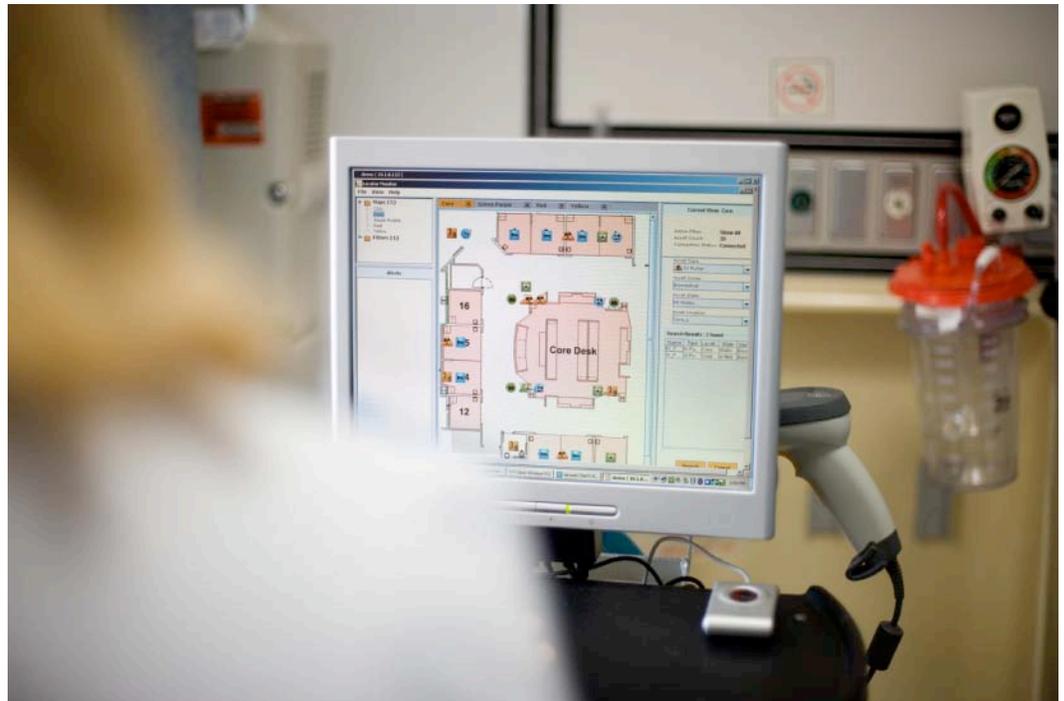


The Cisco Location-Aware Healthcare Solution

Intelligence about the location of mobile resources streamlines business and clinical processes and frees staff to deliver high-quality care.



Nursing staff and caregivers work in high-stress, high-risk, data-intensive environments that are often dominated by paper-based processes and inefficient workflows. Given the extreme time pressures these professionals experience, it's a constant challenge to increase the time they have available to spend with patients while reducing lower-value tasks that can affect their overall efficiency and effectiveness.

Now leading healthcare organizations are adopting location solutions to improve their awareness of critical resources, including equipment and people. In the RFID in Healthcare Survey from BearingPoint and the National Alliance for Health Information Technology (NAHIT), respondents indicated that they believe spending on RFID will dramatically increase beginning in 2007. Nearly 74 percent of respondents said they anticipate their companies will invest in RFID by that year, with nearly 39 percent expecting their firms to spend US\$250,000 or more on the technology in 2007 and 2008. Large organizations plan to spend considerably more, \$1 million to \$5 million, during that same two-year period.

Driving that spending will be a shift from pilot RFID projects to production systems, expanded live RFID deployments. As part of the Cisco® Medical-Grade Network, the Cisco Location-Aware Healthcare solution can help healthcare organizations monitor and optimize workflows and increase responsiveness as well as productivity and efficiency.

As pilot projects move to production, location-aware health services have converged on three main solution areas: asset management, workflow optimization, and patient tracking. This solution overview will explain the challenges and benefits of each of these services.

Challenges

Mobility of people and assets is a requirement for delivery of high-quality patient care. However, tracking mobile assets, mobile patients and improving the process of providing care with mobile resources poses challenges for healthcare organizations.

