

**The teaching hospital estimates the technology has saved it \$70,000 annually by merely enabling it to locate its IV pumps more quickly.**

By Beth Bacheldor

Oct. 29, 2008—For about two years, the [University of California, San Diego \(UCSD\) Medical Center](#) has employed an RFID-enabled real-time location system (RTLS) to track a variety of assets at its Thornton, Calif., campus. The teaching hospital estimates it has saved approximately \$70,000 annually on IV pumps alone, because it can easily locate the pumps with a click of a button, thereby eliminating the need to rent pumps on a daily basis in order to meet demand. Now, UCSD is expanding the RTLS to its other campus in Hillcrest.

The medical center is using an RTLS from [Awarepoint](#) that employs active RFID tags operating at 2.48 GHz. The tags transmit their unique IDs over the 802.15.4 (ZigBee) communications protocol, to small receivers (which Awarepoint refers to as sensors) that plug directly into standard 120-volt AC wall outlets. These tags and sensors also function as transceivers, communicating with each other via the ZigBee mesh networking protocol. A tag or sensor can pass data to a main access point (known as a bridge) by first sending it to another tag, which then forwards the information to a third tag or sensor, or to the main access point, depending on whether the second tag is in range of the main access point. In the Awarepoint network, a tag can transmit data to a bridge through up to five other tags and receivers. The receivers employ the ZigBee protocol to forward a tag's ID number and signal strength to a bridge, along with its own ID number and the time it read the tag and the ID of the transceiver that may have previously picked up the tag's signal.

The bridges link, via an Ethernet cable, to a central Awarepoint server that calculates the locations of all tagged assets, then displays that information on a map of the facility. Any computer linked to the system's local area network (LAN) can access the map and then employ Awarepoint's software to search for a specified type of asset. The software can provide the asset's location to an accuracy level of 1 to 3 meters (3 to 10 feet). Awarepoint utilizes a proprietary algorithm to determine asset locations, based on the tags' RF signal strength.

Generally, Awarepoint's RTLS requires one sensor per every 1,000 square feet, and one bridge per every 20,000 square feet, according to Matt Perkins, the company's CTO. The recently renovated Hillcrest campus is a 386-bed hospital that measures nearly 1,000,000 square feet. Thornton, meanwhile, is a 119-bed, 238,800-square-foot general medical-surgical facility. UCSD and Awarepoint decline to reveal the number of sensors and bridges the hospital has actually deployed to date.

The Thornton facility has currently tagged approximately 650 to 700 assets, including IV pumps, headlights worn by surgeons, and wheelchairs, according to Tom Hamelin, UCSD's director of perioperative services and the initiator and overseer of the RFID project. At Hillcrest, Hamelin says, he and his team have been "furiously tagging" assets. So far, 400 items have been tagged, and he soon expects to have a total of about 800. Each tags' unique ID number is correlated with information specific

to that item (including the item's serial number, the manufacturer, the model number, and an internal asset number assigned by the biomedical department) in a database that's part of Awarepoint's software.

Awarepoint's RTLS does not operate on a Wi-Fi network, as do other RTLS systems currently on the market. That feature was important to UCSD. "When I started this project, there were two things that the head of IT asked of me," Hamelin says. "He told me not to bring in a system that would mess with the hospital's wireless network, and he asked me for a solution that would determine the location of assets."

Prior to implementing the RTLS, first at Thornton and later at Hillcrest, UCSD had no method for tracking its assets, other than simple pen and paper. "We had inventory lists from the biomedical engineering department," Hamelin says, "and did our best to keep track of things that way." But, he explains, as often happens in hospitals, caregivers would stash items so they could access them when needed, which often resulted in items missing for days on end. Every so often, the hospital would have to put together a "SWAT team" to hunt down all of the various assets and bring them to a vacant storage room. "We'd go from an empty room to a room full of equipment," he adds.

More than two years ago, Hamelin began seeking a solution that would help the hospital track items. UCSD started employing Awarepoint's system, first in the OR department at Thornton, which has seven operating suites and 24 pre- and post-operative beds. "We did the whole second floor, experimenting with the tag," he says. That initial pilot gave Hamelin and his team confidence that Awarepoint's platform would do the job, and that it provided an easy-to-use interface that nurses, doctors and others would utilize. "We have a lot of [technology] systems in the hospital, but they aren't always staff-friendly," he states. "My big concern was how easy the interface was going to be."

To locate an IV pump, for example, a nurse can click on that device from a list of items, then view a map showing where all of the IV pumps are located in that nurse's unit (when a person logs into the system, it defaults to that individual's unit and creates a list of assets specific to that particular group). The assets are shown by red dots on the map. When a red dot is clicked, additional information about the item appears, such as its serial number.

The initial pilot also helped UCSD determine which types of assets it needed to tag. Initially, the hospital thought it should tag only its high-cost items, but it soon realized some of those objects, such as surgical tables—while mobile—really didn't move much. And the hospital also discovered equipment to be tagged that it hadn't originally considered. "Some things we ultimately decided to tag were not very big," Hamelin says, "but these were things that were often getting stashed, like the headlights and lead shields—things that don't seem like much but can delay the start of [surgical cases] and, ultimately, turnover of rooms." After six to seven months, UCSD expanded the RTLS to the entire Thornton facility.

In order to convince hospital management to expand the RTLS to Hillcrest, Hamelin says he had to create presentations illustrating how Thornton saved \$70,000 during the first six months of 2008 by

eliminating the need to rent IV pumps, and how it reduced capital equipment expenditures. Such a level of savings, he notes, "was more than enough to convince the CFO."

With both the Thornton and Hillcrest campuses covered with the RTLS, Hamelin says, the hospital will be able to track assets that move back and forth between the two facilities. "Awarepoint has a query we can run every day to see if there's equipment from Hillcrest at Thornton, and vice versa," he explains.

The hospital doesn't plan to stop there, either. Hamelin says he, his team and Awarepoint will continue analyzing where the system is not only cutting costs, but also improving workflow. And other divisions in the hospital, such as the security department, are interested in employing the RTLS in conjunction with other systems it has installed, such as security cameras. In addition, Hamelin says, UCSD is also considering tagging a variety of surgical instruments. "We plan to expand on what we've been doing," he says.

Awarepoint has worked with other health-care organizations, including [Walter Reed Army Medical Center](#), which in 2007 said it planned to adopt Awarepoint's RTLS to track 4,000 pieces of equipment (see [Army Medical Center Looking to Boost Asset Awareness](#)). And just this week, Awarepoint announced that [Tri-City Medical Center](#), in Oceanside, Calif., is expanding its implementation of the company's RTLS to track nearly 1,000 medical equipment assets throughout the 515,000-square-foot campus. Tri-City Medical Center initially deployed the system in its surgical department, and now plans to track infusion pumps, crash carts, defibrillators, specialty supply carts, microscopes and other items throughout the hospital.