

HPC Solutions: HP, Altair[®] RADIOSS[™] and Windows CCS





April 18, 2008



High Performance Computing (HPC) Requirements

- CAE tools have become standard for manufacturing companies
 - As the complexity and volume of engineering simulations increase, so do the computing requirements
 - Speed, high-performance and efficiency are required when running calculation-intensive applications
- There is increased pressure to
 - reduce development cost and time-to-market
 - increase product performance
 - Gain faster access to data
 - Obtain faster results to improve productivity

A Brief History of HPC

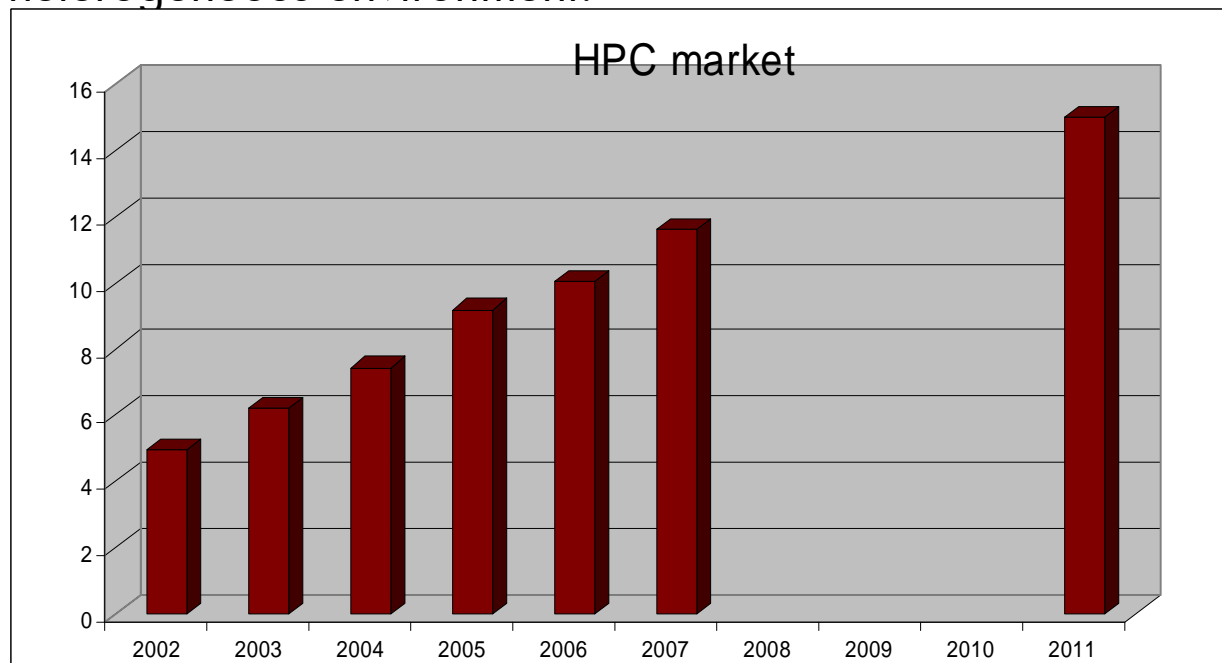
Year	1991	1998	2005	2008
System	Cray Y-MP C916	Sun HPC10000	Small-Form-Factor PCs	Workgroup System
				
Architecture	16 x Vector 4 GB, Bus	24 x 333 MHz UltraSPARC II, 24 GB, SBus	4 x 2.2 GHz Athlon 64 4 GB, GigE	8 nodes with dual socket, Quad-Core Intel® Xeon® Processors/ 3.16 GHz, 4 GB/node, GigE
OS	UNICOS	Solaris	Windows Server™ 2003 or Linux	Windows CCS
GFlops	~10	~10	~10	~809 (80x increase!)
Price	\$40,000,000	\$1,000,000 (40x drop)	< \$4,000 (250x drop)	~\$54,000
Users	Government labs	Large enterprises	Every engineer and scientist	Government labs, automotive, aerospace, medical
Applications	Classified, climate, physics research	Manufacturing, energy, finance, telecom	Bioinformatics, materials sciences, digital media	Oil and gas, medical, climate, physics research, manufacturing

“The HPC market is predicted to top \$12 billion by 2009*, powered in large part by the adoption of HPC solutions by the manufacturing industry”

– IDC

Benefits of HPC Solutions

- HPC flexible and scalable solutions allow manufacturing companies to expand their computing performance.
- Enterprises can maximize their ROI on infrastructure assets using cost-effective solutions that are suited to their specific environment.
- They can also easily manage and share diverse computing resources across geographical boundaries, allowing simultaneous access to data in a heterogeneous environment.

