

# Nanyang Technological University

## Sun Microsystems Provides High Availability Platform for Vanguard Biomedical Database



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With the ability to connect to any part of the world through a humble desktop, the Internet has become an indispensable tool of information exchange for modern biomedical research. For many researchers working in this field, access to key biological databases around the world is a crucial part of the research process. As cornerstones of today’s global biomedical research and discovery machinery, these central repositories of biological information must ensure that their databases are accessible to the research community with a high degree of certainty and consistency.

Chosen to be one of four mirror sites of the US National Library of Medicine’s (NLM) Visible Human Project (VHP), the goal of Nanyang Technological University’s (NTU) School of Biological Sciences is to host the vast VHP datasets (some 115 gigabytes of data in total) online with the qualities of reliability and availability built-in in the underlying computing platform. Sun Microsystems’ V880 server platform provided the requisite computing power and stringent RAS (Reliability, Availability and Serviceability) capabilities for NTU to meet the requirements of a preeminent online information repository.

### Background

The Visible Human Project (VHP) is a long term biological information repository project initiated by the US National Library of Medicine (NLM) in 1989 that collected the photographic, transverse CT, MRI and cryosection images of a representative male and female cadaver produced at one millimeter intervals for the male and one-third of a millimeter for the female. Collectively, the digital image repository numbers to about 20 000 images and amounts to roughly 115 gigabytes (50 for the female and 75 for the male dataset) of digital information.

The long term plan of the VHP is to complement NLM’s massive bibliographic and factual database services with digital libraries that will be distributed over high speed computer networks and by high capacity physical media.

These detailed images of the representative male and female bodies allow researchers to extract highly detailed and precise information about the human anatomy. These are then used to construct animations, 3D models and simulations that can be used for teaching, surgical preparation and the development of a number of biomedical products, such as prosthetic implants.

Recognizing the repository’s immense value to clinical and biomedical research, the School of Biological Sciences (SBS) at Nanyang Technological University began negotiation with the NLM in May 2002 for an official VHP mirror to be based in Singapore.

Other than Singapore, the three other places in the world that have been appointed as official VHP mirrors are Milan, Tokyo and Glasgow. •

The VHP mirrors are established to provide close-proximity data-sources for their immediate regions. The aim is to alleviate network constrictions caused by worldwide users accessing the NLM site directly. With that goal in mind, NTU has chosen to host the entire VHP repository on a Sun Fire V880 for consistent, high-performance online availability to biomedical researchers in the region and from around the world.

### Company

Nanyang Technological University  
(School of Biological Sciences)

### Industry

Research and Education

### System and Solutions Sets:

- Sun Fire™ V880 with 12x36 GB FC-AL disks
- Solaris™ Operating Environment
- Solaris™ PC NetLink
- Sun™ Solstice™ Solution Suites

### Key Business Challenges

- Maintain a data-store of the entire Visible Human Project (VHP) database of 115 gigabytes of anatomical images
- Enabling Internet access to the complete datasets to the biomedical community
- Ensure access is secure, reliable and available to a large number of users 24x7
- Minimize Total Cost of Ownership and costs of system management and maintenance

### Key Business Solutions

- Creation of the School of Biological Sciences (SBS) VHP mirror site
- Deployment of Sun Fire V880 system with 4 UltraSPARC 900 Mhz processor power and 16 gigabytes of memory capacity
- Advance RAS (Reliability, Availability and Serviceability) technologies ensures minimal disruption to services due to maintenance or component failure
- Advance system management solutions ensures minimal maintenance and management costs and hour

“With the fast-paced development in biomedical sciences education, research and services in the growing number of educational, institutional, research and industrial establishment in Singapore and the region, the VHP mirror at NTU is set to become a major biomedical digital image resource to complement the multi-faceted aspects of life sciences teaching and research,” said Professor KC Lun

## Implementation

The Sun Fire V880 offered SBS a simple, trouble-free means of hosting the relatively large VHP dataset on the Internet while ensuring a high degree of consistency and availability. Designed to deliver high-end server performance at entry-level prices, the V880, powered by 4 UltraSPARC III processors, offered incredible scaling power in terms of the number of users served.

In addition to 16 gigabytes of main memory, the SBS VHP implementation employed a V880 configuration with 12 x 36 gigabytes of internal disk memory, enough space to house the 112 gigabytes VHP database as well as allowing headroom for more datasets to be stored. More importantly, the Sun Fire V880 is built with superb RAS (Reliability, Availability and Serviceability) features that met the stringent requirements of reliability and availability of the VHP project.

The Sun Fire V880 and Sun's comprehensive range of advance RAS technologies enabled the NTU to build a reliable, highly available Internet resource repository while keeping the overall system simple and manageable.

Advance RAS technologies that are found in the V880 includes multipathing, redundancy, hotswap (N+1) power supplies, automatic system recovery, hot-plug disks, fibre channel subsystems, etc. These technologies provided a hosting platform that is highly fault-resilient, enabling components and parts to be replaced while the system is running (hot), automatically identifies and bypasses failed components while keeping the system data in tact. Remote system alerts can be sent to administrators via e-mails or pagers to minimize the actual man-hour required to maintain and monitor the system.

Sun system and solution sets deployed for the SBS VHP implementation includes:

- Sun Fire V880 with 12x36 GB FC-AL disks
- Solaris Operating Environment
- Solaris PC NetLink
- Sun Solstice Solution Suites

## Conclusion

The Sun Fire V880 and Sun's comprehensive range of advance RAS technologies enabled the NTU to build a reliable, highly available Internet resource repository while keeping the overall system simple and manageable. Bringing the system to full operational status in early 2003, the NTU VHP site will be able to offer biomedical researchers in the region and from around the world fast, unhampered Internet access to the vast anatomical information of the human body that is the basis of many biomedical research projects and product developments.

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