

Norwegian hospital is one of the world's first to run all communications over Internet Protocol (IP), using Cisco technology

Executive Summary

Customer Name

- St Olav's Hospital, Trondheim, Norway

Industry

- Healthcare

Challenge

- Use technology to improve patient care, enable new forms of treatment, and enhance productivity through better communications

Solution

- High-speed, fully redundant IP infrastructure based on Cisco Catalyst 6500 Series Switches and Cisco Catalyst 4500 Series Switches
- Secure wireless coverage across 11 buildings for mobile clinical staff via Cisco Aironet 1200 Access Points
- Comprehensive IP telephony solution including voicemail, unified messaging and contact centre functionality

Business Value

- Integration of previously stand-alone systems is improving the speed and accuracy of the hospital's response to nurse calls, alarms and emergencies
- Enhanced productivity and more effective treatment are leading to shorter waiting times for new patients



St Olav's Hospital in Trondheim has chosen a Cisco Medical-Grade Network to realise its vision of becoming 'a university hospital at the forefront, focusing on the patient'. The goal is to create a modern hospital facilitating more effective forms of treatment, an improved offering to patients, and a simpler working day for its employees. Established back in 1902, the hospital will now become one of the world's most advanced in its use of IT.

Challenge

St Olav's Hospital in Trondheim, one of Norway's five university hospitals, is part of the Mid-Norway health region, covering over 650,000 people. The hospital has 7,500 employees and 1,000 beds, and treats some 45,000 patients each year.

A major construction project is underway to replace the old hospital building with 11 different clinical units on the existing site. Due to be completed in 2012, the project offered an ideal opportunity to update aspects of the hospital's infrastructure such as technology, in order to improve efficiency and patient care.

The goals for the new St Olav's Hospital are:

- To improve standards of treatment by providing correct information and knowledge to the right person at the right time
- To increase productivity and improve co-ordination between different functions
- To enable new forms of treatment through new technology
- To provide a converged and flexible IP network that supports all communication, and ensures seamless integration between St Olav's Hospital and NTNU (the Norwegian University of Science and Technology)

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Thore Smevik
 IT strategist
 St Olav's Hospital

Solution

St Olav's Hospital put out a tender for an ICT infrastructure with over 2,500 functional requirements. Telenor, the largest telecommunications provider in Norway, was selected as the lead supplier. Other key partners included Cisco Systems, who would supply the network and IP telephony solutions, and Hewlett Packard Norge AS (HP) who would act as systems integrator for these solutions.

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Arve-Olav Solumsmo
Information Manager
Helsebygg Midt-Norge

“It's important to us that Cisco delivers solutions, not just boxes. We also feel that Cisco takes us seriously as a customer,” says Thore Smevik, IT strategist at St Olav's Hospital. “Other deciding factors are Cisco's position as a market leader involved in setting standards, and its considerable investment in healthcare.”

To realise its vision of ‘a university hospital focusing on the patient’, St Olav's Hospital chose to implement a Cisco Medical-Grade Network. This is a framework developed to help customers design and implement networks that satisfy the requirements of a medical environment. Based on experience from the world's leading health organisations, the Cisco Medical-Grade Network has been designed to:

- Be available in a round-the-clock operation
- Secure rapid access to correct information, any place, any time
- Utilise intelligence in the network to ensure availability of information regardless of the application
- Integrate applications and services in a converged network
- Give increased efficiency in the treatment of patients
- Offer seamless communication regardless of location

The hospital's new infrastructure is one of the world's most advanced Cisco Medical-Grade Networks. It consists of a high-speed backbone based on MPLS (multi-protocol label switching) technology and Cisco Catalyst 6500 switches. Two data centres with identical systems located in different buildings on the campus ensure full redundancy in the event of systems failure, providing 99.999 per cent availability.

The use of MPLS technology enables a logical separation of the network that is both scalable and secure. This makes it possible to use the network for a variety of purposes, including guest access for visitors, the provision of entertainment services to patients, and access to sensitive information for clinical staff and to network resources for University research staff.

“We are building a hospital ICT infrastructure to unlock the benefits of modern healthcare communication for the next decades,” says Arve-Olav Solumsmo, Information Manager at Helsebygg Midt-Norge, the construction firm for the new hospital. “Our suppliers must not only be state of the art, but state of the future art.”

