[RFID]

RTLS : A Technology for Effective Tracking Solutions

RTLS has consisted of very short range infra-red systems and complex, multiple antenna, multiple beam long range RFID, making it an esoteric niche market. Real time location systems keep track of valuable assets that used to get lost in the warehouse, factory and yard. While many RTLS use active RFID technology, not all active RFID tags are capable of providing real-time location information. Inevitably, during the lifetime of a technology — especially one that is emerging, comparisons to more well-established, standardized technologies will occur. Such comparisons took place for Bluetooth, WiMAX and WLAN.

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Real time location systems (RTLS) are the fastest-growing RFID application most people have never heard of. For centuries organizations have faced the challenge of locating and tracking inventory and assets by brute force. The activity of receiving, storing and issuing inventory items and tracking the use and location of capital assets has remained essentially unchanged. Whether by quill and scroll; pencil and clip board; or bar code scanner and database, the process is fundamentally the same: receive items, put them away, refer to some kind of list and then find them. Along the way items get misplaced, moved, lost, or forgotten. Some organizations have described their warehouse inventory process as moving products from one black hole to another.

The real value of RTLS is not the technology; but rather the application of the technology in real world practice. Leading companies and organizations are rapidly adopting RTLS to achieve measurable improvements in operations. RTLS supports software alarms to provide notification when something has moved. For instance, a tag on a high value asset can signal an alert if the asset starts to move so that it can be located and stopped

before it is removed from the facility. Or a tag on a process control batch can trigger an alert if the batch does not move to the next process within a specified period of time.

RTLS is Prime for Healthcare industry

Facing greater scrutiny from regulators and payers,

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healthcare organizations are under tremendous pressure to improve efficiency without sacrificing patient care. To maximize their use of existing capital equipment, minimize lost or stolen assets, and increase the productivity of their employees, many healthcare organizations are seeking ways to quickly find and track their valuable assets and ensure those assets remain in the facility. That means finding the motorized wheelchair, portable pacemaker, infusion pump, or other expensive equipment in a streamlined, decentralized model and making sure that the individual leaving the building with a valuable piece of equipment actually has the right to do so.

Other challenges arise from finding people. At critical times, find doctors, nurses, orderlies, or patients without delay. Finally, security issues are a key concern. Certain patients - such as those under psychiatric care, Alzheimer's victims, patients with highly communicable diseases, patients under protective custody, or newborn babies - require extra measures to ensure their safety.

RTLS tags are affixed to mobile assets to locate them instantly and track their usage and movement over time. Valuable assets can be found from any PC connected to the network. Find the nearest wheelchair or portable X-ray machine - and send an orderly to retrieve it expeditiously. Identify under-used equipment - before making unnecessary capital purchases. And prevent loss or unauthorized off-premises use of equipment.

RTLS is Gaining Momentum in Manufacturing Industry

Businesses need faster cycle times, lower costs and greater efficiency. But new demands for build-to-order products with ever-shrinking lead times require more timely and accurate information. Efficient manufacturing requires instant, continuous, and precise knowledge of parts availability, and work-in-process status. RTLS provides total visibility of parts, tools, WIP, finished goods inventory and personnel as they move throughout the factory.

Real Time Locating Systems (RTLS) bring new levels of cost effectiveness and efficiency to manufacturing and supply chain management by enabling businesses to locate, track, secure and inventory their assets. Thousands of high-value assets are managed, including raw materials, sub-assemblies, work in process and finished goods. Mobile resources - people or portable equipment - are located. Assets moving through the manufacturing process are continuously visible.

RTLS tags affixed to inventory, parts, goods and machines are visible through the factory - from receiving raw materials to assembling or machining work-in-process inventory, to finished goods packaging, to shipping. On a LAN or through the web, asset location is instantly available, including where it has been and who has handled it. RTLS provides an audit trail to determine queue lengths and cycle times, which are leveraged to eliminate process bottlenecks, reduce lead times and increase inventory turns.

New Technologies

There are two types of RTLS technology in the market today. The conventional type involves proprietary active RFID tags and a software engine to determine where the assets and personnel are located. On the other hand, the most interesting RTLS systems are being built on top of emerging Wi-Fi networks, with considerable success.

