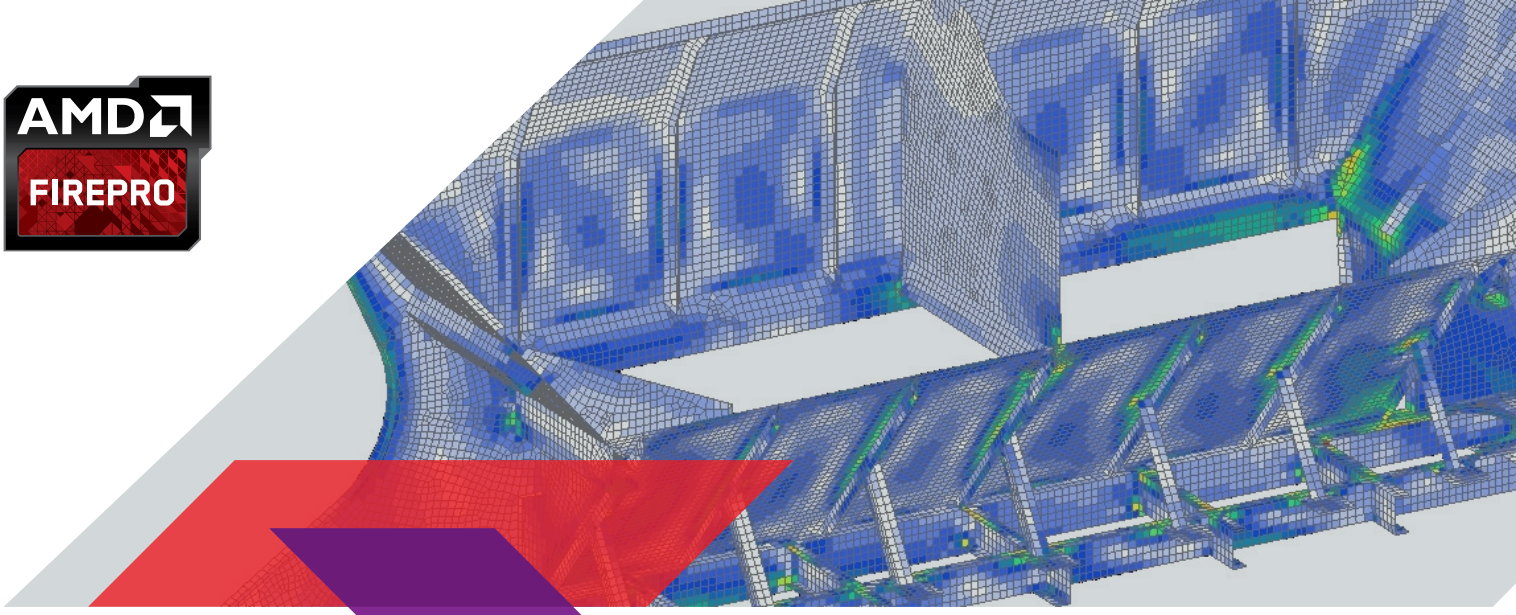


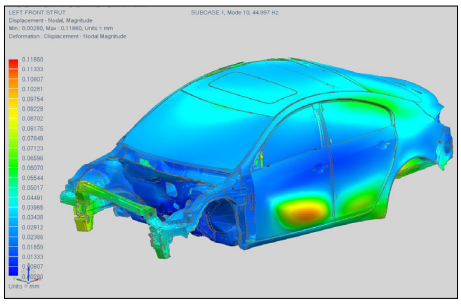
Cooperation between Siemens PLM Software and AMD helps to deliver fast simulation performance.

AMD FirePro™ professional graphics delivers a powerful solution for NX™ Nastran® users to design and simulate on the same workstation.

GPU computing provides opportunities to increase application performance by using the massively parallel architecture of modern graphics processors (GPUs). Siemens PLM Software saw the potential for GPUs to accelerate Siemens NX Nastran simulation solutions and leveraged AMD FirePro GPUs using OpenCL™ to optimize performance in NX Nastran.

