Interoperability Technology Today

Homeland Security

A Resource For the Emergency Response Community

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State Police Aviation Crews Take Flight with New Technology

Maryland State Police (MSP) flight crews are taking to the sky with a new aerial technology in their cockpits. The first agency in the Nation to pilot the technology—known as the Critical Infrastructure Inspection Management System (CIIMS)—the MSP Aviation Command now can efficiently manage inspections of critical structures such as dams, bridges, and large industrial complexes.

Today, local and state law enforcement agencies regularly inspect infrastructures to help protect against damage caused by terrorism or natural disaster. These infrastructure inspection missions are extraordinarily complex—requiring a robust fleet of emergency response vehicles and personnel that can seamlessly and securely share information. The emergency response agency responsible for securing a region's infrastructure must coordinate infrastructure inspections across a fleet including air crafts, water crafts, motor vehicles, and operational control centers. CIIMS makes it easier for MSP flight crews to effectively exchange information about infrastructure sites with their partners on the ground.

"The CIIMS project is a significant milestone in strengthening critical infrastructure nationwide, and it represents an important step toward improving information sharing among our Nation's emergency responders," says Dr. David Boyd, Director of the Department of Homeland Security's (DHS) Command, Control and Interoperability (CCI) Division. CIIMS was developed at the direction of DHS by The Johns Hopkins University Applied Physics Laboratory, and is funded by CCI.

Technology Mile Marker

A cost-effective technology—the hardware package has a current price tag of approximately $3,000—CIIMS enables state police flight crews to complete aerial inspections more quickly and efficiently. The technology provides flight crews with a small, easy-to-use, tablet-sized computer, known as an electronic flight bag (EFB). The EFB is equipped with touch-screen controls that aid data collection efforts and expedite information sharing among local, state, and Federal intelligence communities. Inspection information is downloaded into a common database—helping prioritize inspections based on inputs from industry and local, state, and Federal agencies.

see "New Technology" page 6

Fire Service Puts Digital Voice Coders to the Test

Firefighters nationwide are steps closer to improving digital radio transmissions in high-noise fire response operations. Some firefighters have reported unintelligible audio while using portable, two-way digital radios. This is due to interference from breathing apparatus devices and common background noises such as sirens, vehicles, power tools, and helicopters. In response, the International Association of Fire Chiefs (IAFC) has partnered with Federal agencies—including the Department of Homeland Security's Command, Control and Interoperability Division and the Department of Commerce's Public Safety Communications Laboratory (PSCL)—manufacturers, and fire service leaders nationwide to identify the causes of and potential solutions for this critical communications problem.

In May 2007, the IAFC Digital Problem Working Group—including firefighters, radio and equipment manufacturers, and technical experts—unanimously identified the voice encoder/decoder (vocoder) as the cause of voice audio distortion that some digital radio users have experienced. The vocoder is a hardware/software component in every digital radio. The technology uses a speech analyzer to convert analog voice to a digital signal, and reconverts the digital signal to digital voice. While many fire departments are using digital radio systems with success, field reports indicate that during light to moderate fireground noise the vocoder may slightly distort voice audio. In loud fireground noise scenarios the vocoder may make voice audio completely unintelligible—potentially compromising response operations.

"The worst possible scenario would be that unintelligible voice audio occurs when a firefighter is in a life-threatening situation and a call for assistance would not be understood—resulting in a serious injury or death," says Charlottesville (Virginia) Fire Chief Charles Werner, who chairs IAFC's Digital Problem Working Group.

To effectively and comprehensively address this challenge, the IAFC Digital Problem Working Group established two task groups—the Best Practices Task Group and the Testing Task Group—to work on different aspects of the digital problem. Focused on near-term solutions, the IAFC Best Practices Task Group is working to identify immediate behavioral, procedural, and technical steps agencies can take to avoid fireground noise. With input from digital radio users, this Task Group will provide emergency response agencies with a best practices guide for reducing the possible effects of background noise on radio transmissions.

"This [near-term practice] is really key," says IAFC's Senior Advisor of Government Relations Alan Caldwell. "A technical fix might be some time in the future, but the need to take mitigating steps is now."

The IAFC Testing Task Group is working to scientifically document how fireground noise affects voice audio, and to determine what technology improvements are needed to overcome fireground noise issues. To complete this research, IAFC is working with PSCL, operational fire service personnel, and manufacturers of both communications equipment and fire service apparatus and equipment. Partners are studying prepared and documented live burns, and are conducting tests at laboratories in Boulder, Colorado.

see "Voice Coders" page 6

CONTENTS

State Police Aviation Crews Take Flight 1
Fire Service Puts Digital Voice Coders to the Test 1
Director's Message 2
Standardizing Radio Channel Names 3
Remembering Marilyn Praisner 3
Arizona Scores Interoperability Touchdowns 4
Border Interoperability at a Crossroads 5
In Your Own Words 6
Spotlight 7

Interoperability Technology Today

About Interoperability Technology Today

Through a practitioner-driven approach, the Science and Technology Directorate's Command, Control and Interoperability (CCI) Division creates and deploys information resources—standards, frameworks, tools, and technologies—to enable seamless and secure interactions among homeland security stakeholders. With its Federal partners, CCI is working to strengthen capabilities to communicate, share, visualize, analyze, and protect information.