In phase one, some 560 Cisco Aironet 1200 Access Points provide secure wireless coverage of the entire hospital, ensuring that medical staff always have access to information when they are moving between the 11 different buildings.

St Olav's IP telephony solution includes voicemail and unified messaging, as well as an integrated solution for managing voice contacts. In the first phase, around 2,000 IP telephones are being brought into use, of which 1,000 are wireless. An important working tool for hospital staff, these telephones will be used for such things as receiving alarm calls from various clinical and building systems.

This sophisticated implementation reflects a strong focus on the use of IP telephony in the strategy of the entire Mid-Norway health region. “We believe that IP telephony is the future. Integrating telephony with other solutions opens up great opportunities. We'll be using telephony for more than making calls,” says Thore Smevik.

Wireless LAN-enabled Medical Data Assistant (MDA), PDAs supplied by HP, will be used for applications such as ordering laboratory tests and medicines, and will also act as normal telephones. Laptop PCs will be used for all other clinical applications such as X-ray images and patient records.

The new network provides the hospital with a converged infrastructure for voice, data, and video communications as well as a platform for all administrative and clinical applications and systems.

“When it comes to technological infrastructure, St Olav’s Hospital will probably be one of the world’s most advanced for some time to come. Among other things, we are the first hospital in the world to operate all data, TV, radio and voice communication via IP,” comments Tore Indreråk, Head of ICT at Helsebygg Midt-Norge.

PACS is a filmless radiology application that simplifies the radiology process, saving time, staff and resources. It resides centrally in the Eselberg campus computer centre, but is very demanding of network resources, requiring both high bandwidth (4Gbps) and the network traffic prioritisation enabled by Quality of Service (QoS) to be able to work effectively.

Ulm’s new 10Gbps network infrastructure will be capable of delivering such diagnostic quality radiology images through a web portal to every data port in the network, with fast response times greatly improving a physician’s productivity. Over the coming months radiotherapy will be added to the system.

A Cisco Wireless LAN, with Lightweight Extensible Authentication Protocol (LEAP -Cisco’s proprietary wireless encryption) authentication for security, will cover the whole campus. Even wireless laptops will be able to support the image delivery response level required by the Hospital’s clinicians. Doctors will be able to access diagnoses, results, computer tomography (CT) images, laboratory findings and blood tests, so avoiding the traditional method of writing information down manually and inputting to IT later. This should save time and improve data accuracy.

Two Content Switching Modules in the Cisco Catalyst 6500 Series Switches, sitting in the Hospital’s IT network, also provide a higher level of resilience than is present in the PACS system. If one server fails, the module switches transparently to the redundant server so that the PACS service is never disrupted. This could be critical if, for example, a surgeon is relying on data from the PACS system while performing a surgical procedure. This Cisco-based capability adds intelligence to the network and makes the PACS application more effective.

Business Value

The new network at St Olav’s will revolutionise the distribution and management of messages by allowing the hospital to manage message exchanges from a variety of different sources – such as patient terminals, medico-technical equipment or the Emergency Medical Communications Centre – on the same IP platform.

“We believe that IP telephony is the future. Integrating telephony with other solutions opens up great opportunities. We’ll be using telephony for more than making calls.”

Thore Smevik
IT strategist
St Olav’s Hospital

Formerly, the hospital ran a number of message systems on separate networks, including Nurse Call and Patient Monitoring applications, and building alarms. In future, it will use Cisco Clinical Connection Suite to integrate the wireless and communications capabilities of its Cisco Medical-Grade Network with existing applications and systems. This will reduce IT costs because there will be fewer networks to manage and maintain.

It will also greatly improve response times and patient care by ensuring that messages are routed intelligently, based on recipients’ roles – nurse, doctor, janitor, and so on – and their location. For example, call alarms that would previously have been sent to one individual’s pager, no matter where that person was located, can now be sent to an appropriate member of staff who is geographically closest to an incident.

Nurse Call applications, for example, are widely used in hospitals and traditionally consist of an intercom or alert notification device at the patients’ bedside that is linked to the





nurses station. St Olav's will be able to integrate its Nurse Call application with the new IP infrastructure to provide nurses and patients with more flexible and effective communication. Nurses can receive alerts anywhere on the ward, so can continue to care for patients without missing any incoming calls. The Cisco system's ability to send alerts to the closest clinician shortens response times and improves quality of care. The fact that nurses can communicate directly with patients and colleagues ensures that decisions can be made in real time, based on the most accurate and up-to-date information.

