HP Unified Cluster Portfolio

Integrated Clustering Solutions for High Performance Computing

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With HP's Unified Cluster Portfolio, clustered computing is now more powerful, more flexible, and simpler than ever. Customers can finally choose a packaged high performance cluster solution that is perfectly suited to meet their needs, and one that is simple to manage, easy to use, and cost-effective.

hp invent

"The HP Unified Cluster Portfolio combines the flexibility of a custom built solution with the simplicity, reliability, and value of a pre-configured, factory-built product."
John Connolly
Director, Kentucky Center for Computational Sciences, University of Kentucky

Simplicity, agility, and value for high performance clusters

Clustering technology has swept across the High Performance Computing (HPC) community, firmly entrenched as the leading choice for compute-intensive applications, such as science and research, computer-aided engineering, life and materials science, financial modeling, weather research, and geosciences. IDC, a leading industry analyst firm, believes that clusters will account for more than half of all technical computer sales by 2008[1]. Driving this growth is the constant demand for better price/performance and more compute power to analyze larger engineering and scientific problems.

However, several challenges are inhibiting clustered computing from reaching its full potential. The unwieldy complexity of cluster configuration, system management, and implementing parallel applications are major deterrents. Restricted hardware and software choices, I/O performance limitations, and the lack of integrated, scalable computation, data management and visualization solutions are additional obstacles to deploying clusters.

HP has solved these challenges and given customers a better choice for scalable, clustered HPC. The Unified Cluster Portfolio is an innovative, modular package of hardware, software and services for scalable computation, data management, and visualization. It features flexible platforms, a wide range of open source and commercial middleware, and the latest in industry-standard technology—all with the simplicity and affordability of a factory-built, tested, and supported solution.

Simplicity: easy to deploy and manage; production ready
HP is fundamentally changing the way cluster systems are sold. The Unified Cluster Portfolio's modular framework removes the complexity normally associated with deploying a custom cluster solution by providing a pre-tested, pre-configured, and fully integrated solution. The customer's cluster solution is built at HP's manufacturing integration centers and final integration occurs at the customer site. Cluster Platform software offerings are tested and verified by HP partners to run on a unified platform, enabling rapid deployment and a comprehensive environment for high performance computing. In addition, extensive integration and optimization of applications reduces the risk and complexity of customized porting and provides a unified application environment for diverse workloads and users. Cluster management options, specifically adapted for the Unified Cluster Portfolio from HP and its partners, enable single-system management and user interfaces.

Agility: structured flexibility with the broadest choice of technology
Providing customers with a choice of tested options is key to the appeal of HP's Unified Cluster Portfolio. The portfolio's modular design is built to support a full spectrum of customer requirements and enable easy expansion. The Unified Cluster Portfolio provides the broadest choice of node counts, processors, interconnects, operating systems, and proven open source and commercial middleware and application software. These unified choices are possible because HP leverages the expertise of professionals worldwide in the open source community and commercial companies. The portfolio's standards-based methodology allows HP to adopt the latest cluster technologies and integrate them into a production-ready solution. Customers have access to breakthrough technologies and products with the assurance that they have been thoroughly tested and integrated with every component in the portfolio.

Value: rapid deployment, optimal performance
The HP Unified Cluster Portfolio saves time and money by providing faster deployment and faster ramp-up to production computing. Outstanding reliability and performance also increase the value of your investment by lowering total cost ownership and increasing productivity. Each option in the portfolio is an integrated, tested cluster solution, backed by HP support services for performance and reliability. Each application is optimized for the highest performance possible. Additional HP expertise and technologies, such as the HP StorageWorks Scalable File Share, maximize performance, ensuring reliable and scalable performance. In addition, customers benefit from the single, unified design methodology and production of scale because it lowers cost, improves quality, and drives breakthrough price/performance.

[1] "HP's Strategy for Delivering Cluster Technology to Technical Computing Environments", IDC, Christopher Willard, Ph.D., November 2004.

HP Cluster Platforms
HP Cluster Platforms provide a choice of processors, interconnect and operating systems.