CCI interoperability programs address both voice and data interoperability. CCI is creating the capacity for increased levels of interoperability by developing tools, best practices, technologies, and methodologies that emergency response agencies can immediately put into effect. CCI is also improving incident response and recovery by developing messaging standards that help emergency responders manage incidents and exchange information in real time.

Interoperability Technology Today is published quarterly by CCI at no cost to subscribers. Its mission is to provide the emergency response community, policy makers, and local officials with information about interoperability initiatives nationwide, best practices, and lessons learned.

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Homeland Security

Upcoming Events

Events & Conferences

2008 Homeland Security Science and Technology Stakeholders Conference East
June 2-5, 2008
Washington, DC
www.ndia.org

2008 Industry Roundtable
June 2, 2008
Washington, DC
www.oicroundtable.com

DIRECTOR'S MESSAGE

By Dr. David Boyd

The Command, Control and Interoperability Division (CCI) is committed—as ever—to aligning emerging technologies with the critical needs of emergency responders in the field. In support of this mission, CCI's Office for Interoperability and Compatibility (OIC) is working with emergency responders, Federal partners, and industry on two important initiatives: Public Safety Statement of Requirements (PS SoR) research and development (R&D) and the Project 25 (P25) Compliance Assessment Program (CAP).

Meeting Practitioner Requirements

OIC is conducting R&D on two technical areas of the PS SoR, a two-volume set with Volumes I and II published in 2004 and 2006 respectively.

Developed with practitioner input, the PS SoR is the first document to capture, in one place, a comprehensive set of communications requirements for more than 60,000 emergency response agencies nationwide. The PS SoR defines operational, functional, and technical requirements for diverse emergency scenarios. With its Federal partners, OIC identified a need to further define requirements for emergency response communications in two specific areas: security and video quality.

Security, a primary component of emergency response communications, is a multi-faceted challenge. Emergency responders need a comprehensive framework that assists in requirements definition, specification, and standardization. OIC's R&D efforts in this arena will generate a set of requirements that reflects the security needs, goals, priorities, and technological opportunities of emergency response.

The emergency response community also is developing a significant interest in video technology—from surveillance cameras to onboard video cameras in emergency response vehicles. Building upon OIC's past video testing work, video R&D analyzes the current use of video by emergency responders, anticipates their future use of video, and ensures that technologies accommodate their needs. These R&D efforts will generate a comprehensive set of qualitative and quantitative requirements specific to video quality for all application areas.

Building to Standards

Identifying practitioner requirements is one—albeit essential—piece to ensuring that innovative technologies successfully support emergency response operations. Emergency response agencies also need a mechanism to ensure that the equipment they purchase complies with approved P25 standards.

To officially "recognize" that equipment marketed as a P25 product is actually compliant, OIC worked with practitioners, industry, the National Institute of Standards and Technology (NIST), and the Institute for Telecommunication Sciences to develop an independent compliance assessment program for P25 equipment.

This program, known as P25 CAP, will help emergency response officials make informed purchasing decisions, and will provide manufacturers with a method for testing their equipment for compliance with P25 standards. By consulting reports published on a selected Web site, officials will know which products meet available standards and are indeed interoperable; each piece of equipment will have run the gauntlet of an established testing regime developed under the oversight of NIST.

P25 CAP is a win-win for the emergency response community because it ensures that equipment is compliant and generates vendor competition—resulting in more affordable technologies.

Achieving Progress Together

The PS SoR and P25 CAP initiatives represent important strides toward aligning technologies with responder needs. While addressing capability challenges from different angles, project partners share a common goal: to ensure that emergency responders nationwide have the resources they need in the field. Our partnerships with the emergency response community, Federal agencies, and industry are fundamental to the success of these efforts. As new technologies become available, collaboration will continue to be a critical common denominator across our efforts to provide emergency responders with the resources required to achieve interoperability.

Reporting in Uniform: Standardizing Radio Channel Names

Even during a coordinated emergency response, responders from outside jurisdictions may not be able to locate the radio channel (i.e., frequency) they need to establish communications with the incident commander or command post. The reason being is that individual jurisdictions often assign the same operational channel name or designator to different frequencies. The absence of a common naming convention has the potential to generate confusion among responders and compromise critical operations.

As an example, police officers from an outside jurisdiction responding to a request for assistance are directed to establish contact with the incident commander on a tactical radio channel. The police officers select the tactical channel on their radios, but because the tactical channel on their radios is programmed to a different frequency, they are unable to communicate with the incident commander. If the emergency requires assistance from multiple outside jurisdictions, a second unit of officers would select the tactical channel programmed into their radios—finding that their tactical channel also does not correspond to the other jurisdictions' tactical channels. As a result, the responding units are unable to communicate.

"Unfortunately, confusion generated by different channel names is fairly common in the field," says Command, Control and Interoperability Division Spectrum Manager Tom Chirhart. "The potential exists for a multitude of different channel names. Consider that there are local, regional, state, and even Federal agencies involved—each with their own naming convention. Now consider that these channel names often differ within the same agency across each of the disciplines and applications. You can see where the potential for confusion exists."

Since most radios today are pre-programmed by technicians using software that does not always display frequency, responders in the field may have no way of identifying what frequency they are actually operating on.

