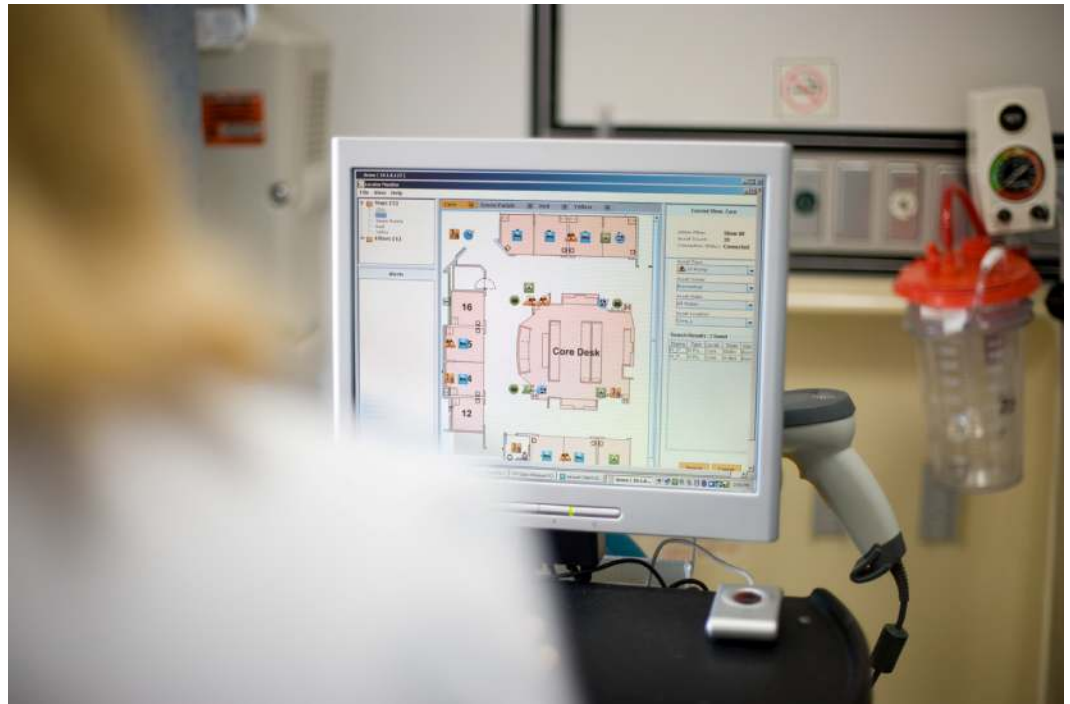


Cisco Location Solution Overview

A fast and simple way to deploy a location solution for process monitoring and optimization, as well as enhanced network security.



Executive Summary

Companies that bring consistency and efficiency to their business processes and faster response time to their customers can increase their competitive advantage and profit margins. The Cisco[®] Location Solution is a fast and simple way to do so for businesses that have already deployed a Cisco Unified Wireless Network. Your business now can monitor and optimize its processes as well as instantly locate unauthorized wireless devices anywhere in its facilities.

Challenges

What makes companies successful? Some would say innovation, best-in-class products, a great brand, or an advanced IT system. But the reality is that even with all these elements, some businesses falter because they cannot bring all these assets together. Business processes can be the cornerstone of a company's success. However, because most business processes are very specific to their particular company, each process monitoring and optimization solution has to be customized. A worker can be a stellar performer in one company and move to the same position within another company, with the same tools, but still sees productivity decreased. If the new work processes hinder efficiency, then work performance will decline despite the individual's capabilities. Great business processes are real competitive advantage as they are difficult to reproduce.

