

# ANSYS® FLUENT® ON AMAZON EC2 HPC6A INSTANCES FEATURING AMD EPYC™ 7003 SERIES PROCESSORS

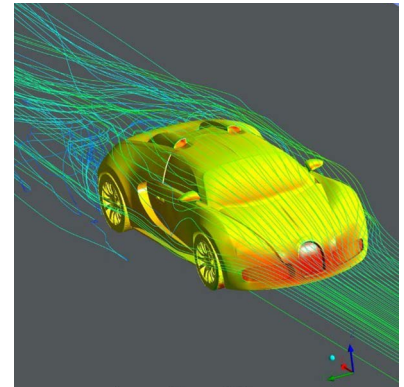
## COMPUTATIONAL FLUID DYNAMICS

3rd Gen AMD EPYC™ processors deliver outstanding scale-out performance running Ansys® Fluent® on Amazon Web Services Hpc6a instances.

June 2023

### ANSYS GATEWAY POWERED BY AWS

Ansys Gateway powered by AWS is a solution for developers, designers, and engineers who want to manage their complete Ansys Simulation & CAD/CAE developments in the cloud. AWS Cloud computing resources can be accessed virtually on any device via web browser through Ansys Gateway powered by AWS portal. It features on-demand access to pre-configured Ansys applications and high-performance computing (HPC) resources on the cloud, taking the load off the customers to setup as well as configure cloud resources for working with Ansys applications.



### AMD EPYC™ 7003 SERIES PROCESSORS

AMD EPYC™ 7003 Series Processors redefine the standards for the modern datacenter. 3rd Gen AMD EPYC processors are built on the innovative x86 architecture and “Zen3” core. 3rd Gen AMD EPYC processors deliver efficient, optimized performance by combining higher frequencies, the largest-available L3 cache, 128 lanes of PCIe® 4 I/O, and synchronized fabric and memory clock speeds, plus support for up to 4TB of DDR-3200 memory. Built-in security features, such as AMD Infinity Fabric™, Secure Memory Encryption (SME), and Secure Encrypted Virtualization (SEV-SNP) help protect data while it is in use.<sup>1</sup> AMD EPYC 7003 Series Processors are designed to bring faster time-to-value along with performance, security, and scalability.

### AMAZON EC2 HPC6A INSTANCES POWERED BY 3RD GEN AMD EPYC PROCESSORS

Amazon EC2 Hpc6a instances are designed to offer the best price performance for compute-intensive, high-performance computing (HPC) workloads. Amazon EC2 Hpc6a instances feature AMD EPYC™ 7003 Series Processors built on a 7nm process node for extreme efficiency with up to 3.6 GHz all-core boost frequency<sup>2</sup> and 384 GB RAM. The elasticity and scalability of AWS with the Amazon EC2 Hpc6a instances gives you optimal Amazon EC2 price-performance for scaling workloads such as computational fluid dynamics, weather forecasting, and molecular dynamics.<sup>3</sup>

#### PURPOSE BUILT FOR HPC WORKLOADS

Amazon EC2 Hpc6a instances offer the latest generation AWS Nitro cards and 100 Gbps Elastic Fabric Adapter networking for inter-node communications. You can also use Amazon FSx for Lustre for sub-millisecond latencies, hundreds of GB/s of storage throughput, and AWS Parallel Cluster to provision Amazon EC2 Hpc6a instances alongside other instance types within the same cluster.

#### AMD EPYC 7003 FOR HPC

3rd Gen AMD EPYC processors deliver the high per-core performance thanks to fast CPU frequencies, lower latency memory, and a unified cache structure. AMD EPYC processors provide high bandwidth between nodes with support for PCIe® Gen 4 network devices and accelerators that greatly benefit HPC applications.

#### ANSYS

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

#### ANSYS FLUENT

Collaboration between AMD and Ansys offers high performance and scalability for Computational Fluid Dynamics (CFD) workloads. Customers across many industries can benefit from the technical partnership between AMD and Ansys.

## ANSYS FLUENT

Ansys Fluent is a general-purpose computational fluid dynamics (CFD) and multi-physics tool that helps empower you to go further and faster as you optimize your product’s performance. Fluent contains the broad physical modeling capabilities needed to model flow, turbulence, heat transfer, and reactions for industrial applications—ranging from air flow over an aircraft wing to combustion in a furnace, from bubble columns to oil platforms, from blood flow to semiconductor manufacturing, and from clean room design to wastewater treatment plants. Fluent covers a broad reach, including special models with capabilities to model in-cylinder combustion, aero-acoustics, turbo machinery, and multiphase systems.<sup>4</sup>

This performance brief displays Ansys Fluent 2023 R1 running the benchmarks on Ansys Gateway powered by AWS shown in Figures 1 and 2 on Amazon EC2 Hpc6a instances featuring AMD EPYC 7003 Series Processors. Each instance includes 96 physical cores with AMD Simultaneous Multithreading [SMT] disabled and a 100 Gbps Elastic Fabric Adapter networking for fast inter-node communication that supports scaling from 1 to 16 instances. Tables 1 and 2 provide detailed test configuration information.



