AMD Reference Configuration: Ansys on Dell PowerEdge 16G Servers

AMD Value Proposition for Ansys

Better performance with 4th Gen AMD EPYC™ CPUs* vs. 3rd Gen Intel® Xeon® Platinum CPUs*

- Up to ~1.5x speedup[1] for Ansys® Mechanical™
- Up to ~1.76x speedup [2] for Ansys® LS-DYNA®
- Up to ~2.17x speedup [3] for Ansys® CFX®
- Up to ~1.75x speedup [4] for Ansys® Fluent®

*2P 32-core 4th Gen EPYC 9374F vs. 2P 32-core 3rd Gen Xeon Platinum 8362

Dell PowerEdge for Ansys

Performance node is Dell PowerEdge R7625

- 2U Rack Server
- 4th Generation AMD EPYC Processors
- Up to 24x DDR5 4800MHz memory
- Optional Direct Liquid Cooling (DLC)

Head/Visualization Node is Dell PowerEdge R6615

Why run Ansys applications on AMD processors?

Companies are investing in high-performance compute infrastructure with the best-performing processors to maximize the value of game-changing Ansys applications. The 4th Gen AMD EPYC processors deliver the optimal architecture for Ansys and help reduce constraints on the number, size, and complexity of simulation models while helping provide faster time to results. In addition, with AMD CPU-based systems, engineers can improve design quality and prototype performance and significantly reduce total cost of ownership (TCO) by using fewer servers to do the same work, helping reduce power and lower related emissions.

How does AMD improve Ansys applications' performance?

Compared to the prior generation, the new AMD EPYC 4th Gen processors achieve better performance[5] for Ansys applications with up to 50% more cores, higher frequencies, support for AVX-512 instructions, more memory bandwidth, and faster PCIe® and Infinity Fabric™ data transfer rate. In addition, optimizing Ansys applications with AMD compilers and libraries can help enhance performance further.

Dell PowerEdge compute node systems configurations with AMD processors for Ansys

Table 1 shows recommendations for Computational Fluid Dynamics (CFD) applications like Ansys CFD including CFX and Fluent. Dell PowerEdge servers with 4th Gen EPYC processors with 12 memory channels per processor and support for AVX-512 instructions can deliver high throughput per node for Ansys CFD applications since they benefit from multicore parallelism and greater memory bandwidth.

Table 1 Sample Dell PowerEdge 16G configurations for CFD (CFX, Fluent)

	Server/Processor	Memory	Storage/Network
Air Cooled	• Dell R7625 server • 2x EPYC 9354 • 64 cores/node • 3.25 GHz | 3.80GHz • L3 Cache of 256MB	• 384GB (24x) Dual-Rank DDR5-4800 16GB DIMMs, 1DPC	• 1x480GB SATA Read Intensive • 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor
Liquid Cooled	• Dell R6625 server • 2x EPYC 9374F • 64 cores/node • 3.85 GHz | 4.30GHz • L3 Cache of 256MB	• 384GB (24x) Dual-Rank DDR5-4800 16GB DIMMs, 1DPC	• 1x480GB SATA Read Intensive • 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor

Table 2 shows recommendations for structural analysis using implicit Finite Element Analysis (FEA), like Ansys Mechanical. Dell PowerEdge servers with lower-core count EPYC processors with high frequencies with support for AVX-512 instructions help efficiently utilize per-core software licenses and offer very high performance per core.

Table 2: Sample Dell PowerEdge 16G configurations for Structural Mechanics: Ansys Mechanical

	Server/Processor	Memory	Storage/Network
Air Cooled	• Dell PowerEdge R7625 server, 8x2.5" chassis • 2x EPYC 9354 • 64 cores/node • 3.25 GHz | 3.80GHz • L3 Cache of 256MB	• 1.5 TB (24x) Dual-Rank DDR5-4800 64GB DIMMs, 1DIMM per channel	• 1x 480Gb NVMe Read Intensive • 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor
Liquid Cooled	• Dell PowerEdge R6625 server • 2x EPYC 9174F • 32 cores/node • 4.10 GHz | 4.40 GHz • L3 Cache of 256MB	• 1.5 TB (24x) Dual-Rank DDR5-4800 64GB DIMMs, 1DIMM per channel	• 1x480GB SATA Read Intensive • 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor

Table 3 shows recommendations for crash applications using explicit FEA like Ansys LS-DYNA. Dell PowerEdge systems with medium core count EPYC processors with high frequencies and high cache- per- -core and support for AVX-512 instructions offer very high performance per core to help efficiently utilize per-core software licenses.

