

How Condition Tracking Can Help You Monitor and Control Your Operational Processes

Executive Summary

When companies want to optimize business processes across several different networks, they turn to the Cisco® Context-Aware Mobility solution, which supports multiple applications such as condition monitoring, asset tracking, and presence. Condition-tracking applications allow organizations to monitor the environmental conditions that mobile or fixed assets are subject to. Parameters that can be measured include temperature, humidity, pressure, whether the item is in motion, and many more. Condition tracking applications are being deployed in many industries such as healthcare, manufacturing, and retail. Examples include temperature monitoring for medications, alert systems for assets in motion, and assembly line management. In addition, perishable goods can be monitored during transportation or storage and alerts can be sent when these conditions are not within acceptable ranges. Room conditions can also be monitored to maintain safety of personnel working in environments that are subject to low or high temperatures or help ensure that patients are comfortable in their hospital environment.

This document will provide an overview of condition tracking applications enabled by the Cisco Context-Aware Mobility solution. You will learn how condition tracking can be coupled with other applications such as presence and asset tracking for greater operational efficiency.

Background

Condition tracking applications are becoming more prevalent in the industry, with the increase in the number of location solutions being deployed. Condition tracking applications monitor the environmental conditions that assets are subject to such as temperature, pressure, and humidity. Companies are now able to answer the question: What is the condition of a mobile asset or environment?

Condition tracking is implemented with the use of wireless sensors, which collect and disseminate environmental data or data relating to the status of a mobile or static asset. Some sensors are already built into RFID tags, which also provide location information. In other cases, customers can choose from a variety of optional, sensors that can be added, such as sensors that detect motion or temperature, that are more relevant for their needs. In many cases, the use of sensors is coupled with asset management or presence applications.

In fact, the global market for RFID and sensor networks is projected to grow to US\$11.6 billion by 2012. Companies are looking for a more comprehensive view of real-world events, including the condition of products, mobile assets, and facility environments, and are thus combining sensor information with location, status, and other contextual information. This is in part because sensor technology has evolved so much and is becoming simpler and more affordable to implement.

Challenges

Today's businesses want to deliver unmatched customer service and make sure that their products and services truly meet customer needs. This is especially pertinent for enterprises, which need to monitor the condition of mobile assets and the environment throughout the entire

lifecycle of products, beginning in manufacturing and transportation continuing all the way to the final delivery for sales, where they are handled by employees and customers. Condition tracking is also applicable to healthcare and other industries that are focused on increasing efficiencies, ensuring business continuity, and improving customer service.

Increasing Efficiencies

IT organizations are constantly looking for ways to improve efficiencies in the mobile workplace for employees who are constantly on the road, visiting sales offices, telecommuting, or working in the warehouse. For example, transportation companies need to monitor events that increase gas consumption, decrease tire pressure to prevent additional maintenance, and avoid breakdowns. Another example is hospitals, which need to be more proactive by avoiding waste and monitoring storage conditions for expensive medications or frozen food.

Ensuring Business Continuity

Another concern for businesses is the need to maintain business and operational processes. This is crucial especially in manufacturing operations facilities, where operations managers need to be alerted when the business processes are delayed. They also need to be notified if equipment needs to be replaced and requires maintenance or when the temperature or humidity becomes too high or low for satisfactory conditions.

Improving Customer Service

Companies need to provide better customer service to increase customer loyalty and maintain revenue. For example, food manufacturers would like the ability to track the temperature for inbound shipments and be alerted when perishable goods go beyond a certain threshold to avoid shortages or automate replenishment. Companies also need to maintain good working conditions for employees who are subject to working in environments that have significantly high or low temperatures; they also need to determine if certain appliances like ovens and freezers are on or off. This is also relevant for hospitals, which must maintain specific room temperature levels to help ensure patient comfort.

