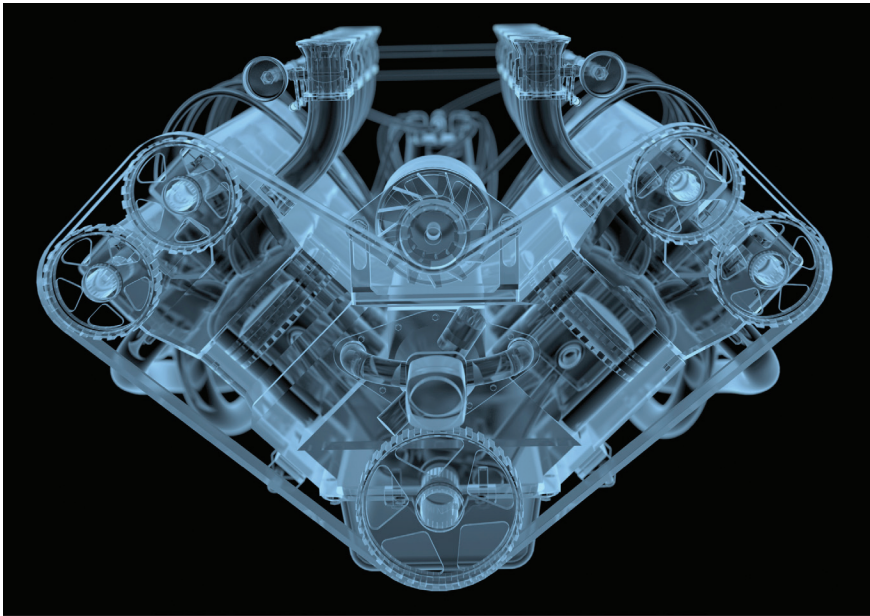




Lenovo Solution for Engineering Analysis

Boost productivity with a more capable infrastructure



Highlights

- Flexible building-block approach to easily select the right systems to power CAE workloads
- Pre-integrated, pretested Intelligent Cluster helps ensure engineering environments are rapidly deployed with greater reliability
- Applications run more quickly on clusters optimized for CAE
- Resource and workload management software improves IT resource utilization and manageability
- End-to-end cluster support reduces deployment and operational issues
- Lenovo ThinkStation offers extreme workstation performance, supports up to three accelerators

Testing and simulation tools play a crucial role in helping engineering teams understand product performance and verify component designs in a risk-free environment.

These applications require high-performance computing (HPC) systems capable of rapidly executing sophisticated simulations and processing large data sets. However, many organizations have limited IT resources to devote to deploying and administering the systems required for such tasks, and could benefit from a computing environment that is flexible, simple to manage and easy to scale without posing an undue burden to their staff.

Lenovo is helping organizations across all industry sectors meet their engineering and design goals by providing an optimized computing infrastructure tailored to their unique requirements. Lenovo servers, storage and HPC software—including cluster, workload and data management software—are designed to help manufacturers develop products better, faster and at less cost.

Since no two engineering software application requirements are the same, Lenovo offers a flexible, building-block approach that makes it easy for organizations to acquire, deploy and manage a robust engineering environment for their most demanding computer-aided engineering (CAE) workloads. With the Lenovo Solution for Engineering Analysis, IT decision makers can simply deploy the right infrastructure—down to the recommended number and types of servers, storage, networking and adapters.

**Versatile
and efficient
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Seventy-five percent of CAE users surveyed rated “integrated and application-optimized” top buying criteria when purchasing a CAE cluster solution.¹

Essential solution to meet demanding engineering workloads

Across all industries, simulations now require increasingly complex models, which place unique workload demands on the computing infrastructure. Based on System x servers, storage and software selected to meet these engineering requirements, Lenovo Solution for Engineering Analysis offers a flexible, yet powerful approach (see Figure 1). The solutions are ideally suited for demanding CAE applications ranging from structural mechanical analysis and flow to general-purpose computational fluid dynamics (CFD), such as aerodynamics, heating, ventilating and air conditioning (HVAC) and fluid flow.

