

High Productivity Computing With Windows

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Get the full proof at www.microsoft.com/hpc

Business Drivers for HPC

1



Competitive Advantages

2



Pressure to improve operational performance (cost, quality and time to market)

3



Quality driven regulatory compliance

4



Rapid cycles of product innovation



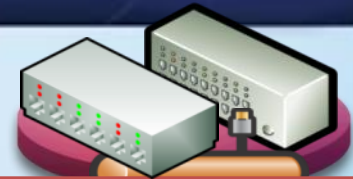
Today's Environment



Corporate Infrastructure



Clusters/Super Computers



High Speed networking



Storage



Information workers



Scientists



Engineers



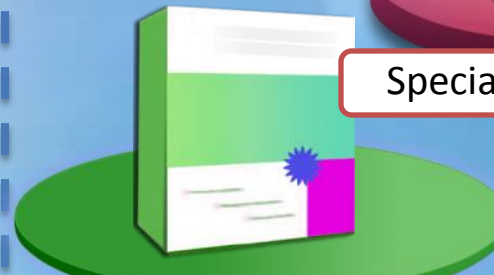
Financial Analysts



Mainstream Technologies



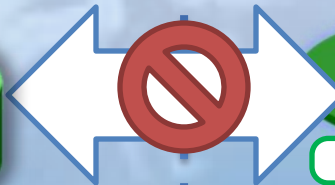
Specialized languages



Compilers



Debuggers



High Productivity Computing

Windows HPC Server 2008



Combined Infrastructure



Integrated Desktop and HPC Environment



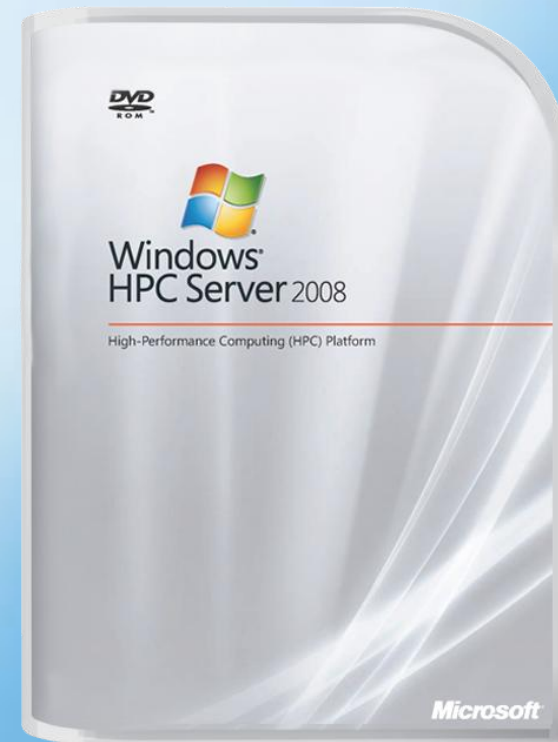
Unified Development Environment



Performing a complex computational science and engineering calculation today is more than about just buying a big supercomputer.

Although HPC traditionally stands for “High Performance Computing”, we believe that the real end-to-end solution should be about “High Productivity Computing”.

What we mean by “**High Productivity Computing**” is the whole computational and data handling infrastructure and also the tools, technologies and platforms required to coordinate, execute, and monitor such a calculation end-to-end.



Traditional Software Methods are Changing



Additional operations per second if code can take advantage of concurrency



Why Microsoft in HPC?

Current Issues

- ❖ HPC and IT data centers merging: isolated cluster management
- ❖ Developers can't easily program for parallelism
- ❖ Users don't have broad access to the increase in processing cores and data

How can Microsoft help?

