



DATA INTEGRATION

Royal Botanic Gardens, Kew



New gigabit network from Data Integration underpins Kew's digitisation project

Data Integration designed and installed a new gigabit network for the Royal Botanic Gardens, Kew, capable of supporting the bandwidth-hungry digitisation application that is making it possible for people all over the world to benefit from electronic scans of the millions of plant specimens archived at Kew.

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Ken Bailey, IT Manager, Royal Botanic Gardens, Kew

Kew

PLANTS PEOPLE
POSSIBILITIES

A National Treasure

To the general public, the Royal Botanic Gardens, Kew are some of the most beautiful and extensive gardens in the world. However, behind the scenes, Kew is also a powerhouse for research and cataloguing in the botanical world. The collections extend beyond its 250 year history, hosting volumes and specimens from as early as the fourteenth century. More impressive than the age of the collections is their variety: the Herbarium is home to over seven million dried plant specimens (representing 98 per cent of the world's genera), the Library and Archives contain over three-quarters of a million items garnered from all corners of the globe, including 4,000 periodical titles and 175,000 prints and drawings.

The entirety of Kew's collections is used by thousands of scientists and researchers each year to produce an extensive list of seminal texts within the world of botany. Output such as *Index Kewensis*, now part of the International Plant Names Index (www.ipni.org), contributes to the most comprehensive index of plant names in the world, serving not only as a valuable resource for the ongoing study of botany but also helping maintain Kew's reputation as a global leader in the study, education and conservation of the natural world.

For Kew to remain at the cutting edge of botanical research, these extensive collections which support Kew's output, must be preserved for future generations. Their significance to history, from the first explorations of plant species through to Darwin's work on evolution and beyond, renders them impossible to replace.

In 2002, Kew began to use digital imaging. The prospect of potentially digitising Kew's entire collections made it obvious that Kew's existing network infrastructure faced severe challenges for both short and long-term data storage, and for the network to enable the rapid and reliable movement of data around the institution and to the other botanical and research institutions around the globe.

Other botanical institutions, particularly in the US, had already begun digitisation initiatives, scanning in samples at resolutions at 300 dpi and taking advantage of features of some proprietary file formats. Kew had other ideas. It wanted to create a single, organisation-wide image database to accommodate the wide range of photographic, art and textual material. For the images of Herbarium specimens, typically A3 in size and of relatively high resolution (equivalent to 600dpi), it is essential to capture the fine detail sometimes needed to help distinguish one species from another. Kew also needed to be confident the scans would be of sufficient quality for inclusion in printed works if required and could be stored in an open, non-proprietary format to ensure their longevity.



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Before the digitisation projects were even underway, Kew began assessing whether its IT infrastructure was capable of supporting the underlying file transferral and storage process. It quickly became apparent that the current network was not equipped to cope with the extra load of scanning, transferring and storing hundreds of gigabytes of digital scans every day while also servicing Kew's day-to-day scientific, visitor and administration facilities. In the autumn of 2003, IT manager Ken Bailey decided that rather than renewing the service agreement for the existing network, he would invite tenders to bid for a new network. Bailey's aim was not only to improve speed and capacity – it also presented an ideal opportunity to ensure that the underlying network was capable of providing high-speed network access at any point within the site at short notice and at a reasonable cost.

Choosing the Network

Bailey's main objective was to build a network that could support not only the massive digitisation project but also enable immediate network access to all the administrators, visitor installations and researchers on site. This would considerably reduce the cost of ongoing support and ownership. Fibre had already been laid between all of the main buildings on the Kew Gardens site between 1993 and 2000, so much of the cabling infrastructure was already in place. Bailey also wanted a scalable network with the ability to run multimedia applications such as voice over IP, CCTV and video at a later stage if required.

Finally, as a primarily public-funded organisation, Bailey needed the Kew network to be affordable and manageable. Although it is the largest and most important IT project at Kew, the Herbarium digitisation project is only one of hundreds of projects that meet Kew's mission of conservation and education. It simply could not afford to spend further resources or time in constantly upgrading the network. In October 2003, Kew shortlisted five network infrastructure integrators to bid for the tender. At the end of November 2003, the successful bid was selected: an Extreme Networks-based campus LAN, which would be designed and implemented by local company, Data Integration, an Extreme Solutions Partner.

