Context-Aware Healthcare Solution Overview

Real-Time Location Tracking, Security Alerts, Workflow Information, and Environmental Monitoring Along with an Unprecedented Visitor Experience

Healthcare Industry Challenges

Excess Capital and Operational Costs

Studies show that 10 to 20 percent of all hospital mobile assets are lost or stolen over the course of their useful life[1]. On average equipment utilization rates are only 35 to 40 percent, meaning hospitals might have up to twice the equipment they need in some areas[2].

Staff Productivity and Improved Patient Care

At any given hospital, the nursing staff spends 10 to 30 percent of its time searching for lifesaving and critical care equipment[3], which has a direct effect on staff efficiency, but also an indirect effect on patient care, because that is time that could be spent in direct interaction with the patient. For biomed, up to 75 percent of maintenance time is spent locating the piece of equipment[1]. Flagging a piece of equipment for maintenance can be burdensome for the user, resulting in decreased productivity. Lack of workflow integration with critical systems, such as Nurse Call status and automated presence, means nurses must complete one more manual step during their already very busy days.

Regulatory Compliance

Some studies have shown that 20 percent of equipment cannot be located for preventive maintenance[3]. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires compliance with hand hygiene procedures prior to entering or leaving a patient room. In addition, JCAHO requires healthcare organizations to provide auditing of all environments used to contain or store temperature-sensitive medications or specimens, and manual monitoring of these environments is time consuming and error prone.

Patient and Staff Safety

Patient elopement, infant security, and staff duress might expose a hospital to extreme liability issues. For recalled equipment, it can be difficult to have an accurate inventory of all equipment or to find the equipment, resulting in a piece of recalled equipment being used for patient care.

Suboptimal Patient Flow

Lack of knowledge of patient, equipment, or staff location and status can increase the average length of stay, procedure completion time, or bed turnover time. Inefficiencies in patient workflow from admission to discharge cannot be efficiently analyzed and improved upon without automatic data gathering and associated reporting tools. In addition, lengthy wait times and not keeping patients informed can lead to the patient leaving without getting treatment.

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[1] RFID Solutions for Healthcare. Part number AB-RFIDHLTHCARE, 0811. 2011. Motorola Solutions. http://www.motorolasolutions.com/rfid/healthcare

[2] Hill-Rom AssetAdvantage™ (2012, December 10). http://www.hill-rom.com/usa/Services/Category/Equipment-Services/Asset-Advantage/

[3] Heart Technologies (2012, December 10). http://heart.net/index.php/industries/medical/rfid-equipment-tracking

Patient Satisfaction

Healthcare institutions are increasing looking to provide an unprecedented patient and visitor experience to improve patient satisfaction surveys such as those issued by the Consumer Assessment of Healthcare Providers and Systems (CAHPS) and distinguish themselves from the competing hospitals. With the visitors to the hospital, there is also a trend of proliferation of the use of mobile devices, and hospitals are looking to engage their visitors through these devices to provide services such as indoor GPS, listing internal services such as the cafeteria or pharmacy, and delivering customized information directly to the user's phone based on that user's current location.

Context-Aware Healthcare Solution Overview

The Cisco® Context-Aware Healthcare solution is composed of three distinct feature sets that all use the Cisco Unified Access infrastructure and capabilities that are a part of the Cisco Mobility Services Engine (MSE).

Location Services

Using Cisco partner CCX certified tags and sensors that use the Cisco Unified Access infrastructure, hospitals can integrate contextual information such as location, temperature, and presence information into their clinical workflow, increasing staff efficiency, simplifying inventory management, and improving patient care. Location can be tracked for mobile assets, staff, or admitted patients, enabling multiple benefits that are discussed in this paper. In addition, the temperature and humidity of environment-controlled storage can be automatically monitored to reduce waste and improve productivity.

Connected Mobile Experiences

Cisco's new Connected Mobile Experiences solution utilizes the same core Unified Access infrastructure and uses the ability to detect and locate any wireless mobile device, such as smartphones and tablets, in order to provide opportunities for unprecedented on-premises visitor engagement, as well as unprecedented visibility into the flow of people in your environment. In addition, analytics are captured and can be analyzed to provide greater visibility into visitor movement and patterns.

Wireless Intrusion Protection System (wIPS)

As part of the Cisco MSE, the wIPS license offers advanced network security for dedicated monitoring and detection of wireless network anomalies, unauthorized access, and RF attacks.

Healthcare Business Challenges Addressed

The location services functionality of the Context-Aware Healthcare solution helps solve the capital, inefficiency, and safety challenges discussed previously by enabling tracking, alerting, and compliance in the primary areas of equipment, patient, and employee tracking. The Connected Mobile Experience features provide functionality for visitors to your hospital.

Location Services: Equipment Tracking

Attaching an Real-Time Location System (RTLS) tag or sensor to a piece of equipment enables several use cases:

- **Location tracking:** Enhances staff (nursing, biomed, IT) efficiency by quickly being able to locate a piece of equipment instead of wasting time searching for it.