- ❖ Well positioned to mainstream integration of application parallelism
- ❖ Have already begun to enable parallelism broadly to the developer community
- ❖ Can expand the value of HPC by integrating productivity and management tools

Microsoft Investments in HPC

- ❖ Comprehensive software portfolio: Client, Server, Management, Development, and Collaboration
- ❖ Dedicated teams focused on Cluster Computing
- ❖ Unified Parallel development through the Parallel Computing Initiative
- ❖ Partnerships with the Technical Computing Institutes

Windows HPC allows you to accomplish more, in less time, with reduced effort by leveraging users existing skills and integrating with the tools they are already using.



Administrator

- Integrated Turnkey HPC Cluster Solution
- Simplified Setup and Deployment
- Built-In Diagnostics
- Efficient Cluster Utilization
- Integrates with IT Infrastructure and Policies



Application Developer

- Integrated Tools for Parallel Programming
- Highly Productive Parallel Programming Frameworks
- Service-Oriented HPC Applications
- Support for Key HPC Development Standards
- Unix Application Migration



End - User

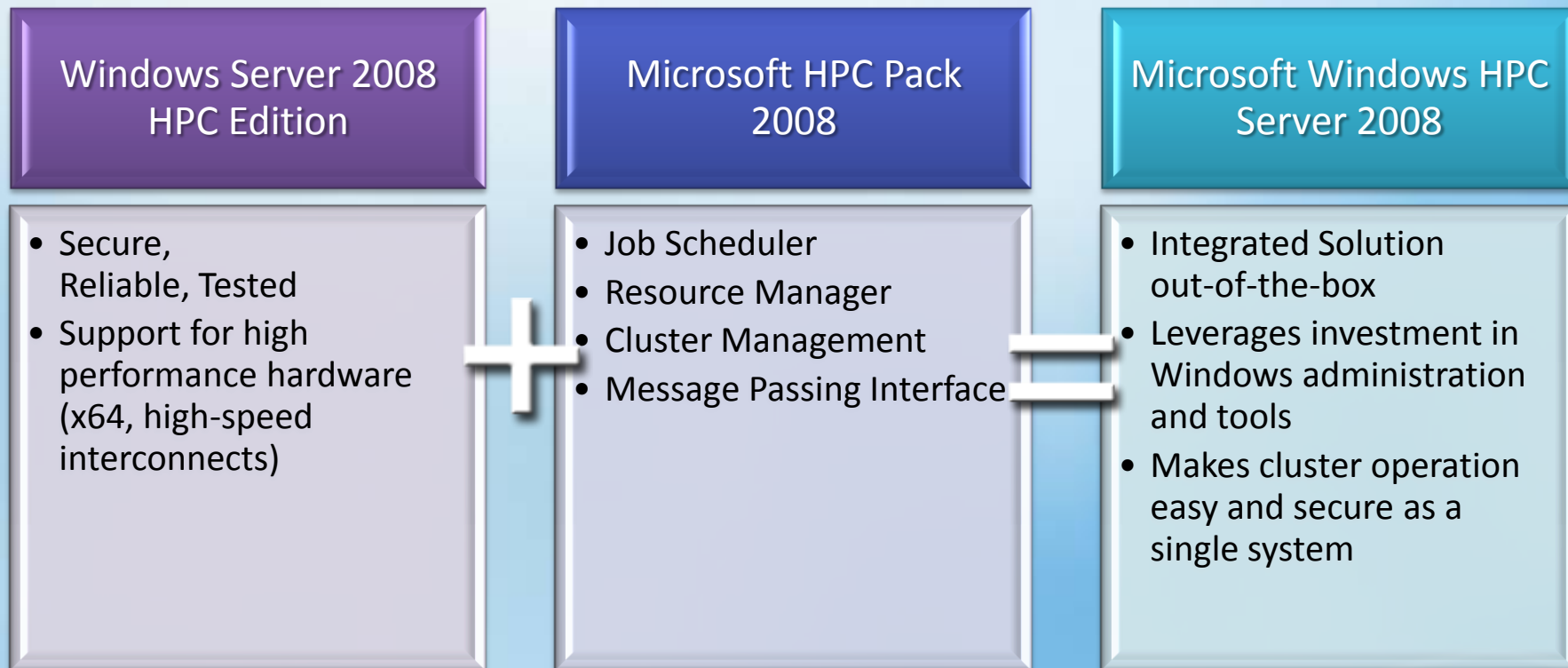
- Seamless Integration with Workstation Applications
- Integration with Existing Collaboration and Workflow Solutions
- Secure Job Execution and Data Access



