

supercomputing. simplified.



PARTNER PROFILE

The COMSOL Group provides software solutions for multiphysics modeling. They are a fast growing, high tech engineering software company with a proven track record and a vision as a leader of the industry. The company was founded in July 1986 in Stockholm, Sweden and has grown to include offices in Denmark, Finland, France, Germany, The Netherlands, Norway, India, Italy, Switzerland, United Kingdom, and U.S.A.

Comsol's customers are researchers and engineers working for leading technical enterprises, research labs, and universities. Comsol's products help them design and develop safer and more energy efficient automobiles and aircraft, improve the reception to mobile phones, assist in the search for new energy sources, exploring the universe, developing medical equipment for more accurate diagnoses, and help to educate the next generation of scientists.

WINDOWS® HPC AND COMSOL MULTIPHYSICS BRING EASE-OF-USE TO PARALLEL COMPUTING

COMSOL® DEVELOPED COMSOL MULTIPHYSICS TO SUPPORT THE PARALLELISM ON WINDOWS HPC SERVER 2008 R2

SITUATION

With the new version of COMSOL Multiphysics, Comsol chose to focus on serving the broadest market possible while adhering to their tradition of developing innovative software. To accomplish this, COMSOL placed ease of use and accelerated time to solution as primary product requirements. "Usability is key to adoption," says Niklas Rom, PhD, Vice President of Engineering for COMSOL. "We make each software release as accessible as possible to a wide audience."

SOLUTION

The goal to make its simulation products accessible extends to the operating systems that COMSOL software supports. In addition to accessibility, parallel computing is another key component in minimizing time to solution for complex multiphysics problems. COMSOL Multiphysics for Windows HPC Server 2008 R2 brings a flexible and intuitive simulation environment to parallel platforms resulting in a scalable and affordable cluster solution for virtual prototyping.

"For us, Windows HPC Server 2008 R2 plays a key role in lowering the intimidation factor and other considerations involved when new users consider working in a parallel computing environment..."

-David Kan, Vice President of Sales, Southwest United States, for COMSOL

With a market consisting of researchers and IT staff who are often more comfortable using Windows, it made sense to focus on Windows HPC Server 2008 R2

as the platform OS for HPC and parallelism in COMSOL Multiphysics.

COMSOL MULTIPHYSICS

COMSOL Multiphysics is a software environment for the modeling and simulation of any physics-based system. A particular strength is its ability to account for multiphysics phenomena. Optional modules add discipline-specific tools for acoustics, chemical engineering, earth science, electromagnetics, heat transfer, microelectromechanical systems (MEMS), and structural analysis.

COMSOL Multiphysics for Windows HPCS targets mainstream computing. Version 4.0 delivers a flexible and intuitive simulation environment to parallel platforms, which provides users with a scalable and affordable cluster solution for virtual prototyping. All controls needed for configuration and management of jobs with Windows HPC Server 2008 R2 are readily available with the click of a button within the COMSOL Multiphysics graphical user interface. No command-line operations are required.

WINDOWS HPC SERVER 2008 R2

Windows HPC Server 2008 R2 combines the power of a 64-bit Windows Server® platform with rich, out-of-the-box functionality to improve productivity and reduce the complexity of an HPC environment.

Windows HPC Server 2008 R2 enables broader adoption of HPC, and increases productivity by providing numerous end-user, administrator, and developer features and tools.

