

University of Calgary

Sun Success Story.



The University of Calgary has implemented technology from Sun Microsystems, Inc. as the basis for its unique and powerful bioinformatics research environment. Scientists gain new insights by immersing themselves in a 10 foot by 10 foot CAVE® (built by Fakespace Systems of Kitchener, Ontario) where they are surrounded by 3D stereo images of structures such as molecules, cells, or tissues. A Sun Fire™ 6800 server equipped with 4 Expert3D graphics accelerators and 5 terabytes of Sun StorEdge™ T3 disk arrays powers this breakthrough visualization technology.

Applications developed for Calgary's virtual reality CAVE are being implemented using Java 3D™ technology, which allows researchers to use any available Java™ enabled equipment for development, and involve the CAVE itself only for the final program execution. Hardware and software from Sun, along with the superb support rendered under Sun's Center of Excellence for Visual Genomics program, position the university at least two years ahead of competing research organizations.

Building on a Long History of Success with Sun Technology

The University of Calgary is a research and teaching university of growing national and international stature. According to the Canadian Association of University Business Officers, the U of C is the most research-intensive university in Alberta and among the top 10 in Canada. Research funding exceeds \$134.5 million per year.

The university's young and energetic Faculty of Medicine is making major contributions to the world's medical community. The U of C is a major node of the Canadian Bioinformatics Resource (CBR) network. "In CBR, we're still productively using the very first Sun workstation we ever purchased, eight years ago," reported Dr. Christoph Sensen, Professor of Biochemistry and Molecular Biology. "Most other platforms, PCs for example, have operating systems that become obsolete every few years. Unlike many other vendors, Sun pays close attention to protecting existing investments when it introduces new products and releases."

Sensen's research achievements and enthusiastic support for Sun technology prompted Sun to ask him to join the Sun Informatics Advisory Council, where he shares insights with Sun on development directions for the bioinformatics market. In this capacity, he witnessed an early 2001 demonstration of a CAVE environment enabled by Java 3D technology in a Sun laboratory.

Company:

University of Calgary

Industry/Market

Education, Healthcare

Products/Services

- Sun Fire™ 6800 server (20 UltraSPARC® III micro-processors)
- 4 Expert3D graphics accelerators
- Sun StorEdge™ T3 disk arrays (5 TB)
- Sun StorEdge DLT tape library
- 14 Sun Ray™ 1 appliances
- Solaris™ 8 Operating Environment
- SAM-FS and QFS software
- Forte™ for Java™
- Forte 6 Update 2
- Sun HPC ClusterTools™ software
- Sun Grid Engine software
- Veritas NetBackup
- Fakespace Systems, Inc. CAVE® displays

Key Business Challenges

- Gain competitive edge in bioinformatics research
- Provide immersive environment capable of conveying new insights into complex 3D structures
- Manage vast quantities of data quickly and easily
- Decouple the application development environment from the execution environment

Key Business Solutions

- Two-year head start on competitive undertakings
- Immersive 3D stereo environment provides unique visualization powers
- Capacity to store and process many terabytes of bioinformatics data
- Java 3D™ technology permits CAVE applications to be developed without consuming CAVE resources

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“I was so excited by its unique potential for bioinformatics research that I strongly encouraged Sun to make the CAVE more than just a demonstration,” Sensen reported. “Of course there was a selfish reason too – we had to have one in our laboratory!”

The World’s First CAVE Solution Based on Java 3D Technology Outside Sun Laboratories

Sun took Sensen’s advice, and he was quick to become the first customer – but not before performing due diligence on competitive offerings. “Other computer companies tried to provide our environment,” Sensen said, “but none of them could match Sun for providing the horsepower and scalability required by our ambitious plans. Nor could I imagine any of them providing the outstanding support we’ve always received from Sun – the best ever in my experience. Finally – and this is a feature whose importance I can’t overemphasize – none of them offered a CAVE solution based on Java 3D technology. The reason that’s so important is that without the Java 3D approach, new applications would have to be developed in the same environment where they’ll be executed, which would impose a big burden on both the developer and us. Now I can just tell our collaborators to simply download Java 3D software from www.sun.com, perform their development on whatever Java enabled equipment they have handy, and come to us only when they want to execute the final programs on the real thing. It’s a crucial breakthrough.”

