# Call for Cell Phone Forensics

*The functionality of cellular phones today rivals that of personal digital assistants (PDAs) and even laptop computers. Cellular phones can perform all of these tasks and more: voicemail, music/MP3 player, camera, video camera, voice recorder, Web browser, e-mail appliance, text/instant messenger, address book, calendar, notepad, and games. They also send and receive phone calls.*

Early cellular phone technology (circa 1984) featured very little functionality. Cellular phones were communication devices that supported wireless voice transmissions as two-way full-duplex radios. Within a few years, features such as voicemail and text messaging became available. Now, data come and go using wireless data transfer coupled with Bluetooth®, infrared, and propriety or USB data cables that connect directly to a computer. Small external media placed inside the phone can hold up to 6 gigabytes of information.

Any technology that can be used for legitimate purposes can be used to accomplish illegal aims as well. State and local law enforcement officials responding to emergencies and criminal complaints almost inevitably discover the presence of a cell phone. These cellular phones should not be overlooked as a potential source of evidence and intelligence in any type of criminal investigation. A quick look at the headlines will reveal criminals using cellular phone technology as a network for coordinating a criminal enterprise, a means to send harassing text messages to a

victim, a method of producing photographs viewed by a pedophile, or a way for international or domestic terrorists to detonate devices.

Knowing a cellular phone may contain useful information and being able to extract that all-important data, however, are two different matters. Cellular phones present many hurdles to the investigator, including custom-designed operating systems and varied network providers with an almost infinite number of operating systems, all combining to produce unfamiliar file systems and hardware and using proprietary cables, chargers, and connectors. Law enforcement investigators need to learn about all of the potential sources of evidence that may be found in cellular phones, as well as mastering the options for reliably seizing the devices and methods available for locating cellular phone forensic information.

Cellular phones present a number of potential sources of evidence:

- **Media devices** such as MicroSecureDisk (MicroSD) cards, present a very

straightforward source of evidence for a forensic examiner to process, because standard forensic tools will work to recover this type of data.

- **SIM (Subscriber Identity Module) cards** are present in all GSM (Global System for Mobile communications) phones. All GSM phones contain one or more SIM cards. SIM cards also can be read through a fairly straightforward process since the type of data held on SIM cards and the manner in which it is stored is clearly defined by GSM standards. Similar technology is also emerging

for CDMA (Code Division Multiple Access) phones.

- **Memory chips,** located inside the handset, use the same type of memory found in compact flash cards and thumb drives. However, the storage of the data is typically proprietary and standard forensic tools usually will not decipher the data. This makes forensic examinations of cellular phones extremely difficult.

- **Network providers** such as T-Mobile, Cingular, AT&T, Verizon,

# Unjamming the Backlog

*Between 1977 and 1993, 13 young women were strangled to death in Jackson County, Missouri. Forensic evidence showed that the murders were committed by the same suspect, but for more than a decade, the killer was able to elude the authorities. In 2004, laboratory technicians analyzed a blood sample that had been sitting on a shelf since 1987. DNA evidence from this sample identified 53-year-old Lorenzo Gilyard as the alleged murderer.*

# National Missing and Unidentified Persons System
## NamUs

## www.namus.gov

The blood sample was finally analyzed as the result of work being carried out at the Office of Justice Programs' (OJP) National Institute of Justice (NIJ), which had created a program to help analyze millions of backlogged DNA samples nationwide. Since its inception, this program has uncovered critical evidence to solve thousands of cold cases and has dramatically enhanced the capacity of local law enforcement to use DNA evidence as a crimefighting tool.

The National Missing and Unidentified Persons System (NamUs) is the first national online repository for missing persons records and unidentified decedent cases. Launched in July 2007 by the Office of Justice Programs' National Institute of Justice, NamUs will eventually consist of two databases, one filled with records of unidentified decedents and the other with missing persons reports.

The July 2007 launch marked the availability of the unidentified decedents database; medical examiners and coroners can now upload cases to the site. The missing persons database will be in development through September 2008. The website also provides access to resources such as State clearinghouses, medical examiners and coroners, law enforcement, victim assistance resources, and legislation. In 2009, the two databases will be linked and users will be able to search for matches between missing persons and unidentified decedent records.

According to the Bureau of Justice Statistics, in a typical year, medical examiners and coroners handle approximately 4,400 unidentified human decedent cases, 1,000 of which remain unidentified after 1 year. In April 2005, NIJ convened a summit of law enforcement officials, medical examiners, coroners, forensic scientists, policymakers, victim advocates, and families of the missing. As a result of this summit, the Department of Justice created a National Missing Persons Task Force, which recommended improved access to information about these cases through a national database.

As NIJ investigated the challenges involved in researching unidentified decedent cases, the extent of another, related problem became apparent: a lack of reporting of missing persons cases. Cases of missing persons 18 years old and younger must be reported, but for cases involving adults, reporting is voluntary. Very few States require law enforcement agencies to submit missing person reports on adults, leading to an overall low reporting rate. NamUs will work with State clearinghouses and the public to ensure that this data is included in NamUs and other national-level databases. Thus, the NamUs reporting and searching system will improve the quantity and quality of, as well as access to, data on cases involving missing persons and unidentified human remains.

The unidentified decedents database was initially created by the National Association of Medical Examiners (NAME), an NIJ grantee, using volunteer time and effort. NIJ also capitalized on strategic partnerships with the National Center for Forensic Science (www.ncfs.org/) in Orlando, Florida, and NAME for the unidentified decedent reporting component of NamUs, and with the National Forensic Science Technology Center (www.nfstc.org/) in Largo, Florida, for development of the missing persons database.

The NamUs databases are just one element of a broader program to improve the Nation's capacity to address these cases. NIJ also funds free DNA testing on unidentified human remains and provides family reference-sample kits, at no charge, to any jurisdiction in the country. Other efforts include training law enforcement officers, medical examiners, judges, and attorneys on forensic DNA evidence.

Due to the popularity of television shows like CSI, many Americans are aware that even the tiniest amount of DNA evidence can help solve the most difficult cases. What most do not know is that there has been a huge backlog of unanalyzed DNA evidence. Hundreds of thousands of pieces of DNA evidence that could have solved cases remained untouched for years. In one instance, 12,000 rape kits—evidence collected from victims through an emotionally painful medical exam with the expectation that it will be used to help identify the assailant—were found collecting dust in a warehouse in Queens, New York.

Earlier this decade Congress approved the first Federal funds to help clear up the backlog. Dr. John Morgan, NIJ Deputy Director for Science and Technology, and his team were tasked with developing and administering this program, but they set out to do more than just create a grant program that States and localities could use to support their forensic work. They understood that DNA is the most significant new tool for solving crimes since the fingerprint, so they created a program that would improve all aspects of how DNA technology is used by State and local law enforcement.