Using building blocks for infrastructure deployment, adding more compute capacity is as simple as adding the right number and type of pre-configured building blocks to meet your engineering needs.

Recommended building blocks include:

- **Structural mechanics:** To perform structural integrity, vibration analysis or acoustics testing requires a high-performance server with large local storage for scratch I/O and moderate-to-extreme memory and I/O capabilities. The **System x3550** M5 1U server or **System x3650** M5 2U rack server meets those demands with a combination of power, efficiency and reliability. The x3550 server is a price-performance leader supporting up to two Intel® Xeon® E5-2600 v3 processors, up to 1.5 TB TruDDR4 Memory and 24 TB internal storage. The x3650 server offers an array of storage configurations (up to 26 drive bays) that optimize structural testing workloads. It provides full end-to-end 12 Gbps support for up to four RAID adapters for enhanced performance and data protection. The platform enables users to create a mix-and-match offering with compute, storage and acceleration, including support for graphics processing units (GPUs) or Intel® Xeon Phi™ coprocessors.
- **Computational fluid dynamics (CFD):** Here again, the x3550 runs CFD workloads exceptionally well while providing desired flexibility and cost efficiencies. For larger engineering projects in need of more than 30 servers, the density-optimized **NeXtScale System nx360** M5 server combines superb performance and efficiency to meet the demands of aerodynamics, cooling, HVAC or combustion analysis applications. It leverages a dense chassis design with the ability to pack up to 72 servers, networking and storage into a standard 19-inch rack. A typical rack holds only 42 1U systems, but this chassis doubles the density (up to 84 compute servers within the same footprint).
- **Impact analysis:** Crash or impact testing requires a server with parallel scalability, typically up to 64 or 128 cores. Modest memory requirements and I/O capabilities are also typical. Integrated with two Intel Xeon processor E5-2600 v3 series processors, either of the **x3550** or **NeXtScale** M5 servers will provide optimum performance for demanding crash simulation and impact analysis workloads.

- Head/management servers:** The x3650 M5 server is an ideal head/management server. To simplify deploying and managing CAE clusters, Lenovo offers IBM Platform HPC, an all-in-one workload and resource management software. With the ability to perform cluster provisioning, monitoring and management, along with workload scheduling and reporting, Platform HPC provides all the functions needed to easily deploy, administer, monitor and use a high-performance cluster.
- 2-D/3-D remote visualization:** With a choice between the x3650 M5 or NeXtScale servers, you can't go wrong when selecting a remote 3-D graphics server. NeXtScale offers PCIe Native Expansion (NeX) trays and the ability to pack two GPU adapters into a 1U slot. The system lets you create an ultra-dense GPU or Intel Xeon Phi node with up to two high-powered accelerators attached to a single compute node within 1U effective rack density. You can accelerate application performance by offloading compute-intensive portions to the GPU, while the remainder of the code still runs on the CPU.
- Networking:** This essential solution contains integrated networking that is designed for ease of implementation, operations and optimal application performance. A Gigabit Ethernet "top of rack" switch handles cluster access and administration. The network can be readily incorporated into a variety of customer campus networks. Additionally, the solutions contain a high-speed InfiniBand-based network. The majority of CAE software packages are designed to take advantage of this high-speed network using Platform MPI. The data storage system can also be readily configured to take advantage of the network.

Top-rated reliability and customer satisfaction

In a recent survey by Technology Business Research Inc. (TBR), customers rated hardware quality, ongoing reliability, performance, virtualization, efficiency and scalability as the most critical attributes to consider when purchasing x86 servers. Results from the same survey showed System x servers achieved the top ranking across all attributes—earning it a No. 1 rating in overall customer satisfaction. The ranking demonstrates the ability of System x servers to meet the evolving demands of today's enterprises.²

