UK National Health Service – Blood & Transplant Builds World's Largest Centralised Blood Supply Management System on HP Integrity Servers and HP OpenVMS

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NHS Blood and Transplant

HP customer case study: NHSBT UK National Health Service – Blood & Transplant (NHSBT)

Industry: health services

Objectives

- Provide a better experience to donors
- Increase visibility of blood supply and improve contingency plans
- Consolidate and simplify the central system with minimal business disruption
- Ensure high uptime
- Reduce costs and improve efficiency

Approach

- Implement HP Integrity servers in OpenVMS cluster configuration at two separate data centres with multiple layers of redundancy
- Move from three regional centres with isolated databases to one national system

IT improvements

- Maintained 99.9% uptime
- Reduced data centre footprint
- Maintained exceptional reliability
- Built disaster-tolerant solution

Business benefits

- Enhanced donor relationships
- Improved blood stock management through visibility across entire country
- Improved disaster and emergency planning and capabilities
- Provided better health support services to the public while reducing costs
- Increased visibility into blood supply chain nationwide

Lifesaving services, reliant on technology

Every country's population is vitally dependent on a consistent and safe supply of blood, organs, plasma and tissues – and a solid base of blood and organ donors. As part of the UK's National Health Service, NHS Blood & Transplant (NHSBT) is responsible for optimising the supply of blood, organs, plasma and tissues and raising the quality, effectiveness and efficiency of blood and transplant services. NHSBT manages the supply of blood to hospitals throughout England and North Wales, tracking it from when it is first donated, through its testing and separation into various products and, finally, to its dispatch to hospitals.

The organisation has a particularly important role to play following any major incident where people might be injured and where blood is urgently needed to save lives. The efficient, stable operation of NHSBT's computing infrastructure is of paramount importance in ensuring that patients receive the blood they require – and that the blood they receive is entirely safe.

'On the operational side, we can handle a period of downtime of a few minutes or even hours, but beyond that, we could be putting lives at risk. Our systems are safety-critical and mission-critical,' says Neil Hogg, general manager of IT for NHSBT. 'On the business side, today we manage the largest blood centre in the world, and we're responsible for the blood supply chain from end-to-end – it requires extreme efficiency and visibility into the supply chain.'

The need for an advanced infrastructure

NHSBT did not always oversee the largest consolidated blood donor database in the world. Until 2008, blood supply gathered at 13 centres around the country was managed through three independent data centres throughout England – each with disparately managed regional databases. The three locations used HP AlphaServer systems under the HP OpenVMS operating system with HSG80 disk arrays running the Mimer SQL database and Pulse software from Savant. Pulse is a blood and product core management system that starts with donor management and donor session planning, continues through to laboratory testing and stock management, and ends with safe dispatch to hospitals. The software handles approximately 2.5 million donations every year for NHS Blood and Transplant.

While NHSBT was satisfied with the ongoing stability, reliability, and overall functionality of OpenVMS and Pulse, the organisation recognised that its AlphaServer systems and storage were nearing end of life. 'It was becoming increasingly difficult and costly to obtain support for our legacy systems,' says Andrew O'Connor, systems engineering and operations manager for NHSBT. 'Parts were becoming more expensive. It was time to migrate to new systems that would allow us to reduce maintenance and operating costs, improve performance, cut our data centre footprint, and give us the flexibility and headroom to react to future developments.'

A move towards consolidation and simplification

Just as it became clear that an infrastructure upgrade was in order, several operational issues – stemming from having three separate regional databases – were emerging as well. There was no easy way to obtain an overall view of the blood supply or to move blood from one region of the country to another. And, if an NHSBT centre was compromised, blood collection, production and blood product transfers across regional database boundaries grew complex – making contingency planning in the event of an emergency difficult. To add to the challenge, donors were not recognised if they moved to a region not served by their database. This caused frustration among donors who had to re-register in the new region.

'It was clear that the three databases should be consolidated into a single national one,' says Ian Millar, core services manager for NHSBT. 'And at the same time, we needed to migrate to new hardware and storage. With both occurring simultaneously, we were looking at a major undertaking.'

Customer solution at a glance

Primary applications
- Savant Pulse

Primary hardware
- HP Integrity rx6600 Servers in HP OpenVMS clusters
- HP Integrity rx2660 Servers
- HP StorageWorks 4100 Enterprise Virtual Arrays
- HP ProCurve switches

Primary software
- HP OpenVMS operating system
- Mimer SQL database

HP Services
- HP Disaster Tolerant Continuity Solution

Building a disaster-tolerant platform

While the availability requirements of the Pulse system are not as difficult to achieve as those of a real-time, mission-critical system – its SLA uptime requirement is 99.9% – the Pulse system cannot suffer a loss of service for an extended period of time without extremely careful advanced planning. In the event of a major incident, blood products must be immediately available and moved quickly to where they are needed. Consequently, the system had to be designed to survive multiple failures.

