

ANSYS® LS-DYNA® ON AMAZON EC2 HPC6A INSTANCES FEATURING AMD EPYC™ 7003 SERIES PROCESSORS

FINITE ELEMENT ANALYSIS

3rd Gen AMD EPYC™ processors deliver outstanding scale-out performance running Ansys® LS-DYNA® on one to four Amazon Web Services Hpc6a instances.

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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™ technology, Secure Memory Encryption (SME), and Secure Encrypted Virtualization (SEV-SNP) help protect data while it is in use.¹ 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 frequency² 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.³

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 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 LS-DYNA

Collaboration between AMD and Ansys offers high performance and scalability for Finite Element Analysis (FEA) workloads. Customers across many industries can benefit from the technical partnership between AMD and Ansys.

ANSYS LS-DYNA

Ansys LS-DYNA® is the most used explicit simulation program in the world. It is capable of simulating complex real-world short-duration events in the automotive, aerospace, construction, military, manufacturing, and bioengineering industries. For example, the automotive industry uses LS-DYNA to analyze vehicle designs and predict both a car's behavior in a collision and how that collision affects the car's occupants. LS-DYNA allows automotive companies and their suppliers to save time and expense by testing car designs without having to tool or experimentally test a prototype.

This performance brief displays Ansys LS-DYNA 13.1.1 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 4 instances. Ansys LS-DYNA scales very well on Hpc6a instances with a speed up of ~2.47x at 384 cores for both of the models. FEA explicit solvers typically do not scale beyond 2-4 nodes, with production models running ~400 to 500 cores.

Tables 1 and 2 provide detailed test configuration information.

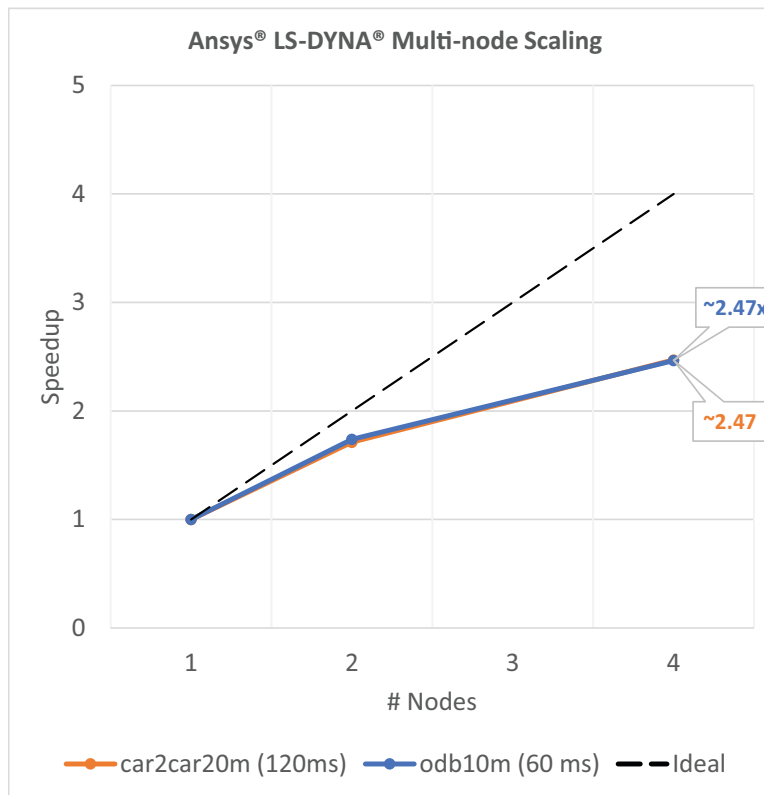


Figure 1: Ansys LS-DYNA scaling performance

AMAZON EC2 HPC6A INSTANCE CONFIGURATION

SOFTWARE	
Solver	Ansys LS-DYNA 13.1.1
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 scaling of Ansys LS-DYNA on Ansys Gateway powered by AWS as the number of instances scales from 1 to 4. 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 LS-DYNA explicit workloads 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/structures/Ansys-Is-dyna> for detailed information about Ansys LS-DYNA.
5. Please see <https://www.ansys.com/amd> for information about the partnership between Ansys and AMD.

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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](#)
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