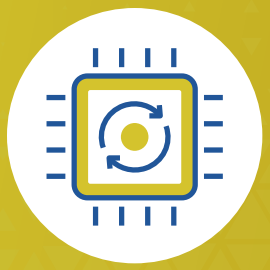
# 3rd Gen AMD EPYC™ 75F3 processor-based servers for better MongoDB analysis value

## A cluster of four servers running VMware vSphere 7.0 Update 3d and VMware vSAN costs less and offered a better performance per dollar spent than a four-server cluster backed by 3rd Gen Intel Xeon Platinum 8380 processors

Organizations with numerous data sources, such as manufacturing components and sensors, can unify their data in MongoDB databases for analysis. Running those workloads on-premises could meet speed, flexibility, and security requirements, and that likely means investing in a new dedicated hardware solution.

We found that a VMware vSphere® 7.0 Update 3d cluster of four dual-socket servers powered by 3rd Gen AMD EPYC™ 75F3 processors can offer a 42.9 percent lower hardware, software, and support cost than a cluster of comparably configured servers with 3rd Gen Intel® Xeon® Platinum 8380 processors. In addition, using Yahoo Cloud Serving Benchmark (YCSB) operations per second (OPS) performance from the two solutions running read-only big data MongoDB workloads, the cluster of AMD EPYC processor-based servers processed more OPS per dollar than the cluster of Intel Xeon processor-based servers. Saving on CapEx to bring a dedicated MongoDB analysis solution on-premises and getting better performance per dollar from it could help your organization's bottom line.



**Spend 42.9% less***

on hardware, software, and support

**Get 43.4% better performance/$***

in OPS/dollar

**server costs on the 4-node, 2P AMD EPYC 75F3 cluster versus 4-note, 2P Intel Xeon 8380 cluster running YCSB on MongoDB.*

## How we approached testing

For our environments under test, we created two four-node VMware vSAN clusters:

- Supermicro® AS-1124US-TNRP servers powered by AMD EPYC 75F3 processors
  - For one server, the total cost of hardware plus three years of labor and support and a one-year warranty was $21,305.90—a total of $85,223.60 for a four-node cluster[1]
- Supermicro SYS-620U-TNR servers powered by Intel Xeon Platinum 8380 processors
  - For one server, the total cost of hardware plus three years of support and labor and a one-year warranty was $30,338.40—a total of $121,353.60 for a four-node cluster[2]

Other than the processors, we configured the server clusters identically. Each of the servers in both clusters had a 240GB 6Gbps SATA SSD to use for the hypervisor and four PCIe® 4.0 NVMe SSDs for the vSAN storage. We also equipped each server with 1,024 GB of PC4-3200 RAM across 16 memory modules.

We configured a vSAN datastore on each cluster with two disk groups, each comprising one 1.92TB NVMe SSD for cache and one 3.84TB NVMe SSDs for capacity per server. The vSAN datastore served as shared storage for our MongoDB environment.

To account for the core count differences between the two processors in our comparison—that is, 32 cores per AMD EPYC processor and 40 cores per Intel Xeon processor—we assigned a different number of CPU resources to each VM based on the CPU architecture. In the cluster powered by 3rd Gen AMD EPYC processors, each Config VM had 8 vCPUs and 8 GB of memory fully reserved; each Mongos VM had 24 vCPUs and 32 GB of memory fully reserved; and each Mongod VM had 12 vCPUs and 128 GB of memory fully reserved. We used the same configuration for the cluster with 3rd Generation Intel Xeon Scalable processors, except each Mongos VM had 32 vCPUs fully reserved. To generate load on each MongoDB cluster, we ran YCSB. YCSB has several different workload profiles with different mixes of reads and writes. To drive more CPU usage and reduce the load on the storage, we selected Workload C, which is a read-only workload.

For more details about our configurations, testing methodologies, and CPU utilization, see the science behind the report.

### About AMD EPYC 75F3 processors

Part of the third generation of EPYC 7003 Series Processors, the EPYC 75F3 has 32 cores and 64 threads of computing power. According to AMD, the processor features PCI Express® 4.0 I/O connectivity and supports up to eight DDR4 memory channels per socket.[3] The third generation of AMD EPYC processors can also offer AMD Infinity Guard security features, such as Secure Encrypted Virtualization (SEV), Secure Nested Paging (SEV-SNP), Secure Memory Encryption (SME), and more.[4]

To learn more about the EPYC 75F3 processor, visit https://www.amd.com/en/products/cpu/amd-epyc-75f3.

