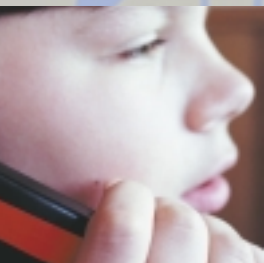
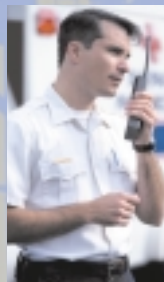


A Priority Investment for America's Future Safety

PSWN Program Information Brief



PSWN

**Executive
Summary**

Summary

Wireless communications for public safety is a critical need, essential to the protection of life and property. Yet, our Nation's public safety personnel often rely on outdated wireless technologies and radio systems that have surpassed their service life. The age of existing systems, combined with recent technological advances in wireless communications and the changing mission requirements of public safety agencies, are compelling a majority of public safety agencies to replace their existing wireless systems. With estimated replacement costs in the millions of dollars, and the complexities associated with large information technology development projects, improving public safety radio communications poses a daunting challenge for state and local government officials.

As new public safety radio systems are developed across the Nation, current obstacles that hinder mission-critical public safety communications must be addressed. Paramount among existing problems is a lack of interoperability among public safety agencies. Public safety personnel from different agencies frequently lack the ability to communicate with one another, or with their counterparts in neighboring jurisdictions. A lack of interoperability within a region can severely hinder the ability of public safety agencies to provide a coordinated response to natural disasters, catastrophic accidents, or even routine public safety emergencies.

Regional coordination and leadership from senior state and local government officials is critical to fostering interoperability among public safety agencies. The issues associated with interoperability must be addressed as replacements to existing systems are being planned, funded, and implemented. If the efficiency and effectiveness of public safety communications is to be maximized, replacing public safety radio systems can no longer be accomplished independently.

Senior government and elected officials, who have been traditionally unaware of the critical consequences of the existing lack of communications interoperability among public safety agencies, need to become actively involved in supporting radio system replacements and encouraging collaborative regional systems development efforts. Without strong leadership, funding, and oversight of public safety radio system projects by state and local government officials, improvements in public safety communications will be marginal at best, and our Nation's public safety personnel will remain ill-equipped to communicate during crises and emergency situations.

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“Each of the Nation’s police officers, firefighters, and paramedics — more than 2.2 million public safety personnel — require access to a radio to be dispatched to an incident or to request assistance.”



AMBULANCE

Improving Public Safety Communications — An Urgent National Need

All across the Nation, businesses and families are taking advantage of the innovations in wireless communications to improve customer services and quality of life. However, many state and local governments have not yet been able to make use of these innovations to improve services to their citizens. Of these services, perhaps none is more visible or important than public safety. Yet, our Nation’s public safety personnel — police officers, firefighters, and paramedics — often rely on outdated wireless technology and decades-old communications systems.

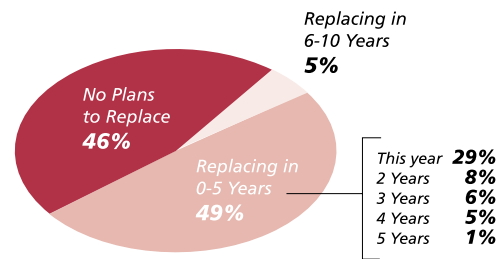
Since the installation of existing public safety communications systems, significantly more capable wireless technology has become available and along with that significantly more stressing communications requirements have emerged. The welfare of our public safety personnel, and the protection of life and property, demands that state and local governments begin to address the urgent need to improve public safety wireless communications.

Public Safety Communications Requirements

Wireless communications for public safety is a critical need, essential to the protection of life and property. Radios are the primary communications tool of public safety personnel. Even with the proliferation of advanced paging and cellular telephone capabilities, more than 98 percent of the public safety agencies still rely on either handheld (portable) or vehicular (mobile) radios for their mission-critical communications.¹

- *Wireless communications is a critical need for public safety. Radios are the virtual lifeline that connects public safety officials.*
- *Technical advances, aging and outdated systems, and changing mission requirements are compelling public safety agencies to replace their existing radio systems. One-half of the Nation’s public safety agencies will be replacing these systems within the next five years.*
- *The replacement of public safety radio systems represents a sizable capital investment for state and local governments. State systems can require as much as \$500 million, while local systems require tens of millions.*
- *Like other complex, multi-year IT projects, public safety radio system replacements will require strong commitment and leadership from state and local elected officials.*

**Exhibit 1
Public Safety Agencies Planning to Replace
their Radio Systems Within 10 Years**



These radios are often the lifeline for emergency responders and citizens in danger. When a firefighter is trapped in a burning building, or a police officer requires back-up, radio communications ensure that help is immediately available. When a natural disaster strikes or a catastrophic accident occurs, radio communications provide the means for public safety agencies to mount a coordinated and effective response.

Over the years, the very nature of public safety operations has changed. Increased threats and changing mission requirements have levied new responsibilities on public safety agencies. These new responsibilities increasingly require communications across agency and jurisdictional boundaries – a critical communications capability not readily available today for many public safety agencies. Existing public safety communications systems are simply unable to meet today’s more complex operational requirements.

Impending Radio System Replacements

The combined effects of technological advances, aging and outdated radio systems, and changing mission requirements are compelling public safety agencies to replace their existing radio systems. Public safety agencies are beginning to address this critical need. More than one-third of state and local public safety agencies (37 percent) – approximately twenty thousand throughout the Nation – are planning to replace their existing radio systems within the next two years. There is a clear sense of urgency within the public safety community regarding this issue, with more than a quarter (29 percent) hoping to replace their existing radio system by the Year 2000. (See Exhibit 1.)

