Session 028

High Performance Computing

Brian Lewis, Infrastructure System Architect, Microsoft

IBM @server xSeries Technical Conference

Aug. 9 - 13, 2004

Chicago, IL

Windows Server

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Agenda

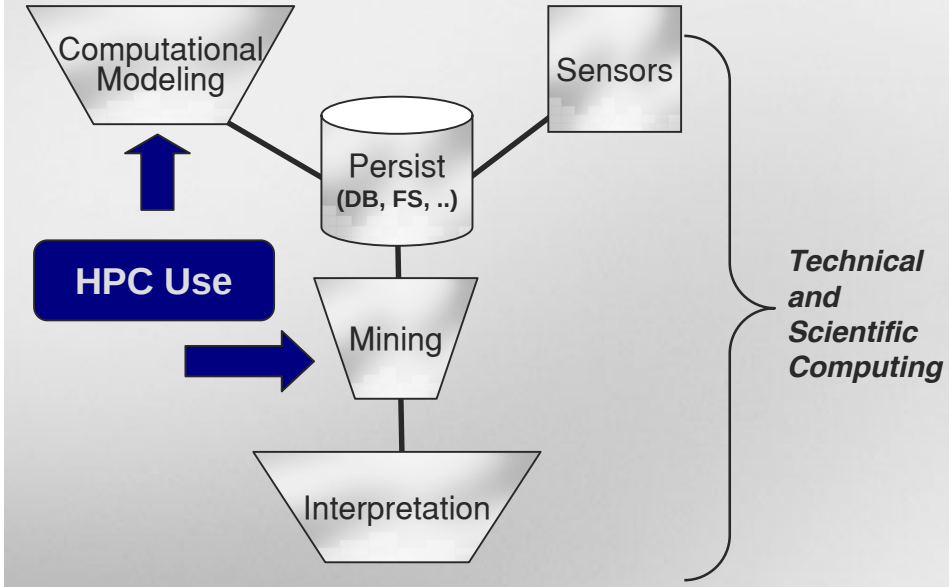
- Market Definition & Trends
- Microsoft & HPC Today
- Microsoft's HPC Mission & Goals
- Call to Action

Market Definition & Trends

Defining High Performance Computing (HPC)

HPC Definition: Using compute resources to solve computationally intensive problems

