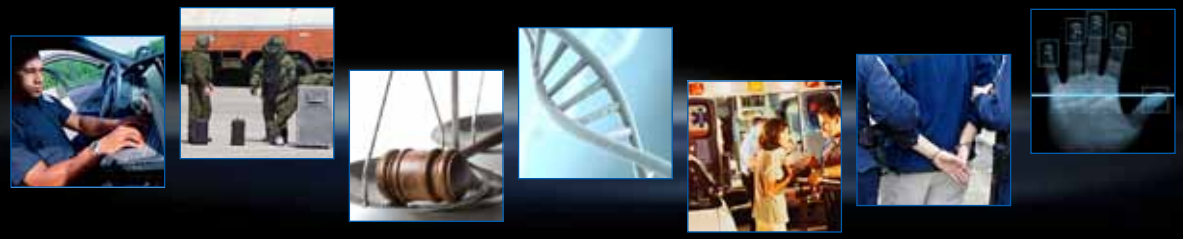
U.S. Department of Justice
Office of Justice Programs
National Institute of Justice

NIJ



HIGH-PRIORITY CRIMINAL JUSTICE TECHNOLOGY NEEDS

U.S. Department of Justice
Office of Justice Programs

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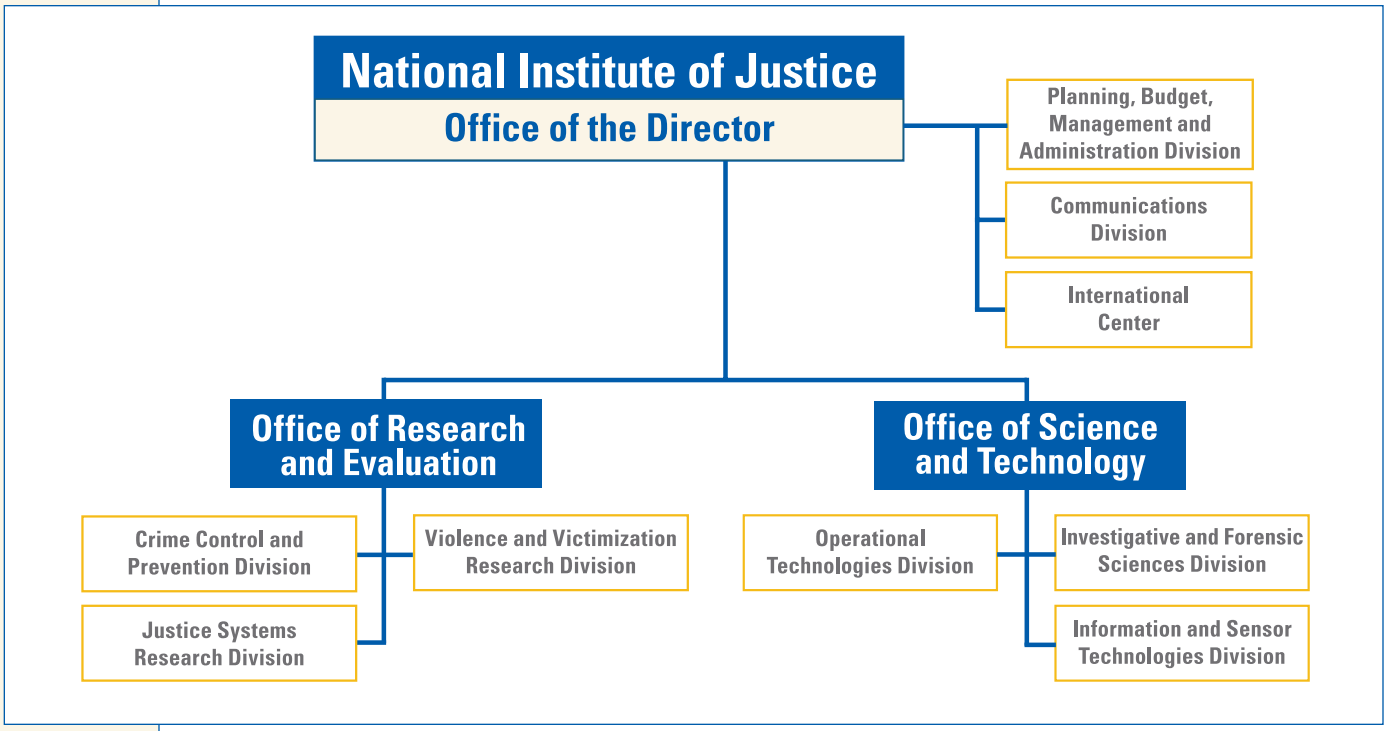
NIJ's Mission and Organization

As the research, development and evaluation arm of the U.S. Department of Justice, the Office of Justice Programs' National Institute of Justice (NIJ) is dedicated to researching crime control and justice issues to help enhance the criminal justice system and increase public safety.