For state and local government officials facing the formidable task of replacing these systems, the next five years will be a crucial period. They will be challenged to keep pace with rapidly evolving wireless technologies, exploit emerging applications to meet current operational needs, and ensure coordination across traditional jurisdictional boundaries. If these challenges are not met, however, public safety agencies could become even more ill-equipped to handle current and future public safety communications requirements.

Costs of Radio System Replacement

In addition, governments will be challenged to accomplish these radio system replacement projects within very tight budget constraints. Each of the Nation’s police officers, firefighters, and paramedics — more than 2.2 million public safety personnel — require access to a radio to be dispatched to an incident or to request assistance. In addition to handheld and mobile radios, these systems rely on an extensive infrastructure of radio repeaters, towers, dispatch consoles, and related communications equipment.

Although no one knows the exact investment in existing public safety radio systems, a recently developed estimate indicates that the value (i.e., replacement costs) of these systems nationwide is at least \$18.3 billion.² This estimate only includes the cost to replace existing radios with equipment that is similar in both function and feature. Replacing or upgrading systems with new technologies, additional features, and interoperable capabilities will no doubt drive costs even higher.

“With existing capital investments estimated in billions of dollars and the fiscal constraints experienced at all levels of government, the replacement of public safety radio communications systems poses a difficult task for elected officials.”

With existing capital investments estimated in billions of dollars and the fiscal constraints experienced at all levels of government, the replacement of public safety radio communications systems poses a difficult task for elected officials. Although the average cost for a radio system project can vary greatly depending on system requirements, it represents a sizable capital investment that can rarely be accommodated within existing public safety operating budgets. At the state level, the replacement of a basic radio system, for a single public safety agency, can require \$100-200 million. More ambitious statewide efforts, which include multiple agencies, shared systems, and increased functionality, can require as much as \$400-\$500 million. At the local level, replacing systems can require capital investments in the tens of millions of dollars, even for small or mid-size communities.

Understanding

A Critical Time for Radio Systems Replacement

“Outdated equipment affects the ability of public safety agencies to provide effective public safety services.”



Given the current pace of technological innovation, systems that were designed and installed as little as 10 years ago are now considered technologically obsolete. Nearly one-half (48 percent) of public safety agencies are using radio systems that are more than 10 years old. In fact, 17 percent rely on technology that has been in existence for 20 years or longer.

Aging of Existing Systems

The problems associated with aging systems, including excessive maintenance and repair costs, inadequate vendor support, unavailable replacement parts, and system failures, are a reality for a majority of public safety radio systems. Old or outdated equipment poses a serious problem for more than one-third (38 percent) of public safety agencies, affecting their ability to provide effective public safety services.

Technical obsolescence is not the only factor driving the urgent need to replace or upgrade public safety radio systems nationwide. There are a variety of other factors – both operational and political – that make this such a critical time for states and localities to begin planning for the replacement of their public safety radio systems.

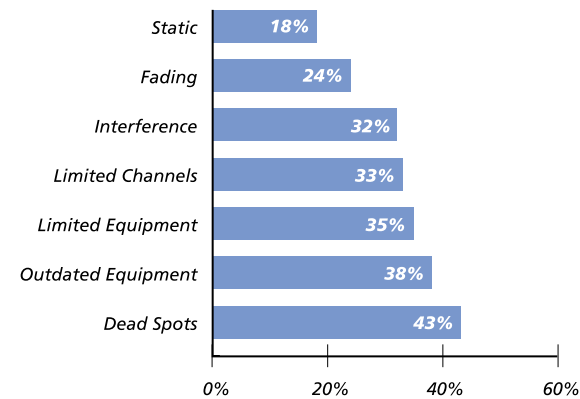
Changing Nature of Public Safety

Paramount among these factors is the changing nature of public safety operations. Police, fire, and emergency medical operations are more complex today than ever before. With the introduction of new mission responsibilities such as community-oriented policing and advanced life support emergency medical services, public safety personnel are taking on significant new responsibilities placing more diverse requirements on their communications system.

- *Nearly one-half of the Nation's public safety agencies operate communications systems that are more than 10 years old and are now considered technologically obsolete. Outdated equipment affects the ability of public safety agencies to provide effective public safety services.*
- *Existing radio communications systems are frequently unable to interoperate, resulting in an inability of public safety personnel from different agencies or jurisdictions to communicate with each other during emergencies.*
- *Public safety radio communications are further hindered by limited wireless data communications capabilities.*
- *The political and regulatory arena has drawn attention to the need for integrated public safety communications systems that support task force, mutual aid, or day-to-day interoperability requirements.*
- *Increased threats and changing mission requirements have levied new responsibilities on public safety agencies. The size of the public safety work force has grown accordingly.*
- *As a consequence, current radio communications systems experience multiple functional shortfalls due to a lack of expandability, including coverage problems, system overload, and channel congestion.*

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Exhibit 2
Public Safety Agencies with Serious Radio System Problems



Fire officials are more and more concerned with hazardous materials, police officials are responding to domestic terrorism, and paramedics are now training for mass casualties associated with catastrophic accidents or chemical and biological incidents. Furthermore, as the mission responsibilities continue to grow, so does the size of the public safety workforce. There are more public safety personnel on the street, providing a broader range of services to an ever-growing population than ever before.