According to Morgan, the White House and Congress eventually committed hundreds of millions of dollars to support the President's *Advancing Justice Through DNA Technology* initiative, and its impact has been astounding.

"Through OJP, NIJ has provided funding and technical assistance that has supported the analysis of more than 2 million samples from convicted offenders, clearing out the entire national backlog that existed in 2003," Morgan says.

To link offender DNA samples to crimes, evidence and biological material from crime victims and scenes must also be analyzed. Through OJP, NIJ programs provided funding to perform analysis on these DNA samples from more than 60,000 cases. Thus far, more than 16,000 matches have been documented as a result. These include matches of crime scene evidence to offender samples and matches of crime scene evidence to other crime scene evidence, providing law enforcement with important links between cases. NIJ has also set aside $4 million for post-conviction tests to help exonerate the innocent.

NIJ's strategy called on individual States to pass laws requiring the collection of DNA samples from all persons convicted of a felony. Forty-three States have passed such a law, dramatically increasing the number of offender samples in State databases and the number of crimes solved.

The DNA initiative provided more than $100 million to expand the capacity of State and local crime labs, so more DNA testing can be performed in-house, helping to prevent the development of future backlogs. Training continues for persons involved in collecting, analyzing, or using DNA evidence in the criminal justice system. In addition, NIJ funds the research and development of new tools to analyze smaller samples of DNA evidence and highly degraded evidence, and to make analyzing DNA evidence less costly.

"DNA evidence has changed the way law enforcement solves crimes, and NIJ has changed the way that law enforcement uses DNA," Morgan says. "These efforts have already directly contributed to a significant number of arrests, and thanks to the capacity building component of their work, those arrests represent only a small fraction of the number of crimes that will eventually be solved."

This past September, Morgan and his team of researchers, forensic analysts, and lawyers received the 2007 Service to America Medal in Justice and Law Enforcement for their work that has helped solve thousands of cold cases, dramatically expanded the capacity of local law enforcement to use DNA evidence, and produced numerous products that are changing the way the criminal justice community uses DNA to investigate cases, present evidence in court, and handle mass fatalities. These products include training materials, lessons learned from 9/11, solving missing person cases, and the National Missing and Unidentified Persons System.

*For more information on the President's DNA Initiative, visit www.dna.gov, which includes training resources, publications, grant funding, research, and news. For more information on the Service to America Medals, visit www.servicetoamericamedals.org.*

and others present another source of forensic information.

When seizing a cellular phone, investigators need to realize that when a phone is turned on and connected to a provider's network, the data on the phone constantly changes; thus, potential evidence could be lost. Officers must immediately sever a phone's connectivity to a provider network in order to preserve this vital data. This can be accomplished in several ways; all methods have advantages and disadvantages, and only proper training will determine which method is right for a particular situation.

It is vital that investigators obtain any keyboard lock codes or PIN codes used to access a phone. If a power charger, data cable, original box, or bills can be found, they should be seized immediately. Document all identifying information so that an investigator can identify the phone to the network provider when requesting information on its subscribers in addition to any other information that could be useful in an investigation.

The type of cellular phone, an investigator's training, and an agency's access to hardware and software will dictate the best methods for forensic examination of a particular cell phone. If it is necessary to turn a phone on to examine it, an investigator should be aware that the phone will connect to the provider network and the received missed calls, voicemail notifications, and/or software updates, any or all of which will cause the phone's internal memory to be reorganized. Steps should be taken therefore to isolate the cellular phone during an examination.

## Cellular Phone Forensics

In some cases, investigators will glean data from the cellular phone by turning on the phone and perusing various screens and settings, recording information displayed via video, photograph, or handwritten notes. It is important that investigators, through training and experience, know all their options when confronted with a seized cellular phone.

Devices such as "project-a-phone" can facilitate this process. However, this is probably the least favorable way to examine a cellular phone and should be done only as a last resort. Using methods like this one make it very easy to miss data and impossible to retrieve deleted information.

Investigators can also retrieve cellular phone data by using a data connection from a computer to a cellular phone along with software that understands the phone's data storage. Many different tools can be used to accomplish this purpose, some phone specific, others able to examine a wider range of phone makes and models. Investigators using this method, however, will not see deleted data or data that may reside in memory but cannot be accessed by this particular tool (much like the problems that may arise when investigators perform forensic analysis of logical files from a hard drive).

The most favorable method for examining cellular phones is not always an option for all cellular phone types. Ideally, an investigator can read data directly from the memory chips on the phone's circuit board and store this data in a file. The contents of this file can then be examined with a hex editor or interpreted with software such as Cell Phone Analyzer (CPA), allowing extraction of both active and deleted data. Another advantage is that this method can be used with the cellular phone powered off, so there is no change to the data in the phone's memory.

A thorough examiner will use one (or all) of the methods described above when examining cellular phones for valuable evidence. Some cellular phones, however, simply defy any examination beyond direct viewing.

Investigators who find this information overwhelming should know there is help available. State, local, and Federal agencies continually endeavor to build their resources and create strategies that work for handling cell phone technology. Listservs and bulletin board forums for cellular phone forensics may provide answers to questions. There are also software packages and training courses that specifically target law enforcement. Investigators need to reach out and find these resources quickly, before their next investigation that hinges on data from a cellular phone.

*For more information, visit BK Forensics at www.bk.forensics.com, or phone 888–781–7178.*

# Basic Resources

## The following list of resources, which may not be all inclusive, may be helpful to law enforcement officers looking to learn the basics of cell phone forensics.

### Training

- BKForensics (www.bkforensics.com)
- Forensic Telecommunications Services (FTS) (www.forensicts.co.uk)
- Mobile Forensics Inc. (MFI) (www.mobileforensicstraining.com)
- Paraben Corporation (www.paraben.com)

### Software and Hardware

- BitPim (www.bitpim.sourceforge.net)
- BKForensics (www.bkforensics.com)
- Compelson Laboratories (www.mobiledit.com): MOBILedit! Forensic
- Fernico (www.fernico.com): Zippy Reporting Tool
- Guidance Software, Inc. (www.guidancesoftware.com): Neutrino device acquisition tool and Neutrino WaveShield™ signal-blocking bag
- iCardForensics (www.icardforensics.com): .XRY

- Logicube (www.logicubeforensics.com): CellDEK
- Oxygen Software (www.oxygensoftware.com): Oxygen Forensic Suite
- Paraben (www.paraben.com): Device Seizure, Device Seizure Toolbox, SIM Card Seizure
- Susteen, Inc. (www.datapilot.com): DataPilot, SecureView for Forensics

### Reports

*Cell Phone Forensics: An Overview & Analysis Update,* NIST, http://csrc.nist.gov/publications/nistir/nistir-7387.pdf

*Guidelines on Cell Phone Forensics,* National Institute of Standards and Technology (NIST), http://csrc.nist.gov/publications/nistpubs/800-101/SP800-101.pdf

### Glossary of Common Terms

**CDMA:** Code division multiple access. A type of digital cellular network.

**GSM:** Global system for mobile communications (originally from Groupe Spécial Mobile). A type of digital cellular network.

