

## Enable Inventory and Zone Management Applications through Cisco Context-Aware Mobility Solution

### Executive Summary

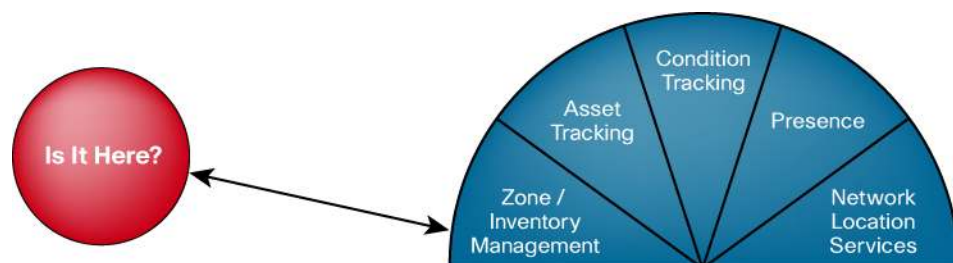
An “inventory” is a list of goods and materials that a business keeps in its stock. The nature of these goods and materials varies widely by industry—for example in the case of a manufacturing facility, inventory could mean the finished products in their warehouse, whereas the inventory in a retail store would be their merchandise. In other industries such as in Healthcare, the definition of inventory can also be expanded to include people such as caregivers or patients in addition to goods such as medical equipment. This becomes increasingly relevant as you want to ensure that caregivers are available in the facility for prompt patient service. Whatever the actual nature of the “inventory” in question, businesses in all industries need to track and manage their inventory for financial (expense tracking) and accounting (depreciation) purposes as well as productivity (availability for use) purposes.

The Cisco<sup>®</sup> Context-Aware Mobility solution provides business processes with information on the assets and resources in response to questions such as the following:

- Is it here?
- Where is it?
- What is its condition?
- What is its status? And
- Where in my network is it?

This document will focus on the ability of the Cisco Context-Aware Mobility solution to provide information in answer to the “Is it here” question to enable zone and inventory management applications. A “zone” is any area defined by the business that the business wants to monitor. The figure below shows the different applications supported by the Cisco Context-Aware Mobility solution.

**Figure 1.** Keeping Track of Your Inventory—Is It Here?



## Business Challenge

Most industries today are characterized by cost pressures, stringent regulatory environments and customers demanding improved responsiveness. As businesses look to automate their processes for improved efficiency, there is an urgent need to increase asset and resource visibility so that they can be optimally utilized. Today, in a majority of industries asset management is primarily a manual process and as a result it is inaccurate, time consuming and error-prone. Also, the inability to access the asset information in real time and ensure its availability when needed impedes the business in taking prompt action or making decisions, thereby negatively impacting profits and sales.

Corporate WLAN technology implementations along with Wi-Fi devices have been increasing over the past years primarily to enable mobile employee connectivity. This document will provide additional solution options for inventory and zone management applications to improve asset visibility. The options described here are the ones that businesses can take advantage by extending their investment in the Cisco Unified Wireless Network.