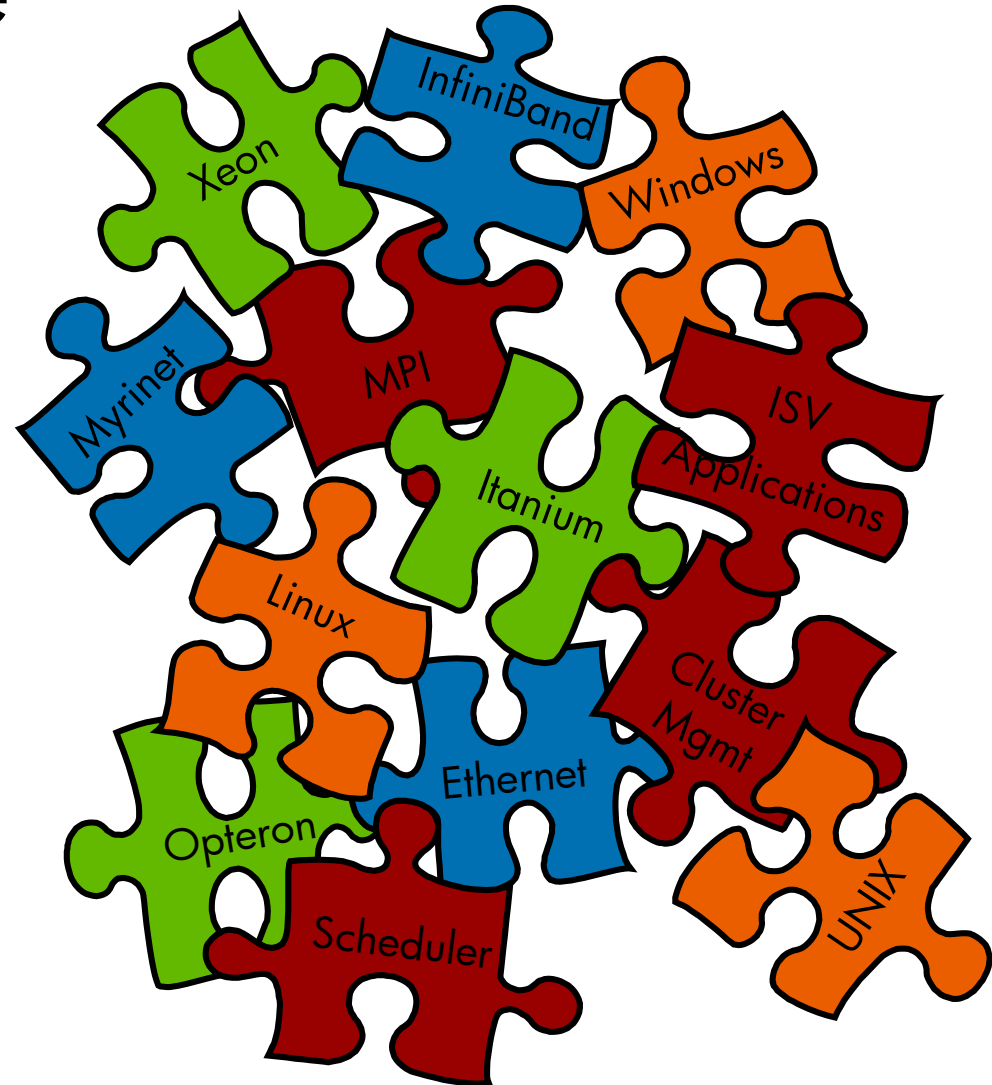


HP Cluster
Platforms—
Supercomputing
made simple

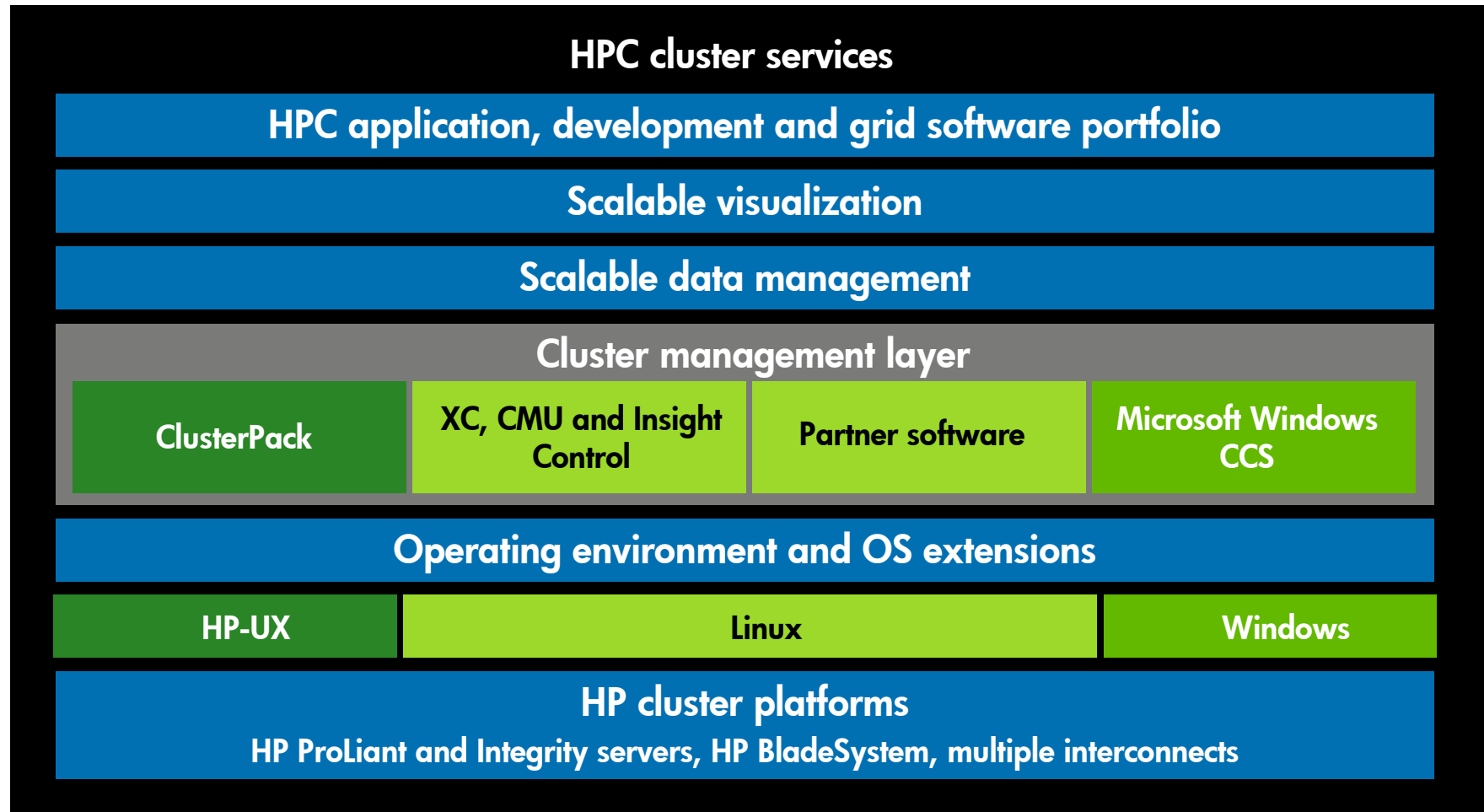


The Cluster Puzzle

- Built with many pieces
- Lots of choices
- Pieces are constantly mutating!
- Takes time and resources
- Involves risks






Unified Cluster Portfolio



HP Cluster Platforms

Flexible, pre-configured designs scale up to 1024 nodes

		Compute Nodes	Interconnects
HP Cluster Platform 3000 and 3000BL 		HP ProLiant DL160 G5	GigE, IB, Myrinet *
		HP ProLiant BL260c/ BL460c/BL480c	GigE, IB
HP Cluster Platform 6000 and 6000BL 		HP Integrity rx2660 HP Integrity rx3600/6600*	GigE, IB and Quadrics*
		HP Integrity BL860c	GigE, IB
HP Cluster Platform Workgroup System		Up to eight HP Integrity BL460c	GigE, IB
HP Cluster Platform 		Single rack HP CP3000/ CP3000BL and HP CP4000/CP4000BL and CP Workgroup System	GigE, IB

Workstation nodes available for visualization

* By special request

HP Cluster Platforms: Turnkey solution for today's HPC workload



Typical cluster delivery

- Lots of choice but:
 - work
 - time
 - risk
- Not a reference design
 - Not characterized
 - Not documented
 - Software not qualified
 - Not vendor supported



**HP Cluster
Platforms**
Delivered



**HP Cluster
Platforms**
Installed

HP = choice without the pain and risk



High Performance Computing with HP BladeSystems

Density, Speed and Designed for Scale

- Scale clusters to the extent of your budget!
- With HP c-Class systems you get
 - Excellent scalability and ease of management
 - Fastest Blade interconnect on the planet with 4X DDR InfiniBand support
 - Smart power technologies and effective cooling
 - The latest processors from Intel (Xeon and Itanium)



High Performance Computing with HP BladeSystems

HP BladeSystem Cluster Platforms*

HP Cluster Platform 3000BL	HP Cluster Platform 6000BL
Featuring HP ProLiant BL260c, BL460c, or BL480c nodes	Featuring HP ProLiant BL860c nodes
Intel Xeon Processors	Intel Itanium Processors
<ul style="list-style-type: none">• Turnkey, factory integrated BladeSystem clusters for HPC• Up to 512 compute nodes• Software options for OS and management	

* Intel Processor-based

HP Supercomputer-in-a-box

The power of supercomputing outside the Data Center. Made simple with BladeSystem c3000 and HP Cluster Platform.