**IMEI:** International mobile equipment identity number. A 15-digit number that indicates a manufacturer, model type, and country of approval for GSM devices.

**PIN:** Personal identification number. A code used to complete a call.

**PUC:** Personal unblocking code used in GSM mobile phones and some smartcards. Most mobile telephones offer the feature of personal identification number protection. After switching on the phone, the user is (optionally) requested for security reasons to enter a 4- to 8-digit PIN enabling the phone's nonemergency calling functions. If the wrong PIN is typed in more than three times, either the SIM card, the device, or both become locked. They can be reverted to their original unlocked state, however, by entering a PUC, but if the wrong PUC is entered 10 times in a row, the device will become permanently blocked and unrecoverable, requiring a new SIM card. Cellular phone users are therefore advised by most providers to keep their PUC written down in a safe place separate from the device.

**PUK:** PIN unblocking key or personal unblocking key, another term for PUC.

**SIM:** Subscriber identity module, a removable "smart card" for mobile phones. SIM cards securely store the service-subscriber key used to identify a mobile phone. A SIM card allows users to change phones by simply removing the SIM card from one mobile phone and inserting it into another mobile phone. The use of a SIM card is mandatory in the GSM world.

**UMTS:** Universal mobile telecommunications system is one of the third-generation (3G) mobile phone technologies. Currently, the most common form uses W-CDMA as the underlying air interface, is standardized by the 3GPP, and is the European answer to the ITU IMT-2000 requirements for 3G cellular radio systems. To differentiate UMTS from competing network technologies, UMTS is sometimes marketed as 3GSM, emphasizing the combination of the 3G nature of the technology and the GSM standard that it was designed to succeed.

**Source:** Adapted from Wikipedia (http://wikipedia.org).

# RECOGNIZE THE
# FACE

R ecording serious crime on surveillance video is a common occurrence today. Unfortunately, the quality and resolution of a single frame of these video recordings is usually insufficient to recognize the faces of the perpetrators. Through a program sponsored by the Office of Justice Programs' National Institute of Justice (NIJ), however, researchers in the Visualization and Computer Vision Lab at GE Global Research and Pittsburgh Pattern Recognition (PPR) have teamed up to help resolve this frustrating problem with new technology.

Under an NIJ-sponsored program, GE Global Research and PPR are developing computer vision and image processing technology that will improve the quality of facial images taken from video. The underlying video processing technology is composed of face detection, active shape and appearance models, and super-resolution image processing. Initially, face detection algorithms locate the faces of persons in video. Secondly, active shape and appearance models lock on to the individual three-dimensional shape of the face in each video frame, allowing it to be rotated to a frontal view. This enables a frame-to-frame registration of the face so that all of the images can be combined. Super resolution processing then reconstructs a higher resolution image of the face from several lower resolution video frames. About 10 to 20 video frames are needed to produce a single, higher quality image of the face.

With the core technology now developed, GE is currently building a prototype interactive video application for forensic video analysis. This forensic tool will allow the user to first select a face from a surveillance video clip. The system will then accurately lock on the face in each frame in 1 to 2 seconds. The resulting image will have higher quality and greater clarity that can be used for automatic identification using face recognition software or distributed on bulletins and wanted posters.

Plans call for NIJ to beta test the face enhancer prototype tool. After testing, the prototype will be handed off to development teams at GE Security.

Moving from forensic analysis to real-time surveillance, GE Global Research and PPR are soon to begin another NIJ-sponsored project titled "Active 3D Face Capture." Setting up a video surveillance system for a large area such as a schoolyard or a parking lot requires many cameras and associated wiring, and this still leaves acquiring high-quality face images of people onsite as a challenge. This project aims to solve this problem with computer vision technology and automatically controlled pan-tilt-zoom (PTZ) cameras.

Active 3D Face Capture will include development of algorithms and a prototype surveillance system that uses multiple fixed and PTZ cameras to automatically monitor a wide region. Computer vision software will detect people in the far field; the camera control system will then point multiple PTZ cameras toward the subject and capture zoomed-in video. Because PTZ cameras can zoom in quite far, the coverage region of one camera is much larger than that of a typical fixed camera.

To be cost effective, however, PTZ control must be automated and reliable. Automatically capturing multiple simultaneous PTZ videos of a face will allow for accurate stereo reconstruction of the face shape, which will in turn improve face registration and super resolution. Active 3D Face Capture gains an extra edge from use of the facial quality enhancement system from the face enhancer program.

Both NIJ-funded, the face enhancer program and Active 3D Face Capture are linked by a common goal: the enabling of biometric identification at a distance and bringing biometric sensing into the open.

GE Global Research is the centralized research organization for the General Electric Company, and PPR is a recent spinoff of Carnegie Mellon University specializing in object recognition software for photographs and video.

*For more information about this facial recognition project, contact Stan Erickson at the National Institute of Justice, 202–305–4686 or stanley.erickson@usdoj.gov.*

# CORRECTIONS ASSISTANCE

*A*ccording to the latest figures available from the Office of Justice Programs' Bureau of Justice Statistics, almost 2.25 million individuals are in the custody of this country's State and Federal prisons and local jails. Also, just more than 1.5 million individuals are under the jurisdiction of State or Federal correctional authorities. Jurisdiction refers to the legal authority of a State or Federal correctional system over a prisoner, regardless of location or type of facility where the prisoner is housed.

Add to these statistics the fact that prison admissions are outpacing prison releases and it becomes evident that correctional agencies, large and small, need all the assistance they can get. The Office of Justice Programs' National Institute of Justice (NIJ) has several technology-oriented initiatives underway to benefit the corrections field. In addition, NIJ is taking steps to expand its corrections technology portfolio in the coming years.

## Technology Assessment

With the support of NIJ, the Northeast Technology Product Assessment Committee (NTPAC) began in 2000 as an initiative of the Massachusetts Department of Corrections. NTPAC brings together partners from 13 Northeast States in regular quarterly meetings comprising senior level correctional practitioners who identify and evaluate emerging technology products and prototypes that have the potential to significantly affect the correctional operation and mission.

NTPAC collaborates with the Association of State Correctional Administrators, John Hopkins University Applied Physics Laboratory, and NIJ and its Office of Law Enforcement Technology Commercialization and National Law Enforcement and Corrections

"Of all the initiatives we undertake, technology assessment proves to be the most useful," says NIJ Corrections Program Manager Jack Harne. "Lots of agencies at the State and local levels don't know how to review technology properly before they buy a product. This forum will give them needed skills."

Using NTPAC as a model, the newly formed committees will—

- Identify correctional technology needs.

- Evaluate products and services.

- Convene quarterly meetings to share information regarding product evaluation.

