HP: Pioneering Grid Computing's move into the enterprise market

change + hp

HP is developing technologies for enterprise Grids that support mission-critical applications.

The future is Grid

For years, Grid Computing has been the province of academic and government researchers who have been hooking together individual computers around the world to perform compute-intensive tasks. These virtual supercomputers, which can quickly process vast amounts of information, have helped produce breakthroughs in earth science, life science, physics, and other fields.

In industry, Grid Computing enables companies to do more with less, rapidly deploy resources for new projects, and improve time to market for new products. Grid Computing is used to accelerate new-product development in manufacturing, biotechnology, and pharmaceutical industries, as well as risk analysis of financial services.

Grid technologies have not been ready for full enterprise deployment due to several complex issues—among them the convergence of underlying infrastructure standards, the management and security of complex Grid infrastructure deployments, and the definition, deployment, and lifecycle management of Grid-enabled application services. Whereas traditional Grid Computing tasks are often deadline-driven or can be scheduled in batch mode, enterprise Grid applications such as Web retail and corporate databases need to run continuously over long periods of time and require more stringent reliability, security, and accountability.

HP, known globally for its innovative technologies and commitment to delivering meaningful, end-to-end solutions to its customers, has devoted considerable resources to bringing the benefits of Grid Computing to the corporate world. In taking a leadership role in Grid standardization efforts and by working closely with its partners and customers, HP is developing technologies for creating intelligent enterprise Grids that can process mission-critical applications while navigating such formidable boundaries as corporate firewalls and networks.

Solutions for the adaptive enterprise.

hp invent

"HP's unique CCN program was another cornerstone of its success in winning the contract, and clearly differentiated HP from its competitors. No one else was able to offer the experience and knowledge that HP demonstrates via this initiative . . ."
Giovanni Aloisio, University of Lecce professor and President of the SPACI Consortium

The promise of Grid in the enterprise

Grid Computing is a natural enabler of HP's vision of the Adaptive Enterprise, in which business and IT are synchronized to capitalize on change. In an Adaptive Enterprise, IT is a highly efficient, flexible service with the agility to change in line with an organization's priorities and its business environment. Grid Computing makes more efficient use of IT resources, allows collaboration across global extended teams, and enables the establishment of ad hoc, secure IT projects between geographically disparate units—even across organizational boundaries.

Fully realized, the promise of Grid Computing enables an environment in which all of your IT resources—servers, storage, network devices, data stores, and applications—are available when and where you need them most. Grids allow you to provision applications and allocate capacity among geographically and organizationally dispersed teams as your business needs change. This ability to handle peaks and troughs in demand enables you to take advantage of underutilized resources, rapidly deploy resources for new projects, and improve time to market for new products.

In short, the enterprise Grid accelerates innovation and creation by delivering simplicity, agility, and value to your business.

HP's commitment to Grid

HP Chairman and Chief Executive Officer Carly Fiorina has promised to use industry standards to Grid-enable all of HP's products, from the smallest handhelds, printers, and PCs to the most powerful storage arrays and supercomputers. They'll all be able to connect with and serve as resources on a Grid.

HP continues to demonstrate its leadership in Grid Computing with its active involvement in collaborative research projects. For example, the HP Collaboration and Competency Network (HP CCN) is a forum to facilitate wide-ranging collaboration, innovation, discovery, and competency sharing between HP, HP partners, and customers in high-performance computing.

In addition, HP became the first commercial enterprise to be included in the Large Hadron Collider (LHC) Computing Grid, which will distribute and process data generated by the next-generation experimental facility at CERN, the European Lab for Particle Physics. HP has linked computing resources at HP Puerto Rico to CERN's LHC Computing Grid to help manage and analyze the massive quantities of data the lab will produce. HP was also selected by the Southern Partnership for Advanced Computational Infrastructures (SPACI) to be the lead technology partner to establish a Grid-enabled R&D IT environment, the first of its kind in Europe.

HP is involved in collaborative research projects with, among many others, the Pittsburgh Supercomputing Center, GridLab, WestGrid, OurGrid, GriddLeS: Building Grid Applications from Legacy Software, and the Georgia Institute of Technology.

HP's leadership role in developing Grid standards

Helping to drive Grid standardization efforts is a logical step for HP, which emphasizes open, standards-based technologies and supports heterogeneous environments. Along with scientific institutions and other major corporations, HP is an active participant in a leading standards body—the Global Grid Forum (GGF)—whose chair is HP Vice President Mark Linesch. The GGF has overseen creation of an Open Grid Services Architecture (OGSA), the service-oriented architecture for Grid Computing.

HP has co-authored both the OGSA document and the Web Services Resource Framework (WSRF), a collection of specifications that defines a standard way to treat interactions among clients, services, and dynamic IT resources using Web services.

HP is also a founder and board member of the Enterprise Grid Alliance (EGA), which is addressing requirements and solutions for Grids in the enterprise.

Building on Grid technologies

HP is focused squarely on the management and execution of the enterprise Grid. A uniform way of managing the wide range of computing resources in an organization—including multiple operating systems, platforms, data formats, and applications—is essential to bringing Grid to the enterprise. HP is working to create open protocols and standard interfaces to manage and control all types of resources—from servers to printers to firewalls to applications.

The Web Services Distributed Management (WSDM) standard—based on HP's Web Services Management Framework (WSMF)—is being developed by the Organization for the Advancement of Structured Information Standards (OASIS) to provide a management framework for all types of IT resources. Applied to the Grid, WSDM offers a common approach for managing all components of a Grid deployment, including resources and services. WSDM also handles such issues as federation, distribution, monitoring, and control. HP engineers and researchers are working with other OASIS/WSDM members to make WSDM Grid-compatible, integrating it with the WSRF standards.

