Lockheed Martin Improves Security Capabilities and Reduces HPC Costs with PBS Professional

Key Highlights

Industry
Aerospace and Defense

Challenge
Support multiple security domains while consolidating HPC systems

Altair Solution
PBS Professional with support for Red Hat cross-domain security

Benefits
- Tens of millions in HPC cost savings
- Reduced datacenter footprint and power consumption
- Simplified IT architecture
- Enhanced flexibility and control

Customer Profile

Headquartered in Bethesda, MD, Lockheed Martin (LMC) is a global security and aerospace company that employs about 115,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainability of advanced technology systems, products and services.

Lockheed Martin staffs several government owned HPC programs that provide support for managing the high-performance computing (HPC) resources used by government directed R&D contractors and scientists to support compute-intensive modeling and simulation research. LMC provides supercomputing hardware and helps users convert, optimize and parallelize their software codes to run as efficiently as possible on the government owned HPC systems. The LMC staff also helps contractors and scientists get access to the data they need to perform their computational research.

The Challenge: Managing HPC Resources in Multi-Level Security Environments

LMC configures the systems for the government with Red Hat Enterprise Linux 6 cross-domain system (CDS) configurations for multi-level security (MLS). Red Hat Enterprise Linux's CDS capabilities deliver an out-of-the-box configuration that enables users and data at different security levels to share the same resources (including hardware, operating systems, disks, etc.). This configuration uses the MLS policy and other features built into Red Hat Enterprise Linux to enable Role Based Access Control (RBAC), automated auditing, and many other security features.

Red Hat Enterprise Linux's MLS configuration helps control hardware costs by combining users at different security levels on the same HPC systems while ensuring efficient system access by all users. This is particularly useful for the U.S. military and intelligence

Lockheed Martin Success Story

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Joseph Swartz,
Program Chief Scientist at Lockheed Martin

communities where information systems supporting multiple data sets (such as those classified as Secret, Top Secret, or Confidential) historically have been physically separated to mitigate security concerns.

Joseph Swartz, program chief scientist at LMC, explains: "For example, with cross-domain security a user at a higher security level (say Top Secret) can read data from a lower security level (say Secret). If the Top Secret user modifies the data in any way, the system automatically re-labels the data to the Top Secret level. Without this capability enabled, the Top Secret user would have to gain access to a different HPC system to access the data he needed; then we would have manually had to reset the security level of that data to Top Secret."

Cross-domain security can also be used on an unclassified HPC system to separate companies with proprietary data from each other, thereby ensuring data protection but requiring only one system.

There are many other uses for this type of Red Hat configuration, which reduces the number of HPC systems required, increases system security and enhances overall flexibility in many areas inside and outside of an HPC environment.

Because users at different security levels share the system, Lockheed Martin needed to deploy a resource scheduler capable of operating in an MLS Red Hat Enterprise Linux environment, enabling the greatest flexibility in setting queue and job priorities, providing automated accounting information, and offering many other capabilities to help each user gets his or her runs completed in the appropriate time and with the appropriate priority.

Implementing a CDS/MLS aware workload management software enables companies like Lockheed Martin and their HPC programs to manage their HPC resources in real time and offer the ongoing ability to consolidate and share HPC systems with complex security requirements and constraints. It also ensures users will get maximum utilization from HPC systems.

"Without a workload manager that can use Red Hat Enterprise Linux cross-domain security, we were forced to install a version of our scheduler at each security level and manage the HPC resources by whiteboard," said Swartz. "Each security level was assigned to a specific set of hardware resources, so if the security level was not running at a given time, those resources were wasted since they couldn't be shared by others users at different levels of security."

The Solution: Altair's PBS Professional with Cross-Domain Security Support for Red Hat Enterprise Linux

LMC evaluated all proven HPC resource management vendors and closely investigated the ability of each vendor to meet queuing and prioritization requirements, as well as the company's willingness to work with Lockheed Martin to make the code modifications required to bring the scheduler into compatibility with cross-domain configurations of Red Hat.