Figure 1: Ansys Fluent multi-node scaling on a variety of Ansys benchmarks.

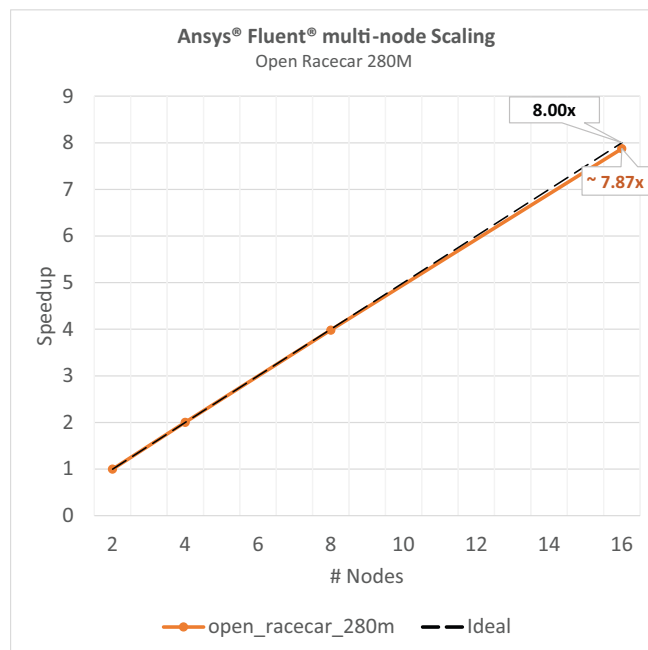


Figure 2: Ansys Fluent multi-node scaling on the open\_racecar\_280M benchmark.

For the larger models, Ansys Fluent generally exhibits super-linear<sup>8</sup> scaling through 16 instances by delivering an average speedup up of ~17.73x at sixteen instances (1536 cores). For the Open Racecar 280M model, the average speedup is ~7.87x at 16 instances (1536 cores).

## AMAZON EC2 HPC6A INSTANCE CONFIGURATION<sup>s</sup>

SOFTWARE	
Solver	Ansys Fluent 2023R1
MPI	IntelMPI 2021.3
OS	CentOS 7.9

Table 1: Amazon EC2 Hpc6a test environment

## AMAZON EC2 HPC6A INSTANCES AND SPECIFICATIONS

SIZE	CPU CORES	MEMORY (GB)	MEMORY PER CORE (GB)	L3 CACHE (MB)	ELASTIC FABRIC ADAPTER NETWORKING
Hpc6a.48xlarge	96	384	4	384	100 Gbps

Table 2: Amazon EC2 Hpc6a instance specifications

## CONCLUSION

Amazon EC2 Hpc6a instances powered by AMD EPYC 7003 Series Processors offer excellent performance and scalability for running HPC workloads. The test results shown above showcase linear scaling of Ansys Fluent on Ansys Gateway powered by AWS as the number of instances scale from 1 to 16. Amazon EC2 Hpc6a instances introduce several targeted features to deliver cost and performance optimizations for customers running tightly coupled HPC workloads that rely on high levels of inter-instance communications. With 100 Gbps Elastic Fabric Adapter networking, and AWS Nitro System making all 96 cores available, the Amazon EC2 Hpc6a instances let you scale computational fluid dynamics at the best price performance in Amazon EC2.

## 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
3. Please see <https://aws.amazon.com/ec2/instance-types/hpc6/> for more details about Amazon EC2 Hpc6a instances.
4. Please see <https://www.Ansys.com/products/fluids/Ansys-fluent> for detailed information about Ansys Fluent.
5. Please see <https://www.Ansys.com/partner-ecosystem/high-performance-computing-partners/amd> for information about the partnership between Ansys and AMD.
6. Please see <https://www.ansys.com/products/fluids/ansys-fluent> for additional information about Ansys Fluent
7. Please see <https://www.ansys.com/products/cloud/ansys-gateway> for additional information about Ansys Gateway powered by AWS.
8. AMD defines “linear scaling” as an equal and proportionate application performance uplift relative to single node performance; that is, when scaling out to 2 nodes results in 2x the performance of a single node, scaling out to 4 nodes results in 4x the performance of a single node, and so forth. “Super-linear” scaling is when the performance uplift achieved by adding one or more node(s) is greater than linear. AMD allows a +/- of 2% margin of error when claiming linear or super linear scaling. GD-205

## ACKNOWLEDGEMENTS

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### RELATED LINKS

- [Amazon EC2 Hpc6a Instances\\*](#)
- [Elastic Fabric Adapter\\*](#)
- [Amazon FSx for Lustre\\*](#)
- [AWS ParallelCluster\\*](#)
- [AWS Nitro System\\*](#)
- [Ansys Gateway powered by AWS\\*](#), [Ansys\\*](#), [Ansys and AMD\\*](#), and [Ansys HPC\\*](#). Please contact Ansys [here\\*](#)
- [AMD EPYC™ Processors](#)
- [AMD EPYC Technical Briefs and Tuning Guides](#)

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