



Platform HPC Enterprise Edition Simplifying Cluster Lifecycle Management

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Contents

1. Introduction	3
2. The cluster management challenge	4
3. Re-thinking HPC clusters	5
4. Unique features	6
4.1 Unified management interface	6
4.2 Cluster provisioning and management	7
4.3 Integrated workload management	9
4.4 Parallel job management	10
4.5 Adaptive scheduling	10
4.6 Service and support	10
5. A complete solution	11
6. Sources of cost savings	11
7. Summary	13

1. Introduction

As any IT manager knows, cost and complexity often go hand in hand. There are few software environments more complex than modern high performance computing (HPC) clusters, so dealing with the problem of complexity in cluster management is central to containing cost.

Linux®-based commodity clusters dominate supercomputing, and are making serious in-roads in corporate and academic settings as well. This is due in part to their superior performance, cost-effectiveness and flexibility.

Ironically, the same factors that make Linux® the clear choice for HPC professionals can make it less accessible to smaller centers that may have Microsoft Windows® administrators on staff but have little or no UNIX® or Linux experience. The complexity and associated cost of cluster management threatens to erode the very benefits that make open, commodity clusters so compelling. Not only can HPC cluster deployments be difficult, but the ongoing need to deal with heterogeneous hardware and operating systems, rapidly evolving toolsets, and changing HPC middleware combine to make deploying and managing an HPC cluster a daunting task. The industry needs a fresh approach.

This paper provides an overview of Platform HPC Enterprise Edition, an “all-in-one” cluster lifecycle management solution that provides the industry’s richest toolset for deploying, using and managing HPC clusters. Platform HPC Enterprise Edition dramatically simplifies both the installation and ongoing management of Linux clusters, by offering a complete set of capabilities that focus on application performance and ease of use. These features are simply not found in other HPC cluster management software stacks.

Platform HPC Enterprise Edition is the top of the line offerings in Platform HPC Suite. The other edition in the suite is Platform HPC Workgroup Edition (formerly called Platform HPC Workgroup Manager), which is geared towards smaller scale clusters with less complex workload. The brief comparison of both editions is included in this paper.

2. The cluster management challenge

To provide a proper HPC application environment, administrators need to deploy a full set of capabilities to their user communities as shown in Figure 1. These capabilities include cluster provisioning and management, application workload management, and an environment that makes it easy to develop, run and manage distributed parallel applications. Because modern application environments tend to be heterogeneous, some workloads will require Windows® compute hosts while others will require particular Linux operating systems or versions. The ability to change a node's operating system on-the-fly in response to changing application needs (referred to as adaptive scheduling) is also important since it allows HPC centers to maximize resource use and present what appears to be a larger resource pool to cluster users.

Cluster users increasingly demand web-based access to their HPC environment both for submitting workloads and for managing and monitoring their jobs once submitted. An easy to use application-centric web interface can have tangible benefits including improved productivity, reduced training requirements, reduced errors rates, and remote secure access.

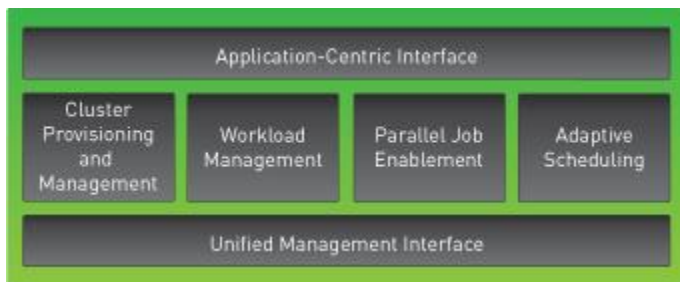


Figure 1. Essential components of an HPC cluster solution

While there are several cluster management tools that address parts of these requirements, few address them fully, and some tools are little more than collections of discrete open-source software components.

Cluster toolkits such as NPACI ROCKS, IBM® xCAT and Scyld Clusterware™ focus largely on the problem of cluster provisioning and management. While they clearly simplify cluster deployment, administrators wanting to make changes to node configurations or customize their environment will quickly find themselves hand-editing XML configuration files or writing their own shell scripts. Third-party workload managers and various open-source MPI¹ implementations might be included as part of a distribution, but these included components are loosely integrated at best, and they often represent a separate point of management and an entirely new subsystem that needs to be learned by a cluster administrator to be managed effectively.