Enduring Challenge

The issue of uniformity across radio channel names is not new. In early 2000, the Public Safety National Coordination Committee (NCC)—a Federal Communications Commission (FCC) Federal advisory committee that operated from 1999 to 2003—proposed national interoperability channel naming guidelines to provide standardization across the Nation. While the FCC did not mandate the NCC's standard channel nomenclature protocol, the emergency response community widely supported the NCC's recommendations.

In response to enduring channel naming challenges and new operational requirements, several emergency response organizations approached the National Public Safety Telecommunications Council (NPSTC) with a request to update the NCC's standard channel nomenclature. With contributions from emergency responders nationwide and input compiled through a 90-day public comment period, NPSTC released the *NPSTC Channel Naming Report* in June 2007.

A robust channel naming convention, says Chirhart, will include the identification of the radio band being used, a channel designator, a channel identifier, and a modifier that will identify any specific functionality of the channel.

Standardized Naming Format

The *NPSTC Channel Naming Report* proposes standard channel names for interoperability radio frequencies to improve emergency response. According to NPSTC guidelines, every FCC-designated interoperability channel in the public safety radio services will have a unique name developed according to a standardized format. This format consists of a maximum of eight characters, separated into four components—Btype##M—a spectrum band designator (B), a channel use designator (type), a unique channel identifier (##), and a modifier character (M).

The spectrum band designator is a unique single alphanumeric character that designates the public safety spectrum segment that the channel is found within:

- **L** very high frequency (VHF) low band
- **V** VHF high band
- **U** ultra high frequency (UHF) band
- **7** 700 MHz public safety band
- **8** 800 MHz National Public Safety Planning Advisory Committee band

The channel use designator is an alphanumeric place tag that indicates the primary purpose of the channel's operations:

- **CALL** is dedicated nationwide for the express purpose of interoperability calling.
- **DATA** is reserved nationwide for the express purpose of data transmission.
- **FIRE** is primarily used for interagency incident communications by fire licensees.
- **GTAC** is primarily used for interagency incident communications among eligible emergency response agencies and eligible non-governmental organizations.
- **LAW** is primarily used for interagency incident communications by police licensees.
- **MED** is primarily used for interagency incident communications by emergency medical service licensees.
- **MOB** is primarily used for on-scene interagency incident communications by any eligible emergency response agency, using vehicular repeaters.
- **TAC** is primarily used for interagency communications by any eligible emergency response agency.

The unique channel identifier is a numeric one- or two-place tag intended to designate the specific channel. Channel identifiers are grouped by band segment:

- **1–9** VHF low band (30–50 MHz)
- **10–39** VHF high band (150.8–162 MHz)
- **40–49** UHF band (450–470 MHz)
- **50–89** 700 MHz
- **90–99** 800 MHz "NPSPAC" band (806–809/851–854 MHz)

The modifier character is a single alphanumeric tag intended to identify a modification to the default operation type on the channel.

Windows of Opportunity

The logistics and cost to reprogram channel names in radios could take considerable time and effort if an agency has a large inventory of equipment in the field. This time and fiscal investment is often the reason agencies object to updating or changing their channel naming conventions.

To minimize costs for emergency response agencies, NPSTC has recommended that Federal grant monies be allocated for channel naming purposes. Additionally, NPSTC has identified three implementation opportunities that carry a nominal price tag. First, emergency response agencies will need to replace or reprogram radios operating in the 800 MHz band due to FCC-designated rebanding. Second, emergency response agencies will need to reprogram radios operating in the 700 MHz band with new channel names as new radios are fielded or rebanded for 700/800 MHz dual band systems. Finally, in accordance with FCC narrowbanding rules, before January 1, 2013, emergency response agencies will need to replace older, wideband-only radio equipment or reprogram existing narrowband-capable radios programmed with wideband channels that operate between 150 MHz and 512 MHz. This migration could provide an opportune time for agencies to incorporate the new channel naming into their radio reprogramming.

"Using common channel naming is important enough to make the naming convention standard, and doing it over a two-year period or so makes it well worth the effort radio shops have to make in touching the radios," says NPSTC Executive Director Marilyn Ward. "In the end, we will have the ability to respond into other jurisdictions and know where to go on the radio. Without a change it is 'same old same old confusion'."

The NPSTC Channel Naming Report is available on the NPSTC Web site at www.npstc.org/channelNaming.jsp.

Remembering SAFECOM Executive Committee Chair Marilyn Praisner

The Department of Homeland Security's Office for Interoperability and Compatibility and champions of interoperability nationwide fondly remember the life of Montgomery County (Maryland) Council member Marilyn J. Praisner, who passed away on February 1, 2008. Marilyn was recognized across the Nation for her extraordinary leadership on technology and communications issues. Marilyn brought invaluable expertise, insight, and a tireless work ethic to the SAFECOM Executive Committee (EC), which she chaired since its creation in 2003. Under her leadership, SAFECOM advanced interoperability progress for emergency responders across all levels of government. Prior to her service on the SAFECOM EC, Marilyn served as the Vice Chair of the National Task Force on Interoperability's Governance Subcommittee. She also represented local government on the Public Safety Wireless Network program. Even the most impressive trail of awards and headlines may not capture the remarkable legacy Marilyn has left us. This edition of *Interoperability Technology Today* is dedicated to her memory.

