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9/11 disconnect: 5 years later, many first responders stuck with second-rate wireless gear

Feature By Carolyn Duffy Marsan, Network World, 08/31/06

When Denver police responded to a shooting spree at a Safeway warehouse in June, they could talk to each other over standard 800MHz radios. They also could talk to police, fire and emergency responders from neighboring towns, thanks to a $2 million investment made last year to integrate public-safety networks in a 10-county region around Denver.

But when they stormed the 1.3 million-square-foot building, they lost all communications. Chaos reigned inside the warehouse, as 150 employees ran from a disgruntled employee who gunned down five co-workers — killing one — and set fires inside the building.

“The warehouse was a large, dense building with refrigerators. Our radios didn’t work in the building, because nothing would penetrate the refrigerators,” says Dana Hansen, manager of wireless networks for the city and county of Denver. “The SWAT team had to do a workaround. It was less than ideal.”

Click to see: Dana Hansen, manager of wireless networks, Denver

Hansen says Denver police regularly run into situations where its radios won't work inside big buildings, such as high schools and high-rises. That's why the department is spending $11 million this year to upgrade its wireless network to provide in-building coverage.

The Denver incident is typical of the state of wireless communication among emergency responders today. Cities and states are trying hard to upgrade their public-safety networks in the wake of Sept. 11, 2001, but first responders in many jurisdictions don't have such state-of-the-art capabilities as in-building coverage, support for Internet standards, and broadband speeds for text messaging, images and streaming video. These gaps become glaringly evident when a disaster occurs.

Lessons learned from Hurricane Katrina
D.C. deploys wireless net for first responders
Michigan County upgrades first-responder net

Overall, the communications systems used by first responders today are only marginally better than they were five years earlier, says Royce Kincaid, program manager in wireless networks at Northrop Grumman Information Technology, which has developed public-safety systems for Boston, Seattle and Portland, Ore. "They have not solved true interoperability or the broadband-type requirements."

"There has been modest improvement over the last five years," agrees John Vaughan, general manager of wireless systems for M/A-Com, a provider of standards-based radios and gateways for public-safety agencies. "The technology is available . . . but it will be 10 years before it will be deployed broadly across the whole country."

What's the holdup?

Obviously, improvements to first-responder networks are happening more slowly than experts predicted immediately after Sept. 11, when the inability of police, fire and other first responders to talk to each other was cited as a major flaw that needed to be fixed.

The reasons for the delay are many. First, a large amount of legacy gear is in use. Many jurisdictions lack funds to replace their communications systems. And the federal government was slow to mandate interoperability standards for public-safety radios.

Probably the biggest single reason is the lack of available spectrum needed to support broadband wireless devices for public-safety radios.

That is finally about to change. The FCC has mandated that TV stations give up the 700MHz channels and that bandwidth be available for broadband public safety applications. Unfortunately, that switch won't occur until February 2009.

Lack of spectrum "has been a major stumbling block until now," Kincaid says. "The FCC rulemaking is important because it will give jurisdictions and public-safety organizations a place to build broadband networks. In the past, every time we wanted to build a broadband solution we had to come up with our own spectrum."

The availability of broadband spectrum also will make it easier for police and fire departments to roll out wireless data devices, which are just starting to appear. For example, in Washington, D.C., and the state of Maryland, police, fire and emergency-response vehicles are being equipped with laptops that provide higher bandwidth connections and support the transmission of maps, photos and even streaming video.

The Los Angeles Police Department and the city Housing Authority have installed a Motorola broadband network with

cameras in a troubled housing project called Jordan Downs. A policeman who enters Jordan Downs has access to live streaming video of what's going on in that housing development.

Of course, voice will always be the primary means of communications, according to most experts. "Having a BlackBerry is great, but if someone is chasing me with a gun, I'm going to throw away my BlackBerry and grab my radio to call for help," Vaughan says.

