

# FCC Certifies Ubisense's UWB

One of the first outlets of ultra-wideband RFID technology to get the FCC green light for commercial use, Ubisense is looking at applications as disparate as combat training and corporate office design.

By Mary Catherine O'Connor

Dec. 13, 2004—Ubisense, a Denver-based developer of tracking systems that use ultra-wideband (UWB) RFID technology to create indoor, real-time location positioning systems, has received certification from the Federal Communications Commission (FCC). Since its founding in 2002, the company has been developing its UWB technology and its products are being used, under a premarketing agreement that does not require FCC certification, for research projects at 20 research institutions around the world. Now that the company has gained FCC certification by proving that its UWB products function within the appropriate band and work in the manner in which they are intended, Ubisense can sell its products in the U.S.

Unlike conventional RFID systems, which operate on single bands of the radio spectrum, UWB transmits a signal over multiple bands of frequencies simultaneously, from 3.1 GHz to 10.6 GHz. UWB signals are also transmitted for a much shorter duration than those used in conventional RFID. UWB tags consume less power than conventional RF tags and can operate across a broad area of the radio spectrum,. UWB can be used in close proximity to other RF signals without causing or suffering from interference because of the differences in signal types and radio spectrum used.

Ubisense uses active tags, which the company calls Ubitags, and readers, or Ubisensors, operating from 5.8 to 7.2 GHz, manufactured by C-MAC, a British maker of microprocessors and frequency products. The tags have a unique 32-bit (4-byte) identifier and beacon their location as often as 10 times a second—essential for tracking people walking quickly through a monitored area—or as infrequently as once every few minutes; this rate can be changed dynamically over a wireless link while the system is running and in response to an individual tag's behavior. If a tag is moving quickly, the update rate of its beacon can be programmed to increase, and if tag is stationary, the update rate can programmed to decrease. This conserves battery life.

A Ubisense tag looks like a pager, weighs 145 grams and has a battery life of approximately one year, depending on frequency of use. It has two buttons, a buzzer and two LED lights. All of these input/output features can be programmed for specific uses by the system administrator. The buttons, for example, could be used by a lecturer giving a presentation being streamed over the Internet to remote viewers. Through an attached sensor, a video camera could be set to follow the lecturer as he moves around a room. The lecturer could then press one of the bottoms to zoom in on an object he points the Ubitag to (a white board, for example) so that remote viewers could see it closely. He could use the other button to zoom back the camera's focus back out. The buzzer could be programmed to signal a user about an scheduled appointment, or a doorway sensor could be programmed to sound the buzzer if area access is not allowed. The lights could be used for similar messaging. The Ubitags can store up to 200 bytes of data, 4 of which are used to store a 32-bit unique ID. Tag data can be changed over the network and individual tags can be paged.

A Ubisense RFID reader is small box, about 6 inches tall, that is networked with other Ubisensors though Ethernet cabling and that runs on a low-voltage DC supply, or alternately through the Ethernet cabling.

Ubisense says UWB systems work well indoors because the short bursts of radio pulses emitted from UWB tags are easier to filter from multipath reflections (RF signals reflected from surfaces) than conventional RF signals. But while UWB works well across structures and through walls, metallic and liquid materials still cause some signal interference. This can be overcome, the company claims, through the strategic placement of RFID readers and the use of more RFID readers.

The Ubisense system works by creating sensor cells—each cell requires a minimum of four sensors, or readers—throughout buildings or collections of buildings, such as a corporate campus (an unlimited number of readers can be networked together in a manner similar to cellular phone networks). Active UWB tags are placed on assets and objects or worn by personnel badges. The readers receive data from the tags, from as far as 150 feet, and send it through the Ubisense Smart Space software platform, which is integrated into a corporation's existing information system and operates on either Microsoft or Linux platforms.

Ubisense says what sets its system apart from other location systems is the combined use of two algorithms—one algorithm calculates the time difference of arrival of a signal at two different RFID readers and the other calculates the angle of arrival of the signal—in order to pinpoint the location of a tag to within 6 inches. Other location systems use one of these two location methods, but by using both, Ubisense says it needs fewer readers than other systems using only the time-difference algorithm.

The Ubisense software can be integrated with AutoCAD drawings of the monitored areas and renderings of the tagged objects and people in 2D or 3D. The software can also be integrated into existing camera systems within a facility.

Ubisense CEO C. Warren Ferguson says this type of visual-tracking application creates a location-awareness system that can be used by businesses to utilize working space to its maximum level of efficiency. The Ubisense workplace-consulting system requires personnel to carry Ubitags to track their movements throughout the workday. By analyzing the data collected over a set period of time, Ferguson says, office designers can improve the workflow in the office and save space. Office planners can use the Ubisensor system to determine how often meeting rooms are used, for example, and by how many people, working in which departments within the corporation. Such information can lead to improved office layouts. "You can use less space if you design it well," says Ferguson, "and that saves companies money," pointing to reports that the cost of securing work space is second only to employee compensation for many corporations.

He says the Ubisense products could also be used to enable corporations to accommodate staff that do not regularly work in a given office location. By wearing a Ubitag, the staff member would be logged into the company's network upon arrival and an administrator could appoint her or him a workstation with a computer that grants appropriate file access. Calls for the staff member could be forwarded to a phone nearest to the tag's location.

Ubisense has no commercial contracts yet, but it has begun talks with [Cubic Defense Applications](#), a San Diego-based firm that supplies military training and combat simulation services to the U.S. government, about using Ubisense gear and software to develop urban-warfare training simulators in which opposing teams of soldiers wearing UWB transmitters are tracked in real time and in 3D through Ubisense software. In such applications, personnel could watch the simulations in 3D and in real time, and later the participants could view recordings to learn more about the exercises.

Other applications that Ubisense is marketing include tracking people and assets in high security areas or hospitals. UWB is recognized by the asset-tracking industry as a good fit for hospitals because it operates outside of the UHF frequency range that is used in essential equipment in many healthcare facilities. Portland, Maine-based [Parco Wireless](#) produces a UWB asset-tracking system and sold its first commercial installation,

to a hospital in Washington, D.C., in August ([Hospital Gets Ultra-Wideband RFID](#)).

Ubisense is not releasing pricing information. It says its newly certified FCC UWB products are currently in production. The Institute of Electrical and Electronics Engineers (IEEE) is working on a UWB standard, but there are no industry standards that have been widely accepted. (A rift between two UWB associations, the UWB Forum and the Multiband OFDM Alliance, has caused what is being widely referred to as a standards war.) Ubisense says it does not forecast its products interoperating with other UWB products any time soon, however, so it is not compelled to find a standard.

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