PT

Greater OLTP workload performance

153,826

137,667

11.73%
more orders per minute than the HPE solution

Single-socket Dell EMC cluster

Dual-socket HPE Gen10 cluster
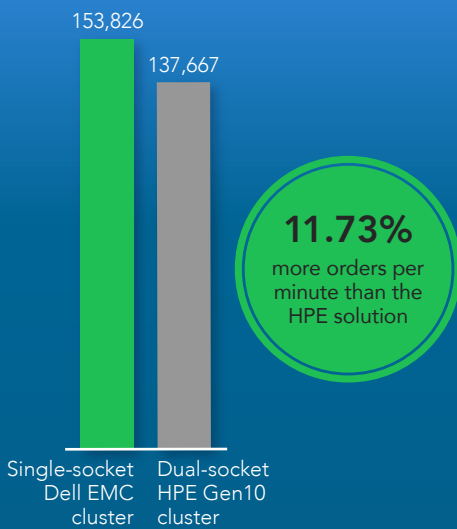
Greater OLTP performance for each dollar spent on hardware and software
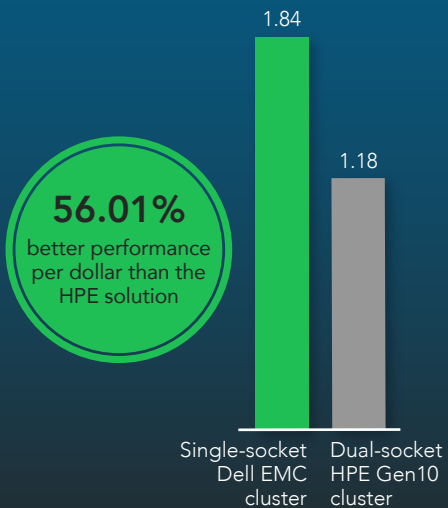
1.84

1.18

56.01%
better performance per dollar than the HPE solution

Single-socket Dell EMC cluster

Dual-socket HPE Gen10 cluster

*For more details on our data, see page 3 of this report.

Get stronger SQL Server performance for less with Dell EMC PowerEdge R6515 clusters powered by AMD EPYC 7502P processors

On an OLTP workload in a virtualized environment, a cluster of these single-socket servers outperformed a cluster of the higher-priced dual-socket HPE ProLiant DL360 Gen10, powered by Intel Xeon Gold 6242 processors

We compared the online transactional processing (OLTP) database performance of three server clusters: One with current Dell EMC™ hardware, another with current HPE hardware, and a third, baseline cluster that used legacy HPE hardware. Both current clusters outperformed the legacy cluster, with the current Dell EMC cluster executing 11.73 percent more orders per minute (OPM) than the current HPE cluster.

We also compared the hardware cost of the two current clusters. The current Dell EMC cluster's hardware cost 28.38 percent less than that of the current HPE cluster. Taking performance and hardware cost into account, we found that the current Dell EMC cluster had a 56.01 percent better performance-to-cost ratio than the current HPE cluster.

Each cluster contained three nodes, ran Microsoft Hyper-V, and hosted Microsoft SQL Server 2019 virtual machines. The current Dell EMC cluster used single-socket PowerEdge™ R6515 servers, each powered by an AMD EPYC™ 7502P processor. The current HPE cluster used dual-socket ProLiant DL360 Gen10 servers, each with two Intel® Xeon® Gold 6242 processors. The legacy HPE cluster used five-year-old dual-socket ProLiant DL360 Gen9 servers.

We built the Dell EMC solution we tested from prerelease hardware. It is available as a build-your-own option. For the latest information on Dell EMC products and solutions, see https://www.delltechnologies.com/en-us/products/index.htm

Get stronger SQL Server performance for less with Dell EMC PowerEdge R6515 clusters powered by AMD EPYC 7502P processors

March 2020

An overview of our testing

We conducted hands-on testing to measure the virtualized OLTP performance of three Hyper-V clusters backed by Microsoft Storage Spaces Direct:

- **Current Dell EMC cluster.** Three new Dell EMC PowerEdge R6515 servers, each powered by one AMD EPYC 7502P processor. As of November 27, 2019, each server retailed for $27,776.37, for a total hardware price per cluster of $83,329.11.

