

AMD Reference Configuration: Ansys on Dell PowerEdge

AMD Value Proposition for Ansys Better Performance with 3rd Gen AMD EPYC™ CPUs vs. 3rd Gen Intel® Xeon® Platinum

- Up to 33% faster¹ for Ansys® Mechanical™ *
- Up to 119% faster² for Ansys® LS-DYNA® **
- Up to 118% faster³ for Ansys® CFX® ***
- Up to 68% faster⁴ for Ansys® Fluent® ***

* 2P EPYC 75F3 vs. 2P Xeon 8362, ** 2P EPYC 7773X vs 2P Xeon 8380, *** 2P EPYC 7573X vs 2P Xeon 8362

Optimization Boost with AOCL

Up to 212% gains⁵ for Ansys® Mechanical™

Ansys® Mechanical R1 vs. Ansys® Mechanical R2 both using 2P EPYC 75F3

Ansys CFX users can reduce server counts using 3rd Gen EPYC™ 7573X CPUs with 3D-VCache™ by up to 51%⁶ vs. 3rd Gen Intel® 8362 powered servers.

Sample Dell Technologies Configuration

for Ansys Head / Login Node



Dell PowerEdge R6515

Performance Compute Node



Dell PowerEdge R6525

Visualization Node



Dell PowerEdge R6515

Dell Technologies® compute node systems configurations with AMD EPYC processors for Ansys

Dell PowerEdge 15G servers with high core count EPYC processors can deliver high throughput per node for Ansys applications across a range of use cases.

In general, liquid-cooled options will deliver the highest performance. If liquid cooling is not an option, air-cooled systems are a great choice for price-performance.

For crash applications like Ansys LS-DYNA, Dell Technologies 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.

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) by using fewer servers resulting in reduced power consumption and lower related 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 solution with 2P Intel 8362CPUs, with up to an estimated 51% TCO savings over three years while using 50% fewer cores.⁶

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 geometric performance improvement of up to 26% with estimated gains as much as up to 212% versus the competition.⁵

Table 1: Sample Dell PowerEdge 15G configurations for CFD (CFX, Fluent) and Crash (LS-DYNA)

	Server/Processor	Memory	Storage/Network
Liquid Cooled	<ul style="list-style-type: none"> Dell PowerEdge R6525 2x AMD EPYC 75F3X 64 cores/node 4 nodes per cluster for a total of 256 cores 2.8 GHz 3.6 GHz L3 Cache of 768MB (with AMD 3D V-Cache) 	<ul style="list-style-type: none"> 256GB (16x) Dual-Rank x8 DDR4-3200 16GB DIMMs, 1DPC 	<ul style="list-style-type: none"> 1x480GB SATA Read Intensive 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor
Air Cooled	<ul style="list-style-type: none"> Dell PowerEdge R7525 2x AMD EPYC 7543 64 cores/node 4 nodes per cluster for a total of 256 cores 2.80 GHz 3.60GHz L3 Cache of 256MB 	<ul style="list-style-type: none"> 256GB (16x) Dual-Rank x8 DDR4- 3200 16GB DIMMs, 1DPC 	<ul style="list-style-type: none"> 1x480GB SATA Read Intensive 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor

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

Table 2: Sample Dell PowerEdge 15G configurations for Structural Mechanics: Ansys Mechanical

	Server/Processor	Memory	Storage/Network
Liquid Cooled	<ul style="list-style-type: none"> Dell PowerEdge R6525 2x AMD EPYC 7373X 32 cores/node 4 nodes per cluster for a total of 128 cores 3.05 GHz 3.80GHz L3 Cache of 768MB (with AMD 3D-V Cache) 	<ul style="list-style-type: none"> 1TB (16x) Dual-Rank x4 DDR4-3200 64GB DIMMs, 1DPC 	<ul style="list-style-type: none"> 2 RAID0 1TB NVME write intensive SSD drives for local scratch 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor
Air Cooled	<ul style="list-style-type: none"> Dell PowerEdge R7525 2x AMD EPYC 7543 64 cores/node 4 nodes per cluster for a total of 256 cores 2.80 GHz 3.60GHz L3 Cache of 256MB 	<ul style="list-style-type: none"> 1TB (16x) Dual-Rank x4 DDR4-3200 64GB DIMMs, 1DPC 	<ul style="list-style-type: none"> 2 RAID0 1TB NVME write intensive SSD drives for local scratch 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor

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 processor-based scalable Dell Technologies 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 Dell Technologies or a certified Dell Technologies business partner.
- **Remote management** available with proactive monitoring and remediation of any Ansys operational issues.

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¹MLN-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.

²MLNX-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.

³MLNX-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.

⁴MLNX-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](#)

⁶MLNXTCO-001: As of February, 2022 based on AMD Internal analysis using the AMD EPYC™ AMD 3D V-Cache™ VALUE ANALYSIS & GHG TOOL - version 3.10 estimating the cost and quantity of 2P AMD 32-core EPYC™ 7573X powered server versus 2P Intel® Xeon® 32 core Platinum 8362 based server solutions required to deliver 4600 jobs per day with ANSYS CFX-50. This scenario contains many assumptions and estimates and, while based on AMD internal research and best approximations, should be considered an example for information purposes only, and not used as a basis for decision making over actual testing. For additional details, see <https://www.amd.com/en/claims/epyc3x#faq-MLNXTCO-001>.

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