

Enriching
 eLearning

Robust Repository of Learning Content

CUSTOMER

- Nanyang Technological University

INDUSTRY

- Education

CHALLENGES

- Ensuring Sufficient Storage Capacity
- Minimising IT Infrastructure Costs
- Enabling a Highly Available Network

OFFERING

- Implementing Storage Area Network (SAN)
- IT Procurement
- System Integration
- Backup Recovery Services

BENEFITS

- Reliable and Scalable Storage Solution
- Cost Efficiency

Transforming Learning ■ In a traditional classroom setting, communication between teachers and students is usually one-dimensional. Education took on a new paradigm when Nanyang Technological University (NTU) of Singapore launched its innovative S\$6million elearning initiative named edveNTUre. It enables 23,000 local and distance learning students, and 1,300 academic staff to access online resources through innovative means of content creation and knowledge discovery. The elearning platform allows dynamic content to be delivered digitally over the campus wired and wireless network to any student, anytime, anywhere and on various devices. edveNTUre complements the traditional lectures through several elearning tools including discussion forums for collaborative knowledge sharing, personalised learning, dynamic content delivery, and other automated eTeaching tools. edveNTUre is available at <http://edventure.ntu.edu.sg>.



“Backup is so smooth now and we hardly feel it. With our limited manpower and the speed of e- and m-learning adoption, this comes as a much needed tool that increases the availability of elearning’s database.”

- Associate Professor Tan, Director for Centre for Educational Development, NTU.

Challenges ■ Planning for edveNTUre commenced in November 1999 and the concept of edveNTUre was that it should be a dynamic elearning environment that will evolve and facilitate change. One of the major challenges faced by the Centre for Educational Development (CED) was to provide a robust, reliable and dependable mission-critical elearning infrastructure for the campus with no down-time allowed.

Today this mission critical service is powered by high-end servers running on 20 UNIX, 34 Windows, 2 Linux and 2 Macintosh servers with 10 terabytes (TB) raw network storage. The system architecture facilitates those times when additional compute power is required, for example, during the pre-examination time window, system resources (processors and memory) could dynamically be re-allocated from one server domain to another without shutting down the system.

Uptime, All The Time ■ The initial target was to have 100 courses online by the end of 2000. By December 2000, over 800 courses went live. The number of page views was 1 million per month in January 2001, and 1 million per week in July 2002. One year later in July 2003, page views hit 2.1 million per week. In August 2004, the page view rate surged to 7 million per week.

“As a result of the high utilisation rate in our elearning services, we foresaw the pressing need to set up a multiple server platform as well as an effective backup recovery system to cope with the growing demand,” said Associate Professor (A/P) Daniel Tan, Director of CED, NTU. This growing demand was met by configuring multiple elearning application servers.

With extensive experience in providing reliable storage solutions to its customers in the region, NCS helped NTU design and

implement a centralised storage solution for efficient and effective management of elearning services. It played a key role in integrating software and hardware from multiple vendors to ensure high availability of the Storage Area Network (SAN) and tape backup systems.

In a matter of four months, NCS, together with the project team, implemented and integrated the software and hardware to NTU’s elearning SAN infrastructure. The transition has been flawless, with no disruption to the daily operation of the campus.

Due to the mission-critical nature of edveNTUre, NCS proposed to install VERITAS NetBackup, which is known for its reliability and ease of use in a heterogenous environment. A/P Tan is eager to implement VERITAS NetBackup too because of NTU’s rapid storage growth, estimated at 2TB per year, requires a stable and intelligent tool to manage. VERITAS NetBackup simplified the backup and recovery of all parts of the database, including archived re-do logs and control files. This enabled NTU to perform hot, non-disruptive backups, be it full or incremental, of databases anytime they want.

Future Plans ■ Within three years of implementation, nearly 90% of courses in the University have an active online presence. The next phase for NTU is to “humanise” elearning, which is to make elearning interactive and engaging with more active collaborations and student-professor learning involvement. This includes the proliferation in the use of the video talking head format synchronised with the lecture presentation, live audio-video delivery, text chat and document annotations of a lecture presentation and delivery.

NCS will continue to support NTU by ensuring the availability, reliability and efficiency of the SAN and tape backup systems.

NTU’s edveNTUre is awarded
Intelligent20 Award 2004 and
CIO Honouree 2004

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