INTEROPERABILITY FOR PUBLIC SAFETY RADIO EQUIPMENT

HEARINGS

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION

COMMITTEE ON SCIENCE AND TECHNOLOGY

ONE HUNDRED ELEVENTH CONGRESS

SECOND SESSION

MAY 27, 2010
and
SEPTEMBER 23, 2010

Serial No. 111–97
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C O N T E N T S

Interoperability in Public Safety Communications Equipment

February 3, 2010

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Progress on P25: Furthering Interoperability and Competition for Public Safety Radio Equipment

September 23, 2010

INTEROPERABILITY IN PUBLIC SAFETY COMMUNICATIONS EQUIPMENT

THURSDAY, MAY 27, 2010

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:00 a.m., in Room 2318 of the Rayburn House Office Building, Hon. David Wu [Chairman of the Subcommittee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

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Subcommittee on Technology and Innovation's

Hearing on

Interoperability in Public Safety Communications Equipment

Thursday, May 27, 2010
10:00 a.m. – 12:00pm
2318 Rayburn House Office Building

Witness List

Dr. David Boyd
Director, Command, Control & Interoperability, Science and Technology Directorate,
Department of Homeland Security (DHS)

Mr. Dereck Orr
Program Manager, Public Safety Communications Systems,
National Institute of Standards and Technology (NIST)

Dr. Ernest L Hofmeister
Senior Scientist, Harris Corporation

Mr. John Muench
Director of Business Development, Motorola Inc.

Chief Jeffrey D. Johnson
President, International Association of Fire Chiefs,
and Chief, Tualatin Valley Fire and Rescue, Aloha, Oregon

HEARING CHARTER

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION

Interoperability in Public Safety Communications Equipment

THURSDAY, MAY 27, 2010
10:00 A.M. 0912:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

I. Purpose

Communication among first responders is essential in emergency response. Recent disasters, including 9/11 and the 1999 Columbine High School shooting, have illustrated the communication problems that can occur when multiple agencies respond to a disaster. Compatible technology is critical to enabling interoperability, or the ability of first responders to communicate with their counterparts from other agencies and jurisdictions. For two decades, the public safety community, private industry, and the Federal Government have been working on technical standards that will ensure that digital land mobile radio (LMR) systems from different vendors are interoperable. The purpose of this hearing is to discuss the status of these standards and the interoperability capabilities of public safety LMR equipment.

II. Witnesses

- **Dr. David Boyd**, Director, Command, Control & Interoperability, Science and Technology Directorate, Department of Homeland Security
- **Mr. Dereck Orr**, Program Manager, Public Safety Communications Systems, National Institute of Standards and Technology
- **Dr. Ernest L Hofmeister**, Senior Scientist, Harris Corporation
- **Mr. John Muench**, Director of Business Development, Motorola Inc.
- **Chief Jeffrey D. Johnson**, President, International Association of Fire Chiefs, and Chief, Tualatin Valley Fire and Rescue, Aloha, Oregon

III. Brief Overview

The public safety community has long recognized the challenge of providing for interoperable communications. Enabling first responders from different agencies and jurisdictions to communicate requires not only cooperation and planning, but also compatible technology. However, without common standards, there is no assurance that a manufacturer's proprietary systems will interoperate with its competitors' systems.

Since 1989, representatives from public safety, industry, and the government have been working together to develop common standards (known as the "P25" standards). The purpose of these standards is not only to ensure interoperability, but also to promote market competition, spectrum efficiency, and an easy transition from analog to digital radio systems.

Much progress has been made on these standards since 1989 and P25 radios and radio systems are now available. However, not all of the standards originally called for have been completed. As more public safety agencies make significant investments in radio systems, it is important to assess the status of the process and understand its impact on public safety.

In addition to the development of standards, assessing the compliance of P25 radios with the standards is critical for ensuring the investment made by governmental agencies will meet the expectations of the P25 process. Currently, there is no formal mechanism within the existing P25 process for validating that products claiming P25 compliance are in fact built correctly to the standards. The Department of Homeland Security (DHS) Compliance Assessment Program (CAP), a voluntary testing program, provides an alternative verification mechanism and is therefore an important tool for public safety in making equipment procurement deci-

sions. However, the CAP currently does not require all of the testing that was originally envisioned.

IV. Background

Lack of Interoperability

The lack of communications interoperability has posed significant challenges in the response to large-scale disasters, such as the 1995 Oklahoma City Bombing, the 2001 attack on the World Trade Center in New York City, and Hurricane Katrina in 2005. At the scene of the Oklahoma City bombing, fragmented communication frequencies and conflicting standards prevented police and fire agencies from communicating with the National Guard, Federal Emergency Management Agency, and other Federal agencies. Lack of interoperability contributed to the chaos and tragedy of 9/11 when some 200 firefighter did not receive a message broadcast on NYPD radio channels that the collapse of the first tower was imminent. And, in the days immediately following Hurricane Katrina, local and Federal agencies could not talk to one another. For example, first responders in helicopters were unable to communicate with crews patrolling in boats, hampering rescue efforts. Even the response to the Columbine High School shooting was hindered by a lack of interoperable equipment. Nearly 1,000 first responders from different agencies arrived on the scene but the lack of interoperability prevented them from being able to adequately assess the situation and the threat level, slowing the response. In these situations, first responders had to use message runners, an inefficient practice that limits the flow of information to incident commanders.[1]

Enabling interoperability requires major planning and coordination among the agencies and jurisdictions that may need to work together when responding to a disaster. However, as the examples above illustrate, incompatible radio systems significantly hamper interoperability. Technology-based causes of interoperability include proprietary designs or unique configurations among different radio systems that operate in different frequencies of the radio spectrum. First responder agencies have used a variety of ad-hoc solutions to enable interoperability, such as swapping radios or creating mutual aid channels, but such solutions are less efficient than systems designed to interoperate.

Project-25

The process of developing open standards for digital public safety radios began in 1989, when the Association of Public-Safety Communications Officials (APCO) and the National Association of State Telecommunications Directors (NASTD), with the involvement of the Department of Justice (DOJ) and other Federal agencies, launched Project-25 (P25). The developers initiated P25 with the goals of having a user-defined and user-driven standards process that would allow for interoperability, multi-vendor procurement of equipment, an easy transition from legacy analog equipment to digital equipment, and greater spectrum efficiency.

The involvement of the user community makes P25 a unique technical standards development process. The Telecommunications Industry Association (TIA), which is a standards development organization accredited by the American National Standards Institute (ANSI), writes and maintains the technical standards documents. The public safety community interacts with TIA's technical standards process through a Steering Committee. Aided by a User Needs Subcommittee, the Steering Committee develops the Statement of User Requirements on which the standards are based. Memoranda of Understanding govern the interaction between TIA's standards development committees and the Steering Committee. This interaction is further facilitated by a working committee between the two groups.[2]

Public safety LMR systems include fixed infrastructure, such as towers and base stations, and portable units, such as handheld and car-mounted radios. P25 seeks to provide for standardization of eight interfaces where components of the LMR systems must communicate with each other.[3] The first set of standards developed focused on the Common-Air Interface (CAI), which defines the communication protocols between radio transmitters and receivers. This standard is intended to ensure that a portable radio from one manufacturer can communicate with a portable radio from another manufacturer. It is crucial for overall interoperability between two dif-

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[1] Tristan Weir, *Federal Policy Toward Emergency Responder Interoperability: A Path Forward*. Thesis submitted for a Masters of Science in Technology Policy from the Massachusetts Institute of Technology, 2006.

[2] The APCO 25/34 Interface Committee (APIC), a joint subcommittee of the Steering Committee and the TIA Private Radio Section.

[3] *http://www.pscr.gov/outreach/p25dsr/menu_top/p25_interfaces.php*

ferent systems. Other standards suites needed for interoperability cover the interfaces between the larger infrastructure components. These include:[4]

- The Console Subsystem Interface (CSI), which defines how radio frequency components of the system and console (such as the equipment used by dispatchers) connect with one another.
- The Fixed Station Interface (FSI), which defines how components of the radio system that are fixed in place (such as base stations) connect with other components of the system.
- The Inter-RF subsystem Interface (ISSI), which defines how different radio networks should connect with one another.

Although the P25 process began in 1989, the entire suite of standards for all eight interfaces is not yet complete. According to a 2007 Government Accountability Office (GAO) report,[5] despite spending over $2 billion from 2003 to 2005 on interoperability, many states were far from achieving that goal. GAO identified the slow rate of P25 standards development as among the myriad factors hindering faster adoption of interoperable public safety communications systems. The report noted that the P25 standards committees took four years (from 1989 to 1993) to develop the CAI, but that the committees developed no additional standards between 1993 and 2005 that could be used by manufactures for additional elements of a P25 compliant system.

Although GAO did find that "significant progress" was made in defining the three other interfaces most critical to interoperability after 2005, they cited concerns from participating National Institute of Standards and Technology (NIST) researchers that these standards were still incomplete, allowing manufacturers to develop products based on inconsistent interpretations. Tests conducted between 2003 and 2006 showed that these inconsistent interpretations of the standards caused P25 radios to fail aspects of interoperability tests.

The 2007 GAO report further cited concerns that the lack of compliance testing had limited the impact of the standards process for digital LMR systems. Developers include compliance tests within standards documents to provide a mechanism to validate whether a product is actually built to the standard and minimize issues that arise with inconsistent interpretations of the standard by different manufacturers. Without this testing, there is no way to validate that a product labeled "P25 compliant" will perform as intended.

In response to GAO's 2007 assessment that work on P25 had slowed after the CAI, TIA asserted that 114 standards and documents were in fact published between 1993 and 2005 and that manufacturers themselves had initiated compliance testing to ensure the interoperability of their products.[6] However, according to the Public Safety Communications Research (PSCR) program,[7] standardization for all eight of the P25 standards remains incomplete. According to the PSCR program's Project 25 Documents and Standards Reference for May 2010: "For most cases, a P25 interface, service, or equipment standard is not complete until all documents that provide the Overview, the Protocol Specifications, the Protocol Conformance Test Procedures, the Performance Measurements Methods, the Performance Recommendations, and the Interoperability Test Procedures are published or are approved for publication by the appropriate [TIA] committee." Although much progress has been made, only the ISSI has been fully completed.

Involvement by the Federal Government

Over the past 15 years, multiple Federal agencies have addressed the interoperability issue, from the DOJ to the Federal Communications Commission (FCC). The current lead within the Federal Government is the Department of Homeland Security (DHS) SAFECOM program. SAFECOM provides technical research and development through the DHS Science and Technology Directorate and practitioner guidance and coordination through the Office of Emergency Communication.

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[4] Project 25: The Quest for Interoperable Radios, Issue Brief from the COPS Interoperable Communications Technology Program, Dan Hawkins, May 2007.

[5] *First Responders—Much Work Remains to Improve Communications Interoperability*. GAO–07–301, April 2007.

[6] *http://www.tiaonline.org/gov_affairs/press_publications/documents/TIAResponsetoGAOReportonP25.pdf*

[7] The PSCR program is housed in Boulder and is a joint effort between the National Institute of Standards and Technology/Office of Law Enforcement Standards (NIST/OLES) and the National Telecommunications and Information Administration/Institute for Telecommunication Sciences (NTIA/ITS). *http://www.pscr.gov/projects/lmr/p25_stds_dev/p25_stds_dev.php*.

Although Federal agencies have been involved with P25 since it began, the 2004 *Intelligence Reform and Terrorism Prevention Act* (P.L. 108–458) specifically directed the Secretary of Homeland Security to establish a program to enhance the interoperability of public safety communications. In addition to facilitating planning and coordination among all levels of government, the legislation directed the Department of Homeland Security to work—in consultation with NIST, the private sector, and others—to "accelerate the development of national voluntary consensus standards for public safety interoperable communications."

Compliance Assessment Program (CAP)

As noted above, no formal mechanism exists in the P25 process to validate that the radio equipment meets the standards. In the report accompanying the FY 2006 *Department of Homeland Security Appropriations Act* (H. Rept. 109–241), Congress directed DHS to work with NIST and the DOJ on a P25 Conformity Assessment Program. The resulting DHS Compliance Assessment Program (CAP), which certifies testing laboratories and specifies which tests must be conducted, is a voluntary process for P25 equipment suppliers to show that their equipment meets P25 standards for "performance, conformance, and interoperability." However, conformance assessment testing is not currently required, nor do CAP requirements exist for all eight interfaces.

The SAFECOM *Recommended Guidance for Federal Grant Programs* requires that grant applicants using DHS funds to purchase P25 equipment must obtain Supplier's Declaration of Compliance (SDoC) documents and Summary Test Reports (STR) when they purchase the equipment. DHS also provides a website (*www.rkb.us*) where manufacturers can post these documents.

Conformity assessment tests whether a manufacturer has interpreted and implemented a standard correctly. It is more rigorous than interoperability and performance testing and is arguably the best mechanism for ensuring that manufacturers are interpreting the standards consistently and for ensuring that all standardized functions on the radio will interoperate. Finally, conformity assessment testing is considered important for ensuring the backwards compatibility of new technology that must be connected to legacy systems, sometimes as many as 20 years old.

Additional Issues with P25

In addition to the concerns outlined above, GAO's 2007 assessment of interoperability identified two other issues preventing more widespread adoption of P25 equipment: (1) the lack of information and expertise among state and local agencies in buying equipment to meet their needs, and (2) the increased cost of P25 systems over conventional radio systems.

Digital radios are complex and manufacturers offer many different features and levels of functionality. GAO noted that agencies lacked comparative information about product functionality and typical first responder requirements. In addition, P25 radio units can cost more than 2- to 3-times the cost of conventional analog radios suitable for first responder use. Building an entire P25 LMR system, which is critical for interoperability, is also a major cost for municipalities.

700 MHZ and Public Safety Broadband Network

The P25 standards cover interoperability for voice communications over digital LMR systems. With the availability of broadband, many public safety agencies are integrating data functions into their operations. Since there is no dedicated public safety broadband network, public safety agencies must use commercial wireless providers. A public safety broadband network is part of ongoing discussions on the use of the newly-available portions of the 700 MHz band. Public safety officials see the 700 band as a resource for extra voice capacity, broadband, and Voice-IP back-up systems. Many would like to see a public/private partnership build a network that would allow public safety priority access during an emergency but be available for commercial users during normal operation.

While public safety demand for spectrum is generally less than network capacity in normal operations, demand can often exceed capacity during a crisis. A public/private network would potentially allow for a more efficient use of resources, but commercial providers have been hesitant to commit to the extra requirements and hardening a public safety network requires. For example, public safety networks must be available in remote locations and the infrastructure must be able to withstand disasters, like hurricanes or earthquakes. The inability to solve these challenges contributed to the failure of the recent FCC auction of spectrum designated for a public safety/commercial carrier partnership (the "D–Block") to meet the reserve price.

Debate is ongoing on how to govern, finance, and build a network to provide greater spectrum resources to public safety. However, the National Public Safety Telecommunications Council, DHS, and NIST have developed a public safety Broadband Network Statement of Requirements document to offer guidance to the FCC, which has stated that a 700 Mhz public safety broadband network must be interoperable, but has not issued regulations on how such interoperability would be achieved. In addition APCO is identifying gaps in standards to ensure that the network will support interoperability and roaming. Standards are particularly important if the national public safety broadband system is eventually built out as a system of networks.

Finally, the move toward broadband could pose a challenge as public safety agencies move to comply with FCC narrow-banding requirements. In 2004, the FCC mandated that by 2013, all public safety agencies needed to transmit using 12.5 kHz-wide channels, rather than using 25 kHz-wide channels. It has been further proposed that, by 2018, public safety will migrate to 6.25 kHz-wide channels and the P25 standards process is already in the process of developing standards for 6.25 kHz. As the name implies, though, data-rich broadband communication requires wider channels. Thus, within the public safety portion of the 700 Mhz band, systems will have to enable both broadband and narrowband transmissions.

V. Issues and Concerns

Status of Standards

Project 25 began in 1989. Although the standards developers have made much progress since that time and P25 systems are now being fielded around the country, the complete suite of standards has not yet been completed. Continued advances in technology will mean continued updates and revisions for the P25 standards. However, as public safety organizations implement P25 systems, it is important to gain insight into how the status of the standards development process will affect their current operations and future procurements.

Compliance Assessment Program

Radios are a lifeline for first responders. Ensuring that they work as intended is critical for the safety of these individuals and the lives and property they protect. It is also critical in ensuring that the significant amount of public money used to procure these systems is well spent and improves the communication capabilities of public safety agencies. The DHS CAP may provide the public safety community with the assurance that products sold as P25 compliant meet all of the requirements of the standards. Potentially, too, it may identify areas where the standard has not been uniformly implemented. While it is important to balance the time and expense incurred by manufacturers in performing compliance testing with the benefit to the public safety community, it is also essential that there is a trusted process available to ensure that P25 equipment is interoperable and meets the other requirements of the standards.

Future Issues

P25 is unique in bringing the user community and industry together in the standards development process. Such cooperation in the standards process is important as public safety increases its use of broadband and other technologies.

Chairman WU. The hearing will come to order.

Good morning and thank you for coming to today's hearing focused on interoperability in public safety communication equipment, and I want to warn everyone in the room first, not our witnesses, because they are extremely knowledgeable, that the topic of this morning's hearing is extremely complex, technical, and has kind of made my head swim at times. However, I do believe that it is very, very important to public safety and good government.

We have learned important lessons from Oklahoma City, September 11, Columbine High School and Hurricane Katrina and other disasters that interoperable communication is crucial to effective emergency response. When time is of the essence and lives are at stake, a clear flow of information is absolutely essential. Unfortunately, it is not uncommon for police officers, firefighters and other emergency responders from different regions, from a single region, or even a single city to be using incompatible communication systems which don't talk to each other. This lack of interoperability has contributed to the deaths of first responders and hindered the ability to rescue people in harm's way.

Enabling interoperable communication systems, where public safety personnel can talk with each other in real time, takes planning and cooperation by all levels of government. Interoperability also requires equipment that is capable of communicating with each other and assuring interoperability requires complete standards, conformance testing and compliance assessment. First responders on digital land mobile radio systems built to proprietary specifications cannot communicate well. Lack of published standards and compliance testing may also have consequences for competition among equipment vendors and consequently options for and prices to emergency service agencies.

When I visited NIST's [National Institute of Standards and Technology] interoperability and standards lab this past February in Boulder, Colorado, I was shocked to learn that after more than 20 years of development, the vast majority of standards needed to assure interoperability for first responders and to enhance competition for the benefit of purchasers are not yet usable. This puts first responders at unnecessary risk and provides governmental purchasers with less competition than they would otherwise have.

Since 1989, the public safety community and industry have been working together on Project 25, or P25, a suite of standards that will not only enable interoperability but also produce competition in the marketplace for digital land mobile radio systems and provide other benefits. While there has been some progress on the P25 standards since 1989, the standards remain incomplete.

In this hearing, I would like to understand the implications of this for public safety agencies procuring systems sold as P25 compliant. I would also like to get a better sense of when we can expect all of the standards to be completed or at least usable. For purpose of comparison, we have standards for cell phones and other forms of communication, and not only standards, but with respect to cell phones we have gone through G1, generation 2, generation 3 and now we are transitioning to G4 devices, and standards have been established for all these different generations of devices.

A second issue that we will discuss today is the lack of a formal compliance assessment process for the P25 standards. A compliance assessment process tells purchasers that a product meets all of the requirements of a standard. Any laptop with a Wi-Fi logo, Bluetooth-enabled devices or indeed any toaster with an Underwriters Lab sticker, had to go through testing and certification to be able to display those marks. P25 does not have an equivalent independent testing certification process. The Department of Homeland Security's Compliance Assessment Program can fill this gap. It seems to me that emergency services communication is too important for caveat emptor to be the standard. Also, when first responders spend millions of dollars on new, complex communications technology, expecting interoperability, conformance and relying upon the P25 logo, they should not come up empty-handed.

In addition to being mission-critical and life-critical technology, these systems represent major expenditures for governmental agencies across the country. I, and most other Members of Congress, are asked every single year for funds to upgrade emergency responder communication systems. Taxpayers deserve both safety and value for their dollar.

I would like to thank our witnesses for being here today. It is important that this process move forward and that the public safety community and industry continue to work together to make further advances in first responder technology.

Chairman WU. Now I would like to recognize Mr. Smith for his opening statement.

[The prepared statement of Chairman Wu follows:]

PREPARED STATEMENT OF CHAIRMAN DAVID WU

Good morning and thank you for coming to today's hearing focused on interoperability in public safety communication equipment.

We've learned an important lesson from September 11th, Hurricane Katrina, and other disasters: interoperable communication is critical to effective emergency response. When time is of the essence and lives are at stake, a clear flow of information is essential. Unfortunately, it is not uncommon for police officers and firefighters from a single region, or even a single city, to be using incompatible communication systems. This lack of interoperability has contributed to the deaths of first responders and hindered the ability to rescue people in harm's way.

Enabling interoperable communication systems, where public safety personnel can talk with each other in real-time, takes planning and cooperation by all levels of government. However, interoperability also demands radios that are capable of communicating with one another. First responders on digital land mobile radio systems built to proprietary specifications cannot communicate. Ad-hoc solutions, like patching technologies or sharing radios, are less efficient than the seamless interoperability offered by systems based on open architecture.

The purpose of today's hearing is to examine the status of the standards development process for this open architecture. Since 1989, the public safety community and industry have been working together on Project 25, or P25, a suite of standards that will not only enable interoperability, but also promote competition in the marketplace for digital land mobile radio systems and provide other benefits. While there has been a lot of progress on the P25 standards since 1989, the entire set of standards remains incomplete. I would like to understand the implications of this for public safety agencies procuring systems sold as "P25 compliant" and get a better sense of when we realistically can expect all of the standards to be completed.

A second issue that we will discuss today is the lack of a formal compliance assessment process for the P25 standards. A compliance assessment process signals to the purchaser that a product meets all of the requirements of a standard. Any laptop with a Wi-Fi logo, or any toaster with an Underwriters Laboratory sticker, had to go through testing and certification to be able to display those marks. P25 does not have an equivalent process. The Department of Homeland Security's Com-

pliance Assessment Program fills this gap, but we must be sure it provides the highest possible level of assurance to the public safety community that systems sold as P25-complaint actually meet all of the requirements of the standards. It seems to me that there ought to be a formal, comprehensive system in place to ensure that it is not *caveat emptor* when first responders spend millions of dollars on complex communications technology.

The most important question for the first responders who rely on this equipment is "does it work?" In addition to being mission-critical technology, these systems represent *major expenditures* for government agencies across the country. Particularly at a time of uncertain and dwindling budgets cost-effective procurement enabled by an open-architecture is essential.

I'd like to thank our witnesses for being here today. Project 25 is unique in the world of standards development in that the users of the technology—in this case our public safety officials—are integral to, and directly involved in, the standards development process. It is important that this process move forward, and that the public safety community and industry continue to work together to make further advances in first responder technology.

Mr. SMITH. Thank you, Mr. Chairman, for calling today's hearing on the interoperability of public safety communications equipment, specifically Project 25, or P25 standards.

In nearly every public safety emergency, as the events mentioned by the Chairman to the baseball-sized hailstones that hit my home community this week, we are reminded of the need for our first responders to have interoperable communications across both jurisdictions and lines of duty. Although the P25 standard was initiated in the late 1980s, it was the terrorist attacks on September 11 which prompted government and industry to actively implement these standards with action continuing to this day.

All parties clearly understand it is in their interest to ensure emergency communications tools advertised as P25 compliant meet that standard. At the Federal level, we have a responsibility to ensure local jurisdictions are able to work together and taxpayer dollars are spent only on equipment which works as promised. Equipment manufacturers know sales will go elsewhere if competitors' products achieve higher levels of operability and interoperability, and our first responders clearly understand the importance of interoperable equipment in protecting the lives of themselves and certainly those whom they serve. At the same time, we must keep in mind interoperability is inconsequential if outside forces such as power outages actually knock out equipment and advances in technology and increased availability of bandwidth may move us to technologies above and beyond P25 standards.

I expect the primary questions addressed in this hearing will be, what has been achieved so far, where is it going and is it progressing quickly enough while also touching on where emergency communications may go into the future.

With that, thank you, Mr. Chairman. Thank you to the panelists for sharing your insight and expertise, and I look forward to a constructive hearing. I yield back.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF REPRESENTATIVE ADRIAN SMITH

Thank you, Chairman Wu, for calling today's hearing on the interoperability of public safety communications equipment—specifically Project 25, or P25, standards.

In nearly every public safety emergency—from national scale disasters such as the 9–11 attacks and Hurricane Katrina down to localized storm events such as the baseball-sized hail and high winds we experienced earlier this week in western Ne-

braska—we are reminded of the need our first responders have for interoperable communications, across both jurisdiction and lines of duty.

Although the P25 standard was initiated in the late 1980s, it was the terrorist attacks on September 11 which prompted government and industry to actively implement these standards, with action continuing to this day.

All parties clearly understand it is in their interest to ensure emergency communications tools advertised as P25 compliant meet that standard. At the Federal level we have a responsibility to ensure local jurisdictions are able to work together and taxpayer dollars are spent only on equipment which works as promised. Equipment manufacturers know sales will go elsewhere if competitors' products achiever higher levels of operability and interoperability. And our first responders clearly understand the importance of interoperable equipment in protecting the lives of themselves and those they serve.

At the same time, we must keep in mind interoperability is inconsequential if outside forces such as power outages knock out equipment, and advances in technology and increased availability of bandwidth may move us to technologies above and beyond P25 standards.

I expect the primary questions addressed in this hearing will be "What has been achieved so far?" "Where is it going?" and "Is it progressing quickly enough?" while also touching on where emergency communications may go in the future.

With that, thank you again Chairman Wu, and welcome to our panelists. I look forward to a constructive hearing and I yield back the balance of my time.

Chairman WU. Thank you, Mr. Smith.

If there are other Members who wish to submit opening statements, your statements will be added to the record at this point.

And now it is my pleasure to introduce our witnesses. Dr. David Boyd is the Director of the Command, Control and Interoperability Division of the Science and Technology Directorate at the Department of Homeland Security. Mr. Dereck Orr is the Program Manager of the Public Safety Communications Systems Program at the National Institute of Standards and Technology, or NIST. Dr. Ernest Hofmeister is Senior Scientist at the Harris Corporation. Mr. John Muench is the Director of Business Development of Motorola. And our final witness is Chief Jeffrey Johnson, who is President of the International Association of Fire Chiefs and the Chief of the Tualatin Valley Fire and Rescue Department in Aloha, Oregon.

Welcome, all. You will each have five minutes for your spoken testimony. Your written testimony will be included in the record for this hearing, and since we do have your written testimony and have read it, rather than simply summarizing, please focus your comments as much as possible on answering the following four questions. What factors have delayed the development of the needed technical standards? What has delayed conformance and compliance testing? What is the impact of the absence of applicable standards and tests? And when can we expect completion of those standards and tests needed to assure interoperability and competition?

When you complete all your oral testimony, we will begin with questions and each Member will have five minutes to question the panel.

Dr. Boyd, please proceed.

STATEMENTS OF DAVID BOYD, DIRECTOR, COMMAND, CONTROL AND INTEROPERABILITY DIVISION, SCIENCE AND TECHNOLOGY DIRECTORATE, DEPARTMENT OF HOMELAND SECURITY (DHS)

Dr. BOYD. Thank you, Mr. Chairman, Ranking Member Smith.

Emergency responders need to be able to respond to incidents using their own equipment, particularly when they are supporting

jurisdictions other than their own. And they need the ability to exchange the whole range of data, imagery and maps, as well as to communicate by voice and to combine all of those sources of information as needed during an emergency. Any strategy for improving interoperability must be informed by practitioner input. That is, it must be based on actual user needs and driven from the bottom up. Practitioners include the end-user community that supports all aspects of securing the homeland during both day-to-day operations and large-scale incidents or disasters.

The existing response infrastructure is complex, as the Chairman has already pointed out. There are more than 50,000 different emergency response agencies throughout the United States, each with its own local and state government regulations and requirements. Further, each locality has some form of legacy communications system and its own budget and planning lifecycles. The existing public safety communications infrastructure in the United States represents, as a conservative estimate, an investment of more than $100 billion for voice system hardware alone. These existing systems cannot be quickly or easily replaced so the only way to move toward nationwide interoperability without wasting existing investments is through a system of systems approach which capitalizes on already existing infrastructure.

This approach allows agencies to join together using standards, compatible procedures and training exercises without having to discard major investments in existing systems and it enables emergency responders to use their own equipment to respond to incidents anywhere in the Nation. By leveraging standards, emergency responders can communicate by voice and exchange data, imagery, video and maps, creating situational awareness that improves response for both daily operations and major incidents. Furthermore, the system of systems approach is naturally more robust. It eliminates the risk that one failed technology, or link, will cause the entire system to fail.

Since 2004, the legislatively established Office for Interoperability and Compatibility, OIC, which is within my office within the Science and Technology Directorate, has partnered with NIST and the National Telecommunications and Information Administration to accelerate the development of the Project 25 suite of standards for narrowband communication. These standards help produce voice communications equipment that is interoperable regardless of manufacturer while retaining compatibility with legacy systems and permitting scaling from small to large incidents.

A few years ago, we discovered through testing that much of the equipment advertised as P25 compliant was unable to interoperate with P25 equipment manufactured by other companies, and in many cases, even with earlier P25 equipment manufactured by the same company. In response, Congress authorized OIC to establish the Compliance Assessment Program in coordination with NIST. A comprehensive Compliance Assessment Program is a key element to improving interoperable communications. It provides a process through which equipment can demonstrate that it correctly follows the standard and is able to interoperate with other equipment that follows that standard.

When interoperability testing is combined with conformance testing, emergency responders can be assured that equipment conforms to the standard and will interoperate with all compatible equipment that correctly implements the standard including equipment that hasn't been tested. Furthermore, conformance testing helps provide increased confidence that equipment developed in the future will retain compatibility with legacy systems. Recognizing the need for an open and transparent process, the program established a governing board to represent the collective interests of organizations that procure P25 equipment. Its membership consists of local, tribal, state and Federal Government employees who are active in the operation or procurement of communications systems. The board considers all comments in an ongoing effort to address both the requirements of the users and the concerns of the manufacturers. Using testing standards published by P25, the P25 CAP [Compliance Assessment Program] aims to add quality, openness and rigor by building on the product development testing already performed by manufacturers. The first group of laboratory assessments began in December 2008, and by April 2009 DHS [Department of Homeland Security] recognized the first eight laboratories. Four different manufacturers have had emergency communications equipment complete the P25 CAP process, which includes publishing Suppliers Declaration of Compliance and Summary Test Reports.

Unfortunately, claims of compliance are not limited to the equipment that has completed the P25 CAP and this could lead to confusion among emergency responders. As a consequence, we have clarified the definition of P25 compliant equipment through SAFECOM guidance for Federal grant programs, which is used by all of the interoperable grant programs outside of DHS as well as by DHS.

I appreciate the opportunity to testify before you today. I look forward to continuing to work with emergency responders and manufacturers and I welcome the Committee's interest and support of interoperable communications. I look forward to answering any questions the Committee may have.

[The prepared statement of Dr. Boyd follows:]

PREPARED STATEMENT OF DAVID BOYD

Introduction

Good morning Chairman Wu, Ranking Member Smith, and Members of the Subcommittee. Thank you for inviting me to speak to you today.

Within the Department of Homeland Security (DHS), the Science and Technology (S&T) Directorate's Command, Control and Interoperability Division (CCI) uses a practitioner-driven approach to create and deploy information resources that enable harmonized and secure interactions among homeland security stakeholders.

Since the creation of the Department, there has been considerable progress in strengthening interoperable communications—the ability for all emergency responders to securely communicate with whomever they need to, when they need to, and when properly authorized to do so—across the nation. Having access to relevant, real-time and actionable information is vital to make tactical, strategic, and planning decisions that can prevent terrorist attacks, protect the homeland from natural or man-made disasters, improve response and recovery, and strengthen the resiliency of our communities. Emergency responders need to be able to respond to an incident using their own equipment and be able to communicate not just by voice, but to have the ability to exchange data, imagery and maps, and combine all of these sources of information as needed during an emergency.

The Office for Interoperability and Compatibility (OIC) within CCI works to ensure that the emergency response community—including local, tribal, state, and Federal emergency responders—have the systems and equipment functionality that they need to save lives and safeguard the nation. Among its activities, OIC is authorized to accelerate, in consultation with other Federal agencies, including the National Institute of Standards and Technology (NIST), the private sector, and nationally recognized standards organizations, as appropriate, the development of interoperable communications [1] and develop a compliance assessment program [2].

System of Systems

A successful strategy for improving interoperability must be informed by practitioner input—that is, based on user needs and driven from the frontlines up. Practitioners include the end-user community that supports all aspects of securing the homeland during day-to-day operations and large-scale incidents or disasters. The existing response infrastructure is complex; there are more than 50,000 different emergency response agencies throughout the United States, each with its own local and state government regulations and requirements. Further, each locality has some form of legacy communication system and its own budget and planning lifecycles.

The existing public safety communication infrastructure in the United States represents, conservatively, an investment of more than $100 billion for voice systems hardware alone. These existing systems cannot be quickly or easily replaced.

One option to optimize resource effectiveness and eventually realize nationwide interoperability is a system of systems approach. The system of systems approach would allow separate agencies to join together using standards, compatible procedures, and training exercises without having to discard major investments in their existing systems, and enables emergency responders to use their own equipment to respond to an incident anywhere in the nation. By leveraging standards, emergency responders could communicate by voice and exchange data, imagery, video, and maps—creating situational awareness that improves response for daily operations and major incidents. Furthermore, the system of systems approach is more robust—it eliminates the risk that one failed technology or link will cause the entire system to fail.

Acceleration of Standards

The standards development process is integral to achieving interoperability. The ability to share critical emergency-related data—a map, a situational report, the status of medical resources—on demand and in real time is imperative in today's response environment. While this need has been apparent for years, *comprehensive* standards do not yet exist, because the systems and the range of standards required is complex.

Communication standards allow for the creation of multi-vendor systems that can bridge disparate technology and spectrum. In conjunction with development of the standard itself, it is just as essential that a compliance program for equipment testing be used. A robust compliance program ensures products are not only interoperable but also are implemented correctly by adhering to the standard.

Since 2004, OIC has partnered with NIST and the National Telecommunications Information Administration's Institute for Telecommunication Sciences to accelerate the development of the Project 25 (P25) suite of standards for narrowband communications. P25 standards help produce voice communications equipment that is interoperable, regardless of manufacturer. In addition to interoperability, P25 aims to promote more efficient use of spectrum while retaining compatibility with legacy systems, and scaling to support small-to-large incidents. While P25 consists of eight interfaces, the emergency response community prioritized the development of four interfaces:

- Common Air Interface (CAI) [3]
- Inter-RF Subsystem Interface (ISSI) [4]

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[1] *Intelligence Reform and Terrorism Prevention Act of 2004* § 7303, Pub. L. No. 108–458 (codified at 6 U.S.C. § 194)

[2] *Department of Homeland Security Appropriations Act of 2007*, H.R. Rep. No. 109–699

[3] This interface provides wireless communication between radios. The major CAI standards documents are complete except for trunked conformance test standard. The date for completion of this standard is currently uncertain pending a commitment of resources from manufacturers and support from the standards body.

[4] This interface joins two land mobile radio systems so that they act as one system and can support multijurisdictional, seamless roaming. The ISSI functional standards are complete, and ISSI commercial equipment is expected to begin deployment soon. The multi-vendor seamless

- Console Subsystem Interface (CSSI)[5]
- Fixed Station Interface (FSI)[6]

Specifically, CAI and ISSI are fundamental to system and equipment interoperability, and thus are the highest priorities for both the emergency response community and DHS S&T.

P25 standards are developed through a voluntary consensus process[7]. The success of the overall effort is dependent on multiple factors including active participation from the user community and equipment manufacturers, the standards meeting requirements defined by emergency responders, a willingness to build to the standard, and a comprehensive compliance assessment program to determine whether equipment follows the standard. The need for consensus throughout this effort often sets the pace for how quickly they are completed. A strong desire for progress and partnership among all stakeholders, manufacturers and emergency responders alike helps build consensus and ensure a steady pace.

Compliance Assessment

A comprehensive compliance assessment program is a key element to improving interoperable communications—it provides a process through which equipment can demonstrate that it correctly follows the standard and is able to interoperate with other equipment following the standard. When interoperability testing is combined with conformance testing, emergency responders can be assured that equipment conforms to the standard and will interoperate with all compatible equipment that correctly implements the standard, including equipment that was not tested. Furthermore, conformance testing helps provide increased confidence that equipment developed in the future will retain compatibility with legacy systems.

A few years ago, it was discovered through testing that much of the equipment advertised as P25-compliant was unable to interoperate with P25 equipment manufactured by other companies and, in some cases, even with earlier P25 equipment manufactured by the same company. In response, Congress authorized OIC to establish the P25 Compliance Assessment Program (CAP), in coordination with NIST. The P25 CAP allows emergency responders to confidently purchase and use P25-compliant products, and represents a critical step toward allowing responders to communicate using their own equipment.

Recognizing the need for an open and transparent process, the P25 CAP established a Governing Board (GB) to represent the collective interests of organizations that procure P25 equipment. Its membership consists of local, tribal, state, and Federal Government employees who are active in the operation or procurement of communication systems. The P25 CAP GB encourages members of the public to attend meetings and provide comments in order to increase stakeholder participation in the program. Before the P25 CAP GB publishes compliance documents, they solicit direct input from manufacturers, emergency responders, and other interested parties during an open comment period. The GB considers all comments in an ongoing effort to address both the requirements of the users and the concerns of the manufacturers. Through this open process, the GB continues to work towards the goal of creating the first commonly-accepted definitions of compliance across all interfaces.

Using testing standards published by P25, the P25 CAP aims to add quality, openness, and rigor by building on the product development testing already performed by manufacturers. The first group of laboratory assessments began in December 2008, and by April 2009, DHS recognized the first eight laboratories as part of the P25 CAP. A DHS-recognized laboratory is authorized to produce detailed test reports for P25 equipment. Four different manufacturers have had emergency communications equipment complete the P25 CAP process, which includes publishing Suppliers' Declaration of Compliance (SDoC) and Summary Test Reports.[8] The SDoC is the manufacturer's formal, public attestation of compliance with the standards for the equipment and the Summary Test Reports provides the equipment pur-

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roaming allowed by the ISSI will constitute a serious advancement over existing bridging technologies. Those technologies will remain important for bridging existing equipment, since systems are required to use the ISSI.

[5] This interface specifies the basic messaging to interface a console subsystem to a P25 RF Subsystem

[6] This interface specifies a set of mandatory messages supporting digital voice, data, encryption and telephone interconnectivity necessary for communication between a Fixed Station and P25 RF Subsystem

[7] National Technology Transfer and Advancement Act of 1995 § 12, Pub. L. No. 104–113 (codified at 15 U.S.C. § 272 note)

[8] As part of P25 CAP, SDoC and Summary Test Reports are required to be published on FEMA's Responder Knowledge Base Web site at *https://www.rkb.us/*

chaser with a summary of the tests conducted on the equipment along with the testing outcome.

Unfortunately, claims of compliance are not limited to the equipment that has completed the P25 CAP. This can lead to confusion among emergency responders and in the marketplace. DHS has attempted to clarify the definition of P25 compliant equipment through the SAFECOM Guidance for Federal Grant Programs. Specifically, the SAFECOM grant guidance states that "all new digital voice systems must be compliant with the P25 suite of standards." The grant guidance qualifies P25 equipment compliance to mean the completion of testing consistent with P25 CAP. Only under compelling circumstances may an agency use grant funding to purchase non-P25 equipment. The SAFECOM grant guidance continues to be used by interoperable and emergency communications grant programs outside of DHS, including the Department of Justice Office of Community Oriented Policing Services Technology Program.

Conclusion

Emergency responders' ability to communicate is vital to completing their mission, and the P25 CAP provides them with the credible facts and data to evaluate manufacturers' claims of standards compliance. The testing of P25 within communication equipment will improve interoperability as well as confidence in the suite of standards. In order to have a fully functional P25 CAP, at a minimum there must be comprehensive compliance testing for the CAI and ISSI. Conformance tests for the ISSI do exist and are under development for the CAI; however, the successful incorporation of conformance testing in the P25 CAP is dependant on manufacturer participation. Without this rigorous testing, a "P25 radio" is compliant in name only.

I appreciate the opportunity to testify before you today. I look forward to continuing to work with emergency responders and manufacturers, and I welcome the committee's interest and support of interoperable communications.

I look forward to answering any questions you may have.

BIOGRAPHY FOR DAVID BOYD

Dr. David G. Boyd joined the U.S. Department of Homeland Security (DHS) upon its establishment in March 2003. Dr. Boyd serves as the Director of the Command, Control and Interoperability (CCI) Division within the Science and Technology Directorate. Dr. Boyd leads multiple cutting-edge research and development (R&D) programs in communications interoperability, cyber security, knowledge management, reconnaissance, surveillance, and investigative technologies, and basic and futures research; his CCI programs and projects comprise a budget of more than $80 million. As one of the earliest members of the Department, Dr. Boyd helped to build the Science and Technology Directorate from the ground up. In 2004, he was selected to lead the Office for Interoperability and Compatibility—an office established by Congress charged with coordinating interoperable communications efforts across the Federal Government and with the Nation's 60,000 emergency response agencies.

Dr. Boyd's "bottom-up," practitioner-driven approach has revolutionized the Federal Government's approach to strengthening interoperable communications. Under Dr. Boyd's leadership, CCI includes state and local emergency responders in the planning, development, and implementation of projects. Needs gathered directly from responders are used to develop comprehensive solutions that have the most significant impact on practitioners and can be implemented throughout the Nation. This approach has significantly improved the Federal Government's relationship with these agencies and ensured that Federal projects address the needs of responders in the field. Dr. Boyd is a recipient of a 2005 Presidential Rank Award, the highest recognition available in the Federal Civil Service, and holds a career appointment in the Senior Executive Service. Both he and his Division have received more than a dozen national awards since 2003.

