

AXCESS

**Active Radio Frequency
Identification (RFID) Powers
Productivity and Protection in
the Enterprise**

**White
paper**



“ACTIVE” RFID POWERS PRODUCTIVITY AND PROTECTION IN THE ENTERPRISE

Now in 2005, RFID has become a universally recognized acronym. Radio Frequency Identification (RFID) was just predicted by Information Week to be one of the top 10 IT trends in 2005. Research firms ABI and Nucleus Research qualified RFID as a “hot” IT program in 2005. According to the 2004 State of the CIO Survey, implementing RFID was cited as a top priority by both the CIO’s the CEO’s surveyed. The effort to implement the passive tagging of items in the supply chain was intense in 2004. One of the key lessons learned was that RFID has a much broader potential in the enterprise, particularly “active” or battery powered tags which can provide automatic, dynamic visibility into what is going on in and around the enterprise. Active RFID offered profound benefits in visibility, productivity, efficiency, and security.

Introducing Active RFID

Active radio frequency identification tags are wireless transponders which can automatically identify, locate, track, monitor and protect a variety of things. Unlike GPS, active RFID operates around the enterprise in a local area, indoors or out. The things that can be tagged include: personnel, assets, vehicles, inventory, and well as their condition and the environment around them. The term “active” means there is a battery on board to provide power to send a signal on demand. Active tags can be activated (or woken up) for transmitting when they reach a particular location. Or, they can be programmed to transmit (or beacon) at set intervals or when a change of condition occurs. Changed conditions include movement or sensor thresholds such as temperature, humidity, shock or any number of sensor detections.

Active tags have the range to automatically identify a person, vehicle or asset without human intervention. People are identified as they approach a secured door or turnstile and automatically authorized for entry. They can be automatically located and tracked based on the need. Assets can be automatically protected, giving the owner the freedom to come and go from a secured location with the asset as they please. Trucks can be provided fast, “rolling access” to a yard. Trucks, trailers, and personnel can be automatically identified and coordinated resulting in dramatic efficiencies in personnel and asset utilization all of which can enable increased revenue. This “hands-free” mode provides automated visibility, improved productivity, and dramatically reduces human intervention.

Active tags, because of their power also have the ability to act autonomously (i.e. without an external activation). A number of added value functions accrue. A tag can be configured to alarm and send an alert signal if removed, so (anti-tamper) active tags provide a very good security solution for assets and containers. Tags equipped with a motion sensor on-board can alarm in the event of unauthorized inventory movement. Beacons tags can provide an automatic inventory count. A signal is sent to a receiver at pre-determined time intervals to provide continuous monitoring of the inventory and its location.

Active tags are also used for wireless sensor monitoring. Active tags can be integrated with different sensor types to monitor the change of conditions of such things as temperature, humidity, and pressure, as well as hazardous chemicals or radiation. Either by transmitting dynamically, or by performing a store and forward of sensor data collected over time, active RFID tags automatically provide additional visibility into and control of “things” in and around the enterprise.

Understanding Active RFID vs. Passive RFID

RFID tag technology falls into two broad categories – passive or active. Simply stated, active has an on-board power supply (e.g. a battery) while passive relies on capturing and “re-using” a small portion of the wake-up signal’s energy to transmit its RFID tag I.D. back to the receiver. This is a “good news, bad news” situation. The “good news” is that passive tags can be manufactured and sold at much lower price point today than active tags. This is a critical element in many RFID supply chain applications requiring the tagging of millions of units. The “bad news” is that passive tags often struggle to provide reliable reads given the performance limitations of a technology using only a small amount of power to push its signal off metal surfaces, through layers of palletized products, etc. Also, passive tags sometimes struggle to provide a highly reliable signal when supply chain goods are in motion. Active tags therefore have an innate performance advantage over passive tags when it comes to providing a consistently robust, penetrating signal. So higher value “things” at the pallet level and above often require active tags. Considering the total cost of ownership, an active tag’s higher cost is offset by a lower cost reader and processor infrastructure making the cost justification easier. Containers, trucks, and trailers are the best examples of high value items that require active tags.

