WHITE PAPER:

Extending the Reach of Healthcare Asset Tracking Systems with Passive RFID

Introduction

The benefits of using Real-Time Location Systems (RTLS) for asset tracking in healthcare operations are well established through industry practice. Systems that provide accurate and timely asset location help to reduce operating costs and enhance both organizational efficiency and patient safety by:

- Automating and improving the accuracy of patient identification
- Reducing the incidence of preventable medical errors
- Raising the utilization rate and preventing the loss of critical biomedical equipment
- Monitoring compliance with equipment maintenance and sterilization procedures and other hospital protocols
- Providing objective assessment of key hospital operational metrics

Simply put, accurate location systems improve patient satisfaction and staff efficiency by reducing the time wasted in waiting and searching for critical assets.

Location Technologies

A number of location technologies have been developed to address the requirements for RTLS in hospitals and other clinical settings. In the past, many of these solutions relied on custom-developed hardware and software solutions. While custom-built RTLS radio frequency (RF) technologies achieved excellent results, they were costly to purchase, costly to deploy, difficult to maintain, and impossible to integrate effectively with other related hospital information services and applications. These practical issues have sometimes hindered the deployment or effectiveness of important RTLS functionality.

More recently, however, the use of standardized, off-the-shelf commercial RTLS technology has come to the forefront for healthcare applications. These are technologies and products that have been developed and refined in other industries such as information services, manufacturing, and retail operations. These standardized technologies are matured, commoditized, and multi-sourced. They bring with them the important benefits of low installation and operating cost, conventional management tools, standardized interfaces and robust performance—all of which help greatly to streamline RTLS application deployment and integration with existing hospital information services.

Given these benefits, today's leading solution for RTLS in healthcare settings leverages the use of IEEE 802.11 Wi-Fi wireless networking. Wi-Fi based RTLS leverages communication infrastructure; in many cases building upon an existing investment. Deployment of Wi-Fi in hospitals is growing at more than twice the pace of Wi-Fi adoption in other settings, driven by proliferation of Wi-Fi connected communication devices including laptops, PDAs, Voice over IP (VOIP) devices and the increasingly widespread adoption of electronic medical records (EMR), wireless Computer-based Physician Order Entry (CPOE), prescription transmission and other applications.

Wi-Fi based RTLS solutions offer the immediate capability to track existing Wi-Fi connected IT assets in a facility. Additionally, Wi-Fi RTLS allows small battery-powered Wi-Fi tags (about the size and shape of a small pager) to track assets and personnel that are not otherwise Wi-Fi enabled. These "active tags" can be affixed to expensive or critical assets and can also be carried by hospital staff. Active tags may also incorporate a variety of sensors that can log temperature or humidity changes, or trigger transmissions based on tag movement.

However, there are classes of assets that until now could not be tracked using active tagging due to either form-factor or cost reasons. Examples include tracking of disposable and consumable products and containers, surgical samples and dispensed medications.

Introducing Passive RFID into Healthcare Location-Based Applications

Passive RFID is a standardized automatic identification technology that has been deployed for years in manufacturing, retail, and logistics settings. Passive RFID tags do not require batteries.

Passive tags can be incorporated into disposable labels and wristbands that can also carry conventional printing; they can be incorporated into the packaging of medical materials, consumables and supplies; and they can be laminated into durable ID photo badges. They can also be molded into durable plastic packaging that will withstand severe mechanical and environmental stresses, such as autoclaving.

Passive tags are affixed to assets using adhesives, tie-wraps, or mechanical hardware. They may even be incorporated directly into biomedical equipment's housing either during or after manufacture. Specialized tags are designed for application to metal surfaces, liquid containers, and IT assets such as laptops.

Passive tags carry unique identifiers that RTLS applications associate with the asset to which each tag is attached—the tag need not (and generally does not) contain data that directly identifies the asset or individual that bears it. For more advanced applications, passive tags may carry additional read/write memory capacity. Passive tags may also be enhanced by thin "paper" batteries that supply the minute power to support on-tag temperature and humidity sensors, enabling economical applications that track storage conditions for perishable or sensitive items.

Passive tags are interrogated and located by devices called readers. Readers may either be fixed in permanent locations and connected to the wired or wireless hospital network, or they may be mobile and connected by Wi-Fi. For example, mobile readers could be mounted in carts used to transport tracked items. Reader functionality may also be integrated into a handheld computer, PDA or mobile phone. Typically, a conventional fixed reader can reliably interrogate a tag at a range of 5-15 meters. Readers can sense tagged asset location with high accuracy and fine resolution, and they can also sense direction of travel as assets pass through doorways, stairwells and elevators.

