

INTEROPERABILITY PLANNING FOR PUBLIC SAFETY

CONSIDERATIONS FOR EFFECTIVE JOINT EMERGENCY COMMUNICATIONS

When every second counts, first responders must be able to talk to each other – no matter what agencies they work for. Yet, despite years of heightened attention to security and preparedness, many communities are still short of the goal. The continuing inability to smoothly communicate across the boundaries of agency and jurisdiction can introduce delays, create perceived barriers to action and raise questions involving control of the communications system that further hamper response to major incidents.

DEVELOPING AN INTEROPERABILITY PLAN

- **Establish a team**
Planning begins with end users, including police, fire, EMS and other first responders, meeting to identify specific needs in specific situations. The team should include multiple agencies within a jurisdiction, and potentially other regional, city and federal departments. While the team may include front line personnel, team members need to have the authority and skill set to appropriately represent their respective departments. The team should have an executive sponsor whose role is to provide general guidance to the team, help them navigate bureaucratic hurdles and arbitrate in areas of team conflict.
- **Assess Needs**
Once the team is identified, members can begin to assess interoperability requirements. Who must communicate? How and when? Under what situations will agencies work together? What level of interoperability, as defined on the next page, is appropriate for each situation and each mix of agencies?
- **Identify Solutions**
What communications equipment is currently in use? How well does it work today? Which agencies currently have a method of intercommunicating and how well has that been working? Do existing systems have redundancies to ensure that they keep working even if a component fails?

An assessment of your communication resources should take place, identifying current configurations and any gaps. Identify potential vendors and funding needed to help you address those gaps. Develop a technology plan to update your communications system to deliver the required level of interoperability.
- **Document the Plan**
Document the plan and have all members approve it, ensuring all parties understand their roles and responsibilities. Hold regular meetings to make sure progress is being made on the plan. Periodically review the plan to ensure that ongoing needs are being met and continue planning for the future.
- **Implement Solutions**
Solutions may include purchasing or upgrading equipment, which might also involve the development of new procedures. Given budget and time frame issues, you might choose a phased approach that starts with high-priority quick fixes and builds to a comprehensive solution that is optimized for long-term results.
- **Put the Plan into Practice**
One of the most critical aspects of any interoperability plan is user knowledge. Ensure, through training and ongoing practice drills, that everyone knows how to implement the plan during an emergency.
- **Maintain Equipment**
Once your system is defined and redundancies are built in, it is critical to develop a robust maintenance plan to ensure that equipment is ready should disaster strike. Test the back up generators. Have a plan to make sure all equipment is charged and ready for operation at a moment's notice. Run disaster scenarios, taxing the system, to make sure it will meet your operational requirements.

SUCCESSFUL INTEROPERABILITY PLAN ELEMENTS

- Concise and precise
- Documented
- Agreed to by all parties
- Communicates roles and responsibilities with team members
- Plan is practiced
- Periodic review

INTEROPERABILITY IS ACHIEVABLE

Every community, whatever its size, can achieve a level of interoperability that will enhance the ability of participating agencies to interact during:

- Day-to-day routine operations such as road closures and traffic accidents
- Planned events such as sporting events or V.I.P. visits
- Unplanned events including natural and man-made disasters (hurricanes, tornados, floods, fires, criminal attacks and more)
- Task force operations that cover multiple jurisdictions

Participating agencies can expect to receive many benefits from interoperability, including the ability to:

- Share costs and enjoy economies of scale, making the investment more affordable

- Consolidate communications planning and operations across departments
- Make better use of the assistance available from municipal, state and federal agencies
- Share intelligence and coordinate plans for successful joint operations

Since every community – and every department or agency – is unique, your interoperability plan is a balancing act between cost and benefit, immediate need and long-term progress. The best solution for you will depend on your current operational procedures, needs and resources, and those of other agencies.

FEDERAL GRANTS

The Department of Homeland Security provides the SAFECOM Guidance for Federal Grant Programs. They issue a new Guidance every year: www.safecomprogram.gov.

TECHNOLOGY CHOICES FOR INTEROPERABILITY

Public safety agencies have multiple technology approaches to achieve interoperability. The Department of Homeland Security SAFECOM program has defined five levels of technology interoperability in its Interoperability Continuum.

The ultimate goal for voice interoperability is a Project 25 (P25) Standards Based Shared Networks (Level 5), although other levels can be useful when circumstances do not permit immediate migration to Level 5 technology. Part of developing an interoperability plan is an assessment of current equipment and definition of the type of solution that best fits your needs based on the situation or application and interoperability partnership considerations.