- Develop partnerships and share information with correctional administrators throughout their respective regions.

Department of Corrections is creating a correctional crime-mapping and information-management system to monitor daily operations and identify trends, patterns, hotspots, and areas of concern for correctional managers.

Called COTAS (Correctional Operational Trend Analysis System), this NIJ-supported project uses archived data to look for patterns in such areas as inmate health and conduct. According to Harne, the creation of analytical tools using statistics, data modeling techniques, and mapping will help identify key indicators of disruption, violence, and institutional risk, which in turn will help administrators proactively minimize negative impacts. The implementation of COTAS will place Florida in the forefront of development and application of technology in correctional operations.

According to Harne, NIJ has begun the first part of a multiphase project. The initial phase calls for a needs assessment that will draw input from representatives of the cell phone industry, law enforcement, and corrections. On completion of the needs assessment, the project will move on to a technical survey and gap analysis of existing cell phone detection technology. This project, Harne says, was tagged as a high priority by NIJ's Corrections Technology Working Group, which provides guidance relating to technology needs and operational requirements relating to the field of corrections.

## On the Horizon

Although putting affordable technology that meets end-user needs and requirements into the hands of practitioners does not happen overnight, Harne says that NIJ plans to expand its existing technology assistance to corrections. In a solicitation released in March of last year, NIJ proposed six projects for research and development. These projects include—

- **Contraband detection.** This technology will consist of a single transportable device that will detect a broad spectrum of all types of contraband, including weapons and cell phones.

Technology Center–Northeast to disseminate information throughout the northeast United States. (For more information on NTPAC, visit www.ntpac.org; also see "Going Beyond the Sales Pitch," *TechBeat* Fall 2003 at www.justnet.org/techbeat/fall2003/.)

Drawing on the success and collaborative approach of NTPAC, NIJ recently created similar groups to serve the Southeast and the West. Eventually, plans call for the three groups to collaborate to identify best practices and discuss technology needs and priorities for corrections.

"One thing you learn is that different agencies are at different levels relative to technology review," Harne says. "The most important part of this whole process is to bring them together and orient them to properly review technology. Eventually, NIJ plans to expand this effort to include a Web-based forum for information sharing on a national level."

## Risk Prediction

By employing existing crime-mapping tools to develop a Web-based trend analysis system, the Florida

## Cell Phone Detection and Defeat

As cell phones become smaller, smuggling them inside correctional facilities becomes easier. In turn, inmates find it easier to continue their criminal activities, harass victims, or transmit photographs.

"Cell phones are a real, major issue. Almost every correctional agency has problems with cell phones," Harne says. "We need to eliminate the phones or at the least render them useless in the correctional facility."

- **Data analysis and integration.** Primarily a software package that will analyze datasets of information such as inmate telephone call records, financial data, and other similar information, this program will extract information and identify trends that might be related to criminal activity. Secondarily, it will be able to be integrated with other systems so that information can be shared among several facilities.

# NO REST

## for

I t's a schedule all too familiar to many in public safety. Night shift ends at 8 a.m. Court begins a short time later, with no time for sleep in between. By the time court is over, it's time to pick up the youngest child after school. An hour later it's time to take the oldest to soccer practice. Then it's dinner time, and in a few short hours, it's back to work.

For a day or two, even a few more, most people in good health can keep pace with that kind of schedule. But as the months and years go by, lack of proper rest can really take its toll. So says Bryan Vila, a former law enforcement officer who is a professor at Washington State University in Spokane and a pioneer of research into how fatigue affects police officers.

Vila and several of his colleagues are making plans to create a laboratory setting where officers, intentionally deprived of sleep, will test their shooting, driving, and other skills when drowsy. These plans call for equipment such as deadly force decisionmaking and driving simulators, peripheral awareness monitors, communications equipment, and exercise machinery, all of which will be used to test officers' judgment and physical skills. Subjects will be deprived of sleep for 24 hours or more and will be tested wearing full uniforms and gear to make the simulations as realistic as possible.

Vila speaks several dozen times a year to law enforcement agencies and organizations about the profound effects that sleep deprivation can have on officers' performance. His presentation focuses on how sleep (or the lack thereof) and stress affect health in general, how this impacts the decisions that law enforcement officers must make daily, and what law enforcement agencies and officers can do to improve the situation.

"Normal stress protects us from threats, but prolonged stress damages the body and the brain," Vila says. "If you work in law enforcement, you know all about disrupted sleep and about not having specific time set aside for sleep."

Washington State University plans to use the state-of-the-art simulation technology to assess two major areas: performance and attentiveness. Vila notes that studies of military personnel from Walter Reed Army Medical Center indicated that soldiers who went 48 to 72 hours without sleep lost none of their marksmanship skills. Their ability to distinguish appropriate targets, however, did become impaired. Other studies show that individuals deprived of sleep for 24 hours exhibit the same level of physical impairment as persons with a .10 blood alcohol level.

"Short-term effects of sleep deprivation include worsened mood, decreased awareness, impaired physical and cognitive functioning, and reduced ability to deal with stress," Vila says. "When an individual builds up a sleep debt, it takes several days or more of increased sleep to erase it. Also, poor sleep generates worse sleep in a vicious cycle, leading to long-term effects such as profound fatigue, which can reduce officer safety, health, and performance."

A large body of research shows that the vast majority of people need 7 to 8 hours of sleep each night with a minimum requirement of 6.5 hours average to avoid sleep deprivation. Shift work, overtime, swing shifts, and "moonlighting," all common in the law enforcement and corrections community, also interfere with establishing good sleep habits. Studies by Vila and his colleagues have shown that—

- Fifty-three percent of law enforcement officers average less than 6.5 hours of sleep daily.

- More than 90 percent of law enforcement officers report being routinely fatigued and 85 percent reported driving while drowsy.

- Although no regulated work-hour standards exist for law enforcement and corrections personnel, officers routinely exceed U.S. work-hour standards for power plant operators, truck drivers, and airline pilots.

- Depression and suicidal thoughts increase for male officers as their overtime increases; for female officers, these mental states are more affected by shift changes.

- Since 1974, felonious deaths of law enforcement officers have declined, while the rate of accidental deaths has remained more or less steady in spite of the advent of radial tires, shoulder harnesses, anti-lock brake systems, and airbags.

"In summary, many officers are overly tired all the time," Vila says. "This is a serious problem because fatigue severely impacts the parts of the brain that we use to think clearly, to solve problems, and to make difficult moral choices. Officers are out there equipped with a lot of sophisticated technology and are dealing with people in stressful situations. They need their most important piece of protective equipment—their brain—to be working for them."

Possible fatigue countermeasures include minimizing shift rotation (but considering individual preferences such as childcare issues), educating officers about the need to get sufficient rest, and minimizing overtime and long hours, Vila says.

