



Achieving Interoperability Through Cooperation and Coordination

Honolulu, Hawaii
Post-Symposium Report

Final

November 2000

FOREWORD

The Honolulu, Hawaii, Public Safety Wireless Network (PSWN) Program Symposium began October 10, 2000, and concluded October 12, 2000. Booz·Allen fulfilled all of the general symposium and facility requirements and ensured that all attendees were registered on site, sign-in was monitored, and pre-conference materials were distributed. 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 also be sent to those who attended the symposium.

TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1 Purpose	1
2. SYMPOSIUM TOPICS.....	3
2.1 The PSWN Program Is Developing and Providing Technical and Policy Solutions to Public Safety Wireless Interoperability Challenges	3
2.2 Regional Approaches to Interoperability in Hawaii.....	7
2.3 Successful Approaches and Policy Solutions to Public Safety Wireless Interoperability on a Statewide Level.....	10
2.4 Wireless Data Technology Developments and Issues Related to Statewide, Shared Public Safety Wireless Communications.....	13
2.5 Public Safety Responses to Past Mass Casualty Incidents Highlight the Benefits and Needs of Interoperability	17
2.6 How Large Federal Agencies Coordinate the Development of Interoperable Wireless Communications Systems.....	19

1. INTRODUCTION

The Public Safety Wireless Network (PSWN) Program sponsored the Honolulu, Hawaii, PSWN Program Symposium from October 10, 2000 through October 12, 2000. The symposium was co-hosted by the State of Hawaii and the Honolulu Police Department. 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; and St. Louis, Missouri. 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 Honolulu Symposium, 198 public safety officials from around the country assembled to discuss various topics relating to public safety wireless communications interoperability. Chief Lee Donohue of the Honolulu Police Department and Hawaii's Lieutenant Governor Mazie K. Hirono provided introductory and keynote remarks, respectively. During their comments, each acknowledged the importance of public safety communications, as well as the need for interoperability among public safety agencies. The speakers praised the cohesive efforts of the law enforcement community, especially given the events of the Sacred Falls incident. Additionally, the speakers encouraged attendees to work together, and share their experiences and successes, in hopes of continuing to improve interoperability in Hawaii and nationwide.

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 ask LMR equipment manufacturers questions about their planned technologies. Attendees were also able to learn about region-specific issues (e.g., the Sacred Falls incident, the Columbine High School shootings, and the Air Florida crash) that required significant wireless communications interoperability.

1.1 Purpose

This report provides a detailed summary of the events of the Honolulu, Hawaii, PSWN Program Symposium. It is designed to be a historical resource to 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/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 throughout 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 a specific topic are provided and thoroughly explained using information presented during briefings and answers to questions asked during panel sessions.

2. SYMPOSIUM TOPICS

The Honolulu, Hawaii, Symposium was organized into six key topic areas. The session on each topic area generally lasted for a half-day of the symposium. The key topic areas included presentations from various people, ranging from members of the public safety community to PSWN Program managers. Certain topic areas also included panels of experienced public safety officials who answered questions from the audience. The topics were selected to give the symposium attendees a flavor of 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
- Regional Approaches to Interoperability in Hawaii
- Successful Approaches and Policy Solutions to Public Safety Wireless Interoperability on a Statewide Level
- Wireless Data Technology Developments and Issues Related to Statewide, Shared Public Safety Wireless Communications
- Public Safety Responses to Past Mass Casualty Incidents Highlight the Benefits and Needs of Interoperability
- How Large Federal Agencies Coordinate the Development of Interoperable Wireless Communications Systems.

During the sessions, 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

During the past four 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 managers described their 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 panel discussion on the technical solutions that the PSWN Program is developing. These topics were presented during the first half-day of the symposium.

Improving Radio Interoperability Can Save Lives

The PSWN Program's vision is that of seamless, coordinated, and integrated public safety communications for the safe, effective, and efficient protection of life and property. Specifically, the program is focused on improving wireless interoperability between 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.

In its leadership position, the program is developing 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 the program begins to offer interoperability services to local, state, and federal public safety entities. Public Safety WINS is being developed as a multi-media package that includes video and CD-ROM. The video portion of Public Safety WINS was shown during the Honolulu Symposium.

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 provided below.