Windows HPC Server 2008



- Complete, integrated platform for computational clustering
- Built on top the proven Windows Server 2008 platform
- Integrated development environment



Evaluation available from <http://www.microsoft.com/hpc>



Application

- Home Grown
- ISV
- ...

Scheduler

- Microsoft HPC Pack
- Partner
- Home Grown

Management / Monitoring
/ Administration

- Microsoft HPC Pack
- Microsoft System Center
- Partner

OS

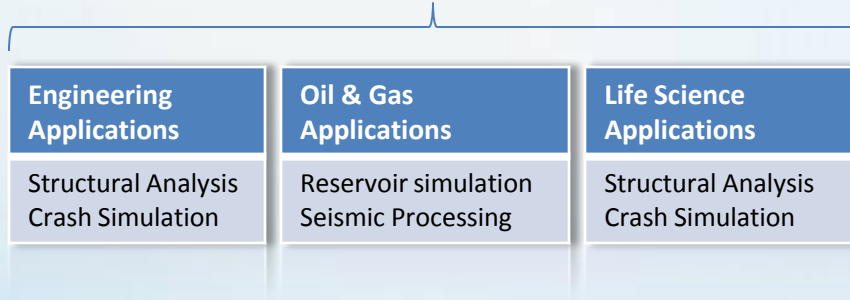
- Windows Server 2008 HPC Edition

Hardware



Scenario: Broaden Application Support

V1 (focusing on batch jobs)



V2 (focusing on Interactive jobs)



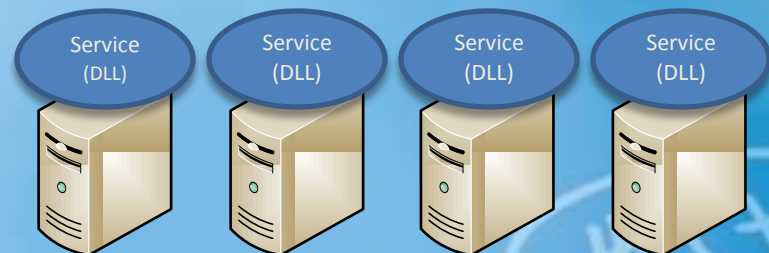
Job Scheduler

Resource allocation
Process Launching
Resource usage tracking
Integrated MPI execution
Integrated Security

