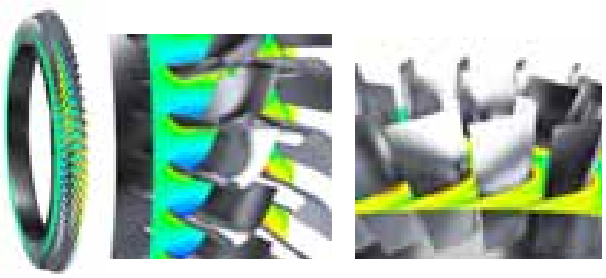
Realize Your Product Promise™

High-Performance Computing

ANSYS®



For today's product designs, simulations are larger and more numerically complex than ever. Meshes are finer, more geometric detail is required, and physical phenomena need sophisticated treatment. ANSYS HPC supports parallel processing, distributed solving, parametric analysis, multiphase models and other capabilities that speed numerically large analyses.

ANSYS high-performance computing tools enhance product insight and productivity.

Leverage your hardware investment to gain optimal product performance, reliability, innovation and reduced time to market.

HPC is a product development imperative. ANSYS solutions improve productivity by providing common tools versus point solutions and by supporting scalable, global deployment on internal or cloud-based high-performance computing, storage and workstation infrastructures.

Forty years after engineering simulation first revolutionized product design, today's business world is a very different place. Intensive market pressures are forcing organizations to gain more exacting insights into anticipated product behavior — earlier in the development cycle than ever before.

A critical factor is being able to understand how the product will function across a range of real-world operational conditions. Without this insight, you may not make the right design decisions — ones that can differentiate your product and ensure ultimate product integrity.

The process, though, is filled with challenges. Simulations are growing in size and complexity as engineers strive to replicate the physical world with greater accuracy and fidelity. Engineers have moved beyond single-component or single-physics analyses to consider multiple physics across entire product systems. To develop better, smarter products requires analyzing a wider range of parameters via design of experiments and six sigma studies.

Without such rich level of detail, you'll lack confidence that your innovations will perform as expected in the real world. But is there a system designed to address these issues and make the engineering process more productive?

High-performance computing (HPC) is a key strategic enabler of large-scale simulations. But even the most powerful hardware will fail to deliver on its full potential unless mated with simulation software designed specifically for HPC environments.

ANSYS: Built for HPC

ANSYS® technology enables highly scalable HPC deployment, giving you virtually unlimited capacity for high-fidelity simulation and the detail it provides. You can launch our HPC solutions within a workgroup or across a distributed

"To retain freedom to innovate and adapt the car quickly, we rely on a robust modeling process. This puts new designs on the track quickly. With a significant reduction in process times over the last three years, ANSYS HPC solutions have continued to be the tool of choice for Red Bull."

Nathan Sykes
CFD Team Leader
Red Bull Racing

"HPC is also about increasing analysis accuracy by using larger and more complex models. Alternatively, the same hardware could be dedicated to solve a large number of smaller problems simultaneously — thus opening the door to design optimization."

Herbert Güttler
General Manager
MicroConsult GmbH

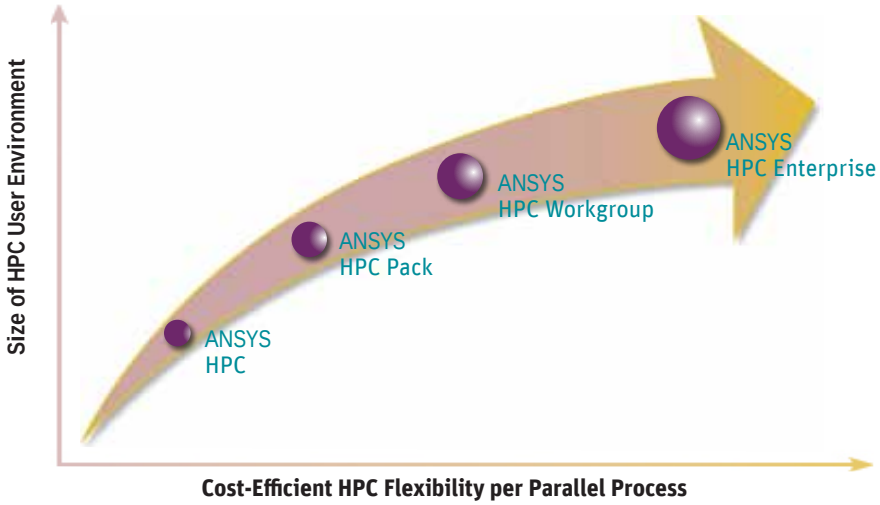
enterprise — whether using local workstations, department clusters or enterprise servers — wherever your resources and people are located. A variety of ANSYS HPC solutions addresses the needs of small-, medium- and large-sized enterprises.