Before joining DHS, Dr. Boyd served as the Director of Science and Technology for the National Institute of Justice at the Department of Justice, where he oversaw an activity which grew from a budget of $2 million and a staff of four into the single largest law enforcement and corrections technology development activity in the United States with an active portfolio of more than $750 million and a staff of more than 200 Federal and contract personnel in technology centers across the Nation. His office managed R&D programs in every facet of technology affecting law enforcement and corrections, including the forensic sciences, less than lethal technologies, information and communications technologies, and concealed weapons and contraband detection, among others. He directed the DNA and forensic laboratory im-

provement programs, which expanded the forensic community from fewer than six DNA-capable crime laboratories to more than 130 in all 50 states.

Dr. Boyd has served on the White House National Science and Technology Council, the National Security Council Committee on Safety and Security of Public Facilities, and as the Executive Chair of the Department of Justice's Technology Policy Council.

Prior to joining the Civil Service, Dr. Boyd served more than 20 years in the U.S. Army. He has commanded combat, combat support, and training units in the U.S. and overseas, in times of both peace and war, and has served on military staffs from battalion level to the Pentagon, where—as an operations researcher—he was responsible for the design and supervision of the development and application of automated models in support of the Chairman of the Joint Chiefs of Staff. He has represented the U.S. in bilateral meetings with Soviet and other foreign analysts, and led a special strategic analysis in support of the first Gulf War. His more than three dozen military awards include the Bronze Star and the Purple Heart.

He is a graduate of the University of Illinois—Champaign, Golden Gate University, the University of Illinois—Chicago, and Walden University. He holds graduate degrees in Management and Public Policy Analysis as well as a doctorate in Decision Sciences, and has published extensively.

Chairman WU. Thank you, Dr. Boyd.
Mr. Orr.

STATEMENTS OF DERECK ORR, PROGRAM MANAGER, PUBLIC SAFETY COMMUNICATIONS SYSTEMS, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

Mr. ORR. Chairman Wu, Ranking Member Smith, Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss public safety communications and the P25 project.

The Public Safety Communications Research program, known as PSCR, is a joint effort among NIST and NTIA [National Telecommunications and Information Administration] at Commerce. The PSCR serves as the technical lead for several Administration initiatives focusing on public safety communications. From the beginning, one of the core focus areas of the PSCR has been to participate in the Telecommunications Industry Association land mobile radio standards development process. The vast majority of our first responders across the Nation use land mobile radio systems every day to communicate as they perform their missions. This includes the radios that you see police officers or firefighters wearing on their belts.

Interoperability for these radios has been a problem as we have seen in recent national emergency situations and achieving interoperability is not possible without the existence of published standards that define how the various components of a public safety communications system will interoperate regardless of manufacturer. In the absence of standards, achieving this level of interoperability would not be possible.

Public safety users have recognized this for some time. Approximately 20 years ago, representatives from local, state and Federal public safety associations and agencies joined together with industry to address the absence of available standards for land mobile radios as they entered the transition from analog to digital-based systems. Thus, Project 25, or P25 as we know it today, was launched. Based on our experience, there are four main issues with P25 that are hampering progress towards seamless interoperability and open competition.

First, since P25's inception in 1989, only one and a half of the eight interfaces in the suite of the standards needed for interoperability and competition as defined by P25 are complete. Second, as a result of the lack of complete standards, only a fraction of any P25 system purchased today is truly standards based. Third, many public safety agencies believe that when they purchase a system labeled P25 that it is based on a complete set of standards. They interpret a P25 system to mean LMR [Land Mobile Radio] system that is fully standards based. We believe it is important that public safety agencies make their procurement decisions and valuations on a realistic set of expectations. Fourth, there has been a lack of industry-led compliance assessment and certification programs. Compliance to the standard is essential and in fact every major wireless technology we know of ensures interoperability among devices and adherence to the standards by establishing rigorous and comprehensive compliance assessment and certification programs. P25 should be no different. We need to identify problems with products or the standard in the lab, not in the field.

NIST has been actively engaged on behalf of DHS in the P25 process to accelerate the adoption of standards. In addition, to address the lack of a compliance testing program, DHS and NIST partnered together to establish the Project 25 Compliance Assessment Program. This is a government-led program outside of the P25 standards development process and was created with direction from Congress to ensure that Federal grant dollars are being spent on communications equipment that will result in interoperability and improve public safety's ability to protect lives and property.

From the beginning, the P25 CAP was developed with the expectation of incorporating all three types of tests, performance, conformance and interoperability, into the program. However, over the last year, an issue of including conformance tests in the P25 CAP has arisen which has slowed down our ability to launch a fully functional program. I want to make clear: conformance tests are the one type of test that ensures that a product adheres to the written standard and, therefore, increases confidence that there will be interoperability in the field. However, the general response from industry was that only performance and interoperability tests were necessary for compliance assessment.

DHS, NIST, other Federal partners and many public safety users spent nearly a year trying to find an acceptable resolution that would minimize the burden on industry while maintaining the integrity of the P25 CAP through the inclusion of all three types of tests. In the absence of achieving consensus, and given public safety's insistence on the inclusion of conformance tests in the P25 CAP, the program moved ahead by including conformance tests for the most recently published interface. I am pleased to say that over the last two months we have witnessed a willingness within the P25 standards body to actively participate in the identification of relevant conformance tests for the P25 CAP.

NIST hopes that within two years the P25 CAP is a fully functional program including performance, conformance and interoperability testing for at least the interfaces which are crucial to interoperability. Achieving this will require significant commitment and focus by all parties, and for its part, NIST is prepared to assist in

meeting this worthy goal. NIST remains dedicated to continuing to work with this Subcommittee, industry, our Federal sponsors and partners and public safety users to see the P25 standards completed and to develop programs to help public safety purchase interoperable land-mobile radio equipment.

In conclusion, I want to thank Chairman Wu for his leadership on interoperability standards for public safety communications and for the positive effect his involvement has had in moving this issue forward.

I am happy to answer any questions you may have.

[The prepared statement of Mr. Orr follows:]

PREPARED STATEMENT OF DERECK ORR

Chairman Wu, Ranking Member Smith, Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss Public Safety Communications and the P25 project. I serve as the Program Manager for Public Safety Communications Systems in the Office of Law Enforcement Standards (OLES) at the National Institute of Standards and Technology (NIST). In addition, I am the Program Manager for the Public Safety Communications Research (PSCR) program, which is a joint effort among NIST and the National Telecommunications and Information Administration (NTIA) at the Department of Commerce (DOC) Labs located in Boulder, Colorado.

The Public Safety Communications Research (PSCR) program serves as the technical lead for several Administration initiatives focusing on public safety communications, most importantly the Department of Homeland Security's (DHS) Office for Interoperability and Compatibility (OIC) within the Science and Technology Directorate. The PSCR program is also involved in many of DHS's key communications interoperability related programs, including the SAFECOM Program within the Office of Emergency Communications (OEC). The strong partnership among OIC, SAFECOM and the PSCR program is an excellent example within the Administration of multi-agency coordination and collaboration, and is something for which we at NIST are very proud.

Working alongside our Federal partners, the PSCR program has provided the lead technical role in some of the key advancements in public safety communications over the last five years. NIST, in partnership with OIC, has led the development of an open interface for Voice-over-Internet Protocol (VoIP) public safety applications, developed technical requirements for public safety video applications to ensure that they meet the needs of public safety, so that, for example, a police officer can properly identify suspects based on a video. We have also scientifically corroborated concerns from the public safety community that digital radios did not perform as well as analog radios in loud noise environments. This has been particularly important to the fire community whose communications were significantly degraded at the time they would need to communicate most. In addition, NIST has been heavily involved in the emerging public safety broadband issue by leading, over the last several years, the technical committees that have worked directly with public safety to define their requirements for a nationwide public safety broadband system. We have recently kicked off a project to develop and implement a broadband demonstration system at the Boulder Labs that will focus on understanding how the future fourth generation broadband standards will and will not meet public safety's requirements for their mission critical needs.

My DOC colleagues at the NTIA recently announced that it will make Recovery Act broadband grants available to public safety entities that this month received authorization from the FCC to build out broadband public safety communications systems utilizing the 700 MHz band. I want to note that my comments today are not related to those 700 MHz-based broadband systems.

From the beginning, one of the core focus areas of the PSCR has been to participate in the Telecommunications Industry Association (TIA) Land Mobile Radio (LMR) standards development process. These are the systems that the vast majority of our first responders use every day across the Nation to communicate as they perform their missions. These are the radios that you see police officers or fire fighters wearing on their belts. As that is the topic of today's hearing, I will focus the remainder of my remarks this morning on the current state of the formal standards development and test programs for public safety land mobile radio systems.

Interoperability for public safety communications is defined as "the ability to share information via voice and data signals on demand, in real time, when needed, and as authorized." The public safety community expects that this level of interoperability will be available using equipment from multiple manufacturers, that they are transparent to the user requiring little or no special knowledge of the system, and that they are not dependent on common frequency assignments.

Achieving this definition of interoperability is not possible without the existence of published standards that define how the various components of a public safety communications system will interoperate, regardless of manufacturer. In the absence of standards, achieving this level of interoperability would not be possible.

Public safety users have recognized this for some time. Approximately twenty years ago, representatives from local, state, and Federal public safety associations and agencies joined together to address the absence of available standards for Land Mobile Radios as they entered the transition from analog to digital based systems. They did this for two primary purposes. The first was to ensure that interoperability could be achieved, assuming the use of equipment from multiple manufacturers. Second, through standards, the public safety community wanted to be able to take advantage of cost reductions associated with a more competitive Land Mobile Radio market.

Understanding the difficulty in specifying the complex operations of the various components of a land mobile radio system, the public safety community partnered with the Telecommunications Industry Association (TIA) to serve as the standards development organization (SDO) for this effort. Thus Project 25, or P25 as we know it today, was launched. For the last six years, PSCR has been an active participant in the P25 standards process, especially in the development of test standards.

A commonly misunderstood aspect of P25 is that it is comprised of a single standard. Instead, it is a suite of standards that specify the eight open interfaces listed below between the various components of a land mobile radio system (e.g.: hand held to hand held, hand held to base station, mobile unit to repeater, etc.):

- **Common Air Interface (CAI)**: this interface defines the wireless access between mobile and portable radios and between the subscriber (portable and mobile) radios and the fixed or base station radios;
- **Inter-RFSubSystem Interface (ISSI)**: this interface permits users in one system to communicate with users in a different system, from one jurisdiction to another, from one agency to another, from one city to another, etc.;
- **Fixed Station Interface (FSI)**: this interface describes the signaling and messages between the RFSS and the fixed station by defining the voice and data packets (that are sent from/to the subscriber(s) over the common air interface) and all of the command and control messages used to administer the fixed station as well as the subscribers that are communicating through the fixed station;
- **Console Sub-System Interface**: this interface is similar to the fixed station interface but it defines all the signaling and (CSSI) messages between the RFSubSystem and the console, the position that a dispatcher or a supervisor would occupy to provide commands and support to the personnel in the field;
- **Subscriber Data Peripheral Interface**: this interface characterizes the signaling for data transfer that must take place between the subscriber radios and the data devices that may be connected to the subscriber radio.
- **Network Management Interface**: this interface allows administrators to control and monitor network fault management and network performance management.
- **Data Network Interface**: this interface describes the RFSSs connections to computers, data networks, external data sources, etc.
- **Telephone Interconnect Interface**: this interface between the RFSS and the Public Switched Telephone Network (PSTN) allows field personnel to make connections through the public switched telephone network by using their radios rather than using cellular telephones.

For any one of these eight interfaces to be considered complete (so that multiple manufacturers can build and test to a common standard) the following five types of standards documents have to be published:

- **Overview**: serves as the general mission statement for the interface;
- **Protocol**: specifies the messages and procedures to be followed in the development of equipment implementing the interface;

- **Performance**: specifies the test procedures to be executed to ensure the device under test operates within the expected bounds identified in the standard (i.e. emissions and adjacent channel interference);
- **Conformance**: specifies the test procedures to be executed to ensure the device under test produces messages that adhere to the message format and procedures detailed in the protocol document;
- **Interoperability**: Specifies the test procedures to be executed to determine if two or more different devices under test respond appropriately when communicating over the interface.

The most important of these documents is the protocol document which provides the details needed by each manufacturer to develop products that implement the particular interface. However, of only slightly less importance are the three test documents that allow each manufacturer to comprehensively test their implementations in a common way so as to limit variant interpretations of the protocol and ensure overall uniformity in product development. In addition, uniformity in implementation of the interfaces is crucial for seamless interoperability.

Based on our experience, there are four main issues with P25 that are hampering progress toward seamless interoperability and open competition.

1) Standards for all eight interfaces are not published.
2) Only a portion of P25 systems are standards based.
3) It isn't clear to public safety agencies what a P25 system entails.
4) There is no industry-led formal compliance assessment program.

To date, only the conventional portion of the CAI and the Inter-RF-Subsystem Interface have a completed suite of documents as defined above. The more complex trunked CAI continues to lack conformance test documents (crucial for uniform implementation) although trunked CAI products have been sold for almost a decade. The remainder of the six interfaces are in various states of document completion. Therefore, since its inception in 1989, one and a half of the eight interfaces have been completed.

Second, as a result of the lack of complete standards, only a limited portion of a P25 system is truly standards based. To our knowledge, only the CAI is currently supported in most P25 system deployments, although some jurisdictions are now on the verge of procuring the recently completed ISSI, and ISSI manufacturers are piloting this new interface in several locations across the United States.

Third, many public safety agencies believe that when they purchase a system labeled P25, that it is based on a complete set of standards. They interpret a "P25 system" to mean a LMR system that incorporates the P25 interfaces. Most public safety agencies do not have the, resources to dedicate to researching the status of the complex standards process so that they have a clear picture of what a "P25 system" currently entails. The reason we, and our partners, try to provide outreach to as many public safety agencies as possible is that we believe it is important that they make their procurement decisions and valuations on a realistic set of expectations.

Fourth, there has been a lack of a compliance assessment and certification programs. As mentioned above, compliance to the standard is essential and in fact every wireless technology we know of ensures interoperability among devices by establishing rigorous and comprehensive compliance assessment and certification programs. Successful completion of the compliance assessment process often results in limited rights to the use of a certification logo (i.e. Bluetooth, Wi-Fi, or WiMAX) which is intended to impart to consumers the fact that the product has been tested in some type of formal process and should be expected to work with other devices with the same logo.

In the case of P25, the industry participants never established a formal and uniform compliance assessment and certification program. Instead, testing to determine P25 compliance was performed by each manufacturer in whatever manner they each determined was sufficient for validation of their products. There has been no industry led formal test regime and there is no certification process or stamp for P25 products.

The P25 logo has instead been used by manufacturers as a marketing logo to convey to users that their product was developed to P25 standards specifications. However, many public safety agencies that we speak with incorrectly assume that the logo is a certification stamp signifying the completion of a formal and uniform test regime.

To address the first three issues, NIST has been actively engaged on behalf of DHS in the P25 process to accelerate the adoption of standards. To address the lack of a compliance testing program DHS and NIST partnered together to establish the

Project 25 Compliance Assessment Program (P25 CAP). This is a government-led program outside of the P25 standards development process, and was created with direction from both Commerce and DHS appropriations committees in order to ensure that Federal grant dollars are being spent on communications equipment that will result in interoperability and improve public safety's ability to protect lives and property. Additionally, this program is designed to provide greater clarity to public safety agencies regarding the status of the P25 standards, and to, more importantly, provide them with a higher level of confidence that the products they are purchasing will interoperate with other P25 products. In this partnership, NIST performs the lab assessments and DHS develops the overall program policy, as well as recognizing participating laboratories. This program has been developed over the last five years and is comprised of several key elements:

- **Test Standards**: P25 CAP uses published P25 performance, conformance, and interoperability test standards. Whenever possible, the P25 CAP looks for guidance from the P25 technical committees and manufacturers for input on what tests are most applicable. In addition, the P25 CAP only uses a subset of available P25 tests. The subset of tests are published in DHS P25 CAP Compliance Assessment Bulletins.
- **Interfaces**: The P25 CAP is currently focused on the two P25 interfaces (CAI and ISSI) that are crucial to interoperability and that will help achieve the nation-wide system of system's approach supported by the DHS SAFECOM Program.
- **Lab Recognition**: The P25 CAP utilizes recognized laboratories that have been assessed and recommended by PSCR personnel based on adherence to appropriate portions of international laboratory testing standards and on their competence at executing the P25 tests specified in the DHS P25 Compliance Assessment Bulletin. If a laboratory successfully completes the assessment phase, DHS issues a Certificate of Recognition which signifies their ability to participate in the P25 CAP.
- **Manufacturer Participation**: The P25 CAP is a voluntary process and relies on vendor participation for its success. To be in compliance with the P25 CAP, participating vendors must have their equipment tested in a DHS recognized laboratory and must post the results of the testing at a publicly accessible DHS website (*www.rkb.us*).
- **Federal Grant Guidance**: The P25 CAP is required in the SAFECOM Federal Grant Guidance which applies to DHS grant programs and is leveraged by other Federal agencies as well, such as the Department of Justice's COPS Office. The grant guidance limits P25 equipment purchases to products that have been tested in P25 CAP recognized labs and have the proper documentation posted on the RKB website. This helps ensure that all Federal investments support standards-based equipment and interoperability.

The P25 CAP was developed with involvement from both the industry and the public safety community. The goal of the program is to increase public safety's confidence that P25 products being purchased will operate and interoperate, based on a formal and uniform test program, while at the same time minimizing the financial burden that implementing a voluntary compliance program might place on the P25 industry. Therefore, it should be noted that the resulting program is a minimalistic compliance assessment program. It does not rise to the level of rigor imposed by the wireless technologies mentioned above or that of the European public safety communications standard, TETRA. The P25 CAP does not involve third party certification and does not lead to a certification stamp. The program instead requires that a manufacturer publish a Supplier's Declaration of Compliance which specifies the product tested, the tests performed, and the DHS recognized lab used to perform the test. The manufacturer must also publish a Summary Test Report (STR) that provides pass/fail data for each of the tests required by DHS. The SDoC and STR are posted by the manufacturers on a DHS website (*www.rkb.us*). Public safety agencies using Federal grant dollars can only purchase P25 equipment with published documents available on the DHS website. In addition to testing information being publicly available, the equipment will have been tested in laboratories that have demonstrated an adequate quality management system and P25 testing proficiency. In striking this balance our hope is increase the amount and quality of information available to the public safety community, while at the same time creating a minimalistic program that will gain wide-spread industry participation.

To date, DHS has recognized eight laboratories to perform the current CAI tests required by the P25 CAP program. As of November 2009, all DHS grantees purchasing P25 CAI related equipment are required to ensure that the equipment is

in compliance with the P25 CAP guidelines, prior to taking final acceptance. Currently there are four manufacturers who have complied with the current requirements of the P25 CAP. All four have published information on their subscriber units (walky-talkies) which is out of the approximately eleven manufacturers that make P25 subscriber units (36% participation rate). In addition, two of the four manufacturers have published documents relating to their infrastructure (base stations, etc.) which is out of approximately eight manufacturers that make P25 infrastructure—a 25% participation rate.

The publication of this information is a significant milestone for public safety. For the first time, public safety officials have one place that they can go to obtain test results performed through a formal process and whose results are presented in a common manner, making comparisons between manufacturers' products much less time consuming. In fact, we are aware of multiple public safety agencies using the P25 CAP in their procurement decisions and evaluation. However, the participation rate must increase for the program to be truly effective.

It must also be noted that the current program covering the CAI includes only performance and interoperability tests. This is due to the fact that at the time of the publication of the DHS P25 CAP Compliance Assessment Bulletin in 2008, there were no relevant published CAI conformance tests to draw from.

Since 2008, conformance tests have been published for the conventional CAI, and the PSCR program and its Federal partners are currently working with the manufacturers and public safety users within the standards committees to determine the appropriate tests to incorporate into the P25 CAP. Although we are hopeful that we will be able to identify existing, and where needed develop, appropriate conformance tests for the conventional CAI, it must be noted that the issue of conformance testing has been a significant problem within the P25 standards community over the last year.

From the beginning, the P25 CAP was developed with the expectation of incorporating all three types of tests (performance, conformance, and interoperability) into the program. This expectation was articulated in program documents, charters, and presentations. Many manufacturers echoed this expectation in their own documents and presentations. However, as was noted above, the issue of conformance tests did not develop until after the drafting of the first DHS P25 CAP Compliance Assessment Bulletin because at the time of publication there were no published conventional or trunked CAI conformance tests to draw from.

Leveraging published conformance tests into the P25 CAP became an issue for the first time in April 2009 during the development of the recommended set of tests for the ISSI. Because published conformance tests for the ISSI were available for consideration, the PSCR recommended a subset of the published conformance tests for inclusion into the P25 CAP. The general response from industry to this recommendation was that it was not their intent that the P25 CAP would include conformance testing, and should instead focus on performance and interoperability testing for compliance assessment. At that time, the PSCR as well as our Federal partners and many of the public safety users participating in the meetings reiterated the expectation that the P25 CAP would incorporate conformance testing.

The rationale for this was, and remains, that at the core of any compliance assessment or conformity assessment program is the expectation that products will be tested to ensure that they adhere to the messages and procedures mandated by the standard. Interoperability, especially in the wireless field, is achieved through consistent implementation of the interface standard across products and manufacturers. If consistency in implementation is achieved, and the protocol standard is unambiguous, then the expectation of interoperability is significantly increased, though not guaranteed. By implementing conformance testing in the P25 CAP, the program is ensuring that each product tested is traceable to the published standards.

The reliance on conformance testing is common across wireless technology certification programs, all but one of which is developed and administered by their relevant wireless industry associations and interest groups such as Wi-Fi, Bluetooth, WiMAX, and LTE. The non-industry conformance testing example is the European public safety communications standard, TETRA. The TETRA compliance assessment program is a joint program between government and industry, and relies heavily on conformance testing as well. To exclude conformance testing from the P25 CAP would make it, to our knowledge, the only wireless technology compliance assessment program to do so. In fact, several of the manufacturers of P25 equipment also develop TETRA products, as well as other wireless devices for the standards listed above and submit their other products for conformance testing as required by the respective programs. As I have stated previously, the P25 CAP is already a minimalistic program. All of the programs listed above are significantly more rig-

orous and resource intensive. Removing conformance testing from the program would call into question its ability to achieve the goals of confidence and interoperability it was established to address. Given the critical importance of the radio equipment to both the first responders and the citizens they serve, we cannot recommend such a course.

All of the programs mentioned above also rely heavily on interoperability tests, as does the P25 CAP. However, interoperability tests only demonstrate whether two different products work together. A successful interoperability test result does not demonstrate that the products adhere to the standard. In addition, you cannot infer that because two different manufacturers' products interoperate that either will be interoperable with a third manufacturer. Interoperability must be confirmed with a direct test with another product, or in some cases a test against a reference model which does not exist in the P25 industry.

Interoperability testing in any industry is resource intensive, requiring significant coordination among all manufacturers. Understanding this, the P25 CAP requires that participating manufacturers only demonstrate interoperability with three other manufacturers' products, thus limiting the number of coordinated tests required. Conformance tests, on the other hand, can be performed without any other manufacturer's equipment present.

Finally, Land Mobile Radio equipment is designed to be fielded for years if not decades. Therefore, it is highly likely that products fielded today will be operating alongside new products fielded ten or even twenty years from now. However, there is no requirement that manufacturers test future products against past products. To do so would create an exponential growth in the number of tests required, and would place an unfair financial and administrative burden on any P25 equipment manufacturer. Instead, by including conformance testing in the program, products released today, as well as ten years from now, will show traceability to the same standards, thereby increasing the confidence in interoperability while minimizing the testing required.

NIST and DHS staff presented this rationale to the relevant committees within P25 and worked for months to develop an acceptable list of tests (at one point only proposing 18 conformance tests out of the full set of 92). However, the final recommendation out of P25 to DHS was that no conformance tests should be included in the P25 CAP for the ISSI. DHS at that point developed a list of conformance tests, with input from Federal, state, and local P25 system owners and/or managers and published an ISSI Compliance Assessment Bulletin in March of this year. The P25 CAP program is now awaiting applications from laboratories interested in performing ISSI testing.

There were indications within the standards committee that there would be similar resistance to including conformance testing for compliance assessment for the other interfaces, including the common air interface.

However, the tide has turned. I am pleased to say that over the last two months we have witnessed a renewed willingness within the P25 standards body to actively participate in the identification of relevant conformance tests for the P25 CAP. We are currently working within the standards committees to identify and develop a recommended set of conformance test for the conventional CAI, and we hope to see significant and expedited progress on developing conformance tests for trunked CAI equipment.

It is frustrating to many that we are only now implementing a compliance testing program over a decade after the products have been released into the marketplace. And it is true that the program will not have a significant impact on the currently installed base. But what is important to keep in mind is that the Federal Government's significant investment in communications equipment for first responders and other law enforcement agencies will drive procurement decisions. In addition, there are thousands of agencies that will be upgrading their aging Land Mobile Radio systems over the next decade, and most will likely adopt the P25 standard. The P25 CAP will have a significant impact on these future purchases and will improve the likelihood that interoperability can be achieved.

NIST hopes that within two years, the P25 CAP has a fully functional program including performance, conformance, and interoperability testing for at least the CAI and ISSI interfaces which are crucial to interoperability. Achieving this will require significant commitment and focus by all parties, and for its part, the NIST is prepared to assist in meeting this worthy goal. NIST remains dedicated to continuing to work with this Subcommittee, industry, our Federal sponsors and partners, and public safety users to see the P25 standards completed and to develop programs that help public safety purchase interoperable Land Mobile Radio equipment.

Again, I am honored to be here before this Subcommittee today, and I am happy to answer any questions that you may have.

BIOGRAPHY FOR DERECK ORR

Dereck Orr is the Program Manager for Public Safety Communication Standards at NIST's Office of Law Enforcement Standards, and has held that position since December 2002.

In that role, he leads a program that serves as an objective technical advisor and laboratory to the Department of Homeland Security and public safety to accelerate the adoption and implementation of the most critical public safety communication standards and technologies.

From October 2003 until October 2004, Mr. Orr was detailed to the Department of Homeland Security to serve as the Chief of Staff of the SAFECOM Office within the Science and Technology Directorate, to help establish the new program.

Prior to working at NIST, Mr. Orr served as a professional staff member of the Senate Appropriations Subcommittee for the Departments of Commerce, Justice, and State, and Related Agencies under Senator Fritz Hollings. In that position, Mr. Orr was responsible for the appropriations accounts relating to state and local law enforcement issues.

Previously, Mr. Orr served four years at the Office of Community Oriented Policing Services (COPS) at the Department of Justice.

Mr. Orr received a Masters in Public Policy from the College of William and Mary and a Bachelor of Arts in American History from the University of Texas at Austin.

Chairman WU. Thank you very much, Mr. Orr.

Dr. Hofmeister, please proceed.

STATEMENTS OF ERNEST L. HOFMEISTER, SENIOR SCIENTIST, HARRIS CORPORATION

Dr. HOFMEISTER. Thank you, Chairman Wu.

Chairman Wu and distinguished Members of the Subcommittee, thank you for inviting me to testify on the interoperability in public safety communications equipment.

Chairman WU. Dr. Hofmeister, have you pressed your button? Have you turned your mic on?

Dr. HOFMEISTER. It says "talk" here.

Chairman WU. Maybe a little bit closer.

Dr. HOFMEISTER. I will try this. How is that?

Chairman WU. Terrific.

Dr. HOFMEISTER. Well, thank you again for allowing me to testify.

There are a number of technology approaches to achieve increasing levels of interoperability, going from swapping radios, to gateways, to shared channels, to proprietary shared systems, to standards-based shared systems. Harris believes that all of these approaches are deployed today to achieve varying levels of interoperability.

At the upper end of the interoperability capability are standards-based shared systems. The predominant standard for these systems in the United States is the TIA–102 [Telecommunications Industry Association] P25 suite of Project 25 standards. The number of deployed P25 systems is increasing and the level of interoperability across these systems provided by different vendors is increasing, and with radios provided by different vendors.

As a quick standard summary, the TIA–102 P25 standard suite consists of approximately 69 published standards with about 13 in ballot as new, revised or addendum standards, and with about 15 in draft. This suite addresses 11 defined Project 25 interfaces in the categories of service, the system and equipment. The P25 interfaces critical for interoperability and competition (the common air interface [CAI], the inter-RF subsystem interface [ISSI], and the

fixed station interface [FSI]) are specified in more detail in the current suite than some others.

While some not involved in the standards development process may comment that standards development takes a long time, the TIA process, like other standards development organizations, is a consensus-based process by design. The standards are developed by top engineers from industry who have the knowledge and perspective to assure successful product implementation to the standard. Getting to consensus and developing the requisite detail of the standard takes time but the resultant standard product is technically solid and long-lasting.

Harris believes that since 2005 the standards pace is at full industry and user support capacity. We have many meetings where everybody is making contributions, so we are kind of working at capacity that we have, I believe, in the industry.

Now, there were several questions asked, and I am going to try to answer what I can in the testimony here. One was, what is the status of public safety land mobile radio standards in terms of meeting the original P25 goals of enabling interoperability, competition among vendors, spectrum efficiency, graceful migration and user-friendly equipment? Harris believes that the P25 community has made strong progress in meeting each of these cited goals: specifically, the first three. For enabling interoperability for radios and radio infrastructure, detailed common air interface radio product design and interoperability test standards are in place and multiple vendor radio products and infrastructure radio products have demonstrated a high functional level of interoperability through the form of CAI interop testing as part of the CAP program over the last year. As Dr. Boyd mentioned, over 20 radio products or radio classes from four vendors have been approved with Suppliers' Declarations of Compliance posted to the official website.

For enabling interoperability with systems and networks, detailed ISSI baseline product design and interoperability test standards are in place. The P25 CAP requirements are in place. The first ISSI products are emerging. Informal ISSI interoperability testing among a number of vendors has already taken place. Formal ISSI interoperability testing as part of the P25 CAP is expected over the next year.

And for competition among radio vendors, fairly strong competition among radio vendors has developed with over 15 vendors providing P25 radio products across a variety of frequency bands. Competition among P25 system and network vendors has developed with five vendors supplying P25 systems. Almost all large P25 system procurements have a separate system and infrastructure procurement and user radio procurement, so there is competition on both levels.

For spectrum efficiency, from the start the P25 common air interface provided the 12.5 kilohertz narrowband capability and voice efficiency required by 2013 for "narrowbanding" the below 512 band and now in the 700 megahertz public safety band. The P25 phase 2 common air interface for two-slot TDMA [time division multiple access] (two users in 12.5 kilohertz), well along in development, will enable meeting the 6.25 kilohertz per voice path require-

ment for the 700 megahertz band ahead of the January 1, 2017 deadline, as well as the future unspecified requirement for the below 512 band.

What mechanisms exist for customers to have confidence that P25 equipment will be interoperable and function as intended? There are several layers in place. First, P25 manufacturers design and extensive internal product verification test processes are already in place by Harris, and others. There is past industry practice. The manufacturers with deployed or deploying systems developed a practice of communicating and resolving cited interoperability issues. P25 CAP is another layer that has been installed recently. The DHS-recognized labs are implementing the P25 CAP that performs formalized testing to the standards and requirements to provide additional assurance of interoperability, performance, and conformance (to the standards) for critical interfaces. Harris supports a solid, practical DHS P25 CAP program and associated testing for the benefit of our customers, other public safety agency users, and manufacturers. Harris developed and maintains a DHS-recognized compliance laboratory.

In addition, as part of procurement requirements, procurement agencies have the ability to specify special tests as part of the procurement and we are seeing that specification more frequently.

So Chairman Wu and other Members, thank you for the opportunity to testify today and share with you the Harris views on interoperability in public safety communications equipment. Interoperability is a multidimensional challenge that involves five interdependent elements: governance, standard operating procedures, technology including standards, training and exercises, and usage. The level of interoperability achieved depends on the progress in each of the elements and the coordination and management of the five elements. My remarks have focused on the practical technical solutions.

For the higher levels of interoperability, Harris believes that while more work is needed, strong progress has been made in recent years through the continued P25 standards development, the CAP testing and the public safety procurement requirements. The product P25 standards, the testing standards and the product features are in place or soon will be in place to enable a solid level of P25 trunked and conventional system interoperability.

Thank you, Mr. Chairman. I would be happy to answer any questions. Thank you.

[The prepared statement of Dr. Hofmeister follows:]

PREPARED STATEMENT OF ERNEST HOFMEISTER

INTRODUCTION

Chairman Wu and distinguished members of the Subcommittee, thank you for inviting me to testify on "*Interoperability in Public Safety Communications Equipment*."

I am a senior scientist in the Public Safety and Professional Communications (PSPC) group of the RF Communications Division of the Harris Corporation. I have worked as an engineer/scientist and technical manager in the Land Mobile Radio (LMR) business for over 17 years for Harris and the predecessor companies of Tyco Electronics (M/A-COM) and Ericsson GE. For the last ten years I have been leading the business' LMR TIA–Project 25 standards participation.

Harris strongly supports the TIA–P25 standards development and has identified more than 12 top senior Harris engineers to work on TIA–P25 standards develop-

ment. A number of these senior engineers hold chair or vice-chair leadership positions in TIA and P25 subcommittees. For the last six years I have served as chair of two subcommittees involved in critical standards development: the TIA TR–8.12 two-slot TDMA subcommittee (next generation air interface) and the APIC Vocoder Task Group (speech coding standards). I also represent Harris on the P25 Compliance Assessment Program matters in the P25 community. From 1999–2003, I served on the Steering Committee of the Public Safety National Coordination Committee (NCC) FACA advising the FCC on interoperability channels/standards for the emerging 700 MHz public safety spectrum.

LMR products and associated standards represent the core business of Harris PSPC. Harris PSPC is a leading supplier of assured communication systems and equipment for public safety, Federal, utility, commercial, and transportations markets—with products ranging from the most advanced IP voice and data networks, to industry leading multiband, multimode radios, to public safety-grade broadband video and data solutions. With more than 80 years of experience, Harris PSPC supports over 500 systems around the world.

Harris PSPC is a full capability P25 supplier with a full range of P25 radio products, systems, networks and services with over 50 P25 systems either fully deployed or currently being deployed in North America. Harris PSPC support of the P25 standard extends beyond products alone. The Harris P25 Compliance Assessment Laboratory in Lynchburg, VA was one of the first labs recognized by DHS as an interoperability and performance testing compliance lab to satisfy the DHS Compliance Assessment Bulletin (CAB) requirements for the P25 Ph 1 Common Air Interface. This facility has hosted several formal P25 CAP interoperability tests with P25 suppliers such as Motorola, E.F. Johnson, Kenwood, Tait, ICOM and Technisonic. Harris invests significant resources each year in the P25 standard process, product development and compliance assessment testing.

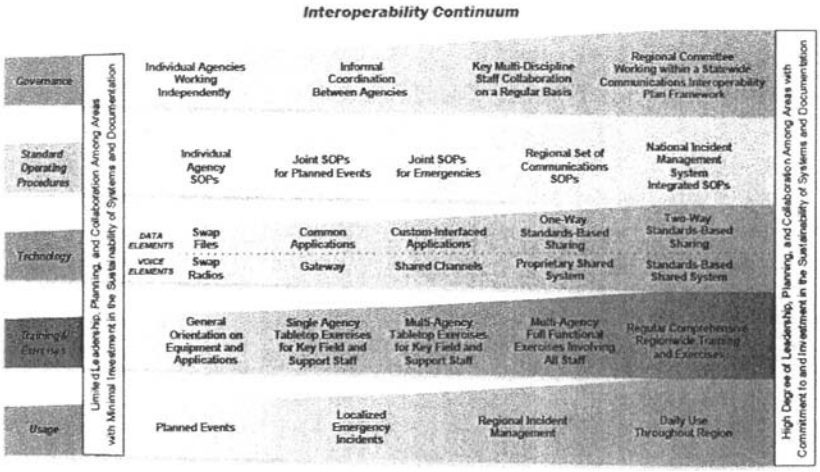
OVERVIEW COMMENTS ON PUBLIC SAFETY COMMUNICATIONS INTEROPERABILITY

Harris agrees with the description and characterization of interoperability on the DHS SAFECOM Interoperability website page[1] and in the DHS Interoperability Continuum Brochure:[2]

- What is communications interoperability? Wireless communications interoperability specifically refers to the ability of emergency response officials to share information via voice and data signals on demand, in real time, when needed, and as authorized.
- Interoperability is a multi-dimensional challenge involving five interdependent elements as illustrated in the diagram from the Interoperability Continuum Brochure:

[1] *http://www.safecomprogram.gov/SAFECOM/interoperability/default.htm*

[2] Interoperability Continuum, A tool for improving emergency response communications and interoperability, U.S. DHS, from website *http://www.safecomprogram.gov/SAFECOM/interoperability/default.htm*, file Interoperability_Continuum_Brochure_2.pdf



The overall topic of *Interoperability in Public Safety Communications Equipment* and the subtopics of P25 standards status, customer confidence that P25 equipment will be interoperable, and recommendations on timely standards development and compliance assessment processes fall into the TECHNOLOGY element, so the remainder of the Harris testimony will focus on the TECHNOLOGY ELEMENT.

TECHNOLOGY ELEMENT INCLUDING LMR STANDARDS STATUS

Technology Approaches—"Technology, including standards, for voice and data communications is a critical tool for improving interoperability, but it is not the sole driver of an optimum solution."[3] As displayed in the Technology bar of the Interoperability Continuum, there are a number of approaches to achieve increasing levels of interoperability: swapping radios, gateways, shared channels, proprietary shared systems, and standards-based shared systems. Harris believes that all of these approaches are deployed today to achieve varying levels of interoperability.

Several gateway products on the market enable effective interoperability among legacy analog communication systems and more modern digital communications systems. While the LMR radio spectrum is fragmented and split into multiple RF bands, certain bands through regulatory rules and/or frequency coordination practice have set aside subsets of channels to be shared for interoperability. In particular, the narrowband portion of the 700 MHz public safety band has a number of dedicated interoperability channels with the guidelines and standard (P25 Ph 1 conventional) specified. The 800 MHz public safety band has set aside mutual-aid channels for interoperability.

The emergence of multi-band, multi-protocol radios that can communicate on several or all of the LMR bands with multiple radio protocols will enable increased levels of interoperability in the future. There are a number of proprietary shared systems where there are gateways as well as agreements and shared protocols in place to enable interoperability across these systems.

At the upper end of interoperability capability are standards-based shared systems. The predominant standard for these systems in the U.S. is the TIA–102 P25 suite of Project 25 standards. The number of deployed P25 systems is increasing and the level of interoperability across these systems provided by different vendors is increasing as well with radios also supplied by different vendors.

Standards Status Summary[4]—As noted, the predominant LMR public safety standard in the U.S. is the TIA–102 P25 suite of Project 25 standards.[5]

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[3] From reference cited in footnote 2.

[4] Status from three TIA documents: PN–3–3591–UGRV1 (to be published as TIA–102), Project 25 System and Standards Definition, TIA Standard, January 2010 (in review for ballot in TIA–TR–8 committee); TR8docs.xls (Apr 28, 2010); and TR8proj.xls (Apr 28, 2010).

[5] The P25 standards have and continue to be developed under an MoU agreement between the Telecommunications Industry Association (TIA) as a sanctioned Standards Development Organization and the Project 25 Steering Committee representing APCO, NASTD, and the Federal Gov't

- Project 25 started in 1989 and has developed and continues to develop multiple standards in conjunction with TIA and in response to the user/practitioner driven Project 25 Statement of Requirements (SoR). The SoR evolves to reflect new user requirements and corresponding new and updated standards are developed.
- Currently, the TIA–102 P25 standards suite consists of approximately 69 published standards with about 13 in ballot as new, revised, or addendum standards, and with about 15 in draft. This suite addresses 11 defined Project 25 interfaces in the categories of service, system, and equipment.

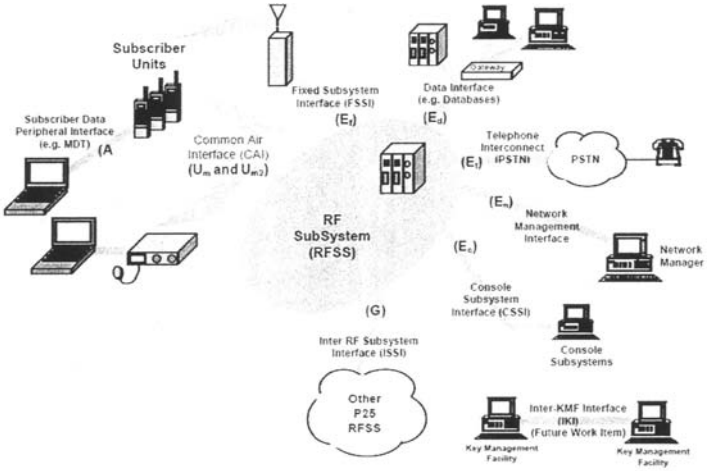


Figure 2-1 P25 Functional Network Model

- The P25 interfaces critical for interoperability and competition [the common air interface (CAI), the inter-RF subsystem interface (ISSI), and the fixed station interface (FSI)] are specified in more detail in the current suite than some other interfaces.
- The focus of the P25 standards development effort over the last couple of years is:
  - P25 CAP—developing the bulletins and standards associated with implementation of the P25 Compliance Assessment Program for the P25 Ph 1 trunked FDMA CAI, the ISSI, the Ph 1 conventional CAI, and then the P25 Ph 2 trunked TDMA CAI.
  - P25 Ph 2 TDMA CAI—completing the standards suite for the P25 Ph 2 trunked TDMA CAI for doubled capacity and 6.25 kHz per voice path spectral efficiency. The core definition standards needed for product development are complete or nearly ready for ballot. The associated test and measurement documents for performance, interoperability, and conformance are well along in the drafting stage.
  - ISSI Scopes 2 and 3—completing Scopes 2 and 3 for the ISSI suite of standards. The Scope 1 standards are complete, support product development, and are mature for procurement. The core definition Scope 2 and 3 documents are well along with the supporting measurement documents in drafting. The P25 console interface standard (CSSI) is a subset of the ISSI standard suite.
  - Security—completing the Inter KMF interface standards and encryption updates.
- While some not involved in the standards development process might comment that standards development takes a long time, the TIA process, like other Standards Development Organizations, is a consensus based process by design. The standards are developed by top engineers from industry who have the knowledge and perspective to assure successful product implementation to the standard. Getting to consensus and developing the requisite detail of

the standard takes time, but the resultant standard product is technically solid and long lasting.