HPC Role in Science

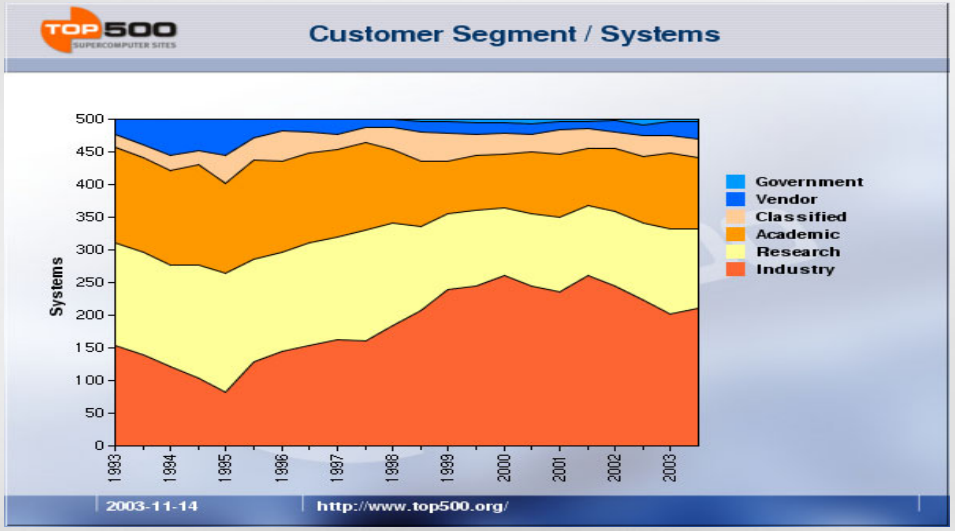


Different Platforms for Achieving Results

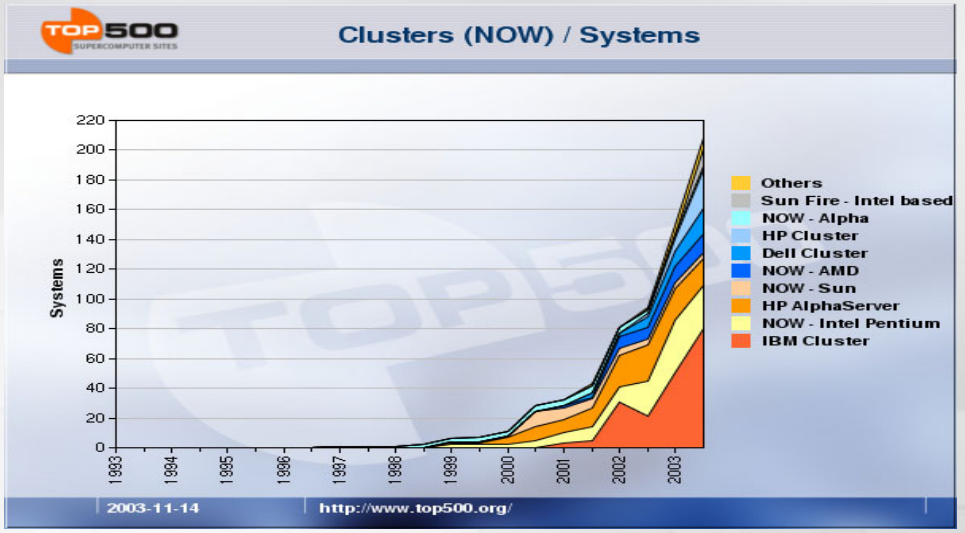
Systems	MPPs, Vector, NUMA	Dedicated HPC Clusters	Resource Scavenging
Customer Examples	Earth Simulator, ASCI Series, U.S. Gov't	MS Treasury, Equifax, Astra Zenaca, Looksmart, DaimlerChrysler, Glaxo-	Norvartis, Pratt & Whitney, SETI, GE, Boeing
Goal	Absolute Perf	Price/Perf, SLA	Harness unused cycles
Targets	Large Scale SMP	Clusters	Underutilized Desktops & Servers
Coupling	Extreme	Tightly, Loosely	Loosely
Comm	Shared Memory	MPI, none	Proprietary
Network	Bus, backplane	Myrinet, Infiniband, GigE	TCP/IP - LAN

Top 500 Supercomputing Trends

Increasing enterprise investment in powerful HPC systems



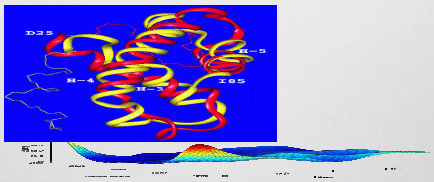
Clustering as an approach to HPC is growing rapidly

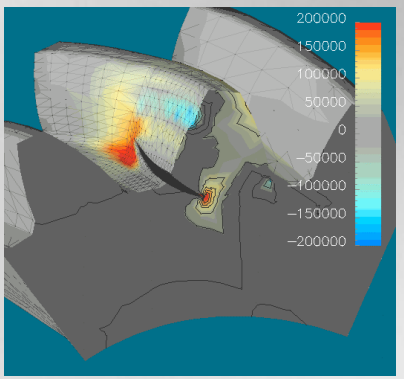


HPC Systems are affecting every vertical…

- Leverage Volume Markets of Industry Standard Hardware and Software.
- Rapid Procurement, Installation and Integration of systems
- Cluster Ready Applications Accelerating Market Growth

  - Engineering
    - LSTC
    - Ansys
  - Bioinformatics
    - BLAST
    - Gaussian
  - Finance
    - Matlab
    - Excel
  - Oil & Gas
    - Eclipse
    - ProMAGIC
  - Government
    - UExplore
    - NOAA Hysplit