For ANSYS software to effectively leverage today's (and tomorrow's) hardware, efficient execution on multiple cores is essential. ANSYS continues to release consistent, significant solution improvements, developed specifically to sustain speed and scaling on the latest HPC workstations, servers or clusters.

"ANSYS HPC technology is enabling Cummins to use larger models with greater geometric details and more realistic treatment of physical phenomena to generate results in less time."

John Horsley
Engineer
Cummins Turbo Technology

ANSYS HPC solutions offer a range of licensing options that help users to meet current requirements and plan for seamless upgrades related to future needs.



Maximize your HPC ROI by partnering with the leader **in engineering simulation — and leverage the benefits of** ANSYS partnerships with leading hardware developers.

NVIDIA collaborates with ANSYS to develop GPU acceleration for mechanical solvers; the company also uses ANSYS in a wide range of simulation applications. Engineers exploited HPC resources (including GPUs and parallel processing) to examine multiple design ideas for 3-D gaming glasses.

Around the globe, companies are investing in HPC resources to support product development efforts. But is your business getting the greatest possible payback on investments?

As the acknowledged industry leader in engineering simulation, ANSYS has made a commitment to offer a comprehensive suite of solver and HPC advancements across the entire range of physics. Whether your focus is on structural, thermal, fluids or electromagnetic analysis — or the complex interactions of multiple physical forces — ANSYS delivers a range of benefits that maximize the return on your HPC resources.

Virtually Unlimited Parallel Processing

The various ANSYS HPC licensing options allow scalability to whatever computational level a simulation requires, from small user group options to enable entry-level parallel processing up to virtually unlimited parallel capacity. For large user groups, ANSYS facilitates multiple parallel processing simulations, highly scalable for the most challenging projects when needed.

Continuing core solver improvements across the ANSYS suite remove scaling bottlenecks, pushing performance out to higher core counts and enabling efficient processing of numerically large, incredibly detailed simulations. Our HPC tools intelligently distribute complex problems across multiple CPUs and GPUs, leading to the fastest, best possible solution.

The ANSYS approach to HPC licensing crosses physics, so you get a single solution that you can leverage across disciplines.

Support for Your Unique HPC Environment

HPC-ready solutions from ANSYS allow you to manage your geographically distributed computing resources, including file transfer, remote access, data management, collaboration and security in deploying our software within your enterprise.

Using ANSYS, you can remove the artificial barriers to high-fidelity insight and productivity. Your cross-disciplinary, multisite engineering team can collaborate effectively and make the most of shared computing investments.

ANSYS HPC tools can help you manage the need for intermittent, elastic access to extremes of computational capacity, which are often a consequence of performing numerically large simulations.

"We realized that today's workstations are tremendously under-utilized. We made a conscious decision to identify and execute a new strategy to achieve greater value from our hardware and software investments. We have significantly increased our throughput, and we are using all the available technologies at Parker Aerospace to expedite design decisions using ANSYS."