Mobile Assets

Clinical staff spend significant time searching for portable ultrasound equipment, X-ray systems, gurneys, or wheelchairs each day in healthcare organizations. Before a health system in Northern Illinois implemented a location tracking system, they interviewed all department managers at the 395-bed hospital and calculated that they were losing US\$4000 in wages every day searching for assets (source: eWeek, October 2005). Modern Healthcare has reported that the typical hospital cannot locate 15 to 20 percent of its assets, and time spent searching for these assets equates to \$1900 per nurse (source: IDTechEx January 2007). If an infusion pump or other piece of equipment isn't at hand, busy staff will likely rent a unit or hoard equipment instead of having to continually search for it. This results in over-provisioning of the equipment needed for patient services and ultimately increases the cost of providing services.

Theft and misplacement of critical assets is also common. Brett Mello, director of information technology at Bronson Health Group, points out that hospital wheelchairs occasionally leave with the patient. "We found wheelchairs down the street, at the shopping mall," Mello says. Other valuable equipment such as EKG leads is sometimes discarded with the laundry.

Mobile Patients

Providing efficient, high-quality patient care requires that clinicians know patients' locations and conditions continuously. When procedures must be done in a sequential and time-sensitive order, it is critical to be able to determine the patient's location and have access to patient's vital signs. Other patients may simply want to get out of bed. To monitor these events, many hospitals have a person assigned as a "sitter" in the patient room, but this consumes valuable resources.

Tracking the location of those with dementia is another challenge that will become increasingly more prevalent as the population ages. The location of newborns must also be tracked to avoid tragic, high-profile incidents that reverberate in the community. Helping locate people and assets in a transparent and automated way can save caregivers a great deal of time and drastically improve the efficiency of such tasks.

Mobile Workflow

Optimizing resources for improved workflow is a continuous challenge because providing healthcare to patients is an extremely dynamic and mobile process. In addition, healthcare organizations are faced with staffing and capacity limitations that aggravate workflow bottlenecks. Business process applications, such as bed management and Emergency Department systems, have emerged to address workflow problems in clinical processes. However, fast, accurate status information to feed into these workflow applications is not always available and reliable. Without an automated way to collect bed status information, turnover time lengthens and admissions slow down. For example, the average wait time for an Emergency Room patient before they are moved to an in-patient hospital bed is seven hours (source: The e-Health Industry Project, University of Calgary's Faculty of Medicine).

Optimizing workflow, by being able to locate resources and coordinate this information with staff members will enable you to take full advantage of your workflow applications. For instance, as patients arrive in the Emergency Room, knowing the caregivers available in the area at the time of admission makes it possible to rapidly allocate resources as needed. Patient discharge information can now be directly integrated with the bed management application, allowing the closest nurse to be notified and take action. In addition to location information, the Cisco Location Aware solution can simultaneously collect information such as the operational status (is it on or off) or environmental status (temperature, humidity, vibration, motion) of resources connected to the network. This information is valuable input to workflow optimization—it is inexpensive to gather, accurate, and timely, and it can be used to identify where you can modify and enhance the delivery of your services and eliminate bottlenecks.

Solution

The Cisco Location-Aware Healthcare solution offers multiple configurations, so you can deploy a solution that perfectly fits your organization's needs. Using Wi-Fi location and chokepoint technology are two important ways to deploy the solution.

Wi-Fi Location System and Chokepoint System

Wi-Fi location technology is at the heart the Cisco Location-Aware Healthcare solution. By simply adding the Cisco Wireless Location Appliance to your Cisco Unified Wireless Network, you instantly benefit from the ability to locate any Wi-Fi devices on your premises. Locatable devices can include the existing wireless devices within your network such as Wi-Fi laptops or Wi-Fi phones as well as Wi-Fi tags added to mobile assets such as projectors.

In addition to helping locate devices on the move, some Wi-Fi tags also have sensor capabilities for such information as temperature, pressure, and humidity. The tags can be used to monitor both the conditions in specific places (for example, by placing one tag in each room of the facilities) and the conditions a mobile asset is exposed to.