Operational Constraints

Many of the operational limitations experienced with current radio communications systems are a result of their limited capacity and their lack of expandability. Capacity limits based on outdated usage requirements mean public safety personnel are not always able to get the system access they need. A lack of expandability means that problems with coverage, system overload, and channel congestion, cannot be easily addressed. Public safety agencies experience serious operational problems from “dead spots” in coverage, interference, and limited channel capacity. (See Exhibit 2.) When a radio transmission fails to reach its intended destination, or a public safety worker cannot get immediate access to a radio channel, lives are put at risk.

A lack of interoperability is another critical operational constraint in many existing systems. That is, personnel from different agencies frequently lack the ability to communicate with one another or with their counterparts in neighboring jurisdictions. The lack of interoperability is often due to agencies using incompatible equipment, different frequency bands, and unique operational protocols. Yet, the changing mission requirements of public safety have placed a greater emphasis on joint operations and joint task forces – and thus the need for communications interoperability.

A lack of interoperability hampers the ability of more than one-third (36 percent) of public safety agencies to respond to an emergency call. Recognizing this significant shortfall in existing systems, 90 percent of public safety agencies stress that interoperability will be a prominent consideration when developing their next radio system.

Existing public safety operations are further hindered by limited data communications capabilities. The ability to transmit and receive types of data in a mobile environment, coupled with technological advances such as mobile data terminals and laptops, can provide the public safety personnel in the field with direct access to valuable information such as a criminal’s fingerprints or blueprints of a building. The inability to take advantage of data communications limits the ability of public safety agencies to more efficiently accomplish their mission.

“Public safety agencies must work together to meet their new mission responsibilities and ensure that their radio systems will support the joint provision of services.”

Political Influences

The political environment is also driving the need for public safety radio system replacements. Public safety is not immune to the heightened focus during the 1990s on “reinventing government” for the more efficient and cost-effective provision of services. Government agencies are reengineering their processes and organizational structures, away from stovepipe operations toward collaborative work environments and partnerships that cross traditional organizational boundaries. Public safety services are no exception.

This new approach to government services has focused attention on integrated public safety communications. As early as 1993, the National Performance Review (NPR) recognized the need for the public safety community to develop multi-agency, multi-jurisdictional radio systems. Public safety agencies must work together to meet their new mission responsibilities and ensure that their radio systems will support the joint provision of services. With the large number of public safety agencies planning to replace their systems in the next few years, this coordination must take place now. Otherwise, disparate systems will be developed, further intensifying or creating new compatibility problems and operational difficulties.

Regulatory Influences

Regulatory issues are also driving the need for change. Recent developments in spectrum policy and management, for example, compel public safety agencies to rethink how they use spectrum and how their systems are designed. Spectrum enables access to public airwaves and is essential to the operation of any wireless communications system. Sufficient spectrum is needed to ensure capacity requirements are met.

Regulatory agencies responsible for the management of spectrum are requiring public safety agencies to be more efficient with their use of spectrum. Public safety agencies are pressed to transmit the same amount of information through smaller slices of spectrum, known as channels. Because spectrum is a valued and finite natural resource, realizing efficiencies with its use allows for a greater range of applications, including wireless data and commercial services.

In addition to efficiencies, recent spectrum management changes require or compel some public safety agencies to move their communications operations to different regions, or bands, of the radio spectrum. For public safety to take advantage of newly allocated spectrum and be responsive to other regulatory changes, radio systems often must be completely replaced.

“For public safety to take advantage of newly allocated spectrum and be responsive to other regulatory changes, radio systems often must be completely replaced.”

Public Awareness

Finally, public attention has recently begun to focus on the issue of public safety response and the critical role of communications. Natural disasters on the scale of the 1998 wild fires in Florida, the 1997 flooding in North Dakota, and the 1994 Southern California earthquake dramatically illustrated the rapid and coordinated response needed from local, state, and federal public safety agencies. Man-made disasters and catastrophic accidents are equally demanding on public safety, as demonstrated by the recent tragedy in Littleton, Colorado, the crash of TWA Flight 800 in 1996, the Oklahoma City bombing in 1995, and the World Trade Center bombing in 1993.

These national emergencies have cast a spotlight on the deficiencies in the communications capabilities of our public safety agencies and created an environment of interest to the media and the public. By leveraging this public interest, elected officials can build the support needed to improve public safety radio communications.



“The very nature of the public safety communications interoperability problems necessitates proactive regional leadership, not only from public safety agencies, but also from our elected government officials.”



Making Public Safety Communications a Priority— The Case for Regional Leadership and Support

3

Lives, property, critical public infrastructures, and natural resources are all at stake during disasters and catastrophic accidents. Public safety agencies and government officials must be prepared to respond immediately to these emergency situations. If emergency response efforts are effective, the public’s perception of state and local governments is immediately enhanced. However, if the response to an emergency falls short of expectations, the public can be just as quick to assign blame to their elected officials. Integrated and interoperable public safety communications can simplify and improve emergency response.

The Need for Regional Interoperability

A lack of communications interoperability within a region can severely hinder the ability of public safety to provide an effective and coordinated response to large-scale incidents. A large number of differing public safety agencies from across a region are necessarily involved in both the immediate emergency response and the prolonged disaster recovery operations. Unfortunately, with this regional involvement, the current ability of public safety agencies to communicate effectively decreases – just as the importance of interoperable communications increases.

Recent data indicate that most public safety agencies have limited confidence in their ability to perform in regional response situations requiring mutual aid (54 percent) or task force communications (66 percent) interoperability.³ (See Exhibit 3.)