Question 1a: What is the status of the public safety land mobile radio standards process in terms of meeting the original Project 25 goals of enabling interoperability, competition among vendors, spectrum efficiency, graceful migrations from legacy systems, and user-friendly equipment?

Harris believes that the P25 community has made strong progress in meeting each of the cited original P25 goals.

- Enabling interoperability—radios & radio infrastructure: Detailed CAI radio product design and interoperability test standards are in place and multiple vendor radio products and infrastructure radio products have demonstrated a high functional level of interoperability through the formal CAI interoperability testing as part of the P25 Compliance Assessment Program (CAP) over the last year. As of May 24, 2010, twenty vendor radio products (or radio model classes) from four vendors (EF Johnson, Harris, Motorola, and Tait) have approved Suppliers Declaration of Compliance (SDoCs) posted to the official RKB website for information and review by public safety agencies and practitioners.
- Enabling interoperability—systems & networks: Detailed ISSI baseline product design and interoperability test standards are in place. P25 ISSI CAP requirements are in place. The first ISSI products are emerging. Informal ISSI interoperability testing among a number of vendors has taken place. Formal ISSI interoperability testing as part of the P25 CAP is expected over the next year.
- Competition among vendors: Fairly strong competition among radio vendors has developed with over 15[6] vendors providing P25 radio products across a variety of frequency bands. Competition among P25 system and network vendors has developed with five vendors supplying P25 systems. Almost all large P25 system procurements have a separate system/infrastructure competition and user radio competition.
- Spectrum efficiency: From the start, the P25 Ph 1 FDMA CAI provided the 12.5 kHz narrowband capability and 12.5 kHz per voice path spectral efficiency required by 2013 for "narrowbanding" the below 512 MHz band and now in the 700 MHz band. The P25 Ph 2 TDMA CAI (two users in 12.5 kHz) standards, well along in development, will enable meeting the 6.25 kHz per voice path requirement for the 700 MHz band ahead of the Jan 1, 2017 deadline as well as the future (unspecified) requirement for the below 512 MHz band. In addition to satisfying the regulatory requirements, the P25 Ph 1 and Ph 2 CAIs are efficient in using the scarce public safety spectrum. The P25 Ph 2 CAI essentially doubles the capacity of a P25 Ph 1 system. In addition, both the P25 Ph 1 and Ph 2 CAIs are or will be deployed using trunking and simulcast techniques for enhanced spectral efficiency.
- Graceful migrations from legacy systems: Over the years, the P25 system vendors have successfully migrated many of their legacy customers to P25 according to the customer needs and plans and without disruption of mission critical communications. Harris has successfully migrated a number of its EDACS customers to P25 according to their needs and plans and there are a number of migrations in the planning process now.
- User-friendly equipment: Harris believes that P25 equipment is user-friendly, but, because of its complexity, formal training is highly recommended for the user to obtain the maximum benefit with efficiency. Harris believes that all P25 equipment vendors provide user manuals and offer formal training for their products.

Question 1b: How does the status of the standards process impact the communications equipment that public safety officials are buying today?

- While the standard suite will continue to evolve with new and revised standards (otherwise the standards are dead) in response to the changing P25 SoR, Harris believes the current suite of P25 standards are rich and mature with corresponding products from several vendors so the public safety procurements can be assured of competition and functional capability to match the public safety user needs. The current suite, including the P25 Ph 1 FDMA

[6] P25 radio or related product vendors include: Harris, Motorola, EF Johnson, EADS, Tait, Kenwood, ICOM, Daniels, Reim, Datron, Thales, Teltronic, Technisonic, Zetron, and Futurecom.

CAI and the baseline ISSI offer a very solid and rich set of public safety features. There have been many P25 procurements over the last few years with a number underway now based on the current P25 standards suite and products.

- Almost all procurements specify a future smooth migration to new features on particular interfaces. Early adopters are specifying the coming P25 Ph 2 TDMA CAI for capacity and spectral efficiency or a definite migration timeline with committed costs to P25 Ph 2.

Question 2: What mechanisms exist for customers to have confidence that P25 equipment will be interoperable and function as intended?

- P25 Manufacturer Design and Extensive Internal Product Verification Testing Processes: Harris follows rigorous internal product design, test, and verification processes to achieve the highest practical assurance that our products meet design requirements, including standards, and have been tested to demonstrate the features offered in the product at both the product level and the system level. Harris follows a Stagegate Product Development Process consisting of five thresholds leading to production as part of the Harris Quality Management System that is registered and conforming to the requirements of ISO 9001:2008. Formal product and systems testing conducted by the Harris Systems Integrity group consists of Engineering Verification Testing (EVT), Systems Integration & Verification Testing (~6 months), and finally Final System Validation Testing including Field Validation Testing (~3–4 months). Formal P25 Compliance Assessment Program (P25 CAP) testing for the performance, interoperability, and conformance scopes as appropriate for the P25 interfaces within the P25 CAP is performed in a DHS Recognized P25 CAP Laboratory.
- Past/Current Industry Practice: Prior to the implementation of the P25 CAP, customers with a interoperability/function concern went directly to the manufacturer. If satisfaction was not received, the customer could go to the appropriate TIA–P25 subcommittee for resolution. This process continues today. A few years ago, there were a number of issues identified in P25 systems being deployed and these issues were treated in an informal Hosted Manufacturers Interoperability Board (HMIB). After resolution of this set of issues, the HMIB was transitioned into the formal TIA TR–8.25 P25 Compliance Assessment subcommittee. In many cases, interpretation of the standard created the issue and the solution was to clarify the standard with revisions and upgrades. The majority of this standards cleanup work has been done. Products compliant with the newer standard versions should not have issues of interoperability. Also, in many cases. for newer interfaces the standards are consensus "Greenfield" so challenges with legacy implementations should be much reduced.
    - As a result of the HMIB and associated activity, the P25 manufacturers with deployed or deploying systems developed a practice of communicating and resolving cited interoperability items. There are communications between the systems experts of Harris and Motorola on cited interoperability items so that these items can be understood and resolved. Over the last few years, vendors have deployed multiple P25 systems that are operational with radio user equipment from one or several other vendors. Harris has at least two deployed and operational P25 systems for which all the user radios are supplied by other vendors.
- P25 CAP: Recently, DHS recognized laboratories are implementing the P25 Compliance Assessment Program (CAP) that performs formalized testing to standards and requirements to provide additional assurance of interoperability, performance, and conformance (to the standards) for critical P25 interfaces. The results of the formal P25 CAP testing for the product under test are documented in SDoCs (Supplier's Declaration of Compliance) and STRs (Summary Test Reports). The SDoCs and STRs are reviewed by DHS and posted to the reference repository, the RKB (Responder's Knowledge Base) available to public safety procuring agencies and practitioners. The P25 interfaces incorporated into the P25 CAP are: the P25 Ph 1 trunked FDMA CAI, the ISSI, the P25 Ph 1 conventional FDMA CAI, and then the P25 Ph 2 trunked TDMA CAI.

Harris supports a solid, practical DHS P25 Compliance Assessment Program (P25 CAP) and associated testing for the benefit of our customers, other public safety agencies/users, and manufacturers. Harris developed and maintains a DHS Recog-

nized P25 Compliance Assessment Laboratory, recognized in May 2009, for the required scopes of P25 CAP CAI Baseline testing for performance and interoperability. The Harris Recognized Laboratory has performed performance testing on its P25 radio products and has hosted formal P25 CAP interoperability testing for multiple P25 radio product vendors. Similarly, Harris P25 radio and infrastructure products have been tested at two other Recognized Laboratories. As a result of this testing, SDoCs and STRs for seven Harris P25 products (or radio model classes) are now posted on the RKB website.

- Procurement Requirements: As part of procurement requirements, procuring agencies can specify demonstration of any special interoperability and function requirements including, or in addition to, the P25 CAP.
- Special Testing as Part of Contract: Procuring agencies can also specify certain interoperability and functional testing, including or in addition to, the P25 CAP as part of their Customer Acceptance Testing.

Question 3: What recommendations do you have to ensure that the standards development and compliance assessment processes meet the needs of public safety in a timely manner?

- Although challenging, the P25 suite of standards could be organized into "releases" like some other standards to simply and clarify the description of standards content over time; i.e., Release 1, Release 2, Release 2.1 etc. P25 products could then be marked as compliant with P25 Release 1, P25 Release 2 etc. This could also simplify any P25 product compatibility descriptions.
- Again, although challenging and having been discussed a number of times by users and manufacturers in the P25 standards community, the array of P25 mandatory and standard option features could be grouped or packaged into levels of increasing capability; i.e., P25 Level 0 (baseline); P25 Level 1 (Level 0 plus more features); P25 Level 2; etc. This grouping of features could make the product marking of features supported and the P25 CAP testing of features packages more simplified and efficient.
- Agreement among public safety agencies on the features for interoperability, as defined by several levels of interoperability, would be beneficial. These levels could include: P25 Interoperability Capability 0 (baseline); P25 Interoperability Capability 1 (Capability 0 plus more features), etc. This grouping of interoperability capability features would make specification and testing of interoperability simpler, more efficient, and adaptable to the interoperability needs of various public safety agencies.
- Prioritizing the consensus-based standards development according to the needs of the public safety agencies and the industry capability to support the development is important.
- As a slight note of caution, Harris urges the subcommittee to consider an appropriate balance among testing, regulatory requirements and flexibility for innovation within the P25 standards and products. Harris certainly supports rigorous testing for compliance for mission-critical public safety communication products and systems. While it can be argued that more testing is always good and may catch an unusual behavior or concern, there is a point where additional testing, especially redundant testing, does not add significant assurance benefit. It is possible that "over-testing" and regulation requirements could become a barrier to entry into the P25 market for smaller companies and deter a larger base of competition. Also, for P25 manufacturers, the necessity of supporting any over testing and regulation requirements will divert critical engineering resources from advancement of new P25 standards and the development of new P25 product features. It will inevitably increase the time for completion of certain standards and increase the time-to-market for some product features that are much requested by public safety agencies.

CONCLUSION

Chairman Wu and other members of the Subcommittee, thank you for the opportunity to testify today and share with you the Harris Corporation views on *Interoperability in Public Safety Communications Equipment*. As previously noted, interoperability is a multi-dimensional challenge that involves five interdependent elements. These elements, as illustrated in the diagram from the DHS Interoperability Continuum Brochure, include Governance, Standard Operating Procedures, Technology (including LMR standards), Training & Exercises, and Usage. The level of interoperability achieved depends on the progress in each of the elements and the coordination/management of all five elements. My remarks today have focused on

the Technology (including LMR standards) area where we at Harris believe that substantial progress has been achieved in recent years in the establishment of practical technical solutions and approaches. For the higher levels of interoperability based on standards-based shared systems, Harris believes that while more work is needed, strong progress has been made in recent years through continued TIA–P25 standards development, P25 CAP testing, and public safety agency procurement requirement and practices that include separate system infrastructure and user radio procurements. The P25 product standards, the testing standards, and product features are in place or soon will be in place to enable a solid level of P25 trunked and conventional systems interoperability.

BIOGRAPHY FOR ERNEST HOFMEISTER

Dr. Hofmeister holds the position of Senior Scientist within the Harris Public Safety and Professional Communications (PSPC) group. He is responsible for establishing and representing the Harris PSPC technical position on standards and regulatory issues within the company, industry, and standards/regulatory bodies. He provides leadership for Harris participation in the TIA TR–8 Mobile and Personal Private Radio Standards committee and associated APCO Project 25 committees and holds several leadership positions on subcommittees and task groups. Dr. Hofmeister represented the Harris PSPC predecessor company, Tyco Electronics (M/A-COM), on the Steering Committee of the Public Safety National Coordination Committee (NCC) advising the FCC on operational rules for the emerging 700 MHz public safety band. He also has technical oversight involvement on new technology introduction and in establishing technical strategies in line with business strategies.

Relevant Experience

Dr. Hofmeister has worked in the Land Mobile Radio industry for 17 years in Lynchburg, VA with Harris, Tyco Electronics (M/A-COM) and Ericsson GE Private Radio Systems in the positions of Senior Scientist, Distinguished Fellow of Technology, Chief Technology Officer, and Manager of Advanced Technology. He also led several developments for the Ericsson LMR system product EDACS including the coordination of Prism TDMA developments and advanced marketing of EDACS TDMA technology and marketing. The TDMA developments included an air interface, a base station and portable at 800 MHz, and a TDMA infrastructure overlay. Previously, he spent eight years in research and development of industrial imaging technology at the GE Corporate Research and Development Center in Schenectady, NY and 21 years in research and development of aerospace and defense radar systems at GE Aerospace Electronics Systems in Utica, NY.

Past Employer

GE Corporate Research and Development Center, Schenectady, NY
GE Aerospace Electronic Systems, Utica, NY

Education and Certification

Ph.D. (EE) Syracuse University, 1973; Communications and Controls Major

MSEE Syracuse University, 1969
BSEE Case Western Reserve University, 1963
GE Management Development Course, 1991; GE Engineering Operations Course, 1983; GE Advanced (ABC) Course in Engineering, 1966

Chairman WU. Thank you, Dr. Hofmeister.
Mr. Muench.

STATEMENTS OF JOHN MUENCH, DIRECTOR OF BUSINESS DEVELOPMENT, MOTOROLA INC.

Mr. MUENCH. Thank you, Mr. Chairman Wu, Ranking Member Smith.

When the P25 standard was first envisioned by APCO [Association of Public-Safety Communications Officials], the goal was to create a vibrant marketplace for public safety equipment that allows all vendors to compete on a level playing field. This goal has been achieved, providing interoperability, product innovation and price competition to the public safety market. Motorola took an early lead in the development of the Project 25 radio systems, and today over 13 radio manufacturers sell Project 25 equipment to public safety users throughout the world. Project 25 started with a wireless interface, commonly referred to as the common air interface, and this has been functionally complete for some time.

In addition to the wireless interface, there are 10 other interfaces, or connection points, for Project 25 systems that are identified for standardization. Progress on the remaining interfaces is in various stages of development and driven by current market needs.

There are a growing number of industry participants that continue the work necessary to complete and maintain a full set of documents for each of the 11 interfaces. Since the Project 25 standard was first adopted by the FCC [Federal Communications Commission] in 2001, 36 states have developed statewide P25 networks as have 165 cities and counties. In total, nearly 70 percent of the U.S. population is covered by a public safety Project 25 network. Practically speaking, the widespread adoption of the P25 standard has allowed for interoperability, regardless of state or local boundaries.

Motorola invented the police radio in 1930 and strives toward total customer satisfaction. When a first responder orders a public safety radio and network, Motorola does not simply perform the installation and walk away. We continue to work to ensure the equipment performs as advertised, as intended. This includes testing to validate interoperability with P25 equipment from other manufacturers. Motorola understands there are life-threatening consequences if equipment fails to function as intended. Motorola has an open-door policy that allows any manufacturer to test P25 standards-based features with our P25 networks. Motorola also participates in the DHS testing program. In adherence to the NIST guidelines, Motorola has posted the compliance testing results for our entire Project 25 portfolio of products on the Responder Knowledge Base.

Significant progress has been made with respect to the development of Project 25 standards. The original Project 25 goals created by the public safety community have been met and additional standards work continues for new technologies and features. In

order to maintain an efficient P25 standards process, it is important to maintain a diverse group of users, as Project 25 covers Federal, state, county and local users. These users include law enforcement, fire, police and EMS services. It is just as critical to include industry representation in these discussions as industry writes the standards, they build to the standards and they test the standards. For the consensus process, this group ensures that there are agreed-upon common goals supported by the user organizations and industry. These goals are properly prioritized so that all participants have a common set of objectives. Once those priorities are set, this Project 25 group must sustain focus on the task at hand until it is complete. By keeping these basic steps top of mind during the standards process, we can continue to meet the needs of public safety in a timely manner.

Project 25, which is focused primarily on mission-critical voice, is not the end of the interoperability story. Public safety users are demanding high-bandwidth applications and content to facilitate greater intelligence and information sharing between local, state and Federal agencies. Motorola believes it is imperative that Congress act to dedicate the D block spectrum for public safety broadband. This will provide public safety with enough spectrum to deploy broadband networks in addition to the existing Project 25 mission-critical voice networks capable of meeting the public safety demand for the foreseeable future.

Again, I want to thank you for holding this hearing on an issue critical to public safety in this country. Interoperability saves lives, and Motorola remains committed to building the mission-critical communications equipment first responders have trusted for 80 years. Thank you.

[The prepared statement of Mr. Muench follows:]

PREPARED STATEMENT OF JOHN MUENCH

Chairman Wu, Ranking Member Smith, and members of the Committee, thank you for the opportunity to discuss interoperable public safety voice communication, and specifically the Project 25 Standard. It seems only appropriate that the Technology and Innovation Subcommittee hold this hearing, given the significant innovation and technological advancements that have occurred in public safety communications, in part, driven by the Project 25, or P25, standard.

What is the P25 Standard?

When the P25 standard was first envisioned by the Association of Public-Safety Communications Officials (APCO), the goal was to improve mission-critical communication interoperability, to see more competition in the marketplace, and to spur innovation. Through the hard work of APCO, Telecommunications Industry Association (TIA), government officials, and equipment manufacturers, the P25 standard has created a vibrant marketplace for public safety equipment that allows all vendors to compete on a level playing field, resulting in price competition and product innovation. Motorola took an early lead in the development of P25 radios and today, over 13 equipment manufacturers sell P25 equipment to public safety users throughout the world. (See Appendix A.) In fact, the P25 standard is considered the key to achieving interoperability by industry and government alike. As such, the FCC has adopted P25 as the interoperability standard for public safety narrowband operations in the 700 MHz spectrum recently made available to public safety nationwide through the DTV transition.

What Is the Status of Interoperability?

Since the P25 standard was first adopted by the FCC in 2001, thirty-six states have deployed statewide P25 networks, as have one hundred sixty-five cities and counties. (See Appendix B.) In total, nearly 70% of the U.S. population is covered

by a P25 public safety network. (See Appendix C.) Practically speaking, the widespread adoption of the P25 standard has allowed for interoperability:

- Among public safety agencies at the Federal, state, and local level,
- Between state police in neighboring states,
- For multiple jurisdictions responding to a catastrophic event, such as Hurricane Katrina, and;
- At large-scale, planned events, such as the Super Bowl and Olympics.

We have seen first-hand that effective, coordinated, and accessible communications between first responders is critical to the public safety mission, and the P25 standard has led to significant improvements in public safety interoperability.

There is still a great deal of work to be done and several factors will contribute to how quickly P25 is adopted by even more organizations. One of the biggest hurdles to ubiquitous use is that it takes very long periods of time to replace old systems and radios with P25 compliant equipment. The life-cycle of a public safety radio is anywhere from seven to fifteen years, and for a public safety network, it can be decades. Given the limited budget resources of state and local governments, Congress cannot mandate interoperability today and see it realized tomorrow unless it provides the funds to accomplish equipment replacement.

When Will the Standard Be Complete?

Standards work on P25 will only be complete when the standard is no longer in use. From its inception, P25 was expected to be a living document, subject to amendments, revisions, additions/deletions as technology advanced. Revisions are normal and to be expected, given that P25 replaces numerous proprietary solutions that have been sold by multiple manufacturers for decades. As more P25 systems are deployed, and more users become engaged in the process, additional requirements emerge and changes are made.

Similarly, the original P25 architecture has been significantly enhanced as the list of features and services expands. The first P25 architecture defined only five system interfaces. Interfaces are the physical locations where one component "connects" with another. Today, eleven P25 interfaces are identified. As desired features and services are added or redefined, the interfaces that make up the system architecture likewise must be reviewed and updated.

To date, TIA has published nearly two hundred documents, creating or revising almost fifty published standards utilized by industry to design and develop interoperable P25 products and systems. TIA further develops and proposes documents for interoperability testing and standards compliance demonstration to the government. Project 25 has two phases of standards development driven by varying FCC regulatory requirements. Phase 1 products are designed to operate in a 12.5 kHz channel bandwidth and have been in use since the mid 1990s. Phase 2 equipment is developed to operate with greater spectral efficiency and essentially double the number of voice paths that operate within a single 12.5 kHz channel.

As of May 2010, the technical specifications for Project 25's Phase 1 systems are functionally complete, with compliance testing underway and multiple manufacturers listed as meeting the National Institute of Standards and Technology (NIST) compliance requirements for their products. P25 Phase 1 allows for two critically important features. First, Phase 1 ensures that a P25 radio in the hands of a first responder can communicate directly with any other P25 radio in the same spectrum band. This means that the Michigan State Police officers who responded to Hurricane Katrina were able to directly communicate with the Louisiana State Police, in Louisiana. Second, P25 Phase 1 allows a first responder from one jurisdiction to communicate with the network itself in a neighboring jurisdiction. This allows the first responder to communicate not only with officers in the field, but with dispatch, even though they are outside the coverage area of their "home" network.

While work continues on Phase 2, keep in mind that there is no functional change that will be apparent to the officer or firefighter in the field due to Phase 2 improvements. Phase 2 essentially allows more public safety radios to utilize a given P25 network, but future enhancements to the standard will not change interoperability for the public safety official.

How Does a First Responder Know They Are Buying P25 Equipment?

Motorola places paramount importance on our relationship with our customers in the public safety community. Motorola invented the police radio in 1930 and views our customer relationship more like a partnership.

When fire departments were concerned that firefighters who dropped their radios in a fire could not find them in darkness and smoke, Motorola responded with a

glow-in-the-dark radio. Similarly, when law enforcement expressed an interest in finding ways to improve officer safety, Motorola developed emergency alerting capability in our radios. When a police or fire department orders a public safety radio and network, Motorola does not simply perform the installation and walk away. We continue to work to ensure the equipment performs as intended, including testing to validate interoperability with P25 equipment from other vendors. Motorola understands there are life-threatening consequences if equipment fails to function as intended.

In addition to the informal internal testing Motorola performs individually and with our competitors at our labs in Schaumburg, IL, Motorola also participates in the Department of Homeland Security (DHS)-defined formal compliance testing programs. The formal testing program is validated by the standards experts at the NIST. When the testing is complete, manufacturers post their results in the Responder Knowledge Base, or RKB. To date, Motorola has posted tested and validated P25 equipment for portables, mobiles, and infrastructure. (See Appendix D.)

Recommendations to Meet Public Safety Needs

As you can see, significant progress has been made with respect to P25 standards development. The original P25 goals, created by the public safety community, have been met, and additional standards work continues for new technology and features. In order to maintain an efficient P25 standards process, it is important to:

- Maintain a diverse group of users and industry to drive the P25 consensus process,
- Document the common goal of the group, and;
- Sustain focus on the goals.

By keeping these tenants top of mind during the standards process, P25 practitioners can continue to meet the needs of public safety in a timely manner.

Public Safety Needs More Spectrum for Broadband Applications

But P25, which is focused primarily on voice systems, is not the end of the interoperability story. In the past ten years, we have seen an explosion in demand for data applications in the consumer space, via text, email, pictures, and video. Likewise, public safety users are demanding high-bandwidth applications and content to facilitate greater intelligence and information sharing between local, state and Federal agencies, to enhance criminal investigations, and to improve the safety of our first responders. Imagine an officer responding to a 9–1–1 call and arriving on the scene, already knowing the situation on the ground because she was able to see live video streaming in her vehicle, or a firefighter being able to look at an electronic blueprint of a building before arriving at the fire. These are just some of the innovative applications available today to public safety, however, the use of this data has been limited due to the lack of available spectrum.

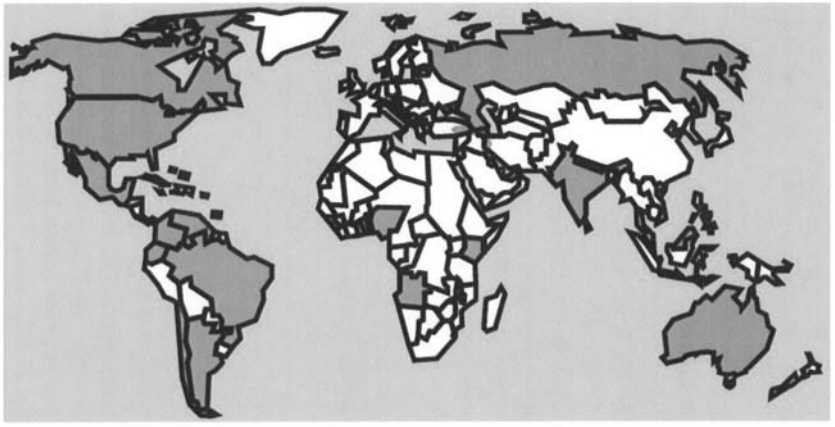
Unfortunately, today's public safety officers have limited access to data services. Prior to the 700 MHz allocations, public safety lacked the spectrum to enable mobile services. Today's public safety networks are only capable of providing the functional equivalent of commercial texting services. Of course, public safety users can buy mobile broadband service from commercial carriers, and many do, but these networks rarely provide the reliability and coverage that first responders demand from their communications networks. Motorola believes that it is imperative that the Congress act to dedicate the 10 MHz "D Block" spectrum for public safety broadband. This will provide public safety with a total of 20 MHz of 700 MHz spectrum to deploy broadband networks capable of meeting public safety demand for the foreseeable future. Our nation's first responders deserve the same access to content as anyone with a Facebook account or cell phone.

Conclusion

Again, I want to thank you for holding this hearing on an issue critical to public safety in this country. Interoperability saves lives and Motorola remains committed to building the mission critical communications equipment first responders have trusted for eighty years. Thank you.

Appendix A

Project 25 systems deployed around the world



United States	Bahamas	Malaysia
Australia	Trinidad y Tobago	Nigeria
Russia	Chile	Angola
Latvia	Ecuador	Kenya
Canada	Colombia	Kuwait
Brazil	Argentina	Kurdistan
Mexico	Venezuela	
Costa Rica	India	

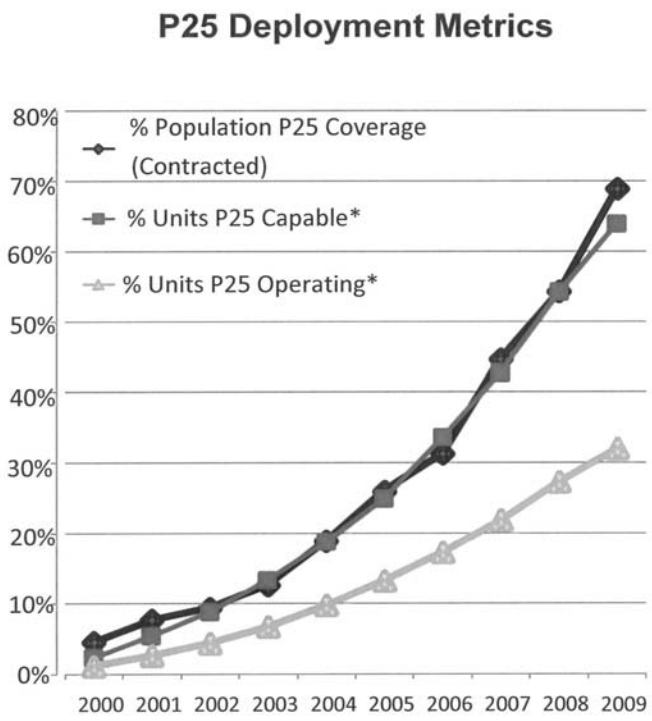
Appendix B

P25 Deployment

36 Statewide Networks
165 Local Project 25 Systems

- P25 Statewide System
- Currently Operating Non-P25 Statewide System w/Plans to Migrate to P25
- No Current Statewide System w/Plans to Move to P25 Statewide System
- Currently Operating or Implementing Non-P25 Statewide System
- No P25 Statewide
- City/County P25

Appendix C



* Estimated Units % of Mission Critical installed base per Motorola internal analysis

Appendix D

Motorola Leads DHS Compliance Assessment Program with First SDoCs for Multi-band Project 25 APX Family of Radios

Motorola in collaboration with the Department of Homeland Security's Compliance Assessment Program continues to advance interoperability initiatives supporting mission critical communications

May 06, 2010

SCHAUMBURG, IL – May 6, 2010 – The Enterprise Mobility Solutions business of Motorola, Inc. (NYSE: MOT) today announced the publication of the first multi-band (VHF/700/800) Project 25 (P25) portable and mobile radios on the Responders Knowledge Base website (www.rkb.us). The publication of the SDoCs (Supplier's Declaration of Compliance) and STRs (Summary Test Report) comply with the DHS Office of Emergency Communications: *Fiscal Year 2010 SAFECOM Guidance for Federal Grant Programs* for purchasing Project 25 LMR equipment/systems providing mission critical users with access to those grant funds to purchase Motorola products (http://www.safecomprogram.gov/SAFECOM/grant/default.htm).

The **Motorola** multi-band APX™ 7000 portable and APX™ 7500 mobile radios **SDoCs and STRs document the successful completion of the current DHS CAP suite of Interoperability and Performance Tests.** Specifically this documents the successful interoperability testing of the APX radios with Motorola's P25 system, with Harris Corporation's P25 system, and with an EFJohnson Technologies P25 system.

The Motorola APX radio portfolio is the industry's first Project 25 true multi-band subscriber family combining seamless VHF and 700/800 MHz operation for both FDMA and TDMA operation to have an SDoC and STR posted as part of the DHS CAP Program. The APX radio portfolio incorporates the most recent enhanced full rate P25 vocoder to support existing P25 Phase 1 FDMA operation while leading the way for full P25 Phase 2 TDMA operation with the enhanced half-rate vocoder.

In addition to the improvements in voice clarity gained with the enhanced P25 vocoder, Motorola has uniquely enhanced the overall APX audio experience through a comprehensive design integrating additional noise cancelling circuitry, noise suppression system, microphone and speaker systems to meet the needs of public safety customers.

In addition to the APX family of radios, also published on the DHS RKB website are Motorola's ASTRO® 25 system infrastructure and Motorola's XTS® 5000, XTS® 2500, XTS® 1500, XTL™ 5000, XTL™ 2500, and XTL™ 1500 radios.

The Motorola ASTRO 25 SDoC and Summary Test Report document the successful trunked interoperability testing of Motorola's ASTRO 25 infrastructure with radios from 10 leading industry subscriber manufacturers: Motorola, EFJohnson Technologies, Harris Corporation, Icom, Kenwood, PowerTrunk, RELM Wireless, Tait Radio Communications, Technisonic and Thales.

Over the past 24 months, Motorola's support of the DHS CAP program included the hosting of two formal interoperability events on the Motorola ASTRO 25 system infrastructure and the participation in three other P25 infrastructure manufacturer's interoperability events. Additionally, Motorola was in the first batch of DHS recognized labs for DHS CAP testing in May 2009.

"In addition to the P25 CAP, Motorola continues to provide P25 subscriber manufacturers with opportunities to informally test on Motorola's ASTRO 25 system infrastructure, promoting interoperability within the industry," said Brenda Herold, corporate vice president, Motorola Global ASTRO Product Solutions. "These opportunities further demonstrate Motorola's unwavering commitment to the advancement of multi-manufacturer interoperability and our support of the DHS CAP. "

For example, earlier this year, Motorola and five other manufacturers demonstrated the successful testing of interoperable communications between the Motorola ISSI.1 Network gateway and ISSI Gateways from the five other manufacturers.

Motorola continues to be a key technical contributor in the P25 standards body, providing technical resources to write the compliance tests outlined by TIA and referenced as part of the DHS CAP Program.

About Motorola
Motorola is known around the world for innovation in communications and is focused on advancing the way the world connects. From broadband communications infrastructure, enterprise mobility and public safety solutions to high-definition video and mobile devices, Motorola is leading the next wave of innovations that enable people, enterprises and governments to be more connected and more mobile. Motorola (NYSE: MOT) had sales of US $22 billion in 2009. For more information, please visit www.motorola.com.

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BIOGRAPHY FOR JOHN MUENCH

John Muench is the Director of Business Development as it relates to worldwide standards activities associated with government and public safety products for Enterprise Mobility Solutions for Motorola. John directs both the Technical and Business activities supporting Standards Development. Through a complete understanding of Motorola customers' needs, his team translates services and features into TIA standards as well as develops business strategies around those TIA standards. In his 16+ years at Motorola, John has participated in system engineering, system design, project management and system roadmap planning for private two-way radio systems in the United States and Europe. John's experience encompasses all aspects of radio system design, including base site, subscriber, dispatch, central office, security, radio, and network management equipment. John's expertise includes managing sales bidding strategies of next generation products, prioritization of features to support the product development process and complex system P&L management.

Chairman WU. Thank you very much.
Chief Johnson, please proceed.

STATEMENTS OF JEFFREY D. JOHNSON, PRESIDENT, INTERNATIONAL ASSOCIATION OF FIRE CHIEFS, AND CHIEF, TUALATIN VALLEY FIRE AND RESCUE, ALOHA, OREGON

Chief JOHNSON. Thank you, Chairman Wu and Ranking Member Smith. My name is Jeff Johnson. I am the Fire Chief of Tualatin Fire and Rescue, President of the International Association of Fire Chiefs, and for eight years have been Chairman of the Oregon Wireless Interoperable Network. I am looking forward to today's testimony.

I would like to begin my testimony this morning, sir, with a working definition of interoperability. It is the ability for public safety responders to communicate with staff from other responding agencies and to exchange voice and data communications on demand, when authorized, in real time. And while interoperability is very important, mission-critical operability is of greater importance because without operability, there is no interoperability.

The majority of America's 30,000-plus fire departments operate with analog radios. Digital radios available now for about 20 years are being used by a growing number of jurisdictions today. When these radios began entering the public safety market, a standard known as P25 began development and is still in process. P25 en-

sures a common standard of performance features and a common air interface to allow interoperability between the radios produced by different manufacturers. This P25 standard is kept to mission-critical operability and interoperability and has long been fully supported by the International Association of Fire Chiefs.

The P25 digital standard is actually a complex suite of standards which define the interface for radios, consoles, base stations and other system components. However, we in the fire service are not so much interested in how radio systems work, but that they work.

We are pleased that the manufacturers are working with NIST and DHS and that four of the major manufacturers now meet CAP requirements. It has taken a very long time to get to this point. I am pleased we are here, but we need to complete the P25 standard in the interest of ensuring public safety that the digital radios they buy will indeed work interoperably.

I would like to end my presentation this morning with a glimpse of the future as we see it, which is all about interoperability and communications standards. The International Association of Fire Chiefs is working diligently with other public safety leadership organizations to build out a nationwide public safety interoperable wireless broadband network. This is the future for public safety communications and is vitally necessary. One of the major difficulties today in achieving interoperability is trying to connect, at great expense, I might add, the thin slices of disparate spectrum which have been allocated by the FCC over the years to public safety as each new band has become available. In effect, we are building sideways connector roads to the lanes of spectrum which have been allocated to public safety and adding no meaningful forward throughput.

The envisioned broadband system needs to be mission critical at the outset. At first, it will support data and video communications. In time, the goal of the IAFC, and its allies, is to use this network for mission-critical voice communications. To achieve this goal, the D block of spectrum is vital to developing this robust network. Only then can we hasten the transition from the current land mobile radio communications to mission-critical voice over Internet protocol system. Our quest for the D block is a one-time opportunity to make sure that the inadequate spectrum we have today is moved to a larger, more robust and comprehensive broadband network, and to create a national architecture of Internet protocol for public safety.

Recently, the FCC announced in its national broadband plan that it will auction the D block to commercial interests without the needed public safety requirements. Thus, public safety seeks passage of legislation to allocate the D block directly to the Public Safety Spectrum Trust. H.R. 5081, introduced by Representative Peter King, is currently before the House Energy and Commerce Committee. The bipartisan legislation has the strong support of both public safety leadership and major national organizations representing state, county and local government. Our collective mission is simple: The D block is vitally needed by public safety to ensure an efficient broadband system which will attract commercial interest and reduce the need for government funding. This is our only path to solving interoperability long term once and for all.

Thank you, Mr. Chairman, for the opportunity to appear before you and this Committee on this very important subject. I would be happy to answer any questions.

[The prepared statement of Chief Johnson follows:]

PREPARED STATEMENT OF JEFFREY JOHNSON

Good morning, Chairman Wu, Ranking Member Smith, and distinguished members of this subcommittee. I am Jeff Johnson, president and chairman of the board of the International Association of Fire Chiefs (IAFC) and chief of the Tualatin Valley Fire and Rescue Department located in Beaverton, Oregon.

I would like to begin my testimony with a working definition of interoperability: the ability of public safety service and support providers—law enforcement, firefighters, EMS, emergency management, public utilities, transportation, and others—to communicate with staff from other responding agencies, and to exchange voice and/or data communications on demand, when authorized and in real time. And while interoperability is very important, mission-critical *operability* is of greater importance. Without operability, there is no interoperability.

Significant Federal, state and local resources continue to be expended to develop greater interoperability between and among first responder agencies as well as jurisdictions. It is a daunting task but progress is being made. There are five separate lanes on the Department of Homeland Security Interoperability Continuum to achieve that goal: Governance, Standard Operating Procedures, Training and Exercises, Usage, and Technology. Radio equipment falls into the Technology lane.

The majority of America's 30,000+ fire departments operate with analog radios. Digital radios, available now for two decades, are being used by a growing number of jurisdictions today. When these radios began entering the public safety market, a standard known as P25 began development and is still in process. P25 ensures a common standard of performance features and a common air interface to allow interoperability between the radios produced by different manufacturers.

This P25 standard is key to mission-critical operability and interoperability and has long been fully supported by the IAFC. The P25 digital standard is actually a complex suite of standards which define the interface for radios, consoles, base stations and other system components. However, we in the fire service are not so much interested about how radios and systems work, but THAT they work.

To ensure that they work is part of the mission of both the Public Safety Communications Research (PSCR) program, located at the NIST laboratories in Boulder, CO, and the Department of Homeland Security's Office for Interoperability and Compatibility (OIC). The OIC and NIST have established a testing capability to ensure that digital radios used by the fire service and other public safety entities will actually perform as designed. It is called the P25 Compliance Assessment Program (CAP). The CAP is composed of three testing elements which are:

- Performance—the specifications are correct,
- Conformance—to validate the various P25 protocols used in the system, and
- Interoperability—to prove that one or more manufacturer's radios will operate on another manufacturer's system.

These three tests conducted in P25 CAP-recognized testing sites give fire chiefs assurance that the P25 radios they buy will work not only on their system but with radios from other manufacturers on other systems. All this is key to give assurance to fire departments that do not have the capability to test the radios and systems they buy.

We are pleased that manufacturers are working with NIST and DHS, and that four of the major manufacturers now meet the CAP requirements. It has taken a very long time to get to this point. I am pleased we are here, but we need to complete the P25 standard in the interest of assuring public safety that the digital radios they buy will, indeed, work interoperably.

I would like to end my presentation this morning with a glimpse of the future—which is all about interoperability and standards. The International Association of Fire Chiefs is working diligently with other public safety leadership organizations to build out a nationwide, public safety, interoperable, wireless, broadband network. This is the future for public safety communications and vitally necessary.

One of the major difficulties today in achieving interoperability is trying to connect, at great expense, the thin slices of disparate spectrum which have been allocated by the Federal Communications Commission (FCC) over the years to public safety as each new band became available. In effect, we are building sideways connector roads to the main communications lanes. What is needed is a nationwide ar-

chitecture allowing all public safety to have the ability to communicate on one, major superhighway. So, while we need to maintain operability and interoperability of the current mission-critical Land Mobile Radio (LMR) systems, our future is in broadband technology.

The envisioned broadband system needs to be mission-critical at the outset. At first it will support data and video communications. In time, the goal of the IAFC and its allies is to use this network for mission-critical voice communications. To achieve this goal, the D Block of spectrum is vital to developing a robust network. Only then can we hasten the transition from current LMR communications to mission-critical Voice over Internet Protocol. Our quest for the D Block is a one-time opportunity to make sure that the inadequate spectrum allocations to public safety in the past are not repeated for this new technology.

Public safety, from a spectrum allocation determined by Congress in 1997, is currently licensed for 10 MHz of nationwide broadband spectrum in the 700 MHz band. The license is held by the Public Safety Spectrum Trust (PSST), a 501(c)(3) corporation composed of 15 public safety organizations. The original plan was to combine public safety's 10 MHz with 10 MHz from the adjoining D Block of spectrum to be sold at auction to build out a 20 MHz nationwide broadband network that would be built to public safety mission-critical standards. But, the submitted bid did not meet the reserve price set by the FCC.

Recently, the FCC announced in its National Broadband Plan that it will auction the D Block to commercial interests without the needed public safety requirements. Thus public safety seeks passage of legislation to allocate the D Block directly to the PSST. H.R. 5081, introduced by Rep. Peter King, is currently before the House Energy & Commerce Committee. The bipartisan legislation has the strong support of both public safety leadership and the major national organizations representing state, county and local government. Our collective message is clear: the D Block is vitally needed by public safety to ensure an efficient broadband system which will attract commercial interests and reduce the need for government funding.

Thank you, Mr. Chairman for the opportunity to appear before you on this very important subject. I would be pleased to respond to any questions.

BIOGRAPHY FOR JEFFREY JOHNSON

Jeff Johnson, Fire Chief and Chief Executive Officer, joined Oregon's Tualatin Valley Fire & Rescue (TVF&R) in 1989, following an 11-year fire service career in Douglas County, Oregon. Chief Johnson served as a TVF&R Division Chief and Assistant Chief prior to becoming Fire Chief in 1995.

TVF&R is a fire district with approximately 500 members providing fire, EMS, specialty rescue and prevention services in the Portland metropolitan area. While under Chief Johnson's leadership, TVF&R has twice received the International Association of Fire Chiefs (IAFC)/U.S. Safety and Engineering Fire Service Excellence Award, the top award for organizational excellence in the fire service. TVF&R is accredited by the Center for Public Safety Excellence's Commission on Fire Accreditation International (CPSE/CFAI).

Chief Johnson is an ambassador for excellence and innovation in our service to the community. Additionally, he advocates for cooperative initiatives and other busi-

ness practices that achieve efficiencies and demonstrate smart government and value for the citizens' investment. He has authored two fire service books and is a featured guest lecturer across the nation.

In August 2009, Chief Johnson was installed as the President and Chairman of the Board of Directors of the International Association of Fire Chiefs (IAFC). He also holds membership in the Metropolitan Fire Chiefs Association and various IAFC Sections. He is the IAFC's alternate representative to the SAFECOM Executive Committee and a member of the USA Delegation to the Comité Technique International de Prevention et d'Extinction du Feu (CTIF), also known as the International Association of Fire and Rescue Services.

