Get MongoDB database-driven insights for less with Dell EMC PowerEdge R6515 servers powered by 3rd Gen AMD EPYC 75F3 processors

A cluster of these servers running VMware vSphere 7.0 Update 1 and vSAN delivered better value than a cluster of the same servers with 2nd Gen AMD EPYC 7542 processors

Distributed MongoDB databases can help your business by bringing together information from a variety of sources. Servers that run these databases more quickly can give decision makers the freshest information sooner, whereas slower servers can take longer to generate actionable insights.

Running read-intensive big data MongoDB workloads in our data center, a VMware vSphere® 7.0 Update 1 cluster of four single-socket Dell EMC™ PowerEdge™ R6515 servers powered by 3rd Gen AMD EPYC™ 75F3 processors executed 20 percent more Yahoo Cloud Serving Benchmark (YCSB) operations per second (OPS) compared to a cluster of the same servers with 2nd Gen AMD EPYC 7542 processors. When we coupled the better performance with the hardware and support cost for both solutions, we saw a performance-per-dollar difference of 8.7 percent.

20% more
operations per second*

8.7% better
performance per dollar*†

*vs. the same server with the AMD EPYC 7542 processor   †Based on the total hardware cost with 3 years of Basic Next Business Day support

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More about MongoDB

MongoDB is a document-based database that uses a distributed approach to storing data. According to MongoDB, the database "stores data in flexible, JSON-like documents, meaning fields can vary from document to document and data structure can be changed over time."[1]

Learn more at https://www.mongodb.com/what-is-mongodb.

Our test approach

In our data center, we tested two VMware vSphere 7.0 Update 1 cluster configurations with VMware vSAN™:

- One cluster comprising four single-socket Dell EMC PowerEdge R6515 servers, each with one 32-core 3rd Gen AMD EPYC 75F3 processor. As of February 26, the price for hardware plus Basic Next Business Day support (36 months) for one server was $36,977.00, or $147,908.00 for the four-server cluster.[2]

- One cluster comprising the same four single-socket Dell EMC PowerEdge R6515 servers, each with one 32-core 2nd Gen AMD EPYC 7542 processor. As of February 26, the price for hardware plus Basic Next Business Day support (36 months) for one server was $33,407.00, or $133,628.00 for the four-server cluster.[3]

Each server featured 256 GB of RAM, one BOSS card with two 480GB M.2 SSDs for the hypervisor, and six NVMe SSDs. We configured each node of the vSAN cluster with two 1.6TB mixed-use drives for the caching tier and four 1.92TB read-intensive drives for the capacity tier. We measured the performance of each cluster using a virtualized MongoDB database and Workload C of the YCSB tool, which consists entirely of read operations. We ran a four-node vSphere cluster for each solution, with each node hosting four MongoDB VMs, each with a 32GB database for a total of 16 MongoDB VMs. We deployed 64 YCSB driver VMs on separate hardware to run Workload C against the MongoDB VMs. We ran this workload three times on each cluster and identified the median OPS result of the three runs. To calculate a performance-per-dollar ratio for each solution, we divided the operations per second output by the price for hardware and support above. For more details on our test process and configurations, see the science behind the report.

About Dell EMC PowerEdge R6515 servers

According to Dell Technologies, these single-socket 1U servers offer the following high-level specifications:

- Up to 64 high performance AMD 3rd Gen cores
- PCIe Gen4 for high throughput connectivity
- Support for up to 10 SAS/SATA/NVMe drives
- Improved VM density and SQL performance[4]

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

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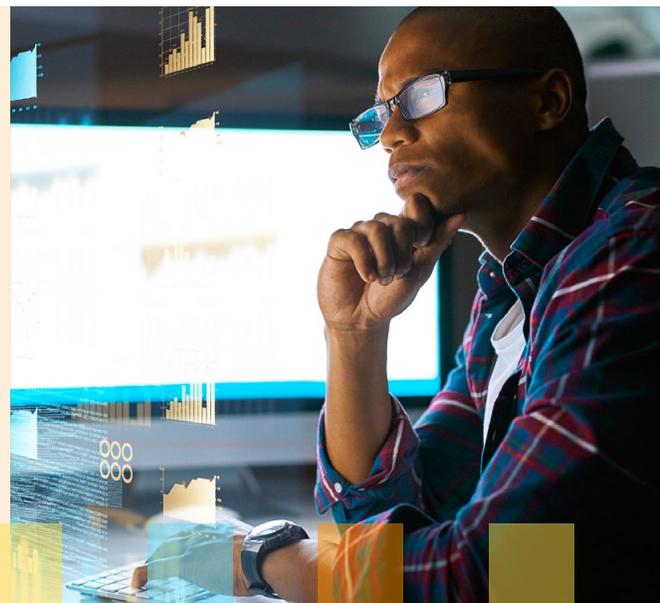
About AMD EPYC 75F3 processors