Arizona Scores Interoperability Touchdowns

The real winners at this year's Super Bowl XLII executed game-day strategies *off* the field. Last February, Arizona emergency response agencies representing multiple jurisdictions and disciplines partnered to support Super Bowl XLII activities across the Glendale and Phoenix regions. A milestone in the state's interoperability planning, the event highlighted Arizona's interoperability progress.

The complexity of the Super Bowl events—including concerts, tailgate parties, police escorts, and National Football League (NFL) Experience activities—required a robust fleet of emergency response vehicles and personnel. With approximately 60 local, tribal, state, and Federal emergency response agencies supporting events scattered throughout Glendale and Phoenix, interoperability planning was essential.

Interoperability planning for Super Bowl XLII began one year out from game day, February 3. The Interoperability Work Group—one of 22 work groups established to support Super Bowl events—collaborated with existing interoperability governance bodies to coordinate communications planning. Comprised of local, tribal, state, Federal, military, and private-sector representatives, the Interoperability Work Group practiced a "bottom-up," user-driven approach. "For past events, we told responders what resources were available, and expected them to design operations around those resources," says Jesse Cooper, Phoenix (Arizona) Communications/Information Technology Project Manager and Co-Facilitator of the Interoperability Work Group. "Today, we use a practitioner-driven approach. Responders tell us what they need, and we make it happen."

Resource sharing, says Cooper, was key to successfully meeting the technology needs for interoperability during Super Bowl XLII events. To provide effective radio coverage and avoid overloading a single communications system, emergency responders used two communications infrastructures: the Phoenix and the Glendale system. Since the Phoenix system provides broader coverage than the Glendale system, agencies used the Phoenix system for events requiring extensive coverage, i.e., police escorts and events beyond the Glendale system's coverage area. Agencies used the Glendale system for operations that did not require coverage outside the region, e.g., communications at Glendale's University of Phoenix Stadium.

During Super Bowl activities, personnel operated on their own existing communications equipment. Like many emergency response agencies nationwide, agencies in Arizona typically purchase communications equipment independently of each other. To bridge communications' gaps between disparate radio systems, agencies used shared talk groups which are programmed into each agency's radios—allowing users on one network to communicate with users on other networks. Additionally, the Interoperability Work Group maintained a cache of 600 pre-programmed radios for distribution to responders—namely, Federal personnel—whose radios were not capable of connecting to the Phoenix and Glendale systems.

Regionalized standard operating procedures (SOPs) and training exercises were critical to the success of technology capabilities. Agencies operated according to a pre-existing SOP which defines how to manage a response requiring assistance from multiple jurisdictions using disparate systems. The SOP includes provisions for plain language usage and adherence to National Incident Management System guidelines. In addition to regional training exercises, agencies supporting Super Bowl XLII used the 2008 Fiesta Bowl—held one month before Super Bowl XLII and at the same stadium—as an important trial run for game day.

Agency and jurisdiction partnerships proved invaluable in successfully implementing communications plans for Super Bowl events. "The Interoperability Work Group provided a great opportunity for cross-pollination among emergency response, military, and private-sector groups," says Cooper. "The partnerships and cooperation formed among these entities and the members of pre-existing governance groups will continue long after the Super Bowl. Keeping them engaged in the [interoperability planning] process is important to long-term sustainability and realizing our vision for statewide interoperability."

Pursuit of Progress

Advancing statewide interoperability has topped the agendas of Arizona's leaders—including that of Arizona Governor Janet Napolitano, who recently set the goal for Arizona to be 85 percent interoperable within the next two years. Arizona's vision for statewide interoperability includes a state-wide, 700 Megahertz (MHz), Project 25, standards-based radio system. Due to be completed in 2013, the statewide communications network includes a statewide digital backbone to support high-level network connections to existing 800 MHz and Very High Frequency (VHF) regional systems.

Demonstration Project

The first phase of the statewide communications system is a Demonstration Project intended to show the baseline design for the expanded statewide system. This project shows how completely separate radio systems can be interconnected to permit continuous radio coverage across large portions of the state. Broad radio coverage is essential in Arizona, the sixth largest state in the Nation that shares 389 miles of international border with Mexico. The vastness of Arizona's landmass coupled with its concentrated metropolitan areas currently presents the region's emergency responders with significant challenges.

The Demonstration Project creates a 700/800 MHz system of systems in Phoenix and Yuma, planned to also connect between those counties and Pima County when the Pima system is operational. "Connecting these systems will potentially give radio users the ability to roam throughout central and southwestern Arizona, and have interoperability with other users," says Captain Paul Wilson of the Pima (Arizona) County Sheriff's Department.

Partnerships have proven invaluable to the Demonstration Project and the progression of interoperability in Pima County, which shares 130 miles of international border with Mexico—42 percent of which is tribal land. "We had partnerships upfront and included everyone in the planning," says Wilson. "That type of practitioner investment and input is critical to a successful initiative."