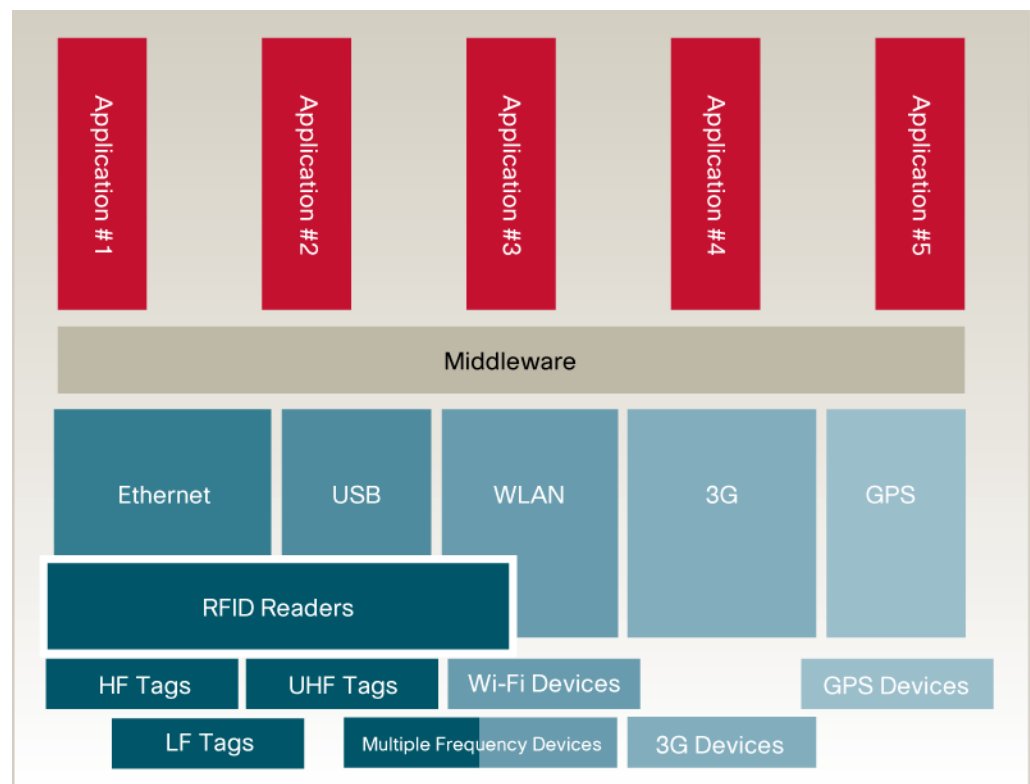
While business processes have been widely studied in manufacturing and supply chain organizations, and valued as an important differentiator for several years, it is a new thought process for many industries. Because of the lack of resources and expertise in process optimization and monitoring, most companies postpone approaching the problem. Several nonstandard technologies have been developed that require customers to choose one vendor for their entire solution and then deploy and manage several independent overlay networks (as shown in Figure 1). The Cisco approach uses your existing wireless infrastructure in order to:

- Minimize the total cost of ownership (TCO) by using a multipurpose network
- Allow a fast and simple implementation for a first location solution
- Provide a wider range of locatable devices and applications that share the Wi-Fi standard

In addition, several features such as the Cisco Compatible Extensions program or the open API of the Cisco Wireless Location Appliance allow you to use your network as a platform to integrate any third-party Wi-Fi tags or applications.

Cisco customers now have a solution that provides openness and fosters innovation while supporting several location technologies on the same wireless network, technologies that in the past required multiple overlay networks.

Figure 1. The Fragmented Landscape of Location Solutions



Cisco Location Solution

Cisco Unified Wireless Network

The foundation of the Cisco Location Solution is the controller-based architecture of the Cisco Unified Wireless Network as described on Figure 2. The Cisco Unified Wireless Network includes the following primary components: access points, WLAN controllers, and the Cisco Wireless Control System.

