The Nobel Foundation: Using the Internet to Inspire Innovation

Since 1901, the Nobel Foundation, headquartered in Stockholm, Sweden, has been honoring outstanding achievements in physics, chemistry, medicine, literature, and peace (economics was added in 1969) through its annual Nobel Prize awards. It recognized the value of the Internet in 1994, when the Foundation first announced its Nobel Prizes via the Internet. A year later, the Foundation established an official Web site and, in 1998, produced its first Webcast.

In order to provide information about the Nobel Prizes, to interest students worldwide in the work of the laureates, and to promote public understanding of science, literature, and peace achievements, the Nobel Foundation created the Nobel e-Museum (NeM), www.nobelprize.org, a virtual museum of science and culture on the Internet, in 2000. The NeM offers a true e-learning opportunity for people worldwide with articles by Nobel Laureates and prominent authors as well as live Webcasts and video on demand (VoD) from Nobel lectures, interviews, and the Prize Award ceremonies. As the official Nobel Web site, this on-line museum gives access to the work of over 700 laureates throughout history.

The Nobel Cisco Internet Initiative

In preparation for the 100th anniversary of the first Nobel Prizes, Nobel kicked off a major initiative in January 2001 in partnership with Cisco that includes new content and expanded capabilities. Through the Nobel Cisco Internet Initiative, Cisco will provide the Nobel Foundation with network infrastructure and technology to help the NeM inspire excellence in human achievement. The initiative upgrades the NeM's networking capabilities and allows for dynamic new content. In addition to infrastructure technology, Cisco will also support content development plans for physics in a new section of NeM called Science and Technology. "Working with Cisco greatly enhances our possibilities for the future," said Nils Ringertz, Director of the NeM. "Cisco has been a leader in Internet technology, and we felt comfortable partnering with them."

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- Nils Ringertz, Director of NeM

The Enhanced Network Opportunity

Traffic has grown dramatically since the Foundation established its original Web site in 1995. In 2000, more than 107 million documents were accessed by more than 2 million visitors. New sections added in 2001 include the Wallenberg Young Scholars Program, that include multimedia experiences in addition to content on literature and peace. Later a teacher's corner will be added. Expanded content and new capabilities, and the higher profile of the Foundation surrounding the centennial year, translated into significant increases in visitors to the site. The NeM required a robust network infrastructure that could support its expanded Web hosting and content delivery needs during the 100th anniversary year—and in the future.

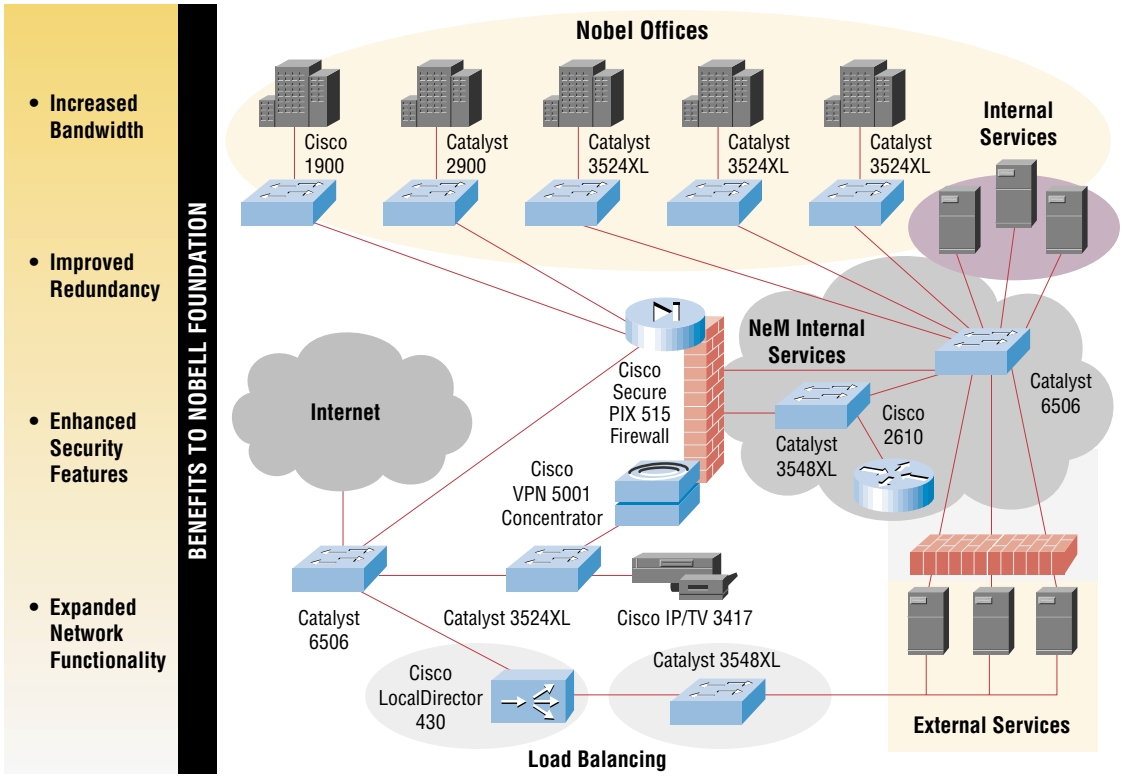
Key requirements for the enhanced NeM network:

- Increased traffic-handling capabilities to meet today's needs
- Scalability to easily expand in the future
- Improved redundancy to maximize availability
- Enhanced security to facilitate remote employee access and reduce unauthorized access to Web content

The Technology Behind the NeM Network

As shown in Figure 1, redundancy begins at the connection point to the outside world. Two fiber optic circuits connect the NeM to the Internet via the Royal Institute of Technology (KTH) in Stockholm. The dual Catalyst® 6506 Switch (with Supervisor 2 MSFC2 cards) in front of Cisco PIX™ 515 Firewalls were installed to handle traffic. The Cisco PIX 515 Firewalls securely separate the public Web site side of the network from the internal applications used by the NeM staff.

Figure 1 Nobel e-Museum Network



The Cisco Secure PIX 515 Firewall Series delivers strong security in an easy-to-install, integrated hardware/software appliance that offers outstanding performance. Unlike typical CPU-intensive, full-time proxy servers that perform extensive processing on each data packet at the application level, Cisco Secure PIX 515 Firewalls use a non-UNIX, secure, real-time embedded system. The Cisco Secure PIX 515 Firewalls deliver superior performance of up to 125,000 simultaneous connections and nearly 120 megabits per second (Mbps) throughput.

In addition to the Cisco PIX Firewall, security is further enhanced through the Cisco VPN 5001 Concentrator, which was installed to provide secure, virtual private network (VPN) access to staff at remote offices or when working from their homes. The Cisco VPN 5001 Concentrator enables organizations to simply and cost-effectively establish and manage VPNs.

A purpose-built, remote-access VPN platform and associated client software, the Cisco VPN 5001 Concentrator incorporates high-performance VPN technology with advanced encryption and authentication techniques. It terminates standard IP Security (IPSec) tunnels initiated in client computers, which provides secured access to the internal NeM network via standard Internet Service Providers (ISPs), whether employees are traveling or working from home.

Efficiently handling the rapidly increasing Web site traffic is essential. Two Cisco LocalDirector 430 systems dynamically load-balance traffic between the NeM's co-located servers to ensure timely access and response to Internet Web site requests. "Cisco's load balancing technology allows us to locate all servers locally, enabling us to not only handle more traffic efficiently, but also to scale as demand increases," said Hans Mehlin, Webmaster for NeM. Eleven servers were installed to serve HTTP, with two providing RealVideo services, one offering file transfer protocol (ftp) services, and one providing external mailing lists. Cisco LocalDirectors are independent of domain name servers and applications, functioning at the front end in a group of servers. They intelligently balance traffic demands between servers and speed user access to server-based applications.

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- Hans Mehlin, Webmaster for the NeM

The design for the internal office network, like the external network, focuses on reliability. Two Cisco Catalyst 6506 switches form the center of a double star with Cisco 3500 Series switches connected via Gigabit Ethernet to both Cisco 6506 switches for redundancy and maximum bandwidth availability for intra-office communication.

Results

The design enhancements Cisco made to the NeM network provide complete equipment redundancy for the highest level of availability. This enables the NeM to reach scalability and increased traffic-handling capability goals. In addition, the network's Web servers can handle significantly more traffic due to the load distribution architecture, which allows expansion without redesign. And finally, internal services and applications are only accessible from internal and VPN connections, ensuring security.

Summing up the Nobel Cisco Internet Initiative, Michael Sohlman, Executive Director of the Nobel Foundation said, "Our relationship with Cisco provides the Nobel Foundation with an opportunity to develop technically the Nobel e-Museum. It will also contribute to explaining the discoveries that created the fundamentals of Information Technology. Millions of visitors will enjoy higher technical quality, and thanks to Cisco, we have increased our ability to deliver dynamic e-learning content."

Building a Scalable Network for Future Technology Needs

A key requirement for the enhanced network infrastructure was the flexibility to add new features and capabilities, such as more interactive documents, in subsequent phases. These include the implementation of a multicasting infrastructure and the deployment of back-office applications to increase productivity within NeM. "We would like to provide high-quality video streams for visitors primarily at universities with which we have high-speed connections," says Mehlin. "For the millions of other visitors, we will continue to rely on low-bandwidth RealVideo."

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— Michael Sohlman, Executive Director of the Nobel Foundation

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