Foundations for the Future

The many advanced features of ANSYS 12.0 were designed to solve today's challenging engineering problems and to deliver a platform for tomorrow's simulation technology.

As this special spotlight in *ANSYS Advantage* attests, release 12.0 delivers a compelling advancement in what the CAE industry has, until now, only envisioned — a full range of best-in-class simulation capabilities assembled into a flexible multiphysics simulation environment specifically designed to increase engineering insight, productivity and innovation. Whether the need is structural analysis, fluid flow, thermal, electromagnetics, geometry preparation or meshing, ANSYS customers can rely on release 12.0 for the depth and breadth of simulation capabilities to overcome their engineering challenges.

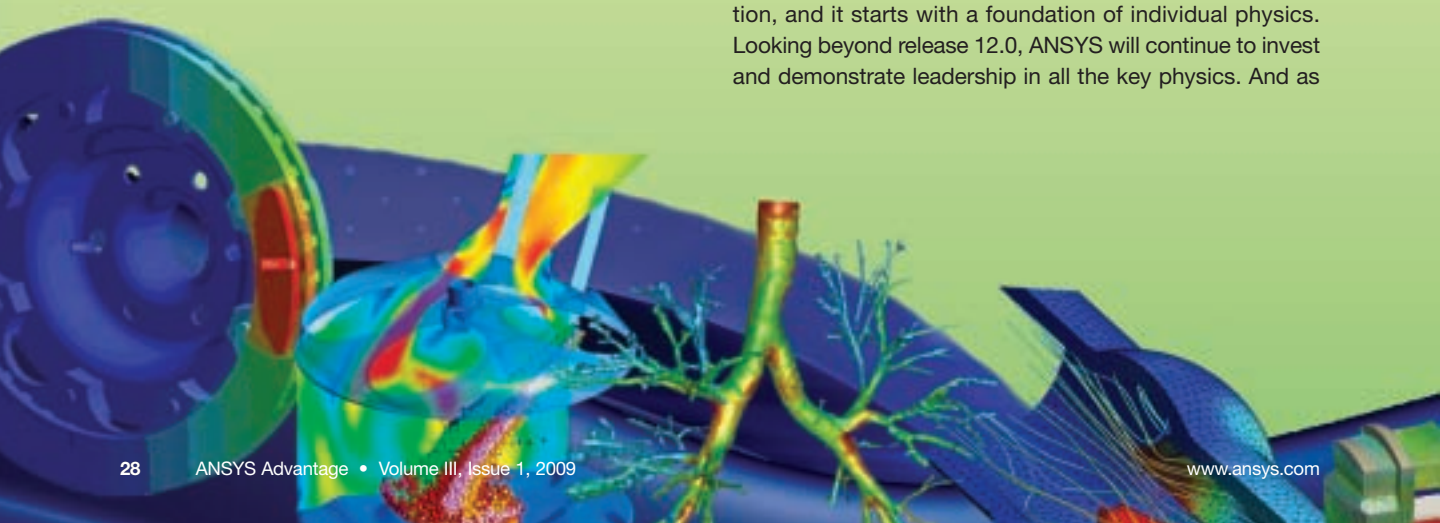
Staying true to our commitment to develop the most advanced simulation technologies, release 12.0 has further expanded the depth of individual physics and more intimately coupled them to form an engineering simulation capability second to none. A multitude of new material models, physics and algorithms enable simulating real-world operating conditions and coupled physical phenomena, while new solver technology and parallel processing improvements have dramatically reduced run times and made complete system simulations more computationally affordable.

Shouldering the array of technology in release 12.0 is our next-generation simulation platform, ANSYS Workbench 2.0. Seamlessly spanning all stages of engineering simulation, ANSYS Workbench 2.0 has been engineered to manage the complexities of today's simulations and to accelerate innovation.