Collaboration also has been central to the success of the Yuma Regional Communications System which serves as a model for Arizona's statewide system. "We're this small city yet we have one of the most modern communications systems in the Nation," says City of Yuma (Arizona) Assistant Information Technology Director for Telecommunications Greg Wilkinson. "The relationships among Yuma's emergency response leadership have made this possible. With these partnerships, everyone's committed to getting the job done; in many cases that involves resource sharing."

Digital Microwave Network

To advance construction of the statewide communications system, Arizona is upgrading its microwave network from outdated analog to digital infrastructure. This microwave network provides the infrastructure necessary to connect remote communication sites together. An upgraded digital microwave network will provide the backbone for a modern, standards-based interoperable radio network.

see "Interoperability Touchdowns" page 5

"Interoperability Touchdowns" from page 4

Once the digital statewide microwave network is completed, local, tribal, state, Federal, military agencies, and authorized non-governmental entities will have the capability to join the statewide network for day-to-day and large-scale operations. The microwave system also will foster a broad level of interoperability with existing regional systems by network-to-network connections through the microwave backbone.

Near-Term Solution

Since the statewide communications system is still in its infancy, Arizona also is deploying a near-term statewide interoperability solution intended to immediately improve radio communication among emergency response agencies using mutual aid channels. Known as the Arizona Interagency Radio System (AIRS), the suite of radio channels—Ultra High Frequency, VHF, and 800 MHz—is available for use by any emergency response agency that subscribes via a signed Memorandum of Understanding. Expected to be completed in 2009, the mutual aid channel solution is important in a state where cross-border operations are commonplace. Arizona routinely engages in mutual aid operations with neighboring states.

The AIRS solution and statewide system address communications breakdowns that compromised local response operations during recent large-scale disasters—including the 2002 Rodeo-Chediski wildfire. The magnitude of this blaze—which destroyed more than 400 homes and cost more than $150 million to suppress—demanded a multi-discipline, multi-jurisdictional response. When responding agencies arrived on-scene, they discovered that their radios were incompatible. The Rodeo-Chediski wildfire represented a capability gap that routinely compelled agencies to use runners, radio swaps, and multiple dispatchers to relay messages among responding agencies.

Valuable Partnerships

Arizona's practitioner-driven approach has proven pivotal in advancing communications beyond the patchwork of frequencies and equipment that once supported the state's emergency response operations. "In the dark ages of interoperability planning, we assumed that we didn't need to engage practitioners in the early stages of planning," says Arizona Public Safety Communications Commission (PSCC) Executive Director Curt Knight. "Today, we have shifted that paradigm to realize that practitioners on the ground need to be involved from the start."

This conceptual shift in Arizona's approach to interoperability gained momentum in July 2004, when Governor Napolitano and the State Legislature established the PSCC. Tasked with advancing statewide interoperable communications, the PSCC originated as an ad hoc committee comprised of elected, appointed, and career emergency response executives. Committed to a practitioner-driven approach, the PSCC is comprised of 15 emergency response officials representing all disciplines across all government levels, including tribal agencies—Arizona is home to 22 Federally recognized Native American tribes.

The Arizona Statewide Interoperability Executive Committee (SIEC) operates as a five-member advisory committee to the PSCC. To ensure statewide interoperability planning meets the needs of responders in the field, the SIEC includes two subgroups: a Technical Work Group and an Operational Work Group.

"The impact of the collaboration and cooperation among these groups and emergency response agencies statewide is significant," says Knight. "It is important to recognize the valuable role of personalities and partnerships in advancing progress," says Knight. "In Arizona, these partnerships have developed, and we're now in a place where those partnerships are bearing fruit—helping us achieve a common infrastructure."

Best Practices from Interoperability Progress in Arizona

- Involve emergency response frontline users *early on*.
- Develop a statewide planning process that is user-driven *and* champion-supported.
- Ensure funding is in support of a statewide mission rather than stovepipe systems.
- Think regionally—recognizing the importance of partnerships and collaboration.

Border Interoperability at a Crossroads

Disasters know no boundaries, let alone the U.S. international borders with Canada and Mexico—together spanning more than 7,000 miles across 17 U.S. states. Canada and the U.S. share the longest common border in the world, which runs 5,522 miles across Alaska, Washington, Idaho, Montana, North Dakota, Minnesota, Michigan, Ohio, Pennsylvania, New York, Vermont, New Hampshire, and Maine. One-third the length of the Canadian boundary, the U.S. border with Mexico—spanning California, New Mexico, Arizona, and Texas—is the most frequently crossed international border in the world.

Emergency response agencies responsible for managing these borders are no strangers to cross-border interoperability challenges. Emergency response operations at the international borders require support from multiple U.S. agencies and their Canadian and Mexican counterparts. Many times, agencies arrive on scene to discover that their communications systems are incompatible—potentially compromising critical missions. In response, many states have applied band-aid approaches to improving communications—using patches and gateways as immediate, interim solutions. Additionally, some U.S. jurisdictions have developed mutual aid agreements with the international regions they border, and routinely hold training exercises to test cross-border interoperability.

In support of a comprehensive, long-term solution to cross-border communications, the Senate passed legislation in March 2007 for an International Border Community Interoperability Communications Demonstration Project, as part of the Improving America's Security Act of 2007. This demonstration project identifies and implements interoperable communication solutions in no less than six border communities—three on each border.

