



RED HAT HPC SOLUTION

LINUX CLUSTERS MADE SIMPLE

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INTRODUCTION

Analysts, engineers, and scientists are constantly pushing the computational limits of their IT resources. In response, businesses are adopting high-performance computing (HPC) clusters to gain a competitive edge handling these compute-intensive workloads. With such a high performance-to-price advantage, HPC clusters on industry-standard (x86) servers have emerged as an alternative to expensive supercomputers running non-industry standard architectures with proprietary operating systems.

As a result, Linux®-based systems have come to dominate the Top 500 Supercomputing List (www.top500.org). And clusters of powerful Linux systems are making dramatic inroads in corporate and academic settings. In fact, Linux HPC clusters are being deployed to solve complex problems across many industries with a wide range of both custom and packaged applications (see Table 1).

TABLE 1: HPC USE ACROSS A WIDE RANGE OF INDUSTRIES

INDUSTRY	WORKLOADS	APPLICATIONS	
Manufacturing	Computational fluid dynamics	Ansys	Abaqus
	Finite element analysis	Nastran	LS-Dyna
	Crash simulation	Fluent	
Oil and gas	Reservoir simulation	ECLIPSE	STARS
	Seismic survey analysis	VIP	MEPO
	Data visualization	DMS	
Life sciences	Drug discovery	Accelrys	Simulia
	Genetic research	Schrodinger	SAS
	Data informatics		
Financial services	Monte Carlo simulations	Algorithmics	Murex
	Financial analytics	Tillinghast	Calypso
	Risk analysis	Sungard	Wolfram
Electronic design	Electronics simulation	Cadence	Reuters
	Design verification	Synopsis	Magma
	Regression testing	Mentor Graphics	
Scientific research	Phenomena modeling	Mathworks	
	Large datasheet manipulation	Gaussian	

As Linux clusters move into corporate-wide and department-level environments, the snowballing cost of cluster management threatens to erode the benefits that make open, commodity-hardware clusters so compelling. Not only can HPC cluster deployments be difficult to architect, but the ongoing need to manage heterogeneous hardware and rapidly evolving operating systems and toolsets can cause HPC management costs to spiral upward.



With a proud tradition of simplifying technology by integrating, packaging, and supporting the latest advances in open source software components, Red Hat® has taken the initiative to reduce HPC cluster complexity with the same process.

This paper provides an overview of the Red Hat HPC Solution—a close collaboration between Red Hat and Platform Computing that dramatically simplifies the installation and management of Linux clusters. This unique and powerful solution makes HPC clusters accessible to even the smallest organizations and offers a range of capabilities not found in other HPC management solutions. With the Red Hat HPC Solution, the job of deploying, running, and managing an HPC cluster has been dramatically simplified—resulting in a cost-effective HPC resource that can benefit any size organization.

LINUX IN HPC

There are many reasons why Linux dominates the HPC space. Academic and research communities have found that the open source development model creates a high-performance operating system that is stable, secure, and often leads the way with innovative features. In addition, commercial users have found Linux to be both high-quality and low-cost when compared to traditional proprietary operating systems. This of course appeals to IT departments faced with constrained budgets.

HPC clusters make use of leading-edge server technology in order to squeeze every ounce of computing power out of each IT dollar.

An often under-appreciated aspect of open source development is how rapidly hardware testing and certification can be provided for new processors and chipsets. Red Hat, in close partnership with Intel® and AMD, makes sure drivers and utilities are available for the latest chipsets as soon as they are ready to ship.

According to IDC, 2007 showed a return to significant growth in the high-performance computing market, with a 15% increase to reach \$11.56 billion for the year. Looking forward, IDC projects the total HPC market will expand by a compound annual growth rate (CAGR) of 9.2% to reach just under \$18 billion by 2012. As a result, the HPC market is broadening, with new users entering the market, current industrial users making greater use of computational methods, and increased industrial and scientific research competition based on computer modeling and simulation. This broad adoption is a testament to the clear value HPC clusters offer today.

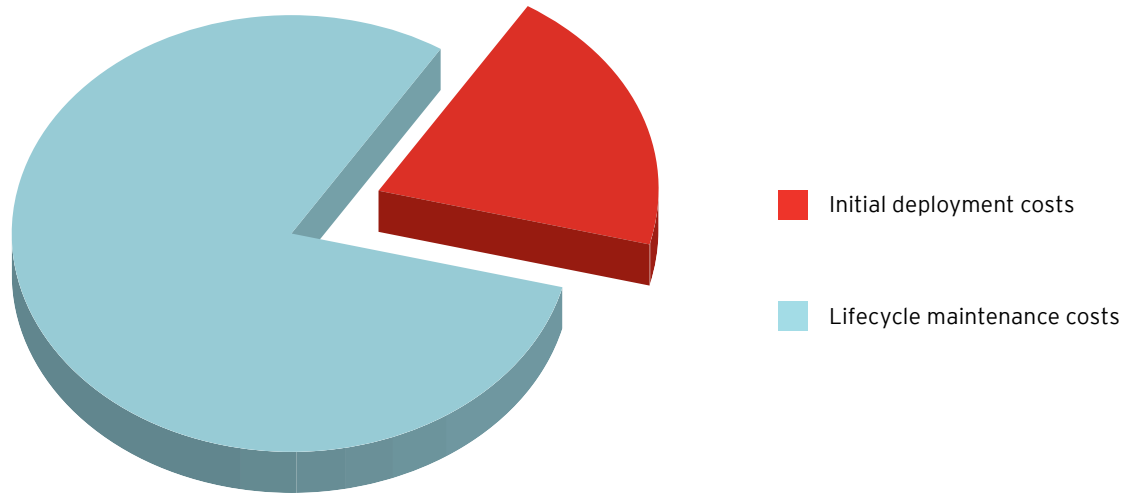
THE LIFECYCLE MANAGEMENT CHALLENGE

As successful as Linux has been, there remain serious challenges with Linux HPC data center deployments. These challenges often center on cost, complexity, and the need for skilled system administrators. In fact, lifecycle management costs tend to dwarf initial deployment costs over time. As much as 80% of IT budgets are directed to operations and maintenance (see Figure 1).

