Getting First Responders on the Same Wavelength

Trend Report: Government

Federal Express can provide up-to-the-second information on the latitude and longitude of every one of its packages in transit. But when it comes to handling the most fragile of cargo – accident victims awaiting transport to hospital emergency rooms – paramedics at the scene still frantically call around to find a hospital with available beds. "We have built an extraordinarily successful commercial information technology model in this country, so why can't public safety agencies do the same?" laments David Aylward, director of COMCARE, a nonprofit coalition of 100 organizations working to improve emergency response.

It's more than a rhetorical question. Emergency agencies, accustomed to sharing information only on a need-to-know basis, loathe change. Even when they do agree on the necessity to communicate, technological barriers may be impossible to breach. Every local emergency agency purchases its own radio equipment and is assigned a specific radio frequency, which often leaves fire, police and EMS personnel unable to talk to one another.

Stats on the Go – First responders can relay victims' vital information to hospitals by entering data into electronic triage markers.

Since 9/11 and Hurricane Katrina, everyone understands the cost of poor communication among emergency workers. Yet despite all the money, energy and research devoted to solving the problem, it's a hard nut to crack.

For example: When officers in an NYPD helicopter flying over the Twin Towers on 9/11 radioed to their command post that the buildings seemed ready to collapse, the police got the message, but hundreds of firefighters inside the buildings never did.

So What's the Problem?

Spurred by such tragedies, emergency responders are finally sitting down to work out solutions, while researchers are developing technologies to make better connections possible. But even here, communication between frontline personnel and technology experts remains an issue. "We can't have systems designed only by people who understand how to move bits of data through the air," says Ramesh Rao, director of the California Institute for Telecommunications and Information Technology (Calit2) at the University of California at San Diego (UCSD). "We have to understand first responders' needs and how they really share information."

Rao says it's unreasonable to expect first responders – some of whom use 40-year-old radios or don't carry walkie-talkies at all – to articulate how state-of-the-art technology can improve their response. Rather, he contends, it's better to put a new device in the hands of first responders to see what works and then build on the results of that experiment to develop additional systems.

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Making Instant Connections

Many new technologies for first-responder communications depend on ad hoc wireless networks that can be quickly deployed across a disaster site when other communication systems fail or are destroyed. Researchers at UCSD and elsewhere have created small lightweight nodes – essentially compact wireless computers – that use radio signals to organize themselves into a Wi-Fi "bubble" that conveys data from the disaster scene. As first responders arrive, their radios and the network nodes link up, expanding the network and establishing automatic transmission routes so emergency workers can communicate.

But when workers enter tall buildings, the network may fail. "You may lose communication on the 80th floor unless you have something to amplify your signal or act as a relay," says Nader Moayeri, manager of the wireless communication technologies group at the National Institute of Standards and Technology, a government agency that develops and tests new technologies. Moayeri's team is working on disposable nodes, dubbed bread crumbs, that responders would drop as they go deeper into a building.

Other innovations in Moayeri's lab include tracking first responders' movements indoors. This would involve installing in a building – long before an emergency – radio-frequency identification (RFID) tags that indicate their location. When a firefighter enters with an RFID reader and scans the tags as he dashes from room to room, both he and his commander can pinpoint where he is. "Today, an incident commander doesn't necessarily know how many firefighters are in a building, so he can't launch a speedy rescue in case someone goes down, let alone coordinate his resources," says Moayeri. "And every year, firefighters die in buildings because they get lost." Moayeri's team is also developing a sensor to detect when a first responder has stopped moving, is exhibiting abnormal vital signs or indicates a high temperature and – with the use of his bread crumb system – to then communicate the message to incident command so that help can be called in.

Tracking Victims

On 9/11 first responders couldn't contact area hospitals to find out which had beds available or could provide particular services. Now, research funded by the National Library of Medicine and conducted at Johns Hopkins, UCSD and other academic centers is creating systems

When other communication systems fail, ad hoc wireless networks can be quickly deployed across a disaster site.

to help emergency personnel and disaster command centers wirelessly monitor the condition of thousands of victims and get them to the right hospitals quickly. Instead of attaching a paper triage card to a victim, for example, paramedics can activate an electronic tag that flashes a color-coded light, indicating the severity of the victim's status, and transmits the patient's location and condition to the disaster command center. Those in the worst shape receive sensors that show heart rates and blood oxygen levels and instantly alert authorities when a patient's condition is deteriorating.

The electronic tag also sends the hospital a record of the care paramedics have provided on the scene. Meanwhile, the command center receives up-to-the-minute data on which hospitals have available beds and special facilities such as burn units.

"Remember those scenes of people walking around downtown Manhattan after 9/11, carrying pictures of loved ones and asking if anyone had seen them? We're trying to prevent that from ever happening again," says Nick Gragnani, executive director of the St. Louis Area Regional Response System, which manages U.S. Department of Homeland Security grants for St. Louis and seven surrounding counties. In parts of the region, first responders will soon benefit from a $1.7 million system that will equip them with devices that can scan a victim's driver's license or credit card to get a positive ID and create a medical record to send electronically to a hospital. A family searching for a loved one will only have to call an emergency hotline to find out where that person has been taken.

"The nation has made a huge investment in high technology during the past 20 years, and in most walks of life the advances have been enormous," says Rao. "Now we have to make sure first responders also benefit. We've already paid the price for their communication gap."

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