Technology Overview

Condition tracking is one of the applications supported with the Cisco Context-Aware Mobility solution, which enables organizations to dynamically capture and use contextual information from mobile assets to optimize, change, or create communications flow and business processes. The contextual information is automatically collected using the wireless connectivity of RFID tags that are attached to mobile assets that do not have wireless connectivity. These Wi-Fi tags have started to integrate sensor capabilities to combine both location and condition information that is sent across the wireless network. Companies are using these tags to track the information associated to mobile assets and trigger real-time alerts based on rules that are defined to a mobile asset. Sensors can provide data about status, tampering, quantity, and distance traveled, if the asset is in motion or not, and any other information relevant to the business process and applications. Sensors can also be placed in fixed locations like in a refrigerator or storage room. They can be also applied to rooms, zones, and other indoor or outdoor areas with network connectivity.

The most common sensors used today provide information about:

- **Temperature:** Creates a wireless alert when the temperature is above or below a certain threshold

- **Pressure:** Transmits pressure sensor data that is above or below a certain threshold
- **Humidity:** Transmits humidity information that can be a critical requirement for food or other storage
- **Status:** Communicates any general status string to applications
- **Fuel:** Measures the amount of fuel left in a system
- **Quantity:** Detects a quantity of elements, such as how many items are in a container
- **Distance:** Sends the distance traveled
- **Motion:** Provides transmission control data based on movement of the tag
- **Tampering:** Triggers a notification in real time if a Wi-Fi tag is removed from an asset that is being monitored
- **Battery status:** Measure the percentage of remaining battery life

Some Wi-Fi tags also have one or two call buttons attached to the exterior that can be configured for any action that a business needs to take when the button is pushed. For example, it is possible to set up an alert for maintenance or for equipment replenishment. Call buttons can be combined with other sensors in the same Wi-Fi tag.

Examples of Industry Applications

Healthcare

Hospitals are challenged with finding solutions that will improve the quality of patient care while monitoring and optimizing the processes throughout the entire hospital. Nurses and caregivers need to monitor the condition of mobile assets such as prescriptions that are kept in storage cabinets or medications that are kept in refrigerators. If a nurse forgets to put the medication back in the refrigerator, she can receive an alert letting her know that the temperature may be too high and that she needs to put the medication back into the refrigerator. In the event that the nurse cannot locate the medication, she can use an asset tracking application to find where the medication is in the hospital.

Hospitals are also trying to improve the quality of patient care by monitoring the temperature and humidity information of a room to help ensure that patients are as comfortable as possible. In addition, IT and caregivers are also finding benefits from call buttons that are placed on Wi-Fi tags. Call buttons can be set up to alert maintenance when they need to replace or clean items such as infusion pumps, beds, or other medical equipment.

Manufacturing

In a manufacturing environment, it is crucial to ensure the business continuity and maintain operational safety. Many parts become lost easily, so maintaining inventory and determining if machinery needs to be replaced is essential. Adding condition tracking to inventory management will help companies monitor the condition of pallets, dollies, and shipping containers as they move through the supply chain. Complex production processes in factories where equipment or chemicals must stay within predefined conditions can also be monitored closely and corrective actions taken as soon as a negative trend is noticed. Manufacturing plants can produce more consistently high quality with a better cost control. By tracking the condition of manufacturing assets proactively, organizations can increase the life of the equipment to help reduce costs. They

can also increase business continuity by implementing proactive measures that prevent breaks in the assembly line and avoid late delivery penalties.