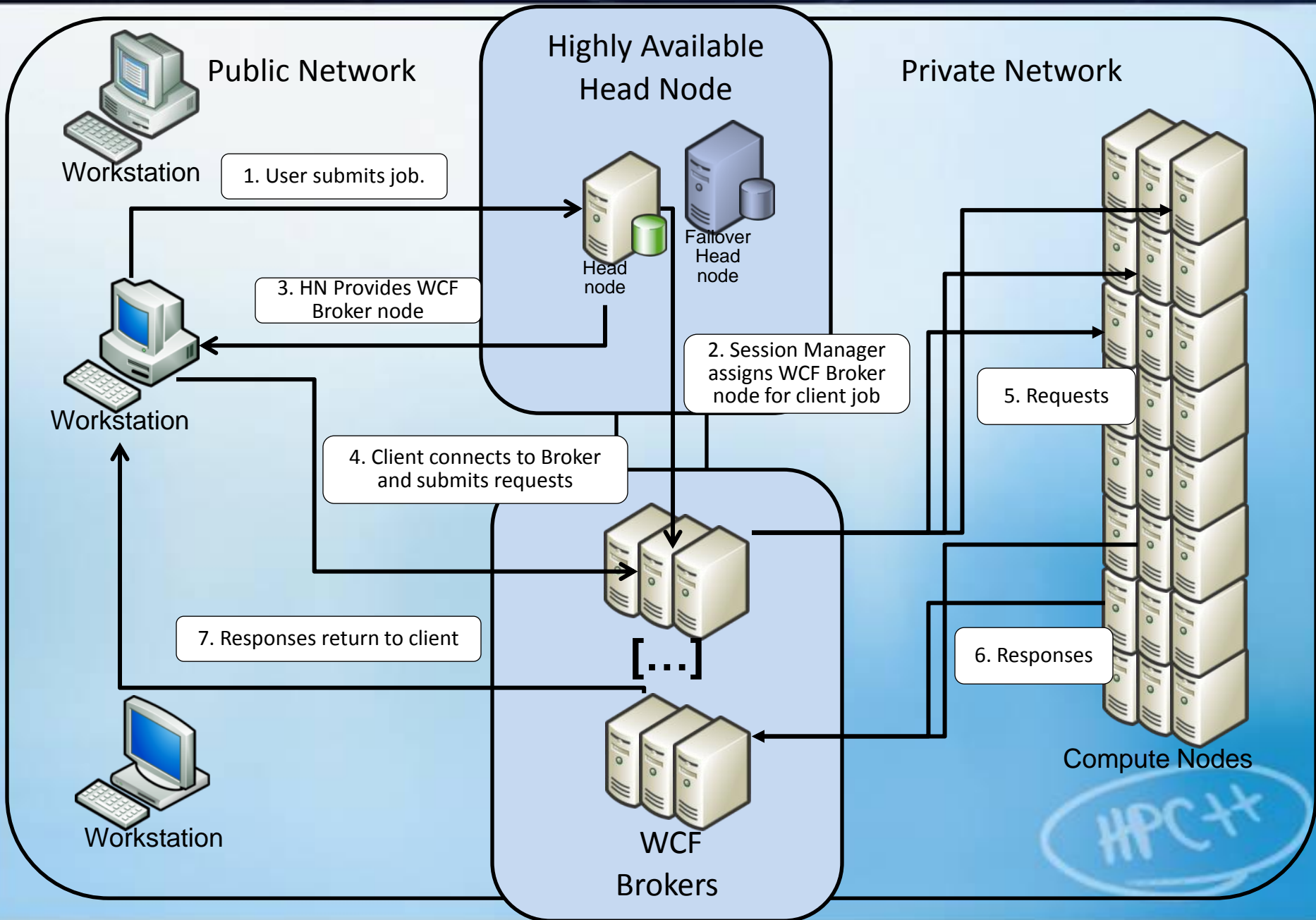


WCF Service Router

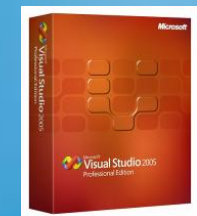
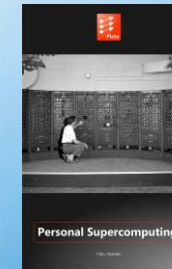
WS Virtual Endpoint Reference
Request load balancing
Integrated Service activation
Service life time management
Integrated WCF Tracing



Service-Oriented Jobs



- **1997** NCSA – the first Windows cluster (NT4)
- **2004** Windows HPC team established
- **2005** Windows Server 2003 SP1 x64
- **2005** Microsoft launches HPC entry at SC'05 in Seattle with Bill Gates keynote
- **2006** Windows Compute Cluster Server 2003 ships
- **2007** Microsoft named one of the Top 5 companies to watch in HPC at SC'07
- **2008** Windows HPC Server 2008
#10 na Top500 (Shanghai Center)