Challenges ahead

As it stands now, many challenges remain before standards-based broadband-communications devices are in the hands of all of the nation's first responders:

Lack of funding is a major impediment. The Department of Homeland Security (DHS) has helped Washington, D.C., and Denver with grants to upgrade wireless systems, but it hasn't been able to cover the cost for all of the major cities in the United States. Replacing all of the infrastructure used by first responders would cost more than $40 billion, Vaughan estimates. "That's a problem," he says.

The DHS has two basic roles: It sets policy related to emergency communications and establishes standards. And it doles out grants to state and local government for equipment upgrades.

Critics say DHS has been slow to set standards and hasn't pushed hard enough to mandate the IP standard and Project 25 (P25), a standards suite for digital land mobile radios (LMR) developed by the Telecommunications Industry Association and used by public-safety organizations. And DHS has allocated billions of dollars for upgrading equipment, but only a small slice of that has gone specifically to wireless communication systems.

"Homeland Security has not made a lot of headway with standards," Kincaid says. "There have been some small pilot projects, but they haven't shown a lot of leadership."

The idea of a nationwide network for first responders also has gotten nowhere. M/A-Com supports the idea of creating a nationwide emergency-response network using the spectrum that the FCC has set aside for mutual aid and common-use analog channels.

This proposal would let federal, state and local officials communicate with LMRs via an analog connection as a fallback mode. "We need a national, interoperable network for disaster recovery," says Vaughan, who estimates the analog approach would cost $1.5 billion and take three or four years to build.

Congressional hearings have been held about establishing a nationwide network for first responders, and it's possible that the Justice Department's Integrated Wireless Network (IWN) program will turn into such a network. There is no federal program to create a nationwide network for all first responders that's funded at this time.

Despite these challenges, public-safety experts insist the nation is in better shape to respond to a terrorist attack than it was five years ago.

"There has been a renewed sense of awareness around the need to have coordinated, standards-based buildouts of technologies," says Mark Moon, corporate vice president for the government and commercial markets for Motorola, a leading LMR vendor. "There's very much more awareness in the New York City and Washington, D.C., areas about crisis-management planning, and there have been buildouts of technology. New York is testing data and broadband, as well as voice, and D.C. is doing the same thing."

On the radio

The primary means of communications for first responders is land mobile radios (LMRs), which provide voice communications at varying frequencies.

Until recently, most LMRs were based on proprietary technology and did not support standards such as IP. Special gateways are required to integrate LMRs from competing vendors. Radios operate on different frequencies, so users can talk only to other users operating on the same frequency.

Before Sept. 11, 2001, individual cities and agencies bought their own LMRs without giving much thought to interoperability on a statewide, regional or national level.

“When you start bringing together police, fire, emergency response, hospitals and ambulances within a particular town or city, or if you expand the crisis to a broader geographic region, then you multiply the interoperability issue,” says Jerry Powlen, vice president for integrated communications systems at Raytheon, which provides law enforcement agencies in Maryland, Virginia and Massachusetts with network devices used to bridge between different radio systems.

Powlen says many cities have addressed interoperability of their LMRs since Sept. 11. Some, such as Denver, have received federal grants for purchasing new radios or gateways. Others, such as Oakland County, Mich., have allocated funding from their operating budgets.

Washington, D.C., leads nation

The Washington, D.C., area is furthest along in its deployment of new communications systems for first responders, experts say.

In 2003, the police department purchased 2,000 new Motorola digital radios and upgraded another 3,500 existing radios as part of an effort to improve wireless radio coverage across the city, particularly inside historic government buildings. Congress allocated $46.5 million for this project.

The Motorola systems provide interoperability with the local fire and emergency services department, as well as the transit authority and federal agencies. While these radios run Motorola’s proprietary technology, they can be upgraded to support P25.

“The national capital region is in pretty good shape, because we standardized on Motorola’s proprietary technology for voice,” says Joe Ross, wireless programs director for the Office of the Chief Technology Officer for the District of Columbia.