1 March 2008, IDC #211500 - Technical Computing Systems: Market Analysis

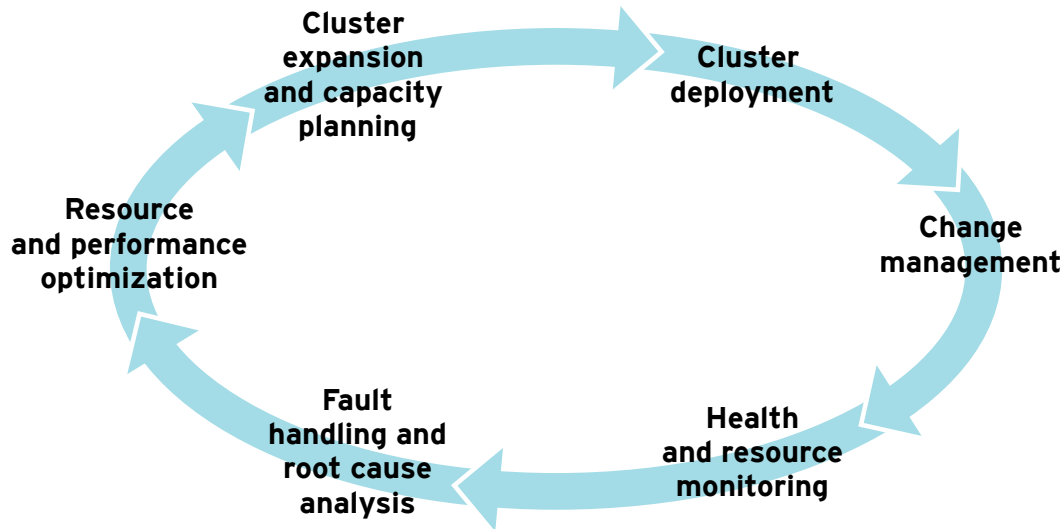


FIGURE 1: SOURCES OF COST IN HPC DATA CENTER MANAGEMENT



While there are tools that address individual parts of the management problem, there is a distinct lack of integrated solutions that address the larger issue of lifecycle management. This is particularly true in heterogeneous, multi-vendor environments.

Hardware vendors tend to provide management tools optimized for their own systems, whereas most cluster environments become heterogeneous over time. This leaves data center managers with no single management tool that addresses the whole platform. They are left instead with costly, siloed tools that tend to focus on the initial cluster deployment. This only increases the complexity and cost of managing an HPC environment, as cluster deployment represents one small part of the larger management challenge (see Figure 2).


FIGURE 2: TOTAL CLUSTER LIFECYCLE MANAGEMENT


The complexity problem is real. Imagine a small IT department grappling with a new vocabulary of cryptic commands, configuring and troubleshooting anaconda² installation scripts, finding the correct OpenFabrics Enterprise Distribution (OFED) drivers for specialized hardware, re-compiling math libraries, installing and configuring an open source monitoring system like Ganglia, and dealing with the interdependencies of hundreds of layered software components. That's a lot of specialized skills, and a lot of time investment.

As clusters grow, they inevitably become more complex. Over time there will be additional applications, new and different network topologies, and new hardware additions with specific driver and kernel dependencies. Issues such as change management, fault analysis, and cluster capacity planning can be significant and complex challenges.

Red Hat and Platform Computing have addressed the problem of lifecycle management and complexity head on. The aspects of lifecycle management outlined in Figure 2 will be revisited later in this paper to illustrate specifically how the Red Hat HPC Solution lowers the lifecycle management costs of clusters.

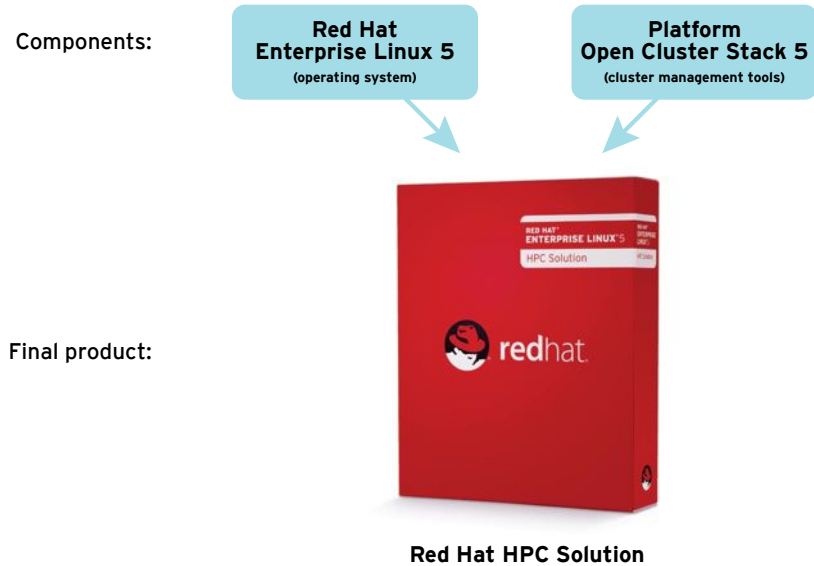
CLUSTERS MADE EASY

The Red Hat HPC Solution is a best-in-class software stack utilizing technology from two leaders in the HPC market – Red Hat and Platform Computing. It integrates the powerful yet easily deployed cluster management tools of Platform Open Cluster Stack 5 with the world-class performance, security, and stability of the world's leading open source operating system. Together, the two provide the full range of tools needed to deploy, run, and manage an HPC cluster in one easy-to-install package (see Figure 3).

² Anaconda is the installation program used by Fedora, Red Hat Enterprise Linux, and other Linux distributions.



