



Counting With Fingers

At a small-town grocery store, clerks move quickly among the shelves of canned goods and boxes of pasta, holding scanners in their palms, passing them over barcodes and flashing information back to the store's central database. A routine inventory is under way.

Down the road in the State correctional facility, officers move among inmates "counting heads," not just once, but several times during the course of the day—another type of routine "inventory," but one that consumes more time and resources.

Soon, however, correctional officers may have access to technology that makes counting inmates as quick and accurate as taking store inventory.

Every day, at every correctional facility across the country, correctional officers take inmate head counts. Some counts are done a few times each day; others are done up to a dozen times.

"Until now, a manual head count has been an institution's only option," says Rob Donlin, corrections program manager at the National Institute of Justice's (NIJ's) National Law Enforcement and Corrections Technology Center (NLECTC)-Southeast. "If that manual count produces the correct number, everything is fine. But a problem happens if the manual count comes up short. Say that you are supposed to have 75 inmates in your cell block, and you come up with 74. The first thing you would do is count them all over again to make sure that you didn't make a counting error. If you come up with 74 again, then you know that someone is missing, but you don't know who."

When a situation such as this occurs, staff conduct a roll call to determine who is missing, a tedious process that can take hours. Meanwhile, administrators may notify local law enforcement of a potential escape, but until staff complete the roll call, administrators cannot provide a name or a description.

By later this year, however, a new scenario may be in place. BWX Technologies, which operates the Y-12 National Security Complex in Oak Ridge, Tennessee, for

the U.S. Department of Energy (DOE), has teamed up with NLECTC-Southeast to develop a portable biometric identification scanner that uses technology similar to the devices that perform those grocery store inventories. A prototype of this biometric counting system is currently undergoing extensive field testing in a number of correctional facilities.

Donlin says that with the envisioned biometric counting system, correctional officers will use handheld units to scan inmates' fingerprints and send them back to a central database. The central unit will check the fingerprint for a match in the database and, in less than 5 seconds, will send back the inmate's mug shot for visual verification. When all officers have completed their scanning rounds, the central unit will generate a report either indicating that all inmates have checked in or listing those who are missing. He says that while the counting system may have little effect on the time it takes to perform an initial count, it will eliminate the need for second counts and roll call counts. It also will immediately provide data on missing inmates, including their fingerprints and mug shots.

Although using scanners to verify fingerprints is not new, using them to verify inmate fingerprints is. In an effort to keep down the ultimate cost of a biometric counting system, BWX Technologies staff searched extensively for commercial-off-the-shelf (COTS) technology that met the requirements they received from NLECTC-Southeast. While the idea for a biometric counting system for correctional applications came out of an NLECTC brainstorming session, Donlin says, BWX Technologies Y-12 staff made it a reality. "They're the brains behind it. We just go in with the ideas and say, 'Make it happen.' I'm sure someone, somewhere, has looked into developing a biometric counting system before, but when we asked for it, the people at Oak Ridge came up with a winner."

The winner they came up with was a commercially available biometric device that includes a fingerprint scanner, a speaker that beeps when the scan is complete, and a full-color screen to display the mug shot. The

device also includes voiceprint recognition, a full keyboard, and a smart-card scanner, among other features. "It will do a whole lot more than what we have in mind. It has lots more buttons than we need," says BWX Technologies' Ron Cain.

As part of the COTS approach, the existing scanner, which weighs about 3¹/₂ pounds, including a battery, and costs about \$5,000, is being used in the field tests. Then, Cain says, a stripped-down version will be created once testing is complete. This stripped-down version, he says, may weigh less and certainly will cost less—approximately \$2,000 per unit. Cain describes that final version as including only an on/off button, the fingerprint scanner, the speaker, and the display. It will use wireless technology to transmit fingerprints to a database maintained on an ordinary PC, and will run on Windows® CE 3.0, an operating system designed for PDAs (personal digital assistants).

Although using existing technology made Cain and coworker Kibbee Streetman's job easier, they still had to research the technology, design the database, and anticipate snags. "One of our biggest challenges is that all of these ideas we have talked about are very doable with existing wireless technology, but questions remain about how well it will work in a correctional environment, where there is a lot of concrete and a lot of metal that could interfere with transmission," Cain says. "If this seems to be a problem when testing reaches the maximum-security level, we may need to install repeaters to boost the signal."

Initially, field testing began in a correctional facility work center, which does not have large amounts of concrete and metal. Testing is continuing at a number of other facilities that have various security levels. But at every security level, evaluators, and ultimately future users, must deal with inmates who will try to beat the system.

Donlin says that the system's database can store all 10 fingerprints for every inmate, allowing a correctional officer to choose any finger at random. This helps block attempts by inmates to try such tactics as sanding their thumbprints or making a phony thumb that slips over their own but uses a cast of someone else's print. Since the database sends back the mug shot that corresponds with a given fingerprint, a correctional officer who sees someone else standing in front of him knows someone is trying to trick the system.

The difficulty of altering or faking all 10 fingerprints definitely played a role in the decision to use fingerprints as a biometric indicator, according to Cain and Street-

man, who say that NLECTC–Southeast's original request specified only that the counting system be based on a unique biometric identifier. They also considered voiceprints and even a new, developing technology that scans the veins under the skin. "Fingerprints seemed like the best choice, because they are hard for someone to change, yet simple for the inmate and the correctional officer to scan," Cain says.

Because BWX Technologies' contract with DOE allows the group to perform work for other agencies under certain conditions, NLECTC–Southeast was able to approach the contractor about developing a biometric counting system.

"If we go out and solve a technology problem for someone else, and can later apply that solution to work done for DOE, it's a win-win situation," Cain says. DOE wins because the agency gains access to information on new technology, and NLECTC–Southeast and the corrections community win because it is hard to get the private sector interested in developing technology for the corrections community.

"Corrections is a very small field from a business standpoint," Donlin says. "There are a lot of things that would make the job easier, but the business world doesn't look into developing them because there wouldn't be enough profit in the product. The correctional field either has to use existing technology or find people, such as NIJ, who will listen to what they have to say and do the research and development."

Members of the corrections community got their chance to have input into the system's development, which is being funded by NIJ, during a Corrections Technology Workshop sponsored by NLECTC–Southeast last fall. Cain says that he came to give a 10- to 15-minute presentation on doing inmate counts, and came away with numerous ideas for other uses for the system. Participants suggested tying the fingerprints to a medical database, so health professionals could pull up complete medical records and also be sure that one inmate was not trying to get another's medication; using the system to track inmates on a work detail; and restricting access to certain areas by placing scanners outside each location and using them for portal control. Expanding on the latter suggestion, Donlin explains that an inmate who works in the cafeteria would be allowed into that area early in the morning, but other inmates could not go inside until mealtime.

"Inmates are always playing games," he says. "They get paid, say, 40 cents a day to work in the work center, and they report to work, but then they say they have to

go to the doctor, they have to go to the psychologist, they spend the whole day running around, then claim they were there the whole time. Using this system for portal control would track their movements and verify their movements for that day.”

As the system comes into full use in numerous correctional facilities, Cain expects corrections personnel to come up with even more ways to use the fingerprint scanner. “Just like new versions of software come out all the time, we will keep coming out with new versions of the biometric counting system that can do more things.”

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