Homeland Security

Science and Technology

Virtual USA

Advancing Interoperability at All Levels

The Problem

The need for real-time, actionable information is critical during day-to-day and emergency response operations where multiple jurisdictions and disciplines interact. Plenty of homeland security related information exists at the local, tribal, state, and Federal levels, but since equipment investment decisions have been made based on the specific operational needs of individual agencies without benefit of any national strategy or standards, this information is often trapped in silos. As a result, potentially critical information often does not make it into the hands of the people who need it the most.

Virtual City, State, Regional and Federal Initiatives

Several initiatives have been undertaken at all levels to address this problem. At the state level, Alabama and Virginia are using standards-based, open architecture geospatial technologies to create statewide systems known as Virtual Alabama and Virginia Interoperability Picture for Emergency Response (VIPER), respectively. As common operations platforms for emergency response, these systems are capable of seamlessly integrating hundreds of previously disparate data sets. States such as Louisiana and Mississippi are engaged in similar efforts. The City of Beverly Hills, California, has also embarked on a multi-jurisdictional initiative to launch a Virtual City platform that can be shared by partners across California.

At the regional level, the Regional Operations Platform Pilot (ROPP) brings together several states—Alabama, Georgia, Florida, Louisiana, Mississippi, Texas, and Virginia, as well as observers from Tennessee,— to seamlessly share critical information between their disparate common operating platforms. This pilot integrates existing platforms, enhanced visualization tools, and other data sets to allow participating states' systems to interoperate and exchange information with each other, regardless of the platform or application. (See Virtual Alabama, Virtual City, and ROPP in "Virtual Projects")

At the Federal level, the U.S. Department of Homeland Security's (DHS) Office of Infrastructure Protection has established DHS Earth to provide key elements of a common operating picture. In addition, there are a number of other initiatives, such as the United Incident Command Decision Support (UICDS), that are employing standards to enable the sharing of disparate data sets—such as the information in computer-aided dispatch systems—and make them available to all operations platforms.

Virtual USA

While these efforts represent important progress, the Nation's ability to seamlessly share information across localities, states and regions is still limited. To address this problem, the DHS Science and Technology (S&T) Directorate's Command, Control and Interoperability Division (CID), assisted by the First Responder Technologies program (R-Tech) created the Virtual USA initiative. Through this initiative, CID and R-Tech

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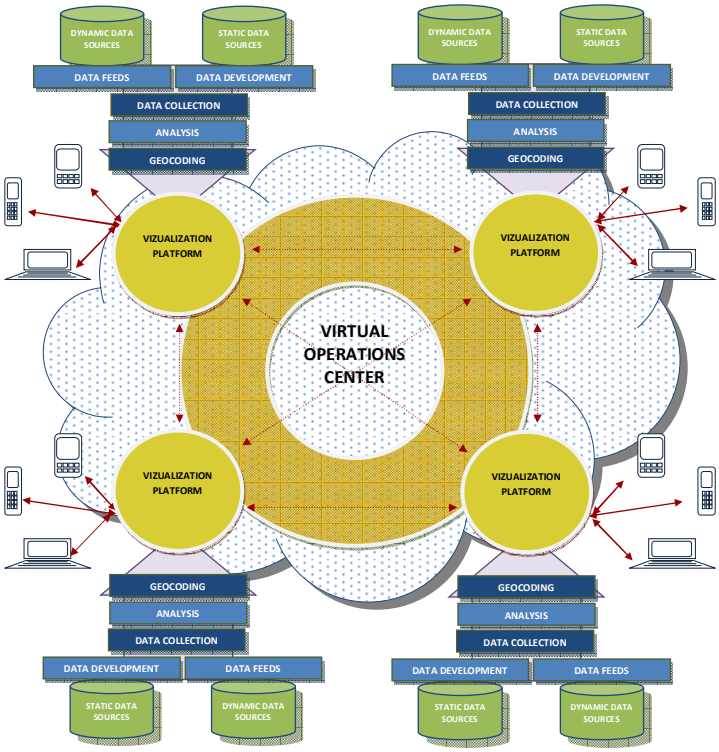
are partnering with local, tribal, state, and Federal agencies to build on the shift away from proprietary, siloed systems toward standards-based, commodity-driven, open architecture technologies. This shift from proprietary systems allows technologies to connect more easily across disciplines and jurisdictions for emergency response operations.

Since many communities have significant resources invested in legacy platforms which they cannot afford to abandon, Virtual USA leverages a system-of-systems approach to seamlessly share relevant information when needed (see Figure 1). More specifically, it aims to foster the integration of disparate technologies across the information management lifecycle - linking tools used for collection, analysis, management, communication, and protection of actionable data - both within each and across components (see "Virtual USA Key Projects").



Drawing on the experiences of Virtual City, Virtual State, and ROPP, as well as other CID and S&T programs, Virtual USA will demonstrate and share lessons learned and best practices with local, state, and regional jurisdictions.