FIGURE 3: BEST-IN-CLASS SOFTWARE HPC STACK



Red Hat HPC Solution is an evolutionary improvement over previous cluster management toolkits. It is different because it provides a comprehensive application development and deployment stack designed to be easy to deploy, use, manage, and update. It achieves this through an intuitive, web-based management GUI called the Platform Management Console. This optional GUI enables even non-specialists to deploy and maintain HPC systems and tools in accordance with industry best practices.

The Red Hat HPC Solution can be used to deploy and manage any x86-based cluster environment. It supports a range of hardware platforms as well as a range of pre-packaged software components known as kits.

The Red Hat HPC Solution provides:

- A complete HPC cluster solution, including a blend of integrated and tested open source software components
- An open source workload management system called Platform Lava
- Power and console management (available via supported hardware)
- A collection of the latest cluster management tools from the open source community
- An automated software maintenance and patching facility
- Pre-integrated HPC tools and libraries
- User-oriented application portals tailored to common HPC applications
- 24x7 support from Red Hat



PROJECT KUSU - AN OPEN HPC MANAGEMENT TOOLKIT

The roots of the Red Hat HPC Solution are in Project Kusu. Project Kusu is an open source development effort focused on creating a next-generation cluster management tool. Kusu is designed with the following goals in mind:

- Simplify cluster management, operation, and deployment.
- Support multiple Linux distributions including Red Hat Enterprise Linux, CentOS, Fedora, SuSE® Linux Enterprise Server, OpenSUSE, and Ubuntu Linux.
- Transparently integrate open source and commercial software into a single consistent cluster operating environment with a modular and hybrid stack.
- Maintain standards; remain fully open source and vendor-certified.

The Open Source Grid Development Center (OSGDC, sponsored by Platform Computing) is the team behind Project Kusu. It is composed of experienced Linux cluster administrators and developers with extensive hands-on knowledge of HPC environments. Project Kusu is their attempt to provide a fresh approach to cluster management.

Project Kusu delivers a powerful set of cluster management tools designed to be exceptionally easy to use. These tools are a key component of the Red Hat HPC Solution. Kusu—along with other open source HPC technologies—is freely downloadable from hpccommunity.org, a resource repository sponsored by Platform Computing that serves the HPC technical community.

RED HAT HPC SOLUTION COMPONENTS

The Red Hat HPC Solution includes a full suite of HPC software components. The complete solution is designed to make installation and deployment easy. The key is that the full suite of HPC components configure themselves automatically upon installation. HPC clusters that might have taken months to deploy with all the necessary layered software components can now be reliably deployed in a few hours. In addition, the Red Hat HPC Solution is easy to use through the optional Platform Management Console (PMC). It allows even relatively inexperienced users to efficiently manage an HPC cluster.

The following is an overview of the major software components.

Web-based management GUI (PMC):

The PMC is a comprehensive and intuitive interface used to administer all components of the clustered environment. The PMC is new to Platform OCS 5 and is shown in Figure 4. It is an optional (no cost) download from <http://my.platform.com> called “GUI.kit”. Not only does the PMC support all of the functions needed to initially provision and maintain cluster nodes, but it also includes other features such as cluster monitoring, reporting, graphs, workload management tools, and user-oriented job submission interfaces. When nodes are added to the cluster, they automatically become visible and manageable through the PMC GUI. Administrators can perform the vast majority of cluster management activities from within this single, simple interface.



FIGURE 4: THE PLATFORM MANAGEMENT CONSOLE



Provisioning

The Red Hat HPC Solution offers the widest range of deployment options available. It supports diskless nodes, image-based nodes, and customizable package-based provisioning. Large numbers of hosts can be easily added as a group. The Red Hat HPC Solution attends to details like IP address assignment and node naming conventions. Unlike other HPC offerings, the Red Hat HPC Solution can manage the deployment of multiple operating system versions to a cluster simultaneously. This gives administrators the flexibility they need to support a variety of tools that may have specific operating system dependencies.

Console and power management

Console and power management is built in. Cluster administrators can assume console control, access a secure shell, or cycle the power on any cluster node remotely through the PMC. Power management features, coupled with smart workload scheduling policies, make it possible to schedule preferentially to the most power-efficient machines and idle systems not in use. This allows administrators to reduce power consumption and adjust cooling requirements.

Complex network topologies

Network environments tend to grow in complexity, so being able to configure and manage complex network topologies is an important feature for any cluster management tool. The Red Hat HPC Solution allows administrators to name and manage multiple networks, including private storage subnets or dedicated management networks for BMC controllers. It also allows these nodes to connect to these networks through the management console. This means that cluster administrators retain flexibility and are not constrained to deploying only simple Beowulf-style clusters.



Repositories, kits, and components

The Red Hat HPC Solution relies on a unique architecture that simplifies the task of software installation and maintenance. Kits form the basic unit of software distribution in Red Hat HPC Solution clusters. These unique kits understand software dependencies and prerequisites and can fully install and configure themselves. Tedious tasks such as upgrades and patches can be fully automated using standard Linux capabilities and the Red Hat Network (RHN) service. The standard kits provided for the Red Hat HPC Solution include:

- **Base kit** - Contains the tools and applications for managing the Red Hat HPC Solution cluster
- **Cacti kit** - An open source reporting tool used to collect and graph various node metrics (Figure 5)
- **Ganglia kit** - A powerful open source resource monitoring solution
- **HPC kit** - A comprehensive collection of tools, MPI implementations, libraries, and utilities specific to HPC clusters
- **Platform Lava kit** - An open source workload scheduler compatible with Platform LSF
- **Platform LSF kit** - A commercial workload scheduler for serial and parallel workloads
- **Nagios kit** - A comprehensive open source host, services, and network monitoring solution (NMS) (Figure 6)
- **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)

