AMD EPYC™ 7763 processor-based servers can offer a better value for MySQL workloads

A cluster of servers with 3rd Gen AMD EPYC 7763 processors costs less and offered better performance per dollar than comparably configured servers with 3rd Gen Intel Xeon Platinum 8380 processors

Creating a hyperconverged VMware vSAN™ solution with top-bin, high-core-count processors can deliver high-quality performance and density for transaction-processing database workloads. As that high-quality performance can come at a significant cost, any hardware savings could help your bottom line and raise the value of the solution.

In our data center, we ran an online transaction processing (OLTP) workload on two four-server vSAN clusters —one with 64-core 3rd Gen AMD EPYC 7763 processors and one with 40-core 3rd Gen Intel® Xeon® Platinum 8380 processors. The processors are top-bin models from each chip manufacturer, meaning they are the most powerful models the vendors offer in those processor families. In addition to running vSAN, both of our clusters ran VMware vSphere® 7.0 Update 3e and hosted Red Hat® Enterprise Linux® 8.6 with MySQL® Community Server 8 database VMs. Each server in the cluster contained six high-speed KIOXIA NVMe disks to serve as the pooled storage resources for vSAN: four KIOXIA CD6 disks for capacity and two KIOXIA CM6 disks for cache.

The OLTP workload we used produces results in transactions per minute (TPM). When we divided the TPM by the solution hardware costs, we found that the cluster with the 3rd Gen AMD EPYC processors processed more TPM per US dollar spent on hardware and support than the cluster with the 3rd Gen Intel Xeon Scalable processors. For ecommerce workloads using a MySQL database, this could mean great performance for new and existing customers with a smaller data center investment.

Spend 33% less*

on hardware and support

Process 66% more performance/dollar*

while running an OLTP workload

**Server costs of the four-node cluster with AMD EPYC 7763 processors vs. the four-node cluster with Intel Xeon Platinum 8380 processors, both running an OLTP workload*

About the AMD EPYC 7763 processors

This 64-core CPU from the 3rd generation of AMD EPYC 7003 Series processors offers 128 threads for top-bin multi-core processing performance. The processor also features PCI Express® 4.0 I/O connectivity and supports up to eight DDR4 memory channels per socket.[1] The 3rd 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.[2] To learn more about the EPYC 7763 processor, visit https://www.amd.com/en/products/cpu/amd-epyc-7763.

What is 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 eliminates the need for bulky, expensive external arrays and instead brings compute and storage resources together. According to VMware, vSAN is "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 we approached testing

For our environments under test, we created two four-server clusters:

- Supermicro AS-1124US-TNRP servers powered by AMD EPYC 7763 processors
  - For one server, the total cost of hardware plus three years of support and labor and a one-year CRS warranty was $29,265.25—a total of $117,061.00 for a four-node cluster[3]
- Supermicro SYS-620U-TNR servers powered by Intel Xeon Platinum 8380 processors
  - For one server, the total cost of hardware plus three years of labor and support and a one-year CRS warranty was $39,197.62—a total of $156,790.48 for a four-node cluster[4]

The key difference between the two clusters was the processors in each server. Each of the servers in both clusters had a 240GB 6Gbps SATA SSD to use for the hypervisor and six 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 a single disk group comprising one 1.6TB mixed-use NVMe SSD for cache and two 3.84TB NVMe SSDs for capacity per server. The vSAN datastore served as shared storage for our MySQL environment. We ran the OLTP workload (TPROC-C) from the HammerDB benchmarking tool on each of the 32 MySQL Community Server VMs (eight VMs per host).

To account for the core count differences between the two processors in our comparison—that is, 64 cores per AMD EPYC processor and 40 cores per Intel Xeon Scalable processor—we assigned a different amount of CPU resources to each VM based on the CPU architecture. In the cluster powered by 3rd Gen AMD EPYC processors, each VM had 32 vCPUs and 112 GB of memory fully reserved. In the cluster with 3rd Generation Intel Xeon Scalable processors, each VM had 20 vCPUs and 112 GB of memory fully reserved.

During testing, the AMD EPYC processor-based cluster averaged 84 percent CPU utilization, and the Intel Xeon Scalable processor-based cluster averaged 94 percent. For more details about our configurations, testing methodologies, and CPU utilization, see the science behind the report.