- **Coordination and partnerships.** Improved coordination and partnerships within the public safety community is 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.
- **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 make rules 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 is also partnering with the National Telecommunications and Information Administration (NTIA) to fund the development and testing of additional components for voice standards for digital LMR systems.

- **Security.** To ensure that its communications systems are secure, the public safety community needs to incorporate security features into its communications systems. The PSWN Program is developing recommended security guidelines for digital LMR systems and is developing security policy and security planning templates to assist radio managers in designing their system security policies and procedures.

***Real-Life, Technical Solutions for 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 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:

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 megahertz (MHz) systems in the Salt Lake City area. The solution ties the two systems together using Motorola's Omnilink product to provide seamless roaming over a contiguous area. The pilot is also exploring the use of shared talkgroups to improve interoperability among federal agencies in the area. Additionally, the pilot hopes to support critical, interoperable communications during the 2002 Winter Olympic Games.

Southwest Border. The PSWN Program is attempting to demonstrate wireless connectivity between two systems using different trunking protocols (i.e., a Motorola system and an Ericsson system) in El Paso, Texas, and Las Cruces, New Mexico. The program plans to use the pilot agencies' existing frequencies to provide interoperability in areas where the two systems coverage overlaps.

New Hampshire/Vermont. The PSWN Program is working to address cross-border interoperability issues along the New Hampshire and Vermont border. The main objective of the project is to implement a solution that allows users to cross into the other state, and either talk on their "home" system or the other state's system. The program is still considering technical options for this project. One specific option is a console-to-console patch between the two systems.

South Florida. The PSWN Program is working to develop a solution for interoperability in three South Florida counties: Broward, Dade, and Monroe. The program is hoping to provide interoperability between federal and local public safety agencies that would need to communicate should a mass migration of immigrants from Cuba occur. The program is attempting to provide console-to-console connectivity between the participants and link disparate systems by deploying three JPS ACU-1000 switches in the area. The program is also investigating reprogramming available mutual aid channels into existing radios as a means for providing interoperability.

Washington, DC. The PSWN Program is working to address unique issues in the Washington, DC, metropolitan area. The metro area includes portions of two states, Maryland and Virginia, all of the District of Columbia and a large presence of federal agencies. The goal of the pilot is to provide interoperability by connecting participants in different frequency bands. Most of the local agencies in the area are on 800 MHz systems while the states are on very high frequency (VHF) and low band systems, respectively. The federal agencies operating in the area primarily use VHF radios. The program is working to connect local, state, and federal agencies using either a switch concept or tri-band repeaters.

Montana. The PSWN Program is working with the State of Montana, and its Public Safety Communications Council, to develop a consolidated radio site that will be shared by several entities (local, state, and federal) within the state. It is envisioned that the state can be a model for developing shared use sites within the state 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 Federal Bureau of Investigation (FBI). Unfortunately, progress has been slowed by the summer wildfires in the area.

San Diego. The PSWN Program has recently completed a pilot project in the San Diego, California, area. The project's objective was to improve interoperability between the Regional Communications System, which provides communications for 161 agencies in San Diego and Imperial counties, and Federal Government agencies operating in the area. Additionally, the pilot was designed to demonstrate interoperability across disparate frequency bands and radio systems. The PSWN Program developed a transportable communications system to demonstrate this interoperability. Specifically, the pilot used a JPS ACU-1000, which was deployed in a mobile command vehicle, to connect the participants. The PSWN Program provided radios that were added to a mobile command van, as well as some of the labor needed to integrate the switch into the van. The solution was successfully demonstrated during a tabletop exercise in May 2000.

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 Regional Approaches to Interoperability in Hawaii

The State of Hawaii has several exciting communications efforts under way. During the symposium, representatives of local public safety agencies discussed many of these efforts. Three key themes, described in detail below, emerged during the discussions in this topic area. Additional presentations addressed other telecommunications initiatives in the State of Hawaii. These topics were presented during the second half-day of the symposium.

