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THE BEAST THAT ROARS FOR WORLD-CLASS SCIENTIFIC RESEARCH

A Nexsan Case Study of
Wellcome Trust

THE BEAST THAT ROARS FOR WORLD-CLASS SCIENTIFIC RESEARCH

A Nexsan Case Study

Scientific research is now opening up new pathways towards a greater understanding of the genetic basis of many common ailments that have plagued and perplexed humanity for centuries.

Nowhere are these endeavors more in evidence than at the Wellcome Trust Centre for Human Genetics. Established in 1994, the centre undertakes vital research into the genetic basis of common diseases, including asthma, diabetes, malaria and cardio-vascular disease. A not-for-profit organization, it places all of its findings in the public domain - a tremendous asset to global biomedical research.

For the past eight years, the centre has been located in the Henry Wellcome Building of Genomic Medicine, University of Oxford. Here it explores all aspects of the genetic susceptibility of disease, seeking an understanding of how these DNA variants may contribute to risk of disease in the population and how such genetic factors contribute biologically to a disease process.

The centre houses multi-disciplinary research teams in human genetics, functional genomics, bioinformatics, statistical genetics and structural biology, all of which presents a multitude of challenges when it comes to data storage and availability. With so much research underway, data volumes have expanded at a staggering rate. What has fuelled this frenzy is the explosion in bioinformatics and statistical genetics work involved in genomic research, says Dr Tim Bardsley, the centre's IT manager, "particularly since the Sanger Institute mapped the entire human genome".

Under founder director John (now Sir John) Sulston, the Sanger Institute spearheaded the UK contribution to the Human Genome Project. It sequenced almost one-third of the human genome, greatly enhancing our ability to study the diseases that afflict people and animals, and was instrumental in ensuring that sequence data were made freely available to researchers worldwide for the benefit of all. As well as the human genome, the Sanger Institute has sequenced the genomes of numerous disease-causing microbes, including those that cause tuberculosis, malaria, leprosy and diphtheria (see panel, 'The Sanger Institute: a new focus').

"As a result, scientific, research-focused organizations like ours are faced with extremely complex storage management tasks," states Bardsley. "Our expanding research programs and increasing data are forcing an exponential growth in our data storage requirements, a phenomenon seen right across the scientific research industry."

All this is a far cry from how things were when he joined the centre eight years ago. "Then bioinformatics had a relatively small role, with far fewer stats being generated. Even six years ago, our SAN [Storage Area Network] was the size of a modern hard disk. To meet our expanding requirements, this was first upgraded to eight terabytes and then, through further recent investment, to fifty terabytes."
With a total of around 500 network-connected permanent staff to cater for, including administrators and scientists (primarily located within the main building itself, but many also collaborating with associates worldwide), IT has to provide the bandwidth – and data security – that helps to sustain the centre's operations. That means ensuring the vast amounts of data generated, and then relayed to bioinformation for detailed analysis, can travel at speed, unhampered, through the network.

"The bottom line is that, when genetic material is being analyzed, large output files are created," states Bardsley, "each of about fifty megabytes in size – and all of these have to be kept online in order to facilitate research." As a result of this activity, the centre's data yield has soared from 20GB a day a couple of years ago to the current daily level of 200-300GB. With a 120-node Linux cluster and 25 core servers, IT's task is to ensure user data processing needs are always being met."

"The underlying concern for us always with any equipment is resilience to failure. Nexsan offered the industry-leading storage density to handle our data and it is superior in a number of ways. Though we have experienced failures with other manufacturers, Nexsan's technology has never failed."

- Dr Tim Bardsley, IT manager, Wellcome Trust Centre for Human Genetics

It is little wonder, then, that the centre was an early adopter of storage network solutions – and one key area of investment has been in Nexsan technology. Last year, the centre bought two 21TB SATABeasts, Nexsan's powerful, high-capacity storage system, and has recently followed that up with the purchase of two more (see panel, 'The beast unleashed').

Bradley points specifically to the SATABeast's advanced mechanical design, which not only provides excellent cooling, reduced drive vibration and high levels of energy efficiency, but also makes the SATABeast extremely reliable. For, whilst failure of the centre's IT systems would have a highly detrimental effect on all users - and especially its researchers - protection of the data is paramount. "We have research programs that have been running now for three years or more. Raw data is our life's blood and that is why it is safeguarded so well. There is no really no way to put a price on how valuable that is," says Bardsley.

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He was also impressed by the level of attention and involvement that Nexsan exhibited after the centre's latest SATABeast purchases from reseller S-Store. "They brought in one of Nexsan's VPs at one point and we were able to quiz him about the technology in some detail. It's unusual for someone of that standing to become involved in that way and we were able to establish the direction Nexsan is taking, which was very valuable to us, in terms of planning our own future needs."

The recent investment was triggered in part by a major collaborative project on which the centre is embarked. "The requirement, capacity wise, was to give our people on-line DAS [Direct Attached Storage], so storage consolidation was a major driver. That has increased our overall data capacity to 42TB - and we are using around 30TB of that already."

The decoding of the human genome has opened up a world of possibilities that have transformed scientific research in a way that could not have been contemplated a few short years ago. SATABeast now forms part of the insurance policy that underpins that work for the Wellcome Trust Centre for Human Genetics, with further investment in Nexsan technology likely in the not so distant future, as data storage needs continue to expand. ■

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THE SANGER INSTITUTE: A NEW FOCUS

A key aspect of the Sanger Institute's work is to identify sequence variation in human populations, and how specific variants contribute to health and disease. One major initiative, the Cancer Genome Project, is systematically searching all human genes for genetic variations implicated in cancer - a quest that has already unearthed new cancer genes and potential new therapies.

Under current director Allan Bradley, focus has shifted to the use of genome sequence data and the development of high-throughput methods to answer important biological questions and the role of genes in health and disease. The breadth of the Institute's work has expanded, and in the past two years nearly 20 new senior project leaders have been recruited. New laboratories are being built to house these new studies.

The Wellcome Trust Sanger Institute is named in honour of Fred Sanger, a double Nobel Laureate who devised the method for DNA sequencing used in the Human Genome Project.

THE BEAST UNLEASHED

SATABeast from Nexsan is an extreme density, energy efficient storage array designed to meet the challenges of the most demanding storage environments. Featuring both Fibre Channel and iSCSI connectivity, SATABeast provides unmatched flexibility along with enterprise-class features, performance and proven reliability. SATABeast employs Nexsan's revolutionary AutoMAID™ energy-saving technology, which transparently places SATABeast disk drives in an idle state, reducing power consumption and operational costs. AutoMAID™ delivers the cost-saving benefits of MAID (Massive Array of Idle Disks), without the limitations of slow access times and special host software. AutoMAID™ is the first power saving technology that supports standard high performance RAID implementations as well as backup, VTL (Virtual Tape Library) and archiving applications.

Nexsan's award-winning RAID controller architecture utilises dual RAID engines on each SATABeast controller to provide extremely high throughput performance across 42 spindles. SATABeast's 42 high-capacity drives can be segmented into multiple RAID sets or a single large storage pool. LUN Mapping allows users to easily configure the massive disk capacity for dozens of servers or one.

SATABeast offers high availability features including continuous background integrity scans to ensure drive health and data accessibility. All individual SATABeast components are fully redundant and hot swappable with each controller featuring full cache coherency to maintain data integrity, even in the event of a power loss.