



Cisco Connected Real Estate for Healthcare:

Changes the Way We Design, Build, and Manage
Healthcare Environments

Executive Summary

Today's healthcare executives encounter new challenges to providing quality healthcare within their budgets. One reason is that the world's population is growing, and expected to double by 2050. This growing population is increasingly moving back into cities. And governments around the globe are mandating energy savings. This impacts healthcare facilities disproportionately because healthcare buildings use three to four times the energy of a typical building with the high consumption of clinical and business equipment running around the clock.

At the same time, the cost of care is rising, a result of advances in the tools, treatments, and techniques used to prevent and cure disease. And yet the financial resources available for health services are limited, even in the richest nations. Hospital administrators must therefore grapple with the need to maintain or increase care levels without increasing budgets. This requires new ways of working, using labor-saving technology and more efficient workflows, and better ways to get the most out of facilities investments.

The Connected Real Estate for Healthcare framework from Cisco helps address these challenges. Its premise is that the traditional approach to designing hospital buildings—deploying multiple proprietary networks for voice, video, and data; heating, ventilation, and air conditioning (HVAC); security and access; energy; lighting; fire and safety; and other functions—unnecessarily increases capital costs and operational expenses. When developers and builders replace disparate networks with one simplified, flexible, and scalable IP network, and incorporate the Cisco® Connected Real Estate for Healthcare framework into their buildings, it creates a catalyst for an information utility, while reducing cost and complexity. Not only do operational, energy, and maintenance costs drop, but the hospital IT group can deliver innovative new services that improve caregiver productivity and enhance patient care.



Unified communications converge voice, video, and data capabilities over building information networks with videoconferencing, telemedicine, wireless and remote access, and other collaboration and productivity tools. Converging security applications over the building information network allows you to use your existing IP infrastructure for video surveillance, access control, visitor management, and fire safety. The IP infrastructure can even support the monitoring, control, and visibility of your varied building systems, such as HVAC, lighting, transportation, and energy management.

The convergence of these systems over a single information network allows healthcare organizations to:

- Introduce innovative workplace processes that improve the productivity of caregivers
- Create new caregiver and patient experiences
- Protect hospital assets
- Reduce the total cost of ownership
- Increase shareholder value
- Address sustainability

St. Olav's Hospital in Trondheim, Norway, is one of that country's five university hospitals. It has 5000 employees and 1000 beds, and treats approximately 45,000 patients each year. The hospital's new infrastructure is one of the world's most advanced Cisco Medical-Grade Networks. To differentiate its patient services, St. Olav's has equipped every patient room with an IP-based patient terminal that provides access to TV, radio, telephony, the Internet, a special application for ordering food, nurse call, and control of room lighting and temperature. Using a security card, hospital staff can use the same terminals to access clinical applications.

The IP Network as the Building Information Utility

Network connectivity has traditionally been an afterthought in building construction, left to the healthcare organization that moves into the building. Every application and system is bought, installed, and managed separately. But today, growing numbers of builders and healthcare organizations see the IP network as an integral part of the building design.

They are creating an information utility, based on a fiber optic backbone infrastructure that is both wired and wireless. This information utility is the enabler that allows tenants to be green, save energy, and to better operate and manage systems on a daily basis. Integrated into building automation and management systems, it offers better visibility into critical systems such as uninterrupted power supplies, generators, and surgical suites, for better and faster response by operations teams. Combined with Connected Real Estate, the Cisco Information Utility transforms facilities into intelligent building systems.

To give just one example, telephones running through a PBX system would historically bring in hundreds of pairs of lines or cables. Video conferencing would typically add two high-bandwidth lines. All would be procured, provisioned, and managed separately. Now this can all be integrated onto a Cisco Information Utility, reducing IT management and total cost of operations.

When builders plan for the network infrastructure as part of the building foundation, their tenants can:

- Avoid the costs of deploying and managing multiple proprietary networks for voice, video, and data as well as separate building systems and associated devices to control HVAC, security and access, fire and safety, elevators, and lighting.
- Comply with new legislation on energy consumption and environmental impact. Today, buildings consume 50 percent of the world's energy and 90 percent of the electricity. New building regulations seek to cut that, offering various incentives to do so.
- Transform organizations into automated, enabled, networked, virtual workplaces that enhance productivity and efficiency.
- Deliver new patient services that increase the hospital's competitive appeal. For example:
 - Smart bathrooms that notify staff when lavatories need to be cleaned or if consumables are low
 - Rooms that feature integrated Nurse Call
 - In-room controls that let patients change lighting, temperature, and sound without staff intervention.

