Manufacturers face a constant demand for higher efficiency, whether they are designing the latest aircraft, automobiles, turbines or biomedical devices. In these and many other industries, computational fluid dynamics (CFD) software is what enables product developers to bring new concepts to life, optimize performance and bring ideas to market faster than the competition.

CFD is the science of predicting fluid flow, heat and mass transfer, chemical reactions and related phenomena by solving mathematical equations. To be effective, it requires extremely computationally intensive software that performs complex physical modeling used in engineering design and analysis. This software, in turn, needs hardware platforms that can deliver comparable speed and reliability.

This is what makes the CFD solution from ANSYS and IBM so powerful. It combines the leading CFD software platform, ANSYS® Fluent®, with a complete portfolio of ultra-reliable, high-performance systems, clusters and storage from IBM.

Solution Overview
ANSYS Fluent is one of the most powerful CFD tools available. Its ability to model fluid flow and heat transfer in complex geometries is unparalleled, and its extensive physical modeling capabilities are used in a wide range of applications, from furnaces to helicopters to nuclear reactors to wastewater treatment plants.
Fluent software leads the engineering simulation industry in the number of complex physical models it can solve using unstructured meshes. It enables combinations of elements in a variety of shapes, including quadrilaterals and triangles for 2D simulations and hexahedra, tetrahedra, polyhedra, prisms and pyramids for 3D simulations. Its total range of capabilities includes:

- Sophisticated numerics and robust solvers
- Turbulence simulation
- Acoustics analysis
- Dynamic and moving mesh modeling
- Heat transfer, phase change and radiation modeling
- Reacting flow simulation
- Multiphase modeling.

ANSYS Fluent delivers powerful, scalable high-performance computing (HPC) capabilities. Parallel processing enabled by ANSYS HPC, allows users to consider higher-fidelity CFD models, including larger systems, greater geometric detail and more complex physics. Using 64-bit technology, ANSYS Fluent can run parallel calculations on meshes consisting of a billion cells or more. The result is enhanced insight into product performance that can’t be gained any other way. This detailed understanding can reveal design issues that might lead to product failure or troubleshooting delays. Using HPC to understand detailed product behavior provides confidence in a design and helps ensure that a product will succeed in the market.

The technology in ANSYS Fluent is optimized for the latest multi-core processors. It benefits greatly from recent improvements in processor architecture, algorithms for model partitioning combined with optimized communications and dynamic load balancing between processors. This is why it works exceptionally well on systems from IBM.

**High-performance computing**

Because ANSYS Fluent is so computationally intensive, it requires innovative HPC platforms to run at maximum efficiency and deliver the results engineers expect. IBM offers an extensive portfolio of HPC systems and storage, as well as decades of experience solving complex problems in numerous industries. By partnering with IBM, ANSYS allows users to choose a single, reliable source for world-class CFD solutions that optimize product performance and improve product development processes.

The centerpiece of the IBM portfolio is the IBM Intelligent Cluster integrated solution, which is built on the highly innovative IBM System x® rack, BladeCenter® and iDataPlex® servers. These solutions can be optimized to meet CFD-specific requirements. They offer significant price/performance advantages and can reduce power and cooling costs up to 50 percent while maximizing performance density — which is critical for HPC workloads.

**IBM System x.** The IBM System x3550 M3 builds on the latest Intel® Xeon® processor technology with extreme processing power plus superior energy-management and cooling features to meet demanding workloads at a lower cost per watt. The IBM System x3650 M3 also provides high performance for mission-critical applications with an energy-efficient design that supports more cores, memory and data capacity in a scalable 2U package. For enterprise server applications, the IBM System x3850 X5 offers exceptional performance and reliability with highly flexible configurations and memory expansion options.

**IBM BladeCenter.** This highly integrated system helps reduce management complexity, increase performance and energy-efficiency, and significantly reducing costs. The IBM BladeCenter HX5 enables unprecedented performance and utilization in a blade form factor for database and virtualization. With enhanced MAX5 scalability, the HX5 blade offers memory capacity of up to 640 GB — in a double-wide blade. The result is optimal server utilization with more virtual machines per system and larger and faster databases. IBM BladeCenter HS22 and HS22V blade servers improve the economics of the data center even more with up to 23X faster performance than older servers, plus phenomenal reductions in energy and connectivity costs, IT footprint and networking cables.

