

Tsinghua University Expands Campus Network with Force10 E-Series Switch/Routers

Customer PROFILE

Customer
Tsinghua University

Industry
Education



Applications
Campus backbone network; core aggregation; network security

Highlights
Force10 Networks' resilient, scalable systems help a leading Chinese university deliver high-speed Internet access to more than 60,000 campus nodes in a new 10 Gigabit Ethernet network expansion.

As the Internet becomes an increasingly more important part of higher education, universities must find a reliable way to interconnect to students, researchers and faculty. The challenge is enabling fast Web access while safeguarding the network against security risks like computer viruses and worms, which can severely impact performance.

Beijing-based Tsinghua University, China's leading science and engineering university, is meeting this challenge by deploying Force10 Networks E-Series switch routers in a major 10 Gigabit Ethernet (10 GbE) network expansion. The resiliency and predictability of the Force10 E-series will enable Tsinghua University to deliver reliable high-speed Internet access to more than 40,000 students and faculty, even in the face of worms and distributed denial of service (DDoS) attacks.



Increasing Bandwidth Needs

Well known for its science and engineering schools, Tsinghua University's population of more than 20,000 students and 7,100 faculty members is growing rapidly; the new Zi-Jing campus in the northeastern part of Beijing will add another 20,000 students over the next several years. However, the university's existing Gigabit Ethernet (GbE) network is approaching the breaking point as the student population continues to increase, impacting network performance and reliability.

Security is also a concern. The university found itself not only experiencing external attacks from Internet worms and viruses, but unanticipated

internal attacks as well. These created a traffic burden on the already stretched network, particularly at aggregation nodes in the network operations center (NOC) and at the new Zi-Jing campus.

To address its bandwidth and security needs well into the future, the university decided to build a new 10GbE campus network to provide students and researchers with high-speed Internet and intranet access, the bandwidth to collaborate on data-intensive computing projects and a variety of other advanced networking services. The new network will connect with the university's existing campus network and to CERNET, the Chinese Education and Research Network.

"Building a robust and scalable campus network with a new generation of technology is a strategic decision that will enable us to offer new services, such as remote multimedia education and grid computing, to our students and faculty," says Professor XueNong Li, director of the Tsinghua University Network Research Center.

In fact, with 60,000 nodes distributed among classrooms, research facilities, dormitories and Internet cafes, Tsinghua's network will be the largest 10GbE single-campus network in China.

"Much like a carrier network supporting thousands of subscribers, Tsinghua's network will require the same resiliency, security and performance service providers typically demand," said Chris Zhang, China country manager at Force10 Networks.

The challenge was finding a vendor that could provide true line-rate capacity and the scalability to handle increased future traffic, while enhancing overall security without impacting performance. When its existing vendor was unable to provide such a solution, Tsinghua turned to Force10.

Tsinghua University: Expands Campus Network

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Unmatched Performance, Scalability and Security

As the university searched for switch and routing solutions for its new network expansion, they discovered that unlike other vendors, the Force10 E-Series met all of their requirements for resiliency, scalability, security, line-rate performance and full L2 switching and L3 routing. As a result, Tsinghua University initially purchased one E600 for its NOC and one E600 system for the core aggregation node at the northern campus.

"We were very interested in Force10's hardware-based architecture," says Li. "It provides line rate, non-blocking forwarding performance across all ports, even with security features like ACLs enabled, giving large campus networks like ours a high level of predictability."

The E-Series' fully distributed hardware and modular software guarantee line rate GbE and 10GbE throughput across all ports regardless of traffic conditions. The E600 also provides a

900 Gbps non-blocking switch fabric and 56.25 Gbps of non-blocking bandwidth to each line card slot. In addition, Force10's FTOS operating system is customized for high availability and fault tolerance, with modular processes allocated to multiple system processors.

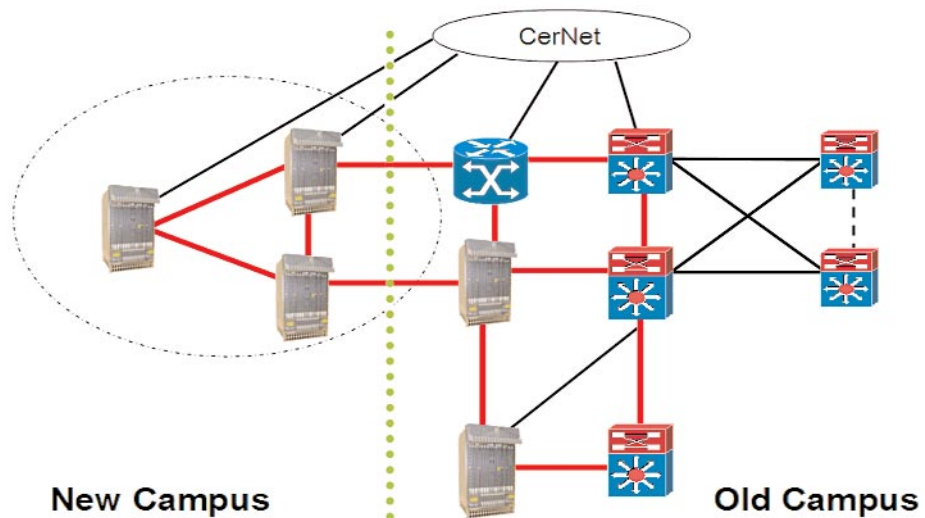
"Since installing the Force10 systems, we have already experienced a noticeable improvement in application performance, with faster downloads and a more stable core network," Li says.

