Hewlett Packard Enterprise | AMD

Solution brief

FOSTER CRITICAL FINITE ELEMENT ANALYSIS WORKLOADS

HPE ProLiant Gen10 Plus and HPE Apollo Gen10 Plus servers with AMD EPYC 7003 Series processors with AMD 3D V-Cache technology

Running finite element analysis (FEA) simulations on HPE ProLiant Gen10 Plus and HPE Apollo Gen10 Plus servers powered by AMD EPYC 7003 Series processors with AMD 3D V-Cache delivers features that count:

- Up to 768 MiB per socket on the processors allows simulations to be performed more quickly
- Broad I/O bandwidth through PCIe Gen4 delivers fast communication for quick computation
- Large memory bandwidth (DDR4, 8 channels per CPU, 2 DIMMs per channel) supports faster computation
- Dense compute with minimal local storage requirements

The largest available L3 cache in the AMD EPYC™ 7003 family helps boost performance and productivity by up to 7% on implicit FEA workloads and up to 33% on explicit FEA workloads.[1]

FOCUS ON HIGH-QUALITY DESIGN TO REDUCE RISK AND COST

Your organization depends on computer-aided engineering (CAE) to design and test ideas for new products without having to build physical prototypes. Using virtual prototypes is typically a far cheaper and quicker alternative to using physical prototypes. The result: enabling CAE to substantially reduce costs and speed up workflows.

CAE also enables your company to focus on only those designs that have the best potential for success. With CAE, you can help reduce design risk by finding issues early in the design cycle before products go to manufacturing—effectively identifying defects that could be costly.

A critical part of the CAE cycle is the structural analysis of components and assemblies. Structural applications generally use a mathematical technique called finite element analysis (FEA), which includes two primary numerical simulation approaches:

- **Implicit FEA**—Used for longer-duration, relatively static problems to simulate strength and vibration of products such as automobile and aerospace engines and tires, as well as medical devices such as stents and heart valves.
- **Explicit FEA**—Used for high-impact and short-duration simulations, such as crash, impact, and blast simulations. Such "nonlinear" events[2] are modeled to predict cascading damage to structural and component integrity.

While legacy FEA solutions met manufacturers' needs initially, your organization might be looking for a solution that provides more. What if a new solution could deliver a lot more—such as up to 7% greater performance and productivity on implicit FEA workloads and up to 33% more performance and productivity on explicit FEA workloads?[3]

These "out of the box" performance uplifts are delivered with no application software changes. You simply upgrade your existing HPE Gen10 Plus servers with AMD EPYC 7003 Series processors with AMD 3D V-Cache™ to receive a wide range of game-changing benefits.[4]

INDUSTRY-LEADING PLATFORM DRIVES BETTER BUSINESS OUTCOMES

Whether you choose HPE ProLiant DL325 Gen10 Plus v2, DL365 Gen10 Plus, or DL385 Gen10 Plus v2 servers or HPE Apollo 2000 Gen10 Plus or 6500 Gen10 Plus servers to run your FEA simulations, nothing stacks up to the leading performance, productivity, and cost-saving benefits you gain by using AMD EPYC 7003 processors with AMD 3D V-Cache.

[1,3] HPE internal testing—Dassault Systèmes Simulia Corp. Abaqus/Standard and Abaqus/Explicit suite of standard FEA benchmark testing was completed between February 16–20, 2022, using the HPE Apollo 2000 Gen10 Plus platform comparing the performance of up to four compute nodes of the AMD EPYC 7543 2.8 GHz 32C CPU with 256 MB of L3 cache and the AMD EPYC 7573X 2.8 GHz 32C CPU with 3D V-Cache Technology. Results may vary based on factors including silicon version, hardware and software configuration, and driver versions.

[2] Nonlinear events refer to any search or data access that does not occur in a specific order, such as direct access or random access.

[4] Updating to the latest BIOS is always recommended when updating processors.