- **Current HPE cluster.** Three new HPE ProLiant DL360 Gen10 servers, each powered by two Intel Xeon Gold 6242 processors. As of December 3, 2019, each server retailed for $38,783.00, for a total price per cluster of $116,349.00.

- **Legacy HPE cluster.** Three 5-year-old HPE ProLiant DL360 Gen9 servers, each powered by two Intel Xeon E5-2680 v3 processors. (Note: We did not include the legacy cluster in our cost analysis.)

Each cluster ran Hyper-V with Failover Clustering and Storage Spaces Direct and hosted 18 Microsoft SQL Server 2019 VMs (six VMs per host), against which we ran an OLTP workload. (Complete details of the server configurations and the testing we performed are available in the science addendum to this report.)

Once we had our performance results in hand, we looked at the costs of the new servers and calculated the number of orders per minute per dollar each of the new solutions achieved to assess the value they provided.
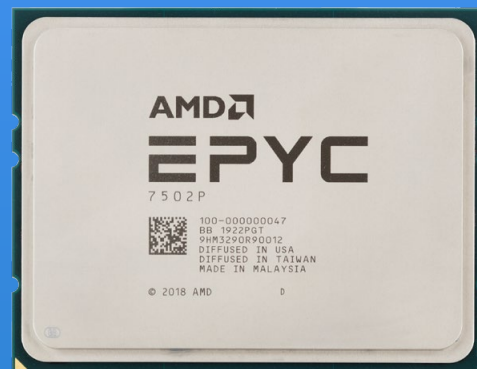
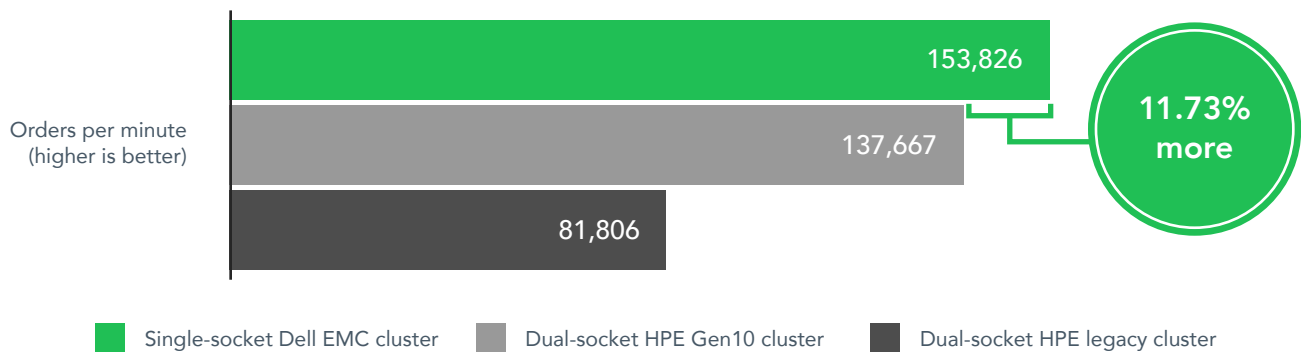## About AMD EPYC 7502P processors

2nd Gen AMD EPYC processors are the latest offering from AMD. The Dell EMC PowerEdge R6515 rack servers we tested were each powered by a single AMD EPYC 7502P processor. This 32-core processor uses AMD Infinity Architecture and is part of the AMD EPYC 7002 Series.

Learn more at https://www.amd.com/en/processors/epyc-7002-series

How the systems performed

We ran the OLTP workload against each cluster of 18 SQL Server VMs using the DVD Store 3 (DS3) benchmarking tool. DS3 models an online DVD store, where customers log in, search for movies, and make purchases. DS3 reports a running average of the number of orders per minute the benchmark achieves.

The following chart shows the average OPM output of all 18 SQL Server VMs in each cluster over the course of a 30-minute test run. Both current clusters dramatically outperformed the legacy HPE cluster, with the current Dell EMC cluster achieving 11.73 percent more orders per minute than the current HPE cluster.

