

## Cisco Context-Aware Mobility Solution: Put Your Assets in Motion

How Contextual Information Can Drastically Change Your Business Mobility and Allow You to Achieve Unprecedented Efficiency

### What You Will Learn

Context-aware mobility—the ability to capture and integrate into business processes detailed contextual information about things such as location, temperature, the availability of an asset, and applications used—is fast becoming the next level of true enterprise mobility. With the Cisco® Context-Aware Mobility solution, mobile users can go beyond simple anytime, anywhere connectivity to automatically having the right device, the right application, and the right environment while on the go. They will now be able to answer business-critical questions about both mobile assets and the users of those assets, and hence directly improve their organization's profitability.

This solution overview introduces the different technologies required to deliver context-aware mobility. It also explains and provides examples on how the Cisco solution can be deployed to empower their mobile workers by providing them with unprecedented insight into corporate assets.



### Challenges

Today over 10 million subscribers are using location-based services. However, with more than 300 million subscribers expected by the end of 2011, the technology and its market adoption are clearly at a tipping point. Considering that location is only one of the many contextual parameters your business can gather about mobile assets—others include environmental temperature or humidity, or whether an asset is static or in motion—the potential for intelligently coordinating those assets and increasing business efficiency is tremendous.

But to deliver a full context-aware mobility experience, several challenges have to be overcome. Indeed, collecting information for each mobile asset manually is time consuming, introduces errors and delays, and cannot scale with an ever-increasing number of assets, such as laptops, smartphones, tagged wheelchairs and infusion pumps in hospitals, as well as pallets and hand tools in plants or sticker applicators in retail stores. In addition, business processes often encompass multiple networks such as Wi-Fi, outdoor mesh, cellular, or GPS, and retrieving

information from disparate networks increases the chance of losing some information or adding delay to the information exchange process. Because of these limitations, business applications that should follow mobile workers usually do not have access to the relevant information at the right time and from the right place. The only alternatives today are costly, tailor-made adapters developed by application integrators. Such adapters cannot encompass all the possible combinations and need to be updated every time a change is introduced in one of the networks, APIs, or devices.

Finally, to fully benefit from contextual information about mobile assets, several technologies have to be used simultaneously and in complementary ways. For instance, to automate the capture of information of information about an asset, the processes that collect the information need to be always active. Information capture has to happen throughout the whole business process and across all the wireless networks involved, regardless of the different technologies involved. A fully automated system makes a more comprehensive set of data available, especially as compared to manual records that are usually limited to a few basic parameters.

### Context-Aware Mobility Defined

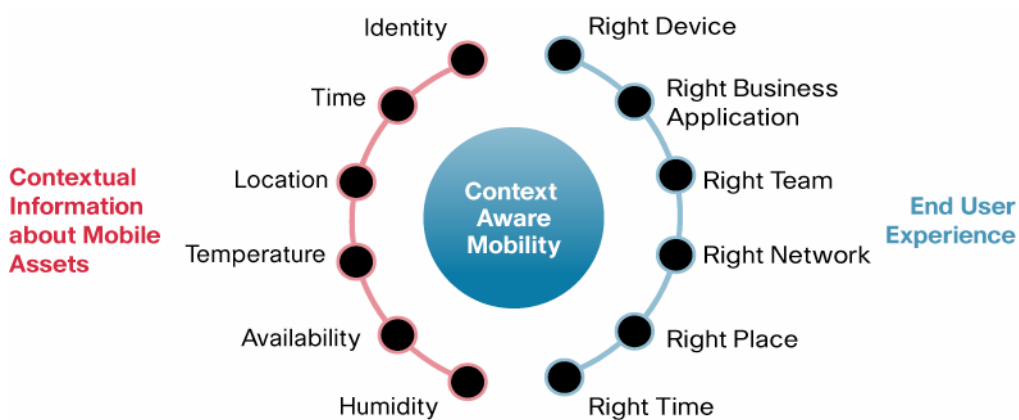
A context-aware mobility Solution is the ability to capture contextual information via wireless devices and networks and to analyze it and use it in order to mobilize business applications either by updating inputs in real time and by optimizing the user interface for the working environment. Thanks to Cisco's Context-Aware Mobility Solution, mobile workers can make better decisions and corporations can have more comprehensive and accurate insight into their business.