"Just as firefighters need to be able to talk to policemen and other first responders during a disaster, U.S. personnel along our borders need to be able to communicate with their Canadian or Mexican counterparts in order to keep our borders secure," says U.S. Senator (Minnesota) Norm Coleman.

Congressional requirements provide common denominators for demonstration projects in each of the to-be-selected sites:

- Address the interoperable communications needs of emergency response providers and the National Guard.
- Foster interoperable emergency communications systems among local, tribal, state, and Federal emergency response agencies and their counterparts in Canada or Mexico.
- Identify common, international, cross-border radio frequencies for communications equipment.
- Foster the standardization of interoperable emergency communications equipment.
- Identify solutions that will expedite interoperable communications across national borders.
- Ensure that emergency response providers can communicate with each other and the public at disaster sites.
- Provide training and equipment to enable emergency response providers to deal with threats and contingencies in a variety of environments.
- Identify and secure appropriate joint-use equipment to ensure communications access.

To ensure that the demonstration projects meet the specific needs of each border community, Senator Coleman authored an amendment making certain that various population densities are considered in the pilot program.

"It would be wrong to just assume that what works in one border community will work in all of them. A solution that works for Detroit and Windsor may not work for International Falls and Fort Frances," says Senator Coleman. "The bottom line is that our personnel along the border are tasked with an extremely important mission, and we need to be sure they have the communications systems necessary to do their jobs."

"New Technology" from page 1

"Our Aviation Command conducts thousands of aerial homeland security checks each year during return medical evacuation flights and specific missions," says MSP Superintendent Colonel Terrence B. Sheridan. "CIIMS enables any state police flight crew to immediately know what and where the critical infrastructure sites are, and equips them with the latest intelligence information about those sites."

Before a flight, the pilot's EFB is docked with a ground-based intelligence network. This network downloads inspection information into the EFB, including what structures the pilot needs to inspect, infrastructure photographs, and inspection-related questions.

During the flight, the EFB displays icons representing local air traffic and the crew's aircraft position in real-time. Pilots can overlay these icons on maps of their choice. Unlike the Federal Aviation Administration's air-traffic control radar, the EFB display is intended only to help flight crews visualize inspection scenarios.

Using touch-screen controls, the pilot inputs the aircraft's destination. Based on the aircraft's destination, the CIIMS system automatically creates a list of nearby critical infrastructure the flight crew needs to inspect. Once the crew selects properties from this inspection list, CIIMS populates the display map with icons of the structures in accurate geographic locations.

Once a crew is within sight of a selected inspection site, the EFB screen displays a list of questions—unique to each infrastructure—designed to guide pilots through the inspection process. The flight crew responds to each question using touch-screen controls. Photos of the properties stored within the computer help inspectors easily recognize an infrastructure from the air.

Back on the ground, the flight crew redocks the EFB with the intelligence database. Data collected during the inspections is downloaded and shared with other law enforcement personnel and the state homeland security agency.

This effective collection and exchange of inspection intelligence has strengthened the MSP's ability to deliver on its mission. "Protecting our citizens against foreign and domestic terrorism is an integral part of the mission of the Maryland State Police," says Sheridan. "We are proud to have been a part of the team that developed this unique technology."

Readily Transferable

DHS will use the results of the CIIMS pilot to develop a prototype system that other flight organizations can use. While the initial CIIMS prototype was designed for use by state police aerial inspection crews—the technology is installed in a MSP Dauphin helicopter and a fixed-wing aircraft—the system could eventually be incorporated into in-car, maritime, and rail-based computers used by law enforcement agencies.

DHS is working with CIIMS partners to make the software and documentation available for nationwide deployment. Development in this area is focused on how to effectively manage the critical infrastructure data necessitating inspections as well as the data collected during inspection missions. "We plan to take a hard look at how best to use the CIIMS technology to help inspections in the port environment, and we are also exploring a number of technologies developed by the National Visualization and Analytics Center to complement the CIIMS program," says CCI Knowledge Management Program Manager Herb Engle. "Across all of these efforts, the partnership with and the work of the MSP has been pivotal to the success of CIIMS."

"Voice Coders" from page 1

The testing includes nine different noise scenarios (e.g., with or without mask, low-air alarm sounding, chainsaw operating) for three primary communication methods: traditional 25 KHz analog FM; original Project 25 (P25) vocoder; and enhanced P25 vocoder. The testing also replicates four of the noise scenarios for 12.5 KHz analog FM. Participating practitioners listen to the noise recordings, and try to determine the spoken words exchanged across the communication devices. Practitioners then select what they believe to be the correct words from a pre-defined word list. Known as an intelligibility test, the PSCL and IAFC are conducting the tests according to the National Fire Protection Association 1981 standard.

"There are a number of benefits to public safety that result from this testing," says Dereck Orr, Program Manager of Public Safety Communications at NIST's Office of Law Enforcement Standards. "The first is that public safety—in particular the fire service—will have a technical quantification of the environment that they work in. They will be able to take the information from this experiment to the radio manufacturers and say definitively, "This is the environment that we have to operate in. Please design your radios to work there."

Additionally, the testing results will help emergency response agencies communicate technology gaps to industry. "Public safety will be able to use the testing to demonstrate explicitly to radio manufacturers how far short the current production models of radios fall," says Orr. "To date, public safety has always had to report these types of things anecdotally to the manufacturers, who then have a difficult time addressing the issue successfully."