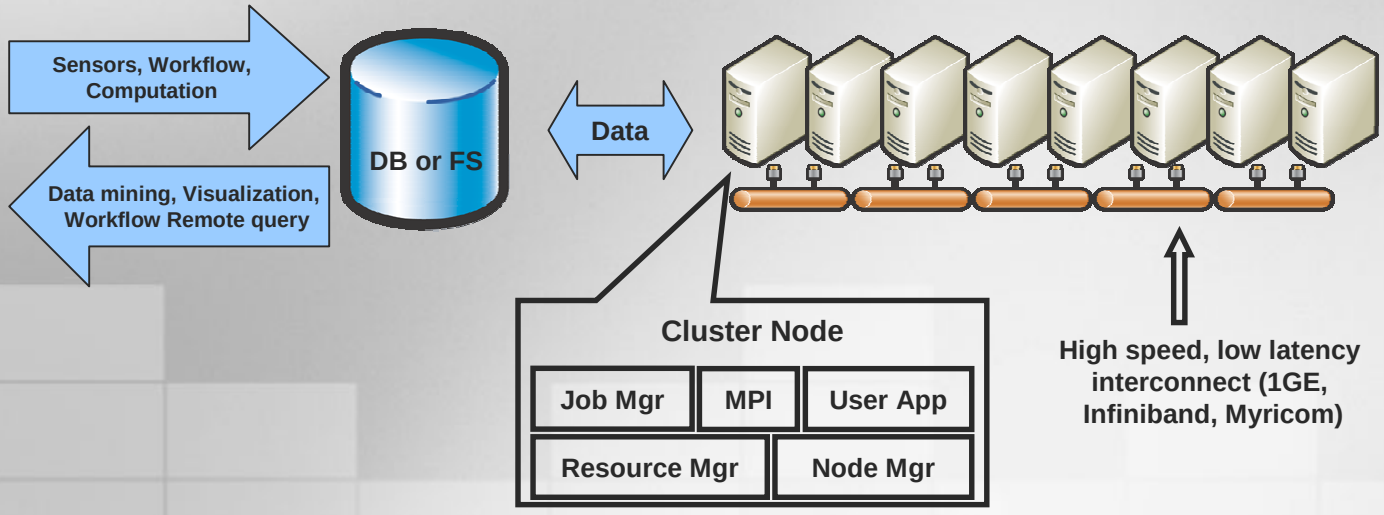




The convergence of affordable high performance hardware and commercial apps is making supercomputing personal