- Large-scale public safety emergencies highlight public safety agency’s dependence on radios and the mission-critical requirement of interoperable communications.
- However, a majority of local public safety agencies are not confident in the ability to perform in situations requiring mutual aid or task force interoperability with state or federal agencies.
- This requirement is not limited to national emergencies, but is a vital component of the daily activities of public safety agencies.
- State officials are in a unique position, as they can provide the necessary proactive leadership and support to ensure that public safety agencies develop systems that support interoperable communications.

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Exhibit 3
Local Public Safety Agencies with Limited Confidence in Their Ability to Handle Different Types of Interoperability

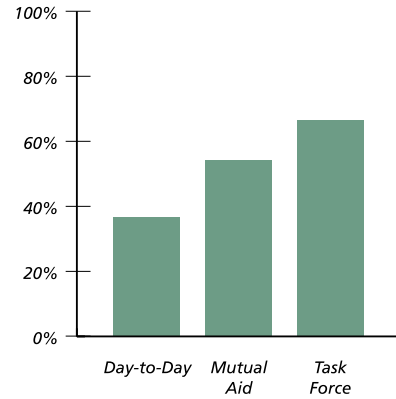
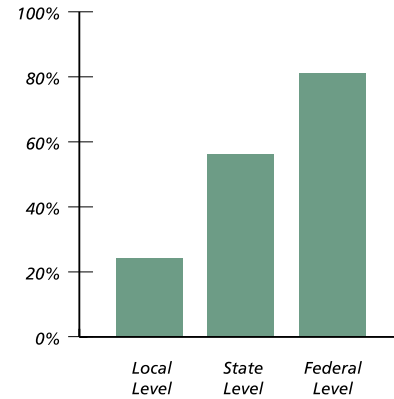


Exhibit 4
Local Public Safety Agencies with Limited Confidence to Interoperate with Different Levels of Government



Even more striking is the fact that local public safety agencies express limited confidence in their ability to communicate with state (56 percent) or federal (81 percent) public safety organizations. (See Exhibit 4.) This lack of confidence, combined with the demonstrated communications difficulties experienced during recent catastrophic events, should signal a warning in state houses and city halls across the Nation.

While large-scale incidents dramatically illustrate the need for regional communications interoperability, routine public safety operations that occur on daily basis can also be severely hampered by a lack of interoperability. Police pursuits, highway accidents, and large fires occur daily, each requiring a regional response from multiple agencies and jurisdictions. However, even during these routine public safety incidents, more than a third of public safety agencies (36 percent) have limited confidence in their ability to interoperate.

The Need for Regional Leadership

The very nature of the public safety communications interoperability problems necessitates proactive regional leadership, not only from public safety agencies, but also from our elected government officials. This leadership must come from those who have the responsibility for ensuring public safety across jurisdictional boundaries, and the ability to marshal the coordination and resources necessary to address this issue. Regional leadership and coordination can take many forms, depending on prevailing government practices and existing partnerships. A region may be a major metropolitan area, a coalition of counties, an entire state, or even a multi-state alliance.

Many of our most basic public services, such as transportation administration and educational standards, are typically coordinated, regulated, or funded at the regional level. Regional responsibility for these functions stems from an interest in ensuring minimum standards and equal access to specific public services or the uniform implementation of policy initiatives. State or regional coalitions are in an advantageous position to coordinate and foster the creation of regional interoperable communications for public safety. Government officials need to be concerned, not only with the public safety communications capabilities of their own agencies, but of all public safety operations within the region, including local, state, and federal agencies.

The Federal Government has already acknowledged the importance of improved public safety communications through efforts such as the NPR. Furthermore, the Federal Government has recognized that states are strategically positioned to address the issue of interoperable communications directly and in the most efficient and coordinated manner. In fact, in initiatives proposed by the Federal Government, states have been positioned as the interoperability linchpin with and among local jurisdictions.

Regional Communications Infrastructure

State or regional leadership in the planning and coordination of public safety wireless communications infrastructures is critical for interoperability among public safety agencies at the local, state, and federal levels. Elected officials have a vested interest in establishing and protecting critical public infrastructures that cross jurisdictional boundaries and benefit many constituents. Similar to state highway design and construction standards, a regional public safety communications infrastructure can ensure a basic and uniform quality of service for the common good of all within a jurisdiction, region, or state.

“Government officials need to be concerned, not only with the public safety communications capabilities of their own agencies, but of all public safety operations within the region, including local, state, and federal agencies.”

Through the creation of statewide or regional shared public safety wireless communications systems, state and local officials would also be fulfilling their responsibility to efficiently and effectively use tax dollars. The number of stovepipe systems owned and operated by individual agencies will be reduced, preventing an expensive duplication of efforts and promoting sharing of resources among agencies with common missions and responsibilities. Chief Information Officers (CIOs) from local, state, and federal agencies nationwide recognize that cross-boundary investments in technology infrastructure provide the most value to the citizens.⁴ By leveraging economies of scale, elected officials can avoid the unnecessary costs and inevitable criticism of duplicative efforts.

Planning

4

Overcoming Obstacles— Toward Interoperable Public Safety Communications

“As with all complex IT projects, improving public safety communications and achieving interoperability will require state and local governments to overcome a multitude of obstacles.”



Every year, local, state, and federal governments spend upwards of \$70 billion on Information Technology (IT) projects. And every year, despite the ongoing progress of the technology itself, more and more government IT projects fail.⁵ Multi-million dollar investments that do not meet objectives have resulted in a reluctance by some government officials to undertake future large IT projects. In many cases, these failures could have been mitigated or even avoided with an awareness of the potential pitfalls and with deliberate systems planning to ensure potential obstacles are addressed.

