CASE STUDY
Intel® Xeon® processor 5500 series
High-Performance Computing
Energy Efficiency: Environment and Performance

Serious Performance

Intel® Xeon® processor–based SGI Altix* systems deliver dense, energy-efficient performance for Oxford Supercomputing Centre

You have to love an institution that names its high-performance computing (HPC) systems after fictional supercomputers that committed murder or mayhem. But if the Oxford Supercomputing Centre (OSC) at the University of Oxford shows a whimsical side in naming its systems, it is completely serious when it comes to helping researchers use them to solve complex research challenges. Two of the OSC's most powerful supercomputers are SGI Altix* systems based on the Intel® Xeon® processor family, including a dense SGI Altix Integrated Blade Cluster (ICE) powered by the Intel Xeon processor 5500 series.

OSC OXFORD SUPERCOMPUTING CENTRE

"SGI Altix* enables the OSC to tackle complex research projects that were not previously possible...The reliability of the equipment means that we can spend more of our time with our users, enhancing their research."

– Jon Lockley, Manager, Oxford Supercomputing Centre

CHALLENGES

- **Expanding capacity.** Building on its success in meeting the needs of campus researchers, the OSC received funds to expand its HPC resources and extend its services to commercial users.
- **Scale and flexibility.** The center needed a flexible platform that could run a wide variety of technical applications and scale to meet fast-growing requirements.

SOLUTION

- **Intel® Xeon® processor–based performance.** The OSC selected a 528-core SGI Altix ICE blade cluster powered by the Intel Xeon processor 5500 series, adding it to an SGI Altix 4700 blade cluster based on the Intel Xeon processor 5400 series.

IMPACT

- **Dense, energy-efficient performance.** The Intel Xeon processor 5500 series' energy-efficient performance helps SGI pack up to six teraflops of computing muscle into each rack, enabling OSC to reduce operating costs, free up floor space, and run a cooler, greener data center.
- **Research progress.** The newest Intel Xeon processor–based SGI system brings OSC up to 30 teraflops of total performance, enabling users to advance their understanding of a wide range of complex issues.

High Performance Drives Progress

From nanotechnology to climate change, scientific and technical progress increasingly depends on high-performance, data-intensive computing. In 2008, the Oxford Supercomputing Centre surveyed available technologies and chose an Intel Xeon processor 5400 series–based SGI Altix 4700 cluster to support researchers across the University of Oxford. Named Red Queen after the supercomputer in the horror film and video game *Resident Evil*, the cluster has supported research in astronomy, chemistry, biology, and other fields.

When OSC received funding to add support for commercial users, it again conducted a broad survey of available technologies and chose an Intel Xeon processor–based solution from SGI. This time, OSC selected an SGI Altix ICE cluster powered by the breakthrough energy-efficient performance of the Intel Xeon processor 5500 series. The new 528-core system, dubbed HAL after the legendary computer in *2001: A Space Odyssey*, brings OSC up to 30 teraflops of total computing power, with 30 terabytes of network-attached storage.

Powered by Intel® Xeon® processors, HAL and Red Queen help OSC support its researchers while creating a greener data center.

Flexible Systems

OSC's computing demands vary widely between university research projects and a broad array of commercial users' needs. The center required a particularly flexible solution that could quickly process vast amounts of data and provide outstanding performance for data-intensive technical applications. Research projects running on the SGI Altix systems range from the study of mantle flow under mid-ocean ridges to the modeling and assessment of complex social trend data. In addition, the OSC is fully equipped to deliver HPC services over the cloud. By capitalizing on the operating efficiencies that have resulted from this large-scale service deployment, the university is able to offer competitive rates for its compute-on-demand services.

"When working with the broad range of applications, data, and computational requirements demanded by university research, it is essential that our equipment can meet our exacting demands," says Jon Lockley, manager of the OSC. "In addition, the center has equally rigorous requirements for reliability and energy efficiency. The SGI Altix delivers on all fronts."

The modular blade design of the Altix 4700 delivers dense computing performance: over one teraflop per rack. The Altix ICE can be configured with up to 512 processor cores per rack, delivering up to six teraflops of computing power and providing the ability to scale to thousands of nodes. In addition, to help keep OSC operating costs down, the Altix platform radically reduces power and cooling overhead.

"SGI Altix enables the OSC to tackle complex research projects that were not previously possible," Lockley says. "We have experienced great progress in our research capabilities since implementing the SGI HPC systems. Now, as we begin to undertake commercial projects, we are enabling local businesses to capitalize on the university's and SGI's HPC resources and expertise. Our partnership with SGI is helping the OSC to become a leading facility for supercomputing for both academic and commercial purposes."

Spotlight on Oxford Supercomputing Centre (OSC)

The University of Oxford was the first university in the English-speaking world. Today, it has more than 20,000 students and is considered one of the world's top academic institutions.

The Oxford Supercomputing Centre was established in 1997. OSC is part of the university's e-Research Centre (OeRC) and is classified as a Major Research Facility. It is a campus-wide resource available to all Oxford University researchers and also leases compute cycles to commercial users. To promote researchers' success, OSC offers training and application support in addition to powerful HPC systems.

Energy Efficiency: Environment and Performance: Lower energy and cooling costs through more environmentally friendly computing.

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