Workplace Solutions: Integrating Space, Technology, and Services

Shortages of nurses and clinicians have increased the urgency of productivity improvements. Healthcare organizations need to provide their staff with the tools and technology to deliver service to more patients—without taking shortcuts that might compromise patient safety. In buildings with Cisco Connected Real Estate for Healthcare, clinicians and nurses can receive voice, video, and data on their handheld wireless device, saving countless trips to the nurse's station each day to answer calls or retrieve information. By promoting greater collaboration and mobility, Cisco Connected Real Estate can streamline caregiver and administrative processes and improve workflow.

The University Hospital in Sana, Germany installed wireless access, IP phones, and bedside terminals for patients and staff. All access points are integrated with medical systems and building management systems. Since the money the hospital receives from the government is a fixed amount per patient, the bedside terminals allow them to increase revenues by offering IP telephony, video on demand, and Internet access.

Patients can also use the terminal to request food or drink, even if they are unable to speak. Integrating the nurse call system with the phone allows nurses to answer questions or find out exactly what the patient requires without going to their room each time. The IP gateway integrates other hospital facility management systems such as night porter security. This opens up the way for more efficient, centralized management and the possibility of consolidating services from various hospitals to centralized contact centers.

Right now, 60 percent of staff time is spent taking care of environmental requests. When patients can use an automated self-service information utility to control the temperature and lighting in their own rooms, staff can spend more time for true clinical work and improve patient response and care.

Other innovative applications are already installed around the world.

- IP-enabled bathroom fixtures will now automatically dispatch maintenance staff when there is no more toilet paper or soap, or when the lavatories are dirty. Today, the cleanliness of bathrooms is the second-highest area of complaints.
- An IP music system provides any kind of music to any speaker in the building with a simple web interface. Music can be in a children's ward, the cafeteria, and lobbies.
- Scent Air provides selected fragrances to commercial and public spaces. The fragrance can be different in various sections of the hospital to enhance the experience and lessen the sterile smell of a hospital floor.
- An LED lighting system can light up buildings, facades, or water treatments with simple programming from your laptop.

More Efficient Caregiver Processes and Workflow

Clinical Collaboration: In buildings with a Cisco Connected Real Estate foundation, voice and video can be sent over the same network used for data and building systems. This facilitates collaboration between teams, which improves caregiver productivity and the quality of patient care. In the event of a cardiac arrest, a missing patient, a fire, or other emergency, for example, nurses can use Cisco Unified MeetingPlace to quickly set up voice and videoconferences with a crisis management team. The ability to initiate ad hoc voice and videoconferences can also help overcome language and cultural barriers. If a patient speaks another language and an interpreter is not on site, the hospital can arrange a videoconference with a qualified interpreter in another facility. Voice and videoconferencing capabilities also help deliver telemedicine services to patients at detention facilities and other remote locations.

The Health Care Interpreter Network (HCIN) of Northern California is a system of shared remote interpreter services operated by Northern California public hospitals. Running on a Cisco Medical-Grade Network, this integrated solution of voice, video, and data communication offers hospital staff instant access to trained interpreters. The network currently routes approximately 3500 videoconference and phone calls per month, with an average response time of 22 seconds.

When combined with Cisco Mobility for Healthcare applications, Cisco Clinical Collaboration can improve nurse call, hospital services, and clinical event processes. Caregivers and patients are connected to vital health information when and where they need it.

For example, when patients ring their nurse-call buttons to request assistance, the system delivers the requests either to the Cisco Unified IP phone at the closest nurse station or directly to a nurse's wireless Cisco Unified IP phone. The nurse can instantly confirm receipt of the message by pressing a soft key on the phone, and talk directly with the patient if needed. Productivity increases for the nurse and the patient experience are improved through faster response times.

