SUCCESS STORY

Large State University

EXECUTIVE SUMMARY

Challenge

Support secure, high-performance research and higher-education computing network while simplifying management and delivering a world-class user experience.

Solution

- Brocade ICX Switches for campus network access and aggregation.
- Brocade MLX Series Core Routers.
- Brocade VDX Switches in the data center.
- Brocade Network Advisor.
- Brocade integration with Aruba wireless network.

Results

- Optimized high-performance, world-class research network, reducing times for big-data transfers from days or hours to minutes or seconds.
- Converged infrastructure to deliver network capabilities with superior user experience across the campus, state, and international locations.
- Simplified management of network resources, saving time and operating budget.
- Gained visibility into network traffic for optimizing scalability, planning, decision-making, and internal customer service.

University Delivers Near-Limitless Possibilities to Researchers and Students

This large university includes 24 campuses, 17,000 faculty and staff, 100,000 students, a teaching hospital, more than 500,000 active alumni, and an online World Campus. The IT team is central to the university's scholarly mission.

The university also conducts $150 million of federally funded research annually—all of which relies on the university's network. University departments and colleges use centralized IT support to obtain networking infrastructure and services, such as voice over IP (VoIP), wireless, administrative computing, research computing, and Internet connections. Today, the network includes 4,000 LAN switches, 5,000 wireless access points, and 18,000 VoIP phones.

Like many institutions, the university wants to deliver the best education as cost-effectively as possible. For IT, that means reducing data transport costs, even though the amount of data generated is increasing geometrically. It also means maintaining and operating a high-performance infrastructure efficiently. This can be a challenge with research activities that demand high security, super-high performance, huge data capacity for big-data data transfers, and global connectivity. The medical center also has demanding requirements, since it must support research, teaching, and caregiving. For example, new instrumentation is continually being adopted because it continues to improve precision at lower costs. However, as the university acquires more research instrumentation, it must manage exponentially more research data. Data must be moved quickly between campuses, exchanged with other institutions, and delivered around the world to other research centers. The university needed high-density 10 Gigabit and 100 Gigabit network capacity, as well as advanced virtual Layer 2 services at the core of the network.

Users' demands are also growing, but the IT team remains lean. Students need high performance and reliability for their academic work, along with high-speed mobile connections anywhere they want to work using their own mobile devices. Peak periods of the academic year, such as during student registration, place tremendous strain on the network. An infrastructure of this size and complexity

needs every possible advantage in simplifying network management. As part of its roadmap, IT plans to converge infrastructure and services to improve manageability.

Building a Next-Generation Integrated Network

The university's internal service provider controls connectivity between departments and locations and owns the network core and associated services. The enterprise network interconnects 24 campuses through Brocade® MLX® core routers, with the main network located at the main campus. Due to the large scale of the network and different departmental requirements, the routers are needed to provide the network backbone with advanced Layer 3 services such as MPLS/VPLS for Virtual Private LANs and Virtual Router Redundancy Protocol (VRRP) to improve performance and reliability. Additionally, Brocade ICX® 6610 Switches provide virtual Layer 2 forwarding with traffic isolation using Q-in-Q tagging to securely interconnect departments and schools while the university migrates its legacy equipment to the new network core. Thanks to high-density 10 Gigabit Ethernet (GbE)/100GbE links, Brocade MLX Routers deliver connectivity to the Internet2 research network and support a DMZ high-performance, low-latency science network.

"We're working closely with Brocade to deploy a next-generation integrated core network, "says the Senior Director of Central Information Technology Services. "Brocade delivers the high density and capabilities we need while sharing our interest in pushing the technology envelope. Brocade also shares our perspective on research networks, which clearly set them apart from other vendors we considered."

At the edge of the network, stacked Brocade ICX 6450 and 6430 Switches support lab and office connectivity while providing Power over Ethernet (PoE) to wireless access points, VoIP phones, security cameras, and card access readers. At the distribution layer, some departments use stacked Brocade ICX 6610 Switches to aggregate traffic and forward it to the core through high-density 10GbE uplinks. End-to-end traffic prioritization and Quality of Service (QoS) are implemented across the network to deliver an optimum user experience with voice, videoconferencing, and video surveillance services.