The Islands of Hawaii Are Updating Their Radio Systems

The island geography of Hawaii makes it truly unique within the United States. The islands introduce unique political, governmental, and geographic challenges that obviously affect public safety communications and interoperability within the state. The state is divided into the following four counties: the City and County of Honolulu, County of Hawaii, County of Kauai, and the County of Maui (which also encompasses the islands of Kahoolawe, Lanai, Maui, and Molokai). These counties are in various stages of implementing new radio systems. The counties emphasized the need for coordination throughout the state during these efforts. During the symposium, each of these counties provided updates about their systems.

Honolulu. The City and County of Honolulu has jurisdiction over the island of Oahu. The Honolulu Police Department is implementing an Ericsson 800 MHz, trunked radio system. The system has more than 5,000 users, including the Honolulu Police Department, Oahu Civil Defense, Department of Public Safety, and the FBI. Several other state and local entities use the system's microwave backbone. The system is overseen by the 800 MHz Steering Committee, which is composed of representatives from state and local agencies involved in the system.

Hawaii. The "Big Island" of Hawaii is in the embryonic stages of developing a countywide system. Its current conventional VHF radio system is considered obsolete. The county is securing funding for a new system and addressing the effects of the refarming of 2 gigahertz (GHz) microwave spectrum. The county believes there are significant opportunities for cooperation and sharing within its boundaries.

Kauai. The County of Kauai has implemented a Motorola 800 MHz, trunked radio system. The system currently has users from all levels of government. At the local level, users include police, fire, transportation, and civil defense. At the state level, users include the Department of Transportation, Department of Land and Natural Resources, and State Civil Defense and at the federal level, users include the United States Coast Guard and the FBI. The county is upgrading its three existing sites, building five new remote sites, developing two remote conventional sites, and building a new radio/E-911 dispatch center.

Maui. The County of Maui has implemented an 800 MHz E.F. Johnson radio system. The system has about 900 users, including the local police, public works, and the state Civil Defense Agency. The system can support 256 talkgroups, although only 35 are in use. Because most of the county's agencies are on the system, there are minimal interoperability problems within the county. However, there are effects on interoperability when these county agencies try to communicate with other localities and state and federal agencies. The county is planning to buy additional radios to communicate with these entities.

Many Challenges to Interoperability Exist in Hawaii

The fact that all of the counties have, or are implementing, disparate 800 MHz systems, has introduced several challenges to improved interoperability. First, the representatives from the counties recognized the need for coordination between each of the counties and the state. They suggested the need for a statewide committee to discuss the development of a statewide system with involvement from the counties. Additionally, the panelists identified the need to share system costs. Finally, the state needs flexibility in Federal Communications Commission (FCC) rules about frequency reuse. The state's low population density and terrain make it difficult to meet current spectrum requirements. Flexible rules would give the state many more options in its systems developments.

Partnerships Across Governmental Levels Are Improving Interoperability in Hawaii

The State of Hawaii has several examples of officials from all levels of government joining together to share resources and improve interoperability. During the symposium, several presenters briefed the audience on activities within, and related to, Hawaii. These activities are described below.

Rainbow Communications System. In Hawaii, state and federal agencies have developed a microwave backbone that allows communications connectivity between the islands. The system, known as the Rainbow Communications System, was established more than 20 years ago as the result of the need of several federal agencies to expand their communications systems in Hawaii. Concurrently, Hawaii was seeking to upgrade its communications system. The Rainbow Communications System is not a statewide, interoperable communications system, but a shared backbone for state and federal agencies. Each agency came to the table with different resources. The federal agencies brought financial support and spectrum availability, while the state entities managed the land or facilities where the communications sites were needed. The Rainbow Communications System is governed by the Rainbow Executive Council, which is led by United States Customs and composed of representatives from each of the six—partner agencies. Each group owns a part of the system, which ensures active and ongoing partnership and allows other agencies to use their resources.

Communications Interoperability Task Force. The State of Hawaii has identified a need for a task force to focus on interoperability issues. The primary driver for this task force is the threat of terrorist activity and mass casualty incident responses. Furthermore, each of the island counties operate disparate radio systems while the state operates upward of six independent systems. Also complicating matters is the significant presence of federal agencies with wireless operations in the state. All of these radio systems lead to problems with communications among key first responders to incidents.