When administrators of the Poudre Valley Health System, in northern Colorado, decided to meet the demands of the area's increasing population by building a new hospital, they wanted a network that would support the latest clinical technologies with high-level security and robustness, and would provide caregiver mobility. The Cisco Medical-Grade Network supports virtually unlimited wireless access throughout the hospital. The nurse call system will contact a caregiver wirelessly, rather than calling out to a central desk and having the unit nurse track down the caregiver responsible for an individual patient. The hospital has also implemented a system called the GetWell Network. This allows online access to patient information and a complement of entertainment services, as well as the opportunity to provide feedback to hospital staff.



Context-Aware Healthcare: Hospital staff must track a wide variety of devices that are constantly being moved. By one estimate, hospitals cannot find 15 to 20 percent of the devices they own. Of the eight hours needed to perform preventive maintenance on an intravenous (IV) pump, seven hours are typically spent locating the pump. An average 400-bed healthcare facility can save from \$400,000 to \$500,000 annually by reducing short-term equipment leases, loss prevention, fewer purchases, and labor savings.

At the Bronson Healthcare Group of Kalamazoo, Michigan, greeters and orderlies previously devoted part of each day to looking for wheelchairs, and twice a week they sent e-mail "wheelchair alerts" to all 4000 employees. Now that Bronson tags its wheelchairs, any clinician who needs a wheelchair simply calls a greeter's station and asks for the nearest chair. A quick glance at a screen shows within three meters where the tagged wheelchairs are. Patients wait no more than a few minutes for a wheelchair, and the hospital saves \$28,000 a month by eliminating searches. RFID asset tracking also increases the productivity of the biomedical engineers who maintain sophisticated equipment. Bronson Healthcare Group estimates that simply locating assets accounts for more than half of its labor costs associated with some equipment calibrations, repairs, and upgrades.

Administrative Process Efficiencies

In buildings with Cisco Connected Real Estate, clinicians and nurses can use any network-connected PC or terminal to take live or recorded training courses—eliminating the need for caregivers to travel and giving them the flexibility to take courses during less busy times.

Using a converged network for all hospital functions can also create back-office process efficiencies. Employees can sign on and off their shifts by logging in to any Cisco Unified IP phone. Healthcare organizations save time by tracking assets with the wireless IP network instead of manually recording inventory. Networked administrative discharge systems help make better use of patient rooms and examination areas.

When caregivers can connect to the hospital network and use the phone from any location, healthcare facilities can reduce dedicated office space. At Norway's St. Olav's Hospital, for example, all physician offices other than examination rooms have been eliminated. Physicians now work from any convenient location in the facility, logging in to any Cisco Unified IP phone to personalize it with their phone number and preferences.

Convergence and Integration: IT and Building Systems on a Common IP Network

Healthcare organizations with a geographically dispersed portfolio of real estate gain even more benefit from Cisco Connected Real Estate by exercising oversight and control across the entire portfolio from any point on the network. Systems that can be monitored and controlled include:



- Critical medical systems
 - Medical gas supplies
 - Temperature control for blood banks and cryogenic storage facilities
 - Nurse call, baby tagging, and other alarm-generation systems
- HVAC
- Elevators
- Lighting
- Security
- Universal power supply
- Kitchen refrigeration
- Blast chillers

The ability to centrally manage and monitor building services and devices provides economies of scale, and real-time reporting improves response time. At the Reutlingen Regional Clinics of Germany, for example, patient satisfaction has increased because patients can now control the lighting, heating, and blinds in their rooms. Patients use a simple, touch-screen interface on their Cisco Unified IP phones to operate the controls, sending signals over the IP network. Patients can even use their Cisco Unified IP phones as a door intercom.

Enhanced Energy Management Strategy

The United States Green Building Council (USGBC) released the LEED building standards in 2000. By 2006 LEED was adopted by the U.S. Government, 15 states, and 49 cities. 24,000 building-industry professionals are LEED accredited, and 563 million feet of commercial space is LEED certified or registered. In the United Kingdom, the equivalent standard is The Building Research Establishment Environmental Management Method (BREEAM). A growing number of regulatory and government organizations require BREEAM building assessments. This includes the Office of Government Commerce; Department for Children, Schools and Families; the Housing Corporation; Welsh Assembly Government; regional development agencies; and local authorities.

