



Saving Lives and Property Through Improved Interoperability

***Minneapolis, Minnesota
Post-Symposium Report***

FINAL

July 2001

FOREWORD

The Minneapolis, Minnesota, Public Safety Wireless Network (PSWN) Program Symposium began June 19, 2001, and concluded June 21, 2001. Booz·Allen fulfilled all of the general symposium and facility requirements and ensured that all attendees were registered on site, monitored sign-in, and distributed preconference materials. Booz·Allen also assisted with overall presentation support, including managing each speaker's time. All PSWN Program equipment and the remaining symposium materials were transported back to the PSWN Program Technical Resource Center (TRC) after the symposium. This document describes the key themes discussed during the symposium and includes the final attendance list. The final report will be posted on the Web site. Interested parties can download the report or call 1-800-565-PSWN and request a copy of the document.

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1. INTRODUCTION

The Public Safety Wireless Network (PSWN) Program sponsored the Minneapolis, Minnesota, PSWN Program Symposium from June 19, 2001, through June 21, 2001. The symposium was cohosted by the Metropolitan Radio Board and the Minnesota Department of Transportation. Previously, the PSWN Program has sponsored similar symposiums in Charlotte, North Carolina; Harrisburg, Pennsylvania; Sacramento, California; Boston, Massachusetts; Chicago, Illinois; Mesa, Arizona; Denver, Colorado; Lansing, Michigan; Orlando, Florida; St. Louis, Missouri; Honolulu, Hawaii; and Boise, Idaho. The program has also sponsored a mini-symposium in Washington, DC. The purpose of these events has been to discuss issues related to the interoperability of public safety land mobile radio (LMR) communications and public safety shared systems.

At the Minneapolis Symposium, 166 public safety officials from around the country assembled to discuss various topics relating to public safety wireless communications interoperability. Minnesota's Commissioner for the Department of Administration, David Fisher, and Anoka County Commissioner Dave McCauley provided introductory remarks and the keynote address. During their comments, each acknowledged the importance of regional cooperation, national awareness, and interoperability as essential for life and safety. Additionally, the commissioners advised attendees to work together, share experiences, and take away newfound knowledge in hope of improving interoperability in Minnesota and throughout the Nation.

Following the keynote remarks, attendees were briefed on the PSWN Program and its overall goals and objectives. Attendees then discussed the key technical and policy issues critical to improving wireless interoperability and were able to question public safety state representatives about the current state of their respective systems' development. Attendees were also able to learn about funding issues related to creating interoperable systems.

1.1 Purpose

This report provides a detailed summary of the events of the Minneapolis, Minnesota, PSWN Program Symposium. It is designed to be a historical resource for those who attended the symposium and to provide a broad overview for those who were unable to attend. In general, this symposium report highlights—

- Key themes that the presentations and panels supported during various portions of the symposium
- Interoperability challenges and success stories that were discussed throughout the symposium
- Important facts and information that were provided to the audience
- Answers to questions of interest that were asked during the symposium.

The document is organized according to the major topic areas presented at the symposium. Within each section, the key themes that emerged from consideration of a specific topic are provided and thoroughly explained using information presented during briefings and the answers to questions asked during panel sessions.

2. SYMPOSIUM TOPICS

The Minneapolis, Minnesota, Symposium was organized into three days of topic areas. The key topic areas included presentations from various people, ranging from members of the public safety community to PSWN Program representatives. Certain topics were addressed by panels of experienced public safety officials who answered questions from the audience. The topics were selected to give the symposium attendees a perspective on the PSWN Program and the state of interoperability at all levels of government. The topics covered are listed below:

- The PSWN Program Is Developing and Providing Technical and Policy Solutions to Public Safety Wireless Interoperability Challenges
- Exploring Technical Solutions in the State of Minnesota
- States Are the Linchpins for Achieving Wireless Interoperability Throughout the Nation
- How Equipment Manufacturers and Emerging Technologies Can Help Foster Public Safety Wireless Interoperability
- Issues Affecting Public Safety Communications
- How Federal Initiatives Are Working to Promote Wireless Interoperability.

Over the three days, several key themes emerged. In the following sections, each topic and the related themes are presented. The themes are supported by the remarks of the presenters and panelists.

2.1 The PSWN Program Is Developing and Providing Technical and Policy Solutions to Public Safety Wireless Interoperability Challenges

Over the past several years, the PSWN Program has worked with the public safety community at the local, state, and national levels to improve public safety interoperability. During the symposium, the PSWN Program representatives described the vision for the program and several of the key activities being performed by the program. Four key themes, described in detail below, emerged during the discussions in this topic area. These themes were evident in the PSWN Program update and the discussion on the technical solutions that the PSWN Program is developing. These topics were presented on the first day of the symposium.

Saving Lives and Property Through Improved Interoperability

The PSWN Program envisions seamless, coordinated, and integrated public safety communications for the safe, effective, and efficient protection of life and property. Specifically, the program focuses on improving wireless interoperability among public safety entities at all levels of government. The PSWN Program is a federally funded program, jointly sponsored by the Department of Justice (DOJ) and the Department of the Treasury (Treasury). The program works in partnership with local and state public safety agencies to improve interoperability.

The PSWN Program is divided into two phases. Phase I, PSWN Implementation Planning, takes place from fiscal year (FY) 1997 through FY 2001. During Phase I, the PSWN Program performed an integrated set of studies and evaluations of existing public safety wireless interoperability systems and developed pilot projects. These activities resulted in a knowledge base known as Public Safety WINS: Wireless Interoperability National Strategy.

