# SIMULIA® ABAQUS® ON 5TH GEN AMD EPYC™ PROCESSORS
## FINITE ELEMENT ANALYSIS

Powered by 5th Gen AMD EPYC™ Processors

**November 2024**

## AT A GLANCE

Dual-socket systems powered by 32-core and 64-core 5th Gen AMD EPYC™ processors demonstrate outstanding generational performance uplifts on SIMULIA® Abaqus® 2024HF1 versus 4th Gen AMD EPYC systems.[1]

## PERFORMANCE HIGHLIGHTS

A 2P 32-core 5th Gen AMD EPYC 9375F server delivered a composite average performance uplift of ~1.22x versus a 2P system powered by 4th Gen 32-core AMD EPYC 9374F processors on selected SIMULIA Abaqus benchmarks. Also, a 2P 64-core 5th Gen AMD EPYC 9575F system delivered a ~1.34x uplift versus a 2P system powered by 4th Gen 64-core AMD EPYC 9554 processors on the same set of SIMULIA Abaqus benchmarks.

RELATIVE SIMULIA ABAQUS PERFORMANCE
(2P 32-CORE SYSTEMS)

| | |
|---|---|
| **1.00x** | **~1.22x** |
| 4th Gen AMD EPYC™ 9374F (2 x 32c) | 5th Gen AMD EPYC™ 9375F (2 x 32c) |

RELATIVE SIMULIA ABAQUS PERFORMANCE
(2P 64-CORE SYSTEMS)

| | |
|---|---|
| **1.00x** | **~1.34x** |
| 4th Gen AMD EPYC™ 9554 (2 x 64c) | 5th Gen AMD EPYC™ 9575F (2 x 64c) |
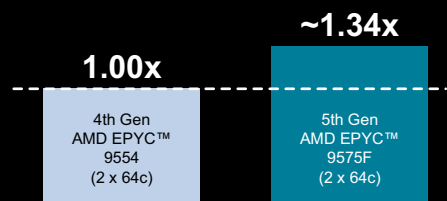
## KEY TAKEAWAYS

2P 5th 32-core and 64-core Gen AMD EPYC systems deliver superb generational SIMULIA Abaqus 2024HF1 performance uplifts compared to 2P servers powered by comparable 32-core and 64-core 4th Gen AMD EPYC processors. The maximum 32-core uplift is ~1.25x on the aba-e14_DropTest_v0 benchmark (5th Gen AMD EPYC 9375F vs. 4th Gen AMD EPYC 9374F), and the 64-core uplift is ~1.44x on the aba-s12 benchmark (5th Gen AMD EPYC 9575F vs. 4th Gen AMD EPYC 9554).

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.[2]

