Testimony of

Daniel M. Cotter
Director, First Responders Group
Science and Technology Directorate
U.S. Department of Homeland Security

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Chairman Donovan, Ranking Member Payne, and distinguished members of the committee, thank you for inviting DHS to speak with you today. I appreciate the opportunity to discuss the Department of Homeland Security (DHS) Science and Technology Directorate's (S&T) work in "Using Innovative Technology and Practices to Enhance the Culture of Preparedness."

I have been the Director of the First Responders Group (FRG) for the last three years and have over 30 years of experience working on programs related to preparedness. Prior to my time at FRG, I served as the DHS Chief Technology Officer and Geospatial Management Officer. In addition, my career has included seventeen years of experience working for the Federal Emergency Management Agency (FEMA), the U.S. Army Corps of Engineers, and the U.S. Geological Survey, and a decade of experience working at the executive level in the private sector. My experience in this field led to my selection as a Fellow of the American Association for the Advancement of Science in 2005.

Culture of Preparedness

FEMA's Strategic Plan for 2018–2022 sets clear goals for building a culture of preparedness and readying the nation for catastrophic disasters. The strategy recognizes the critical roles that state, local, tribal, and territorial (SLTT) governments, as well as the private sector and non-governmental organizations (NGOs), have in preparedness and response.

S&T, through research programs such as the Flood Apex program, Hurricane Technology Modernization, and Radiological/Nuclear (Rad/Nuc) Response and Recovery project, is delivering innovative capabilities for FEMA to help meet these goals. These include new capabilities that were used operationally by FEMA during the 2017 hurricane season.

Critically, all of these programs are based not only on our partnership with FEMA, but also on a strong, collaborative focus with our SLTT, private sector, and NGO partners. Through these collaborative efforts, we are working with FEMA to ensure that the results of our research increase disaster response and resiliency at all levels of governments.

The vast majority of incidents are handled at the local and state level. For example, first responders and emergency management officials handle over 240 million 911 calls per year, rarely requiring any form of assistance from the federal government. However, in those rare instances when the SLTT community requests the support of the federal government, it is paramount that the responding federal community is instantly interoperable with the SLTT community, able to communicate, and share mission critical data. Federal authorities' ability to integrate to a wide variety of local needs is essential for rapid and effective response. Technologies and standards to share data range broadly from the status of first responder resources in the impacted area to the status of critical infrastructure, including energy, water, communications, and transportation lifelines.

Additionally, improved modeling, data analytics, and mitigation techniques are critical to increase resilience. The need for technologies to ensure interoperable communications and information sharing between and amongst the nation's tens-of-thousands of governmental units and first responder organizations is more critical than ever before.

The Role of Research and Development

S&T is unique and essential in its ability to perform research for our operational components and across the Homeland Security Enterprise. DHS S&T has statutory responsibilities to perform research to develop new technologies that enhance safety and efficiency for all first responder disciplines, such as enhanced personal protective equipment, and ensure public safety voice and data communications interoperability between and among the federal government and the SLTT public safety community.

S&T understands that having the right technology in the hands of the nation's 3.3 million first responders can save critical minutes or seconds—and reduce injuries, save lives, and limit property damage. S&T plays an indispensable role in the federal government conducting critical research and development for first responders across all disciplines and at all levels of government. These responders serve in over 70,000 organizations across the nation including not just FEMA, but DHS operational components, such as the U.S. Immigration and Customs Enforcement (ICE), U.S. Customs and Border Protection (CBP), Transportation Security Administration (TSA), U.S. Coast Guard (USCG), U.S. Secret Service (USSS), and the National Protection and Programs Directorate (NPPD). The needs of responders and the public are at the center of every decision FRG makes. That is why S&T partners with agencies at all levels of government by developing requirements, conducting technology scouting, leveraging existing investments, developing innovative technologies, testing and evaluating technologies, transitioning and commercializing technologies, and integrating technologies into regular use.