"We chose Altair thanks to PBS Professional's rich set of queuing, managing, and reporting capabilities and the company's willingness to innovate with us," said Swartz. "The PBS Professional implementation with Red Hat

offered broad flexibility in setting queue and job priorities, and provided the automated accounting information and many other capabilities we needed to ensure each user gets his job completed in the appropriate time and with the appropriate priority."

"Red Hat Enterprise Linux features tight integration with SELinux, which enables the platform's native configurations to offer Role-Based Access Control (RBAC), data labeling, and continuous monitoring of security controls," explained Shawn Wells, Director of Innovation Programs, Red Hat Public Sector.

"Through PBS Professional, Altair abstracts these technical complexities to provide a consumable interface for cross-domain supercomputing, supporting multi-level security and unifying underlying security controls with workload management."

LMC worked closely with Altair to ensure the product met the highest levels of security requirements to work correctly in a Red Hat Enterprise Linux cross-domain environment. LMC is using PBS Professional on two SGI UV1000 systems with 1024 cores total, and is in the process of adding three more 512 core systems.

The Result: Cost Savings and Improved System-Wide Efficiency

Thanks to the new PBS Professional installation supporting cross-domain security*, Lockheed Martin can now easily and securely manage HPC resources in real time across more than 20 different security levels and compartments, ensuring the full utilization of the systems.

In addition, by providing a cross-domain supercomputing platform, the Altair-Red Hat solution enabled Lockheed Martin to dramatically reduce HPC procurement costs in support of a large U.S. government program. Rather than maintaining individual HPC systems, Lockheed Martin consolidated into two supercomputers resulting in tens of millions of dollars in upfront savings, reduced datacenter footprints and power consumption, and a simplified IT architecture.

"Ultimately, the cost savings to the government is huge," said Swartz. "Savings are achieved through reduced hardware costs, reduced staffing requirements, reduced security maintenance and other costs, licensing fees, etc."

The combined Red Hat and Altair PBS Professional capabilities result in a strong solution for flexible, highly configurable shared environments where security and performance are top priorities, such as classified research and development communities and government organizations.

These capabilities have also benefited the U.S. government and tax payers by providing highly capable HPC systems for modeling and simulation at a fraction of the cost of alternative configurations.

"If you are required to provide a highly secure computational environment with labeled security for each user's data -- and, potentially more important, with requirements to map job execution to specific computing resources for faster execution – the Altair solution will enable you to deploy a smaller yet fully capable shared HPC system at a fraction of alternative configuration hardware costs," said Swartz.

*PBS Professional with Cross-Domain Security Support is a Limited Availability feature. Ask Altair about implementing this capability at your site.

About Altair

Altair empowers client innovation and decision-making through technology that optimizes the analysis, management and visualization of business and engineering information. Privately held with more than 2,000 employees, Altair has over 45 offices throughout North America, South America, Europe and Asia/Pacific. With a 30-year track record for high-end software and consulting services for engineering, computing and enterprise analytics, Altair consistently delivers a competitive advantage to customers in a broad range of industries. Altair has more than 5,000 clients representing the automotive, aerospace, government and defense, and consumer products verticals. Altair also has a growing client presence in the electronics, architecture engineering and construction, and energy markets.

About PBS Works

PBS Works™, Altair's suite of on-demand cloud computing technologies, allows enterprises to maximize ROI on existing infrastructure assets. PBS Works is the most widely implemented software environment for managing grid, cloud, and cluster computing resources worldwide. The suite's flagship product, PBS Professional®, allows enterprises to easily share distributed computing resources across geographic boundaries. With additional tools for portal-based submission, analytics, and data management, the PBS Works suite is a comprehensive solution for optimizing HPC environments. Leveraging a revolutionary "pay-for-use" unit-based business model, PBS Works delivers increased value and flexibility over conventional software-licensing models.

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