In March 2010, Chief Johnson was appointed to the U.S. DHS/FEMA Local, State, Tribal and Federal Preparedness Task Force by DHS Secretary Janet Napolitano to assist in assessing the state of the nation's disaster preparedness and developing recommendations specific to building resiliency into communities across America.

Jeff is a graduate of the National Fire Academy's Executive Fire Officer (EFO) Program and achieved the CPSE Chief Fire Officer (CFO) Designation. He is also a member of the Institution of Fire Engineers U.S. Branch (MIFireE).

By gubernatorial appointment, he is the Chair of Oregon's State Interoperability Executive Council, and a member of the Oregon Homeland Security Council and the Oregon Broadband Advisory Council. He is Past President of both the Western Fire Chiefs Association and the Oregon Fire Chiefs Association (OFCA), the Past Chair of the Oregon Governor's Fire Service Policy Council, and a charter member of Oregon's Meritorious Service Committee. Locally, he is a board member for both the Washington County Office of Consolidated Emergency Management (OCEM) and for the Washington County Consolidated Communications Agency (WCCCA), which is the local 911/dispatch center.

In the corporate environment, Jeff sits on the boards of two private companies, specifically as a member of the Informed Publishing, Inc. Board and as the chair of the Emergency Services Consulting International (ESCi) Board. He also is on the Editorial Board of *FireRescue Magazine*.

Chief Johnson holds a Bachelor of Science Degree in Business and Associate Degrees in Fire Science and Criminal Justice Administration. During his leisure time, Jeff enjoys spending time with his wife, Kay, and their two children. As an avid outdoorsman and student of Oregon history, Jeff enjoys camping, fishing, and motorcycling in Oregon's back country.

Chairman WU. Thank you very much, Chief Johnson.

And now it is in order for the panel to ask questions, and the Chair recognizes himself for five minutes.

Mr. Orr, in your written testimony you raise a point that only a limited portion of the Project 25 system is truly standards based. What is the practical impact of that statement?

Mr. ORR. Standards, at the most basic, are blueprints to allow multiple manufacturers to build a product in a similar way which will allow those products to interoperate. In the absence of that blueprint, in the absence of those standards, you cannot have that common implementation that allows interoperability and, therefore, you cannot have open competition and you cannot have multi-vendor interoperability in the field. The impact of the lack of standards in this situation is that the standards that remain undefined in Project 25 make it difficult for a common implementation to occur which will increase the likelihood of non-operability in the field and increases the difficulty of open competition.

Chairman WU. So Mr. Orr, what you are saying is that lack of completeness of those standards has an impact on competition levels and also on safety for emergency responders?

Mr. ORR. Absolutely.

Chairman WU. Are any of the panelists, are any of the witnesses aware of any situation in recent years where public safety folks using P25 labeled systems and believing them to be compliant were unable to communicate with other first responders using P25 sys-

tems? And if so, do you know what caused that to happen? And in no particular order. Dr. Boyd.

Dr. BOYD. Our experience, both after 9/11 and during Katrina, was that systems which were labeled P25 where the interpretation of the standard has deviated a little bit between manufacturers meant they couldn't communicate directly. But probably the best single example we have is the testing we did among systems which were in the field, and the important element there is that it tells you there are systems in the field that were labeled P25 that—because of those minor variations in interpretation—cannot communicate with each other, sometimes within one manufacturer's line. So what you have to worry about is what happens if they are called on to provide mutual aid in other jurisdictions because while they both have P25 systems, they may not be able to communicate with each other because of minor differences. As any engineer designs a system, he has to interpret what amounts to a text-based standard.

Chairman WU. And that interpretation, if there is differing interpretation, that is where conformance testing and compliance testing, that is what those forms of tests can address. Is that——

Dr. BOYD. Absolutely. The only way you arrive at common interpretation is through a standardized test. At the end of the day, a standard is not operationalized until there is a test.

Chairman WU. Going back to any other examples of lack of communication between P25 labeled systems? Okay. Very good.

Mr. Muench, I am not getting this quite right. You know, my high school German would tell me that that is Muench, but can you say it for me?

Mr. MUENCH. Muench, bench with an M.

Chairman WU. Thank you very much, sir.

Mr. Muench, in your testimony, you said that the technical specifications for P25 phase 1 systems are functionally complete. Can you explain to us what you mean by that?

Mr. MUENCH. Yes. Functionally complete means that there is enough information in the standard for manufacturers to build product and deploy product, actually do interoperability testing with other manufacturers. As I said in my testimony, there have been over a million units sold of Project 25. All participate within interoperability testing throughout the informal programs that Motorola has within our facility in Schaumburg.

Chairman WU. Well, I don't know if this is in comparison or in contrast or the same thing, but Dr. Boyd, in your testimony you state that comprehensive standards do not yet exist. Can you explain to us what you mean by that?

Dr. BOYD. Right now there are four primary components we are concerned with, such as the common air interface and the ISSI standard. Some of the standards—while they have been tested at some level—are not really fully complete and have not yet been accepted entirely by the community. Until the final vote is taken and a test is developed—some tests are already in place—no standard is complete, because at the end of the day, it is the test that determines whether variations in interpretation are creating an interoperability problem.

Chairman WU. Now, my time is expired, but I don't know if we have a disagreement here or not. Can we have Harris and Motorola on one hand and DHS and NIST on the other hand, can you address whether there is a difference of opinion about this?

Dr. HOFMEISTER. Thank you, Mr. Chairman. Speaking for Harris, we have 50 systems deployed and we have systems that have different vendor radios. We have a system that was deployed with none of our radios, and we have achieved the full level of the customer satisfaction in daily operations with those systems. We have interoperated with Motorola systems, as John just said. We have gone to Schaumburg to test during our development as an assurance. This illustrates informal development practices that have been developed over time. They have come to our lab for testing their developments. So over the last few years we have actually developed a more cooperative relationship in the industry. I believe the standards are functionally complete, as John said. We have implemented them. We have tested them.

Now, are the last little bits of the standards complete? I think the common air interface is very solid. I think the baseline ISSI, which is coming out, is very solid. The console interface is a subset of that. That is a little bit in the future. The fixed station interface I believe is very solid. Products are starting to emerge from that. So I actually think the picture is a little bit better than my colleagues here would present for fielded systems.

Chairman WU. Thank you.

Mr. Smith.

Mr. SMITH. Thank you, Mr. Chairman. I am trying to myself get a grasp of how widespread the problem is.

Dr. Boyd, you mentioned that within one manufacturer, one product is not compatible with another or interoperable with another?

Dr. BOYD. Yes. In fairness to the manufacturers, remember that this process started in 1989. That is 21 years ago. So manufacturers' equipment that was labeled as P25 compliant, and that, in many cases was produced long before any of these interfaces were really finished, often didn't communicate with other manufacturers or even with newer equipment in their own line. Both Motorola and Harris and others have increasingly applied more and more stringent applications in order to make sure that this equipment comes closer to those standards. I think one way to picture how well things are going is, that in 2008 when Congress finally authorized the development of the Compliance Assessment Program, that really started the ball rolling, even though it had started in 1989 at a time before Bluetooth and before people texted and all those kinds of things we are now used to. We are now looking at a real compliance test probably in two more years. That is an amazing change over time. But I think what you have to remember is that this development over time is something that is reflected in one of my colleague's——

Mr. SMITH. Are you saying that it might have been interoperable at one point but maybe not as interoperable today as it once was?

Dr. BOYD. Oh, absolutely. In fact, it is important to remember there are legacy systems out there that aren't going to be changed out for a long time.

Mr. SMITH. Right, so what is the solution there? I mean, how are we any better off today with a standard or hopefully not a mandate that would paint a picture that is ultimately going to change due to industry coming with a better way of doing things that meets the standard at one point, you know, the previous standard but yet throws in a few other bells and whistles along the way?

Dr. BOYD. The way we talk about standards is that there ought to be some core set of functionalities that we make sure remain in place. Otherwise what happens if we don't——

Mr. SMITH. Right. Are we without those today?

Dr. BOYD. I think we are getting close to having those but if we don't——

Mr. SMITH. We are not there?

Dr. BOYD. —have those, then every new generation moves away from that and creates exactly the same problem we have been trying to fix. I think the manufacturers are working very closely with us to develop that core set of functionalities. That is why——

Mr. SMITH. I mean, that is in the best interest of everyone involved.

Dr. BOYD. Absolutely.

Mr. SMITH. Even if it might lead to a profit that I think is a good thing. Sometimes I wonder around this place.

When we get to the larger issue here, I just hope that we don't have the heavy hand of government establishing a mandate that ultimately I think will shut down innovation. Can you assure me that that is not going to happen?

Dr. BOYD. Well, I would hope not. I think that both the challenge and the strength of the standards process in the United States are kind of interesting. The challenge is that consensus is probably best spelled S–L–O–W. The strength is that it makes sure everybody gets heard, it makes sure we leave open potential for innovation as the standards are developed, and it also ensures we don't have lots of diverging paths, that we have paths that allow innovation and move in the same direction so the road gets wider, but doesn't diverge.

Mr. SMITH. I appreciate that. That is actually a good analogy.

Now, from an agency perspective, Chief Johnson, if you could tell me or tell us how you would go about verifying the interoperability of a particular product. Do you have to do that only after you purchase it? How do you verify?

Chief JOHNSON. Well, I think the assessment that most public safety officers look at is whether it is P25 compliant or not and make their purchasing decision based upon that is pretty accurate. Very, very few departments, individual departments possess the individual ability to test the compliance of their system, plus, even if you bought it thinking it was compliant on day one, it doesn't mean that the radio network that you used couldn't change out to a different manufacturer a year later or that your mutual aid agency that you are running into changes theirs, and I think that illustrates why it is so important to make sure that compliance assessment testing is done and that it is accurate so that we can buy with confidence. I mean, let's face it: Public safety wireless communication devices are expensive. But there are reasons they are expensive. They are largely bulletproof. They are intrinsically safe.

They don't cause an explosion. You know, they are waterproof. They are firefighter-proof, and that is saying something. And I think, you know, we forget those elements that lead the price of the product, and frankly, the public safety market is a pretty small market when you compare it to the Blackberry market or some of the others.

Mr. SMITH. I just want it to be Congress-proof, too.

Chief JOHNSON. Thank you, but to a great extent, sir, we are relying on the certification.

Mr. SMITH. Thank you.

Chairman WU. Thank you very much, Mr. Smith.

Chief Johnson, you said that you are relying upon the certification, in essence you are relying upon the representation that P25 is interoperable, that equipment labeled P25 is interoperable.

Chief JOHNSON. Mr. Chairman, that is correct, and I think also many of the grants today require that you purchase P25 equipment.

Chairman WU. Well, I thought I heard earlier that sometimes P25 equipment won't talk with each other, that they are not truly interoperable and that different generations of P25 equipment may not be interoperable. It seems to me that if it is not interoperable, one of the two systems should not be labeled P25 so that Chief Johnson isn't mislead, that two items bearing a P25 sticker really work with each other.

Dr. BOYD. I think in fairness I should note that I am talking about systems that label themselves as P25 but because there was no test process to ensure it really did comply around these core functionalities, like the common air interface or other interfaces. What we are after is a core set of functions. We want them to be able to develop lots of bells and whistles that go beyond core capabilities, that may later become necessities. I like to point at the cell phone, for example, which in 1970 was hardly anybody's idea of a necessity. I would challenge that view today.

Mr. SMITH. Now it is an entitlement.

Chairman WU. Chief Johnson, given the knowledge that the standards are arguably not complete, how much confidence do you and you colleagues have in those purchasing decisions without the certifications?

Chief JOHNSON. Mr. Chairman, I think most public safety responders trust the P25 standard and are purchasing equipment expecting reliable communication with other systems, and I think that is the current standard of field today.

Chairman WU. So the confidence level is reasonably high or do you have some residual concerns?

Chief JOHNSON. I think within our industry, the confidence level is reasonably high, but I think there is always the question mark of making sure that it operates across systems and that is why we reach out to our other colleagues, you know, fire chiefs reach out to other fire chiefs and police chiefs that may be operating similar types of equipment and then we actually check with other chiefs to make sure that they are having a good experience with the products we are about to buy, and that is frankly the benefit of an association like the International Fire Chiefs is, you can reach out to a large group. And candidly, I think this is true with the public in

general, we are more likely to trust another fire chief's experience than we are the representation of the manufacturers, and that is just the state of the market in any product, not just in radio communications.

Chairman WU. I would like to ask the panel, and this is really aimed, I suppose, at the other four witnesses. What factors have delayed the development of technical standards and what factors have delayed the implementation of compliance or conformance tests? In any particular order.

Dr. BOYD. I think there are three major things that have delayed them, and I think they are all the kinds of things we are all working on. The first one is that it is a consensus process, and I think it ought to remain a consensus process, but that means it is slow. The second one is that the technology has changed pretty dramatically since we first started this in 1989, and so that means that we have had to make lots of adjustments as we developed the standard to take into account all of the other things that have been happening technologically, because the standard you would have designed in 1989 is not what you are going to design now. So the standards process probably is never going to be fully finished, but we can arrive at something that allows rational migration. The third one is that there is a huge installed infrastructure that no community can afford to simply throw away, and we are going to have to keep that in mind as we implement any of these that we make sure we don't implement technologies that have the effect of isolating communities that can't afford to buy into newer systems. We always have to think about how we keep those legacy systems able to communicate with the newer equipment, and I think the manufacturers in fact have done a pretty good job of developing some of those bridging technologies that permit that to happen.

Chairman WU. Mr. Muench? Dr. Hofmeister?

Mr. MUENCH. I would actually say that the standards based on—since it is a voluntary process and it requires significant expertise in the area with the limited resources in the industry, we have been moving along at a fairly good pace and keeping up with technology. We are just about to embark upon the second phase of the standard.

Chairman WU. Now, it has been 21 years.

Mr. MUENCH. Absolutely, and we have significant progress. Over 70 percent of the U.S. population are covered by Project 25.

Chairman WU. Well, covered by Project 25 apparently is different from knowing that these P25 systems are actually fully interoperable or, you know, functional with each other.

Mr. MUENCH. So maybe I can go back to the point that was made earlier, a lot of the general statements about interoperability issues. Since 2005, we haven't had the reports that have come in about interoperability challenges. Motorola has investigated all of them, and the majority of the time it is how the actual equipment is configured. This is a complex technology. This isn't like plug-and-play that you would have on your Apple computer. This takes—you know, there is configuration of the equipment, there is the execution of the test or the pass and fail criteria that are set up. So some of the issues that have come up and they have called them inter-

operability issues are really configuration issues, and it has not related back to conformance or compliance to the standard.

Chairman WU. Dr. Hofmeister and Mr. Orr, I want to give you a chance to address this, although my time has expired.

Dr. HOFMEISTER. Thank you, Mr. Chairman. I think as I said in my testimony, in terms of the pace of the standards, before 2005 or the gap between 1995 and 2005, things were pretty slow. Since 2005, the standards pace has picked up, and as I testified, I believe it is at the pace that we have the capacity to support with the number of engineers that have the capability and the quality to develop the standards. In terms of interoperability across these systems (some are legacy systems), I will say the interop testing that is going now under P25 CAP and the posting of SDOCS [Supplier's Declaration of Compliance], these systems are complex. Every system that you test against has a hardware revision number, a software revision number, whether that is infrastructure or your radio, and you need to make sure that those are known. Now, as a result of that process, both Harris and Motorola—and we release products or product software about every six months or so. We then have an obligation to tell the major manufacturers whose radios are operating our system: look, we are having this new release, we don't think it is going to affect anything but you might want to check to make sure that your radios operate this way. So I think we are going to get much better going forward so we won't have this issue that maybe there are generations of the product in the field with interoperability challenges.

Chairman WU. Thank you.

Mr. Orr, would you care to address this topic before we go to Mr. Smith?

Mr. ORR. Sure, Mr. Chairman. I think I would like to point out something which is, I understand, the consensus process can be slow and it can be cumbersome. Simply building consensus is difficult. However, I think it needs to be pointed out and what is important in this case is that it has been since 1989 that we have gotten to the state where we are where we have one and a half of the eight interfaces complete. In that same period of time since 1989, we have had 2G cellular standards developed, systems deployed, 3G cellular standards developed, systems deployed, 4G cellular standards developed and now systems are being deployed. So standards don't have to be slow. The standards process doesn't have to be slow. In addition to that, every one of those wireless technologies, cellular, Wi-Fi, Bluetooth, as an industry knew that it is imperative as an industry to be successful in that deployment of that technology was to wrap an incredibly rigorous compliance assessment program around it. So every single one of those technologies has an industry-led compliance assessment and certification program. P25 is the only one, that I am aware of, that has not done that in a major wireless industry. So I think the key is here that it doesn't have to take forever but we do need to move the process forward and we do need to complete the first suite of standards.

Chairman WU. Does anyone know why P25 is uniquely different in this respect?

Dr. BOYD. I don't really think it is uniquely different. I think the only complexity for—and it is not for P25, but for interoperability in general is that there is so much legacy gear out there. But P25 looks to the future. It is what we are going to be doing as we build out new equipment and put it into place. I really don't think ultimately that it is uniquely different. I think there hasn't been a lot of focus on it. I know the first time we started working on interoperability some time ago when I was in the Justice Department back in 1993, there wasn't a whole lot of interest other than in public safety, and even then it was a very slow, very cumbersome process. I can't say that folks were energized in the same way they have been since 9/11 and Katrina.

Dr. HOFMEISTER. Just a comment on the question you asked, I believe the difference is the scale of the industry. This, by any sense, is a fairly small, specialized industry. The scale of people involved, the scale of income, the scale of R&D, the scale that can be devoted to development of standards in my view is much different than the commercial industry where you are selling millions of these things. We are selling thousands of these radios and so on. So I believe the scale makes a difference in the amount of resources that can be devoted to development of standards.

Chairman WU. Thank you.

Apologies, Mr. Smith. Please proceed.

Mr. SMITH. Thank you.

I am just trying to again get a grasp of what all that takes place here. Now, in terms of meeting P25 standards, Mr. Muench, could you mention what takes place in meeting those standards?

Mr. MUENCH. First, the industry participates in the standards development process actually defining the technical definitions and producing the documents required for standardization to be published by a recognized standards development organization. This also includes the actual tests to validate the compliance to the standard. Once that standard is published, then manufacturers build the products in adherence to the standard. We test—we go through rigorous testing through our development process and then once our products are complete and ready to deploy out in the market, we do interoperability testing not only with ourselves but with other manufacturers to ensure that we have the Project 25 interoperability so when we deploy these products, they are not going to have any issues. Then beyond that, there are external programs such as the Compliance Assessment Program by DHS that provides even further confidence that the products that have been manufactured and are beginning to be deployed are complaint to the Project 25 standard.

Mr. SMITH. So when you say testing, can you give us—I mean, especially in light of what Dr. Hofmeister said, we are not talking about the same number as we have cell phones and so obviously the whole bus there moves a little more slowly.

Mr. MUENCH. Right.

Mr. SMITH. But in terms of testing, what is placed on industry in terms of the burden of testing?

Mr. MUENCH. At this point in time, beyond the DHS CAP program, industry itself does the testing on its own within our internal labs because the end goal here is total customer satisfaction.

We don't want to have an issue where public safety lives are in danger because a product doesn't work regardless of manufacturer. We understand the mission-critical aspect of our business.

Mr. SMITH. Okay. And so moving forward, what do you think should or should not be done so that perhaps there is the flexibility necessary for industry to innovate and yet sustain the necessary functions of communication?

Mr. MUENCH. Thank you. Good question. I think things are going along relatively good right now. When we look at external programs and supporting these external programs, again to Dr. Hofmeister's comments on the scale of the industry, we would prefer to have a wider breadth of external testing as opposed to depth, and when I talk about depth of testing, it is, "Do you really want to know if the ones and zeros are in the right place in your message," or do you want to ensure that "can you hear me now" tests between different manufacturers works, and that is the ultimate, in Motorola's view, that is the ultimate test is when you get out in the field and multiple manufacturers are able to talk to each other on the radio system and inherently by providing interoperability testing you are testing the other aspects such as conformance which industry continues to do internal in their development.

Mr. SMITH. Anyone else wishing to elaborate? Mr. Orr.

Mr. ORR. I think, to follow up John's comments, first of all, those ones and zeros can be incredibly important to determine whether or not when you hit the emergency button on the radio whether the emergency alarm on the radio goes off or not. So the ones and zeros in a radio and implementing the protocol that is published in the standard is critical because that was built to do a certain function so you have to follow the protocol to get the functionality that it is expecting. So checking the ones and zeros is important, but I think, Mr. Smith, you bring up a very important issue, which is understanding what burden this may place on industry, and that is something we have taken very seriously from the very beginning. We realize that any additional testing that is placed upon industry is going to cost money and so we have done everything within this program to ensure that we are minimizing the burden on industry, minimizing the financial requirements that are needed to put the program in place, but our threshold at any moment always has to be that we can look a fireman or a policeman in the eye and tell them we created a program that will give them the confidence necessary that when they hit the button on that radio, that it is going to do what it is supposed to do. Every wireless industry knows in a multi-vendor environment that problems can occur. Find those problems in the lab. Do not find them in the field.

Mr. SMITH. Now, when you say confidence, is there confidence lacking in the field today?

Mr. ORR. Yes, because right now—the traditional testing in Project 25 until the Compliance Assessment Program was developed was manufacturer testing in their own individual laboratories and the P25 logo stating that that manufacturer themselves believes that they have implemented the P25 standard in a way that is consistent with the protocol. In every other wireless industry, you have to take your radio to a third-party lab, have it certified by a third-party body to get a logo that say you are going to actu-

ally interoperate in the field. That is a level of confidence that we are used to in Bluetooth devices, Wi-Fi devices, cellular devices. That is the kind of confidence that public safety is assuming and wanting in that P25 logo that just doesn't exist.

Mr. SMITH. That is not necessarily a government agency, that certifying agency, or is it?

Mr. ORR. No, it is not a government agency. In all of those industry cases, that is industry itself creating a body to do that in all of those other industry cases.

Mr. SMITH. But we have got the masses that are—the numbers are quite different. Is that——

Mr. ORR. The numbers are different but the end result and the need for the same end result, which is interoperability and proper functionality, is not different.

Mr. SMITH. Okay. Chief Johnson, do you feel that there is confidence lacking in the field?

Chief JOHNSON. Mr. Smith, you know, I don't have any personal knowledge that there is widespread lack of confidence. I don't dispute his observations. And probably the reason for that is, is that most of the systems I am familiar with are purchased through a Request for Proposal [RFP] in a competitive bid process and the procurement process in and of itself requires that the compliance testing at the end of it demonstrates that it is working and it is operable across the system. So it is very common for us to say I am looking for this kind of a system, and you don't get your money until you prove that it works. So I think that kind of an environment reduces my exposure to people that may be lacking confidence but I wouldn't dispute his observation.

Mr. SMITH. Back to Mr. Muench, there has been mention of other products, other wireless products that are subject to a third-party review. Obviously your company makes a lot of items that probably would be subject to those third-party reviews. Can you tell us the difference? What can we take away from that for the good of this discussion?

Mr. MUENCH. Absolutely. To Dereck's point on compliance testing, we believe that compliance testing is vital to making sure that you have developed to the standard. The real issue is, do you need to do these tests outside of the development testing or do you need to validate them within development. That is really what it comes down to. Motorola does the testing today. And the litmus test or how Motorola determines whether this is important to share with customers is when customers go out to RFP, request the type of testing that the tests that they require are interoperability tests. Customers can come to us today and ask for, you know, before we give you our money, we want to see your conformance tests and Motorola would be happy to. We just haven't had those requests from our customers, you know, outside the process for that level of detail. So again, we look to the market, in this case the public safety market, to request that of industry.

Mr. SMITH. Thank you, Mr. Chairman.

Chairman WU. I thought the chief said that as part of the process that compliance testing is always asked for, and Mr. Muench, I thought you said that conformance tests aren't performed because customers don't ask for it. What am I not understanding here?

Mr. MUENCH. So industry absolutely does conformance testing during the development process. That is when you are developing the software.

Chairman WU. Mr. Muench or Mr. Orr, can you explain to me later on the difference between developmental tests and, if you will, tests after the——

Mr. MUENCH. Assessment tests, correct.

Chairman WU. Go ahead with your answer.

Mr. MUENCH. I was just going to say, Motorola absolutely supports and does compliance testing during the development process to make sure that we adhere and are compliant to the Project 25 standard as written. Motorola writes the actual conformance tests and publishes them along with the other industry within the P25 TIA process. So we have those conformance tests. We run those conformance tests. The issue is, once we develop a product, if there is—there hasn't been a need to increase confidence around conformance. The customers are looking for confidence around interoperability because that makes sure that their emergency button when it is pushed on our system goes through every time and that can be done through an interoperability test with other manufacturers, and we do that within our testing labs before we release products. We also do them when customers come to pick up their systems and test them within our factory. We will bring other manufacturers' radios in and they can go and push the emergency button and make sure it goes through and gets through.

Chairman WU. Mr. Orr, would you care to address this issue, and also the emergency button or distress button issue, whether there is a problem or an issue there?

Mr. ORR. Sure. And if you would like, I can address the development versus interop issue as well.

Chairman WU. Go ahead.

Mr. ORR. I think the issue has come up in the past in discussing how to implement the Compliance Assessment Program. The question has been, when does the testing have to occur. The manufacturers, as Mr. Muench has stated, believe that they already do the testing in the development phase, so why do they want to retest the equipment again after development phase? We have recognized that and we have actually reached out to all the manufacturers and said we are happy to allow the Compliance Assessment Program to wrap into the development phase so that you can do that testing in development and count that as your compliance assessment. You just have to wrap the quality system around it and have auditing, paperwork. You have to have the right equipment and the right personnel doing the testing. The equipment has to have been proven to actually work correctly, the test equipment does. So you can do certain things but count the tests going on in development as your compliance assessment test. So we want to work with the manufacturers to make this work for them. That is our goal. We want this to work but we want to have a successful program.

As to the issue of conformance tests versus interoperability tests, I think a very important point needs to be made here. Again, and I hate to belabor this point, every other wireless industry believes that conformance and interoperability tests are necessary to ensure interoperability in the field, not one or the other, both. It is not

take one, take the other. It is take both. The other issue for us that I think is incredibly important for cost purposes is the interoperability testing simply tests whether Manufacturer A's works with Manufacturer B's product. You cannot infer that because A works with B that A works with C. You have to test A to C. That is the only way an interoperability test proves that something works. Conformance test looks at——

Chairman WU. Let me ask you, so if I have a product and I can talk with you, Mr. Orr, and you have a product and Mr. Smith has a product and you can talk with Mr. Smith, and even though they are both P25 compliant, it may be that Mr. Smith and I cannot talk with each other even though we can and you can but Mr. Smith and I cannot communicate?

Mr. ORR. Absolutely, an interoperability test, if you and Mr. Smith and I were the only ones that did our interoperability test——

Chairman WU. Well, that was the gist of my question earlier. If that is the case, shouldn't one of our radios be required to have the P25 sticker removed?

Mr. ORR. Well, and that is the importance of conformance tests. How do you know who is not conforming? There is a couple of cases that could have occurred here. One is, one of the people making the radios didn't conform to the protocol document so somebody is not P25 compliant. There is another completely legitimate scenario which is both are complying with the protocol document, which means the protocol document itself has a problem and needs to be addressed. Those are legitimate issues that can exist in any standards body, and that is why these kind of programs are put in place.

Now, one more point, if I may, I want to make about interoperability testing. Because it requires me to test against every manufacturer, the permutations of tests against all other manufacturers becomes quite large. Our program only requires a manufacturer to test against three other manufacturers. We don't require them to test against every other manufacturer because what happens is, with every new version and firmware revision that comes out years and years down the line, that would mean you would have to do interoperability testing back with every existing system that is still in the field. If you get ten years down the line, you would be looking at 8,000 interoperability tests. That is financially impossible. Conformance testing allows each individual manufacturer to prove adherence to the standard and traceability to the standard without testing against another product in the market.

Chairman WU. Mr. Muench, you are not opposed to conformance testing?

Mr. MUENCH. Absolutely not. We do it. We perform it today.

Chairman WU. Mr. Smith.

Mr. SMITH. So I guess I am still unclear. You are saying that A and B might be compatible but A and C aren't, the users, so how do you go about requiring and mandating tests without having this huge burden that you just said you can't go back to thousands of other points? Unless I am missing something.

Mr. ORR. So how do you find out whether A or B or A or C is implementing correctly? Well, there are two things you have to do to improve the confidence that it is going to work in the field, in

the labs. One is, you have each manufacturer run the tests that show they have implemented the standard correctly, the protocol. They have done it right. They look at the ones and zeros and make sure they are in the right order, they are in the right place, they have all met the standard correct. You then do a series of interoperability tests to increase the confidence that people are implementing correctly, but what we have not done is said you have to go out and do interoperability testing against every other manufacturer because of the permutations of tests required and because of the financial burden that would place on the burden.

Dr. BOYD. Basically what you are doing is what amounts to a statistical series of tests. When you add the second test, I can't be certain that my triangle—A, B, and C—works. When I add the third test, I dramatically increase the likelihood that you will be able to communicate with lots of other systems in addition to the three we talk to. There is a point when testing against more and more systems provides very, very small diminishing returns. It is just the reality that I am far less likely to have a conformance problem that creates an issue once I have tested three or four systems. I don't have to test a thousand systems.

Mr. SMITH. Okay.

Chairman WU. But if you test against the standard, you don't have to guess about the number? You don't have to do three to interpret that five also works. If you test against the standard, then you know that it works?

Dr. BOYD. That is exactly right.

Mr. SMITH. I am still trying to get a grasp of how urgent this situation is, because I want to be sensitive to the use of public funds, taxpayer dollars that are oftentimes in huge amounts and having served at the local government level, these are big hits to a budget and you want it to be effectively spent and also have the opportunity in the future to acquire maybe some updates and things like that that work and build even greater confidence.

So Dr. Boyd, Mr. Orr, on a scale of one to ten, what is the urgency for taking action? Ten being extremely urgent.

Dr. BOYD. I would say it approaches ten, and the reason that I say that is, the reason this whole program started is because the public safety community kept asking us how they could know what works and what they ought to invest their very, very precious and limited grant money on so they would not end up in three years behind the eight ball because the standards that were going to be required as part of the grant process created new issues for them. In fact, I think it actually helps industry because by providing that confidence to first responders, they are much more likely now to begin to free up and make those investments and they don't get challenged nearly as much by county commissions or city councils who are understandably very concerned that their first responders not buy into a system that is going to turn out to not be interoperable in three years.

Mr. SMITH. Right. Okay. So you say it is extremely urgent that action be taken.

Mr. Orr, same question.

Mr. ORR. I agree completely with Dr. Boyd.

Mr. SMITH. Okay. Thank you, Mr. Chairman.

Chairman WU. Thank you.

Ms. Biggert, would you care to ask questions?

Ms. BIGGERT. Yes. Thank you, Mr. Chairman, and I am sorry I missed the testimony.

So I understand that you all have been discussing a little bit of what I wanted to ask, and I am sorry I missed that, but I am from Illinois and I know, Dr. Hofmeister, you work with Naperville, which is in my district, and Mr. Muench, Motorola has been a long-standing company in Illinois. Both do fine jobs.

I just wanted to ask you both, does there need to be an industry-led formal compliance assessment program in place as Mr. Orr has testified? Does either of your companies offer your facilities to other vendors to validate interoperability across multi-vendor product platforms prior to formal interoperability testing under DHS and NIST guidelines?

Dr. HOFMEISTER. Thank you for the question. Certainly Harris, as I think I mentioned earlier, has an interoperability lab in our facility in Lynchburg, Virginia, as a result of putting that together for the Compliance Assessment Program. We also offer that for informal testing for other radio vendors to come in. Motorola has been there testing some products they are developing in terms of data. So yes, that is happening, and we fully support that.

To your first question, whether it should be an industry-led compliance assessment effort, sort of on the scale I think of what other industries are doing, we at Harris have a hard time thinking about that because of the size and scale of the industry. We just can't afford to do everything to the scale that cellular and other industries do. We have to make the best judgments we can. I think the P25 Compliance Assessment Program that is in place is moving in that direction. We support conformance testing, as Mr. Muench mentioned, during product development. We are less supportive of repeating that testing afterwards but we are trying to work through the issues with Mr. Orr and others to make sure that we meet those requirements. So if you take a Wi-Fi system or something like that, take WiMAX, for example, I believe it costs somewhere in the neighborhood of $100,000 to $300,000 to put your product through that testing. That is a scale, if you set that up. We just can't support; and we don't believe the industry can support that. Thank you.

Ms. BIGGERT. Thank you.

Mr. Muench, would you care to comment?

Mr. MUENCH. Thank you. Yes. Motorola absolutely supports the informal testing. We have a lab set up. We visit the other manufacturers' labs so very similar to what Dr. Hofmeister just spoke of. As far as the first question, you know, the industry that we work in is fairly small. There are 13 manufacturers, and I can tell you from the DHS Compliance Assessment Program, we have had 10 of the 13 manufacturers participate in our interoperability testing and it is referenced on our Supplier Declaration of Compliance that is loaded up onto the DHS site, so I think participation is very good. I think confidence level is fairly high. So at this point in time, I don't believe that a formal program led by industry is necessary.

Ms. BIGGERT. Do you work with other manufacturers in your testing or do you rely solely on your internal tests?

Mr. MUENCH. No, we absolutely work with other manufacturers.

Ms. BIGGERT. Is it possible that a communication device could pass the test but fail to operate, interoperate seamlessly with a third vendor's product?

Mr. MUENCH. In the extreme case where a manufacturer either didn't have the expertise or was trying deliberately not to conform, yes. The experience that we have had with deploying product, we have not come across that yet. The industry, we have a good working relationship with each other and we—it is in all of our best interests to make sure that these products interoperate together as specified in the Project 25 standard.

Ms. BIGGERT. Thank you very much. I yield back, Mr. Chairman.

Chairman WU. Thank you.

I think what I just heard is some concern about a formal compliance testing process. In the written testimony, there was testimony to the fact that the European standard, TETRA [Terrestrial Trunked Radio], requires a formal testing process and that American manufacturers which sell in Europe actually go through this compliance testing process. What distinguishes the approach you take in Europe where there is this testing versus your position here in the United States?

Mr. MUENCH. The first point is that it is actually mandated by the E.U. that you perform this level of testing, which right now the tests are over 300 tests and take a significant amount of time to get a product certified through that process. The concern here would be that by putting those rigorous tests and that amount, as I said, depth into the testing in a formal process, and again, looking at the permutations of how many products you bring to market as well as a number of manufacturers, you could slow down the adoption of Project 25 and actually create larger barriers of entry to smaller companies.

Chairman WU. But we heard concerns about the cost of testing and yet you still find it worthwhile to be in the European market where this testing has to be performed?

Mr. MUENCH. Absolutely. We support standards that are defined by their marketplace.

Chairman WU. Dr. Hofmeister or Mr. Orr?

Dr. HOFMEISTER. Just a quick comment on the TETRA testing. We don't actually participate in that market with the TETRA testing, but we do sense that there are some second thoughts in that marketplace and they are sort of thinking of the cost and there is one document with a recommendation that you actually do conformance testing along with interoperability. You do interoperability testing and do some conformance monitoring as part of that to maybe help reduce the impact, and that is something we have talked about with Mr. Orr and his colleagues about—maybe that is something that we could consider as a way of doing interoperability testing and doing conformance monitoring as part of that process.

Chairman WU. Any comments from either Mr. Orr or Dr. Boyd?

Mr. ORR. I would just like to reiterate, we certainly looked at the TETRA model. We heard loud and clear the manufacturers in Project 25 concerns about the costs, and like I said before, we have truly tried in every way possible to make this as least burdensome

a process on the U.S. manufacturers. We do not want to negatively impact the U.S. manufacturers. We do want to create a higher level of confidence for our public safety users that the products are going to work when they are in the field and they need those radios to work. So I do want to make that very clear, and I also would like to make the point that I think both of these companies have pointed out in the past, it was the Compliance Assessment Program itself that really started to open up these multi-manufacturer laboratories and create the atmosphere where multiple manufacturers began to travel to other manufacturers' labs and test within them. So it has had a beneficial impact but we do pay attention to their concerns and we continue to work with them to make this a beneficial but cost-reducing program.

Dr. BOYD. I think that is an important point, which is why the program very consciously decided that we ought to use existing manufacturers' laboratories, not invent a new Federal laboratory to drive all of this. That is really the foundation piece of the model.

Chairman WU. Thank you. I believe, Mr. Smith, you have some further questions.

Mr. SMITH. Let me ask Chief Johnson, on a scale of one to ten on urgency for action in terms of where we are today and what needs to be done, on a scale of one to ten, how urgent is this?

Chief JOHNSON. Thank you, Mr. Smith. Pursuing this where we are today in the Project 25 standard has not been my primary area of study, so I really do not have a feel for it, sir. I think reflecting back on my comment about how in public safety we make sure that we are buying compliant products, I think the larger the purchase, the larger the scale and the more likely you are to use a request for proposal bid system where you can hold people accountable on the back end for functional testing, the safer you are as a public safety responder. If you buy one or two radios, you are more subject to the certification and having to trust the certification. I think to reiterate a component of my testimony, and I really appreciate where the Committee is coming from in this regard is, at the end of the day, I think it is unreasonable to expect a police chief or a fire chief to be conversant enough in the technical details, and I think you basically want to be able to look at a standard and trust that that standard says it will work from provider to provider to provider in case you are not doing an RFP-based system where you can actually test in a field.

Chairman WU. Chief, it is awfully hard for a Congressman to be conversant in this area also.

Mr. SMITH. Here, here. Thank you, Chief.

On the European model then, is that a more desirable situation, Dr. Boyd?

Dr. BOYD. I don't think we want a mandated system that in fact is very, very government heavy and very, very government driven, and quite frankly is much more expensive than anything we think is really appropriate to put into place here. I think we want the kind of voluntary consensus-based assessment program that we have.

Mr. SMITH. Mr. Orr, is that European model more desirable than what we have now?

Mr. ORR. No, I believe what I would like to see happen is for the program we have in place to become fully functional, and if that meets the requirements and we see in the field what needs to happen and the result is that we have equipment that meets the standard and we don't have any significant problems in the field, then the program is working and there is no reason to do anything more than that.

Mr. SMITH. Dr. Hofmeister, would TETRA testing be the reason Harris is not in Europe?

Dr. HOFMEISTER. No, I don't think that is the full reason. I think it is just a full business reason. That would be a component but not——

Mr. SMITH. Contributing factor?

Dr. HOFMEISTER. A contributing factor but not a full reason, right.

Mr. SMITH. Anyone else wishing to weigh in? Thank you.

Chairman WU. If none of the Members of the Subcommittee have any further questions, I would like to offer folks this opportunity because you all have come a long ways and also done a lot of preparation for this hearing, so if there is anything that we have not asked but you would like to contribute to this hearing, I would like to give you an opportunity going from left to right to add that now. Dr. Boyd?

Dr. BOYD. Just one brief point, and that is to remember that while we have been talking about land mobile radio, the movement of the world into a digital arena means that we are now really talking about interoperability across all of these digital systems and so over the long haul we have to remember that as we look at interoperability, we have to think beyond just voice into data maps, imagery, video and all the rest that public safety requires in large-scale emergencies like so many of these we have unfortunately seen in the last few years.

Chairman WU. Mr. Orr?

Mr. ORR. I would simply end on the fact that I would point out that over the last few months, like I said in my testimony, we have been having some healthy discussions with our industry partners in Project 25 and we are moving forward and deciding what are the appropriate interoperability performance and conformance tests for each of the existing interfaces right now, and I feel confident and I want to remain confident that when we report back to the Committee at some point that we will have seen progressed and moved forward in this issue, but I think the momentum over the last few months has been a positive one.

Chairman WU. Dr. Hofmeister?

Dr. HOFMEISTER. Yes, thank you, Mr. Chairman. Just a couple points that didn't come out and were in my written testimony in terms of recommendations. One, there is an array of mandatory and standard option features that are part of the standards suite. One suggestion would be to get the user community and manufacturers to work together to define those into packages, baseline level zero, baseline level one, so that you could refer to them as packages and not have to constantly refer to a whole array of these things. I think that would help with simplification of what it is compliant with and what the functionality is. But even more than that, and

it gets back to Dr. Boyd's testimony, the interoperability, again, to define levels of interoperability from very baseline level zero, what functions are required there, level one, and make sure those are rock solid. Right now, I think there could be much progress in making sure that you define what those levels of interoperability are and make sure those are present and tested for in every product. Thank you.

Chairman WU. Thank you.

Mr. Muench.

Mr. MUENCH. Thank you, Mr. Chairman. Yes, I would just like to reiterate that significant progress has been made in Project 25 and we continue to stay up with technology maybe making it look like we are not making progress but we continue to adopt new technology. As we move forward, Motorola absolutely supports the formal Compliance Assessment Program but we would like to make sure that industry representation is part of that process since it is industry that are the ones that write the standards, we are the ones that develop the equipment, manufacture the equipment and actually perform the testing. So again, having these industry experts as part of the process and providing, you know, the recommendations, we have been making a lot of progress as of late and we are going to continue to make progress.

Chairman WU. That is a good thing. Thank you, Mr. Muench. You know, these are consensus standards developed by multiple parties, mostly private industry, and my understanding is that Underwriter Laboratories and such testing efforts are also joint ventures of private industry. Thank you.

Chief Johnson?

Chief JOHNSON. Thank you, Mr. Chairman and Members of the Committee. We have spent a great deal of time today talking about the technical standards and how functional the radio system is. As Oregon's governor asked me to solve Oregon's interoperability problem, I found myself in front of the House and the Senate trying to explain what the national standard was for interoperability in a radio network, and it was then that I discovered there wasn't one, that there was no national recommendation for radio network, and I think that part of our problem is, of course, the technical matters we talked about today, but that is only one of the swaths in terms of solving interoperability. I think what we need next to truly move past our interoperability challenges in this country is, we need a predictable national architecture for public safety communications, and that means that we combine the public safety broadband spectrum which is allocated today with the D block and that will create an adequate enough swath that we can foresee and predict that public safety will move into what I will call a radio over Internet protocol, and OEC [Office of Emergency Communications] has actually identified this in their dual path strategy about moving from this land mobile radio-based environment that we have today, moving out of—(frankly, there are still systems out there today operating on crystal radios and many system operating on stamp chip sets) to moving to an Internet protocol-driven radio system.