The task force evolved to address these needs. The group consists of representatives from local, state, and federal government who have an interest in addressing interoperability problems within the state. These options include implementing the Digital Network Management System, obtaining and installing several ACU-1000s from the Department of Justice, and investigating shared infrastructure opportunities such as a statewide system with participation from all levels of government. The task force is currently an informal group with no tasking and no commissioning from the governor. The group is evaluating options for improving interoperability. Critical next steps for the task force include formalizing its group, developing a memorandum of agreement for the participants, and evaluating a unified command system for crisis events.

PACMERS. PACMERS is a Department of Defense initiative to provide a fee-for-service LMR system in the western states of Hawaii and Alaska. The four branches of the military, the Army, Navy, Air Force, and Marines, support the project. The premise is to provide seamless, interoperable radio service for civil response and humanitarian missions in these states and related territories. PACMERS has several key objectives. First, the system is intended to provide Project 25 based radio service that meets federal narrowband requirements. Second, the system should provide more effective military support to civil agencies. Third, the fee-for-service construct is intended to encourage others to join the system and share in the benefits of the system. Finally, PACMERS intends to use a contract vehicle that makes it easy for others to purchase equipment to use on the system. The PACMERS program is in the acquisition phase and was not able to offer system details due to the competitive nature of the procurement.

2.3 Successful Approaches and Policy Solutions to Public Safety Wireless Interoperability on a Statewide Level

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 Pennsylvania, Michigan, and Alaska shared 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.

States and Regions Are Successfully Implementing Shared, Interoperable Wireless Systems

Statewide and regional systems are being developed in many areas of the country. The development of these systems takes time, dedication, and a commitment to sharing resources. During the symposium, speakers from Pennsylvania, Michigan, and Alaska provided updates on developments involving their states.

Pennsylvania. The Commonwealth of Pennsylvania is implementing an innovative trunked, 800 MHz statewide system. The primary system vendor is M/A Com and it is developing the system using a voice-over-Internet Protocol (VoIP) backbone. The system is being designed to provide 95 percent mobile coverage. The commonwealth has secured \$222 million of funding for the project. The \$95 million is for the trunked radio system and the remainder is for the sites and microwave facilities. The commonwealth is fully funded for infrastructure only. Users will have to provide their own equipment to access the system.

There are 25 state agencies that provide more than 25,000 users on the system. Pennsylvania's system is being designed and implemented in seven regions, each of which is controlled through a regional operations center. To date, the commonwealth has completed nine pilot sites throughout the state and 37 sites in the southeastern regions of the state. An additional 42 sites are being constructed. For more information on the Pennsylvania system, interested parties can visit its web site at www.radio.state.pa.us.

Michigan. The State of Michigan has been a leader in the development of statewide systems for years. In the state, the Michigan State Police is 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. As with Pennsylvania, Michigan is funded to provide the infrastructure while federal and local agencies that wish to participate on the system provide the end-user equipment. The system is costing the state approximately \$200 million.

Michigan's system is being developed in four phases. The first three phases are complete, and 120 tower sites are operational. Phase four is the upper peninsula of the Michigan. 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. Michigan plans to upgrade the first three phases of the system to offer integrated voice and data throughout 2001. For more information on the Michigan system, interested parties can visit its web site at www.mpscs.com.

Alaska. The State of Alaska has initiated a project, the Alaska Land Mobile Radio System (ALMRS), to provide seamless, interoperable radio communications to the Department of Defense (DoD), federal and state agencies, and local governments. ALMRS is unique because it is being jointly developed by the DoD, federal agencies, and the State of Alaska. ALMRS will provide a statewide infrastructure that will be totally interoperable and can be used for daily activities and mutual aid responses. Agencies that wish to participate in the system will have to provide their own end-user equipment. ALMRS is being designed and implemented using a four-zone approach. It is envisioned that ALMRS will be fully implemented by 2002.

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. These best practices and additional considerations for developing statewide systems are listed 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 argue for the project against 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 systems 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.

- **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. Often times local governments have stringent limitations on tower siting and resolving these issues can be difficult and time consuming.

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 5 to 10 years to complete. Another problem is that agencies do not typically consider life-cycle cost issues when planning a system and therefore find unexpected costs arise 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 a lawyer, financier, and an accountant.
- Officials planning statewide systems should use consultants to help them develop business plans and validate the large dollar amounts needed to develop these systems. 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.
- Often times agencies have a misconception that buying a radio system is a one-time purchase and they fail to realize that costs don't 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 pricing 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.