S&T supports operational components to address some of the most critical issues facing the Department and first responders, including: improving first responder safety and effectiveness; mitigating impacts of natural disasters; providing tools to render safe Improvised Explosive Devices (IEDs); assisting survivors from earthquakes and other disasters; identifying threats in passenger bags; saving children from human trafficking, slavery, and sexual abuse; and improving situational awareness for humanitarian assistance and disaster relief. S&T also

provides systems engineering advice to support complex, integrated technical solutions, human systems integration, architecture development, and transition and acquisition decisions.

The goal of FRG research is to ensure first responders: have the personal protective equipment they need to work safely in any environment; are never out of touch with their peers or command regardless of where they are operating; and have all information needed in real time to operate safely, effectively, and efficiently. We summarize this by saying that the first responder of the future will be: ***Protected, Connected, and Fully Aware.***

The Next Generation First Responder (NGFR) Apex Program is a five-year program that began in January 2015, and is part of a longer-term S&T commitment to envision and assist the responder of the future. NGFR continually collaborates with first responders across the nation on various projects—from developing program requirements to testing prototypes of technology. These cutting-edge technologies will improve emergency response time and accelerate decision-making to save more lives.

NGFR is comprised of more than 15 research and development projects, ensuring that responders are better protected, connected, and fully aware. NGFR is enabling new, non-traditional public safety technology developers—including startups—to easily "plug and play" their technologies into a system. NGFR reduces barriers to developing first responder technology and opens doors to entrepreneurs, while lowering costs and increasing choices for public safety organizations. NGFR is incrementally delivering these capabilities over the program cycle and will continue to partner with first responders to test and evaluate innovative technologies before they are available on the market.

FRG partners closely with NPPD's Office of Emergency Communications and the Department of Commerce's National Institute of Standards and Technology (NIST) and National Telecommunications and Information Administration (NTIA) as well as their associated Public Safety Communications Research (PSCR) program. By collaborating with these partners, as well as coordinating directly with the First Responder Network Authority (FirstNet), an independent authority within NTIA, FRG is playing an important role in the implementation of the nationwide public safety broadband network.

Traceable Requirements

As a research organization, S&T recognizes that it is a mission support organization and does not own the DHS component or first responder mission. Our job is to understand the needs of the communities and focus our research efforts into developing effective solutions. Our goal for most of our first responder research activities is to provide solutions in the 18–24 month timeframe. We make sure that these new technologies and capabilities are available to first responders by coordinating closely with FEMA to assure that these technologies can be made available on the FEMA Authorized Equipment List (AEL), and therefore eligible for purchase with federal grant dollars. This includes working with groups such as the National Fire Protection Association (NFPA) and NIST, to ensure compliance with all applicable standards.

To gather and validate requirements, S&T works directly with frontline mission personnel at all levels of government and from all disciplines. As part of this effort, S&T leads the First Responder Resource Group (FRRG), which is composed of 140 fire, emergency medical service (EMS), emergency managers, and law enforcement first responders from various state, local, and federal agencies across the country, including DHS operational components. This group meets annually to identify high priority capability gaps and to help make first responders aware of technologies that S&T has transitioned to the commercial market. The most recent meeting was held earlier this year and included over 103 attendees with representatives from DHS component agencies that included FEMA, ICE, CBP, USCG, the Federal Law Enforcement Training Centers (FLETC), and the Federal Air Marshal Service. By the end of the meeting, the FRRG members were able to help S&T identify 24 new capability gaps, which will assist in determining what new projects will be funded by S&T and ultimately transitioned to the commercial market place for the first responder community to purchase.

The FRRG process has led to dozens of cost effective solutions, such as:

- The Electronic Recovery and Access to Data Prepaid Card Reader, a card-reading device system capable of analyzing and freezing funds on prepaid bank cards that are suspected of having ties to criminal activity. The device is being used in 42 states by over 900 agencies, as well as in 3 other countries. Federal, state, local, and tribal law enforcement agencies have seized over $10 million in criminal funds after law enforcement conducted investigations and obtained authority to seize these funds through the judicial system.

- FRG developed the Wildland Firefighters Advanced Personal Protection System to provide unprecedented protection to wildland firefighters. The NFPA certified garment system improves radiant thermal protection; reduces heat stress; and improves form, fit, and function. The garments are commercially available from two manufacturers who have sold more than 20,000 garments.