FIGURE 5: CACTI SCREENSHOT

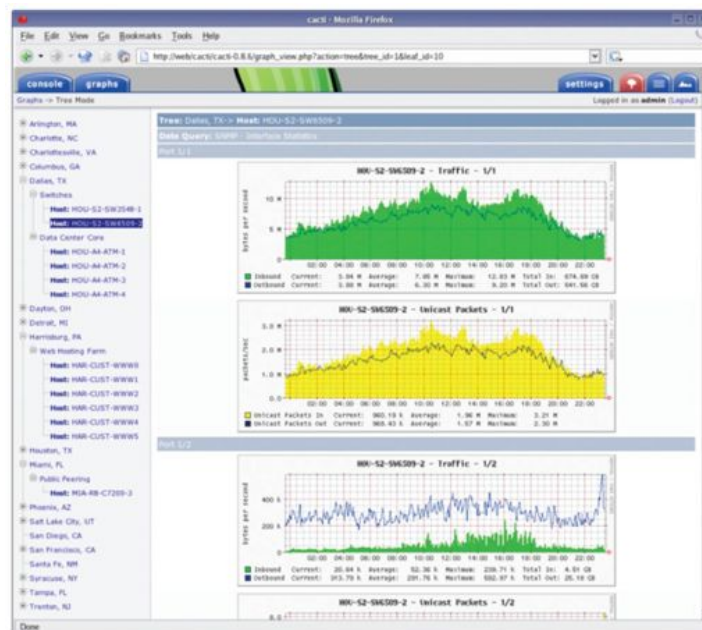
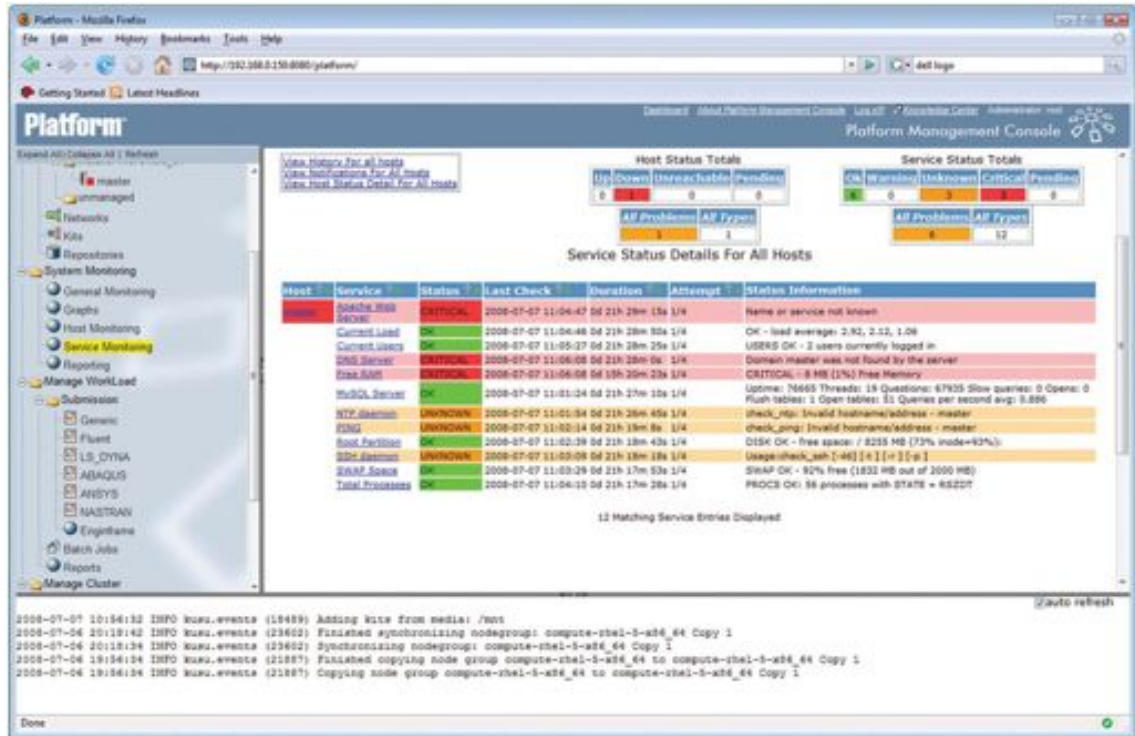




FIGURE 6: NAGIOS SCREENSHOT



Operating systems are a special class of kit in the Red Hat HPC Solution. They are automatically recognized as installation media of supported operating systems. Whole operating systems are stored in this flexible kit format on the installer (master) node.

Cluster management services

Many powerful tools are included that save administrators time and effort. Among these are CFM (the cluster file manager) and PDSH (a parallel distributed shell). Although we can't cover these tools in detail here, they streamline administration, allowing changes to be propagated to cluster nodes without the need to re-provision systems.

Integrated cluster monitoring and reporting

With the Red Hat HPC Solution, reporting and monitoring functions are configured and ready for use through the GUI. Monitoring tools include node monitoring, service monitoring, sophisticated graphic capabilities, workload monitoring, and network monitoring. A variety of standard reports is available as well, including availability reports and inventory reports. Interfaces are provided to optional commercial reporting solutions, such as those included in Platform LSF.³

³ While the reporting facilities included in the Red Hat HPC Solution are impressive on their own, there are additional commercial reporting tools such as Platform Analytics and Platform RTM that address common reporting requirements (such as license feature usage by project or group). These optional components fit seamlessly as upgrades into the Red Hat HPC Solution cluster environment, protecting a customer's investment by ensuring that they can add capability easily as needed.