2.4 Wireless Data Technology Developments and Issues Related to Statewide, Shared Public Safety Wireless Communications

Wireless data is among the latest emerging technologies having an impact on public safety communications. Wireless data is also proving to be a viable solution for interoperability among public safety agencies operating on disparate radio systems. Many states are developing statewide data systems or upgrading their voice systems to be data-capable. During the symposium, representatives from Illinois and North Carolina shared their success with statewide data systems. The Federal Government has also identified wireless data technology and several other key issues as important to improving interoperability. Presentations on these topics were also made during the symposium. Several key themes, described in detail below, emerged during the discussions in this area.

States Are Developing Wireless Data Networks as a Means To Achieving Interoperability

A number of wireless data systems are being developed nationwide. These systems are providing an alternative way to address many interoperability challenges. Two states, Illinois and North Carolina, highlighted their statewide data systems during the symposium. Their systems are described below:

Illinois Wireless Information Network. Illinois is rolling out a statewide wireless information network based on Cellular Digital Packet Data (CDPD), which is a standard-based, data-only, secure network. The system is known as the Illinois Wireless Information Network (IWIN). The project has involved more than six vendors and will be completed in four phases, with full statewide coverage expected by the end of the year. After one year of service IWIN is being used by six state agencies and 52 local agencies. A total of 3,000 users are on the system and the Illinois State Police is adding about 30 units per week. Any user on the system can send text messages and other data to another user on the system anywhere in the state. This capability is providing real-time interoperability in Illinois.

Criminal Justice Information Network. The State of North Carolina is implementing an 800 MHz private data network known as the Criminal Justice Information Network (CJIN). The goal of CJIN is to make mobile data available to all public safety agencies within the state. Its stated objectives include improving officer safety, increasing officer efficiency and effectiveness (i.e., reduce paperwork, reduce errors, achieve better use of staffing), and improving interoperability. In contrast to Illinois, North Carolina elected to build its data system privately because not everyone in the state was served by a cellular provider. This limitation would not allow the state to provide service to all public safety agencies.

To date, the state has implemented the system on 114 base stations. More than 150 agencies, and a total of 4,500 users, are now using the system. The cost of the project will be about \$16 million. The state was able to keep the cost low because the system was built with shared resources. The state provides the base stations, data transmitters, and access to the 800 MHz system while local agencies provide tower space, tower houses, and use of spare 800 MHz frequencies available in their area.

The Federal Government Is Investigating Interoperability Using Wireless Data

The Federal Government is testing wireless data applications for the public safety community through the National Crime Information Center (NCIC). The NCIC was created by the FBI in 1967 to help criminal justice agencies improve their operations by providing a nationwide information system to support investigations. The system is undergoing a major upgrade known as NCIC 2000. The success of NCIC and its increased usage, coupled with technological advances such as mobile data terminals, laptops, and increased capabilities of local, state, and other federal systems, led to the NCIC 2000 initiative. During the Honolulu Symposium, representatives of the NCIC's Wireless Applications Test Program briefed attendees on the current status of activities within their program.

NCIC 2000 will provide many features in addition to its current offering. These enhanced features include fingerprint images, enhanced name searches, probation and parole lists, on-line manuals, improved data quality, information linking, mugshots, other images (e.g., vehicles, boats, or vehicle and boat parts), convicted sex offender lists, access to SENTRY (an index of individuals incarcerated in the federal prison system), delayed inquiry, and an on-line ad-hoc inquiry. NCIC 2000 went on line in July 1999 and transmitted its first mug shot over CDPD on August 18, 1999.

The PSWN Program will be working in conjunction with the NCIC 2000 program to evaluate the feasibility of integrating NCIC 2000 into various mobile data communications systems. This wireless applications test program will assess the reliability and ease of use of the NCIC 2000 hardware and software in different wireless environments. The wireless applications test program will also assist in developing guidelines for interface to various wireless communications and increase liaison support between local, state, and federal criminal justice agencies on mobile data communications. To date, the test program involves more than 40 vendors, 10 public safety agencies, and 4 different infrastructures (e.g., CDPD, private voice/data system). The wireless applications test program's next steps include testing these technologies in an operational environment. Several local, county, state, and federal agencies have expressed interest in participating in the field tests.

