdge R650 server

According to Dell, the Dell EMC PowerEdge R650 is an enterprise server that aims to optimize application performance and data center density.[1] Offering new features such as support for PCIe Gen4, NVMe® hardware RAID, expanded memory capacity, Hot Plug BOSS controllers, and the latest generation of Intel Xeon Scalable processors, this server has the potential to increase reliability as well as performance.

New features of the vSAN cluster using latest-generation Dell EMC PowerEdge R650 servers

- **New processors** – 3rd Generation Intel Xeon Scalable processors power latest-generation Dell EMC PowerEdge R650 servers and can potentially deliver more cores per processor than previous generations of Intel Xeon processors
- **Robust memory capacity** – Up to 2 TB of RDIMM or 4 TB of LRDIMM memory
- **All-flash PCIe NVMe storage** – The latest generation server supports up to 153 TB of storage from 12 2.5-inch NVMe SSDs
  - NVMe drives can handle more operations per second than SATA SSDs to offer faster storage access and increased bandwidth
  - Support for higher-speed PCIe NVMe, which doubles the throughput per PCIe slot compared to older generation servers
- **Remote direct memory access (RDMA)** – IT admins can now enable this feature for vSAN clusters
  - For more information, see the callout section below "What is RDMA?"
- **New versions of VMware vSphere** – We installed version 7.0 Update 2 of the hypervisor on the latest-generation servers, the first version of vSphere that supports vSAN RDMA

What is RDMA?

RDMA allows servers connected in a network to trade data by accessing each other's memory directly and without involving the servers' OS, processors, or cache. Enabling RDMA can help improve workload performance as well as each server's throughput because CPU resources can focus more on processing workload queries rather than those requests to trade data. RDMA was not available for vSAN configurations of the Dell EMC PowerEdge R640 and R630 servers at the time of our previous testing, so we could not enable the setting for those solutions.

How we tested

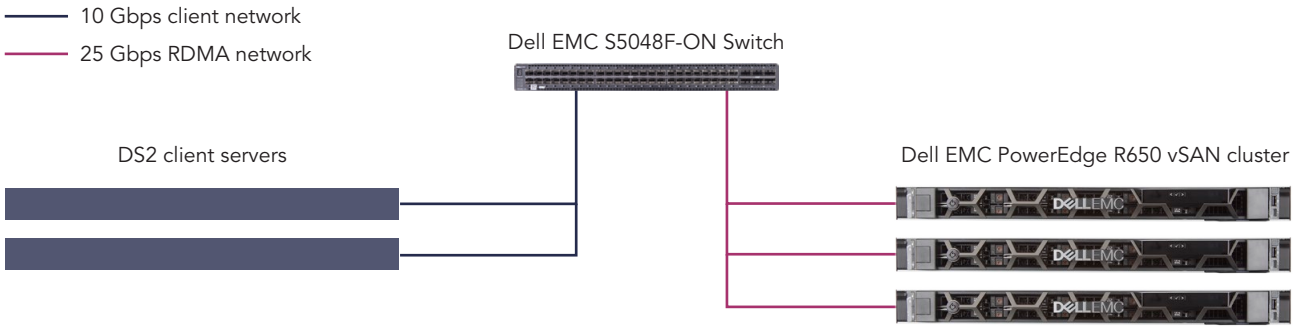
Our hands-on testing measured the virtualized OLTP performance of a VMware vSAN cluster comprised of three latest-generation Dell EMC PowerEdge R650 servers, each powered by two 3rd Generation Intel Xeon Gold 6330 processors. Each server had two vSAN disk groups, and we set up each disk group with one NVMe SSD in the cache tier and three NVMe SSDs in the capacity tier. We directly connected all NVMe drives from the backplane to the mother board. The PowerEdge R650 cluster hosted 18 Microsoft SQL Server 2019 VMs (6 VMs per host), against which we ran iterations of an OLTP workload that we created with the benchmarking tool DVD Store 2 (DS2).

We compared the performance of the PowerEdge R650 server-based vSAN cluster to the performance of PowerEdge R640 and PowerEdge R630 server-based clusters from a previous study that we published in September 2019 (visit http://facts.pt/qnuhaw1).[2] The configurations of the PowerEdge R640 and R630 solutions contrasted with the PowerEdge R650 solution in the following ways:

- Two Intel Xeon Gold 6230 processors powered each of the three Dell EMC PowerEdge R640 servers. Each server had two vSAN disk groups, and we set up each disk group with one NVMe SSD in the cache tier and three SATA SSDs in the capacity tier. We attached all disks to the storage controller and set them up in pass-through mode.
- Two Intel Xeon E5-2690 v3 processors powered each of the three Dell EMC PowerEdge R630 servers. Each server had two vSAN disk groups, and we set up each disk group with one SATA SSD in the cache tier and two SATA SSDs in the capacity tier. We attached all disks to the storage controller and set them up in pass-through mode.