**IBM System x iDataPlex.** This large-scale solution can help users deal with constraints in power, cooling or physical space. The innovative design of the iDataPlex solution integrates Intel Xeon processor-based processing into the node, rack and data center for power and cooling efficiencies, and required compute density. Its flexible design is ideal for large-scale data centers. It dramatically reduces air conditioning expense, yet offers up to 5X compute density for efficient space utilization.
IBM ISV & Developer Relations
Solution Brief

Manufacturing

IBM storage solutions. These innovative storage technologies include IBM Scale Out Network Attached Storage (SONAS), which is designed to embrace and deliver cloud storage in the petabyte age. SONAS provides extreme scalability to accommodate capacity growth for up to 21 petabytes and manages multiple petabytes of storage and billions of files in a single file system. The IBM General Parallel File System (GPFS) is a high-performance enterprise file management solution that enables seamless capacity expansion and high reliability/availability. IBM also offers a wide variety of tape and disk-based storage technologies.

Solution benefits
ANSYS Fluent software is a fast, accurate and robust CFD solution. Its built-in physical models simulate a multitude of complex processes, while add-on modules and customization tools allow for more specialized applications. Combined with the power, performance and reliability of IBM solutions for HPC, ANSYS Fluent provides everything manufacturers need to improve the quality of new designs and bring new offerings to market faster and with lower costs.

Advantages of the ANSYS and IBM solution for CFD include:
• **High performance.** The Intelligent Cluster is an ideal solution for heavy-duty compute workloads such as CFD. With its broad range of server platforms, processor choices, accelerator options, robust storage solutions, networking/communications fabrics and operating systems, users can configure a solution that delivers speed and performance parameters that are closely aligned with the specific engineering design application.

• **Lower operating costs.** Components in the Intelligent Cluster are designed to deliver maximum computing power with the most compact, energy-efficient footprint possible. This means users can right-size the data center for any design lab, minimizing power consumption and cooling demands without compromising the performance of the ANSYS Fluent software.

• **Easier deployment.** User-friendly ANSYS Fluent software makes it easy for new users to reach top productivity more quickly. Behind the scenes, IBM Intelligent Cluster solutions are shipped having been thoroughly tested, assembled, cabled and prepared for rapid deployment.

ANSYS Fluent and IBM Benchmark Results

IBM provides the HPC platforms and storage required to run ANSYS Fluent software at maximum efficiency with high availability and lower operating costs.

Sample configurations
There is an IBM solution for every ANSYS Fluent workload.
ANSYS and IBM: advanced design

With innovative ANSYS software driven by high-performance IBM hardware platforms, the joint value of this offering for design engineers and analysts is considerable. It brings together a leader in CFD tools and technology with a proven provider of the solutions required to manage highly specialized computing workloads.

ANSYS

With the unequalled depth and unparalleled breadth of ANSYS engineering simulation solutions, companies are transforming their leading-edge design concepts into innovative products and processes that work. Today, almost all of the top 100 industrial companies on the FORTUNE Global 500 invest in engineering simulation as a key strategy to win in a globally competitive environment. They choose ANSYS as their simulation partner, deploying the world’s most comprehensive multiphysics solutions to solve their complex engineering challenges. The engineered scalability of solutions from ANSYS delivers the flexibility users need, within an architecture that is adaptable to the processes and design systems of their choice.

IBM

Generating insight from the growing velocity, volume and variety of data is an extraordinary challenge for any organization’s IT infrastructure. Computing workloads are becoming more and more sophisticated and specialized. These workloads require computing systems that are tuned to the performance demands and characteristics of each workload. This is what IBM delivers. IBM offers a broad systems and storage portfolio combined with decades of experience solving real business problems in many different industries. With x86, POWER® and mainframe systems, disk, tape and network storage systems, IBM can offer the right combination of systems to meet the challenges of any business.

For more information

To learn more about IBM systems, servers and storage solutions, contact your IBM sales rep or visit:

ibm.com/systems/deepcomputing/

To learn more about ANSYS, please visit:

www.ansys.com or email hpcinfo@ansys.com