Release 12.0 is a notable milestone in the company's nearly 40-year history of innovating engineering simulation, and it sets the stage for a new era of Smart Engineering Simulation — an era in which ANSYS customers will gain more from their investment in simulation by increasing the efficiency of their processes, increasing the accuracy of their virtual prototypes, and capturing and reusing their simulation processes and data. However, the advancements of ANSYS 12.0 notwithstanding, the journey is far from complete. To address the simulation challenges on the horizon, ANSYS will continue to reinvest in research and development and to explore new technologies. In particular, there are a few areas that we consider vital in the pursuit of Simulation Driven Product Development — areas in which ANSYS has laid strong foundations and remains committed to build upon as we look beyond release 12.0.

Physics First

ANSYS customers rely heavily on simulation before making commitments to product designs or manufacturing processes. High-fidelity engineering simulation is absolutely paramount when upstream engineering decisions can determine the overall success of a product and, in some cases, the company's financial success. At ANSYS, we believe our customers should never have to compromise by making broad-based engineering assumptions due to limitations in their analysis software. That is why we have taken a comprehensive multiphysics approach to simulation, and it starts with a foundation of individual physics. Looking beyond release 12.0, ANSYS will continue to invest and demonstrate leadership in all the key physics. And as



we develop tomorrow's advanced capabilities, we will continue to allow them to be combined in ways that free engineers from making the assumptions associated with single-physics simulations. Within the ANSYS Workbench simulation paradigm, we will enable engineers to routinely consider the effects of fully coupled physical phenomena.

High-Performance Computing

As one might expect, high-performance computing (HPC) is a strategic enabling technology for ANSYS. The appearance of quad-core machines on the desktop and the increased availability of compute clusters have ushered in a new era of parallel and distributed computing for our customers. ANSYS has kept pace with the exponential increase in computational horsepower with prolific development in the areas of parallel and distributed computing and numerical methods. The result is improved scalability and dramatically reduced run times for large-scale fluid flow, structural and electromagnetic simulations.

Solving large-scale problems with meshes exceeding 1 billion cells has been the latest stretch goal for fluid flow simulation. Recently, HPC and software from ANSYS were combined to investigate the aerodynamics of a racing yacht using 1 billion computational cells. Breaking this barrier demonstrates our conviction for high-performance scientific computing. As computational resources increase and engineering simulations become larger and more complex, we will continue to ensure that our solvers scale appropriately. Moreover, our forward deployment of HPC technology is not limited to solvers. The complexity of today's models and massive amounts of results data require more-scalable solutions for preparing models and interpreting results as well.