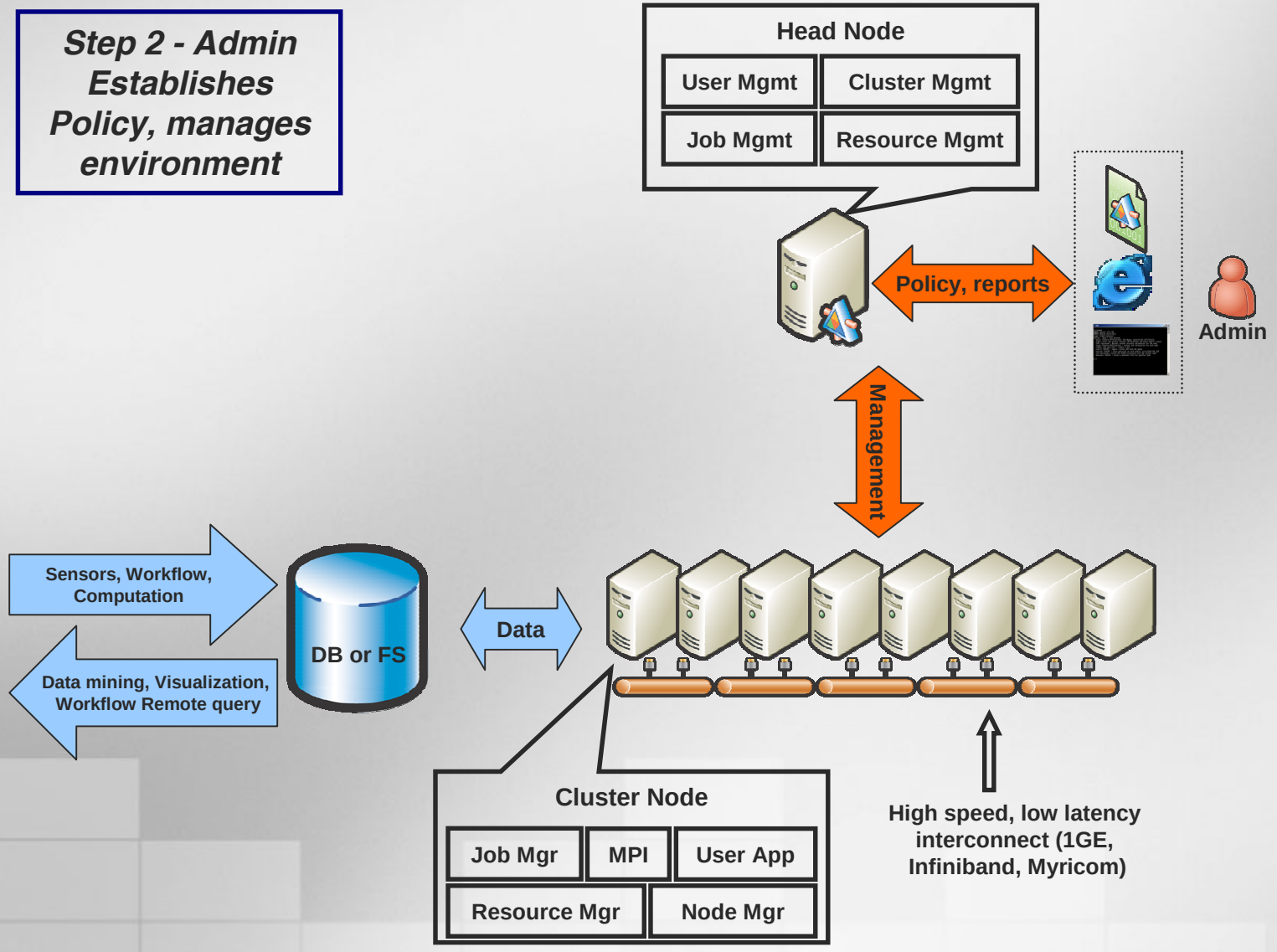
Typical HPC Environment

Step 1 - System & Datastore Established

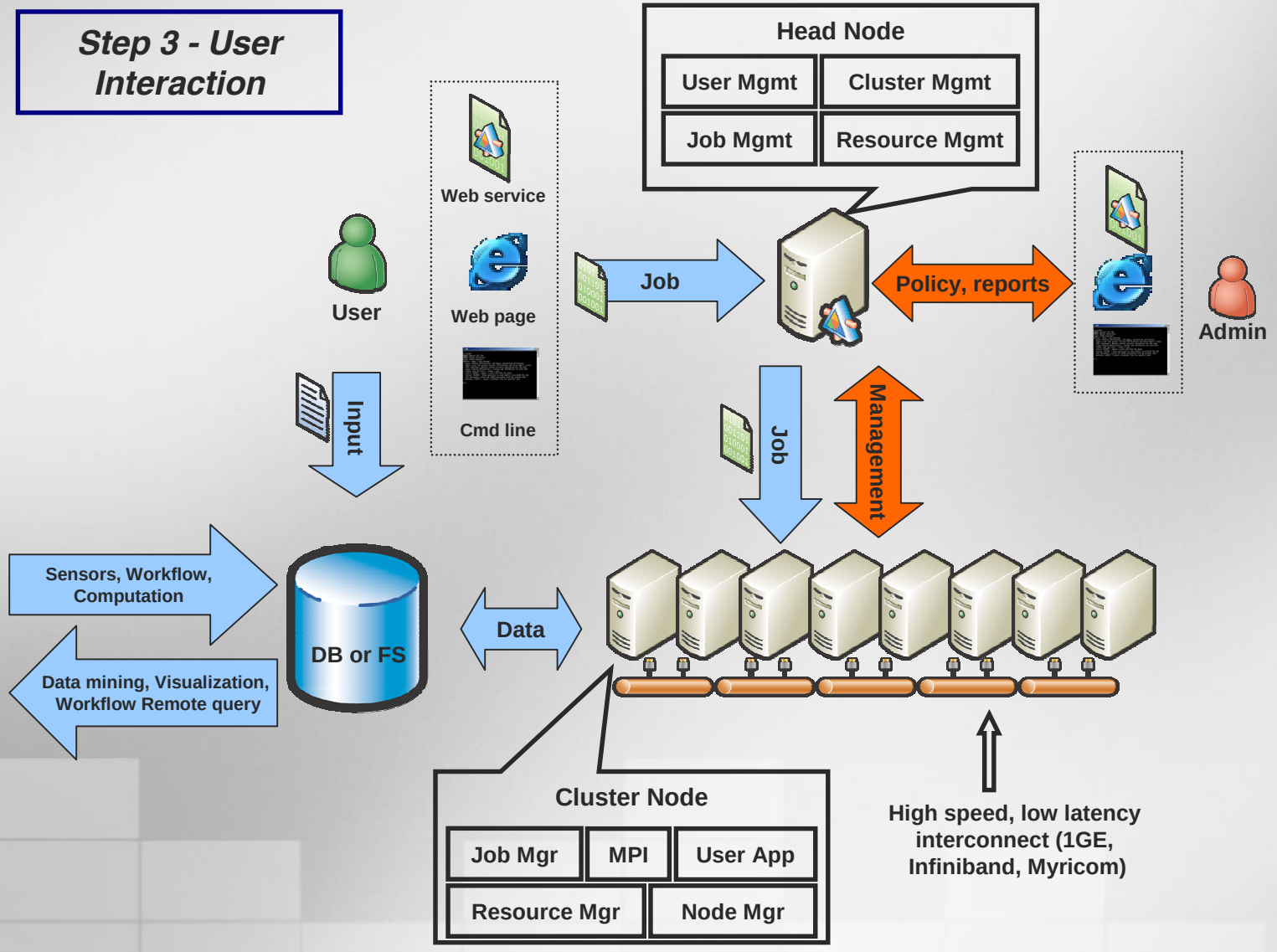


Typical HPC Environment

Step 2 - Admin Establishes Policy, manages environment



Typical HPC Environment

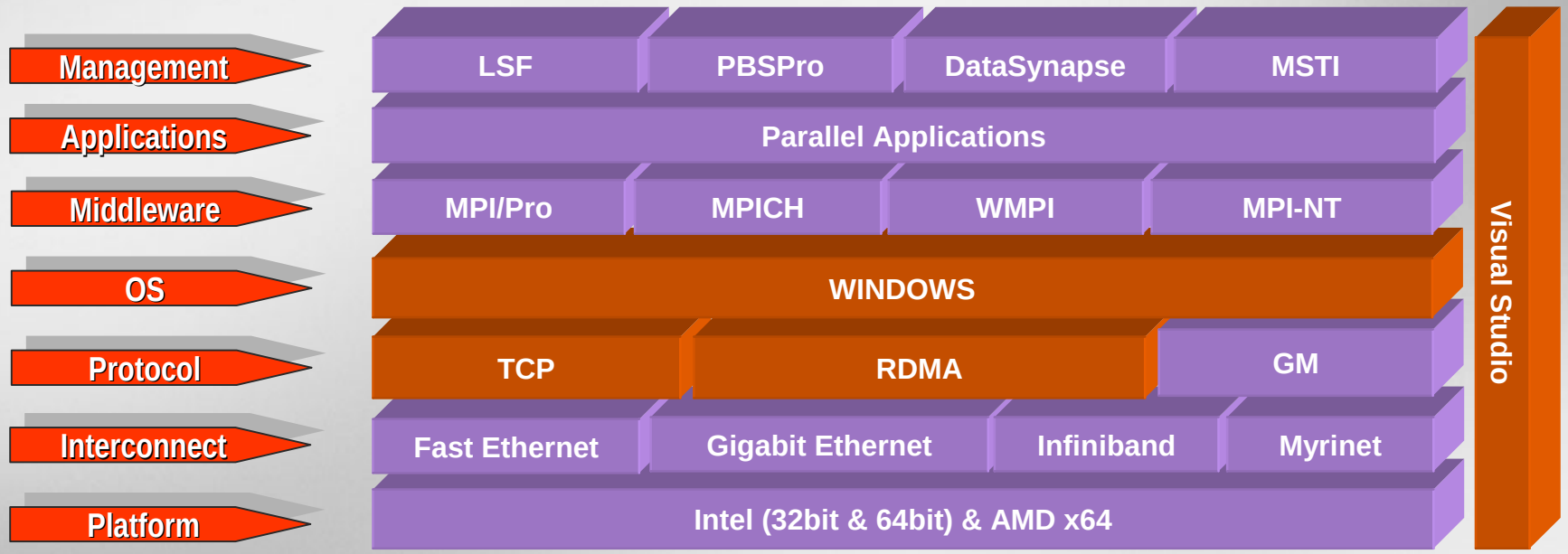


Microsoft & HPC Today

Microsoft Addressing HPC Today

Technical Solution

- Partner Driven Solution Stack



Ecosystem

- Special HPC-specific licensing via OEM partners
- Partnerships with ISV to develop on Windows
- Partnership with Cornell Theory Center

Partners - Example List

OEM

- Appro
- Dell
- HP
- IBM
- Verari
- RLX

Middleware

- MPI Softtech
- mpC Workshop
- Critical Software
- Altair

Interconnects

- Myricom
- Extreme Networks
- TopSpin
- Infinicon Systems

ISV

- Altair
- Ansys
- Avaki
- Computer Modeling Group
- DataSynapse
- Entropia
- Landmark
- LSTC
- Mathpoint
- MPI
- MSC Software
- MuPAD
- Platform
- Powerell
- Schlumberger
- United Devices

- and many more...

Cornell Theory Center Partnership

Goal:

To Provide Windows Based High Performance Cluster Computing Services.

How:

Demonstrate Windows-based HPC is enterprise ready, has lower TCO and higher reliability than the competition.