Now, this will take time. Moving from LMR today to IP [Internet protocol] radio is going to take many, many years but it is the only way to identify a national architecture that will draw industry to

a common place and give fire chiefs and police chiefs a predictable system that we can move to and move out of interoperability being this connection sideways to this disparate radio spectrums, and if we don't identify an adequate enough path moving forward, we are going to address our frequency spectrum limitations by adding yet another small swath out of yet another spectrum, and that will perpetuate the interoperability problems that we have faced for the last 30 years. I hate to quote Dr. Phil, but I would just ask, "How is that working for us?" We have 30 years of giving us little slice by little slice by little slice and we haven't got the job done. It is time to take this one-time opportunity, Mr. Chairman, when we vacated these TV stations to allocate the D block to public safety. That will give us a predictable swath that will move us toward radio over Internet protocol.

Mr. Chairman, Members of the Committee, I appreciate the opportunity to be heard.

Chairman WU. Thank you very much, Chief.

This has been a steep technical hill for the Committee to climb, for Members to climb, for staff to climb, and I want to thank you all for helping us understand that. It still seems that there is some differences in viewpoint or perhaps we are talking about technical standards in a slightly different way. What it comes down is, I remain concerned that Mr. Smith and I can both have handhelds and each of us can talk with the chief and yet we can't talk with each other and all three of us have P25 certified systems Project 25 systems. It seems to me that if it is P25 certified, we should have taken the standards and the testing to a point where these three P25 certified devices will all talk with each other rather than two of them not communicating, and I remain concerned about that. And evidently there is consensus in the panel that progress has been made and that some important progress has been recently made, and I encourage all the parties which are active in this industry, the government players and the end user community, to work together in the best spirit of doing what is good for customers and shareholders and especially the general public to develop systems which are interoperable and dependably so and permit additional layers to be added on without dire problems. It is in that spirit that I want to seriously consider holding a follow-up hearing to see where we are on this and to clarify issues that remain unclear, and I will take responsibility for the fact that perhaps we haven't dug deeply enough in this particular hearing.

Again, I want to thank each and every one of you for appearing, for your travel time, for your preparation time. The record will remain open for two weeks for additional statements from Members and for questions, additional questions and your answers to follow-up questions that the Committee may ask.

The witnesses are excused and the hearing is adjourned. Thank you very much.

[Whereupon, at 11:45 a.m., the Subcommittee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Dr. David Boyd, Director, Command, Control and Interoperability Division, Science and Technology Directorate, Department of Homeland Security (DHS)

Questions submitted by Chairman David Wu

Q1. P25 equipment purchased with DHS grant dollars must follow the CAP testing and evaluation requirements. How does DHS monitor the grant programs to ensure that grantees follow this requirement?

A1. The DHS Office of Emergency Communications (OEC) and the Office for Interoperability and Compatibility (OIC) support SAFECOM's development of guidance, research, testing, and standards of communications technology. SAFECOM issues an annual document titled "Recommended Guidance for Federal Grant Programs" to provide a point of reference for Federal grant programs that fund interoperable emergency communications activities. The guidance is intended to ensure that Federal grant funding for interoperable communications aligns with national goals and objectives and ensures alignment of state, local, and tribal investment of Federal grant funding to statewide and national goals and objectives.

The SAFECOM guidance specifically states that when a grantee procures P25 equipment and systems they should, at a minimum, "ensure the vendor has participated in equipment testing consistent with the Project 25 Compliance Assessment Program (P25 CAP)."

FEMA/GPD acknowledges this guidance and incorporates it by citation into all grant guidance and application kits, "States that are using FY 2010 HSGP funds to purchase Interoperable Communications Equipment . . . must consult SAFECOM's coordinated grant guidance, which outlines standards and equipment information to enhance interoperable communications."

FEMA/GPD does not monitor its grantees to ensure they follow the P25 CAP requirement. However, in an effort to assist grantees purchasing communications equipment, information related to the P25 CAP has been incorporated into the Responder Knowledge Base (RKB) website, which maintains the DHS Authorized Equipment List. P25 vendors can now include test result summary reports and a Supplier's Declaration of Compliance (SDoC) on the RKB for grantees to reference.

The grant program that most directly addresses the P25 CAP is the Public Safety Interoperable Communications (PSIC) grant program, which is administered by both FEMA/GPD and the National Telecommunications and Information Administration (NTIA). Approximately 90 percent of all available PSIC funding ($848 million out of the available $968 million) is being used by grantees to acquire and deploy equipment to improve interoperable communications.

As background, the PSIC Grant Program Guidance and Application Kit released in August 2007 stated that:

> "Agencies purchasing Project 25 (P25) compliant equipment must obtain documented evidence from the manufacturer that the equipment has been tested to and passed all of the applicable, published, normative P25 compliance assessment test procedures for performance, conformance, and interoperability as defined in the "Grant Guidance—Project 25 Explanatory Addenda," which can be found at *www.safecomprogram.gov/SAFECOM/grant/defaults.htm*."

In June 2009 with the designation of the initial eight laboratories approved to test equipment under the P25 CAP, PSIC program managers and officials from the Office of Emergency Communications (OEC) met with the National Institute of Standards and Technology (NIST) Office of Law Enforcement Standards and received guidance on the program. The PSIC Grant Program included language in its technical assistance offering in the National Preparedness Directorate Technical Assistance Catalog.

Q2. Acknowledging that P25 is a work in progress, at the end of his testimony, Dr. Hofmeister suggested that defining the standard functions and features included within a "package" may offer public safety a clearer picture of the functionality of the LMR systems they are choosing. What are your thoughts on this recommendation or on other ways of providing agencies with a better window into the status of P25 and the implications the status may have on functionality?

A2. Defining the standard functions and features required to identify a product as P25 compliant would provide greater transparency to the public safety community. A common definition for the sets of features offered by manufacturers could be beneficial, but only if it better informs the public safety community's procurement proc-

ess and defining these feature sets does not cause additional delays. When there is a common definition of features across manufacturers, public safety officials can directly compare equipment based upon its functionality and how it will meet their requirements. This transparency combined with a robust compliance assessment program, including conformance testing, will provide increased confidence that equipment will meet the needs of the public safety community. (Conformance testing demonstrates how equipment conforms to the standard and will interoperate with all compatible equipment that correctly implements the standard, including equipment that was not tested.)

The Office for Interoperability and Compatibility (OIC) and the National Institute of Standards and Technology (NIST) are actively working to provide more information on P25 to the public safety community. The P25 Document Suite Reference identifies the current status of the highest priority P25 standards. Manufacturers are also required to submit Suppliers' Declaration of Compliance (SDoC) and Summary Test Reports. The SDoC is the manufacturer's formal, public attestation of compliance with the standards for the equipment. The Summary Test Reports provide the equipment purchaser with a summary of the tests conducted on the equipment along with the testing outcome. All of these documents are available to the public safety community through the Federal Emergency Management Agency's Responder Knowledge Base Web site (*https://www.rkb.us/*) and through NIST's Public Safety Communications Research Program Web site (*http://www.pscr.gov/*).

Q3. In your testimony you mentioned that there are products in the field that were built in the early phases of P25 and that these systems, though labeled P25, may not interoperate. How widespread is this problem and how well aware are public safety agencies that their older P25 systems may not interoperate with newer systems?

A3. There are more than 50,000 public safety agencies throughout the United States, each with its own local and state government regulations and requirements that can impact interoperability. It is difficult to assess how widespread the problem is. Often responders do not know whether they can truly communicate until the need to interoperate with different agencies arises. Based on our work in the field, there is a perception in the public safety community that buying P25 equipment does not guarantee interoperability. The perception that P25 equipment does not interoperate has impacted the pace of adoption. The best way to ensure P25 systems can communicate and also improve the public safety community's confidence in these systems is to have a robust compliance testing program that includes conformance testing.

The Department of Homeland Appropriations Act, 2007, (P.L. 109–295, Title VI, §672(a)) (October 4, 2006) amended the Homeland Security Act of 2002 (Act), by adding a new section 314 to that Act. Under section 314, codified at 6 U.S.C. 195, the Director of the Office for Interoperability and Compatibility is required to, among other things, in coordination with the Federal Communications Commission, the National Institute of Standards and Technology, and other Federal departments and agencies with responsibility for standards, support the creation of national voluntary consensus standards for interoperable emergency communications. P25 CAP provides a process through which equipment can demonstrate that it correctly follows the standard and is able to interoperate with other equipment following the standard. When interoperability testing is combined with conformance testing, the public safety community can be assured that equipment conforms to the standard and will interoperate with all compatible equipment that correctly implements the standard, including equipment that was not tested. Conformance testing helps provide increased confidence that equipment developed in the future will retain compatibility with legacy systems.

Q4. One issue raised at the hearing was that some of the interoperability problems that have emerged were not due to a failure to conform or comply with the standard, but were due to configuration issues. Do you agree with this? What is the role of the P25 process and/or the Federal Government in ensuring that configuration issues do not hinder interoperability?

A4. Radio systems are complex and include many features and functions that need to be configured. The way a radio is programmed varies from manufacturer to manufacturer. When public safety practitioners respond to an emergency and attempt to use their own equipment to communicate with responders from different agencies they may be forced to reconfigure their radios. This effort can waste valuable time and expend limited resources during an emergency. Additionally, improperly configuring a radio can prevent interoperability. Configuration issues could be addressed either through the voluntary consensus process or directly by manufacturers.

To date, P25 has focused on standardizing interfaces instead of internal functions of equipment, such as the method for configuration. Communication standards focus primarily on standardizing the interfaces because that is critical to ensuring devices can communicate across manufacturers. Internal device functions allow for product differentiation and manufacturers are free to be innovative with their product as long as they correctly implement the interface, allowing for interoperability.

Questions submitted by Representative Ben R. Luján

Q1. I am glad to see that we are having this important discussion, and I look forward to working with you all and my colleagues on policy that supports effective, high-tech public safety equipment. As a border state, New Mexico is faced with unique public safety challenges. Can you elaborate on how interoperability can affect border security? How can we support interagency coordination as well as coordination with state and local governments on establishing interoperability standards and technology to assist border security efforts?

A1. Since its creation, the Office for Interoperability and Compatibility (OIC) has supported user driven processes such as P25. Recognizing the need for an open and transparent compliance process, OIC established a P25 Compliance Assessment Program Governing Board to represent the collective interests of organizations that procure P25 equipment. The Governing Board consists of local, state, and Federal Government employees who are active in the operation or procurement of communication systems. Members of the Governing Board represent states and communities on the northern and southern border. Their input into the Governing Board helps ensure the work benefits interoperability on the border.

Questions submitted by Representative Gary C. Peters

Q1. First responders in Michigan and other border regions must be prepared to coordinate with foreign first responders should an emergency occur at border crossings. Has the effort to increase compliance and interoperability of public safety LMR systems included coordination with international entities, such as Canadian first responders and regulators?

A1. As part of its efforts to improve interoperability, the Office for Interoperability and Compatibility (OIC) is coordinating with responders from Canada. Representatives from OIC have participated in the Canadian Voice Interoperability Workshop to discuss the need to accelerate P25 standards and use a robust compliance process. Additionally, the P25 Compliance Assessment Program provides a universal method for testing for compliance to P25, which is used internationally.

Q2. First responders in Michigan tell me that radio communication would be one of the most significant challenges in communicating with Canadian personnel in case of emergency and that they currently lack the capability to communicate in the event of a large scale disaster such as a tunnel failure or bridge sabotage at the border. Has there been any effort to develop or provide first responders at border regions with specialized shared radio units that would provide seamless cross border communication? Have government regulators worked with Canadian regulators to discuss how to create radios that would be interoperable and meet both countries' regulatory requirements?

A2. One of the goals of Office for Interoperability and Compatibility's (OIC) Multi-Band Radio (MBR) Project is the advancement of MBR technology to improve key communications between local, tribal, regional, state, and Federal agencies. To do this, OIC is collaborating with practitioners and industry to develop MBR technology that will enable a single radio to operate across disparate radio bands in use by the emergency response community in both the United States and Canada. OIC is funding the test and evaluation (T&E) of a single handheld MBR through three phases of pilot testing. Phase One involved T&E by U.S. and Canadian emergency response organizations along the Seattle/Blaine, WA border region and other Canadian emergency response agencies (e.g., Vancouver Transit Police) during the 2010 Olympics. During Phase Two, representatives of various emergency response disciplines in Michigan will use the MBRs, which have already been deployed and programmed. Upon the completion of full software development, OIC plans to conduct another pilot with cross-border potential in Phase Three with DHS's Customs and Border Protection in the Greater Detroit area. Pilot planning remains underway and is expected to include Canadian counterpart agencies. Additionally, OIC is collabo-

rating with practitioners in Nogales, Arizona to conduct MBR T&E along the southwest border.

U.S. and Canadian regulators have a close working relationship and have worked together for many years to share radio spectrum along the border region. This is no simple task, as radio signals do not stop at the border and each nation has equal access to all radio spectrum. The State Departments of both Nations, the U.S. Federal Communications Commission, the National Telecommunications and Information Administration, and the Canadian spectrum regulatory body, Industry Canada, have all been actively engaged in solving regulatory issues, including the sharing of the radio spectrum along the border region.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mr. Dereck Orr, Program Manager, Public Safety Communications Systems, National Institute of Standards and Technology (NIST)

Questions submitted by Chairman David Wu

Q1. Acknowledging that P25 is a work in process, at the end of his testimony, Dr. Hofmeister suggested that defining the standard functions and features included within a "package" may offer public safety a clearer picture of the functionability of the LMR systems they are choosing. What are your thoughts on this recommendation or on other ways of providing agencies with a better window into the status of P25 and the implications the status may have on functionability?

A1. Public safety users today have great difficulty understanding what P25 is or means as they are procuring equipment. Part of that confusion stems from the fact that not all of the P25 interface standards are complete. Additionally, there is no set of standardized features required for a product to be labeled P25. The definition of a feature set required for the use of the P25 logo would give public safety increased confidence that a system labeled as P25 at least meets a minimum set of requirements and promotes interoperability.

Public safety users also benefit from the clear definition of each feature's completion status. With this information, public safety can determine which features of a system are truly standardized, and thus make better-informed procurement decisions.

In response to the absence of these initiatives within the P25 process, NIST and the Department of Homeland Security's (DHS) Office for Interoperability and Compatibility (OIC) have instituted the P25 Document Suite Reference (P25 DSR) and the P25 Compliance Assessment Program (P25 CAP). The P25 DSR identifies the current status of each of the five standards that make up the P25 interfaces. This information is updated following each P25 standards meeting, or faster as needs dictate. The P25 DSR can be found on the Public Safety Communications Research (PSCR) program's website (*www.pscr.gov*).

Addressing the lack of a standard feature set required for the use of the P25 label, NIST and the Department of Homeland Security launched the P25 Compliance Assessment Program, a voluntary program that allows P25 equipment suppliers to formally demonstrate their products' compliance with a select group of requirements by testing it in recognized labs. The output, Suppliers' Declarations of Compliance and Summary Test Reports, from the P25 CAP are available on DHS's Responders Knowledge Base website (*www.rkb.us*). All agencies (Federal, state, and local), however, have a unique set of requirements or operating conditions, and as such, each agency should require test information for those unique requirements, beyond those provided by the P25 CAP, during their procurement process (i.e., through Request for Proposals (RFPs), etc.).

Q2. One issue raised at the hearing was that some of the interoperability problems that have emerged were not due to a failure to conform or comply with the standard, but were due to configuration issues. Do you agree with this? What is the role of the P25 process and/or the Federal Government in ensuring that configuration issues do not hinder interoperability?

A2. NIST does not know the degree to which configuration issues lead to radio problems in the field, but in our experience, the difficulty in configuring or programming a public safety radio, which varies from manufacturer to manufacturer, can be considerable. One variable that plays a large role in the complexity of radio configuration is the number of features incorporated into each radio. Additionally, each manufacturer has a different physical method of programming the radios along with a different software interface. In other words, there is no common method of configuring radios across multiple manufacturers.

This complexity, and the lack of a standardized method for programming radios across different vendors, can lead to operability and interoperability issues. However, in discussions with public safety organizations responsible for the provisioning of radios operating on a system, we have been informed that many of the issues found in the radios also require software upgrades to the radios themselves rather than a simple reconfiguration. Thus we are confident that some issues found in the field are due to problems beyond configuration and programming, and are instead due to non-conformance to the standard or problems with the standard itself.

That said, we do believe that configuration issues could become critical, hindering interoperability during an event where agencies from surrounding areas bring their

own equipment into a response. If each radio used in an event requires configuration prior to use, and reconfiguration is complex and difficult, then the ability to communicate could become compromised.

If configuration issues are indeed contributing to interoperability issues, as has been identified by Mr. Hoffmeister, then it behooves those involved in the P25 process to address this issue given that the purpose of P25 is to standardize interfaces to facilitate interoperability.

Questions submitted by Representative Gary C. Peters

Q1. First responders in Michigan and other border regions must be prepared to coordinate with foreign first responders should an emergency occur at border crossings. Has the effort to increase compliance and interoperability of public safety LMR systems included coordination with international entities, such as Canadian first responders and regulators?

A1. Coordination among American and Canadian first responders is critical should an incident occur at the border. It is important that both American and Canadian public safety agencies are able to leverage P25 standards to increase confidence in interoperability among their systems. It is also important that PSCR and other Federal emergency communications agencies work closely with their Canadian counterparts.

For the last several years, PSCR staff have been invited to participate in the Canadian Voice Interoperability Workshop to speak on issues such as P25 and voice quality in land mobile radio systems. During these presentations, PSCR staff speaks to the status of P25 standards development and points out the fact that Canadian public safety agencies can also use the P25 CAP given the public distribution of the information. PSCR anticipates continuing its participation in such events as long as invited. In addition to direct participation in Canadian interoperability events, PSCR has committed to sharing all work product that can be shared publicly with the Canadian first responder community.

In addition to this direct cooperation with Canada, other organizations are working directly on border interoperability issues with both Mexico and Canada. These organizations include the Department of Homeland Security's Office of Emergency Communications (OEC) and its Border Interoperability Demonstration Project as well as the National Public Safety Telecommunications Council's Border Issues Working Group.

Q2. First responders in Michigan tell me that radio communication would be one of the most significant challenges in communicating with Canadian personnel in case of emergency and that they currently lack the capability to communicate in the event of a large scale disaster such as a tunnel failure or bridge sabotage at the border. Has there been any effort to develop or provide first responders at border regions with specialized shared radio units that would provide seamless cross border communications? Have government regulators worked with Canadian regulators to discuss how to create radios that would be interoperable and meet both countries' regulatory requirements?

A2. While PSCR works directly with the Canadian first responder community (through Industry Canada and the Canadian Interoperability Technology Interest Group), it does not work with specific border agencies in either the U.S. or Canada. Both DHS OEC and DHS OIC have direct relationships with their Canadian counterparts and are likely better informed to answer this question.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Dr. Ernest L. Hofmeister, Senior Scientist, Harris Corporation

Questions submitted by Chairman David Wu

Thank you Chairman Wu for your sincere interest in the Hearing subject and related topics. Harris appreciates the opportunity to provide additional information in response to your questions.

Q1. At the end of your testimony you suggested that "there could be much progress in making sure you define what those levels of [baseline and above] of interoperability are and make sure those are present, tested for and present in every product." What would be required to implement this type of product labeling?

A1. The intent of this comment was to reference one of the Harris recommendations in the written testimony that: "Agreement among public safety agencies on the features for interoperability, as defined by several levels of interoperability, would be beneficial. These levels could include: P25 Interoperability Capability 0 (baseline); P25 Interoperability Capability 1 (Capability 0 plus more features), etc. This grouping of interoperability capability features would make specification and testing of interoperability simpler, more efficient, and adaptable to the interoperability needs of various public safety agencies." Within the P25 suite of standards, there is an array of mandatory and standard option features.[1] As the name implies, mandatory features are those features that must be included in every P25 radio and system product. For example, Unaddressed Voice Call is a mandatory feature for the conventional mode of operation and Group Call Voice is a mandatory feature for the trunked mode of operation. For the current published suite of P25 standards, there are approximately 10 mandatory conventional features and 13 mandatory trunked features. However, for standard option features, there are approximately 30 standard option conventional features and 34 standard option trunked features. A standard option feature is a feature that the user has the option of purchasing/deploying and the manufacturer has the option of providing in its P25 radio and system product. With the 10–13 mandatory features representing the most basic level of operation and the 30–34 standard option features variably implemented in public safety P25 systems according to the buying needs/requirements of the user and the manufacturers option to provide, the range of P25 features varies significantly from P25 system to P25 system. The reason for the relatively large number of standard option features is to allow flexibility for various size public safety agencies to implement systems with capability scaled to their needs from relatively small, lower capability to very large, high capability needs. While such flexibility is good to allow adaption to user needs, it does create challenges when attempting to define one or more standard interoperability profiles (levels of capability) that can be tested and practiced with high assurance that the needed interoperability will work well when needed.

It is Harris' view that with such variability and flexibility in P25 features supported, interoperability in terms of features/capability means something quite different from public safety agency to public safety agency and especially from smaller, more likely rural agencies to larger, more likely metropolitan agencies. As noted in the Harris written testimony, "although challenging and having been discussed a number of times by users and manufacturers in the P25 standards community, the array of P25 mandatory and standard option features could be grouped or packaged into levels of increasing capability; i.e., P25 Level 0 (baseline); P25 Level 1 (Level 0 plus more features); P25 Level 2; etc. This grouping of features could make the product marking of features supported and the P25 CAP testing of features packages more simplified and efficient." A similar grouping or packaging of features into levels or profiles of interoperability would reduce the large variability in terms of

[1] The official definitions of mandatory and standard option features are included in the Project 25 Statement of Requirements (P25 SoR, Mar 3, 2010 Approved Version) as:

- A Mandatory service, feature, or capability supported by the suite of P25 standards is to be supported by all P25 systems. Implementation of the so-designated services, features, or capabilities shall comply with the P25 standards defined by TIA.
- Likewise, a Standard Option service, feature, or capability is supported by the suite of P25 standards. The user has the option of deploying so designated services, features, or capabilities. Likewise, manufacturers have the option of offering so designated services, features, or capabilities. If deployed in a particular P25 system, implementation of the Standard Option shall comply with the P25 standards defined by TIA.

interoperability features supported to a reduced set levels or profiles. Such grouping of interoperability capability features would make specification, testing, and marking of interoperability capability simpler, more efficient, and adaptable to the interoperability needs of various public safety agencies.

Harris views that the steps needed to implement such a specification, testing, and marking of interoperability levels or profiles would include:

a. P25 knowledgeable public safety agencies working together for consensus to define the P25 features for several levels of interoperability capability. These levels or profiles could include: P25 Interoperability Capability 0 (baseline and probably just the mandatory features); P25 Capability 1 (Capability 0 plus more features); P25 Capability 2 (Capability 1 plus more features), etc. Harris would envision that there should be five or fewer capability levels.

b. Once the Capability Levels are defined in item a, the P25 community (industry and users) would select or develop the interoperability test standards corresponding to the features specified in the Capability Levels. This could be a selection of a subset of tests in the current trunked voice interoperability and the conventional voice interoperability standards. For the higher level(s) of interoperability, it may be necessary to develop supplemental interoperability tests for the standards.

c. The results of item b could be provided to the P25 Compliance Assessment Program Governing Board for their consideration to incorporate into the formal P25 Compliance Assessment Program interoperability tests through a Compliance Assessment Bulletin (CAB).

d. The current or additional Recognized P25 Compliance Assessment Laboratories could be assessed as necessary and recognized for these Interoperability Capability Levels.

e. Manufacturer's products could then be tested in the P25 CAP Recognized Laboratories per the CAB.

f. Based on the results of the P25 CAP interoperability testing, the posted Summary Test Reports (STRs) and the Supplier's Declaration of Compliance (SDoCs) could reflect the Interoperability Capability Level(s) passed.

f. If desired, a suitable P25 Interoperability Capability Level sticker or marker could be developed and used to visually show the P25 Interoperability Capability Level of the subject P25 product.

This approach could be consistent with the testimony during the Hearing of Dr. Boyd, "The way we talk about standards is that there ought to be some core set of functionalities that we make sure remain in place. I think the manufacturers are working very closely with us to develop that core set of functionalities." [2]

Q2. One issue raised at the hearing was the difference between performing conformance testing while the product is in development and doing so after the product has been developed. Can you please comment on Mr. Orr's statement that testing during development meets conformance testinq requirements if done with the "right" equipment and quality system in place? What is involved in developing the testing equipment and quality system?

A2. As a preface before answering the question and specifically on ISSI conformance testing, Harris views ISSI conformance testing as a design verification method used on software subsystems during product development in engineering laboratories. Harris does conformance testing as part of product development in engineering laboratories and at various stages of development (e.g., unit test, integration test, and SVT) to verify subsystem design. The testing is less formal, but done. In general, Harris does not feel that repeating conformance tests on a formal basis after complete product development adds significant value compared to the effort required. Harris is on public record several times in comments [3] [4] to the P25 CAP Governing Board regarding its position on formal P25 CAP ISSI conformance testing. That being said, Harris recognizes that the P25 CAP Governing Board issued a P25

[2] From 5.27 hearing transcript for Dr. Boyd statements at lines 874 and 883.

[3] Harris Comments on DHS OIC P25–CAB_ISSI_REQ—December 2009, Ernest L. Hofmeister, Harris Corporation, January 18, 2010.

[4] Harris Comments to DHS P25 CAP Governing Board—March 31, 2010, Ernest L. Hofmeister, Harris Corporation

CAP ISSI Compliance Assessment Bulletin (CAB) that specifies approximately 30 conformance and 27 interoperability tests and that this CAB is in effect.[5]

In terms of answering the question, Harris agrees with Mr. Orr's statement that there is a provision in the P25 Compliance Assessment Laboratory guidelines that would allow "recognized" conformance testing during product development if done with the "right" equipment and quality system in place. The Guide[6] "discusses an approach of integrating recognized P25 CAP compliance test activities with the Product Development organization design validation testing activities. However, in order for this integrated approach to be successful, the recognized P25 CAP laboratory and product development must ensure that the provisions of NIST Handbook 153[7] are completely satisfied."

While Harris continues to evaluate the integrated approach, Harris is concerned about the operational practicality of integrating the product development environment into the P25 Compliance Assessment Lab environment in compliance with the Guide and NIST Handbook 153 and the business investment impact to do so. The practicality and investment challenges include establishing the "right" test equipment (including software test tools) and the quality system per NIST Handbook 153.

a. "Right" Test Equipment

Regarding the "right" test equipment, for conformance testing for interfaces like the Common Air Interface (CAI) where commercial off-the-shelf test equipment like protocol analyzers and RF test equipment exists that can be readily validated per NIST Handbook 153, establishing the "right" test equipment is not a challenge. However, for conformance testing for interfaces like the Intra-RF SubSystem Interface (ISSI) where the ISSI product is primarily software and where commercial off-the-shelf software test tools that can be readily validated per NIST Handbook 153 do not exist, establishing the "right" test equipment is a significant challenge. Conformance testing for software products like the ISSI by its nature is tedious and labor intensive without some automated and validated test tool. Harris is not aware of such a tool, but maintains a high interest level in sources or information on such a tool. An R&D version of an automated tool has been offered by NIST, but it has not been validated to our knowledge and especially not per the NIST Handbook 153 requirements for software test tools. Similarly, an ISSI software test tool offered a small company, Valid8, has been evaluated by Harris. Our assessment is that while this tool is promising for the future, a sizeable amount of continued development, maturation, and validation would be required before it could be considered a "right" test tool. Harris and industry experience with software and products from R&D labs and small companies is that much effort is often required to finish the development to a product and to validate and then to support.

Harris also notes that formal ISSI conformance testing will likely not be a one-time event where tedious, labor intensive testing might be more supportable. As with many complex P25 products, Harris expects that ISSI product releases will occur over time with successive releases supporting more and more of the ISSI features. ISSI conformance testing would be required for each successive ISSI product release.

Harris cannot afford to be both an LMR P25 equipment manufacturer and a test equipment/tool manufacturer. The public safety LMR P25 industry is just not like the cellular industry where we understand formal conformance tests are done. The much higher product mix and the much, much smaller volumes means that Harris, and likely the industry, must do things differently than the cellular industry. The orders of magnitude difference in scale between the LMR P25 industry and the cellular industry was identified and discussed during the hearing.

Thus, for ISSI conformance testing, the lack of a validated, automated software test tool ("right" equipment) represents a significant practical technical and business investment challenge. This challenge applies independent of whether the formal conformance testing is integrated with product development or whether it is done separate from product development after the product is complete in a recognized P25 CAP lab. Development and validation of an automated ISSI conformance test tool

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[5] P25 Compliance Assessment Bulletin, Baseline Inter-RF Sub-System Interface Testing Requirements, P25–CAB–ISSI_TEST_REQ, Office for Interoperability and Compatibility, U.S. DHS, March 2010.

[6] P25 CAP Laboratory Testing: Guide for Integration With Product Development Organizations, issued by P25 CAP, June 26, 2009, file Integration of P25 lab testing with product development r10.pdf.

[7] NIST Handbook 153, 2009REV Edition, "Laboratory Recognition Process for Project 25 Compliance Assessment," Kurt B. Fischer and Andrew Thiessen, Editors, Office of Law Enforcement Standards, Electronics and Electrical Engineering Laboratory, National Institute of Standards and Technology, U.S. Department of Commerce, June 2009.

by the Public Safety Communications Research (PSCR)[8] program (or another NIST/OLES or NTIA/ITS) group or validation of a 3rd party tool by PSCR for use by industry is an area where the DHS (or PSCR, NIST/OLES, NTIA/ITS) could make a significant contribution toward reducing the burden on the small P25 industry consistent with their intent indicated in the statements of Mr. Orr during the hearing.[9] A rough order of magnitude (ROM) estimate for Harris to develop and validate an automated ISSI test tool is $1.4 MUSD with a recurring expense of about 10% to maintain the tool. This amount represents a substantial portion of the R&D cost to develop the ISSI product itself. In the resource constrained R&D environment, development of an automated ISSI test tool by Harris would require diverting critical software engineering resources from ISSI product development to test tool development. The result would affect Harris' ability to compete in the marketplace through reduced ISSI product innovation and longer time to market for ISSI features in order to implement formal ISSI conformance tests. Such an investment and diversion of resources would not be justified or acceptable for normal business considerations and practices and especially for the formal testing that Harris believes provides little added value or compliance assurance beyond that already provided by the normal in-formal conformance testing as part of product development.

b. Operational Practicality and Quality System

Harris understands the need for the rigor and careful formal control in the P25 CAP as defined in the Guide and NIST Handbook 153 for such testing to be recognized by DHS/NIST. While not impossible, the rigor and careful formal control is more challenging to implement for the case where the product development environment is integrated with the separate P25 CAP lab environment than when the P25 CAP lab is maintained as a separate and self-sustaining environment.

For Harris, the Product Development environment, while controlled, is very dynamic, flexible, fast-paced, and less formal with hardware and especially software changes rapidly implemented, tested, and revised leading to a final hardware and software configuration. The final hardware and software configuration is then released to the System Verification & Test (SVT) environment within the Product Integrity organization for more rigorous, controlled, and formal product and system verification testing. There is interaction and iteration between the SVT and product development groups for items found in SVT testing that could be problems or unexplained behavior leading to a final version of hardware and software that is releasable for products and systems. The SVT testing often extends over a period of months and usually includes Beta testing at one or more customer installations. Harris has formal product releases indicated as PR–AB–C and system releases indicated as SR–DE–F.

Establishing a Quality Management System for integrating elements of the product development and SVT environments into the Harris P25 CAP lab environment can be done with suitable effort, care, and due diligence. The challenge Harris sees is the operational practicality of the integrated environments. The concern is the coordination and interruption of the flow and interaction of the normal activities in the product development and SVT environments to accomplish the P25 CAP conformance testing. Repeated interruptions for P25 CAP conformance testing for the various near-final versions of software before final release could have an undesired impact on the product and system software release schedule. While still under evaluation, Harris, at this point, would likely favor performing the P25 CAP conformance testing after the product has been developed and ready for release in the separate P25 CAP lab environment. An earlier concern about CAP testing of the final product because some P25 CAP conformance tests are invasive and require special software test code that would undesirably reside in the final product has been alleviated. The recent practice in the TIA–P25 and NIST/OLES groups has been to not include any invasive tests in the P25 CAP.

c. Harris Summary and Business Perspective for P25 CAP ISSI Conformance Testing

Harris supports a solid, practical DHS P25 Compliance Assessment Program (P25 CAP) and associated testing for the benefit of our customers, other public safety agencies/users, and manufacturers. Harris agrees with Mr. Orr's statement that

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[8] Per Mr. Orr's written testimony for this hearing, "The PSCR program serves as the technical lead for several Administration initiatives focusing on public safety communications, most importantly the Department of Homeland Security's (DHS) Office for Interoperability and Compatibility (OIC) within the Science and Technology Directorate." For more information on PSCR see the website: *http://www.pscr.gov*.

[9] Mr. Orr's statement starting at line 1201 of the 5.27 hearing transcript: "We realize that any additional testing that is placed on industry is going to cost money and so we have done everything within this program to ensure that we are minimizing the burden on industry, minimizing the financial requirements that are needed to put the program in place". . . .

there is a provision in the P25 Compliance Assessment Laboratory guidelines that would allow "recognized" conformance testing during product development if done with the "right" equipment and quality system in place. The Guide[10] "discusses an approach of integrating recognized P25 CAP compliance test activities with the Product Development organization design validation testing activities." While Harris continues to evaluate the integrated approach, Harris is concerned about the operational practicality of integrating the product development environment into the P25 Compliance Assessment Lab environment in compliance with the Guide and NIST Handbook 153 and the business investment impact to do so. The practicality and investment challenges include establishing the "right" test equipment (including software test tools) and the quality system per NIST Handbook 153. Regarding the "right" test equipment, for conformance testing for interfaces like the Common Air Interface (CAI) where commercial off-the-shelf test equipment like protocol analyzers and RF test equipment exists that can be readily validated per NIST Handbook 153, establishing the "right" test equipment is not a challenge. However, for conformance testing for interfaces like the Intra-RF SubSystem Interface (ISSI) where the ISSI product is primarily software and where commercial off-the-shelf software test tools that can be readily validated per NIST Handbook 153 do not exist, establishing the "right" test equipment is a significant challenge. Establishing a Quality Management System for integrating elements of the product development and SVT environments into the Harris P25 CAP lab environment can be done with suitable effort, care, and due diligence. The challenge Harris sees is the operational practicality of the integrated environments. The concern is the coordination and interruption of the flow and interaction of the normal activities in the product development and SVT environments to accomplish the P25 CAP conformance testing. Harris, at this point, would likely favor performing the P25 CAP conformance testing after the product has been developed and ready for release in the separate P25 CAP lab environment.

In terms of a Business perspective to establish and maintain a recognized P25 CAP ISSI conformance testing laboratory, Harris has conducted a ROM scoping analysis of the total ISSI market and the investment to establish and maintain a recognized P25 CAP ISSI conformance testing laboratory. The ROM scope investment to establish and maintain a recognized P25 CAP ISSI conformance testing laboratory ranges from a substantial portion of the total estimated annual ISSI market to several times the total estimated annual ISSI market. The range corresponds to the situations of establishing and maintaining a recognized laboratory integrated with the product development environment and establishing and maintaining a recognized laboratory separate from the product development environment. Such an investment for either situation would not be justified or acceptable for normal business considerations and practices and especially for testing that Harris believes provides little added value or assurance beyond that already provided by the normal conformance testing as part of product development. Harris believes that a validated 3rd party automated ISSI conformance software test tool as a minimum and likely a 3rd party recognized P25 CAP lab for ISSI conformance testing are critical for the practical implementation of formal ISSI conformance testing per the P25 ISSI CAB in effect and cited earlier. Development and validation of an automated ISSI conformance test tool by the Public Safety Communications Research (PSCR)[11] program (or another NIST/OLES or NTIA/ITS) group or validation of a 3rd party tool by PSCR for use by industry is an area where the DHS (or PSCR, NIST/OLES, NTIA/ITS) could make a significant contribution toward reducing the burden on the small P25 industry consistent with their intent indicated in the statements of Mr. Orr during the hearing.[12]

Additional Comments

Harris offers the following additional comments to clarify certain areas brought out during the course of the hearing:

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[10] P25 CAP Laboratory Testing: Guide for Integration With Product Development Organizations, issued by P25 CAP, June 26, 2009, file Integration of P25 lab testing with product development r10.pdf.

[11] Per Mr. Orr's written testimony for this hearing, "The PSCR program serves as the technical lead for several Administration initiatives focusing on public safety communications, most importantly the Department of Homeland Security's (DHS) Office for Interoperability and Compatibility (OIC) within the Science and Technology Directorate." For more information on PSCR see the website: *http://vvww.pscr.gov*.

[12] Mr. Orr's statement starting at line 1201 of the 5.27 hearing transcript: "We realize that any additional testing that is placed on industry is going to cost money and so we have done everything within this program to ensure that we are minimizing the burden on industry, minimizing the financial requirements that are needed to put the program in place". . . .

P25 Equipment Interoperability:

It was implied that not all P25 certified (vendor self-certification) equipment can interoperate. An example was given where you have three P25 radios from different systems and only two could talk to each other. Harris believes that this is not the norm and that the status of interoperability among P25 equipment from various vendors is very good and we testified to that fact. Land Mobile Radio systems are complex and one could say that each system deployed is custom to that user. This presents challenges in how a particular system is configured. We have testified that many times inconsistencies are a result of how a radio system is configured versus whether or not the equipment meets the standard. We should also point out that currently P25 systems of one frequency can not interoperate with P25 systems of a different frequency regardless of whether they pass testing. This is being addressed by the in-place ISSI standard.

Completion Status of P25 Standards:

In the context of the hearing subject, "Interoperability in Public Safety Communications Equipment," Harris believes it is important to state the completion status in terms of the interfaces that are critical and fundamental to system and equipment interoperability. Harris agrees with Dr. Boyd's DHS S&T testimony that the CAI (conventional and trunked) and the ISSI are the interfaces critical and fundamental to system and equipment interoperability. Per Mr. Orr's PSCS testimony, "To date, only the conventional portion of the CAI and the Inter-RF–Subsystem Interface have a completed suite of documents as defined above. The more complex trunked CAI continues to lack conformance test documents (crucial for uniform implementation) although trunked CAI products have been sold for almost a decade." From this view and using the five standards documents per interface for completion per the Mr. Orr written testimony, the P25 standards completion status for the interfaces critical and fundamental to system and equipment interoperability is pretty solid:

- Conventional CAI—5 of 5 documents complete—100% Complete
- Trunked CAI—4 of 5 documents complete with conformance to be completed—80 % Complete
- ISSI—5 of 5 documents complete—100% Complete.

For this analysis, 14 of 15 standards documents are complete; i.e., 93 % Complete.

In addition, for the trunked CAI interoperability as reported in the Harris written testimony, multiple radio products and infrastructure radio products have demonstrated a high functional level of interoperability through the formal CAI interoperability testing as part of the P25 Compliance Assessment Program (CAP) over the last year. As of May 2010, twenty vendor radio products (or radio model classes) from four vendors (EF Johnson, Harris, Motorola, and Tait) have approved Suppliers Declaration of Compliance (SDoCs) and Summary Test Reports (STRs) posted to the official RKB website for information and review by public safety agencies and practitioners. To have passed the trunked voice interoperability standard for these tests, each P25 radio needed to pass 20 tests in the standard on at least three different manufacturer's system infrastructure. It is for these reasons of standards completion status above and the cited trunked interoperability testing results that Harris stated in its testimony that the P25 product standards, the testing standards, and the product features are in place or soon will be in place to enable a solid level of P25 trunked and conventional systems interoperability.

Standards pace is at full industry support capacity:

While some not involved in the standards development process might comment that standards development takes a long time, the TIA process, like other Standards Development Organizations, is a consensus-based process by design. The standards are developed by top engineers from industry who have the knowledge and perspective to assure successful product implementation to the standard. Getting to consensus and developing the requisite detail of the standard takes time, but the resultant standard product is technically solid and long lasting. Harris believes that since 2005, the standards pace is at full industry/user support capacity. As a rough estimate, there are less than 25 top engineers in this industry with the knowledge, perspective, and capability to develop credible Project 25 standards. Since 2005, there have been approximately 23 week-long, face-to-face TIA & P25 meetings with over 40 working attendees per meeting amounting to ~37,000 person hours or over 23 person years. In addition, there have been over 10 hours of subcommittee or task group conference calls per week over this period with over 10 people participating amounting to ~28000 person hours or over 17 person years. In addition, the prepara-

tion time of technical document contributions is done outside of the conference call and meeting time. Since 2005 over 13,000 contributions toward the TIA–P25 suite of standards have been submitted for review, critique, and edit. Without researching the TIA records for years 2005–2007, over 75 documents have been formally balloted as a standards documents and over 60 documents have been published as TIA–P25 standards in the 2 1/2 years since 2008 through the present time in 2010. Hence, the Harris view that the standards pace is at full industry/user support capacity.

On-site Compliance Assessment Labs:

There was testimony about voluntary testing programs for P25 systems. Both Harris and Motorola testified to the fact that they both have established Compliance Assessment Laboratories and have hosted multiple vendors. Harris testified that it has invested significant resources in support of the P25 standards process. We should highlight that in addition to time, personnel and the costs associated with these standards activities, Harris spent close to $2M to establish an in-house test capability including capital and operating/development costs. It is in the vendor's best interest to deploy compliant equipment. As Chief Johnson testified, most systems are procured through a process that ensures that all equipment is operational before the system is approved for first responder use.

Established testing paired with the strict requirements of the procurement process ensures positive results.

As noted during Harris' oral testimony, the P25 industry is small by comparison to the commercial industries of cellular, WiFi, and Bluetooth mentioned by Mr. Orr in his written and oral testimony. To illustrate the total 2009 North American Land Mobile Radio market is estimated to support 12 million users of which 4 million represent public safety users. The P25 industry is estimated to be about half of the total with about 1.5 million users. In contrast, the total 2009 U.S. cellular market is estimated to support about 270 million users/subscribers. The P25 market is about 0.5% of the commercial users/subscribers. Given the scale difference of the P25 industry with a commercial industry like cellular, Harris believes that comparisons and expectations for the P25 industry in terms of the rate of standards development and industry-led compliance assessment are not relevant.

