SPACE!

DEAKIN UNIVERSITY EFFICIENTLY MANAGES TERABYTES OF INFORMATION WITH A STORAGE AREA NETWORK BASED ON CISCO SYSTEMS TECHNOLOGY

FOUNDED IN 1975, DEAKIN UNIVERSITY IS A GOVERNMENT FUNDED HIGHER EDUCATION AND RESEARCH INSTITUTION WITH SIX CAMPUSES LOCATED ACROSS VICTORIA FROM MELBOURNE TO WARRNAMBOOL 300 KILOMETRES AWAY.

In addition to traditional campus-based teaching, the university provides flexible online learning options including computer-aided learning, computer simulation and video.

It caters for some 60,000 students onsite, with a further 5,000 off shore students studying online from locations as distant as Singapore, India, Hong Kong and Malaysia.

Deakin's underlying IT strategy is to invest in the future and actively embrace innovation and change. According to Craig Warren, Information Technology Services Desktop & Network Services manager, this strategy is supported with a technology refresh and rollover program that involves upgrading systems every few years. As a result, Deakin has a history of technology achievements – it was the first Australian university to embrace UNIX for enterprise applications and the first Cisco customer in Australia to deploy Cisco IP Telephony.

THE CHALLENGE

IN 2002, DEAKIN UNIVERSITY'S MAJOR SOFTWARE APPLICATIONS INCLUDED THE FINANCE AND STUDENT RECORD SYSTEMS, BUT THERE WAS AN EVER-INCREASING GROWTH IN THE USE OF E-MAIL, FILE, PRINT, AND WEB SERVICES COUPLED WITH AN EXPONENTIAL GROWTH IN STORAGE REQUIREMENTS.

Storage was becoming an issue with human resources information and imaging and graphics specialist applications used by the various academic departments requiring enormous amounts of space.

Already the Information Technology Services (ITS) division was faced with the challenge of efficiently and reliably managing 35 terabytes of data located in various Direct Attached Storage (DAS) devices, some of which were Fibre Channel Arbitrated Loop (FC-AL) attached and some were Small Computer Systems Interface (SCSI). While these direct attached storage devices were working well for a few servers, the ITS division could foresee that the projected exponential storage growth would make such a solution non-viable from a management perspective in the long-term.

In response to this, Deakin researched the options for a reliable, high-performance storage solution to simplify and centralise management, consolidate resources, and support the diverse applications used across the University on both UNIX and Linux servers.

Craig Warren says: "We decided to build a Storage Area Network (SAN) as a foundation infrastructure that would cater for growth and flexibility, and support our UNIX and IP server clusters through iSCSI (Small Computer Systems Interface over IP) and FCIP (Fibre Channel over IP)."

After reviewing the technology available, the ITS division determined that implementing a Cisco SAN would increase the accessibility of data across the university and enable the IT department to manage it more efficiently and cost-effectively. It also offered the necessary security and scalability features. This initiative was approved as part of Deakin's current IT strategic plan.

THE SOLUTION

TO SAFELY AND SECURELY STORE FILES AND DATA, DEAKIN'S STRATEGY WAS TO CONSOLIDATE STORAGE WITH CISCO MDS 9000 SERIES SAN SWITCHES AND STORAGE SERVERS FROM IBM.

Craig Warren comments: "We chose the Cisco MDS platform for our SAN for several reasons. Cisco was already a strategic partner for networking with Deakin, as well as a partner with IBM. The Cisco solution provided significant features such as iSCSI, FCIP, and VSANs [virtual SANs], as well as extensive diagnostics and management tools."

Because storage area networking was viewed as another type of network for ITS to support, Deakin appreciated the FC TraceRoute, FC Analyzer management tools as well as the CiscoWorks integration.

Warren says: "We also thought that the Cisco MDS 9509 was a high performance platform and its high density would provide us with growth and flexibility in the future."

The MDS storage networking technologies support high-speed Fibre Channel over IP. It also supports IP connectivity through iSCSI for individual hosts, and FCIP for interconnecting SANs beyond Fibre Channel distance capabilities. Leveraging this, ITS plans to extend the SAN to support geographically diverse secondary storage for disaster recovery in a later implementation phase.

Deakin implemented the SAN in phases, starting with the Waterfront campus data centre, which supported the greatest number of storage devices. Storage exists to support applications and the Deakin ITS group consolidated the server infrastructure as part of the migration from DAS to SAN, migrating from multiple hosts at the Waterfront campus to a single server running separate domains. During the implementation they made greater use of servers running Linux for applications such as e-mail, file, printing and web services, using clustering to provide high service availability.

