

MICRON® PCIe® GEN5 AND GEN4 NVMe™ SSDS: IDEAL SOLUTIONS FOR RDBMS PERFORMANCE: PostgreSQL® DECISION SUPPORT

Powered by 5th Gen AMD EPYC™ Processors

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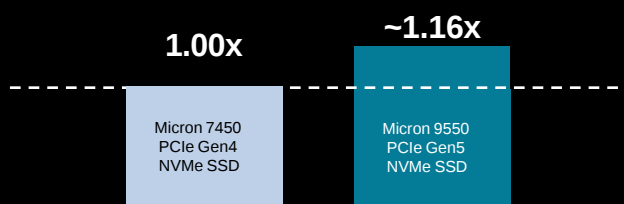
AT A GLANCE

Micron® PCIe® Gen5 and Gen4 NVMe™ SSDs deliver compelling performance on a 32-core 5th Gen AMD EPYC™ system running a decision support workload on PostgreSQL® at SF100. While not all use cases will require the benefits of an SSD generational upgrade, the PCIe Gen5 solution is ideal for those needing a 16% performance improvement. However, if such an improvement is not necessary, the Gen4 option provides excellent value.

PERFORMANCE HIGHLIGHTS

A Micron 9550 PCIe Gen5 NVMe SSD delivered a performance uplift of ~1.16x on a PostgreSQL TPROC-H decision support workload at SF100 versus a Micron 7450 PCIe Gen4 NVMe SSD. Both drives were tested in a single-socket server powered by a 32-core AMD EPYC 9355P processor.

RELATIVE NVMe SSD PERFORMANCE
TPROC-H QPHH @ SF100



KEY TAKEAWAYS

PostgreSQL relies heavily on disk access for operations such as checkpoints (writing outstanding relation file changes to disk), index creation, and backups. System storage Input/Output Operations per Second (IOPS) speeds therefore play a key role in overall PostgreSQL performance. The higher bandwidth and data transfer rates of PCIe Gen5 relative to PCIe Gen4 make PCIe Gen5 SSDs like the Micron 9550 SSD ideal for tasks that require quick data access, as demonstrated by this test result, which measured relative decision support performance in queries per hour (Q_{ph}PH) using a 100 GB dataset (SF100). For customers who do not require top-of-the-line performance from their RDBMS platform, the Micron 7450 SSD (PCIe Gen4) provides an excellent solution. 5th Gen AMD EPYC processors are available in 1P and 2P configurations and feature:

- Up to 128 “Zen 5” or 192 “Zen5c” cores.
- Up to 512 MB L3 cache in “Zen 5” AMD EPYC processors.
- Up to 4 links of Gen 3 Infinity Fabric™ at up to 32 Gbps.
- 12 memory channels that support up to 9 TB of DDR5-6000 memory.
- Support for PCIe® Gen 5 at up to 32 Gbps.
- AVX-512 instruction support for enhanced HPC and ML performance.
- AMD Infinity Guard technology to defend your data.¹

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AMD EPYC 9005 PROCESSORS

5th Gen AMD EPYC processors are the newest generation of the powerful and efficient AMD EPYC processor family for servers that have set hundreds of [world records](#) for performance and efficiency. The AMD EPYC 9005 processor family is built on the breakthrough high performance, highly efficient “Zen 5” processor core architecture and advanced microprocessor process technologies to better meet the needs of the modern AI-enabled data center. The complete line of 5th Gen AMD EPYC processor offerings include a wide range of core counts (up to 192 cores and 384 threads per processor), max boost frequencies up to 5 GHz², generous L3 cache capacities, high energy efficiency, and competitive cost points. These cutting-edge technologies and features are all backed by the familiar x86 software compatibility that allows servers powered by AMD EPYC 9005 processors to readily support almost any business need.