	Compute node and processor	Interconnects	Operating Systems
HP Cluster Platform 3000	HP ProLiant DL360 G4, HP ProLiant DL380 G4, HP Proliant DL140 G2 servers and and HP xw8200 workstations with Intel® Xeon™ processors	Myrinet InfiniBand Gigabit Ethernet	Linux Microsoft Windows
HP Cluster Platform 4000	HP ProLiant DL145 G2, HP ProLiant DL585, HP Proliant DL385 servers with AMD Opteron™ processors	Quadrics Myrinet InfiniBand Gigabit Ethernet	Linux Microsoft Windows
HP Cluster Platform 4000 BL	HP Blade Server BL35p, HP Blade Server BL45p servers with AMD Opteron™ processors	Gigabit Ethernet	Linux Microsoft Windows
HP Cluster Platform 6000	HP Integrity rx1620, HP Integrity rx2600 servers with Intel® Itanium® 2 processors	Myrinet InfiniBand Gigabit Ethernet	Linux HP-UX

Choose the platform that meets your needs

The foundation of the Unified Cluster Portfolio is the HP Cluster Platforms—HP Cluster Platform 3000, 4000, 4000BL, and 6000. These integrated solutions consist of a choice of processors, interconnects, and middleware, providing the simplicity of a turnkey product with the flexibility of a custom solution. HP is the only vendor that offers customers a choice of all three industry-standard processors for HPC—Intel® Itanium® 2, Intel® Xeon™, or AMD Opteron™ processors.

HP Cluster Platform 3000
The HP Cluster Platform 3000 features ProLiant servers with Intel Xeon processors, a choice of Myrinet, InfiniBand or Ethernet interconnects, support for either Linux or Microsoft Windows environments, and numerous other middleware options. The HP Cluster Platform 3000 includes the world's best selling ProLiant DL140, DL360 and DL380 servers, available with the latest Intel® Xeon™ processors with Intel EM64T for 64-bit applications. EM64T allows users to run either 32-bit or 64-bit operating systems on the servers while increasing the memory address space. The HP Cluster Platform 3000 also offers integrated visualization nodes, utilizing HP Intel® Xeon-based workstations.

The HP Cluster Platform 3000 provides a high performance system ideal for a full range of scale out applications. The latest system performance and processing power drive a greater workload per processor, while memory intensive applications benefit from faster memory speeds and improved memory interleaving.

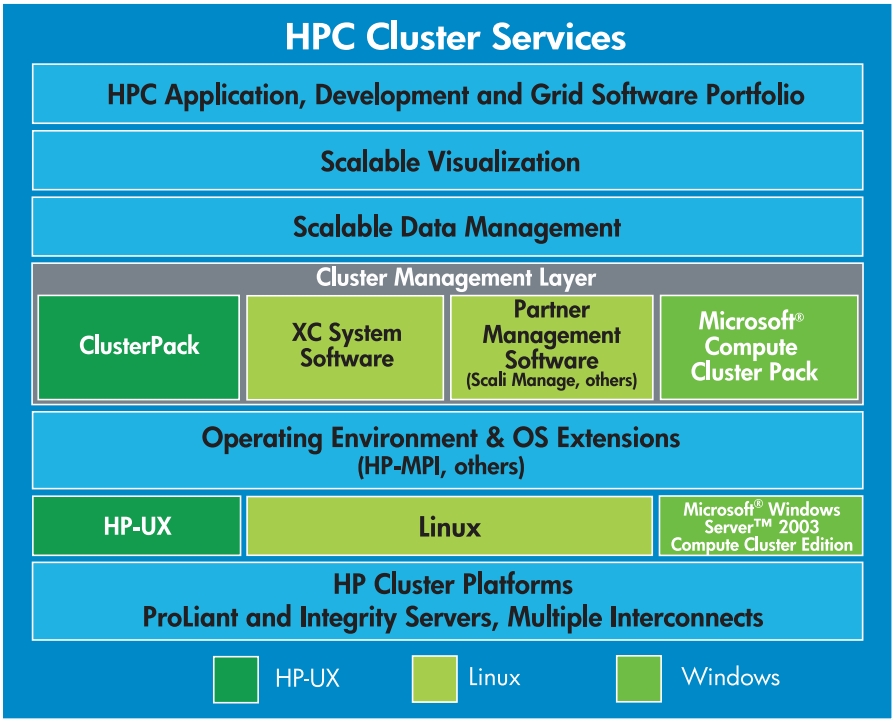
HP Cluster Platform 4000 and Cluster Platform 4000BL
The HP Cluster Platform 4000 features ProLiant servers with AMD Opteron™ processors, a choice of Quadrics, Myrinet, InfiniBand or Ethernet interconnects, support for either Linux or Microsoft Windows environments, and numerous other middleware options. The HP Cluster Platform 4000 features the new AMD Opteron processor-based ProLiant DL145, DL385, and DL585 servers as the compute and/or control nodes. The AMD Opteron™ processor is an evolution of current x86 architectures that can provide immediate performance advantages in 32-bit environments, accelerate ISV adoption, and further advance the future of 64-bit ecosystems.