As with all complex IT projects, improving public safety communications and achieving interoperability will require state and local governments to overcome a multitude of obstacles. Government officials must be aware of the general challenges inherent in these IT projects, as well as the many obstacles to interoperable public safety communications, if they are to provide the needed leadership for successful radio system replacements. However, through strong legislative leadership and executive-level support, even the most formidable obstacles can be overcome.

Public Sector IT Development Projects

Many large public sector IT system development projects encounter difficulties because of inadequate planning; a lack of experience on the part of governments in implementing large, complex IT systems; or the inability of contractors to deliver as promised. Problems also arise as a result of underestimating the scope of the project, not understanding the true mission requirements, and failing to coordinate with all affected agencies.

- *As with other complex IT projects, improving public safety communications will require facing and overcoming a multitude of obstacles.*
- *Solid IT planning and project management, coupled with an ongoing awareness of these obstacles, can help state and local governments realize improved public safety communications and interoperability.*
- *Obstacles to developing interoperable public safety communications include:*
 - *Securing adequate funding;*
 - *Addressing spectrum constraints;*
 - *Establishing standards-based systems;*
 - *Protecting new systems from security threats; and*
 - *Coordinating among jurisdictions.*

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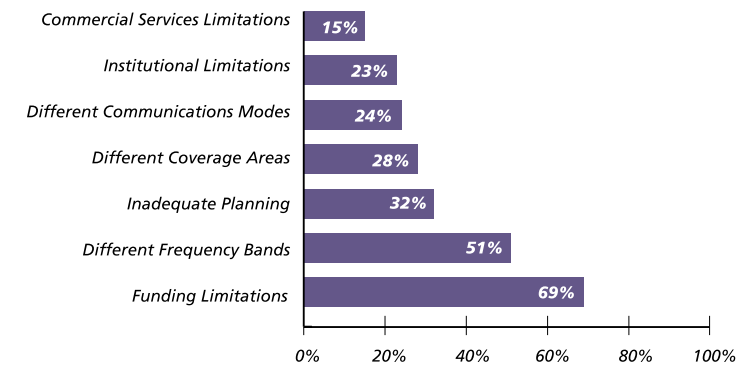
Scope of Radio System Replacements

The size and complexity of radio system replacement projects, especially those involving multiple agencies and jurisdictions, can lead to a variety of risks and pitfalls. Because public safety wireless communications systems are increasingly computer controlled and interconnected, their replacement or upgrade can be viewed as similar to other large IT projects undertaken by state and local governments. Problems that have plagued other large public sector IT projects – cost overruns, project delays, unmet mission requirements, and incompatible systems – are likely to occur during radio system replacement projects as well. Strong leadership from state and local policy makers, and deliberate systems planning and project management by public safety officials and IT professionals, is essential to ensure that public safety wireless communications requirements are identified and met.

Fundamental to the planning and development of improved public safety communications is the recognition of a number of obstacles that currently frustrate interoperability among public safety wireless systems throughout the Nation. As with many public initiatives, securing the appropriate resources is of paramount importance.

The magnitude of the funding required, while daunting, is not the only obstacle governments will face as they proceed with replacements of their existing public safety radio systems. In the case of wireless communications systems, strong fiscal support must be accompanied by the availability of sufficient and appropriate spectrum. Implementing interoperable public safety radio systems also requires deliberate systems planning and considerable coordination among jurisdictions. Additional obstacles that need to be considered by policy makers include the availability of standards-based technologies and the incorporation of appropriate security measures. Solid IT planning and competent project management, coupled with a basic awareness of the obstacles to interoperability, can help state and local governments officials realize the goal of improved public safety communications. Otherwise, improvements in public safety communications will be marginal at best.

**Exhibit 5
Public Safety Agencies With Serious Interoperability Obstacles**



Funding and Planning

With every budget cycle and legislative session comes spirited competition for scarce public funding for worthwhile projects and initiatives. All too often, funding requests to replace or upgrade public safety communications systems are lost in a backlog of unfunded needs. When state and local public safety agencies were asked to rate various obstacles to radio systems replacement and interoperability, funding was identified as the primary concern. More than two-thirds (69 percent) of public safety officials rated a lack of funding as a serious obstacle. (See Exhibit 5.)

“Strong leadership from state and local policy makers, and deliberate systems planning and project management by public safety officials and IT professionals, is essential to ensure that public safety wireless communications requirements are identified and met.”

The reasons for the inability to secure funding for radio systems are as varied as public agencies themselves – from misjudging the budget cycle to insufficient justification and inaccurate cost estimates. However, because public safety agencies typically do not have their own means to generate revenue, they must ultimately turn to the legislative body to seek funding for radio systems replacements. In many cases, a solid strategic plan, including clear identification of mission requirements and a realistic funding proposal, can mean the difference between securing funding and waiting for the next budget cycle to try again.

Although planning may seem to be an obvious part of public safety radio system replacement project, inadequate systems planning is a major problem for public safety agencies. In fact, 32 percent of public safety agencies indicate that a lack of adequate planning has been a serious obstacle to implementing interoperable communications systems. In addition to problems with securing funding, a lack of adequate planning can result in ineffective project management, and can ultimately preclude achieving interoperability.