Click to see: Joe Ross, wireless programs director for the Office of the Chief Technology Officer for the District of Columbia

Mike Morgan

In 2004, the district unveiled a pilot project dubbed the Wireless Accelerated Responder Network (WARN), which is the nation’s first citywide, broadband wireless public-safety network. WARN is an all-IP network built using equipment from Flarion Technologies, which was recently acquired by Qualcomm. The WARN pilot cost $2.5 million.

WARN covers 95% of the district and uses experimental 700MHz spectrum provided by the FCC. WARN has an

average throughput of 1Mbps, which is an order of magnitude faster than the 9.6Kbps transmission rates previously available. WARN has 200 users, including representatives of the police, fire, emergency management, health and medical examiners departments. The U.S. Park Police and the U.S. Secret Service also use WARN.

Ross says the district hopes to expand WARN as the broadband solution across the region. “We’re in the throes of a project to build a regional network across 2,500 square miles of the national capital region that will provide broadband and seamless interoperability,” he says. “We’re using industry standards, so we can get inexpensive cards and PDAs and we can leverage the best of what the commercial markets have.”

WARN was used first for the presidential inauguration in January 2005, and at every major local event since then. For example, on the Fourth of July this year, the U.S. Park Police and the district police and fire departments used WARN for video surveillance during the evening festivities on the Mall.

“The U.S. Park Police and the district fire department were sharing video and sending it back to their command center,” Ross says. “They were tracking the National Weather Service reports, because severe weather was coming through.”

Besides getting new technology, police, fire and emergency officials from the District of Columbia and surrounding cities and counties in Virginia and Maryland have ironed out interoperability procedures and tested their voice and data communications systems during such planned events as the Marine Corps Marathon and the dedication of the World War II Memorial.

Because of improved coordination and leading-edge technology investments, the Washington, D.C., area would respond much better to a terrorist attack today than it did five years ago, Ross says.

“Our response would be better in a number of ways,” he explains. “The new radio network has coverage in the tunnels, so if there were any impact in the subway system, we have radio down there. We now have interoperable systems for all the police, fire and district agencies. And we can communicate directly with federal agencies. We have very aggressive in-building coverage. We probably have the best communications in the nation.”

New York builds statewide net

Washington, D.C., is among the many local governments that have addressed first-responder interoperability by purchasing new communications gear or gateways that provide interoperability between disparate systems.

“Thirty-one of the 50 states have undertaken statewide initiatives to build out statewide networks as a basis of interoperability,” Moon says. “The more regional or statewide networks connect multiple users across the region more effectively.”

For example, New York is building a Statewide Wireless Network (SWN) under a $2 billion contract with M/A-Com awarded last year.

The idea for SWN originated a decade ago, when the New York State Police wanted to upgrade its communications systems, which are now 30 years old. The state decided to broaden the effort to include all state agencies involved in public safety, as well as local first responders. The state is building a wireless backbone network, and localities can decide whether they want to buy the same M/A-Com radios or build gateways to the network.

Initially, SWN will have 55,000 users from 30 state agencies. The first region, which is in western New York, plans to go live in December. SWN will cover New York City next year and all of the state by 2010.

SWN features radios capable of 700MHz and 800MHz frequencies as well as support for IP. With IP, SWN can upgrade radio software over the network and provide mobile data support.

"We will have a true integration of land mobile radios and IT to best serve everybody on the system," says Hanford Thomas, SWN project director for the New York State Office of Technology. "SWN provides for dynamic bandwidth allocation of frequencies, very efficient use of spectrum . . . and automatic vehicle location, so we know where our people are. It also provides for security, with encryption on the network from end to end, and user authentication."

Megan Levine, director of the New York State Office for Technology, says although SWN was on the drawing boards for years, it became a priority after Sept. 11.

"Sept. 11 helped with our ability to get policymakers to readily see the need for interoperability," she says. "After what happened to New York City, everyone agreed we needed to do a better job of being able to communicate with each other."

Despite widespread support and allocated funds, SWN still faces challenges in terms of gathering support from local first responders.