Other HPC solutions are oriented to the particular problem of application workload management. These include solutions such as Condor®, Sun Grid Engine (SGE), MOAB Cluster Suite®, and PBS Professional™. While these are all capable workload managers, most do not address at all the issue of cluster node management, application-centric portals or adaptive scheduling. If such capabilities exist at all they usually require the purchase of additional software products.

Parallel job management is critical as well. The whole reason that customers deploy HPC clusters is to maximize application performance, and processing problems in parallel is a common way to achieve performance gains. The choice of MPI, its scalability, and the degree to which it is integrated with various OFED² drivers and high performance

¹ MPI refers to the message-passing interface, a widely deployed solution in HPC environments that enables distributed parallel applications by facilitating communications between processes running on different machines.

² OFED refers to the OpenFabrics Enterprise Distribution

interconnects has a direct impact on delivered application performance. Furthermore, the workload manager needs to incorporate specific parallel job management features, or busy cluster users and administrators can find themselves spending time cleaning up after failed MPI jobs or writing their own shell scripts to do the same.

As with any IT environment, on-going management represents the largest single cost associated with HPC clusters. If a cluster management solution is not complete and fully integrated, customers will quickly find themselves in the technology integration business, needing to deal with the problem of “what works with what” and grappling with a plethora of discrete software components, each having different management interfaces and software pre-requisites. Upgrading software in such an environment becomes a major challenge, since there is no guarantee that the newly added software component will work with other components in the HPC software stack.

Complexity is a real problem. You can imagine a small organization or department grappling with a new vocabulary of cryptic commands, configuring and troubleshooting Anaconda³ kick start scripts, finding the correct OFED drivers for specialized hardware, and configuring open source monitoring systems like Ganglia or Nagios[®]. Without an integrated solution, administrators need to deal with dozens of distinct software components, and progress with HPC cluster implementations can slow to a crawl.

3. Re-thinking HPC clusters

Clearly these challenges demand a fresh approach to HPC cluster management. Platform HPC Enterprise Edition represents a “re-think” of how open HPC clusters are deployed and managed. Rather than addressing only part of the HPC

management puzzle, Platform HPC Enterprise Edition addresses all facets of cluster management including:

- Cluster provisioning and management
- Workload management
- Parallel application enablement
- Adaptive scheduling
- Unified management
- Application-centric user interfaces
- Real-time monitoring

Platform HPC Enterprise Edition offers capabilities not found in other cluster management suites. At its heart is Platform Cluster Manager (PCM), an easy to use web-based cluster provisioning and management tool. Industry leaders including Dell™, Intel®, HP, Cray, and Red Hat® have all embraced Platform Cluster Manager as the basis of their own HPC cluster management solutions, recognizing its technical superiority, flexibility and ease of management features.

In addition to various industry standard MPIs, Platform HPC Enterprise Edition also includes Platform MPI⁴, a high-performance MPI implementation that delivers superior application performance owing to its core-aware multi-threaded architecture along with ease of management features and parallel application debugging capabilities.

Platform Computing’s flagship workload management solution, Platform LSF, is included in Platform HPC Enterprise Edition. Unlike other solutions where the workload scheduler is an add-on, separately installed and configured, Platform LSF is pre-configured and ready for use when Platform HPC Enterprise Edition is initially installed. Platform LSF is integrated directly into the Platform Application Center, a highly customizable web-

³ Anaconda is the installation program used by Fedora, Red Hat Enterprise Linux and other Linux Distributions

⁴ Platform MPI was formerly HP MPI 2.3

based job submission and management interface. With this web interface, users can immediately begin submitting and monitoring their jobs. Also included with Platform HPC Enterprise Edition is Platform ISF Adaptive Cluster. Platform ISF Adaptive Cluster can change the composition of the HPC cluster dynamically based on application requirements. It does this by rebooting nodes from an alternate partition and incorporating these nodes into a Platform LSF cluster as peers. Platform ISF Adaptive Cluster makes sure that there is an optimal mix of operating system and application environments deployed depending on changing workload requirements and administrator defined policies. Other components included in Platform HPC Enterprise Edition are:

- Collections of the latest cluster management tools from the open-source community
- An automated software maintenance and patching facility (via RHN or Yum⁵)
- Pre-integrated HPC tools, libraries and developer tools
- An Intel® Cluster Ready⁶ certified software suite
- An easy to use web interface used for cluster management
- A web portal that makes it easy to deploy self documenting application specific interfaces
- A full NVIDIA® CUDA environment to streamline the deployment of GPU-based clusters
- Quality and reliable enterprise support, backed by Platform Computing and leading software providers and OEMs

Platform HPC Enterprise Edition upgrades the capability of Platform HPC Workgroup Edition (formerly Platform HPC Workgroup Manager) which is geared toward workgroup and departmental sized compute clusters. The comparison of Platform HPC

Enterprise Edition and Platform HPC Workgroup Edition is shown in Table 1.

Product Components	Platform HPC Workgroup Edition	Platform HPC Enterprise Edition
Platform Cluster Manager	Yes	Yes
Platform MPI	Yes	Yes
Platform LSF	Yes Platform LSF Workgroup Edition (up to 32 nodes)	Yes Platform LSF (Full feature set)
Platform Application Center	Yes (Limited feature set) ⁷	Yes (Full feature set)
Platform ISF Adaptive Scheduler	Yes (multi-boot only)	Yes (multi-boot only)
Platform RTM	No (Cacti only)	Yes (Full feature set)

Table 1. Platform HPC Suite components by version

4. Unique features

Platform HPC Enterprise Edition provides important features not found in other HPC cluster management solutions. In this section we'll explore some of these unique capabilities in more detail.

4.1 Unified management interface

Platform HPC Enterprise Edition features a unified management console that is used to administer all aspects of the cluster environment. Through the management console, administrators can install

⁵ Yum (yellow dog update manager) originally developed by Yellowdog Linux is a tool included in major Linux distros for automating package maintenance for systems that use RPMs for distributing packaged tools and applications

⁶ The Intel® Cluster Ready (ICR) program and technology package makes it easy to design, build and deploy clusters built with Intel components.

⁷ The full-featured version of the Platform Application Center includes an integrated drag-and-drop interface builder and VNC console capabilities for graphical interactive workloads. These capabilities are not present in Platform HPC Workgroup Edition.

and manage cluster nodes and interact with interfaces for cluster monitoring, reporting, charting and workload management.

As changes are made to the cluster configuration through the console, Platform HPC Enterprise Edition automatically re-configures key components as illustrated in Figure 3. Because configuration of the cluster is automated, administrators don't actually need to know how to install, configure or administer the various included tools like Ganglia, ntop, and Nagios® or facilities like Platform LSF or Platform ISF Adaptive Cluster. This is because these components are configured and re-started as required automatically whenever the configuration of the cluster is changed. All Platform HPC Enterprise Edition components are immediately ready for use through the web-based interface on installation. This degree of automation saves the cluster administrator time meaning they don't need to become expert in the administration of open-source software components. It also reduces the possibility of errors and time lost due to mis-configuration. Cluster administrators enjoy the best of both worlds – easy access to powerful web based cluster management tools without the need to learn and separately administer all the tools that comprise the HPC cluster environment.

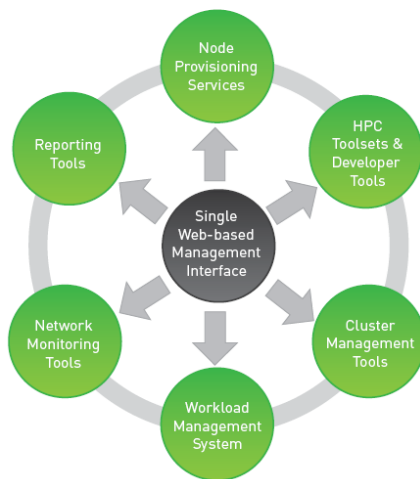


Figure 3. Changes in the web interface result in automated reconfiguration of components

Whereas competing cluster management tools either do not have a web-based interface or require multiple interfaces for managing different functional areas, Platform HPC Enterprise Edition presents a single unified interface through which all administrative tasks can be performed including node-management, job-management, jobs and cluster monitoring and reporting. Using the unified management interface, even cluster administrators with very little Linux experience, can competently manage a state of the art HPC cluster.