These new building requirements will impact healthcare because 90 percent of all electricity produced is consumed in buildings. Healthcare buildings use three to four times the energy of a typical building because of round-the-clock nature of their business and the high consumption of large clinical and business equipment systems. But, according to the U.K. Carbon Trust, 30 percent of the energy consumed in primary healthcare in the United Kingdom is wasted. This is a significant amount of money that could be better spent in patient care.

Heating and lighting are the largest sources of energy consumption in healthcare. The Connected Real Estate framework helps to keep this consumption under control through daylight saving, time scheduling, and occupancy detection integrated with bookings systems, access control systems, and business systems. The integration of these systems on a converged network allows data sharing and constant automatic monitoring and targeting. Hospitals using the solution have experienced significant reduction in lighting and heating costs for corridors and waiting areas.



The London Health Sciences Centre in Ontario, Canada, uses sophisticated web-based computer systems to remotely control and monitor air conditioners, heating equipment, and lights, eliminating the need for staff to go from building to building to extinguish lights and adjust thermostats. The hospital forecasts a 5 to 10 percent decrease in the US\$8.5 million annual energy cost for the more than 40 buildings on its three campuses. In corridors and waiting areas, lighting has been cut by as much as 50 percent and temperatures reduced by up to 2 degrees.

The task of energy control is made easier by 9,000 control and monitor points that keep track of room temperature, air quality, and humidity throughout the campuses. These allow engineering staff to observe the impact of changes in air temperatures and, when necessary, make adjustments remotely. In many areas of the complex—with the exception of operating rooms and patients' rooms—the temperature of heated air is being decreased to 18°C from a normal 20°C. If cold weather makes warmer conditions necessary, the system automatically boosts temperatures.

Improved Safety

The convergence of IT networks and building systems allows healthcare providers to implement more sophisticated and comprehensive physical security through video surveillance, access control, and asset management.

Integrating devices such as CCTV cameras with door security systems, card readers, and IP-based lock controllers and networks helps staff to respond more quickly and effectively to security events based on immediate data. If somebody forces a door, for example, staff can send a signal to the nearest CCTV camera to focus on the door, and security guards can monitor the video from a central location to decide the most appropriate action. IP-based CCTV has been shown to reduce vandalism, graffiti, and other forms of antisocial behavior in remote areas of hospital facilities. Security personnel can view clear images from any web browser and initiate action early enough, in many cases, to prevent harm. Scanning digital archives of CCTV images is much faster than scanning videotapes. Safety improves, as well, when access control systems are integrated with other hospital systems. If the badge of an employee who is listed as on holiday or sick leave is swiped through an access control reader, the system can deny access and alert security personnel to possible identity theft.

Cisco Connected Real Estate for Healthcare also improves safety by facilitating the communication of emergency status and instructions to patients, visitors, and staff. Security personnel can send voice, video, and data alerts to multiple devices, including PCs, IP phones, digital signage, and public address systems. Third-party IP telephony applications can be used to quickly inform building occupants of security breaches that may require evacuation.

Economy of Scale Through a Remote Integrated Operations Center

Organizations can now manage and monitor all the devices and applications over the Internet and IP network. With the ability to remotely access communication, security, and building automation in any building, multiple buildings can connect over the same framework for greater savings by centralizing the building management and operations of the entire healthcare system. Or use the same concept to outsource building management to a third party that specializes in hosted managed services.

Having visibility into critical infrastructure allows healthcare organizations to leverage virtualization of these systems and open them up to a more efficient and cost-effective, centralized management. This centralization makes systems smarter and more valuable with:

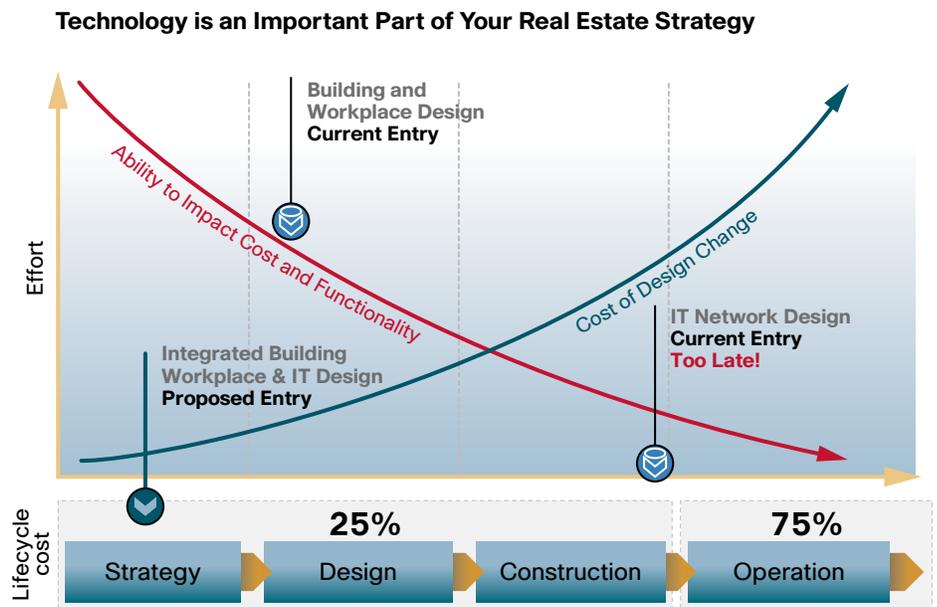
- Control of energy conservation
- Critical infrastructure elements like UPS, generators, surgical suites
- Proactive maintenance that can prolong the life of systems and reduce service calls.

Joint Commission Readiness

Visibility into systems allows better response times and management, plus detailed and consolidated reports for continuous commissioning and sustained compliance. This makes it easy to prepare for audits with an existing paper trail of systems performance that includes tests of air-conditioning systems and other environmental systems, consolidated in a closed loop environment.

Timing Considerations: When to Add Cisco Connected Real Estate for the Greatest Financial Benefit

The illustration below shows the four phases of a building lifecycle and the costs associated with each phase. Because the largest portion of a building's total lifecycle cost—75 percent—accrues during the maintenance and operations phases of the building, decisions made during these phases can have far-reaching financial and operational impact and strategic, informed decisions can reduce ongoing costs over the lifecycle of the building.



By including the Cisco Connected Real Estate framework in the building design process and installing it early in the construction phase, builders and their healthcare tenants gain the following advantages:

- Reduced initial capital costs as well as lower ongoing costs from maintaining a single, standards-based IP network instead of multiple proprietary networks. The Cisco Connected Real Estate framework uses embedded technologies to deliver high levels of security and resilience, further reducing maintenance and repair costs. All network components—hardware, software, and services—are based on open standards and are designed using roadmaps that anticipate and support constantly changing business requirements.
- Reduced disruption for a retrofit.
- Reduced operating expenses over the building’s lifecycle through centralized monitoring, maintenance, and control of the building environment.
- Increased return on investment because the healthcare organization can begin experiencing cost savings, increased productivity, and enhanced patient services from the first day of occupation.
- Prolonged life of building systems with monitoring systems and reduced energy. This can include everything from light bulbs and lighting ballasts to compressors, Freon, and more.

Conclusion

Today’s healthcare providers face a daunting challenge: sustaining or improving patient care levels despite shortages of clinicians and nurses, increasing competition, and financial pressure. Builders and developers can help healthcare organizations meet the challenge in an innovative way by designing buildings with a standards-based IP network to deliver and manage the hospital’s services more efficiently and at a lower cost. When builders and developers design their buildings with a Cisco Connected Real Estate for Healthcare framework, healthcare providers benefit by reducing the total cost of ownership with lower network, operating, and contract costs, plus asset protection through IP-based applications and centralized control of systems. They can find new ways of working with mobility and collaboration that allow greater productivity and efficiency. Automated systems that allow patient self-service create new patient and clinical experiences. And sustainable systems save energy and meet environmental regulations. All this reduces both capital and operating expenses for the life of the building, while offering the ability to provide new services for patients and guests, and increasing shareholder value. Cisco Connected Real Estate for Healthcare brings together all the necessary elements in a building to work for the patient and the caregiver.



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