CTC Manhattan

CTC High-Performance Solutions Headquarters

- Showcase HPC/.NET Windows Clusters
- Customer Briefings, Training Facility and Consulting Offices
- In House Computational Finance Expertise

Consulting Engagements

- Financial Analytics, *VaR computations, portfolio analysis*
- Option pricing, hedging, exotics, risk management, energy, credit risk

Seminars and Workshops

- Current Financial Topics
- Latest Training for the latest Software Tools
- Data Mining

CTC Ithaca

CTC High-Performance Solutions Scalability Center

- Leading Edge, Large Scale Windows Clusters: R&D
- Seamless Integration with Production Clusters at CTC-Manhattan

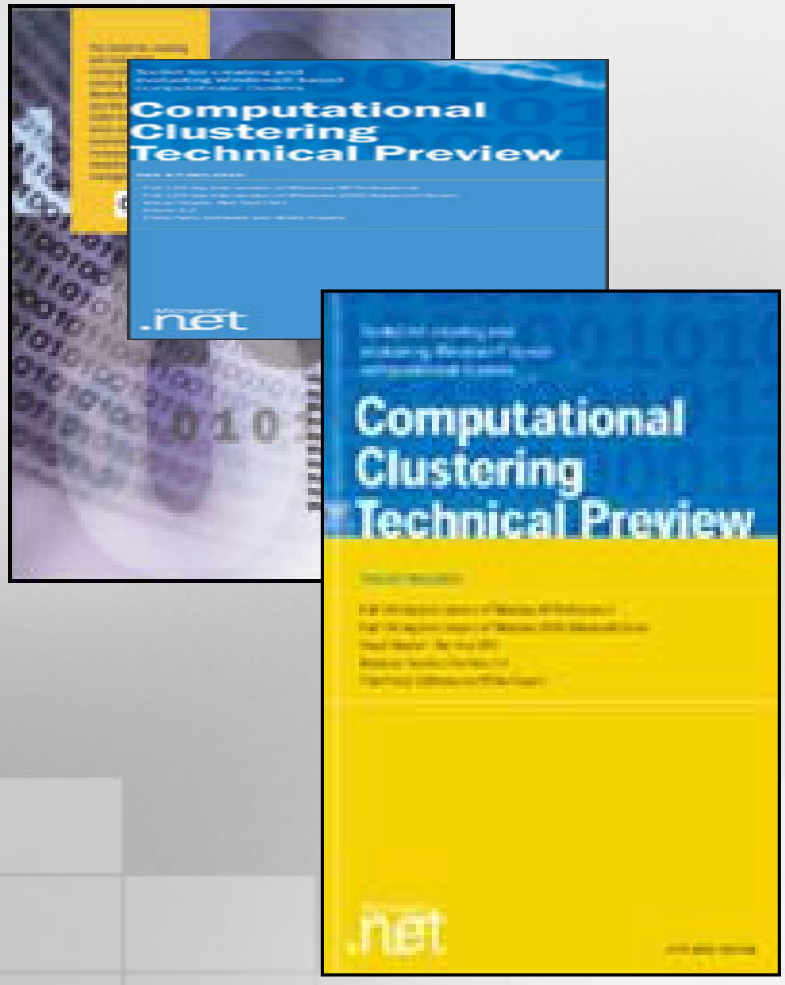
Enabling Technological Breakthroughs

- Computational Science
  - Protein Folding and Structural Biology, Computational Fracture Mechanics, Genomics
- Computational Finance
  - Optimization, Analytics & Methods

Systems and Consulting Staff

- Porting & Proof of Concept Demonstrations, Performance Tuning
- Custom HPC and .Net Cluster Installations
- Unix to Windows Porting

Helping Others Get Started



CCTP Kit Delivers:

- Hands-on preview of core HPC technologies
- Allows for compatibility testing & tuning
- Free opportunity to preview Windows HPC Solutions

Software Included:

- Microsoft Windows XP Professional evaluation version
- Microsoft Windows 2000 Advanced Server evaluation version
- Microsoft Visual Studio .Net DVD evaluation version
- Microsoft Services For Unix 3.0 evaluation version
- MPI/Pro 1.6.4 from MPI Software Technology, Inc. (free up to 32 processor clusters)
- ClusterController 1.5.2 from MPI Software Technology, Inc. (free up to 32 processor clusters)
- MuPAD 2.5.1 Algebra System
- MPI-CH 1.2.4 (open source software)
- PETSc 2.1.4 Suite of Data Structures and Routines
- Intel Vtune Analyzer Evaluation Version
- Intel C++ Compilers Evaluation Version
- Intel Fortran Compiler for Windows Evaluation Version
- Intel Math Kernel Libraries Evaluation Version
- Computational Cluster Monitor from Cornell Theory Center
- PLAPACK package (open source software)

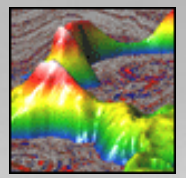
Windows HPC Customer Examples

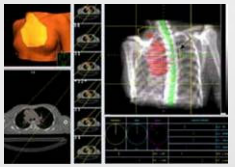
Enterprise

EQUIFAX	Financial Analysis	840 Nodes
	Rendering	600 Nodes
Oil Exploration Firm	Seismic Processing	>17,000 nodes

