AMD EPYC™ 9554 MONGODB® PERFORMANCE LEADERSHIP
NOSQL DATABASE MANAGEMENT SYSTEMS

Powered by 4th Gen AMD EPYC™ Processors

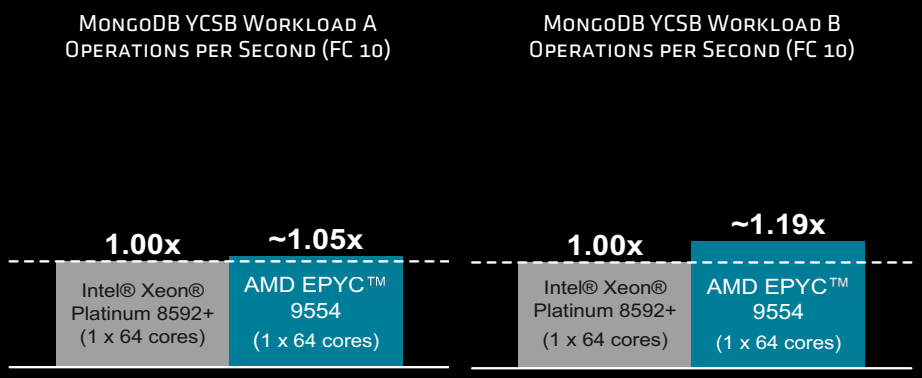
May 2024

AT A GLANCE

A single-socket server powered by a 64-core 4th Gen AMD EPYC™ 9554 processor shows excellent MongoDB® performance gains compared to a single-socket server powered by a 64-core Intel® Xeon® Platinum 8592+ processor.

PERFORMANCE HIGHLIGHTS

A single-socket system powered by a 64-core 4th Gen AMD EPYC 9554 processor outperforms a single-socket 64-core Intel Xeon Platinum 8592+ system running MongoDB by ~1.05x on YCSB Workload A and ~1.19x on Workload B at significant processor cost savings (Page 2):



KEY TAKEAWAYS

MongoDB® is a cross-platform document-oriented database developed by MongoDB Inc. It is classified as a NoSQL database and uses JSON-like documents with optional schemas and is built around an intelligent distributed systems architecture that allows developers to place data where apps and users need it. MongoDB can run across geographically distributed data centers and cloud regions to provide high availability, workload isolation, scalability, and data locality. A single 1P node powered by a 64-core 4th Gen AMD EPYC 9554 processor delivers ~1.05x and ~1.19x uplifts versus a single 1P node powered by an Intel Xeon Platinum 8592+ processor on YCSB Workloads A and B, respectively, using the YCSB default field count of 10 and field length of 100. The AMD EPYC processor tested also delivers a significant cost savings versus the Intel Xeon processor tested. General purpose 4th Gen AMD EPYC CPUs are available in 1P and 2P configurations and feature:

- Up to 96 cores (192 threads) per processor.
- Up to 384 MB L3 cache.
- Up to 4 Gen 3 Infinity Fabric™ links at up to 32 Gbps.
- Up to 12 memory channels per socket that support up to 6 TB of DDR5-4800 memory.
- Support for up to 128 (1P) and up to 160 (2P) PCIe® Gen 5 with up to 32 Gbps bandwidth.
- AVX-512 instruction support for enhanced HPC and ML performance.
- AMD Infinity Guard technology to defend your data.[1]

IN THIS BRIEF

COST SAVINGS

As of May 13th, 2024:

- The listed 1Ku AMD EPYC 9554 processor price is $9,087.
- The listed 1Ku Intel Xeon Platinum 8592+ price is $11,600*.

Thus, the 1P AMD EPYC 9554 system outperforms the 1P Intel Xeon Platinum 859+ system running MongoDB with YCSB Workloads A and B at a processor cost savings of $2,513. Your actual costs may vary based on a number of factors, including but not limited to the retail system purchased.

TEST METHODOLOGY

The Yahoo! Cloud Serving Benchmark (YCSB) is an open-source benchmarking that is often used to compare the relative performance of multi-node and NoSQL databases deployed in cloud or other distributed environments. It presents results using metrics such as throughput (in operations per second), runtime, and latency. The YCSB benchmark consists of six core workloads, labeled A through F. AMD engineers tested MongoDB on the AMD and Intel systems described in Tables 2 and 3, respectively, using YCSB Workloads A and B. Workload A uses a 50/50 read/write ratio to simulate a workload performing frequent updates, such a session store recording recent activity. Workload B uses a 95/5 read/write ratio to simulate a workload performing frequent queries, such as looking up pricing information. Each operation consisted of reading 10 fields (YCSB field count 10).

