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ARINC, Impeva Unveil Real-Time Supply Chain Tracking Solution

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Designed to provide in-transit visibility of assets and goods, and currently being tested by the U.S. Army, the solution leverages a variety of RFID technologies including mesh networking and wireless sensors.

By Beth Bacheldor

Jan. 2, 2009—ARINC, a provider of communications and engineering solutions as well as systems integration to government, defense and commercial organizations, and Impeva Labs, a provider of global asset management and optimization systems and services, are unveiling a new real-time supply chain tracking solution designed to provide companies with in-transit visibility of their assets and goods.

The solution, called Asset Assure, leverages a variety of RFID technologies including mesh networking and wireless sensors that can measure a variety of conditions including temperature, humidity, movement, shocks and intrusions (such as a door opening on a container). ARINC says Asset Assure can be used in a variety of markets to monitor mobile assets, such as locomotives, railcars, trucks, trailers and sea vessels; intermodal containers; fixed assets such as pipelines and oil platforms; and high-value components such as jet engines.

The Global Sentinel Unit (GSU), which can be mounted directly onto a vehicle or container, serves as an RFID interrogator and communications gateway.

Asset Assure is commercially available now and can be customized to meet the customers' needs. The solution is derived from a solution ARINC and Impeva designed for the U.S. Army Logistics Innovation Agency (LIA), as part of a five-year, $20 million contract awarded in 2006 to deliver a next-generation wireless communications solution for the tracking, safeguarding and monitoring of containerized shipments containing arms, ammunition, and explosives.

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Asset Assure is designed to do more than simply track assets, says Jim Potter, a senior manager with ARINC. It includes tracking, monitoring, security and tracing (by combining data from multiple entities that can provide information on location, environmental conditions and more).

"When you put something in a shipping container and lock it up, you want to know who handles it and when, and you'd like to know if the shipment is late and not going to be where it is supposed to be. But you'd also like to know if the container is opened at any point along the way, and perhaps you want to know what the temperature is inside and whether shocks occurred to the container. And you want to know all this in a very real-time sense," Potter says. "This is in-transit visibility, and that is what Asset Assure provides."

The solution includes two main components: Global Sentinel Unit (GSU), which serves as an RFID interrogator and communications gateway, and the Remote Sensor Units (RSUs), which functions as active RFID tags. Each RSU transmits a unique ID number as well as any data collected from wired and wireless sensors communicating with the RSU. The GSU forwards all that data to servers that make up the Global Sentinel Device Management Center.

Located in an Impeva Labs data center in the United States, these servers run Web-based software that processes and stores all the data collected by the GSUs and RSUs. All cargo-related data and continuous GPS position reports are encrypted before being sent over the satellite or cellular communications link. Customers can securely access the data via a Web browser or can download the data, via secure XML, to their own transportation management systems on site. Asset Assure can be configured to send alerts via e-mail, text message and voice mail.

The GSUs are battery-powered and can be mounted directly onto vehicles or containers or above doorways of railcars or trucks. The device contains a GPS receiver to determine its location data and as well as communications modems, depending on the customer's needs. For example, it can contain an Iridium satellite modem and a multi-band cellular modem. The GSU can also include its own wireless and integrated sensors, and wireless LAN capabilities. Having integrated sensors in the GSU eliminates the need for RSUs, in some cases.

"Because the GSU is a platform, we can interface to any sensor set...some of which may not be easily accommodated by a RSU because of size or power requirements. That's one of the important design criteria for the GSU as a platform, the ability to interface with any commercial sensor set," says Potter. Also, if a customer requires, the GSU can have a built-in RFID interrogator to read other types of tags besides the RSUs. "In addition to satellite and cellular, if required, we can integrate wireless LAN to leverage those [kinds of] connections when available," he says.

Sensors communicate directly to the GSU in a number of ways, dependent on how they are connected. Integrated sensors (those that are part of the GSU) and tethered sensors (those attached by wires) communicate with the other GSU components directly over the sensor data communications bus.

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Wireless sensors communicate with the GSU over the 2.4 GHz mesh protocol, a customized derivative of the 802.15.4 standard.

The RSU, which is mounted onto assets, also uses that same protocol to communicate with the GSU and with sensors and other RSUs. The RSU can work with a variety of sensors integrated into the RSU itself to measure, for example, the temperatures of bearings or brakes or a container's motion, but can also work with wireless sensors that support the mesh networking capabilities. The RSUs can communicate with each other in a mesh network and with GSUs and has built-in security and encryption. All data transmitted by the GSUs, RSUs and wireless sensors is encrypted.

The GSUs can be configured to report to the Global Sentinel Device Management Center at specific intervals (such as every two hours) and also can be programmed to report immediately if a pre-set business rule has been violated (such as if an RSU has reported to the GSU that temperatures have risen beyond acceptable levels in a shipping container). GSUs can also vary the times they report data to the management center when they enter a defined area, or GeoZone, which is determined by the GPS and could be a port or yard.

The Army's LIA recently finished earlier this month, a 60-day test of Asset Assure, which the military branch refers to as Next Generation Wireless Communications (NGWC) for Logistics Applications. The LIA used the system to track outbound shipment originating from a depot in the western United States and arriving at another depot on the southeastern coast.

During the test, of which details are not being disclosed, the GSU sent reports every few hours and then more often when the shipments were moving through military installations. In addition, at one point during the test the GSU sent an alert when a door was opened on one of the containers (the opening was planned, and done as part of the test).

Now, the Army will begin certifying the solution complies with U.S. Department of Defense's Information Assurance procedures, Potter says. Once certifications are obtained, the military will begin to deploy the solution in 2010.