## Solution Overview

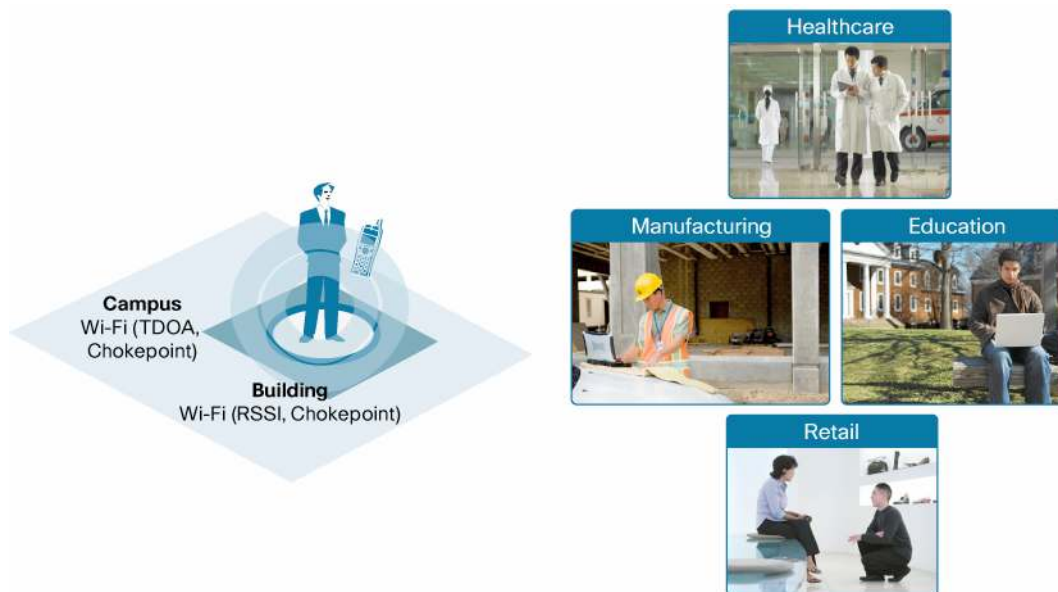
The Cisco Context-Aware Mobility solution comprises technologies such as received signal strength indication (RSSI), time difference of arrival (TDOA) and chokepoint that work in conjunction with the Cisco Unified Wireless Network to enable the location of assets or resources for inventory or zone management applications in indoor, high ceiling and outdoor environments.

- **RSSI:** In the case of RSSI, the location of the asset or resource is calculated based on an algorithm using the strength of the Wi-Fi radio signal emanating from the asset as an input. This technology is primarily used for locating assets indoors and in less challenging RF environments. The Wi-Fi radio can be placed in either a tag device that is attached to the asset such as a wheelchair or it could be in the client device itself such as a tablet PC that is carried by the end user.
- **TDOA:** The TDOA technology for context awareness is based on another algorithm that is primarily applicable in outdoor or RF challenging environments for instance in places like warehouses that have high ceilings. The Cisco Context-Aware Mobility solution uses this technology to provide the location of assets such as forklifts and cars that have tags attached to them and that may be located in an outdoor parking lot.
- **Chokepoints:** To use the chokepoint technology, a tag that can detect the chokepoints has to be placed on the asset or resource. When the asset and thus the tag get close to the chokepoint, it signals it to the Wi-Fi network. The communication between the chokepoint and the tag also helps determine if the asset is entering or exiting the pre-defined zone.

The choice of the right technology RSSI, chokepoint or TDOA technology, for inventory or zone management really depends on the nature of the business problem being addressed. Access to the location data provided by the Cisco Context-Aware Mobility solution can be integrated into the company's business applications through an open API.

Let's take a look at some sample business scenarios illustrating the applicability and benefits of these technologies in different industries, as shown in Figure 2.

**Figure 2.** Inventory/Zone Management by Industry



### Healthcare

**Business problem:** In the case of a hospital, the nursing staff may need to know that the minimum number of physicians is available in the Intensive Care Unit (ICU). If that number drops, they then need to issue an alert so that the staffing requirements can be maintained. The physicians in this case would represent the “inventory” that the nursing staff is tracking and the “zone” being monitored is the ICU.

In addition, hospitals also need to help ensure the security and optimal usage of high value medical items (inventory) such as infusion pumps. To enable this, they may define their storage rooms as “zones” which they then monitor to track the equipment as it enters or exits the zone. If an infusion pump is not returned to storage for cleaning within its designated time, the relevant staff needs to be alerted so that they can determine if the pump has been stolen or just misplaced.

A hospital ward may be another zone that the nursing staff may track to help ensure patients don't leave it un-aided or without authorization.