Each of the systems listed in Tables 2 and 3 was configured with three MongoDB server VMs and 1 test client VM. Each of the three MongoDB server VMs were configured as shown in Table 1.

MONGODB SERVER VM CONFIGURATION	
vCPUs | memory	16 | 128 GB
Storage	1 x 3.5 TB NVMe
OS	Ubuntu22.04, Kernel: 5.15.0-105-generic
Software	MongoDB v7.0, JDK v14.0.2

Table 1: MongoDB server VM configuration

The client VM was configured with YCSB v0.17.0.

SYSTEM CONFIGURATION

AMD NODE CONFIGURATION	
CPUs	1 x AMD EPYC 9554
Frequency: Base | Boost[2]	3.10 GHz | 3.75 GHz (up to)
Cores	64 cores / 128 threads
L3 Cache	256 MB per CPU
Memory	768 GB DDR5-4800 (12 x 64 GB DIMMs), 1 DPC
NIC	Broadcom NetXtreme BCM5719 Gigabit Ethernet PCIe
Storage: OS | Data	4 x 3.84 TB NVMe disk (SAMSUNG MZWLO3T8HCLS-00A07)
BIOS Version	KAE118M-4.11
BIOS Settings	SMT=ON, NPS=1
OS	Ubuntu® 22.04 (kernel 5.15.0-105-generic)
OS Settings	vm.swappiness=1, vm.dirty_ratio=15, net.ipv4.tcp_rmem=4096 87380 16777216, net.ipv4.tcp_wmem=4096 65536 16777216, fs.file-max=6815744, fs.aio-max-nr=1048576

Table 2: AMD node configuration

INTEL NODE CONFIGURATION	
CPUs	1 x Intel Xeon Platinum 8592+
Frequency: Base | Boost[2]	1.90 GHz | 3.90 GHz
Cores	64 cores / 128 threads
L3 Cache	320 MB per CPU
Memory	2048 GB DDR5-4800 (32 x 64 GB DIMMs), 1 DPC
NIC	Broadcom NetXtreme BCM57508 Gigabit Ethernet PCIe
Storage: OS | Data	4 x 3.84 TB NVMe disk (SAMSUNG MZWLO3T8HCLS-00A07)
BIOS Version	ESE124B-3.11
BIOS Settings	Hyperthreading=ON
OS	Ubuntu® 22.04 (kernel 5.15.0-105-generic)
OS Settings	vm.swappiness=1, vm.dirty_ratio=15, net.ipv4.tcp_rmem=4096 87380 16777216, net.ipv4.tcp_wmem=4096 65536 16777216, fs.file-max = 6815744, fs.aio-max-nr=1048576

Table 3: Intel node configuration

The database was configured using three server instances and one client instance. Both Workload A and Workload B used a Field Count of 10 with a field length of 100.

FOR ADDITIONAL INFORMATION

Please see the following additional resources for more about 4th Gen AMD EPYC features, architecture, and available models:

- AMD EPYC™ 9004 Series Processors
- AMD Documentation Hub

REFERENCES

1. AMD Infinity Guard features vary by EPYC™ Processor generations. Infinity Guard security features must be enabled by server OEMs and/or Cloud Service Providers to operate. Check with your OEM or provider to confirm support of these features. Learn more about Infinity Guard at https://www.amd.com/en/technologies/infinity-guard. GD-183
2. Maximum boost for AMD EPYC processors is the maximum frequency achievable by any single core on the processor under normal operating conditions for server systems. EPYC-18

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RELATED LINKS

- MongoDB*
- AMD EPYC Processors
- AMD Documentation Hub

**Links to third party sites are provided for convenience and unless explicitly stated, AMD is not responsible for the contents of such linked sites and no endorsement is implied.*

SUPERB DATA ANALYTICS PERFORMANCE

Enterprises of all sizes rely on ever-growing datasets to query and analyze data to derive mission-critical business insights that support key decisions. Systems powered 4th Gen AMD EPYC™ 9xx4 processors deliver superb data analytics performance across even the most demanding workloads and dataset.

"ZEN 4" CORE & SECURITY FEATURES

General-purpose support for up to:

- 96 physical cores, 192 threads
- 384 MB of L3 cache per CPU
- 32 MB of L3 cache per CCD
- 6 TB of DDR5-4800 memory
- Up to 128 1P, up to 160 2P PCIe® Gen 5 lanes

Infinity Guard security features[1]

- Secure Boot
- Encrypted memory with SME

MONGODB®

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