Company Aims to Turn Readers to Radar

A South African RFID technology developer says it has developed a technology enabling a single low-cost reader to pinpoint the location of any UHF RFID tag within read range.

By Jonathan Collins

Oct. 28, 2005—Claiming a breakthrough that could revolutionize how UHF RFID is used, Trolley Scan, a Johannesburg, South Africa, developer of radio frequency identification technologies, says it has developed a new technology that enables low-cost readers (interrogators) to identify the location of UHF RFID tags, both passive and active. The system uses currently available UHF tags and existing UHF spectrum allotted to RFID.

"It is now possible to get the position of a transponder, as well as identify it, without additional radio spectrum," says Mike Marsh, managing director of Trolley Scan.

The new technology—dubbed RFID-Radar—is currently at the prototype stage, though the company has reportedly already built a reader that has proven successful. The system works with UHF tags independent of make or model, or the protocol or standards on which they are based.

This technology adds a significant amount of computing power, compared with that offered by UHF readers currently on the market. That extra computing power enables the reader to calculate the distance of a transponder within an accuracy of 0.5 meters and a pointing direction of within just 1 degree. Up to 100 transponders can be located simultaneously, at a distance limited only by the read range of the specific tags being tracked. In a two-reader system, the interrogators can operate within 4 meters of each other.
Each reader utilizes an array of adjacent antennas. One transmits RF signals to energize the passive transponders, while one to three others, depending on the spatial tracking, receive RF signals from transponders. One receiving antenna determines a tag's location in one dimension, with two needed for 2D and three for 3D. The reader consolidates the huge amount of information retrieved by the reader antennas to report the identity, range and pointing vector to the tag in 1D, 2D or 3D space. It can also track the movement of tags in the reader zone, updated at one-second intervals.

According to Trolley Scan, that kind of positional sensing capability has traditionally required either three or more readers to triangulate the transponder position or—as found in military radar applications—equipment costing up to $1 million and a large swathe of spectrum. By contrast, the company's offering can be set to operate in any frequency range, from 860 to 960 MHz, and uses just 10 kHz of spectrum for the energizing signal. "We looked at the problem in a completely different way than how it has been addressed in the past," says Marsh.

RFID-based real-time location systems are already being offered commercially by other companies, but those tend to use active tags and require more than one interrogator. WhereNet, for example—an RTLS system provider in Santa Clara, Calif.—uses 2.4 GHz tags, with a typical indoor read range of 350 feet. Sensors acting as RFID readers measure the arrival time of the signal from the tag, while software running on a server networked to the sensors uses an algorithm to calculate the distance of a tag from at least two sensors.

WhereNet says its system can pinpoint a tag's location to within 10 feet.

Trolley Scan acknowledges that adding significantly more computing power to a reader would make it more expensive. The company maintains, however, that as processing power becomes cheaper, its RFID radar software could run on specially designed dedicated chips that could be added to a reader at a cost of just few dollars. The company says its own prototype readers, used for demonstrations of the technology in South Africa, cost less than $1,000 to produce. “We can use a standard reader, just with much more memory and processing power,” says Marsh.

The ability to track location using a combination of low-cost equipment and no additional spectrum will create and extend the value of UHF RFID into many applications. These could include tracking herds of cattle and pinpointing the location of individual animals from a distance, monitoring the movement of assets in a building or keeping track of children in a nursery. Airports could use the technology not only to locate baggage and passengers as they move through a terminal, but also to monitor any unauthorized staff entry into security zones. The system can record exactly where tagged people go, rather than just the moment they pass through choke points.

In the supply chain, this technology could locate items in a warehouse or back room. Because the location of a tag can be determined by a single reader, in fact, Trolley Scan says its offering could be deployed in mobile applications—such as fitted to a forklift truck and used to locate tagged shipments and items.

According to Trolley Scan, more than 100 companies—mostly from its primary existing customer base of RFID systems integrators, government agencies and universities—have expressed interest in acquiring prototypes of its RFID-Radar equipment. These devices are set for delivery in January. Ideally, the company says it would like to sell its new invention to another company to market, but it may also license the technology to RFID equipment vendors to add to their existing readers.