Spring 2008, NCSA, #23
9472 cores, 68.5 TF, 77.7%



Spring 2008, Umea, #40
5376 cores, 46 TF, 85.5%



Spring 2008, Aachen, #100
2096 cores, 18.8 TF, 76.5%



Fall 2007, Microsoft, #116
2048 cores, 11.8 TF, 77.1%



30% efficiency improvement

Rank	Organisation	Rmax	Cores
15	Shangai	180.6	30720
56	NCSA	68.5	9600
77	Stuttgart Univ.	50.7	5376

Windows HPC Server 2008

Windows Compute Cluster 2003

Spring 2007, Microsoft, #106
2048 cores, 9 TF, 58.8%



Spring 2006, NCSA, #130
896 cores, 4.1 TF



Winter 2005, Microsoft
4 procs, 9.46 GFlops



Ready for Prime-time

#23
Summer
2008

Location	Champaign, IL
Hardware – Machines	Dell blade system with 1,200 PowerEdge 1955 dual-socket, quad-core Intel Xeon 2.3 GHz processors
Hardware – Networking	InfiniBand and GigE
Number of Compute Nodes	1184
Total Number of Cores	9,472 cores
Total Memory	9.6 terabytes
Particulars of for current Linpack Runs	
Best Linpack rating	68.5 TFPs
Best cluster efficiency	77.7%
For Comparison...	
Linpack rating from November 2007 Top500 run (#14) on the same hardware	68.5 TFPs
Cluster efficiency from November 2007 Top500 run (#XX) on the same hardware	69.9%
Typical Top500 efficiency for Clovertown motherboards w/ IB regardless of Operating System	65-77%



7.8% improvement in efficiency on the same hardware running Linux

About 4 hours to deploy



Industry Focused Partners

Windows HPC Server 2008



Academia

Aerospace

Automotive

Financial Services

Geo Services

Government

Life Sciences



Microsoft HPC in EMEA

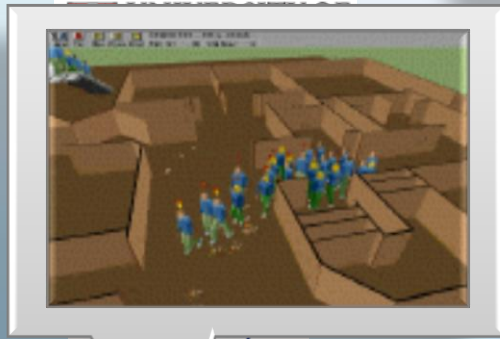
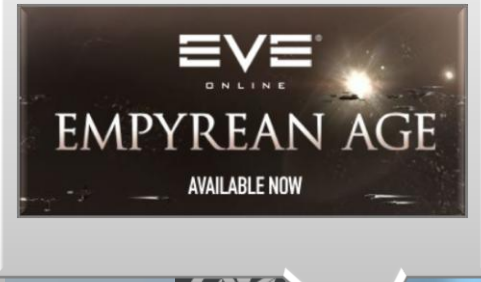
Windows HPC Server 2008

Acad



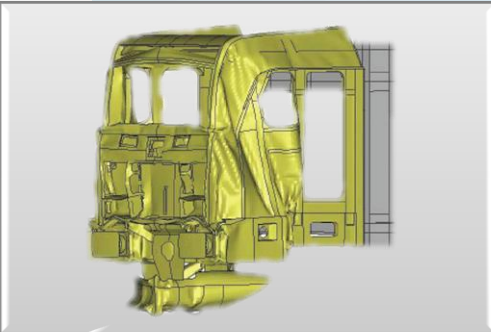
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CELLSYS

