Success Story

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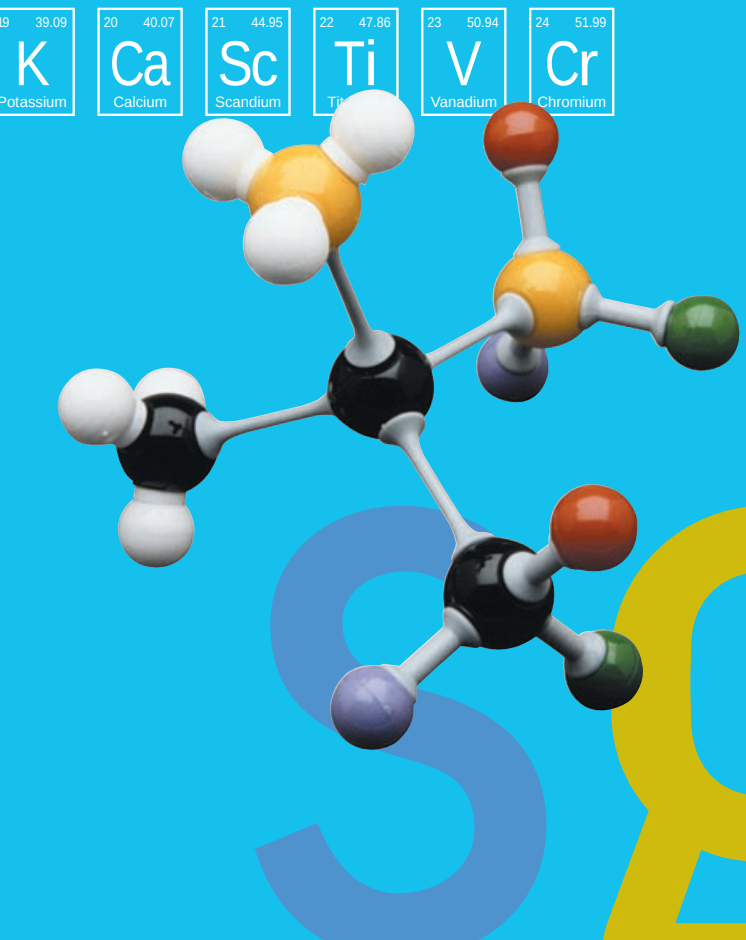
— Al Stutz, Director of High-Performance Computing, OSC

SGI at Ohio Supercomputer Center Supercomputing Based on Linux® Clusters



Cost-Effective Supercomputing for the 21st Century

In today's cost-conscious environment, academic and research institutions are continually looking for new ways to optimize their technology investments, even at the highest level of supercomputing. Through a unique four-way partnership with SGI™ Professional Services, Myricom, and the Portland Group, the Ohio Supercomputer Center (OSC) found its solution in a new Linux OS-based Beowulf cluster called The Brain.

Beowulf clusters are specialized supercomputers that are gaining popularity in the technical and enterprise computing market because of their high performance at a relatively low cost. Based on today's proliferation of less expensive commodity hardware and the freely available Linux operating system, Beowulf clusters are used for solving very specific types of problems through massive parallel processing. In less than 30 days, OSC and SGI assembled a supercomputing entity that enables Ohio's scientists, educators, and engineers to reach important insights at almost half the cost, without sacrificing performance compared to a standard mainframe. Based on the SGI Linux™ environment and powerful SGI™ 1400L servers, The Brain daily pumps out results for nuclear physics equations, chemistry problems, and computational fluid dynamics.

"This project provides the center with an opportunity to expand its role as a statewide resource by bringing even more scalable computing power to Ohio's scientists and engineers," says Charlie Bender, executive director of OSC. "Working with SGI has allowed us to assist researchers to use the high-performance Linux computing systems at their desktops at both OSC and the National Science Foundation supercomputer centers."

Building the Supercomputing Cluster
The new OSC Linux cluster consists of 32 SGI 1400L servers, each with four 500 MHz Intel® Pentium® III Xeon™ processors. Preloaded featuring the SGI Linux Environment featuring Red Hat® Linux 6.0, the 32 servers provide a computing environment connected by Myricom's newest Myrinet 64-port switch at 1.27Gb per second per port (with four ports per machine). An SGI™ Origin™ 2000* series server acts as the NFS server for storage, and a legacy PC running Linux serves as the cluster console.

"Working with SGI Professional Services consultants gave our work teams an excellent synthesis of ideas," said Al Stutz, the center's director of high-performance computing. "The staff were excellent at coming up with ideas for evaluating choices and finding the best course of action. SGI provided us with some of the internal procedures that it uses to support Linux clusters, while taking some of our concepts and incorporating them into their ongoing Linux offering."

The OSC cluster includes all the components of the SGI™ Advanced Clustering Environment (ACE), including the Portable Batch System (PBS) for batch job scheduling, Samba for heterogeneous file sharing, the MPICH communications protocol, and SGI Performance Co-Pilot™ software for performance tuning. Each 1400L server includes standard availability features such as hot-pluggable disk drives and power supplies. The cluster is monitored through both the central console and the individual servers' administrative capabilities, including an emergency management port for maintaining a system event log, capturing critical sensor data such as temperature changes, and remotely resetting power via a serial line. SNMP support ensures that the cluster can be administered using standard enterprise management tools.

The Portland Group has provided a number of key compilers for the cluster, which runs a wide range of both open source and commercial applications, including Fluent for CFD calculations, QCD Lattice for physics particle research, MSC, Cactus (a relativity modeling tool), Etna's TotalView, and Gaussian for chemistry problem solving. Ohio's research community accesses its programs through OARnet, the state's high-performance network that provides Internet connectivity to more than a million Ohio residents.

Planning for the Future of Supercomputing
"We believe that this type of cluster is an important aspect of the future of supercomputing," says Doug Johnson, OSC's technical project lead. "Today's trend is toward increasing interoperability. By using Linux, we have gained a large application base for our user community; by using clusters, we have gained a cheaper, more scalable, and more flexible solution."

"SGI has become OSC's corporate ally in building these types of solutions, helping OSC to become an academic leader in Linux clustering," says Mike Armstrong, SGI's project manager. "SGI continues to stay on the leading edge of the academic environment, knowing what supercomputing customers are looking for and what types of solutions will work for them. The fundamental processes of this project will apply to other installations, making SGI Linux solutions easier and faster to implement."

*Origin 2000 is now being marketed and sold as the SGI™ 2000 series.

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Corporate Office
1600 Amphitheatre Pkwy.
Mountain View, CA 94043
(650) 960-1980
www.sgi.com

North America 1(800) 800-7441
Latin America 1(650) 933-4637
Europe (44) 118.925.75.00
Japan (81) 3.5488.1811
Asia Pacific (65) 771.0290

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