Wi-Fi location services offer the following features:

- Regular updates of location and sensor information
- Pervasive tracking of the location and sensor information (throughout the facilities)
- Calculation of location using an adaptive algorithm that reflects the environmental characteristics and enables locating an asset within 10 meters

Other applications that need to meet specific tracking requirements can benefit from adding chokepoint technology such as in the following scenarios:

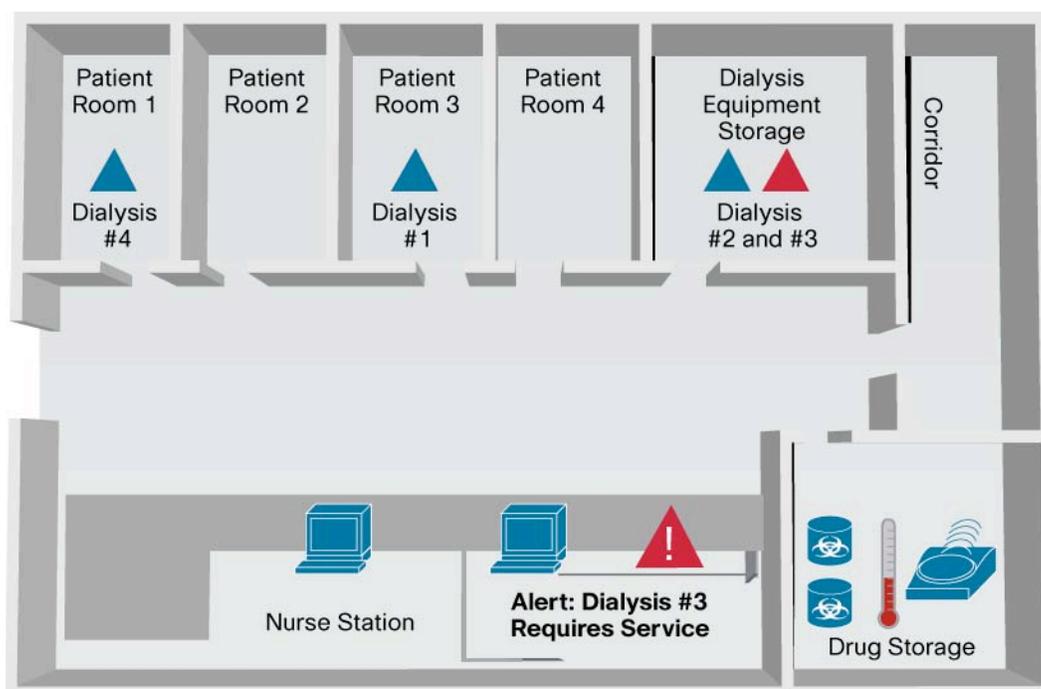
- If you need to determine the precise location of an asset in less than a 10 meter radius, for instance within a specific storage room
- If you need to know the location of an asset from a predefined set of places such as in specific departments or buildings of a healthcare facility.
- If you only need to be alerted to the location of an asset during certain events for example when an asset enters or leaves a building.

Businesses with a Cisco Unified Wireless Network can leverage the benefits of both worlds by deploying a Cisco Wireless Location Appliance for pervasive location tracking and sensor capabilities, while deploying chokepoint technology only when and where it is necessary to optimize their business-critical processes.

Improve Patient Safety with Monitoring of Patient Location

As Figure 1 illustrates, Wi-Fi patient tags can be used to monitor the location of patients as they move from procedures to their beds.

