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

LOCKHEED MARTIN

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, Maryland, Lockheed Martin (NYSE: LMT) is a global security and aerospace company that employs approximately 97,000 people worldwide and is principally engaged in the research, design, development, manufacture, integration and sustainment of advanced technology systems, products and services.

Lockheed Martin staffs several government owned high-performance computing (HPC) programs that provide support for managing resources used by government directed R&D contractors and scientists to support computer-intensive modeling and simulation research. Lockheed Martin 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 Lockheed Martin 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

Lockheed Martin 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 communities where information

Keywords: Aerospace and Defense, Lockheed Martin, Red Hat, SELinux, MLS, HPC, PBS Professional

Lockheed Martin Success Story

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

Joseph Swartz,
Program Chief Scientist at Lockheed Martin

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 Lockheed Martin, 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

Lockheed Martin 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 RoleBased 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.

Lockheed Martin 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. Lockheed Martin originally installed PBS Professional on two SGI UV100 systems and quickly added 3 additional systems.

They then installed 5 Cray(R) CS(TM) distributed memory clusters in their new data center with a total of 388 sockets, representing the first use of MLS on distributed memory cluster systems.

The Result: Cost Savings and Improved System-Wide Efficiency

Thanks to the 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.

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

About Altair

Our vision is to transform product design and organizational decision making by applying simulation, optimization and high performance computing throughout product lifecycles.

We are a leading provider of enterprise-class engineering software enabling innovation across the entire product lifecycle from concept design to in-service operation. Our simulation-driven approach to innovation is powered by our broad portfolio of high-fidelity and high-performance physics solvers. Our integrated suite of software optimizes design performance across multiple disciplines encompassing structures, motion, fluids, thermal management, electromagnetics, system modeling and embedded systems, while also providing data analytics and true-to-life visualization and rendering.

We were founded in 1985 in Michigan, and have a balanced global footprint with 62 offices in 22 countries, and over 2,000 engineers, scientists and creative thinkers.

About PBS Works

Altair PBS Works™ allows enterprises to maximize ROI on existing infrastructure assets. PBS Works is the most widely implemented software suite for managing grid, cloud, and cluster computing resources worldwide, voted "Best Use of HPC Application in Manufacturing" by HPCwire readers' Choice Awards in 2016. With products for fast, powerful scheduling, portal-based submission, analytics and data management, PBS Works is a comprehensive solution for optimizing HPC environments.

About HyperWorks

HyperWorks is the most comprehensive open-architecture simulation platform, offering technologies to design and optimize high performance, efficient and innovative products. HyperWorks includes modeling, analysis and optimization for structures, fluids, multi-body dynamics, electromagnetics and antenna placement, model-based development, and multiphysics. Users have full access to a wide suite of design, engineering, visualization, and data management solutions from Altair and its technology partners.

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