## IN THIS BRIEF

# DETAILED RESULTS

Figures 1 and 2 provide detailed performance uplift information for the tested 32- and 64-core systems. All uplifts shown below are the average of three test runs performed on each benchmark. Please see Tables 1 and 2, below, for detailed system configuration.
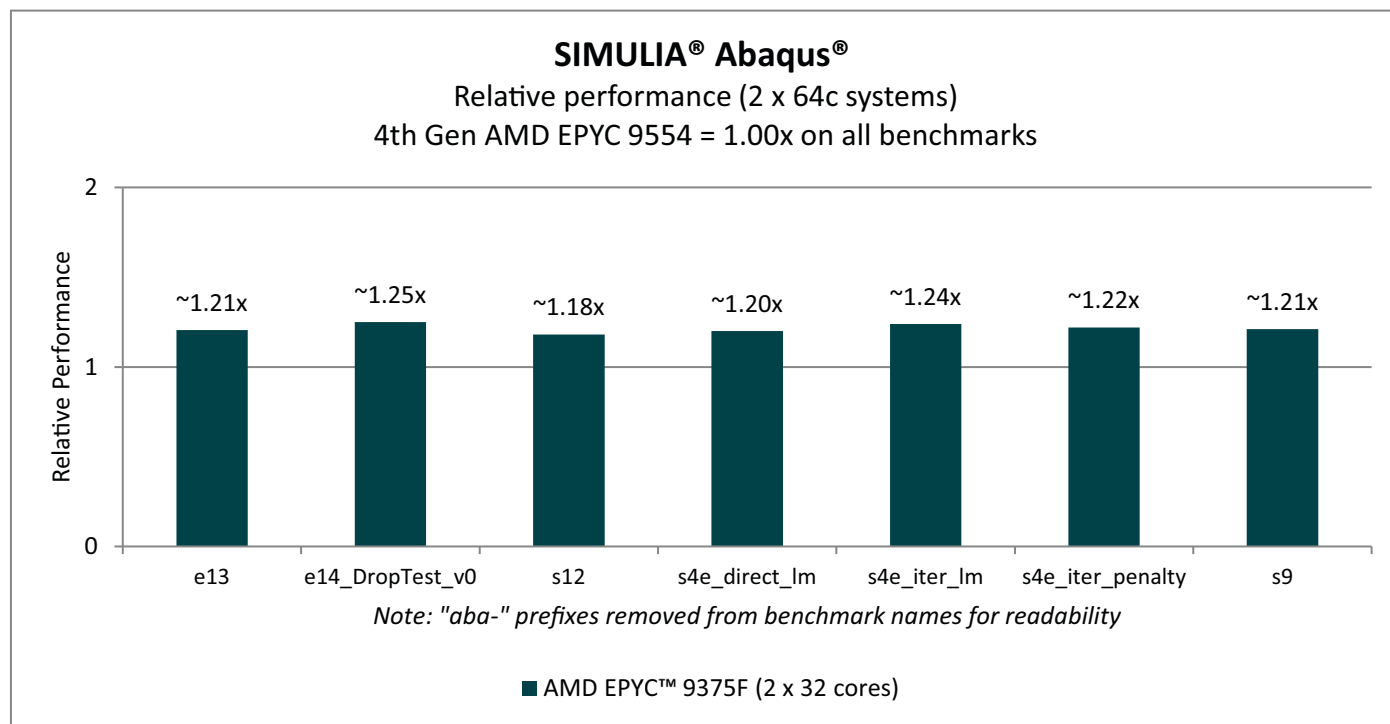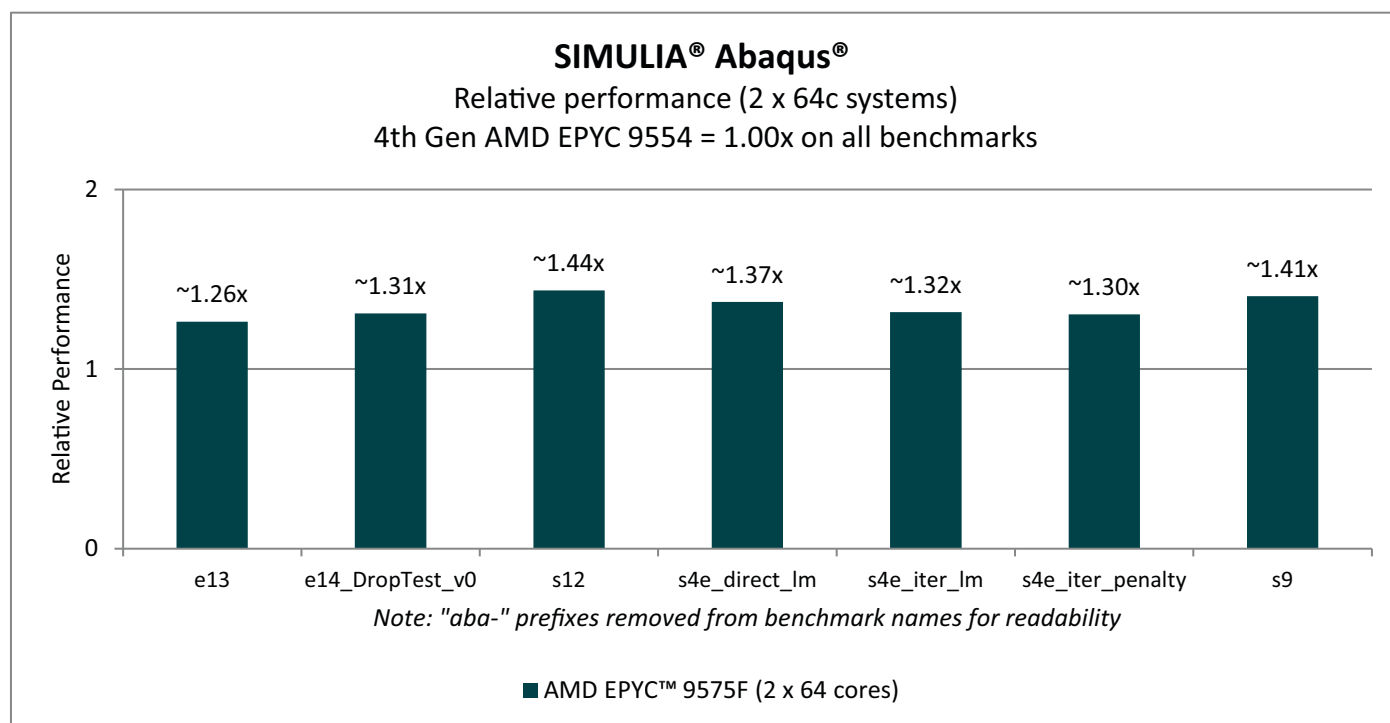