ANSYS Workbench Framework

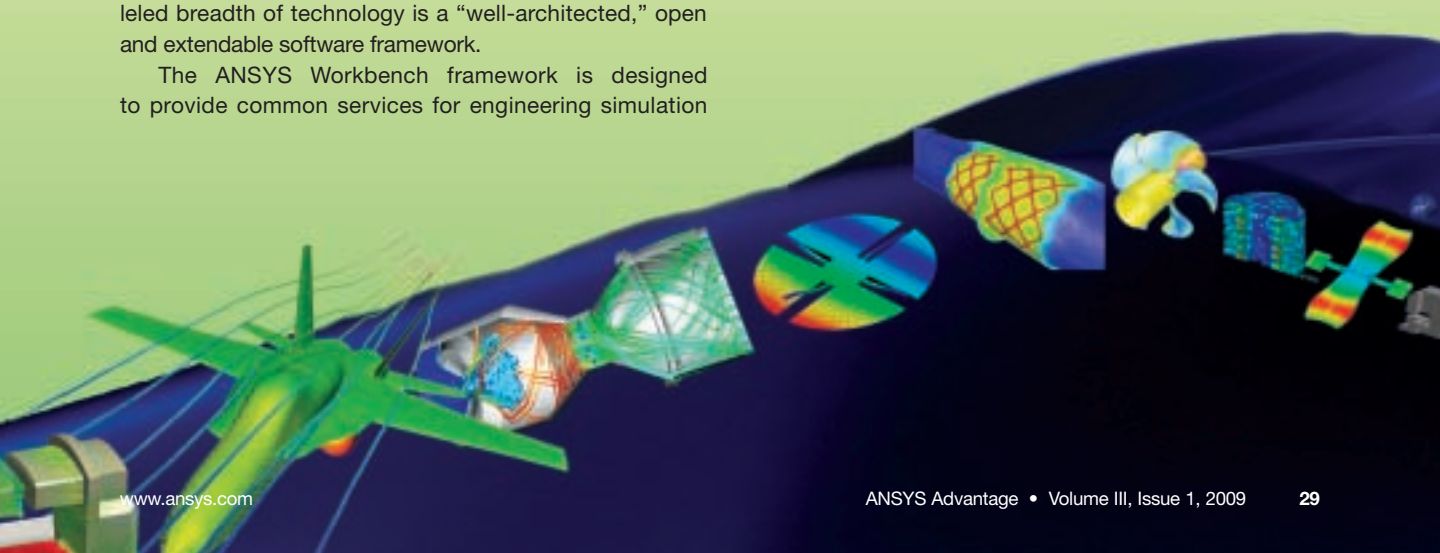
The ANSYS Workbench 2.0 platform is a powerful multi-domain simulation environment that harnesses the core physics from ANSYS; enables their interoperability; and provides common tools for interfacing with CAD, repairing geometry, creating meshes and post-processing results. Instrumental to the successful integration of this unparalleled breadth of technology is a "well-architected," open and extendable software framework.

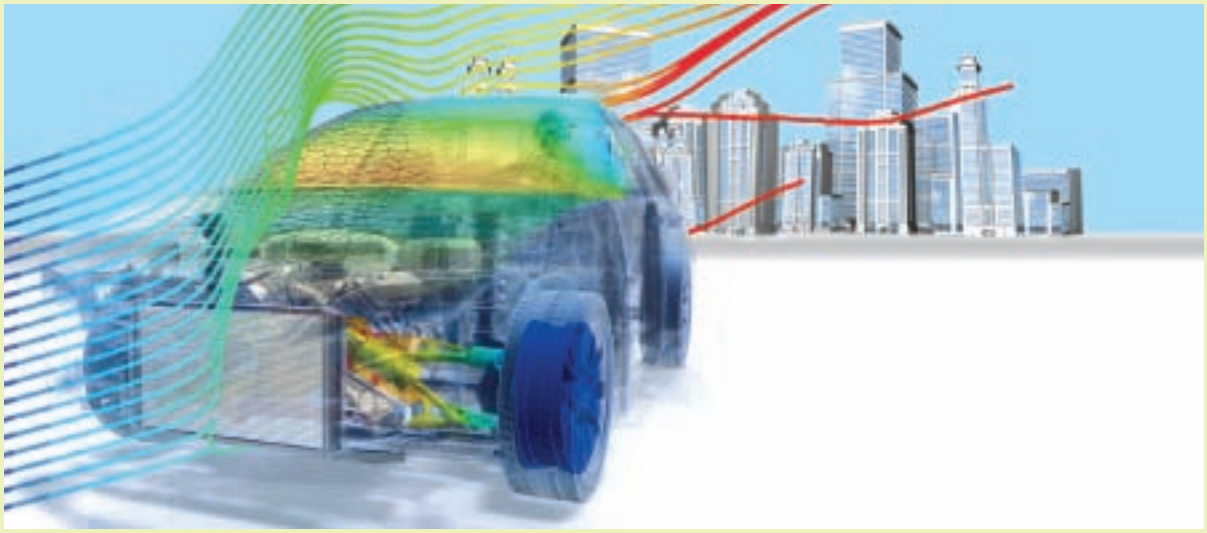
The ANSYS Workbench framework is designed to provide common services for engineering simulation applications — data management, parameterization, scripting and graphics, among others. Release 12.0 relies heavily on the framework's data management and parameterization services to integrate existing applications into the ANSYS Workbench environment, where they have become highly interoperable. Over subsequent releases, these applications will leverage the framework's graphical toolkit to establish a consistent user interface and further blend the various applications integrated into the platform. At the onset of developing ANSYS Workbench 2.0, we identified scripting and journaling as fundamental requirements of the new architecture. As such, a top-level scripting engine has been thoughtfully designed and lays the groundwork for future ANSYS Workbench customization and batch processing. Looking beyond release 12.0, all these services will be further refined and will fuel rapid add-in development and a further expansion of capabilities. Over time, ANSYS customers and partners will leverage the framework's open architecture, enlisting its services to create tailored applications, and will elevate ANSYS Workbench as an application development platform for the engineering simulation community.