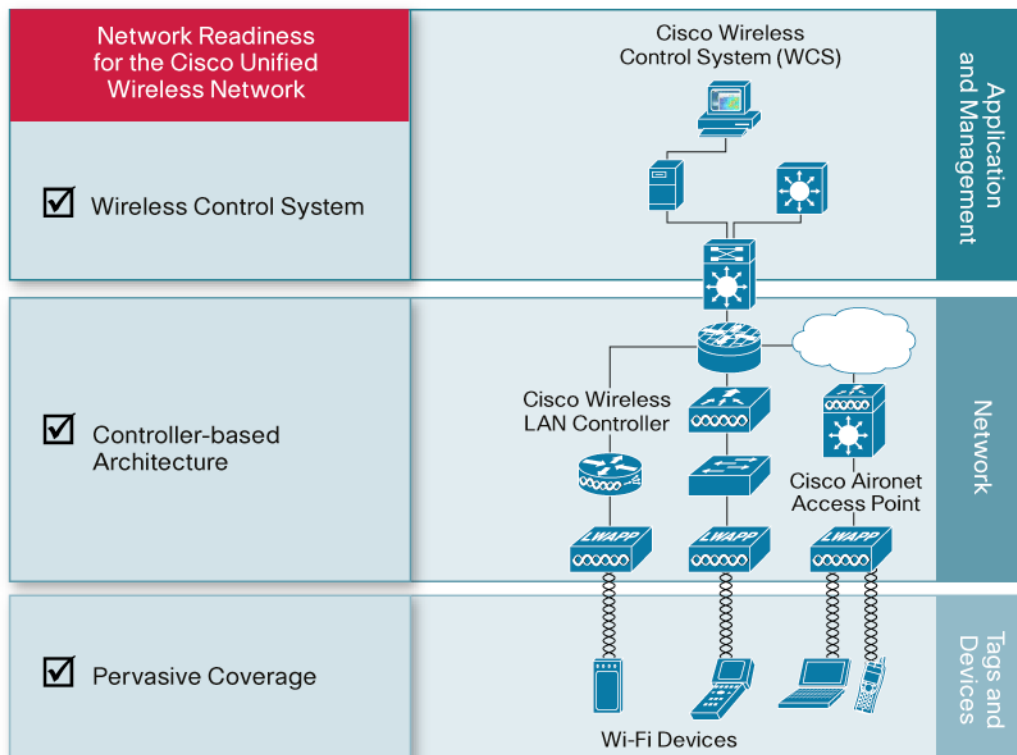
Cisco Aironet[®] access points wirelessly connect devices to the network resources and simultaneously monitor the air space to send radio information back to the WLAN controllers. The WLAN controllers can be standalone devices or integrated with switches or routers. The WLAN controllers collect and analyze the radio information sent by the access points. Based on this information, the WLAN controllers build a comprehensive view of the wireless environment and automatically take action to avoid interferences or gaps in coverage.

The Cisco Wireless Control System is a management tool that uses the information gathered by the WLAN controllers to provide a complete view of the WLAN across multiple controllers for easier planning, configuration, and management from a central location. This architecture offers several benefits such as

- Anytime, anywhere access to information for easier collaboration with colleagues, business partners, and customers
- Real-time access to business-critical applications such as instant messaging, e-mail, and databases to boost productivity and speed business decision making
- Mobility services such as voice over Wi-Fi or guest access

Prior to deploying the Cisco Location Solution, you should make sure that your wireless network covers all the areas where processes should be optimized (probably the entire campus or facility) and that you have enough access points to ensure high availability for business-critical applications.

Figure 2. Cisco Unified Wireless Network



Deploying the Cisco Location Solution

The Cisco Location Solution offers multiple configurations, so you can deploy a solution that perfectly fits your organization's needs.

Wi-Fi Location System

By simply adding the Cisco Wireless Location Appliance to your Cisco Unified Wireless Network as shown in Figure 3, you instantly benefit from the ability to locate any Wi-Fi devices on your premises. The locatable devices could be the existing wireless devices such as Wi-Fi laptops or Wi-Fi phones and also Wi-Fi tags added to mobile assets such as projectors.

In addition to providing connectivity for the Wi-Fi devices, the access points detect the presence of the laptops, phones, or tags and send this information to the Cisco Wireless Location Appliance. The appliance calculates the exact location of each device and stores its location history. Using the Cisco Wireless Control System, you can locate the device locations on the system's floor map and study their historical patterns. This information can serve multiple purposes:

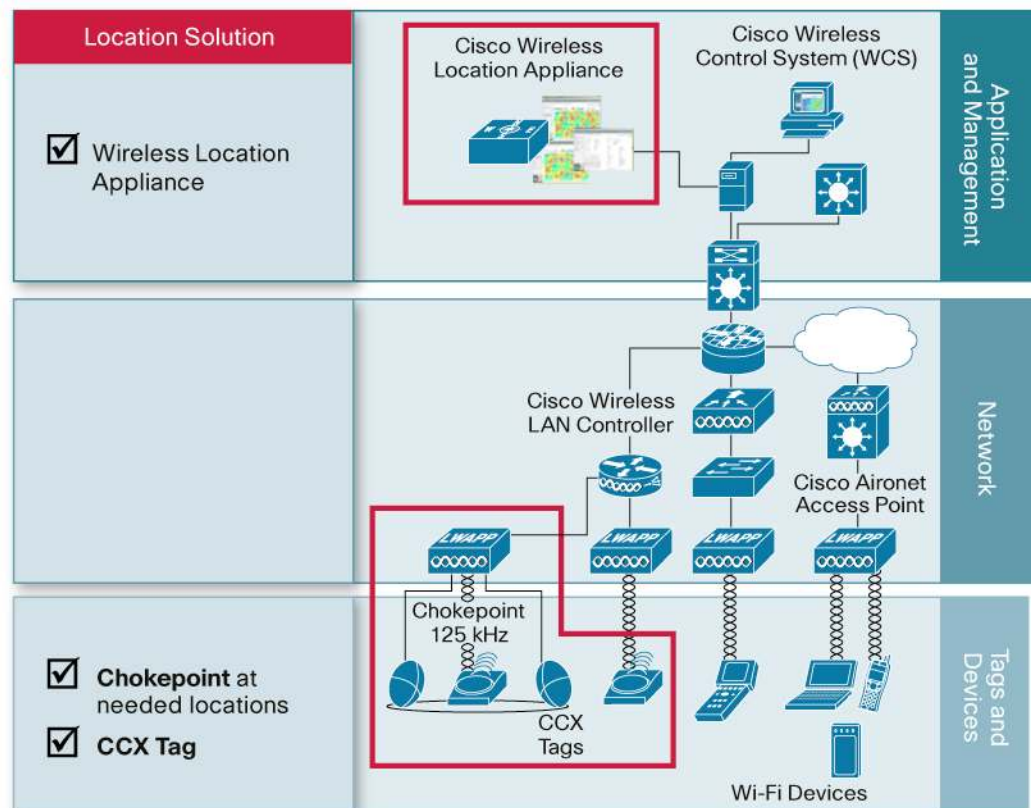
- Enhance visibility into WLAN usage to fine-tune capacity planning
- Locate unauthorized wireless devices to increase network security and accelerate response time
- Track a variety of mobile assets within the facilities to monitor processes and find opportunities to optimize them

In addition to helping locate devices on the move, some Wi-Fi tags also have telemetry capabilities and can sense information such 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 (such as transportation).

As part of the Cisco Location Solution, the Cisco Compatible Extensions program for Wi-Fi tags allows you to combine any application with any tag and benefit from the latest wireless innovations. All the vendors that are CCX compliant ensure that the location and, if applicable, telemetry information sent by their tags over the Cisco Unified Wireless Network will be captured and stored by the location appliance.

To promote further compatibility and flexibility, the Cisco Wireless Location Appliance offers an open API so third-party software developers can retrieve location and telemetry information and include it in their business applications. For example, inventory management software can connect to the Cisco Wireless Location Appliance and automatically update information such as the number of pieces of equipment stored, in which building they are, and at what temperature.

Figure 3. Cisco Location Solution Components



The Wi-Fi Location System offers the following features:

- Regular update of the location and telemetry information sent between the locatable device (Wi-Fi device or tag) and the reader (access point)
- Ability to have a long range between the locatable device and the reader
- Pervasive tracking of the location and telemetry information (over all the facilities)
- Calculation of location using an adaptive algorithm that reflects the environmental characteristics and enables locating an asset within 10 meters

Examples of location solutions that specifically require these features are:

- **Search for a lost locatable device:** The device could be anywhere in the facility so pervasive tracking is needed, as well as access to tracking information at any time (for example, when the device is needed or at the discovery of the loss).
- **Remote inventory:** When a vehicle arrives at the Wi-Fi-enabled facilities, its identification and the condition of the Wi-Fi tagged goods can be retrieved without manual intervention. The tags can send this information to the access points from a long distance.

Chokepoint Location System

For other applications though, different characteristics may be required:

- **The location accuracy may have to be higher than 10 meters:** if we have to locate an asset at the shelf level for instance
- **The location has to belong to a predefined set of places:** if we need to know in which building an asset is without the need to know exactly where in the building
- **The location information only have to be known at certain events:** if the access to inventory applications should be granted to the purchase manager on every time he enters the inventory room with his laptop

For these types of scenarios, another frequency can be used along with chokepoint technology¹. The chokepoint location system consists of multiple-frequency tags (Wi-Fi 2.4 GHz and a lower frequency) and chokepoints transmitting at the lower frequency.

As the multiple-frequency tags come close to a chokepoint, their lower frequency side receives energy from it and thus they transmit their location and telemetry information through the Wi-Fi side of the tag to the access point. A chokepoint location system presents the following characteristics:

- Location and telemetry information are updated on a per-event basis, such as when the tag is in proximity of the chokepoint.
- The locatable device and the chokepoint should be within a close distance.
- Location is deterministic and limited to certain zones; the predefined set of possible locations is equal to the set of the chokepoints locations.
- Highly accurate location is needed ranging from a few inches up to 2 feet or 60 centimeters depending on the vendor

Businesses with a Cisco Unified Wireless Network can thus benefit from the best of both worlds and deploy a Cisco Wireless Location Appliance for pervasive location and telemetry, while deploying chokepoint technology only where and when necessary to optimize their business processes.