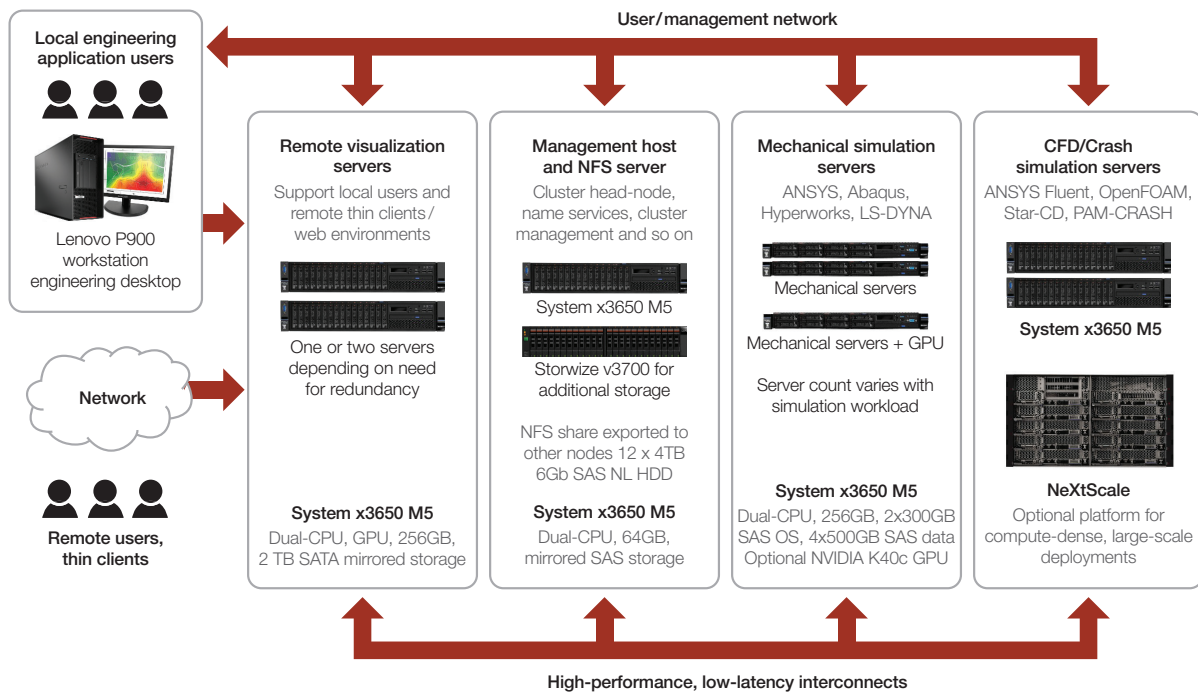


Figure 1. Lenovo Solution for Engineering Analysis

Faster time to results

Lenovo Solution for Engineering Analysis can help engineering companies transform and integrate their engineering analysis infrastructure to develop products better, earlier and at less expense.

Optimize storage efficiency, simplify management

To complement CAE server environments while delivering flexibility and innovative storage functions, Lenovo offers the IBM Storwize V3700. Users can leverage the internal storage from the x3650 management server for modest storage requirements or use the Storwize V3700 for larger, more expandable storage needs. This easy-to-use system can handle the volumes of data used and generated by engineering, design and simulation applications; enable rapid and flexible cloud services deployments; and deliver the performance and scalability needed to gain insights from the latest analytics technologies.

Thin provisioning optimizes efficiency by allocating disk storage space in a flexible manner among multiple users, based on the minimum space required by each user at any given time. This process can help organizations save power, lower heat generation and reduce hardware space requirements. Storwize V3700 also includes storage pool balancing that operates automatically to distribute data across arrays in a pool to deliver balanced array performance and help eliminate the need for manual tuning. The function is sensitive to different drive types and takes each of their capabilities into account with no intervention required.

Accelerate engineering testing and analytics

When you need to run more design cycles, simulations and analysis to get business results more quickly, HPC cluster and workload management can help accelerate your results. The Lenovo Solution for Engineering Analysis offers pre-integrated IBM Platform Computing software or the ability to plug into your existing managed environment.

Consider IBM Platform HPC—it allows engineers to focus on their work rather than on the intricacies of managing CAE workloads. Out-of-the-box features include IBM Platform LSF workload and resource scheduler and the Platform Application Portal, designed to help reduce the complexity of CAE. You get higher utilization and greater throughput—the software stops and starts jobs automatically, moves them to the right resource in the right priority and helps maximize your infrastructure for every task.

