

Testimony of

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*“Innovations in the Field of Emergency Preparedness”*

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## **INTRODUCTION**

Thank you Chairman Donovan, Ranking Member Payne, and members of the Subcommittee. I am Dereck Orr, Division Chief of the Public Safety Communications Research (PSCR) program, which is one of the primary federal programs conducting research, development, testing, and evaluation for public safety communications technologies. The Division is housed within the Communications Technology Laboratory (CTL) at the National Institute of Standards and Technology (NIST) in Boulder, Colorado. Thank you for inviting me to testify today about innovations in the field of emergency preparedness and specifically on emergency communications.

Our nation's first responders deal with emergencies every day. And whether it is a routine traffic stop, a multi-alarm fire, or a large-scale event, such as Hurricanes Harvey and Sandy, or the attacks on 9/11, the ability of first responders to communicate with each other, on-scene as well as through incident command, remains one of the most critical determinants of success for emergency response.

Since 2002, NIST's PSCR program has worked to drive innovation and advance public safety communication technologies through cutting-edge Research and Development (R&D). PSCR works directly with first responders and the solver community to address the public safety community's urgent need to access the new and improved technology that enhances the public safety community's ability to respond to emergencies. PSCR's mission is to research and develop the features identified by public safety identities as critical so that these features will soon be available to enhance their performance. Drawing on critical requirements provided by public safety practitioners, such as the First Responder Network Authority (FirstNet®), the PSCR program provides insight to wireline and wireless standards committees developing standards for voice, data, image, and video communications.

Since June first of this year, approximately 235 miles southwest of the NIST labs in Boulder, a significant wildland fire has been burning. The fire spans almost 55,000 acres and is currently only 50 percent contained. This incident has required the deployment of almost 1000 personnel, as well as 24 engines, seven helicopters, and two fixed-wing aircraft. This is a complex response requiring reliable communications and constant situational awareness. The primary means of communication for this response effort is Land Mobile Radio (LMR), a proven narrowband technology that is used for mission-critical voice communications; you might be familiar with LMR as "push a button to talk" technology. Almost all information, such as changes in fire behavior, personnel and asset location, status updates, and weather conditions, will be transmitted via these radios.

Now, imagine a world in which future technology—for example, highly deployable drones with autonomous flight controls—serve as communications hubs, allowing for not only voice communications, but location-mapping, video analytics, and real-time weather updates.

Imagine that all of this information could be easily transmitted to first responders' broadband devices, such as smartphones, tablets, and even heads-up displays. Putting this technology in the

hands of first responders would help them assess emergency scenarios safely and smartly before sending in personnel. It would help them reduce harm to people and damage to property. It would help them avoid unnecessary injury or death.

Congress did much to lay the groundwork for this vision in the Middle-Class Tax Relief and Job Creation Act of 2012, which, among other things, charged NIST with utilizing up to \$300 million from the Public Safety Trust Fund to conduct research and assist with the development of standards, technologies, and applications to advance wireless public safety communications.<sup>1</sup>

At PSCR, we believe this future is achievable, and we are working to accelerate its arrival.

## **FUTURE TECHNOLOGIES**

Getting cutting-edge technology into public safety community's hands for day-to-day operations can be a difficult task. For example, using a smartphone while wearing structural firefighting gloves is almost impossible. Having to aggregate and make sense of millions of pieces of information coming in from multiple sources, including from sensors, video cameras, and social media, while simultaneously responding to an active incident, is not effective. Many technology products designed for broader commercial markets do not provide solutions specific to the needs of the public safety community. Given this reality, research carried out at NIST can be nothing short of transformative, helping to focus the attention of product manufacturers and service providers on critical public safety research and development. I would like to describe for you a few of the ways in which PSCR is doing this.

First, we conduct internal research at our laboratories, where PSCR serves as the objective technical advisor for critical public safety communications technologies. Over 45 division staff and an additional 50 researchers from other NIST labs and divisions are researching and developing communications technologies and measurement standards across five key public safety research areas:

- Integrating the Long-Term Evolution (LTE) technology that powers most mobile phones with traditional first responder LMR technology for the period of time that these two technologies will coexist;
- Making mission critical voice capabilities available on LTE broadband devices;
- Enabling location-based services for personnel and assets, especially inside of buildings;
- Enhancing user-interfaces for accessing and transmitting complex information; and
- Promoting public safety analytics tools that will help the public safety community make use of the large amounts of data that will be available to them.