Extreme Networks was attractive to Kew because of its ability to deliver a quality network that met all of Kew's needs at an affordable price. Additionally, Extreme Networks' channel partner Data Integration was able to install the new network backbone both easily and quickly without disturbing any activity on the network. As well as changing the IT infrastructure, Kew was also upgrading its Novell operating system and the Extreme Networks boxes could continue to support IPX efficiently alongside IP.

According to Bailey, "The Extreme Networks package not only provided a very elegant solution for what we needed but also a simple and unobtrusive changeover. We absolutely had to ensure that during the transition any changes behind the scenes would go unnoticed by users. Data Integration and Extreme Networks were able to deliver this while meeting our budget and within the optimum time frame."

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The solution

Between November and December 2003, Extreme Networks and Data Integration worked on implementing the proposed network. The first stage following initial design was to set up, configure and test the equipment in a laboratory environment which helped identify some implementation issues and proved the resilience and failover capabilities of the design. The deployment then took place, with the six Alpine 3804 modular switches installed alongside the old core network equipment at key locations across the site in a dual ring topology. Two additional fibre connections, acting as bypasses, cut across the loop connecting the four most populous building clusters.

The figure-of-eight style network supported Kew's requirement for speed by providing a number of alternative routes by which information could travel in the event of high network traffic between buildings and also ensured increased network resiliency. To improve redundancy in different server locations, dual connections were run from an additional Summit 200 unit linked to an adjacent node. This simple but effective design ensured that Kew's core network could remain online in the event of multiple hardware or connection failures.

The final phase simply consisted of disconnecting edge devices and reconnecting them to the new core. In many cases, this was so undisruptive that it could take place during working hours. For the massive archival project underway in the Herbarium, the Alpine switches were the key to transporting and storing files across the network.

With two gigabit connections running between each of the Alpines, there is now ample bandwidth available to support the digitisation project. As traffic from Kew's other research and visitor-focused activities increases, Kew will make use of the inherent scalability offered by the modular Alpine switches, ensuring fewer network upgrades and reducing the total cost of ownership.

Ease-of-management, is major plus point for Kew's new network infrastructure. Having completed the first phase in December 2003, Kew is now finishing its second incarnation. A Summit 48si was added to the Herbarium as the final addition to the first phase to provide further support for the digitisation project. Extra Summit 200s and 400s have since been added as part of the secondary, consolidation phase to accommodate network growth and development. The ability for in-house staff to add new hardware within six months of the completion of the first phase is testament to the ease with which the boxes are installed and managed.

"While training is provided for staff, they were able in fact to install extra switches before receiving any formal training simply by copying existing configurations, making a few appropriate text edits then uploading the configurations to the new switches. Moreover, we find Extreme Networks' consistent command interface refreshing. With less time needed for network maintenance, we are able to place greater focus on the large-scale, long-term projects that will help Kew stay at the forefront of research and development in the world of botany," commented Bailey.

Moving Forward

With the network infrastructure in place, Kew has since been able to focus again on projects affecting the administrative, visitor and research departments.

Future developments to Kew's network infrastructure will see the network expand to new parts of the campus and will support new applications. The network is capable of delivering voice over IP, CCTV and other video applications and supporting interactive information facilities for visitors. For the digitisation projects, there will be a demand for more capacity at ever-increasing delivery speeds. As Kew continues to invest in its digital assets, new opportunities will be created internally and externally for both scientific and commercial uses of the unique resource. With each of these future initiatives, Kew's IT department will continue to be able to manage the network as easily as it did through the first phase.

Bailey is optimistic about the future of the new network. "We have no regrets about our decision to work with Extreme Networks and Data Integration. We have been able to initiate and support the significant new demands of the digitisation projects, whilst maintaining 'business as usual' services for the rest of the organisation. It's all gone very smoothly and, best of all, we have been able to improve the overall facilities of Kew at the same time."

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