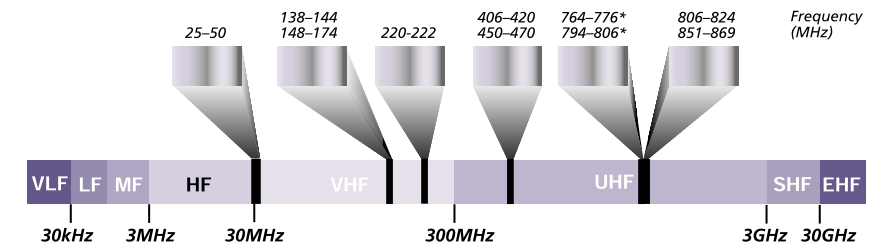
Improving public safety interoperability needs to be a priority focus at all stages of radio system development, including the initial planning activities. This requires an understanding on the part of senior government officials as to the importance of interoperability. As a matter of priority, these officials must encourage progress in achieving interoperability through policies, planning, and fiscal support.

Spectrum

Even if funding was no object and planning was well-executed, public safety radio systems would still be limited in their capability and capacity by radio spectrum constraints. The current amount of spectrum allocated for public safety use is insufficient to meet present-day needs. This finite amount of spectrum has had to accommodate significant increases in public safety mission requirements and staffing during the past decade.

Consequently, radio spectrum allocated for public safety services has been fully assigned in many metropolitan areas.⁶ This results in a limited number of channels available to public safety personnel — ultimately creating a serious obstacle to interoperable communications and affecting the ability of public safety agencies to provide assistance when needed.

Exhibit 6
Public Safety Spectrum Bands



The bands assigned to public safety are spread across the spectrum, creating difficulties for interagency communications.
*Additional spectrum bands allocated for public safety use as a result of the Balanced Budget Act of 1997.

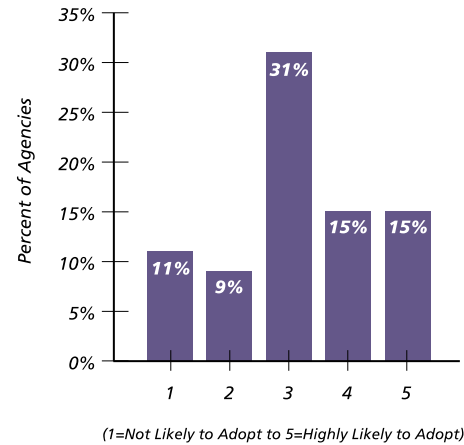
The current spectrum allocated for public safety use is located in nine discrete portions of the radio spectrum. (See Exhibit 6.) The use of multiple frequency bands by public safety agencies operating in the same geographic regions further complicates interoperability and joint response communications. More than one-half (51 percent) of public safety officials rated systems operating in different frequency bands as a serious obstacle to interoperability. Policy makers must continually be aware of the spectrum constraints in their area as well as the spectrum requirements for current operational needs and future requirements.

Standards-based Technology

Because public safety agencies will be operating in multiple bands for some time, systems architecture and equipment that support multi-band communications are essential if interoperability is to be routinely achieved among public safety agencies operating in different bands. (See Exhibit 7.) In addition, a variety of new radio technologies are becoming increasingly available to public safety agencies as they replace or upgrade their existing radio systems. Despite the increased functionality and efficiency these new technologies offer, no one standard has been established to ensure that these technologies are interoperable.

Different vendors have different schemes for implementing public safety communications systems. In fact, because of the proprietary nature of many of these technologies, some radios are not compatible even when the radios operate with identical frequency assignments. Consequently, system planners must become familiar with both the frequency assignments and the technology used by neighboring jurisdictions to ensure compatibility.

Exhibit 7
Public Safety Agencies Planning for Interoperability Standards in Their Next Radio System



Without planning for new systems with an open architecture and standards-based technologies in mind, state and local governments can inadvertently create “closed systems,” resulting in significant barriers to interoperability. An open architecture facilitates the interconnecting of radio systems and eases the ability of agencies to expand their systems as their staffing levels increase or mission requirements change. Open systems also allow for competition between differing radio equipment vendors and facilitate the seamless introduction of emerging technologies into an existing infrastructure. If not addressed in this current era of system replacements, the public safety community could end up with numerous mini-systems that actually contribute to more severe interoperability problems.

Security

While advancing technology and increased interoperability provide immeasurable benefits to the public safety community, they also expose public safety radio systems to security vulnerabilities. In the past, public safety officials were primarily limited to worrying about known threats, such as citizens with scanners listening in on radio calls. As a result, security concerns were often an afterthought of system development and design.

Today, security concerns are much more complex and pervasive. Interconnected systems result in more people having access to information, increasing the potential for a security breach. The increased potential of system intrusion, combined with the very real threat of domestic terrorism, results in a serious security issue for public safety officials. In recent years, individuals have penetrated public safety systems for malicious reasons — with some of these system penetrations originating from computer hackers outside the country. Prudent system planning requires the incorporation of appropriate physical and cyber security measures.

Coordination

Public safety agencies from state and local government with similar regional coverage needs must coordinate, cooperate, and work together to develop shared systems that improve interoperability. Just as states are recognizing the need to maintain wireless public safety coverage that encompasses the majority of land within the states, local governments are expanding the coverage area and scope of their missions.

Efforts to coordinate statewide or regional planning of shared systems can help state and local governments realize significant cost and spectrum efficiencies as well as resolve technical, operational, and organizational issues that impede interoperability. State and regional officials need to be aware that political, turf, and institutional issues can be an obstacle to achieving this level of coordination.

“Public safety agencies from state and local government with similar regional coverage needs must coordinate, cooperate, and work together to develop shared systems that improve interoperability.”