To design and implement a new disaster-tolerant platform, NHSBT worked with XDelta Limited. Colin Butcher, technical director for XDelta, began by creating a proof of concept. 'Our first job was to figure out if it was feasible to do the project at all,' says Butcher. 'The most pressing design issue was whether or not we could migrate the three regional databases to create a national database in the time available to us – a matter of a few hours.'

In addition to quickly and successfully consolidating the three disparate regional blood databases, the old and new systems had to work in parallel until the old systems had been decommissioned. The design and specification of new hardware, a new version of the OpenVMS operating system, new storage subsystems, a new version of the Mimer SQL database and updated Pulse applications had to be implemented in a way that allowed Pulse to run unchanged as far as users were concerned.

With these design criteria in mind, the choice of HP Integrity servers and OpenVMS for the new solution was clear to the entire team. 'Our experience with the OpenVMS operating system is that it is incredibly stable and reliable, and it supports the uptimes we need for a critical system like Pulse,' says O'Connor. 'Then we saw that moving to HP Integrity servers would save operating costs, data centre space, and give us better performance, reliability and headroom for the future – there really was no downside.'

Multiple levels of redundancy

Based on XDelta's design, NHSBT's new system is hosted in two physically separate data centres that provide multiple levels of redundancy using active/active HP OpenVMS clusters on HP Integrity rx6600 Servers with HP StorageWorks 4100 Enterprise Virtual Arrays. Additional HP Integrity rx2660 Servers are used for a test and training environment. HP Preferred Partner OCSL staged the hardware at their own facility, as well as delivering and installing the hardware on site at the two data centres.

Cluster-interconnect traffic between the two data centres is sent over two physically separate Gigabit Ethernet circuits carried on two diverse DWDM2 inter-site links. The private cluster-interconnect data network is implemented using HP ProCurve switches with ProCurve meshing. The cluster nodes and storage arrays are interconnected via dual SAN fabrics, with each cluster and each storage array connected to both fabrics.

On a day-to-day basis, Savant, the authors of Pulse, provide system maintenance and support services and software updates. According to Ian Gray, technical director for Savant, the Pulse system is exceptionally stable, partly because of its basis on OpenVMS. 'We started using OpenVMS back in the 1980s because of its high availability,' says Gray. 'Today, OpenVMS offers advanced features like volume shadowing between nodes to synchronously replicate data between sites and storage arrays – capabilities like this still don't exist in other operating systems available today.'

The HP Disaster Tolerant Continuity Solution (DTCS) team monitors the entire solution to help minimise system downtime. 'HP DTCS provides us with proactive system hardware monitoring and cluster failover services,' says Hogg. 'In one instance, HP contacted us about a disk failure we weren't aware of, and the parts were delivered the same day.'

Data migration with minimal downtime

Once the infrastructure was in place, the team began the process of merging the three databases into a single national one – the most daunting part of the project. On the operational side, the team established a process for safely managing a specific period of downtime for the Pulse system, with six hours as a minimum to 24 hours as an absolute maximum. They then worked over three weekends, moving one region's worth of data across to the new system at a time. Once the first batch of data proved stable in production on the new hardware, database and application, the team moved the other two regional databases. The process went smoothly, thanks to careful advanced planning.

'What we discovered is that with the performance of the Intel® Itanium®-based Integrity servers and the high-performance storage arrays, we were able to slash a trial data migration workload on the AlphaServers from somewhere around six days down to around seven hours on Integrity,' says Butcher. 'So instead of it looking like the project might not be possible, it was well within our reach with Integrity servers.'

Reduced costs and a more advanced, agile system

The new national system has had a positive effect on NHSBT, as well as on the English and Welsh public. Says O'Connor, 'The HP Integrity servers and OpenVMS are very, very reliable, and they offer exceptional performance and security – an important factor because we have to safeguard donor information.' He also notes that the move to HP Integrity servers has cut operational and maintenance costs and data centre footprints.

NHSBT is also benefiting from a business standpoint. With the new national system, the organisation is providing a better experience to donors and improving disaster and contingency planning.

'We literally couldn't be in the business we are today without consolidating our systems and transforming into a more efficient organisation,' says Hogg. 'We've built the biggest centralised blood management system in the world, and we now have great visibility into our end-to-end supply chain. It was a challenge moving to a national system, and we are grateful to HP and our other partners involved for mitigating the risk and making the project a success.'

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