CP Workgroup System

HP BladeSystem c3000 enclosure + HP Cluster Platform

HP BladeSystem c3000

- Most versatile blade enclosure for SMB, remote sites, branch offices

HP Cluster Platform (CP)

- Standard 'cluster as a product' set the bar for HPC cluster deployments

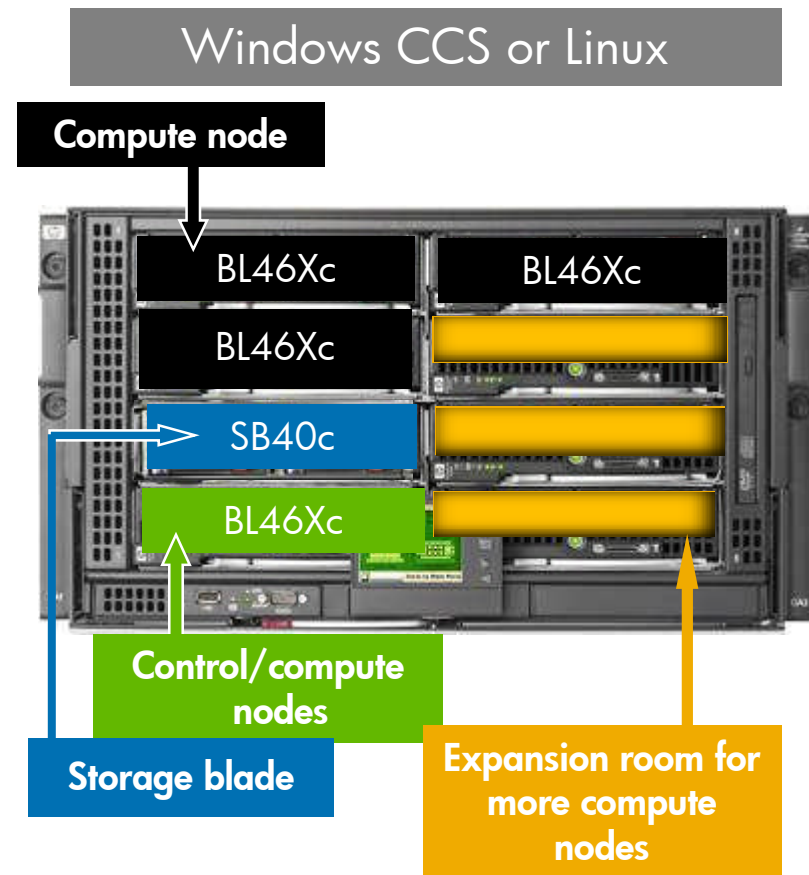
- Nearly a **teraflop** of computing in a small footprint of only 2 square feet
- Application-tuned bundles jointly developed with ISVs, available via HP's application VARs

Benefits

- Accelerate innovation
- Shorten time to market
- Reduce order and deployment complexity

HP Cluster Platform Workgroup System

- Up to 8 server blades in HP BladeSystem c3000 - a simple, compact design with customer needs in mind
 - 809 Gflops in a 2 sq ft footprint
 - Plug into 110V or 220V wall power
 - No special cooling required
- Gigabit Ethernet and InfiniBand* interconnect options
- Choice of Linux cluster systems or Microsoft Windows CCS
- Ideal for compute intensive workloads in CAE, L&Ms, Oil&Gas, FSI, etc.



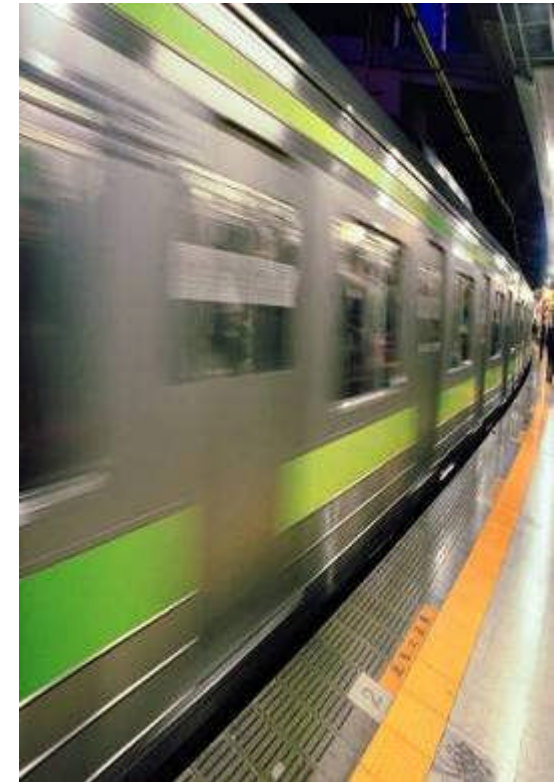
Up to 64 cores of processing power to tackle serious HPC workloads

