ANSYS FLUENT® ON 5TH GEN AMD EPYC™ PROCESSORS
COMPUTATIONAL FLUID DYNAMICS

Powered by 5th Gen AMD EPYC™ Processors

November 2024

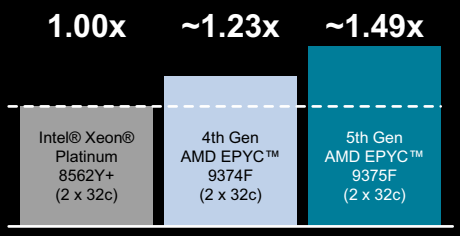
AT A GLANCE

Dual-socket systems powered by 32-core and 64-core 4th and 5th Gen AMD EPYC™ processors demonstrate outstanding competitive and generational performance uplifts on Ansys Fluent® versus 5th Gen Intel® Xeon® Platinum systems.[1]

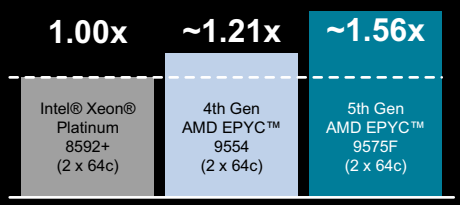
PERFORMANCE HIGHLIGHTS

2P 32-core 4th Gen AMD EPYC 9374F and 5th Gen AMD EPYC 9375F servers delivered composite average Ansys Fluent uplifts of ~1.23x and ~1.49x versus a 2P system powered by 5th Gen 32-core Intel Xeon Platinum 8562Y+ CPUs, respectively. Also, 2P 64-core 4th Gen AMD EPYC 9554 and 5th Gen AMD EPYC 9575F systems delivered composite average Ansys Fluent uplifts of ~1.21x and ~1.57x versus a 2P system powered by 5th Gen 32-core Intel Xeon Platinum 8562Y+ CPUs, respectively.

RELATIVE COMPOSITE AVERAGE ANSYS FLUENT PERFORMANCE (2P 32-CORE SYSTEMS)



RELATIVE COMPOSITE AVERAGE ANSYS FLUENT PERFORMANCE (2P 64-CORE SYSTEMS)



KEY TAKEAWAYS

2P 32- and 64-core 4th and 5th Gen AMD EPYC systems deliver superb performance uplifts compared to 2P servers powered by 32- and 64-core 5th Gen Intel Xeon Platinum CPUs. For example, the 32-core 5th Gen AMD EPYC 9375F system delivered a ~1.70x uplift on the pump_2m test case, and the 64-core AMD EPYC 9575F system delivered a ~1.68x uplift on the aircraft_14m test case. The 32-core 4th Gen AMD EPYC 9374F system delivered a ~1.41x uplift on the pump_2m test case, and the 64-core 4th Gen AMD EPYC 9554 system delivered a ~1.29x uplift on the aircraft_14m test case. 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.