Figure 1. Monitoring Patient Location



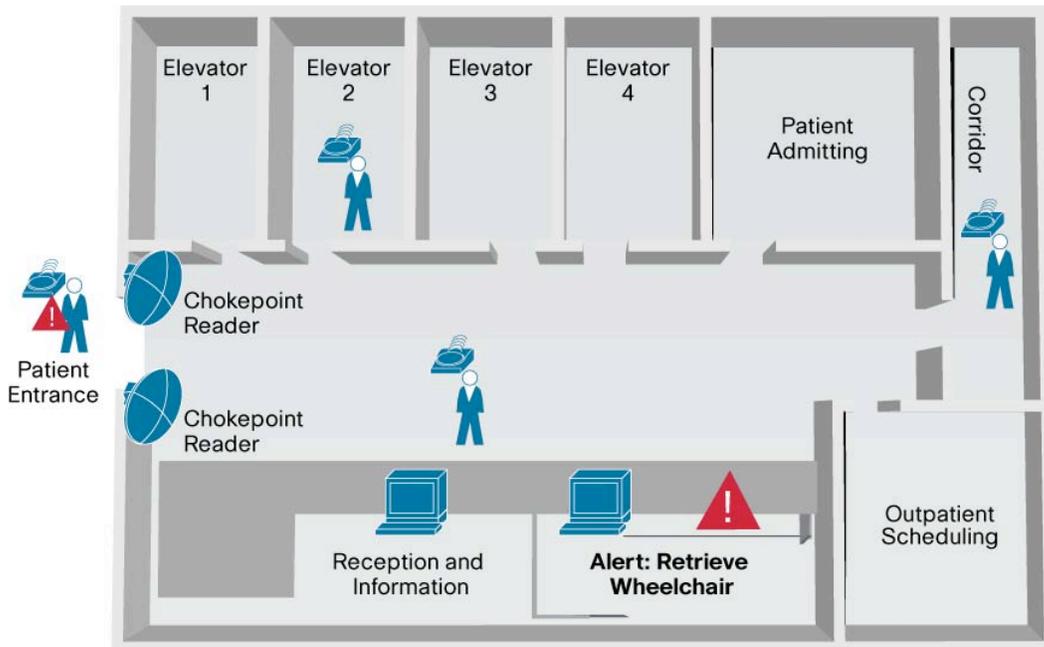
For this application, a location-aware Cisco Unified Wireless Network is deployed throughout the hospital facility to enable speedy tracking of the patient's location. The wireless network should be available in areas that patients are allowed to access as well as areas designated for authorized personnel only such as in the equipment and drug storage areas shown in the illustration. The patient is provided with a small tag which can be conveniently worn to enable tracking. When a patient enters a prohibited zone, an alarm can be triggered to enable hospital staff to redirect the patient. This system helps you cost-effectively ensure patient safety by using your existing wireless network. Tags can also be configured to support panic button functionality for emergency notifications.

Improved patient safety is not the only benefit of this application. When coupled with clinical applications, tracking the location of the patient can also improve workflow. To enable high quality care, patients, procedures, equipment and staff must be synchronized. With the patient tracking solution, clinical staff can use a PC in any location in the hospital to instantly access the location of the patient. You no longer need to call to locate patients or to page and wait for an answer. The Cisco solution can make patient location information available to clinical or scheduling applications to facilitate the efficient delivery of high quality care.

Reduce Asset Loss and Misplacement

To track essential mobile equipment such as wheelchairs, the Cisco Unified Wireless Network must be deployed pervasively throughout the facility. A Wi-Fi asset tag is applied to the wheelchair so that it can be tracked either in real time as it moves throughout your facility or, using chokepoint technology, only when it moves through a doorway as it exits the building. Figure 2 illustrates how chokepoint notification works.

Figure 2. Chokepoint Notification



As shown in Figure 2, a chokepoint-based notification is triggered by Cisco Compatible Extensions Wi-Fi tags as the wheelchair comes within range of a chokepoint. In this example, the chokepoint is located at the primary patient departure door and the notification can alert facilities or security to collect the wheelchair and return it to inventory. In chokepoint configurations, notifications are triggered by a variety of Wi-Fi tag actions, including entry or exit of a tag from a specified zone, doorway, or gate. In addition, specific tags can be made to blink, providing a visual indicator that a specific wheelchair should be collected. Chokepoint products from third party vendors together with the Cisco Location solution provide full visibility to the location and status of important assets such as the location of the wheelchair near the doorway in the example above.