Real Time Locating Systems (RTLS) are fully automated systems that continually monitor the locations of assets and personnel. An RTLS solution typically utilizes battery-operated radio tags and a cellular locating system to detect the presence and location of the tags. The locating system is usually deployed as a matrix of locating devices that are installed at a spacing of anywhere from 50 to 1000 feet. These locating devices determine the locations of the radio tags.

The systems continually update the database with current tag locations as frequently as every several seconds or as infrequently as every few hours for items that seldom move. The frequency of tag location updates may have implications for the number of tags that can be deployed and the battery life of the tag. In typical applications, systems can track thousands of tags simultaneously and the average tag battery life can be five or more years.

A tag can emit a signal through the air using one of three different methods: either optically (infrared), acoustically (ultrasound), or using radio waves (RF).

Infrared: IR systems can be configured to provide a hyper accurate RTLS solution, but suffer from the serious drawback that the signal does not penetrate

walls. A true 2D tracking system would therefore require three receivers in every room, which is usually not attempted due to the high cost. Instead, IR systems are used in a proximity mode, with each receiver indicating which tags it can see. In this way an IR system can provide room level accuracy (since tags in neighboring rooms are not seen), but with a dense deployment of receivers (one per room).

Ultrasound: Ultrasonic systems use very short pulses of ultrasound in order to locate tags. Since ultrasonic signals do not penetrate walls either, the exact same pros and cons that apply to IR systems apply to ultrasonic systems. Additionally, however, a great deal of ultrasonic "noise" in the environment causes interference concerns.

Radio Frequency: Radio Frequency (RF) systems are by far the most widely deployed RTLS systems in use today. The key differentiating feature is that RF signals penetrate walls and allow a significant reduction in infrastructure density compared to IR and ultrasonic systems. There are, however, multiple types of RF RTLS systems: Ultra-High Frequency (UHF), 2.4 GHz, and Ultra Wideband (UWB).

UHF: UHF systems are those with frequency of operation in the hundreds of MHz (typically 433 MHz or 915 MHz). Although these systems are useful for tag detection because they operate over long ranges, they suffer from a major drawback as an RTLS technology: the accuracy of a RF RTLS technology is a function of the frequency bandwidth (the swath of spectrum occupied). In the case of UHF systems, the bandwidth is rather narrow and the accuracy rather poor.

2.4 GHz: Systems that operate in the 2.4 GHz band are called "spread spectrum" because they occupy a wide swath of frequencies. In this way they provide much better accuracy than UHF systems, sometimes even as good as room level.

There are two main classes of 2.4 GHz RTLS: those that confirm to the WiFi standard, and those that do not. Those that confirm to the WiFi standard allow the reuse of existing WiFi infrastructure. For this reason WiFi RTLS is gaining good momentum on the basis of reduced cost of ownership. Generally speaking, those that do not confirm to the WiFi standard provide slightly better accuracy.

WiFi RTLS itself is split onto two main classes: signal strength and time of arrival. As mentioned earlier in this article, time of arrival systems provide better accuracy, but suffer from degraded performance in densely walled buildings. Most time of arrival WiFi systems are therefore deployed outdoors or in wide open spaces. Conversely, although signal strength WiFi suffers from poorer location accuracy, it works well in densely walled environments, and almost not at all outside or in wide open spaces.

Ultra Wideband: As the name implies, ultra wideband (often abbreviated to "UWB") systems occupy the widest swath of spectrum of any of the RTLS technologies, and consequently offer the best accuracy. Like WiFi, a UWB system can operate in signal strength or time of arrival modes, with the time of arrival mode providing location as accurately as 12".

UWB systems have the added advantage of maintaining good time of arrival performance on densely walled environments which make it a popular choice for providing bed-level accuracy in healthcare environments. Its ability to simultaneously locate many thousands of tags is also beneficial for some applications.

