

Nanyang Technological University

Sun Microsystems Powers Advance Research in Nano-technology, Grid-Computing, and Life Sciences



“We are very glad to work with Sun Microsystems on the NCSV project. Sun’s track-record and technology in high-performance computing, as well as the reliability and scalability of its computing platforms, are significant attributes for the support of large scale research projects. They are the fundamental ingredients for building a leading-edge supercomputing infrastructure,” said Prof Liew, Director, Nanyang Center for Supercomputing and Visualization.

Sun Microsystems, which in 2002 has set a benchmark for reducing the run-time of tracing protein sequences from 144 days down to a mere 42 hours, is set once again to provide high-performance computing solutions for an advance research facility with Singapore’s Nanyang Technological University. The Nanyang Center for Supercomputing and Visualization is poised to provide leading-edge supercomputing and visualization infrastructure to specialists world-wide who pioneer research projects in the fields of mechanical engineering, nano-technology, grid-computing, and life sciences.

About Nanyang Center for Supercomputing and Visualization

The Nanyang Center for Supercomputing and Visualization (NCSV) was established in 2001 to provide high performance computing infrastructure and services to researchers working in the areas of mechanical engineering, nano-technology, grid-computing, and life sciences. It is a project commissioned jointly by Sun Microsystems and the Nanyang Technological University, and will cost an estimated S\$10 million (US\$5.6m) in its entirety. The goal of the center is to serve as a coordinating center for researchers from all parts of the world, as well as to give them access to high-performance computing resources.

The NCSV system is designed to handle sophisticated research operations that require massive computing power. The center’s server is host to a number of specialized engineering applications, including ANSYS, LS DYNA, GAUSSIAN, Computational Fluid Dynamics, numerical, and visualization systems. In addition, the center will also be home to the Asia Pacific Science and Technology Center (APSTC), a dedicated research project of 3 research scientists and 6 research engineers who will work on joint Economic Development Board of Singapore (EDB) and Sun Microsystems projects.

To function effectively as a supercomputing infrastructure provider, NCSV needs to provide powerful computing capabilities as well as technologies that would optimize the performance of its systems. Powerful computing platforms and efficient processing minimize the build-up of bottle-necks caused by complex research projects. The system must also be able to intelligently manage all its resources so that maximum capacity is harnessed from the system throughout all times. As well, a fail-safe back-up system is also required to ensure the safe-keeping of research data.

“At a time when research projects have very sophisticated operations and very high through-put processes where the same operation is performed repeatedly over many thousands of data points, the power of the computing platform and the ability to optimize performance become significant in determining the success of a project. The faster your computer is able to process operations and generate results, the more accurate and comprehensive your research findings are going to be,” said Prof. Liew, Director, Nanyang Center for Supercomputing and Visualization.

The business needs of designing the high-performance computing center are identified as follows:

- Fast processing time for research tasks in order to reduce bottle-necks and increase amount of projects the center handles
- Intelligent management of resources to fully utilize all resources within the system
- Comprehensive collaborative platform to enable researchers from all parts of the world to work together
- Efficient system management to reduce costs of operation, maintenance, and upgrade

End-to-end High Performance Computing Platform

Sun Microsystems’ end-to-end solutions provided just the right mix to build the NCSV system. The NCSV system is designed to have a front-end Technical Compute Portal that presents all of the center’s

Company

Nanyang Center for Supercomputing and Visualization

Industry

Education/Research

Products/Solutions

- Solaris™ Operating Environment
- Quick File System (QFS)/ SAN File System (SAN FS)
- Sun ONE™ Portal Server
- Sun ONE™ Directory Server
- Sun ONE™ Web Server
- Sun ONE™ Grid Engine
- High Performance Computing (HPC) Forte™ 6 Compiler
- HPC Cluster Tools
- Sun Fire™ 15K Enterprise Server
- Sun Fire™ 4800
- 2.6 Terabytes Sun StorEdge™ T3 array for HPC SAN
- Sun Enterprise™ 280R
- Sun Blade™ 2000

Key Business Challenges

- Fast processing time for research tasks in order to reduce bottle-necks and increase amount of projects the center handles
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Key Business Solutions

- Implement high-performance, high-resilience, high-availability computing network powered by Sun enterprise-class servers
- Implement resource management tools and multi-read, multi-write, high-scalability filing system
- Install the Technical Compute Portal
- Implement and transfer of Sun™ knowledge in system management, high-performance computing, and grid computing

supercomputing resources to the research-user. The Web-based collaborative platform allows researchers to work together from different locations, and is customized to present suites of applications to each logged-in user. From the interface, a researcher can make use of the NCSV system to initiate testing and modeling, file reports, and update findings without having to actually access the back-end of the system.

Sun Microsystems' Professional Services (Sun PS) began working on the NCSV project at the start of 2002. By May, infrastructure, architecture, and solutions components were determined. Installation of the NCSV system began in June 2002.

Grid technology, and storage and back-up solutions, are integrated into the infrastructure to harness the greatest computing power from the system as well as to safeguard research work that has already been done.

For computing power, the Sun PS team implemented a Sun Fire™15K, Sun Microsystems' high-end enterprise-class server, and installed high performance workstations, workgroup and mid-frame servers, as well as a 2.6 terabytes StorEdge™T3 array.

To ensure optimal utilization of the network's resources, a Sun ONE™Grid Engine was installed to actively seek out idling resources on the network and intelligently channel the computing power for use in the system's current operations. The Sun ONE™Grid Engine is a Sun Microsystems solution that makes use of grid technology to enhance network management and optimize utilization of software and hardware resources. As much as five to ten times more usable power can be harnessed from a system with the application of this solution.

The system is backed up by Sun StorEdge™T3 array as well as Sun's Quick File System (QFS) and SAN-File System (SAN-FS) solutions. The QFS is a powerful multiple-read and multiple-write filing solution that lets a system scale up to 250 terabytes per file system. The SAN-FS backs-up data continually, allowing incremental memory of a process to be recorded. This enables not only a very small window for conducting back-up operations, but also the ability to retrieve information and resume work from mid-point.

Sun Microsystems solutions that were deployed for the NCSV project included the following:

- Sun Fire 15K
- Sun Fire 4800
- 2.6 Terabytes Sun StorEdge T3 array for HPC SAN
- Sun StorEdge L180 Tape Library
- Quick File System (QFS)/ SAN File System (SAN-FS)
- Sun ONE Technical Compute Portal
- Sun ONE Grid Engine
- HPC Forte 6 compiler
- HPC Cluster Tools
- Sun E280R
- Sun Blade 2000

Power Computing, Advanced Research

Powered by Sun Microsystems' solutions, the NCSV's supercomputing infrastructure allows researchers access to all its high-performance computing resources from a Web-based interface that facilitates collaboration for researchers from different parts of the world. Grid technology, and storage and back-up solutions, are integrated into the infrastructure to harness the greatest computing power from the system as well as to safeguard research work that has already been done. The researcher has no need to worry about finding adequate computing resources to carry out his work, and he can be sure that any data or result that has been reached by the system is safely backed-up.

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