

Using Wireless Tagging Technologies to Locate and Route Resources

As gasoline blows past \$4.00 per gallon, few driving experiences are more frustrating than sitting in downtown traffic waiting for a traffic light to change to green. Of course you just got through waiting for the previous traffic light to change just one block behind you. While your car idles and your carbon footprint expands, you visualize your hard-earned income escaping out your car's tailpipe. Under your breath you mutter, "If only they synchronized these lights!"

Although most major cities today synchronize their lights to improve traffic flow, these systems require regular adjustment to ensure coordination among the various signals. New York City, where traffic flow is critical to commerce and public safety, requires a robust approach to monitoring and managing traffic flow. With congestion pricing—paying for the privilege to drive a car within a restricted geographic zone—rejected in Albany for now, the city must rely upon its current use of road sensors, signal control devices, and analytical software to manage traffic.

Engineers in the Department of Transportation (DOT) adjust traffic lights in real time to respond to accidents, fires, special events, and unexpected traffic snarls. Traffic management software analyzes the flow patterns of cars in the city streets and adjusts the timing of traffic signals at adjoining intersections to maximize the throughput of traffic at throughout the city. As traffic-jammed as most New York City streets can be at rush hour, the situation would be much worse without the technology deployed by the NYC DOT.

These principles of city traffic management can be applied to resources—professional staff and equipment—utilized to manage patient care. Although I

have previously described the use of RFID in tracking staff (2004), equipment and patients to better deploy resources, additional technologies provide more options in effectively deploying limited resources in the care of patients.

RFID, WiFi Tags and Location Tracking

Radio frequency identification (RFID) tags provide a simple means to track the location of both objects and people. Commonly used to prevent theft in retail stores (these small devices are often hidden in the product packaging and set off an alarm if not deactivated before leaving the store premises), these relatively inexpensive devices are now being attached to hospital resources (e.g., portable X-ray machines, infusion pumps) and personnel. Tags come in both active and passive forms.

Passive RFID tags require passing through an electromagnetic field to be activated. For example, RFID tags are often used to monitor newborn infants in hospitals to prevent abductions. A perimeter security field is established around the maternity ward to indicate, through an alarm, if any of the tagged infants pass through the perimeter field. However, once through the barrier, the tagged infant's location cannot be tracked.

Functioning in a different way are active RFID tags which are powered by a small battery that broadcasts a signal to available antennas. Similarly, WiFi tags come with their own power source, but they differentiate themselves from active RFID by broadcasting a signal to any existing WiFi networks within the hospital. Considering that most hospitals have installed WiFi networks for deployment of their other HIT applica-

tions (e.g., electronic medical record, clinical portals), WiFi tags are able to leverage this existing technology investment. This offers a significant advantage over both active and passive RFID tags, which require their own RFID technology-based antennas.

WiFi tags function much like global positioning system (GPS) devices but use different technology. The WiFi tag signal can be tracked dynamically to continuously locate, through triangulation or other means, the exact position of an object or person in real-time. Therefore, using the example above, a WiFi-tagged baby who unexpectedly leaves the maternity ward can be tracked throughout the facility using available WiFi coverage.

Hospitals are just beginning to utilize these WiFi tags to identify the location of portable diagnostic and treatment equipment, facilitating the routing of the equipment to where it is needed. Some organizations are utilizing tags to track their skilled workers but not on the same scale as for inanimate assets.

WiFi Messaging for Routing

Healthcare delivery requires a mobile workforce that can communicate without delay. With the increased functionality now inherent in mobile phones, physicians, nurses, and other healthcare providers utilize these devices as critical communication tools in care delivery. Communication modalities include both voice and messaging. Text messaging takes the form of person-to-person and automated computer-generated results, alerts, and reminders.

Tracking objects with RFID or WiFi tags helps manage inventory but does little to route staff. Only by utilizing the

communication capabilities of handheld devices, can instructions—via text messages or automated voice messages—be sent to staff to efficiently manage their workflow around equipment availability and waiting patients.

Cellular service can be spotty and unreliable, and limited service quality hampers the use of these valuable mobile communication devices in a hospital setting. Fortunately, the development of WiFi-based voice and text communication helps fill the void presented by the limitations of cellular technology.

Communication devices exist today that employ both cellular and WiFi technology within one handset. Utilizing cellular and WiFi-based location tracking to determine which communication technology provides the best connection, communication management software can now route voice and text requests to and from handheld devices utilizing the best backbone technology and frequencies. As this process takes place continuously, com-

munication requests are transferred seamlessly between cellular and WiFi communication backbones.

Physicians, nurses, and other health-care professionals carrying WiFi-enabled phones within the facility can communicate with each other instantaneously, through voice or text messaging, eliminating the need for asynchronous paging and callbacks. In addition, phones with WiFi and cellular access to the Internet present seamless access to clinical Internet portals, a valuable tool in managing patients.

Reaching the Next Level

Currently no routing program uses artificial intelligence to match patient needs with available equipment and personnel to maximize efficiency of workflow. That said, it is only a matter of time before such programs are offered to hospitals and clinics. Traffic management software exists to route automobiles, and logistics programs—such as those used by FedEx and other package delivery companies—work to route aircraft and trucks to pick-up and deliver packages. Combining such analytical routing capabilities with current patient care processes presents a valuable opportunity where resources—both trained staff and equipment—can be deployed efficiently. This maximizes benefits to patients while contributing to restraining the growth in health-care costs. **IPSQH**

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