How each cluster performed

When we ran the TPROC-C workload from HammerDB on both solutions, we saw an advantage for the clusters using the 64-core AMD EPYC 7763 processors. That solution processed 24,913,848 TPM, and the vSAN cluster backed by 40-core Intel Xeon Platinum 8380 processors processed 20,046,107 TPM.

The solution with AMD EPYC 7763 processors offered a better value from performance advantages and hardware and support savings

To arrive at our performance-to-cost ratio, we first determined the hardware list prices with three years of support for both solutions (see page 2). Figure 1 compares those hardware costs, which include server and NVMe drive pricing. The AMD EPYC processor-based solution cost 33 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.)

Despite having a higher core count, the AMD EPYC processor-based solution has the same licensing costs as the Intel Xeon Scalable processor-based solution due to the license pricing models for VMware vSphere, Red Hat Enterprise Linux, and MySQL.[6,7,8] Because those software costs were the same for both solutions, we did not include them in our comparison.

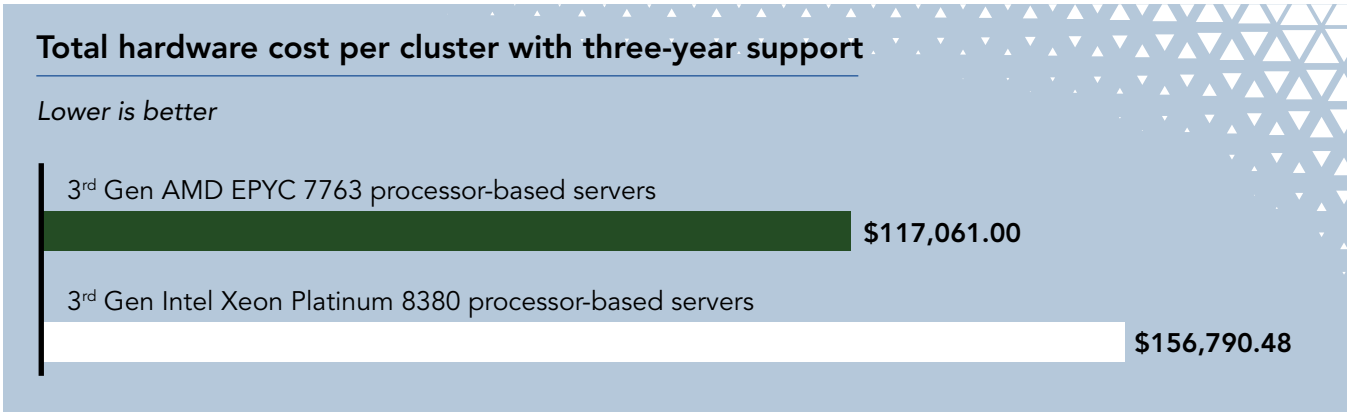

Figure 1: Total cost in USD of the hardware, three-year support, and software for the two solutions we tested. Lower is better. Source: Principled Technologies.

About HammerDB

The TPROC-C OLTP workload assesses how well an environment can handle online transactions like those you would find in online banking, retail, or other ecommerce sites. The benchmark reports results in TPM. HammerDB developers derived their OLTP workload from the TPC-C benchmark specifications; however, as this is not a full implementation of the official TPC-C standards, the results in this paper are not directly comparable to published TPC-C results.

As Figure 2 shows, the cluster of servers powered by AMD EPYC 7763 processors delivered 212.82 TPM per dollar, or 66 percent more than the cluster of servers powered by Intel Xeon Platinum 8380 processors (127.85 TPM per dollar). For every dollar an organization spends on hardware, software, and support for the cluster of servers with AMD EPYC 7763 processors, they could get 66 percent higher application throughput than they could with the cluster of servers with Intel Xeon Platinum 8380 processors.