HP Cluster Platform



- **Easy to order and quick delivery for high performance computing**

- Factory integrated solutions and deployment services
- One cabinet configurations of Cluster Platform systems
- Limited menu of servers simplifies configuration process
- Available from HP and resellers



www.hp.com/go/cp-express

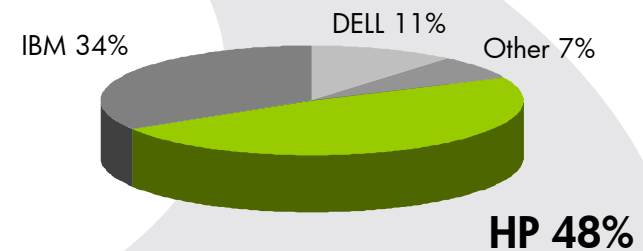
HP leading the HPC market



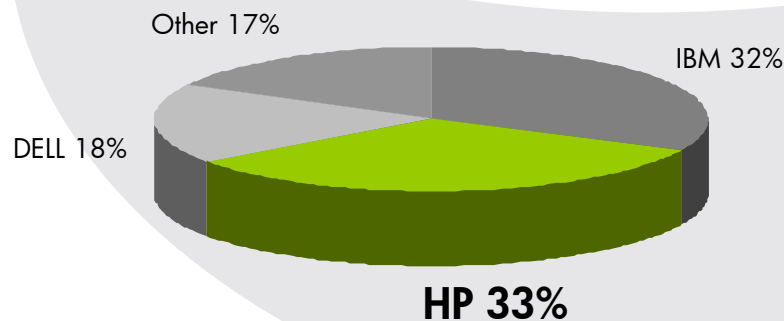
HP leads

- HPC market overall 4 years running²
- Cluster space, driving HPC market²
- Blades, the optimal clusters solution¹

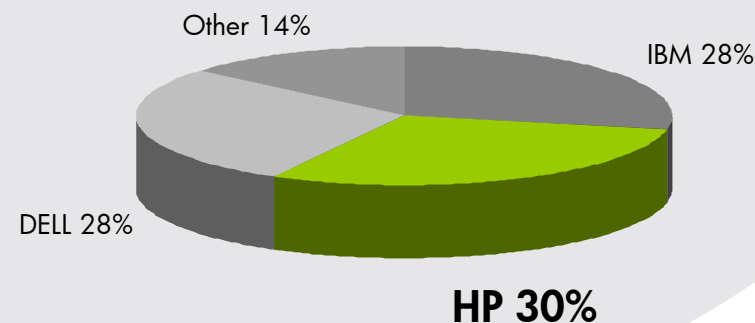
1H07 total blades by vendor¹



1H07 HPC by vendor²



1H07 HPC clusters by vendor²



Sources: 1- IDC, Worldwide Technical Server QView, Q3 2007.
2- IDC Worldwide Quarterly Server Tracker, Q3 2007.

All market shares and ranks are by revenue.



Powerful HPC Solutions

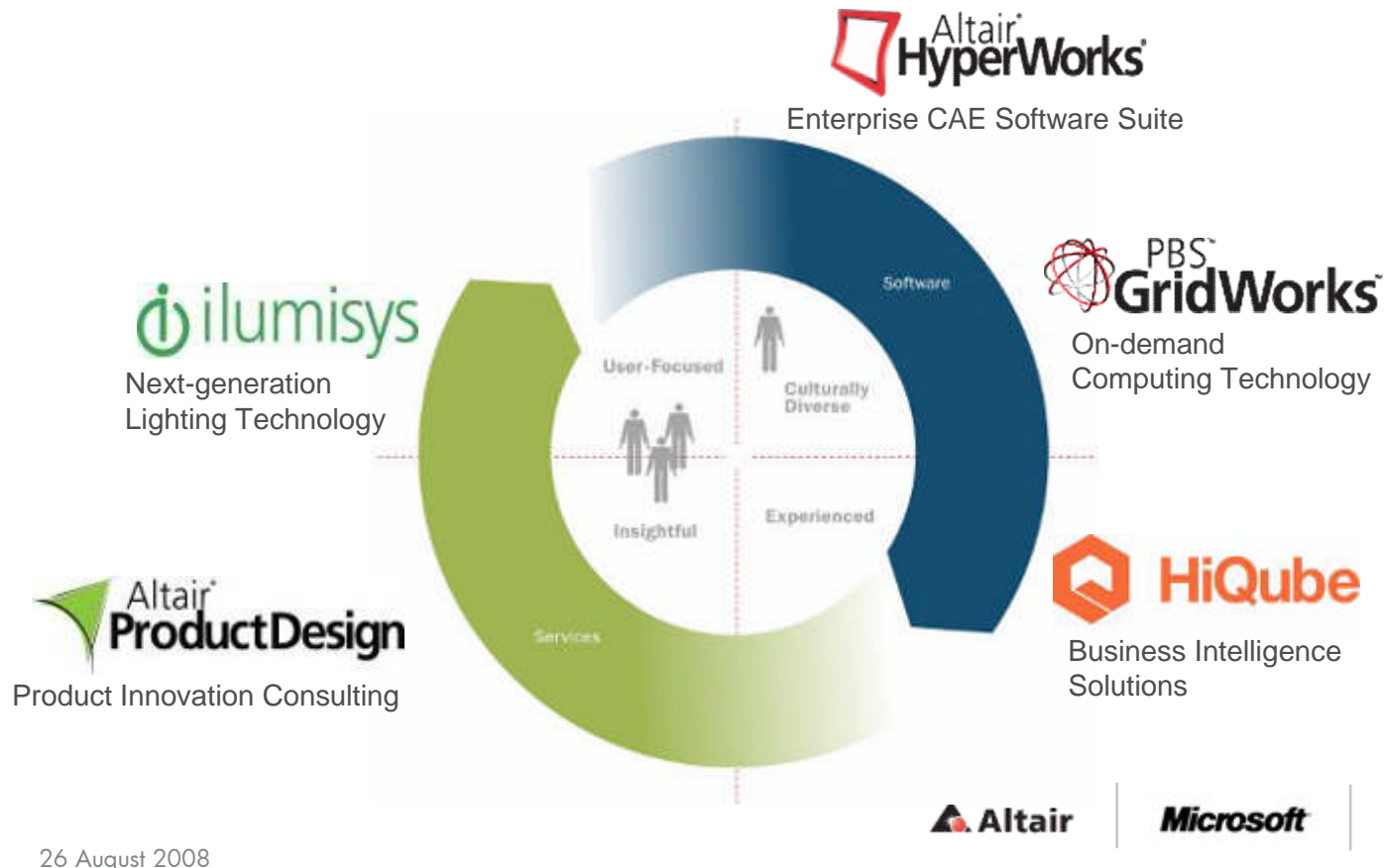
- Expand your capability
- Reduce TCO
- Reduce risk