Public Safety WINS presents the program's strategy for improving interoperability throughout the Nation. Public Safety WINS will serve as an information baseline for the program as it begins to offer interoperability services to local, state, and federal public safety entities. Public Safety WINS is being developed as a multimedia package that includes video and CD-ROM. The video portion of Public Safety WINS was shown at the beginning of the Minneapolis Symposium.

Currently, Phase II, PSWN Interoperability Assistance, offers a suite of services that assist the public safety community in executing Public Safety WINS. These services include providing an information clearinghouse and offering interoperability assistance to public safety agencies with specific interoperability issues. Phase II takes place from FY 2002 through FY 2006.

Improving Interoperability Requires Comprehensive Coverage of Key Issues

The PSWN Program is active in five key issue areas that must be addressed to improve interoperability. The issue areas, and how the PSWN Program is addressing them, are highlighted below.

- **Coordination and partnerships.** Improved coordination and partnerships within the public safety community are critical to improving interoperability. In an effort to facilitate new partnerships, the PSWN Program has provided briefings for speakers at annual conferences of national public safety associations. The program also hosts regional symposiums to bring together public safety officials to share their ideas and experiences with others. The program and the National Institute of Justice will cohost a National Interoperability Forum this fall that will gather state decision makers, elected and appointed officials, and public safety executives to encourage the policy community to initiate or continue steps to improve interoperability.
- **Funding.** Limited funding for communications is a major issue faced by the public safety community. The program has developed reports and guides that highlight the issues related to upgrading and replacing public safety wireless systems and discuss sound funding strategies for the life cycle of a communications system.
- **Spectrum.** The PSWN Program recognizes that spectrum is a limited resource. The program is supporting efforts to try to acquire more spectrum for public safety and to enact rulings that flexibly allow interoperability.

- **Standards and technology.** The development of standards and open-systems architectures is a key issue that must be addressed to make progress toward improved interoperability. The program also partnered with the Criminal Justice Information Services Division of the Federal Bureau of Investigation (FBI) to assess the integration feasibility of National Crime Information Center (NCIC) 2000 through its Wireless Applications Test Program (WATP) of hardware and software.
- **Security.** To ensure that its communications systems are secure, the public safety community needs to incorporate both physical and system security measures so that public safety agencies can effectively and efficiently carry out their critical operations. The PSWN Program is developing recommended security guidelines for digital LMR systems, and is building security policy and security planning templates to assist radio managers in designing their system security policies and procedures.

***Technical Solutions for Public Safety Wireless Communications Interoperability
Are Available Today***

The PSWN Program is working with local, state, and federal entities to conduct interoperability pilots throughout the Nation. These pilot projects allow the PSWN Program to demonstrate interoperability solutions on active systems. The program hopes that these pilots will help initiate future development of interoperable systems. Pilot projects are under way in Salt Lake City, Utah; along the Southwest border; along the Vermont/New Hampshire border; in South Florida; and in Washington, DC. In addition, the program is assisting the State of Montana and has recently completed a pilot project in San Diego, California. These pilot projects were discussed in detail during the symposium. Brief descriptions of the pilot activities are provided below:

Southwest Border. The PSWN Program is conducting end-to-end tests of the pilot solution in Las Cruces, New Mexico, and El Paso, Texas. This pilot provides a unique solution for interoperability between proprietary trunked systems. The PSWN Program is implementing a fixed site talk-group-to-talk-group or conventional-channel-to-talk-group interoperability link that will allow subscriber units in one city to talk to subscriber units in another.

Montana. The PSWN Program is working with the State of Montana and its Public Safety Communications Council to develop a consolidated radio site that several entities (local, state, and federal) will share within the state. It is envisioned that the state can be a model for developing shared use sites and that lessons learned from this process can be applied to similar sites statewide. Participants on the shared site include the Montana Department of Transportation, Montana Department of Justice, Montana Highway Patrol, Montana State Lands, Carbon County, Bureau of Land Management (BLM), United States Forest Service, and the FBI. Under this program, several public safety agencies' equipment will be collocated at a single site. To that end, the PSWN Program issued requests for quotation and procurement to vendors for the collocation effort and monitored the construction of the collocation tower.

Washington, DC. The PSWN Program selected a pilot technical solution for providing interoperability in the Washington, DC, area. The solution implements tri-band (i.e., very high frequency [VHF], ultra high frequency [UHF], and 800 MHz) repeater stacks at six traffic choke points around the DC area “Beltway” and ties these repeaters into an interconnected network of local 800 MHz systems. The pilot involves a large federal presence and addresses the challenges of bringing together many different radio networks and systems operating in different bands.

Salt Lake City. The PSWN Program is supporting the Utah Communications Agency Network in Salt Lake City. Specifically, the program is working to develop a software solution to connect two 800 MHz systems in the Salt Lake City area. The solution links the two systems using Motorola’s Omnilink product to provide seamless roaming over a contiguous area. The pilot is also exploring the use of shared talk groups to improve interoperability among federal agencies in the area. Additionally, the intention is to support critical, interoperable communications during the 2002 Winter Olympic Games and into the future.

VHF Trunked System Pilot. The PSWN Program met with the integrated program team (IPT) for the pilot and began reviewing system requirements to determine the best approaches for the VHF Trunked System Pilot. The goal of this pilot project is to evaluate a trunked VHF radio system that is fully compliant with current and emerging Telecommunication Industry Association/ Electronics Industry Association 102 (TIA/EIA-102) standards. Additionally, the pilot intends to promote a better understanding of federal wireless user needs and requirements.