Contextual information should be collected for any mobile asset involved in a business process, and this includes not just devices and products but also people. For instance, a mobile asset can be a worker, a customer, or a patient, or it can be a pallet of finished goods, a vehicle, a work in progress on a conveyor belt, a chemical substance flowing in a pipe, a pouch filled with blood or medication, or medical equipment like infusion pump and wheelchairs.

The data collected about the mobile asset may include its identification information (for example, its radio frequency ID [RFID]), the date and the time of the day, its physical location, the surrounding temperature, humidity, or pressure, if the asset is in motion or not, and any other information relevant to business processes and applications.

Figure 1 summarizes some of the kinds of contextual information that can be collected and the benefits to end users.

**Figure 1.** Context-Aware Mobility Solution Logic



This information is captured over a wireless network. If the mobile asset is a wireless device like a laptop or a phone, the information will be directly sent from the device radio module over Wi-Fi, cellular, or any other technology. When the mobile asset does not have a radio capability, wireless tags can be attached to it to collect the parameters needed. Some advanced parameters such as temperature, pressure, humidity or motion require a sensor to be present on the wireless tag or device itself.

Once collected and stored, an intelligent mechanism analyzes the sensor data and defines rules to give the relevant information to the right business process in order to deliver a true mobile experience for the user.

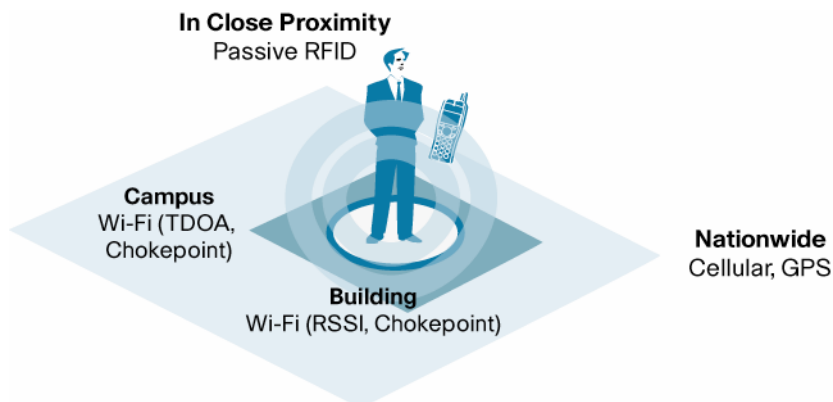
As an example, consider the following scenario: An alert is sent to the IT team as the wireless sensor on laptop L, running in building A, registered abnormal temperatures. When the member of the IT team arrives in building A, his or her mobile device automatically opens a map of building A and helps locate L. Once the IT staff member is close enough to L, the associated case report appears on the screen, accelerating the process and reducing the chance for error. If in the meanwhile, another IT case opens and is located in building A, the same IT staff member is notified. Thus the contextual information is used to optimize the team's resources and speed up resolution of the problem. The result is increased customer satisfaction.

### **The Technologies Used to Deliver Context-Aware Mobility**

Typically, several wireless networks have to be used during execution of the same business process and thus for the same context-aware mobility solution. As the most widely adopted wireless technology is Wi-Fi or wireless LAN (WLAN), we will provide more use cases for it, but Wi-Fi mesh, WiMAX, cellular, or GPS networks can also be used when devices, tags, and sensors with the proper radios are available, as shown in Figure 2. A variety of context-aware technical solutions using Wi-Fi or other wireless networks can be deployed running standalone or simultaneously. For detailed information about other context-aware technical solutions in addition to Wi-Fi, see the following white paper: [The technologies behind a Context-Aware Mobility Solution](#).

Wi-Fi is often the wireless network used because of its high penetration rate in corporations and the wide availability of devices with Wi-Fi radios. Wireless devices, tags, or sensors send the contextual information they collected via WLAN, and the network, in turn, uses these signals to calculate the location of the assets. The algorithms used vary depending on the RF environment and the accuracy needed for a specific application. For indoor applications, algorithms are often based on received signal strength indication (RSSI). For outdoor or high ceiling environments such as warehouses, time difference of arrival (TDoA) is often most appropriate.