Timing for Overcoming Obstacles

While the need to replace existing public safety radio systems is an immediate and urgent concern for a majority of public safety agencies, now is the time to coordinate across traditional organization boundaries to develop shared or interconnected systems. Thousands of individual public safety agencies, several regions, and entire states are already making plans and determining the requirements of their new systems. Strong leadership is needed from elected officials to ensure interoperability and avoid committing resources to radio systems that are incompatible with one another.

Strategy

5

“Replacing radio systems can no longer be accomplished independently if the efficiency and effectiveness of public safety communications is to be maximized.”

Identifying Regional Roles and Responsibilities— Strategic and Tactical Actions



Decision-makers at all levels of government have an obligation to make use of technology to ensure the public’s safety and improve services to their citizens. Replacing radio systems can no longer be accomplished independently if the efficiency and effectiveness of public safety communications is to be maximized. This regional role of fostering interoperable public safety communications carries with it both strategic and tactical responsibilities.

Strategic Responsibilities

The public safety communications environment is continuously evolving with the introduction of new technologies, changing mission requirements, and shifts in the political and regulatory environment. Improvement in public safety communications interoperability will require elected officials be cognizant of issues that have strategic importance for public safety communications.

Many senior government and elected officials have traditionally been unaware of the critical consequences of the existing lack of interoperability among public safety communications systems. These officials must develop and maintain a sufficient understanding of existing public safety communications, unmet mission requirements, and agency plans for system replacement so as to make interoperability a core requirement for future systems development efforts. Recognizing the current and future communication requirements of public agency agencies as well as the capabilities and limitations of existing systems will better prepare elected officials as they consider this issue.

- *To promote interoperable public safety communications, state officials must make the issue of public safety radio system replacement a strategic priority:*
 - *Develop an understanding of their current and future public safety systems requirements;*
 - *Facilitate and encourage collaborative systems and shared systems development;*
 - *Learn from the experiences of other state and local governments;*
 - *Educate the public on the importance of public safety communications and interoperability;*
 - *Work to identify funding sources that can be targeted for public safety communications and explore opportunities for funding assistance from the Federal Government and other entities.*
- *To ensure obstacles to interoperability are addressed, state officials must hold public safety and IT officials accountable for meeting a number of criteria in their planning and design of new public safety radio systems:*
 - *Include specific mechanisms for fostering interoperability among all public safety agencies operating in a region;*
 - *Incorporate technology standards that promote an open architecture;*
 - *Identify opportunities for shared infrastructure development with surrounding jurisdictions;*
 - *Understand current and future spectrum requirements and formalize spectrum management processes; and*
 - *Ensure security threats are addressed throughout the system life cycle.*



AMBULANCE

“Elected officials also need to begin to understand the magnitude of the funding issue for public safety communications and begin to explore mechanisms to address this need.”

Appropriately prioritizing interoperability initiatives also requires an understanding of the existing capabilities and replacement plans for public safety radio communications systems operating within the same geographic region. State officials can and should exert their leadership to encourage and facilitate collaborative systems and shared systems development. Efforts such as shared systems development can help achieve interoperability for specific regions while maximizing the available resources.

Furthermore, regional officials need to learn from the experiences of other state and local governments in developing and implementing solutions to the public safety communications problem. Jurisdictions and public safety agencies across the Nation encounter similar obstacles in addressing the need for interoperability. By learning from the successes and failures of others, governments can shorten the path to workable solutions of public safety communications interoperability.

Continued education on interoperability issues within their jurisdiction or region is paramount for elected officials. Today, most citizens are unaware of the many challenges inherent in public safety communications and assume that all public safety agencies are able to seamlessly communicate with each other during disasters and emergency situations.

Critical to the continued improvement of public safety radio communications is the monitoring and, at times, active engagement in the regulatory environment influencing public safety radio communications. This environment includes areas such as technology standards from government and industry organizations, spectrum and communications policy from the Federal Government, and security and privacy issues decided within state and federal courts. Elected officials should recognize and exercise their ability to influence this regulatory environment in a manner that benefits public safety radio communications.

Elected officials also need to begin to understand the magnitude of the funding issue for public safety communications and begin to explore mechanisms to address this need. The considerable fiscal resources required to upgrade or replace public safety radio systems necessitates their inclusion in capital plans and financial forecasts. Incorporating the future cost of public safety radio communication systems in budget forecasts greatly reduces the chances of a surprise budget request for a \$100 to \$200 million replacement radio system, and, perhaps more importantly, allows these projects to be included in the same funding streams as other large multi-year capital improvement projects. Additionally, elected and public safety officials must be watchful for funding assistance from the Federal Government and other entities, public or private, that may take the form of direct aid, grants, or cooperative system development.

Tactical Responsibilities

Several tactical requirements need to be considered to ensure the upgrade or replacement of existing public safety systems address and resolve the problems inherent in existing systems, including interoperability. These requirements should be addressed by elected officials early in the planning process, and prior to funding for any new public safety communications system.

Public safety communications systems have life cycles similar to other IT systems. The stages usually include identifying a need, planning for the solution, developing a system design, procuring and installing the system, performing system testing and acceptance, and maintaining the system. Elected officials can leverage its ability to ensure obstacles are addressed by targeting the planning and design stages of public safety communications system replacement.

Specifically, elected officials need to require public safety agencies and IT executives to meet a variety of criteria in their planning and design of new public safety radio systems. At a minimum, the systems development plan should include mechanisms for fostering interoperability among all public safety agencies operating in the region. The system design should incorporate technology standards that promote an open architecture.



To further facilitate interoperability and to ensure the most efficient use of public resources, system upgrade or replacement projects should thoroughly assess the public sector wireless environment throughout the coverage area of the proposed system. This process will identify potential opportunities for shared infrastructure development, common requests for proposals to achieve economic buying power, and provide for the opportunity to build stronger public safety coalitions.