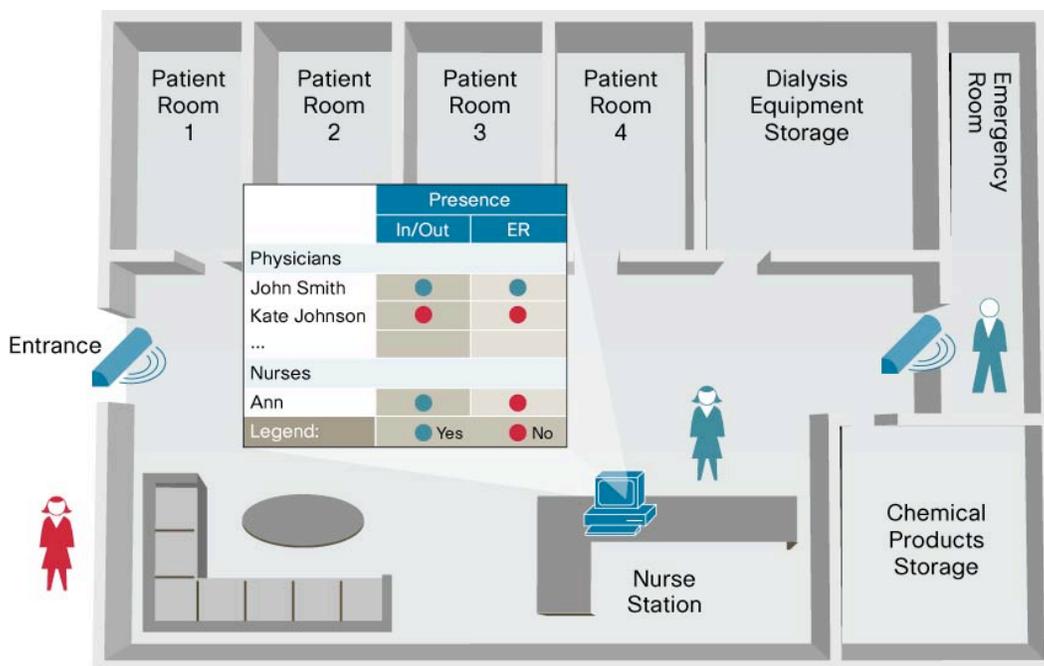
The Cisco Location-Aware Healthcare solution simultaneously supports both real-time tracking of assets like wheelchairs and chokepoint notification alerts which are enabled when an asset with an active RFID tag enters or exits a chokepoint area. Both tracking methods use the same wireless infrastructure and the same set of tags, but chokepoint technology requires additional (non Wi-Fi) readers positioned at the entry and exit points. For summary information about chokepoint system, see the Cisco WCS Location Notifications Summary.

Optimize Workflow and Staff Management

The Location-Aware Healthcare solution can also be used for staff management, as shown in Figure 3. When a patient needs a physician, it helps nurses to know which physicians are in the building so that they can direct the request to the closest physician or to the patient's primary physician whenever possible. If the patient's primary physician is in the Emergency Room for example, the nurse can decide to redirect the request as needed to another available physician.

Chokepoint systems placed at the entrance of the building and of the emergency room, quickly and with minimal effort empower the nurse with information about the location of available physicians enabling optimal timely decisions to be made in the best interest of the patients.

Figure 3. Using Location Technology to Manage Staff



Business Benefits

The Cisco Medical-Grade Network provides a highly responsive and trusted environment for securely sharing vital healthcare information and improving interactions among stakeholders throughout the entire healthcare community. It delivers the right information, to the right people, at the point-of-need.

As part of the Cisco Medical-Grade Network, the Cisco Location-Aware Healthcare solution enables applications that transform business operations to deliver compelling benefits. The solution is enabled on a secure, scalable, and unified infrastructure for the lowest total cost of ownership. The solution automates the collection of status information and location data. This information can

be exported to clinical applications and utilized to optimize processes such as asset management, patient tracking, and procedure scheduling.

The Cisco Unified Wireless Network and the Cisco Location Solution are the primary components of the Location-Aware Healthcare solution. The Location-Aware Healthcare solution is uniquely designed for providers to enhance real-time awareness and insight to their operations. It provides mobility, security, and instant access to data applications that can help healthcare organizations accelerate responsiveness, increase productivity, and improve the quality of care provided.

Location-Aware Healthcare Solution Examples

As the following examples illustrate, location solutions can help reduce the cost of providing high-quality healthcare through improved workflow and asset utilization.

Northeast Medical Center in Charlotte, North Carolina, tracks 1000 devices using the Cisco Location-Aware Healthcare solution. They implemented the solution after they acquired 600 smart infusion pumps. "We'd have to walk around and find them," says Susan Wilfong, director of technical services for information systems at the hospital. With the Location-Aware Healthcare solution operational expenses were reduced in two ways. Clinical staff spent less time locating and collecting equipment within the facility and the hospital saved on the hourly service fees it paid to maintain the pumps - which would often include the time needed to locate them.