*Figure 1: Detailed 32-core performance*

# 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 GHz[3], 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.

# SYSTEM CONFIGURATION

| AMD SYSTEM CONFIGURATION | | | | |
|---|---|---|---|---|
| CPUs | 2 x AMD EPYC 9374F | 2 x AMD EPYC 9375F | 2 x AMD EPYC 9554 | 2 x AMD EPYC 9575F |
| Frequency: Base \| Boost[3] | 3.85 GHz \| 4.30 GHz (up to) | 3.80 GHz \| 4.80 GHz (up to) | 3.10 GHz \| 3.75 GHz (up to) | 3.30 GHz \| 5.00 GHz (up to) |
| Cores | 32 cores/socket (64 threads) | | 64 cores/socket (128 threads) | |
| L3 Cache | 256 MB per CPU | | | |
| Memory | 1.5 TB (24 x 64 GB DDR5 4800) | 1.5 TB (24 x 64 GB DDR5 6000) | 1.5 TB (24 x 64 GB DDR5 4800) | 1.5 TB (24 x 64 GB DDR5 6000) |
| Storage | Samsung MZQL21T9HCJR-00A07 | | | |
| BIOS Version | RTI1009C | RVOT1000A1 | RTI1009C | RVOT1000C |
| BIOS Settings | SMT=OFF; NPS=4; Determinism=Power | | | |
| OS | RHEL 9.4.5 (kernel 5.14.0-427.16.1.el9_4.x86_64) | | | |
| OS Settings | amd_iommu=on, iommu=pt, mitigations=off | | | |
| Runtime Tunings | cpupower idle-set -d 2, cpupower frequency-set -g performance, echo 3 > /proc/sys/vm/drop_caches, echo 0 > /proc/sys/kernel/nmi_watchdog, echo 0 > /proc/sys/kernel/numa_balancing, echo 0 > /proc/sys/kernel/randomize_va_space, echo 'always' > /sys/kernel/mm/transparent_hugepage/enabled, echo 'always' > /sys/kernel/mm/transparent_hugepage/defrag | | | |

*Table 1: AMD system configurations*

# TEST METHODOLOGY

SIMULIA, a Dassault Systèmes brand, provides a standard set of benchmarks* that evaluate the performance of different platforms running SIMULIA applications, such as Abaqus 2024HF1. These benchmark cases represent typical usage and cover a range of sizes. The uplift is calculated as the ratio of the systems under test (*sut*) to the reference system (*ref*). In this Summary Brief, the 4th Gen AMD EPYC processors are the *ref* and the 5th Gen AMD EPYC processors are the *sut*. The total amount of variability between individual runs was <1%.

# 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

### AUTHORS

Michael Senizaiz and Wilmer Finollnciarte contributed to this Performance Brief.

# REFERENCES

1. See https://www.3ds.com/products/simulia/abaqus*.
2. 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
3. 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

## RELATED LINKS

- SIMULIA Abaqus*

- 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.*

## BOOST PERFORMANCE WITH AMD EPYC

AMD EPYC™ processors are built to handle large scientific and engineering datasets - ideal for compute-intensive modeling and advanced analysis techniques. Leveraged by many of the world's largest, most scalable data centers and supercomputers, AMD EPYC™ enables fast time-to-results for HPC.

## "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 features[2]

- Secure Boot
- Encrypted memory with SME

## DASSAULT SYSTÈMES

Dassault Systèmes provides businesses and people with collaborative 3D virtual environments to imagine sustainable innovations. By creating virtual experience twins of the real world with its **3D**EXPERIENCE® platform and applications, customers of Dassault Systèmes push the boundaries of innovation, learning and production.

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