

Boeing Boosts Network Performance While Reducing Costs



Executive Summary

- **Customer Name:** Boeing Defense, Space, and Security Division
- **Industry:** Aerospace
- **Location:** Seattle, Washington
- **Number of Employees:** 64,000

Challenge

- Maintain performance of mission-critical production environment
- Run FC and IP across the same interface and maintain high performance
- Provide I/O in each physical server for 30 virtual guest domains on both FCoE and 10GbE networks

Solution

- Cisco FCoE solutions enable high-density, high-speed, and low-latency consolidated networks

Results

- Improved performance 20 percent by transitioning to converged network
- Reduced deployment times for each new server by 25%
- Boosted IP performance by up to 30 percent, saved 35% in capital expenses, and cut 90% of power costs

Boeing Defense, Space, and Security Division relies on Cisco to deliver both FCoE and IP over a single, cost-effective infrastructure.

Challenge

A division of the world’s largest aerospace company, Boeing Defense, Space, and Security (BDS) provides end-to-end services for large-scale systems that enhance defense and security platforms for global military, government, and commercial customers. BDS supports a diverse range of customers, including the U.S. Army, the Securities and Exchange Commission (SEC), and U.S. Department of Defense (DoD). In addition to manufacturing aircraft and rockets, BDS is developing enhanced capabilities through network-enabled solutions, including communications, intelligence, surveillance, and reconnaissance technologies.

The BDS IT team needs to provide clients with high-performance technical computing and SAN environments. Some of the proprietary program environments it provides require 24x7 operations and the highest availability possible. To support its large, integrated IT program, Boeing operates a data center infrastructure with a mix of Oracle SPARC servers on a Fibre Channel (FC) network and Intel servers on a 10-Gigabit Ethernet (10GbE) network.

When the global recession hit the aerospace industry in 2010, BDS came under extreme pressure to cut costs. “We didn’t have the funds to continue operating in the same way,” says technology fellow, Dennis Kuehn. “To meet our users’ growing needs, we were adding more servers, yet each server port cost was \$3000 with previous systems. This was clearly unsustainable.”



The cost-cutting imperative

BDS needed to reduce the TCO of its SANs, storage management, and networking for local and remote sites. Also, it needed to increase network agility, improve scalability, and support IT goals of providing customer and company communities services and resources faster and easier.

Part of the solution for BDS was virtualization: the team virtualized 60% of its shops using hardware hypervisors on its SPARC servers and VMware on its Intel servers. However, this required the team to run dual network topologies, both FC and IP, and add complexity to the network to maintain high performance because of I/O bottlenecks.

BDS needed a solution that would support high performance with minimum staffing and maximum hardware utilization. As a result, the company decided to adopt Fibre Channel over Ethernet (FCoE) to consolidate its IP and SAN data traffic on a single network and to reduce hardware requirements, as well as cut power, cooling, and administrative costs. “Our challenge was getting enough I/O in each physical server to share across 20 or 30 virtual guest domains on both networks, while keeping costs down,” says Kuehn.

Boeing considered its options carefully before making its choice. “Businesses that deploy solutions from certain vendors, or use standards like InfiniBand, find that the only path to success is to have a completely homogenous environment. This means that they run the risk of only being able to work with a single vendor, which inhibits flexibility and makes them powerless when vendors raise prices,” says Kuehn.

For Kuehn, Cisco products were the obvious choice. “The Cisco Nexus converged network adapters (CNAs) provided the solution we needed, enabling us to run both FC and IP data across the same interface,” says Kuehn. “We needed best-of-breed products that could support heterogeneous environments and Cisco products clearly fit our requirements.”

Solution

Since deploying its first Cisco Fibre Channel over Ethernet (FCoE) implementation in 2010, BDS has extended its use of FCoE and is now 100 percent multihop FCoE. BDS leverages the high-performance, high-density Cisco Nexus 7000 F-series Ethernet switches as its core switches and Cisco Nexus 5000 switches as access switches.

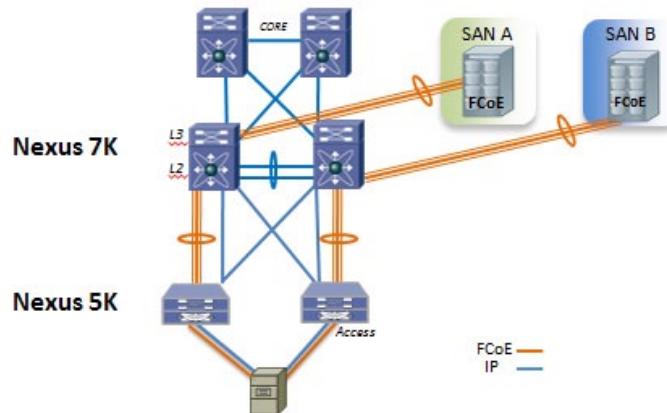
Kuehn describes the BDS architecture as a shared grid, with the Cisco Nexus 7010 as the central plexus. Cisco Nexus 5010 switches route both the storage and servers to the top of the racks and then to the central switches. All CNAs and internal networks are 10GB per channel and above. The infrastructure also supports 1GB NAS boxes for non-intensive applications, and legacy products including NAS, NFS, and IPv4.