Tsinghua also found that the Force10 E-Series delivers unparalleled GbE and 10GbE port densities. Each of the university's E600 systems is configured with two 10 GbE line cards and two 24-port GbE line cards. At full capacity, the E600 can support up to seven line card slots per chassis respectively, for a total of 336 GbE or 28 10 GbE ports in each E600 chassis.

"We will be able to aggregate thousands of student and research connections in a single system and still have room to grow," says Li.

"Force10's E-Series has proven to be the most stable and scalable platform in our network, even sustaining line rate performance during periodic traffic spikes caused by network virus attacks."

Professor XueNong Li
Director, Network Research Center
Tsinghua University



Force10 E-Series Deployment in the New Tsinghua Campus 10 GbE Core Network with Legacy Protection

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Line Rate Performance Even During DDoS Attacks

Hackers often target switch/routers using malicious traffic with the intent of overwhelming or disabling the system by targeting the control processor (CPU) that oversees system operations. However, technical innovations in the E-Series' system design secure the network against attacks. For example, the E-Series architecture features separate data and control planes and divides processing functionality among three CPUs on the route processor module (RPM). This patented architecture allows faults to be contained while protecting other parts of the system.

In addition, the system monitors control traffic destined for the RPM and automatically filters traffic that exceeds pre-determined thresholds. A unique rate adaptive mechanism ensures that any traffic stream doesn't overload the CPU, thereby eliminating spiking CPU loads and guaranteeing continual access to the management interface. Network administrators can thus prevent DDoS attacks from disabling the

networking infrastructure or hindering their ability to manage network devices, ensuring a higher level of network security, stability and availability.

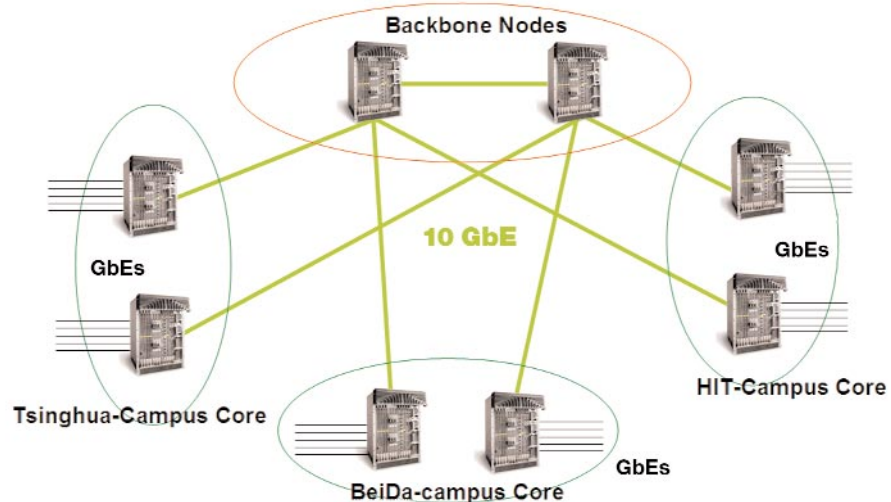
"During the last Blaster virus attack, most of the other systems in the network experienced some level of high CPU utilization, instability and even crashes," says Li. "The Force10 systems were the only ones that withstood the attack without even a blink."

The Force10 systems have performed so well that Tsinghua has purchased another three E600 systems for additional aggregation nodes in the new Zi-Jing campus.

"In our heterogeneous campus network, Force10's E-Series has proven to be the most stable and scalable platform in our network, even sustaining line rate performance during periodic traffic spikes caused by network virus attacks," says Li. "We are extremely happy with our decision to go with Force10."

"We will be able to aggregate thousands of student and research connections in a single system and still have room to grow."

Professor XueNong Li
Director, Network Research Center
Tsinghua University



Force10 E-Series Deployment in the Shenzhen University City Campus Network with a 10 GbE Core



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