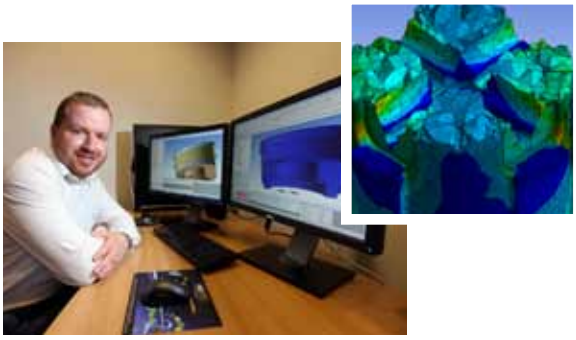
Bob Deragisch
Manager of Enterprise Systems
Parker Aerospace

Organizations in a wide range of industries apply ANSYS HPC to solve their most complex challenges.

Partnerships with HPC Leaders

ANSYS is a trusted HPC partner for your business, delivering confidence through proven and widely applied technologies, deep industry experience and expert support.

To add even greater value, we partner with other leaders in HPC, including chip makers AMD, Intel® and NVIDIA®; HPC infrastructure architects Microsoft®, Red Hat® and SUSE™; and OEMs such as Dell®, HP® and IBM® — as well as leading resellers, technology vendors and system integrators. Our technical collaborations ensure that you get the coordinated, expert support needed at all phases of HPC deployment. From system specification to installation, tuning, troubleshooting and maintenance, ANSYS partners can help you minimize risk and increase productivity.



For an offshore drilling application, Cognity developed a steerable conductor in five months, a time frame months or possibly years less than using traditional methods. ANSYS HPC was critical in expediting the design process.

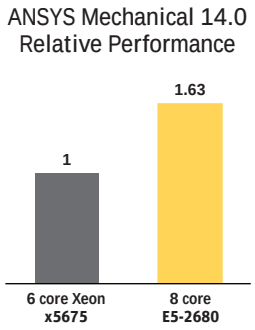
"Parallel processing makes it possible to evaluate five to 10 design iterations per day, enabling us to rapidly improve the design. HPC simulation allowed our team of engineers to develop virtual prototypes and iteratively evaluate design options with rapid turnaround."

Rae Younger
Managing Director
Cognity Limited

"ANSYS has consistently focused software design on the full range of computing platforms — from workstations to supercomputers — with their technology yielding great performance on the latest HPC solutions. This ensures that customers can tackle ever more complex and high-fidelity simulations while still achieving the turnaround time required for product development decision making."

Rajeeb Hazra
Vice President and General Manager
Technical Computing Group
Intel, U.S.A.

In solving your most complex design problems, ANSYS HPC increases throughput of design ideas in every discipline.



Intel Xeon® E5 processors have demonstrated a 63 percent performance increase on the geometric mean of 10 ANSYS Mechanical™ benchmarks over the prior Xeon 5600 family.

Advanced HPC tools are part of our suite that delivers functionality — depth, breadth, a plethora of advanced capabilities and integrated multiphysics — providing confidence that your simulation results reflect real-world parameters. The comprehensive range of software provides access to virtually any field of engineering simulation that a design process requires. Organizations around the world trust ANSYS to help them realize their product promises.

HPC Support across Every Discipline

With ANSYS, you get high-speed, scalable performance across every simulation discipline — structural mechanics, fluid dynamics, thermal and electromagnetic analyses — allowing you to maximize the value of your HPC resources and support cross-disciplinary engineering teams.

Fluid Dynamics

ANSYS delivers hybrid parallelism for multicore/multiprocessor machines within clusters, architecture-aware partitioning, parallel file input and output, and nearly linear scalability up to 3,072 cores.

Structural Mechanics

The suite includes a parallel direct sparse solver, a parallel PCG solver, and GPU acceleration for both shared memory and distributed memory parallel solvers.

Electromagnetics

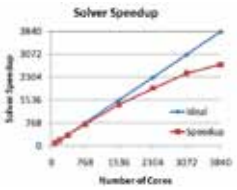
High-frequency electromagnetic simulations are supported by ANSYS capabilities such as distributed memory parallelism and the adoption of the latest Intel compilers and math kernel libraries.