Virtual USA:

- Integrates Existing Frameworks: Virtual USA integrates a set of processes and solutions that complements existing policies, processes, and architectures in each of the respective states. The aim is to establish seamless information exchange among participants, as needed and as authorized.

- Builds on Existing Investments: Significant resources have already been expended on information sharing platforms, architectures, viewers, radios, and other solutions. Virtual USA does not seek to replace these systems, but instead leverages a system-of-systems model to permit new and existing technologies and concepts to exchange information.

- Draws on Practitioner Input: Virtual USA was created based on the needs of local, tribal, and state practitioners to manage data access within their own jurisdictions and to share information with relevant jurisdictions across the Nation, when needed. Virtual USA will continue to include practitioners in every step of the process.

- Employs a Comprehensive Approach: Virtual USA is not limited to making information exchanges possible between only two agencies or fixed points; instead, the initiative will foster dynamic information sharing among all relevant practitioners.

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Virtual Projects

- **Virtual City**
  An effective way to test and demonstrate the viability and benefits of a technology intended to enable seamless information sharing and communication is to deploy it in an area that will use the capability on a daily basis. As part of its strategy, the U.S. Department of Homeland Security Science and Technology (S&T) Directorate's Command, Control and Interoperability Division (CID) is supporting Virtual City, a national program benefitting small- and medium-sized cities nationwide, which will demonstrate interoperable voice and data communications, information collection and management, and visualization techniques. The pilot demonstration, being held in the City of Beverly Hills, California, will integrate data from multiple sources and make that information more accessible to responders for day-to-day decision making within Beverly Hills and neighboring jurisdictions. In the event of an emergency, the capability will also be made available to the state emergency operations center for statewide use. CID will collect lessons learned and make best practices available to help other cities across the Nation.

- **Virtual State**
  The State of Alabama approached CID with Virtual Alabama, a visualization tool they developed which overlays statewide satellite imagery and aerial photography with critical data such as real-time weather information and the location of fire hydrants, pipelines and other infrastructure information critical to the state in emergency situations. The project continues to be enhanced and is now able to display both before and after information related to disasters, such as tornadoes and floods, including architectural data, and tax and boundary information needed to prepare disaster cost information for FEMA as well as in helping to attract business. While meeting the concerns of localities that need to be able to restrict access to certain data, the only limit to what can be displayed is the imagination of those who draw on the system. CID also piloted, through the School Safety project, innovative video-streaming techniques that allowed school officials, as well as first responders en-route and on the scene of an incident, to more quickly determine the nature, location, and direction of a threat.

- **Regional Operations Platform Pilot**
  Building on Virtual Alabama, CID and R-Tech created the ROPP. Partnering with several states—Alabama , Florida, Georgia, Louisiana, Mississippi, Texas, Virginia, as well as observers from Tennessee, they will work to seamlessly share critical information among their disparate common operating platforms. The effort will integrate existing platforms, enhanced visualization tools, and other data sets such as hurricane data. This will allow all of the state systems to interoperate and exchange information with each other, regardless of the particular platform or application in use. The goal is to create technologies and methodologies which are both application and platform agnostic and which enable the exchange of information by leveraging legacy investments.

Virtual USA Key Projects

CID is dedicated to providing homeland security practitioners with a toolkit that includes the essential technologies, expertise, and processes to gather, analyze, manage, share, and protect information. The following projects are just a few examples of CID's efforts toward advancing the Virtual USA initiative:

Collect

- Tagging, Tracking, and Locating Technologies: CID is developing smaller, more efficient, and more reliable tagging, tracking, and locating devices for use on objects of interest in law enforcement investigations. The devices have longer ranges and can perform in harsher law enforcement operational environments.

- Sensor Webs: Through this initiative, CID is developing intelligent sensor platforms capable of communicating wirelessly and acquiring geographically disparate real-time data. The sensor platforms also enable the processing and analysis of environmental, nuclear, chemical, biological, or imaging data. Efforts will result in robust, low-cost, easily deployable sensor nodes that may be positioned to detect and track intruders, provide information on emergency situations, and increase situational awareness.

- Network Identity Management: For the Virtual USA concept to succeed, the American public needs assurances that sensitive information will be shared only with those who are authorized and have a need to know. Network Identity Management (IdM) addresses this issue by identifying who logs into a computer system and identifying the role (job function, organization, clearances, etc.) of the individual. Cabinet-level departments at the Federal level (e.g., Department of Defense, Department of Justice, DHS) as well as city and state agencies have all started to address this issue. Therefore, CID's IdM project focuses on interoperable technical solutions between the various methods being deployed, as well as on pilots of IdM between organizations.

Analyze

- Mid-Atlantic Data Sharing: CID has successfully established a Research to Reality (R2R) program with the Port Authority of New York and New Jersey (PANYNJ). To build on current, acknowledged CID successes and demonstrate the Virtual USA concept, CID plans to expand this work to the Lehigh Valley (Pennsylvania) Police agencies and the New Jersey State Police. CID has secured agreements from these law enforcement agencies and PANYNJ to share information and to use current R2R technologies for its collection, management, analysis, and secure dissemination capabilities.