Beyond P25:

Complete ubiquitous interoperability among existing narrowband LMR systems will not be achieved through deployment of P25 equipment alone. As Dr. Boyd testified, public safety has an installed base of radio systems equal to approximately $100 Billion. These systems are of varying ages, operating frequencies, mode, etc. . . . Other than cost, there are many considerations when procuring a radio system; some of which are size, use, geography, spectrum availability, future proof, etc. . . . There are smaller, rural entities today that do not have the funds to upgrade to an expensive digital system yet may be the central site of a manmade or natural disaster and will need to interoperate with other first and second responders during an incident. To address the unique needs of public safety entities and to achieve varying levels of interoperability, vendors provide a wide array of products from P25 radios and infrastructure to Internet Protocol (IP) networks that connect disparate systems through standardized network architecture.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mr. John Muench, Director of Business Development, Motorola Inc.

Questions submitted by Chairman David Wu

Q1. One issue raised at the hearing was the difference between performing conformance testing while the product is in development and doing so after the product has been developed. Can you please comment on Mr. Orr's statement that testing during development meets conformance testing requires if done with the "right" equipment and with a quality system in place? What is involved in developing the testing equipment and quality system?

Q1a. Can you please comment on Mr. Orr's statement that testing during development meets conformance testing requirements if done with the "right" equipment and with a quality system in place?

A1a. Any testing within the Department of Homeland Security (DHS) Compliance Assessment Program (CAP), be it Performance, Conformance or Interoperability testing, is required to be done in a lab that has been formally assessed by National Institute of Standards and Technology (NIST) and as a result, is formally recognized by the DHS CAP for specific types of testing, such as Conformance testing. The formal assessment of the lab includes providing the assessment team with Lab Management and Lab Quality manuals. These describe the management and quality practices of the lab. According to the NIST Handbook on CAP Lab Assessment, the assessment does not concern itself with the maturity of or adequacy of these practices. Instead, the assessment only ensures that evidence exists that these practices are documented by the lab and followed by the lab.

Mr. Orr's statement is based on an observation that conformance testing may occur in a recognized lab that is dedicated to DHS CAP testing or that conformance testing may occur in a manufacturer's "development" lab that is not dedicated to DHS CAP testing. Note that some types of conformance tests are intrusive to the physical product and so, it may be more practical to execute such tests in a product development lab that essentially "opens up" the equipment under test.

Mr. Orr's statement about "a quality system in place" means that if conformance testing is to be done in a development lab that is not dedicated to DHS CAP testing, the management and quality practices of that lab must meet the expectations of the NIST Handbook on CAP Lab Assessment in order for the development lab's test results to be accepted by the DHS CAP.

The nature of conformance testing is validation that the standardized messages are sent under specified conditions and that when standardized messages are received, the resulting reaction to the standard message content is as specified. Conformance tests require validation of specified stimulus conditions, specified message content and specified reaction to the message content. This requires test equipment that can capture messages exchanged, and display the message sequence and content.

The NIST Handbook for Lab Assessment identifies four categories of test equipment that may be used by a recognized lab for DHS CAP testing. For each category, the Handbook also identifies certain requirements for each category of equipment. During assessment, the lab is required to provide evidence supporting the categorization of the equipment to be used and to provide evidence that the equipment is meeting the requirements specific to that categorization.

Mr. Orr's statement about "done with the "right" equipment" means that the equipment used to produce the test results has been assessed and approved during lab assessment.

Q1b. What is involved in developing the testing equipment and quality system?

A1b. The quality system is a document describing the policies and practices of the lab intended to produce quality results. This documentation also typically describes how these policies and practices will be monitored and enforced. This documentation is created and maintained by the management of the lab and provided to the assessors during NIST lab assessment.

As previously noted, the NIST Handbook on Lab Assessment identifies 4 categories of test equipment:

- Commercial Off the Shelf (COTS) test tools—Test equipment is not modified in any way after purchase and prior to use.
- Modified Off the Shelf (MOTS) test tools—Test equipment is modified to some extend after purchase and prior to use.

- Custom test tools—Test equipment is not commercially available and is custom made for specific use.
- Open Source/Freeware test tools—Test equipment is available to the general public under an open source license agreement and is not modified prior to use.

Only test equipment falling into the "MOTS" or "Custom" categories requires any sort of development. In these cases, the developer determines the requirements for the test equipment imposed by the test methodology and using a documented design and development process, builds or modifies the equipment capabilities to meet the requirements of the test methodology. Once the custom or modified capabilities have been implemented, per the documented design and development processes, these capabilities are validated the against the design requirements prior to actual use.

Q2. Acknowledging that P25 is a work in progress, at the end of his testimony, Dr. Hofmeister suggested that defining the standard functions included with a "package" may offer public safety a clearer picture of the functionality of the system they are buying. What are your thoughts on this recommendation, or other ways of better communicating the status of P25 to purchasers?

A2. The reality of the P25 market is for P25 compliant products to be designed and manufactured for flexibility in order to meet the diverse mission needs of the users. Standardized packaging of P25 features is something that can be done, but in my opinion will not ultimately satisfy the end user requirement for better information on the status of P25.

Public Safety Practioners commonly ask for Project 25 status and feature information as outlined by these four questions:

1. What features are in P25?
2. Where can a definition for these features be found?
3. What features have been implemented by a manufacturer?
4. What features have been tested for multi-manufacturer interoperability?

The answers to four questions help them determine, what set of P25 features meet their specific communications needs, which manufacturers provide the desired set of P25 features that meet their specific needs and whether the desired P25 feature set has been successfully tested for interoperability with the desired manufacturers.

The answers to the first two questions can be found in the P25 Statement of Requirements document published by the P25 User Needs Subcommittee and in TIA–102 Standard documents. The Public Safety Practioners develop and publish the "P25 Statement of Requirements" themselves. Public Safety Practioners receive free access to the published TIA–102 Standard documents through a special TIA web access. Normally, the TIA Standard documents have to be purchased.

Each manufacturer markets the information as to what features and functions their company has implemented in their product lines. Among the supported features and functions are those claimed to be compliant to the Project 25 standard. If this information is not readily available, purchasers can get insight as to which P25 features have been implemented by a manufacturer by issuing either a Request for Information or a Request For Proposal.

Information on which features and functionality have been tested for interoperability and between which manufacturers, has not been publicly available in the past. The driving force for formal interoperability testing is the DHS grant monies. The grant guidance outlines a requirement for manufacturers to produce a P25 Suppliers Declaration of Compliance (SDoC) and Summary Test Report (STR). These documents include the results of formal interoperability testing. Purchasers can obtain information describing what P25 functionality has been tested by which manufacturers by requesting SDoC/STRs from the manufacturers or obtaining them from the Responder Knowledge Base (RKB) website.

The P25 Standard will never be comparable to the 3G/4G or WIMAX standards when it comes to public recognition or when a user is looking for information. The P25 manufacturers are not selling equipment to multiple global cellular service companies-each with massive marketing departments, operating worldwide cellular networks. P25 manufacturers are not shipping hundreds of millions of hand held radios every year.

The P25 manufacturers sell products to a unique marketplace that values products based on the Project 25 standard and implemented to provide guaranteed performance, long-term durability, security and features necessary for mission critical communications. Project 25 actively involves and uses the input of Public Safety

Practioners (Police, Fire, EMS personnel, as well as State, Local and Federal agencies) when determining the needs and the scope of the P25 standard. Public Safety Practioners are members of P25 committees, they can submit comments on draft P25 standard documents and they can attend meetings in person and on conference calls. They are free to comment on the priorities of the P25 standard. Public Safety Practioners have always been involved with the development of the P25 Standard. Although the P25 market is smaller, the involvement of the user community in the standard development enables an informed user community without the massive marketing departments like the cellular marketplace.

There have been discussions within P25 about structuring specific features into packages to make ordering easier with the assumption that this would make it easier for the purchaser to understand what he is purchasing. One of the challenges of offering prepackaged P25 features for 'mission critical' communications equipment and systems is that the size, mission and communication needs of public safety agencies vary dramatically. It is this variation that limits the value and utility of standardized feature packages.

The size of a public safety agency can vary from 6 officers to over 35,000 officers; who serve populations from a few thousand to a few million. This size variation impacts the features needed and how the system operates. The different communication needs of the fire fighter all geared-up with breathing masks at the fireground, the metropolitan patrol police officer walking a beat, the state trooper patrolling the highways at high and slow speeds, Federal law enforcement patrolling remote borders and the military communicating at forts and bases require different communication features and operations. The frequency bands in which these agencies operate are different, with different FCC and NTIA licensing requirements that directly impact the design and operation of the equipment and system. These public safety practioners use some of the same P25 services and features but may also require services and features with special behaviors, or various combinations of features, services and accessories that make their operations unique. For example, Federal law enforcement using P25 equipment have wireless security requirements that are not imposed on state and local users.

Motorola does not envision a future where there is just one model of a P25 radio, nor should there be a P25 radio *limited* to only the P25 features fully-defined by published P25 standards. Today, there are many radio models and configurations that are P25-complaint and also support other standards or proprietary operations. Manufacturers offer product tiers at different price points and are free to configure feature sets to meet particular marketplaces. A manufacturer offers feature variations that are marketed to meet the individual business opportunities for that manufacturer. Customers continue to request features for their equipment that are not part of P25.

It has been Motorola's experience that purchasers of P25 equipment are most concerned with the status of multi-manufacturer interoperability. Aside from having a defined TIA Standard, P25 purchasers want to know what features, with what P25 portable and mobile radios, are interchangeable with what P25 fixed radio systems. The only action that resolves this concern is documented interoperability testing. The faster more features are added to the P25 CAP interoperability test suites, the faster users will know the interoperability status of products that can meet their feature needs. The P25 CAP could be expanded to cover more features faster, if the expansion first focused on interoperability testing of functionally-defined features with follow-on testing expansion to include conformance testing of these same features. The current P25 CAP testing approach is more vertical in nature. The current approach defines conformance and interoperability testing feature by feature. This provides a complete testing profile by feature but slows the initial interoperability testing for all features. Conformance testing is part of P25, but it is not a substitute for interoperability testing.

Also, the current 'rule of 3' for posting interoperability testing maybe keeping some vendors from posting interoperability performance status on the RKB. The 'rule of three' requires that the P25 equipment from one vendor be interoperability tested with three P25 equipment vendors. It is difficult, and can take many calendar months, for multiple manufacturers to schedule interoperability testing considering the multiple product development schedules of P25 manufacturers. Motorola would suggest that the 'rule of 3' for posting interoperability testing results be relaxed, allowing posting results with just one other manufacturer, but maintaining the 'rule of 3' for equipment to be eligible for DHS grant monies.

Appendix 2:

Additional Material for the Record

STATEMENT FOR THE RECORD FROM SKYTERRA COMMUNICATIONS

Statement for the Record

May 27, 2010 Hearing on Interoperability in Public Safety Communications Equipment

Subcommittee on Technology & Innovation
House Committee on Science & Technology

For many years, public safety users and other important constituencies across America have struggled with the issue of communications interoperability. The ability of one first responder to connect with another is paramount not just to the safety and security of the individuals that are responding to an emergency but also to the safety and security of the communities and circumstances in which those events occur.

Since the September 11th attacks, America has invested hundreds of millions of dollars in new technologies, equipment, strategies and standards to improve the nation's communications interoperability. As a result of these investments tremendous progress can be seen across the country in the form of new technologies, enhanced training, new equipment and improved operations.

While there is much to applaud about the nation's progress on this issue, many problems remain. Legacy communications systems and behaviors remain in place, thereby anchoring today's public safety interests to many of the same positions they held on the morning of September 11th. Furthermore, there is no single investment or technology answer to the country's ongoing interoperability challenges.

Full and successful communications interoperability will only come about with the merger of innovative and adaptable technologies; cooperative partnerships; available resources; and policies and programs that promote flexibility and resilience. These are the operating tenets of today's satellite communications industry.

Today, across America, emergency operations centers, law enforcement officers, public safety officials, hospitals, military personnel, critical infrastructure owners and many others are using satellite communications equipment and related technologies to serve and secure their communities. As one of the satellite industry's most innovative leaders, SkyTerra Communications, a subsidiary of Harbinger Global Wireless, has proven the difference that satellite communications can make to any community in America.

From the post-disaster conditions along America's Gulf Coast following Hurricanes Katrina, Rita and Ike, to the rampant fires of California, to the ice storms that brought down Kentucky's communications infrastructure, satellite communications have operated and performed in conditions where existing land mobile radio and terrestrial systems have not.

SkyTerra Communications
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SkyTerra Statement for the Record

As described in the attached materials, SkyTerra provided critical satellite communications during each one of those events, and during many others. Most recently, first responders and government agencies took SkyTerra units to Haiti, when satellite provided the only viable communications link for an extended period of time after earthquakes destroyed much of the terrestrial infrastructure. Moreover, as is described in the attached report of the International Association of Fire Chiefs, SkyTerra provides its users with the SMART talkgroup feature, allowing push-to-talk interoperability among all users of SkyTerra's satellite services. Using SMART talkgroups, dozens of agencies at the federal, state, local and tribal levels can talk directly to one another during a crisis, whether they are on opposite sides of the country or a few hundred yards apart – crucial interoperability when it is most needed.

SkyTerra looks forward to continuing and expanding its commitment to public safety interoperability as it deploys its next generation satellite network, which will provide mobile satellite functionality to data cards and handsets that are the same size as those used in the consumer market today. These handsets will also have access to terrestrial infrastructure, but can use the satellite whenever that infrastructure is not available. No longer will public safety be constrained to buying a single satellite terminal to share among a dozen or more first responders – each first responder will have satellite functionality built into their own handsets. This translates into a significant field operations advantage.

As promising and accomplished as satellite communications has proven and will continue to prove to be, it is not a singular solution to addressing the ongoing challenge of America's communications interoperability. Only a full "system of systems" approach that brings the capacity of today's land mobile radio and terrestrial systems together with satellite communications offerings will present the country with the reliable, resilient and interoperable operations that Americans expect and deserve.

At the 4th Annual University Network Summit, sponsored by DHS' Science & Technology Directorate, keynote speaker ret. US Army LTG Russel Honoré, a hero of Hurricane Katrina, observed that "*we* [in the US] *need to get off land-based systems*" and "*need to harness the power of satellites*."

Sharing his first-hand experiences of what happens when there is large scale devastation from a wide-scale disaster (e.g., 2005's Hurricanes Katrina & Rita, etc); he explained that communications is always the first thing knocked out and the first thing needed to begin response and recovery operations.

While his observations are not unique, they do speak to the lessons that we fail to adopt as a matter of investment, operation and policy. We cannot expect to serve the interests of the American public in emergencies and other disasters if keep replicating the same attitude and operations again and again when it comes to today's interoperability considerations.

It is paramount that our nation includes satellite communications and its capacities as part of our overall investment, operational and policy strategies. If our nation continues to focus on land mobile radio systems, and not explore interoperability of those systems with satellite systems, the American public should expect no difference in outcome when disasters strike. That, by any measure, is not acceptable.

SkyTerra and the other members of the satellite communications industry welcome the opportunity to work with Members of Congress, the Obama Administration and other interested interoperable communications

stakeholders in shaping comprehensive, adaptable and resilient strategies that serve the interests of public safety and the American public at large.

Until we learn from the countless examples of failed communications interoperability (e.g., Katrina, Rita, Kentucky's ice storms, etc.), and provide for more balanced and comprehensive communications approaches, we will remain a nation unable to fulfill the demands of public safety, citizens and communities on their most challenging days. That is a lesson SkyTerra and the satellite industry are committed to addressing and we are prepared to do our part to ensure every voice is heard when it is most critical.

* * *

If you have any questions about this statement, please do not hesitate to contact

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PROGRESS ON P25: FURTHERING INTEROPERABILITY AND COMPETITION FOR PUBLIC SAFETY RADIO EQUIPMENT

THURSDAY, SEPTEMBER 23, 2010

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 2:00 p.m., in Room 2318 of the Rayburn House Office Building, Hon. David Wu [Chairman of the Subcommittee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515–6301
(202) 225–6375
http://science.house.gov

Subcommittee on Technology and Innovation's

Hearing on

Progress on P25: Furthering Interoperability and Competition for Public Safety Radio Equipment

Thursday, September 23, 2010
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building

Witness List

Mr. Tom Sorley
Deputy Director Radio Communication Services,
City of Houston Information Technology Department

Ms. Ellen O'Hara
President, Zetron

Mr. Marvin Ingram
Senior Director, ARINC, Public Safety Communications

Mr. Russ Sveda
Manager of the Radio Technical Service Center, Department of the Interior

HEARING CHARTER

COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION
U.S. HOUSE OF REPRESENTATIVES

Progress on P25: Furthering Interoperability and Competition for Public Safety Radio Equipment

THURSDAY, SEPTEMBER 23, 2010
2:00 P.M.–4:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

I. Purpose

The Project 25 standard for digital land mobile radios is intended to further seamless communications interoperability among America's first responders, enable competition among radio equipment manufacturers, and provide for the efficient use of limited spectrum resources. In May of 2010, the Science and Technology Committee's Subcommittee on Technology and Innovation held a hearing to discuss the status of the Project 25 standard and the remaining challenges. This hearing will discuss these challenges further and explore how the status of Project 25 affects an array of stakeholders.

II. Witnesses

- **Mr. Tom Sorley,** *Deputy Director Radio Communication Services, City of Houston Information Technology Department*
- **Ms. Ellen O'Hara,** *President, Zetron*
- **Mr. Marvin Ingram,** *Senior Director, ARINC, Public Safety Communications*
- **Mr. Russ Sveda,** *Manager of the Radio Technical Service Center, Department of the Interior*

III. Brief Overview

In 1989, the public safety community joined together to address the lack of interoperability between digital radios supplied by different vendors through the development of the Project 25—or P25—technical standard for digital land mobile radios (LMRs). For over a decade, the P25 process made minimal progress in completing the standards. However, major disaster events (including the September 11th attacks and Hurricane Katrina) renewed motivation to drive the process forward and eliminate the technical barriers that prevent public safety officials from different agencies and jurisdictions from communicating during an emergency response.

In a May 2010 hearing, the Subcommittee heard testimony on this progress, as well as on what some viewed as remaining challenges. For example, witnesses disagreed on the status of the P25 standards. Whereas witnesses representing two federal agencies claimed that many of the technical documents within the suite of P25 standards were not yet completed, those representing equipment manufacturers argued the standards were "functionally complete," enabling engineers to build interoperable equipment. Witnesses also debated the degree and rigor of testing that should be required to verify manufacturers' claims that radio systems are P25-complaint.

This hearing will continue the Technology and Innovation Subcommittee's examination of the P25 standard, and explore how the status of the standards documents and the testing requirements impact P25 stakeholders. This hearing will also review the role of the P25 standard in ensuring radio systems are interoperable and that there is competition among vendors.

IV. Background

Project 25

The lack of interoperability—often defined as the ability of emergency responders to communicate with whom they need to, when they need to, and as authorized—has long challenged America's public safety community. Interoperability problems between responding agencies were documented in the response efforts to the 1995 Oklahoma City bombing, the September 11th attacks, and Hurricane Katrina, making response efforts more chaotic, less efficient, and even more dangerous. In the World Trade Center attacks, firefighters did not receive the New York Police Department message to evacuate the building immediately, contributing to the deaths of those firefighters. In the response to Hurricane Katrina, officials in helicopters could not communicate with responders in boats, slowing rescue efforts. First responders in these cases, and other large-scale events, ended up employing message runners, which limited the flow of information to incident commanders.[1]

While planning, governance, and training are essential components of interoperability, standards-based technology is generally accepted as critical to achieving seamless interoperability either in an emergency or during day-to-day operation.[2] The emergence of digital technology in the late 1980s highlighted the importance of standards in ensuring interoperability. These digital radio systems used proprietary protocols and technology which, unlike their analog forbearers, were incompatible with the proprietary technologies of other vendors, even when those radios were deployed within the same spectrum band.[3]

In 1989, to escape proprietary systems and promote interoperability, the Association of Public-Safety Communications Officials (APCO) and the National Association of State Telecommunications Directors (NASTD), along with several federal agencies, began work on the P25 suite of standards for digital LMR systems. The originators of P25 sought to develop a user-defined and user-driven standard that would allow for interoperability, multi-vendor procurement, and the transition from legacy analog equipment to digital equipment, as well as promote greater spectrum-use efficiency.[4]

The APCO process eventually led to a partnership between the public safety community and the Telecommunications Industry Association (TIA)[5] to collaborate on standards. Through a process agreed to by TIA and the participating representatives from the public safety community, public safety users define the requirements for the standard and the standards documents are then produced by engineers from TIA and digital radio manufacturers who volunteer their expertise.

Representatives from several federal agencies were among the original participants in P25. However, the slow rate of progress toward greater interoperability spurred Congress to direct the Department of Homeland Security to take a more active role in promoting interoperability and hastening the development of the P25 standards. The 2004 *Intelligence Reform and Terrorism Prevention Act* (P.L. 108–458) directed the Secretary of Homeland Security to establish a program to improve the state of interoperable communications capabilities for first responders. Among other requirements and activities, the legislation directed the Department of Homeland Security to work—in consultation with NIST, the private sector, and others—to "accelerate the development of national voluntary consensus standards for public safety interoperable communications." Since the passage of the Act, NIST, through the Public Safety Communication Research Program (a joint program between NIST and the National Telecommunications and Information Association), has taken leadership roles in the P25 standards development process, particularly in areas of testing and certification.

A 2007 Government Accountability Report (GAO) report[6] noted that, despite over $2 billion of federal spending to advance interoperability, communities across the

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[1] Tristan Weir, *Federal Policy Toward Emergency Responder Interoperability: A Path Forward*. Thesis submitted for a Masters of Science in Technology Policy from the Massachusetts Institute of Technology, 2006.

[2] Department of Homeland Security, SAFECOM Program's Interoperability Continuum tool, available at: *http://www.safecomprogram.gov/NR/rdonlyres/54F0C2DE-FA70-48DD-A56E-3A72A8F35066/0/Interoperability_Continuum_Brochure_2.pdf*.

[3] COPS Interoperable Communications Technology Program, May 2007 Issue Brief, *Project 25: The Quest for Interoperable Radios*, by Dan Hawkins, available at: *http://www.dps.mo.gov/homelandsecurity/documents/SEARCHP25Primer.pdf*.

[4] *Id*.

[5] The Telecommunications Industry Association is an ANSI-accredited standards development organization.

[6] GAO Report 07–301, April 2007. *First Responders—Much Work Remains to Improve Communications Interoperability*.

country were still far from achieving that goal. GAO identified a number of barriers to interoperability, but also cited the slow rate of P25 standards development as among the factors hindering faster adoption of interoperable public safety communications systems.

GAO noted that while the P25 standards developers took four years (from 1989 to 1993) to develop the Common Air Interface (defined below), they did not complete any additional standards between 1993 and 2005. GAO found that P25 participants had made "significant progress" on the standards for interoperability after 2005, but that many standards were still incomplete. Further, GAO reported that tests conducted between 2003 and 2006 showed that inconsistent interpretations of the standards caused P25 radios to fail aspects of interoperability tests.

P25 encompasses a suite of standards, each of which defines the technical requirements necessary for components of the radio system infrastructure to interface—or interoperate—with one another. Public safety land mobile radio (LMR) systems include the portable handheld and car-mounted radios used by emergency responders, as well as fixed infrastructure such as towers, base stations, and console. Those P25 standards identified as most critical to interoperability are listed below:[7]

- **The Common-Air Interface (CAI)**, which defines the communication protocols between radio transmitters and receivers. This standard is intended to ensure that a portable radio from one manufacturer can communicate with a portable radio from a different manufacturer.
- **The Console Subsystem Interface (CSI)**, which defines how radio frequency components of the system and console (such as the equipment used by dispatchers) connect with one another.
- **The Fixed Station Interface (FSI)**, which defines how components of the radio system that are fixed in place (such as base stations) connect with other components of the system.
- **The Inter-RF subsystem Interface (ISSI)**, which defines the connection between different radio system networks.

Compliance Assessment Program (CAP)

Standards are technical documents, but engineers may vary in their interpretation of the protocols included in the documents. Ultimately, this variability in interpretation can impact the functionality of equipment. For this reason, in the case of many telecommunications standards—such as Wi-Fi or BlueTooth, the relevant industry stakeholders develop testing and certification processes to ensure products meet the specifications of the standards and that the standard is being interpreted consistently among vendors.

For many years, P25 lacked a formal testing process to validate that manufacturers had correctly and uniformly implemented the standards in their equipment and were not misappropriating the P25 label. In 2005, in response to reports of failed interoperability tests of P25-labeled equipment (between different manufacturers, and even between different models from the same manufacturer), Congress directed the Department of Homeland Security (DHS), working with the Department of Justice (DOJ) and the National Institute of Standards and Technology (NIST), to develop a P25 Compliance Assessment Program (CAP).[8] The DHS CAP certifies laboratories and specifies which tests must be conducted to show compliance with the standard. The DHS CAP is a voluntary program, but any P25 digital radio systems purchased with DHS grants must meet the requirements of the program.

The P25 CAP sought to specify testing requirements for performance, interoperability, and conformance.[9] Conformity assessment tests whether manufacturers have correctly and consistently interpreted and implemented the standard. It is generally more rigorous than interoperability and performance testing and it is arguably the best mechanism for ensuring that all standardized functions will interoperate across all manufacturers. Conformance testing is also considered particularly important in ensuring backwards compatibility of new technology, which must

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[7] COPS Interoperable Communications Technology Program, May 2007 Issue Brief, *Project 25: The Quest for Interoperable Radios*, by Dan Hawkins, available at: *http://www.dps.mo.gov/homelandsecurity/documents/SEARCHP25Primer.pdf*.

[8] Directed in the *FY2006 Department of Homeland Security Appropriations Act* (H. Rept. 109–241)

[9] *Charter for the P25 Compliance Assessment Program, April 2008*, available at: *http://www.safecomprogram.gov/NR/rdonlyres/D295A545-44A4-4226-AAF7-56A33684908E/0/Project25ComplianceAssessmentProgramCharter.pdf*

connect and interoperate with legacy systems, some as many as 20 years old or older.

May 2010 Hearing

On May 27, 2010, the Subcommittee on Technology and Innovation of the House Committee on Science and Technology held a hearing on the status of interoperability for public safety communications equipment. The Subcommittee heard testimony from the public safety community, federal agencies, and major manufacturers of radio equipment.[10] The hearing addressed the status of the P25 standards and the degree of testing needed to ensure that P25 products conform to the applicable standards.

The witnesses made different arguments on the scope of P25 and the impact the status of the process had on digital radio equipment being fielded today. Witnesses from DHS and NIST identified eight interfaces (i.e., standards) encompassed by P25, and according to NIST's testimony, only one and a half of the eight interfaces were complete. The witness testified that:

> *To date, only the conventional portion of the CAI and the Inter-RF-Subsystem Interface have a completed suite of documents*[11] *. . . The more complex trunked*[12] *CAI continues to lack conformance test documents . . . although trunked CAI products have been sold for almost a decade. The remainder of the six interfaces is in various stages of document completion.*

The witness further testified that because the P25 standards remain incomplete, radio systems that are sold as P25 are in actuality only partially standards-based.

LMR industry representatives did not dispute that P25 was technically incomplete, but they stressed that the standards needed to change as technology evolved and argued that the available standards actually enable interoperability across vendors. Motorola, a major manufacturer of LMR equipment, held that "the technical specifications for Project 25's Phase 1[13] systems are functionally complete." Accordingly, the industry representatives pointed out that the P25 standards documents completed to date enable two important functions: (1) ensuring that a P25 portable radio can communicate directly with any other P25 portable radio in the same spectrum band; and (2) allowing a first responder, within the coverage area of a neighboring network, to communicate with his/her home network (e.g., dispatchers) through the neighboring network.

The manufacturer representatives also noted that P25 developers have generated approximately 69 published standards, with an additional 13 in the ballot phase and 15 in the draft phase. Given that the standards development process relies on the voluntary efforts of expert engineers, and consensus amongst all of the stakeholders, Harris' testified that "the standards pace is at full industry and user capacity."

Witnesses at the hearing also disagreed about the degree of testing that should be required to validate that products meet the standards. NIST testified that the CAP attempted to create a rigorous and formal testing program, while minimizing the burden the testing requirements would impose on industry. NIST noted that not only does the CAP not require third-party certification, CAP developers leverage the testing standards developed and published by the P25 standards developers themselves.

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[10] Witnesses at May 27th Hearing: **Dr. David Boyd**, Director of the Command, Control, and Interoperability Division of the DHS Science and Technology Directorate; **Mr. Dereck Orr**, Program Manager for public Safety Communication Systems, at NIST; **Dr. Ernest Hofmeister**, Senior Scientist at the Harris Corporation; **Mr. John Muench**, Director of Business Development for Motorola, Inc.; and **Chief Jeffery Johnson**, President of the International Association of Fire Chiefs, and Chief of Tualitin Valley Fire and Rescue, Aloha, Oregon.

[11] From testimony provided by Dereck Orr: for P25, each complete interface, or standard, includes five documents—a protocol document, which provides the details to implement the particular interface, and three test documents (tests for performance, interoperability, and conformance), which allow manufacturers to "comprehensively test their implementations in a common way" to limit variants in interpretation of the protocol. All of these documents are developed via a consensus process.

[12] Trunked radios are considerably more complex than conventional. In a trunked radio system, users are not assigned to particularly frequencies, but instead have access to any frequency that is open, and are connected automatically via the system. Not being confined to assigned channels allows more efficient use of the frequencies because more users can be on the system at any given time.

[13] As noted in the testimony provided by Motorola and Harris, Phase 1 of Project 25 refers to enabling communication at bandwidth's of 12.5 kHz to comply with FCC "narrow-banding" requirements. Phase 2 will further reduce the width of the communication channel to 6.25 kHz in anticipation of future FCC mandates to use limited spectrum resources more efficiently.

Federal Government witnesses also noted that, although the CAP as originally planned was to include interoperability, performance, and conformance testing for all completed interfaces, the first P25 CAP requirements (which were issued in 2008) did not include conformance testing. Those requirements covered only the CAI standard, which—at the time—was incomplete and included no conformance testing documents. NIST and DHS further testified that manufacturers strongly objected to a proposal to include conformity testing for the ISSI standard, which had a completed conformance testing document, in the CAP in 2009. The agency witnesses voiced strong support for including conformance testing, arguing it was the best tool to ensure interoperability and backwards compatibility with legacy systems.

At the hearing, the manufacturer representatives noted that both of their companies follow rigorous internal testing procedure, and had worked extensively with other companies, and within the P25 process, to resolve identified interoperability problems. Harris noted that past interoperability problems reflected ambiguities within the P25 standards, which have subsequently been resolved, and should no longer pose problems. Motorola contended that any interoperability problems found today are likely a result of differences in equipment configuration between radio systems.[14]

While the manufacturers were supportive of the P25 CAP, they questioned whether the benefit of more rigorous testing would outweigh the cost. Both Harris and Motorola pointed to the costs of developing the needed equipment to perform the tests. They also noted that while conformance testing is routinely done in the telecom industry, the public safety equipment industry and market is significantly smaller and testing would therefore be more burdensome.

The charter, witness testimony, and webcast to the May hearing can be found on the Science and Technology Committee's website (*http://science.house.gov/publications/hearings_markups_details.aspx?NewsID=2866*).

700 Mhz and Public Safety Broadband Networks

The P25 standards cover interoperability for voice communications over digital LMR systems. With the availability of broadband, many public safety agencies are seeking to integrate data functions into their operations. Generally, public safety agencies that seek to integrate these functions now must rely on commercial carriers to provide broadband service. However, the National Broadband Plan recommended the creation of a nationwide interoperable public safety wireless broadband network, which would allow data and extra voice capacity for public safety.

Many policy and technology issues may need to be resolved before more widespread implementation of public safety broadband networks is possible. In addition to questions about the fate of the "D–Block" (an additional 10 Mhz of the 700 band spectrum) and debate on how to govern, finance, and build a network for public safety, significant issues arguably remain with respect to standards and testing. NIST and the National Telecommunications and Information Administration (NTIA) have worked with the public safety community over the past three years to define the technical requirements needed for a public safety broadband network. Working with the broadband industry, NIST and NTIA are also developing a test-bed to test broadband technology against public safety needs. Testing will begin early next year. Public safety-specific standards for broadband technology have not yet been addressed in an organized fashion.

V. Issues and Concerns

Even in their current state, the P25 standards have improved interoperability for public safety radios. LMR vendors have shown that handheld and portable radios from different manufacturers can communicate with one another. However, there are unanswered questions on whether further progress is still needed to address two

[14] As noted by NIST in response to Questions for the Record (located in the Appendix to this charter), methods for the configuration, or programming, of radios vary across manufacturers. Such programming is complex, and made more complex by the number of features present in a particular radio. The lack of standardized methods for programming can lead to interoperability, as well as operability, problems, particularly in an emergency response setting, where time is critical. However, NIST further noted that ". . . in discussions with public safety organizations responsible for the provisioning of radios operating on a system, we have been informed that many of the issues found in the radios also require software upgrades to the radios themselves rather than a simple reconfiguration. Thus we are confident that some issues found in the field are due to problems beyond configuration and programming, and are instead due to nonconformance to the standard or problems with the standard itself."

key goals of the P25 process: (1) ensuring seamless and reliable interoperability, and (2) fostering competition for public safety communications equipment.

Although representatives from industry claim that the P25 standards are "functionally complete", concerns persist that currently fielded P25 systems are not completely standards-based. In addition, questions remain on the extent to which testing should be required to validate that products meet the standard.

Though there are clear disagreements over these technical matters, it is less clear what the consequences of these disagreements are for the interoperability of the equipment and for ensuring competition among vendors in the P25 equipment market. Further discussion of the practical impacts of these issues should help provide more insight into whether, and to what extent, the P25 process is meeting its original goals.

Chairman WU. Good afternoon. This hearing will now come to order. I would like to welcome everyone, and everyone who has joined us this afternoon for our hearing.

This is the second hearing the Subcommittee has held on the interoperability of public safety communications equipment, and I am glad we have the opportunity to revisit this important topic.

The ability of first responders to communicate with each other during an emergency is absolutely vital. In many major disasters, including 9/11, response efforts have been hindered or imperiled because emergency officials responding from surrounding jurisdictions could not use their equipment to communicate with each other.

While many factors contribute to this lack of interoperability, proprietary technology makes the situation far worse. Without a common technical standard, there is no assurance that equipment from one manufacturer will work with equipment from another manufacturer. This means that first responders may not be able to communicate with each other when it matters most, and it means that public safety agencies may be forced into buying components of their public safety communications systems from a single manufacturer, limiting competition and driving up prices.

In 1989, the public safety community and other stakeholders set out to create a common technical standard for public safety radios, known as P25. Although progress has been made over the last 20 years, the P25 standard is not yet complete.

At our hearing in May, we learned about disagreements among some of the players in the P25 standard-setting process over the status of the standard and the degree and rigor of testing that should be required. While these disagreements are on highly technical and complicated issues, they have real-world implications for our first responders and for those in harm's way. Simply put, our local public safety officials need the certainty that open standards provide. Right now that certainty does not exist.

I am pleased that we have the opportunity today to hear from people who build, test and operate P25 equipment. I hope to learn from our panel about how technical disagreements over document status and testing affect interoperability and competition for public safety radio systems.

Local, state and federal public safety agencies spend billions of dollars on communications equipment. The size of this investment and the mission-critical nature of this equipment make it imperative that P25 fulfill its goals.

I would now like to recognize Ms. Biggert for her opening statement.

[The prepared statement of Chairman Wu follows:]

PREPARED STATEMENT OF CHAIRMAN DAVID WU

Good afternoon. I would like to welcome our witnesses, and everybody who has joined us, to today's hearing.

This is the second hearing the Subcommittee has held on the interoperability of public safety communications equipment, and I am glad we have the opportunity to revisit this important topic.

The ability of first responders to communicate with each other during an emergency is vital. As reports have shown, in many major disasters, including 9/11, response efforts have been hindered or imperiled because emergency officials respond-

ing from surrounding jurisdictions could not use their radios to communicate with each other.

While many factors contribute to this lack of interoperability, equipment based on proprietary technology makes the situation far worse. Without a common technical standard, there is no assurance that equipment from one manufacturer will work with equipment from another manufacturer. This means that first responders may not be able to communicate with each other when it matters most. And it means that public safety agencies may be forced into buying the various components of their public safety communications systems from a single manufacturer, limiting competition and driving up prices.

In 1989, the public safety community and other stakeholders set out to create a common technical standard for public safety radios, known as the P25 standard. Although progress has been made over the last 20 years, the P25 standard is not yet complete.

At our hearing in May, we learned about disagreements among some of the players in the P25 standard process over the status of the standard and the degree and rigor of testing that should be required. While these disagreements are on highly technical and complicated issues, they have real-world implications for our first responders and those in harm's way. Simply put, our local public safety officials need the certainty that a standard provides and, right now, that certainty does not exist.

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Local, state, and federal public safety agencies spend billions of dollars on communications equipment. The size of this investment and the mission-critical nature of this equipment make it imperative that P25 fulfill its goals.

Ms. BIGGERT. Thank you, Chairman Wu, and thank for you calling today's hearing on the interoperability of public safety communications equipment, specifically Project 25, or P25 standards.

A previous hearing on this topic in May highlighted the fact that though the Project 25 process has been ongoing for more than 20 years, progress on standards for communication interoperability has been slow.

Today's hearing will focus on the process to ensure that communications equipment not only incorporates the existing P25 standards but also performs at the level anticipated by the National Institute of Standards and Technology (NIST) and the other stakeholders developing the standards. I hope we will also learn about P25 standards that have not been fully completed and how we can encourage the advancement of that process.

One of the challenges faced by improving public communication interoperability is the inherent friction between our free market system and the desire for multi-vendor equipment to work seamlessly together. In the interest of public safety, it is obvious that the first responders must have functional, interoperable equipment. The public expects that in times of emergency, whether it is fire, a crippling winter snowstorm or a terrorist attack that public safety communications will work across geography and jurisdictions without a hitch. But when the public safety agencies and vendors do not work closely together on standards confirmation, the end result may be equipment that works perfectly in some situations but fails miserably in others.

So I look forward to learning more about the standard-setting process and how we can encourage innovation, competition and truly interoperable products available to the men and women working so hard to protect our safety.

So with that again, Chairman Wu, thank you, and I welcome our witnesses and look forward to an informative hearing. I yield back the balance of my time.

[The prepared statement of Ms. Biggert follows:]

PREPARED STATEMENT OF REPRESENTATIVE JUDY BIGGERT

Thank you, Chairman Wu, for calling today's hearing on the interoperability of public safety communications equipment—specifically Project 25, or P25, standards.

A previous hearing on this topic in May highlighted the fact that though the Project 25 (P25) process has been ongoing for more than 20 years, progress on standards for communications interoperability has been slow. Today's hearing will focus on the process to ensure that communications equipment not only incorporates the existing P25 standards, but also performs at the level anticipated by the National Institute of Standards and Technology (NIST) and the other stakeholders developing the standards. I hope we will also learn about the P25 standards that have not been fully completed and about how we can encourage the advancement of that process.

One of the challenges faced by improving public communication interoperability is the inherent friction between our free market system and the desire for multi-vendor equipment to work seamlessly together. In the interest of public safety it is obvious that first responders must have functional, interoperable equipment. The public expects that in times of emergency—whether it is fire, a crippling winter snow storm, or a terrorist attack—that public safety communications will work across geography and jurisdiction without a hitch. But when public safety agencies and vendors do not work closely together on standards conformance, the end result may be equipment that works perfectly in some situations, but fails miserably in others.

I look forward to learning more about the standards-setting process and how we can encourage innovation, competition, and truly interoperable products available to the men and women working so hard to protect our public safety.

With that, thank you again Chairman Wu, and welcome to our witnesses. I look forward to a informative hearing and I yield back the balance of my time.

Chairman WU. Thank you very much, Ms. Biggert.

If there are other Members who wish to submit additional opening statements, your statements will be added to the record at this point.

[The prepared statement of Mr. Mitchell follows:]

PREPARED STATEMENT OF REPRESENTATIVE HARRY E. MITCHELL

Thank you, Mr. Chairman.

Communication among first responders is critical in an emergency response situation. However, to communicate effectively and efficiently, it is essential that first responders have compatible technology that will allow them to communicate with their counterparts from other agencies and jurisdictions.

Today we will continue to discuss the P25 standard, including how the status of the standards documents and the testing requirements impact P25 stakeholders. We will also examine the role of the P25 standard in ensuring radio systems are interoperable and that there is competition among vendors.

I look forward to hearing more from our witnesses today on the issue of public safety interoperability.

At this time, I yield back.

And now it is my pleasure to introduce our witnesses. Mr. Tom Sorley is the Deputy Director of the Radio Communication Services for the City of Houston Information Technology Department. Ms. Ellen O'Hara is the President of Zetron. Mr. Marvin Ingram is the Senior Director of ARINC, Public Safety Communications. And our final witness is Mr. Russ Sveda, who is the Manager of the Radio Technical Service Center of the Department of Interior.

You will each have five minutes for your spoken testimony. Your written testimony will be included in the record for the hearing in its entirety, and when all of you complete your testimony, we will

begin with questions. Each Member will have five minutes to question the panel. Mr. Sorley, please proceed.

STATEMENT OF TOM SORLEY, DEPUTY DIRECTOR, RADIO COMMUNICATION SERVICES, CITY OF HOUSTON INFORMATION TECHNOLOGY DEPARTMENT

Mr. SORLEY. Hello. My name is Tom Sorley. I am the Deputy Director of Radio Communications for the City of Houston. I also serve as the Chair of the Technology Committee for the National Public Safety Telecommunications Council and as Vice Chair of the Governing Board for the Department of Homeland Security's Project 25 Compliance Assessment Program.

I am leading the city's efforts to implement one of the largest P25 radio systems in the country. The system will be one of the first to implement the newest version of the P25 standard known as Phase 2. Phase 2 will operate with double the spectral efficiency of currently deployed Phase 1 systems, which is critical to large metropolitan areas such as Houston where we suffer from severe spectrum shortages.