RADIOSS SPMD Performance

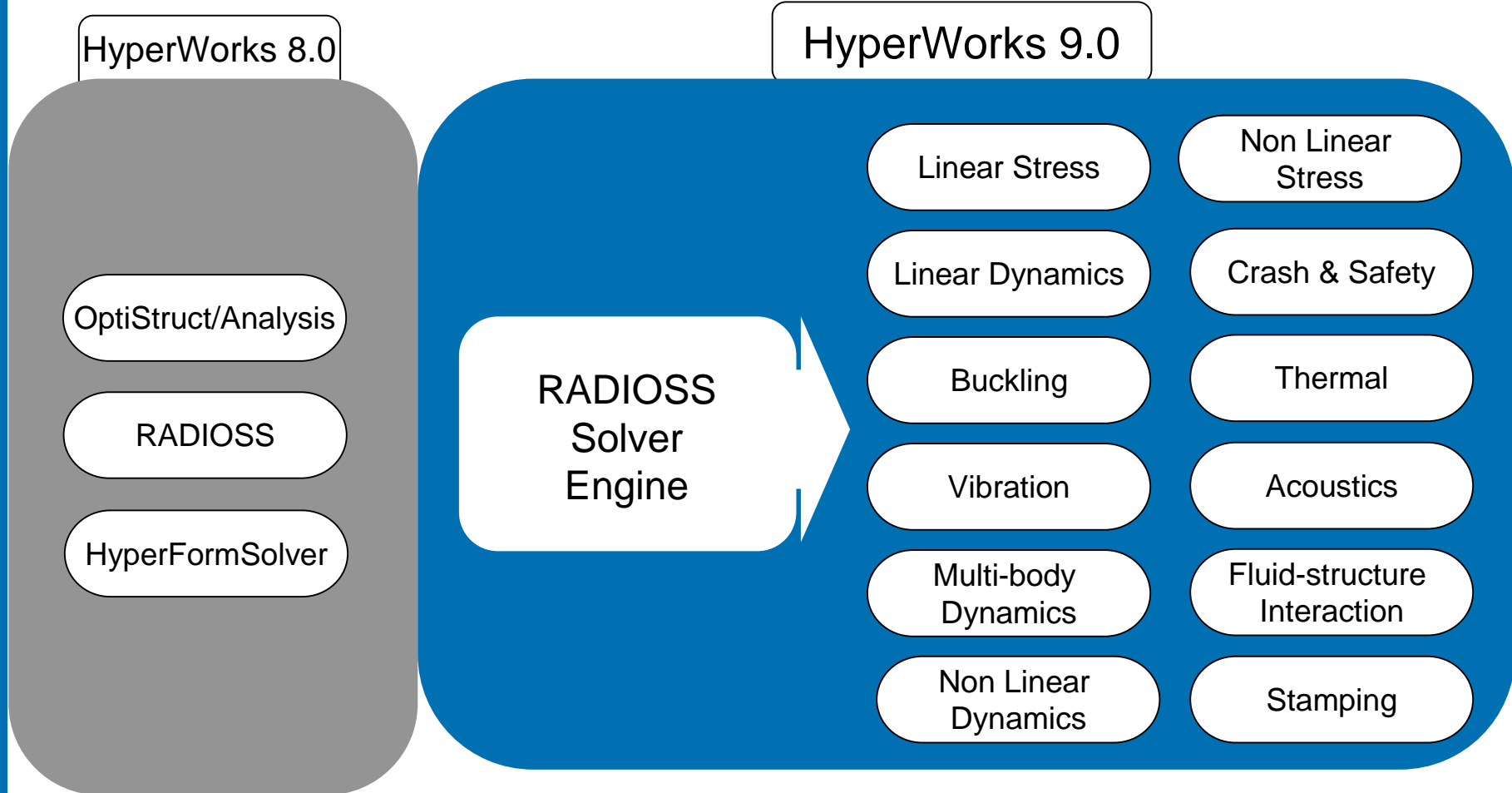


Altair – Innovation Intelligence

- A global software and services company focused on information analysis, visualization, product development and high performance computing.



Altair FEA solver



RADIOSS V9.0

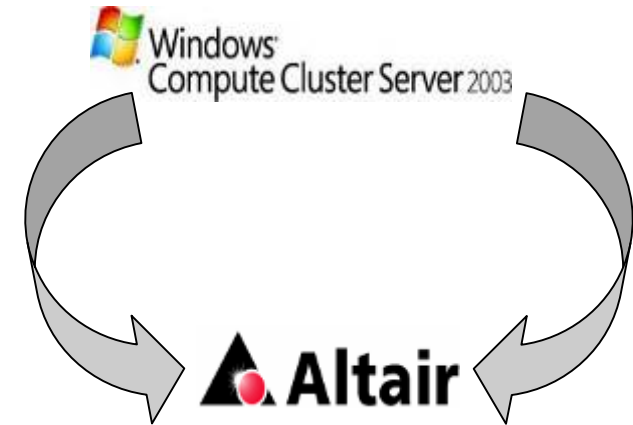
- Linear Structural Analysis
 - Point, Pressure, Gravity, and Thermal loads
 - Stress, Strain, Inertia Relief, Normal Modes, Linear Buckling, Contact
- Linear Dynamic Analysis
 - Frequency response, Random response, Transient response, Acoustic frequency response
- Durability Analysis
 - Multi-body dynamics, stress, strain, fatigue
- Non-linear High Speed Impact
 - Crash, Safety, Drop Testing
- Stamping
 - Incremental, One-Step
- Thermal Analysis
 - Steady State Heat Transfer, Transient Heat Transfer, Thermo-Mechanical Coupling
- Fluid and Fluid-Structure Interaction
 - Bird impact (sph), underwater explosion (ALE), slamming, sloshing....



RADIOSS & Microsoft Windows CSS

- Benefits

- Extended simulation capability
- Increased modeling accuracy
- Greater product innovation
- Reduced product development time
- Accelerated engineering insight
- Simplified cluster deployment, operation and integration
- Reduced IT administration overhead
- Leverage familiar Windows HPC platform that integrates with existing infrastructure and tools



Customer Success Story - CIMES

CIMES LLC: Innovative French design firm