### About VMware vSAN

For organizations looking to reduce the complexity and footprint of their data centers, hyperconverged infrastructure (HCI) can help. As part of their HCI portfolio, VMware offers software-defined storage with vSAN that can eliminate the need for bulky, expensive, external arrays and instead bring compute and storage resources together.

According to VMware, vSAN is "an enterprise class storage virtualization software that provides the easiest path to HCI and hybrid cloud."[5] To learn more about VMware vSAN, visit https://www.vmware.com/products/vsan.html.

## How each cluster performed

When we ran the read-only YCSB Workload C on both solutions, we experienced comparable per-core performance. The dual-socket servers in a vSAN cluster with AMD EPYC 75F3 processors processed 369,425 OPS (1,443.06 OPS per core), and the vSAN cluster backed by Intel Xeon Platinum 8380 processors processed 450,749 OPS (1,408.59 OPS per core).

## Spend less on hardware, software, and support and achieve better performance per dollar

To arrive at our performance-to-cost ratio, we first determined the list prices of hardware with three years of support for both solutions. We show this cost on page 2. Here, in Figure 1, we also incorporate the cost of VMware software licensing alongside the costs of the hardware and three-year support. The AMD EPYC processor-based solution cost 42.9 percent less than the Intel Xeon processor-based solution. (For more information on how we arrived at our cost analysis results, see the science behind the report.)

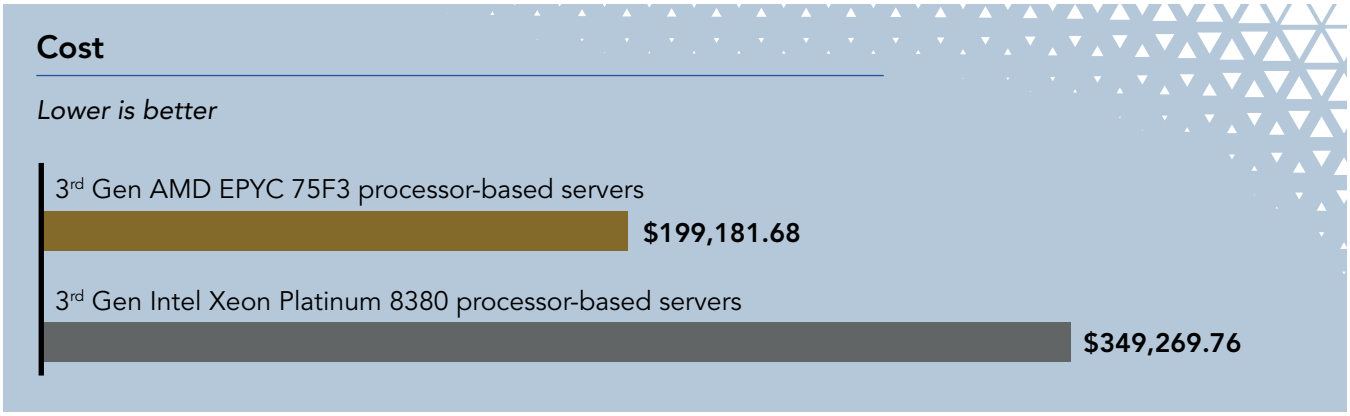



Figure 1: Total cost in USD of the hardware, three-year support, and software for the two solutions we tested. Lower is better. Source: Principled Technologies.

As Figure 2 shows, the cluster of servers powered by AMD EPYC 75F3 processors delivered 1.85 OPS per dollar, whereas the clusters of servers powered by Intel Xeon Platinum 8380 processors delivered 1.29 OPS per dollar. The cluster of AMD EPYC processor-based servers offered 43.4 percent more OPS per dollar. For every dollar an organization spends on hardware, software, and support for the cluster of servers with AMD EPYC 75F3 processors, they could get 43.4 percent higher application throughput than they could with the cluster of servers with Intel Xeon Platinum 8380 processors.