Open workload management

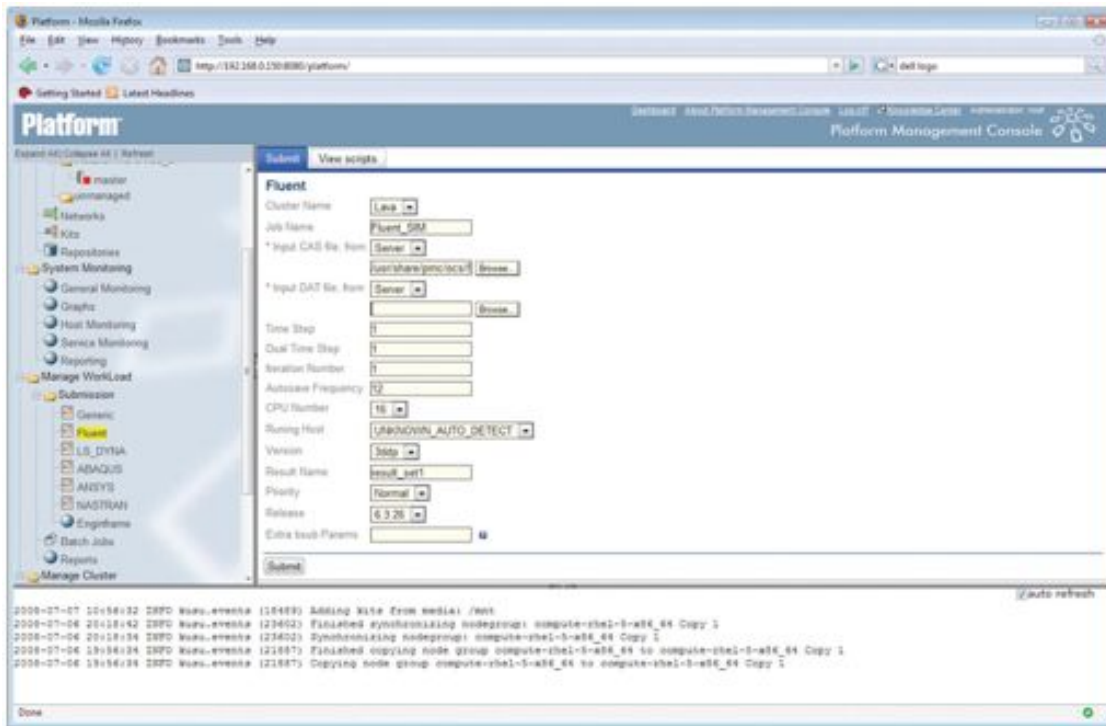
Unlike other cluster management solutions where workload management is provided as a third-party add-on, the Red Hat HPC Solution includes a fully integrated and functional workload management tool. Users can choose to use the built-in open source Platform Lava workload manager or opt for the full-featured Platform LSF workload manager instead. Because Platform Lava is command-line compatible with Platform LSF, power users have an upgrade path if their requirements grow and their use of workload management becomes more sophisticated. This upgrade path fully preserves a customer's investment in any in-house developed scripts and management procedures.

Application-centric interfaces

Another powerful feature of the Red Hat HPC Solution is its support for application-specific interfaces. Job submission templates for common HPC applications are included with the PMC as shown in Figure 7. By providing self-documenting, user-friendly interfaces, training requirements and submission errors can be reduced dramatically. Users who wish to evolve this capability or deploy a full-blown HPC portal reflecting their own branding can easily do so with optional components like EnginFrame™ web portal.

EnginFrame provides a customizable application-centric interface that interacts seamlessly with the Platform LSF or Platform Lava workload managers. These application-centric interfaces are ideal for educational institutions where HPC tools may need to be deployed to student populations in a controlled fashion.

FIGURE 7: RED HAT HPC SOLUTION APPLICATION SPECIFIC INTERFACES





KEY CONCEPTS

To fully appreciate the power and flexibility of the Red Hat HPC Solution, it is necessary to first understand a few key concepts. These tenets clearly explain how the Red Hat HPC Solution simplifies ongoing cluster management in ways that other management solutions cannot.

First, the Red Hat Package Manager (RPM) is a core component included in virtually all major Linux distributions. It installs, uninstalls, verifies, queries, and updates software packages, allowing operating systems as well as add-on packages to be installed in a modular fashion.

The Red Hat HPC Solution builds on this concept of packages with the introduction of kits. Kits are higher level abstractions of software that have the following properties:

- Kits contain RPMs that make up software packages
- Kits contain a “meta-RPM” that stores key information about the kit. This information can include things like package prerequisites, documentation, and installation and uninstallation methods
- Kits can also contain components, or collections of individual RPMs. Components are exceedingly useful since different software configurations may be required by different types of cluster hosts. For example, a customer deploying the Platform LSF workload manager will have one software configuration for a master host and a different configuration for a compute host or submission host. These different “profiles” for software deployments can be represented as “components” of a kit drawing from the standard set of RPMs contained in the kit.

FIGURE 8: RED HAT HPC SOLUTION KITS

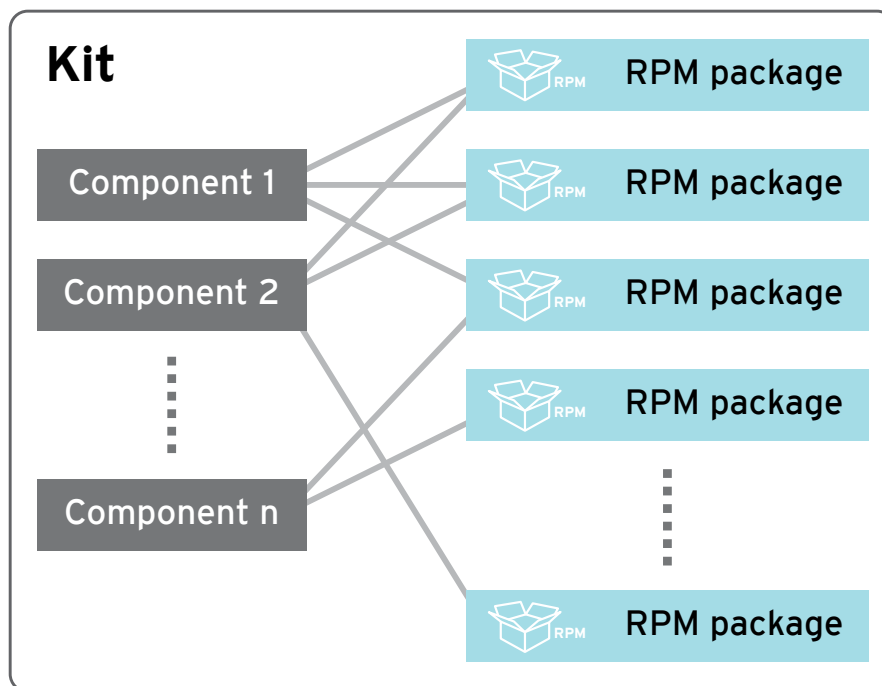




Figure 8 shows a conceptual diagram of a kit. Components can include collections of RPMs, and may have dependencies on particular RPM packages and versions. Kits may depend on the presence of other kits, or they may depend on particular RPMs. In fact, to the Red Hat HPC Solution, an operating system distribution is just a special type of kit.