**Solution:** To address the business problems listed above, healthcare organizations can use the Cisco Context-Aware Mobility solution to track the physicians via their Wi-Fi client devices (notebook computers, dual-mode phones or Wi-Fi PDAs) or badges that will act as tags. They can integrate this information into the corporate directory so that the physicians can be contacted easily when appropriate and needed. Zone or inventory management applications based on the Cisco Context Aware Mobility solution can also be used for monitoring high-value equipment or patients by placing tags on them.

**Benefits:** Some critical benefits of zone or inventory management applications in healthcare include optimal utilization of the hospital staff and assets and improved security measures for valuable medical equipment as well as patients leading overall to better cost control and patient service.

## Manufacturing

**Business problem:** Manufacturing facilities are typically large and spread out between indoor and outdoor locations. They also have challenging RF environments due to tall ceilings and the presence of metal equipment, industrial fans and other sources of RF interference. To illustrate a sample zone management application in manufacturing, these facilities can be characterized by “zones” primarily for security purposes depending on the cost of the equipment in that zone and the skill set required to operate it. To help ensure the safety of the staff (for example, in nuclear facilities) some of these “zones” can be designated as off-limits for people without the proper authorization. Furthermore, given the large area of the facility, plant managers need to know that the relevant number of personnel and specialized equipment (such as spectrum analyzers in a semiconductor facility) are present to ensure optimal utilization of the plant

**Solution:** The challenging RF environment of the manufacturing facility can be supported by the Context-Aware Mobility solution to keep track of the specialized equipment or inventory available in the facility. By placing tags on the assets, the plant manager can visualize the location of the assets within the facility. The Cisco Context-Aware Mobility Solution also enables the creation of special “zones” as mentioned above to prevent unauthorized access. The inventory or zone management application can also be combined with another application such as [condition tracking](#) that uses the Cisco Context-Aware software to track the condition of the inventory such as its temperature, humidity and so on.

**Benefits:** Zone management enables the manufacturing facility to meet its regulatory and safety requirements by maintaining stringent control over access to unauthorized zones.

## Education

**Business problem:** In the case of educational institutions, the “inventory” being managed could be the servers in the computer labs as well as the staff and enrolled students who spend a large percentage of their time on campus. Staff and student security is a key priority for educational institutions especially in the case of any emergencies. As a result the institution may define “zones” by department, building or even dormitories so that they can locate people quickly and communicate with them easily. Another potential zone could be the classroom so that the faculty can automatically track which students are in attendance in their class.

**Solution:** Educational institutions can leverage the Cisco Context-Aware Mobility solution to define the zones highlighted above. By tracking the Wi-Fi client devices used by the students and faculty, the administrative staff can identify in real time if any students are left behind in case of an emergency evacuation. The IT staff can also monitor their computer labs “zones” by using Cisco Context-Aware Mobility Solution and issue alerts in case of any security violations.

**Benefits:** Zone and inventory management applications provide accurate location information on the assets, faculty and staff within the predetermined zones, thereby enabling educational institutions to better track them for improved security and communication.

## Retail

**Business problem:** Zone or inventory management is a critical application in retail as it can directly impact customer service and satisfaction. Retailers would like to know about the presence of buyers in a particular department so that they can automatically push product information and promotions to their Wi-Fi devices. They also need know the availability of valuable assets such as scanners or reusable crates and forklifts to prevent thefts and improper handling or track if their

inventory levels are low resulting in potential missed sales. To enable inventory or zone management, a retailer could define a store room or a specific department within the store as a zone.

**Solution:** The Cisco Context-Aware Mobility solution can help to define the zones as mentioned above to prevent the unauthorized access of goods or their removal. It can also track products leaving the warehouse and then issue alerts if the stock levels drop below the permissible level. Furthermore, the solution can enable the tracking of Wi-Fi client devices (PDA's, dual mode phones) being used by the shoppers to push the relevant information to them based on their location within the store. When combined with other applications enabled by the Cisco Context-Aware Mobility solution such as Presence, a sales clerk can locate and contact their sales manager in a timely fashion to either report any alerts or provide service to a customer or use [Condition Tracking](#) to get the status of their merchandise.

