CDE #73789

INTEROPERABILITY GAP: IS IT WIDENING OR SHRINKING?

Interoperability is advancing in some areas, but lingering barriers keep the goal just out of sight.

By Christine Massengale

We've all heard the saying, "*You can't see the forest for the trees*," which describe one's inability to step back and grasp the big picture. The quest for radio interoperability following the September 11, 2001, attacks led to the creation of SAFECOM and the publication of the SAFECOM Interoperability Continuum. The continuum was designed to provide a 30,000-foot view of the entire communications ecosystem — bridging local, state, regional and federal systems to foster connectivity.

This article provides an overview of interoperability: What it means, how the Interoperability Continuum guides it, the technical standards and best practices that support it, the challenges agencies face, and ways to close remaining gaps.

WHAT IS INTEROPERABILITY?

In public safety communications, interoperability is the ability of emergency responders to effectively share information in real time and as needed, regardless of their respective communications systems. This simple explanation belies the immense challenges of making it possible. After all, interoperability has been a central goal since APCO's inception, when early members called for an inter-city radio network to communicate all-points bulletins across jurisdictions — and 90 years later, the work continues.

Faced with numerous challenges, interoperability can feel like a moving target or even an unattainable goal. How can we view the entire ecosystem clearly, and more importantly, what steps can help bridge the interoperability gap?

THE INTEROPERABILITY CONTINUUM

The SAFECOM Interoperability Continuum is a framework that enables agencies of all sizes and jurisdictions to design their communications capabilities and measure progress toward full interoperability. Its guiding principles are divided into five lanes, which include governance, standard operating procedures, technology, training and exercises, and usage.

Recurring challenges exist in each lane — standardization, funding sustainment and, most significantly, the human factor. The interface between all these systems — their governance, adoption, implementation and daily use — is the people. The spectrum of individuals who impact interoperability ranges from taxpayers to politicians and policymakers, industry leaders and manufacturers, agency heads and emergency managers at every level of government, as well as individual jurisdictions and end users, both in the field and in emergency communications centers (ECCs).

GOVERNANCE

Governance provides agencies with the mechanisms for overcoming some of the human factors. It is the playbook that defines what resources are available, how coordination will occur and what each entity is allowed to bring into the arena. It removes handshake understandings and formalizes the way things will be done. The adoption of governance also helps agencies with equipment and infrastructure funding and helps ensure that both standards and needs are met — for example, ensuring that when an agency identifies a need (such as new radios), the purchase also complies with established standards like P25 radio systems and P25 compliant devices so that equipment can be integrated and used effectively on a shared system.

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Governance protects the autonomy of individual agencies while also giving them a voice in planning and decision-making for necessary resources, funding and participation in training, exercises and daily use of the systems being used.

At its highest level, governance involves multidisciplinary jurisdictions that formalize agreements supporting statewide strategic plans. This broader collaboration helps agencies recognize not only their own "forest," but also the forests around them.

Governance may help frame legislation on how regional or state system managers/owners work together, who creates the rules for system use and coverage, and how funding may be collected and subsequently allocated to include potential user fees, taxes or other revenue. It may help agencies define procurement models for equipment to address depreciation, explore software-as-a-service (SaaS) solutions or mandate minimum system requirements. Some examples of governing bodies that may provide guidance to the local or state level include state 9-1-1 boards, regional interoperability councils (RICs), state emergency operations centers (SEOCs) and the National Council of Statewide Interoperability Coordinators (NCSWIC).

STANDARD OPERATING PROCEDURES

Standard operating procedures (SOPs), standard operating guides (SOGs) and field operations guides (FOGs) outline the rules of engagement for responders to communicate and coordinate during an incident. At a minimum, individuals within their respective agencies need a clear understanding of their own capabilities and how to use their equipment and systems effectively. Beyond the local response level, these guides are designed to work within the framework of the National Incident Management System (NIMS), which provides a standardized, scalable and effective approach to incident response.

While these guides are designed to narrow the interoperability gap, they are still at the mercy of the human factor. Incorporating these guides into daily use and ensuring understanding by end users is especially important when they must venture into a joint response or outside their own daily-use talk groups or channels.

Some examples within the guides that may enhance understanding and interoperability for end users include adoption of plain language, rather than use of 10 codes or other agency-specific language during a multi-agency/jurisdiction response, and use of standard nomenclature for mutual aid and interoperability channels.