In summary, passive and active RFID capabilities are related, but they are distinctly different technologies which should be matched to the application’s technical and economic requirements. Automatically identifying personnel, assets, and vehicles are “active” applications and the cornerstones of automated visibility, security, and quality improvements in the enterprise. In the supply chain for example, total visibility, security and quality can only be attained by utilizing both.

Easy Implementation

Active RFID is implemented in a similar, industry standard approach as passive systems. The receiver is connected to the network using a standard TCP/IP Ethernet connection. The palm sized reader is about the same size as the latest generation passive one; pleasing to the eye and “architecturally correct”. The receiver covers a circular area including about 3,000 square feet and is similar in concept to Wi-fi where the omni-directional coverage picks up any transmission in the coverage area.

In applications where you want to wake up the tag at a particular geographic point, there is an activator/antenna present. This operates much like a traffic intersection loop for tripping a traffic light. So, activations can take place in multiple areas such as doorways, hallways, and they share the receiver. This is unlike a passive system where the activation signal is included in the receiver unit. The activator/antenna only requires a power source to operate. The activator power unit is palm-sized and can be fully hidden along with the antenna.

When the tag enters the (distance-selectable) activation field, it wakes up, writes the activator ID to memory and then transmits to the receiver. Tag transmissions typically include multiple pieces of information such as the tag’s unique ID and time/date. In addition, the receiver ID and the separate activator ID can be transmitted for greater location discrimination.

The easy, seamless installation via industry standard methods makes active RFID a complementary and logical extension to existing network-based enterprise applications. Acceptance of the technology has been helped greatly as evidenced in the following applications.

Active RFID Key Capabilities

In an August 2004 market study and end user survey by Venture Development Corporation, Active RFID systems were found to have a series of valuable characteristics including:

- Enhanced dependability because of high performance
- Enhanced security/access control including theft reduction
- The ability to link tags together in software for custodianship
- The ability to automate identification and location by removing human intervention
- Improved data integrity because of accuracy and reliability
- Improved read accuracy and longer read ranges
- Increased data transfer rate

The study found the reasons end users implement active RFID systems centers around increased productivity including: streamlined processes; labor reductions; increased visibility and automation; and the provision of real-time information. Additional capabilities unique to active tags were also cited by end users as being important including: sensor monitoring; automatically beaconing signals; and tamper resistance.

The applications most important for customers when considering adoption include: asset tracking including work-in-process (WIP); supply chain management; security and access control; and sensing/monitoring. The target markets for active RFID were cited to grow at a 38% CAGR. Key industries included: automotive; electronics; aerospace; pharmaceuticals; government/military; transportation; and retail.

RFID was Commercialized in the Security Industry

With all the talk of RFID revolutionizing the enterprise supply chain, there has been little mention it was the security industry that first put RFID into commercial acceptance. Although RFID was invented in the 1930's, Electronic Article Surveillance (EAS) arrived on the scene in the late 1960's and became a commonplace technology for thwarting retail theft. The industry followed with proximity-capable access control cards which now are commonplace RFID devices for personnel and vehicle access. Yes, EAS and proximity access cards are based on RFID.

The next wave of solutions being implemented today use "Active" RFID, battery-powered autonomous cards and tags in broad-based solutions where automatic control and tracking are needed to address the unique requirements we now face. And, active RFID tagging has more far reaching strategic implications for the role of security in the enterprise.

Security Access Control

The demand for improved access control is wide ranging. Increases in the use of access control are evidenced in downtown multi-tenant office buildings. Demand has increased for vehicle access control across multiple industries. The rise in laptop theft and the cost of lost intellectual property has driven up demand for asset protection. There is a common denominator. With the increase in demand, the limitations of passive RFID coverage and its impact on worker productivity are magnified. With passive systems, behavior has to be altered in some form to comply with the system. "Proximity" ID cards having to be presented to a reader during rush hour create entry and exit bottlenecks. The same is true for vehicles stopping at entrance gates. And, asset protection has to be automatic as it is tough to expect a would-be thief to present the asset to a reader for check-out.