Improved asset utilization and management can also reduce the need to order or lease additional equipment. A community hospital in Richmond, Virginia, implemented an asset location-tracking solution, which resulted in their asset utilization rates increasing from 40 percent to 70 percent (source: eWeek, October 2005). Improved asset utilization benefits your organization by enabling you to spend scarce capital resources more efficiently.

Improved workflow produces greater efficiency and improved patient care. Location systems can enable significant improvements in complex processes when combined with business applications. In a recent interview with Healthcare Technology, Gregg Malkary, managing director of the Spyglass Consulting Group, states: "Healthcare organizations nationwide are making investments in radio frequency identification (RFID). They are focusing on active RFID technology that enables them to track the real-time movement of high-value mobile assets, patients, and staff. Active RFID-based solutions have a very compelling ROI because they replace manual, inefficient paper-based processes to help increase operational efficiency and improve the quality of patient care delivery" (source: Healthcare Technology, Volume 4).

For example, when a 100-bed facility in Missouri used a location tracking system as part of a pre-operative workflow application, the facility documented an increase in operating room utilization from 57 to 73 percent within the first year of system implementation (source: Radiology Today, September, 2006).

Quantifying the Benefits

A 2006 study by Forrester Research quantified the benefits of location solutions. With location tracking services, customers reduced the amount of time spent searching for assets and minimized the cost of replacing assets that could not be found. The return on investment for the composite company in the Forrester Research model is 55 percent, with a break-even point of 16 months after the deployment of a location solution. Additionally, asset theft and inventory shrinkage can represent significant financial losses. Cisco Location-Based Services provide real-time notifications that enable you to take action immediately when an asset is removed from its designated area.

Qualitatively the benefits associated with location solutions included improved IT productivity through location-based trend analysis and improved customer satisfaction through reduction in wait time for services.

Bronson Methodist Hospital in Kalamazoo, Michigan, provides another example of how location tracking can lower costs and improve the delivery of services. For years, Bronson lost time, productivity, and money whenever employees from any department had to leave their normal duties to hunt for wheelchairs. Bronson's IT networking department, the applications group, and the nursing staff worked together to address this challenge and transformed the process of finding assets with Cisco's Location-Aware Healthcare solution. Today, patients wait no more than a few minutes for a wheelchair, and Bronson saves \$28,000 per month by eliminating manual searches. Bronson has put an overall IT architecture in place, enabling the hospital to expand location tracking by tagging other devices such as hospital beds, infusion pumps, and more. For more information on Bronson Methodist Hospital, visit: <http://www.cisco.com/go/unifiedwireless> or <http://www.cisco.com/go/healthcare>

Why Cisco?

Cisco is the leader in healthcare connectivity for collaboration and a catalyst for transforming healthcare business processes based on its industry innovation, participation, and collaboration:

- **Innovation:** Cisco has a 20-year proven track record deploying innovative network solutions and best practices that enable physicians, hospitals, clinics, and other healthcare and life science organizations to do things better.
- **Participation:** Cisco is involved with international healthcare initiatives focused on improving access to healthcare information.
- **Collaboration:** Cisco is working with healthcare industry leaders, including applications, systems, and service providers, device manufacturers, and medical technology vendors, to connect the entire healthcare environment to a common information and communications infrastructure.

The Cisco Unified Wireless Network is the industry's only unified wired and wireless solution to cost-effectively address the mobile asset and resource issues facing healthcare organizations with an integrated and comprehensive location system. Cisco's Location-Aware Healthcare solution enables asset management, patient location tracking, and optimized workflow to be securely deployed in your organization. Cisco is unique in its ability to offer the integration and participation of Cisco Compatible Extensions for Wi-Fi tags and to offer centralized control and configuration of thousands of networking devices and tags. As a result, Cisco delivers the lowest total cost of ownership for wireless location solutions for healthcare providers.

Cisco's Location-Aware Healthcare solution is part of the Cisco Clinical Connection Suite: a suite of complementary solutions that connect clinicians, patients, and vital health information.

For More Information

For more information, visit these Websites:

- Cisco Location Solution: <http://www.cisco.com/go/location>
- Cisco Healthcare solutions: <http://www.cisco.com/go/healthcare>
- Cisco Unified Wireless Network: <http://www.cisco.com/go/unifiedwireless>

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