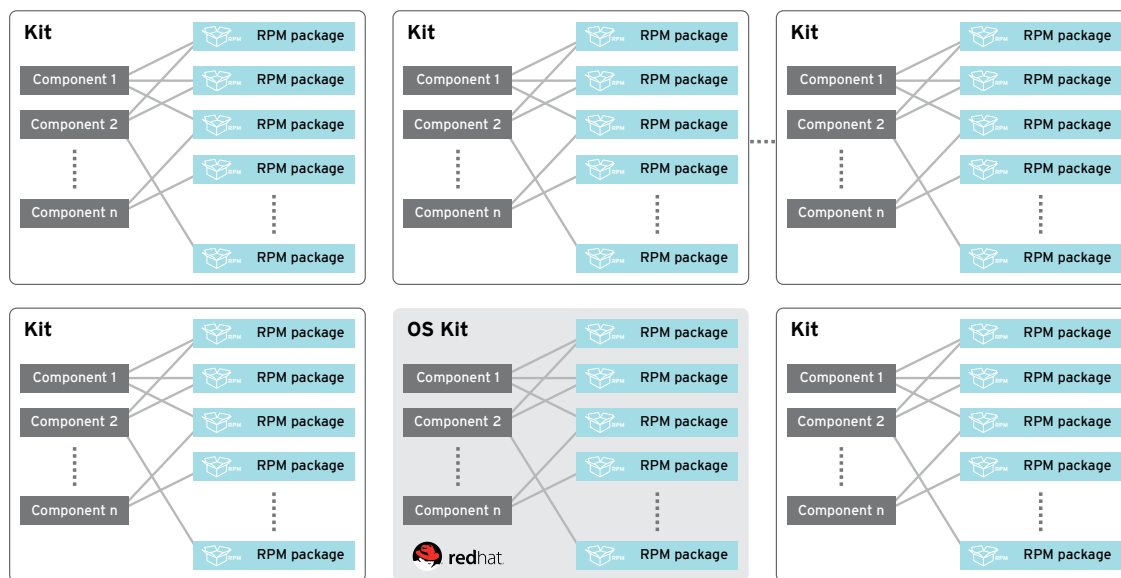
While the Red Hat HPC Solution includes all of the kits necessary to deploy an HPC cluster, users can also create their own kits. This allows the user to package custom or additional software so that it can be easily deployed and managed.⁴ While there are command-line tools to manipulate these kits, kit administration can also be performed entirely through the management GUI.

Kits are assigned to repositories, and the Red Hat HPC Solution supports a practically unlimited number of repositories. A repository contains an operating system (OS) kit as well as additional special purpose kits. The PMC allows repositories to be manipulated, and allows kits to be assigned to one or more repositories. Organizations typically want multiple repositories since they may be deploying to clusters with multiple machine architectures and different operating systems.

The Red Hat HPC Solution has the ability to clone repositories through the PMC. This allows administrators to upgrade software or apply patches to one repository, test the deployment of the new software to cluster nodes, and easily roll back to the working repository in the event of a problem. Upgrades done in this fashion are essentially risk-free. A conceptual diagram of a repository is shown in Figure 9.

FIGURE 9: RED HAT HPC SOLUTION REPOSITORIES

Repository



⁴ Instructions for creating an Red Hat HPC Solution kit, along with additional information about kits, can be found on the project Kusu website at <http://www.osgdc.org/confluence/display/KUSU/Kusu+Kits>.