The major appeal of active tagging is that security coverage is increased automatically through controlled, automatic tag activation, and vastly greater transmit range. All this occurs with little or no impact on employees, while still retaining the level of control offered by passive RFID. Hence,

it offers the best of both worlds. The buzzword most often used to characterize Active RFID's automatic nature is "hands-free", meaning no manual presentation is required. Personnel are automatically identified at the turnstile with the active card in their purse or pocket, "hands-free". Cars and trucks now have rolling access through gates. Assets are automatically identified and secured if necessary before leaving the building. So, in addition to productivity and convenience, the hands-free element of active RFID brings "automatic control" to 21st century access control solutions.

There are also new uses. The breadth of the technology and the degree of customization available to each user's unique environment solves problems and makes the dealer/integrator look good in the eyes of the customer. Tags are easily linked to other tags and to other sensors. Personnel tags are linked to vehicle tags and to payload tags for greater integrity. Asset tags automatically linked to personnel tags mean authorized personnel can remove assets non-intrusively. And the implementation is straight forward. This is all done today.

Personnel Access Control & Tracking

Active RFID ID cards now come in ISO standard I.D. card print sizes. They have a distance selectable activation capability. So, active cards can act like proximity cards at the low end. For hands free access, the card will activate the door as you approach it. Long range transmissions are typically tracking beacons for location determination.

High speed access is also more easily addressed using active RFID cards as the presentation requirement is eliminated. Typical read speeds are 10+ cards/tags per second through a doorway. "Anti-tailgating" (or preventing someone from walking in behind you), if required is accomplished via turnstiles. The activator antennas are installed at the entrance to each lane. The activator electronics are embedded in the turnstile housing and the receiver has the flexibility to share multiple activators and can be placed at the most advantageous (and architecturally correct) position. Tag reads are discriminated per lane thereby individually authenticating entry by person, by lane, "hands-free".

An additional benefit to automatic identification is the ability to set up control zones within the facility. Actual or virtual access control within the facility can be easily implemented. In the enterprise, computer rooms, inventory rooms, and trading floors are good examples. Visitor tracking is also easy to accomplish even without locked internal doors. A virtual control zone threshold can be set up, even in the middle of the hallway to identify visitors wandering out of position. This becomes very cost effective as escort costs are eliminated.

Today, nurses are tracked as a way to ensure the proper personnel can be located for any emergency. Searches can be done by group, thereby identifying all appropriately trained nurses in the proximate area. Also in healthcare, infants are tagged in the nursery for protection. Seniors are tagged in assisted living centers to identify wandering. And, using active tag wristbands, patients can be automatically identified without disturbing them and for more accurate procedures and medications.

Prisoners have electronic wrist bands permanently affixed (some with tamper-proof bands) to provide access control and location determination thereby reducing the guard load. While the priority of the system is to reduce guard load and prevent escapes, the tags also identify situations where potential violence may erupt such as when two inmates from opposing gangs are located too close together.

Automatic identification and tracking identifies daytime intruders in the enterprise. A simple passive infrared detector (PIR) can be linked to personnel cards/tags to check to see if they are present or alternatively if an intruder is there. By connecting an active RFID tag to the PIR

device output, the device will alert the system when a person is present and the system can be programmed to check for a match. An intruder without a card or tag trips a PIR walking through the facility. Since the PIR's tag reports a "hit" without the intruder having a tag activated at the same spot, the mismatch creates an alarm condition. Security personnel know the exact location based upon the location of the PIR.

For homeland defense and hazardous material concerns, the personnel tags offer a way to inventory personnel at "mustering" locations in the event of a facility catastrophe. Personnel go to a pre-defined location away from the building where they can be automatically counted and inventoried to provide better data for rescue operations.

Finally, many added value solutions can be created when Active RFID personnel cards are linked to other cards and tags. The most frequent links are to vehicles and corporate assets such as laptops.

Vehicle Access Control and Automatic Payload Tracking

Active RFID tags for vehicles provide a great deal of flexibility and performance. Active tags in the UHF frequency band from 315 MHz to 433 MHz use omni-directional antennas so varying heights of vehicles, from sports cars to heavy duty trucks can economically and reliably use the same antenna. There is very little infrastructure to install making the installation aesthetically pleasing and economical. Since the tags have batteries to provide a stronger signal for long range transmission, the tag can be placed in many areas of the cab, offering more flexibility than passive-based toll tagging. Reliability is also greater as the metallic elements in windshields don't disturb the tag signals.