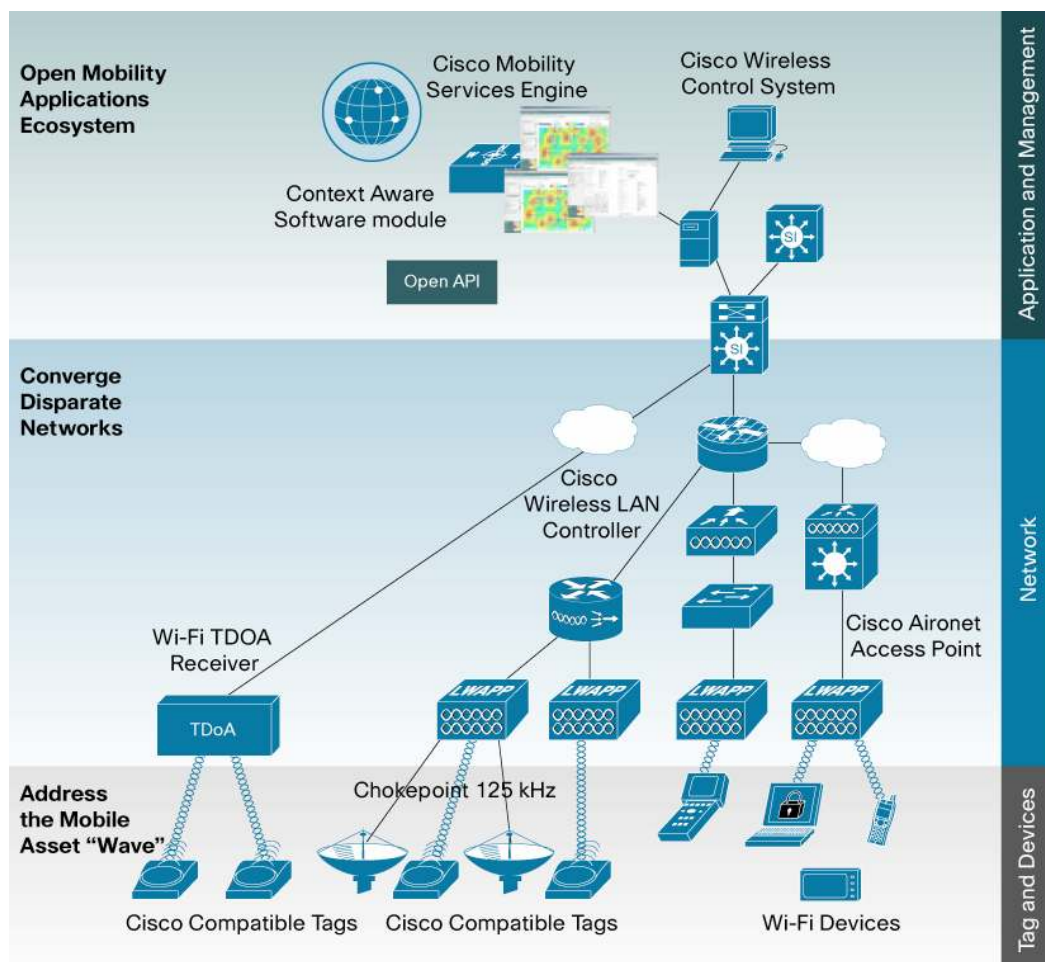
Retail

Retail stores are challenged with providing the best quality of goods and improving customer satisfaction to generate customer loyalty and increase business. Condition tracking helps to meet all of these goals through sensors that monitor the condition of goods. For example, consumers will be more likely to find fresh food products since the staff can be alerted when the temperature and humidity of perishable goods exceeds a specific threshold. Some retail stores have also coupled condition tracking with asset-tracking applications to keep track of inventory by adding RFID tags to shelves as a way to monitor stock levels. Applications to help prevent theft are being used increasingly as well—for instance, employees can receive an alert when an item is in motion or when a Wi-Fi tag has been tampered with or removed. This is especially useful for high-valued items such as wide-screen televisions.

Context-Aware Solution Components

To deploy a Cisco condition-tracking solution, the Context-Aware Mobility solution must be in place to support this application. Figure 1 illustrates the Cisco Context-Aware Mobility solution architecture.