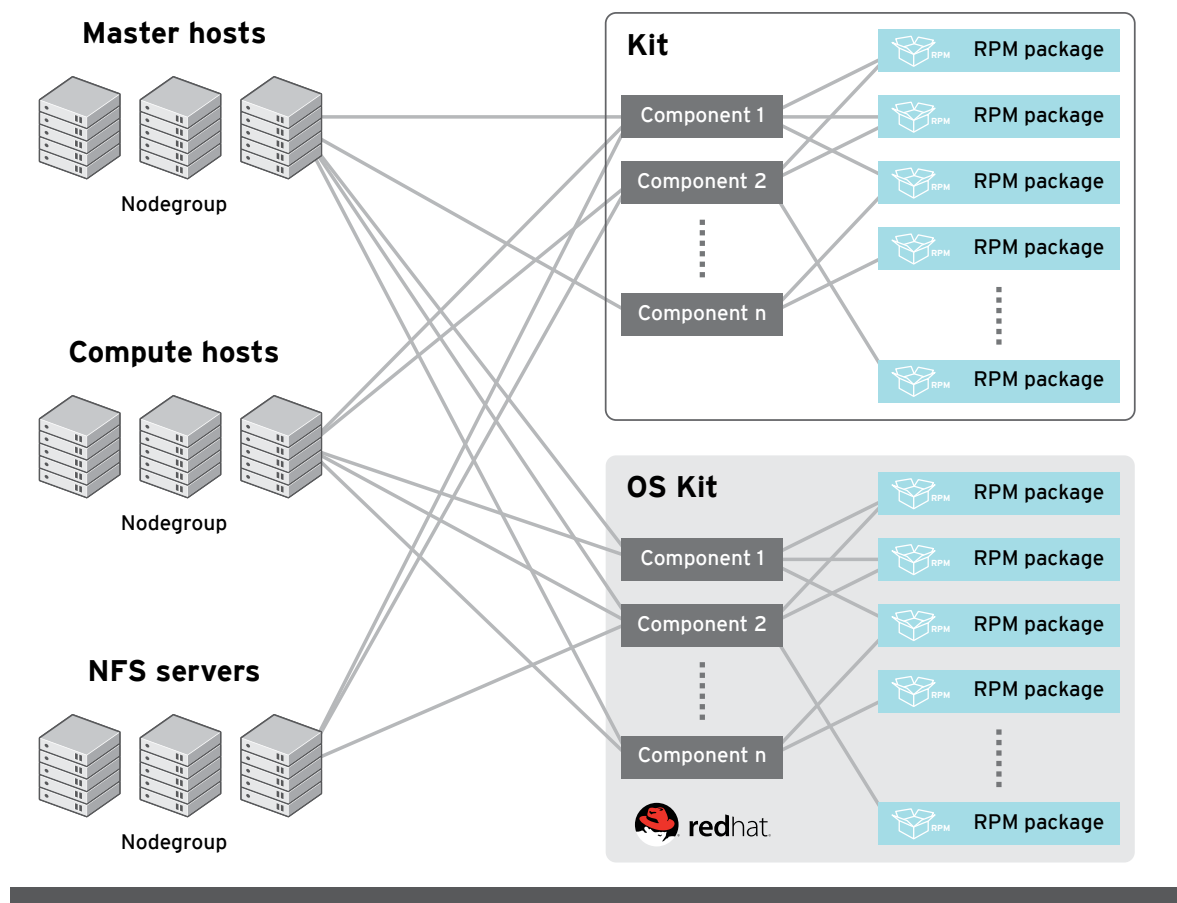


The Red Hat HPC Solution allows a variety of kits—including entire operating systems—to be loaded into an installer node and then associated with repositories. The last major concept we'll address is the notion of node groups. Node groups are collections of physical hosts that share common properties. Cluster administrators can easily define their own arbitrary node group definitions. (For example: `x64_compute_hosts`, `license_servers`, `mpi_hosts`, `master_hosts` and `xen_hosts`)

Node groups may also be used as a mechanism to reflect asset ownership. For example, multiple departments may combine their assets into a single cluster.

Node group definitions are associated with components, and components are drawn from a repository. This concept is illustrated in Figure 10. By drawing only the needed components from the repository, the definition of node groups becomes extremely flexible. If I install a new kit into a repository, then making that kit available to all nodes in a node group is simply a matter of changing the node group definition to include the needed components of the kit. If components change in the repository, all nodes that rely on that component will be changed to reflect the new definition automatically.

FIGURE 10: ASSOCIATING COMPONENTS WITH NODE GROUPS





System administrators will appreciate the power of this unique management concept. With the Red Hat HPC Solution, you no longer have to think about the actual provisioning and installation of systems. Instead, valuable IT staff can focus on thinking about node group definitions and the software building blocks associated with the type of system. Upgrades to systems are simply a consequence of changing the contents of a repository, changing a node group definition, or assigning a physical host to a different node group.

EFFECTIVE LIFECYCLE MANAGEMENT

Earlier the point was made that lifecycle management costs often dominate IT budgets. After explaining the components of the Red Hat HPC Solution and covering the concepts of kits, repositories, and node groups, we can now more precisely explain how the Red Hat HPC Solution reduces lifecycle management costs.

Cluster deployment

When most people think of cluster deployment or provisioning, they tend to think only of the initial deployment. However, over its lifespan, a cluster will grow and change, and the software required on nodes will change as well. The Red Hat HPC Solution dramatically simplifies cluster deployment in the following ways:

- The Red Hat HPC Solution installs in under one hour and can deploy cluster nodes immediately through a single integrated GUI.
- Because all of the components are pre-integrated and pre-tested with optimized libraries, fully functional HPC clusters can be deployed in hours (rather than the weeks often required in “do-it-yourself” efforts).
- Changing the software stack on a cluster node is simply a matter of assigning that node to a different node group through the PMC. This saves administrators significant time and removes the need for expert administrators.

Change management

Installing new software or patches can involve significant risk. With its unique management architecture, the Red Hat HPC Solution simplifies change management by removing the risk from upgrades and patches. The ability to simultaneously support multiple configuration stacks (expressed as node group definitions, drawing from components in repositories) is very useful to organizations that face regulatory requirements requiring them to demonstrate repeatability of calculations or retain deprecated software configurations.

It also provides the ability to:

- Create multiple repositories with different collections of software components
- Revert node groups to different configurations at any time simply by associating node groups with components from a different repository
- Snapshot and use the Red Hat HPC Solution to automatically patch OS components in a repository via Red Hat Network or yum. In the event of a problem, you can revert to the known repository while deploying a few test nodes to troubleshoot any issues
- Use powerful facilities like “driverpatch,” which allows device drivers to be “poked” into repositories directly – meaning that the clusters are always able to accommodate new hardware models



Health and resource monitoring

Health and resource monitoring requires the ability to monitor key measures such as system availability, service availability, and resource usage. The Red Hat HPC Solution automatically installs and configures open source management and monitoring tools like Nagios, Cacti, and NTOP so that cluster health and resource monitoring are available immediately. All of this is integrated into the PMC, so the cluster administrator has no additional software to deploy or interfaces to learn.

The Red Hat HPC Solution goes well beyond simple node and network monitoring. It also integrates workload management, so that administrators can see how cluster resources are being used by job and by group. As sites grow, they may require more sophisticated reporting and monitoring, so Platform Computing offers a number of optional packages that address these requirements. These include Platform RTM, a reporting, tracking, and monitoring system implemented as an add-on to Cacti, and Platform Analytics, an OLAP-based tool that allows administrators to correlate infrastructure-related metrics as well as workload-related metrics with data such as software license utilization. This allows you to answer business-level questions about the operation of the cluster.