Vermont/New Hampshire State Interoperability Assistance. The PSWN Program supported public safety representatives in Vermont and New Hampshire in designing and implementing a cross-border interoperability solution. The proposed solution involves installing VHF radios with microwave interconnects in Vermont to achieve interoperability with New Hampshire.

Salt Lake City Pilot. The PSWN Program met with the coordinating working group and determined the optimal pilot system for the Salt Lake City metropolitan public safety community. As the host of the 2002 Winter Olympic Games, Salt Lake City is seeking enhanced functionality for current systems through comprehensive radio coverage and seamless interoperability with minimal dispatcher intervention. A cross-system interconnect solution is being implemented, allowing for wide-area interoperability among local, state, and federal public safety entities and virtually eliminating jurisdictional obstacles to interoperability.

Maritime Case Study. The PSWN Program developed an action plan and pilot strategy for improving public safety communications in southeast Louisiana. The strategy and plan were based on the results of a case study of public safety communications in the area and discussions with public safety leaders in Louisiana. The program is examining several options as part of the pilot, including developing a regional maritime wireless interoperability strategy, implementing a VHF-to-800 MHz link, implementing a console-to-console link, conducting a mobile command post upgrade, and developing a regional maritime wireless data strategy.

The Native American Tribal Nations Interoperability Assessment. The PSWN Program met with representatives of the Bureau of Indian Affairs (BIA) and the National Park Service to coordinate planning activities. This project will explore the unique communications and interoperability challenges facing tribal nations when interacting with local, state, federal, and other tribal public safety agencies.

South Florida Pilot. The PSWN Program performed field tests and coordinated activities associated with resolving end-to-end system test failures. This pilot demonstrates quick system implementation of a discrete, short-term interoperability solution for local, state, and federal users in different frequency bands. A fixed solution and a mobile solution are being implemented. The fixed solution uses leased circuits and a shared channel to link designated dispatch consoles and agencies together for interoperability. The mobile component uses a package designed to extend interoperability beyond current coverage areas by applying a modular interface system that can be mounted on a mobile platform.

The PSWN Program Is Seeking to Provide Direct Interoperability Support to the States

The program recognizes that the states are the linchpins for implementing interoperability throughout the Nation. Therefore, the program is seeking to provide direct support to individual states by initiating a dedicated state interoperability campaign. The objective of the campaign is to encourage the trend toward statewide systems development and to provide leadership and expertise on interoperability issues. As a part of the state campaign, the program will work to establish or participate in forums that are tasked with improving public safety wireless communications with their respective states.

2.2 Exploring Technical Solutions in the State of Minnesota

The State of Minnesota has several exciting communications efforts under way. During the symposium, representatives of local public safety agencies discussed a number of these efforts. These topics were presented during the second half-day of the symposium.

The State of Minnesota Is Developing an 800 MHz Statewide Shared Public Radio System

In the early 1990s, state and local government public safety services experienced rapid growth in the use of radio communications. The increased radio traffic on the public safety systems in the Minneapolis metro area created a severe interference problem among existing users. Another complicating factor was that all Federal Communications Commission (FCC) radio frequencies within the metro area were in use, which limited system expansion and in some cases, prohibited growth of radio systems. To address this problem, the 1996 Minnesota Legislature funded the construction of a metro-wide 800 MHz backbone system to meet the demands of the metro area and provide capacity for local subsystems to join the network. The implementation of the system is in progress, and it will be operational in 2002.¹

¹800 MHz Executive Team, *800 MHz Executive Team Report to the 2001 Legislature—800 MHz Statewide Shared Public Radio System*, February 2001, p. 5.

Looking beyond the Metro Project, the Minnesota Legislature directed the Office of Technology and the Departments of Administration, Transportation, and Public Safety to establish a planning committee for developing a statewide shared public safety radio system. The planning committee was directed to solicit input from local governments and major radio users and to study and assess current and future wireless communications requirements and concerns of local government.

The 800 Megahertz Executive Team designed a survey with input from local users, officials, and radio system managers to capture their common interests with respect to interoperability. The survey was distributed to 900 agencies, which then issued the survey to their subgroups. A total of 648 surveys were returned. The survey results assisted the executive team in determining the status and needs of public safety radio users. The report was distributed in draft form and discussed among local users in 10 community meetings. The feedback from these meeting was incorporated in the final report. The results were compiled in the report to the legislature and guided framing of the recommendations.

In its report, the executive team recommended the following:

1. Provide state leadership for the design, implementation, and maintenance of a statewide radio system
2. Develop and apply statewide standards and guidelines for components of the radio system
3. Establish a committee to guide system design
4. Initiate an education program focused on radio usage and develop a five-year plan for implementation.

The report outlines options for governance structure and funding but does not include recommendations in these areas because further research must be conducted and local input solicited and incorporated.

The current state administration is not requesting funding for the FY 2002-03 period for implementing the system. Thus, state and local agencies will have to work together over the next two years to explore options for addressing the needs of users outside the seven-county metropolitan area. The remaining work includes projecting additional design costs and analyzing system options, exploring alternatives for shared financing, and establishing a structure for governance that addresses local needs.

Interoperability for the Fire Services in the Metro Wide 800 MHz Trunked Radio System

This presentation focused on interoperability issues for the various fire services that are participating in the metrowide 800 MHz trunked radio system. Fire departments from Hennepin County and Carver County share this system, as do two offices of the State of Minnesota, the Minneapolis Fire Department, and West Metro emergency services providers.