TECHNOLOGY

The technology lane now consists of three sub-categories: data, security/continuity of operations and voice elements. As technologies for achieving interoperability advance, they often become more intuitive and easier to use for the end user. Unfortunately, that also frequently comes with a higher price tag. Proprietary software, apps and subscription services can impact funding and purchasing choices and reduce interoperability when neighboring jurisdictions adopt incompatible systems.

This is where a standards-based approach becomes crucial in facilitating interoperability. Standards ensure that equipment and system manufacturers can share voice or data through seamless interfaces. They also give system managers the tools to connect systems architecturally.

Security and continuity of operations for these systems have become even more critical as many services and connections are IP-based, cloud-hosted and potentially vulnerable. Security may include ensuring both

physical security and conducting audits of devices on the system, as well as performing system access monitoring. Software updates, security patches, and system and encryption key management are also important security measures.

Speaking of encryption, some may argue that encryption inhibits interoperability. This does not mean that encryption is not desirable or, in some operations, a requirement. It means agencies should ensure they have a good encryption management plan in place and that they are coordinating with other local and state agencies.

Challenges with encryption include devices that only allow single-key encryption versus multi-key encryption. This means there can be no sharing of encryption across jurisdictions (unless they are using the same encryption key).

Another debate involving encryption is whether to use the older Data Encryption Standard (DES), Motorola's proprietary Advanced Digital Privacy (ADP) or the newer Advanced Encryption Standard (AES). DES is no longer the supported standard and has been replaced by AES as the preferred standard. In fact, it is a requirement (if encryption is to be used) for federal agencies and when purchasing radio equipment with federal grants. This requirement is meant to foster encryption interoperability rather than inhibit it by encouraging new purchases to meet the standard.

Voice elements are the third section of the technology lane. Interoperability across voice channels can range from swapping radios (or carrying more than one radio), which is less than ideal, to sharing a standards-based system, which is ideal. In between, other options include creating gateways and patches to channel sharing or sharing across proprietary systems.

The Project 25 (P25) standard uses digital land mobile radio technology to facilitate the transfer of both voice and data, making more efficient use of the radio spectrum. It allows devices to communicate with analog or conventional legacy radios as well as other P25 compliant devices. The standards for producing P25 compliant radios encourage interoperability and compatibility. However, as devices become more advanced, there is the challenge of a higher price tag.

As with any piece of technology, the more complex the internal components, materials sourcing, manufacturing and shipping, the more expensive it becomes. Agencies must weigh the need for devices and equipment that are considered mission-critical, ruggedized, longer-lasting and standards-based against their budget and funding constraints.

Interoperability standards and guidance are all on point. The manufacturers, while trying to attract customers with proprietary extras to make their products stand out, still provide standards-based equipment that enables multidisciplinary and interagency coordination. The interoperability challenge isn't a technology issue so much as it has become a funding, adoption and implementation issue.

TRAINING AND EXERCISES

Training and exercises are a vital piece of the interoperability puzzle. All too often end users are handed a piece of cutting-edge equipment with very little instruction or follow-up to ensure its use is maximized — a classic example of the human factor at play. End users need training on the equipment's functionality and features that include practical applications and examples, coupled with opportunities to develop muscle memory for its use. Interoperability, intended to enhance responder safety, can instead be an inhibitor if the end user cannot quickly, comfortably and safely navigate to a desired talk group or proficiently use their issued equipment.

Exercises provide a safe environment for end users across jurisdictions and regions to practice equipment use, understand the roles of others in the communications ecosystem and establish relationships that enhance coordination. Tabletop and functional exercises also provide opportunities to identify interoperability gaps and figure out how to bridge them.

USAGE

Usage is the final lane in the continuum and relies most heavily on end users and the human factor. This is where all the other lanes depend on the people who are doing the work and carrying the equipment. The end users are only as good as the equipment they carry and their training, ability and willingness to use it. The way they operate daily builds the foundation for how they will operate during expanded and regional events.

One frequently overlooked element of usage includes telecommunicators. They must be trained in parallel with the field responders, as well as empowered to make command decisions for talk group management and assignment. Their understanding of what talk paths are available to those in the field plays a crucial role in incident management as well as interoperability during quickly evolving circumstances.