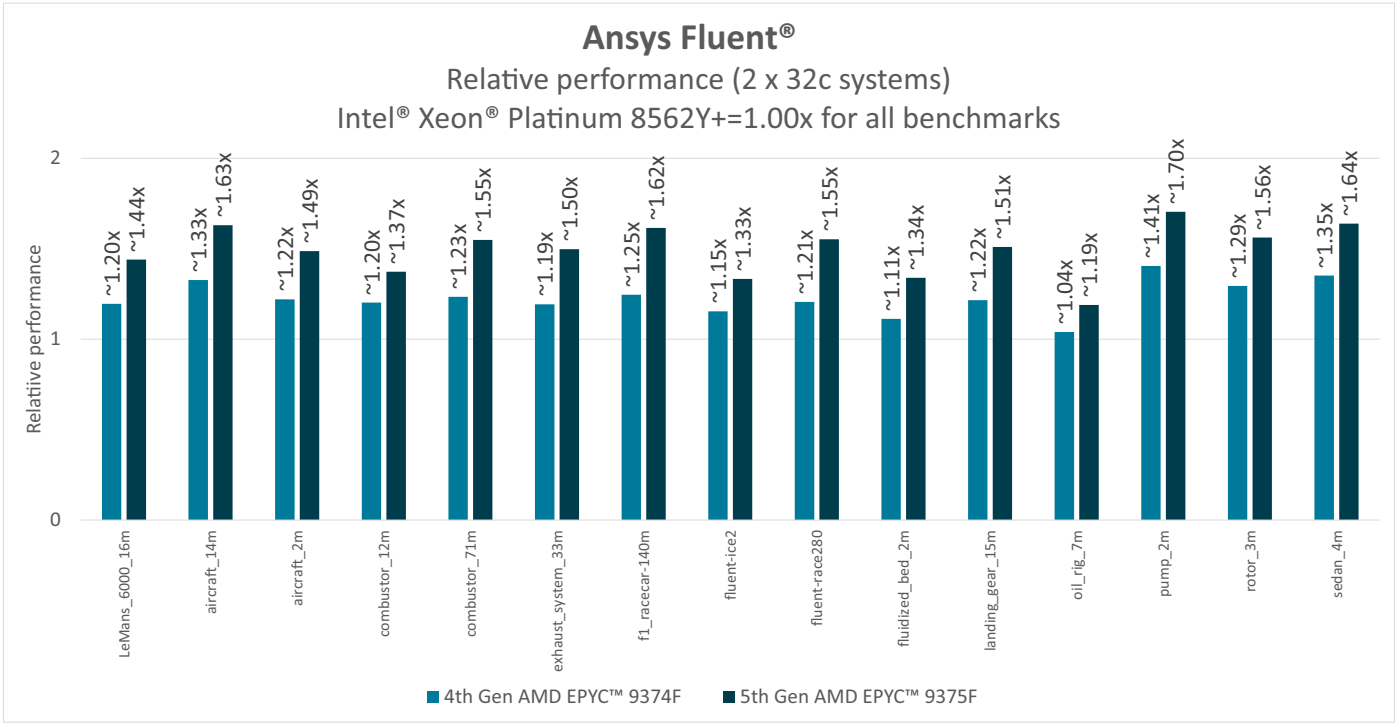


Figure 1: Detailed 32-core performance

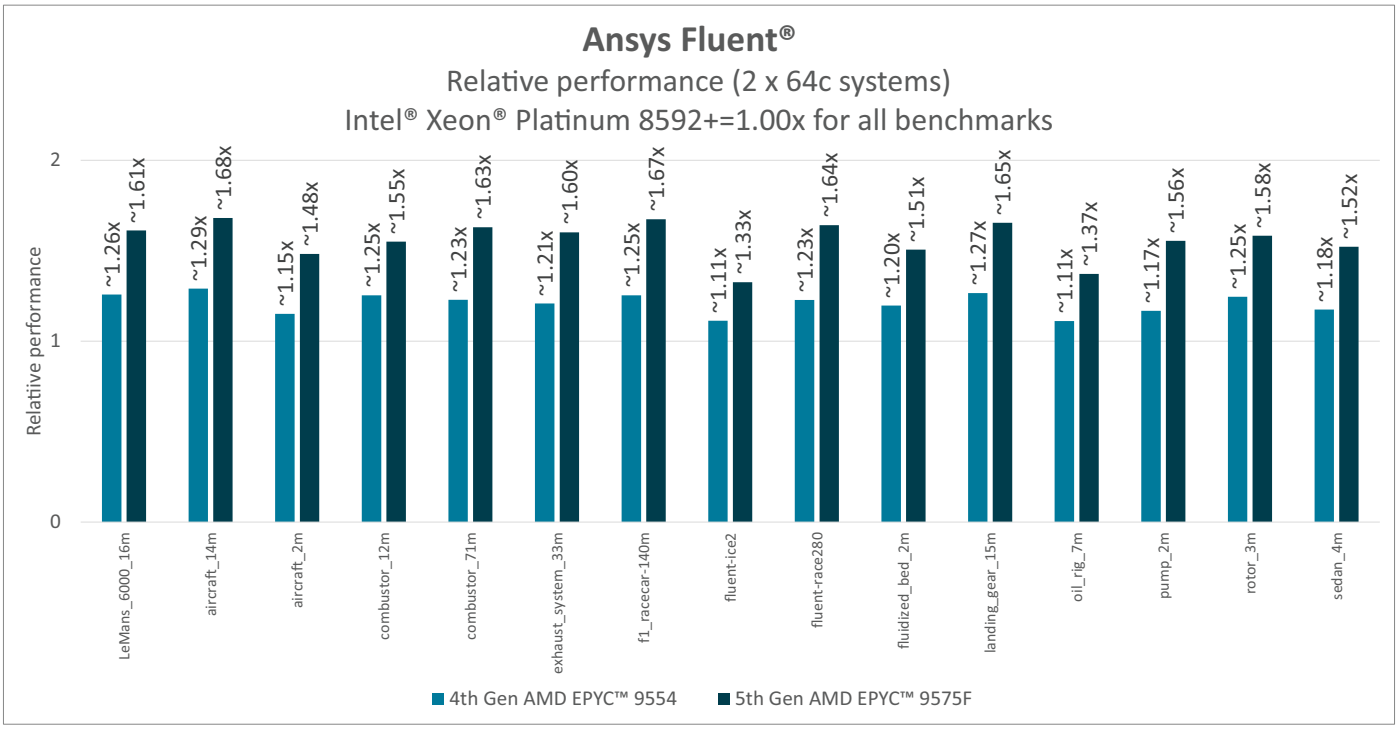


Figure 2: Detailed 64-core performance

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

INTEL SYSTEM CONFIGURATION		
CPUs	2 x Intel Xeon Platinum 8562Y+	2 x Intel Xeon Platinum 8592+
Frequency: Base | Boost	2.80 GHz | 4.10 GHz (up to)	1.90 GHz | 3.90 GHz (up to)
Cores	32 cores per socket (64 threads)	64 cores per socket (128 threads)
L3 Cache	60 MB per CPU	320 MB per CPU
Memory	1.0 TB (16 x 64 GB DDR5 5600)	
Storage: OS | Data	Kioxia KCMYXRUG3T84	
BIOS Version	ESE122V-3.10	
BIOS Settings	SMT=OFF; High Performance Mode	
OS	RHEL 9.4.5 (kernel 5.14.0-427.16.1.el9_4.x86_64)	
OS Settings	processor.max_cstate=1, intel_idle.max_cstate=0, iommu=pt, mitigations=off	
Runtime Tunings	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 2: Intel system configurations

TEST METHODOLOGY

Ansys provides a standard set of benchmarks that evaluate the performance of different platforms running Ansys Fluent. These benchmark cases represent typical Ansys Fluent application usage and cover a range of sizes. The uplift is calculated as the ratio of the systems under test (*sut*) to the reference systems (*ref*). In this Performance Brief, the Intel Xeon Platinum 8562Y+ and Intel Xeon 8592+ processors are the *ref* systems, and the AMD EPYC processors are the *sut*. The AMD EPYC processors tested include the 4th and 5th Gen AMD EPYC processors listed in Table 1, above. All systems tested were configured as shown in Tables 1 and 2, above.

