

## Reinforcing the Value of Highly-Accurate and Reliable Indoor Location Technology in Healthcare

December 5, 2014 by Healthcare Business Today Team – [Leave a Comment](#)

By Luc Darmon, VP of Business Development, DecaWave

As GPS technology is spreading from smartphones to tablets to watches, and more, people are becoming increasingly accustomed to being able to track and process locations. As indoor location technology is developed and released to market, people are warming to the idea that location services can work indoors as well. At the same time, managers of offices and other large-scale enterprises, including hospitals and medical centers, are also planning around the ability to know where people and things are.

In the healthcare industry, applications of indoor location technology have been valuable in many areas. One is simply the ability to track patients, either for their safety or to track their care. A second is asset tracking, monitoring the locations of movable equipment so that it can be found quickly when it's needed. A third is tracking staff, so that the nearest appropriate staff member can be summoned for any need that arises. A fourth is enabling patients and visitors to find where they need to go without interrupting hospital staff.

Other uses of indoor location technology are more unique to the need of the healthcare industry. A fifth is to log and monitor which staff members are near various patients, to ensure that each patient is checked on a regular basis, and as a means of auditing who was near a patient if a question arises about the treatments that were given. A sixth is to monitor when staff members use hand-washing stations, to ensure that sanitary policies are followed. A seventh is to monitor which staff members access supply rooms or medicine cabinets, particularly for restricted drugs.

One challenge in deploying indoor location systems into healthcare facilities is matching the solution to the specific requirements. Some solutions run on cell-phones and other mobile devices, while others use "tags" on people or equipment that are tracked as they move around. Some solutions require deploying little radio units throughout the site, while others rely on wireless networks already in place. Some solutions track locations on a central server that can be used by management, while others track locations on the cell-phones or other mobile devices that are moving around. All of these and other factors need to be considered in selecting an indoor location solution.

One factor that is often overlooked, however, is accuracy requirements. Most indoor location systems on the market are accurate only to within 5-7 meters and some are less accurate than that. Some are accurate to within 1-2 meters. Very few are more precise than that.

In a hospital setting, accuracy of 5-7 meters is perfectly adequate for some tasks. For example enabling visitors to find their way around the site on their smartphones does work very well with 5-7 meter accuracy. Systems for paging the closest doctor can also work effectively with that level of accuracy.

On the other hand, many healthcare applications of indoor location technology need much higher accuracy. Accuracy of 7 meters is often not sufficient to know what room something is in. For example, if a nurse needs to find a patient, and the lost patient might have suffered from some sort of attack and need medical attention critically, it is critical for medical staff to know exactly which room the patient is in so as not to waste time finding the patient when they arrive within 7 meters but there are 4 rooms within that range.

Moreover, if the goal is to know which patient's bed the nurse is standing by, or which medicine cabinet in the supply room a medical technician is opening, then higher accuracy is needed. Most hospital beds are within 2-3 meters of each other, and many hospital supply rooms have the cabinet with sensitive and risky medicines only a meter or two from the cabinet with the gauze and iodine. If indoor location technology is going to be used for monitoring access and logging medical checks, or any other policy maintenance, then a solution is needed that will deliver very high accuracy, all of the time.

The challenge is that most wireless technologies, including the well-known Wi-Fi and Bluetooth, cannot deliver sub-meter location accuracy with a 95% reliability or better. The reasons for this are very technical, and relate to how narrowband radio, including both Wi-Fi and Bluetooth, encode information within radio waves. All narrowband radio systems transmit in a way that is very practical for wireless Internet, sending media between phones, or for wireless earphones, but which does not straightforwardly support accurate or reliable location tracking. This is why, out of fifty or more indoor location solutions on the market, only a handful can achieve sub-meter accuracy, and even less are accurate to within 10-20cm.

In addition to this, many approaches have accuracy that fluctuates a lot based on the physical layout of the place. Some technologies work very well when the things being tracked are within line-of-sight of some of the system's radio beacons, but are less accurate when the things being tracked are in different rooms. Some technologies work well when walls are made of wood or drywall, but not when walls are made of stone or metal. In Healthcare settings, when it's unacceptable for accuracy to diminish when sick patients or equipment enter certain rooms, technology is needed that works reliably in all settings.

A new approach to wireless indoor location positioning is just reaching market. This wireless technology is called IEEE802.15.4a, now wrapped under the IEEE802.15.4-2011 standard and it's implemented on top of radio technology called ultra-wideband (UWB). UWB transmits information in a manner that is more resilient to interference, and which supports location measurement much more accurately and reliably by means of very precise Time of Flight measurement. The wireless standardization associations approved 802.15.4a a few years ago. Over the next few months, you can expect to hear a lot more about indoor location,

and in particular about highly accurate indoor location technology based on IEEE802.15.4-2011. This technology will first be reaching market in radio beacons that are deployed around a site and tags that are attached to equipment or people that need to be tracked. In the longer term, makers of smartphones and other mobile devices, and makers of network systems, are looking at integrating 802.15.4-2011 support into their products.

In the meantime, as indoor location technology gets more and more attention in the mass market, pay attention to the small print that discusses how accurate and how reliable the location positioning is. If you want visitors to see a blue dot on a map, or if you want to be able to find the nearest doctor, high precision may not be critical. But if you need to find patients fast enough to save their lives, or if you want to do policy management, treatment auditing, and other serious work based on indoor location, precision matters.

*Luc Darmon is VP Business Development at DecaWave, a fabless semiconductor company headquartered in Dublin Ireland*

*DecaWave recently launched the first chip to implement 802.14.4-2011 over ultra-wideband radio. DecaWave's ScenSor is a 6x6mm CMOS single-chip transceiver, and has attracted strong interest from RTLS players across the board, particularly in the healthcare vertical which represents a strong growth area for RTLS and indoor location technologies.*