SOCIETE GENERALE Corporate & Investment Banking



دبي للبتروم
Dubai Petroleum



EURO/CFD Industrial Simulations

P B M



ERICSSON

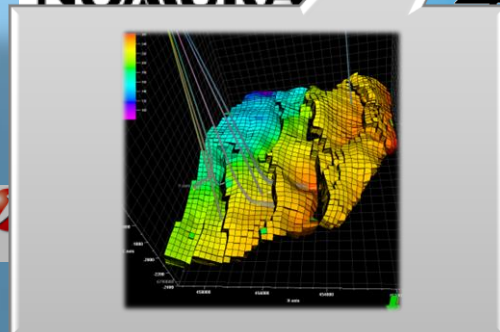


CIMES Energy

NOMURA



BOMBARDIER
alinghi
DEFENDER 33rd AMERICA'S CUP



شركة تطوير حقل زاكوم
Development Company (ZADCO)



MAN
AREVA

FhG
raunhofer Gesellschaft

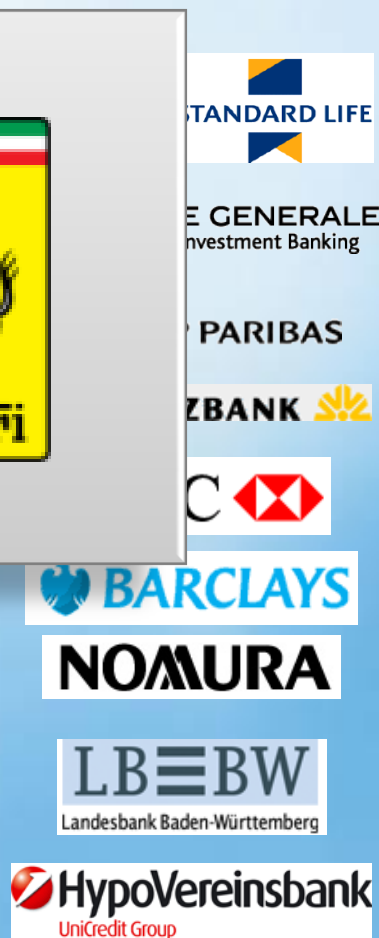
Academic



Engineering



Finance



Other



“We are very excited about utilizing the Cray CX1 to support our research activities,” said Rico Magsipoc, **Chief Technology Officer for the Laboratory of Neuro Imaging**. “The work that we do in brain research is computationally intensive but will ultimately have a huge impact on our understanding of the relationship between brain structure and function, in both health and disease. Having the power of a Cray supercomputer that is simple and compact is very attractive and necessary, considering the physical constraints we face in our data centers today.”



Microsoft[®] **CRAY**



Windows[®] HPC Server 2008



Microsoft HPC in the Future

Windows HPC Server 2008


Windows
Compute Cluster Server 2003


Microsoft
Visual Studio 2005


Windows
HPC Server 2008


Microsoft
System Center
Operations Manager 2007


Microsoft
Office SharePoint
Server 2007


Microsoft
Visual Studio 2008


Microsoft
.net
Parallel Extensions
Hyper-V™


Windows Server™


Microsoft
System Center


Microsoft
Office
Futures


Microsoft
Visual Studio


Microsoft
SQL Server


Microsoft
.net
Hyper-V™

2006

Personal Super Computing

- Microsoft Entry into HPC
- Personal And Workgroup Technical Computing
- End User Applications available for Windows
- Parallel and HPC Development Tools
- Ease of Management and Deployment

2008

Broad Reaching HPC

- Support Traditional & Emerging HPC
- Larger Cluster support & Top500 Range
- Greater Accessibility for Windows-based Users
- Broader Developer support with tools and SOA
- Improved Management and Deployment

Future

Seamless Parallelism

- Parallel Computing Everywhere
- Ultra-Scale/Cloud Computing
- Transparent User Access
- Implicit parallelism for .NET developers
- Dynamic and Virtualized workloads
- Mainstream Management of HPC and IT Infrastructure



Financial Services Firm Scales Fast-Growing Hedging Application on Low-Cost Windows Cluster



Fund Manager Improves Performance, Eases Administration with Computing Cluster

"It's like having an incredibly powerful CPU at your finger tips. The ease of use creates a kind of transparency where the line between the desktop and the compute cluster no longer exists." - Christopher Mellen, Head of Research, Grinham Managed Funds