NIJ provides objective, independent evidence-based knowledge and tools to meet the challenges of crime and justice, particularly at the state and local levels. NIJ's diverse audience includes:

- Policymakers at all levels of government.
- Practitioners who work in the criminal justice field.
- Researchers.
- The American public.



NIJ organizational structure chart.

The Director of NIJ, who is appointed by the President and confirmed by the Senate, establishes the Institute's objectives in light of those of the U.S. Department of Justice and the Office of Justice Programs. When setting policy and practice, NIJ actively solicits the views of criminal justice professionals and researchers.

NIJ's organizational structure is designed to integrate the social and physical sciences to maximize cross-discipline research, development and evaluation. New tools and technologies are not in themselves solutions without appropriate policies and practices. Policies and practices must effectively integrate technology.

NIJ has two operating offices:

- The Office of Research and Evaluation, which develops, conducts, directs and supervises social science research and evaluation activities across a wide variety of criminal justice issues.
- The Office of Science and Technology, which manages technology research, development, testing and evaluation; the development of guides and technical standards; and programs for building capacity and providing technology assistance to local, state and, as appropriate, tribal and federal law enforcement, corrections and courts agencies, and crime laboratories.

NIJ's principal authorities are derived from the Omnibus Crime Control and Safe Streets Act of 1968, as amended (see 42 USC § 3721-3723), and, as it relates to the activities of its Office of Science and Technology, from Title II of the Homeland Security Act of 2002.

NIJ's Office of Science and Technology

Criminal justice practitioners, such as law enforcement and corrections officers, increasingly rely on technology to do their jobs. Through its Office of Science and Technology, NIJ (1) serves as the national focal point for work on criminal justice technology and (2) carries out programs that, by providing equipment, training and technical assistance, improve the safety and effectiveness of criminal justice technology as well as access to that technology by local, state, tribal and federal enforcement agencies. The Office of Science and Technology's principal tasks in supporting this mission include:

- Establishing and maintaining advisory groups to assess the technology needs of state, local, tribal and federal criminal justice agencies.
- Establishing and maintaining performance standards for criminal justice technologies.
- Establishing and conducting a compliance testing program that supports those standards.
- Carrying out a research, development, testing and evaluation (RDT&E) program to improve the safety, effectiveness and efficiency of criminal justice technology.
- Providing technical assistance to criminal justice practitioners.
- Serving as a clearinghouse for information on criminal justice technologies.

The Office of Science and Technology also operates the National Law Enforcement and Corrections Technology Center (NLECTC) system. Created in 1994, the NLECTC system plays a vital role in enabling the Office of Science and Technology to carry out its mission. The NLECTC system's centers and offices provide:

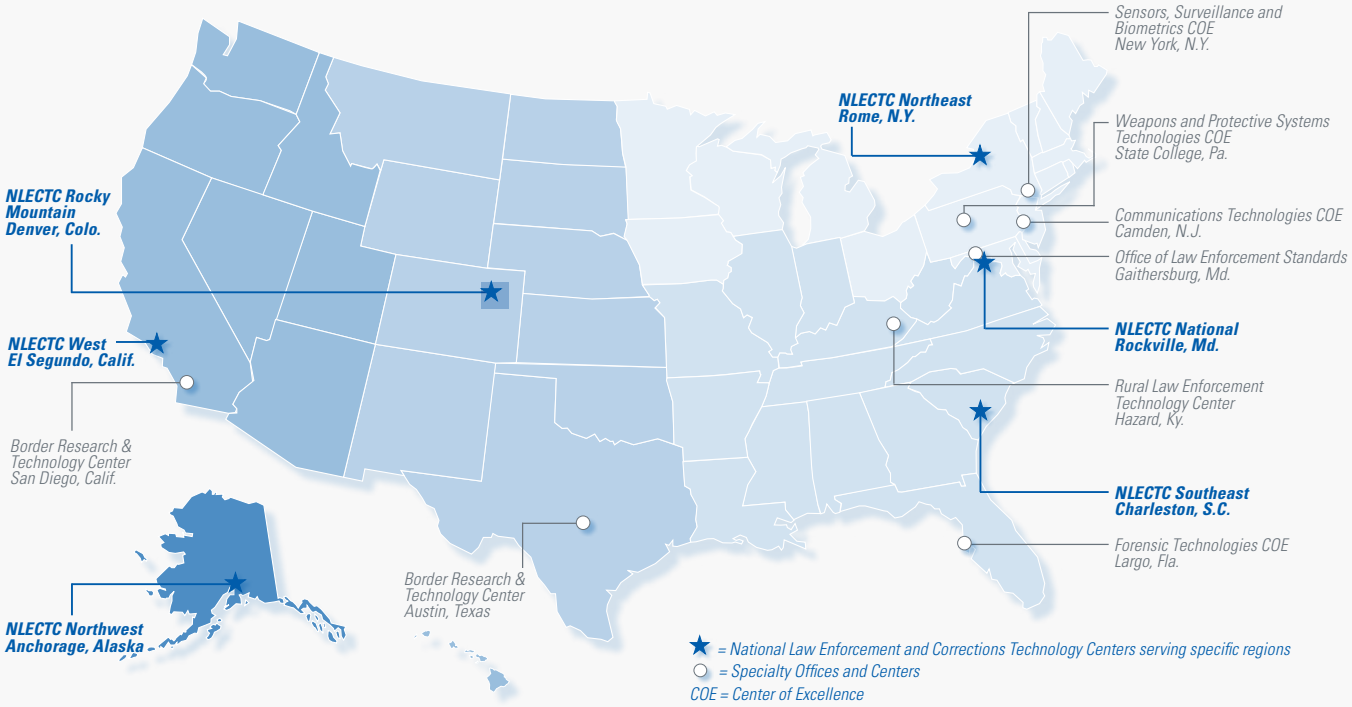
- Scientific and technical support to NIJ's RDT&E projects, particularly the identification of criminal justice technology needs.
- Support for the transfer and adoption of technology into practice by law enforcement and corrections agencies, courts and crime laboratories.
- Assistance in developing and disseminating technology guidelines and standards.
- Technology assistance, information and support to law enforcement and corrections agencies, courts and crime laboratories.

National Law Enforcement and Corrections Technology Center System

In 2007, to better align the work of the NLECTC system with the Institute's RDT&E activities, NIJ added four Technology Centers of Excellence through an open, competitive peer-reviewed process:

- Communications Technologies in Camden, N.J.
- Forensic Technologies in Largo, Fla.
- Sensors, Surveillance and Biometric Technologies in New York, N.Y.
- Weapons and Protective Systems Technologies in State College, Pa.

A key focus area for the centers of excellence is testing and evaluation. They also provide specialized technology assistance and serve as the principal means through which NIJ identifies nationwide criminal justice technology needs. By way of comparison, the regional centers identify unique regional technology needs and serve as the initial point of entry into the NLECTC system for criminal justice practitioners seeking technology assistance.



How NIJ Sets Its Research Agenda

The needs of practitioners in the field drive NIJ's RDT&E agenda.

Within NIJ's Office of Science and Technology, two specialized entities play an important role in advising its RDT&E investments: Technology Working Groups and the Law Enforcement and Corrections Technology Advisory Council.

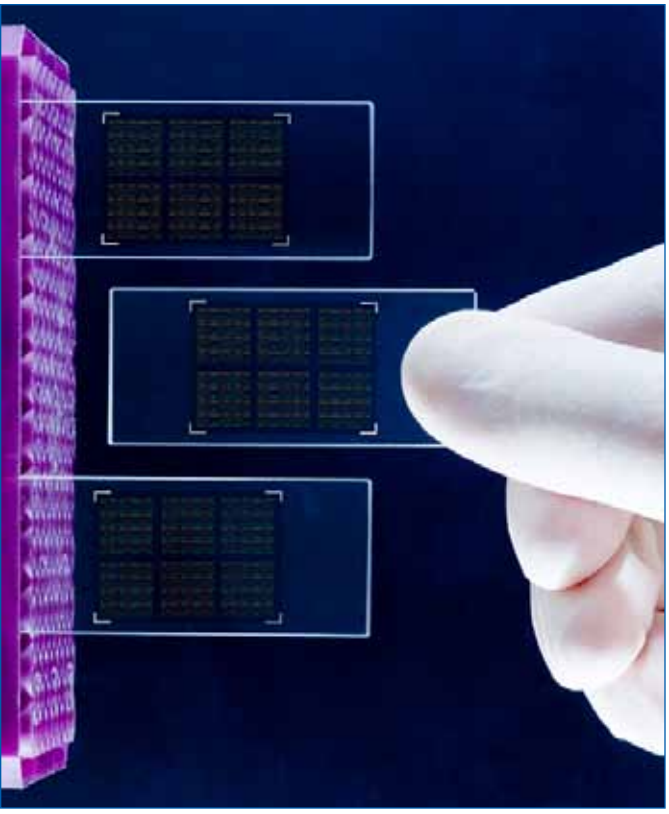
Technology Working Groups (TWGs). A TWG is a practitioner-based committee of 10 to 20 experienced practitioners from local, state, tribal and federal agencies and laboratories associated with a particular NIJ technology investment portfolio, such as Biometrics. Each portfolio has a TWG, which identifies criminal justice technology needs within that portfolio. These portfolios and TWGs are not static; they change as priorities within the field change, as solutions are implemented or as new technologies emerge. TWG members are represented on the peer-review panels that evaluate potential solutions to address practitioner needs. Agencies from which TWG members are drawn are routinely involved in testing and evaluating the resulting solutions. The TWGs, and through them the criminal justice practitioner community, are embedded in the NIJ RDT&E process from beginning to end.