An industry-wide challenge, radio manufacturers are actively engaged in testing vocoder solutions. "What we learn from this testing will involve radio manufacturers, and will hopefully be used in the development of better vocoder technology that will be able to more effectively overcome the common background noise that may be encountered at emergency incidents," says Werner.

This issue highlights how critical it is to consider every element of an emergency response environment—protective gear, warning devices, power tools, radios—when introducing new technologies. "It is critical to look at *all* of the components to ensure that they work well together, and that new technologies or improvements do not diminish the existing performance of any one of the other components," says Werner.

With digital radio use widespread among all emergency response disciplines, the impact of vocoder technology progress is significant. "This problem affects every digital radio basically the same—regardless of discipline," says Werner. "A police officer or EMS [emergency medical service] personnel working in a high-noise area also could potentially experience unintelligible voice audio."

IN YOUR OWN WORDS

By Captain Robert Kuzma, Technology Implementation and Risk Assessment, San Francisco (California) Fire Department

Advancing VoIP Interoperability with Specifications

Emergency response, industry, and policy members of the Public Safety Voice over Internet Protocol (VoIP) Working Group are taking significant steps to improve the compatibility of VoIP-based devices. A developing technology, VoIP transmits voice conversations using Internet networks commonly used by businesses and consumers.

Today, multiple products and applications support VoIP for communications among emergency response radios, dispatch centers, and infrastructure. Unfortunately, because manufacturers use different technical approaches, these products are often incompatible.

To address these compatibility gaps, the Public Safety VoIP Working Group is assisting in the development of VoIP specifications. These specifications will help one emergency response agency seamlessly connect its radio system to another agency's system over a network, regardless of manufacturer.

To ensure that the profiles are aligned with the needs of practitioners in the field, the Public Safety VoIP Working Group identified a list of requirements including, but not limited to, reliability, common security framework, affordability, manageability, scalability, and capacity to leverage commercial off-the-shelf technologies.

Recently, the Working Group achieved a significant milestone when it demonstrated how a new interface specification, the Bridging Systems Interface (BSI), helps one emergency response agency seamlessly connect its radio system to another agency's system through the use of VoIP-based devices. When implemented into gateways and bridges, the BSI provides a common, efficient connection point between disparate VoIP-based radio systems. The demonstration, known as a Plugfest, was a success—resulting in basic voice interoperability.

VoIP equipment with a specifications-based interface—enabling compatibility among bridging devices regardless of manufacturer—is expected to be available within the year. This represents a major success for emergency response communications, and reminds us of what we can achieve when we sit down at the table together.

Technology represents the tool, which permits the responder community—whether law enforcement, fire service, or emergency medical services—to achieve its operational objectives. However, we still need to ensure that the implementation of the communications tools coincides with governance and training. The responder community is at the point—from a technical standpoint—where we can communicate, i.e., the technology is available. The next step is to ensure that when communications interoperability is required, we will have moved from can communicate to will communicate.

The Golden Years: Achieving Interoperability Milestones with Contois

A chronicle of California's interoperability progress undoubtedly includes Sheryl Contois, Director of Police Technical Services for the Palo Alto Police Department. Contois has been a leader on interoperability issues since 1998—collaborating with local, state, and Federal partners to advance interoperability progress across California and the Nation.

Contois' career in the emergency response field began in 1979 as a 9-1-1 dispatcher. The work was a turning point for Contois, and the beginning of a successful emergency response career. A 29-year veteran of the field, Contois served as a dispatcher, supervisor, manager, trainer, teacher, and consultant before becoming Director of the Palo Alto Police Department's Police Technical Services in 2000. For Contois, each position provided insights into the multiple facets and dimensions of interoperability.

Witnessing the impact of communication deficiencies on Silicon Valley response operations solidified Contois' commitment to improving interoperability capabilities and reducing response times. In support of these missions, Contois began working on identifying ways to leverage existing technologies and interconnect the region's disparate computer-aided dispatch (CAD) systems. Emergency response operations rely on CAD systems to ensure that personnel and resources are efficiently dispatched to the field. Jurisdictions often share personnel and resource information—ensuring that the closest units respond, even if they are across jurisdictional lines. As in many regions nationwide, many of the Silicon Valley's CAD systems are disparate and unable to communicate with dispatch systems in neighboring jurisdictions.

"[We thought that] linking the CAD systems would eliminate the numerous phone calls that we had to make between our 9-1-1 centers to request resources," says Contois. "Those phone calls took away the precious minutes that we might have gained by sending the closest first responder to the scene of an emergency, if that resource happened to be coming from a fire station in another jurisdiction."

Contois' commitment to improving CAD interoperability and communication capabilities is enduring. Today, she leads two, high-visibility interoperability projects: the Silicon Valley Regional Interoperability Project (SVRIP) and the CAD Interoperability Project (CADIP). Formed in 1998, SVRIP aims to link more than 30 of the region's emergency response agencies through an integrated voice-data communications system. Last year, SVRIP partnered with practitioners and the Department of Homeland Security's Office for Interoperability and Compatibility (OIC), managed by the Command, Control and Interoperability Division, to launch the CADIP. This project is identifying approaches to linking CAD systems to assist local and state agencies as they migrate toward multi-jurisdictional, interoperable CAD systems.