Issues noted in developing a workable shared system included the numbers of entities that would share the system. Similarly, their many groups have a wide variety of operating procedures. Other complicating factors are that only some of the agencies are migrating to the system initially, and the participating agencies operate on several different bandwidths.

To achieve interoperability, the system supporters and designers also had to consider geography, in-building coverage, audio capacity, and quality.

To illustrate interoperability problems, Mr. Seal discussed two recent incidents. The first was a chemical fire that generated chlorine gas. This situation attracted protesters against the chemical manufacturer and media attention while the departments were trying to evacuate citizens from the area. Interoperability had to be achieved through dispatchers, which proved neither effective nor efficient. In the second incident, in scattered areas, protesters came to Minneapolis when the International Society of Animal Geneticists met. Protesters dropped canisters of unidentified, foul smelling liquids. Hazmat teams responded, and when testing of the liquid was found positive for cyanide, law enforcement joined the response team. Safe zones were set up around the areas where canisters were dropped.

The time lag in communications resulted in several containers being picked up instead of left for the response team. One officer had to undergo a decontamination procedure because he had touched the canister.

Generally, the various functional modes in use during these incident responses created interoperability issues.

Developing Interoperability Procedures With a Diverse Group of Radio Users

Interoperability procedures were developed for the Minnesota Metro Project using a highly interactive, collaborative approach. More than 45 volunteers from the metropolitan area cities, counties, and the state, representing law enforcement, fire, EMS, and public works actively participated throughout the process.

The large number of participants, the complexity of the system, and the need to establish procedures with nonparticipating entities led to the decision to enlist a facilitator to achieve consensus and make the overall process more efficient by seeing that agenda items were addressed, meetings stayed on track, and results were captured.

The first step undertaken was to divide the project into discrete subparts. A rollout meeting drew extensive participation. One of the first decisions was to form two structured teams—one of participants in the metro system and the other of nonparticipants. The two structured teams would avoid penalizing those entities not joining the Project 25 system. That decision was also prudent given that communications procedures would have to be established between participants and non-participants.

The process was further structured by a spreadsheet that listed all of the deliverables and their status. It was noted that meeting management proved crucial on two fronts: both the process and the content had to be managed. Mr. Lee explained how the systems managers group delayed some procedures for discussion in order to keep focused on the goals. During the six-month period, the two teams reached a consensus on 46 procedures and 13 forms and formats.

The activities of the regional task team were also highlighted. It was emphasized that system users participated in the meetings, not just managers. That participation was crucial because police departments, fire departments, and EMS groups were in at the beginning so that their needs could be addressed in the design stages. An ad hoc committee was also formed, and the system designer led an educational forum. The participation of those who wanted to join the metro system to a more limited extent was also facilitated. Again, it was noted that the inclusiveness and the thoroughness of the process were key to a successful development process and fostered system buy-in.

In going forward, plans call for maintaining the meeting procedures and planning for the development of training materials.

2.3 States Are the Linchpins for Achieving Wireless Interoperability Throughout the Nation

Statewide infrastructures are quickly becoming the most efficient, cost-effective way to improve interoperability around the country. Planning statewide systems, however, is a difficult task. Many states around the country have implemented, or are implementing, shared, statewide systems. During the symposium, representatives from Alaska, Colorado, Michigan, Nevada, and Utah related their experiences with statewide systems development. Several key themes, described in detail below, emerged during the discussions in this topic area. These topics were presented during the third half-day of the symposium.

Obtaining Funding for Large, Statewide, Wireless Communications Systems Is Possible

Obtaining funding is the critical first step in making statewide systems a reality. Acquiring the large amounts of funding needed to plan, build, and maintain a public safety communications system may be one of the greatest challenges of public safety agencies. In fact, this process often takes more than 10 years to complete. Another problem is that agencies do not typically consider life-cycle cost issues when planning a system; therefore, they encounter unanticipated costs during the system's life. As states have proceeded through this process, several common keys to success have emerged. During the symposium, officials who have funded statewide systems shared some of these keys to success with the audience. Several are described in detail below.

- Agencies must develop a core funding team. Ideally, this team would include representatives from the fields of law, finance, and accounting.

- Officials planning statewide systems should enlist consultants to help them develop business plans and validate the large dollar amounts needed for system development. Business plans must describe, in detail, what efficiencies will be gained and what services can be improved by using the new system. Consultants can also help to sell the business plan at county meetings and board meetings.
- Agencies often have a misconception that buying a radio system is a one-time purchase. As a result, they fail to realize that costs do not end when construction does. Agencies should be aware that they need to cost these systems for their entire life cycles. It was also noted that investing in upgrades is becoming an easier sell because people realize technology becomes obsolete quickly.

Federal and state grants are another way that states can fund interoperable systems. One such grant is administered by NTIA to set up demonstration projects by county and local governments. In addition, NTIA provides matching funds for states to help them maintain their systems. This funding source also helps to raise the level of awareness at the state and local levels that the Federal Government is interested in advancing technology in the public safety sector.

Florida–Public-Private Partnership. The State of Florida and Com-Net Ericsson entered into an agreement for a public-private partnership. Under this agreement, Com-Net Ericsson will build, own, and maintain a statewide communications network that meets the state’s stringent coverage requirements. More than 130 sites will be built throughout the state during an aggressive implementation time frame. Under the agreement, the State of Florida receives a statewide system complete within 36 months, a statewide data backbone, and guaranteed coverage. The infrastructure support and maintenance (20–year service level agreement), covers 6,000 subscriber radios, disaster relief mobile site (fully functional mobile site), \$300,000 purchase credit per convey tower (cap \$25.5 million), third party tenant revenue sharing (20 years: 15 percent, 30 years: 50 percent), and third party subscriber revenue sharing (5 percent).

