Precyse Technologies' RFID System Uses Beacons to Extend Reach

The company's iLocate technology enables companies to track assets in remote sites, by deploying multiple beacons that allow an RFID reader to communicate with battery-powered tags thousands of feet away.

By Claire Swedberg

Aug. 7, 2008—Several companies in the Middle East and North America are trying out an asset-tracking solution that leverages multiple beacons, allowing a single RFID reader to communicate with battery-powered tags located thousands of feet away. The iLocate solution, provided by Israeli RFID company Precyse Technologies, is being utilized by freight managers, agriculture equipment manufacturers and rail companies to monitor their vehicles or other large assets in outdoor yards and remote locations.

Byron Blackburn, president of Illinois-based consultant services company Blackburn Global, says he has sold the product to a number of customers as an alternative to an RFID system that would require an expensive permanent installation. Rather than, for instance, cabling multiple readers throughout a location, this solution can be set up quickly, Blackburn says, and moved or removed if needed elsewhere, without a large infrastructure to dismantle. That's because there is just one reader, along with a series of beacons that locate and transmit signals to and from the battery-powered RFID tags.

The companies Blackburn works with are typically concerned about the safety of their assets, which often consist of vehicles that could be driven off a site, and the fuel stored in those vehicles. The site where these assets are being tracked is often remote, with no staff present to read or write to asset tags.

One popular alternative, Blackburn says, is the iLocate system. The system, according to Precyse Technologies' product marketing director, Rom Eizenberg, incorporates battery-powered RFID tags, multiple beacons, a centralized middleware software package and an RFID interrogator that serves as a base station. The tags rely on the beacons to communicate with a single RFID interrogator up to 3,000 feet away, thereby avoiding the need to deploy multiple readers.

Most other active RFID tags on the market, Eizenberg notes, must be written to by an exciter or reader at closer range. With iLocate, Eizenberg says, a user at a single remote location can load new software or instructions—such as how often to transmit—onto thousands of tags via the beacons. Users can also encrypt the tags and change the security keys remotely, if necessary.

In a typical installation, one reader is installed in the middle of a site, connected to a generator or battery for its power source. If the yard is larger than 6,000 feet across, a second interrogator is required. For a large outdoor yard of many thousands of feet, or for an interior location, multiple beacons would be deployed. The beacon is a small box that can be installed on ceilings, walls or poles in an array, about 300 to 900 feet apart. It uses its own battery, making it independent of power sources. The beacon transmits its unique ID number on a regular, preprogrammed basis.

When a Smart Agent tag comes within a beacon's vicinity, the tag captures that beacon's ID number, then integrates its own ID number with that of the beacon and transmits that data to another beacon, which forwards that information to other beacons until reaches the site's single RFID reader. The tags, beacons and interrogator all transmit at either 433 MHz or 2.4 GHz frequencies, complying with the IEEE 802.15.4 air-interface protocol—the same standard on which the ZigBee protocol is based. The interrogator can then utilize a GPRS or Ethernet connection to send the information back to the server. Tags can also be wired to sensors and programmed to transmit sensor data, such as temperature readings or the amount of fuel in a vehicle's tank.

To determine a tagged asset's general location (such as Zone A or Zone B), the system accesses a database containing each beacon's ID number and location. The tag can be instructed not to transmit information again until it loses transmission with that beacon (if it is being moved out of that beacon's range) or until it comes in range of another beacon. If the beacon transmission does not change, however, the tag does not send any data. In that way, Eizenberg says, it conserves battery life.

"We can send commands to the tag," Eizenberg says, "and remotely update the behavior of the tag by updating the tag's software." The value, he explains, is not only in being able to instruct that tag to change its own behavior—such as the amount of times it beacons, or what sensor data it transmits—but also in security.

Traditional readers, Eizenberg claims, can create an opportunity for someone outside of a site to access the local area network (LAN), by using the reader as a gateway to that LAN. "If the reader takes data from the air and forwards it into the LAN network," he says, "then anyone can use this 'bridge' between the wired LAN and air outside to inject attacks on the network." For example, an individual could send a signal imitating a tag's message that could have a malicious code. That can be avoided, Eizenberg notes, using bidirectional encryption—that is, instructing encryption keys to be exchanged between a tag and reader, so that data can still be safely transmitted, but no information would be accessible to an unauthorized individual trying to access the system.

The system can also employ triangulation if a user wants to pinpoint a more exact location. In this case, the beacons are more closely placed, depending on the accuracy required, and when a tag receives transmission from several beacons at once, it sends that data to the interrogator, which passes it on to the server. Software on the server utilizes that information to triangulate a more precise tag location, within a few feet. Some users, Blackburn says, choose to mix the options with the longer-range solution, with beacons spread hundreds of feet apart outside and triangulation employed inside a building or in other places where their exact location is more critical. Users can add beacons as necessary, to increase location accuracy without making other infrastructure changes.

If sensors are added to the system, Smart Agent tags can be employed to track details about an asset, such as a vehicle's fuel level, mileage or engine function. If someone attempts to steal an asset, or to steal fuel from that asset, the tag can be instructed to transmit an alert to the user, based on data from sensors such as a drop in fuel level, or the start of an engine's ignition. The infrastructure savings, Eizenberg claims, compared with a traditional RFID solution involving multiple readers, amount to thousands of dollars, depending on the size of the installation. Each beacon typically costs about $350, while a reader costs several thousand dollars. Tag price can vary from $55 for a single tag to $15 per tag in quantities above 50,000.

Blackburn says he has been providing the system for the past year, and that his customers—which asked not to be named—are using it at remote locations, as well as for temporary asset tracking. "There aren't many tags I've come across that have this kind of flexibility," he states. "I can walk out to a customer with a product that needs to be tracked where there is no power. You can pound wooden stakes into the ground, attach beacons, use a battery- or solar-powered reader, and you can start reading."

RELATED_ARTICLES Some of Blackburn's clients, he adds, are tracking their vehicles' efficiency by monitoring the mileage and fuel levels remotely. This is accomplished by wiring the RFID tags to sensors, or odometers, as well as by tracking when the vehicles need to be serviced.

Precyse offers iLocate middleware that provides the central database and location services. Users typically utilize their own legacy software systems to then manage the RFID data. In some cases, Eizenberg says, iLocate also provides an asset-tracking server that includes a map interface, reporting tools and dashboards.