

Radio communication's bandwidth melting pot

By Kevin Kane

Director of Sales and Business Development

Government and Public Safety, Harris RF Communications

The need to provide first responders with an improved system for interoperable communications remains an urgent national priority, despite the painful lessons of 9/11 and Hurricane Katrina. Even with the attention being paid to interoperability, emergency officials around the country cannot be confident they'll be able to communicate with each other when they need to most.

Consider just a few recent examples:

- Emergency officials in West Virginia were hampered by "rampant" communication problems in their response to a fatal explosion at a chemical factory last summer, according to public hearings.
- Last year, Congress criticized the U.S. Capitol Police for failing to upgrade its radio system. Officers have complained about dead spots where they cannot call for backup or, more importantly, reach Washington, D.C. police.
- Last year, an investigation by a Pittsburgh television station documented repeated communication failures at suburban police and fire departments. One police sergeant told the station he often has trouble hearing his own officers.

Working together

These types of problems are disconcerting given the growing complexity of U.S. homeland security. More and more missions now call for a joint response, where disparate agencies are thrust together - often in the heat of the moment. No one can truly predict the nature and location of the next big emergency.

The recent wildfires in California, for example, involved police, fire and emergency medical units from a range of jurisdictions, as well as the National Guard. U.S. border and coastal areas in places such as Miami and San Diego require the sustained coordination of federal immigration and drug enforcement agencies, as well as state and local law enforcement. Even the search for a lost child demands an integrated response. Currently, local, state, federal and tribal agencies need to have the capability to work closer together with law enforcement, public safety, fire response, search and rescue and border protection.

The realities of daily operations with overlapping jurisdictions call for more communications flexibility. The U.S. government has approximately 100 agencies and 200,000 agents and officers, with large areas of responsibility—the U.S. Coast Guard alone is responsible for 95,000 miles of coastline. At the same time, there are more than 48,000 agencies and 2.5 million first responders at various state and local levels. While roughly half of these agencies use the VHF high frequency band to communicate, the other half are widely fragmented across the VHF low, UHF low, UHF high, 700-MHz and 800-MHz frequency bands.

Connecting the bridge

In an event requiring joint response from agencies operating on different frequency bands, communication is only possible through ad-hoc network bridges, gateways or radio swaps.

But, in situations involving damage to infrastructure and widespread loss of power, such as Hurricane Katrina, those network switching protocols become useless—leaving personnel

isolated and unable to coordinate their work. Radio swapping or radio caches represent potential solutions, but these have proven to be costly and ineffective in providing direct interoperability. These approaches also require additional training and logistical planning, and tie up money that could be used elsewhere.

Multiband software-defined radios are a superior solution to the nation's interoperability challenges. These radios support communications across multiple frequency bands, including VHF, UHF, 700 MHz and 800 MHz, as well as multiple modes, including analog/digital, narrowband/wideband and modes with different encryption algorithms.

Political developments support the shift at this time. Multiband radios make it easier to build regional communications systems, such as the one proposed for Los Angeles County. A single multiband radio can communicate with any of the radio towers within a particular region. For example, Los Angeles recently deployed New York-based Harris RF Communications radio systems during the Great Southern California Shakeout, the country's largest-ever earthquake drill. Among the radios deployed were systems that would allow public safety officials to quickly restore emergency communications in cases of damage to existing infrastructure.

A trend toward merged response systems is also driving the demand for multiband technology. The U.S. Department of Interior, for instance, has proposed a project in which its agents would share the use of Montana's statewide public safety communications system, which is under development. Key to the success of this proposal is the availability of compatible radios. Multiband radios would allow users to connect to each system, regardless of frequency band. Montana, neighboring states and provinces in Canada face vast interoperability challenges by virtue of a shared 550-mile border. These states have engaged with a long list of agencies to coordinate activities, ranging from state and local law enforcement on both sides of the border, to the Royal Canadian Mounted Police and the FBI.

Already in use

One model where multiband, multimode radios are being used today is one most people keep very close—mobile telephones. Mobile phones operate in a very similar fashion to trunked land mobile radios, using frequencies between 850 MHz and 1900 MHz in the United States, and providing global support for FDMA, CDMA, TDMA and GSM modes. This built-in flexibility extends coverage across the globe.

Perhaps a better explanation is the transition to multiband radios for tactical military communications, which has greatly improved interoperability on the battlefield. As recently as 10 years ago, military radios were almost all single-banded radios. But as the speed of war increased, joint operations were required to stay ahead of the enemy, thus increasing the need for improved communication and coordination. Special Forces, in particular, led the call for an integrated solution—one radio, one battery. Today, the U.S. Department of Defense and Ministries of Defence around the world have standardized multiband, multimode communications, providing new and extended capabilities for ground-to-ground, ground-to-air and ground-to-satellite communications.

And yet, a number of myths still exist about multiband radios—namely, that they are too expensive and consume too much power to be useful in an operational context. In point of fact, the price of a multiband handheld radio in use by the U.S. military is very comparable to the price of some higher-tier land mobile radios today. What's more, since a multiband radio can support multiple frequencies, customers would need to purchase multiple single channel radios to accomplish the same level of interoperability, further driving up procurement costs.

Likewise, new electronics, battery technologies and advanced power-management techniques have extended multiband radios' battery life to meet critical mission times—often in excess of 12 hours per cycle.

With these compelling advantages in mind, companies are investing in the development of software-defined, multiband radio products designed for everyday use by public safety personnel.

Harris' Unity XG-100 is one example of a radio that delivers reliable interoperable communications to the user. It provides full-spectrum coverage, from VHF through the 800-MHz band, plus support for the APCO P25 waveform in both conventional and trunking modes, with the ability to upgrade to P25 Phase 2 standards.

The radio also offers a range of advanced capabilities, such as embedded GPS for location reporting, situational awareness and cognitive radio; Bluetooth connectivity; premier noise suppression; and a leading software-defined architecture for emerging requirements.

In a typical Unity XG-100-type operational scenario, federal agencies responding to a scene would be operating on VHF high bands; local or state police on UHF digital; fire on UHF analog; and EMS on 800-MHz digital. Using a single radio, these agencies would all be able to talk and work as one—coordinating their rescue efforts to focus on operational planning and execution rather than establishing communications.

Because of communication's need to be flexible to support critical and complex missions and to adapt to changing technical standards, multiband software-defined radio technology will be the key enabler for a powerful solution to the future of the nation's challenges in public safety communications.

Kevin Kane is director of sales and business development for the Government and Public Safety business in the RF Communications Division of Harris Corporation. He previously served as director of business development for Harris' tactical radio business.

This article appeared in the February 2009 issue of Law Enforcement Technology magazine.