- **Location alerting:** Control “shrinkage” by alerting if a piece of equipment, such as a wheelchair, goes past a defined location, such as a door.
- **Inventory management:** Provides the ability to run reports to see how many of a defined asset exist. In addition, this can also be used for more efficient management of rental equipment.
- **Utilization reports**: Run reports from automatically gathered data to see the utilization of a device or group of devices.
- **Preventive maintenance or recall management:** Integrate with biomed systems to alert when Preventive Maintenance is needed on an asset. In the event of a recall, you can easily view the current inventory and display the location of the assets that require action to be taken.
- **Corrective maintenance alerts:** Push a button on the RFID tag to alert when the device needs maintenance or cleaning.
- **Temperature and humidity monitoring:** Automatically monitor and track the temperature and humidity of critical storage areas and send alerts if those parameters are out of a defined range.

Location Services: Admitted Patient Tracking and Alerting

RFID tags can be attached to admitted patients to improve workflow, safety, and security.

- **Workflow analysis:** Track the location of a patient and run reports to see how much time is spent at each location during the care cycle.
- **Patient elopement and infant security:** Send an alert, display a video on a digital sign, or take any number of other automated actions when a patient or infant passes a defined location.

Location Services: Employee Tracking

RFID tags can be carried by employees for some additional workflow, safety, and compliance use cases.

- **Infection control:** Activators attached to hand-washing stations can track when an employee complies with hand hygiene procedures.
- **Staff duress:** By pushing a button on the RFID tag, a staff member can make a duress alert and have their location known for a rapid response.
- **Nurse call system integration:** Automatically acknowledge a nurse call alert when the nurse is in the proximity of the patient’s bed.
- **Integration with virtual whiteboard**: Integrate with a digital sign in the patient’s room to display the name and picture of the employee who has entered the room.

Connected Mobile Experiences

The Connected Mobile Experiences functionality adds on many potential use cases and benefits for interacting with your visitors who have smartphones.

- **Indoor GPS and directions:** On the visitor's smartphone or tablet, display a listing of primary departments (radiology, pharmacy) or areas of interest (parking lot, cafeteria, gift shop, ATM) on a virtual map. Visitors also can receive “turn-by-turn” directions with a moving blue dot noting their current location, similar to what one would have walking outdoors.

- **Targeted location-based messaging:** Deliver personalized pop-up messages, based on current location, to the user's smartphone. For example, "You are leaving parking lot West-Blue Floor 2" displayed as the user leaves the lot or "Welcome Mr. Smith. Would you like directions to radiology for your appointment today?" displayed as the user enters the hospital.
- **Integration with other clinical systems:** Integration with other systems opens up a wide variety of additional use cases. For example, the system can let registration know when a patient has entered the building, integrate with room management systems to conduct self-rooming at a clinic, or integrate with your pharmacy system to let a patient know when a prescription is ready so the patient doesn't have to wait in a crowded pharmacy.
- **Advanced analytics:** Detecting and tracking devices also provide you with visibility and analytics into visitor flow and behavior that can be useful to improve the patient experience. For example, with this information, one can see wait and dwell times in a clinic or ER waiting room and take actions to improve workflow.
- **Automatic wireless connection:** The solution provides the ability for users to automatically connect to the dedicated guest wireless SSID network, avoiding connection complications.

Wireless Intrusion Protection

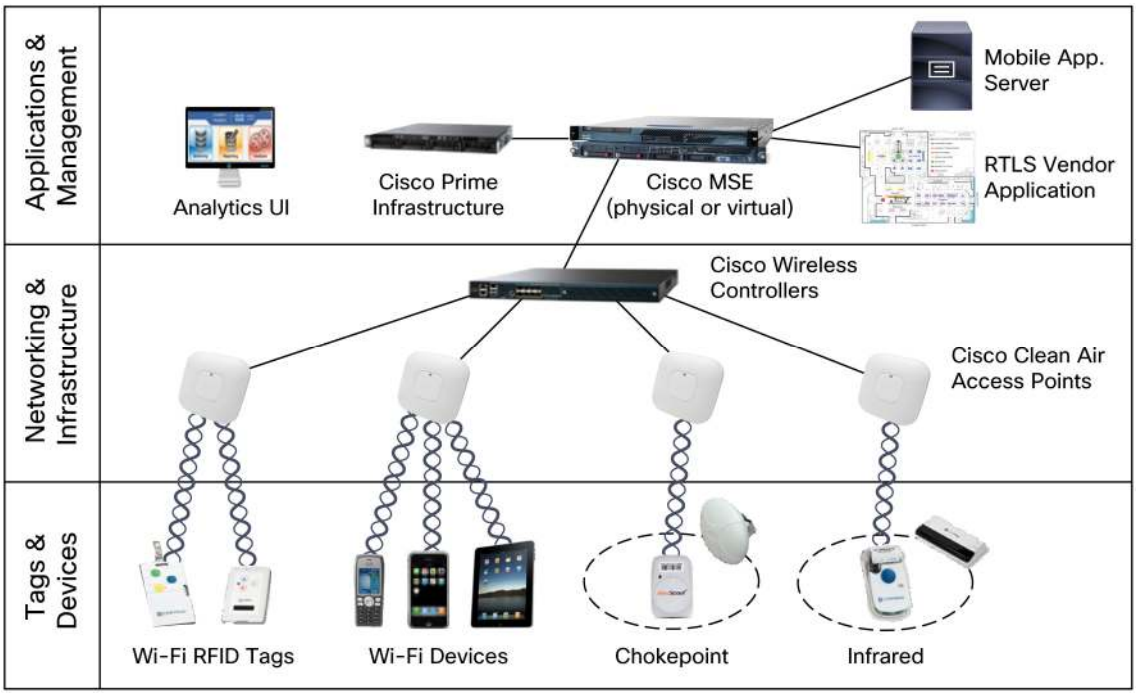
wIPS is a licensed feature on the MSE and is integrated in the infrastructure of the Cisco Unified Wireless network to provide comprehensive wireless security. Benefits of wIPS include:

- **Protection against wireless threats:** Identifies wireless attacks against your network, including rogues, network reconnaissance, authentication and encryption cracking, denial of service, man-in-the-middle, and impersonation attempts.
- **Simplified threat response:** Multiple detection approaches are utilized to reduce false alarms.
- **Corrective action:** Integration to the WLAN infrastructure to enable the fixing of security threats and performance issues in real time.

Solution Architecture Design

Figure 1 illustrates the Context-Aware Healthcare architecture, providing both location services and connected mobile experiences functionality. The components of the Cisco Context-Aware Healthcare solution include mobile assets such as Wi-Fi devices and Wi-Fi tags certified with the Cisco Compatible Extensions program, Cisco Unified Access Network, Cisco MSE, Cisco Prime™ Infrastructure, and Cisco Open API interface for integration to the RTLS vendor's application. For Connected Mobile Experiences functionality, a mobile application server is also required as part of the solution along with additional licensing on the MSE.

Figure 1. Architecture Design



Location Services: Application and Management

The application and management layer of the solution consists of the Cisco Mobility Services Engine (physical or virtual server), Cisco Prime Infrastructure, and selected RTLS vendor's application.

The Cisco MSE, with its Open API interface, integrates into business processes and calculates contextual information for the Wi-Fi tags, internal Wi-Fi devices, and temperature and humidity sensors. It also contains the wIPS, providing network visibility and comprehensive threat prevention.

Cisco Prime Infrastructure interfaces with the MSE and provides integrated management and application performance visibility across wired and wireless networks, enabling faster troubleshooting and more efficient network operations. It also provides the graphical interface for the configuration of the MSE.

The RTLS vendor's application interfaces with the Cisco MSE's Open API, gathering the contextual information for the monitored devices and taking applicable actions dependent on site-specific configurations.

Connected Mobile Experiences: Application and Management

With the Advanced Location Services license providing the Connected Mobile Experiences functionality, location analytics are available as part of the MSE. You also get a mobile application SDK that provides functionality including indoor GPS, turn-by-turn directions, personalized user content, and customized push notifications.

Networking and Infrastructure

The networking and infrastructure layer consists of the level 2/3 switch infrastructure and Cisco Wireless Controllers, which manage the CleanAir® Access Points and send location information to the MSE for processing.

Tags and Devices

The final layer contains the actual Wi-Fi tags and internal devices, such as Cisco wireless phones, tracking people, and assets. It also includes the BYOD smartphones or tablets carried by visitors. Also, this layer can contain vendor-specific sub-3-meter location technology, such as infrared or ultrasound, which can supplement the pervasive wireless network.

Why Cisco: Maximize Investment

Cisco is the leader in healthcare connectivity and a catalyst in transforming healthcare based on its industry innovation, participation, open standards, and collaboration. The Cisco Context-Aware Healthcare solution uses the existing Cisco Unified Access Network to provide hospitals with up-to-date visibility to internal resources and provide an unprecedented visitor experience. It lowers the total cost of ownership of the solution by maximizing current infrastructure investments.

To learn more, visit:

- http://www.cisco.com/go/contextaware
- http://www.cisco.com/go/mobileexperiences
- http://www.cisco.com/go/mse
- http://www.cisco.com/go/wips

Why Cisco: AssureWave

The unique Cisco AssureWave program focuses on satisfying customer quality requirements in critical markets in the wireless space. This program expands on the product testing done by Cisco's development teams and consists of large testing labs that replicate common wireless architectures and test select code releases and feature sets exclusively on the Cisco wireless controller platforms.

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