- In partnership with first responders, the U.S. Army and the private sector, S&T developed the Enhanced Dynamic Geo-Social Environment (EDGE) Virtual Training tool that is available free of charge to any first responder agency across the country. S&T established a point of distribution for the software and the first environment, a multi-story hotel. Currently, 600 agencies across the nation are using EDGE, as well as two other nations. A school building environment will be available later this year and promises to help first responders and school personnel better prepare for active shooter incidents.

Tangible Results

S&T, through its FRG, has transitioned 47 products and completed 80 other projects that have resulted in knowledge products such as standards, concepts of operations, and other guidance for first responders. Working with the DHS operational components, S&T has built strong partnerships to deliver technically sound, cost-effective technologies that have yielded significant impacts including:

- Aided in identifying over 475 child exploitation victims, in coordination with ICE's Homeland Security Investigations, using advanced facial recognition tools.

- Improved emergency management mutual aid in 40 states, reducing time to identify resources from 72 hours to as little as 30 minutes.
- Partnered with 14 countries and over 40 startups to increase technology development globally and bring new technology to market more efficiently.
- Deployed the Android Team Awareness Kit (ATAK) to enhance situational awareness at national and border security events. ATAK is a tool that allows all emergency workers to share situational awareness in an unprecedented way. ATAK has already saved lives during emergency response activities by enabling 300 unique users across 17 agencies participating in the hurricane response (i.e., Hurricane Harvey, Hurricane Irma, Hurricane Maria) to share information and awareness via ATAK, which impacted 3,000 rescues.
- Supported search and rescue units across the globe, including FEMA's Urban Search and Rescue teams, by rapidly locating survivors buried under collapsed buildings after earthquakes through the use of Finding Individuals for Disaster and Emergency Response (FINDER). FINDER is a tool that detects human heartbeats under rubble piles.
- Supported radiation detection training, through the National Urban Security and Technology Laboratory, for over 2,000 law enforcement officers.
- Published over 1,000 System Assessment and Validation for Emergency Responders (SAVER) Reports—S&T's version of Consumer Reports® for responder technologies.
- Published the Radiological Dispersal Device (RDD) Response Guidance: Planning for the First 100 Minutes, co-branded with FEMA and the Department of Energy's National Nuclear Security Administration, which was incorporated into FEMA preparedness planning and training.
- Integrated the Rad Decontamination App into FEMA's RadResponder toolkit. RadResponder is a smartphone App that can be downloaded by any first responder and provides them with just in-time guidance to deal with rare radiological events.
- Created the Toolkit for Radiological Operations Support Specialist (ROSS), a FEMA National Incident Management System position developed with S&T, which is posted to RadResponder for first responder access.
- Provided technology evaluations to enhance responder capabilities during Active Shooter events, including an exercise last year with the New York Police Department, Fire Department of New York, Metropolitan Transportation Authority (MTA) Police Department and MTA Metro-North Railroad, New York State Police, and U.S. Army National Guard.
- Developed the Smoke and Particulate Resistant Structural Turnout Ensemble, the first turnout gear to offer firefighters protection from exposure to hazardous, cancer-causing chemicals. Today, there is an extremely high likelihood of a firefighter developing cancer due to exposure to hazardous chemicals and particulates.
- Developed and tested the Pat-down Accuracy Training Tool, a mannequin with embedded sensor technology that provides objective feedback on pressure, sequence, and coverage during pat-downs at four airports and the TSA Academy.

S&T Innovations and Preparedness

Working with FEMA in supporting the strategic goals of a culture of preparedness and readying the nation for catastrophic disasters, S&T is collaborating with federal, state, local, territorial,

and tribal governments, as well as the private sector and non-governmental organizations to advance a whole-of-community approach to increase disaster preparedness.

Shaken Fury

This includes support to FEMA's 2019 national exercise Shaken Fury 19, which S&T is using to help elevate regional resilience in the New Madrid Seismic Zone through the generation and adoption of new information sharing technologies and protocols that will enhance shared situational awareness between critical response and recovery organizations and their associated operations centers. This transition of new innovations and technologies is facilitated through a strong standing relationship with the Central United States Earthquake Consortium (CUSEC), an association of eight member and ten associated states.