Clearly, hands-free access means greater convenience and safety. Arms don't get wet as the driver's window stays up. But perhaps the greatest advantage is "rolling" access. As the vehicle approaches the gate the tag is activated, transmitting in time for authentication to occur as the vehicle passes through at up to 35 miles per hour. Rolling access reduces carjacking and is now gaining widespread popularity in residential gated communities, country clubs, and universities, among others.

For homeland defense, cities and counties find the automated, intelligent gate access for their fleets less costly than using manned guards while still providing an increased measure of security by linking driver to vehicle. New car dealers automatically know where every car is while maintaining the security of the vehicle through gated lots. The car inventory automatically feeds into the dealer "floor plan" software to provide an accurate financial picture.

In commercial fleet operations, the entire truck/driver/payload system is linked to eliminate the guard at the gate and automate the operation. Quarries, municipal dumps, and airport re-fueling stations have implemented systems where the driver is linked to the truck and only when the amount of payload is accounted for does the gate open. The transaction is fully automated and when considering payload inventorying and accountability we see a powerful new economic force being considered; the security system also benefits supply chain efficiencies.

Asset Tracking and Protection

Network security has justifiably developed into a large industry as keeping the network running smoothly and protecting corporate information goes right to the core of the organization. New corporate governance regulations even address how corporate assets are protected by management as those assets directly affect share values and shareholder wealth. But how different is the loss of corporate intellectual property (a.k.a corporate secrets) from a hacker than the loss of the laptop that holds the information? The recently published losses of laptops at the Department of Energy, INS, FBI, and Department of Defense indicate an average loss of between 1% and 4% of the laptop population per year. Safeware estimated 620,000 business laptops were stolen in 2002. The loss of any one laptop can have catastrophic effects on the corporation and that is why the application has attracted so much interest. The recent Computer Security Institute/FBI study found the average laptop theft cost \$27k each. Given the signal-attenuating elements resident with a laptop and the need to automatically identify the laptop before it leaves the enterprise, active RFID is the only viable solution.

The active RFID solution has an added advantage where the activation antenna can be hidden covertly in the ceiling, under a rug, inside a picture frame, etc. A tag placed on a laptop is automatically identified at the exit and linked to the custodian to check for authorized movement. Unauthorized movements enable door locks or sound alarms. The laptops are even identifiable exiting large buildings through turnstiles.

Ironically, desktops secured with cables are affixed with active RFID tagging to ensure security. In computer labs, cables are easily cut by thieves but with an active RFID tag equipped with a tamper wire, an alarm is triggered when the cable is cut. Any high value asset can be protected such as test equipment, tools, and even supplies.

Asset tagging also applies to reducing loss and asset utilization in hospitals. A typical large hospital will lose 10% of its mobile asset base in a year. This includes portable devices such as heart monitors, infusion pumps, wheel chairs, and gurney's. Tagging these assets provides real time location and inventory counts as well as theft prevention. The biomedical engineering department now has an automated way to identify items in need of routine maintenance. The accuracy of this process is important for recurring hospital accreditation.

Other assets such as art can be secured with active tags with motion sensors built in. If the art ever moves, the wireless motion sensor triggers an alarm automatically. High value assets sometimes come in small packages such as keys. In casinos, active tag "key fobs" prevent keys to slot machines and cash drawers from leaving the premises, saving thousands of dollars in mandatory re-keying.

One of the latest active RFID applications is cargo tagging. The active tag has the advantage of being autonomous so a beacon signal can be set for regular intervals. The integrity of the cargo door is automatically detected through the regular electronic signal coming from the tag on the cargo door lock. An anti-tamper cable alters the signal transmission if the tag is removed or the cable lock tampered with. If the transmission does not indicate an "all O.K." signal, the cargo container is moved to quarantine for inspection. The tag is a simple, effective and reliable solution for cargo container security. And, a cargo container can be linked to a truck and driver.

Once again, the linking of payloads to trucks, trailers, and drivers increases the integrity of material exiting and entering the enterprise. Payloads such as gravel, municipal trash, rental equipment and fuel are common active RFID security applications, a clear cross-over into the supply chain arena.

