

Chicago Fire Dept. Tests ZigBee-based RFID System

Commanders want to track rescuers' actual position within burning buildings.

By Claire Swedberg

Oct. 11, 2006—The Chicago Fire Department is testing a wireless system that will pinpoint the location of firefighters in burning buildings. At the University of California, Berkeley, researchers developed the system in response to a request by the fire department following the events of Sept. 11, 2001, when rescue workers in the Twin Towers using incompatible two-way radios were unable to communicate with each other

Developed by the school's mechanical engineering department, together with the Center for Information Technology in the Interests of Society (CITRIS), the Fire Information and Rescue Equipment (FIRE) system provides firefighters and command chiefs details about rescue workers' positions in a building. The two-way radios that most fire departments use have limitations in this respect, as they require firefighters to themselves provide status reports on their locations.

The FIRE system, which the Chicago Fire Department began testing in the spring, consists of two elements—SmokeNet and FireEye. The SmokeNet is a wireless network using Moteiv's Tmote Sky wireless sensing platform and sensors, as well as its Boomerang software, which enables wireless sensor devices to register and report changes in the environment to firefighters. The sensors, which use two AA batteries, can be installed in smoke detectors, on ceilings, or in door jams throughout a commercial building, says Paul Wright, chief scientist for CITRIS, a public-private partnership that creates information technology solutions for social, environmental and health-care problems.

The sensors use active 2.4 GHz RFID tags with a read range up to 100 feet. As part of its pilot program, the Chicago Fire Department has installed these sensors throughout one of its facilities. The FIRE system is also installed in some UC Berkeley buildings and is being examined by several other cities, Wright says.

The in-building sensors send out an RF signal every two seconds, scanning for firefighters whose air tanks are equipped with wireless sensors that both receive and send transmissions to and from the building sensors installed. The sensor in each firefighter's air tank includes a unique number; as a firefighter passes an in-building sensor, the air tank sensors communicate its ID number to in-building sensor, establishing the firefighter's location. This position information is sent via a wireless ZigBee network to chiefs' or incident commanders' tablet PCs. The PCs will have access to AutoCAD drawings, provided by the city, of buildings in which the sensors have been installed, and firefighters' locations will appear on the screen as dots. Knowing the location of the firefighters helps commanders make tactical decisions, such as when to have firefighters evacuate.

The in-building sensors also can be equipped to measure smoke levels and temperature, alerting firefighters about conditions around them. There can be dozens of sensors in the building transmitting to a firefighter's corresponding sensor at any time, says Andrew Redfern, a wireless sensor networks research engineer at UC

Berkeley.

UC Berkeley student Joel Wilson has developed a system known as FireEye, which includes a head-mounted display screen attached to the nose guard inside the helmet of a firefighter. The FireEye displays an interactive floor plan map featuring the firefighter's current location, or that of other company members, on a postage stamp-sized LCD screen positioned below the right eye of the fire fighter.

"This technology provides a breakthrough for safety, efficiency, and effectiveness of first responders," says Joe Polastre, chief executive officer for Moteiv. The system pilot is funded by the Chicago Fire Department as well as by Ford Motor Co., a CITRIS associate corporate member. Early prototypes of the FireEye were built at the Ford Rapid Prototyping Lab, a 2,000-square-foot design studio within the UC Berkeley's mechanical engineering department.

The Chicago Fire Department and UC Berkeley hope to have the system installed in Chicago, but when that would happen is still unknown. In the meantime they will continue to test the technology to obtain proof the FIRE system works effectively. The city will have to decide the logistics of obtaining all commercial building floor plans and mandating that commercial buildings have FIRE sensors installed.

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