AMD EPYC 7003 processors with AMD 3D V-Cache at a glance

- Industry's first x86 CPU built with true 3D die stacking without solder bumps
- Uses the same "Zen 3" cores as AMD EPYC 7003 CPUs without AMD 3D V-Cache
- Extends the AMD EPYC processor family to include processors with more low-latency L3 cache
  - Up to 768 MiB total
- Socket, infrastructure, BIOS,[7] and software are compatible with existing standard AMD EPYC 7003 CPU offerings
- Large L3 cache reduces memory-bandwidth pressure and latency
- Provides significant performance uplifts in many applications vs. EPYC 7003 Series processors without AMD 3D V-Cache
- AMD EPYC 7003 CPU offerings are ideal for a range of workloads including commercial HPC applications:
  - Finite element analysis (FEA)
  - Computational fluid dynamics (CFD)
  - Electronic design automation (EDA)

[5] EPYC-026: Based on calculated areal density and based on bump pitch between AMD hybrid bond AMD 3D V-Cache stacked technology compared to AMD 2D chiplet technology and Intel® 3D stacked micro-bump technology.

[6] With AMD EPYC 7003 processors with 3D V-Cache, every core is a member of a Core Complex Die (CCD). The shared L3 cache means any core can access all the L3 cache on the CCD. Even though the CCD might have fewer active cores, the total amount of L3 cache is still 96 MiB, so on any AMD EPYC 7003 processors with 3D V-Cache part, any single core can access up to 96 MiB of L3 cache.

[7] Updating to the latest BIOS is always recommended when updating processors.

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Benefits

- **High density and throughput**—Up to 64 cores per socket support high-performance computing (HPC) and dense computing; enables more than 200x the interconnect densities of current 2D CPU technologies.[5]
- **Outstanding core performance**—AMD "Zen 3" architecture is critical for single-threaded FEA applications and for maximizing expensive commercial ISV per-core licenses.
- **High I/O bandwidth**—128 PCIe 4 lanes enable highly efficient and powerful I/O configurations.
- **Large L3 cache capacity, with up to 96 MiB cache per core.[6]**

HPE SERVERS—PROTECT, DETECT, RECOVER

Depending on the type of FEA problems you need to solve, you can choose the right HPE Gen10 Plus servers for the job. HPE ProLiant DL325 Gen10 Plus v2, DL365 Gen10 Plus, and DL385 Gen10 Plus v2 servers and HPE Apollo 2000 Gen10 Plus and 6500 Gen10 Plus servers with AMD EPYC processors deliver a wide range of unique choices to help you optimize your high-fidelity FEA environment.

Regardless of which HPE Gen10 Plus servers you choose, you receive HPE and AMD's latest innovations in security features and performance—enabling you to help protect your data, detect cyberthreats, and recover from system failures:

- **Silicon root of trust from HPE** creates an immutable fingerprint that verifies the system's firmware code is valid and uncompromised.
- **Secure boot** helps ensure that drivers launched during the boot process are digitally signed and validated against a set of trusted certificates securely stored in the BIOS.
- A dedicated **AMD Secure Processor** is embedded in the AMD EPYC system on a chip; the processor manages secure boot, tying into the silicon root of trust from HPE at the firmware level and validating the HPE BIOS during the boot process; state-of-the-art security features help decrease potential attack surfaces as software boots, executes, and processes your critical data.
- **HPE's secure supply chain** ensures that all component vendors are vetted and sourced from Trade Agreements Act (TAA) designated countries.
- **Exclusive HPE technology** conducts daily checks of a server's essential firmware to ensure that no criminal malware is inserted during the system's verification process.
- In the unlikely event of a firmware breach, you can **securely and automatically recover** the server's firmware to a previously known good state.

WHY HPE AND AMD FOR FEA

Powered by the latest AMD EPYC 7003 processors with AMD 3D V-Cache, HPE's comprehensive portfolio of high-performance systems and software—backed by high-value HPE services and augmented by an outstanding ecosystem of performance-optimized FEA applications—helps companies like yours:

- Accelerate the design process to meet time-to-market pressures
- Reduce FEA runtimes to maximize engineering productivity
- Enable high core count throughput to do more simulations and improve design quality
- Maximize utilization of FEA software licenses to minimize cost
- Enhance FEA solution performance with the same or smaller data center footprint
- Receive the benefits of partnering with industry leaders for your high-performance computing needs

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