**Benefits:** Retailers can greatly benefit from inventory or zone management applications enabled by the Cisco Context-Aware Mobility solution by leveraging it to improve customer satisfaction and improve security.

### Deployment Considerations

Let's look at some deployment considerations for businesses implementing inventory and zone management applications.

The first step towards deploying these applications is the definition of the zone. The zone is the specific area in which asset availability needs to be tracked in response to the question "Is It Here?" i.e is the asset within the zone or not. The size of the zone could vary from a university campus all the way down to a specific shelf inside a manufacturing warehouse.

Let's consider the need for asset availability information within a larger zone, for example the 5th floor in a multi-storey hospital. The minimum network requirements in this scenario would be to ensure WLAN connectivity within this pre-defined zone so that asset visibility is not impacted by dead spots in coverage. The Wi-Fi radio in the asset (tag or the client device) would then interact with the wireless network on the 5th floor signaling the assets presence. If the asset leaves this zone, the network no longer receives a signal from the asset and would hence infer that the asset is not in the zone. In either case, the business application would have an answer to the question "Is It Here?". This deployment uses the basic data network connectivity available within the zone with minimal or no specific network changes. As a result, businesses can benefit from zone and inventory management applications in an easy and cost effective manner.

For scenarios where the business application needs more immediate notification as the asset enters or exits the zone, for example a ward in the hospital, chokepoints can be deployed at the entry and exit points to the ward to capture asset information as the tags cross them. Chokepoints are also relevant in situations where the size of the zone is very small, for example a shelf or rack in a warehouse. In these cases chokepoints placed on the shelf provide information on whether the asset is located on that shelf.

Furthermore if business applications need an answer to the question "where is it?" in addition to "is it here?" within the zone, then the RF deployment may have to be optimized to enable better location accuracy. For example, if a doctor is not available within the zone, then answering the question "where is it" will provide information on the next closest zone where the doctor may be available. Additionally RSSI based location tracking can be deployed for indoor environments to identify the specific area within the zone where the asset is present. For high-ceiling, outdoor and more challenging RF environments, TDOA receivers can be used to get more accurate asset

location information. As the need for accuracy keeps increasing, the deployment density of the access points should also be designed accordingly so that the location information can be calculated more precisely.

All the deployment scenarios mentioned above for inventory or zone management applications can also serve as the foundational implementation for leveraging other applications such as condition tracking and asset tracking.