"The Grid has the potential to solve real business problems by simplifying global access to enterprise computing services." Shane Robison, HP Chief Strategy and Technology Officer

In order to further the adoption of the various Grid-related standards and foster innovation, HP has, in concert with the Globus Alliance and the Apache Software Foundation, developed robust implementations of the WSDM, WSRF, and WSN standards. These implementations have been submitted as open source to the Apache Software Foundation.

Another hurdle for the enterprise Grid has been the lack of a broadly accepted way of deploying and configuring the software and hardware on which it operates. HP Labs has built a framework—the Smart Framework for Object Groups (SmartFrog)—that provides rules for how resources on a Grid are configured, run, and managed through their lifecycle. HP holds a major position in the GGF's Configuration Description Deployment and Lifecycle Management (CDDLM) working group, which is developing a standard that incorporates SmartFrog concepts. HP has made SmartFrog available for free download at www.smartfrog.org, under the open-source GNU Lesser General Public License (LGPL).

HP solutions for the management and execution of the enterprise Grid

HP provides a comprehensive set of industry-standard building blocks and innovative, application-focused solutions—as well as Consulting and Integration Services—to enable the enterprise Grid.

- **HP Consulting & Integration Services:** HP works collaboratively with customers and partners to plan, design, implement, and manage Grid Computing solutions that enable the Adaptive Enterprise. Service professionals assess needs on an individual basis, evaluate the return on investment, and then design and implement solutions that work. HP offers a variety of Grid-focused services, including a Grid Orientation Service, a Grid Assessment Workshop, a Grid Knowledge Transfer Workshop to create a customer center of expertise, Design and Deployment Services, and Grid Optimization Service. All are designed to enable the management and execution of Grid Computing in your enterprise.
- **Grid-enabled systems and servers:** HP enables popular Grid middleware to run well on its systems. HP has ported, tested, and tuned the Globus Toolkit—the open-source Grid infrastructure implementation—to its server platforms. HP co-founded and funds the Globus Consortium for the development, testing, packaging, and support of Globus. In addition, HP collaborates with independent software vendors so that third-party Grid software runs well on HP platforms. HP is working on Grid initiatives with partners such as Altair Engineering, Avaki, Axceleon, DataSynapse, GridSystems, GridXpert, NICE, Oracle®, Platform Computing, Prospero, United Devices, and others to help make Grid Computing ready for enterprise applications.
- **HP StorageWorks Grid:** This is a collaborative storage network that performs all the functions of today's networked storage while delivering on the promise of large-scale storage pooling, or virtualization. It provides fully integrated management of the whole storage Grid as if it were a single system—whether the network scales out by adding disks and other storage devices, or scales up by aggregating the performance and other capabilities of its component modules. The HP StorageWorks Grid is an evolution of today's SANs because it is completely compatible and coexists with traditional network storage deployments. To simplify management even further, existing arrays—from HP and other vendors—can eventually be incorporated into the storage grid using smart cells.

- **HP OpenView Automation Manager:** This tool automatically provisions resources among different applications according to their priorities and needs. Resource allocation can be accomplished on a scheduled basis, or it can be programmed to provide an application with more processing power by reducing the resources elsewhere. HP OpenView Automation Manager, which works in heterogeneous environments, includes a tool that creates a visual model of your business operations so you can get a complete picture of your IT infrastructure, enabling the automation of maintenance tasks.

A winning collaboration

HP worked closely with DreamWorks to develop innovative technologies for offsite animation rendering on the popular 2004 feature film *Shrek 2*. HP's Utility Rendering Service (URS) gave DreamWorks the flexibility to manage enormous amounts of computational power to render high-quality film animation for the final stages of *Shrek 2*. More than a half-million individual frames were processed on the HP URS, which created a pooled set of resources enabling the studio to add significant peak capacity as it was required—eliminating the studio's need to make a major capital investment. HP also collaborated with DreamWorks on its Virtual Studio Collaboration (VSC)—a virtual collaboration center for producers, directors, and animators working in different locations around the world.

The HP collaboration with DreamWorks is one of many success stories that illustrate the ways in which HP technologies enable the Adaptive Enterprise. If your business goal is to create an environment in which you can share resources globally and collaborate with partners and suppliers, Grid Computing can answer your needs. With its continued commitment to the success of enterprise Grid Computing, HP can help improve your business agility and increase your competitive advantage.

To learn more

For more information on HP's Grid Computing initiatives, please visit HP and Grid Computing at:
www.hp.com/go/grid/

Additional resources

- HP Labs: **www.hpl.hp.com/**
- Web Services Resource Framework and Notification: **http://devresource.hp.com/drc/specifications/wsrf**
- Globus Toolkit for HP-UX, Tru64 UNIX®, and Linux®: **www.hp.com/products/globus**
- HP Collaboration and Competency Network: **www.hp.com/go/collaboration**
- HP StorageWorks Grid: **www.hp.com/go/storagegrid**
- HP OpenView Automation Manager: **www.managementsoftware.hp.com/news/press/pr/2004/pr_0070.html**
- SmartFrog: **www.smartfrog.org**
- Global Grid Forum: **www.gridforum.org**
- Enterprise Grid Alliance: **www.gridalliance.org**
- OASIS: **www.oasis-open.org**
- CERN Large Hadron Collider Computing Grid: **http://lcg.web.cern.ch/LCG/**
- SPACI: **www.spaci.it**

Additional information on these implementations can be found at these Web sites:

- Apache implementation of WSRF—**http://incubator.apache.org/apollo**
- Apache implementation of WSN—**http://incubator.apache.org/hermes**
- Apache implementation of WSDM—**http://incubator.apache.org/muse**

To learn more, visit www.hp.com

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