Active Tagging Opportunities in Trucking and Supply Chain Logistics

All too often, trucking, fleet operators, 3PL's and other logistics operations have to resort to manual, error prone methods to identify, locate, and manage vehicles and payloads. RFID tagging presents the opportunity to economically automate the process, thus reducing errors and making the overall process more efficient.

Active tags provide a means to automatically account for the arrival of tractors, trailers, and drivers. The automatic identification provides a means for directing loads to assigned docks. Case studies indicate a reduction in turnaround time of as much as 20 minutes and a reduction in labor and asset requirements by as much as 44%. Active tags can also ensure the integrity of the cargo. With tags operating as electronic door seals, the cargo door tag automatically reports if the door has been opened in-route indicating the potential for theft or shrinkage. Finally, upon departure the driver's tag is matched to the tractor and trailer to ensure only those assets leave the facility which are supposed to.

Sensors

As sensors costs and form factors decline the use of RFID as a low cost wireless backbone increases. Today, temperature, humidity, and vibration can be mounted direction inside the active RFID tag. The tag provides both location and status for the asset. The growth in the need for sensors used for homeland defense has increased since 911. Nuclear, biological, and chemical sensors are typically large and immovable, yet the demand is for a distributed array of sensors to provide the best detection. Active RFID can be added to any electronic sensor to provide immediate wireless communications capability. The importance of this in homeland defense sensing relates to the need to corroborate sensor reads so as to eliminate false alarms.

Radiation detectors equipped with wireless tags can provide effective coverage for enterprise office buildings as well as municipal government needs such as airports and ports. Similarly, gas detectors now sense multiple noxious and potentially deadly gases which when combined provide a shield of detection for terrorist threats.

Optional Integrated Digital Video

Network-based digital video is available to record any RFID transaction in the enterprise. This includes personnel access control, asset protection, supply chain points of control, vehicle activities, and sensor alarms. For example, with the arrival and unloading of goods in the supply chain, video recording can be triggered upon arrival of the goods or any number of user-defined conditions. The event database of video can be linked to the location and/or tag ID. Queries on the status of a particular item can provide a snapshot, a video clip, or live video feed from the network camera. Continuous recording of warehouse activity provides documented video evidence for exception reporting, critical events and/or emergencies. This assists in insurance settlements and aids in providing proof with video verification for claims and carrier/handler accountability.

Digital video can be automatically recorded at strategic points throughout the facility. Video from any recorded camera is searchable by location, time, or date and can be instantly retrieved and viewed via a network PC.

Software and Middleware Plays a Big Role

As mentioned, an active RFID system can be easily added to any existing security system via the network (or via security industry standard Weigand protocol). With simple “white list” logic routines in the door panel or in the host software, intelligent filters are automatically applied. The security system is effectively expanded via the automatic control capabilities of active RFID.

Many RFID systems can also operate in a parallel, standalone mode with graphical tracking software to locate assets and personnel and show recent movements. This represents a powerful capability, a step up in intelligence for the system also improving productivity in the security department. Finally, these systems use middleware to automatically read and convert virtually any sensor, alarm, or transaction as input to the intelligent filtering process. The degree of automatic control and tracking in the system becomes endless. With this middleware the automatic control and tracking elements of active RFID for access control meets many of the needs the supply chain gurus can't solve any other way.

Active RFID's Strategic Role in the Enterprise

RF communications is now pervasive in our society, from cordless phones to cell phones, to Wi-Fi hot spots at the local coffee shop. Consider again the broad use of RFID in other industries: vehicle toll collection; ski lift access; vehicle manufacturing; race timing; forklift tracking; animal tracking; tracking library books; finding personnel at amusement parks; tracking healthcare personnel; preventing diversion and brands; buying gasoline (and hamburgers); and car ignitions/immobilizers; etc. Security applications are now broad as well considering the applications discussed here: electronic asset surveillance; personnel access control; vehicle access control; and asset protection. So it's with little surprise that active RFID is a key platform for solving the unique access control challenges of the 21st century. But it doesn't stop there. The security industry's use of active RFID is once again an example of applying today's technology to today's new challenges. And, once again we see the security network evolving toward a strategic role in the enterprise, in this case through the potential to support supply chain automation activities.