These 32-core processors use AMD Infinity Architecture and are part of the AMD EPYC 7003 Series. The latest offering from AMD, 3rd Gen EPYC processors offer increased I/O with "up to 32MB L3 cache per core," 7nm x86 technology, and new security features like Secure Encrypted Virtualization - Secure Nested Paging (SEV-SNP) and Encrypted State (SEV-ES).[5] AMD positions the EPYC 75F3 model as being well suited for high frequency use cases such as VM density, virtualization, and VDI.[6]

Learn more at https://www.amd.com/en/processors/epyc-7003-series.

Testbed diagram

Figure 1 shows our testbed diagram. Each of the four YCSB infrastructure servers contained 16 VMs serving as the YCSB data drivers, for a total of 64 VMs. These VMs acted as remote clients to access the MongoDB database.
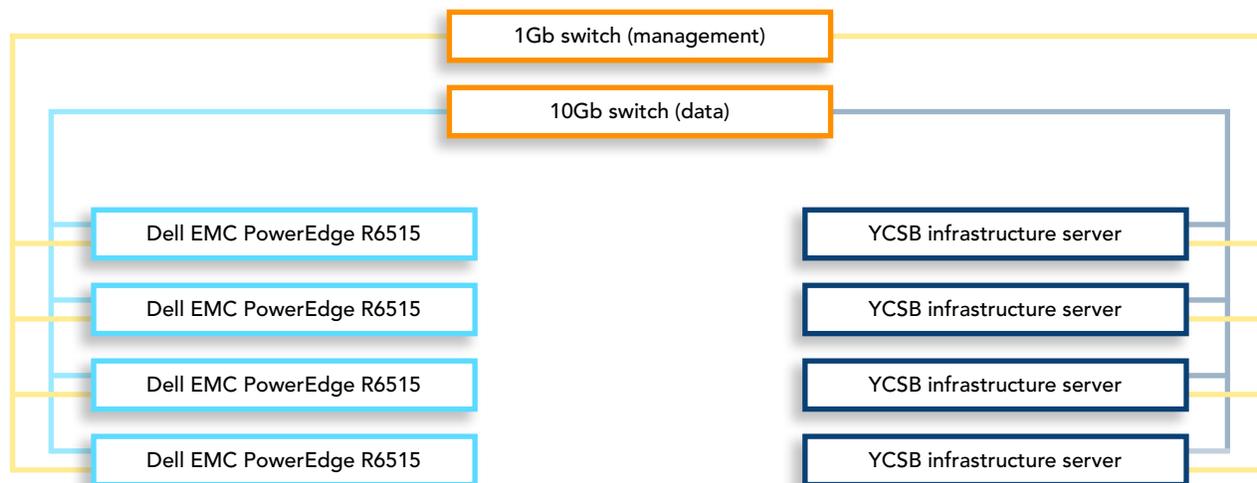
Figure 1: The testbed we used. Source: Principled Technologies.

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Measuring MongoDB performance with YCSB

When we ran the read-only YCSB Workload C on both solutions, the single-socket Dell EMC PowerEdge R6515 vSAN cluster with AMD EPYC 75F3 processors achieved 20 percent more operations per second than the vSAN cluster with the 2nd Gen AMD EPYC 7542 processors (see Figure 2). A company that selects servers that process a greater number of OPS could do more work in the same amount of time, or perform a given amount of work in less time.