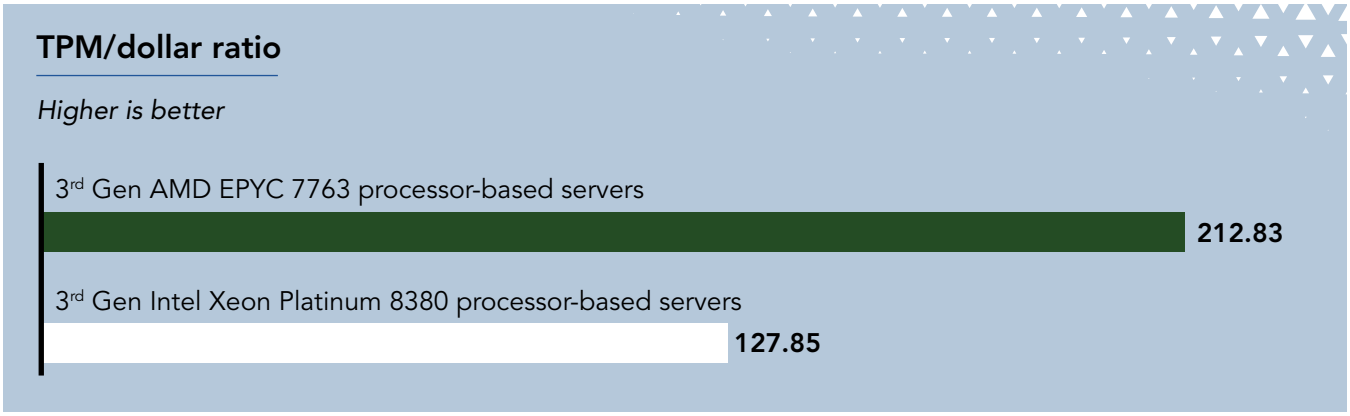

Figure 2: Ratio of MySQL OLTP performance (as measured by the TPM each solution processed) to hardware and support cost per US dollar. Higher is better. Source: Principled Technologies.

Real-world benefits for ecommerce

Imagine having a larger customer base browsing your online catalog or creating multi-item orders with barely noticeable website processing. Depending on the data center solution you choose for your ecommerce applications, that could be either a pipe dream or a reality. Whether you're one of the larger online retailers in the world or striving to be, a solution that supports a strong customer base while delivering a better value and saving you money could help your organization's bottom line. The lower cost of the vSAN cluster of servers powered by 3rd Gen AMD EPYC 7763 processors that we tested could help you meet MySQL OLTP workload needs while processing more transactions per minute for each dollar you spend on hardware.

Conclusion

VMware vSAN clusters of servers with top-bin CPUs can perform well for OLTP MySQL workloads. Even though these kinds of processors can come with hefty price tags, servers with 3rd Gen AMD EPYC 7763 processors can cost less than those with 3rd Gen Intel Xeon Platinum 8380 processors. We found that the AMD EPYC processor-based servers we tested cost 33 percent less than the servers with Intel Xeon Scalable processors, which contributed to the AMD EPYC processor-based solution processing 66 percent more TPM per dollar. Choosing AMD EPYC 7763 processors could help your IT department's bottom line, delivering a good value for your organization.

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1. AMD, "AMD EPYC™ 7763," accessed September 22, 2022, https://www.amd.com/en/products/cpu/amd-epyc-7763.
2. 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.
3. We received a quote from Supermicro on September 16, 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 cost quote for the KIOXIA CD6 drives that we received from Supermicro on August 9, 2021. We then added the cost of the KIOXIA CM6 drives from CDW, (https://www.cdw.com/product/kioxia-cm6-v-mainstream-ssd-1.6-tb-u.3-pcie-4.0-x4-nvme/6991469, accessed September 16, 2022).
4. We received a quote from Supermicro on September 16, 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 cost quote for the KIOXIA CD6 drives that we received from Supermicro on August 9, 2021. We then added the cost of the KIOXIA CM6 drives from CDW, (https://www.cdw.com/product/kioxia-cm6-v-mainstream-ssd-1.6-tb-u.3-pcie-4.0-x4-nvme/6991469, accessed September 16, 2022).
5. VMware, "What is vSAN?" accessed September 27, 2022, https://www.vmware.com/products/vsan.html.
6. VMware, "Licensing for ESXi Hosts," accessed September 28, 2022, https://docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.vsphere.vcenterhost.doc/GUID-7AFCC64B-7D94-48A0-86CF-8E7EF55DF68F.html.
7. Red Hat, "Licensing Guide - Red Hat," accessed September 28, 2022, https://www.licensedashboard.com/wp-content/uploads/2021/07/Red-Hat-Licensing-Guide.pdf.
8. We used the free, open-source Community Server Edition of MySQL.

Read the science behind this report at https://facts.pt/CHzaGI4 ▶

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