Law Enforcement and Corrections Technology Advisory Council (LECTAC). LECTAC is made up of senior criminal justice practitioners

NIJ's Technology Investment Portfolios

- Aviation.
- Biometrics.
- Body Armor.
- Communications.
- Community Corrections.
- Court Technologies.
- DNA Forensics.
- Electronic Crime.
- Explosive Device Defeat.
- General Forensics.
- Geospatial Technologies.
- Information-Led Policing.
- Institutional Corrections.
- Less-Lethal Technologies.
- Operations Research/Modeling and Simulation.
- Personal Protective Equipment.
- Pursuit Management.
- School Safety.
- Sensors and Surveillance.

from law enforcement, corrections and courts agencies, and crime laboratories. LECTAC annually reviews the recommendations of the TWGs and advises NIJ on prioritizing investments across its technology portfolios from a criminal justice agency, senior management perspective.



Grant Solicitation Process

NIJ annually solicits applications for research and development leading to the introduction of new tools and technologies into criminal justice practice, advised by TWG and LECTAC recommendations. Those solicitations are released through Grants.gov, the portal to find and apply for federal government grants. Proposals are reviewed by independent peer panels of technologists, principally from academic and government organizations, along with practitioners from local, state, tribal and federal agencies, including TWG representatives.

Based on the results of the peer reviews, NIJ program managers recommend individual applications to the NIJ Director. Historically, approximately 8 percent of applicants receive awards.

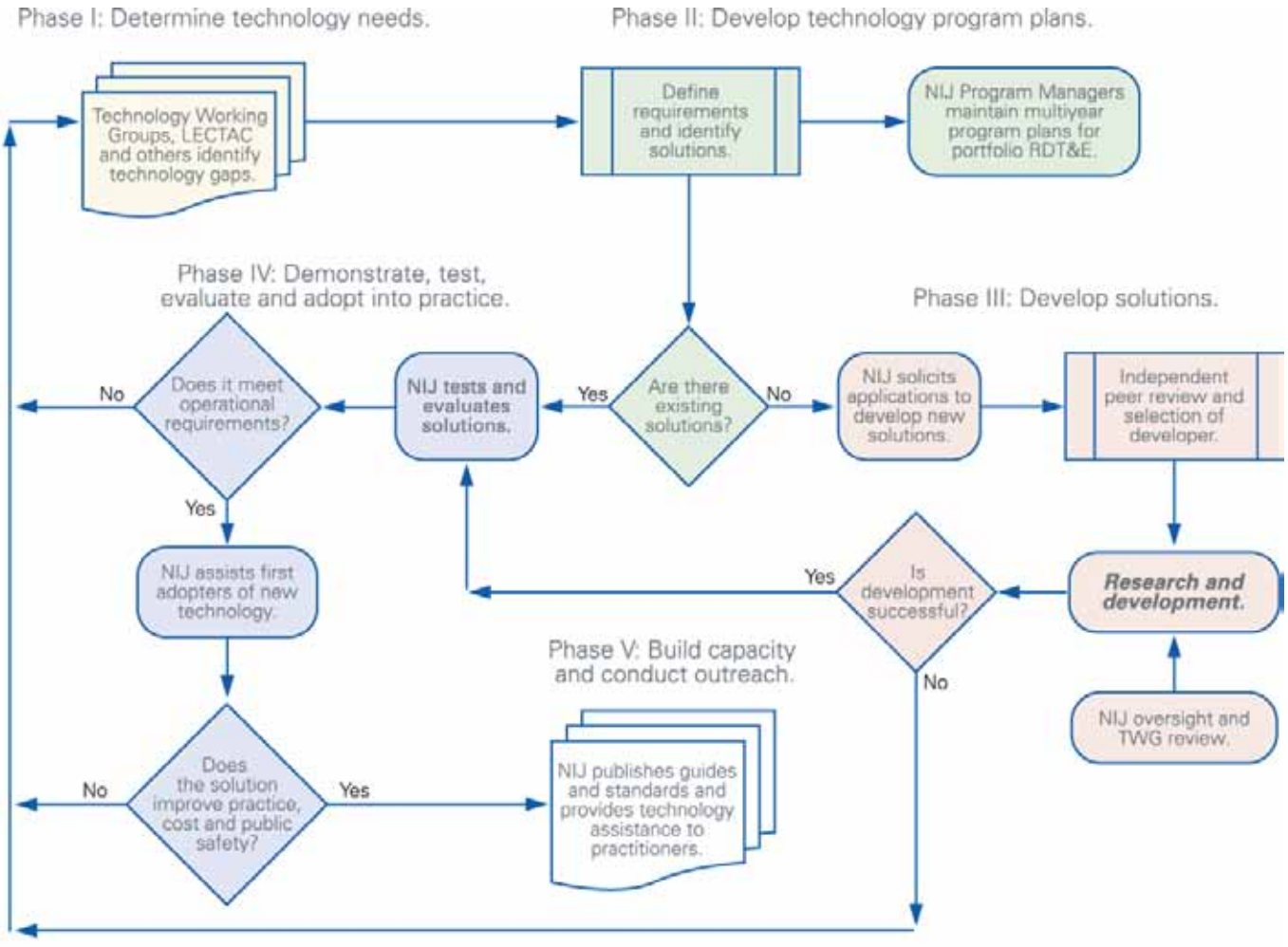
NIJ awards grants to educational institutions, public agencies, nonprofit organizations, faith-based organizations, individuals and for-profit organizations willing to waive their fees. Non-U.S. entities are not eligible for awards.