- Customers include: Arcelor Mittal, Alstom, and Bombardier
- RADIOSS is used to perform dynamic analysis on a range of models
 - Including models that simulate the mechanical strength of structures under shock
 - Example: trains and passenger vehicles in crash scenarios
- Simulations ranging in size from 750,000 up to 1 million finite elements

“The integration of RADIOSS running on Windows CCS allows us to fully exploit the power of HPC, reduces our simulation runtimes, and remains in the familiar and intuitive environment that Windows provides.”

– Arnaud Ringeval, CIMES structural calculations manager, CIMES

Windows Compute Cluster Server



Windows Compute Cluster Server 2003

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



Windows Server
2003, Compute
Cluster Edition



Compute Cluster Pack



Microsoft Windows
Compute Cluster Server
2003

- Support for high performance hardware (x64bit architecture)
- RDMA support for high performance interconnects (Gigabit Ethernet, Infiniband, Myrinet, and others)

- Support for Industry Standards - MPICH2 MPI
- Integrated Job Scheduler
- Cluster Resource Management Tools

- Integrated Solution out-of-the-box
- Leverages investment in Windows administration and tools
- Makes cluster operation easy and secure as a single system

Windows CCS User Perspective



- More research groups are now using HPC applications
- Researchers can now run larger data models and free up the desktop for other tasks

