Counting With Fingers

By Becky Lewis

In a small-town grocery store, a routine inventory is under way. Clerks move quickly among the shelves of canned goods and boxes of pasta, holding scanners in their hands, passing them over bar codes and flashing information back to the store's central database.

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" is being conducted, but this one consumes much more time and resources. Soon, however, correctional officers may have access to improved technology that makes counting inmates go as quickly, smoothly and accurately as other inventory counts.

Every day, at every correctional facility across the country, correctional officers take inmate head counts. Some are conducted a few times each day; others 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 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," he says. "Say that you are supposed to have 75 inmates in your cellblock 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 such a situation occurs, the institution is locked down and inmates are counted in a cellblock housing unit. 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 of the missing inmate.

In late 2003, however, Donlin says a new scenario may be in place. BWX Technologies, which operates the Y–12 National Security Complex in Oak Ridge, Tenn., for the U.S. Department of Energy, has teamed up with NLECTC–Southeast to develop a portable biometric identification scanner that uses technology similar to the devices used to perform grocery store inventories. A prototype of this biometric counting system is undergoing extensive field-testing in several correctional facilities across the Southeast.

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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 an inmate's fingerprint for a match in the database and, in less than five seconds, will send back his or her mug shot for visual verification. When all officers have completed their scanning rounds, the central unit will generate a report that indicates that all inmates have checked in or it will list those who are missing. Donlin 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 will also 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 inmates' fingerprints is. In an effort to keep the cost of a biometric counting system down, BWX Technology staff conducted an extensive search for commercial off-the-shelf (COTS) technology that met NLECTC–Southeast's requirements. While the idea for a biometric counting system for correctional applications was developed during an NLECTC brainstorming session, Donlin says that BWX Technology 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."

What 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 Ron Cain of BWX Technology.

As part of the COTS approach, the existing scanner, which weighs about 3.5 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 and may weigh less and will cost less — approximately $2,000 per unit.

Cain describes the final version as including only an on/off button, the fingerprint scanner, speaker and display. It will use wireless technology to transmit fingerprints to a database maintained on an ordinary computer and will run on an operating system designed for personal digital assistants.

Although using existing technology made Cain and co-worker 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 [or in older institutions], 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 with various security levels. But at every security level, evaluators and ultimately, future users, must deal with inmates who will try to beat the system.

The system's database can store all 10 fingerprints of each inmate, allowing a correctional officer to choose any finger at random, Donlin says. 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 the inmate is trying to beat the system.

The difficulty of altering or faking all 10 fingerprints played a role in the decision to use fingerprints as a biometric indicator, according to Cain and Streetman, who say that NLECTC–Southeast's original request only specified that the counting system be based on a unique biometric identifier. Cain and Streetman 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," says Cain.

BWX Technology Y–12 contracts with the Department of Energy to run the Y–12 National Security Complex. However, because the department contracted with the company to perform work for other agencies under certain conditions, NLECTC–Southeast could approach the group 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 the DOE, it's a win-win situation," Cain says. The department benefits because the agency gains access to information on new technology and NLECTC–Southeast and the corrections community benefit 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 or NLECTC, who will listen to what they have to say and do the research and development."

Members of the corrections community had the opportunity to provide input into the system's development, which is being funded by NIJ, during a corrections technology workshop sponsored by NLECTC–Southeast. Cain says that he had planned to give a 10- to 15-minute presentation on performing inmate counts and came away with numerous ideas for additional uses for the system. Participants suggested linking the fingerprints to a medical database so health professionals can access complete medical records and also be sure that one inmate is 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 the scanners 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 would not be able to go inside until mealtime.

"Inmates are always playing games," Donlin say. "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 show that they shouldn't be paid 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."

For more information on the biometric counting system project, contact Rob Donlin at 1-800–292–4385; donlin@nlectc-se.org.

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