AMD Reference Configuration: Ansys on Lenovo

AMD Value Proposition for Ansys

Better Performance vs. Competition

- Up to 33% faster[1] for Ansys® Mechanical™
- Up to 119% faster[2] for Ansys® LS-DYNA®
- Up to 118% faster[3] for Ansys® CFX®
- Up to 68% faster[4] for Ansys® Fluent®

Optimization Boost with AOCL

- Up to 212% gains[5] for Ansys® Mechanical™

Up to 51% estimated TCO Savings over 3 Years[6]

Sample Lenovo Configuration for Ansys

Head / Login Node

Lenovo SR645 (1U)

Performance Compute Node

Lenovo SR645 (1U)

Visualization Node

Lenovo SR645 (1U)

Why run Ansys applications on HPC systems?

To realize the full potential value of the widely used Ansys applications, companies are investing in high-performance computing (HPC) infrastructure with the best performing processors. This helps reduce constraints on the number, size, and complexity of simulation models while delivering faster time to results. It also helps engineers improve design quality and prototype performance and can significantly reduce total cost of ownership (TCO) with fewer servers, reduced power, and lower emissions.

Yet, challenges remain with HPC infrastructure

Even with modern systems, Ansys workloads are challenged by:

- Inadequate processor frequency and/or core density, requiring massive, often expensive scale-out solutions for many Ansys tasks
- Insufficient memory capacity and bandwidth, and low ratios of cache per core, hurt compute performance
- Poorly optimized I/O
- Lack of data security during computation.

Why AMD for Ansys?

AMD EPYC™ processors help overcome the above challenges and provide an optimal architecture for Ansys applications. Analysis conducted by AMD suggests that manufacturers could achieve significant TCO benefits. For example, to perform 4600 jobs per day with Ansys cfx-50 would require 50% fewer 2P EPYC 7573X powered servers than a competitive configuration, with up to an estimated 51% TCO savings over three years while using 60% fewer cores.[6]

For example, Ansys LS-DYNA, CFX, and Fluent users benefit from AMD EPYC processors with 3D V-Cache™ technology, providing triple the L3 cache compared to regular 3rd Gen EPYC processors.

In addition, optimizing Ansys applications with AMD compilers and libraries can help enhance performance. For example, Ansys Mechanical was optimized with AOCL (AMD Optimizing CPU Libraries) for a geomean performance improvement of up to 26% with estimated gains as much as up to 212% versus the competition.[5]

Expertly architected, optimized Lenovo® configurations with AMD EPYC processors for Ansys

Lenovo systems with high core count EPYC processors (Table 1) can deliver high throughput per node for Computational Fluid Dynamics (CFD) applications like Fluent and CFX since they benefit from multicore parallelism.

For crash applications like Ansys LS-DYNA, LENOVO systems (Table 1) with medium-core count EPYC processors with high frequencies and high cache-per-core offer very high performance per core to help efficiently utilize per-core software licenses.

Table 1: Sample Lenovo configurations for CFD (CFX, Fluent) and Explicit Finite Element Analysis (FEA): Ansys LS-DYNA

	Server	Processor	Memory
Balanced Performance and Cost	• SR645 (1U)	• 2x AMD 7373X CPUs • (16c/socket, 3.05GHz, 280W TDP)	• 256GB Total RAM 16x 16GB DDR4 3200MHz 2R DIMMs
Highest Performance	• SR645 (1U)	• 2x AMD 7573X CPUs • (32c/socket, 2.8GHz, 280W TDP)	• 256GB Total RAM 16x 16GB DDR4 3200MHz 2R DIMMs

For structural analysis using implicit FEA, like Ansys Mechanical, LENOVO systems (Table 2) with low-core count EPYC processors with high frequencies help efficiently utilize per-core software licenses and perform well on 3rd generation EPYC processors without 3D V-Cache technology.