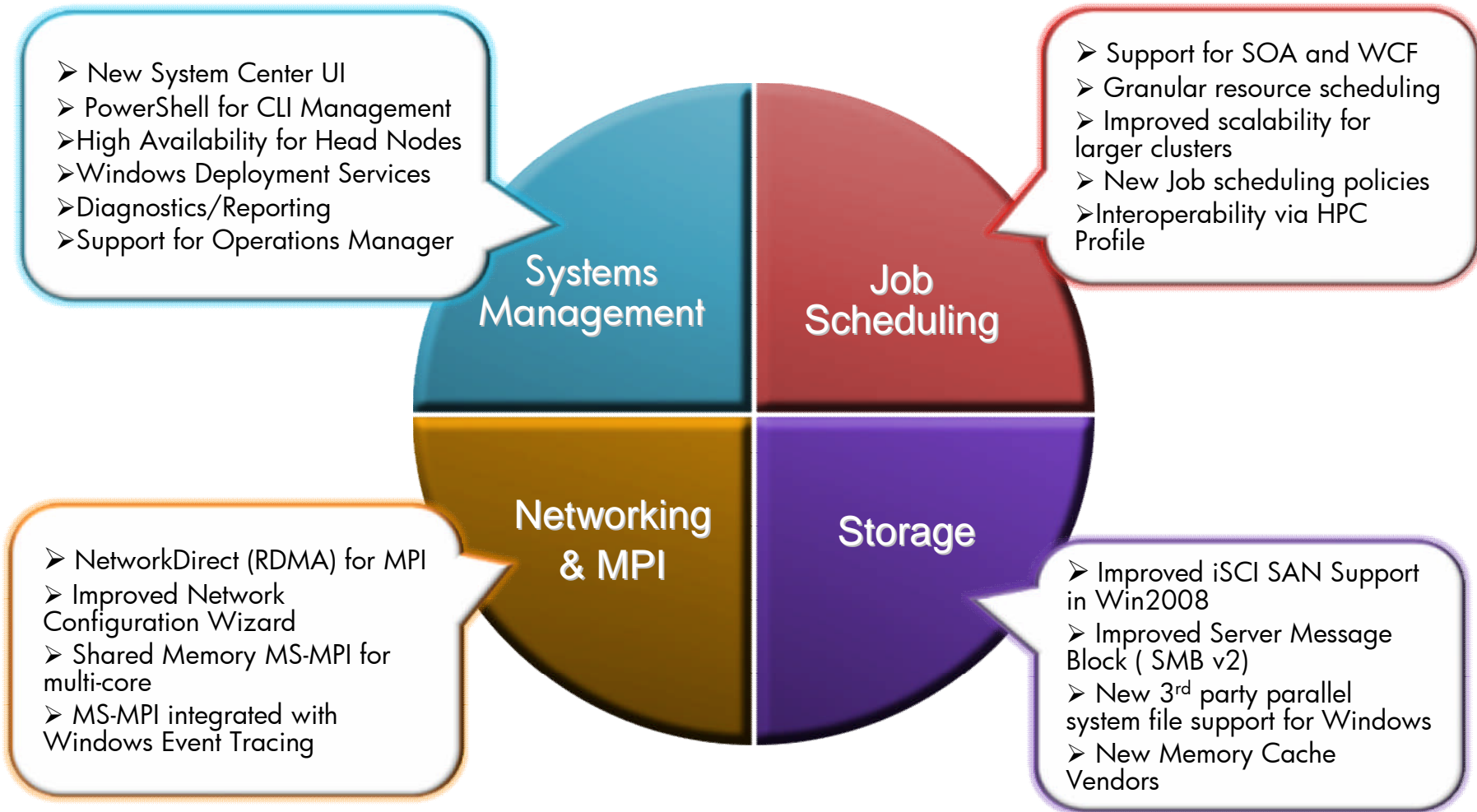


- Easier administration and job management
- Nodes deploy in one hour instead of months
- Cluster availability increases to 500 percent
- Typical projects complete 20 times faster



- Can run four times the number of jobs as before, giving engineers four times the design space
- Designers can perform up to six computations simultaneously, three times as many as before

What's new in HPC Server 2008?



Windows HPC Server 2008: Ready for Prime-time

Location	Tukwila, WA
Hardware – Machines	256 Dual-CPU, quad-core Intel 5320 Clovertown 1.86GHz processors and 8GB RAM
Hardware – Networking	Cisco Infiniband SDR Broadcom GigE
Number of Compute Nodes	256
Total Number of Cores	2048
Total Memory	2 TB of RAM
Linpack Results	
Linpack rating	11.75 TeraFLOPS
Cluster efficiency	77.1%
For Comparison	
Linpack rating from June2007 Top500 run (#106) on the same hardware	8.99 TeraFLOPS
Cluster efficiency from June2007 Top500 run (#106) on the same hardware	59%
Typical Top500 efficiency for Clovertown motherboards w/ IB regardless of OS	65-77% (2 instances of 79%)



30% improvement in efficiency on the same hardware.

Less than 2 hours to deploy

Optimize your HPC environment

- With Altair RADIOSS, HP Cluster Platforms, and Windows CCS you get:
 - a highly accurate solver
 - flexible, scalable, easy to deploy clusters
 - excellent computing performance with Intel processors
 - a familiar Windows interface

For more information

- Altair: www.altairhyperworks.com/radioss
- HP Clusters: www.hp.com/go/hpc
- Microsoft Windows CCS: www.microsoft.com/hpc
- Altair/HP/Microsoft webcast replay (until 10/08): www.hp.com/go/Altairwebinar