Designing and purchasing a P25 system can be a challenge. The P25 standard is actually a suite of standards that has many subelements. Most people who write specifications do not know enough about the suite of standards to properly document their requirements. Thus, the result is systems are sold as P25 compliant when many parts of the systems remain proprietary.

As a large agency, the City of Houston has more resources than most other agencies in the country. However, even with our expertise, items were missed related to the Project 25 standards. Imagine the challenges facing small rural agencies trying to buy these systems.

The P25 process has been ongoing for more than 20 years. As years passed, the rate of technology change increases. While it is true that technology standards must be constantly updated, some better way of delineating the project standard should be deployed.

Over the years, public safety involvement in P25 has paled to that of vendors. Most of the major vendors have several people that dedicate a substantial portion of their work time to participation in the process. In reality, this means that the standard is being driven by those that actively participate: the vendors.

A good start to improving the process could be to provide more public safety representation on the Steering Committee that makes the rules on how the process functions and then creating limited staggered terms for those representatives.

P25 manufacturers often sell proprietary features on top of the basic P25 operation. The standard has provisions that allow vendors to do this in cases where there is not an equivalent feature mandated by the standard. However, radios on systems are almost never replaced en masse so an initial decision on proprietary options has far-reaching impact for years to come.

The biggest barrier, in my opinion, to P25 competition is a lack of knowledge within the public safety agencies themselves. I believe a group needs to be established that is focused solely on the education and the success of the public safety agencies using or contemplating the use of the P25 equipment. Therefore, the DHS

and OEC [Office of Emergency Communications] partnership that is in place for the DHS Compliance Assessment Program should be expanded to include this new role. However, in order for it to be effective, it needs to be undertaken seriously and funded appropriately.

Years ago, the P25 participants produced a paper regarding what compliance assessment should be made of, and it specified three types of test to prove compliance: performance, conformance and interoperability. Recently, the P25 Compliant Assessment Process Procedures Task Group—bear with me, I have to give you an acronym—CAPPTG, changed its stance and said that conformance testing in most cases should be replaced with enhanced interoperability testing. The CAP Governing Board and several leading public safety agencies objected to this change. I believe that was one of the subjects of your hearing you had before. Eventually the CAP Governing Board established the requirement to include conformance testing over the objection of the manufacturers.

The vendors are continuing to assert that conformance testing is too burdensome, even though NIST recently created a test, developed a test tool, and published all the applicable test codes. If developing conformance tests and tools to do them are too onerous, DHS should charge NIST to develop all future test tools and then make them available directly to the test laboratories.

The CAPPTG is charged with making recommendations on appropriate compliance tests. These recommendations are used as input documents into the CAP program. NIST participates and provides input into that process. However, like public safety, NIST is outnumbered on this group. In the past two years, several critical votes have been divided down the line of vendors versus public safety. Each one decided in favor of the vendor position.

The development of these recommended tests is sometimes delayed. As an example, P25 trunk radio systems have been sold for more than ten years but yet there is not a single recommended test available that includes conformance tests for this functionality, not one test. The CAP Governing Board would like to release compliance assessment bulletins for P25 equipment features prior to these features entering the marketplace. To meet this goal, the CAP may need to develop an alternate process that is not dependent on the P25 process to recommend the test.

In closing, I would like to thank Chairman Wu for inviting me to testify today, and on behalf of public safety and the City of Houston, I would like to commend the work of the Subcommittee as it relates to public safety communications and encourage you to continue to weigh in on this very important topic.

[The prepared statement of Mr. Sorley follows:]

PREPARED STATEMENT OF TOM SORLEY

Hello, my name is Tom Sorley. I am the Deputy Director of Radio Communication Services for the City of Houston. I also serve as the Chair of the Technology Committee for the National Public-Safety Telecommunications Council and as Vice-Chair of the Governing Board for the Department of Homeland Security Project 25 Compliance Assessment Program.

I am leading the City of Houston's efforts to implement one of the largest P25 radio systems in the Country. Once completed, the system will be one of the first to implement the newest version of the P25 standard known as Phase 2. This newest version of the standard was created to operate with double the frequency effi-

ciency of the currently deployed Phase 1 systems. This efficiency is paramount for large metropolitan areas such as Houston which suffer from severe spectrum shortages.

Designing, building, and operating a P25 radio system can be a big challenge. The standard is actually a suite of standards that has hundreds of sub-elements. Most people that are writing specifications to buy a new system do not know enough about the P25 suite of standards to even properly document their requirements. In fact, most just specify that the technology must be P25 compliant. They fail to specify individual elements that must be complaint and the result is that systems are sold as P25 complaint when many parts of the system that could be standards-based remain proprietary.

The City of Houston has more resources than most agencies in the country and therefore we were able to employ one of the largest consulting firms in the public safety communications industry. However, even with our expertise and the assistance of our consultant, there were still items that we missed related to the P25 standard. Imagine the challenges facing small rural public safety entities. I believe this is due to the complexity of the standard and the ever changing elements that make up the standard.

The P25 standards development process has been going on for more than 20 years. As mentioned previously, there are many elements to the standard and several interfaces that all must be fully defined. While this work is being done, technology continues to change. In fact as the years pass, the rate of technology change is increasing. Further complicating the process are regulatory changes, such as frequency efficiency rules, that must be addressed in the standards development process. While it is true that technology standards must be constantly updated, some better way of delineating the P25 standard must be developed.

It would be very helpful if the P25 process created versions that could be easily summarized. (example P25 version 3) This version number would allow agencies to know what is included as part of the P25 standard and more importantly what is not included. This is done in other technology standards such as IEEE 802.11 which is a widely accepted standard for wireless local area networks. The 802.11 standard has many versions delineated by different letters of the alphabet. Although consumers don't necessarily understand the difference between 802.11a and 802.11n, they can easily understand that a product is compliant to one version or the other. The bottom line is that P25 has so many moving parts comprised of many different standards within the suite of standards that the lay person would have no real way of determining if the products they are buying really conform.

The three key aspects of Project 25 that make it particularly important for improved communications interoperability:

1. The initiative was begun and is driven by public safety agencies and organizations.
2. It proceeds with both a vision of forthcoming technological change and the need for graceful migration between technologies used by public safety.
3. Competition founded on open standards would produce the best technology, at the best prices for pubic safety agencies.

Driven by Public Safety Agencies and Organizations

Over the years, public safety involvement in the P25 standards development process has become harder and harder to maintain. Some key public safety representatives have been involved virtually from the beginning of the process. However, the number is small and the involvement of others is limited at best. Vendor representatives vastly outnumber public safety. Most of the major vendors have several people that dedicate a substantial portion of their work time to participate in P25. In reality, this means that the standard is being driven by the active participants—vendors.

The P25 standard development process is set up to encourage consistent participation from both vendors and public safety officials. While this seems like a valid approach, travel restrictions on local public safety representatives often leave them unable to consistently attend making them ineligible to vote on key items. Also, the P25 Steering Committee only has two of the initial public safety representatives who have never been rotated, leaving the impression that they have become more partial to the vendors' perspectives on key issues.

The process could be improved by providing more public safety representation on the Steering Committee and by creating limited, staggered terms for those representatives.

Technology Change and Graceful Migration

As previously discussed, the pace of the standards development process is slow. The rapid pace of technology change further slows the completion of this complicated suite of standards. Also, in some cases, it is in the best interest of the vendor community to have parts of the standard lag as this creates an unmet need that must be filled with a proprietary option. For example: The P25 standard has provisions that allow vendors to offer proprietary features/functions provided there is not an equivalent feature/function mandated by the standard. This serves as a motivator to slow the process down.

P25 Competition

Competition is hampered by a lack of understanding by public safety agencies. The only consistent P25 education effort is conducted by the P25 Technology Interest Group (PTIG). This group is made up of vendors and public safety representatives that are charged to promote the success of Project 25 and educate interested parties on the benefits that the standard offers. As indicated in their purpose statement, this group is focused on the success of the standard. I believe that a group needs to be established that is focused solely on the education and success of public safety agencies using or contemplating the use of P25 equipment.

This public safety education effort should be focused around helping local, state, and federal agencies understand the standard by creating outreach materials, draft requirements language, draft purchasing language, and draft contract language. It would seem that the existing partnership between DHS and OEC in the P25 CAP could be expanded to include this new role. However, to be effective this effort must be undertaken seriously and appropriately funded.

Competition is not encouraged by manufacturers. P25 manufacturers often try to sell proprietary features that reside on top of the basic P25 operation of the radios in order to force future sales of their products. Some examples include very simple encryption algorithms that are proprietary and appear to solve a problem for local agencies by providing a cost-effective alternative to standards-based encryption that typically costs several hundred dollars more. However, new entrants into that system, or existing agencies on that system that need radios, are forced to remain with that particular vendor to maintain interoperability with the existing radios that utilize the proprietary encryption. Radios on systems are rarely replaced in mass. Therefore, an initial decision on proprietary options has far-reaching impact for years to come.

Another example of this practice is making accessories that are dependent on particular radios and/or other related items. Years ago, siren controls in police cars were integrated into mobile radios to make the user experience easier. However, compatibility ultimately became an issue as a result most public safety agencies decoupled siren controls and radios in the late 1980's. Recently, our vendor proposed that we consider using a new integrated control head for our radios. The users were very interested in the device as the functionality and ease of use met most of their needs. However, the control head would only operate that particular vendor's siren control package. This would have forced us into a proprietary relationship with radios and related sirens limiting our future buying options. We chose to pass on the option.

P25 Compliance Assessment Program

The DHS CAP is a relatively new program that endeavors to ensure that products marketed and sold to public safety as P25 actually adhere to the standard. Years ago, the P25 participants produced a paper on compliance assessment that established three types of tests to prove compliance:

1. Performance—This test ensures the device performs to the specifications.
2. Conformance—This test ensures the device adheres to the P25 standard.
3. Interoperability—This test ensures the device seamlessly interacts with similar devices.

The P25 Compliance Assessment Process and Procedures Task Group (CAPPTG) drafts Recommended Compliance Assessment Tests (RCAT). These RCATs are used as input documents into the DHS CAP program. The National Institute of Standards and Technology (NIST) participates in P25 and provides input to the CAPPTG to consider in the development of RCATs. However, like public safety representatives, NIST is outnumbered by vendors on this task group. In the past two years, several critical votes have been divided down the line of vendors versus public safety. Each of these votes was decided in favor of the vendor position.

The DHS CAP program created and published the first Compliance Assessment Bulletin that was based substantially (but not completely) on the RCAT from the CAPPTG. Subsequently, the CAPPTG changed its stance and said that Conformance testing was no longer needed. Instead, they advocated replacing conformance testing with enhanced Interoperability testing. The CAP Governing Board and several leading public safety agencies objected to this change. Eventually, the manufacturers acquiesced on this in regard to the Inter Subsystem Interface (ISSI). In fact, some of them testified earlier this year at this sub-committee stressing that they were committed to the CAP program and would continue to participate even if conformance testing were required.

Over the last several months, those same vendors are reverting back to their previous stance on Conformance testing. They have asserted that the testing is too complicated, expensive and burdensome. This is their position even though NIST has created a test and developed a test tool that is easily adopted. In meetings earlier in the year, one vendor stated that they already run ALL the conformance tests during development making the need to repeat them unnecessary. None of the other vendors in attendance at that meeting raised an issue with that statement. If the vendors already run ALL the conformance tests during development and NIST has develop a test while publishing all the applicable test code, why is it that conformance testing is still too complicated, expensive, and burdensome? If developing a test tool to perform conformance tests is too onerous for the vendors, DHS should charge NIST to expand their support of the CAP program by developing the tests and making them available to the test laboratories.

The DHS CAP work plan has been largely driven by the availability of RCATs from the CAPPTG. This is based on the assumption that the P25 process contained the largest collection of P25 experts making it the logical place for test requirements development. Again, NIST and public safety representatives are involved in that process. However, development of RCATs can be delayed based on any number of factors. As an example, P25 trunked radios have been sold in the market place for more than 10 years but there is not one RCAT available that includes conformance tests for trunking functionality. The CAP governing board would like to develop and release Compliance Assessment Bulletins establishing the testing of P25 features prior to or in concert with those features entering the market place. We have a great deal of catching up to do, but it clear to us that we may have to develop an alternate process that is not dependent upon the P25 CAPPTG developed RCATs.

Most major public safety associations have publicly advocated for retaining all three types of tests: performance, conformance, and interoperability as each play a key role in determining if a product is compliant. First responders must be able to predict with certainty what the device they use will perform as expected. It is imperative that each type of test be performed to make sure.

One complicating factor in the DHS CAP is the fact that it is voluntary. No vendor is forced to participate. To date, most vendors do participate, but during the disagreement over conformance testing of the ISSI several vendors informally indicated that if conformance testing was pursued, they would simply not participate. If all the vendors chose to opt out of the process, the process dies. DHS has included a requirement in the Federal Grant Guidance that requires any P25 equipment purchased with grant funds must have a Suppliers Declaration of Compliance (SDOC) on file on the Responder Knowledge Base (RKB) website. However, there are creative ways to get around this requirement. For instance, I heard a story last month that a vendor was willing to give away certain features as "add-ons" to avoid the SDOC requirement. I am not sure if making P25 CAP a mandatory requirement is practical, but it should be investigated.

Why not just use Cell Phones?

Recently, Reuven Carlyle a State Representative from the Seattle, Washington area posted an entry into his blog entitled, "Want Government Reform? Idea #3: A new public safety communication strategy." (Attachment A). In this blog post, Representative Carlyle asserted (among other things) that P25 radios are too expensive and public safety would be better served using cell phones. He asserts that US public safety agencies pay many times more for their equipment than do their counterparts in other countries. While some points in the blog on the surface appear to be true, they are not presented in context.

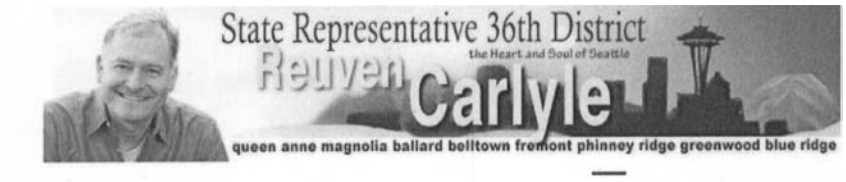
Several days after Rep. Carlyle's blog, Bill Schrier, CIO of the City of Seattle drafted his own blog entry in response. (Attachment B). In Mr. Schrier's post, he points out many of the flaws in the original post by Rep. Carlyle. I agree with all of Mr. Schrier's points. Simply put, public safety has several requirements that can't possibly be met by cellular devices. Network priority, reliability, availability during disasters or weather events, talk-around mode, and ruggedness are several of the

requirements that public safety radios need and cellular devices and systems can't provide.

I have the responsibility of buying these devices for the City of Houston. I would love to be able to purchase a cellular phone that met the needs of public safety. However, one does not exist and it is quite unlikely that one will exist in the foreseeable future.

I would like to thank Chairman Wu for inviting me to testify today. On behalf of public safety and the City of Houston, I would like to commend the work of the sub-committee as it relates to public safety communications and encourage you to continue to weigh in on this important topic.

Attachment A



Want government reform? Idea #3: A new public safety communication strategy

By Reuven Carlyle
September 6, 2010

Have you ever noticed how police officers carry both a cellular phone and a handheld radio? It might surprise you to learn that you are paying hundreds of times more for the radio than the cell phone. And you're about to pay millions more unless we have the courage to change course. Even the New York Times is starting to agitate.

When I joined McCaw Cellular Communications in the early 1990s—one of the world's most entrepreneurial companies—less than 10 million Americans had mobile phones. They were big, clunky and had no data capability. Today there are as many mobile phones as people, prices have fallen and consumers have benefitted from innovation that led to iPhones, Windows Mobile, Droid and other robust platforms. The change has been technically disruptive and positive. In that same time, the nation's public safety community—law enforcement, fire, EMS—has also spent billions of public tax dollars on new infrastructure and yet the quality, cost and functionality of their expensive, proprietary, two-way radios has not materially improved since the 1970s.

Now, the taxpayers of Seattle, King County and Washington State are being asked to spend up to hundreds of millions more for a brand new radio system for police, fire, EMS and other emergency workers.

In Seattle and King County alone my gut check is that the cost will be in the $50 million to $250 million range. Since I'm not on the inside I don't know if this is close or far from the truth, but my gut is that it's uncomfortably in that range. And that says nothing of our friends in Pierce, Snohomish and other communities who are struggling through a similar journey. And Oregon is much further down the same pathway and is now politically panicking in the face of a $600 million bill.

It's time for courageous honesty: In my personal view, the decision is the wrong direction technically, politically, and financially.

The uncomfortable truth is that for city, county and state governments public safety radio equipment costs between 10x and 100x more than it does in most other countries, despite the U.S. leadership position for wireless technologies such as smartphones, WiFi, WiMax and more. Even Seattle, in many ways the hometown of the consumer wireless industry, will pay tens of millions for a proprietary new police radio system.

The reason is that the nation's public safety communications market does not enjoy healthy, vibrant, market-based competition in any way comparable to consumer mobile services

First of all, it is important to acknowledge that we must ensure our police, fire and EMS officials have access to high quality emergency communication systems. Unfortunately, we must upgrade the hardware-based system because the current vendor for the Seattle and King County system, Motorola, has made a business decision to end support for the current network.

In fairness, they told us long ago they would eventually turn off our system, and we needed to buy their next generation system (or conceptually their competitor's system). Unlike in the consumer market, we may have purchased the equipment, but the company retains the right to determine how long our system is supported. It's not much of an exaggeration to say that it's sort of like Verizon asking consumers to directly fund new cell towers and network and then forcing everyone to buy new mobile phones because the company wants to upgrade their internal network capabilities.

Second, our nation's first responders and 9-1-1 dispatchers aggressively moved to establish an industry standard for first responders called "P25" to get better radios at lower prices, to break the monopoly of the current structure. Unfortunately, more than 25 years later, P25 is still not available, still not implemented and even the Chainnan of the FCC recently jolted Members of Congress by acknowledging ". . . [P25] has taken more than 20 years to develop and is still not complete" and "the protracted development of P25 has allowed vendors to take advantage of selling proprietary solutions."

The industry knows that P25 isn't, in fact, truly standards-based and has resulted in even more expensive radios, not the other way around. If our state's march toward P25 continues, it will be more business as usual—and first responder radios will still cost $5,000 each. (Did you catch that? Just one P25 radio for one police officer costs $5,000 and yet it has less processing power and functionality than an iPhone, Windows Mobile or Droid phone).

Yet with few exceptions that is exactly where our current 'group think' in Seattle and King County is leading.

Third, some local Seattle and King County officials have recently applied for the Obama Administration's plans for broadband across the nation utilizing "4G" or "LTE" technology on 700 MHz . . . for the Seattle area. Their position is inspired in part because the broadband system would help first responders. And yet The National Broadband Plan, as written, doesn't help with voice communications—the most essential element for police, fire and EMS officials.

This isn't a modest technical decision, it's a major policy choice facing King County Executive Dow Constantine and the county council as well as Mayor Michael McGinn and the city council.

Here's a picture of where Seattle and King County are headed if we don't change direction: The first 4G or LTE system built in the U.S. for first responders is already underway, in the San Francisco Bay Area—a geography and population similar to our own. The federal government is fronting the $50 million it will cost, and the result is that 300 public safety vehicles will be equipped with 4G data modems. That is $167,000 per police car and fire truck, for video to and from the scene.

At the same time the consumer marketplace—AT&T, Verizon, Sprint and T-Mobile—provides virtually the same mobile service at a fraction of the cost at equal or higher service quality levels in many cases. Public safety is building their own mirror system to commercial services. A mirror system that is on track to be proprietary, closed, and expensive like our existing first responder radio systems.

Of course consumer cellular phones are not perfect nor always a technically viable alternative, and they are by no means a simple alternative, but philosophically they demonstrate the profound value of market-based competition.

I am willing to bet a private tour of the State Capitol building that if you ask 20 police, fire and EMS officials to choose between their cellular phones and their two way radios, the majority will choose to hold onto the former. Their mobile phones are easier, more flexible, equally as reliable in most cases and now support data.

Without question it's important to acknowledge that technically cell phones do have limitations—in basements, rural and other "out of coverage" areas they won't provide essential voice communications for first responders. But the very important and dirty little secret is that neither do the P25 radio systems, or the 4G/LTE systems. Our first responders need handsets that utilize the high feature/low cost advantages of open market cell phone systems, but also work in basements "peer to peer" when out of range of the system. And that solution still shouldn't cost $5,000 for each and every single radio.

While it is true public safety radios need to be heavy duty, it doesn't inherently mean they should cost 10 times as much as commercial systems that have more processing power, more technical flexibility and more application functionality.

Yes this is a bit technical and wonky but the financial implications are stunning in scale—as Oregon is experiencing, approaching $1 billion when the costs of all local agencies are included with the first $600 million buildout.

Is it too late? There is a way forward if we have the courageous honesty to tackle old assumptions and myths.

1. We should stop buying P25 radios at literally $5,000 per radio and start buying TETRA radios. TETRA is similar to P25, but it is truly open standard radio used by police and fire departments in Europe and Asia . They offer more features and are tested around the globe . . . and cost less than $500 each. They are essentially "Nextel-like" in their capability but are a fraction of the cost of the non-open standard P25.
2. We should absolutely back a national broadband plan—but not this one. Not until it is legally bound to an open, public standard that enables true, free market participation from any and all vendors. Not a penny of federal or state funding should go towards any proprietary 4G/LTE solutions, and Seattle and King County public safety leaders should insist on an open standard before launching any 4G/LTE 700 MHz construction in Washington.
3. Let's ask line officers and regular firefighters what they need to do their jobs. They are the users and yet we rarely ask them firsthand what they need to succeed.
4. Investigate the real-deal of the $50 million pilot project in San Francisco, which puts the proprietary 4G/LTE technology in the lead for another 20-year monopoly. Let's understand the implications before Seattle goes down the same expensive route—but likely without the pot of federal money provided to San Francisco.
5. We're not the only ones with this issue. We should ask other regions and states to join us in asking for a market that gives our first responders what they really need, at a price that we can afford.
6. We should have the courage to explore a stronger partnership with commercial mobile operators in underserved areas. We could subsidize the expansion of their networks and provide cell tower sites, for example, in exchange for more sophisticated 'priority access' for public safety—and improved service level agreements—and pricing breaks.

Perhaps a stronger partnership with Oregon could save us both hundreds of millions of dollars or more. We can no longer afford a world where each state, each county, each city 'goes it alone' in the delivery of 'utility' services such as communications. Imagine our buying power united by a technical vision and strategy?

Unfortunately, at the end of the day, we acknowledge we have to buy a new radio system for our faithful and hard-working police, firefighters, and EMTs in the Seattle and King County area.

We as a city, county and state are more innovative, entrepreneurial and technically sophisticated than this. If we believe in government reform and want to display to the public that we have the courageous honesty to seize the opportunity of this crisis, we need to change course even in sacred areas like public safety. We have to question old assumptions, challenge monopolies inside and outside of government, and demand that when taxpayers are paying the bill, there is value for our dollar.

It's the right thing for the public who are served by our courageous law enforcement, firefighters and EMS officials. And it's right for taxpayers.

Your partner in service,
Reuven.

Attachment B

Why Don't Cops and Firefighters Just Use Cell Phones?

By Bill Schrier, bill.schrier@seattle.gov
Chief Technology Officer, City of Seattle
September 10, 2010

Police officers and firefighters carry $5000 radios. Local and state governments spend hundreds of millions of dollars to build public safety radio networks. Yet, today, cell phone networks seem to be everywhere, most people carry a mobile phone and many of us think paying $199 for an iPhone is expensive.

Why can't cops and firefighters and emergency medical technicians (EMT) use cell phones like everyone else? A Washington State legislator from Seattle recently public argued for this approach in his blog. And, at first, this appears to be a simple way for governments to save a lot of taxpayer dollars.

Here are a few reasons public safety officers need their own dedicated networks:

- Priority. Cellular networks do not prioritize their users or traffic. A teenager's cell phone has the same priority as a cell phone used by a police officer or, for that matter, the BlackBerry used by President Obama. We've all experienced "no circuits available" or "network busy" when using a cell phone. When I'm being assaulted or have been injured in an automobile accident or even have had my house burglarized, the last thing I want is to have the network be "busy" so a police officer or EMT couldn't be dispatched. Public safety needs dedicated frequencies where police officers and firefighters have priority and even, perhaps, exclusive rights to for use, without calls being clogged by the public.
- Reliability. Seattle's public safety radio network, part of the larger King County-wide 800 megahertz public safety radio network, handles more than 60,000 police, fire and emergency medical calls every day. It operated last year with 99.9994% reliability - that's about 189 seconds of downtime out of more the than 31 million seconds which composed the year 2009. On the average, only about five out of the 60,000 calls were delayed for any reason, and even then the average delay was about two seconds. What cell phone network has that kind of reliability? How many times have you experienced "no service" or "call dropped" with your cell phone? Do we want firefighters who are reviving a heart attack victim and talking to the emergency room on the radio to all-of-a-sudden have their call dropped? Or should police officers lose service when drunk drivers clog the roads and bars are closing at 2:00 AM because a cell phone company decides to do maintenance because "no one uses the network then"?
- Disasters. Even small disasters cause cell phone networks to collapse. In Seattle, we've had swat team actions or car accidents which have shut down a freeway. Suddenly cell phone service abruptly ceases in that area because EVERYONE is on their phone. A few years ago a rifleman was loose and shooting people in Tacoma Mall. Responding police and EMTs had communications because they had dedicated networks and frequencies, but again cell phone networks were overloaded and down. In a larger disaster such as an earthquake or hurricane (with associated evacuation of large cities), commercial networks will be overloaded or jammed for days by people trying to escape the affected areas. Do we want police and fire departments - or even transportation, electric utilities and public works departments - to be trying to use those same networks while they are responding to the disaster? I don't think so.
- Talk-around. A key feature of most government-operated networks is something called talk-around or simplex or "walkie-talkie" mode. In this mode, individual radios talk directly to each other, without using a radio or cell tower. This is very important at incident scenes -

firefighters commonly use it at the scene of a fire, because the radios will operate at the scene even if there isn't a tower nearby. But this NEVER a feature of cellular phone networks. If the cell tower is down or out of range, that cell phone in your hands is a useless lump of plastic. But the radios of public safety officers still work and will talk to each other even without the tower.

- Ruggedness. No firefighter in his/her right mind would fight a fire using a cell phone for communications. The heat, water and ruggedness of the environment would quickly destroy the device. Yet most public safety radios will survive being dropped repeatedly on the ground or being immersed in water for 30 minutes or more. No standard cell phone can survive the rigorous work of firefighting or policing.

Are there problems with the current dedicated public safety networks? Absolutely.. The use proprietary technologies, for example "Project 25". Theoretically all "Project 25" radios work on any "Project 25" radio system. But only a few of those are deployed around the nation. These proprietary technologies are one reason the radios cost up to $5,000 each.
Representative Carlyle, in his blog, proposes that we deploy "Tetra" radios for public safety. While Tetra is common in some parts of the world, it is not used at all in the United States. This is a dangerous proposal, because it means Tetra networks we buy would not work with the equipment used by any other government or telecommunications carrier anywhere in the United States. If called to respond to a disaster overseas, we could talk to firefighters in Hong Kong or the police in Ireland, however.

Another problem we face is the small market - the total market for public safety is perhaps 10,000,000 radios which are replaced, say, once every 10 years. On the other hand, the cell phone market is huge - 260 million cell phones replaced every two years in the United States alone. The economies of scale means consumers will have a lot more choice, and their cell phones will be relatively cheap.

So is there some way to reduce the sky-high cost of these dedicated public safety networks while at the same time not endangering cops, firefighters, EMTs and the public in general?

Yes, there is.. The FCC, in its national broadband plan, and the federal Department of Commerce, with its forward-thinking grant program for broadband, are lighting the way for a new public safety network which will be more robust, national in scope, and interoperable. By "interoperable" I mean the new public safety equipment will probably operate almost anywhere in the nation, whether on a dedicated government network or on a commercial cell phone network. Here are some features of the new networks:

- The FCC and major public safety organizations have called for the new public safety networks to be built using a fourth generation (4G) technology called LTE - long-term evolution. Not coincidently, this is the same technology which will be used by the major cell phone companies Verizon and AT&T when they construct their 4G networks. The commercial networks will operate on different frequencies than the public safety networks, but they will all be built in same general area of the wireless spectrum - the 700 megahertz (MHz) band.
- Because they are all using the same technology (LTE) and are in a similar slice of radio spectrum (700 MHz) potentially they will all interoperate. That means that public safety officers will use the government networks and frequencies when they are within range, but could "roam" to a commercial network if necessary. So cops and firefighters will have the best of both worlds - coverage from dedicated government networks and coverage from multiple private carriers. The FCC is even considering rules which would require the commercial companies to give public safety priority on the commercial LTE networks.

Why Don't Cops and Firefighters Just Use Cell Phones? *Bill Schrier*

- Because everyone - consumers, cops, firefighters and even general government workers such as transportation and utilities - are all using LTE, constructing the networks can be much cheaper. Commercial telecommunications carriers could put government antennas and equipment at their cell sites, and vice-versa. Perhaps the network equipment at the cell site, or even the central switches could be shared as well. Public safety will still be using its own frequencies and have priority, but could share many other network elements.
- And the radios used by individual public safety officers or placed in police vehicles and fire trucks can be much cheaper as well. Because manufacturers are all making equipment for the same technology - LTE - it could cost just a few hundred dollars. Again, there will be specialized and ruggedized devices for firefighters and others working in punishing environments, but the "innards" - the electronics - will be much less expensive.
- Next, we have to get all first and second responders to use the same or common networks. Here in Washington State, for example, we have multiple overlapping and duplicate networks. City and County police and fire in the region have one network, each electric utility (e.g. Seattle City Light) have another network. Transportation departments have their own networks (e.g. Seattle Transportation and Washington State Transportation each have their own separate network). The Washington State Patrol has its own separate network. The State Department of Natural Resources has its own network. Fish and Wildlife has its own network. And federal government agencies (FBI, customs and immigration) have their own networks. This is patently stupid and expensive. As we build these new fourth generation LTE networks, we need to build a single network with lots of sites and a lot of redundancy and hardening to withstand disasters. And everyone - first and second responders from all agencies - should use it.
- Finally, and perhaps most importantly, all the networks will be nationally interoperable. The lack of communications interoperability was a major finding of the Commission which investigated the September 11th World Trade Center attack. But with these new networks, a Seattle police officer's 4th generation LTE device will also work on New York City's LTE network or New Mexico's :LTE network or on any Verizon or AT&T network anywhere in the nation. As disasters happen anywhere in the United States, and first and second responders are rushed to the scene of the disaster, they can take their communications gear with them and it will work.

The City of Seattle is one of a handful (about 20) forward-thinking governments leading the way to deploy these new networks. Seattle's public safety LTE network, hopefully launched with a federal stimulus grant, will eventually expand throughout the Puget Sound region and across the State of Washington. The State of Oregon also has authority and a grant request to build an LTE network, and we are working with Oregon to make sure our networks work with each other seamlessly.

Is all of this a pipe dream? I don't think so. A number of public and private companies, governments and telecommunciations carriers and equipment manufacturers are working together to realize it. Many of them are in the Public Safety Alliance. In the Federal government, the FCC is working with the National Institute of Standards and the Departments of Commerce and Homeland security are providing grant funding. It will take a lot of work and many years to realize this network.

But when it is finished, we'll have public safety networks which work to keep us safe, and consumer networks which work to keep us productive and linked to our friends and families. These networks will be separate yet connected. They will be built from common technologies. And they will be less expensive for taxpayers than the networks we have today.

BIOGRAPHY FOR TOM SORLEY

Tom Sorley is the Deputy Director Radio Communications Services for the City of Houston. He is currently leading the City's efforts to implement a $125+ million P25, public safety radio system. Mr. Sorley is a nationally recognized leader in public safety communications with over 25 years experience in many facets of the field. Mr. Sorley serves on several national and international committees including the Governing Board Vice-Chair of the Department of Homeland Security P25 Compli-

ance Assessment Program and as the Chair of the Technology Committee for the National Public Safety Telecommunications Council (NPSTC).

Chairman WU. Thank you, Mr. Sorley.

Ms. O'Hara, please proceed.

STATEMENT OF ELLEN O'HARA, PRESIDENT, ZETRON

Ms. O'HARA. Chairman Wu and Members of the Subcommittee, thank you for this opportunity to offer testimony on Project 25 standards and their implementation in public safety radio systems.

I am the President and CEO of Zetron, a manufacturer of public safety communications equipment. Zetron has been serving the communication needs of public safety agencies in our Nation for over 30 years. With several thousand installations worldwide, we are the largest independent manufacturer of interoperable dispatch consoles in the Nation.

I appreciate the opportunity to testify to the Subcommittee regarding the P25 standards. We feel that Project 25, or P25, is critically important to public safety. Zetron is in agreement with the goals of P25. Our company was one of the early signers of the Memorandum of Understanding that created the project, and we have been an active participant in the standards process for the last 10 years.

Chairman Wu, you asked me to address two questions concerning P25. First, what challenges has Zetron faced in integrating our products with those of other vendors? And secondly, how has this impacted our customers? In addition, you asked what recommendations would Zetron make to ensure that the P25 process helps foster competition in the marketplace.

Now, in order to put my answers into context, I would like to refer you to the following graphic. This is a highly simplified depiction of a P25 system. It includes the P25 network and connection to another P25 network, the dispatch console, radios that are used on the system and the critical interfaces that connect these components: the wireless Common Air Interface, or CAI, the Inter Subsystem Interface, which is a wireless interface, ISSI, and the wireline Console Subsystem Interface, or CSSI.

Now, in your first hearing in May, you focused on radio-to-radio interoperability and competition, which is achieved in P25 through the wireless Common Air Interface, CAI. All P25 network manufacturers today in the United States have adopted the CAI standard. As a result, their systems are compatible with all P25 radios regardless of the radio vendor. In this case, competition is well served. It gives customers more choices and better value.

Now, different circumstances affect competition on the wireline side where dispatch consoles are connected to the network. To support competition on the wireline side, two standards have been created. One is the Inter Subsystem Interface, which provides an interface between two different vendors' P25 networks, and the other is the Console Subsystem Interface. The CSSI provides a seamless wired interface between the dispatch consoles of one vendor, such as Zetron, and another manufacturer's P25 network. The CSSI ensures that the customer has a choice in their selection of dispatch consoles. Now, this is important because the dispatch console is the heart of a public safety communications system. It con-

nects first responders such as police officers on their beat with a public safety communication center. The console also supports interoperability among radios by patching together radios that use different frequency bands.

Because dispatch consoles play such a critical role in the communications center, customers are best served when they have the freedom to choose the console that best meets their needs and cost requirements. Without a CSSI standard and the adoption of that standard by the P25 network vendor, the customer's choice is limited to the proprietary consoles provided by the network vendor.

There are several reasons why the adoption of the CSSI standard by P25 network vendors has been slow. Now, each P25 interface, as Mr. Sorley mentioned, is defined by a suite of standards documents that specify how the interface is to be implemented, tested and verified. These are critical documents, and the most important ones which define the CSSI and define how that is to be implemented are indeed complete. Due to other priorities in the standards process, however, the Telecommunications Industry Association, TIA, that manages the process has not yet finalized the testing and verification documents. This situation has given some P25 network manufacturers reason to delay the implementation of the CSSI in their network offerings. A customer who purchases a P25 network from one of these vendors today has no choice but to purchase the network manufacturer's own proprietary console.

Zetron has invested considerable resources to implement the P25 CSSI written standard but today our CSSI-enabled consoles are currently able to connect to the networks of only three of the seven network vendors' equipment: Tait Radio Communications, EADS North America, and Raytheon. The other network manufacturers have not yet publicly adopted the CSSI and thus proprietary consoles are the only choice available to customers of their networks.

We are concerned that competition and customer choice are limited by the slow adoption of the open standards CSSI. Indeed, the lack of widespread adoption of the CSSI has led some of Zetron's customers to delay their transition to P25, which in turn negatively impacts both competition and interoperability.

We feel that incentives are needed to solve this problem. To that end, I would like to offer two recommendations that could help eliminate some of the obstacles to competition.

First, we believe that the completion of the full suite of published standards for P25 wireline interfaces would remove a significant roadblock to their adoption. To hasten this process, we recommend that the Federal Government consider issuing grants to manufacturers so that they can allocate the resources necessary to complete the standards. This would allow a manufacturer such as Zetron to provide dedicated engineering resources to the TIA for the purposes of completing the testing and verification documents of the CSSI, thereby completing the full suite of standards for this P25 wireline interface.

We also recommend that the Federal Government set a date within the next 12 dates after which it will no longer fund through grants the purchase of P25 networks that offer only proprietary consoles rather than the open standard CSSI. This means that if the offered P25 network equipment can support consoles, then that

equipment must also support the open standard CSSI. Otherwise it is ineligible for purchase using interoperability grants.

In closing, I would like to reiterate Zetron's strong support for these two objectives of Project 25. We believe that policies that support the completion and adoption of open standards, wireline interfaces such as the CSSI will help ensure that P25's goals of interoperability and competition will be fully realized.

Chairman Wu and Members of the Subcommittee, thank you again for this opportunity to testify before you on these important matters.

[The prepared statement of Ms. O'Hara follows:]

PREPARED STATEMENT OF ELLEN O'HARA

Chairman Wu and members of the Committee, thank you for this opportunity to offer testimony on Project 25 standards and their implementation in public safety radio systems.

I am President and CEO of Zetron, a manufacturer of public safety communications equipment.

Zetron has been serving the communications needs of our nation's public safety agencies for over 30 years. With several thousand installations worldwide, we're the largest independent manufacturer of interoperable dispatch consoles in the nation.

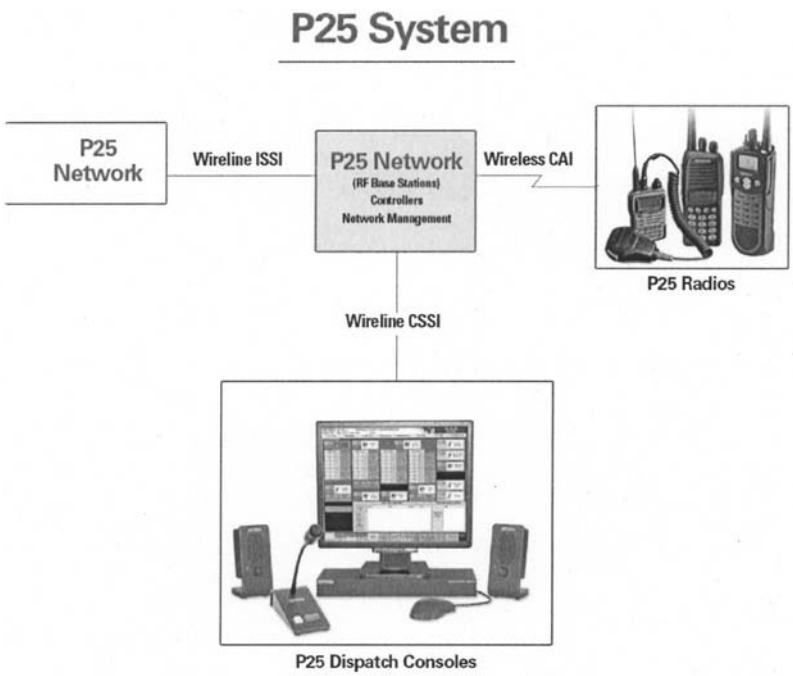
I appreciate the opportunity to testify to the Committee regarding the Project 25 standard. We feel that Project 25 (P25) is critically important to public safety. Zetron is in agreement with the goals of P25. Our company was one of the early signers of the P25 Memorandum of Understanding (MOU), and we have been an active participant in the P25 standards-development process for the past decade.

Chairman Wu, you asked me to address two questions concerning P25:

First, what challenges has Zetron faced integrating our products with those of other vendors, and how has this impacted our customers?

Second, what recommendations would Zetron make to ensure that the P25 process helps foster competition in the marketplace?

In order to put my answers into context, I'd like to refer you to the following graphic.



This is a highly simplified depiction of a P25 system. It includes the P25 network, the dispatch console, radios that are used on the system, and the interfaces that connect these components: the Common Air Interface (CAI), the Inter Subsystem Interface (ISSI), and the Console Subsystem Interface (CSSI).

In your first hearing in May, you focused on radio-to-radio interoperability and competition, which is achieved in P25 through the wireless Common Air Interface.

All P25 network manufacturers in the United States have adopted the CAI standard. As a result, their systems are compatible with all P25 radios, regardless of the radio vendor. In this case, competition is well served—it gives customers more choices and better value.

Different circumstances affect competition on the wireline side, where dispatch consoles are connected to the network.

To support competition on the wireline side, two standards have been created. One is the Inter Subsystem Interface—which provides an interface between two different vendors' P25 systems.

The other is the Console Subsystem Interface. The CSSI provides a seamless wireline interface between the dispatch consoles of one vendor (such as Zetron) and another manufacturer's P25 network.

The CSSI ensures that the customer has a choice in their selection of dispatch consoles. This is important because the dispatch console is the heart of a public safety communication system. It connects first responders, such as police officers on their beat, to the public safety communications center. The console also supports interoperability among radios by patching together radios that use different frequency bands.

Because dispatch consoles play such a critical role in a communication center, customers are best served when they have the freedom to choose the console that best meets their needs and cost requirements. Without a CSSI standard **and** the adoption of that standard by the P25 network vendor, the customer's choice is limited to the proprietary console provided by that network vendor.

There are several reasons why the adoption of the CSSI standard by P25 network vendors has been slow.

Each P25 interface is defined by a "suite" of standards documents that specify how the interface is to be implemented, tested and verified. The critical documents, which define the CSSI and how to implement the standard, are complete. Due to

other priorities in the standards process, the Telecommunications Industry Association (TIA) has not yet finished the testing and verification documents.[1]

This situation has given some P25 network manufacturers reason to delay the implementation of the CSSI in their network offerings. A customer who purchases a P25 network from one of these vendors today has no choice but to purchase the network manufacturer's own proprietary console.

Zetron has invested considerable resources to implement the P25 CSSI wireline standard. But today our CSSI-enabled consoles are currently able to connect to the networks of only three of the seven network vendors' equipment—Tait Radio Communications, EADS North America, and Raytheon. The other network manufacturers have not yet publicly adopted the CSSI, and thus proprietary consoles are the only choice available to customers of those networks.