The HP Cluster Platform 4000BL utilizes HP ProLiant Server Blades, featuring the AMD Opteron™-based BL35p and BL45p servers as compute nodes, supporting a mix of two and four processor nodes, and ProLiant DL servers as control or utility nodes. Gigabit Ethernet is utilized for the cluster interconnect, and is integrated within the BladeSystem infrastructure.

The HP Cluster Platform 4000 and 4000BL are excellent performers in environments where the workload is a mix of 32-bit and 64-bit applications, such as electronic design automation, life sciences, and geosciences. Applications that are compute intensive and run well on clusters of 32-bit systems, such as many computational fluid dynamics applications, will also see advantages with AMD Opteron processor-based clusters.

HP Cluster Platform 6000
The HP Cluster Platform 6000 features HP Integrity servers with Intel Itanium 2 processors and a choice of Quadrics, InfiniBand or Ethernet interconnects. Co-developed by HP and Intel, the revolutionary Intel Itanium architecture reduces platform costs and enables higher performance and scalability. The HP Cluster Platform 6000 is now offered with choice of Integrity rx1620, rx2620, and rx4640 servers as cluster nodes, with support for either Linux or HP-UX operating environments. The HP Cluster Platform 6000 delivers superior 64-bit performance and can easily scale up or scale out for complicated workloads, such as seismic analysis, molecular modeling, and structural mechanics.

The Unified Cluster Portfolio
An innovative, modular package of hardware, software and services for scalable computation, data management, and visualization.



HP Cluster Platform Express provides a fast, easy way to configure and order single-rack implementations of the HP Cluster Platform 3000 and 4000. Customers can select from a menu of popular cluster components, which are then factory assembled, thereby reducing integration costs while shortening time-to-deployment.

Your choice of cluster software components

Depending on the platform, operating system and interconnects selected, numerous software components are available to complete your turnkey, custom-designed cluster. The Unified Cluster Portfolio supports standard cluster deployments using popular Linux software stacks available from the open source community, such as Open Source Cluster Application Resource (OSCAR) and NPACI Rocks. HP complements this open source option with a set of commercial products, developed and supported by HP and their partners. HP maintains the most extensive portfolio of optimized technical applications through partnerships with ISVs.

Operating Systems (OS) choices
HP understands that in today's competitive business environment, OS flexibility is paramount. HP offers the flexibility to choose between Linux, HP-UX and Windows operating systems. This flexibility is important because some applications are only available, or are more economical, on certain operating systems. Regardless of operating system, HP includes HP Service Care Packs, which provide access to HP's experienced service professionals and hands-on cluster expertise.

Linux
HP combines its supercomputing expertise and Linux clustering technology with the open source flexibility of Linux to deliver specifically tailored, cluster solutions. HP's team of experts has extensive experience with Linux clusters, having delivered and supported some of the most powerful Linux clusters to date in both public and private sectors. All HP Cluster Platforms are qualified and tested for the Linux OS with your choice of Red Hat EL 3.0 or 4.0, or SUSE SLES 9—each available with HP support services. A Red Hat compatible Linux OS is integrated with HP XC System Software.

HP-UX
HP's award-winning HP-UX operating system is offered on the Cluster Platform 6000 (Integrity). A proven operating system, the HP-UX 11i V2 is the premier UNIX OS in the market, especially important for enterprise customers who demand a robust operating environment for mission critical applications. An extensive portfolio of applications and robust tools are available for the HP-UX OS.

Windows
For customers running in a Microsoft Windows environment, HP offers cluster solutions with Microsoft Windows Server 2003 as a featured option with the HP Cluster Platform 3000, 4000 and 40000BL. This allows these customers to smoothly expand their technical computing capabilities with minimal training and disruption.

"...HP's Unified Cluster Portfolio will deliver a supported, complete cluster computing environment for our analysis applications and reduce the risks and complexity our customers may face in moving new cluster technologies into production use."
Ken Short, VP of Marketing, ABAQUS, Inc.

Cluster management software options
One of the biggest concerns for both IT administrators and end users is the manageability of the cluster environment. HP solves the problems associated with managing clusters with several products either invented by HP or solved in collaboration with partners and their expertise.