TEST METHODOLOGY

The HammerDB benchmark tool was used to build and generate the PostgreSQL TPROC-H workloads at SF100. The HammerDB TPROC-H workload is an open-source workload derived from the TPC-H Benchmark Standard, and as such is not comparable to published TPC-H results, as the results do not comply with the TPC-H Benchmark Standard. The 5th Gen AMD EPYC system described in Table 1, below, ran the workload three times with the Micron 7450 PCIe SSD (PCIe Gen4 reference SSD), and the median performance was then calculated. The same AMD EPYC system then ran the same workload three times with the Micron 9550 SSD (PCIe Gen5 test SSD), and the median performance was then calculated. The reported performance uplift was calculated as the median Micron 9550 SSD performance divided by the median Micron 7450 SSD performance and then normalized such that the Micron 7450 SSD performance = 1.00x.

SYSTEM CONFIGURATION

AMD NODE CONFIGURATION	
CPU	1 x AMD EPYC 9355P
Frequency: Base Boost ²	3.55 GHz 4.40 GHz (up to)
Cores	32 cores/socket (64 threads)
L3 Cache	256 MB per CPU
Memory	176 GB DDR5-5200 (11 x 16 GB DIMMs), 1 DPC
Storage	1 x Micron 7450 PCIe Gen4 NVMe SSD (reference SSD) 1 x Micron 9550 PCIe Gen5 NVMe SSD (test SSD)
BIOS Version	RPUT1002D
BIOS Settings	SMT=ON, NPS=1, Determinism=Power
OS	Ubuntu® 24.04.1 LTS (kernel 6.8.0-48-generic)
OS Settings	vm.swappiness=1, kernel.sem=250 32000 100 128, fs.file-max=6815744, net.ipv4.ip_local_port_range=9000 65500, net.core.rmem_default=262144, net.core.rmem_max=4194304; net.core.rmem_default=262144, net.core.wmem_max=1048576, fs.aio-max-nr=1048576
PostgreSQL Version	14.13
PostgreSQL Tunings	shared_buffers=80GB, huge_pages=ON, wal_level=minimal, effective_io_concurrency=16, synchronous_commit=local

Table 1: AMD node configuration

FOR ADDITIONAL INFORMATION

Please see the following additional resources for more information about 5th Gen AMD EPYC features, architecture, and available models:

- [AMD EPYC™ Processors](#)
- [AMD Documentation Hub](#)

REFERENCES

1. AMD Infinity Guard features vary by EPYC™ Processor generations and/or series. 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 <http://www.amd.com/en/products/processors/server/epyc/infinity-guard.html>. GD-183A
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

AUTHORS

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RELATED LINKS

- [Micron 9550 NVMe™ SSD*](#)
- [AMD EPYC Processors](#)
- [AMD Documentation Hub](#)

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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 5th Gen AMD EPYC™ 9xx5 processors deliver superb data analytics performance across even the most demanding workloads and dataset.

“ZEN 5” CORE & SECURITY FEATURES

Support for up to:

- 192 physical cores, 384 threads
- Up to 512 MB of L3 cache per CPU
- 32 MB of L3 cache per CCD
- 9 TB of DDR5-6000 memory
- Up to 128 (1P) or 160 (2P) PCIe® Gen 5 lanes

Infinity Guard security features¹

- Secure Boot
- Encrypted memory with SME

POSTGRESQL®

PostgreSQL® is an open source relational database system that includes features designed to store and scale complex datasets. It originated at the University of California at Berkeley and has been in active development ever since. PostgreSQL is known for its proven architecture that reliably delivers data integrity, powerful feature set, and extensibility backed by an active open source community.

MICRON 9550 SSDs

The Micron 9550 NVMe™ SSD is built to manage critical workloads requiring extreme speed, scalability, and power efficiency such as AI, performance-focused databases, caching, online transaction processing (OLTP) and high-frequency trading. The Micron 9550 SSD enables these workloads and more for flexible deployment in cloud, data center, OEM and system integrator designs. Capacities up to 30.72TB help ensure optimal storage density.

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