Departmental

aQuantive	Market Data Analysis	160-processors
DOE Contractor	Ship/Sub Engineering	40-processors
HUTCHINSON WORLDWIDE	Auto Parts Structural Analysis	128-processors
PERLEGEN	Genome Data Analysis	54-processors
UNIVERSITY OF CALGARY	Petroleum Engineering	32-processors
UNC SCHOOL OF MEDICINE	Cancer Treatment Planning	100-processors





KLA-Tencor Corporation

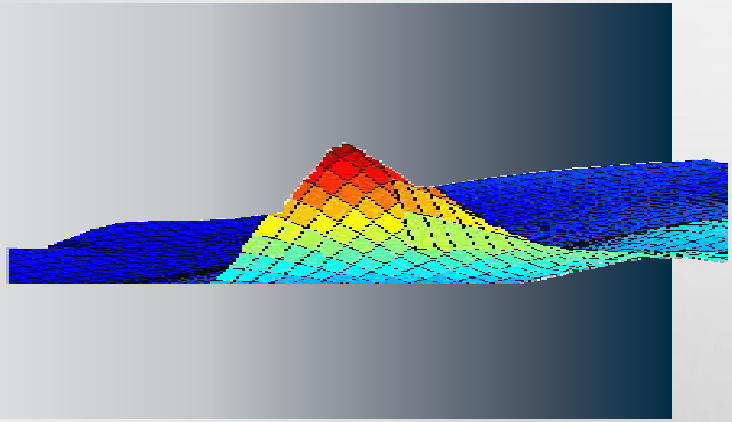
Problem Proprietary SUN systems too expensive to scale-out to meet product development schedules.

Solution Consulted with CTC on systems planning, initially installed midrange Windows 2000 cluster. Now running Windows 2003 Server.

Results Met accelerated product development schedules at fraction of cost of proprietary servers. Used CTC for peak processing. New silicon wafer inspection machine will be driven by Windows cluster.

KLA-Tencor products test the quality of silicon wafers for Intel and other semi-conductor leaders

Commonwealth Bank



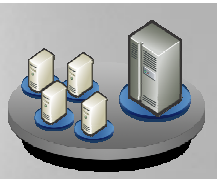
Problem Existing Unix-based Sun system taking 13 hours to complete a Monte Carlo simulation with limited flexibility, scalability, and considerable operating costs

Solution Using Compaq/Intel hardware running Microsoft software, created a distributed computing solution to do the same computing task much faster at a fraction of the cost

Results New solution was 25% faster at 25% of the cost and paid for itself within 12 months. New solution has greatly improved scalability, fault tolerance and level of redundancy

The Commonwealth Bank is one of Australia's leading providers of integrated financial services.

Transitioning to the future



While we have success today…

Customers require:

- An integrated supported solution stack
- Simplified job submission, status and progress monitoring
- Maximum compute performance and scalability
- Simplified environment from desktops to HPC clusters

Administrators require:

- Better cluster monitoring and management for maximum resource utilization
- Flexible, extensible, policy-driven job scheduling and resource allocation
- Maximum node uptime
- Secure process startup and complete cleanup

Developers Require:

- Programming environment that enables maximum productivity
- Availability and optimized compilers (Fortran) and math libraries
- Parallel debugger, profiler, and visualization tools
- Parallel programming models (MPI)