Table 2: Sample Lenovo SR645 (1U) configurations for Structural Mechanics: Ansys Mechanical

Problem Type	Processor	Memory	Storage	Upgraded internal Storage
Problems with limited scaling	• 2x AMD 72F3 CPUs • (16c/socket, 3.7GHz, 180W TDP)	• 1024GB Total RAM 16x 64GB DDR4 3200MHz 2R DIMMs	• 2x 2.5" 1.6TB SAS SSD	• 2x 3.5" Kioxia CM6-V 1.6TB NVMe PCIe 4.0
Problems with more scaling	• 2x AMD 7573X CPUs • (32c/socket, 3.05GHz, 280W TDP)	• 1024GB Total RAM 16x 64GB DDR4 3200MHz 2R DIMMs	• 2x 2.5" 1.6TB SAS SSD	• 2x 3.5" Kioxia CM6-V 1.6TB NVMe PCIe 4.0

In addition to CPU-based solutions, Ansys and AMD have collaborated to enable Ansys Mechanical on AMD Instinct™ graphics processing unit (GPU) accelerators.[7]

Benefits: AMD based scalable Lenovo systems with Ansys

- **Validated and optimized** solution with compute, storage, software, services, and financial options
- **On-site install, start-up, and integration services** delivered by Lenovo or a certified Lenovo business partner
- **Remote management** available with proactive monitoring and remediation of any Ansys operational issues.

"Our customers are engineering experts, but that expertise doesn't always stretch to HPC cluster selection and deployment. We want to give our customers the best possible experience and, for that reason, we are working with Lenovo, AMD, and business partners to provide our customers an Ansys-optimized cluster solution designed for ease of procurement, deployment, and operation."
Wim Slagter
Strategic Partnerships Director, Ansys

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[1]MLN-130A (https://www.amd.com/en/claims/epyc#faq-MLN-130A): ANSYS® Mechanical® 2021 R2 comparison based on AMD internal testing as of 09/27/2021 measuring the average of all Release 2019 R2 test case simulations (5% better average) using a server with 2x AMD EPYC 75F3 versus 2x Intel Xeon Platinum 8362. Steady state thermal analysis of a power supply module 5.3M (cg1) is max result of 33%. Results may vary.

[2]MLNX-009A (https://www.amd.com/en/claims/epyc3x#faq-MLNX-009A): ANSYS® LS-DYNA® 2022.1 comparison based on AMD internal testing as of 09/27/2021 measuring the average time to run the 3Cars, Car2Car, odb10m-short, and Neon test case simulations (69% better average). Configurations: 2x 64C AMD EPYC 7773X with AMD 3D V-Cache Technology ("Milan-X") versus 2x 40C Intel Xeon Platinum 8380. 3cars is the max result of 119%. Results may vary based on factors including silicon version, hardware and software configuration and driver versions.

[3] MLNX-010A (https://www.amd.com/en/claims/epyc3x#faq-MLNX-010A): ANSYS® CFX® 2022.1 comparison based on AMD internal testing as of 02/14/2022 measuring the average time to run the cfx_10, cfx_50, cfx_100, cfx_lmans, and cfx_pump test case simulations (88% better average). Configurations: 2x 32C AMD EPYC™ 7573X with AMD 3D V-Cache technology™ versus 2x 32C Intel Xeon Platinum 8362. Cfx_10 is the max result of 118%. Results may vary based on factors including silicon version, hardware and software configuration and driver versions.

[4] MLNX-014 (https://www.amd.com/en/claims/epyc3x#faq-MLNX-014): ANSYS® FLUENT® 2022.1 comparison based on AMD internal testing as of 02/14/2022 measuring the average rating of the Release 19 R1 test case test case simulations (23% better average). Configurations: 2x 32C AMD EPYC™ 7573X with AMD 3D V-Cache™ versus 2x 32C Intel Xeon Platinum 8362. Pump2 is the max result of 68%. Results may vary based on factors including silicon version, hardware and software configuration and driver versions.

[5] Performance of Ansys® Mechanical® Optimized with AMD Optimizing CPU Libraries (AOCL) on AMD EPYC™ 7003 Series Processors

[6] Based on a comparison of a 2P AMD EPYC 7573X-powered server running Ansys cfx-50 vs. a similarly configured 2P Intel Xeon Platinum 8362-based server to deliver 4,600 jobs per day. Detailed results and TCO calculations are provided in MLNXTCO-001 in the AMD EPYC family claim information endnotes.
See *AMD EPYC claim MLNXTCO-001 at www.amd.com/en/claims/epyc3x*.

[7] Ansys and AMD Collaborate to Speed Simulation of Large Structural Mechanical Models Up to 6x Faster