The system comprises voice and data communications, and accommodates analog, digital, and digitally encrypted voice to provide seamless coverage statewide for 98 percent of the state agencies. Additional features include mobile coverage, selective portable outdoor coverage, a 20–year service level and access agreement, network maintenance, and ongoing technology refreshment.

Com-Net Ericsson received 130 conveyed towers with shelters, generators, and microwave systems. In addition, Com-Net Ericsson received a one-time payment of \$40 million from the State of Florida’s Accumulated Trust Fund and annual proceeds to the trust fund of \$325 million for approximately 20 years.

Financial highlights projection revenue sharing of \$200–\$640 million. The end–of–term options include a 20–year communications system with the options of buying back everything, less towers, for \$1.00, or negotiate extension, or terminate agreement. In 50 years, buy back the towers for \$1.00 each, or negotiate extension, or terminate agreement.

In Public-Private Partnership Agreements, define your requirements, take stock in your assets, determine what the limitations are and solicit solutions from potential private partners.

Michigan. Historically, the State of Michigan has been a leader in developing statewide systems. The Michigan State Police are serving as the lead agency in developing a digital, trunked, Project 25-compliant, 800 MHz system for use by all state agencies and interested federal agencies and local governments. The primary vendor for the system is Motorola. The key feature of the system is that it provides intra-agency interoperability statewide. The state funds the infrastructure, whereas federal and local agencies that wish to participate on the system provide their own end-user equipment. The system is costing the state approximately \$200 million.

The state has a full-time staff that maintains the system and the equipment that is part of the infrastructure. The state also provides a hands-on user training program, having found that users needed to be retrained after having received inadequate training from other groups.

Michigan's system is being developed in four phases. The first three phases are complete, and 120 tower sites are operational. Phase four covers the east and west areas of the Upper Peninsula. The 61 towers in this phase are under construction. The system currently has more than 2,800 subscribers from all levels of government. An additional 12 local jurisdictions intend to join the system. As new participants join the system, they discover the benefits of a shared system; and as members, they incur only minimal costs to use the backbone of the statewide system. Michigan plans to upgrade the first three phases of the system throughout 2001 to offer integrated voice and data. For more information on the Michigan system, interested parties can visit its Web site at www.mpscs.com.

Nevada. The State of Nevada is currently operating two separate systems: an 800 MHz trunked radio system, known as the Nevada Shared Radio System, and a VHF high-band trunked radio system, known as Nevada Statewide Trunked Radio System. Although both systems are set up to work statewide, there are several differences between the systems, including the participants. The proposed 800 MHz system has 57 sites and will offer voice mobile data, and telemetry, with 1,400 radios in service. The VHF system has 54 sites and offers only voice, with 1,600 radios in service. The cost of the VHF system is more than twice that of the 800 MHz system. The VHF system is considered an "open" system rather than "shared". The 800 MHz system was contracted with ComNet Ericsson and the VHF system with Motorola.

Public Safety Agencies Must Consider Several Key Issues When Planning Statewide Systems

Planning statewide systems can involve technical issues, political considerations, and coordination with peers in other organizations. As states nationwide have completed this process, several best practices have emerged. During the symposium, representatives from various states shared their experiences and some of these best practices, as detailed below.

- **Executive-level support.** Senior government support is critical for successful statewide systems. Political champions can give a project credibility, ensure funding for the project's survival, and defend the project in the face of opposition. These individuals also provide needed support during the legislative process and in supporting requests for funding public safety wireless communications systems.
- **Buy-in from local entities.** Most successful statewide system groups have found ways to involve local agencies in gaining support for system development. Well-developed and consistent presentations to important existing and potential stakeholders, including the use of professional quality videos, help obtain and maintain buy-in from the government executives, legislatures, the citizenry, and other key stakeholders.
- **Memorandum of understanding (MOU).** An MOU is a detailed agreement that describes the purpose and intent of the shared system, defines the users, and defines the owner/operator responsibilities. MOUs are sometimes used to forge partnerships and are instrumental in the early stages of planning and partnering. The MOU often allows communication lines to be opened.
- **A shared vision.** A compelling vision, with an understanding of the urgent need to improve public safety communications, is required to achieve the needed level of support. Furthermore, the state must be willing and able to assume integration responsibilities for the system and work to overcome turf and coordination issues with local and federal partners.
- **Site acquisition.** Public safety agencies should be aware of environmental and land-use regulations as they prepare to develop their sites. Local governments often have stringent limitations on tower siting, and resolving such issues can be difficult and time consuming.

2.4 *How Equipment Manufacturers and Emerging Technologies Can Help Foster Public Safety Wireless Interoperability*

The vendor panel facilitator gave equipment vendors an opportunity to dialogue with the audience with respect to issues that are uppermost in the minds of the public safety community. These issues include the status of the manufacturers' progress toward more competition in the interoperable equipment market and what can be done to bridge the gap between user needs and the needs of the manufacturers with respect to return on investment. Different vendors had differing viewpoints, but one general theme emerged: users must make themselves heard. They need to be proactive in working with the industry so that the community's needs can be understood.

