

YOUKU STAYS AHEAD IN CHINA'S ONLINE VIDEO MARKET WITH JUNIPER NETWORKS DATA CENTER MAKEOVER

Summary

Company: Youku

Industry: Media and Entertainment

Challenges: Rapid growth of its online audience and content library, combined with the need to deliver a high-quality streaming service at higher definitions.

Selection Criteria: Scalability, operational simplicity, high availability, low-latency performance, cost-effectiveness, and cloud readiness.

Solution: EX8216, EX4200, EX3200, EX2200 Ethernet Switch and Junos operating system

Results: A simplified but highly reliable and cloud-ready data center network architecture enables Youku to scale capacity on an as-needed basis while keeping a lid on operational cost thanks to dramatically improved manageability.

Since its creation in 2006, Youku (NYSE: YOKU) has aimed to be the primary source of online video content for Chinese Internet users across all Internet-enabled devices. Youku has adopted a hybrid content strategy by licensing long-form, professionally produced content, fostering user-generated content and producing original Web videos under its "Youku Original" brand.

Challenges

According to iResearch, Youku had approximately 231 million unique monthly visitors from homes and offices in March 2011 and approximately 52 million from Internet cafés in February 2011.

Globally, Internet video traffic surpassed peer-to-peer traffic in 2010 and, by 2012, is forecast to account for more than 50 percent of consumer Internet traffic, up from 40 percent in 2010 and surpassing 60 percent by the end of 2015. Video-on-demand traffic is projected to triple over those five years, with high-definition video overtaking standard definition in 2011.

The situation is particularly acute in Asia, where the rate of Internet traffic growth is higher than most other regions. IP traffic in Asia Pacific is forecast to reach 24 exabytes—1 billion gigabytes—per month by 2015, rising at a compound annual growth rate of 35 percent from 2010.

For Youku, with its ambition to remain the online video leader in the world's biggest IP-connected market, these numbers add up to a massive data center engineering challenge. The rapid growth of its audience and content library, combined with the need to deliver a high-quality streaming service at higher definitions, forced Youku to rethink its data center network architecture and adopt a far more scalable, higher-performance infrastructure.

"You could really sum up the challenge we faced in two words—scalability and complexity," said Jian Yao, chief technology officer of Youku. "The complexity of our existing data center network made it difficult, if not impossible, to scale fast enough to keep up with demand."

Selection Criteria

Beyond these macro challenges, Youku had some specific technical challenges relating to the internal element of its data center network infrastructure. The internal network is used primarily for distributed content synchronization across the data center, putting a premium on low-latency performance best provided through a single Layer 2 switching domain. This had to be capable of supporting 100 server racks at the outset and ultimately more than 300.

To satisfy these demands, Yao and his team needed to find a solution that would enable Youku to simplify its data center network, give it close-to-linear scalability, and ensure low-latency performance on the internal network. System stability, availability, cost-effectiveness and a clear path toward cloud computing were also key criteria.



Having already had their hands full dealing with the difficulty of scaling and managing a conventional three-layer data center switching infrastructure, Yao and his team were open to alternative, potentially superior solutions. The Juniper Networks 3-2-1 data center network architecture, which defines a strategy for simplifying data centers by reducing today's three-tier networks to two tiers using Juniper's unique Virtual Chassis technology—and ultimately to just one switching tier with Juniper Networks® QFabric™ technology—struck a resonant chord.

Given their goals, Youku team members knew they would need more than a pro forma technical proposal. “Juniper Networks took the time to explore a wide range of technical issues with us in depth, enabling them to gain a complete understanding of our requirements and enabling us to better understand many aspects of network topology and configuration,” said Yao.

“Having a single operating system running across our entire switching infrastructure further simplifies network administration, especially so given the way Junos OS automates operations and orchestrates security across multiple devices. That means we can scale the network without really growing our operating costs.”

Jian Yao,
Chief Technology Officer, Youku

Solution

Following this in-depth analysis, the data center networking solution adopted by Youku follows the Juniper Networks 3-2-1 roadmap, with particular elements tailored to its specific requirements. Both the internal and external networks employ a two-layer switching architecture, running on the Juniper Networks Junos® operating system, which eliminates the complexity and latency of an aggregation layer.

The internal network is based around a pair Juniper Networks EX8216 Ethernet Switches connected through an 8x10 Gigabit Ethernet (10GbE) link aggregation group (LAG) to create a fully redundant core, with EX3200 Ethernet Switches forming the access layer. An EX8216 can support up to 128 wire-speed 10GbE ports in a single chassis, which is based on a 12.4 Tbps backplane. With each EX3200 switch configured with 24 1GbE access ports and dual 10GbE uplinks to the EX8216 switches, this configuration provides Youku's internal network with up to 2,880 1GbE server ports.

Youku is using Virtual Chassis technology on its data center's external network, which allows multiple Juniper Networks EX4200 Ethernet Switches to operate as a single, logical core switch. An EX4200-based Virtual Chassis configuration can incorporate up to 10 devices interconnected over a 128 Gbps backplane, with each switch supporting up to 48 wire-speed 1GbE ports. This gives Youku the ability to scale the external network by adding switches incrementally as requirements grow while avoiding a large up-front investment.

The access layer of the external network is made up of the Juniper Networks EX2200 Ethernet Switches in 24+4 1GbE configurations. Each EX2200 employs two 1GbE uplink pairs, which are connected to separate EX4200 switches for redundancy. Each EX4200, in turn, is connected to Youku's service provider router over a bundled pair of 10GbE links, giving the Virtual Chassis configuration up to 200 Gbps of total uplink capacity.

To ensure a high level of user satisfaction, Youku also operates a number of high-capacity local caching systems at Internet data centers across the country. Space and power are often at a premium in these locations, so the switching configuration—composed of an EX3200 core switch and EX2200 access switches—occupies a small footprint.

Results

By eliminating the aggregation layer in its data center network—a primary source of complexity—Youku was able to cut its up-front costs while simplifying manageability. Flattening the data center network to two layers reduced the number of switch interactions by up to 99 percent compared to the three-layer design, and application performance is boosted by a 77 percent reduction in latency.

Viewed as a whole, the solution delivers well against Youku's objectives: high scalability and carrier-class reliability on both sides of the data center network; wire-speed performance on all core switching ports; and very low latency where it is needed for internal operations. The simplified architecture and the pay-as-you-grow model enabled by the Juniper Networks Virtual Chassis technology have also helped Youku gain a high return for its capital expenditure.

“Of course the glue that holds it all together is Junos, and this is another huge advantage for us,” said Yao. “Having a single operating system running across our entire switching infrastructure further simplifies network administration, especially so given the way Junos OS automates operations and orchestrates security across multiple devices. That means we can scale the network without really growing our operating costs.”

Next Steps and Lessons Learned

“As we move on to a cloud computing architecture the investment we've made in Juniper Networks EX Series Ethernet Switches and Junos OS will pay further dividends because we won't have to re-architect the network,” said Yao. “All the capabilities we need are already there so we can move forward at whatever pace the demands of business dictate.”

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.

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