July 2016



Welcome to the PSCR Newsletter!

Dear Partner,

I am excited to announce the launch of the Public Safety Communications Research (PSCR) Program's Quarterly Newsletter. We will use this newsletter to share information, news, and insights on PSCR's current programs; highlight research and development activities; and announce engagement opportunities.

Since PSCR's inception, we have worked to accelerate the adoption and implementation of critical public safety communication technologies through cutting-edge research and development. We cannot achieve this mission without continued coordination and collaboration with the public safety community, industry, academia, and government partners. Our hope is that this newsletter will enhance our relationships with our stakeholders by providing glimpses into our current efforts and identify partnership opportunities.

We want this newsletter to be valuable to our partners, we encourage you to share your suggestions and feedback to help us improve our outreach.

Thank you for your support,
Dereck Orr
Chief of the NIST Public Safety Communications Research Division

Accelerating Innovation in Public Safety Communications

The Middle Class Tax Relief and Job Creation Act of 2012 marked an unparalleled push toward interoperability and next-generation technologies for the public safety community. The landmark provisions contained within the

Upcoming Events

Public Safety Analytics Summit
August 3-4, 2016
Department of Commerce
Boulder Labs
For questions, please email
Marc Leh at

legislation provided a dedicated funding source for the deployment of the Nationwide Public Safety Broadband Network (NPSBN), a dedicated, interoperable network for first responders. The Act also directed the National Institute of Standards and Technology (NIST) to utilize up to $300 million of funds raised from the AWS-3 spectrum auction to establish a Research and Development (R&D) program to advance public safety's communications technology capabilities.

The Public Safety Communications Research (PSCR) program established the Innovation Accelerator program in January 2016; the R&D initiative includes two key focus areas specified in the legislation; accelerating the deployment and implementation of Mission Critical Voice capabilities over broadband; and enabling the integration and migration of communications from Land Mobile Radio (LMR) to Long Term Evolution (LTE). In addition, the legislation called on NIST to advance broadband technologies beyond what they are capable of today. To do this, the PSCR has worked with stakeholders from public safety, industry, academia, and government to identify R&D priorities that have crosscutting positive impacts for the public safety community, including Location-Based Services, Public Safety Analytics, and Enhanced User Interfaces. We are developing technology roadmaps for each of these three areas to better understand the current state of the technology, forecast the evolution of capabilities and gaps, and identify potential R&D opportunities. To date, we have published two of the three roadmaps; Location-Based Services and Public Safety Analytics. In May, we kicked off planning efforts for the Enhanced User Interface roadmap. This cross-disciplinary approach will enable us to make better informed R&D decisions that will provide the greatest benefit to public safety practitioners.

For the first time, we have the unique opportunity to not only identify technology gaps, but to spur the development of innovative solutions. The Innovation Accelerator will leverage grants, cooperative agreements, and prize challenges to foster innovation in communications technologies. The private sector and federal government alike have leveraged a prize challenge approach to make significant technological strides and reach beyond their normal repository of problem solvers to identify cost-effective solutions to the nation's most complex problems. We are looking forward to announcing these opportunities and working with new partners to promote technology advancements for public safety communications.

We will continue to keep you up-to-date on the status of these efforts.

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2016 Public Safety Broadband Stakeholder Meeting - Pulling the Future Forward



Jeb Benson introduces the Public Safety Analytics Panel at the 2016 Public Safety Broadband Stakeholder Meeting.



Meeting attendees take advantage of this year's demonstration booths.

In early June, PSCR hosted its 7th annual Public Safety Broadband Stakeholder Meeting in San Diego. It focused on the strides made towards the deployment of a dedicated broadband network for public safety, its supporting technologies, and a glimpse into key research and development (R&D) projects that will make it a reality.



Dereck Orr, PSCR Division Chief opened this year's meeting by introducing the Innovation Accelerator. He emphasized PSCR's goal to push innovation to new boundaries in order to identify cost effective solutions that meet public safety's unique needs. Throughout the meeting, we heard from leaders in public safety communications and subject matter experts on the work being done across public safety, government, industry, and academia to accelerate the development of mission critical public safety communications technologies.

FirstNet Chair Sue Swenson delivered the opening keynote. She focused on the shift from concept to implementation as FirstNet works through the evaluation phase of the Nationwide Public Safety Broadband Network (NPSBN) Request for Proposal process. She highlighted the continued focus on excellence in execution to ensure the effective deployment of the network.

The meeting featured panel discussions that provided an in-depth look into several of the Innovation Accelerator's main focus areas including Mission Critical Voice, LMR to LTE integration, Location-Based Services (LBS), Enhanced User Interface (UI), and Public Safety Analytics. The panels addressed PSCR's collaborative roadmapping process for identifying R&D priorities that will lead to PSCR R&D projects. The meeting also featured breakout sessions on the Innovation Accelerator Prize and Challenge Competitions, which highlighted how the input gathered during the roadmapping process will be used to shape the scope and requirements for upcoming competitions to help identify solutions to PSCR project areas.