4.2 Cluster provisioning and management

Fast and efficient software installation – Platform HPC Enterprise Edition can be installed and configured in less than one hour on a master node by inserting an installation DVD and answering a series of simple questions. Layered software packages are deployed as self-describing “kits”, and installing software on cluster nodes is simply a matter of associating cluster nodes with flexible node group definitions through the web-based interface.

Flexible provisioning – Platform HPC Enterprise Edition offers multiple options for provisioning Linux operating environments that include:

- Package-based provisioning
- Image based provisioning
- Diskless node provisioning

Mixed clusters comprised of Linux, Microsoft® Windows® and Windows HPC® nodes can also be deployed, and using Platform ISF Adaptive Cluster node personalities can change dynamically based on application demand.

Large collections of hosts can be added as a group, and Platform HPC Enterprise Edition attends to details like IP address assignment and node naming conventions that can reflect the position

of cluster nodes in data center racks for ease of management. Unlike competing solutions, Platform HPC Enterprise Edition can deploy multiple operating systems and OS versions to a cluster simultaneously including Red Hat Enterprise Linux, CentOS and SUSE Linux Enterprise Server as well as Microsoft operating systems as described earlier. This provides administrators with greater flexibility in how they serve their user communities, and means that HPC clusters can grow and evolve incrementally as requirements change.

Repositories, kits and components – Kits form the basic unit of software distribution in Platform HPC Enterprise Edition. Kits understand their own software dependencies and pre-requisites, and can install, configure, and uninstall themselves. Many kits employ “plug-ins” that allow included software components to re-configure themselves automatically in response to external events such as a change in the configuration of the cluster or the personality of a node.

Tedious tasks such as upgrades and patches can be automated using standard facilities such as Yum and Platform HPC Enterprise Edition integrates with the Red Hat Network (RHN) service for those with RHN subscriptions.

Pre-configured software kits – Among the standard software kits provided for Platform HPC Enterprise Edition are:

Base kit – Contains all the tools and applications required to manage the cluster

Cacti kit – An open source reporting tool used to collect and graph various node metrics

Ganglia kit – An open-source resource monitoring solution

HPC kit – A collection of tools, MPIs, libraries and utilities

Platform LSF kit – Robust and high performance workload management solution Platform LSF

Platform MPI kit – An optimized MPI providing superior performance and management

Nagios kit – An open source host, services and network monitoring solution (NMS)

NTOP kit – A tool to monitor network bandwidth and analyze traffic

OFED kit – A collection of drivers supporting server and storage interconnects and facilities such as IP over InfiniBand (IPoIB)

PCM GUI – Unified management web interface

CUDA kit – The full CUDA® development and run-time environment making it easy to deploy and manage HPC clusters exploiting the power of NVIDIA® Tesla® GPUs.

Platform ISF AC Kit – Platform ISF Adaptive Cluster

Platform RTM – A Cacti-based workload monitoring and analysis facilities for Platform LSF clusters

Platform HPC Enterprise Edition can support a practically unlimited number of node group definitions that incorporate different operating systems and different layered software tools. Changing the configuration of a node is simply a matter of assigning that node to a different node group. Installing or de-installing software components is accomplished by clicking a check box beside the components to be installed presented through the web-based interface. Platform HPC Enterprise Edition supports multiple repositories based on different operating systems and versions, and node groups draw software components from these different repositories providing unmatched flexibility.

Cluster File Manager – Platform HPC Enterprise Edition includes CFM (Cluster File Manager) and PDSH (a parallel distributed shell). The Cluster File Manager simplifies administration and increases cluster availability by allowing changes such as new package installations, patch updates, and changes to configuration files to be propagated to cluster nodes automatically without the need to re-install cluster nodes. PDSH is a mechanism that allows experienced administrators to perform operations quickly in parallel across multiple cluster nodes.