- Enhanced Analytics – Fusion Center Pilot: In this project, DHS S&T is engaging a select group of Fusion Centers and will work to baseline current analytical needs, capabilities and tools. The focus is on identifying capabilities, technologies and candidate products and processes that best fit the Fusion Center's mission and challenges. A structured process will them examine, out of over 400 existing analysis tools, what best fits the Fusion centers needs. A capability pilot, using the identified tools and technologies, and focused on validating and informing how the capabilities are applied will be deployed for use within the selected Fusion Centers. Needs that are not addressed in the Pilot will be captured, and will inform and guide future DHS S&T research and development efforts.

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Manage

- Law Enforcement Information Framework (LEIF): Providing team members with up-to-date, synchronized information is critical to the success of investigations or incident response operations. CID's Law Enforcement Information Framework (LEIF) allows officers and first responders to collect, share, and analyze large volumes of data that often come from many different sources and in many different forms. LEIF operates effectively in the field, on the desktop, and in the command center or situation room by providing better access to richer information in real time. The LEIF environment enables large volumes of existing and newly collected data – images, video, text, sketches and audio - to be combined and organized in ways that facilitate more effective decision making. LEIF is embedded with tools that automatically look for patterns in the data based on topics, trends, geography, and other relationships, and allows this information to be visually represented for analysis based on officer-provided parameters. This enriched, evolving analytics functionality enables teams to more efficiently and effectively deploy their resources, resulting in continuously more productive investigations or response operations.

- CompStat 2: CompStat 2 is a new, operational technology that provides emergency response agencies with advanced computer services to simplify, organize, and easily display data already on file. It is built upon CompStat, which is currently used by police agencies across the country but relies on simple spreadsheets or other kinds of computer programs to track personnel and improve the deployment of law enforcement resources. CompStat 2 combines the same personnel data with other common investigative or surveillance data and publicly available data from the Global Terrorism Database. It then automatically displays those data in easy-to-understand charts, graphs, and visual images. These charts and graphs can be updated regularly, in real-time, using a secure, web-based computer or mobile platform. The technology ultimately improves both law enforcement and homeland security by showing patterns and trends of crime and by indicating risks and vulnerabilities to critical infrastructures.

Share

- Multi-Viewer: Currently, there are many sources of geospatial data available. For example, DHS uses the Integrated Common Analytical Viewer and DHS Earth, Virginia uses VIPER, and Alabama uses the Virtual Alabama platform. For Virtual USA to become a reality, there must be an architecture and methodology for geospatial information to be shared, when appropriate, on an as-needed basis. The Multi-Viewer project is focused on developing this architecture and any necessary new technology.

- Multi–Band Radio (MBR) Pilot: CID is demonstrating a prototype for the first-ever portable multi-band radio (MBR). Equal in cost, size, and weight to existing portable radios, the MBR provides emergency responders with cutting-edge communications capabilities. The MBR allows emergency responders to communicate with partner agencies, regardless of the frequency band in which they operate.

- Emergency Data Exchange Language Data Messaging Standards: CID is partnering with the emergency response community, Federal agencies, industry, and standards development organizations to accelerate the development of data messaging standards for emergency response. Emergency Data Exchange Language enables the exchange of data, files, and hospital availability information across disparate software systems and applications. These standards will significantly assist emergency responders in achieving their goal of quickly and seamlessly exchanging critical information, regardless of which system they use.

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- Integrated Public Alert and Warning System (IPAWS) /Commercial Mobile Alert Service (CMAS): CID is working with the Federal Emergency Management Agency to enhance the Nation's current public alert and warning capabilities. CID is supporting a standards-based framework for the Integrated Public Alert and Warning System (IPAWS)—and CMAS. These early warning systems will help the American public receive emergency alerts and warnings in a timely manner through multiple means and mediums. CID is working with the alert and warning stakeholder community to identify and develop standards and protocols that ensure the IPAWS system of systems is interoperable. CMAS will be a national public warning system that transmits geographically-targeted emergency alerts to the public on cell phones, pagers, and other mobile devices.

- Regional Information Sharing and Collaboration (RISC): CID is developing enhanced information sharing capabilities critical to improving the capacity of law enforcement and other emergency response agencies to protect the public against terrorism and other criminal acts that threaten its safety. Using the Virtual USA concept through its state, local and tribal law enforcement and public safety partner organizations, -- the RISC program provides a user-driven research and test capability to address threat dissemination and information sharing requirements through rapid prototyping, experimentation, and operational demonstrations of new processes and applications.

Protect

- Information Infrastructure Security: Through the Information Infrastructure Security (IIS) program, CID is engaging with industry, government, and academia to ensure that the core functions of the Internet develop securely and benefit all owners, operators, and users. The IIS program ensures Internet naming and routing services are reliable, even in the event of a cyber attack. The Domain Name System Security program was created to ensure that users reach correct and valid Internet sites and to guarantee the authenticity and integrity of Internet communications.

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