Total OPS on the Yahoo Cloud Serving Benchmark
(higher is better)

1,923,609

1,599,015

■ Dell EMC PowerEdge R6515 cluster with 3rd Gen AMD EPYC 75F3 processors

■ Dell EMC PowerEdge R6515 cluster with 2nd Gen AMD EPYC 7542 processors
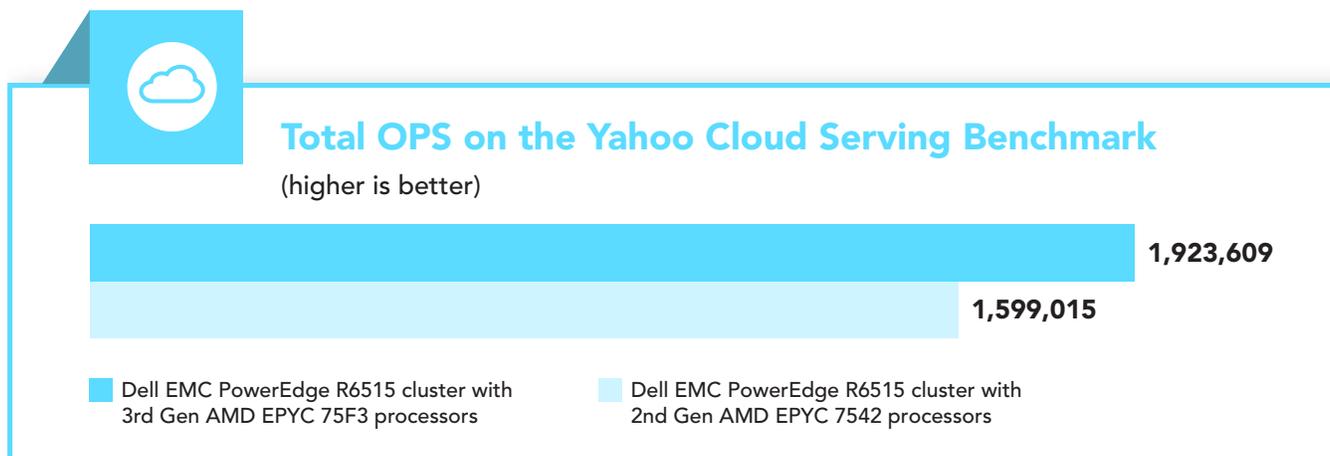
Figure 2: Total number of operations per second each cluster achieved in testing on YCSB Workload C. Higher is better. Source: Principled Technologies.

About the Yahoo Cloud Serving Benchmark

According to Yahoo!, "the goal of the Yahoo Cloud Serving Benchmark (YCSB) project is to develop a framework and common set of workloads for evaluating the performance of different 'key-value' and 'cloud' serving stores."[7] The benchmark serves many databases including Apache HBase and Cassandra, two NoSQL databases that can handle large datasets.

To learn more, visit https://research.yahoo.com/news/yahoo-cloud-serving-benchmark.

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Real-world benefits for manufacturing

As the internet of things (IoT) continues to expand, companies such as Toyota[8] and Bosch[9] are pioneering new software, apps, and workflows for the factory floor with MongoDB. Whether your company captures IoT data to analyze equipment, manage maintenance schedules, or aid your operators with correct tool usage, a server solution that can quickly process MongoDB workloads could deliver those insights in less time. A Dell EMC PowerEdge R6515 cluster powered by AMD EPYC 75F3 processors could deliver 20 percent more operations per second and 8.7 percent better performance per dollar than the same cluster powered by the 2nd Gen AMD EPYC processors we tested, so that you can bring innovation to your employees, products, and customers in less time—and at a better value.

Better performance for each dollar you spend

To determine the performance-per-dollar ratio, we took the total number of operations per second that each of the solutions achieved, and divided it by the price for hardware plus support. As Figure 3 shows, the Dell EMC PowerEdge R6515 cluster with the AMD EPYC 75F3 processors provided 8.7 percent better performance per dollar than the cluster with the AMD EPYC 7542 processors. With the single-socket Dell EMC PowerEdge R6515 cluster equipped with AMD EPYC 75F3 processors, companies that use MongoDB could carry out more database work for every dollar they spend on hardware than they could with the same cluster powered by the 2nd Gen AMD EPYC processors we tested.