Some of our most recent lab projects include:

- Using a backpack outfitted with *Light Detecting and Ranging* technology, otherwise known as LiDAR, which emits a pulsing laser to quickly and easily

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<sup>1</sup> Public Law 112-96, Section 6303.

map and develop three-dimensional models of buildings for the creation of enhanced maps and location tracking for response activities;

- Developing a Virtual Reality (VR) Test Environment for assessing which future user-interfaces will have the largest improvement on public safety operations;
- Creating mission-critical voice measurement methods that will allow public safety and industry to compare LMR with LTE, so as to determine when and if transition to LTE is possible for voice communications; and
- Working with industry partners to prototype small, self-contained LTE “networks in a box” that responders could be rapidly deploy using drones to establish communications anywhere.

Second, PSCR puts substantial resources into promoting the development of these technologies externally, through the Public Safety Innovation Accelerator Program (PSIAP). The PSIAP is carried out primarily through grants, cooperative agreements and Open Innovation Prize Challenges. These PSIAP efforts give NIST access to experts and innovators from around the world, and greatly expand the number of researchers focusing on key public safety communications issues. In 2017, PSCR awarded \$38.5 million in grants and cooperative agreements to 33 recipients--including teams from New York University, Rutgers, the Atlantic City Police Department, and the State of New Jersey Office of Homeland Security and Preparedness.

Through PSIAP, we are accelerating research in the areas of mission-critical voice, data analytics, location-based services and network resiliency. Thus far in Fiscal Year 2018, we’ve engaged PSIAP award recipients both with grants and Open Innovation Prize Challenges. To date, we have awarded \$6.1 million in grants and cooperative agreements to seven recipients for research into enhanced user interfaces. In addition, we anticipate that over \$4 million in additional federal funding opportunities for mission-critical voice and location-based services will be awarded by the end of this fiscal year.

In 2018, PSCR has launched and completed its first two technology-based prize challenges, with total prize amounts of \$400,000. These challenges were focused on baselining the maximum flight time possible for a drone carrying a payload similar to our “network-in-a-box” prototype, and on using the Virtual Reality Test Environment to develop effective in-building navigation interfaces for future first-responder heads-up-displays. Through these challenges, we have had the opportunity to engage with innovators from all walks of life (e.g., professionals, academics, and hobbyists), see companies and partnerships form, and witness people become passionate about using their skills and knowledge to help the public safety community even after the competitions have ended. I firmly believe that encouraging these open partnerships between public safety, private industry, and academic institutions is strengthening the pace of--and passion for--delivering tangible solutions. Whereas just two years ago the PSCR footprint extended little beyond our laboratories in Colorado and Maryland, today, roughly 150 entities from around the world are engaged in bringing innovation to public safety. Never before has there been such focus on communications technology R&D benefitting first-responders.

Between 2013 and 2016, PSCR engaged hundreds of public safety, government, and industry stakeholders through workshops and summits to publish targeted R&D roadmaps. PSCR

leverages these roadmaps and continues to gather input from our diverse stakeholder base to develop our innovation strategy and program plans. We also work closely with our partners at FirstNet, the National Telecommunications and Information Administration (NTIA), the Department of Homeland Security (DHS), the Department of Justice (DOJ), and the Federal Communications Commission (FCC), to ensure effective coordination mechanisms are in place to support our shared public safety mission. These communities and partnerships are fundamental to the success of the program, because, as noted by an attendee at our Annual Public Safety Stakeholder Meeting, *“it may be the greatest technology in the world, but if it doesn’t help first responders, they’re not going to adopt it.”* We at PSCR are laser-focused on helping first responders.

In closing, I’d like to highlight the PSCR tagline: *“Pulling the Future Forward.”* By statute, NIST’s window within which it must obligate monies from the Public Safety Trust Fund will end in 2022, now just four years away. To make the best use of the resources provided to us within this timeframe, we are making special efforts to focus our R&D and program plans by employing the following three criteria, which any PSCR initiative must satisfy: first, it must address an urgent and unmet need; second, it must not be redundant with what is happening in the private sector; and third, it must transform the public safety mission. This is our success framework.

NIST is committed to reducing the time by which public safety will get access to these key technologies by accelerating the pace of research in these areas and expanding the number of researchers focused on the mission. By establishing measurement methods, enlisting new research recruits, and developing proof-of-concept methodologies, all with traceable links to public safety, we will transform the future of emergency response--making the best possible use of time, talents and resources.

Thank you for the opportunity to testify about NIST’s work regarding innovations in emergency preparedness technology. I will be pleased to answer any questions you may have.



## **Dereck Orr**

Dereck Orr is the Division Chief of the Public Safety Communications Division at NIST's Communications Technology Laboratory (CTL). He has also served as the Program Manager for the Public Safety Communications Research (PSCR) program since 2002. The PSCR program acts as an objective technical advisor and laboratory to the public safety community 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. Prior to that, Mr. Orr served four years at the Office of Community Oriented Policing Services (COPS) at the Department of Justice.

### **EDUCATION.**

Masters in Public Policy, College of William and Mary

Bachelor of Arts, University of Texas at Austin.