Siemens PLM Software has a program to continuously optimize NX Nastran performance. Several years ago, the simulation experts saw the potential to increase Nastran simulation performance using GPU-accelerated computing. With customer interest in leveraging GPU computing also evident, the Siemens-AMD cooperation expanded with a technical partnership to apply AMD FirePro graphics GPU processing power and the open-source, GPU programming language, OpenCL to the problem of optimizing special calculations within NX Nastran.

Siemens PLM Software team faced many challenges to optimize NX Nastran for a heterogeneous GPU & CPU environment. Issues to address included load-balancing to ensure a good use of all the computing resources of the system, managing the data and computing balance in the system given the architectural characteristics of a modern workstation, adapting to new programming platforms, and ensuring correct portability for target hardware. The technical assistance provided to the NX Nastran optimization team includes graphics hardware and GPU programming knowledge.



OpenCL is a cross-platform, open-source development environment for GPU-accelerated computing.

OpenCL is the programming platform the NX Nastran team chose to meet these challenges and support their optimization work. Most importantly, OpenCL is a cross-platform development environment and it allows the developers to address different computing configurations with a single set of code. OpenCL delivers another important benefit to the NX Nastran developers.

Solution Partner

PLM

SIEMENS

Industry:

CAD & Engineering

Application:

NX Nastran from Siemens PLM Software

Challenges:

- Lowering costs and computing time to solve increasingly complex engineering problems
- Compress Product development time and reduce costs
- Deliver innovative, high-quality products to market faster

Solution:

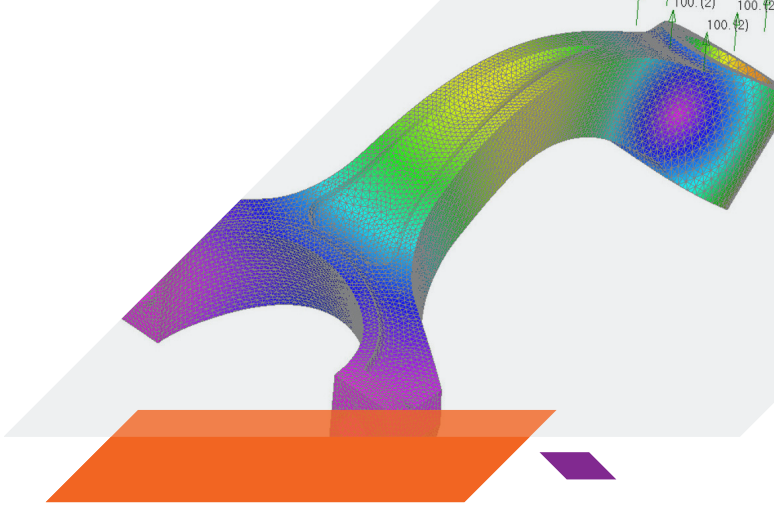
- GPU-accelerated NX Nastran using OpenCL™ and AMD FirePro™ graphics
- Delivers outstanding performance that drives product decisions and time to market across the complete product lifecycle
- GPU support to turn your workstation into a personal supercomputer

Value Propositions:

- AMD FirePro™ graphics represents a powerful, fully optimized and certified solution for NX Nastran users to design and simulate on the same workstation
- Optimized and certified by Siemens PLM Software
- Up to 2.62TFLOPS of peak double-precision floating point performance
- Up to 16GB of dedicated GPU memory to accelerate simulation process for very large models

The AMD FirePro graphics Advantage:

- Three-year warranty and extended availability – Compared to consumer graphics, AMD FirePro™ graphics cards have an extended lifecycle
- Highest level of customer support – Customers have the ability to contact the AMD technical team directly
- Energy efficiency – AMD FirePro™ graphics cards are based on a highly efficient GPU design and feature power saving technologies like AMD PowerTune and AMD ZeroCore[2]
- AMD Eyefinity – A single card can power up to 3, 4 and even 6 displays with up to 4K resolution with each output (4096 x 2180 pixels using DisplayPort 1.2)[1]



"Siemens PLM Software and AMD share a common goal to collaborate with exceptional market leaders to deliver high-performance innovative solutions that meet the demanding requirements of our customers. AMD has the necessary solutions and tools, such as their award-winning AMD FirePro™ graphics product line, to help Siemens provide customers with high performance simulations. As a result, customers are given the freedom to focus on innovation, industry leadership and top-line growth."