"It's a very difficult endeavor, because of the breadth of the state, the different topology, our sensitivity to the environment in terms of where towers can be sited . . . and the way New York government is structured in that we are not a strong county-based state," Levine explains. "We are very home-rule oriented, where local towns and governments . . . each make their own funding decisions for public safety."

One locality that's not waiting for SWN is New York City, which in May launched a pilot program to test a wireless data network for its police and fire departments. New York's Citywide Mobile Wireless Network will provide the city's police and fire departments with high-speed links for transmitting images, including maps, building layouts and photos.

New York City selected Northrop Grumman and Motorola to install and test its wireless capabilities in lower Manhattan. After a six-month pilot, the city may select one of the vendors to implement the wireless system citywide. The pilot costs $2.7 million, and the estimated cost of implementing the full network is $500 million.

"The city of New York has been very innovative and aggressive at trying to drive a next-generation, broadband, high-speed data solution," Motorola's Moon says. "Mission-critical data — whether that be video or data — will be available seamlessly throughout the city to their officers. By creating this pilot, they are saying they would like to have real-time data available to every officer, every beat cop, every first responder."

New York City's program is focused on leading-edge capabilities rather than standards, but state officials say they can link whatever the city buys to SWN.

"New York City presents a ton of complexities that we are not seeing in other parts of the state," Levine says. "SWN is not viewed as the New York City solution, but it will integrate with it. We will be contributing to the solution."

New York is slightly behind the Washington, D.C., area in purchasing new communications gear for first responders, but it should catch up soon thanks to its statewide SWN radio program and New York City broadband pilot projects.

"We've done a lot of work to have our existing systems operate better or more efficiently," Thomas says. "I'm confident that New York is in a much better place than it was in 2001 in terms of interoperability. We have a ways to go, and SWN will be a major step forward on a technology level."

Feds push wireless standards

Federal agencies also are beefing up their communications networks for emergency response. In Washington, D.C., and Alaska, federal agencies have teamed with state and local officials to build standards-based wireless networks.

For example, the U.S. Army in 2003 spent $11 million on standards-based radio systems for all its military bases in

Maryland and Virginia. The Army also bought gateways to interoperate with 60 nearby public-safety agencies.

The Army's M/A-Com network came in handy last summer during the National Boy Scout Jamboree at Fort A.P. Hill in Bowling Green, Va. Thunderstorms delayed President Bush, who planned to deliver a speech there, and 300 attendees developed heat stroke waiting for his arrival.

"The Army was able to coordinate helicopters, EMTs, police and fire with officials around the fort," Vaughan says. "They had six hours of intense interoperability demands. It didn't turn into a disaster thanks to that system."

Most of the federal wireless initiatives, including the Army's, require P25, which is geared to LMRs used in public-safety and first-responder applications. P25-compliant radios can communicate in analog mode with legacy radios and in digital or analog mode with other P25 radios.

P25 is being supported in both radios and gateways that connect different kinds of radio systems to an IP backbone. DHS recommends that first-responder wireless projects support P25. "We've deployed quite a bit of P25 systems with the federal government, and we have some counties and some cities that have gone to P25 systems," Vaughan says.

One huge initiative by the federal government that could push adoption of P25 is the IWN, a $2.5 billion project that will provide new radios to 80,000 federal law enforcement officials. Run by the Justice Department, the IWN procurement has been delayed for several months. In June, the Justice Department announced a fly-off competition between Northrop Grumman and General Dynamics to design a prototype IWN system.

As standards such as P25 become more widely used, users can adopt more of the network techniques that corporate users enjoy.

"We believe you can have a unified network that is not necessarily uniform. With a unified network, we can take disparate legacy systems and build on top of that a network that is public-safety-grade VoIP system. Then we can plug in legacy radio systems," Vaughan explains. "Now we have a unified system at the network level even though the radios are not unified. The VHF radios can talk to the UHF radios not directly but across the network."