Figure 1. Context-Aware Mobility Solution Architecture



The components of the Cisco Context-Aware Mobility solution used for condition tracking are:

- **Mobile assets that could be manufactured by Cisco technology partners, including Wi-Fi tags:** A Wi-Fi tag is an RFID tag that is attached to a mobile asset and connects to the WLAN so that contextual information about the mobile asset can be captured.
- **[Cisco Compatible Extensions program for Wi-Fi tags](#):** This program, which is open to Cisco technology partners, helps to ensure that tags comply with a predefined format so that advanced information such as temperature, humidity, and motion are captured and available to the rest of the solution, including business applications from other Cisco partners.
- **[Cisco Unified Wireless Network](#):** This multipurpose network is the only unified wired and wireless network solution to cost-effectively address the wireless network security, deployment, management, and control issues that businesses face, in addition to their needs for context aware information.
- **[Cisco Mobility Services Engine](#):** This platform hosts the [Cisco Context-Aware software](#) that captures, stores, and analyzes contextual information from multiple wireless networks. RSSI software can be used to locate devices and tags that are indoors. TDOA software is used in conjunction with TDoA receivers that are placed outdoors or in RF challenging environments. Chokepoints are typically deployed along zones of interest or doorways for the business applications.
- **Cisco open API:** Once all the contextual information has been captured, calculated, and stored by the Cisco Context-Aware software, it can be made available to any business application that needs it by means of the Cisco open API. Cisco's open API is based on the Simple Object Access Protocol/Extensible Markup Language (SOAP/XML) protocols. Access to this API is available to any Cisco technology partner and allows a full integration into customers' business processes.

Business Benefits

With condition tracking, companies can gain more visibility and make better decisions for their operational processes. This will ultimately help to deliver better customer service, increase efficiency, and improve the safety of employees. Critical business benefits are:

- **Monitoring and optimizing business efficiencies:** Monitoring production conditions, for instance, in manufacturing can accelerate the delivery of an order and optimize the quantity of inputs needed. It also prevents operational disruption by automatically alerting the necessary party, such as an operations manager, IT staff, or nurse to ensure processes are on track for optimal business continuity. Deploying condition tracking can also help to improve the safety of employees by making it possible to monitor environmental conditions such as temperature and humidity and to determine whether an appliance is on or off.
- **Maximize customer satisfaction:** Condition tracking enables better customer service by monitoring the condition of goods such as perishable food, prescriptions, chemicals, or objects that are subject to complex manufacturing, transportation, and storage processes. Providing quality service—whether it is for patients, consumers, or partners—is crucial to the success of a business.
- **Lower cost of ownership:** Condition monitoring can be combined with other contextual applications such as asset tracking and presence. Being able to centrally manage the

location and the condition of mobile assets not only improves productivity, but also saves valuable time spent on manual processes.

Implementation Notes

Network Connectivity

Companies interested in implementing condition tracking for a fixed asset will need to have basic wireless LAN coverage in the area near the fixed asset. Companies interested in tracking conditions while the asset is mobile will need to have a pervasive wireless LAN in the facility or coverage wherever the asset will be.

Combining condition tracking with other applications such as [asset tracking](#) or presence will have additional network requirements. Please refer to the [Context-Aware Mobility website](#) for more information on these applications.

Cisco Compatible Extensions Program for Wi-Fi Tags

Customers with a Cisco Context-Aware Mobility network infrastructure can purchase Cisco compatible Wi-Fi tags with sensor capabilities. With the [Cisco Compatible Extensions program](#), customers can benefit from the latest innovation and technology advances offered by Cisco technology partners. This program also offers improved consistency and compatibility and allows customers to choose Wi-Fi tags from multiple partners. It also supports third-party applications, enabling companies to choose applications based on end-user requirements rather than network constraints.

For More Information

For more information about the Cisco Context-Aware Mobility solution, visit:

<http://www.cisco.com/go/contextaware>

For more information about the Cisco Compatible Extensions program, visit:

http://www.cisco.com/web/partners/pr46/pr147/ccx_wifi_tags.html

As a Cisco partner, find more information on the Cisco open API at: http://www.cisco.com/cgi-bin/dev_support/access_level/product_support

For more information about the Cisco Mobility Services Engine, visit: <http://www.cisco.com/go/mse>

For more information about the Cisco Unified Wireless Network, visit:

<http://www.cisco.com/go/unifiedwireless>



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