

INDUSTRY ALLIANCES REDEFINING

TECHNICAL COMPUTING



Technical Computing Solution Profiles



New technical computing technologies are enabling companies of all sizes to put high-performance workstations and clusters to work—from designing the world's most exotic supercars to studying airflow over potato chips baking in an oven. High-performance computing is no longer confined to applications at national research centers and academic institutions. It's now within reach for a wide range of commercial applications as well.

As supercomputers shrink in size, their computational power becomes more accessible to run increasingly complex algorithms on huge amounts of data—allowing automotive engineers to design and test an entire car before the first prototype is ever built or a potato chip manufacturer to optimize a baking process by simulating flow rates and temperatures to find the combination that produces the tastiest chip. In fact, companies everywhere are using high-performance workstations and clusters coupled with powerful technical computing solutions to bring high-quality products to market more quickly.

With the prospect of offering more to their customers—shortened design times, improved product quality, enhanced productivity—savvy independent software vendors (ISVs) are on a fast track to exploiting newly released technologies for high-performance technical computing. To meet a host of new, complex requirements, these ISVs look not only for platforms optimized for higher performance, but also for tools and programs to help them efficiently create and deploy complete technical computing solutions.

Leading ISVs, such as ANSYS, Autodesk, and Schlumberger, are looking to Intel, with its high-performance workstation and cluster-based server platforms, development tools, and customer deployment programs, to help them create total solutions for their most demanding customers.

ANSYS

Delivering innovative products faster

ANSYS develops software used to predict how product designs will behave in manufacturing and real-world environments. These simulation solutions are widely used by engineers and designers across a broad spectrum of industries, including aerospace, automotive, manufacturing, electronics, biomedical, and defense high-performance computing (HPC) environments. With the ANSYS open and flexible suite of simulation technologies, users can analyze designs directly on the desktop, providing a common platform for fast, efficient, and cost-conscious product development—from design concept to final-stage testing and validation.

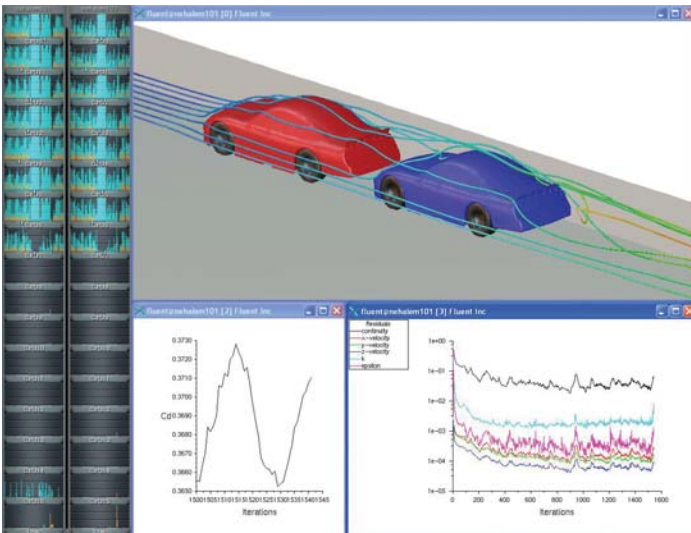
ANSYS® CFX® and FLUENT® computation fluid dynamics (CFD) solutions address a wide range of issues related to the diverse nature of fluid dynamics. The software includes sophisticated tools for increasing performance through the simulation-driven design of pumps, fans, turbines, compressors, and other rotating machinery. These solutions offer a comprehensive range of physical models, such as combustion, reacting flow, and radiation, which can be applied to a broad range of industries and applications. Helping to provide insight into equipment designs and processes, ANSYS CFX and FLUENT increase production, improve longevity, and decrease waste. ANSYS also offers ANSYS® Mechanical™ solutions, a set of analysis tools that include concept simulation, advanced analysis, and simulation capabilities for linear to nonlinear coupled physics analysis.

“Intel has demonstrated impressive performance gains for the broad suite of simulation software from ANSYS running on the new Intel® Xeon® processor 5400 series. These second-generation quad-core systems address the demands of today's memory-intensive, hi-fidelity, multi-physics analyses that are essential for Simulation-Driven Product Development™. It's this superior combination of high-performance hardware and fast, reliable software from ANSYS that enables our customers to meet their growing need for sophisticated engineering simulation.”

- Jim Cashman, President and CEO, ANSYS, Inc.

“ANSYS is excited to be a charter member of the Intel® Cluster Ready program. High-performance clusters are a key technology for our customers, and we expect that the Intel Cluster Ready program will make it easier for ANSYS software to deploy seamlessly on cluster systems from a variety of our OEM partners. This will benefit our customers, who should be able to implement a combined hardware and software solution faster and with less risk and cost.”