"The obvious conclusion is that minimizing fatigue and stress will protect officers," he says. "However, this requires a change in the culture, which traditionally says that the more hours an officer works, the tougher

# the Weary

he or she is. Many law enforcement departments also must contend with workforce shortages that require officers to work overtime. It may not be possible to change the culture all at once, but once agencies are made aware of the risk, they can—and must—begin making the kinds of small adjustments to policy and practice that nudge the police culture in the right direction. Evolutionary approaches like this are often more effective in policing than dramatic attempts to revolutionize how things are done."

*For more information on the research being conducted by Professor Vila, visit www.spokane. wsu.edu/Academics/CrimJ/crimj_vila.html or contact him directly at vila@wsu.edu or 509–358–7711. For more information on sleep research at Washington State University at Spokane, visit www. spokane.wsu.edu/researchoutreach/sleep/.*

## STUDY:
# Officer Fatigue

Several years ago the Office of Justice Programs' National Institute of Justice sponsored the first-ever study specifically on the effects of fatigue on police performance. Findings from this study led to the publication of the report "Evaluating the Effects of Fatigue on Police Patrol Officers." This report can be accessed at www.ncjrs.gov/pdffiles1/nij/grants/184188.pdf/. In addition, a 2002 article in the *NIJ Journal* titled "Tired Cops: The Prevalence and Potential Consequences of Police Fatigue" can be accessed at www.ncjrs.gov/pdffiles1/jr000248d.pdf.

## National Criminal Justice Reference Service

In addition to funding the National Law Enforcement and Corrections Technology Center, the National Institute of Justice (NIJ) and other Federal agencies support the National Criminal Justice Reference Service (NCJRS), assisting a global community of policymakers, practitioners, researchers, and the general public with justice-related research, policies, and programs.

NCJRS offers reference and referral services, publications, onsite and offsite conference support, and other technical assistance. The easiest way to access NCJRS is online.

### Start at http://www.ncjrs.gov

The NCJRS website showcases the latest criminal and juvenile justice and drug policy information. Take advantage of:

- Topic-specific resources.
- Online registration and ordering.
- Searchable abstracts, calendar of events, and questions-and-answers databases.

### Stay Informed

Register at http://www.ncjrs.gov/subreg.html to receive:

*JUSTINFO.* A biweekly electronic newsletter that includes links to full-text versions of printed publications.

*E-mail notifications.* Periodic messages about new publications and resources that match your specific interests.

### NCJRS Contact Information at-a-Glance

**Web:**    http://www.ncjrs.gov

**Phone:**  800–851–3420
(Monday – Friday,
10 a.m. to 6 p.m. e.s.t.)

**Fax:**    301–519–5212

**Mail:**   NCJRS, P.O. Box 6000,
Rockville, MD 20849–6000

The National Institute of Justice is a component of the Office of Justice Programs, which also includes the Bureau of Justice Assistance; the Bureau of Justice Statistics; the Community Capacity Development Office; the Office for Victims of Crime; the Office of Juvenile Justice and Delinquency Prevention; and the Office of Sex Offender Sentencing, Monitoring, Apprehending, Registering, and Tracking (SMART).

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## www justnet.org

**Online News Summary.** Online News Summary includes article abstracts on law enforcement, corrections, and forensics technologies that have appeared in major newspapers, magazines, and periodicals and on national and international wire services and websites.

**Testing Results.** Up-to-date listing of public-safety equipment evaluated through NIJ's testing program. Includes ballistic- and stab-resistant armor, patrol vehicles and tires, protection gloves, handcuffs, and more.

**Publications.** Publications from NIJ and NLECTC that you can view or download to your system, including printer-friendly versions of *TechBeat* articles and features.

**Calendar of Events.** Calendar of Events lists upcoming meetings, seminars, and -training.

**Links.** Links takes you to other important law enforcement and corrections websites.

*For help establishing an Internet connection, linking to JUSTNET, or finding needed technology and product information, call the NLECTC Information Hotline at 800–248–2742.*

*It wasn't too long ago that people watched for the coming of this vehicle with anxiety and fear. Today, others will watch for it with hope and relief. At one time, its arrival meant an appointment with the dentist was imminent. Now, its arrival means restoration of vital communications is imminent.*

What was once a 30-foot mobile U.S. Navy dental clinic has been transformed into a mobile communications center that includes satellite telephone, wireless Internet, computer terminals, and a radio interconnect device. This unusual usage turnaround took place through the 1033 Excess Property Program and the combined efforts of the North Carolina Law Enforcement Support Services (NCLESS), National Law Enforcement and Corrections Technology Center (NLECTC)–Southeast, and Border Research and Technology Center (BRTC). Both NLECTC–Southeast and BRTC are programs of the Office of Justice Programs' National Institute of Justice (NIJ).

"We spent $36,000," says Ken Dover, NLECTC–Southeast's Excess Property Program Manager. "To create this setup new, it would have cost between $200,000 and $300,000. We used excess computers and projectors. NCLESS provided a lot of the labor, which was a huge savings. They stripped out the dental chairs and other equipment, did some minor repair work, and installed the equipment. It didn't all come from the 1033 Program, but a lot of it did."

According to Dover, the 1033 Program permits the Secretary of Defense to transfer, without charge, excess U.S. Department of Defense supplies and equipment to State and local law enforcement agencies.

"We had been on the lookout for mobile communications possibilities, and I had heard about the van," he says. "NCLESS was the logical agency to turn to for a partner, and their response was extremely positive. They already had the ability and the staff through their 1033 program to assist. They were used to deploying equipment on this scale. After Hurricane Katrina, they had provided five tractor-trailers full of equipment."

Dover says the van, acquired through the efforts of NLECTC–Southeast in fall 2006, was the perfect vehicle. It had only 10,000 miles on the odometer and already included a self-contained generator and running water. With NIJ approval and NCLESS support, the reconstruction of the vehicle began. First, workmen divided the vehicle into two "rooms," one primarily for communications, the other for meetings. Additional equipment installed included a police agency radio, a marine radio, a citizens band radio, a ham radio, four computers, and an overhead projector.