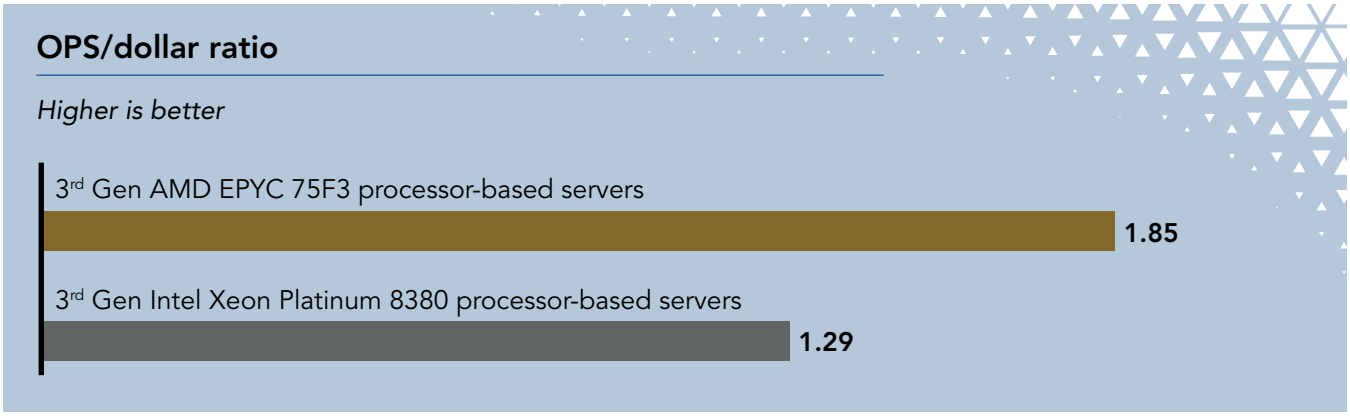



Figure 2: Ratio of MongoDB performance (as measured by the OPS each solution processed) to hardware and support cost per US dollar. Higher is better. Source: Principled Technologies.

## 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."[6] The benchmark serves many databases including Apache HBase and Cassandra, two NoSQL databases that can handle large datasets. The workload we used, Workload C, only reads data from the database (100 percent reads and no writes).

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

## Real-world benefits for manufacturing

By implementing MongoDB-based Industry 4.0 (the intersection of interconnectivity, automation, machine learning, and real-time data)[7] initiatives, manufacturing companies could improve their overall equipment effectiveness, increase product quality, and reduce waste.[8] On-premises HCI servers that can process MongoDB workloads could deliver insight using data from warehouses, multiprocessing stations, and sorting areas. Manufacturing organizations seeking to run those workloads could save by choosing a four-server vSAN cluster powered by AMD EPYC 75F3 processors, which offers a 42.9 percent lower hardware and support cost and 43.4 percent more OPS per dollar than a four-server cluster powered by Intel Xeon Platinum 8380 processors. So you can bring innovation to your employees, products, and customers while potentially helping your bottom line.

# Conclusion

In our hands-on testing of two MongoDB vSAN clusters, four dual-socket servers powered by 3rd Gen AMD EPYC 75F3 processors delivered comparable per-core performance and offered a 42.9 percent lower hardware, software, and support cost than a comparably configured four-server cluster powered by Intel Xeon Platinum 8380 processors. Based on those findings, the cluster with AMD EPYC 75F3 processor-based servers could offer a better value, delivering 43.4 percent more OPS per dollar spent.

1. We received a quote from Supermicro on February 2, 2022 for the hardware and support cost of the server minus drive costs. To arrive at the total cost, we added this amount to a drive cost quote we had received from Supermicro on August 9, 2021.
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3. AMD, "AMD EPYC™ 75F3," accessed June 17, 2022, https://www.amd.com/en/products/cpu/amd-epyc-75f3.
4. Server OEMs and cloud providers must enable AMD Infinity Guard features for use. In addition, security features can vary by AMD EPYC processor generations. Learn more about Infinity Guard at https://www.amd.com/en/technologies/infinity-guard.
5. VMware, "What is vSAN?" accessed June 17, 2022, https://www.vmware.com/products/vsan.html.
6. Yahoo!, "Yahoo Cloud Serving Benchmark," accessed June 17, 2022, https://research.yahoo.com/news/yahoo-cloud-serving-benchmark.
7. Marr, Bernard, "What is Industry 4.0? Here's A Super Easy Explanation For Anyone," accessed June 17, 2022, https://www.forbes.com/sites/bernardmarr/2018/09/02/what-is-industry-4-0-heres-a-super-easy-explanation-for-anyone/?sh=43380c369788.
8. Preiss, Gabriela, "Manufacturing at Scale: MongoDB & IIoT," accessed June 17, 2022, https://www.mongodb.com/blog/post/manufacturing-scale-mongodb-iiot.

**Read the science behind this report at https://facts.pt/3Claf9s ▶**

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This project was commissioned by AMD.