Atomic Weapons Establishment Relies on Extreme Networks® to Meet the Demands of its High-Performance Computing Cluster

The Atomic Weapons Establishment (AWE) has been central to the defense of the United Kingdom for more than 50 years, providing and maintaining the warheads for the country's nuclear deterrent. Uniquely among the nuclear powers, AWE covers the whole life cycle of nuclear warheads, in a single establishment. This includes initial concept and design, through component manufacture and assembly, to in-service support and, finally, decommissioning and disposal.

Since 1993 AWE has been managed on behalf of the Ministry of Defense under a goverment-owned/ contractor-operated arrangement. AWE hosts one of the largest and most advanced research and development centers in the United Kingdom, facilitating the design and production of Britain's nuclear warheads. These warheads must have assured performance, but with the most stringent safeguards against unplanned operation.

Scientific and technical computing has always played a major role in AWE's work, so when the organization needed to meet the switching demands of its Galaxy Cluster Supercomputer, comprised of 115 dual-CPU nodes running at 2.8 GHz and deliver a peak 64 bit performance of 5.6 Gflop/s, AWE looked to Extreme Networks.

Achieving Extreme Cluster Performance

AWE worked closely with Prime Business Solutions to evaluate high-performance switching solutions for the cluster. Together, they developed a clear understanding of the cluster's immediate requirements as well as those well into the future, and developed criteria to assess several vendors. Throughput, port density and the ability to scale the cluster without significant or costly upgrades, were the primary focus.

"Some vendors clearly didn't meet our stringent performance requirements, and others came close but price was an issue," explains Neil McMahon, High-Performance Computing Network Manager. "After evaluating the options, Extreme Networks was the clear winner."

AWE selected Extreme Networks BlackDiamond® 10808 core switch because it delivered the most cost effective, high-performance solution. The BlackDiamond 10808 augments the BlackDiamond family of core switches with a new platform incorporating major technological breakthroughs in the areas of scalability, security, resiliency and extensibility—all requirements in a cluster environment.

Keeping the Cluster Up and Running 24x7

At AWE, the cluster must be available 24x7. Downtime, whether due to network failures or taking switches down to perform upgrades, dramatically affect the cluster's processing productivity.

"Our goal was to minimize network downtime, and that included taking switches down for upgrades," explains McMahon. "With the BlackDiamond 10808 every active component, including the software, can be upgraded without taking the switch out of service. That's a significant benefit in a clustering environment."

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Built to deliver a high level of resiliency for cluster networks, the BlackDiamond 10808 leverages a new state-of-the-art chassis designed to help ensure that every possible redundancy is available. The BlackDiamond 10808 delivers high availability by providing carrier-class redundancy; failover to a backup component occurs without affecting users or application traffic. By combining innovative self-healing hardware and software capabilities, it is designed to be the industry's most resilient switch.

By providing the high network availability AWE's cluster applications require, Extreme Networks offers greater flexibility to meet organizational needs without sacrificing performance or increasing costs. Extreme Networks supports high network availability by offering advanced features such as industry standard VRRP and Extreme Standby Router Protocol (ESRP) for fully coordinated Layer 2 and Layer 3 client router redundancy. ESRP also delivers multi-layer redundancy for servers and clients. In addition, Policy-Based Quality of Service (QoS) allows network managers to create policies that provide network availability for mission critical applications running on cluster servers.

Because AWE moves large amounts of data from disks to the compute area, line rate throughput was also a paramount concern—degradation in performance is unacceptable. For networks processing and managing large amounts of traffic, such as AWE's clustering applications, Extreme Networks supports jumbo frames. An Extreme Networks infrastructure supports jumbo frames across every switch—for up to six times the efficiency of smaller-sized frames, resulting in more efficient transmission of data between the individual nodes in a cluster.

"The throughput we've been able to achieve with the BlackDiamond 10808 is tremendous," notes McMahon. "There has been a noticeable increase in throughput and performance gains compared to the switches we replaced."

Scaling to Meet Future Needs

In AWE's high-performance clustering environment, space is at a premium. The organization needed a flexible, high port density solution that would allow the cluster to grow without requiring additional space. In addition, AWE needed the clustering solution it selected to scale to meet future needs without requiring significant new investment, including the ability to upgrade to 10 gigabit without a forklift overhaul of the network.

"Because we don't know the availability of additional funds in the future, it was important to select a solution that could meet our evolving requirements, including moving to 10 gigabit without a forklift upgrade," says McMahon. "Extreme was able to deliver the scalability and extensibility our cluster demands."

Offering the greatest number of 10 gigabit and Gigabit Ethernet ports of any switch in the industry, BlackDiamond 10808 scales to meet both the immediate and potential future requirements of even the most demanding cluster environments. In addition, Extreme Networks BlackDiamond 10808 incorporates programmable ASIC technology. Not only does the BlackDiamond 10808 hardware support a wide array of protocols from day-one, the programmable ASIC technology helps ensure the platform will support emerging protocols without costly hardware upgrades—offering revolutionary investment protection for cluster networks.

Even though there are plans to grow the cluster from 115 nodes today to more than 400 nodes in the future, network management will remain simple.

"Although the performance of the network has increased, the time and resources required to manage it haven't," says McMahon. "Extreme's management platform is easy to learn and intuitive." By sharing a common operating system and management platform between Extreme Networks switches, the Extreme Networks solution can deliver high-performance clustering without creating greater management complexity. The ExtremeWare® XOS™ operating system delivers the uncompromising management, control and security needed for demanding cluster networks. With standards-based multi-layer switching and Policy-based QoS, AWE is able to take advantage of the tools it needs to make the most of network capacity. In addition, the high port density available in Extreme Networks switches offers support for a large number of server clusters without increasing the cost of supporting those clusters.

McMahon concludes, "While other vendors had plans to deliver the high-performance solution we needed, Extreme was able to deliver a solution today."

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