While the Red Hat HPC Solution is itself quite complete, the add-on tools provide users with an increased degree of investment protection, ensuring that capabilities can always be upgraded.

Fault handling and root cause analysis

With greater information about cluster operations, administrators are much more efficient addressing faults and determining the root cause of failures. The Red Hat HPC Solution includes Nagios, a powerful host and service monitoring facility integrated with the PMC. Nagios provides a number of automated features that save time and effort:

- Nagios monitors a variety of network services, system resources, and environmental factors like temperature.
- It has the ability to provide alerts via email, pager, or other configurable interface in the event that thresholds are exceeded.
- It supports event handlers that allow exception conditions to be handled automatically. This maximizes uptime, reduces administrator workload, and prevents unplanned outages.
- It provides a comprehensive web interface that logs notifications and problem history to help administrators perform root cause analysis on failures.

Resource and performance optimization

Getting the most from computing assets is critical in high-performance computing environments. The Red Hat HPC Solution helps ensure optimal resource use by:

- Including math libraries and developer tools that ensure compute resources run at peak efficiency from day one.
- Providing integrated workload management with Platform Lava, and making those management tools accessible to end-users and administrators alike through the web-based PMC GUI.
- Integrating cluster monitoring and reporting tools able to provide performance and utilization reports for individual nodes or aggregated results for groups of nodes.



Cluster expansion and capacity planning

The Red Hat HPC Solution eases the task of expanding clusters and performing capacity planning through a number of integrated components accessible through the PMC.

- Extensive and customizable graphing capabilities help administrators visualize trends and usage patterns essential in spotting patterns and forecasting future resources requirements.
- Both Platform Lava (integrated with the Red Hat HPC Solution) and Platform LSF provide reporting on historical workloads and usage, including capacity planning statistics such as job pending time and turn-around time.
- The Red Hat HPC Solution allows individual nodes or groups of nodes to be added to the cluster easily without disrupting ongoing cluster operations.

SOURCES OF COST SAVINGS WITH THE RED HAT HPC SOLUTION

The savings realized with the use of the Red Hat HPC Solution can be dramatic. HPC centers sometimes seek to maximize hardware procurements, but under-investing in management tools and administrator training represents a false economy. Employing the Red Hat HPC Solution saves or avoids significant costs in a number of critical areas.

- For IT departments that rely on paid employees or consultants to deploy and manage HPC clusters, the Red Hat HPC Solution dramatically reduces the level of effort required to install the cluster and configure all of the layered services. Even a moderately experienced administrator could spend months building a fully functional HPC cluster. The Red Hat HPC Solution can reduce this effort to a matter of days.
- Most organizations depreciate their capital assets over a fixed period of time. For example, a department with a three-year capital depreciation policy that takes six months to get a cluster operational realizes a reduction of 17% in terms of financial return on assets—and this is before they account for the cost of people's time or periods of avoidable outages. The Red Hat HPC Solution maximizes financial return on assets by ensuring that clusters are immediately usable.
- Some organizations may account for system and network monitoring and management costs outside of the context of the HPC deployment itself. These costs are real, however, and the tools included in the Red Hat HPC Solution often come at an additional cost with other cluster management solutions.
- By relying on pre-integrated, pre-tested, and certified configurations fully backed by both Red Hat and Platform Computing, customers are assured that in the event of problems, issues can be addressed quickly and efficiently without the need for additional on-site consultants or support expertise.



UNIQUE CAPABILITIES

The Red Hat HPC Solution offers unique capabilities relative to other cluster provisioning and management solutions. Table 2 compares features of the Red Hat HPC Solution (Based on Platform OCS 5.1) with the prior version of Platform OCS (version 4.5x based on Rocks⁵) and with Rocks+ V from ClusterCorp Inc.

Advantages of the Red Hat HPC Solution center around its use of the Kusu open source cluster management platform, its comprehensive management GUI, its support for multiple operating systems, and its superior lifecycle management features.

TABLE 2: FEATURE COMPARISON BETWEEN THE RED HAT HPC SOLUTION AND OTHER SOLUTIONS

FACILITY/FEATURE	THE RED HAT HPC SOLUTION	PLATFORM OCS 4.5.1 (ROCKS)	ROCKS+ V ⁶
Comprehensive web-based management GUI	Yes	No	No
Simplified provisioning/setup	Yes	Yes	Yes
Application centric web portal	Yes	No	No
Linux platform support	Yes	Yes	Yes
HPC components and kits (or rolls)	Yes	Yes	Yes
Package, imaged, and diskless provisioning	Yes	Package	Package
Node configuration templates	Yes	Partial	Partial
Mixed OS and version support	Yes	No	No
Automated repository updates (via yum)	Yes	No	No
Repository snapshot (trial installs)	Yes	No	No
Automated cluster patching	Yes	No	No
Automated RPM dependency management	Yes	No	No
Integrated workload management	Yes	3rd party	3rd party
Directly supported by Red Hat	Yes	No	No

⁵ Rocks was developed by the Rocks Cluster Group at the San Diego Supercomputer Center at the University of California and its contributors.

⁶ ClusterCorp offers a licensed commercial solution based on Rocks.



SUMMARY

“Clusters made simple” is the best way to describe why the Red Hat HPC Solution is ideal for managing a Linux cluster. The Red Hat HPC Solution allows analysts, engineers, and scientists from organizations of any size to deploy the power of HPC with an out-of-the-box, pre-integrated, vendor-certified software solution. Because the Red Hat HPC Solution is so easy to manage, administrators can spend less time worrying about the cluster infrastructure and more time focusing on their business. Users and administrators are more productive with an HPC cluster that just works—and the Red Hat HPC solution does more than that. It performs optimally, right from day one. Red Hat and Platform Computing take the cost and complexity out of HPC cluster deployments, delivering high performance with unprecedented simplicity and value.



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