Both servers from the previous study used 256 GB of RAM and ran vSphere 6.7.

For more information on the server configurations and our testing, see the science behind the report.



About 3rd Generation Intel Xeon Scalable processors

According to Intel, 3rd Generation Intel Xeon Scalable processors are "[o]ptimized for cloud, enterprise, HPC, network, security, and IoT workloads with 8 to 40 powerful cores and a wide range of frequency, feature, and power levels."[3] Intel continues to offer many models from the Platinum, Gold, Silver, and Bronze processor lines, which are aimed at "the most common workload requirements."[4]

For more information, visit http://intel.com/xeonscalable.

About DVD Store 2

DVD Store 2 simulates customers creating accounts, logging in, searching for items, and placing orders to an ecommerce website. It is available for MySQL, Microsoft SQL Server, Oracle, and PostgreSQL databases.

To learn more about OPM and other information specific to our benchmark workloads, visit the DVD Store 2 website at https://github.com/dvdstore/ds21.

Generate more revenue with greater application delivery capacity

When we ran our OLTP database workload on the Dell EMC PowerEdge R650 server-based vSAN cluster, we saw significantly better performance for the Dell EMC PowerEdge R650 solution powered by 3rd Generation Intel Xeon Scalable processors versus the older solutions. The latest-generation servers delivered 1.96 times the orders per minute (OPM) of the previous-generation PowerEdge R640 solution and 5.02 times the OPM of the older PowerEdge R630 solution. Based on these outputs, a vSAN cluster of latest-generation PowerEdge R650 servers with 3rd Generation Intel Xeon Scalable processors could help organizations handle more ecommerce orders now and in the future.

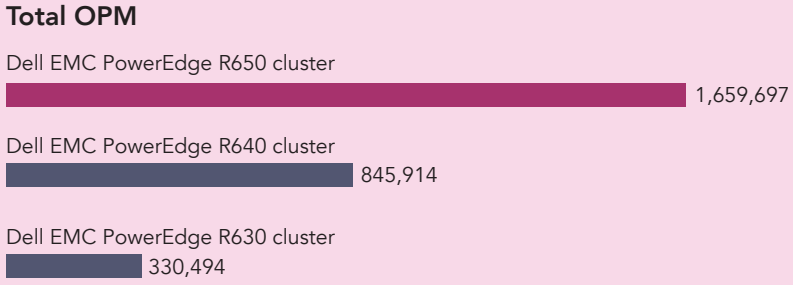


Figure 1: Total OPM each solution achieved while running the OLTP workloads against SQL Server 2019 VMs. Higher is better. Source: Principled Technologies.

About VMware vSphere 7

vSphere is an enterprise compute virtualization program that aims to "deliver a developer ready infrastructure, scale without compromise, and simplify operations."[5] This latest version of vSphere integrates VMware Tanzu to allow IT admins and others to bring Kubernetes containers to their organizations' infrastructure with self-service access.

To learn more about vSphere 7, visit https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/vsphere/vmw-vsphere-datasheet.pdf.

Conclusion

Aging servers don't offer all of the performance-boosting innovations and improvements that newer ones offer. When you replace older Dell EMC PowerEdge R630 and R640 servers in VMware vSAN clusters with latest-generation Dell EMC PowerEdge R650 servers powered by 3rd Generation Intel Xeon Scalable processors, you can unlock the transactional database performance potential that helps meet user demand and boost revenue. In our data center, a vSAN cluster of the latest-generation servers processed up to 5 times the OPM of clusters of older servers. If you're running OLTP SQL Server workloads on clusters of older PowerEdge servers, replacing them with the latest-generation Dell EMC PowerEdge R650 servers powered by 3rd Generation Intel Xeon Scalable processors could deliver these performance benefits and more.

1 Dell EMC, "Dell EMC PowerEdge R650 Spec Sheet," accessed June 2, 2021, https://www.delltechnologies.com/asset/en-us/products/servers/technical-support/dell-emc-poweredge-r650-spec-sheet.pdf.

2 Principled Technologies, "Boost transactional database performance of VMware vSAN clusters by replacing older servers with new Dell EMC PowerEdge R640 servers," accessed May 27, 2021, https://principledtechnologies.com/Dell/PowerEdge-R640-VMware-vSAN-OLTP-0919.pdf.

3 Intel, "3rd Gen Intel® Xeon® Scalable Processors," accessed May 27, 2021, https://www.intel.com/content/www/us/en/products/docs/processors/xeon/3rd-gen-xeon-scalable-processors-brief.html.

4 Intel, "Intel® Xeon® Scalable Processors," accessed May 27, 2021, https://intel.com/xeonscalable.

5 VMware, "VMware vSphere," accessed June 16, 2021, https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/vsphere/vmw-vsphere-datasheet.pdf.

Read the science behind this report at http://facts.pt/7RKmfRu►

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