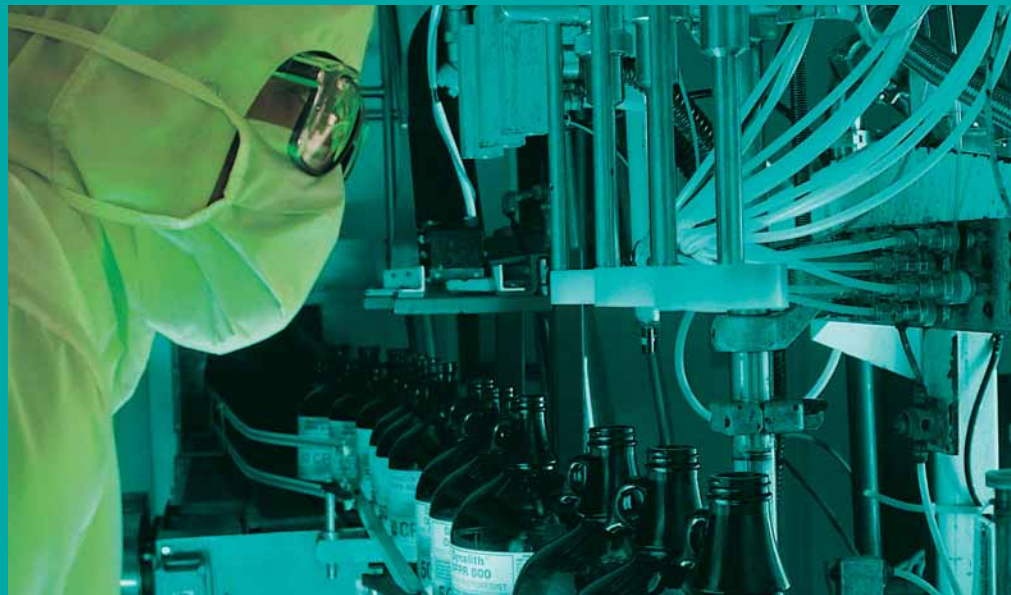




> LEADING DUTCH RESEARCH NETWORK LAUNCHES THE WORLD'S FIRST COUNTRYWIDE ADAPTIVE OPTICAL NETWORK

NORTEL



Case Study

SURFnet

"We realised early on that Nortel and SURFnet share the same vision when it comes to agile optical networking. Both are committed to staying at the cutting edge of innovation.

Because of this, we've been able to rely on Nortel to help us push the boundaries of scientific and networking research even further than before."

> Erik-Jan Bos, Director of
Network Services, SURFnet

SURFnet
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Customer: SURFnet

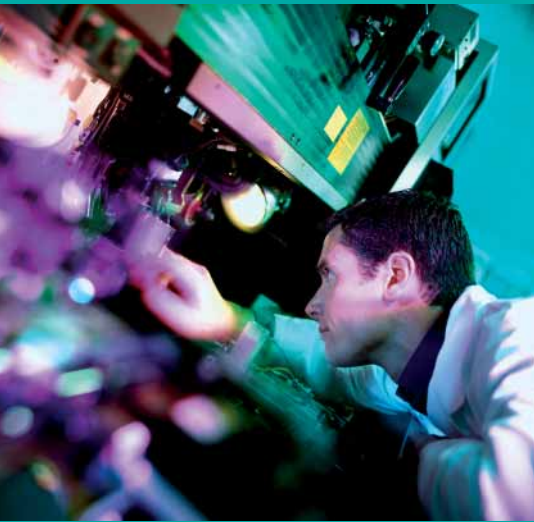
Country: The Netherlands

Industry: Education

Challenge: To provide flexible, high-bandwidth connectivity to over 180 research and higher education organisations throughout the Netherlands.

Solution: An adaptive, all-optical, intelligent network was built using a combination of the Common Photonic Layer (CPL), the Optical Multiservice Edge 6500 and the Optical Metro 5000. The Metro Ethernet Routing Switch 8600 was also deployed to support essential routed IP networking.

- Benefits:**
- **Cutting-edge functionality** – only Nortel can offer the combination of the latest eROADM and eDCO technology that provides photonic network agility
 - **Increased flexibility** – SURFnet's network can be remotely and dynamically configured, ensuring the appropriate network connectivity for every user
 - **Reduced cost** – the solution supports optical lightpaths that allow large data streams to bypass the IP-routed network, for more efficient connectivity
 - **Improved performance** – Grid Computing techniques allow researchers to make more effective use of network, computing and storage resources, whilst supporting cutting-edge research initiatives



“Nortel is the only vendor able to offer the advanced combination of eROADM and eDCO that we needed to make our network fully flexible and future-proof.”

› Erik-Jan Bos,
Director of Network
Services, SURFnet

The scenario

In today's fast-moving marketplace, meeting ever-changing end-user demands is one of the major challenges faced by network operators. This is especially true for SURFnet, the National Research Network in the Netherlands and one of the world's leading research and development organisations in the field of high-end networking.

Based in Amsterdam and extending throughout the Netherlands, the SURFnet network caters for over 750,000 end users across 180 different institutions, including universities, research centres and academic medical centres. Networking needs range from running everyday applications to supporting high-bandwidth e-Science tools that can stretch an IP network to its very limits.