Within the scope of Shaken Fury 19, S&T is working with FEMA and CUSEC, as well as the Department of Defense and the National Guard, to integrate several new candidate capabilities such as:

- CUSEC Regional Common Operating Picture enhancements
- Tools and guides to improve situational awareness and emergency management response
- Mutual Aid Resource Planner
- New technologies for communications restoration, including the next generation of deployable communications infrastructure
- Autonomous mass casualty patient monitoring and tracking
- Use of unmanned aerial systems for damage assessment
- Testing of S&T sponsored low-cost flood sensors

S&T recognizes the importance of capturing lessons learned from events such as Shaken Fury 19; therefore, S&T has developed an Incident Management Information Sharing Capability Maturity Model (IMIS CMM) that provides a means for the SLTT community to objectively assess their ability to share information with partners. Assessment results will be used to steer corrective actions to increase interoperability between all levels of government.

Flood Apex program

The Flood Apex program was created at the request of the Administrator of FEMA to bring together new and emerging technologies designed to increase communities' resilience to flood disasters and provide new decision support tools to FEMA, state and local governments, and other stakeholders. The Flood Apex program is focused on six research challenges:

- Reducing flood fatalities
- Reducing uninsured losses
- Improving mitigation investment decisions
- Enhancing community resilience
- Improving data and data access
- Improving modeling and predictive analytics

To address these challenges, S&T is focused on:

- New flood sensors and alerting
- Smarter remote sensing and situational awareness

- New products from high performance computing and artificial intelligence
- Realigned economic incentives and risk analysis

While the Flood Apex program is not scheduled for completion until FY 2020, research products are already transitioning into operational use. These include the use of deep learning techniques with high-resolution satellite and aerial imagery, to produce building outlines needed by FEMA for recovery operations. Over the course of hurricane response and recovery operations, S&T delivered over 19 million building outlines across eight states, Puerto Rico, and the Virgin Islands. These outlines supported a variety of federal and SLTT emergency management and first responder functions and activities. FEMA alone used these data to expedite over 115,000 damage assessments. The Flood Apex technologies helped support FEMA in speeding the release of over $200 million in disaster assistance to survivors.

Other technologies, such as the low-cost flood sensors, Observed Flood Extent, and HAZUS Tsunami Module, have been proven and are now moving to various states of adoption and use. We are working with the Association of State Flood Plain Managers and others to stimulate flood-proofing innovation and advance flood mitigation. These innovations include pursuing development of nationally recognized standards for flood proofing products, such as water proofing materials, semi-permeable barriers, and smart sensors.

Ongoing Flood Apex research is supporting FEMA in the areas of flood insurance research, working with leaders in the private sector and academics. FEMA recognizes that insurance is one of the most important disaster recovery tools. Our research is focused on helping FEMA to close the insurance overage gap in the area of flood insurance.

Wireless Emergency Alerts

S&T's research and development efforts are also having game changing results on emergency alerts, warnings, and notifications to communities across the nation. S&T led an effort to improve geo-targeting capabilities and public response to alerts and warnings. In partnership with FEMA, the Federal Communications Commission (FCC), and the wireless industry, S&T helped develop Wireless Emergency Alerts (WEA) to enable the dissemination of alerts to mobile devices and the geo-targeting of specific locations so that only people in the affected area are notified. As part of FEMA's Integrated Public Alert and Warning System, WEA enables the distribution of Presidential alerts, AMBER alerts, and imminent threat alerts (e.g., hurricanes and tornadoes, where life or property is at risk) to mobile devices, including cellular phones and pagers. The FCC adopted FRG's research findings and recommendations on message effectiveness, increased character length, addition of URL links, pictures, and videos to the alerts, and employed new technology to support geo-targeting functions. In the last 5 years, WEA has been used to issue over 35,000 emergency alerts. The National Weather Service has sent well over 33,000 WEA alerts. California officials used WEA 4 times in response to the 2017 wildfires in Northern California, and 16 times for the Los Angeles area wildfires to successfully move citizens to safety. WEA was also used extensively in all areas affected by the 2017 hurricanes, including 21 WEA alerts sent in Puerto Rico. Additionally, WEA provides awareness that has aided in the recovery of missing children. In 2016 alone, 179 AMBER Alerts

were issued in the U.S. involving 231 children. Since system deployment in 2012, WEA has been credited with the safe return of 47 missing children.