There were many more dynamic sessions that provided snapshots into the exciting work that has been done across the world to advance public safety broadband capabilities. As the 2016 meeting closed, PSCR reemphasized it's commitment to continued collaboration with practitioners, stakeholders and research partners to advance communications and access to cutting-edge technology for public safety.

In the Lab - Research and Development Updates

By Tracy McElvaney

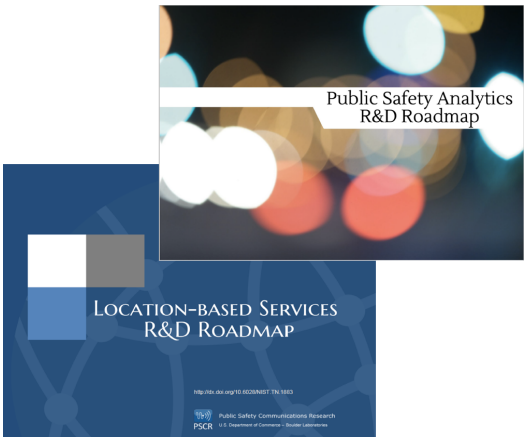
Where do you begin when you are asked to write the inaugural installment of the Research and Development (R&D) update for the first edition of the PSCR Newsletter? Certainly not at the beginning! Short and sweet was the direction given by our program office.

So, welcome to the PSCR R&D update. Today, I am focusing on the R&D program highlights. In future installments, we'll delve more into specific areas of research. Here we go!

Teaming for Success

PSCR launched the NIST Public Safety R&D program in late 2014. In addition to the NIST program, we continue to work closely with our Federal Sponsors at the Department of Homeland Security and FirstNet. PSCR prides itself on being practitioner driven and highly engaged with Public Safety stakeholders. We currently have more than 30 active tasks across 64 researchers and 60 active Cooperative Research and Development Agreements (CRADA) in the Broadband II Consortium. Approximately 70% of our R&D staff come from outside of PSCR through Inter-Agency and Reimbursable Agreements. In addition to leveraging the NIST Communications Technology Laboratory (CTL) capabilities and a long term R&D partnership with the NTIA Institute of Telecommunications Sciences, PSCR partners with the NIST Information Technology Laboratory (ITL) and the Physical Measurement Laboratories (PML) for advanced communications research.

PSCR R&D Roadmapping



We continue to make great strides on the R&D roadmapping efforts. The Location Based Services (LBS) Roadmap which was published in May 2015 was the first in a series of roadmaps which help to identify priority research areas for public safety beyond broadband communications. To date, we have published the findings from the Location Based Services Summit which further refines the R&D priorities Public Safety feel are most critical to the advancement of LBS and the Public Safety Analytics Roadmap. PSCR announced the launch of these R&D programs in early June at the 2016 Public Safety Broadband Stakeholder Meeting. We were also excited to announce the kickoff of the Public Safety User Interface Working Group which is focused on creating the next roadmap in the series, and the Analytics Summit which will be held in Boulder at the NIST labs in early August.

NIST Public Safety R&D

The Middle Class Tax Relief and Job Creation Act of 2012 directed NIST to focus research efforts on Mission Critical Voice (MCV), Land Mobile Radio (LMR) to Long Term Evolution (LTE) integration and eventual migration, and technologies beyond broadband that are vital to public safety communications. At present, we are working hard in the labs to spin up the LBS and MCV programs.

On the LBS front, PSCR has zeroed in on a solid first step aligning with the outcomes of the LBS Summit. Our priority focus will be accelerating the realization of persistent sub-meter accuracy in 3 dimensions, including the ability to visualize this in situational awareness applications. While the lab works on deployment of CRADA solutions in order to support this work, PSCR has sponsored advanced research topics with our R&D partners in the ITL and PML laboratories. Our ITL partners will be leading 3D Map Visualization capabilities and the creation of a testbed to allow for the validation of an ISO testing standard for location based technology solutions (ISO/IEC 18305), while our PML partners will be focused on advanced position, navigation and timing solutions (PNT), and aiding in identification of viable ways to achieve sub-meter persistent location for Public Safety. The goal of these advanced R&D programs is to identify technology gaps which can be addressed through innovation challenges and Federal Funding

Opportunities.

The MCV program had a great round table discussion with Public Safety practitioners and stakeholders in early March. As a result of this meeting, key capabilities, performance indicators and challenges were identified as necessary to achieve MCV capabilities on broadband. This information will be used to create a baseline evaluation of LMR and current LTE Push-to-Talk solutions in order to identify key barriers in accelerating a nationwide mission critical voice solution. Both the LBS and the MCV programs intend to rely heavily on the PSCR Innovation Accelerator program in order to pull in the timeline and availability of advanced solutions for Public Safety.