Integrated cluster monitoring and reporting – With Platform HPC Enterprise Edition, reporting and monitoring functions are integrated directly into the unified web interface. Monitoring facilities include node monitoring, service monitoring, graphing capabilities, workload monitoring and network monitoring. Various standard reports are produced automatically including cluster and host availability reports, workload and utilization reports and inventory summaries. Platform HPC Enterprise Edition also includes Platform RTM, a powerful Cacti-based monitoring facility that provides cluster administrators with a real-time view of cluster nodes and workloads. Platform RTM is time-zone aware and can be used to centrally monitor and manage clusters spread around the globe.

Repository snapshots / trial installations – Upgrading software can be risky, particularly in complex environments. If a new software upgrade introduces problems, administrators often need to rapidly “rollback” to a known good state. With other cluster managers this can mean having to re-install the entire cluster. Platform HPC Enterprise Edition incorporates the notion of repository snapshots, in essence a “restore point” for the entire cluster. Administrators can snapshot a known good repository, make changes to their environment, and easily revert to a previous “known good” repository in the event of an unforeseen problem. This powerful capability takes the risk out of cluster upgrades.

Support for new hardware models – Over time, cluster administrators will likely want to add new hardware to their clusters, and this new hardware may require new or updated device drivers not supported by the OS environment on the installer node. This means that a newly updated node may not be able to network boot and provision itself until the installer node on the cluster is updated with a new operating system, a tedious and disruptive process. Platform HPC Enterprise Edition includes a driver patching utility that allows updated device

drivers to be “poked” into existing repositories, essentially “future proofing” the cluster and providing a simplified means of supporting new hardware without needing to re-install the environment from scratch.

Software updates with no re-boot – Some cluster managers take the approach of always re-installing nodes, regardless of how minor the change in configuration is. This is simple of course, but on busy clusters scheduling downtime can be difficult and disruptive. Platform HPC Enterprise Edition performs updates intelligently and selectively via the Cluster File Manager so that compute nodes continue to run even as non-intrusive updates are applied. The repository is updated as well so that future re-installs will reflect the same changes made “live” on cluster nodes. For changes that require the re-installation of the node (changing an operating system for example) these changes can be made “pending” until downtime can be scheduled.

4.3 Integrated workload management

Integrated workload management – While other cluster management solutions require that a workload manager be separately sourced, installed and configured, Platform HPC Enterprise Edition includes Platform LSF, a high performance, robust and feature rich workload management solution that is optimized for simplified deployment and management and is fully configured on installation. Platform LSF is immediately accessible to both cluster administrators and users through the unified management web interface.

Platform Application Center – Application specific job submission templates for popular HPC tools are included in the Platform Application Center, a key component of Platform HPC Enterprise Edition. By providing self documenting, user friendly interfaces, training requirements and submission errors are reduced. These application centric interfaces are ideal for organizations supporting remote user

communities, or educational institutions where HPC tools may need to be deployed to student populations in a controlled fashion. Platform Application Center includes a drag and drop application interface builder that makes it easy to build and maintain libraries of application specific interfaces. Also included in Platform HPC Enterprise Edition is a VNC adapter that allows users to interact with graphical jobs without ever leaving the web browser.

4.4 Parallel job management

Platform MPI – The HPC kit in Platform HPC Enterprise Edition includes various industry standard MPI implementations including MPICH1, MPICH2 and MVAPICH1 optimized for cluster hosts connected via InfiniBand, iWARP or other RDMA based interconnects. Unique to Platform HPC Enterprise Edition is Platform MPI (formerly HP MPI), a value added MPI implementation that provides superior management features along with better performance and scalability. Platform MPI is specifically optimized for both Platform LSF and multi-core systems.

4.5 Adaptive scheduling

Adaptive scheduling and dynamic provisioning – With the multi-boot manager included in Platform ISF Adaptive Cluster, cluster hosts can re-boot themselves from a different disk partition automatically in response to changing application workloads. Through the management console, administrators can choose to deploy a reasonable mix of Windows® and various Linux environments depending on the anticipated needs of their user communities. As users submit jobs or run applications that have particular operating system dependencies (expressed using the graphical Platform Application Center user interface or via the Platform LSF command line), the composition of the cluster can flex within configurable limits. Rather than being an extra-cost item as it is with other HPC management suites, this capability is included as a core feature of Platform HPC Enterprise Edition.