Combining Active and Passive RTLS into a Comprehensive Solution

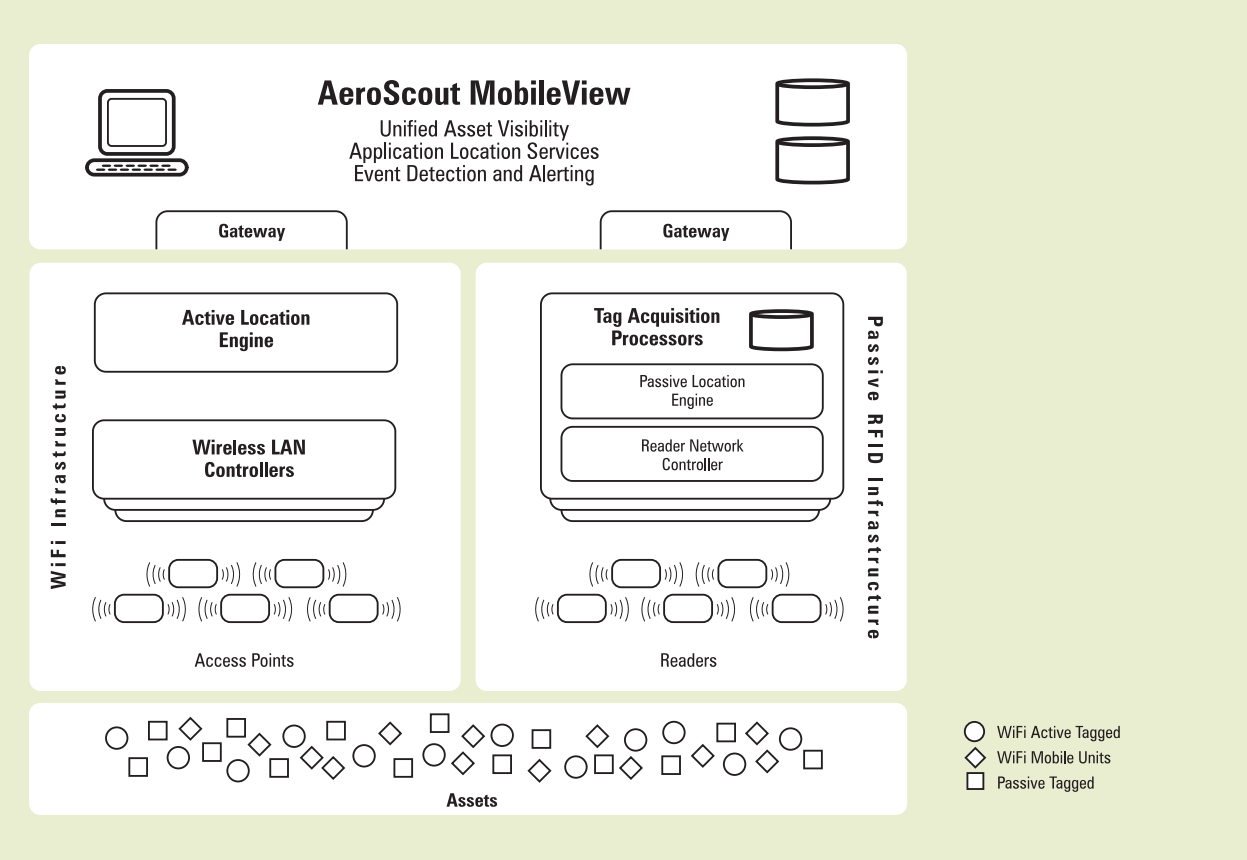
Active and passive location technologies work well together. They play complementary and synergistic roles in a comprehensive architecture for supporting location-based applications in healthcare environments.

Active, Wi-Fi based RTLS provides long range and ubiquitous coverage for existing assets with Wi-Fi capabilities (such as laptops or PDA's), and Wi-Fi Tags supplement this coverage for personnel and assets. Some tags even incorporate programmable buttons that can function as emergency calls or provide other basic communication functions.

Passive RTLS provides comparatively short-range coverage, but affords high resolution, rapid reporting, and allows the tagging of a broad range of assets and supplies where active tagging is impractical.

With standardized software interfaces, both active and passive location information can be unified in common RTLS infrastructure. AeroScout® MobileView offers this powerful functionality, fully integrated into a secure, web-based solution that also offers timely real-time alerts and detailed location history and reporting capabilities.

The following diagram shows the complete architecture for a hybrid active and passive RTLS:



Conclusion

The adoption of RTLS in hospitals and healthcare organizations enhances clinical work-flow, improves patient safety and treatment experience, illuminates operational inefficiencies, and produces better asset management. These benefits are expected to save clients millions of dollars in unnecessary capital and operations expenditures, and will undeniably save lives through reduction in preventable medical errors and enhanced availability of critical staff and equipment.

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