

# LENOVO: A TRUSTED PARTNER IN HPC

CUSTOMER-CENTRIC STRATEGY AND NEW CAPABILITIES ARE HELPING LENOVO WIN

## SUMMARY

When Lenovo purchased the IBM System x business in 2014, customers were naturally anxious to see how their relationship with their system vendor would change. This was especially true for their High Performance Computing customers who were accustomed to enjoying a close working relationship with experienced engineers and scientists. They wondered if the new company would exhibit the same passion and expertise for the HPC market and retain its commitment to innovative products and customer collaboration. After all, if these customers didn't value the close relationship with the experts and the high-quality products one expects from Big Blue, they probably would have purchased their HPC gear elsewhere. Based on the healthy growth that Lenovo has seen in HPC, where they now, according to [TOP500](#) list announced by the Top500.org in June 2016, rank #2 with 92 systems, it seems safe to conclude that Lenovo is managing the transition quite well.

## HPC CUSTOMERS PLACE HIGH DEMANDS ON THEIR VENDOR PARTNERS

HPC customers want to focus on the science and engineering in their specific field, not computer technology and computer science. Given the staggering size of these systems, it is critical that the system architecture allows them to easily manage the complexity of the compute, network, and storage infrastructure based on open standards. These customers need a vendor partner who thoroughly understands their needs and who is able to collaboratively translate those requirements into the sophisticated high performance computing systems that will allow them to execute their mission. To ensure a successful project, the vendor must have deep expertise and be willing and able to apply that expertise throughout the design, selection, and implementation processes. Finally, the vendor needs to deliver the required computing capacity within the customers' perennially limited budgets.

## LENOVO'S APPROACH TO MANAGING COMPLEXITY

Lenovo system designs are based on industry standards, and yet are innovative beyond the ubiquitous 1U and 2U servers that dominate the low-cost, no-frills server world. |

believe the Lenovo innovations in the 6U, 12 bay NeXtScale System M5 are a particularly good example, offering configuration flexibility in a very dense package, featuring front-loaded CPU compute nodes, GPU accelerators, storage, and PCIe expansion trays. The system also supports both air-cooled and warm-water cooling options to maximize energy efficiency. This design helps customers reduce and manage the complexity of a heterogeneous computing platform, and allows the system to easily evolve to adopt new technologies over time while protecting customers' investments along the way.

## THE VITAL ROLE OF COLLABORATION

HPC users today are facing two key challenges. First, their budget does not allow them to fulfill their technical vision. Second, the currently available technology often does not meet their needs, requiring them to co-design and model the performance of a next-generation solution with their vendor. As the IBM HPC team transitioned to Lenovo, they had to make a decision: they could go the route of low cost/low value vendors, or take the path of remaining a collaborative and trusted partner. Or, could they do both?

According to the Lenovo HPC team, after decades of developing close customer relationships and experience, they realized that this was a key competitive advantage they needed to retain. It was their culture and in their DNA. As a result, Lenovo claims to have retained most of their loyal customers and employees while driving down costs to allow them to attract new clients to their brand.

As important, Lenovo has also been able to retain key expertise in disciplines such as weather, financial services, computer aided engineering (CAE), and healthcare, necessary for customer collaboration. These local and headquarter Lenovo experts, many with decades of experience in HPC, continue to work closely with their customers to ensure a successful installation. According to Lenovo, this kind of collaboration resulted in industry-leading customer satisfaction ratings. It is important to note that Lenovo also retained the right to leverage critical HPC software such as IBM Spectrum Scale, as well as the storage systems critical to HPC installations, so they are able to design a complete solution to their customers' computing challenges.

A few examples show how Lenovo has continued to foster a customer-centric strategy. The first is the Leibniz Supercomputing Centre (LRZ) of the Bavarian Academy of Science and Humanities, one of the largest academic data centers in Europe and a long-time IBM client. LRZ needed to fit their new supercomputer into a tight power budget, and still deliver the level of performance the scientific community demanded. So

Lenovo set out to design and deliver a solution for LRZ and created an innovative design which is now the Lenovo Water Cool Technology Lenovo offers worldwide to their customers.

Another recent example of customer collaboration is the co-design, installation and startup of the Marconi Cluster with Cineca in Italy. Cineca is an inter-university computing consortium based in Casalecchio di Reno, Italy, made up of 70 Italian universities, 5 research institutions and the Italian Ministry of Education, University and Research (MIUR). According to Lenovo, Marconi is the largest Intel Omni-Path cluster in the world, as of June 2016. Lenovo managed the risks and complexities of installing an entirely new interconnect technology when they installed 1,512 nodes with a total of 54,432 Broadwell Xeon cores and a peak double precision performance of 2 petaflops. In order to meet Cineca's schedule, the Lenovo team pre-assembled, configured and shipped the fully populated racks to the Marconi site, enabling them to put the system into production in record time. Now that they are up and running, the next milestone will be the installation of 250,000 Intel Xeon Phi™ (Knights Landing) cores, delivering 11 petaflops peak performance. With this installation, I believe Lenovo has demonstrated that they do not shy away from tackling even the toughest of challenges.

Finally, Lenovo has moved beyond the traditional supercomputing installations and is working with commercial companies to leverage the power of HPC in their businesses. For example, Lenovo is working with Vestas, a Danish wind-powered generator company to optimize the location of their turbines. Using weather forecasting and observational data, Vestas uses big-data tools on Lenovo clusters to develop and use precise models for wind flow to help staff understand wind patterns and turbulence near each wind turbine and select the best location to reduce the cost per kilowatt hour of energy produced.

## DELIVERING THE PERFORMANCE NEEDED AT THE RIGHT PRICE

Price/Performance still reigns king for many HPC users. While not overly glamorous, limited budgets and lofty research goals force many users to steer purchasing decisions toward vendors who can get them the most performance for every dollar spent. According to Lenovo, they are having broad success in public sector space, where pricing is typically a primary purchasing criteria. If so, it appears that Lenovo's world-class supply chain and efficient operational model is helping them win in accounts and markets that were previously too price sensitive for IBM to win.

## THE ROAD AHEAD

The Lenovo HPC team is now turning their attention to the next big challenges in HPC, from next generation GPUs and interconnects, such as NVIDIA Pascal and Intel Omni-Path, to new innovations in processors such as Intel Xeon Phi and those from ARM Holdings. One area of rapid growth and interest to Lenovo is the use of Deep Learning to build artificial intelligent (AI) systems for recommendations and classification. These new application areas require systems that can efficiently train deep neural networks to create artificial intelligences. AI systems learn by sifting through massive amounts of data which can demand trillions of billions of calculations, but they also hold tremendous promise for HPC and enterprise applications that scientists are just beginning to explore. Lenovo is in an enviable position to address this market, since it already has close working relationships with many of the leading internet-scale datacenters driving these innovations. Lenovo can also leverage its customer-centric approach and the power of its world class, low-cost supply chain to work collaboratively with customers who are exploring the potential of Deep Learning which may yield some very compelling solutions and results. As a result, we should expect Lenovo to take a collaborative approach to Deep Learning system designs that will be rooted in solving their customers' specific problems and meet the challenges and promises that AI can present.

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