



**Customer:** RWTH Aachen University

**Web Site:** [www.rwth-aachen.de](http://www.rwth-aachen.de)

**Customer Size:** 30,000 students

**Country or Region:** Germany

**Industry:** Education—Universities

#### Customer Profile

Located in Aachen, Germany, and known for excellence in engineering, RWTH Aachen University is the largest technical university in Germany. It has more than 30,000 students.

#### Software and Services

- Microsoft® Server Product Portfolio
  - Windows® HPC Server 2008

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## Research University Sees Performance Gain with Windows HPC Server 2008 Solution

“We are really impressed with many of the new features of Windows HPC Server 2008. Microsoft is a pretty young player in the HPC market, but this is already a very solid product.”

Christian Terboven, Project Lead for HPC on Windows, Center for Computing and Communication, RWTH Aachen University

*High-performance computing (HPC) is an important service that the Center for Computing and Communication (CCC) at RWTH Aachen University provides to its mostly research-oriented customers. To support a growing number of Windows®-based parallel applications, the CCC upgraded from Windows Compute Cluster Server 2003 to Windows HPC Server 2008. It is taking advantage of increased network performance and other advanced features of the new product.*

#### Business Needs

The Center for Computing and Communication (CCC) at RWTH Aachen University delivers centralized IT services for the university. It also provides high-performance computing (HPC) resources for many research groups at the university; about 20 percent of the HPC resources are used by other state universities. Many CCC customers require HPC to run complex parallel processing applications such as numerical simulations and computational fluid dynamics calculations.

While still supporting many native UNIX applications, the CCC observed an increasing interest in compute services based on the Windows® operating system. “A lot of Windows-based development is going on with the Microsoft® Visual Studio® development system, and most researchers have a Windows PC on their desk,” says Christian Terboven, Project Lead for HPC on Windows at the CCC. “In the past, if they needed more compute power, these researchers were forced to port their code to UNIX because we offered HPC services primarily on UNIX.”

The CCC foresees significant growth in the number of Windows-based applications for the next few years. "To give you an idea of the Windows growth we expect, the majority of the machines from our most recent and our next big procurements will potentially run Windows," says Terboven.

## Solution

To support the growing need for HPC services for Windows-based applications, the CCC was eager to test Windows HPC Server 2008, the successor to Windows Compute Cluster Server 2003, which the CCC had used for several years. "We hope the new Job Scheduler will make it easier for users to submit jobs," says Terboven. "Also, some of our applications have several levels of parallelism, and we need the Job Scheduler to adapt these levels to the resources used for the batch run." Other applications, he says, are designed to use the Microsoft Message Passing Interface (MS MPI) to take advantage of the high-speed, hardware-independent remote direct memory access provided by NetworkDirect.

In April 2008, the CCC deployed a 256-node cluster with Windows HPC Server 2008 and an InfiniBand network specifically to perform a TOP500 run. Published twice a year in June and November, the TOP500 list ranks the 500 most powerful supercomputers in the world. Achieving a LINPACK score of 18.81 teraflops and 77 percent efficiency with time for only minimal performance tuning, the cluster is at position 100 (as of June 2008). "When we are able to fine-tune performance, we expect to achieve over 80 percent efficiency," says Terboven.

## Benefits

With Windows HPC Server 2008, the CCC is prepared to meet the growing demand for

HPC resources among its Windows users. Benefits include the following:

- **Expansion of customer base.** Terboven believes that Windows HPC Server 2008 will help the CCC expand its existing science and technology customer base to include business customers, many of whom run business intelligence models using spreadsheet software. "These people have not been our customers before because they didn't use HPC and we couldn't convince them to go to an unfamiliar operating system like UNIX," says Terboven. As their business models grow too large to process on a PC, they can submit their jobs to the cluster for faster processing. "We are really impressed with many of the new features of Windows HPC Server 2008," says Terboven. "Microsoft is a pretty young player in the HPC market, but this is already a very solid product."
- **Speed of deployment; ease of management.** "The deployment speed for Windows HPC Server 2008 is really impressive compared to UNIX," says Terboven. "Whether you install 2 nodes or 50, it still requires just two hours because everything is running in parallel using the multicasting approach." It took about half a day to set up and install 256 Windows HPC Server 2008 nodes for the TOP500 run. With the new template-based deployment feature in Windows HPC Server 2008, system administrators can include specific drivers and software, such as Intel compilers, in the installation procedure template. "Now we manage only one template and then roll it out to the nodes to which it applies," says Terboven.

- **Control of resources for job submission.**

"The new Job Scheduler gives us exquisite control of the resources reserved for jobs," says Terboven. Users can now specify the amount of memory; the number of cores, sockets, and nodes needed for a job; and the licenses that are required for runtime. Before, they could specify only the number of CPUs. "It is significantly easier for users to submit jobs now," says Terboven.

- **Increase in network performance.** For the CCC, Windows HPC Server 2008 with its support for NetworkDirect on InfiniBand has dramatically improved MPI performance. The CCC has a lot of MPI code that will benefit from the faster MPI implementation in Windows HPC Server 2008. "We have seen an improvement of 30 percent or more," says Terboven.

- **Integration with development tools.**

Researchers who use Visual Studio appreciate how easy it is to develop, debug, and run a program on the cluster. "With UNIX we don't see this type of tight integration yet," says Terboven. "The tools in Windows HPC Server 2008 are really great. It's pretty impressive how stable it is already."