- Chris Reid, Vice President of Marketing, ANSYS, Inc.



ANSYS® FLUENT® software demonstrating multitasking.

ANSYS and Intel

Intel and ANSYS have collaborated in many areas of development, including the optimization and validation of the recently released 45nm Quad-Core Intel® Xeon® processor 5400 series. Using ANSYS's industry-leading benchmarking approach, the two companies have demonstrated that ANSYS applications running on computers with Intel Xeon processor 5400 series achieved a performance increase of between 19 and 39 percent compared to applications running on prior-generation technology.^{1,2}

In addition, at the Spring 2008 Intel Developer Forum in Shanghai, China, FLUENT software was featured in the keynote address by Pat Gelsinger, senior vice president and general manager of Intel's Digital Enterprise Group. He described a two-car drafting simulation running on a multi-node cluster of servers utilizing next-generation Nehalem processors with Intel® QuickPath Interconnect and an integrated memory controller. A scaled-down version of this demo was paired with a popular computer-aided design (CAD) solution script to demonstrate the ability to multitask on Nehalem-based workstations.

Autodesk

Increasing productivity through technology

Autodesk is one of the world's leading design software and services companies, offering solutions for the architectural, engineering, construction, manufacturing, infrastructure, and digital media markets. With state-of-the-art 2-D and 3-D software products optimized for technical computing workstations, Autodesk helps customers create digital prototypes while visualizing, simulating, and analyzing real-world performance early in the design process. These capabilities provide flexibility to optimize and improve designs before building them, saving both time and money while improving quality and fostering innovation.

Targeting professionals and consumers, Autodesk's design solutions enable users to design, build, manage, and own building projects; design, manufacture, and manage manufactured goods; and design, build, manage, and own infrastructure projects for both public and private users. A great example of this is the Autodesk® AutoCAD® software, a customizable and extendable CAD application for 2-D drafting, detailing, functional design documentation, and basic 3-D model design.

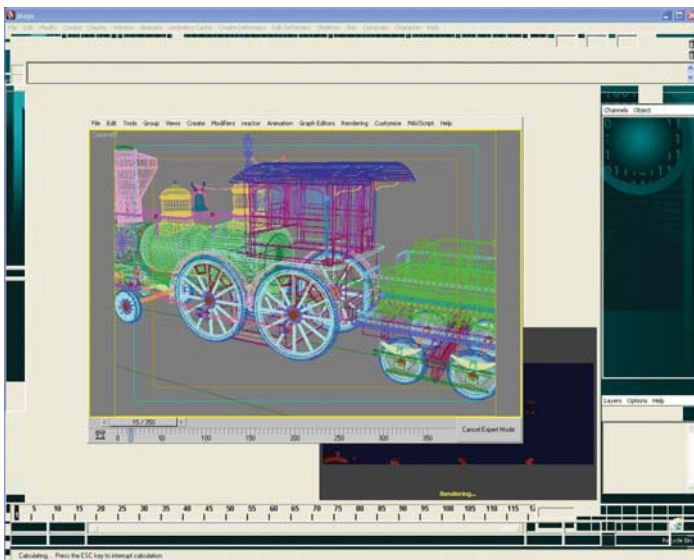
“Autodesk real-time raytracing just hit a new high with the new Intel® Xeon® processor 5400 series. Systems with these new microprocessors can deliver a more comprehensive and powerful design visualization environment, enabling our users to reach levels of realism and quality previously unheard of in our industry.”

- Richard Jones, Vice President of Alias® at Autodesk

Autodesk's Media and Entertainment solutions target post-production facilities, broadcasters, and creative professionals with a variety of applications, including feature films, television programs, commercials, music and corporate videos, interactive game production, design visualization, Web design, and interactive Web streaming. Autodesk's animation products, such as Autodesk® Maya® and Autodesk® 3ds Max®, provide advanced tools for 3-D modeling, animation, rendering solutions, and design visualization and visual effects production. Other Autodesk products, such as Autodesk® Flame®, Autodesk® Flint®, Autodesk® Lustre®, and Autodesk® Smoke®, provide color grading, editing, finishing, and visual effects, compositing, media mastering, and encoding technology and increase the productivity of creative professionals.

Autodesk and Intel

Autodesk is working with Intel to deliver software and hardware technologies that can scale across multi-core architectures. For example, the two companies have shown how industrial designers using Autodesk® Inventor® coupled with a simulation application from ANSYS are now designing, creating, testing, and improving their products through fast and effective digital prototyping.



Autodesk® 3ds Max® showing animation performance improvements.