- The HP-developed XC System Software integrates leading open source cluster packages with the Linux operating system, HP MPI, and Platform Computing's LSF. The XC System software provides a complete environment for production deployments, with a focus on ease-of-use, productivity, and scalability.
- Scali Manage™ is an advanced Linux cluster solutions, providing comprehensive solution for system installation, configuration, management, and monitoring.
- ClusterPack is automatically installed and configured on HP-UX based systems. ClusterPack provides a single point of access for cluster system administration, cluster system resource control and monitoring, as well as distributed workload management.

* Microsoft Windows Compute Cluster Server 2003 (CCS) is scheduled for release in the first half of 200. CCS accelerates time-to-insight by providing an HPC platform that is simple to deploy, operate and integrate with existing infrastructure and tools.

To ensure customers have a powerful set of tools for deploying cluster applications, HP develops and supports an infrastructure that provides highly optimized mathematical subroutine libraries for Integrity systems (HP MLIB) and a messaging-passing interface (HP-MPI) available on HP-UX and Linux. HP-MPI takes advantage of shared memory for efficient message-passing on SMP systems and supports multiple, high performance interconnects. This greatly improves the performance of parallel applications developed for clusters.

To complete the software development portfolio, HP is allied with leading suppliers of software development tools. With its partners, HP offers a complete HPC Software Development Environment for all three available operating systems. The ProLiant HPC Partner Suite features tools for software development and resource management from leading developers, available for purchase online at the HP Small and Medium Business Store.

HP Cluster Platforms enable leading applications for all key HPC industry segments: life and materials sciences, computer-aided engineering, electronic design automation, geosciences, product life cycle management, defense and security, and scientific research. HP works with partners, such as Novell, to test and validate applications on reference stacks available in the Unified Cluster Portfolio.

Grid capabilities and tools
HP has been a pioneer in Grid Computing, an important piece of the HP Adaptive Enterprise strategy. HP Adaptive Enterprise solutions enhance and complement industry standard grid technologies to construct a flexible IT environment. HP's approach to Grid Computing is based on a commitment to open, vendor-neutral standards. The Unified Cluster Portfolio exemplifies this commitment by leveraging open grid standards, proven open source and commercial middleware, and application software.

"HP's new Cluster Platforms are perfectly designed for the CAE community. Customers using our computational fluid dynamics software are eager to take advantage of highly scalable clusters based on industry-standard technology. We are delighted to see HP focused on this opportunity, and we believe that HP's range of offerings within the Unified Cluster Portfolio will be well received by our customers. Fluent's software is enabled and scales extremely well on the full range of Cluster Platforms, from Xeon to Opteron to Itanium. These systems will definitely help our customers expand the value of engineering simulation in their organizations."
Paul Bemis
Vice President, Product Marketing
Fluent, Inc.

Scalable storage and visualization

Clusters are scalable, computational engines that can deliver immense computing power—trillions of calculations per second—to meet the most demanding compute-intensive research projects. This increase in computation creates larger volumes of data that need to be managed and visualized. However, advances in computational performance have outpaced capabilities in scalable storage, I/O, and visualization tools. In addition, traditional solutions treat computation, data management and visualization as separate problems, importing and exporting data over slow network interfaces.

HP's Unified Cluster Portfolio has solved these challenges with two revolutionary offerings—the StorageWorks Scalable File Share (HP SFS) and the HP Scalable Visualization Array (HP SVA). These two products can be integrated with the computational components of the Unified Cluster Portfolio, greatly enhancing performance. This integration also provides additional functionality, such as computational steering, which requires the computation, data management, and visualization components to be tightly coupled.

HP StorageWorks Scalable File Share (HP SFS)—high-bandwidth, scalable storage for Linux clusters
HP SFS is a powerful file server that gives users of Linux clusters a storage option that is easy to use and easy to administer. HP's industry-leading, open source-based file server shares bandwidth by distributing files in parallel across clusters of industry-standard server and storage components.

The limited scalability of NFS file sharing techniques can diminish the speed and throughput of applications running on large Linux clusters. HP SFS is engineered to provide extremely fast, scalable, and reliable I/O for Linux clusters. Bandwidth easily scales from 200 megabytes per second, using standard interconnects, to more than 35 gigabytes per second using high speed interconnects. HP SFS delivers potentially unlimited scalable storage capacity from terabytes to petabytes of storage.

As components are added to scale a typical cluster environment, physical failures become more likely. HP SFS maintains resiliency while scaling with numerous transparent failover and recovery features. HP meticulously designed HP SFS with resilient HP hardware and software.

