

**The 442-bed Virginia facility will utilize the system to track the locations of hundreds of cardiac telemetry units and other assets, as well as to monitor refrigerator temperatures.**

By Beth Bacheldor

Dec. 15, 2008—In early 2009, [Mary Washington Hospital](#), located in Fredericksburg, Va., plans to install active RFID tags and a real-time location system (RTLS) throughout its 442-bed facility, to track the hundreds of small cardiac telemetry units it employs to monitor patients' heart rates. The facility will also utilize the RTLS to track wheelchairs, IV pumps and other medical equipment, as well as to monitor the temperatures of refrigerators used to store medicines and vaccines.

The RTLS, supplied by [RadarFind](#), is designed to let hospitals use wireless technology to track assets without having to burden Wi-Fi networks, which many organizations utilize for a variety of mission-critical health-care applications. At Mary Washington Hospital, for instance, doctors and nurses use the facility's Wi-Fi network to communicate via handheld devices.



*Mary Washington Hospital*

RadarFind's system includes active 902-928 MHz ultrahigh-frequency (UHF) RFID transponders that can be attached to assets and interrogators that plug directly into an outlet. The readers capture the tag's signal, which includes a unique ID number, and transmit that data wirelessly over the same UHF band, to so-called collectors installed around the hospital. The collectors (typically, one such device is installed on each floor of a facility) then pass the information on to a RadarFind server via a local area network.

The interrogators can calculate an item's location to within several feet on the floor on which it is located, using a combination of signal strength and trade-secret technologies. In addition, the readers utilize wireless synchronous multiple-input multiple-output (MIMO) technology, a communication technique employing multiple antennas to receive data from the tags and eliminate multipath interference, thereby enabling an item's location to be determined more accurately. RadarFind's tag also features a switch to indicate an asset's condition. When the item is clean and available for use, for example, a nurse can slide a plastic cover to expose a green sticker. This also causes the tag to modulate its signal to denote that the asset is ready for use, so personnel using the RadarFind software to view a floor plan of the facility can observe both the asset's location and its status.

RadarFind has developed a new form factor of its RFID tag especially for Mary Washington Hospital. The cardiac telemetry units are designed to enable patients to walk around, rather than remain bed-ridden and hooked up to stationary devices. The units transmit the patients' heart rates to a system that skilled technicians monitor at all times; in the event that a problem arises, nurses and doctors can thus respond quickly. But because a cardiac telemetry unit is so small—not much bigger than a deck of cards—Mary Washington Hospital was unable to find an RTLS RFID tag on the market that could be attached to the device. "RadarFind was willing to develop this special tag and application, before we were even customers," says Andy Holden, the company's director of biomedical services.

RadarFind's chief medical officer, Vincent Carrasco, explains that this new tag will snap onto a piece of the cardiac telemetry unit. "What has really been challenging," he says, "is these devices are plugged into other units, and there are a number of different manufacturers of these devices." According to Carrasco, RadarFind will develop tags that can be used on a variety of cardiac telemetry units from different manufacturers.

With the cardiac telemetry units tracked by RadarFind's RTLS, hospital staff members will be able to instantly determine where in the hospital the patient wearing a particular unit is located, and more quickly get help to that individual if required. Nurses at Mary Washington Hospital typically keep tabs on patients by communicating with them and checking their charts, but if a patient wanders down to the cafeteria without alerting anyone and experiences a problematic change in heart rate, it may take several minutes to locate that particular patient. With the RTLS, Holden says, this can be accomplished much more quickly.

In addition, the hospital will be able to track the locations of the cardiac telemetry units even when they are not on patients. The units are costly, averaging \$3,000 apiece, and are often misplaced or lost. Sometimes, the devices are left on a patient's bed, and then mistakenly rolled up into the bed linens and sent out with the laundry. "Are they going out in the laundry, or in patients' suitcases? We don't know," Holden says.

Once the system is installed—which will comprise approximately 500 tags (including those designated for use with the cardiac telemetry units), 350 interrogators plugged into outlets, and 20 collectors—the hospital plans to set up audible and visual alerts that staff members can view on their computers at

specified areas, such as at the hospital entrance, and develop processes for handling those alerts.

In addition to tracking the cardiac telemetry units and other equipment, the RadarFind tags—thanks to their status feature—will help the hospital monitor whether a device has passed through the appropriate decontamination process before being assigned to another patient.

"I'm very excited about the opportunities this system is going to provide us," Holden states. "It is going to change the way we do business. So much of our time is lost looking for equipment, or not knowing where equipment and people are, and this is going to make it so much easier to find equipment and allow us to improve customer service. We'll be able to provide a wheelchair when a patient needs it, for instance."

Finally, according to Carrasco, Mary Washington Hospital will employ RadarFind's tags and system to monitor the temperatures of refrigerators used to store medicines and vaccines. If a refrigerator is accidentally left open, or ceases to function, the problem might not be discovered until it is too late, he says, thereby ruining thousands of dollars' worth of medicines.

In June 2008, RadarFind extended its system's sensor capabilities to enable customers to track temperatures, capitalizing on a capability that allows the tags and readers to gather environmental data to monitor their own health. If, for instance, a reader plugged into an outlet were to begin overheating, the embedded sensor would detect that problem and alert the RTLS (see [RadarFind Offers Temperature-Sensing Tags](#)). The firm developed a software upgrade to its RTLS that leverages the temperature-sensing capabilities so tags can, for example, be placed inside refrigerators or freezers to monitor their temperatures and provide instant notification of variances. If the temperature within a particular refrigerator varies beyond a preset range, an alert can be sent out via e-mail or text to the wireless devices of specified personnel, in accordance with hospital protocols.

Refrigerators typically have doors made of metal, which can interfere with UHF RF signals, primarily by reflecting them. Nonetheless, says Steve Jackson, RadarFind's CTO, the company's tags are still able to transmit their signals to readers situated outside of a refrigerator, because of what's known as RF aperture.

"The door of a typical refrigerator is sealed with a gasket, which is not metallic, and which forms a sizable gap for the radio waves to go through," Jackson explains. "The dimensions of this gasket are far larger than needed for a significant amount of signal to exit the refrigerator, at the frequencies we use. This gap, transparent to our radio signals, is referred to as an aperture."

If the aperture is of sufficient size, it's as if the door weren't there—thus, the read range is unaffected. In addition, RadarFind readers will be installed with sufficient proximity to tagged refrigerators.