

Converged 100GbE Optical IP Integration Scales Sweden's National Academic Network

Summary

Company:

SUNET

Industry:

Education

Business Challenge:

- Create a new efficient high-performance network across Sweden
- Increase the resilience and availability of its network
- Create a more agile and open environment

Technology Solution:

- MX2020, MX2010, MX960, and MX480 3D Universal Edge Routers
- MPC3E-NG and MPC6MIC-3D-DWDM and 100GbE Coherent Optical Interfaces

Business Results:

SUNET now has a converged multilayer network that:

- Is more than ten times faster than its previous network
- Has lower operational costs by approximately 20 percent
- Is more resilient, intelligent, and robust

SUNET connects over 30 universities and colleges and about 100 additional associated research institutions, providing them with access to high-speed data services. It also offers cloud storage, digital collaboration tools, and Web conferencing services. SUNET originated in the 1980s as a research project for computer scientists, and it paved the way for the Internet in Sweden. Operating in both research and production environments, SUNET enables Swedish research and higher education institutions to collaborate nationally and internationally, supporting about half a million users, including students, researchers, and administrators.

Business Challenge

SUNET's existing network had been operating successfully for about ten years. However, its optical transport equipment was approaching its end-of-life, and the contract with its dark-fiber supplier was coming up for renewal. Scale, resilience, and agility had become an issue and SUNET took this opportunity to take a new approach to building a network across Sweden.

As Börje Josefsson, chief operating officer at SUNET, explains: "We know traffic will continue to increase, but we need to contain costs as our traffic grows. At the same time, we need a network that is agile enough to adapt to future demands and give us flexibility." That was one of the reasons why open standards and interoperability were critical requirements, as it would help ensure that SUNET wasn't locked into any single vendor, allowing it to take advantage of future innovations.

SUNET considered all of the available technology options and undertook a thorough set of vendor discussions before deciding on a multilayer integrated IP and optical network, concluding that it would be the most efficient way to deliver scale and provide the most resiliency.

"If we had taken a traditional network approach, we would have spent far more money. Now we have a network that's at least ten times faster than we used to have, has lower risk of outages, has greater resiliency, and actually has lower costs than it had before, all down to the integrated optics."

Börje Josefsson, Chief Operating Officer, SUNET

"Optical integration into the routing layer makes perfect sense," says Per Nihlén, chief technology officer at SUNET. "We no longer need transponders sitting back-to-back with optics in the routers, and we don't need redundant transponders lying around to do rerouting. Simplifying the network like this significantly reduces space and power requirements, eliminates capital and operational costs, and improves network availability because there are less components that can fail. Because the router has an inherent understanding of the fiber conditions, it can reroute around performance degradation before a fiber has even broken. So we get higher availability and more flexibility about how we route."

"We already have customers requesting multiple 100GbE links, and we need an evolutionary path to deliver them terabit links. With Juniper's converged technology, we know we can scale to support them, and do it in a cost-effective way."

Per Nihlén, Chief Technology Officer, SUNETT

Technology Solution

SUNET selected Juniper Networks to supply its integrated IP and optical solution, using [Juniper Networks® MX 3D Universal Edge Routers](#), including MX2020, MX2010, MX960 and MX480 models, directly equipped with integrated coherent optical transponders. The [Juniper Networks MX2020 3D Universal Edge Router](#) is the industry's highest-capacity modular edge router, scaling beyond 80 Tbps, with support for ultra-high-density 10GbE, 40GbE, and 100GbE interfaces.

The SUNET core runs over approximately 8,000 km of dark fiber at speeds of 100GbE, using dense wavelength-division multiplexing (DWDM) coherent optical interfaces, the first deployment of its type anywhere in the world. The optical domain is provided using equipment from Adva, including DWDM equipment, reconfigurable optical add-drop multiplexers (ROADMs), and inline amplifiers (ILAs). No optical DWDM filters are used in the network, creating a fully grid-less domain. This gives SUNET the flexibility to grow and deploy higher speed services in the future.

As Per Nihlén explains: "When we need to run our network at even higher speeds, such as a terabit or more, we might need to use more optical spectrum per channel than today's 50 GHz standard. By avoiding the use of optical filters, we can do this without touching the optical network at all. But to make this work, we need tunable transponders that don't scan across the whole channel range and interfere with other optical paths. With Juniper, we've been able to deploy a network that doesn't use any optical filters, giving us massive flexibility and the potential to scale without sacrificing our current investment."