Over the past few years, the university has experienced tremendous growth in wireless connectivity for staff and students, and it has expanded its Aruba wireless network several times during this period. Brocade integration with Aruba technology simplifies management of the university's wired and wireless networks with a single toolset. The IT team uses Aruba ClearPass for security and policy management.

In the data center, Brocade VDX® 8770 Switches and Brocade VDX 6740 Switches with Brocade VCS® Fabric technology support the university's research requirements for wire speed, high data volumes, and ultra-low-latency switching. The Brocade VDX Switches and fabric connect multiple buildings on campus over high-speed fiber links in a virtual, distributed data center design that alleviates the need for additional dedicated data center space. The Brocade VDX Switches also form separate data center infrastructures for the medical center campus and a disaster recovery facility.

In nearly all of the VDX deployments, the Brocade VCS fabric is "stretched" between two or more data centers

using dark fiber. The exception is the Brocade VCS fabric for the research network science DMZ, which provides building-level aggregation for researchers, connecting them into two data centers, a High-Performance Computing (HPC) cluster, and Internet2. This large Layer 2 network is the first of its kind, representing a cross section of various colleges and departments, each with their own research requirements. The Brocade VDX research network is designed using 10 GbE Inter-Switch Link (ISLs) over distance, which keep the fabric "lossless" while stretching it between data centers.

Traffic Monitoring Delivers Big Advantages

Another requirement for the new network was the ability to use open standards-based traffic flow measurement technologies. The university is using sFlow monitoring technology to achieve numerous goals. By monitoring sample data packets, the university is minimizing its threat exposure and quickly remediating any unforeseen impact. Another important application for sFlow is marking research traffic as it comes into the network and prioritizing or redirecting it as needed. With Brocade, the university improved packet sampling, which can scale to 100 GbE capacity as needed.

"The sFlow technology gives us unprecedented insight to network traffic," said the Network Systems Engineer. "We now can see everything from Layer 2 to Layer 7 across all network interfaces. This visibility is allowing us to make decisions based on real data for scaling efficiently, optimizing planning and decision-making, and helping us serve our internal customers better with solutions that better meet their needs."

The university is currently working with Brocade on Software-Defined Networking (SDN) solutions. Research is currently underway to evaluate the use of sFlow and OpenFlow to provide more flexible, high-performance detection and mitigation of Denial of Service (DDoS) attacks.

Simplifying Management

"We needed a way to more effectively manage our systems and devices," says the Senior Director. "Brocade Network Advisor has made a big difference. We can remotely manage switches, perform code upgrades, and push mass configuration changes quickly and easily."

The university also plans to implement mixed stacking, a feature of the Brocade HyperEdge® Architecture, which supports consolidation of aggregation and access switches to streamline management while enabling premium switching features and services to be extended to entry-level switches. Mixed stacking will give the university even greater maintenance, management, and port utilization efficiency.

With sFlow technology on the Brocade VDX Switches, the university is able to troubleshoot quickly and take action in seconds. The goal is to automate as many processes as possible to simplify change management. With the abstraction features offered by the Brocade VDX Switches, the team can easily make small changes that deliver significant impact without having to touch physical devices or re-architect infrastructure.

Upholding a World-Class Research Reputation

As the university finishes its research and science network migrations, it will create a high-performance network optimized for research traffic and research science flows. Already, research data transfers that used to take up to 15 days have been reduced to 20 hours. And with superior visibility into network traffic, sources, and destinations, the network team is reaching out to research users of the network and helping them accelerate results, gain more time for experimentation, and save money.

"Our research network will enable faster scientific studies, with higher quality and better efficiency for researchers," says the Vice Provost for Information Technology. "Brocade allowed our research teams to experiment with equipment and technologies for specific research needs. This close collaboration has grown, enabling researchers to do the work they need to do."

The Next Steps

The university is moving closer to completing its planned integration of the traditional network backbone with data, voice, video, and high-speed research network capabilities across all locations. With the new infrastructure, the research network positions the university as a premier research center and will enable it to attract additional future research funding. There will be almost no limit to what the school's researchers, students, and staff can accomplish.

"Sometimes I'll see international students huddled over a laptop watching a cricket match back home, or a student on a video call to a girlfriend," says the Vice Provost. "You never get a thank you note for it, but when you see that happen and know that we and our network make that possible, it's really satisfying."

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