We hear the requirements, therefore moving forward…

Microsoft HPC Mission & Goals

June 2004

Windows Server

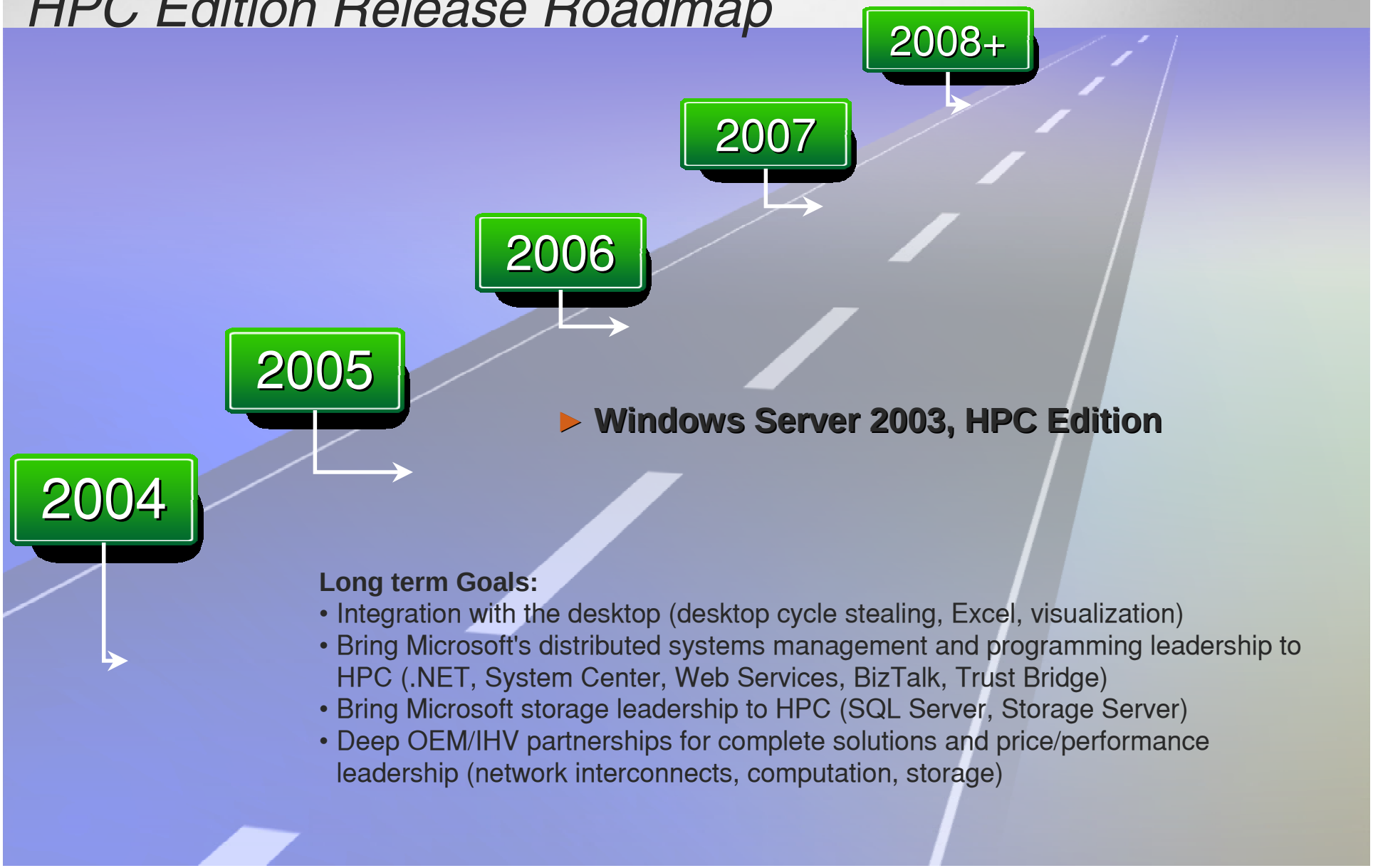
Windows Server 2003
HPC Edition release

Mission:
Deliver the easiest to deploy and most cost effective solution for solving scaled-out business, engineering and scientific computational problems.

Core Technologies	• Based on Windows Server 2003 • Support for high performance hardware • Support for industry standards MPI2, RDMA on Ethernet & Infiniband • Integrated job scheduler and cluster resource management
Key Value	• Trusted platform • Greater price/performance • Broad application support • Easy to use, scalable and secure job management
User Benefits	• Leverages investment in Windows administration and tools • Lower total cost of ownership • Runs the applications that power your business • Makes cluster operation easy and secure as a single system

Microsoft Windows Server

HPC Edition Release Roadmap



Long term Goals:

- Integration with the desktop (desktop cycle stealing, Excel, visualization)
- Bring Microsoft's distributed systems management and programming leadership to HPC (.NET, System Center, Web Services, BizTalk, Trust Bridge)
- Bring Microsoft storage leadership to HPC (SQL Server, Storage Server)
- Deep OEM/IHV partnerships for complete solutions and price/performance leadership (network interconnects, computation, storage)

Resources:

To Learn More

- Microsoft HPC website: http://www.microsoft.com/hpc/
- CTC Activities: http://cmssrv.tc.cornell.edu/ctc/winhpc/
- HPC Toolkit: http://www.microsoft.com/windows2000/hpc/toolkit.asp

Other Sites:

- 3rd Party Windows Cluster Resource Centre www.windowsclusters.org

Send questions to hpcinfo@microsoft.com

Microsoft®

Your potential. Our passion.™

June 2004

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