For now however, today's solutions define a clear path for active RFID's role in the security industry. Active RFID improves on the productivity and convenience of proximity systems and adds the necessary elements of automatic control and tracking to increase the scope of the security system. The ability to use industry standard methods to augment the existing system for personnel access control, vehicle access control, and asset protection adds active RFID as a vital weapon in the security department's arsenal for addressing the new challenges of the 21st century.

AXCESS ActiveTag™ System Overview

ActiveTag™, manufactured by AXCESS Inc., is a wireless tag and sensor communications system comprised of Activators, activation antennas, Receivers and small, battery-powered radio transponders or “tags”. The system is both robust and feature-rich, making it ideal for logistics and industrial applications.

Implementation is flexible as tags can be affixed to goods in inventory at any level of aggregation, such as a pallet, box, container, or directly on the item itself. Mounting of the tags can be either permanent or temporary. For example, a tag can be permanently incorporated into a shipping pallet or container, either at time of manufacture or as a retrofit. Alternatively, a tag could be placed inside the carton or slipped into an external sleeve, such as an adhesive shipping label or packing list envelope. ActiveTags are imprinted with serialized ID numbers and can be integrated with a printed bar code or passive “smart label” for ease of recognition by other reader systems, as well as the naked eye.

The ActiveTag system supports multiple means for tag activation. In typical operation, the tag is awakened by a low frequency (LF) 132 kHz radio activation signal generated by a small radio transmitter (“Activator”) connected to an application specific antenna. Tags can also be configured to automatically “beacon” at periodic time intervals. And perhaps most critical to HAZMAT applications, tags can be integrated with one or more sensors, continuously monitoring status and transmitting sensor data or alerts as conditions warrant.

Upon activation, the ActiveTag transmits a high frequency (HF) radio signal (either 315 MHz or 433 MHz) containing, at a minimum, its preprogrammed ID number that uniquely identifies the source of each transmission. Tag signals are transmitted to small, low-cost Receivers. Since tags can be reliably read at distances of 35 feet or more, each Receiver can cover a 2500-3000 square foot area. Receivers can be located virtually anywhere in a warehouse, storage yard or processing facility. They can even be installed in a transport vehicle such as a truck, trailer or HAZMAT carrier.

Receivers convert the tag signals into data and then pass the information on to a host PC or controller running application software. Numerous standard communications protocols are currently supported, including serial (RS-232), network (Ethernet TCP/IP), Wiegand (SIA 26-bit standard) and others. However, the system can easily be adapted to virtually any standard or proprietary communications protocol. For example, serial data can be transmitted over a wireless IEEE 802.11 WLAN and then dropped onto a LAN using off-the-shelf industry standard components. In most applications, bandwidth utilization is so low that hundreds of Receivers can be deployed using the existing network, thus avoiding the installation and maintenance costs associated with implementing a dedicated reader network.

The Receiver also supports user configurable decision logic, relay control and output filtering capabilities. If required, the Receiver can be configured with additional memory such that data can be stored and forwarded at a later time. Both portable and handheld versions of the Receiver are also possible. The Activator/Receiver components can even be integrated into a handheld bar code or smart label reader for greater utility.

The ActiveTag wireless communications protocol supports multiple, high-speed tag reads. Unique transmission codes are used to distinguish between normal LF activations, time-based beacon transmissions and signals containing sensor data. Tag transmissions are typically comprised of a series of randomized “bursts”, making the protocol both reliable and flexible. Depending on the objective, various parameters within the protocol can be optimized to support both low and high duty-cycle applications.

ActiveTag “Control-Point” Activation

To conserve power, the ActiveTag remains “asleep” until awakened by a low frequency (LF) radio signal. This activation signal is generated by a small LF radio transmitter called an “Activator” connected to an application specific antenna. The power level of the Activator (user tunable) and the type/size of antenna determine the size/density of the activation field.

The Activator requires only power (24 VDC or 110 VAC) and can be installed remote from the activation antenna (50 feet or more). Each Activator is user programmed with a unique “static” Location ID. As the tag passes through the activation field, the Activator’s location ID is written to the tag. The tag then transmits both its ID number and the Location ID, thus providing specific location information at time of activation. As tag transmission signals can travel 35 feet or more, a single Receiver can service multiple activation fields, thus reducing infrastructure and maintenance costs.