The Research, Development, Testing and Evaluation Process

The RDT&E process helps ensure that NIJ's research portfolios are aligned to best address the technology needs of the criminal justice community. The rigorous process has five phases:

- Phase I: Determine technology needs. Principally in partnership with TWGs and LECTAC, NIJ identifies criminal justice practitioners' functional requirements for new tools and technologies.
- Phase II: Develop technology program plans to address those needs. A multiyear research program is created to address the needs identified in phase I. One of the first steps is to determine whether products that meet those needs currently exist or whether they must be developed. If a solution is already available, phases II and III are not necessary, and NIJ moves directly to demonstration, testing and evaluation in phase IV. If solutions do not currently exist, they are solicited through annual, competitively awarded science and technology solicitations. TWG members help review the applications.
- Phase III: Develop solutions. Appropriate solicitations are developed. Grantees are selected through an open, competitive, peer-reviewed process, and grants are awarded. The grantee and the NIJ program manager then work collaboratively to develop the solutions.
- Phase IV: Demonstrate, test, evaluate and adopt potential solutions into practice. A potential solution is tested to determine how well it addresses the intended functional requirement. NIJ then works with first-adopting agencies to facilitate the introduction of the solution into practice. After adoption, the solution's impact on practice is evaluated. During the testing and evaluation process, performance standards and guides are developed as appropriate to ensure safety and effectiveness; not all new solutions will require the publication of new standards or guides.
- Phase V: Build capacity and conduct outreach. To ensure that the new tool or technology benefits practitioners, NIJ publishes guides and standards and provides technology assistance to second adopters.

The Research, Development, Testing and Evaluation Process



Standards and Compliance Testing

NIJ's Office of Science and Technology administers a standards and compliance testing program to help ensure that equipment will perform at a safe, dependable and effective level. This comprehensive program develops performance standards for equipment, testing protocols, guidance for evidence collection and standard reference materials.

The NLECTC system oversees the development of standards and a standard-based testing program that includes body armor, handcuffs, semiautomatic pistols and other equipment (see http://www.justnet.org/Pages/testing_overview.aspx).

Ballistic Resistance of Body Armor

NIJ published the first body armor standard more than 30 years ago. The standard has been updated several times in the ensuing years. The methodology was based on one-time testing of the ballistic performance of new "out of the box" armor. That standard and the accompanying compliance testing program proved highly successful, resulting in more than 3,000 officers' lives saved.

In July 2003, a relatively new Zylon®-based body armor vest failed an officer in the field. The attorney general tasked NIJ with determining the cause of that failure and the need for revising the body armor standard and testing protocol.

NIJ determined that Zylon® was more susceptible to degradation caused by exposure to environmental factors than other ballistic materials in use. In June 2008, after a three-year effort that included extensive testing of ballistic materials and open dialogue with practitioners and armor systems developers, NIJ published a new body armor standard. Two key changes include testing armor systems (1) after they have gone through an environmental conditioning protocol and (2) against updated ballistic threats to reflect what officers face on the street today.