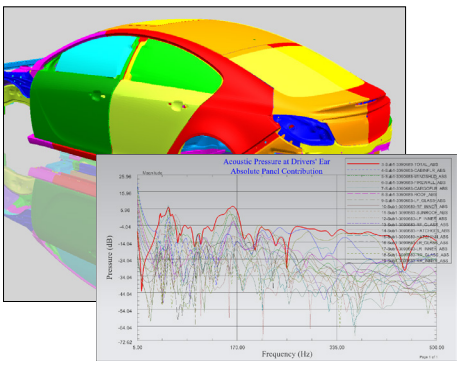
James W. Rusk, Vice President Product Engineering Software, Siemens PLM Software

GPU acceleration benefits for automotive and aerospace

NX Nastran provides finite element analysis (FEA) capabilities and is widely used in automotive, aerospace, machinery, and other industries. When applying GPU-accelerated optimizations to the application, Siemens PLM Software needed to identify the most promising functions to accelerate. One set of special calculations for NX Nastran is the modal frequency response calculations. These calculations are often used in simulations which allow designers to optimize their design for weight and strength characteristics, or to reduce noise, or to minimize vibrations in the design. This makes modal frequency response analysis a very valuable tool in computer-aided engineering.

AMD FirePro GPUs deliver features important to NX Nastran's GPU-accelerated optimizations.

Double-precision floating point performance is critical for NX Nastran. The majority of calculations in NX Nastran use double-precision calculations. And data-transfer is a critical issue for NX Nastran optimizations which makes bandwidth and data transfer latency characteristics in the system very important. For this reason, a good GPU for simulation with NX Nastran should have as much GPU memory available as possible.



The AMD FirePro™ W9100 graphics card tackles both issues. A single AMD FirePro™ W9100 GPU delivers more than two TeraFLOPS of double-precision performance and 16 GB of dedicated memory. Able to manage up to eight graphics and compute tasks in parallel, the AMD FirePro W9100 GPU delivers excellent compute performance and large amounts of GPU memory for engineers to handle the most complex designs and simulations.

Conclusion

The Siemens-AMD cooperation benefits the development process of both companies. The primary objective, however, focuses on improving the productivity of NX Nastran customers and enhancing the workflow for simulation professionals. Computer Aided Engineering is tightly integrated into the design, CAD modeling, simulation, design review, manufacturing workflows. A well-equipped AMD FirePro™ graphics-based workstation will have a modern, powerful GPU, and the NX Nastran solution performance will be faster for many of the most important simulation tasks these workstations must handle. And that is due, at least in part, to this Siemens-AMD technology partnership.

Recommended for NX Nastran

	AMD FirePro W7100	AMD FirePro W8100	AMD FirePro W9100
GPU Memory	8 GB	8 GB	16 GB
Memory Bandwidth	up to 160 GB/s	320 GB/s	320 GB/s
Compute Performance (Single Precision)	3.3 TFLOPS	4.2 TFLOPS	5.24 TFLOPS
Compute Performance (Double Precision)	206 GFLOPS	2.1 TFLOPS	2.62 TFLOPS
AMD Eyefinity Technology	4 4x DP 1.2	4 4x DP 1.2	6 6x mini-DP 1.2
Ready for 4K (UHD)	Yes	Yes	Yes
System Interface	PCIe 3.0	PCIe 3.0	PCIe 3.0
Form-factor:	Single-slot	Dual-slot	Dual-slot

For more information, visit www.fireprographics.com

AMD

[1] AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. Maximum two active adapters supported. See www.amd.com/eyefinityfaq for full details.

[2] AMD PowerTune and AMD ZeroCore Power are technologies offered by certain AMD FirePro™ graphics products, which are designed to intelligently manage GPU power consumption in response to certain GPU load conditions. Not all products feature all technologies - check with your component or system manufacturer for specific model capabilities.