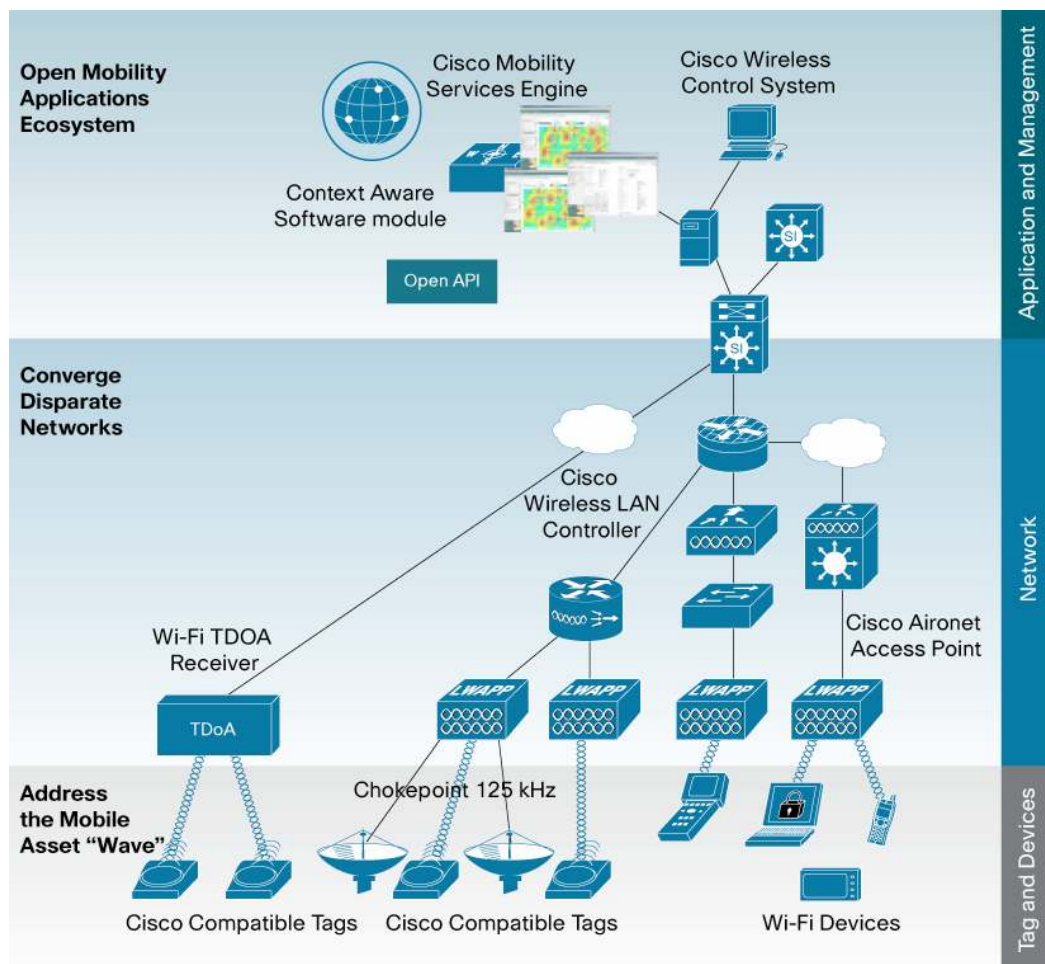
### Inventory and Zone Management Solution Components

The typical components of an inventory and zone management solution include the following:

- **Cisco Context-Aware software:** This is software located on the Cisco Mobility Services Engine that captures, stores and analyzes contextual information from multiple wireless networks. Depending on the application requirement, the Cisco Context Aware software works in conjunction with the following elements for location tracking:
  - **TDOA receivers:** These are primarily used for outdoor or RF challenging environment and compute the location of the tag
  - **Chokepoints:** Chokepoints use a different frequency than Wi-Fi and are deployed along zones of interest for the business applications. They act as exciter for tags that come in a close range from them. These tags, in turn, send a notification via WLAN to the Cisco Mobility Services Engine along with the contextual data they have captured
- **Mobile assets:** These could be devices or tags manufactured by Cisco technology partners and certified as part of the Cisco Compatible Extensions Program.
- **Cisco Unified Wireless Network:** The Cisco Unified Wireless Network is a pervasive network deployment including Cisco Aironet<sup>®</sup> Access Points, wireless LAN controllers and the Wireless Control System
- **Cisco Mobility Services Engine (MSE):** The Cisco Mobility Services Engine hosts the Context Aware software and is an integral part of the Cisco Unified Wireless Network. It is an appliance based, open API platform based on the Simple Object Access Protocol/Extensible Markup Language (SOAP/XML) and it allows the integration of network enabled context aware information into business applications.

The Cisco Context-Aware Mobility solution is based on the Cisco Mobility Services Engine hosting the Context Aware software and is a part of a Service-Oriented Networking Architecture (SONA) for enterprises, to build an adaptive, agile, intelligent network that will serve as the platform for enabling life's experiences (Figure 3).

**Figure 3.** Cisco Context Aware Mobility Solution Architecture



### For More Information

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

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

To learn more about Cisco customers who have deployed the Cisco Context-Aware Mobility solution, visit: [http://www.cisco.com/en/US/products/ps6386/prod\\_case\\_studies\\_list.html](http://www.cisco.com/en/US/products/ps6386/prod_case_studies_list.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](http://www.cisco.com/cgi-bin/dev_support/access_level/product_support)

For more information about the Cisco Mobility Services Engine, go to:

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

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

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



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