INTEROPERABILITY LEVELS	APPLICATIONS	METHODOLOGY
Level 5 Standards-Based Shared Systems	Events of any scale Urban and rural locations Any size geographic coverage area Any radio frequency band	All radios built to a common standard Radios connect via infrastructure or talkaround as appropriate
Level 4 Proprietary Shared Systems	Small to large scale events Cross band Limited geographic areas	Radios talk to each other via infrastructure from the same manufacturer Multiple agencies use the same system
Level 3 Shared Channels	Small to moderate scale events involving 2-4 agencies Planned or unplanned events	Users manually switch to assigned frequencies when instructed to do so Talkgroups identified in advance
Level 2 Gateways (Console Patch)	Small to moderate scale events Preplanned interoperable communications	Links established between disparate systems by dispatcher Unmanned interface box or mobile apparatus
Level 1 Swap Radios	Immediately following a disaster Small events Situations in which no other interoperability strategy is available	Agency personnel physically hand out radios upon arrival at scene

UNDERSTANDING THE INTEROPERABILITY CONTINUUM

To help agencies assess the options available to them, the Department of Homeland Security SAFECOM program has developed a continuum that defines five levels of interoperability, along with the level of leadership, planning, collaboration and investment needed. The continuum matches different technologies to particular uses and users.



GOVERNANCE	Limited Leadership, Planning and Collaboration Among Areas with Minimal Investment in the Sustainability of Systems and Documentation		Individual Agencies Working Independently	Informal Coordination Between Agencies	Key Multi-Discipline Staff Collaboration on a Regular Basis	Regional Committee Working within a Statewide Communications Interoperability Plan Framework	
			Individual Agency SOPs	Joint SOPs for Planned Events	Joint SOPs for Emergencies	Regional Set of Communications SOPs	National Incident Management System Integrated SOPs
TECHNOLOGY		DATA ELEMENTS	Swap Files	Common Applications	Custom-Interfaced Applications	One-Way Standards-Based Sharing	Two-Way Standards-Based Sharing
		VOICE ELEMENTS	Swap Radios	Gateway	Shared Channels	Proprietary Shared System	Standards-Based Shared System
TRAINING & EXERCISES			General Orientation on Equipment and Applications	Single Agency Tabletop Exercises for Key Field and Support Staff	Multi-Agency Tabletop Exercises for Key Field and Support Staff	Multi-Agency Full Functional Exercises Involving All Staff	Regular Comprehensive Regionwide Training and Exercises
			Planned Events	Localized Emergency Incidents	Regional Incident Management	Daily Use Throughout Region	
USAGE							

High Degree of Leadership, Planning and Collaboration Among Areas with Commitment to and Investment in Sustainability of Systems and Documentation

Source: SAFECOM web site www.safecom.gov.

INTEROPERABILITY STANDARDS

Since there is no “one size fits all” solution to interoperability, multiple standards have been developed to support public safety’s need for interoperable communications. The standards bodies are very active with the Department of Homeland Security and public safety organizations such as APCO (Association of Public-Safety Communications Officials).

- **Project 25 (P25)** has been adopted by the Department of Homeland Security and a growing number of public safety organizations worldwide for interoperable communications. The TIA-102 suite of standards is used for the design and manufacture of interoperable Project 25 communications products.
- **Project 25 Phase 2 TDMA trunking** adds TDMA voice services to the existing P25 FDMA trunked voice and packet data services already defined. P25 Phase 2 TDMA trunked operation will meet the 2013 FCC equipment certification requirement for 6.25 kHz channel equivalence mode in UHF and VHF bands and the 2015 FCC equipment certification requirement for 6.25 kHz equivalence mode in 700 MHz band plans. It will also meet the 6.25 kHz channel equivalence 2017 FCC regulatory requirement for operation in the 700 MHz band plans.
- **Project 25 ISSI (Inter RF Subsystem Interface)** enables public safety agencies to utilize the coverage areas of existing connected networks, which might span thousands of square miles.
Provides a wireline interface for connecting multiple P25 systems together. Allows users to maintain secure, encrypted traffic across multiple networks to roam onto other P25 systems and still talk back to their dispatcher and utilize the coverage area of connected systems.
- **BSI – Bridging Interoperable Systems** is a standard approach (as opposed to a “standard”) that provides for the bridging of multiple systems from different manufacturers. It is being developed by a partnership of The Public Safety VoIP Working Group, comprised of the National Institute of Standards and Technology’s Office of Law Enforcement Standards (NIST/OLES), as well as emergency responders and industry representatives.
- **Broadband Data Interoperability** 700 MHz LTE technology has been chosen as the 4G broadband standard for public safety agencies. Work is beginning on interoperable regional public safety broadband systems that not only serve local public safety agencies but connect to carrier grade systems for nationwide interoperability.

CONSIDERATIONS FOR INTEROPERABLE COMMUNICATION SYSTEMS

It is critical to understand the key factors that can effect communication efforts in an emergency. Motorola consultants can help you assess your current capabilities, measure system baselines and design and implement solutions to improve performance.