In the system that recently entered production for the university, a Sun Fire 6800 server runs the department’s internally developed and third party research applications, accessing data stored on five terabytes of Sun StorEdge T3 disk arrays as well as a 20 Terabyte Sun StorEdge DLT tape library. Results are displayed using four Expert3D graphics accelerators, each of which drives a large screen stereo projection display supplied by Fakespace Systems, Inc. Three of the screens are arranged to provide a 270 degree view surrounding the viewers and the fourth is under their feet, providing a completely immersive environment. Images can be delivered in 3D stereo for use in conjunction with a wand and stereo glasses. The user has responsive and completely interactive control over image rotation and zooming, and can therefore zero in on any structure of interest. With the power of twenty 750-MHz UltraSPARC® III processors calculating new images many times per second, the viewer seems to be in the midst

“I am extremely enthusiastic about the design of this server. One of its most important innovations to us is that it can accommodate processors that run at different speeds. This means that we can add new, higher speed CPUs when they become available without having to simultaneously upgrade our existing processors – a huge scalability advantage. The Sun Fire server’s performance has been outstanding, and its reliability has been flawless.”

Dr. Christoph Sensen
Professor of Biochemistry and Molecular Biology
University of Calgary



Dr. Sensen standing inside the CAVE Display

of a continuously moving object space and can therefore see spatial relationships that would be hopeless to detect on conventional images. Insights gleaned in this way help advance bioinformatics research and might eventually lead to better understanding of diseases such as cancer, Alzheimer's, and diabetes, and expedite the development of remedies. The laboratory also has applications in law enforcement, weather forecasting, and oil and gas exploration.

First to Use Server-Based Expert3D Graphics Accelerators

Another first for the university is its use of Expert3D graphics cards, which are generally found in Sun workstations, in a Sun Fire server. Since state-of-the-art graphics rendering is present in the server, it may be summoned for use with a variety of display devices such as the Fakespace Systems projection displays or one of the 14 Sun Ray™ 1 appliances that Calgary uses to provide access to the system outside of the CAVE.

Because Sun Fire servers and UltraSPARC processors are designed in concert, Sun solutions have built-in investment protection features. For example, the UltraSPARC processors preserve the same thermal/electrical footprint within a given generation and the Sun Fire uniboard design allows for easy processor upgrades. As a result, Sun Fire servers support mixed speed CPUs – a feature very important to Calgary's CAVE project. “I am extremely enthusiastic about the design of this server,” said Sensen. “One of its most important innovations to us is that it can accommodate processors that run at different speeds. This means that we can add new, higher speed CPUs when they become available without having to simultaneously upgrade our existing processors – a huge scalability advantage. The Sun Fire server's performance has been outstanding, and its reliability has been flawless in the short time it's been installed.” Unlike many research institutions, Calgary regards its laboratory as being mission-critical since many other universities and private companies depend on it for their work. To keep uptime high, Sun supports the system under the SunSpectrumsm plan with guaranteed four-hour response.

Get the details.

To learn more about the features and capabilities of Sun's Midrange Servers go to the following url:

<http://www.sun.com/servers/midrange/>

Sun offers its customers a distinct competitive advantage.

Sensen cited several other Sun products as contributing important benefits to the laboratory. SAM-FS and QFS software allow data stored on disk and tape to be treated in the same way, so that tape becomes essentially an extension of disk. These Sun software products anticipate when tape-resident data will be required, and load it onto disk for fast access as soon as it is needed. Intelligent storage management keeps related files together, minimizing delays. Many automatic features optimize the disk-tape tradeoff to provide fast access to needed data without wasting disk storage. All of this data management is transparent to users, who never know or care what data resides on disk versus tape. These software solutions also allow online data to grow as large as one billion terabytes before file system reconfiguration is required.

Forté™ for Java™ provides a productive development environment for the many Java™ applications that are written by the laboratory staff. The Sun Fire 6800 server runs the Solaris™ 8 Operating Environment which, Sensen says, “is the most stable operating system on the market. My system administrator lives in Nova Scotia, 3000 miles from the system. And the support from the company is rock-solid.”

Clustering over LANs and WANs for Collaborative Research

Clustering software from Sun will soon play major roles for the university and the community it serves. Calgary plans to soon implement a second CAVE to meet growing demand, including a second Sun Fire 6800 server. The two Sun Fire 6800 servers will be configured in a high availability environment using Sun HPC ClusterTools™ software. Calgary has already linked its laboratory with those of approximately 15 other institutions across Canada through the CBR network, all of which use Sun servers as well, for collaborative research. Sun Grid Engine software will be used to connect all these solutions over a wide-area network, providing users the flexibility of devoting any or all of their collective resources to a single large task. Sensen and his research team have been designated as a Sun Center of Excellence for Visual Genomics, a program that is designed to inspire collaborations of this nature that advance academic research.

Sensen closed with a credit to the superb support that Sun has provided to accompany all its technology. “Sun’s system architects worked diligently with us on planning our system for over a year, providing support that was way beyond anything we paid for,” he said. “Without their help, the lab wouldn’t be what it is today. If another institution were to start now, it would take them two years to duplicate what we’ve put together with Sun’s help. Sun has given us a distinct competitive advantage.”

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