Response and Defeat Operations Support (REDOPS)

Recognizing a gap in responding to IEDs, S&T launched the REDOPS program, a collaborative effort with the Federal Bureau of Investigation (FBI) and the National Bomb Squad Commanders Advisory Board to develop render safe countermeasures for the nation's 466 bomb squads. REDOPS develops innovative tools, as well as Tactics, Techniques, and Procedures to support state and local bomb squads. Results of this research have been published in nine Special Technicians Bulletins and 16 Test and Evaluation Reports and have been incorporated into trainings by the FBI's Hazardous Device School.

Interoperable Communications

One of S&T's key statutory responsibilities is in the area of ensuring first responder communications and data interoperability. It is the objective of S&T research in the area of interoperable communications to ensure that responders are always connected, even in the most challenging environments. S&T has a long history of collaboration with NPPD/OEC and NIST/PSCR on developing solutions for interoperable communicators based on LMR technologies.

First Responder Electronic Jamming – Without radio and cellular communications, first responders' safety is imperiled and their ability to perform their mission is jeopardized. S&T has continued to conduct extensive research into the impacts and mitigation of both intentional and unintentional jamming. Over 1,000 first responders at the federal and SLTT levels have participated in our innovative research and field experimentation over the last several years. As a result of these efforts, we have been able to produce technical guidance on jamming detection and mitigation for the first responder community and we are working with the private sector equipment manufacturers to help improve communications resiliency. Additionally, S&T and the FCC released a joint alert to the law enforcement community with findings from the 2016 First Responder Electronic Jamming Exercise, which has reached more than 100,000 stakeholders. The most recent exercise, held in 2017, evaluated how tactics and technologies could help first responders identify, locate, and mitigate the impact of jamming threats.

Datacasting – First responders often have problems sharing mission-critical information, especially video, when networks become overloaded. S&T supported the development of a datacasting capability, which enables voice and video communications to be transported via existing broadcast television signals to deliver encrypted data to targeted recipients. S&T conducted various datacasting technology pilots with the city of Houston. As a result of these pilots, Houston Fire Department is currently using datacasting technology during operations. Specifically, the Houston Fire Department used datacasting technology to stream video from boots on the ground back to command centers to provide situational awareness during Hurricane Harvey response. The investment in

datacasting technology has helped to enable reliable video transmission during large-scale events where bandwidth and network capacity are usually problematic. Further, S&T is working with FLETC to conduct a datacasting technology pilot to improve responder training in fall 2018.

Information Sharing – We are working to provide first responders with the information they need in a timely manner and provide intelligent technologies that will help them filter through meaningless information and manage their communications seamlessly and without losing time and focus. This includes our partnership with NASA JPL to develop artificial general intelligence for first responders, a cutting-edge digital assistant that provides data analytics, and alerting and analysis. We have conducted testing of this technology in the field and the feedback from first responders and experimentation results have been extremely promising.

Project 25 Compliance Assessment Program (P25 CAP) – S&T is improving Land Mobile Radio (LMR) interoperability through P25 CAP, which has a rigorous process to ensure radio systems are demonstrated to be compliant to standards and interoperable. The program affects well over one million devices in use today. S&T significantly enhanced the program to address new interfaces and standards and formed a new partnership with the Department of the Interior to establish a laboratory to test new interfaces not tested before, which will also have a potential impact on interconnection of LMR systems to FirstNet.

Additionally, we have also developed an Integration Handbook, as part of the NGFR Apex program, to guide industry in development, design, test, and integration of responder technologies. This handbook outlines a "plug-and-play," standards-based environment that enables commercially-developed technologies to integrate and interoperate. Once we have completed our coordination with industry and the first responder community, we hope that the Integration Handbook will become a key reference for first responder communications interoperability and part of the FEMA AEL guidance.

