Higher-Performance Computing

How Lenovo helps workstation users scale up to the power of HPC

For many years, enterprises with demanding engineering, simulation, and analytics workloads have leveraged the power and reliability of workstations. However, with today's ever-growing demands for faster results and better insights, as well as emerging big data, machine learning and artificial intelligence (AI) initiatives, scaling performance beyond a single workstation's capabilities is fast becoming a requirement in the enterprise. Scaling up with an HPC cluster is becoming increasingly attractive and can drive significant business benefits beyond higher performance.

Scaling beyond a single system can seem complex and expensive, but Lenovo makes the transition to clusters simple and affordable for enterprises across multiple industries. In fact, it can even be more expensive not to run a cluster, considering the lost business opportunities that competitors are unlocking today.

One company taking advantage of a Lenovo HPC cluster is Vestas, a leading global wind turbine organization. Besides computer aided engineering (CAE) simulations to optimize their designs, Vestas leverages their big data sources on existing wind power farms to keep their competitive edge. The insights uncovered with the Lenovo cluster enables Vestas to pinpoint optimal locations for turbine placement and new sales opportunities. By utilizing Machine Learning techniques on data from the many sensors out in the field, they can continually improve upon their best-in-class maintenance. For Vestas, HPC technology has become essential to maintaining their business advantage.

Successes like at Vestas are being replicated across industries from manufacturing to life sciences with varying applications, adoption curves and customer bases. However, the overall storyline remains the same: HPC clusters are a prerequisite for transformative businesses, and smart companies are leveraging their power to stay ahead of the competition.

HPC's competitive edge

The enterprise that leverages a cluster to get results in minutes or hours instead of waiting overnight (or longer) gains a significant competitive advantage. Hyperion Research pointed out in an extensive market study in June 2018, that a HPC cluster provides a better ROI in terms of improved productivity and solution time to market. Confirming that, the U.S. Council on Competitiveness detailed in a recent study, the benefits of HPC for U.S. industry can be summarized in one sentence: "To out-compete is to out-compute".

Extending a workstation environment with HPC in the enterprise offers better collaboration, scalability of workloads, and dramatic performance improvements. The enterprise can leverage workstations for visualizations, data interfaces, analytics, and running proof-of-concept simulations, and take advantage of the scalable compute power of HPC clusters for larger and more granular simulations. For example, a number of oil and gas industry companies have used both Lenovo ThinkServer HPC clusters as compute back-ends for Lenovo ThinkStation workstation front ends running Hue visualization applications.

The benefits of Lenovo HPC

Lenovo is the #1 supercomputer provider in the world today as measured by placements in the TOP500 list. Powered by Intel® Xeon® Scalable processors, Lenovo HPC solutions boost performance, accelerate innovation and drive breakthroughs, all while minimizing costs and risks. In the words of Anders Rhod Gregersen, Chief Specialist at Vestas, "Supported by the powerful Lenovo cluster... we can confidently report to potential customers how much electricity their proposed site will produce – giving them peace of mind that they'll get a healthy return on their investment."

High-performance computing is not just running the highest frequency processors; an optimal HPC solution requires high-performance servers, interconnects, storage, software and expertise. Across the board, Lenovo delivers.

Fully integrated solution

All the server, networking, storage and software can come together in a Lenovo Scalable Infrastructure (LeSI) solution, which leverages decades of engineering experience and leadership to reduce complexity of deployment, and deliver an integrated, fully-supported solution that matches best-in-industry components with an optimized solution design. This enables maximum system availability and rapid root-cause problem detection throughout the life of the system.

Servers tailored to your needs

Whether you're looking for energy efficiency, highly dense computing, reduced TCO or GPU-enabled hybrid solutions, the Lenovo HPC portfolio has a wide array of options. Building blocks of a Lenovo HPC solution custom-built for your compute needs could include:

ThinkSystem SD530 - An ultra-dense platform of four nodes in 2U without compromising on IO and storage.

ThinkSystem SD650 - Built on Lenovo Neptune™ liquid cooling technologies to deliver higher performance or energy savings.

ThinkSystem SR650 - A highly-reliable 2U server setting performance world-records and providing maximum configuration flexibility.

ThinkSystem SR630 - A powerful 1U server offering the optimal balance between density and IO and storage richness.

High speed interconnects

Many HPC customers require advanced fabrics for high speed, low latency communication especially for scale-out workloads. One example of this interconnect is Intel® Omni-Path® Architecture (OPA), which supports up to 100 Gb/s throughput. But Intel® Omni-Path® isn't just a faster fabric. It's also re-architecting how data is moved throughout the system to minimize the bottlenecks associated with I/O and increase overall system performance.

High-octane, scalable storage

Lenovo features multiple storage platforms for HPC storage. Your storage investment is future-proofed, making data silos a thing of the past. Among the HPC-ready storage options available for Lenovo clusters are:

- **Lenovo Distributed Storage Solution for IBM Spectrum Scale (DSS-G).** DSS-G offers a modular, building-block approach for Spectrum Scale, enabling customers to scale up or scale out their storage on the fly as demands change. Yet even with data storage potentially located at multiple sites, DSS-G still maintains a global namespace that enables users to view everything as a single storage cluster. It's no surprise then, that Lenovo DSS-G won the HPC Wire 2017 Readers Choice Award for Best HPC Storage Product or Technology.

- **Lenovo and SUSE Enterprise Storage, built on Ceph**. Another software-defined HPC storage solution is called Ceph. SUSE Enterprise Storage separates the physical storage hardware from the data storage logic, or the control plane and can handle any type of data you have. File share systems use file structure, client servers use block storage and newer applications may use object storage.

Easy to use software

Finally, Lenovo supports the most prevalent Linux distributions to align with your IT preferences, including SUSE Linux Enterprise Server. SUSE® software runs on 50 percent of the world's top 50 largest supercomputers. SUSE Linux Enterprise Server is the only Linux distribution that includes supported OpenHPC packages within the distribution.

Lenovo intelligent Computing Orchestration (LiCO) provides a unified web portal access to this open source software stack simplifying the management and use of distributed clusters for HPC workloads and AI model development.

Expertise to help you when you need it

Lenovo HPC Deployment Services can help you speed time to production while reducing risk. With a wide range of services from basic hardware installation and custom advanced configurations, to migration and expansion services, Lenovo professionals bring vast experience, provide field-tested implementation best practices and recommend verified software to help you avoid trial-and-error iterations.

Lenovo's HPC team, who have helped customers accelerate their workloads by 10x or more, regularly refers customers to three Lenovo HPC & AI Innovation centers in Stuttgart, Germany; Morrisville, North Carolina; and Beijing. Here Lenovo's HPC and AI specialists provide access to clusters running software stacks and sample data sets comparable to what many customers currently run on their workstations. This means customers get first-hand experience using bleeding edge technology with data and software representative of their typical workloads and the often tremendous speedup that comes with scaling up to an HPC environment. During this process an optimal design for the customer's workflow and application can be determined. In addition, customers can get previews of Lenovo's future roadmap of server, storage, networking, services, and solutions offerings.

Get started today

Transitioning from workstations to a high performing cluster demands a leading-edge provider to make that "incredible impact" real for every customer. Consult your Lenovo HPC solutions specialist today to find out how HPC can improve your competitive advantage, and to inquire about benchmarking to find out precisely how much HPC can accelerate your specific workflow.

Contact your Lenovo representative