This innovative integrated solution means that SUNET can flexibly provision optical connectivity directly from the router, setting optical launch power and DWDM frequency. SUNET now plans to enable further automation using the Network

Configuration Protocol (NETCONF) YANG modeling language for configuring network equipment, including both the routers and the optical layer. "For us, automating network configuration like this is a practical example of SDN," Per Nihlén says.

IPNett, an Elite partner of Juniper, supported the entire project, providing installation and implementation services for both the Juniper Networks and the Adva equipment. In advance of the deployment, the SUNET team worked directly with product teams at Juniper Networks' head office in Sunnyvale, California, and was closely involved with beta testing the new coherent optical technology. "We'd had a good relationship with Juniper for many years, so we knew we could trust them to deliver an integrated optical network," Börje Josefsson says.

Business Results

SUNET now has the capacity it needs to support its users' high-speed Internet services, delivering research projects, distance learning, cloud-based services, and huge volumes of data transfer for institutions such as the Swedish National Facility for Radio Astronomy. "Our aim is that we should never be the bottleneck for any research project," Börje Josefsson says. "Once we've fully deployed the new network, all universities in Sweden will be connected by two 100GbE capacity uplinks." The network will also match the 100GbE capacity of the regional Nordunet (Nordic University Network), enabling 100GbE links to other research institutions outside Sweden.

"As a research network, we have to interoperate with other institutions around the world. That's why Juniper's support of open standards is so important to us," Per Nihlén adds.

Network availability is as critical to SUNET as performance. The cost of research experiments can often be huge compared to the network costs, so SUNET considers it false economy to cut costs on the network at the expense of availability. But the new network is not only far more resilient, it is also more efficient. SUNET has been able to move from a star network to a ring topology, with more routers than it had before. This means it can route traffic more optimally, so that universities that are closer to each other don't have to send their traffic via a distant hub in the optical network.

"If we had taken a traditional network approach, we would have spent far more money," Börje Josefsson says. "Now we have a network that's at least ten times faster than we used to have, has lower risk of outages, has greater resiliency, and actually has lower costs than it had before, all down to the integrated optics."

"With Juniper, we've been able to deploy a network that doesn't use any optical filters, giving us massive flexibility and the potential to scale without sacrificing our current investment."

Per Nihlén, Chief Technology Officer, SUNETT

Next Steps

SUNET is currently in the process of upgrading its customers from 10GbE to 100GbE, but the converged multilayer network has given it the scalability to provide even greater speeds in the future. As Per Nihlén concludes: "We've known the advantages that this multilayer approach could bring us for a long time, and now we've managed to achieve it. Whatever the future holds, we know our customers will need more bandwidth. We already have customers requesting multiple 100GbE links, and we need an evolutionary path to deliver them terabit links. With Juniper's converged technology, we know we can scale to support them, and do it in a cost effective way."

For More Information

To find out more about Juniper Networks products and solutions, please visit www.juniper.net.

About Juniper Networks

Juniper Networks challenges the status quo with products, solutions and services that transform the economics of networking. Our team co-innovates with customers and partners to deliver automated, scalable and secure networks with agility, performance and value. Additional information can be found at Juniper Networks or connect with Juniper on [Twitter](https://twitter.com/juniper) and [Facebook](https://facebook.com/juniper).

Corporate and Sales Headquarters

Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, CA 94089 USA
Phone: 888.JUNIPER (888.586.4737)
or +1.408.745.2000
Fax: +1.408.745.2100
www.juniper.net

APAC and EMEA Headquarters

Juniper Networks International B.V.
Boeing Avenue 240
1119 PZ Schiphol-Rijk
Amsterdam, The Netherlands
Phone: +31.0.207.125.700
Fax: +31.0.207.125.701



Copyright 2016 Juniper Networks, Inc. All rights reserved. Juniper Networks, the Juniper Networks logo, Junos and QFabric are registered trademarks of Juniper Networks, Inc. in the United States and other countries. All other trademarks, service marks, registered marks, or registered service marks are the property of their respective owners. Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

JUNIPER
NETWORKS