The panel was invited to comment on what they believe is the most prevalent problem related to industry and interoperability. This question elicited a range of viewpoints from the panel. The Thales representative stated that his company's equipment is compatible with Project 25 standards and is operating well on legacy systems. They have found, however, that backward compatibility is sometimes a problem that cannot be resolved. On the other hand, the Nextel representative acknowledged that interoperability of their equipment is limited because of its proprietary technology. Nextel has, however, set up workarounds for the use of consoles. Nextel is also studying public safety initiatives and has determined that opportunity exists in the area of the tri-band dual-mode radio operating at 700 to 900 MHz.

The Motorola representative added that his firm's greatest challenge pertained to legacy systems. Motorola's viewpoint is that interoperability will always pose a challenge. A host of procedures must be addressed, and users and manufacturers must share lessons learned.

The key observation of EF Johnson relative to the initial panel topic was that users needed to ensure that interoperable equipment was not a sole-source environment. To that end, he encouraged a multisource supply system, suggesting that vendors buy radios from other vendors and make them work together in line with Project 25 standards.

The consensus of the panel with respect to the standards process was that the multiband environment had made interoperability an issue despite any progress in the area of standards. Further complicating factors included emerging technologies like two-slot TDMA and four-slot TDMA, which have made an open standards environment that much more difficult to achieve. Mr. Helfrich observed that his firm was a follower; it did not drive standards development. EF Johnson supplies features of terminals in response to customer influence, that is, they adopt a "wait and see" position. Nonetheless, Mr. Helfrich encouraged users to make their voices heard in order to steer the manufacturing process.

The Nextel representative advised maintaining a "short list" of ubiquitous standards that everyone must meet. He also stated that support from the Federal Communications Commission is necessary to revise and review frequency bands. And end users must drive service providers to meet a level of interoperability and consistency.

Reiterating the notion that users must play a stronger role, the Motorola representative agreed that the user-driven aspect was very important. Users must carefully examine available technologies because no single solution fits everyone's need. In essence, users and industry must partner more effectively.

The panel members stated that users needed to make themselves heard. One challenge noted was that customer demand for new features could make it more difficult to retain the features needed for interoperability. Thales was working with other manufacturers to keep those features. The Thales market, however, differs from that of the other vendors in that Thales focuses on portable radios ruggedized for military use. The Thales representative predicted that interesting developments in the military market would benefit civilian sectors. He was referring specifically to the Joint Tactical Radio System (JTRS), which is a software-based radio system platform that can cover wide bandwidths. Although this is an example of a military application that might be converted for civilian use, it has a major drawback—the radio currently costs \$7,000 a set. Another hindrance to wider use of this system is that broader band antenna technology is needed for performance enhancement.

In continuing the presentation, each vendor touched on the manufacturers' need to foresee a return on investment before undertaking a major design effort. Understandably, the industry is market driven; and cost is a major factor for the public safety community. Trade-offs exist in that functionality must be weighed against cost when considering architecture design.

Given an opportunity for audience questions, an attendee who was an official of the Metropolitan Radio Board wondered why the board had received only one response to its RFP for subscriber equipment. And that response was from Motorola. The official questioned whether vendors would really compete in the 800 MHz trunked P25 market. The EF Johnson representative noted that his firm already had a mobile device available for that market, and portables would be available at the end of 2001.

Addressing the same point, the Thales representative stated that his firm did not yet have equipment that operated in the 800 MHz band. He thought that the trunking feature would pose a problem for Thales. Nonetheless, he said Thales was a year-and-a-half away from having a product that would satisfy both 800 MHz and trunking specifications.

Vendors were asked to state when they might have a UHF 406–420 band or 450–470 band, 800 MHz trunked, Project 25 fully compliant system. The EF Johnson representative said that was beyond what his firm could afford as an investment project. Motorola stated it would have VHF/UHF conventional CF1, trunked UHF/VHF products by mid-to-late 2002. Thales was said to be looking at trunking next, then 800 UHF thereafter.

A Standards Update: APCO 25

This presentation provided a comprehensive overview of the status of the full suite of Project 25 (P25) standards. P25 is a long-term standards development process that has drawn local, state, and federal public safety officials together with the goal of promoting compatibility through open standards. Attendees also received a brief overview of Project MESA, which is a cooperative effort of the European Standards Institute, the Telecommunications Industry Association (TIA) in the United States, and the U.S. and European public safety communities.

It was noted that several key advantages are offered by P25 Phase 1 FDMA standards as compared with other standards. For example, only P25 standards can provide coverage that approximates analog. They are also the only written standards that address all public safety bands. Other advantages offered to public safety communities through the efforts of the Project 25 Steering Committee are that P25 enables a planned migration path, provides a true direct mode capability, and is scalable. Moreover, P25 improves spectrum efficiency because it enables recycling of spectrum.

Motorola is the only equipment manufacturer currently building infrastructure that meets the P25 standards, but the P25 group is trying to change that in order to promote competition in the marketplace and give users choices. With respect to encouraging competition, the P25 Steering Committee advises users to define their needs and investigate technologies and manufacturers. In other words, users should consider their options and work to influence the manufacturing process. As Mr. Jorgensen noted, Project 25 is not the only option.

Mr. Jorgensen continued his presentation with an overview of Project MESA, which is an effort to create a standard for wideband, high-speed, ubiquitous data transmission. MESA technology will enable extensive mobility for emergency and safety applications.