Orders per minute
(higher is better)

153,826

137,667

81,806

11.73% more

■ Single-socket Dell EMC cluster   ■ Dual-socket HPE Gen10 cluster   ■ Dual-socket HPE legacy cluster

About Dell EMC PowerEdge R6515 rack servers

Each Dell EMC PowerEdge R6515 rack server is powered by one 2nd Gen AMD EPYC processor with up to 64 cores. (The configuration we used in our testing had 32 cores.) According to Dell EMC, these servers boast the following specifications:[1]

- Up to 16 DDR4 RDIMM/LRDIMM slots
- Up to two PCIe slots—a Gen3 slot and a Gen4 slot
- Integrated security features
- Embedded management tools
- Network Functions Virtualization (NFV)

Learn more at https://www.dell.com/en-us/work/shop/povw/poweredge-r6515.

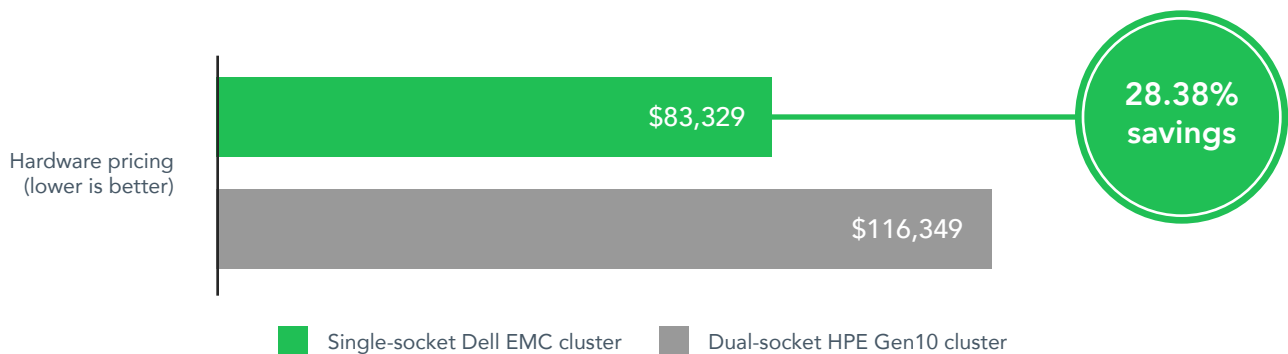## About KIOXIA CD5 Series Data Center NVMe™ SSDs

In our testing, we used the KIOXIA CD5 Series Data Center NVMe SSD. According to KIOXIA, "The CD5 Series is a read-intensive data center NVMe SSD that is optimized to support a broad range of scale-out and cloud applications that include Big Data/IoT, Online Transaction Processing, and Virtualization."[2]

It is available in 960GB to 7,680GB capacities, and KIOXIA states that it has random read/write capabilities up to 550K/50K IOPS and sequential read/write capabilities up to 3,140/1,980 MB/s.[3]

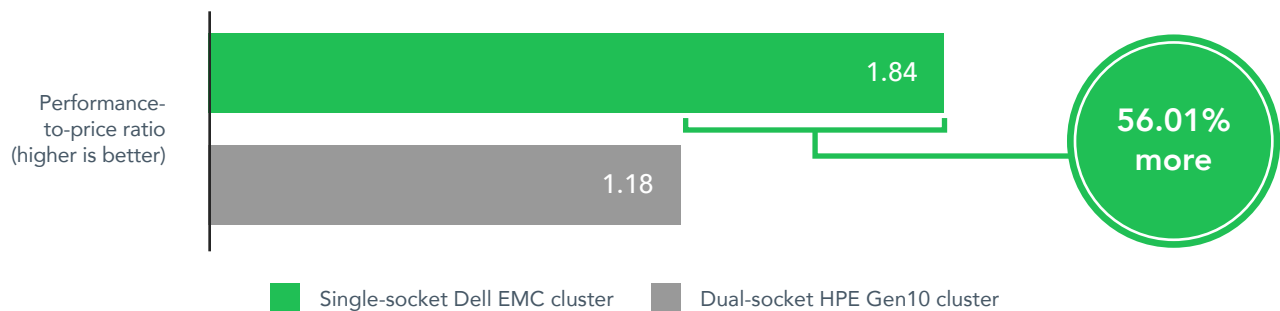Learn more at https://business.kioxia.com/en-us/ssd/data-center-ssd/cd5.html.

