White Paper

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Mobile Asset Tracking with Real-Time Location Systems (RTLS): The Real-Time Visibility Enabler for a Global Supply Chain

Real-time location system, or RTLS, refers to a general area of technology that determines the current position of an object based on real-time information gathered through a wireless system of some sort. Started with the adoption of global positioning system (GPS) for vehicle navigation, a variety of techniques have since been developed and introduced to the market for tracking people and other assets in applications spanning healthcare, security/safety, and logistics. The common challenge RTLS seeks to address is the need for time-sensitive, location related information, often brought about due to the dynamic nature of the object being tracked. For logistics applications, the increasing demand for real-time visibility in today's globalized supply chain means RTLS is becoming an indispensable element for technology investments aiming to improve the quality of the visibility data critical for management to make informed decisions.

In transportation management, the key requirement is being able to track the asset location in a broad geographic area (ideally, anywhere on earth), typically in an outdoor environment. As a result, satellite based technologies (e.g. GPS and its variants) are commonly employed for tracking goods and other assets in real time, whether to take advantage of the GPS signals accessible free of charge, or simply because there are no alternative wireless systems available such as in ocean transport. Meanwhile, land-based transport by rail or road can also utilize cellular infrastructure deployed by wireless carriers to establish the freight or fleet locations. In this case, there is a cost associated with accessing cellular data for location determination, but it can be a more cost-effective approach as part of the overall solution in the enterprise mobility network.

On the other hand, for indoor asset tracking such as in factories and warehouses, GPS or cellular based systems are no longer viable due to the lack of sufficient signal strengths to perform location estimation with satisfactory precisions. Also, due to the nature of the assets of interest (raw materials, WIP, or finished goods in cases and pallets), and the setting (well controlled environments), more economical alternatives can be devised. For instance, assets being transported by conveyors can be identified by fixed mounted scanners/readers with low- cost barcode labels or RFID tags applied to them. Whereas for assets being moved by mobile equipment such as lift trucks or AGVs (automated guided vehicles), all changes are kept updated by equipment mounted readers which associate the item (label on asset) with its current location (labels on shelves and/or floor) whenever the asset is repositioned.

There exists, however, a supply chain visibility gap where over-the-road tracking ends but before the assets enter into the confines of the four-walls, i.e. in the yards. Mobile asset tracking in the yards presents a unique use case of RTLS, in that the environment is outdoors and yet is within a contained physical space. Until recently, the most prevalent approach to managing trailers and tractors in the yard depended on all-manual, resource intensive processes to track the location and status of these assets. The integrity of the data is often severely compromised due to human errors and the non-real-time nature of such processes. Consequently, the visibility gains from investments in asset tracking during transportation or in warehouses are likely to be negated by the inefficiency in the yard processes.

Earlier approach to implement RTLS in the yards often entails tagging each and every trailer with active devices (e.g. active RFID, Wi-Fi, and UWB tags) that periodically broadcast wireless signals which are detected by a network of sensors installed throughout the facility and subsequently used to calculate the (relative) positions of these tagged assets. The high cost of installing the electrical and communication infrastructure required by these systems has limited the adoption of this technique to niche applications like in marine terminals where specialized requirements such as tracking the asset locations in three dimensions cannot yet

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be met with less expensive solutions. Furthermore, in order to conserve the battery life of these active devices, the location signal broadcasts are typically repeated at such low frequencies (e.g. once per hour or longer) that, technically speaking, the location tracking is neither continuous nor in "real time".

The optimal way to implement RTLS for mobile asset tracking in yards can take a page from the experience of building RTLS for tracking asset in transport as well as inside the warehouses. The outdoor environment of yards points to the natural choice of using proven technologies like GPS that can continuously track the current position and speed of the motorized yard tractors, obviating the need for establishing the location detecting infrastructure required by the alternative schemes. On the other hand, an analogy can be drawn between the trailers in the yard and the pallets in the warehouse: they remain immobile until hooked up to the equipment (i.e. yard tractor in the case of trailers) used to move them to the next destination. Having read ranges longer than barcodes without the need for line-of-sight to acquire the data successfully, passive RFID tags applied to trailers is the most economical way for obtaining real-time trailer position in yards. This system leverages existing yard processes such that as the yard tractors go about the yard to carry out their regular duties, the GPS-enabled RFID readers on the tractors recognize the trailers by the tags, and record and report the location data in real time. Besides the fact that only a handful of tractors are typically used to handle a large number of trailers, an additional advantage of putting RTLS on the tractors is that it enables the monitoring of key performance indicators (KPIs) of the yard operations based on quantifiable productivity metrics measured by the actions of the yard trucks. Information such as average time per move, percentage of idle time, etc, cannot be collected reliably and accurately by manual tracking or other means.

Proponents of active-tag based systems have postulated that passive RFID technology is unfitted for building RTLS solutions with enough accuracy, citing spotty GPS performance, the difficulty to achieve 100% read rates, and variance in passive RFID tag read ranges. However, recent development that leverages statistical methods and knowledge based expert systems has been shown in commercial deployments that produce location tracking accuracies meeting customer requirements of their intended applications. With the inherent flexibility in the architecture that minimizes the dependency on infrastructure investment, this new breed of RTLS-enabled yard management solutions are built on a platform combining the cost and availability advantages of the passive RFID and GPS technologies. The ease of implementation for these systems may also prove to be the catalyst for their broader adoption in supply chain and logistics related applications.

The benefit of having real-time electronic data for asset-location related yard activities extends far beyond improving supply chain visibility at a particular locale. Not only do corporations gain actionable data to facilitate process redesign and increase operational efficiency, they now also have the information that allows them to drive Best Practices across all organizations and sites. Finally, being able to share the real-time visibility data within the enterprise as well as with supply chain partners is crucial for enabling collaboration and the transformation to a more responsible and agile global supply chain for the future.

PINCSolutions

PINC Solutions is North America's leading supplier of supply chain visibility and advanced yard management solutions with Fortune-500 customers in the manufacturing, retail, logistics, and transportation sectors. PINC has pioneered the development of cost- effective RTLS using passive RFID technology that minimizes capital investment required in the infrastructure. PINC's award-winning products are designed with a scalable architecture for businesses of any size, and are expandable with modular components as customers needs grow. Available as turnkey solutions and delivered through a Software-as-a- Service (SaaS) model, these systems have proven their value through immediate efficiency improvements in customers daily operations, typically generating positive ROIs in less than a year. To learn more about PINC Solutions, please visit www.pincsolutions.com.