Screaming fast and reliable workstations

The award-winning Lenovo ThinkStation P900 workstation offers dual Intel Xeon processors, up to 1 TB of memory and up to 14 disk drives. It also has the capacity to hold up to three NVIDIA Tesla cards or two Intel Xeon Phi coprocessors. With a 92 percent efficient power supply, it delivers 1,300 watts internally, the highest in the industry. A key feature is the flex connector that allows the fastest Peripheral Component Interconnect Express (PCIe) storage options. This product is designed for extreme reliability.

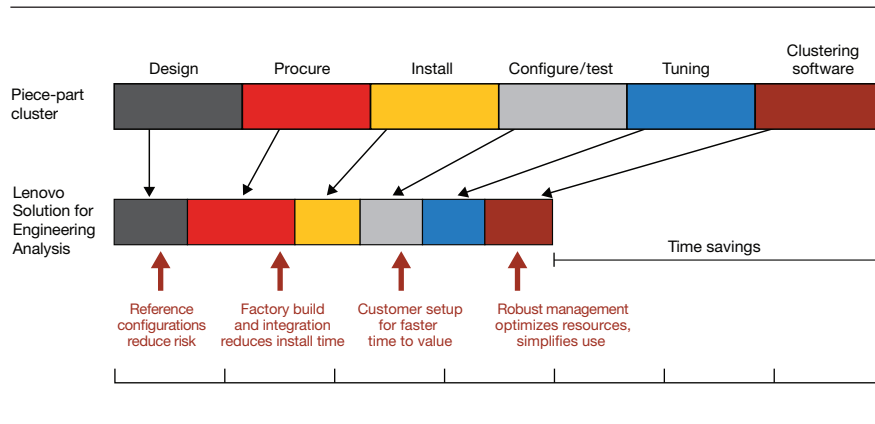


Figure 2. Save time and lower risk with Lenovo Solution for Engineering Analysis

Reduce complexity and save time

Lenovo Solution for Engineering Analysis can be deployed as a cluster with individual part numbers per building block, or as an Intelligent Cluster. The Intelligent Cluster significantly reduces complexity by delivering a preassembled, pretested, integrated cluster comprised of best-in-industry Lenovo and third-party components. Lenovo provides on-site setup of an Intelligent Cluster and supports it as a single solution instead of as hundreds of individual components. Lenovo also serves as a single point of contact for solution-level support for maximum system availability throughout the life of the system. As a result, engineering companies can spend less time maintaining systems and more time producing faster, higher-quality results.

Build on a solid foundation

As data volumes expand, engineering and testing applications require more compute power, and engineering companies of all sizes need more powerful and affordable solutions. Lenovo Solution for Engineering Analysis enables you to create a high-performance environment that is efficient and flexible (see Figure 2). Your organization gains greater access to computing and application resources to meet today's demanding workloads. These resources can be rapidly provisioned and deployed with minimal management. Engineers can become productive quickly, easily submitting more simulations and completing more complex design analysis faster.

Why Lenovo?

Lenovo is a global personal and enterprise technology company—the largest PC and systems company in the world—serving customers in more than 160 countries. Dedicated to building exceptionally engineered PCs, mobile Internet devices and servers spanning entry through supercomputers, Lenovo has built its business on product innovation, a highly efficient global supply chain and strong strategic execution. The company develops, manufactures and markets reliable, high-quality, secure and easy-to-use technology products and services. Lenovo recently acquired IBM's x86 server business. With this acquisition, Lenovo is adding a best-in-class x86 server portfolio along with HPC and CAE expertise.

For More Information

To learn more about Lenovo CAE infrastructure solutions, please contact your Lenovo sales representative or Lenovo Business Partner, or visit: www.lenovo.com/solutions/hpc



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¹ Accelerating Realistic Simulation webcast survey, February 2014

² System x® Server White Paper, January 2015 ©2015 Technology Business Research Inc. www.lenovo.com/images/products/server/pdfs/whitepapers/systemx_top_customer_service.pdf

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