In 2002, SURFnet started to plan the sixth generation of its network. With such a range of needs to cater for, it wanted to build the most flexible infrastructure available, one that could promote knowledge-sharing and enable the deployment of high-end scientific applications.

To meet this growing demand for flexible network connections amongst end users, SURFnet required a hybrid optical and packet-switched network. In this way, it would be able to provide essential IP connectivity for all users, whilst using optical lightpaths for the point-to-point connections that give large data streams their dedicated path outside the IP-routed network. By avoiding the IP-routed network for these demanding applications, the network makes the most efficient use of capacity and provides cost-effective transport.

For additional security, performance and ease of operation, the ability to create Optical Private Networks (OPNs), consisting of a set of lightpaths, was a central requirement. This technology allows universities to connect resiliently to remote locations.

Further, as SURFnet also wanted to enable high-end users and applications to use the network in the most flexible way possible, a system for remote configuration was required, to enable the rapid provision of on-demand services.

To achieve this, SURFnet sought nothing less than an industry leader at the forefront of networking innovation. With a 40-year heritage in optical networking technology, Nortel was well equipped to provide a solution that would meet SURFnet's stringent requirements. Erik-Jan Bos, SURFnet's Director of Network Services, explains: “We realised early on that Nortel and SURFnet share the same vision when it comes to agile optical networking. Both organisations are committed to staying at the cutting edge of innovation. Because of this, we've been able to rely on Nortel to help us push the boundaries of scientific and networking research even further than before.”

The solution

Nortel provided SURFnet with a hybrid optical and packet-switched network that would allow it to offer the right resource in the right situation, every time. For packet-switched IP, Nortel provided routing and Ethernet aggregation equipment based on the Metro Ethernet Routing Switch 8600 to deliver IP connectivity to over 180 institutions across the country, at rates of up to 10 Gbit/s.

Using the Common Photonic Layer (CPL), the Optical Multiservice Edge 6500 and the Optical Metro 5000, Nortel provided an adaptive and intelligent optical network. Erik-Jan Bos explains the benefits of these products: “The network offers researchers access to lightpaths with unprecedented bandwidths and guaranteed performance. We believe that this will enable connected organisations to remain at the forefront of research and education.”

For maximum flexibility, SURFnet also uses the enhanced Reconfigurable Optical Add/Drop Multiplexer capability (eROADM) on the CPL and electronic Dynamically

Compensating Optics (eDCO) on the Optical Multiservice Edge 6500. eROADM enables rapid changes to service and traffic patterns by allowing users to dynamically add and drop optical wavelengths without terminating them. eDCO, meanwhile, allows wavelengths to be routed through the network independent of distance, fibre dispersion and network topology.

To cope with these frequent and possibly rapid changes in the lightpath service, the network is combined with Nortel's Dynamic Resource Allocation Controller (DRAC). This middleware allows the network to be self-adjusting to demand and topology, making it simple for end users to take control of their lightpaths, configuring them to their own real-time usage needs.

As Erik-Jan Bos explains, this technology was one of Nortel's unique selling points: "Nortel is the only vendor able to offer the advanced combination of eROADM and eDCO that we needed to make our network fully flexible and future-proof."

The results

Using the Nortel solution, SURFnet can now offer its users a wider range of services, including routed IP connectivity, lightpaths and Optical Private Networks. It can also enable applications to trigger lightpaths, ensuring that even the most bandwidth-hungry tools receive the level of service they need, when they need it.

Scientists can now run larger and more bandwidth-intensive applications than ever before. They also have access to unprecedented levels of flexibility, allowing them to create 'temporary' networks and reconfigure their existing lightpath networks at will. Additionally, researchers in the Netherlands can now use Grid Computing to connect supercomputers together virtually, allowing disparate computing resources to be combined for more effective use.

Further, because of SURFnet's special relationship with Nortel, it will continue to benefit from all the latest cutting-edge developments in CPL, even once the full scope of the network has been deployed. As Erik-Jan Bos explains: "When the network was launched, we installed release one of the Nortel CPL. We have since upgraded to release two and there will soon be a third release with more features. This sort of rapid development is important for a research network organisation with a highly demanding user base. And Nortel is really listening to our feedback."

Thanks to Nortel, SURFnet has also been able to provide networking solutions for a number of cutting-edge research initiatives. These include the supercomputing networking project StarPlane, which will use SURFnet's network to reconfigure a distributed supercomputer at will. Another project is e-VLBI, the international radio astronomy collaboration, which will connect radio telescopes to a central site, sending high data streams across the network.

Besides offering connectivity within the Netherlands, SURFnet is deeply involved in the Global Lambda Integrated Facility (GLIF), in which leading network organisations participate to co-ordinate lightpath provisioning on a worldwide scale. Open Lightpath Exchanges in GLIF, such as NetherLight in Amsterdam, form switching points between lightpath-capable networks. NetherLight is built and operated by SURFnet, and based on a Nortel optical solution.

As Erik-Jan concludes: "This is truly the cutting edge of networking innovation – and we are pleased with the ongoing commitment we have received from Nortel."

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**> Erik-Jan Bos,
Director of Network
Services, SURFnet**



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