Australia's Oldest University Aims for Excellence with New Data Center Architecture

Sydney University re-architects its data center around Cisco Nexus 7000 Series Switches to create an adaptive, virtualized network foundation for future growth.

EXECUTIVE SUMMARY

Customer and Industry:

- University of Sydney

Challenge

- Increased network bandwidth and capacity in new data center
- Unify storage and network into a scalable architecture
- Improve management of physical and virtual server environment

Solution

- Cisco Nexus 7000 Series Switches.

Expected Results

- Improved data center consolidation on a unified fabric for LAN and SAN
- Improved management of virtual environment for lower capital and operating costs
- Improved scalability on 10GE capacity

Introduction

The University of Sydney, founded in 1850, is Australia's first university, and has an international reputation for outstanding teaching, as a center of research excellence and as an active and engaged community leader. The University of Sydney continues to rise in global rankings, confirming its place within the top 40 universities in the world.

With more than 45,000 students and 3,000 academic staff, the University has over ten different teaching campuses spread throughout the Sydney area. The main campus of the University is spread across two inner-city suburbs of Sydney: Camperdown and Darlington.

In July 2008, the University estimated that its infrastructure consisted of over 600 servers (over half of which exist as virtual machines), over 800 routers and switches, 100TB of storage, 300 wireless access points, and 50,000 switch ports in use. Since 2006, the University has achieved substantial benefits and savings through the use of server virtualization.

Business Challenge

The University has signed a contract for a new 320 square meter data center at an off-site managed facility to replace its current data center at the H08 Computing Center in the Darlington campus. This new site is rated at Tier3+ under the Uptime Institute USA standards classification, and will provide capacity for substantial growth well into the future. Technical fit-out and operational fit-out is underway, with a relocation of the H08 Computing Centre system infrastructure beginning in Jan 2009.

With the upcoming move to the new data center site, the University saw an opportunity to restructure its data center architecture to improve operations and flexibility. "Over the years, our systems have grown in a largely ad-hoc manner," said Steve Junor, Communications Infrastructure Manager, Information and Communications Technology (ICT), University of Sydney. "We use a variety of open source software to handle rudimentary network services such as load balancing, DNS and DHCP. We've had few major issues on these platforms, but they have grown to become a complex setup that's hard to manage. With so many bespoke systems, there's no real modularity, and maintenance is highly dependent on only a certain number of people."

Without an adaptive architecture for the data center network, supporting different application environments in terms of performance, availability, and cost-efficiency has grown increasingly difficult. "Traditionally, any faculty labs that required computational facilities for their research would procure their own servers, storage, and network. As we move toward a shared-services model, central IT will be able to provide many of these services, but this places further demands on our infrastructure in terms of agility and availability," added Steve.

"Real estate on the University campus is extremely valuable, and our data center is taking up a portion of space that it has outgrown and could otherwise be used as a facility that can be used by students and staff. With the move to an off-site managed facility, we now have a chance to upgrade our data center networking architecture, and create a design that will last for the foreseeable future," said Steve. The new data centre symbolizes a real culture change to how the University approaches the provision of its ICT services, in that centralized ICT services are based on industry-standard best practice solutions delivering quality services to the faculties.

When selecting the appropriate switching technology for the new data center, Steve had several requirements in mind, one of which was to have 10Gbps Ethernet (10G) bandwidth connections to each rack. "We currently have a variety of Cisco switching and routing technologies in our data center, which we aim to consolidate over the next 12 months. With 1G

capacity on our blade servers, we were overrunning our backup windows. 10G will remove that issue. We also need the ability to easily segment and virtualize our data center network, and provision storage and computing resources from our virtual pool."

Solution

Having been a Cisco customer for the last eight years, the University was kept up to date on Cisco's data center product roadmap, and became aware of a new core switch from Cisco that would address the University's needs. That core switch was the Cisco Nexus 7000 Series Switch, officially launched in January 2008. "We were told about this device as far back as January 2007, when Cisco provided a demonstration of its capabilities via a remote session to their labs in the US," said Steve. "We were particularly impressed with the Nexus 7000 for its 10G port density, Virtual Device Contexts (VDCs), and the idea of a unified fabric for the data center."

The Cisco Nexus 7000 Series is designed for the core and aggregation layers of a data center. It delivers up to 15 terabits per second of switching capacity in a single chassis, supporting up to 512 ports of 10 Gbps Ethernet, and future delivery of 40 and 100 Gbps Ethernet. Building on Cisco's proven storage area network (SAN) operating system and Cisco IOS Software found in Cisco Catalyst 6500 Series Switches, the Cisco Nexus 7000 Series uses the Nexus Operating System (NX-OS) which delivers real-time system upgrades with exceptional manageability and serviceability.

As of December 2008, the new data center has been equipped with a pair of fully redundant Cisco Nexus 7000 Switch chassis. The switch chassis are equipped with two Supervisor Modules to control Layer 2 and 3 services, redundancy capabilities, configuration management, status monitoring, power and environmental management, and more. Two supervisor modules, three switch fabric modules, and two power supplies were installed in each chassis to create a fully redundant system, allowing real-time maintenance and upgrades to be made with no service disruption, allowing for exceptional high-availability.

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Result

In this phased approach, Layer 2 functions were first enabled in the new data center site, and is now ready for the University to begin moving in servers. "We will be transitioning servers to the new site up to April 2009, after which we will then enable Layer 3 switching on the Cisco Nexus 7000 Series Switch," said Steve.

Using Virtual Device Contexts (VDCs), the University will be able to use the Nexus 7000 Series Switch to segment multiple networks on one switch while maintaining operational independence between the consolidated networks. Since the University was already taking advantage of server virtualization, this would provide more freedom to maximize existing resources by sharing a physical device among several logical functions, and provision resources to faculties that needed it, without underutilizing the capacity of any physical device. "Managing our current number of over 1000 virtual LANs (vLANs) should now be easier with VDC. Previously, we placed isolated silos of servers and storage into its own vLAN," said Steve.

Since the Nexus 7000 is also designed to support the emerging 40 Gbps and 100 Gbps Ethernet (40GE and 100GE) standards, this will provide the University with future scalability, allowing them to move up to higher capacities without impacting the current infrastructure.

"The cost has been reasonable for the amount of 10G switching capacity that we are getting," said Steve. "More importantly, the Cisco Nexus 7000 Series Switch offers a huge range of advanced features that we are eager to explore. The benefits far outweigh the capital investment we are making."

"The support we have received has also further justified our decision to stick with Cisco," he added. "The other vendors that we approached did not seem to have a strong enough Australian presence to support our needs. Plus, Cisco's vision for the unified data center fabric allows us to support high performance LAN and storage applications, yet maintain a consistent approach to the overall architecture."

This re-architecture of the data center will also affect service levels for the ICT team. "Many of the services we offer to students and staff, such as hosting, data backups, and video conferencing, will run much more smoothly from now on. There will also be bandwidth to spare for even more network intensive services such as real-time video editing and storage, lecture streaming and high-definition video conferencing, which is being used by the faculty of medicine, among others, to communicate with hospitals and clinics throughout the state and the world" he added.

Next Steps

"For now, we're enjoying the increased capacity and performance," said Steve. "We hope to explore further offerings from Cisco portfolio of Data Center 3.0 solutions. This includes the software-based Cisco Nexus 1000V switch, as well as how we can bring Ethernet and storage networks together under one protocol in the future," said Steve.

For more information:

To find out more about Cisco Nexus 7000 Series Switches, please visit: http://www.cisco.com/en/US/products/ps9402/

For more information on The University of Sydney, visit: www.usyd.edu.au

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