"If it goes to an area that has been devastated, there is a satellite telephone connection, and local agencies can bring in their laptops and use the wireless connection if they have lost their own Internet capabilities," Dover says. "If it goes to, say, the site of a chemical spill, with agencies from multiple jurisdictions responding, the radio interconnect device will let them all talk to each other. It could even be used in the same way at a big sporting event, like a college or professional football game."
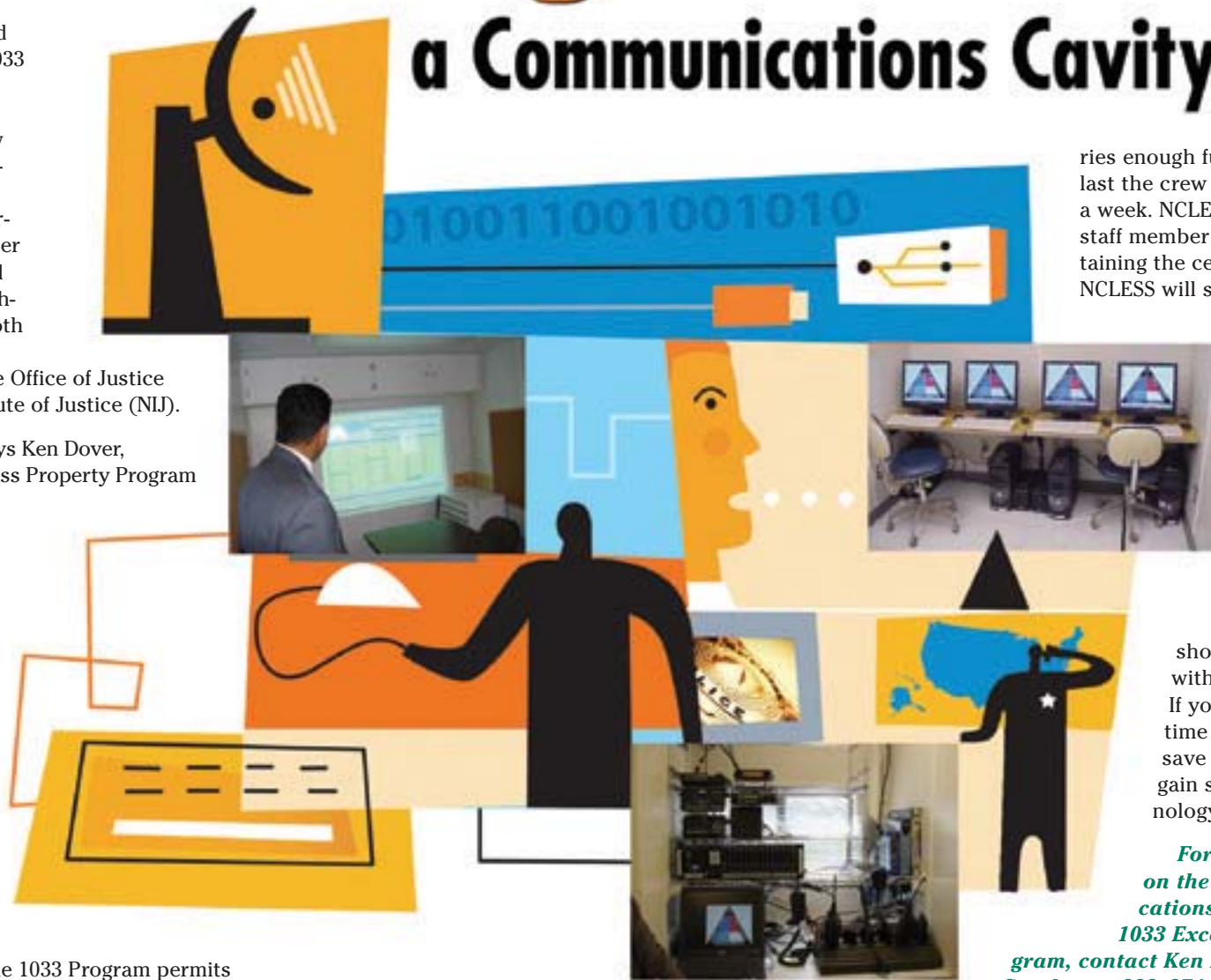
In the event of a long-term deployment, such as after a natural disaster, the mobile communications center will be accompanied by a camper (which sleeps five) and a maintenance truck, which carries enough fuel and supplies to last the crew for approximately a week. NCLESS has assigned one staff member full time to maintaining the center, and NIJ and NCLESS will supply additional staff as needed. Following testing last June in North Carolina and in Charleston, South Carolina, NCLESS, NLECTC–Southeast, and BRTC pronounced the van ready for deployment.

"We really wanted to show what can be done with the 1033 Program. If you put in a little bit of time and effort, you can save a lot of money and gain some terrific technology," Dover says.

*For more information on the Mobile Communications Center or the 1033 Excess Property Program, contact Ken Dover at NLECTC–Southeast, 888–874–5854 or kdover@ nlectc-se.org. Additional information about the North Carolina Law Enforcement Support Services can be found at www. nccrimecontrol.org. Click on Divisions, then click on Law Enforcement Support Services Division.*

# 'Filling' a Communications Cavity



# EXCESS PROPERTY PROGRAMS

**State and local law enforcement and corrections agencies can obtain excess Federal property at little or no cost through the following programs:**

- **1033 Program:** This program permits the Secretary of Defense to transfer, without charge, excess U.S. Department of Defense (DoD) personal property (supplies and equipment) to State and local law enforcement agencies. Agencies can acquire vehicles (land, air, and sea), weapons, computer equipment, body armor, fingerprint equipment, night vision equipment, radios and televisions, first aid equipment, tents and sleeping bags, photographic equipment, and more.

- **1122 Program:** The National Defense Authorization Act for FY 1994 contained Section 1122, which allows State and local governments to purchase new law enforcement equipment for counterdrug activities through the Federal Government. The discounts the Federal Government enjoys because of its large-volume purchasing are thus passed on. These discounts may be especially attractive when dealing with high-tech equipment and newer technologies.

- **Surplus Property Donation:** Each State and territory has a State Agency for Surplus Property (SASP). These agencies were established to receive Federal surplus personal property and to donate it to public agencies and certain nonprofit, tax-exempt agencies. The General Services Administration has the responsibility of administering this program. Law enforcement agencies enrolled in the 1033 Program are eligible to obtain property from their SASP.

- **1401 Technology Transfer Program:** This program identifies, evaluates, deploys, and transfers surplus DoD technology items and equipment to Federal, State, and local first responders to be used in support of homeland security. DoD also provides training and expertise in areas such as interoperable communications and chemical, biological, radiological, and nuclear defense. More information can be found at http://www.defenselink.mil/ policy/sections/policy_offices/hd/faqs/ techTransfer/index.html/.

For more detailed information on these programs, visit www.justnet.org/equipment.

# the NLECTC 'center system'

*Offering no-cost assistance to law enforcement and corrections agencies and crime laboratories—large or small, rural or urban—in the implementation of current and emerging technologies, the National Law Enforcement and Corrections Technology Center (NLECTC) System is an integrated network of centers, specialty offices, and criminal justice technology Centers of Excellence located across the country.*

*Established in 1994 by the Office of Justice Programs' National Institute of Justice (NIJ) as part of its research, development, testing, and evaluation initiatives, the NLECTC System serves as an "honest broker" resource for technology information and assistance and helps introduce technologies into practice within the criminal justice community.*

*The NLECTC System seamlessly delivers its expertise to the Nation's 19,000-plus police agencies; 50 State correctional systems; thousands of prisons, jails, and probation and parole departments; and crime laboratories in a number of technology areas. These technology areas are supported by technology partners who provide the leveraging of unique science and engineering expertise. In addition, technology working groups and a national advisory council provide guidance relating to the technology needs and operational requirements of the public safety community for NIJ's various technology focus areas and ensure a focus on the real-world needs of public safety agencies.*

## Contact NLECTC for: ..............................................

### Technology Identification

The NLECTC System provides information and assistance to help agencies determine the most appropriate and cost-effective technology to solve an administrative or operational problem. We deliver information relating to technology availability, performance, durability, reliability, safety, ease of use, customization capabilities, and interoperability.