**Figure 2.** Different Context-Aware Technologies



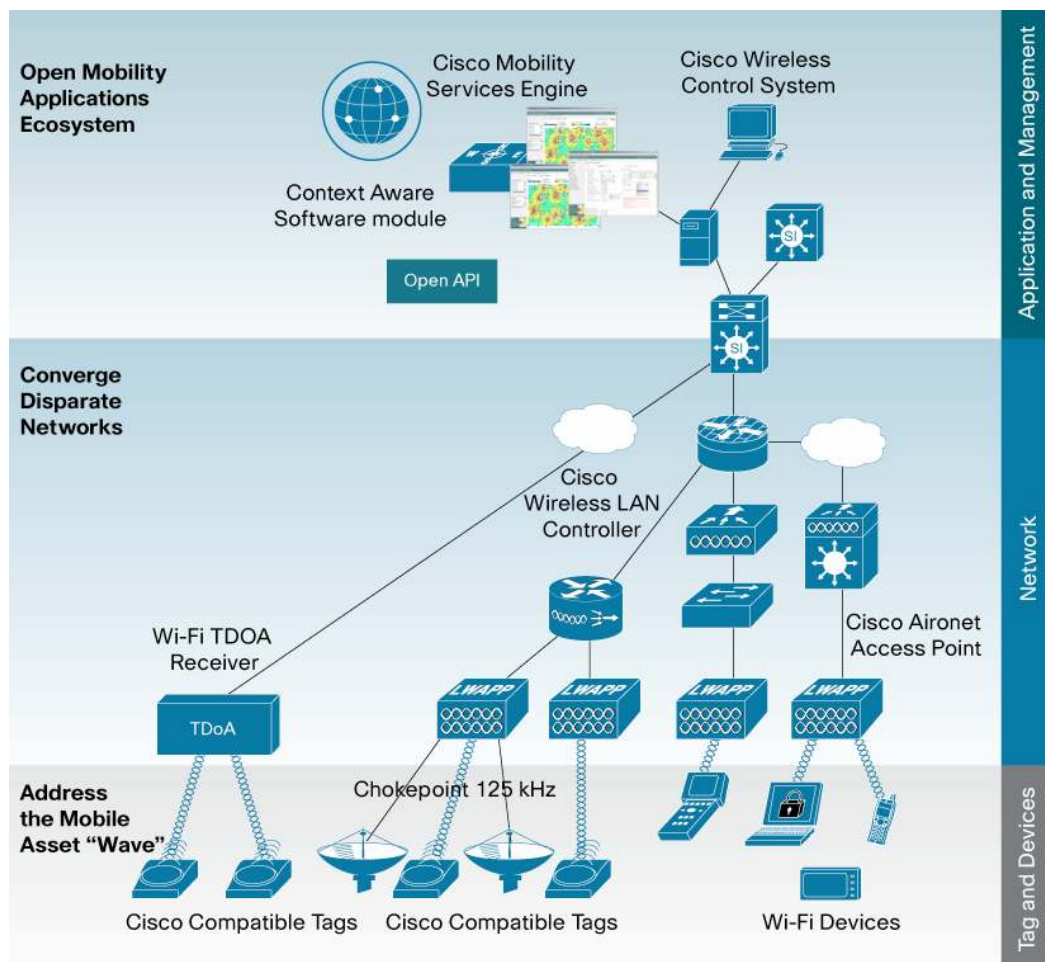
The location of a mobile asset is not always the information relevant to the business application. In many cases, business processes need to know only if an asset is in or out of a zone (room, parking place, and so on). Chokepoints can be used to define a zone, monitor it, and immediately send alerts to the appropriate applications as wireless tags enter or leave the zone.

Sensor capabilities can be directly embedded into tags in order to link the data captured (for instance, motion or temperature data) with the location of the mobile asset, but this is not mandatory. Sensors can also be placed in fixed locations like a refrigerator or a storage room.

### Cisco Context-Aware Mobility Solution

As Figure 3 illustrates, the Cisco Context Mobility Solution can support all the technologies just described in a modular way to adapt to customer needs.

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



The different components of the Cisco Context-Aware Mobility Solution are:

- Mobile assets that can be devices or tags manufactured by Cisco technology partners.
  - **Devices:** Any Wi-Fi device that connects to the WLAN can have its associated contextual information captured.
  - **Tags:** Any Wi-Fi tag attached to a mobile asset and that connects to the WLAN can have its associated contextual information captured
- **Cisco Compatible Extensions program for tags:** This Cisco program, open to technology partners, helps ensure that RFID tags comply to a predefined format so that the advanced information they send (such as motion, humidity and other parameters) is captured and made available to the rest of the solution, including business applications from other Cisco partners.
- **Cisco Unified Wireless Network:** This multipurpose network is also 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 providing context-aware mobility.
- **Cisco Mobility Services Engine:** This platform hosts the [Cisco Context-Aware software](#) that captures, stores, and analyzes contextual information from multiple wireless networks.

