Sorting Out Communications Chaos

Law enforcement and radio vendors search for solutions to the problem of interoperability.

David Griffith

On Thursday Nov. 14, 1996, a man dressed in camouflage fatigues shot his way into a Ford plant in the Oakland County, Mich., community of Wixom. He then killed the plant's number two official, sprayed gunfire around work areas, and wounded two police officers.

The Wixom case was an eye opener for Oakland County public safety officials. Numerous law enforcement agencies responded to the active-shooter incident and, for the officers involved, the incident was an ordeal. The gunman was inside a huge building. If that wasn't bad enough, communications problems among officers from the 25 different agencies involved made it extremely difficult for responders to coordinate the five-hour operation that led to the shooter's surrender.

The eight-year-old Wixom incident still resonates with Oakland County public safety administrators. It is cited as one of the primary factors that Oakland County is now bringing online a sophisticated new M/A-Com public safety community system that will allow law enforcement, fire, and EMS personnel to respond to the same incident and communicate seamlessly.

"After the Wixom shooting and other incidents, the county's communications leadership group realized that we needed a countywide radio system that would allow us all to do our day-to-day business without listening to each other's calls but talk to each other when we need to talk," says Patricia Coates, an Oakland County public safety communications administrator.

The Incident Commander Radio Interface from Communications-Applied Technology is a no-frills, inexpensive solution for radio interoperability.

The Oakland County experience is not unique. Throughout the United States and Canada, public safety agencies have arrived at the startling conclusion that their wireless communications systems are woefully inadequate for coordinating multiagency response at critical incidents. Most were painfully aware of the problem prior to the 9/11 attacks.

Searching for a comprehensive definition for interoperability can lead to an unpleasant expedition into radio geek jargon and public policy wonk-speak, but it essentially means that the radios in the local police cars should be able to communicate with the radios in the local fire, sheriff's, and rescue vehicles.

Frequency Jumble

And that wouldn't be a problem if every public safety communication system in the United States and Canada were being built today or if there were an infinite number of radio frequency bands. Unfortunately, police cars have been using two-way radios since before World War II and broadcast frequencies are limited by natural law.

So public safety agencies operate on a spaghetti tangle of frequencies and frequency bands, including low-band, VHF, UHF, and 800MHz. The result is that officers on VHF radios can't speak to paramedics on UHF radios who can't speak to HazMat teams on 800MHz.

Which is exactly the way the system was intended to work in some areas. The Anytown USA police didn't want to be on the same frequency as the nearby Anycity USA police because they didn't want to listen to each other's calls. So they built systems that don't branch off to other frequencies and that block interference from other agencies.

Magnifying the problem is the aforementioned limits of broadcast frequencies. There's only so much radio real estate, which wasn't a problem back when the first police radios came online. But what the police radios pioneers couldn't imagine was that the curiosity called television would soon fill the airwaves, as would FM radio channels and cell phones.

Branching Out

For public safety agencies to achieve communications interoperability, the old "stovepipe" radio systems have to

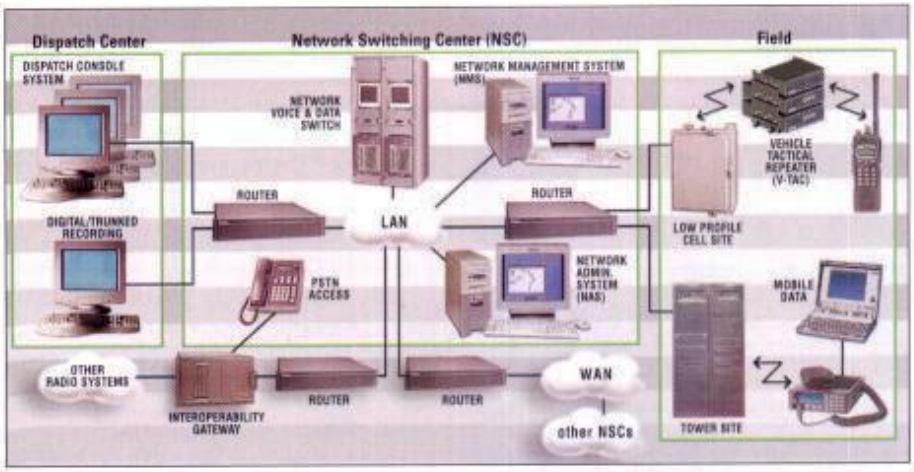

Diagram of a M/A-Com OpenSky voiceover IP system like the one recently installed in Oakland County, Mich.

be broken down and radio real estate has to be cleared of its current occupants. That means that agencies, political officials, the public, and commercial broadcasters, including cell phone companies, will have to change the ways they do business, show resolve, and make sacrifices.