### Technology Assistance

Our staff serves as proxy scientists and engineers. Areas of assistance include unique evidence analysis (e.g., audio, video, computer, trace, and explosives), systems engineering, and communications and information systems support (e.g., interoperability, propagation studies, and vulnerability assessments).

### Technology Implementation

We develop technology guides, best practices, and other information resources that are frequently leveraged from hands-on assistance projects and made available to other agencies.

### Property Acquisition

We help departments take advantage of surplus property programs that make Federal excess and surplus property available to law enforcement and corrections personnel at little or no cost.

### Equipment Standards and Testing

We oversee the development of performance standards and a standards-based testing program in which equipment such as ballistic- and stab-resistant body armor, double-locking metallic handcuffs, and semiautomatic pistols is tested. NLECTC also conducts comparative evaluations (testing equipment under field conditions) on patrol vehicles; patrol vehicle tires and replacement brake pads; and cut-, puncture-, and pathogen-resistant gloves.

### Technology Demonstrations and Capacity Building

We introduce and demonstrate new and emerging technologies through special events, conferences, and practical demonstrations such as the Mock Prison Riot™ and an annual public safety technology conference. We also provide hands-on training assistance for the latest technologies through workshops and software programs dealing with crime mapping, community corrections, and critical incident management. In addition, on a limited basis, NLECTC facilitates deployment of new technologies to agencies for operational testing and evaluation.

### Technology Information

NLECTC disseminates information to the criminal justice community at no cost through educational bulletins, equipment performance reports, guides, consumer product lists, product information databases, news summaries, meeting/conference reports, videotapes, and CD–ROMs. Most publications are available in electronic form through the Justice Technology Information Network (JUSTNET) at www.justnet.org. Hard copies of all publications can be ordered through NLECTC's toll-free number, 800–248–2742, or via e-mail at asknlectc@nlectc.org.

In September 2007, the U.S. Department of Justice, Office of Justice Programs, created four Technology Centers of Excellence (CoEs) as part of the NLECTC System.

Establishment of these CoEs within the existing NLECTC System will further the mission of NIJ by better aligning the NLECTC System with NIJ's research, development, testing, and evaluation activities, enhancing the cost-effective delivery of technology information and assistance services required by State and local public safety practitioners.

The existing NLECTC sites will continue to serve as the initial point of entry for technology information and generalized technology assistance. The new CoEs will serve as an authoritative resource within their respective technology focus areas, providing specialized technology assistance to public safety personnel as well as working with technology developers and users to test and evaluate equipment in operational environments.

### Technology Commercialization

Our law enforcement and corrections professionals, product and commercialization managers, engineers, and technical and market research specialists work together to identify new technologies and product concepts. They then work with innovators and industry to develop, manufacture, and distribute these new, innovative products and technologies.

# TECH shorts
## Technology News Summary

**T**ECHshorts is a sampling of the technology projects, programs, and initiatives being conducted by the Office of Justice Programs' National Institute of Justice (NIJ) and the centers, specialty offices, and criminal justice technology Centers of Excellence that constitute its National Law Enforcement and Corrections Technology Center (NLECTC) System. If you would like additional information concerning any of the following TECHshorts, please refer to the specific point-of-contact information that is included at the end of each entry.

In addition to TECHshorts, an online, biweekly technology news summary containing articles relating to technology developments in public safety that have appeared in newspapers, newsmagazines, and trade and professional journals is available through the NLECTC System's website, JUSTNET, at www.justnet.org. This service, the *Law Enforcement and Corrections Technology News Summary,* also is available through an electronic e-mail list, *JUSTNETNews.* Every other week, subscribers to *JUSTNETNews* receive the news summary directly via e-mail. To subscribe to *JUSTNETNews,* e-mail your request to asknlectc@nlectc.org or call 800–248–2742.

Note: The mentioning of specific manufacturers or products in TECHshorts does not constitute the endorsement of the U.S. Department of Justice, NIJ, or the NLECTC System.

## Instituting Learning About Technologies
### National Institute of Justice, NLECTC–National, and RULETC

NIJ, through its NLECTC System, sponsors three annual technology institutes, one for law enforcement, one for corrections, and one for rural law enforcement. Although the institutes, which run 5 days each, are offered at no cost, they are limited to 25–35 individuals (no more than 1 person per agency). During these forums, participants receive information and assistance on existing and developing technologies, work through problems relating to technology implementation, and exchange lessons learned related to technology. Participants also must give a brief presentation on a technology issue that their department has encountered.

NLECTC–National in Rockville, Maryland, coordinates the law enforcement and corrections institutes, which are held in the greater Washington, D.C./Baltimore, Maryland, area. The Rural Law Enforcement Technology Center, located in Hazard, Kentucky, coordinates the rural law enforcement institute, which is held in locations on the east and west coasts.

Information about upcoming technology institutes can be found at www.ojp.usdoj.gov/nij/events/techinstitutes/.

## Searching for the Evidence
### NLECTC–Rocky Mountain

About 70 percent of all sex offenders are placed on probation nationwide, and most have access to the Internet. The management and monitoring of sex offenders' computer use is important for many reasons. First, it can alert authorities to a new crime such as possession of child pornography. Second, it can provide proper supervision and containment of the offenders by reinforcing treatment prohibitions against access to sexual material and by reducing community risk by increasing the offender's perception of containment. Lastly, monitoring computer use is essential to help the treatment agency understand the offender. Conducting an examination of the offender's computer early in the supervision period provides the officer and the treatment agency with valuable information regarding the offender's sexual interest and intensity. Therefore, effective management of the offender's computer use requires a thorough understanding of what to look for and how to find it. Field Search, the free software program developed by NLECTC–Rocky 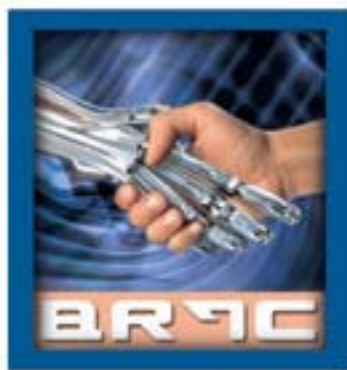Mountain that allows parole and probation officers to check offenders' computers for misuse, helped lead to the arrest of an Iowa man last summer on probation violation charges. Unfortunately for the offender, his probation officer had attended a session of the Managing Sex Offenders Computer Use training sponsored by NLECTC–Rocky Mountain. During the training, the officer received a copy of Field Search and instruction on how to use it in the field. The probation officer used the tool and his new skills to detect child pornography on the offender's computer. This evidence was the basis of the probation violation and the Iowa Division of Criminal Justice Investigation was called in to determine whether new criminal charges would be filed. The offender had been convicted of indecent contact with a child in 2005 and had been placed on probation with a suspended 2-year sentence and ordered to register as a sex offender and complete a sex offender treatment program.