“The new Intel® Xeon® processor 5400 series helps visualization professionals, game developers, and visual effects artists using Autodesk® 3ds Max® 2008 and Autodesk® Maya® 2008 create richer, more complex and engaging digital images, and realistic animations faster than ever before. These new workstations, featuring faster processors, increased memory, and two new advanced PCI Gen2 graphics adapters, will streamline the process of working with complex scenes.”

- Robert Hoffmann, Senior Product Marketing Manager, 3D, Autodesk

Autodesk is also working with Intel to help ensure optimum performance of simulation and rendering solutions to deliver virtual design environments in the entertainment, industrial, architectural, and manufacturing industries. These virtual laboratories help users experiment with new ideas in record time. An animator using Autodesk 3ds Max 2008 and Autodesk Maya 2008 can now iterate over four times the number of designs they were able to create and render previously on single processor workstations.³

Autodesk 3ds Max and Autodesk Maya applications were featured in the advanced technology display at the 2008 Intel Developer Forum in Shanghai, China. The display demonstrated how their recent software advancements supporting multi-core scalability are enabling users to create richer, more complex and engaging digital images and animations faster than ever before.

Schlumberger Optimizing exploration and production

As a leading oilfield services provider, Schlumberger delivers improved exploration and production (E&P) performance for oil and gas companies around the world. Schlumberger supplies a wide range of products to support seismic acquisition and formation evaluation, directional drilling, well cementing and stimulation, and well completion and productivity. The company also provides consulting, software, information management, and IT infrastructure services.

Schlumberger has developed state-of-the-art HPC technologies that allow customers to interpret, visualize, model, and simulate geoscience and engineering data to find and produce hydrocarbon deposits. Using these technologies, customers can better predict the location of oil and gas deposits and simulate fluid flow to improve well productivity and reservoir recovery.

Using HPC clusters, the analytical process begins with a Petrel™ Seismic Server, which analyzes terabytes of seismic survey data. The interpretation results are represented in 2-D and 3-D displays using Petrel Geophysics. Geophysicists use a common workflow and user interface to construct structural interpretation and generate 2-D and 3-D models of the earth's subsurface earth to create drillable prospects. Working collaboratively, geoscientists and drilling engineers create optimal well plans to safely and cost-effectively hit subsurface targets.

Once a reservoir is found, Petrel Reservoir Engineering is teamed with ECLIPSE® reservoir simulation software and the power of HPC clusters to generate animated 3-D simulation models of the reservoir, which help engineers create the best field development plan to optimize production and recovery factors.

Schlumberger HPC seismic-to-simulation technologies seamlessly integrate geophysics, geology, and reservoir engineering in a unified earth model, which allows customers' asset teams to leverage all their information and expertise to reduce subsurface uncertainty and improve decision making. With model-centric workflows, Petrel software eliminates the gaps in traditional systems that require handoffs from one technical domain to the next.

Schlumberger and Intel

Schlumberger and Intel have worked together to tune Schlumberger's Petrel and ECLIPSE software for optimized performance on Intel's new generation of multi-core architecture. Petrel 2008 software enhances the interactive experience of geophysicists and geologists by featuring multi-threaded numerics and on-workstation reservoir simulation, such as Schlumberger's ECLIPSE FrontSim streamline simulation, which is particularly suited for the new 45nm Intel Xeon processor 5400 series workstations.

Schlumberger and Intel are jointly working on advanced compiler and communication technology, such as the Intel® MPI Library 3.1 and the Intel® Compiler Suite, for high-performance cluster software. Both technology leadership companies are collaborating to make Schlumberger cluster software available on the Microsoft® Windows® Compute Cluster Server 2003, expanding options for the user community. Intel and Schlumberger continue to create new technology solutions that offer higher levels of performance and improved workflow for the oil and gas exploration industry.

“Workstations based on the new Intel® Xeon® processor 5400 series change the game for our customers. These new workstations, featuring faster processors, larger memories, and two new advanced PCI Gen2 graphics adapters, give users a remarkably interactive experience and an opportunity to employ parallel geophysical workflows that combine complex large-scale attribute analysis and volume visualization. Net result: higher-quality results and better, more informed decisions in less time than ever before.”

- Russ Sagert, Petrel™ Software Portfolio Manager, Schlumberger Information Solutions

Intel

Technical computing performance starts with Intel inside

The Quad-Core Intel Xeon processor 5400 series was specifically designed for bandwidth- and compute-intensive HPC applications. Compared to prior generations of Intel Xeon processors, these processors provide a performance improvement of 30 percent⁴ out-of-the-box and up to 50 percent⁵ for optimized applications.

Next-generation Nehalem platforms will raise the performance bar even higher, with Intel QuickPath Interconnect, an integrated memory controller technology, and improved communication links between system components.