“One reason we went to Nexus for our central core is because we typically keep our enterprise-class switches for a decade or more, upgrading the supervisor and the cards. While we have to change the edge switches more frequently, it pays to invest in quality central core switches and keep them for a long time,” says Kuehn.

BDS uses the same QLogic cards and drivers across all servers to avoid systemic errors. The company also uses a mix of Oracle, HP, and Dell servers, and SGI 4100 8GB FC storage.

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– Dennis Kuehn
Technical Fellow



Nexus 5000 series switches act as the access layer while Nexus 7000 switches form the core of BDS' multihop FCoE infrastructure.

Results

For BDS, the shift to the new Cisco switching infrastructure and leveraging FCoE has delivered unparalleled value to the organization. BDS has reduced switch costs by using the virtual device contexts on its distribution Nexus 7000 switches to provide both an Ethernet connection and FCoE on the same switch. This functionality allows different data types to share the same switch, saving BDS customers significant CAPEX on its core switches.

The solution also saves server costs. BDS uses the QLogic cards to run IP and FC off the same port at the same time, reducing the number of servers BDS has to procure. BDS always oversubscribes its virtual machines, which are not as critical as the high-performance computing side, so they are 100 percent utilized. “With Cisco solutions, we are utilizing the cores better, and increasing I/O with fewer cables and fewer switches,” says Kuehn. “This consolidation means we use less floor space and power, as well as cut cooling costs.”

It also means that when BDS does need to procure additional servers, cabling is simpler and less expensive. For example, moving from multiple fiber optic media connections to a single copper twinax CX 10GE wire provides capital savings of 35 percent, as well as ongoing power savings because it uses one-tenth of the power.

BDS is also gaining greater value from its systems through increased performance. During testing and configuration, the BDS team discovered that when it had upgraded the design to support FCoE, it had also optimized the TCP/IP performance as the CNAs have integrated TCP Off-load engines (TOE). As a result, BDS boosted TCP/IP performance by 25%-30% and reduced its server CPU overhead, enabling the team to get better processing and IO performance from the same hardware.

Product List

Data Center Solutions

- Cisco Nexus 5000 Series Switches
- Cisco Nexus 7000 Series Switches
- Cisco MDS 9000 Series Multilayer Fabric Switches
- Cisco Catalyst 3750 Switch

Applications

- Microsoft Windows Server
- Oracle Solaris Server

Simplifying management

Ease of management was a priority at BDS from the beginning, because the company needed to provide new services and resources to users faster, as well as reallocate assets quickly to be more responsive to changing business needs. The fact that Cisco has simplified management by maintaining a common OS across its product lines was a key advantage.

“With the Cisco OS, commands for managing the IP and FC sides of the house are very similar,” Kuehn says. “This is critical because people with the skill sets to manage both tasks individually are very rare and very expensive. However, we can now use our existing personnel to manage both IP and FCoE resources quickly and efficiently, increasing their value within the company.”

Ease of management simplified rollout, too. With the initial deployment, BDS transitioned all of its gear to the new environment in less than four hours. BDS can also save time whenever it deploys a new server. In contrast to lengthy deployments that required participation from the networking, storage, and server groups, the Cisco unified environment enables a much faster and more streamlined deployment, reducing the staff time required for integration, test, and deployment of each new server by 25%.

Investing in the future

For Kuehn, the greatest advantage of the Cisco infrastructure is its support of multiple Ethernet storage protocols. This feature offers both compatibility with existing infrastructure and superior investment protection for the company’s future virtualization environments and cloud-ready data centers.

“Our goal is to have a complete private cloud, where we can manage and orchestrate data movement and processing from one site with full reporting and chargeback,” says Kuehn. “And in the near future, we are looking at a second multihop FCoE and a lossless Ethernet to maintain performance rates over both our LAN and WAN environments. Our ongoing relationship with Cisco is key to delivering on our ambitious plans, while staying within a tight budget.”

For More Information

To find out more about Cisco Unified Computing, please visit: www.cisco.com/go/ucs.

To find out more about Cisco Nexus Switches, please visit: www.cisco.com/go/nexus.

To find out more about Cisco MDS solutions, please visit: www.cisco.com/go/mds.



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