For more information on Field Search, contact NLECTC–Rocky Mountain, 800–416–8086, or visit www.justnet.org/fieldsearch/.

## Lending a Robot Hand
### BRTC

The Border Research and Technology Center is partnering with the Space and Naval Warfare Systems Center–San Diego (SPAWAR San Diego) to help agencies obtain robots from the SPAWAR Robotics Group Loan Pool. Robots are available for loan through this office for up to 4 months but are subject to robot availability and the urgency of a user's need. Eligible borrowers include agencies of local, State, and Federal governments. Borrowers are responsible for using the robots safely and for returning them in good working order. Procedures for obtaining a loan are available at https://robot.spawar.navy.mil/. For information on how BRTC can assist your agency, call 888–656–2782.

## Ordering 'The Incident'
### National Institute of Justice

Incident Commander is a PC-based software simulation that models real-world situations within a community, allowing for critical incident management-level training. Anywhere from 1 to 16 people can participate in a scenario by taking a variety of roles within the operations team. Incident Commander is now available on CD–ROM through NIJ's National Criminal Justice Reference Service (NCJRS) website at www.ncjrs.gov. Orders are limited to 16 copies, and shipping and handling fees apply. Domestic public safety personnel can also order the CD–ROM by calling NCJRS at 800–851–3420 and requesting product number NCJ 217516.

For more information about Incident Commander, see "Commanding the Incident," *TechBeat* Winter 2007, at www.justnet.org/techbeat/winter2007 or visit www.incidentcommander.net/.

## Sharing a Photo
### National Institute of Justice

The International Justice and Public Safety Information Sharing Network, referred to as Nlets, is taking the lead on an NIJ-funded project to coordinate standards and policies and implement exchange services for States to share drivers' license photos. The pilot portion of the project is underway in North Carolina, South Carolina, and Virginia; the project's main goal is to deploy a limited operational capability to exchange electronic images from the respective departments of motor vehicles for the sole purpose of positive identification. The project uses the existing Nlets infrastructure and network, with Nlets providing guidance in developing model policies.

Sharing drivers' license photos is listed as a top priority of law enforcement agencies across the country, according to Nlets. Plans call for gradual expansion of the project throughout the Nation following the pilot phase.

For more information on Nlets, visit www.nlets.org. For specific information on the project, contact Bonnie Lock at blocke@nlets.org. Information on initial project results will be available later in 2008.
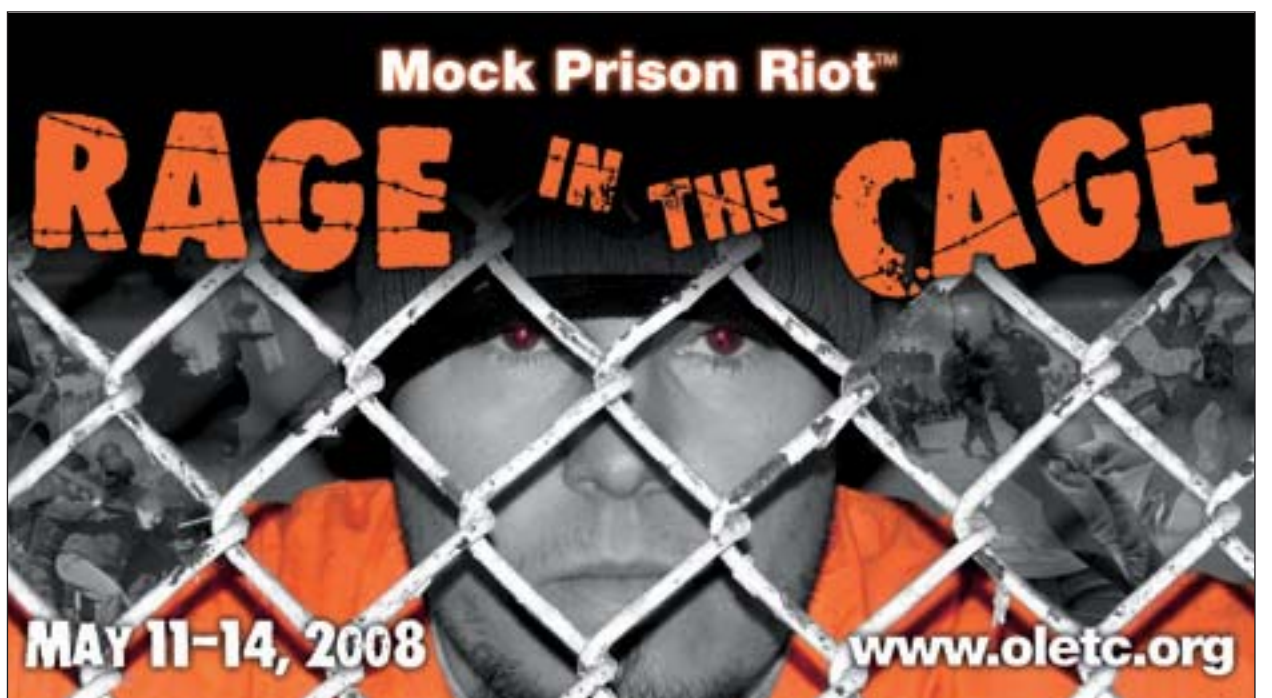


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# CORRECTIONS ASSISTANCE

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- **Duress alarm system.** Corrections professionals specifically need a personal alarm system that is cost-effective, accurate, reliable, and works both indoors and out. A modification of existing technology to meet these requirements could satisfy this need.

- **Traffic identification system.** This technology will provide continuous real-time tracking of both staff and inmates in indoor and outdoor environments. It must be able to resist tampering by inmates and be small and unobtrusive.

- **Surveillance and monitoring.** To meet this technology request, a system will need to provide automatic alerts to correctional officials if an inmate is detected trying to escape or act violently. A "smart" camera is an example of this type of technology.

- **Multi-threat biohazard protective apparel.** This request calls for the design of an entire uniform—shirt, pants, gloves, and so on—that could be worn at all times and protect officers from contact with blood, body fluids, and chemical hazards. It will need to be lightweight, comfortable, and durable.

*For more information regarding NIJ's Corrections Technology Program, visit www.ojp.usdoj.gov/nij/topics/corrections/technology.htm. Or contact Jack Harne, 202–616–2911 or jack.harne@usdoj.gov.*

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Winter 2008

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