In addition, the processes and procedures for acquiring additional spectrum should be fully understood and incorporated into radio system development plans. There must be a documented assessment of current and future spectrum requirements for public safety and other public service agencies that rely on wireless communications. The spectrum management function should be formalized and coordinated with other public service agencies within the state to efficiently use this scarce resource.

Actions should be taken early in the systems planning process to assess the vulnerabilities and threats to existing public safety communications systems within the state. Finally, action plans to improve system security and disaster survivability should be developed and incorporated throughout all stages of the system life cycle. Requests for system upgrades or replacements should include a discrete information assurance component for both physical and cyber security. ■

1 Unless otherwise noted, all percentages are based on the combined results of two studies – the National Institute of Justice State and Local Law Enforcement Wireless Communications and Interoperability and the PSWN Program Analysis of Fire and EMS Communications Interoperability. Each study was based on nationwide surveys of public safety wireless communications and the interoperability issues facing the respective public safety communities.

2 Land Mobile Radio Replacement Cost Study, PSWN Program, June 1998.

3 Definitions of three types of interoperability – day-to-day, mutual aid, and task force – are provided in the Public Safety Wireless Advisory Committee Final Report, pages 46-47, September 11, 1996, and similar definitions were used in the two survey efforts.

4 Finding & Funding IT Initiatives in the Public Sector, Jerry Mechling & Victoria Sweeney, page vii, Government Technology Press, 1998.

5 IBID.

6 Public Safety Wireless Advisory Committee Final Report, page 628, September 11, 1996.

Evaluating

An Elected Officials' Checklist for Evaluating Public Safety Radio Communications

Any number of public safety agencies in your region are likely contemplating replacement of their existing radio communications systems. The following checklist is intended to help elected officials and policy makers better understand the current condition of public safety wireless communications and interoperability within their jurisdiction, region, or state. The checklist may also be useful in evaluating public safety communications systems funding and development proposals.

■ The number of major public safety incidents within the last year that required state and local public safety agencies to work together is ____.

■ The number of regional public safety employees has increased by ____ percent in the past five years.

■ The mission of public safety agencies in the region have changed in the following ways during the past five years:

■ The number of separate public safety wireless communications systems currently operating in the region is ____.

List individual agencies:

■ The public safety radio systems operating in the region are ____ years old.

■ The following mission-critical requirements are not currently met by the existing systems:

- Coverage
- Channel Capacity
- Interoperability with State Agencies
- Interoperability with Local Agencies
- Interoperability with Federal Agencies
- Data Communications Capabilities

■ The following agencies are planning to upgrade or replace their systems in the next five years (list individual agencies):

■ The replacement of these systems individually will cost approximately ____ million.

■ The amount of additional spectrum needed to support current and future public safety communications needs is _____.

■ There (is/is not) ____ a person or office in the regional administration dedicated to public safety communications issues.

■ My jurisdiction, region, or state has established the following criteria to evaluate proposed radio system replacements (list):

■ There (is/is not) ____ a funding source available or that can be targeted for public safety wireless communications.

■ The region has explored the following federal initiatives supporting public safety communications for support and potential fiscal resources (list):

■ Partnerships with the following local, regional, or state agencies have been explored for shared systems development (list):

About the Public Safety Wireless Network Program

The Public Safety Wireless Network (PSWN) Program, a jointly sponsored endeavor between the Department of Justice and the Department of the Treasury, was created in 1996 through Vice President Al Gore's National Partnership for Reinventing Government. The program is responsible for encouraging interoperability among wireless networks so that local, state, and federal public safety requirements can be addressed. The program strives to achieve the vision it shares with the public safety community — seamless, coordinated, and integrated public safety communications for the safe, effective, and efficient protection of life and property. Specifically, the program attempts to:

- Improve the coordination of public safety wireless communications
- Foster actions for adequate radio frequency spectrum for public safety agencies
- Support the development of technical standards for public safety wireless communications systems
- Promote the inclusion of security measures in public safety wireless communications systems
- Identify alternative funding mechanisms for local, state, and federal public safety agencies to improve their wireless communications systems.

During its initial three years, the PSWN program has promoted partnerships among public safety agencies and has pursued case studies and pilot projects, analytical studies, and outreach efforts. Examples of these activities include:

- Hosting regional shared systems symposiums that bring together local, state, and federal public safety agencies to share information on wide-ranging issues such as regional planning, site acquisition, funding, and systems planning
- Providing input to FCC filings to better position public safety agencies to participate in shared systems and improve communications between local, state, and federal public safety agencies
- Developing "how to" guides on local, state, and federal spectrum management processes to assist radio managers in navigating frequency assignment procedures
- Conducting regional needs analyses that characterize mission requirements, determine a baseline of current radio systems infrastructure, and identify opportunities to improve system efficiency
- Evaluating and profiling commercial services to project how these services are likely to be deployed by public safety agencies and the implications for public safety operations
- Partnering with state and local agencies to establish pilot implementations of interoperable radio architectures in multiple regions of the country
- Participating in the test and demonstration of wireless data communications such as the National Crime Information Center (NCIC) 2000 wireless testbed
- Investigating security issues to understand and address the vulnerabilities and risks associated with evolving land mobile radio systems
- Profiling current funding mechanisms and suggesting alternative strategies to receive the requisite funding to replace or upgrade public safety communications systems
- Participating in a federal interagency group that developed a recommendation for a planning and demonstration grant program for statewide public safety radio systems development efforts.