Table 3: Sample Dell PowerEdge 16G configurations for Explicit Finite Element Analysis (FEA): Ansys LS-DYNA

	Server/Processor	Memory	Storage/Network
Air Cooled	• Dell R7625 server • 2x EPYC 9354 • 64 cores/node • 3.25 GHz | 3.80GHz • L3 Cache of 256MB	• 1.5TB (24x) Dual-Rank DDR5-4800 64GB DIMMs, 1DPC	• 2 RAID0 1TB NVME write intensive SSD drives for local scratch • 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor
Liquid Cooled	• Dell R6625 server • 2x EPYC 9174F • 32 cores/node • 4.10 GHz | 4.40 GHz • L3 Cache of 256MB	• 1.5TB (24x) Dual-Rank DDR5-4800 64GB DIMMs, 1DPC	• 2 RAID0 1TB NVME write intensive SSD drives for local scratch • 1 InfiniBand HDR100/Ethernet 100Gb 1-port adaptor

Benefits: AMD CPU-based Dell PowerEdge servers 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** is available with proactive monitoring and remediation of any Ansys operational issues.

Key Contacts

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[1] SP5-130: Mechanical® Release 2022 R2 test cases benchmark comparison based on AMD measurements as of 10/19/2022. Configurations: 2x 32-core Intel Xeon Platinum 8362 vs. vs. 2x 32-core EPYC 9374F for ~1.5x the rating performance. System Configurations:
2P AMD EPYC 9374F (32 cores/socket, 64 cores/node); 1.5 TB (24x) Dual-Rank DDR5-4800 64GB DIMMs, 1DIMM per channel; 1 x 256 GB SATA (OS) | 1 x 1 TB NVMe (data); BIOS Version 1002, SMT=off, Determinism=performance, NPS=4, TDP/ PPT=400; RHEL 8.6; OS settings:
Clear caches before every run, NUMA balancing 0, randomize_va_space 0 vs. 2P Intel Xeon Platinum 8362 (32 cores/socket, 64 cores/node); 1 TB (16x) Dual-Rank DDR4-3200 64GB DIMMs, 1DIMM per channel; 1 x 256 GB SATA (OS) | 1 x 1 TB NVMe (data); BIOS Version
1.6.5, SMT=off, HPC Profile; OS settings: Clear caches before every run, NUMA balancing 0, randomize_va_space 0. Results may vary based on factors such as software version, hardware configurations and BIOS version and settings.

[2] SP5-112: LS-DYNA® Version 2021 R1 Nonlinear FEA benchmark comparison based on AMD measurements as of 09/18/2022. Tests run: obd10m, car2car, obd10m-short, ls-3cars and ls-neon. System Configurations: 2P AMD EPYC 9374F (32 cores/socket, 64 cores/node); 1.5 TB (24x) Dual-Rank DDR5-4800 64GB DIMMs, 1DIMM per channel; 1 x 256 GB SATA (OS) | 1 x 1 TB NVMe (data); BIOS Version 1002C, SMT=off, Determinism=performance, NPS=4, TDP/ PPT=400 versus 2P Intel Xeon Platinum 8362 (32 cores/socket, 64 cores/node); 1 TB (16x) Dual-Rank DDR4-3200 64GB DIMMs, 1DIMM per channel; 1 x 256 GB SATA (OS) | 1 x 1 TB NVMe (data); BIOS Version 1.6.5, SMT=off, HPC Profile. Common: RHEL 8.6 OS settings: Clear caches before every run, NUMA balancing 0, randomize_va_space 0. Results may vary due to factors including system configurations, software versions and BIOS settings.

[3] SP5-116: CFX 2022 R2 Solver, Nonlinear CFD benchmark comparison based on AMD measurements as of 9/16/22. Tests used: cfx_100, cfx_50, cfx_10, cfx_lmans, cfx_pump. Configurations: 2P AMD EPYC 9374F (32 cores/socket, 64 cores/node); 1.5 TB (24x) Dual-Rank DDR5-4800 64GB DIMMs, 1DIMM per channel; 1 x 256 GB SATA (OS) | 1 x 1 TB NVMe (data); BIOS Version 1002C, SMT=off, Determinism=performance, NPS=4, TDP/ PPT=400 versus 2P Intel Xeon Platinum 8362 (32 cores/socket, 64 cores/node); 1 TB (16x) Dual-Rank DDR4-3200 64GB DIMMs, 1DIMM per channel; 1 x 256 GB SATA (OS) | 1 x 1 TB NVMe (data); BIOS Version 1.6.5, SMT=off, HPC Profile. Common: RHEL 8.6 OS settings: Clear caches before every run, NUMA balancing 0, randomize_va_space 0. Results may vary due to factors including system configurations, software versions and BIOS settings.

[4] SP5-035A: Fluent® Release 2022 R2 test cases benchmark comparison based on AMD measurements as of 10/19/2022. Configurations: 2x 32-core Intel Xeon Platinum 8362 vs. vs. 2x 32-core EPYC 9374F for ~1.75x the rating performance. Results may vary.

[5] https://www.amd.com/system/files/documents/epyc-9004-pb-ansys-generational.pdf