



Customer: National Supercomputing Center for Energy and the Environment

Web Site: www.nscee.edu

Customer Size: 12 employees

Country or Region: United States

Industry: Government—Energy and environmental agencies

Customer Profile

The Las Vegas, Nevada-based National Supercomputing Center for Energy and the Environment is a full-service supercomputing facility with a mission for excellence in education and research.

Software and Services

- Microsoft Server Product Portfolio
 - Windows HPC Server 2008

Hardware

- Cray CX1 supercomputer

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Supercomputing Center Sees 46 Percent Performance Gain with HPC System

“The Cray CX1 supercomputer with Windows HPC Server 2008 will help a wider audience take advantage of HPC capabilities.”

Joseph Lombardo, Director, National Supercomputing Center for Energy and the Environment

The National Supercomputing Center for Energy and the Environment wanted to expand the types of systems that it uses to include smaller, powerful computers that are easy for researchers to use. The center opted to test the Cray CX1™ deskside supercomputer with Windows® HPC Server 2008 and was impressed with the results. The new system is 46 percent faster in the delivery of complex analyses, resulting in greater researcher productivity.

Business Needs

The National Supercomputing Center for Energy and the Environment (NSCEE) is a full-service supercomputing facility located at the University of Nevada Las Vegas. Established in 1989 as an act of Congress, the center maintains the most advanced high-performance computing (HPC) systems in Nevada. These computer systems are made available to educational and research centers, state and federal government agencies, and Nevada’s private sector.

The NSCEE mission addresses a range of national scientific challenges and has

supported more than 200 scientific projects related to global atmospheric modeling and fossil energy research. One such project involves providing supercomputing support for studies of nuclear waste isolation, disposal, and transmutation at Yucca Mountain, a proposed underground repository for the storage of high-level nuclear waste.

Although the NSCEE maintains a range of computing resources, the center sought a flexible, affordable option that researchers could easily use, without needing to access one of the center’s large supercomputers.

"We thought it would be valuable to be able to process enormous data sets and models that simulate physical processes but to do so on a smaller, desktop computer that any person could use," says Joseph Lombardo, Director of the National Supercomputing Center for Energy and the Environment.

Solution

After describing the center's needs to its Cray representatives, the NSCEE was introduced to a new computer, the Cray CX1™ desktop supercomputer with Windows® HPC Server 2008. The NSCEE decided to conduct a series of benchmarking sessions to determine how the performance of the Cray CX1 system with 32 cores compared with traditional 32-core HPC solutions.

First, the center needed to determine an appropriate application for testing the Cray CX1 system with Windows HPC Server 2008. It immediately turned to GoldSim Pro risk analysis software, which Sandia National Laboratory—an organization working in partnership at the NSCEE—used for the Yucca Mountain project. GoldSim software, which runs on the Windows Server® operating system, provides Monte Carlo simulation capabilities for dynamically modeling complex systems. Analysts use the software to support decision making and risk analysis by simulating future performance while quantitatively representing the uncertainty and risks inherent in all complex systems.

"We determined that validating the existing data for the Yucca Mountain project and others like it would be ideal for testing the Cray CX1," says Lombardo. "We felt that there was much to be gained if we could complete those analyses more quickly."

In October 2008, the NSCEE deployed the Cray CX1 system with Windows HPC Server

2008 and soon began running tests. "For us, it was essentially a turnkey setup," recalls Lombardo. "We started up the server, set up the accounts that we needed, ported over codes and data sets, and we were ready to work."

Researchers from the center and Sandia conducted a series of benchmarking sessions using the GoldSim software and a suite of 14 associated codes compiled as dynamically linked libraries; they were pleased with the performance results. "We were very surprised," says Lombardo. "The Cray CX1 with Windows HPC Server 2008 handled the data well, with the necessary bandwidth to avoid bottlenecks." In addition, the center also enjoyed such features as the integrated Job Scheduler and the Heat Map, which helps the organization monitor the system because administrators can see which nodes are currently in use and the utilization of each node.

Benefits

Using the Cray CX1 supercomputer with Windows HPC Server 2008 resulted in significantly faster performance than the alternative 32-node systems. The center also appreciated the system's straightforward setup and ease of use, in addition to its flexibility for use in office environments.

■ **Faster performance.** When benchmarking, the NSCEE discovered that the Cray CX1 system with Windows HPC Server 2008 ran more quickly than its 32-core commercial off-the-shelf cluster. "At 46 percent faster, the performance was even better than we thought the system could achieve," says Lombardo. "It's nicely balanced and has been completely reliable. We've been trying to handpick tests that are more likely to be a

challenge, but they've posed absolutely no problems."

■ **Greater productivity.** Achieving faster results means that NSCEE researchers can be more productive and quickly find solutions for improving the country's infrastructure. "Getting results within days instead of weeks means that we can fine-tune our research and make wiser decisions more quickly," says Lombardo. "Ultimately, using a fast system like the Cray CX1 supercomputer with Windows HPC Server 2008 helps us by accelerating the research agenda."

■ **Ease of use.** NSCEE researchers have been impressed with the straightforward nature of the Cray CX1 system with Windows HPC Server 2008. "Scientists don't want a learning curve that costs them valuable research time. Because it comes with a familiar Windows user interface and doesn't take specialized know-how to use it, the Cray CX1 supercomputer with Windows HPC Server 2008 will help a wider audience take advantage of HPC capabilities," says Lombardo. "Plus, the Cray CX1 is small and quiet, so it's convenient for researchers to use right in their offices."

■ **Cost savings.** The new system provides the center with a cost-effective way to conduct analyses. "We have to use our resources wisely and ensure that our systems' price and performance make sense. I'd estimate that we'll see about a 30 percent overall cost savings with the Cray CX1 over comparable systems," says Lombardo. "The Cray CX1 supercomputer with Windows HPC Server 2008 is an affordable way to do sophisticated modeling and simulations to tackle big problems and keep research moving."