Project MESA is sponsored by an international partner group, but anyone can participate. In fact, the expense of the MESA project virtually dictates a public-private partnership that will allow participants to take advantage of technology convergence and leverage knowledge. It's an attempt to achieve a global standard. As Mr. Jorgensen observed, MESA technology will allow for a magnitude of data information movement that is currently unattainable. He said that public safety providers need to be aware of opportunities to participate in this effort so that they have some control over the future of technology that will impact them daily.

Key applications for MESA technology-enabled equipment include high-speed wireless data from incident sites (multiple transmission rates), voice command and control, airborne audio and video surveillance, electronic messaging, fingerprint and iris scanning, and the transmission of building, structural, electric, plumbing, and natural gas plans. MESA will also enable the use of Global Positioning System for individual and unit tracking, surveillance tracking beyond law enforcement applications, remote mapping, and medical bio-telemetry information. It will also provide the ability to use robotics for locating victims of natural or man-made disasters.

He concluded by noting that it was envisioned that Project MESA would achieve a global market.

Crossband Technology Operational Evaluation

In his presentation, Mr. Frantz outlined the AGILE (Advanced Generation Interoperability for Law Enforcement) program, which was created in 1998 to consolidate the interoperability projects at the National Institute of Justice (NIJ). This is a significant effort of the NIJ's Office of Science and Technology (OST).

As Mr. Frantz noted, the AGILE program comprises three major initiatives: research, development, testing, and evaluation (RDT&E); standards identification, development and adoption; and outreach and technology assistance. Through these initiatives, short-term interoperability solutions can be tested, and long-term interoperability solutions can be implemented through standardization efforts.

In the R&D area, NIJ has developed partnerships with local, state, and federal entities to technically and operationally evaluate interoperability solutions. As an example, Mr. Frantz discussed an operational test bed set up with the Alexandria, Virginia, Police Department (APD). The operational requirement is to allow officers to communicate directly with other officers within multiple agencies in the metropolitan Washington area. The technology being tested is the fixed-site Gateway Communications Subsystem based on the ACU-1000 crossband switch. The subsystem provides direct connectivity between the radio systems of the APD and departments with overlapping or adjacent jurisdiction, even though these systems operate at different frequency bands. The ACU-1000 technology was operationally tested originally with the U.S. Secret Service, to provide an interagency link during the presidential inauguration, and has also been tested with the U.S. Park Police, among other groups.

In conjunction with the APD AGILE test bed, the rapid image dissemination for missing and exploited children software capability was investigated. The APD Youth Services unit conducted the test of this wireless data capability. The scanned photos were then posted on the APD mobile data browser site. The tests revealed that the size of the scanned photo images needs to be reduced for easier transmission and downloading. The next step is to test this capability in a mobile environment. Plans also call for this rapid image capability to be applied to other applications, such as missing persons and domestic violence.

Another wireless data effort that Mr. Frantz highlighted was the Capital Wireless Information Network project, the goal of which is to develop an integrated transportation and criminal justice information wireless network in the Washington metropolitan area. This is a multistate, multiagency, multidiscipline wireless network sponsored by PSWN, NIJ/OSTP, the Virginia Department of Transportation, the Maryland State Highway Administration, and the U.S. Department of Transportation.

It was noted that beyond evaluating technologies for interoperability, the test beds were addressing policy and procedure issues and the impact of the new technology on the organization. Results would be shared with local and state law enforcement communities.

In the area of information technology standards, the AGILE program is providing access to technology expertise, supporting working group meetings, and publishing resulting standards. Plans also call for working with justice system disciplines and public safety in developing a suite of standards. With respect to outreach activities, the example cited was the AGILE program support for the 2001 National Public Safety Wireless Interoperability Forum in partnership with the PSWN Program.

For more information about the many components of the AGILE program, Mr. Frantz directed attendees to the program's Web site: www.agileprogram.org.

2.5 Public Safety Responses to Past Mass Casualty Incidents Highlight the Benefits and Needs of Interoperability

The main purpose of this topic area was to highlight how large-scale incidents in various states and regions reveal ongoing interoperability problems. During the symposium, public safety representatives shared their experiences and solutions to incidents with the audience. Speakers included officials who were involved in the actual emergencies. Two key themes emerged in this topic area. These themes are described in detail below.

Various Incidents Highlight Interoperability Challenges Within States and Regions

Every day, many types of incidents occur that reveal the need for a coordinated public safety response. Interoperable communications are vital to the swift resolution of these incidents. Several of these incidents were discussed at the Minneapolis Symposium. Each of these incidents highlighted the vital role of interoperable communications.

St. Cloud, Minnesota Incident. On December 11, 1998, at 11:31 a.m. there was natural gas explosion in downtown St. Cloud. A cable television company was installing fiber-optic cable. Anchors were being drilled to secure poles when a natural gas pipeline was ruptured by one of the anchors. The cable company contacted the gas company and its dispatcher called the fire department. A fire engine was dispatched to the scene. Twenty-two minutes after the fire engine was dispatched, the explosion occurred. Six buildings in a four-block radius were completely destroyed. There were 19 people injured and four fatalities.

Interoperability was critical during the response to the incident. The local police and fire departments used 800 MHz radio systems and the EMS responders used a VHF system. Unfortunately, neither of the responding agencies could interoperate.

Salt Lake City Incident. On August 11, 1999, at 12 noon, a tornado touched down in downtown Salt Lake City. It was the worst tornado in 100 years. The path of destruction was five miles long and a quarter-of-a-mile wide. The tornado was designated as F2 severity. There were 100 hundred people injured—14 seriously and one fatality. Three thousand homes and businesses were destroyed including one hotel and the Delta Center. The National Association of Retailers Convention had two of its outdoor tents completely destroyed.