Current-generation Dual-Core Intel® Itanium® processors, along with next-generation Quad-Core Intel Itanium processors with Intel QuickPath Interconnect, will continue to provide price and performance leadership for large-scale memory solutions in fields like weather and climate modeling, as well as in oil and gas well simulation.

Server platforms with Intel® processors enable users to efficiently and reliably support the smallest to the largest supercomputing clusters. In fact, over 70 percent of the world's fastest supercomputers now run on Intel processors.⁶ And with Intel quad-core workstations users can convert serial HPC application workflows into parallel workflows for faster iterations through design alternatives, compressing the time between idea, concept, and product delivery.

Intel® Cluster Tools simplify deployment and optimize performance

In the early years of HPC cluster usage, designing, developing, and deploying cluster solutions was a challenge. HPC software and hardware components were not tested for compatibility, making configuring a compatible and operationally efficient cluster a matter of trial and error.

In response to this situation, Intel developed the Intel® Cluster Ready program to help simplify the deployment, usage, and management of clustered computer systems. This program includes a specification that sets minimum standards for software and hardware components, enabling software developers to validate just one time across many hardware platforms, speeding development and time-to-market readiness. To minimize troubleshooting, the Intel® Cluster Checker simplifies the task of checking and validating Intel Cluster Ready certified configurations.

Intel also offers the Intel® Cluster Toolkit 3.1 to help ISVs more efficiently develop software applications with optimized parallel performance. This toolkit bundles the Intel® Cluster Tools into a single software package containing the libraries and tools needed to develop, optimize, run, and distribute parallel applications for clusters with Intel processors.

ISVs gain a competitive edge with technologies optimized for technical computing

Leading technical computing software vendors like ANSYS, Autodesk, and Schlumberger are swiftly moving to take advantage of Intel's high-performance workstation and cluster-based server platforms, development tools, and customer deployment programs to refine and accelerate development of their technical computing applications. By allying their world-class expertise with Intel's full range of server technologies, they are helping push the limits of performance, affordability, and choice for an increasingly broad range of customers.

And with the power of high-performance technical computing now within reach, their customers are quickly finding innovative ways to put it to work for applications ranging from oil-well drilling and weather modeling to supercar engineering and potato chip manufacturing.



For more information about:

Intel leadership in technical computing and HPC: www.intel.com/go/hpc/

Intel® Cluster Ready program: <http://softwarecommunity.intel.com/articles/eng/1296.htm>

Intel® Cluster Toolkit 3.1: www.intel.com/cd/software/products/asm-na/eng/307696.htm

ANSYS suite of simulation technologies: www.ansys.com/products/

Autodesk design and media/entertainment solutions: www.autodesk.com

Schlumberger Petrel™ geology and geophysics applications: www.slb.com/content/services/software/geo/petrel/

Technical Computing Solutions Provided by:



¹ Intel® processor numbers are not a measure of performance. Processor numbers differentiate features within each processor series, not across different processor sequences. See http://www.intel.com/products/processor_number for details.

² Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel® products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit Intel Performance Benchmark Limitations (http://www.intel.com/performance/resources/benchmark_limitations.htm).

³ Intel-measured comparison of 3ds Max® Interactive and Maya® mental ray® rendering MayaLogo. ma 4Kx4K workload running 4x concurrently on a DP Quad-Core Intel® Xeon® processor X5482, DP Quad-Core Intel Xeon processor X5460, DP Quad-Core Intel Xeon processor X5355, and DP Dual-Core Intel Xeon processor 5160. Actual performance may vary. See <http://www.spec.org> and http://www.mentalimages.com/2_1_0_mentalray/index.html for more information on the applications and workloads. Jobs/day calculated by dividing a full 24-hour day (86400 seconds) by the average parallel run times in seconds.

⁴ (up to 30%) Source: Intel-measured results Oct 2, 2007 for SPECfp_rate_base2006* comparing Xeon X5472 (3.0 GHz/12 MB L2 Cache/1600 MHz FSB, 5400 Chipset (pre-production platform) to Xeon X5365 (3.00 GHz/8 MB L2 Cache/1333 MHz FSB).

⁵ (up to 50%) Source: Intel-measured results Oct 2, 2007 for Financial Services (Black-Scholes application) running 8 threads with Red Hat EL4-U4 64-bit; 2.6.9-42.ELsmp comparing Quad-Core Intel® Xeon® processor 5300 series-based platform X5365 (3.00 GHz/8 MB L2 Cache/1333 MHz FSB) to pre-production Quad-Core Intel Xeon processor 5400 series-based platform X5472 (3.0 GHz/12 MB L2 Cache/1600 MHz FSB, 5400 Chipset (pre-production platform). Any difference in system hardware or software design or configuration may affect actual performance

⁶ November Top500 Publication [Top500.org](http://www.top500.org)

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