Simulation Process and Data Management

ANSYS Workbench 2.0 is an environment in which a single analyst creates and executes one or more steps of an engineering simulation workflow. ANSYS Engineering Knowledge Manager (EKM) extends ANSYS Workbench by providing the tools to manage the work of a group of analysts and myriad simulation workflows. This includes system-level services to manage and foster collaboration on thousands of models, terabytes of results, hundreds of defined processes and huge investments in simulation.

Looking forward, ANSYS believes that managing data and processes will become integral with engineering simulation. Ten years ago, simulation comprised three discrete and sequential phases: pre-processing, solving and post-processing. With the evolution of ANSYS Workbench, we now look at engineering simulation as a continuous workflow intertwining these steps. In the same way, process and data management will become intertwined





As mechanical and electrical engineering worlds converge, the combination of ANSYS and Ansoft technologies will allow engineers to analyze the behavior of combined systems.

with simulation, expanding its role and aligning it with business processes such as product lifecycle and supply chain management.

Electromechanical System Simulation

The ANSYS acquisition of Ansoft anticipates a trend in the realm of engineering and design: The mechanical, electrical and software engineering worlds will rapidly converge. Several years ago, the synchronization of these worlds was coined "mechatronics," and, today, the combined disciplines are responsible for engineering the electromechanical systems found in everything from washing machines to airplanes. A simple examination of the automotive industry reveals that the more recent and exciting advancements have relied on mechatronics. So, at a time when greeting cards and tennis shoes contain microprocessors and sensors, mechatronics is not just for high-end cars and appliances; rather it is the key to unleashing innovation in every industry.

For many years, electrical and mechanical engineering teams have increasingly relied on simulation to accelerate innovation, but each camp has adopted simulation tools that were not fully capable of addressing the needs of the other — until now. As the separation between the electronic and mechanical worlds becomes increasingly blurred, ANSYS has extended its range of simulation technology by incorporating Ansoft's world-class product portfolio. Standardizing on ANSYS Workbench for Simulation Driven Product Development means establishing a common platform on which to further develop both mechanical and electronic components and analyze the behavior of the combined systems. Driving innovation with mechatronics will require a comprehensive electromechanical simulation environment developed by a leader in both mechanical and electronic simulation software.

The Future Begins Now

With its advancements in individual physics, high-performance computing, multidomain simulation, meshing, and key enabling technologies such as simulation workflow and data management, release 12.0 clearly delivers on the ANSYS vision for Simulation Driven Product Development. But even though we have come a long way with the advent of ANSYS 12.0, there is still an exciting journey ahead. Standing on the strong foundation of all that ANSYS has learned and developed in almost 40 years of leadership in engineering simulation, we see many new opportunities on the horizon that will extend the reach of how customers use our technology. The ANSYS vision and strategy continue to set our bearings, and we continue to invest in pioneering new frontiers of the industry. And most important is that we remain committed to enabling customers to use simulation to develop innovative products that perform better, cost less and are brought to market faster. ■

This article was written through contributions from Todd McDevitt of ANSYS, Inc.