Chuck Jackson, a public safety communications specialist at Motorola, notes that six elements are essential for successful interoperability among agencies: funding, planning, broadcast spectrum, equipment standards, interagency agreements, and trained personnel.

Money is, of course, traditionally one of the reasons why public safety communications lag behind the state of the art. But some states have laws that permit a telephone surcharge to upgrade 911 service and, in some communities such as Oakland County, Mich., this tax is being used to install interoperable public safety communications systems.

Also, the effects of 9/11 and Homeland Security grants have shaken loose some funding for interoperability solutions. Last year in Minnesota alone, seven agencies used Homeland Security grants to build interoperable communications systems.

That was from one state fund. If you extrapolate out to 50 states and about 50,000 agencies, it's not hard to imagine that a proverbial boatload of federal, state, and local tax money is being used to upgrade public safety communications.

Funding is essential, but interoperable radio systems cannot be established just with money. Upgrading a public safety radio system, no matter how small, requires some careful consideration of needs, goals, and implementation strategies.

You also need available radio spectrum, which means the government has to clear some channels. Such plans are afoot. A deal with TV broadcasters is supposed to clear the 700MHz band for public safety transmission of both voice and data by 2006. However, that deal hinges on the public's desire for new digital television sets and is likely to be delayed.

Fortunately, many agencies already have enough broadcast spectrum to per-

mit them to upgrade to interoperable radio systems. And even small agencies have been given a boost in their efforts to improve their communications by an industry standard called Project 25.

Developed in 1989 and just now coming to fruition, Project 25 was an initiative from the Association of Public Safety Communication Officials (APCO) that requires the manufacturers of public safety communications equipment to standardize their products.

Prior to Project 25, when agencies bought equipment from Motorola, or M/A-Com, or E.F. Johnson, or whoever, their entire system had to be from that vendor. Not anymore. Project 25 standardization means that the dispatch center's equipment can be from vendor A and the officer's radios from vendor B.

Dozens of companies make P25 standard equipment, which means that companies that want your business have to make very competitive bids. Which, of course, drives down the cost of upgrading radio systems.

Better yet, P25 standard equipment is backwards compatible to older equipment. And it's scaleable, so a 20-officer department can upgrade its equipment to P25 standard without having to buy equipment meant for a much larger agency.

Consideration for such concerns of smaller agencies is critical to an interoperability plan. For interoperability to exist, agencies have to be willing to communicate with each other.

Once you have funding, a plan, radio spectrum, standardized equipment for the agencies involved, and buy-in from agency commanders, an interoperable communications system can be implemented. But it's critical that your plan include training of not only dispatch center operators, but also field officers to ensure that they know how to work your new state-of-the-art system.

The need for training your personnel on their new equipment seems like a no-brainer. But Motorola's Jackson says that training is often an afterthought in an interoperability plan. "There have been instances where the technology has been in place but because people haven't practiced with it, it couldn't be used, and it didn't get used," he explains.

Talking to Each Other

There are a variety of ways for public safety agencies to achieve interoperable communications.

The simplest interoperability method and one that is still in widespread use is the exchange of radios. Cooperating agencies keep stores of extra radios tuned to the frequencies of other participating agencies and they break them out during critical incidents that require the response of multiple agencies.

Drawbacks to this system are readily apparent. Multiple sets of radios must be maintained. And access to the radios will likely be limited to command staff and incident commanders, so messages will have to be relayed to incident com-

Solutions for Data Sharing

When public safety communications specialists talk about interoperability, their primary focus is usually voice communications over wireless radio systems. But there is another increasingly important aspect of multiagency communications: data sharing.

