



# How will the convergence of **LOCATION**



# TECHNOLOGIES

such as  
**RFID, GPS,  
RTLS, and LBS**

**AFFECT BUSINESS?**

By David H. Williams and Gary Hartwig

**H**ow do manufacturers and distributors locate assets within the supply chain, and how does it affect their business? This is a huge issue, as it affects efficiency and profitability. A car manufacturer bringing vehicles into a country tracks each vehicle as it unloads with Radio Frequency Identification (RFID). The vehicles are then loaded onto trucks tracked via satellite on a hosted automatic vehicle locator (AVL) system. AVL location is used extensively throughout the global supply chain, and trucks are typically tracked by third parties using Global Positioning Satellite (GPS) tracking devices with wireless terrestrial communication via trunked radio, CDMA, GPRS, or other cellular and/or satellite services. While each of these GPS systems requires a 'locate', 'communicate' and 'network' component, they are typically just referred to as fleet management systems.

To the car manufacturer, inbound and outbound logistics in the global supply chain demand intricate scheduling, as they impact operations in the



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entire distribution network. The ultimate goal is to provide affordable supply chain visibility regardless of the technology, so the GPS and mapping systems can be linked to the RFID systems to track each car all the way to the dealership, then linked to the enterprise's operational and financial systems to facilitate customer services and inbound and outbound scheduling. This allows staff to use mobile forms and devices in the field and to integrate lot tracking using RFID or a separate real-time locating system (RTLS) to find high-value assets, no matter where they are.

In a typical supply chain application, clients who have control over their warehouse(s) though chain of custody systems may find it broken

with inbound material or when the goods leave their warehouse, as in the car manufacturer example. Truly affordable 'cradle to grave' supply chain or logistics visibility is still difficult to achieve, due to high software and hardware costs and the cost of integrating with legacy systems. In the real world of logistics and third party inter-modal transportation, communication systems use a mishmash of legacy systems, paper, fax, phone, cell phone, e-mail, Internet, and voice.

The result is a conglomeration of information that is haphazard at best, causing costly and, frankly, unnecessary support processes such as proliferation of third party billing systems, auditing firms to fix errors, and, in general, large-scale inefficiencies.

**THE CONVERGENCE OF WIRELESS LOCATION TECHNOLOGIES**

The reality is that no 'one-size-fits-all' locating technology is appropriate for all conditions and applications. GPS has global coverage but can be hindered by line-of-sight issues from buildings and urban canyons. RFID is excellent and reliable indoors or in situations where close proximity to tag readers is feasible, but has limited range and requires still-costly readers which limit its applicability to low-volume applications. Real Time Location Systems (RTLS), enabled by technologies such as location-enabled Wi-Fi/Wi-Max, are good for very specific geographical areas such as campuses and office buildings, but require full-scale deployments to be effective. Tag-to-tag RTLS systems are affordable and accurate for industrial and yard applications, though they are not appropriate for all indoor applications. Location-based services (LBS) – be they for fleet tracking, navigation, social networking, asset management, or mobile resource management and more – can benefit from more than one of these technologies, depending on the context, use cases, and operating environment.

For supply chain applications in particular, using a combination of locating technology results in seamless, near-real time transport chain visibility with automatic exception reports, dynamic goods routing, online shipment decision support, increased reliability of inbound and outbound load/unload decision making, increased transport capacity and optimization in urban areas (harbors/highways), and secure chain of custody.

Hence, one key need is for an open approach to legacy systems. The goal is to connect the 'real world' of client-centric/warehouse/transportation systems with the back office using the Web to link all the pieces: people/assets/containers/materials. Finally, the need is to use technology in a suitable mix for the client application and geographical area: the aforementioned AVL GPS capability either for fleet or maritime, plus RFID and RTLS, all supported and utilized by robustly designed Location Based Service applications running on mobile devices.

Wherever possible, the trend is to 'go mobile,' running applications on cell phones and PDAs to enable the mobile workforce. In the mobile world, the need for 'green shade' redundancy in billing audits is made obsolete by mobile forms and near-real time integration to online billing for daily business close.

## HAVING TO REPLACE HARDWARE

Most operators and service providers can find logistical efficiencies from asset tracking technology and location awareness, but not if they have to replace existing infrastructure or if the initial capital costs are too high. This is one of the major reasons why only about half of all commercial fleets are using some sort of locating technology. And most indoor real-time asset tracking opportunities are lost due to the high capital costs of RTLS tracking, though costs are coming down.

Mobile devices are used by enterprises to enable their mobile workforce to enter reports for CRM, sales, and a variety mobile forms. The same mobile device may be used to automatically re-order inventory parts, send e-mail, send a maintenance order, send a map for the next job location, or find a piece of equipment. GPS may also

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be utilized by staff to integrate with RFID systems in remote locations, to display RTLS maps via PDAs with a cell network, for example, or to track maintenance staff during the day via their wireless handheld devices using pre-determined spatial and temporal geo-fences.

These devices are now equipped with Assisted-GPS, newer forms of GPS, RFID, Wi-Fi and/or cellular locating technologies which have enabled the latest LBS applications for handsets and PDAs. One technology can be turned on to support location fixes in their most suitable environments, and switch to another when conditions change. This is a significant advantage in certain applications, since a GPS signal can still be lost indoors. As such, A-GPS-enabled cell phones and

PDAs can be located indoors and the handset may be tracked more precisely. This enables non-vehicle-centric applications and can bridge the indoor location gap, typically the domain of RFID and RTLS systems, with an off-the-shelf cellular device on certain networks. Enterprise system integrators need the skills and knowledge to correctly choose those pieces that will fit the application and geography.



In conclusion, the solution to supply chain visibility is not RFID, RTLS, GPS or LBS, or one particular software application deployed independently. The opportunity for enterprises, whether large or mid-size, to find efficiency is to use a variety of

location technologies. Supply chain efficiency resides in not one locating technology or the other; it is being able to provide the combination of all options – a Web-based mobile platform to track assets wirelessly to improve logistic and supply chain business decisions – utilizing appropriate technology in CDMA, GPRS, satellite devices, mapping, sensors, RFID, RTLS and wireless network management, and pull them into networking services on a single platform; and having the technical ability to integrate the system onto mobile devices and into enterprise operational, customer, and financial systems, resulting in greatly improved efficiencies and profitability. **N**

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