The PSWN Program Has Recognized Security as an Important Issue Related to Interoperability

The Federal Government, through the PSWN Program, has identified five key issue areas related to interoperability—coordination and partnerships, funding, spectrum, standards and technology, and security. The program has performed a variety of studies and analyses related to these issue areas. At the symposium, the program overviewed systems security and highlighted how developing system security guidelines and policies for wireless radio systems was often overlooked. The program also encouraged audience members to recognize security needs as a critical part of their thinking as they develop and upgrade systems.

The PSWN Program has developed a number of short-term solutions to communications security. They are—

- Agencies must raise awareness of systems security threats.
- Agencies can take steps to ensure the security of information transmitted on their radio systems.
- Agencies can take steps to protect the integrity of data in their computer systems.
- Agencies can take steps to ensure their systems are available during disasters or unplanned outages.

The PSWN Program has also developed several tools to help agencies in their security planning. These tools include—

- *The Digital Land Mobile Radio System Security Guidelines Recommendations*, which offers a set of security guidelines specifically designed for digital LMR systems
- *The Land Mobile Radio System Recommended Security Policy*, which is designed to help agencies developing their own system security policy
- *The Land Mobile Radio System Security Planning Template*, which is designed to be used as a model that can be tailored to any public safety wireless system.

Equipment Manufacturers Discussed the LMR Environment and Future Plans

During the fourth half-day of the symposium a panel of LMR equipment vendors addressed the future of LMR from the equipment manufacturers' perspective. The equipment manufacturers are key players in improving interoperability. They can affect standards development, ensure competitive prices, and add features that improve the delivery of public safety services. The Honolulu Symposium was the second in which vendors were invited to join a panel where they answered questions directly from the users and were asked to comment on future plans for their products. The vendors attending the panel discussion were Motorola, Nextel Communications, E.F. Johnson, Com-Net Ericsson, Racal Communications, and JPS Communications. Highlights of their discussion are provided below.

Vendors See Many Challenges in Improving Public Safety Communications Interoperability

The equipment manufacturers are optimistic about the future but still see many challenges that prevent interoperability in the public sector. First, it was noted that true unit-to-unit interoperability cannot happen without open standards. Additionally, the lack of standards creates procurement and competition problems that limit innovation in the marketplace. Another problem is the public safety community's continued reliance on proprietary systems, which many vendors believe is not in its best interests longer term. Additionally, equipment manufacturers agreed that there is confusion among users and how they want to migrate their systems given rapidly advancing technology. Finally, there seems to be confusion in the marketplace about Federal Government mandates.

Standards Are Necessary for Public Safety Wireless Communications Equipment

As stated above, standards are essential to the development of future radio systems if interoperability is to be achieved. Currently, there are standards for most, if not all, major electrical components (e.g., VCRs and computers), but there are only a handful of standards for LMR systems. Although certain standards have been generally accepted, none have been widely adopted and this limits competition and the development of new features for users.

The most widely accepted standard in the United States is Project 25. To date, more than 300 Project 25 systems have been deployed. It is being developed in two phases. Phase I focuses on developing a common air interface for digital systems. Phase I is focused on standards for Frequency Division Multiple Access (FDMA) technologies only. Motorola, E.F. Johnson, and Racal representatives all indicated they are developing Phase I compatible equipment. Project 25 Phase II focuses on developing standards for both FDMA and two- and four-slot Time Division Multiple Access (TDMA). Phase II has three solutions: an FDMA solution, similar to Phase I, with compression to 6.25 kilohertz (kHz); a 4-slot TDMA solution that uses a 25 kHz channel; and a 2-slot TDMA solution that uses 12.5 kHz channel and supports 36 kilobits (kb) of data throughput. Com-Net Ericsson supports the development of the Phase II TDMA standards.

Innovative Approaches and New Technologies Are Under Development for Wireless Radio Communications

A portion of the vendor discussion was spent on innovative and future technologies that may change the way public safety wireless networks are developed. These technologies included switching devices, voice-over-IP, and fee-for-service systems.