Price tag comparison

The chart below shows the hardware list prices (excluding sales tax, shipping, and discounts) in US dollars for the current-generation solutions we tested.[4] Because we tested clusters of three servers, we multiply the price for each server by three. The current Dell EMC cluster costs $83,329.11, while the current HPE cluster costs $116,349.00. A company that chose the Dell EMC solution would save $33,019.89, which is 28.38 percent of the cost of the HPE solution.

Hardware pricing (lower is better)

$83,329

$116,349

28.38% savings

■ Single-socket Dell EMC cluster   ■ Dual-socket HPE Gen10 cluster

Putting performance and price together

To determine the performance-to-price ratio, we took the total number of orders per minute each current-generation cluster achieved and divided it by the total hardware cost of the servers in that cluster. The graph below shows the results: due to its greater performance and lower price, the current Dell EMC cluster achieved a 56.01 percent better performance-to-price ratio than current HPE cluster did. This means that a company that uses workloads similar to DS3 could perform 1.5 times the transactional database work for each dollar they spent on hardware by investing in the Dell EMC solution. This could allow them to support more simultaneous users or maintain room for growth.

Performance-to-price ratio (higher is better)

1.84

1.18

56.01% more

■ Single-socket Dell EMC cluster   ■ Dual-socket HPE Gen10 cluster

Below is a table comparing performance and cost data between the two current-generation clusters. The single-socket Dell EMC cluster offered 11.73 percent better performance than the dual-socket HPE cluster at a 28.38 percent lower price point.

	Single-socket Dell EMC cluster	Dual-socket HPE cluster	Difference (percentage)
Orders per minute (OPM)	153,826	137,667	11.73%
Cluster hardware costs	$83,329.11	$116,349.00	28.38%
Performance-to-cost ratio	1.84	1.18	56.01%

About Microsoft SQL Server 2019

According to Microsoft, the latest version of Microsoft SQL Server "builds on previous releases to grow SQL Server as a platform that gives you choices of development languages, data types, on-premises or cloud environments, and operating systems."[5]

It includes features in the following areas: data virtualization and SQL Server 2019 Big Data Clusters, Intelligent Query Processing, In-Memory Database technologies, monitoring, developer experience, security, high availability, platform choice, and more.

Learn more about Microsoft SQL Server 2019 at https://www.microsoft.com/en-us/sql-server/sql-server-2019.

Conclusion

When it comes to hardware, getting greater performance often requires spending more. In our virtualized SQL Server 2019 testing of two current-generation servers in Hyper-V clusters, however, the less expensive option delivered stronger performance on our OLTP workload.

A cluster of three single-socket Dell EMC PowerEdge R6515 rack servers, each powered by one AMD EPYC 7502P processor, achieved 11.73 percent more database orders per minute than a cluster of dual-socket HPE ProLiant DL360 Gen10 servers, each powered by two Intel Xeon Gold 6242 processors. Combining this performance advantage with its 28.38 percent lower hardware price, the Dell EMC solution had a 56.01 percent better performance-to-cost ratio than the HPE solution.

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1   Dell EMC PowerEdge R6515 rack server, accessed December 2, 2019, https://www.dell.com/en-us/work/shop/povw/poweredge-r6515.

2   "CD5 Series Data Center SSD," accessed July 17, 2019, https://business.kioxia.com/en-us/ssd/data-center-ssd/cd5.html.

3   CD5 Series Data Center SSD.

4   Pricing for the Dell EMC PowerEdge R6515 came from the Dell EMC website on November 27, 2019 (https://www.dell.com/en-us/work/shop/productdetailstxn/poweredge-r6515).
    Pricing for the HPE ProLiant DL360 Gen10 came from a quote we received from an HPE Platinum partner on December 3, 2019.

5   "What's new in SQL Server 2019 (15.x)," accessed December 3, 2019, https://docs.microsoft.com/en-us/sql/sql-server/what-s-new-in-sql-server-ver15?view=sql-server-ver15.

Read the science behind this report at http://facts.pt/exon0ka ▶

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This project was commissioned by Dell EMC.