4.6 Service and support

Certified cluster configurations – Platform HPC Enterprise Edition is specifically tested and certified on partner hardware platforms. By qualifying each platform individually, and by providing vendor specific kits with optimized libraries and drivers that take maximum advantage of unique hardware features, Platform Computing has essentially done the integration work in advance, allowing clusters to be deployed quickly and predictably with minimal effort. Platform HPC Enterprise Edition is certified under the Intel Cluster Ready program.

Enterprise class service and support – Widely regarded as having the best HPC support organization in the business, Platform is uniquely able to support an integrated HPC platform. This is because Platform Computing develops all of the key software components included in Platform HPC Enterprise Edition including the cluster provisioning and management tool, the workload manager, the GUI, MPI, the portal and the adaptive scheduling facilities.

Because support personnel have direct access to the developers of all software components, Platform Computing is able to offer a higher level of support and ensure that any problems encountered are resolved quickly and efficiently.

Platform RTM: Correlating workload with system performance						
Capability / Feature	Platform HPC Enterprise Edition	NPACI ROCKS†	xCAT†	MOAB Cluster Suite†	SGE†	PBS Pro†
Cluster Provisioning and Management						
Initial cluster provisioning	✓	✓	✓	*	-	-
Multiple provisioning methods	✓	X	✓	X	-	-
Web-based cluster management	✓	X	X	✓	-	-
Node updates with no re-boot	✓	X	X	X	-	-
Repository snapshots	✓	X	X	X	-	-
Flexible node templates	✓	Weak	✓	*	-	-
Multiple OS and OS versions	✓	Weak	✓	*	-	-
Workload Management and Application Integration						
Integrated workload management	✓	✓	X	✓	✓	✓
HPC libraries and toolsets	✓	✓	X	X	X	X
NVIDIA CUDA SDK support	✓	✓	*	*	*	*
Web-based job management	✓	X	X	✓	✓	*
Web-based job data management	✓	X	X	X	X	*
Multi-boot based on workload	✓	X	X	*	X	X
Advanced parallel job management	✓	X	X	✓	X	✓
Commercial application integrations	✓	X	X	X	X	*
MPI Libraries						
Commercial grade MPI	✓	X	X	X	X	X
Workload and system monitoring, reporting and correlation						
Workload monitoring	✓	X	X	✓	✓	✓
Workload reporting	✓	X	X	*	✓	*
System monitoring and reporting	✓	✓	✓	*	X	X
Workload and system load correlation	✓	X	X	X	X	*

Table 2. Platform HPC Enterprise Edition vs. other offerings

* Item marked with an asterisk indicates that the feature is available, but requires a separately

installed add-on package

- Item marked with a hyphen is not applicable.

† The chart data is comprised of product information as published by each respective company in January 2010.

5. A complete solution

Compared to other cluster management and workload management solutions, Platform HPC Enterprise Edition simply provides the richest set of capabilities without compromising on the openness that makes Linux clusters so attractive to HPC users. It provides an integrated solution that addresses all aspects of cluster management including provisioning, node management, workload management, reporting and parallel job management. Table 2 above contrasts some of the major features of Platform HPC Enterprise Edition with those other cluster and workload management solutions which address only some parts of HPC management problem.

6. Sources of cost savings

Platform HPC Enterprise Edition can help organizations save or avoid costs in a number of areas. Some of the specific areas of cost savings are identified below.

Personnel savings – Platform HPC Enterprise Edition substantially reduces the effort required to deploy and manage a cluster. For even a moderately experienced system administrator, building a fully functional HPC cluster and assembling and configuring all of the various layered software components can easily take weeks.

Platform HPC Enterprise Edition can reduce this effort to a matter of a few days, and it can be reasonably installed and managed by non-specialists owing to its ease of use features.

Time is money – Platform HPC Enterprise Edition ensures that clusters are immediately productive, and that cluster downtime is kept to an absolute minimum owing to features like the CFM and repository snapshots.

Hidden cost avoidance – Some organizations account for additional system and network management tools outside of the context of their HPC deployment. These costs are real, however, the standard features included in Platform HPC Enterprise Edition generally require additional expenditures with other cluster management solutions. Examples of extra components include things like workload management systems, the cost of building or implementing a portal, dynamic provisioning and management tools, and the cost of technical support.