- **Switching Devices.** New switching technology is making it possible to rapidly connect disparate systems. This technology is most useful during tactical and emergency response situations. JPS Communications has developed the ACU-1000, which serves as an intelligent interconnect across multiple bands.

- **Voice-Over-IP.** VoIP brings an interesting opportunity to public safety. The technology would allow radios to use the Internet as the primary backbone and bring all of the associated benefits to public safety. Most vendors agreed that in the future, all public safety networks would be based on VoIP technology. Several vendors suggested that they would have VoIP products very soon. VoIP, however, has a significant number of challenges, specifically as it relates to the public safety environment. Most of the concerns reflect the potential problems with public safety's mission-critical environment. Principally, public safety must have a guarantee that the bandwidth they need will always be available.
- **Fee-for-Service.** An emerging solution for public safety communications is a fee-for-service structure – similar to having a dedicated cellular provider. This solution is attractive because it takes public safety out of the infrastructure game all together. The problem is that cellular does not reach all places, and LMR has always been the answer in areas not easily reached by cellular. However, both Nextel and Com-Net Ericsson expressed an interest in developing nationwide fee-for service systems. Nextel is investigating developing a national system at 700 MHz dedicated to public safety and leased to public safety to meet public safety's needs. Com-Net Ericsson has bought the State of Florida's wireless system and is now leasing it back to the state. Com-Net Ericsson believes this approach could be the basis of its national system.

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 highlight ongoing interoperability problems. During the symposium, public safety representatives shared their experiences and solutions to incidents known both in Hawaii, and nationally, with the audience. Speakers included officials that 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 Honolulu Symposium. Each of these incidents highlighted the vital role of interoperable communications.

Columbine High School Shootings. During a rapid killing spree at a Columbine High School in Littleton, Colorado, two teenage gunmen opened fire on teachers, administrators, and their classmates, killing 15 people (including themselves) and causing \$150 million in damage to the school. The students were armed with semiautomatic weapons and a variety of explosives, and intended to inflict serious damage on the school and the students inside. Following the incident, and subsequent investigation, many lessons on how to deal with a large multi-agency, multi-jurisdictional response to a crisis event became apparent.

The first responders to the incident faced an unknown situation with a variety of concerns. There were gunfire, bombs, escaping students, fire, and many alarms. Responders also had to deal with arriving parents, solve traffic problems, interview witnesses, search the suspects' homes, and worry about natural gas leaks while the situation was ongoing. One hundred sixty-six personnel from a variety of public safety agencies including police (approximately 28 agencies), fire (10 apparatus), EMS (48 units and 2 air ambulances), bomb squads, SWAT teams, and the FBI responded to the incident. Several communications and interoperability challenges were introduced into the situation. These challenges included the following:

- During the initial response, three partial SWAT teams (Jefferson County, Littleton, and Denver) arrived on the scene. One agency communicated on 800 MHz and the other two were on different VHF frequencies. The teams used hand signals to communicate within the building.
- Law enforcement needed to create a perimeter around the school, but the area was so large they needed to use officers from multiple jurisdictions who could not communicate because they were on different frequencies.
- All commercial communications services were being used simultaneously. As soon as the event began, it was impossible to make a cellular phone call.

Sacred Falls Incident. On Mother's Day 1999 there was a tragic landslide at a popular state park on the island of Oahu in Hawaii. Sacred Falls State Park is a popular hiking destination for natives and tourists alike. The park is located in a mountainous region of the island. Hikers have to trek about 3 miles into the forest before they get to the waterfalls. The landslide was this deep into the forest. At the site of the slide, rocks fell more than 700 feet onto unsuspecting hikers. There were 34 people were injured with at total of 8 fatalities. This was the largest mass casualty incident in the Honolulu Fire Department's 150-year history.

Interoperability was a critical problem during the response to the incident. Because of the terrain, radio coverage went dead 100 feet up the trail – even though the tragedy was nearly 3 miles deeper into the forest. Additionally, when military helicopters were brought in to remove the injured they could not talk with police, fire, and EMS officials on the ground. Many of the responders noted that it was nearly impossible to make decisions on the scene when you have no information being shared.