OVERCOMING CHALLENGES

The interoperability gap will continually expand and contract as new equipment and standards are introduced, so what resources or tactics can be employed to bridge it?

- Consider eliminating fees for system use. These fees are typically charged by the owners of regional or state-level radio systems — not by ECCs — to agencies that connect end-user radios to the system. While the fees help cover recurring costs such as system maintenance and programming, they can also create financial barriers for agencies that need access. Alternatives to cover these expenses include grants, expanding budget requests or leveraging fee-based revenue sources. It may seem like robbing Peter to pay Paul, but the question remains: what is more palatable for taxpayers, legislators and local government leaders? Use local, real-world examples and after-action reports to highlight interoperability failures and ongoing agency needs when making the case for funding at a higher level, such as through the state.
- Explore the concept of a co-op of users to expand purchasing power, share infrastructure or equipment, or access existing contracts.
- Inquire about equipment leasing, bundling of services or subscription-based plans, which may allow for discounts and flattened or long-term budget planning.
- Enable legislation or governance for bypassing the process of decommissioning surplus emergency equipment. Agencies can help one another by passing along used equipment that is still in working order. Serviceable hand-me-downs can be readily used by financially distressed municipalities or typically underfunded teams such as volunteer fire and rescue agencies. These efforts foster interoperability that would otherwise be lacking and build relationships between local partners.

When we check all the boxes at the end of every lane on the continuum, we can confidently say that all the right people have

done their best to secure and sustain funding, advance the most current and standardized technologies, and implement and incorporate these technologies into daily use. In short, achieving interoperability means overcoming the worst elements of the human factor — egos, extreme ownership, rigidity of ideas, reactive mindset, and cyclic adoption of seemingly cost-saving but ineffective solutions — while leveraging the most enabling qualities — sense of cooperation and community, strategic thinking, innovation, legacy-building and self-sustainment mindsets. The tagline of the Interoperability Continuum is "It's all about relationships!" ●

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1. Interoperability is best defined as:
   a. Everyone using the same equipment manufacturer and models of equipment
   b. Agencies that respond to and work together on the same incident
   c. The ability of emergency responders to effectively share information in real time and as needed, regardless of their respective communications systems
   d. Agencies sharing operational plans and policies

2. The Interoperability Continuum is a framework consisting of five sets of optimal goals or lanes. Those lanes are:
   a. Government, SOPs/SOGs/FOGs, Technology, Training & Exercises and Utilities
   b. Governance, SOPs/SOGs/FOGs, Technology, Training & Exercises and Usage
   c. Governance, Policy, Technology, Energy and End Users
   d. Governance, SOPs/SOGs/FOGs, Terminology, Training & Exercises and Understanding

3. Governance provides the framework that guides agencies on how to formalize processes within the communications ecosystem.
   a. True
   b. False

4. The Technology Lane includes subcategories of:
   a. Data elements, security/continuity of operations, and voice elements
   b. Environment, cybersecurity and voice elements
   c. Data elements, policies, and voice elements
   d. Data elements, security/continuity of operations and vehicle expenses

5. One of the simplest but less desirable ways to achieve voice interoperability via radio is to:
   a. Call each other by cell phone
   b. Swap radios or carry another radio
   c. Enable a patch at the console
   d. Connect the systems together, architecturally

6. Training and exercises:
   a. Help build muscle memory for using new equipment
   b. Build relationships that enhance coordination
   c. Provide a safe environment for learning new equipment and its uses
   d. All of the above
   e. None of the above

7. Two of the biggest challenges for achieving interoperability are:
   a. Funding and human factors
   b. Encryption and subscriptions
   c. Muscle memory and programming
   d. Conformity and strategy

8. Project25 is a standard for digital land mobile radio (LMR) that:
   a. Makes more efficient use of radio spectrum
   b. Allows communication with analog or legacy systems
   c. Is easily compatible with all other proprietary systems
   d. Both a and b
   e. Both b and c

9. The usage lane of the continuum relies heavily on:
   a. The end users' ability and willingness to use their equipment
   b. Specific technology adoption
   c. Policy and procedures
   d. End users' supervisors

10. Encryption poses its own challenges to interoperability, including:
    a. Use of single-key vs. multi-key encryption
    b. Less secure encryption standards
    c. Strict federal grant requirements
    d. A and b
    e. None of the above

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