Investment Bank Improves Competitive Edge with High Performance Computing



Investment Bank Plans to Boost IT Performance, Reduce Hardware Costs with New Server Technology

"From now on, whatever we will be testing, developing, or evaluating will be based on Windows Server 2008—whether it's business-driven, transition-driven, or research-driven." - Sorin Manta, Manager, Windows Server Infrastructure, Technology and Operations, BMO Capital Markets



IT Services Company Develops Risk and Trading Systems on Integrated Platform



ISV Opts Against Open Source, Doubles Revenue with Office Business Application

"By using Microsoft technologies as the foundation for our development, we're producing an easy-to-use, understandable, low-cost offering that can be confidently adopted by financial services customers." - Graham Twaddle, Founder and Chief Executive Officer of Corporate Modelling





Switch from Linux to Windows Increases Value of HPC for Golf Equipment

"Manufacturer jobs that took 40 hours are now down to 8, enabling engineers to test and refine their designs much faster." - John Loo, Design Systems Senior Manager, Callaway Golf



Leading HPC Vendor Eases Adoption for Customers, with New Windows-Based Offerings

"Many companies see value from HPC, but they have little to no experience with Linux... We need to provide a way for them to advance their theories and research using what they already know." - Beverly Bernard, Product Manager, SGI



64-bit Compute Cluster Performs Crash Analysis, Aides in Safety Compliance



Shipbuilder Introduces HPC on Microsoft to Develop High Value-Added Ship Types



Boeing Tests High Performance Computing Cluster, Improves Processing Time

"Because we develop intelligent graphics software in a Windows environment, it makes sense to work with an HPC cluster that supports that framework." - John F. Bremer Advanced Computing Technologist, Intelligent Graphics Group Boeing



Manufacturer Provides Engineers with Easy-to-Use, High-Performance Computing Solution



Engineers at French Production Company Improve Productivity with New Business Solution





Australian Company Delivers Solutions Faster, Expands Capabilities with HPC Solution

"I came in with zero knowledge of Windows HPC Server 2008 deployment, although I knew a lot about Linux. Within a couple of days, I was deploying Windows-based nodes." - Dr. Simon Beard
Systems Specialist, On Demand Group, ISA Technologies



NASCAR Team Turns to High Performance Computing to Sharpen Competitive Edge

"With simulation times reduced from 24 hours to about 30 minutes, we can run multiple simulations for each race and better tune the simulations for each car, track, and set of track conditions." - Mark Paxton

Research and Development Engineering Manager, NASCAR Team, Chip Ganassi Racing



Pebble Bed Modular Reactor (PBMR) in South Africa adopts Windows HPC Technology Over Linux.



SIMULIA Delivers Simulation Solutions Faster with Windows HPC Server 2008, and Sees the Advanced Programming Tool Set as a Critical Asset.



Microsoft High Performance Computing Solution Helps Oil Company Increase the Productivity of Research Staff

"With Windows Compute Cluster Server, setup time has decreased from several hours—or even days for large clusters—to just a few minutes, regardless of cluster size." - IT Manager, Petrobras
CENPES Research Center





French Yacht Team Streamlines Design with Secure and Familiar Technology

"The transition from Linux to Windows Compute Cluster Server 2003 was flawless. In fact, it was so easy we didn't even notice a change in the office." - Bernard Nivelte, Lead Designer, AREVA Challenge



Easier Cluster Management Helps Northrop Grumman Improve Productivity

"Windows Compute Cluster Server has caused a paradigm shift. Before I had to limit my problem size because I ran out of resources. Now I feel enabled to think bigger." - Thi Pham, PhD, Systems Engineer, Space Technology Sector, Northrop Grumman



Simulation Software on x64 Compute Clusters Boosts Performance, Reduces Costs



Florida Boosts Productivity, Cuts Run Times with High-Performance Computing Cluster