Investing With Partners

Collaboration and coordination are core tenets of NIJ's science and technology investment strategy. Forming strategic partnerships with other agencies allows NIJ to leverage investments, avoid duplicating efforts and devote its resources to areas that offer the highest potential payoff for the criminal justice community.

NIJ shares responsibility with the U.S. Departments of Defense and Homeland Security for providing tools and technology to deal with critical incidents resulting from natural or man-made disasters, including acts of terrorism. Terrorism is a crime, and law enforcement officers will often be among the first responders at the scene of an incident. In support of this mission, NIJ participates in overarching agreements on technology development and transfer with both departments.

Since the mid-1990s, NIJ has been a member of the Technical Support Working Group, the federal forum that identifies, prioritizes and coordinates interagency research and development activities for combating terrorism.

NIJ also has formal international agreements with the Australian National Institute of Forensic Science, the Israeli Ministry of Public Security and the Russian Science and Technology Center. The Institute maintains informal relationships with the Royal Canadian Mounted Police and the U.K. Home Office Scientific Development Branch.

The 1401 Technology Transfer Program is an example of NIJ partnering. It is a collaboration among NIJ, the Department of Homeland Security's Science and Technology Directorate, and the Department of Defense's Office of the Assistant Secretary of Defense for Homeland Defense and America's Security Affairs to transfer military technology and equipment to support homeland security and public safety applications.

High-Priority Criminal Justice Technology Needs

The following pages summarize the high-priority needs for the criminal justice field in the area of technology. These needs are organized into five functional areas:

- Protecting the Public.
- Ensuring Officer Safety.
- Confirming the Guilty and Protecting the Innocent.
- Improving the Efficiency of Justice.
- Enabling Informed Decision-Making.

PROTECTING THE PUBLIC

- Assured means to continuously and accurately monitor the location and status of offenders under supervision in the community, including:
  - A noninvasive, assured method to continuously monitor an offender's substance abuse.
  - Within structures and outside in urban and rural environments.
- Safer, more cost-effective aerial surveillance solutions to identify, locate and track illicit activities and to locate missing persons, particularly for application with small and rural agencies. Solutions must consider regulatory requirements.
- Improved, unobtrusive means to accurately detect a broad spectrum of contraband to preclude its introduction into public venues, including:
  - Academic institutions.
  - Mass transit.
- "Intelligent" surveillance solutions providing automated incident awareness and warnings in public venues, including:
  - Academic institutions.
  - Public transit.
  - Sporting venues.
  - Shopping areas.
- Improved means to detect and respond to weapons concealed on an individual's body at a safe distance, including person-borne improvised explosive devices (IEDs).
- Improved, assured means to detect and effectively respond to vehicle-borne IEDs, which:
  - Are easily transportable.
  - Are rapidly and remotely deployable.
  - Cause minimal collateral effects.
- A means to remotely locate and track cooperative and uncooperative individuals inside buildings in hostage rescue and search situations.

- Improved characterization of currently available less-lethal devices and their health and safety effects, particularly on at-risk populations, leading to improved use-of-force protocols and to safer, more effective devices.
- New, safer, more effective less-lethal devices that:
  - Can better deter individuals from taking a prohibited action.
  - Can instantly incapacitate individuals for a specified period of time.
  - Are suitable for use on at-risk populations.
- Rapidly deployable, effective devices that can safely and remotely stop all types of vehicles under a variety of circumstances.
- Improved means to disseminate urgent public safety information, including:
  - Timely.
  - Accurate.
  - Targeted.
- Improved emergency response solutions. Minimally including:
  - Accurate location of the incident.
  - Timely, optimized response.

ENSURING OFFICER SAFETY

- Confirming and fixing an individual's identity under all circumstances in a timely manner, including:
  - Identifying individuals from video and audio surveillance.
  - Positive identification and verification solutions, including:
    - Equipment and facility access control.
    - Positive identification of information technology systems users.
    - Incident scene access control.
  - An improved ability to effectively perform real-time, accurate identity checks across multiple jurisdictions and data systems.
  - An improved capability to collect and process biometric information at a crime scene in real time, including:
    - Capture and processing of latent finger and palm prints in a manner compatible with automated fingerprint information systems.
- Assured means to continuously and accurately monitor the location and status of individuals and equipment, including:
  - Law enforcement and corrections officers and personnel as well as inmates and detainees.
  - Health status of individuals.
  - Within structures and outside in urban and rural environments.
- Improved solutions to assure communications under all circumstances, including:
  - In areas with limited or no terrestrial communications infrastructure.
- Improved means to detect, locate and defeat the use of unauthorized wireless communications devices in all operating environments, including in, but not limited to, correctional environments. Solutions must consider regulatory requirements.
- Improved, unobtrusive means to accurately detect a broad spectrum of contraband to preclude its introduction into correctional and other operational environments, such as courthouses.