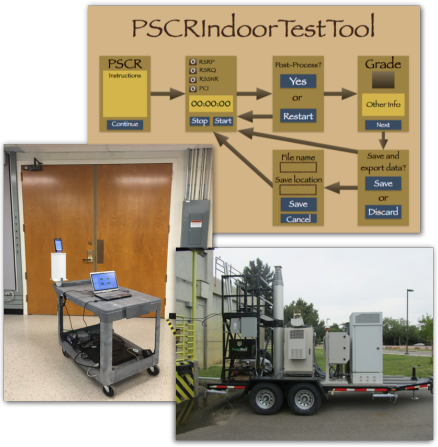
Sponsored Research

As we ramp up new work NIST R&D work, PSCR sponsored work with FirstNet and DHS is in full stride. Our current FirstNet priorities are to focus on advancing the concept of dynamic Quality of Service and Priority management for Public Safety by working with CRADA partners to better understand the nuances of managing priority in complex network environments such as encrypted Mobile Virtual Private Network connections and through secondary access through In-Vehicle Routers supporting Wi-Fi hotspots. PSCR is also focused on aiding FirstNet in developing strategies for mobile application security vetting and Identity Management and Credentialing (ICAM) solutions. PSCR continues to support FirstNet and Public Safety Advisory Committee (PSAC) task team efforts as well as outreach events, like the Statewide Interoperability Coordination and the annual Western Fire Chiefs Association events.

DHS enlists PSCR to perform research in areas that directly benefit First Responders. Important topics like development of a conceptual Local Control Application Programming Interface, evaluation of audio intelligibility of Broadband vocoders in loud noise environments and devising measurement methods to aid Public Safety's ability to assess and convey in-building coverage with smart phones are some of the key areas of focus. The team is also working hard to evaluate Deployable System capabilities and limitations, and are leveraging that experience to work closely with early builder programs.

In the Lab

Last, but not least, we are always busy in the lab developing our test and evaluation capabilities. The PSCR program has a long history of maintaining a demonstration network which supports research, but also provides a demonstration experience for stakeholders and practitioners to make forward looking work more real.



Our current lab priorities are to integrate a virtualized IP Multi-Media subsystem which will enable Voice over LTE support and also allow for research in the area of IMS enabled mission voice areas of focus. We are also working toward improving our ability to develop and leverage mobile applications in research as well as continually improving our laboratory security and evolution in support of upcoming research.

Crowdsourcing Solutions for Public Safety Communications

By Tammi Marcoullier

"No matter who you are, most of the smartest people work for someone else." -Bill Joy, co-founder, Sun Microsystems

Companies and government agencies have used prize and challenge competitions to find solutions to tough problems for hundreds of years. As a form of crowdsourcing, prize competitions incentivize broad

and diverse groups of people to contribute solutions to a problem. Examples of familiar and fantastic results include the invention of the canning process, accurately measuring longitude, the first transatlantic flight, and more recently, private space flight.

The U.S. government launched an umbrella prize program in September 2010 (www.challenge.gov) that has run more than 700 competitions with more than $230 million in prize money and other incentives; PSCR is now using this tool to improve public safety communications technology.

PSCR plans to leverage open innovation crowdsourcing activities over the next six years as part of their Innovation Accelerator program. This means that any person, team, entrepreneur, inventor, or company can participate. We are looking to broaden and diversify the pool of contributors to public safety's most pressing technology issues. Where do you fit in? There are five key areas the prize team will focus on:



- Location-Based Services (LBS)
- Land Mobile Radio (LMR) to Long Term Evolution (LTE)
- Mission Critical Voice over Broadband
- Enhanced User Interfaces (UI)
- Public Safety Analytics

"In challenge competitions, you ask people to do the impossible, in a completely unreasonable amount of time." - Dr. Alok Das, Air Force Research Lab

Some of the key attributes of prize-based crowdsourcing are:

- Prize challenges have clearly defined problems. They ask solvers to reach a goal, milestone, or other outcome. It is not about requirements -- participants can determine creative ways to solve the problem and reach a goal.
- Participation is open. You don't need to qualify with credentials, connections, or industry experience.
- There is no required work once the prize has been awarded. Sometimes there are opportunities to continue, but generally there is no obligation, nor are there requirements about how winners must spend the prize money.
- These are challenges intended to spur leaps in innovation, which means executing this program on accelerated timelines. Some competitions will take place in 30-90 days, others over the course of a year, depending on complexity.
- Multiple winners are great! We aren't looking for a "needle in a haystack" solution, we're looking to build a haystack of needles. The more viable and feasible options exist, the better the chances of transitioning the winning solutions into marketplace products and solutions.

We are looking to collaborate in a multitude of ways, including working groups, judging opportunities, partners, and participants/solvers.

PSCR will post every competition on http://bit.ly/PSprizes, a program-specific page on Challenge.gov. The page includes a discussion board for questions and ideas, and when live, will include a full description of each competition and winner announcements. Email questions to PSprizes@nist.gov.

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