"These projects represent significant milestones for California's emergency responders," says Contois. "The partnerships among disciplines and agencies that have been central to their success will continue to prove essential as we look toward tomorrow's challenges."

Q&A with Sheryl Contois

Q. In your view, what are today's major interoperability challenges? Are there interoperability challenges unique to California?

A. One need only look to the Interoperability Continuum to know of the challenges we face with interoperability: governance, technology, standard operating procedures, training and exercises, and usage. The pursuit of interoperability solutions requires an unwavering commitment, staff resources and time, and, in many instances, a good deal of funding. For us, the greatest challenge has been funding.

In my opinion, I'd say that the size of our state and the number of cities, counties, and first responder agencies contributes to one of the greatest challenges we face. There are a number of well-established and successful interoperability initiatives underway in California. And, there is no one, single approach that meets all our needs. So, I think a unique challenge we face in California—and one that I am proud to say we are overcoming thanks to leadership in the California Office of Homeland Security and Office of Emergency Services—is blending all of these different approaches into an interoperable system-of-systems.

Q. What progress has SVRIP and CADIP achieved?

A. We've made great progress here in the Silicon Valley. The SVRIP is a compilation of six projects—independent voice and data solutions that come together as a system of systems that, when completed, will ensure our first responders can seamlessly and more effectively communicate with each other. Specifically, we now have a radio channel that facilitates command and control interoperability, and can bring together—for the first time in our history—any law enforcement, fire service, or other agency to talk and more effectively manage emergencies. Additionally, we're constructing a digital microwave network that will provide the 'information-highway' for all our interoperable solutions; it's a network that will interconnect with similar systems in nine other Bay Area counties. We also are leading a CAD to CAD proof of concept project that brings together three disparate CAD systems—significantly reducing response times. Preliminary testing has shown upwards of a three-minute time savings on emergency calls involving multiple agencies.

With OIC's CADIP, agencies across the Nation will have a much greater understanding of the CAD interoperability problem and alternative solutions. The case study of three regional approaches to this problem, including the SVRIP CAD to CAD, will provide a roadmap and a toolkit intended to expedite the implementation of similar interoperable data solutions. For us (SVRIP), through the CADIP we've learned that connecting disparate CAD systems together is no easy proposition. It's not just the technology, it's the business processes and rules that must change to allow true data sharing.

Q. What interoperability accomplishment are you most proud of?

A. I am proud of the work we're doing on the SVRIP and its many accomplishments. If I had to select a single, most important accomplishment, it would have to be our governance structure. Under the leadership of our police chiefs, fire chiefs, and city managers, we brought 18 jurisdictions and some 30 first responder agencies together under a single executive committee that has grown from 5 members to 13 as our project has evolved. Our leaders have had the vision and political will to keep us moving forward. I'm also proud and grateful for our congressional leadership; they've provided us with a tremendous amount of support, and have done all they can to keep their colleagues focused on this important issue.

Q. What lessons have you learned since becoming involved in the field?

A. I've learned so many things on this interoperability journey. Interoperability is a slow and, at times, challenging process. There is no quick fix, no one solution that achieves interoperability and meets every jurisdiction's needs. I've also learned that it takes resources to move things expeditiously—we've put in tens-of-thousands of hours of staff work on our interoperability efforts as collateral assignments. The lesson learned for me, for our region, is that full-time project management is a necessity. You need someone who can manage the project itself and all the work it entails—not just manage the individual solutions.
I've also learned that our Federal Government—through PSWN [Public Safety Wireless Network], SAFECOM, OIC, and the newly-created Office of Emergency Communications—has provided great leadership on this issue, and the practitioner-driven approach they've taken, in my opinion, is very effective.

Q. If you were not doing this type of work, what would you be doing?

A. I can't imagine doing anything that would be more personally rewarding than the work I am doing in public safety and on interoperability. It's something my peers and friends will say I am quite passionate about. It has been such an amazing experience—a journey that has allowed me to interact with so many talented and thoughtful individuals, and one that I look back on with great pride. As I near the end of my nearly 30-year career in public safety, I am now looking to the future. I think solving interoperability for first responders of the future is an important mission—one I am grateful to have been part of.

OIC
INDUSTRY ROUNDTABLE

JUNE 2008

2008 INDUSTRY ROUNDTABLE

The Department of Homeland Security's 2008 Industry Roundtable will be held June 2, 2008, in Washington, DC. This roundtable will bring together emergency response leaders, industry representatives, and government officials to collaboratively address key interoperability challenges.

Roundtable participants will discuss interoperability issues, best practices, lessons learned, and initiatives nationwide. These dialogues support interoperability progress by building essential partnerships and helping industry align technology solutions with emergency response needs.

To see the full agenda, or to register for the roundtable, please visit www.oicroundtable.com

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- New aerial technology for critical infrastructure inspections
- Digital radio vocoder testing
- Interoperability successes in Arizona
- Cross-border interoperability progress
- Spotlight on Sheryl Contois of Silicon Valley, California
- Voice over Internet Protocol standards development
- Radio channel naming efforts

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