We are concerned that competition and customer choice are limited by the slow adoption of the open-standard CSSI. Indeed, the lack of the widespread adoption of the CSSI has led some of Zetron's customers to delay their transition to P25, which in turn negatively impacts both competition and interoperability.

We feel that incentives are needed to solve this problem. To that end, I would like to offer two recommendations that could help eliminate some of the obstacles to competition.

- First, we believe that the completion of the full suite of published standards for P25 wireline interfaces would remove a significant roadblock to their adoption. To hasten the completion of these standards, we recommend that the federal government consider issuing grants to manufacturers so that they can allocate the resources necessary to complete the standards. This would allow a manufacturer such as Zetron to provide dedicated engineering resources to the TIA for the purposes of completing these standards.
- We also recommend that the federal government set a date within the next 12 months, after which it will no longer fund, through grants, the purchase of P25 networks that offer **only** proprietary console interfaces rather than the open-standard CSSI. This means that if the offered P25 network equipment can support consoles, that equipment must also support the open-standard CSSI; otherwise, it is ineligible for purchase using interoperability grants.

In closing, I would like to reiterate Zetron's strong support for the objectives of Project 25. We believe that policies that support the completion and adoption of open-standards wireline interfaces such as the CSSI will help ensure that P25's goals of interoperability and competition will be fully realized.

Chairman Wu, and members of the Committee, thank you again for the opportunity to testify before you on these important topics.

Note

[1] **Why Are the P25 Standards Taking So Long?**

This is perhaps the most frequently asked question regarding P25. When asked, it is often in comparison to other wireless communications standards, such as cellular or even Europe's narrow-band public safety standard called TETRA.

We believe that a significant portion of the answer to this question lies in the scope of P25. P25 is unique among all other wireless communications standards in that it includes open, published standards not only for over-the-air protocol and data dispatch consoles to P25 networks (via the CSSI), and to accommodate the unique need of cross-band interoperability (via the ISSI).

While other standards may identify similar interface points, only P25 has gone to the extent of creating standards for these interfaces. This is to ensure that the needs of our nation's public safety agencies are met. Thus the scope of the P25 standard is at least twice that of other wireless communications protocols. In addition, some of the other wireless standards, particularly cellular, were able to leverage the substantial number of existing telephony standards. Land mobile radio, with its unique push-to-talk and selective signaling characteristics, is not able to use telephony standards to the same extent.

Another reason it has taken longer to produce P25 standards is the collaborative, cooperative, and consensus-based approach used. While P25's requirements are identified by its users, as it should be, the actual development of standards to meet those requirements is done mostly by manufacturers.

P25 may not be unique in this approach; some cellular standards have also developed in this way. But being a much smaller market with smaller revenue potential and fewer participants, the amount of resources applied by P25 manufacturers has been relatively small compared to those of cellular manufacturers. In the case of European mobile radio standards, many of these have had external funding and participation by European governments.

Finally, the needs of our nation's public safety users are not static, but continue to evolve. For this reason, Project 25 has always been dynamic, with standards that can be extended and modified to meet emerging needs.

Thus P25 has grown beyond its original vision of the 90's which is "complete," (Phase 1), and is now nearing completion of a Phase 2. In this sense, P25 will not be complete until it is replaced.

BIOGRAPHY FOR ELLEN O'HARA

Ellen O'Hara is currently the president and CEO of Zetron, Inc., which is headquartered in Redmond, Washington.

Zetron provides mission-critical communication solutions for clients in the fields of public safety, transportation, utilities, manufacturing, healthcare, and business. With offices in Basingstoke, England; and Brisbane, Australia; as well as a growing network of sales representatives in Europe, Asia and Latin America, Zetron's reach is worldwide.

Throughout her career, Ms. O'Hara has served in positions of leadership and management for some of the country's leading communications technology companies. Prior to joining Zetron, she served as president and COO of EF Johnson Company in Irving, Texas; and also held senior-level management positions at Motorola, including vice president and general manager of its Radio Products Division, and vice president and director of subscriber operations in its Radio Network Solutions Group. During the 1980's, she also worked for General Electric's Mobile Communications Division (now a division of Harris) in business development, operations and product management.

Ms. O'Hara began her career in the field of organizational development at the Massachusetts Institute of Technology, where she also attended the Sloan School of Management.

Ms. O'Hara has served on several industry association and non-profit boards, including the International Telecommunications Association and the American SMR Network Association. She was Motorola's representative on the FCC's National Coordinating Committee in the late 1990's.

Ms. O'Hara holds an MBA with a Baker Scholar distinction from the Harvard Graduate School of Business, and a BA with distinction from Mount Holyoke College.

Chairman WU. Thank you, Ms. O'Hara.

Mr. Ingram, please proceed.

STATEMENT OF MARVIN INGRAM, SENIOR DIRECTOR, ARINC, PUBLIC SAFETY COMMUNICATIONS

Mr. INGRAM. Chairman Wu, Members of the Subcommittee, thank you for the opportunity to appear before you today to talk about this very critical subject. In my testimony today, I would like to leave you with three points for your consideration. One, standards drive innovation and competition in any marketplace, and it will do so in public safety. Two, technology is not a barrier to the finalizing of the P25 standards, such as CSSI. Three, finalizing communications standards and adoption of compliance and conformance testing is imperative to fully solving the interoperability problem.

I represent a company that has a long history of radio communications, stretching back over 80 years. ARINC was originally formed to manage aeronautical radio frequencies used by the airline industry, and we will perform that task today. ARINC has participated in creating interoperability of communications within the aviation industry and has built and manages a global mission-critical network that is used by airlines all over the world.

The tragic events of 9/11 motivated some people at ARINC to evaluate the problem of public safety communications interoperability and to see how we could leverage our expertise in solving the problem. That is when the business unit I represent, which is the Public Safety Communications Business Unit, was started.

ARINC supports the full adoption and the competition of the current published standards within P25. Over the past few years, the P25 standard has evolved to the point where more manufacturers are making P25-compliant components such as subscriber units, console systems, system control software and repeaters. These

smaller companies make very capable products. However, they don't make complete systems. As an integrator, we now have the ability to take these components from these manufacturers and build systems using a "best of breed" approach. Many of these manufacturers seek ARINC out due to our unbiased approach to designing and implementing public safety systems. ARINC has invested and will continue to invest substantially in the testing and delivery of systems that conform to the P25 standard.

I want to address the questions that you asked, Chairman Wu, of ARINC and me: What challenges has ARINC encountered in integrating P25 digital land mobile radio equipment from different vendors, and in our experience, how can these technological challenges impact the customers of this equipment? It is a good question. ARINC has integrated technology from several different P25 equipment manufacturers including Zetron, EASDS, EF Johnson, Kenwood, Tait and Thales. We are working with several others to get their equipment in our labs so that we can include them in our proposals to our customers. We found these manufacturers to be enthusiastic in working with each other and working with us. We have all collaborated to increase interoperability of the various products. Many of these manufacturers have expressed the desire to participate in ARINC-delivered systems as they feel they will be able to compete with one another on a level playing field.

However, as standards have been delayed, competition has been stifled. Costs have remained high and the full potential for interoperability has not been achieved. Vendors of proprietary systems are taking advantage of the delay in standards development to advance their gain in market share. Customers have had to purchase or extend the life of their existing system or systems with proprietary features and functions, often at a hefty price, until the standards are complete. As Mr. Dereck Orr of the National Institute of Standards and Technology testified before this Subcommittee on May 27, 2010, only small but critical portions of the standard have been ratified and it has only been in the last two years that a compliance testing program has been implemented.

The first few years of P25 deployments had many failures with respect to multi-vendor interoperability and finger pointing as to who was at fault. This instilled a level of doubt in the minds of many first responders that has not been fully overcome. In several procurements we have been asked, how can we guarantee that components from various vendors will interoperate? Even today, as CAP labs attest to interoperability, the customer base uses the past as an excuse to stick with the status quo of a single vendor solution. To be sure, there are still ways to purposefully deploy a P25 system such that another vendor's equipment will not function on it, but there are also ways to deploy it so that it will.

The next question that you asked, what would you recommend to ensure that P25 standards are implemented consistently? I believe that open standards in public safety communications will increase competition and provide innovative and cost-sensitive solutions. We have witnessed this in other industries, but the pace of the current public safety communications standards development process has in fact frustrated equipment manufacturers who wish to invest in the development and enhancement of their products.

ARINC supports accelerating the adoption and implementation of the most critical public safety communication standards and technologies, along with compliance and conformance testing.

Finally, ARINC recommends federal funding be established and managed by a dedicated governing body to provide grants to public safety personnel, technology vendors and others to participate in the ratification of the published P25 standards. ARINC recommends a schedule be established and maintained by the dedicated governing body to ensure completion of the standards in a timely manner. ARINC also recommends the standard be released in manageable phases. Finally, ARINC recommends that this initiative be closely monitored by this and other legislative and regulatory bodies charged with solving the problem of public safety communications.

Chairman Wu, Members of this Committee, thank you again for inviting me to testify before you today.

[The prepared statement of Mr. Ingram follows:]

PREPARED STATEMENT OF MARVIN INGRAM

Chairman Wu, Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss the current state of interoperability and competition in the marketplace in Public Safety radio equipment. It is truly an honor to speak with you today, thank you for the invitation. ARINC support the full adoption of the P25 standards. In my testimony today, I would like to leave you with 3 items for your consideration:

1. Standards drive competition and innovation in any marketplace and it will in Public Safety communications
2. Technology is not a barrier to finalizing the P25 standard—several manufactures are anxiously awaiting completion of several elements of the standards
3. Finalizing communications standards and adoption of compliance and conformance testing is imperative to fully solving the interoperability issue.

I represent a company that has a long history in radio communications stretching back almost 80 years. ARINC was originally formed to manage aeronautical radio frequencies used by the airline industry and we still perform that role today. ARINC has participated in creating interoperability of communications within the aviation industry. ARINC has built and manages a global mission critical network that is used by airlines around world to communicate.

In the aviation industry, many of the communications standards are referred to as "ARINC" standards and they enable voice and data communications interoperability as well as physical equipment interoperability. The standards are far reaching with everyone from airframe manufacturers to rental car companies utilizing them. They enable a pilot to bring you weather forecasts for the destination airport at 35,000 feet, lets a rental car company know you will be late, and enables an engine manufacturer to know when a jet needs servicing automatically.

The tragic events of 9/11 motivated some smart people at ARINC to evaluate how we could leverage our expertise in aviation communications to contribute in solving the public safety communications interoperability problem. That's when the business unit I represent was formed.

While a relative newcomer to public safety, our track record demonstrates our ability to solve complex problems and deliver mission critical solutions. In the industries and markets where we participate we are viewed by our customers as a thought leader and partner. For the most part we do not manufacture hardware; we use existing components to create new or integrated solutions.

From this background you might infer how important standards are to ARINC. Standards are what enable ARINC to build the integrated solutions we provide to our customers. This is true in every market vertical we participate. The market confusion regarding P25 standards is one factor that has slowed our ability to add real value to public safety customers. Until recently, there were only two vendors where customers could purchase a trunked P25 system. These vendors provide a complete end-to-end system sold through a direct sales model with little to no room for additional vendor participation.

Over the past few years the P25 standard has evolved to the point where more manufacturers are making P25 compliant "*components*" such as subscriber units, consoles, system control software, and repeaters. These smaller companies make very capable products, however they don't make a complete system. As an integrator, we now have the ability to take the components from these manufacturers and build complete systems using a "best of breed" approach. Many of these manufacturers seek ARINC out due to our unbiased approach to designing and implementing public safety systems. ARINC has invested and will continue to invest substantially in the in the testing and delivery of systems that conform to the P25 standard.

This transition from a single vendor solution to the integrated multi-vendor solution is nothing new. The IT industry went through this very transition in the early 90's. The real question from our perspective is why has it taken so long for public safety to get where it is? And why does it seem that it still has a very long way to go?

The P25 standard, started in 1989 just celebrated it's 20th anniversary and it's still not complete. To put this in perspective, twenty years ago the Internet was limited to universities and research companies, PC's were very expensive, slow, and very few people had them, there were no mobile phones, and "high speed" connections were 56kbps dialup. If other industries moved at the same pace as the P25 standard, almost no one would have a portable phone, "portable computers" would cost $10,000 weigh 20lbs, with less than 1MB of disk space, and wireless broadband would still be a pipe dream regardless of the spectrum availability. I say this with some risk of offending the many good folks who put so much effort into the standards as they exist today, for they have developed a worthy baseline. But in large part, many are just as frustrated as we are regarding the pace of development. Overall this has had a negative impact on the ability of first responders to communicate and put the public at risk on both a daily basis and during times of crisis such as on 9/11 and during hurricane Katrina.

"What challenges has ARINC encountered in integrating P25 digital land mobile radio equipment from different vendors? In your experience, how can these technological challenges impact the customer of this equipment?"

ARINC has integrated technology from several P25 equipment manufacturers, including EADS, Zetron, EF Johnson, Kenwood, TAIT and Thales. We are working with several others to get their equipment in our labs so that we can then include them in proposals to customers. We have found these manufactures to be enthusiastic in working with us and each other. We have all collaborated to increase the interoperability of all the products. Many of these manufactures have expressed the desire to participate in ARINC delivered systems as they will be able to compete with one another on a level playing field.

However, as standards have been delayed, competition has been stifled, costs have remained high, and the full potential for interoperability has not been achieved. Vendors of proprietary systems have taken advantage of the delay in standards development to advance their gain in market share. Customers have had to purchase or extend the life of their existing system or systems with proprietary features and function, often at a hefty price tag, until the standard is developed enough to use. As Mr. Dereck Orr of the National Institute of Standards and Technology testified before this committee on May 27th, 2010 only small but critical portions of the standard have been ratified, and it's only been in the last 2 years that a compliance testing program has been implemented.

The first few years of P25 deployments had many failures with respect to multi-vendor interoperability and finger pointing as to who was at fault. This instilled a level of doubt in the minds of many first responders that has not been fully overcome. In several procurements we've been asked 'How can guarantee that components from various vendors will interoperate?' Even today, as CAP labs attest to interoperability the customer base uses the past as an excuse to stick with the status quo of a single vendor end-to-end solution, of which there are still only two. *To be sure, there are still ways to purposefully deploy a P25 system such that another vendor's equipment will not function on it, but there are also ways to deploy it so that it will and it has been possible for quite a number of years*.

To once again draw a parallel to another industry, most of you know who manufactured your mobile phone, and what carrier you pay your service charges too. How many of you know who made the infrastructure at the local tower site? Do you worry that it's not compatible? Of course not. The reason is the testing that other industries go through to ensure compatibility and the zeal with which they want to ensure their product is accepted in the marketplace.

Another challenge is dealing with the idiosyncrasies of how each manufacturer interprets the standards. This has the potential to cause issues with deployments.

ARINC maintains a test and demonstration lab at our headquarters in Annapolis Maryland to ferret out troublesome configuration issues before we deploy systems to the field. We also work with vendors during their development cycles to test new functionality or products in a "private" environment that isn't as sterile as their lab, yet won't impact customers. These vendors also test among themselves to see if they have each come to the same conclusion regarding how to implement technology. The level of activity in this arena has increased over the last two to three years due to more vendors in the space and recognition that the procurement process if finally starting to shift from single to multi-vendor solutions.

What we have seen is that vendors with smaller market share must and will work harder to prove to the larger vendors and the market in general that their radio will interoperate with the "big guys". They also work harder to innovate in areas such as ease of configuration, battery life, fireground features, and packaging.

"What would you recommend to ensure that the P25 standards are implemented consistently?"

I believe open standards in public safety communications will increase competition and provide innovative, cost sensitive solutions. We have witnessed this in other industries, but the pace of the current public safety communications standards development process, has in fact frustrated equipment manufacturers who wish to invest in the development and enhancement of their products. ARINC supports accelerating the adoption and implementation of the most critical public safety communication standards and technologies, along with compliance and conformance testing.

- ARINC recommends federal funding be established and managed by a dedicated governing body, to provide grants to public safety personnel, technology vendors and others to participate in the ratification of the published P25 standards.
- ARINC recommends a schedule be established and maintained by the dedicated governing body to ensure completion of the standards in a timely manner.
- ARINC recommends portions of the standards be released in manageable phases.
- Finally, ARINC recommends that this initiative be closely monitored by this and other legislative and regulatory bodies charged with solving the problem of Public Safety interoperability.

Chairman Wu, Members of the Subcommittee, thank you again for inviting me to testify on this very critical issue, I am honored.

BIOGRAPHY FOR MARVIN INGRAM

Marvin Ingram has served as the Senior Director for ARINC's Public Safety Communications business unit since 2004. ARINC is a Communications Engineering and Systems Integration firm based in Annapolis Maryland. Mr. Ingram has led the development of the strategic plan, technical roadmap and go-to-market strategy for the ARINC Wireless Interoperable Network Solutions (AWINS).

AWINS was developed to provide architecture for a standards platform to provide interoperable communications between Public Safety and Homeland Security agencies. It is designed to provide greater flexibility, resiliency, a choice of vendors, lower costs, and the capability for future expansion. As an industry leader in legacy radio systems interoperability using IP and VoIP, ARINC is known as an integrator that delivers mission critical solutions. In addition to traditional legacy radio integration, AWINS includes APCO P25 radio technology. Focused on standards compliant systems, ARINC is able to deliver end to end communications interoperability.

Mr. Ingram has provided leadership for over 20 years in program management, engineering, quality assurance, customer satisfaction, sales and marketing for Public Safety Communications and IT solutions.

Mr. Ingram started his career serving in the U.S. Air Force as an Electronic Intelligence engineer. Mr. Ingram's career includes network engineering and executive management in several information technology organizations prior to joining ARINC.

Chairman WU. Thank you very much, Mr. Ingram.
Mr. Sveda, please proceed.

STATEMENT OF RUSS SVEDA, MANAGER OF THE RADIO TECHNICAL SERVICE CENTER, DEPARTMENT OF THE INTERIOR

Mr. SVEDA. Thank you. Good afternoon, Mr. Chairman and Members of the Subcommittee. I appreciate the opportunity to appear before you today to discuss the Department of Interior's testing program for Project 25. My name is Russ Sveda. I am the Manager of the Radio Technical Service Center for the Department of the Interior, where we provide land mobile radio system engineering and product testing. I have almost 30 years of military and civilian government experience in radio communications and look forward to sharing my experiences with the Subcommittee.

To provide you with a little background, because of the Department's broad land management portfolio, the Department has land mobile radios and systems in use across nearly all of the 50 states and U.S. territories. Our operations, particularly in law enforcement and wildland fire fighting, require a high degree of interoperability with other federal, tribal, state and local agencies. Our law enforcement officers and fire fighters work in remote locations across the country supporting various incidents, whether it is a wildland fire in Alaska, a joint operation with the Border Patrol along the southwest border or hurricane relief efforts in the Southeast, and often we do all these things in one summer. A clear and concise standard for land mobile radio, and confidence in the products' adherence to those standards, are extremely important to us.

The Department of the Interior adopted the Project 25 Standards in 1996 and has been buying and using products that purport to adhere to those standards since then. Unlike many of the other organizations who contract the design and implementation of a turnkey radio system, we typically design and install our own land mobile radio systems with components purchased from multiple vendors in order to minimize our costs.

Our interest in the Project 25 standards and interoperability goes beyond whether vendor A's radio works with vendor B's radio and down into the land mobile radio system itself. Our mission demands that not only must radio A, B and C interoperate and work together on our local system, but that our users' handheld and mobile radios must also work effectively on any system in the country. With our in-house system engineering and implementation, we must further ensure that system equipment from vendor A works with system equipment from vendor B and vendor C.

The slow pace of the development of the Project 25 standards has created some frustration in the radio user community. While I applaud the industry for the success in establishing a solid Common Air Interface, or CAI, so that different radios can talk to each other, most of the standards are still in development. We have invested 14 years in this technology, and today we are still not able to design and install a Project 25 compliant system without significant engineering and customization.

The Department started testing Project 25 products in 2002 as part of a Department-wide radio contract. We found this necessary because of the experiences we and our users had with what I would call the first generation Project 25 products. Since that time, we have evolved our testing along with the evolution of the standards. Today, we test the Project 25 products offered under yet another

contract that supports both the Department of the Interior and the Department of Agriculture.

Our current testing is based on the Project 25 Standards and specifically targets performance, conformance and interoperability. To use resources effectively, though, we select specific tests based on the risks and the impacts to our users, meaning we don't test absolutely everything that is in the standards.

Since 2002, we have seen a drastic improvement in the Project 25 products and a significant increase in the number of vendors that can provide these products. There is still a long road ahead, though.

We envision continuing to test Project 25 products until all the standards are published and the industry has matured in complying with those standards.

The Department of Interior is committed to supporting the Project 25 Standards, and we welcome your support and attention to this topic. It is in the best interest of the government and in particular of those who place themselves in harm's way to continue the standards development and independent testing of Project 25.

This concludes my testimony. I am happy to answer any questions you or the Members of the Subcommittee may have. Thank you.

[The prepared statement of Mr. Sveda follows:]

PREPARED STATEMENT OF RUSS SVEDA

Good Morning, Mr. Chairman and Members of the Subcommittee, I appreciate the opportunity to appear before you today to discuss the Department of the Interior's testing program for Project 25. My name is Russ Sveda. I am the Manager of the Radio Technical Service Center for the Department of the Interior (Department), where we provide land mobile radio systems engineering and product testing for the Department. I have almost 30 years of military and civilian Government experience in radio communications and look forward to sharing my experiences with the Subcommittee.

To provide a little background, because of the Department's broad land management portfolio, the Department has land mobile radios and systems in use across nearly all of the 50 states and U.S. territories. Our operations, particularly in law enforcement and wildland fire fighting, require a high degree of interoperability with other Federal, Tribal, State and local agencies. Our law enforcement officers and fire fighters work in remote locations across the country supporting various incidents, whether at a wildland fire in Alaska, a joint operation with the Border Patrol in the Southwest, or a hurricane relief effort in the Southeast. A clear and concise standard for land mobile radio, and confidence in the products' adherence to those standards, are extremely important to us.

The Department of the Interior adopted the Project 25 Standards in 1996 and has been buying and using products that purport to adhere to this standard since then. Unlike many of the other organizations who contract the design and implementation of a turnkey system, we typically design and install our own land mobile radio systems with components purchased from multiple vendors in order to minimize costs.

Our interest in the Project 25 standards and interoperability goes beyond whether vendor "A's" radio works with vendor "B's" radio and into the land mobile radio "system." Our mission demands that not only must Radio "A", "B" and "C" interoperate on our local system, but our users' handheld and mobile radios must also work effectively on any system in the country. With our in-house system design and implementation, we must further ensure that system equipment from vendor "A" works with equipment from vendor "B" and vendor "C".

The slow pace of the development of the Project 25 Standards has created some frustration in the radio user community. While I applaud the industry for the success in establishing a solid Common Air Interface so that different radios can talk to each other, most of the standards are still in development. We have invested 14 years into this technology and today, we are still not able to design and install a Project 25 compliant "system" without significant engineering and customization.

The Department started testing Project 25 products in 2002 as part of a Department-wide contract. We found this necessary because of the experiences we and our users had with what I would call the "first generation" Project 25 products. Since that time, we have evolved our testing along with the evolution of the standards. Today, we test the Project 25 products offered under yet another contract that supports both the Department of the Interior and the Department of Agriculture.

Our current testing is based on the Project 25 Standards and specifically targets performance, conformance, and interoperability. To use resources efficiently, we select specific tests based on the risk and impact to our users.

Since 2002, we have seen a drastic improvement in the Project 25 products and a significant increase in the number of vendors that can provide those products. There is still a long road ahead.

We envision continuing to test Project 25 products until all the standards are published and the industry has matured in complying with those standards.

The Department is committed to supporting the Project 25 Standards, and we welcome your support and attention to this topic. It is in the best interest of the government and in particular of those who place themselves in harms' way to continue the standards development and independent testing of Project 25.

This concludes my testimony. I am happy to answer any questions that you or the members of the Subcommittee may have.

BIOGRAPHY FOR RUSS SVEDA

In December 2008, Russell A. Sveda was assigned to the Department of the Interior Radio Technical Service Center as Manager, assuming oversight responsibility for the Department's radio technical services and support. The Department has approximately 2,000 radio systems and some 25,000 users located in approximately 2,400 locations across the United States, Puerto Rico, U.S. territories, and Native American Lands. He has nearly thirty years experience in the field of radio communications and information technology, including nine years of which are with the Department of the Interior.

As the Technical Service Center Manager, Mr. Sveda is responsible for providing leadership and technical advice to the Office of the Chief Information Officer for the Department and the subordinate bureaus on the effective use of radio technology and providing technical support. Mr. Sveda is focused on radio infrastructure modernization and ensuring that investments in radio are cost effective, scalable, interoperable and aligned to DOI's mission and strategic direction. In doing so, radio equipment and their compliance to the agency adopted Project 25 standard are a key concern. Mr. Sveda has established a formal testing program for radio products to assure that those used by the Department meet the mission and user requirements.

Before accepting this position, Mr. Sveda served as the Radio Program Manager at the Bureau of Land Management, a bureau within the Department, where he provided leadership for and technical expertise in radio, as well as, policy development and project management for several key radio initiatives.

Prior to his assignments in the Department of the Interior, between 1981 and 2001, he served as an Electronics Maintenance Officer in the United States Marine Corps. His last three years in the Marine Corps were devoted to developing and maintaining the radio communications systems and dispatch centers for the Marine Corp Bases in California. Mr. Sveda provided technical leadership and field support to military training, law enforcement, fire, and logistical support organizations within these bases. He further developed radio interoperability solutions and techniques with local city, county, state and federal organizations, as well as local amateur radio organizations, to improve joint response to incidents. The previous 17 years involved designing and supporting tactical radio, telephone, computer, radar, and weather systems for various combat operations. During this period, Mr. Sveda was also involved in defining test methods and conducting lab and field testing of various communications and electronics equipment.

Mr. Sveda is a graduate of McDowell High School in Erie, Pennsylvania where he specialized in electronics and has held or holds various certifications related to Radio, IT Service Management, and Project Management.

Chairman WU. Thank you very much, Mr. Sveda.

I have been advised that the proceedings on the Floor are such that we expect perhaps five or six votes coming up in just a little bit, and these votes will take about an hour, so it is my intention to get through one, perhaps two rounds of questions, and if there

are any remaining questions, the staff will submit them to the witnesses in writing, and with that, the Chair recognizes himself for five minutes.

These hearings have been focused on the progress of standards development for P25, and I am especially interested in the lack of standards or the lack of progress across the suite of standards, the impact on safety and on price, on safety and competition. I would like to encourage the witnesses to go across the board and address how the slow pace of standards development has affected competition and price on the one hand and the safety of equipment stemming from lack of interoperability on the other.

Mr. SORLEY. Tom Sorley. I guess I will start. We just completed in October of 2008 a very lengthy procurement process for our $100 million plus system, and even though I spent months out canvassing vendors and trying to get interest into our process, we ultimately ended up with two manufacturers making an offering. They happened to be the two largest in the state. That could be because the size and complexity of the procurement. I understand that. But it was a little disheartening that we couldn't have at least three or more. So I think it has a big impact on competition, the fact that we——

Chairman WU. And this is for all the different components of the system?

Mr. SORLEY. All the different components. It was a large—you know, it is a soup-to-nuts radio system.

Chairman WU. Right. And it was not two vendors for each individual component, this is two total, the whole suite of components?

Mr. SORLEY. Correct. And I think that, had the standard been more fully developed, we could have had more vendors come in and give proposals. Many elements are still proprietary in a system as large as mine, and it is just too much risk for the other vendors to come in.

Chairman WU. Mr. Sorley, what is the impact of some of that proprietary technology on someone like you who may be acquiring further equipment which may be interoperable or not interoperable with that proprietary technology?

Mr. SORLEY. Let me give you an example. There is a vendor that offers a very low-cost encryption algorithm—sometimes they give it away for free—that is proprietary, and if you as an agency or a system owner go with that technology, then anyone else that wants to buy radios and join your system, if they want to talk to your people, guess what? They have to buy from that manufacturer. I was talking to a gentleman in Boise, Idaho, last week who has this exact situation. I was suggesting that because of the number of vendors out there for mobile and portable radios they ought to go do a competition for the price. He said, well, we can't do that because we have to talk to everyone else and they all have this encryption. That is just one example. There are a lot of examples like that.

Chairman WU. So if the encryption is not supported across the board, then there is no competition for further sales?

Mr. SORLEY. Correct.

Chairman WU. And one surmises that when you are trapped, then the vendor might be able to achieve a slightly higher price for future sales.

Mr. SORLEY. So let me just illustrate that. In my competitive process, I am buying the radio that he wanted to buy. I am buying it for around $3,000. He is going to have to buy it for around $5,500. That is just an example.

Chairman WU. Yes, quite a premium.

Ms. O'Hara, it is my impression that Zetron, at least in certain instances, has been precluded from competing in the console business. Is that correct?

Ms. O'HARA. Yes, sir. Whenever there is a network vendor that doesn't provide either the standard interface to our consoles or perhaps they might offer a proprietary interface that we then have to go do development work for, it means that either we cannot or it is a pretty onerous burden for us to provide a console on that system. So in many cases customers just go with a vendor that is providing the network and their proprietary interface, and if today they decide to do that because that vendor doesn't have the standards interface and later on down the road they decide they have another operation and they would like to use our consoles, even if the vendor has at that point developed the CSSI, it may not—they may be locked in because of the network that they have already purchased, sort of like Mr. Sorley mentioned.

Chairman WU. And pricing is a function of whether you are locked in or not?

Ms. O'HARA. That is correct, pricing and features, feature capabilities which we may be able to offer, and there are customers who come to us who know our systems and like what we do who say I have no option, and some have delayed their purchases as a result of that.

Chairman WU. If you want that particular feature, it may not be available from a competing vendor?

Ms. O'HARA. That is correct.

Chairman WU. Mr. Sorley.

Mr. SORLEY. If I may amplify that, we are in exactly that situation. Our radio system—we could not buy their consoles. The console system interfaces with something called fire station alerting, and the consoles that we have to buy because they are proprietary do not have this interface that we need. Their consoles do, but I can't buy them because our vendor doesn't support CSSI.

Chairman WU. Thank you.

My five minutes has expired, so let me recognize Ms. Biggert, and if we have time, we might go another round of questions. Ms. Biggert, please proceed.

Ms. BIGGERT. Thank you, Mr. Chairman.

This question is for all of you. Let us suppose that a vendor sold P25 equipment that was proven for interoperability, compliance and conformance. If that was the case, wouldn't all the public safety agencies want to purchase that equipment, thereby advancing that company to the top of the competition? How do we design a voluntary standards process that drives innovation and competition? Ms. O'Hara, you seem to be smiling.

Ms. O'HARA. So let me understand. So your question is, if a company does provide that standards interface they are going to be preferred? And I think that is true. I think the other aspect of your question, which is interesting, is whether the standard covers all of the capabilities and features that a customer may want, and there may be customers who decide that they want a proprietary feature and that is their right and their ability to do that. They just need to understand that unless that vendor offers that proprietary feature or a license for that feature to other, say, console manufacturers, they will be locked in in the future. I don't believe that it is right to tell customers not to buy features, but to Mr. Sorley's point, they really need to be well educated on the impact of buying a proprietary feature, and if they can have influence on the vendor that is providing that feature to influence them to offer that capability or interface to other vendors, that would be an ideal situation, I think.

Ms. BIGGERT. Would anybody else like to address that? Mr. Ingram.

Mr. INGRAM. I would just like to add to that point. First of all, in my testimony I talked about ARINC as an integrator. ARINC is not a product manufacturer. We don't have a dog in the fight. We work with everyone. And our point here is to build the best solution possible to address the customer needs. But oftentimes we do find that some of these proprietary features preclude us from selecting the best product available, and that is something that is systemic at the core of the system and then out to the edges of the system, the radio units themselves, the networks, all the devices. We find that the manufacturers that we work with typically—it is very important for them to be as interoperable as possible, right, because they don't build end-to-end solutions so they have to work with everyone, so there is a very organic sort of relationship between the product manufacturers that we work, ARINC and our customers.

Chairman WU. Let us be very clear about that. They want to fit onto someone else's, but if they get something special, if they can keep that to themselves, then it is to their business advantage to be able to do that.

Mr. INGRAM. It is to their business advantage to build the best product or best component possible, so I will use Zetron as an example. They conform to the CSSI standard. They are capable of interfacing to any public safety network, P25 network, that is available. It is to their advantage to be able to integrate with any system, as many systems as possible. So we view this objectively. We view this almost from a customer's perspective. The technology is not the hurdle. It is really the standard. And I want to make it very clear. The completion of the standard isn't absolutely necessary. The standards are developed in stages, right, so you can have a version of a standard, version 1, version 1A, version 2, version 3, and those standards can be released in ways that manufacturers——

Ms. BIGGERT. You talked about being released in manageable——

Mr. INGRAM. In manageable phases.

Ms. BIGGERT. What do you mean by that?

Mr. INGRAM. Well, there are standards out there like ISSI, CSSI and other very important standards that we are waiting for as the industry, the market is waiting for the full completion of the standard, but it is not absolutely necessary. The standards could be released in phases so product manufacturers know, okay, I can build up until that point, right, I can invest and build up to that point and delivery technology to meet up to that certain point within the standard, and as time goes on, that component within the standard will evolve to include other features of functions or capabilities. So we don't have to wait until the end, and I think that has been part of the problem with the delay or how long this process has taken with P25. We don't have to wait until the end. We can release the standard in manageable phases so manufacturers can build technologies, and the point is that the customers who are receiving that technology won't—that standard will still be compliant as it is upgraded so it won't lock them out or lock them in to any particular technology.

Ms. BIGGERT. Thank you.

I yield back.

Chairman WU. The gentlelady's time has expired.

This standard-setting process has been extraordinarily slow, and I would like to invite this panel to speculate as to the causes for the slow process and what the impact of this slow process has been on competition, price and safety. Mr. Sveda?

Mr. SVEDA. Yes. Thank you. I would like to speak first to the success of the process, in particular in that since our testing since 2002 that today with the Common Air Interface standard published completely, that there is significant competition. The competition has creased significant price reductions or variations so the competition piece has worked now that the Common Air Interface standard has been published and manufacturers are building to it.

Chairman WU. That is for that piece?

Mr. SVEDA. That piece. Now, when you get to the system pieces where we are talking the ISSI and things like that, there is where the challenges are. But I wanted to point out a success that the system does provide or the process has provided us if we could just now speed it up, I guess. Thank you.

Chairman WU. Mr. Sorley.

Mr. SORLEY. I would like to comment, or speculate, as you said, on the possible cause. I think there are a couple of things. One, public safety attempted to drive the standard, and because of the funding for travel and all kinds of other things, public safety's participation has not been as consistent as maybe it could have been or perhaps even should have been so I think that is partly a contributing factor. The other contributing factor is, this marketplace is very small and it is dominated mostly by two or three vendors who happen to have most of the imbedded business on proprietary systems.

Chairman WU. What is the market share, Mr. Sorley?

Mr. SORLEY. I am sorry?

Chairman WU. Any idea what the market share is of the two or three leading providers?

Mr. SORLEY. I would say between three of them they have over 80 percent of the market. And so what motivates——

Chairman WU. Let me pause you just for a second here.

Ms. O'Hara, in the console business that you are competing in, for that line of work you said you could compete for three but not for four of the vendors. What share of the market do those four vendors that——

Ms. O'HARA. About the same that——

Chairman WU. About the same?

Ms. O'HARA. Yes.

Chairman WU. Seventy plus?

Ms. O'HARA. Yes.

Chairman WU. Thank you.

Please proceed, Mr. Sorley.

Mr. SORLEY. So my point to that was that basically we are asking people to cooperatively work together to develop a standard that negatively impacts their business.

Chairman WU. Because once it is interoperable, then it is a commodity product and prices come down?

Mr. SORLEY. Yes. You have new entrants into the market and you have lower prices. That is what the goal is, and so if that is the goal, why would I want that?

Chairman WU. Mr. Sorley, let me ask you this. I have been told equipment with a P25 sticker on it is actually sold for a premium. Can you explain that to me?

Mr. SORLEY. No, sir, I can't.

Chairman WU. Is it that it is allegedly P25-compliant but once you are into it, you are supposed to buy P25-compliant equipment. The sticker says so, so that is what the federal appropriations permits you to buy?

Mr. SORLEY. Yes, sir. Current grant guidance does call for, or in effect mandates, P25 equipment.

Chairman WU. So you can actually charge more for P25-compliant equipment that may not be interoperable?

Mr. SORLEY. I am not sure if that is the case. I do know that with digital radio and the evolution of radio, there is a whole lot more in the box than, say, conventional analog radio. So inherently it is going to be higher cost. You know, there are many elements, technical elements in there that have to be there to guarantee the performance.

Chairman WU. But if it says P25, it is supposed to be interoperable?

Mr. SORLEY. Yes, sir.

Chairman WU. Does anyone know if the grant guidance says that you have to buy P25-compliant equipment and then you have this equipment that has a P25 sticker on it? At what point does it arise to fraud, to fraud on the government that this allegedly compliant equipment is not compliant?

Ms. O'HARA. Well, I will clarify that the interoperability grant funding today only applies to the Phase 1 Common Air Interface, and indeed today, as I mentioned in my testimony, there are many vendors that provide those radios and they do work on the network vendor systems, all of the systems, and that is where we have talked about is a success.

Chairman WU. On the voice. Yes.

Ms. O'HARA. And where it is not—interoperability funding is not dependent on P25 on the system side, and that is the second recommendation I made is, let us apply that across the board, not just on the radio interface.

Chairman WU. And Ms. O'Hara, one of your recommendations is that if the standards process does not move forward, that federal funding be withheld for any equipment that is not compliant?

Ms. O'HARA. Yes. Basically I am just saying let us apply that same logic that was very successful on the CAI side to the wireline interfaces as well.

Chairman WU. Thank you all very, very much. I am told that we are down to just a couple of hundred folks not having voted on the Floor, so I am going to have to get over there to perform my Floor voting duties, and I want to thank you all for appearing before the Subcommittee this afternoon.

The record will remain open for two weeks for additional statements and additions to the record and witnesses to answer questions that the Committee may ask. The witnesses are excused. Thank you all very, very much for being here this afternoon.

[Whereupon, at 2:50 p.m., the Subcommittee was adjourned.]

Appendix:

Additional Material for the Record

LETTERS TO CHAIRMAN DAVID WU AND REPRESENTATIVE ADRIAN SMITH FROM JOHN SUZUKI, SENIOR VICE PRESIDENT OF SALES, EF TECHNOLOGIES, INC., DATED SEPTEMBER 22, 2010

EFJohnson TECHNOLOGIES
We Respond.

September 22, 2010

The Honorable David Wu
Chairman
Committee on Science and Technology, Subcommittee on Technology and Innovation
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Wu:

I recently learned of the Subcommittee on Technology and Innovation's upcoming, September 23rd hearing on Project 25 (P25) standards, communications system interoperability and competition in the marketplace for public safety radio equipment. Our company, which is based in the Dallas, Texas area, has been in business 80 years, and we have substantial experience regarding this issue.

I would be very interested in meeting with you or members of the subcommittee to discuss the challenges posed by proprietary solutions and monopolistic dominance in the public safety communications equipment market, at both the state and federal level. If helpful and appropriate, I would also be interested in offering my testimony before the subcommittee at the upcoming hearing.

We strongly believe Congress should investigate and eliminate the exclusionary practices in this market, especially when federal dollars are involved, and are encouraged that the subcommittee is examining this important public policy matter. Greater competition will help our country reach its interoperability goals more quickly and enhance the safety and security of America's first responders and citizens.

As an executive with EF Johnson Technologies, one of the nation's leading innovators in secure communications solutions for first responders, and a prominent contributor to the development of the initial P25 standards, I fully support the call for greater competition in this area. Here's why:

- **Proprietary product offerings and barriers to competition result in public agencies routinely spending more than necessary on critical communications equipment.** For example, in 2009 Orange County, Florida used federal grant dollars to purchase Motorola radios via sole-source contract (a violation of the county's own procurement rules) at a cost of $4,206 per radio. Had we been given an opportunity to compete, my company could have provided Orange County a nearly identical radio for about $2,700.

- **Competition can drive prices down by as much as 50% when public agencies open the procurement process to competitive bidding among multiple vendors**. For example, in June 2009, the State of Wyoming purchased 337 mobile radios and 146 portables for $1.08 million. The state budgeted $2.5 million based on quotes from another vendor, but was able to save $1.42 million by giving E.F. Johnson a chance to compete. I can share similar stories from California, Louisiana, Mississippi, Georgia and elsewhere. I would be more than happy to provide you additional facts.

Limited competition not only reduces the ability of taxpayers to get the biggest bang for the buck, but also adversely impacts the availability of funds for other vital public safety needs. In a time of tight budgets and increasing demands for fiscal responsibility, such opportunities for cost savings cannot be ignored.

Additionally, the relative lack of true competitive bidding opportunities in the public safety communications equipment market hurts U.S.-based companies that employ American workers, such as E.F. Johnson. We proudly build and service our equipment in Texas, but as you can imagine, our competitive edge is marginalized when U.S. tax dollars support companies that manufacture their products in foreign countries.

E.F. Johnson's systems and equipment, as well as the products and services of other major vendors, have been proven to be interoperable and effective. Our products are used by numerous first responders across the nation and worldwide, including by public safety agencies in many states and tens of thousands of U.S. military personnel in Iraq and Afghanistan.

In closing, the frequent exclusion of E.F. Johnson and other vendors from bidding opportunities with public agencies makes no sense, and goes against sound public policy. All that we and other vendors seek is an opportunity to compete on a level playing field, in order to advance the interoperability goal and help public agencies nationwide.

Thank you for your attention to this issue. I look forward to hearing back from you and setting a time when we can meet to discuss this issue further. In the meantime, please don't hesitate to let me know if I can provide any additional information about our company or experience regarding this subject.

Sincerely,

John Suzuki
Senior Vice President of Sales
E.F. Johnson Technologies, Inc.
1440 Corporate Drive
Irving, Texas 75038-2401
Phone: 972-819-0700

EFJohnson TECHNOLOGIES
We Respond.

September 22, 2010

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Ranking Member
Committee on Science and Technology, Subcommittee on Technology and Innovation
U.S. House of Representatives
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Irving, Texas 75038-2401
Phone: 972-819-0700

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