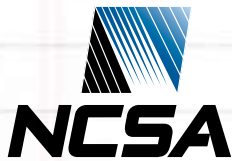
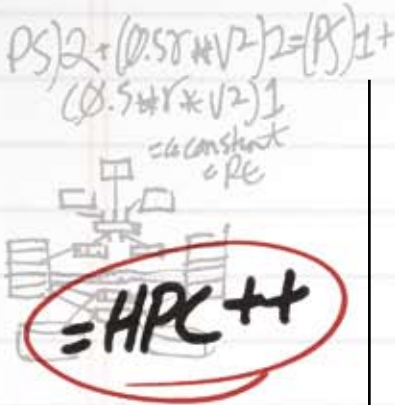


# LY PRODUCTIVE HIGH PERFORMANCE COMPUTING



## CUSTOMER PROFILE

The National Center for Supercomputing Applications (NCSA), at the University of Illinois, Urbana-Champaign, is a worldwide leader in high performance computing. The NCSA has 300 employees that work with researchers to solve extremely complex science and engineering problems.

## SOFTWARE AND SERVICES

Microsoft Server Product Portfolio

- Windows HPC Server 2008
- Microsoft SQL Server 2005

## HARDWARE

1,200 Dell PowerEdge 1955 server computers

## SUPERCOMPUTER CENTER ADDS WINDOWS® HPC SERVER TO 1,200-NODE CLUSTER OPTIONS

"The performance of Windows HPC Server 2008 has yielded efficiencies that are among the highest we've seen for this class of machine."

*Robert Pennington, Deputy Director, National Center for Supercomputing Applications*

To meet the new and expanding needs of its academic and industrial users, the National Center for Supercomputing Applications (NCSA) at the University of Illinois must support the platforms with which those users are familiar, which means offering more than just Linux-based high performance computing (HPC) resources. NCSA achieved that goal by deploying Windows® HPC Server 2008 on the center's 1,200-node HPC cluster.

## BUSINESS NEEDS

The National Center for Supercomputing Applications (NCSA) at the University of Illinois is a global leader in HPC. Since the center opened its doors in 1986, it has made significant contributions to the development of solutions that help scientists and engineers solve the most demanding computational problems.

Five of the HPC systems at NCSA rank in the TOP500 list of the world's most powerful supercomputers, as measured by LINPACK Benchmark performance, the widely used standard for HPC. The newest such system at NCSA is Abe, a cluster of 1,200 Dell PowerEdge 1955 server computers, each configured with

two quad-core Intel Xeon processors, 8 gigabytes of memory, and InfiniBand input/output (I/O) technology.

In fulfilling its mission, which includes meeting the needs of both academia and private industry, NCSA faces a complex task. "We anticipate that the opportunities for clustered HPC solutions will continue to grow and, as they do, the way people use them will expand," says Robert Pennington, Deputy Director for NCSA. "It's not sufficient for us to examine HPC technologies in isolation. We also have to consider which applications people want to run and then create complete HPC solutions that support those applications."

To enable HPC for the mainstream, NCSA must support more than just Linux. "What we're hearing from some of our industrial users is that HPC systems are still too hard to use, they're too difficult to program, or the users can't get access," says Merle Giles, Director of the Private Sector Program at NCSA. "To help partners benefit more from HPC, we need to make our systems more accessible, which means working with the Windows operating system as well as Linux."



## SOLUTION

In April 2008, working with the Microsoft High Performance Computing team, the National Center for Supercomputing Applications deployed the community technology preview of Windows HPC Server 2008 on Abe, achieving a LINPACK score of 68.5 teraflops and 77.7 percent efficiency. The cluster is expected to place twentieth to twenty-fifth in the June 2008 TOP500 list. "Our experience with Windows HPC Server 2008 has been impressive," says Pennington. "Deploying it was much easier than we expected, and the performance results have surpassed our expectations."

The LINPACK run took advantage of work done by Kazushige Gotō, a research associate at the Texas Advanced Computing Center at the University of Texas at Austin, who adapted his hand-optimized math libraries—used by some of the world's fastest supercomputers—to run on Windows. It also took advantage of NCSA's open source-based communication software for the cluster's InfiniBand I/O.

"The Message Passing Interface in Windows HPC Server 2008—and its ability to take advantage of the Network Direct remote direct memory access layer—allowed us to achieve new levels of performance and efficiency," says Mike Showerman, Technical Program Manager in the Innovative Systems Lab at NCSA.

Because of the strong performance, ease of deployment, and interoperability provided by Windows HPC Server 2008, NCSA has decided to bring the operating system into its production computing environment. "We're now running Abe as a dual-boot system, with compute nodes reallocated to run either Windows or Linux depending on user needs," says Showerman. "Our ultimate goal is greater flexibility for our users, and we now have the ability to dynamically reconfigure compute nodes from Linux to Windows to match the submitted workload."

## FURTHER INFORMATION

For more information about other Microsoft customer successes, please visit <http://www.microsoft.com/casestudies>

Tip: To find more HPC case studies, select 'HPC' for Software and Services.

For more information about the NCSA please visit <http://www.ncsa.uiuc.edu>

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## BENEFITS

By adopting high performance computing for Windows, the National Center for Supercomputing Applications is able to provide access to its Abe cluster to a larger set of industrial partners, giving them an easier, more familiar way to accelerate time-to-insight for demanding computational problems. Some of the benefits provided by the center's decision to support Windows include:

- **High performance.** LINPACK results on Abe indicate that Windows HPC Server 2008 is capable of supporting even the most demanding HPC workloads. "The performance of Windows HPC Server 2008 has yielded efficiencies that are among the highest we've seen for this class of machine," says Pennington.
- **Fast scheduling.** The job scheduler in Windows HPC Server 2008, which takes advantage of Microsoft SQL Server® 2005 data management software to optimize performance, took only 35 seconds to allocate resources, deploy binaries, and start the LINPACK run.
- **Rapid deployment.** Using Windows Deployment Services, which is included as part of the Windows Server® 2008 operating system, NCSA can rapidly reconfigure Abe to run Windows and easily schedule software updates as a part of normal operation. "With Windows HPC Server 2008, we were able to go from bare metal to 1,200 compute nodes running LINPACK in four hours," says Showerman.

Even more important than the raw numbers are the new possibilities to be realized through enabling HPC for broader use while supporting even the most challenging work-loads. "We run a very high-end, productive computing environment and are always looking for new ways to add to those capabilities," says Pennington. "With Windows HPC Server 2008, we can give users a new option that scales, is reliable, and offers compatibility with what they're running on their desktops and in their data centers. This will open up new possibilities for how they can take advantage of NCSA resources to solve the computing challenges that they face."