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This functionality meets St Olav's demand for high-quality support for mobility among its clinical staff. It also aligns with the hospital's vision of making correct information available in a secure manner to the right person at the right time.

In order to realise the goal of an improved treatment offering, all patients at St Olav's Hospital will have single rooms. Each room will have an IP-based patient terminal supplied by Cardiac, the Norwegian industrial and medical IT specialists. The terminals give patients access to TV, radio, telephony, the Internet, and a special application for ordering food. In addition, all children's rooms will have an integrated Playstation. With the aid of a security card, hospital staff will be able to gain access to all clinical applications on these terminals.

“The patient terminals will also control nurse calls, alarms, lighting, and room temperature. All this is run via the IP network. In addition, we will have a special network for visitors. This means that they too will get full Internet access, including the ability to work from the hospital,” Thore Smevik explains.

The first of the hospital's new facilities are due to open on a trial basis in October 2005. Extensive use of IT at the hospital is expected to provide better and more effective treatment, which in turn will mean shorter waiting times for new patients. Expectations are high, as Tore Indreråk explains.

“I anticipate that the patients, who are the real end users, will be very satisfied because the new IT solutions give them better facilities than ever before,” he says. “I also anticipate that the staff will be satisfied, particularly with the availability of the system. It will probably take a long time before we can reap the benefits of what we have sown. Among other things, it is about a well-thought out new workflow and how new tools can be used effectively.”

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Technology Blueprint

The hospital's new network consists of 36 Cisco Catalyst 6500 Series Switches – three in the core including one redundant system, two in each data centre, two performing global services such as wireless switching, and 27 in the distribution layer. Around 45 Cisco Catalyst 4500 Series Switches are located in the access layer as edge devices, some of which are redundant systems with dual Supervisor engines and power supplies for added security and resilience.

The network core runs at speeds of 10Gbps, with 6 or 8Gbps in the distribution layer and 4 or 6Gbps to the network edge via Gigabit EtherChannel. Client connections from a range of wireline and wireless devices run at 1Gbps.

Call processing is performed by Cisco CallManager 4.1 running on nine Cisco 7800 Series Media Convergence Servers and supporting 1,000 Cisco Wireless IP Phone 7920 models and 1,000 Cisco 7960 IP Phones in phase one. The complete IP telephony solution also includes voicemail and unified messaging from Cisco Unity, and contact centre functionality from Cisco IP Integrated Contact Distribution. Two Cisco Emergency Responders are used to dynamically identify the location of callers in an emergency. Cisco's IP Communicator application provides enhanced telephony services through the PC, giving hospital staff additional flexibility in how they access information and communicate with colleagues.

The network design placed great emphasis on security, in view of the high levels of availability required and the need to protect confidential information such as patient records. The security provision in the network is required to meet current regulations for public authorities and has been approved by the Norwegian Data Inspectorate.

Cisco Clinical Connection Suite is a multi-party solution that enables clinical staff in hospitals to simplify the communications process, improve their productivity, and enhance patient care. It consists of four components:

- Nurse Call, which utilises third party middleware software to integrate the majority of existing Nurse Call systems with Cisco CallManager, Cisco Aironet 1200 Access Points and Cisco Wireless IP Phone 7920
- Patient Monitoring, which integrates the majority of leading patient monitoring systems with Cisco CallManager, Cisco Aironet 1200 Access Points and Cisco Wireless IP Phone 7920
- Location Based Services, which enables equipment and staff to be located using wireless technologies and third party software
- Collaborative Care, for video conferencing between doctors and specialists in different locations using Cisco IP Communications technologies and partner video endpoints

Helsebygg Midt-Norge (The Hospital Development Project for Central Norway) is an independent project with its own board, funding and mandate from the Norwegian Parliament, yet attached to the Central Norway Regional Health Authority.

The project has two customers, St Olav's Hospital and the Medical Faculty at NTNU, and derives its funding from both the Ministry of Health and the Ministry of Education and Research. The hospital accounts for about 75 per cent of the total area, but there will be more medical students than hospitalised patients at any given time, and hospital and university areas are totally integrated throughout the campus.

The hospital project has an organisation of more than 100 people, with the largest part involved in the ongoing building project (phase 1) but also a substantial group planning phase 2. A complete list is found in the project's Norwegian pages at www.helsebygg.no

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