- **End users** experience a rich and compatible environment that allows the use of familiar applications such as Microsoft Excel®, System Center, and Microsoft Visual Studio®. Organizations can take advantage of existing technology investments and skill sets to help minimize total cost of ownership, optimize return on investment, and make HPC resources easier to manage.
- **Administrators** can use Microsoft management tools to centrally manage the Windows Server infrastructure. Windows HPC Server 2008 R2 includes an improved heat map view for cluster management, extensible diagnostic framework for customized testing in any programming or scripting language, and a rich reporting database and enhanced API for building custom reports.
- **Developers** can use familiar development tools, such as the native parallel debugger in Microsoft Visual Studio®, to develop and troubleshoot parallel programs including support for standard interfaces such as Message Passing Interface (MPI), OpenMPI, and Web Services.
- **Excel 2010** offers cluster-safe user defined functions to Windows HPC Server 2008 R2, which provides the ability to run complex or time consuming User Defined Functions. You can use Excel as a Windows Communication Foundation client to submit Service Oriented Architecture requests to the cluster to visualize results.
- **Desktops** that are running the Windows 7 operating system can now be added to your HPC cluster as workstation nodes. Use these nodes to run cluster jobs based on a configured policy, or bring them online manually as needed. With Windows 7 desktops, your HPC cluster is now more flexible and scalable than ever before.
- **Windows HPC Server R2** has been extended to Windows Azure cloud computing platform as well, allowing administrators to tap into additional computing capacity on demand by transparently adding Azure resources to a local cluster.
- **The WHPC Job scheduler** is multi-core aware, allowing sophisticated scheduling by core, by socket, or by server. Windows HPC Server 2008 R2 includes Service-balanced Scheduling, which optimizes the process of starting jobs and balances the resources that are assigned to jobs in real time, according to their priority. Users can manage this all in a new, simplified user interface.

BENEFITS

Ease of use

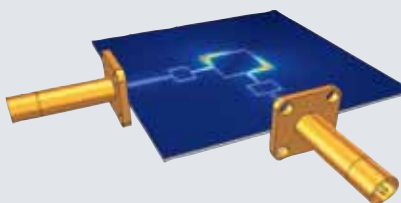
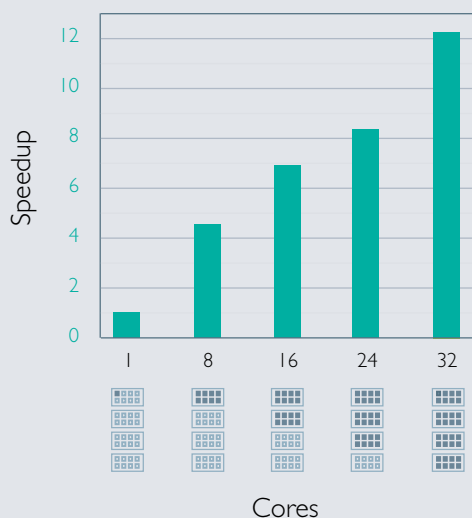
Customers who run COMSOL Multiphysics software on Windows HPC Server 2008 R2 have the potential to spend more time solving engineering problems and less time dealing with underlying computer issues.

Familiarity and Usability

Windows users will appreciate the familiar environment that COMSOL Multiphysics on Windows HPC Server 2008 R2 provides. With Office interoperability and Windows 7 usability, end-users will have the tools they need to create fast, scalable simulations.

Free Cluster Nodes Licensing

Users of COMSOL Multiphysics floating network license will be able to deploy their simulations on any number of hosts – without any additional COMSOL licensing cost. New users who purchase a floating network license will also be able run their simulations on a cluster system with an unlimited number of nodes free of charge.



A frequency domain analysis is performed on a patch antenna by sweeping 21 frequencies in the GHz band. For each frequency a problem with 1.3 million degrees of freedom is solved. The model was run on a small cluster of four Microsoft HPC Server 2008 machines with dual four-core CPUs, Intel Xeon 5420. Each CPU has two memory channels giving it a total of four memory channels. The model required 19 GB memory and the sweep took 33138 seconds on a single core of one machine. PARDISO direct linear solver was used.

COMSOL Multiphysics on Windows HPC Server 2008 R2 in action: Parametric sweep distributed on a small cluster

FURTHER INFORMATION

For more information about Windows HPC Server 2008 R2 and HPC, please visit <http://www.microsoft.com/hpc>

For more information about COMSOL, please visit <http://www.comsol.com>

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