$ Performance per dollar (higher is better)

Dell EMC PowerEdge R6515 cluster with 3rd Gen AMD EPYC 75F3 processors: **13.00**

Dell EMC PowerEdge R6515 cluster with 2nd Gen AMD EPYC 7542 processors: **11.96**
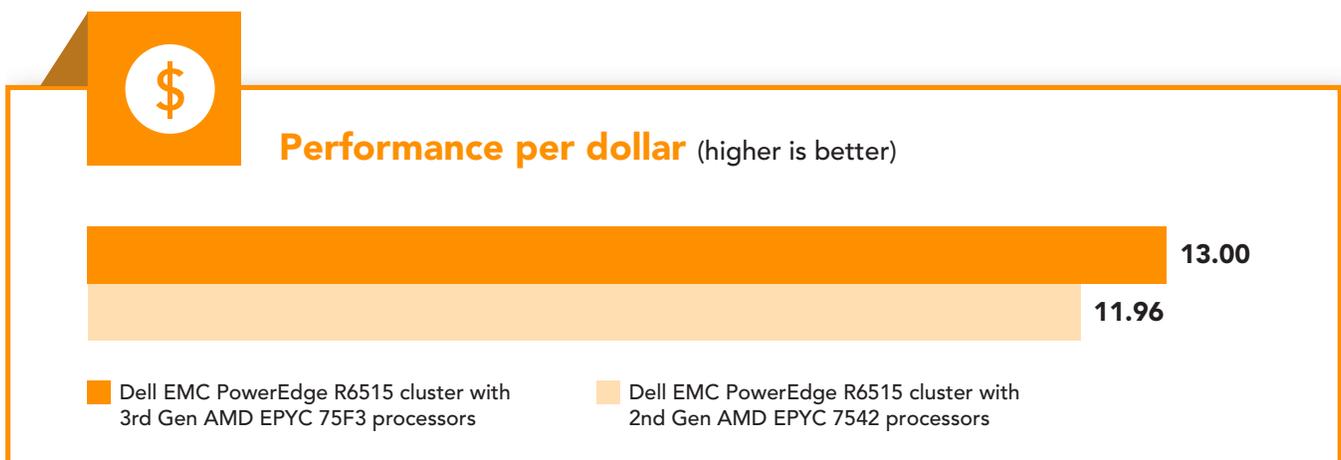
Figure 3: Total number of YCSB operations per second each cluster achieved in testing divided by total hardware cost of cluster. Higher is better. Source: Principled Technologies.

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Conclusion

In our hands-on testing of two MongoDB clusters, a cluster of single-socket Dell EMC PowerEdge R6515 servers powered by 3rd Gen AMD EPYC 75F3 processors handled 20 percent more operations per second and offered 8.7 percent better performance per dollar than an otherwise identical cluster powered by 2nd Gen AMD EPYC 7542 processors.

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1   "What is MongoDB?" accessed March 3, 2021,
    https://www.mongodb.com/what-is-mongodb.

2   We received an itemized Dell EMC PowerEdge R6515 list price quote from Dell Technologies with the AMD EPYC 7542 processor. To calculate the price of the newer solution, we removed the cost of the AMD EPYC 7542 processor and added the pre-release list price for the AMD EPYC 75F3 processor we received from Dell Technologies.

3   We received an itemized Dell EMC PowerEdge R6515 list price quote from Dell Technologies with the AMD EPYC 7542 processor.

4   "PowerEdge R6515 Rack Server," accessed March 3, 2021,
    https://www.dell.com/en-us/work/shop/povw/poweredge-r6515.

5   "AMD EPYC 7003 Series Processors," accessed March 15, 2021, https://www.amd.com/en/processors/epyc-7003-series.

6   "AMD EPYC 75F3," accessed March 15, 2021, https://www.amd.com/en/products/cpu/amd-epyc-75f3.

7   "Yahoo Cloud Serving Benchmark," accessed March 3, 2021,
    https://research.yahoo.com/news/yahoo-cloud-serving-benchmark.

8   Mat Keep, "Video: Toyota Material Handling and Industry 4.0 – Creating a Smart Factory By Moving from Monolith to Microservices, Microsoft Azure and MongoDB Atlas," accessed March 1, 2021,
    https://www.mongodb.com/blog/post/video-toyota-industry-40-creating-smart-factory-moving-from-monolith-ic-code-base-microservices-mongodb-atlas-microsoft-azure.

9   MongoDB, "Bosch Leads Charge into Internet of Things," accessed March 1, 2021,
    https://www.mongodb.com/customers/bosch.

Read the science behind this report at http://facts.pt/yRaITs8 ▶

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This project was commissioned by Dell Technologies.

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