Rugged laptop computers and mobile data terminals are now installed in almost every police vehicle in the country, and every agency has databases full of information that could be invaluable to officers in the field. However, such intelligence is often stored on different networks that can't talk to each other even within the same city.

"The problem in law enforcement is that criminals do not respect jurisdictional boundaries, but information systems do," says Bill Kellett, a data interoperability expert at Castle Hayne, N.C.-based VisionAir.

VisionAir's VisionConnect is a network integration solution that allows multiple agencies to share information from their databases. "VisionConnect provides fingers that reach into archives and records systems and jail systems to retrieve information," Kellett explains.

VisionConnect 1.0, which is now on duty with the Upper Arlington (Ohio) Police Department, leverages such leading-edge technologies as JusticeXML and Microsoft BizTalk to enable sharing of information across networks and across participating jurisdictions. For officers in the field, VisionConnect can be used to query information on a subject and see data from not only his or her agency, but also neighboring agencies, county courts, and other sources. VisionConnect also makes life easier on the administrative staff because once information is entered in one participating database, it can be automatically entered in any participating database.

Agencies that use VisionConnect maintain their own information on their individual databases; there is no central server. Also, each agency can control exactly what information it shares with its neighbors via VisionConnect.

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manders and then forwarded to the other participating agencies.

Using multiple radios is only slightly better than having field commanders talking to dispatch via cell phone and having the dispatchers relay the messages to the other agency's dispatchers. This talkaround system proved disastrous on 9/11 when the collapse of the towers of the World Trade Center destroyed all the local cellular relay towers.

A better interoperability solution is the mutual-aid channel. If all of the local agencies are on different channels of the same band, they can set aside a channel to be used for interoperability. That's a big "if." And the other problem with mutual-aid channels is that they can quickly become cluttered with too many transmissions.

Another time-honored interoperability solution is the console patch. Public safety communications personnel have been using this system for decades. By patching one dispatch center console into another, the dispatcher can enable communication between disparate agencies on different radio bands. Of

Interoperability Technology

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course, the number of frequencies that can be patched is very limited.

The state-of-the-art solution for interoperability is a P25-based shared system like the 800MHz M/A-Com OpenSky system now being implemented in Oakland County. When the installation and training is completed, Oakland County public safety officers will be able to communicate with each other across agencies and throughout the area. Oakland County's new M/A-Com system leverages the county's fiber-optic infrastructure with voiceover Internet protocol technology that enables agencies to send more transmissions per channel.

Incident Interoperability

Areawide systems like Oakland County's are impressive examples of how technology can solve interoperability problems, but they do have Achilles' heels. In such systems, interoperability ends at the county line or wherever the administrators ran out of money or political will. But what happens when an incident occurs on the dividing line between the agencies that have that system and the ones that don't?

That's where portable and mobile interoperability solutions enter the picture. A number of manufacturers offer systems that can be mounted into command or support vehicles and deployed for critical incidents.

The best known of the vehicle-mounted interoperability solutions is the Raytheon JPS ACU-1000 interconnect system. The JPS ACU-1000 is the centerpiece of the Raytheon First Responder and the Bickford Linx command vehicle, and it includes interoperability for a variety of mobile radios, a satellite uplink, video access, and high-speed data ports. It also doesn't come cheap: First Responder systems start at $200,000.

In addition to vehicle-mounted systems, there are also portable interoperability systems. One of the smallest and lightest interoperability systems is the Incident Commander Radio Interface (ICRI) from Communications-Applied Technology.

The smallest ICRI is a 3.5-pound, cigar-box-sized device that's powered by eight AA batteries and contains no computerized signal processing equipment. Seth Leyman, president of Communications-Applied Technology, says the lack of computer processing in the ICRI is one of the design features that makes the system well suited to deployment at a critical incident.

"If you have something that's computer based and you lose power, then you have to wait through the bootup process before you can communicate. With our system, all you have to do is turn it back on," Leyman explains.

To use the ICRI for interoperability between radio systems, all you have to do is connect one radio from each system to the box. A typical ICRI system can connect five radios, a satellite phone, and a landline phone, and it sells for about $8,000, depending on features. ICRIs are on duty with a variety of federal, state, and local law enforcement agencies.

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