University of Oxford supports world-class academic research with Lenovo supercomputer

Overview

The University of Oxford, renowned for its academic excellence, wanted to better support researchers from all faculties. With its existing cluster struggling to cope with growing demand for high performance computing, the university worked with Lenovo and OCF to deploy a Lenovo NeXtScale System M5 cluster with over 5,000 Intel processor cores. With the Lenovo solution, the university can now offer researchers from a wide range of disciplines a truly state-of-the-art research tool, helping to maintain its sparkling reputation.

The University of Oxford is a world-leading collegiate research university. Located in Oxford, England, the university offers undergraduate and postgraduate degrees to over 22,000 students, and consistently ranks at the top of international higher education league tables.

Dr. Andrew Richards, Head of Advanced Research Computing at the University of Oxford, says: "The university is one of the highest-ranking academic institutions in the world, renowned for the quality of its facilities, research and teaching. In recent years, demand for high performance computing (HPC) resources has been growing steadily. To adequately support a wide range of research projects, we knew we needed to boost the capacity and processing power of our existing clusters."

High demand for high performance

The Advanced Research Computing facility at the University of Oxford is a central resource available to all university-affiliated researchers in need of high performance computing (HPC). Traditionally the preserve of physical, medical and biological sciences research, HPC systems are now frequently used for computational analysis and data modeling across a wide range of academic disciplines, including humanities and social sciences.

> "The Lenovo supercomputer is helping the University of Oxford maintain its excellent reputation for research."

—**Dr. Andrew Richards,**
Head of Advanced Research Computing,
University of Oxford

Richards says: "Demand for HPC resources has been growing year on year – so much, in fact, that we had to keep our outdated clusters running longer than we would have liked to avoid interruption to services."

As well as facing growing demand from university researchers, the facility was set to receive hundreds of new external users. "The University of Oxford is a member of the Science Engineering South (SES) consortium," explains Richards. "With funding for regional facilities coming to an end, we needed sufficient capacity to accommodate users coming back to our cluster from SES resources – we knew that our existing clusters would not be able to cope."

Out with the old, in with the new

Recognizing that its existing environment would soon be unable to support researchers adequately, the university shortlisted three vendors to implement a new, more powerful system. Dr. Richards recalls: "The Lenovo solution offered high levels of performance we needed, within the physical constraints of our data center and at a very competitive price. After evaluating power, cooling and maintenance costs over a five-year period, we found that Lenovo was 20% less costly than the next-best offering."

Working closely with OCF, a specialist high performance server cluster integrator, the university deployed a cluster based on 340 dual-processor Lenovo NeXtScale System M5 nodes with a total of 5,440 Intel processor cores. Connected by 40GbE Lenovo RackSwitch G8332 switches to the university's existing Panasas storage system, the Lenovo NeXtScale compute nodes run Simple Linux Utility Resource Manager to schedule jobs. Selected nodes in the cluster also feature NVIDIA Tesla K40 GPUs.

Dr. Richards comments: "Anyone can use the GPUs to accelerate research applications and we now have a large, and growing, GPU community within the university, including researchers in the UK national Networked Quantum Information Technologies program, which is led by our university. We plan to add K80 nodes to our existing K40 GPUs to further support researchers of all disciplines."

To minimize downtime at the point of deployment, Lenovo designed the 12-rack architecture in two six-rack sections, which OCF implemented one at a time. "We appreciated the efforts Lenovo and OCF went to in order to ensure that our services were affected as little as possible by this transition, with a total downtime for our research community of just two weeks," says Dr. Richards.

Invaluable research tool

The new Lenovo cluster, codenamed Arcus Phase B, will support research across the University of Oxford. Dr. Richards says: "The supercomputer will support around 120 active users per month and use little more electrical energy than our old 1,200 core cluster, despite having 5,440 cores. The Lenovo solution's energy-efficiency means that we are already achieving the promised cost savings."

Solution components

Hardware
Lenovo NeXtScale System nx360 M5
Lenovo RackSwitch G8332
Intel Xeon processors

Software
SLURM Workload Manager

He continues, "All of this extra available processing power has significantly improved performance. Waiting times for data simulations are now much shorter—we've gone from two days typically down to less than 24 hours. Researchers are making the most of this boost in performance by ramping up the complexity of their applications and experiments."

By deploying the high-performance Lenovo solution, Oxford has enabled more users than ever before to take advantage of state-of-the-art computational research tools. Although the university's decentralized organizational structure means that faculties can choose to build their own clusters, the performance and cost-efficiency of Arcus is attracting an ever greater number of users.

"The utilization of our cluster is high, typically 80% around the clock, all year round," says Richards. "This translates into high cost-efficiency, because we are making sure that the investment in computing resources is actually doing useful work. We want to spread the message that this centralized cluster is convenient, efficient, and offers much better value than departmental solutions. Lenovo is helping us in this effort by maintaining the original pricing model as we expand the cluster—making it easier to encourage new groups to get more 'bang for their buck' by investing in Arcus rather than in their own smaller clusters."

Dr. Richards concludes: "The Lenovo supercomputer is helping the University of Oxford maintain its excellent reputation for research. No longer just the domain of traditional users, researchers from a wide range of disciplines now utilize computational analysis in their attempt to better understand the world. Instead of trying to analyze mountains of data on departmental desktops or personal laptops, our HPC resources rapidly accelerate the process, enabling researchers to get more detailed results faster."

For more information

To learn more about Lenovo Enterprise Systems contact your Lenovo Sales Representative or Lenovo Business Partner, or visit: lenovo.com/systems

For more information about the University of Oxford, visit: www.ox.ac.uk or connect with @UniofOxford

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