“Control points” are static activation fields positioned at strategic locations throughout the facility, such as docks, gates, doors, corridors, aisles, staging areas, etc. Tags are automatically activated as they pass through each control point. Tag signals received from multiple control points enable the identification, location and tracking of any tagged object or entity, including inventory items such as pallets and containers, as well as equipment, vehicles, personnel, etc.

One of the unique advantages of the ActiveTag System is the ability to make use of LF activation signals to provide a broad range of coverage areas to address multiple applications. For example, a small flat “pad” antenna can generate a small contained field with a tag activation distance ranging from a few inches to a few feet, thus providing strict control over tag activations in a way similar to most passive RFID systems. However, unlike other passive LF systems, a large ActiveTag loop antenna can create a coverage area as big as a dock door or span across several lanes of traffic. Depending on the application and site-specific constraints, the activation antenna can be strategically placed overhead, in or on a wall, over a door, on a desk, under carpet, buried in pavement, etc.

Another unique advantage is the use of dual frequencies, combining LF activation with HF tag transmission. LF signals provide stricter control over the activation field and better signal penetration as compared to infrared (IR) and other high-frequency RF systems operating at a single frequency (HF, UHF or microwave). In addition, ActiveTag’s unique dual-frequency approach overcomes the interference and attenuation problems encountered with most UHF and microwave systems, particularly with regard to signal attenuation from the human body.

Finally, ActiveTag’s unique control point architecture allows specific activation or “capture” zones to be defined. This greatly enhances the system’s ability to provide better location determination than “beacon-only” systems, yet at a fraction of the infrastructure cost of a RTLS (real time location system).

ActiveTag “Beacon” Capability

Using its on-board intelligent processor, an ActiveTag can be configured to automatically “beacon” at periodic time intervals. At the user specified, predetermined time, the tag transmits a long-range, high frequency (HF) signal containing its unique preprogrammed ID number. The tag signal also contains a specific code that uniquely identifies it as a beacon transmission. When the tag data is forwarded to the host, the Receiver can be configured to attach its own unique location ID to the string, thus locating the beacon tag to within a specific cell or “zone” as determined by the Receiver’s coverage area.

ActiveTag’s flexible wireless communications protocol can be modified to support both low and high duty-cycle applications. For example, when “reporting in” on a beacon duty-cycle of once every 60 minutes, the beacon tag randomizes its transmit interval to minimize the potential for data collisions. Depending on the duty cycle and tag density within the range of each Receiver, potentially thousands of beacon tags can be monitored within a single facility. This intelligent data collection scheme allows the system to automatically handle large data collection tasks with a minimum number of Receivers while still maintaining data integrity.

Location, Alert and Status Monitoring Software

In addition to TCP/IP connectivity to a DSS Gateway, AXCESS provides its own Win-based software platforms with advanced functions. ActiveTrac™ is a multi-purpose, single user monitor/track/alert software package that runs on any PC to provide event logging, location and status information and instant alert/alarm notification. Stored images can be assigned to tags for immediate visual recognition. ActiveTrac supports up to 250 ActiveTag Network Receivers and is ODBC compliant for ease of integration with existing enterprise software.

OnlineSupervisor™ (OLS) is a multi-user, browser-based system that leverages both private networks and the Internet to provide status on any tagged item to any authorized user. Users can establish their own data criteria via a customized data “dashboard”. OLS can also incorporate digital video in streaming (fast) video mode for authorized “institutional” users while also providing web video to “casual” users over the Internet for remote viewing of any location or activity. Digital video recording provides after-the-fact review of recorded events in a media-player style format. Rules-based criterion triggers alerts that can be highlighted on the operator screen or sent via email for notification, including wireless email, text messaging and paging. Every user gets the data they need, when they need it anywhere they need it.

Summary

Active RFID tagging has evolved to be a necessary technology for business productivity improvement efforts and security in the enterprise. Active RFID will complement and complete the capabilities of passive tags. Active tags have the flexibility to tag difficult, large, and valuable items. In security, active tags can provide automation for immediate visibility into the activities in and around an enterprise. The homeland defense applications are expected to continue to grow as anti-terrorism funding trickles down. The growth in the use of sensors will be a continued driving force behind the implementation of active RFID solutions.

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