Technology Partnerships

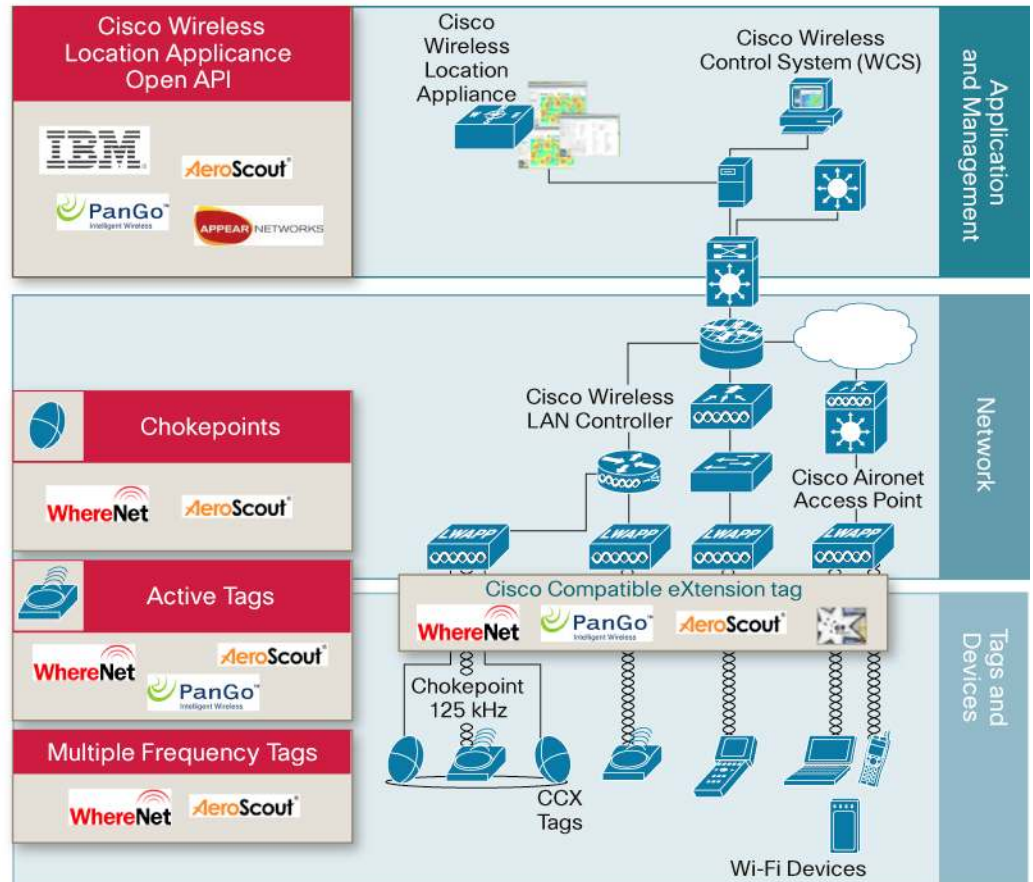
The Cisco Unified Wireless Network is a platform for multiple location technologies and for delivery of data, voice, and video applications anywhere in your facilities. Through the Cisco Technology Developer Program, the Cisco Location Solution offers multiple chokepoint solutions (with multiple-frequency tags and associated chokepoints), and Wi-Fi tags and applications that can interact with

¹ For more details, please refer to the white paper "How to Choose the Right Location Technology

each other even if they are from different vendors. You can thus choose the ideal technology to monitor and optimize your business processes.

Figure 4 shows some Cisco technology partners and their role in the Cisco Location Solution.

Figure 4. Cisco Location Solution Partners



Business Benefits

Safe Choice for a First Location Solution

The Cisco Location Solution is an excellent, safe choice for companies deploying their first location and telemetry solution. The equipment to be added is minimal (Cisco Wireless Location Appliance) and the management tool (Cisco Wireless Control System) is common with the WLAN. The implementation as well as the training should be fast and simple. In addition, the use of the Wi-Fi standard means that your business is not locked into a proprietary solution and can track all its Wi-Fi devices without additional cost.

As your company becomes more familiar with the solution and with process analysis, Wi-Fi tags can be added as well as telemetry information. And for more deterministic applications, chokepoints can be deployed to enhance the flexibility of the solution.