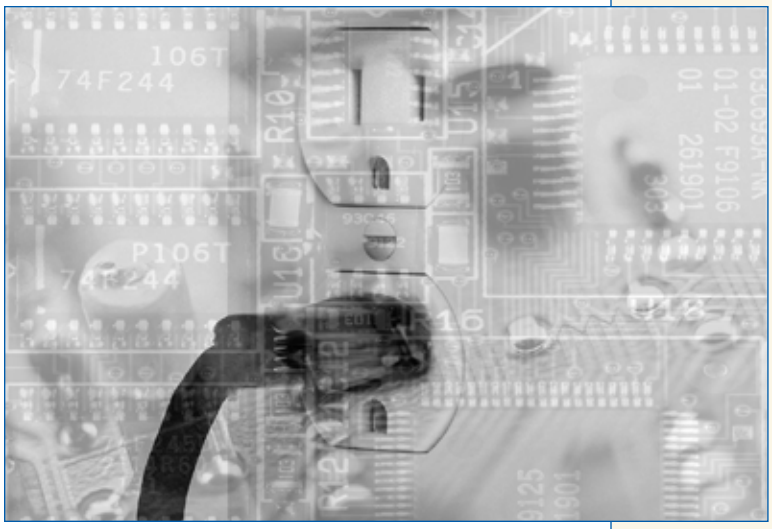
- "Intelligent" surveillance solutions to monitor events in correctional and other operational environments and to identify and provide alerts on potentially dangerous situations prior to their occurring.
- Improved all-hazards protection for law enforcement and corrections officers, including:
  - Lighter weight, more flexible ballistic- and stab-resistant body armor systems that will stand up to environmental degradation and the normal "wear and tear" associated with continuous use.
  - Cost-effective methods to reduce the heat-related stress associated with wearing existing body armor systems without compromising protection and mobility.
  - Improved methods to ensure the continued performance of body armor systems, including:
    - More accurate means to measure deformations to the inside of a body armor system caused by impacts and perforations and their effect on the human body.
    - Accurate means to measure the protection afforded by in-service body armor systems.
  - Tactile; reusable; and cut-, puncture- and pathogen-resistant gloves that provide full dexterity.
  - Improved materials for everyday duty uniforms that are flame retardant, moisture proof, flexible and lightweight and that offer cut, puncture and pathogen resistance.
  - A protective ensemble compatible with law enforcement tactical operations requirements that provides protection from biological agents, radiation exposure and exposure to the toxic materials and gases associated with clandestine drug laboratories.
  - A full-face respirator fully compatible with law enforcement tactical operations requirements.
  - Improved robots and robotic tools that reduce the need for bomb technicians to deal directly with IEDs of all types.

CONFIRMING THE GUILTY AND PROTECTING THE INNOCENT

- Improved capability to expand the information that can be extracted from traditional types of forensic evidence and to quantify its evidentiary value, including:
  - Identification or characterization of:
    - Biological markers that may reveal more information about the source of biological evidence.
    - New substances or chemical constituents of forensic importance.
  - Improved tools for examining aged, degraded, limited, damaged, inhibited or otherwise compromised DNA evidence.
  - Tools to expand the utility of Y-chromosome and mitochondrial DNA.
  - Tools that provide a quantitative measure/statistical evaluation of forensic comparisons, including:
    - Impression evidence.
  - Physical separation of cells or components in mixtures from two or more individuals or sources, including:
    - Sperm.
- Improved capability to use and process digital evidence, including:
  - Tools to investigate the use of peer-to-peer technologies used to facilitate criminal activity, such as distribution of contraband, that address decentralized and unstructured peer-to-peer network protocols.
  - Tools that can recover system files, operating system information, applications, deleted files and unallocated space from small-scale mobile devices, such as cell phones and personal digital assistants.
  - Full data imaging solutions for networks and network-attached or -connected devices addressing:
    - Redundant Array of Independent Disks (RAID).
    - Wireless network devices, including routers, gateways, network interface cards, repeaters, switches, hubs and wirelessly connected external digital media.

  - Network data storage devices that are either directly connected or connected by a computer to the network.

- Improved means to verify the veracity of interviews.
- Improved ability to effectively perform real-time, accurate identity checks across multiple jurisdictions and data systems.
- Improved solutions to automatically determine that related entries in multiple databases that contain varying or inexact details are attributable to the same person.