- **RSSI:** This technology running on the Cisco Mobility Services Engine can be used for devices and tags that need to be located indoors. It is based on the signal sent from the mobile asset to the different access points deployed in the facilities.
- **Chokepoint:** Chokepoints use a different frequency from Wi-Fi and are deployed along zones of interest for business applications. They act as excitors for tags that come in a close range of them. These tags, in turn, send a notification over the WLAN to the Cisco Mobility Services Engine, along with the contextual data they have captured.
- **TDoA:** This technology, which also runs on running on the Cisco Mobility Services Engine, is used in association with TDoA receivers that are placed outdoors or in the challenging RF environments in which some mobile assets must be located.
- **Sensor data:** This type of data depends on the sensor capabilities. The information is sent over the WLAN and captured by the Cisco Context-Aware software module thanks to the Cisco compatible format.
- **Cisco open API:** Once all the contextual information has been captured, calculated and stored by the Context-Aware software module, it can be made available to any business application that needs it through the Cisco open API, which is based on Simple Object Access Protocol (SOAP) and XML protocol. Access to this API is available to any Cisco technology partner and allows a full integration into the business processes of customers.

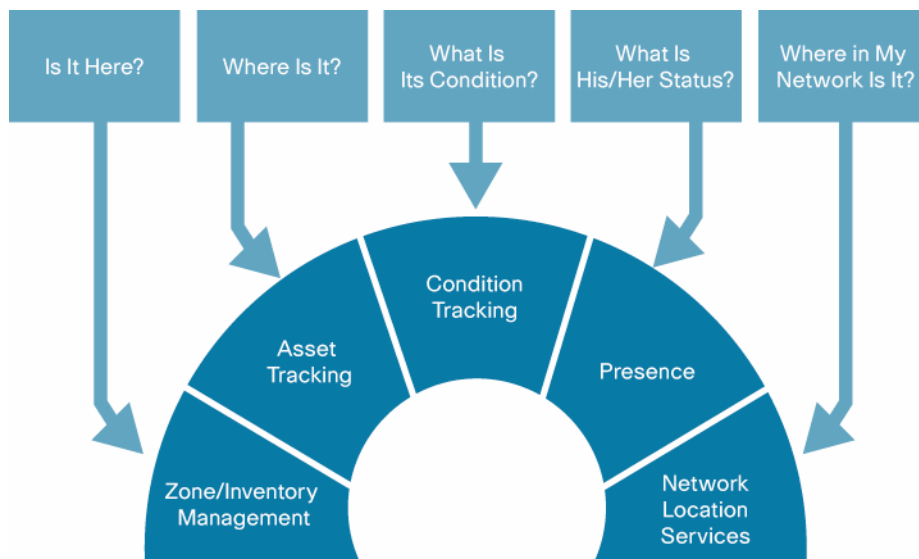
The Cisco Context-Aware Mobility Solution offers a broad range of wireless technologies that deliver solutions to variety of business problems and also act as a platform that is open to any type of mobile asset and any type of business applications deployed on the premises of a Cisco customer. It is an adaptive, agile, and intelligent Service-Oriented Network Architecture (SONA) solution that delivers a superior end-user experience and enables significant efficiency for businesses. To support this approach, Cisco Services and Cisco Wireless LAN Specialized Partners offer a wide variety of specialized networking services and support services is available to help deliver customized and reliable context aware solutions.

### How Context-Aware Mobility Helps Businesses

The Cisco Context-Aware Mobility Solution provides real-time answers to questions that are critical to business success. Just as a search engine helps users by shortening the time needed to find relevant information on the Web, context-aware mobility helps businesses by allowing them to find the information they need right away. Business processes can thus anticipate what mobile workers will need proactively.

The most frequent questions workers and businesses come across can be classified into five categories, each associated with a different type of business application (Figure 4).