The Future of Computation

Higher-fidelity models are critical for simulation to reduce the need for expensive physical testing. As computing technology continues to evolve, ANSYS is committed to working with HPC leaders to ensure support for the breakthrough capability that will make your simulation efforts more productive.

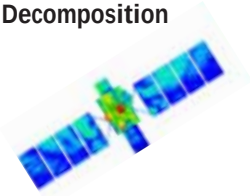
ANSYS HPC

Outstanding Scaling



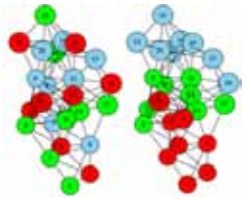
The largest CFD benchmarks from ANSYS yield nearly linear scaling up to 3,072 processors, reducing turnaround time from hours or days to just minutes.

Domain Decomposition



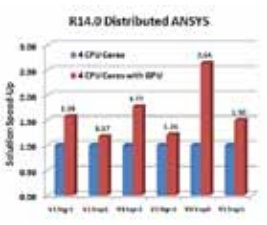
Domain decomposition solved the helix array on a spacecraft with other antennas nearby. This large problem used 1.3M tetrahedra, 25M unknowns and 35 computer cores.

Architecture-Aware Partitioning



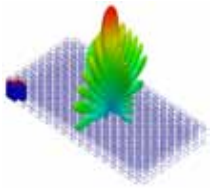
Partitioning in ANSYS fluid dynamics technology enables faster solutions by minimizing network traffic.

GPU Acceleration



GPU computing supports distributed memory structural solutions in the latest ANSYS software, yielding single-machine speed increases of up to two times over a range of benchmark problems.

Distributed Memory Parallel Processing



Distributed memory enabled efficient electromagnetic simulation of this 256-element skewed waveguide array using ANSYS electromagnetics tools.

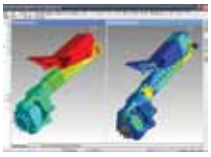
Other ANSYS Engineering Simulation Capabilities

Pre-Processing | **Simulation** | **Post-Processing** | **Archive**

CAD

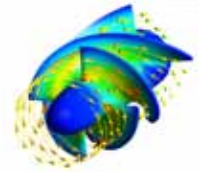
The ANSYS suite provides modeling and geometry creation functions as well as tools for importing CAD, MCAD and ECAD data from various sources. In addition, we collaborate with leading CAD developers to ensure an efficient workflow.

Integration



ANSYS Workbench™ is the framework for the industry's broadest and deepest suite of advanced engineering simulation technology. It delivers unprecedented productivity, enabling Simulation-Driven Product Development™.

Multiphysics

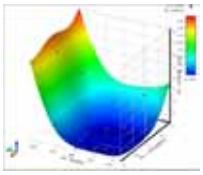


To help ensure a successful product, R&D teams must accurately predict how complex products will behave in a real-world environment. The ANSYS suite captures the interaction of multiple physics: structural, fluid dynamics, electromechanics and systems interactions. A single, unified platform harnesses the core physics and enables their interoperability.

HPC Partnerships

ANSYS partners with hardware and software vendors to ensure that you get the power and speed you need. A number of HPC hardware partners provide preconfigured solutions for optimal performance with ANSYS software.

Design Optimization



Good design starts with identifying the relationship between performance and design variables. ANSYS design exploration tools enable engineers to perform design of experiments (DOE) analyses, investigate response surfaces and analyze input constraints in pursuit of optimal design candidates.

Data Management

ANSYS EKM™ addresses critical issues associated with simulation data, including backup and archival, traceability and audit trail, process automation, collaboration and capture of engineering expertise, and IP protection.

ANSYS®

ANSYS, Inc.
www.ansys.com
ansysinfo@ansys.com
866.267.9724

ANSYS is dedicated exclusively to developing engineering simulation software that fosters rapid and innovative product design. Our technology enables you to predict with confidence that your product will thrive in the real world. For more than 40 years, customers in the most demanding markets have trusted our solutions to help ensure the integrity of their products and drive business success through innovation.

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