HP SFS can span dozens to thousands of Linux clients, dramatically simplifying the ability to run clustered applications. HP SFS allows applications to see a single high bandwidth file system image regardless of the number of Linux clients. And because the interface for these Lustre file systems is POSIX compliant with all of the standard interfaces in place, programs can run without modification. Administration and support is simplified by automatically managing the file server, processes, and databases that track all cluster components. To ensure exceptional value, HP utilizes industry standard

	Feature	Benefit
Simplicity	Unified, modular package of hardware, software and support solution—pre-tested, pre-configured, verified and fully integrated	Simplifies and speeds cluster design, deployment and use; cluster management options enable single-system management and user interfaces.
	Unified development and collaboration with open source and partners—integration and optimization of applications	Reduces risk and complexity of customized porting; provides a unified application environment for diverse workloads and for customers running multiple applications/mixed workloads
Agility	Unified common implementation across servers and operating systems, standards-based methodologies	Broadest choice of node counts, processors, interconnects, operating systems, and software, providing "right tools for the job;" enables easy expansion and quick adoption of latest cluster technologies and components, provides access to breakthrough technologies/products with assurance that they have been tested and integrated
	Unified development and collaboration with open source partners – integration and optimization of applications	Extensive portfolio of qualified development tools and applications
Value	Unified solutions for computation, data management and visualization	Increased performance and functionality at affordable prices; scalable performance on complex workloads
	Unified design methodology	Lowers costs, improves quality, drives breakthrough performance
	Pre-tested, industry-standard components and technology	Outstanding reliability increases productivity through reduced downtime; lowers total cost of ownership with lower administrative costs
	Easy to install and maintain; Warranty and worldwide support, including multiple support levels	Ensures solid foundation with trusted partner to deploy proven or new technology

components and open technology that lower cost of the file share while delivering unprecedented scalability and reliability. HP SFS is optimized specifically for HPC science and engineering applications, and has become a leading choice of high-performance storage for universities, government laboratories, and HPC industries.

Scalable Visualization Array (SVA)—visualization for insight and collaboration

The ability for individuals to see data visually allows them to absorb information more quickly and easily, thereby enhancing comprehension. High performance scientific research and engineering applications generate very large datasets that need to be visualized, often interactively with computational jobs.

"HP Cluster Platforms provide a solid reference configuration for our Materials Studio applications, while offering flexible solutions to meet a diverse set of customer needs..."
Keith Glassford, Director,
Materials Science Marketing, Accelrys, Inc.

In the past, HPC visualization options have been expensive and limited. Conventional proprietary solutions are well integrated with computational systems, but costly. Nonproprietary cluster visualization solutions are not well integrated with the compute and storage clusters; therefore, they cannot visualize and interact with large data sets efficiently.

HP SVA provides an integrated, high performance and scalable visualization capability for clusters that is also cost effective. HP SVA is a Linux cluster visualization system that distributes image data among a number of workstations, each working in parallel to render a portion of the image. Consequently, the data on each node is obviously smaller, and the rendering process takes substantially less time. The data is then composited to produce the final image. Numerous types of compositing are possible, among them are spatial compositing (tiling), depth compositing, alpha blending, and more.

HP SVA lowers the cost for higher performance visualization because it allows true interactive processing of large datasets. The SVA architecture provides a large display surface and high resolution, resulting in easier collaboration, more accurate data interrogation, and better use of the available visualization display resources. In addition, as SVA is dynamically configurable, both multi-session, multi-user, capacity mode and single session, single user, capability mode are supported. This makes the HP SVA vastly more cost effective than competitive products. SVA is available on visualization nodes in the HP Cluster Platform 3000, and in early 2006, in the HP Cluster Platform 4000.

HP Unified Cluster Portfolio– a better choice

The HP Unified Cluster Portfolio is an innovative package of hardware, software, and services for scalable computation, data management, and visualization. The portfolio simplifies and streamlines cluster configuration, deployment, and management. It is designed to support a full spectrum of customer requirements–featuring flexible platforms and the broadest choice of node counts, processors, interconnects, operating systems, and proven open source and commercial software. Each option in the HP Unified Cluster Portfolio is tuned for performance and reliability, increasing investment value by lowering total cost ownership and increasing productivity. HP Cluster Platforms provide outstanding scalability to hundreds or thousands of nodes. The HP Unified Cluster Portfolio is a better choice for HPC because it lowers cost, improves quality, and drives breakthrough price/performance.

For more information, go to www.hp.com/go/clusters

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