Air Florida Crash. In January of 1982 an Air Florida jet that was attempting to land at National Airport crashed onto the 14th Street bridge near Washington, DC. Five people were killed when the plane hit the bridge. An additional 74 passengers died in the icy waters of the Potomac River. At the same time as the airline crash, there was a fatal subway crash on the other side of the city. These two incidents, along with a major snowstorm, paralyzed the city and thwarted the efforts of public safety officials.

Interoperability was nearly non-existent at the scene of the airline crash. More than 20 agencies responded to the crash, but they had only two mutual aid channels (one for fire and one for police) on which to communicate. Because this accident was in the Federal Government's backyard, the communications problems drew a significant amount of attention from lawmakers. The incident also spurred public safety officials in the region to start examining ways to improve communications and enhance interoperability.

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 times these solutions, while not optimum, worked. However, the presenters indicated that had longer-term solutions been employed, there may have been more effective means of interoperability during these incidents. Participants shared several of the following best practices that can 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.

2.6 How Large Federal Agencies Coordinate the Development of Interoperable Wireless Communications Systems

Federal agencies have been charged by 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. During the last half-day of the symposium, representatives from federal agencies briefed the audience on their systems. The main purpose of this topic area was to discuss certain large-scale federal system developments and federal initiatives related to wireless data and security. One key theme emerged in this topic area. The theme is described in detail below.

***Federal Agencies Are Developing and Upgrading Wireless Systems
Throughout the Country***

DOJ, Treasury, and the United States Coast Guard (USCG) are involved in implementing large-scale networks of wireless communications systems. In each of these efforts, federal agencies are seeking to partner with state and local agencies. The Federal Government also plans to partner in jurisdictions where it is overlapping system requirements with state and local agencies. These partnerships are effective because of the economies of scale of large, shared system projects. Representatives from each groups' program office were at the Honolulu Symposium to discuss their ongoing progress. The results of this discussion are provided below:

DOJ. DOJ is implementing significant changes in its communications systems. It has established a Wireless Management Office (WMO) to centralize oversight, management, and procurement of a common Justice Wireless Network (JWN). The WMO is working to consolidate a number of disparate systems, augment its network with commercial services, consolidate equipment procurements, and improve interoperability within the department and with outside agencies. DOJ is implementing pilot projects in San Diego, California; Seattle, Washington; Salt Lake City, Utah; Los Angeles, California; and South Florida. The projects consolidate DOJ components onto single systems and demonstrate improvements in interoperability.

The JWN is being built on an aggressive schedule, moving from the west coast to the east coast. The WMO has divided the country into four zones (western, central, east, and northeast). The WMO has begun planning and implementation in zones 1 and 2 (western and central). These zones were selected to take advantage of existing resources and narrowband assets, to support communications for the 2002 Olympics, and to support operations along the southwest border of the United States. JWN is scheduled for completion during 2004.

TREASURY. Treasury is also planning to implement a nationwide wireless system to support all of its components on a shared infrastructure. Treasury is planning to implement a TIA/EIA-102 (Project 25) compliant narrowband radio system known as the Integrated Treasury Network (ITN). It has established the Treasury Wireless Program Office (TWPO) to manage the development of ITN. The TWPO is also responsible for the design and implementation of ITN and is working to develop partnerships to use non-Treasury-owned systems, both state and federal.

The TWPO also is developing a phased approach for implementing the ITN. The TWPO has identified 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, TWPO is examining a detailed transition plan from legacy systems to the ITN. TWPO is also exploring centralized management and operations and detailed capacity planning for conventional versus trunking determinations. They are also researching a mix of solutions that include commercial services, sharing with local entities, and fee-for-service solutions that take the department out of the infrastructure game.

USCG. The USCG has significant interests in public safety. The Coast Guard's critical missions include the need to protect natural resources, provide search and rescue capabilities, and provide for the public's safety during floods and water disasters. The USCG often partners with local, state, and federal agencies to support its missions. The USCG is updating its communications systems. However, its maritime mission introduces many variables into its planning process. Specifically, the Coast Guard system must be capable of using marine frequencies, must be compliant with international standards, and must be interoperable with both the public (i.e., boaters) and public safety agencies.

The USCG is planning a major acquisition known as the National Distress and Response System Modernization Project (NDRSMP). The goal is to have this system by 2006. It is also envisioned that this system will be in the VHF band to make it compliant with international standards.