Executive Technology Brief

For Public Safety Executives and Elected Officials

A program of the National Institute of Justice

Radio Communications Interoperability

Key points:

- **Radio communications interoperability is the ability for public safety agencies to exchange voice and/or data with each other on demand, when needed.**
- **Radio communications interoperability is a challenge to achieve today because public safety agencies use radios that operate in various frequency bands. Frequency availability and equipment incompatibilities are the main obstacles to interoperability.**
- **Products available today can be configured to provide limited interoperability.**
- **Achieving radio communications interoperability requires addressing *operational*, as well as *technical*, issues. Agencies must develop shared and internal procedures and agreements among all impacted agencies.**

Radio Communications Interoperability is the ability to talk and/or share data in real time between field units and/or agencies. The objective of interoperability is for persons who need to exchange information to be able to do so, even when they are using incompatible radios, without the need for custom equipment.

However, when agencies from different or multiple jurisdictions need to mount a coordinated response today (whether during standard operational activities, critical incidents, mutual aid events, or task force operations), they may not be able to talk to each other via their radios due to incompatible radio equipment. Public safety radio systems operate in different frequency bands (like the AM and FM bands of a radio). Just as an AM radio cannot pick up an FM radio station, public safety radios in one frequency band cannot pick up transmissions in another frequency band. As a consequence, when responding to a major incident, agencies have used many inefficient methods to relay messages. Whether as part of standard operational activities or a major incident, the ability of public safety agencies to coordinate and respond immediately is severely tested. In many cases, precious time can be lost while dispatchers relay emergency communications.

The advent of more sophisticated radio systems such as digital trunking systems compounds this problem. Digital trunked radio systems are designed and manufactured so that, even if two such radio systems are both operating in same frequency band, broadcasts from one manufacturer's radio cannot be heard by another manufacturer's radio, or vice versa.

Although interoperability could be achieved if all agencies in a region purchased compatible equipment to operate in a single frequency band, such a solution is not feasible. The cost of replacing existing equipment is too high for many agencies, especially considering that characteristics of different frequency bands may require placement of additional equipment and construction of additional towers. Also, characteristics of different frequency bands are such that the best solution for one agency may not be the best solution for another agency (characteristics of different frequencies are such that some operate more effectively in urban areas, others in rural areas, and so on). Finally, frequencies may not be available to support all agencies in a single band.

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Limited interoperability can be achieved today using equipment that receives a radio transmission on one frequency and automatically retransmits it on another frequency. Such equipment can vary in capability and cost, but these systems fall into the general category of ***crossband repeater systems*** since they are designed to "repeat" transmissions, often on a different frequency band. Such systems can be deployed without requiring changes to existing radio systems, but can tie up channels which may be scarce, require additional equipment such as radios and antennas, and may be limited by regulatory issues.

There are a number of initiatives to help address these interoperability challenges. Frequencies in the 700 MHz band have been allocated (but are not yet available) for public safety use by the Federal Communications Commission (FCC), which will provide opportunities for agencies or coalitions of agencies to obtain much-needed frequencies (channels). Efforts are also underway to define standards that would allow equipment made by different manufacturers to be compatible (open architecture), thereby eliminating the interoperability challenges within a frequency band. But neither additional spectrum nor standards provides a complete solution to the interoperability challenge, since agencies will continue to use radio systems that operate in different frequency bands, based on the frequency bands that best suit their needs.

Interoperability challenges extend beyond technical and cost issues. Before agencies acquire interoperability capabilities, up-front planning among participating agencies is critical. Policies and procedures must be developed to address issues such as who can authorize, and under what circumstances, links among agency radio systems. Multi-agency training exercises are important as well. While technology can meet interoperability requirements, public safety executives must foster collaborative interagency relationships to fully utilize the capability.

The National Institute of Justice Office of Science & Technology (OS&T) is working with public safety users, industry, and standards development organizations to identify and develop interoperability standardization. OS&T is also sponsoring development of new technology to improve the quality and efficiency of equipment that facilitates interoperability. NIJ has created a project called AGILE (Interoperability Strategies for Public Safety) to pull together all interoperability efforts within OS&T into a comprehensive program to address these issues and communicate findings and developments to the public safety community.

For more information:

AGILE: *Interoperability Strategies for Public Safety* Website*:* www.agileprogram.org.

Interoperability Resource CD-ROM, request via email at askagile@ojp.usdoj.gov, or call 1-202-514-5687.

Or contact a regional National Law Enforcement and Corrections Technology Center:

Northeast (Rome, NY)	888-338-0584
Southeast (Charleston, SC)	800-292-4385
Rocky Mountain (Denver, CO)	800-416-8086
Western (El Segundo, CA)	888-548-1618

Interoperability information can also be found at the *Public Safety Wireless Network (PSWN) Web site:* www.pswn.gov.

The Executive Technology Brief series was created at the request of the Law Enforcement and Corrections Technology Advisory Council (LECTAC) to provide public safety executives and elected officials with a basic understanding of specific technology-related issues and activities. LECTAC is comprised of a cross section of public safety officials representing State, local, and Federal agencies that help to address the technology needs of their constituency. LECTAC's guidance and input was critical to the development of these briefs.