RTLS and WiFI

The question at hand is will Wi-Fi compete with RFID for dominance in the location-based services (LBS) market. We already know, for example, that Wi-Fi and active RFID are competitors for the healthcare asset management industry. Market research firm ABI Research (www.abiresearch.com) established that fact. According to the company, less than 5% of hospitals use tracking systems to stay on top of their inventory, and Wi-Fi and RFID companies feel they can accommodate the gap. After all, there is so much inventory in state-of-the-art hospitals that paper systems can't reliably track assets without a few slipping through the cracks. Use of Wi-Fi or RFID, therefore, could help prevent over-inventory and under-utilization of assets and allow hospitals to know exactly where their equipment is kept.

Today, Wi-Fi and RFID have a presence in the healthcare asset industry. While Wi-Fi systems are familiar to hospitals for other uses, these networks would need to greatly expand to accommodate an asset-tracking capacity. In contrast, RFID has been used for some time for asset-tracking solutions and, therefore, has the technology maturity and ability to address the needs of the healthcare industry.

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Guest column

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What is the Future Scope of RFID Technologies?

The global industry for RFID technology has been steadily growing for past few years, and is expected to pick up pace before stabilizing and settling on a steady growth path. Most of the excitement and promise of Radio Frequency Identification (RFID) supply chain adoption is still three to five years away.

In 2009, the value of the entire RFID market will be $5.56 billion, up from $5.25 billion in 2008. This includes tags, readers and software/services for RFID cards, labels, fobs and all other form factors. By far the biggest segment of this is RFID cards, and $2.57 billion of the total $5.56 billion being spent on all other forms of RFID - from RFID labels to active tags.

Which ICs you used for RFID card reader and for RFID Tags?

RFID card reader: HID OEM 75

RFID Tag: Mifare

What are latest trends you adopt for RFID Technology based applications?

RFID technology is maturing and continues to see tremendous innovation. Today, RFID systems have become broader, deeper and cheaper. Readers are using less power and are operating faster and at longer distances and with more ability to handle interference.

Other trends include the following:

Intelligence and enhancement in devices: RFID readers are growing more intelligent. This means better systems performance, the ability to use tags with more data and easier integration into existing systems without reprogramming.

Mobility: Hand-held, forklift-mounted, and mobile cart readers are changing the paradigm for RFID, opening up new applications.

Tracking: Tracking of assets, vehicles and resources is new area where RFID based applications is opening up new business opportunities.

Growth in applications software: Microsoft and other software companies are creating platforms upon which RFID resellers and consultants can create RFID-enabling software and applications.

Company Profile Corner

ICEGEIN COMPUTING PRIVATE LIMITED

Mr. Anand Surana
CEO & Managing Director

ICEGEIN is India's premier RFID Solution company; Leader in RFID asset tracking systems and Solutions; ICEGEIN's focus is on developing unique, valuable and innovative enterprise-class solutions targeting the worlds leading Banking & Financial houses and manufacturing & Distribution giants.

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But what about the LBS market, for example, real-time location services (RTLS) for asset management, security and work-in-progress tracking? Here too, RFID has a history of demonstrated ability and market dominance, yet it also has a key disadvantage — the fact that it is today populated with proprietary solutions, including expensive readers. This is where Wi-Fi comes in. Its large installed base of equipment makes it cost effective and as a result has opened up new opportunities. Wi-Fi-based RTLS have recently become just such an opportunity, with RTLS functions being handled by specialized software.

Of course, in the LBS market, Wi-Fi faces its own set of disadvantages. According to ABI Research, it is somewhat less accurate, especially outdoors. It is also less secure and can require the addition of up to 20% more Wi-Fi access points to a network. But, if a company already has a Wi-Fi network in place, then it may make sense to implement it for LBS applications; especially given that Wi-Fi is cost effective, needs no extra cabling and is standards-based.

The growth of Wi-Fi-based RTLS may force RTLS based on RFID to diminish, but that does not foretell the technology's demise as it is already entrenched in this space. Besides which, RFID is emerging in other key markets traditionally dominated by technologies like Bluetooth and Wi-Fi. The mobile market is a prime example where RFID solutions are being looked at for use in mobile and handheld devices.