

The Connecticut startup has received a \$100,000 grant from the DHS to work on an intelligent system that can detect behavioral patterns based on data gathered from RFID tags and sensors.

By Beth Bacheldor

Apr. 23, 2009—Using funds it received from a [Small Business Innovation Research \(SBIR\)](#) grant through the U.S. Department of Homeland Security (DHS), auto-ID solutions provider and systems integrator [Queralt](#) is building an intelligent system that learns from data collected via RFID and sensors.

The development effort builds on the Wallingford, Conn., company's existing RFID technology, as well as an integrated behavioral learning engine that enables the system to, in effect, learn an individual's or asset's habits over time. The DHS grant was awarded based on the system's ability to track and monitor individuals and assets for security purposes.



Michael Queralt

"The reason this development is interesting to us is it is very close to our heart in the way we are going with the business," says Michael Queralt, the firm's cofounder and managing director. "We are developing a system that converges physical and logical, electronic security."

Since its founding three years ago, the company has commercially deployed a handful of systems, including an RFID-based system at New Haven Public Schools in Connecticut, to help the school district monitor environmental conditions in its electronics storage closets, as well as track the locations of laptop computers within school buildings (see [New Haven Public Schools Keeps Tabs on Laptops](#)).

The SBIR grant is for \$100,000, and is part of a grant program initiated in 2004 by the DHS. The department provides the grants through the federal government's SBIR program, designed to offer small businesses the opportunity to propose innovative ideas that meet the government's specific research and development needs. The SBIR program, offered through the DHS' Science and Technology (S&T) Directorate and the Domestic Nuclear Detection Office (DNDO), specifically seeks initiatives relevant to the department's various divisions: chemical and biological, borders and maritime security, human factors, explosives, infrastructure and geophysical, and command, control and interoperability.

The core of Queralt's system is the behavioral engine that includes a database, a rules engine and various algorithms. Information acquired by reading a tag on an asset or an individual, as well as those of other objects or individuals with which that asset or person may come into contact, and information from sensors (such as temperature) situated in the area being monitored, are fed into the engine. The engine then logs and processes the data to create baselines, or behavioral patterns. As baselines are created, rules can be programmed into the engine; if a tag read or sensor metric comes in that

contradicts the baseline and/or rules, an alert can be issued. Development of the behavioral engine is approximately 85 percent done, Queralt reports, and a prototype should be ready in a few months.

A company could use the system, for instance, to monitor the behavior of employees to ensure no security rules are breached. The workers could be issued RFID-enabled ID badges that are read as they arrive at and leave work, enter and exit various departments, and log onto and off of different computer systems. Over time, the system will establish a pattern that reflects the employee's typical workday.

If the worker enters the office much earlier than normal on a particular occasion, goes into a department in which he or she does not work, and logs into a computer the individual is not authorized to access, the system could send an alert. Queralt has also been designing application programming interfaces to logical security and identity-management systems from [Microsoft](#), [Oracle](#) and others, so companies can tie the RFID-enabled behavioral system to their security applications.

For approximately a month and a half, Queralt has been testing a version of the system with a health-care company (which the solutions provider is not at liberty to name) that provides home-based services for the elderly in the Republic of Cyprus. Queralt has installed, in about 10 homes, a computer appliance that runs the behavioral engine and includes an Internet connection to a server at the health-care company's office. Every home has also been outfitted with RFID interrogators from [RF Code](#), and each elderly patient wears an RF Code 433 MHz active tag around his or her neck.

The tag complies with the ISO 18000-7 standard, and has a panic button that the wearer can press in times of trouble. Each home also has humidity-, temperature- and motion-sensing tags, as well as contact tags that can, for example, sense when a medicine cabinet has been opened, or if a microwave oven has been operated. "These active RFID tags and active sensors track the elderly patients, and the behavioral engine learns what the person is doing on a regular basis," Queralt explains. "A pattern is established, and if something changes—if it shows an abnormality—that can trigger an alert to the health-care company.

"We create a behavior fingerprint," Queralt continues. "Every morning, the person spends a certain amount of time in the kitchen, using the microwave or the stove, for example. So the assumption becomes that the person is cooking or doing something in the kitchen. We are looking for usage—and changes. Is the person visiting the bathroom more than usual? Might that represent an illness?"

Queralt expects the Cyprus pilot to run for several more months, and to be expanded to additional homes.