OPERATIONAL CAPACITY

Critical incidents often require a large number of responders at the scene. Will your system have the capacity to handle the heavy call volume generated by so many users in one place? This is a concern when users must rely on a limited number of available channels.

- Baseline the capacity of your current system and estimate your future needs
- Consider spectrum-efficient solutions to maximize the capacity of existing radio frequencies
- Manage system access rights to reduce queuing for critical users
- Design a system with stringent grade-of-service requirements to maximize operations during critical incidents

RF COVERAGE

First responders often work in difficult RF environments such as tunnels, buildings, basements, thick forests and moving vehicles. Will radio coverage be sufficient to support a joint response?

- Baseline the coverage of your current system
- Estimate your future coverage needs within a robust interoperability environment
- Deploy a standards-based P25 system for Level 5 interoperability
- Consider roaming across multiple vendors' P25 networks via the P25 ISSI standard interface
- Leverage vehicle repeater systems (VRS), portable repeaters or deployable systems to extend coverage
- Employ talkaround capabilities when working outside the system coverage area

NETWORK AVAILABILITY

The interoperable system is only as strong as its weakest link. Is your system designed so that no single point of failure would interrupt communications?

- Deploy a redundant backhaul network that links RF sites and command centers
- Obtain 24 x 7 support services to monitor and troubleshoot RF sites and backhaul equipment
- Invest in field-deployable RF sites to be used as needed for localized events or in the event of a disaster
- Build redundant master control sites
- Create multiple fallback levels to mitigate the loss of various system elements

NETWORK ACCESS & SECURITY

Protect the network and limit vulnerability by controlling access, managing user group priorities and ensuring that an IP-based system is encrypted at the network level.

- Analyze risks to your system from internal and external threats
- Control access at the individual device, talk group, channel and system levels
- Encrypt traffic to restrict unauthorized interception
- Perform decryption only at the dispatch center and the end-user device for the highest level of protection
- Establish anti-virus authentication systems

USER SAFETY

Radios are a lifeline. Personnel need equipment they can count on despite rain, heat, dust, fog, sand and extreme duty cycles. Mission critical networks are designed and built to keep working in disaster situations when public cellular networks might fail or become overloaded.

- Control your own mission critical network so that your agency, not a telephone company, makes the decisions that impact the reliability of your emergency communications
- Request critical public safety features to ensure that important calls get through
- Specify rugged, mission critical end-user devices with enhanced voice quality
- Request extended battery capacity to support extended shifts
- Enable over-the-air programming so that radios can be reprogrammed automatically in the field as incidents unfold

WORKING TOGETHER TO SUPPORT INTEROPERABILITY

Crafting an interoperability solution that works for you is easier when you partner with a vendor who understands the challenge. For over 75 years, Motorola has been a leader in helping governments apply the latest technologies for protecting their communities in a dangerous world.

Motorola's portfolio of mission-critical technologies enables agencies to confidently take the next steps forward, allowing customers to start with a solution and gradually build upon it to introduce new capabilities and adapt as needs change.

- ASTRO® 25 Integrated Voice and Data Solutions enable agencies to attain Level 5 interoperability for voice and integrated data communications.
- Motorola is committed to standards-based mission critical networks. We have over 250 trunked Project 25 systems and thousands of conventional sites in North America.
- MOTOBRIDGE IP Interoperability Solutions can be used to quickly deploy full-featured and flexible Level 2 interoperability for disparate networks including voice and data, analog and digital, trunked and conventional, as well as across multiple vendors and RF bands.
- Deployable solutions, including complete RF systems on wheels, portable repeaters and dispatch console gateways can be swiftly deployed at the scene to enable interoperability, extend coverage and/or augment existing systems during planned and unplanned events.
- Motorola services allow you to tap into our experience and expertise at any stage in the process, from needs assessment and planning through solutions design, installation, performance optimization, training and ongoing life cycle service.

Motorola technologies are delivered seamlessly into the hands of first responders – simply, reliably and without distracting them from their work. This is “Technology that’s Second Nature™”.

To learn more about Motorola's full range of products and services and how they can help you strengthen your interoperability plan, please visit our Website: www.motorola.com/project25 or contact your Motorola representative.

Other sources of information you may find helpful as you develop your interoperability plan:

DEPARTMENT OF HOMELAND SECURITY SAFECOM
www.safecomprogram.gov/SAFECOM/

NIST – National Institute of Standards and Technology
Office of Law Enforcement Standards
www.eeel.nist.gov/oles/

FEMA – Federal Emergency Management Agency.
National Integration Center (NIC) Incident
Management Systems Integration Division
www.fema.gov/emergency/nims/index.shtm

APCO – Association of Public-Safety
Communications Officials www.apco911.org

PTIG – PROJECT 25 TECHNOLOGY INTEREST GROUP
www.project25.org

TIA – Telecommunications Industry Association
www.tiaonline.org/standards/