Maximize Network Utilization

The same Cisco Unified Wireless Network is used for two purposes now: connectivity and location. Instead of deploying two overlay networks, one WLAN and one with radio frequency ID (RFID)

readers and locatable devices, you can use a multipurpose network for greater efficiency and cost savings.

Management is also simplified in many ways: one network to maintain, one user interface to visualize the WLAN, and location and telemetry information for both Wi-Fi and chokepoint systems. There are fewer devices to manage because the wireless devices act as locatable devices as well.

Lower Total Cost of Ownership

Because the Cisco Location Solution can be implemented in stages, you can deploy a Wi-Fi location system for a pervasive use and later deploy chokepoints only where and when it makes sense. Without the integration offered by this solution, you would have to deploy a myriad of chokepoints in multiple locations across your facilities for a comparable result, but with more costs and maintenance.

Enhanced Security

Thanks to the coupling of WLAN management with location technology, unauthorized Wi-Fi devices can be spotted on the floor map of the Cisco Wireless Control System. These Wi-Fi devices become, by default, locatable devices as they transmit information to the access points. The Cisco Wireless Control System also has access to your network security policies and can detect and automatically locate rogue devices.

In addition, pervasive location allows your company to immediately locate its critical assets in emergency recovery situations.

Investment Protection and Solution Openness

The Cisco Wireless Location Appliance open API and the Cisco Compatible Extensions tag program help ensure that your Cisco Location Solution is open in multiple ways:

- The solution supports a combination of different tags even if they are not from the same vendors, allowing you to deploy the best technology to optimize your business processes.
- Your business can choose any applications it wants based on end-user requirements rather than network constraints, because the solution allows any application to be supported independently from the tags used.
- Because the Cisco Location Solution will support new tags and applications, your business can benefit from the latest wireless technology innovations.

Your investment in wireless technology is thus preserved and your location solution can evolve as new features are created and added.

How to Approach Process Monitoring and Optimization

As stated at the beginning of this paper, most companies outside of the supply chain and manufacturing industries are not familiar with process monitoring, analysis, and optimization. Here are a few recommendations on how to proceed when looking for a location solution.

A business analysis can help identify the parameters that make the greatest impact on your company's profit line. Focusing on the top parameters will simplify the approach.

When coordination between events, people, and assets is essential for profitability, a location

solution is often the answer. Industry experts among the worldwide network of Cisco partners can help perform this analysis.

Once you've deployed a system such as the Cisco Location Solution, you can learn a great deal by monitoring such things as the historical patterns of the location of mobile assets and telemetry information of diverse environments. This first phase of intense monitoring should familiarize your business with all the solution possibilities and how they relate to the processes that need to be optimized.

With this simple solution, most of your business processes can be optimized. However, some will require a different type of information and, at this stage, the addition of chokepoint location systems in strategic places is required.

Several deployments of the Cisco Location Solution show strong ROI across multiple industries.

Healthcare

"A quick glance at the screen shows exactly where the tagged wheelchairs are located... Patients wait no more than a few minutes for a wheelchair, and we save \$28,000 a month by eliminating searches." Nancy Radcliff, RN, Director of Customer Service, Bronson Healthcare Group

"Eventually we will start looking at things like patient tracking, refrigeration monitoring, and workflow logging. We are now starting to define the clinical workflows where active RFID would make sense, and where its current state of development can meet the requirements." Aaron Graves, senior IT technical consultant at Children's Hospital and Regional Medical Center (Children's) of Seattle, Washington

"If the pumps are on the network, we're able to find them. Before we'd have to spend time walking around, just trying to find pumps. Now, with the wireless tools we have, we can always see where they're located on the network-what floor and what unit. This saves us time, but more importantly, it's safer for the patients when we can keep track of their pumps." Susan Wilfong, director of technical services for information systems at NorthEast Medical Center

Hospitality

"The new equipment lets us find out exactly where our clients have been, tells us their radio levels, and provides intrusion detection-features that our previous system lacked," Gilbert Mendoza, IT security director at Pechanga Resort & Casino

Manufacturing

"In the factory, the ability to locate major parts and tooling on a timely basis is critical," James Farricker, chief network engineer and technical fellow at The Boeing Company.

For More Information

- For more information about the Cisco Location Solution, visit:
<http://www.cisco.com/go/location>
- For more information about the Cisco Wireless Location Appliance, visit:
<http://www.cisco.com/en/US/products/ps6398/index.html>
- For more information about the Cisco Unified Wireless Network, visit:
<http://www.cisco.com/go/wireless>



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