Deakin completed migration of all the hosts in the Waterfront data centre over to the SAN one host at a time over several months. The cutover was an ongoing process, with servers migrated over from loop attach or DAS to the SAN one by one during change-control windows at nonpeak hours. Migrating a server typically involved shutting the machine down briefly to upgrade drivers and firmware; for example, installing newer host bus adapter (HBA) drivers or installing a second HBA for multipathing. Each server then was dually connected to the SAN on one Fiber Channel port, and to its existing loop or DAS storage on the other port. A mirror was created on the SAN storage of the loop attached or DAS volumes. The two storage images were run in parallel for a time and then the mirror was split with the SAN storage becoming the primary data store. After the primary storage on the SAN proved successful, the existing FC port connecting to the old loop or DAS storage was disconnected and then connected into the SAN, which allowed for multipathing on the SAN.

MIGRATION AND CUTOVER WERE REMARKABLY SMOOTH, ACCORDING TO WARREN. "THE WHOLE CONFIGURATION OF THE SAN WAS SIMPLE. WE CONNECTED IT TO SERVERS AND IT WORKED. WE KEPT TESTING TO TRY AND FIND SOMETHING THAT WAS NOT WORKING, BUT WE DIDN'T."

For the current SAN infrastructure, Deakin uses two Cisco MDS 9509's in the production network and one Cisco MDS 9216 in its development and test environment at the Waterfront campus. The SAN does have connectivity to the Local Area Network and Wide Area Network. The ITS group uses Veritas multipathing technology to provide high-availability and load balancing to the multiple paths to consolidated storage on the SAN.

To create multiple logical SANs or Virtual SANs (VSANs) within the same physical infrastructure, Deakin uses Cisco VSAN technology. From the IBM ESS server, five ports connect to the production VSAN on the Cisco MDS 9509, and one port connects to a development and test VSAN on each Cisco MDS 9509. For security purposes, a third VSAN is configured for unused ports on the Cisco MDS 9509. This third VSAN isolates new devices connected to the MDS platform from appearing on the production SAN. Zoning, which is used within each VSAN, ensures device security.

THE RESULTS

WITH THE FIRST PHASE OF DEAKIN'S SAN SUCCESSFULLY IMPLEMENTED, WARREN SEES THAT THE KEY BENEFITS ARE BETTER STORAGE UTILISATION AND MANAGEMENT, AS WELL AS AN ARCHITECTURE THAT WILL SUPPORT THE UNIVERSITY'S PROJECTED STORAGE GROWTH.

Craig Warren comments: "The SAN will also be the foundation for our next generation disaster recovery strategy," he adds.

Richard Tan, Director ITS Division, at Deakin University adds: "Based on our ROI calculations, we expected to reduce the amount of time spent on disk subsystem and storage management by 60 percent. We are currently seeing these sorts of savings, and the staff members involved have been redeployed onto other challenging projects especially aimed at improving our capability to deliver even better teaching and learning outcomes."

Based on current storage and past growth, Deakin anticipates that storage requirements will exceed 35 terabytes by the end of 2004.

"We can't afford for even a student assignment to be lost, let alone the latest research results. So in our strategic planning it was deemed that all data generated by the university was corporate and all data should be stored on the most reliable, high-performing storage platform available," says Warren.

In the near future, Deakin plans to implement secondary storage for disaster recovery at the Burwood campus. It will also support tertiary storage and backup in the Warrnambool and Burwood campuses. They plan to implement two Cisco MDS 9506 SAN Switches at each of these campuses in the coming months, migrating existing loop-attached (FC-AL) disk arrays and direct-attached storage to the SAN.

THE PLAN IS TO HAVE ALL DATA STORED ON THE SAN, FROM THE FILE SERVERS, TO STUDENT RECORDS (INCLUDING DIGITISATION OF ALL STUDENT CORRESPONDENCE), TO RICH MEDIA CURRICULUM CONTENT (E-LEARNING).

Overall, Deakin has found that a SAN enables efficient, simplified management of its storage and provides a robust, reliable data utility for the university community. A SAN can allow organisations to support their current storage requirements with a flexible architecture that will support growth. SAN technology is extremely effective within a campus, and can be extended beyond the LAN with line cards, iSCSI, and FCIP.

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