A number of public safety agencies were mobilized for this incident using multiple pagers, portable phones (cellular, PCS, etc.), land line phone systems, four emergency 911 dispatch centers, and mobile data systems (CDPD). Interoperability was a problem during the response to the incident. There was no common communication system among the incident responders. As a result of the incident, UCAN has constructed a nine-county 800 MHz radio system. More than 50 agencies will migrate to this radio system. Radios are programmed using a common programming scheme and common call regional channels, and offer access to multiple dispatch centers and consolidated dispatch centers.

Successful disaster management requires good communications—in one band, with prior planning and agreements, sufficient dispatch resources, common response protocols, and the willingness of agencies to set aside political boundaries and serve the citizens.

There Are Best Practices That Can Improve Interoperability During Tragic Incidents

During each of these incidents, public safety officials were forced to quickly resolve their interoperability problems. Often these solutions, while not optimal, worked. However, the presenters indicated that had longer-term solutions been employed, there might have been more effective interoperability during these incidents. Participants shared several of the following best practices that could help improve interoperability during mass casualty incidents:

- Establish regional and statewide communications and mutual aid plans
- Develop a regionwide incident command system to help coordinate activities during an emergency
- Establish working relationships among hospitals, fire/EMS, schools, and local law enforcement
- Ensure operational readiness through deployment planning, training, drilling, and equipment acquisition.

Shared Key Management Between Government Agencies

The U.S. Customs Service (USCS) and U. S. Immigration and Naturalization Service (INS) collaborated to develop a means of networking together separate agency-specific over-the-air-rekeying (OTAR) key management centers to enable real-time voice privacy key sharing. INS and USCS share common border responsibilities, requiring protected interoperable communications among field officers. The agencies established a memorandum of understanding; outlining operational need for cryptographically protected interoperability, manual key load of 10,000 radios, and extensive networks between USCS' OTAR network and INS' OTAR network. Solutions for both agencies are the effective exchange of any operational traffic key desired and an encrypted interoperable communications between USCS and INS personnel.

Future considerations include extending networking to the INS Master Key Management Faculty (KMF) and the USCS KMF, making the KMF client server environment operating fully automatic, promoting the idea of a Federal Interoperable Traffic Key, and promoting an effort to migrate to 256-bit key Advanced Encryption Standard.

2.6 *How Federal Initiatives Are Working to Promote Wireless Interoperability*

Federal agencies have been charged by the Congress to consolidate communications systems, limit spending, and create interoperable solutions with other federal agencies. Where appropriate, federal agencies intend to partner and share resources with state and local public safety agencies. The main purpose of this topic area was to discuss certain large-scale federal system developments and federal initiatives related to interoperability. One key theme emerged in this topic area. The theme is described in detail below.

Federal Agencies Are Supporting and Promoting Solutions for Interoperability Throughout the Nation

Representatives from National Public Safety Telecommunications Council (NPSTC), Federal Communications Commission (FCC), Department of the Treasury, and National Telecommunications and Information Administration (NTIA) were present at the Minneapolis Symposium to discuss their roles and ongoing progress in promoting interoperability.

NPSTC. NPSTC is a federation of 13 associations that promote and facilitate the implementation of recommendations from the Public Safety Wireless Advisory Committee. Their goal is to promote greater interoperability, cooperation, and information exchange among federal, state, and local public safety agencies nationwide. NPSTC also serves as a collective voice for the transmission of public safety communications and interoperability concerns to the FCC, the Congress, and elected and appointed officials. NPSTC also offers some funding for the use of newly allocated 700 MHz public safety spectrum.

FCC. The FCC, which is directly responsible to Congress, regulates the licensing and use of radio transmitters by state and local governmental and non-governmental entities engaged in public safety activities.

On February 15, 2001, the FCC released Public Notice DA 01-406. In this notice, the FCC's Wireless Telecommunications Bureau informed the states and jurisdictions that they may apply for the 2.4 MHz of spectrum in the 700 MHz band set aside for public safety state licenses. Applications must be made prior to December 31, 2001. FCC rules facilitate partnering of FCC-licensed state and local government entities with federal entities in the 700 MHz band.

NTIA. NTIA serves as the President's principal advisor on telecommunications and information issues. It formulates telecommunications policy for the administration and is the federal spectrum regulator and manager. As such, NTIA plays an integral role in allocating the 700 MHz band, as well as in governing its use by federal entities. Because federal entities cannot hold licenses nor can they develop separate 700 MHz systems, they must find ways to join state and local agencies, thus providing opportunities to create partnerships that will benefit everyone.

Treasury. Treasury is also planning to implement a nationwide wireless system to support all its components on a shared infrastructure. Because of mandates driven by the Congress and NTIA, Treasury is planning to implement a TIA/EIA-102 (Project 25) compliant narrowband radio system known as the Integrated Treasury Network (ITN). Treasury is working to develop partnerships to use non-Treasury-owned systems, both state and federal.

A phased regional approach is being used to implement the ITN. There are six phases for implementation, the sequence of which will be based on mission priorities. Treasury is continuing to examine several issues that will add more value to the ITN proposition. For example, Treasury is examining a detailed plan for transitioning legacy systems to the ITN and exploring centralized management and operations and detailed capacity planning for conventional versus trunking determinations, as well as researching a mix of solutions that includes commercial services, sharing with local entities, and fee-for-service.