Reduced error rates – A commonly overlooked source of cost and reduced productivity is related to user errors in job submission. A 16-way MPI job that runs for two hours, that needs to be run again because the user submitted the job incorrectly, costs 32 hours of CPU time. During this period, other jobs may need to stay in the workload management system waiting for available resources. With features like application-centric portals, and by allowing users to monitor their jobs in real-time, the opportunity for job submission errors is reduced, and if there is an error, users can recognize the error quickly and take corrective action without bothering an administrator.

Improved cluster utilization – There is a significant difference in cost and productivity between a cluster running at 80% utilization versus a cluster running at 95% utilization. Platform LSF, included in Platform HPC Enterprise Edition, is widely regarded the best

among commercial workload management systems. By taking advantage of the sophisticated scheduling capabilities of Platform LSF, customers can not only better align cluster resources to business needs, they can achieve better levels of utilization as well, effectively doing more with less.

Superior price / performance – Because the supplied tools and libraries in Platform HPC Enterprise Edition are optimized for selected vendor hardware configurations, customers are assured that they are getting the highest level of performance possible from their clusters. With a “do it yourself” approach to building clusters, customers risk deploying un-optimized libraries and tools which may work, but at reduced performance levels.

Reduced risk – By relying on pre-integrated, pre-tested, certified configurations fully backed by Platform Computing, customers are assured that any issues can be addressed quickly and efficiently without the need for on-site consultants or additional support expertise that might result in unbudgeted costs.

Infrastructure cost avoidance – Many sites run both Linux and Windows environments. Rather than provision hardware to peak requirements for applications in each environment, total costs can be reduced by automatically changing the personality of cluster nodes in response to application demand. Platform HPC Enterprise Edition includes Platform ISF Adaptive Cluster as a core part of the cluster management solution.

“Future-proofing” – As explained earlier, management costs tend to dominate IT spending. A cluster might run for a few years, but when it comes time to add nodes to that cluster, upgrades can be a challenge since new hardware platforms generally require new operating systems and drivers.

Platform HPC Enterprise Edition provides a number of features that essentially “future proof” clusters including the ability to add device drivers accommodating new hardware without the need to re-install the cluster head-node. Also, it allows different hardware types to draw their configuration from different repositories based on different OS versions. This effectively means that clusters can be grown incrementally avoiding costly downstream “rip and replace” scenarios. As administrators become confident that the new hardware is functioning properly, they can migrate newer cluster nodes to production node groups, and similarly retire older nodes on the same cluster.

7. Summary

Platform HPC Enterprise Edition is the ideal solution for deploying and managing state of the art HPC clusters. It makes cluster management simple, enabling analysts, engineers and scientists from organizations of any size to exploit the power of open Linux clusters with a pre-integrated, vendor certified software solution. Unlike other HPC solutions that address only parts of the HPC management challenge, Platform HPC Enterprise Edition uniquely addresses all aspects of cluster and management including:

- Cluster provisioning and management
- Workload management
- Parallel job enablement
- Adaptive scheduling
- Intuitive application-centric interfaces
- A unified management interface
- A single source of quality support

By focusing on simplified management over the entire life-cycle of the cluster, Platform HPC Enterprise Edition has a direct and positive impact on productivity while helping to reduce complexity and cost. The comprehensive web-based management interface, and features like repository snapshots and the ability to update software packages on the fly means that state-of-the-art HPC clusters can be provisioned and managed even by administrators with little or no Linux administration experience.

With Platform HPC Enterprise Edition, administrators can spend less time worrying about cluster management, and more time focusing on their applications and the needs of their user communities. Similarly, cluster users can spend more time focused on their own projects and research.



Platform Computing is the leader in cluster, grid and cloud management software - serving more than 2,000 of the world's most demanding organizations for over 18 years. Our workload and resource management solutions deliver IT responsiveness and lower costs for enterprise and HPC applications. Platform has strategic relationships with Cray, Dell™, HP, IBM®, Intel®, Microsoft®, Red Hat®, and SAS®. Visit www.platform.com.

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