**Figure 4.** Business Applications Associated with Context-Aware Mobility



### Is It Here?—Zone or Inventory Management

[Zone or inventory management applications](#) interfacing with the Cisco Context-Aware Mobility Solution will be able to define zones and monitor the mobile assets entering and exiting the area. They are widely used in several industries:

- Hospitals use these applications to know which caregivers are in the building and thus on duty, to ensure that there is always attendance in emergency rooms, or to count the number of wheelchairs in a storage room. This translates directly into a faster reaction to emergency situations, a better optimization of human resources, and a maximum utilization of medical equipment.
- In the retail space, knowing when a consumer enters a certain department makes it possible to target the selection of the promotions to send the consumer's mobile device.
- Universities use zone management to automate class attendance and help ensure that no student is left in the building in case of emergency evacuation.
- Automobile dealers or expedited delivery companies can use inventory management to determine at any moment how many and which cars or delivery vans are available in certain parking spaces. In this way, they can more accurately manage resources and achieve greater customer satisfaction.

### Where Is It?—Asset Tracking

[Asset tracking applications](#) interfacing with the Cisco Context-Aware Mobility Solution can help locate a mobile asset anywhere in the campus. This is needed for the recovery of lost equipment and for timely coordination.

- In a factory plant, work-in-progress pieces that need to be assembled can rapidly be located when needed. The result is that factories avoid slow-downs in the delivery of finished goods, increasing both responsiveness and avoiding penalties.
- In a hospital, a nurse can use asset tracking to locate the closest infusion pump to administer a medication to a patient. This results in an improved patient care and a more efficient use of the time of highly skilled workers.

- In retail stores, the closest and more expert employee can be located to advise a customer on a specific product and help him or her make the right purchase.

### **What Is Its Condition?—Condition Tracking**

Condition tracking applications interfacing with the Cisco Context-Aware Mobility Solution can monitor the environmental conditions that an asset is subject to by measuring parameters such as temperature, humidity, pressure, and many more. Perishable goods can be thus be monitored during transportation or storage, and alerts sent when these conditions are not within acceptable ranges.

- For hospitals, condition tracking can prevent the waste of expensive medications and help ensure maximum efficiency in patient treatment.
- In retail stores, consumers will be more likely to find fresh products, and merchants can avoid waste that undermines profitability.
- In factories, complex production processes where equipment or chemicals have to stay within predefined conditions can be monitored more closely so that corrective actions are taken as soon as a negative trend is noticed. Plants gain more consistent quality in their finished goods and a better cost control.

### **What Is the User's Status?—Presence**

Presence applications interfacing with the Cisco Context-Aware Mobility Solution will use people's location information to automate presence status in unified communications applications.

- When a corporate employee is in a meeting room, he or she will be shown as “In a meeting” in all associated collaboration tools without any manual intervention. Co-workers can then use e-mail or instant messaging to communicate instead of an intrusive phone call.
- In the same manner, healthcare organizations can prevent surgeons from being disturbed while in surgery, and they can place the names of other caregivers higher in the list of available resources.

### **Where Is It in My Network?—Network Location Services**

[Network location applications](#) interfacing with the Cisco Context-Aware Mobility Solution can automatically optimize the wireless network resources where they are needed most. Locating rogue devices, interference, or dense usage areas can save the IT team significant time and provide the insight necessary to determine the right actions from the network perspective. The benefits of maximizing the use of network resources are numerous: reduction in troubleshooting time, more IT resources available, delivery of a best-in-class network experience to end-users, and lowering the total cost of ownership (TCO). Historical usage patterns can also be studied prior to introducing any new capabilities in the network and to help make for smooth adoption.

### **Summary**

Over the last few years, technical progress in the capture and analysis of data about mobile assets has made context-aware mobility a reality. This technology has the potential to completely revolutionize the way corporations look at their business and to transform the experience of mobile workers. Unprecedented levels of productivity, efficiency, and collaboration can be reached. But to truly benefit from a pervasive context-aware solution, several conditions must be met.



First, using the network as a platform and converging different wireless technologies is critical to automating data collection and ensuring compliance with business needs. This will also help lower the total cost of ownership for companies by reusing their existing IT wireless infrastructure. Second, identifying the best technical ways to track data at the mobile-asset level will also greatly influence the relevance and comprehensiveness of the data collected. Several options are available, and in most cases, a mix of techniques is required. Finally, making this contextual information available to the rest of the business in a timely and simple manner is crucial to ensuring a fast adoption and allowing corporations to reap the benefits of context awareness.

Once deployed, a context-aware mobility solution provides answers to many questions that businesses face every day. Getting answers to these questions is crucial for making informed decisions and staying competitive. Every worker in the corporation using business or collaboration applications will be able to benefit from a working environment that is more “mobile user friendly.” Workers will be able to increase their productivity by having access to the right people, through the right tool, at the right time.

### For More Information

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

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

As a Cisco technology 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>

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



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