Software Company Delivers 64-Bit Fidelity and Speed for Computer-Aided Engineering





Windows HPC Server 2008 Ranks at 23 Among the World's TOP500 Largest Supercomputers with 68.5 TFlops and 77.7 Percent Efficiency. *(June 2008)*

"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



The Umeå Cluster Achieved a LINPACK Score of 46.04 TFlops and 85.6 Percent Efficiency, Making Their System the Second Largest Windows Cluster Ever Deployed and the Fastest Academic Cluster in Sweden. *(June 2008)*



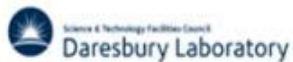
Leading Supercomputing Center in Italy Eases Use, Improves Access with New Cluster

"It will be a big benefit for us to offer researchers a high-performance computing resource with a familiar interface and a natural, user-friendly way to use the cluster from home." - Dr. Marco Voli, CINECA



Researchers' Move from Linux to Windows Yields Performance Gains, New Capabilities

"We were quite surprised when, without any optimization, the new Windows-based HPC system outperformed our highly optimized Linux cluster." – Valerie Daggett, Professor, University of Washington



Facility for Breakthrough Science Seeks to Expand User Base with Windows-Based HPC





Early Detection of Cancer One Step Closer to Solution with Microsoft, Dell and Intel

"The user interface and structure of the Microsoft Windows Compute Cluster Server make managing a large, high-performance computing cluster far less daunting than with other operating systems." - Dr Robert Moritz, Manager of the Proteomics Facility at LICR and Director of the Australian Proteomics Computational Facility



National IT Center Improves Customer Service with High-Performance Compute Cluster.

"Using Windows for high-performance computing means we can offer our customers real added value." - Uwe Wössner, Head of the Visualization Department, High Performance Computing Center Stuttgart



Inventor of Beowulf Cluster Exposes Young Minds to High-Performance Computing



Portuguese University Accelerates Cancer Research with High-Performance Computing



Microsoft Researchers Boost Task Productivity Fiftyfold with Cluster Server Software





Supercomputing Solution Reduces IT Administration Needs at University of Cincinnati Genome Research Institute.



Research-Driven University Breaks Down Barriers to High-Performance Computing



Environmental Scientists Join Forces Against Climate Change with Integrated Platform

"This is the first time we've delivered an integrated solution whereby researchers can sit in front of a Web browser and drive it to completely different scenarios using the data and models of different institutions." - Simon Cox, Professor of Computational Methods at the University of Southampton and Technical Director for Genie



Scientists Accelerate Research and Insight with Accessible, High-Performance Computing Environment

"Even students who come from a Linux background and are using Microsoft developer tools for the first time are finding the change to be positive." - Iain Buchan, Director of the Northwest Institute for BioHealth Informatics at the University of Manchester



University of British Columbia (Vancouver) selects Windows HPC technology over Linux for Masters of Digital Media graduate program





Digital Marketing Firm Installs Microsoft HPC Solution to Simplify IT Operations



Digital Media School Deploys Render Farm Technology, Cuts Compute Runtime By Days

"Before we had render farm, every student rendered on his or her own PC, so sharing images and viewing the current status was not easy. Now we can decide how many PCs will render a particular image. On 32 machines it takes just a couple of hours—this is a huge reduction in time."

- Ng Kian Bee, Deputy Director, Games & Digital Entertainment of NYP's SIDM



- Microsoft HPC Web site – Evaluate Today!
 - <http://www.microsoft.com/hpc>
- Windows HPC Community site
 - <http://www.windowshpc.net>
- Windows HPC Techcenter
 - <http://technet.microsoft.com/en-us/hpc/default.aspx>
- HPC on MSDN
 - <http://code.msdn.microsoft.com/hpc>
- Windows Server Compare website
 - <http://www.microsoft.com/windowsserver/compare/default.mspix>



Thank you!

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Get the full proof at www.microsoft.com/hpc