IMPROVING THE EFFICIENCY OF JUSTICE

- "Intelligent" decision support systems, including:
  - Optimizing sentencing (e.g., institutionalization, probation, parole, therapy, electronic monitoring or treatment), taking into account cost, safety and recidivism issues.

  - Optimizing the way in which law enforcement agencies organize and deploy their resources, to include: patrol district, precinct and beat designs; fleet maintenance; and management and manpower scheduling.
  - Optimizing the way in which law enforcement and corrections agencies employ new technologies, such as automated vehicle locators, smart sensors, wireless mobile networks and knowledge management, in patrol and response operations.
- Improved information and data systems that link an individual's records and citations across various criminal justice databases from the time of entry into the criminal justice system.
- Web applications (services) that facilitate effective cross-jurisdiction information and data sharing and exchange. Solutions must consider the Justice Reference Architecture.
- Immersive technologies to effectively train public safety officers optimally at their stations.
- Devices providing multilingual speech translation capabilities for public safety application, including:
  - Voice.
  - Speech-to-text/text-to-speech.
- Reliable and widely applicable tools and technologies that allow faster, cheaper and less labor-intensive identification, collection, preservation and analysis of forensic evidence of all kinds and the reduction of existing case backlogs, including:
  - Improved laboratory information management systems.

- Improved automated forensic analysis and quality assurance processes.
- Improved screening methods for use at crime scenes and in the laboratory to rapidly and accurately determine the evidentiary value of biological materials.
- Improved methods to rapidly identify and collect biological evidentiary samples at a crime scene.
- Improved tools for preserving biological evidence.
- Improved methods for DNA extraction.
- Improved solutions to address the need for increased data storage capacity to archive large-volume data sets generated in computer forensic examinations.
- Improved solutions for extracting specific data subsets that correspond to specific files from larger data sets during analysis of unallocated space on a digital media device.
- Improved solutions to automatically determine that related entries in multiple databases that contain varying or inexact details are attributable to the same person.

ENABLING INFORMED DECISION-MAKING

- Effective and instantaneous, user-transparent, operable and interoperable voice, data and multimedia communications under all circumstances, including:
  - Wired or wireless networks.
  - Vehicular (including aerial) or foot-mobile.
  - In areas with limited or no terrestrial communications infrastructure.
  - At the dynamic data rates needed for effective law enforcement operations.
  - Mobile hybrid technology for wireless broadband data that seamlessly locates the best route and operational band under any circumstances.
  - Advanced in-building communications that do not rely on pre-existing systems.
- Improved spatial analysis tools and technologies, including:
  - Tools to analyze the geographical linkages of relationships among people, groups and organizations of interest to criminal justice agencies.
  - Exploratory spatial and temporal data analysis visualization tools that examine data in new and unique ways or that extend current capabilities of exploiting crime-related databases.
  - Mapping tools that make geo-coded data available and compatible with the mobile and handheld computing devices used by law enforcement.
  - Tools providing 3-D geo-coding and mapping for large buildings, including those with no electronic computer-aided design files.
  - Tools that identify and extract relationships hidden in large, complex law enforcement agency data sets and operationalize crime theories in a geographic information system environment.

- Affordable and open-source tools that can analyze data across databases and domains received through federated queries to create informed information-led intelligence.

- An "intelligent" automated system that can predict and deter potential criminal activity by correlating patterns of behavior and anomalies in that behavior from multiple data sources, including:
  - Databases.
  - Real-time video and audio surveillance.
  - Real-time geospatial tracking data.
- Better solutions to the effective integration and management of sensor systems in law enforcement command and control systems.
- Automated case management and communications systems that can be used by officers and offenders to track compliance with conditions of release and prompt necessary action.

NIJ Resources

- http://www.DNA.gov. This Web site is a one-stop resource for information about the President's DNA Initiative, including grant and training opportunities.
- http://www.JUSTNET.org. The Justice Technology Information Network (JUSTNET), created in 1995, acts as a gateway to the products and services of the NLECTC system and to other technology information and services of interest to the law enforcement and corrections communities.
- http://www.ncjrs.gov. The National Criminal Justice Reference Service (NCJRS) is a federally funded resource offering justice and substance abuse information to support research, policy and program development worldwide.
- http://www.namus.gov. The National Missing and Unidentified Persons System (NamUs) is the first national online repository for missing persons records and unidentified decedent cases. NIJ launched NamUs in July 2007.
- http://www.techproductnetwork.com. The Tech Product Network showcases law enforcement and corrections products available on the market.
- http://www.less-lethal.org. This Web site was created by the Less Lethal Working Group to assist local, state and federal law enforcement agencies in developing, implementing and enhancing policies governing the use of less-lethal (commonly referred to as nonlethal) technologies.

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