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. See https://www.ansys.com/products/fluids/ansys-fluent.
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

AUTHORS

Michael Senizaiz and Wilmer FinolInciarte contributed to this Performance Brief.

RELATED LINKS

- Ansys*
- Ansys Fluent*
- Ansys and AMD*
- Ansys HPC*
- 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.*

AMD EPYC 9005 FOR TECHNICAL COMPUTING

5th Gen AMD EPYC CPUs deliver excellent per-core performance by taking advantage of fast CPU frequencies, low latency memory, and a unified cache structure. Design engineers can use AMD EPYC processors to perform complex technical computing tasks with ground-breaking high-performance computing and robust security features to deliver excellent results.

"ZEN 5" CORE & SECURITY FEATURES

AMD EPYC 9005 Series Processors support 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

ANSYS

Ansys offers a broad portfolio of engineering simulation software that enables customers to solve complex design challenges, rapidly innovate and easily validate design ideas, and predict the performance of future products.

ANSYS FLUENT

Ansys Fluent is a versatile computational fluid dynamics (CFD) tool that includes well validated physical modeling capabilities to deliver fast, accurate results across a wide range of CFD and multiphysics applications. It is widely used in automotive, aerospace, academia, oil & gas, marine and Formula 1 racing. Typical workload sizes range from two million to 500 million cells.