Our research also extends into areas of close cooperation with PSCR. Some examples include:

- Cooperation and coordination of research on in-building location services
- Use of LIDAR "point clouds" for situational awareness and 3-D mapping
- Coordination of R&D on communications resiliency (participation in First Responder Electronic Jamming Exercises)
- Coordination of deployable communications in adverse environments

Hurricane Evacuation Planning and Decision Making

We have collaborated with FEMA and the U.S. Army Corps of Engineers, as well as state and local emergency managers to develop the nation's next hurricane evacuation planning and decision support system. This new system, called Web-Based HURREVAC, provides an anywhere, anytime, any device, mobile decision support and training platform for emergency managers during hurricanes. HURREVAC is being used by emergency managers in Atlantic and Gulf costal states, Hawaii, the U.S. Virgin Islands, and Puerto Rico, and will be operational for

the 2019 hurricane season to support 25,000+ emergency management stakeholders. This new system provides innovative visualizations of hurricane data and information for evacuation planning and decision making, reducing uncertainty at all stakeholder levels and improving shared understanding of available weather information and developing threats. Using this innovative technology to enhance preparedness will directly impact local communities by lowering the probability of over evacuations, avoiding unnecessary costs, as well as lowering the probability of under evacuations, saving lives.

Training and Virtual Reality

Providing effective, realistic, and effective training tools for first responders is another role played by S&T. In addition to EDGE, S&T is developing virtual Incident Command System (ICS) training tools for firefighters, as well as training tools for TSA and CBP.

We provided 45 ScreenADAPT® systems to TSA and conducted evaluations with hundreds of Transportation Security Officers (TSOs) on single and dual view systems at eight airports across the nation. ScreenADAPT® uses eye tracking technology to examine visual search performance and adapt to trainee's needs in real-time. In some evaluations with TSOs, ScreenADAPT® increased efficiency and effectiveness of trainees, reducing false alarms, and the need for unnecessary manual secondary bag searches that can slow checkpoint throughput. S&T developed a web-based version of ScreenADAPT® and transitioned it to USSS to provide a distributed capability for advanced X-ray image analysis training to 500+ uniformed USSS officers. S&T also developed and implemented the Eye-dentify system, building off ScreenADAPT®, at the FLETC CBP Field Operations Academy providing enhanced impostor detection training. Eye-dentify tracks an officer/agent's eye movements during training to determine where, how long, and in what sequence a trainee is looking at an ID or a face.

The U.S. Border Patrol (USBP) identified a need for improved tracking training tools, methods, technologies, and capabilities. Tracking, also known as "sign cutting," is executed to find evasive, hidden, or missing people along our nation's borders. S&T conducted an analysis of existing training, as well as in depth interviews, ride-a-longs, and walk-throughs at various border locations. S&T then created comprehensive, video-based training utilizing both 2D and 3D videos that have been incorporated into the new training program for all newly hired agents at the USBP Academy at FLETC. USBP Academy and FLETC representatives have collaborated with S&T to provide iterative requirements and for the development of a comprehensive web-enabled Signcutting and Tracking Training module that is being transitioned to provide a distributed capability for both new hire and recurrent/refresher training.

National Urban Security and Technology Laboratory (NUSTL)

NUSTL has been helping to secure American Cities against threats for over 60 years, delivering innovative technology, training and science in 41 states and 306 cities across the country. This program is the DHS lead for testing of UAS counter measures technologies. In addition, the Laboratory develops and transitions to operational use rad/nuc response and recovery tools. These include modeling and simulation tools, radiological dispersal device guidance, and

creating a nationally recognized position definition for a Radiological Operations Support Specialist. Through these efforts, NUSTL is enabling FEMA to:

- Increase capability at all levels of government to manage and characterize complex and catastrophic incidents.
- Improve responders' ability to save lives during the initial response operations of a radiological incident.
- Minimize impact to community and economy through improved methods of incident stabilization, radiological clean-up, and recovery.

Future of Innovation

The advent of the era of "Big Data" and the "Internet of Things," combined with the emergence of a way to discover and move vast amounts of data and information that will result from the public safety broadband initiative, paves the foundation for our ability to make rapid progress towards building a culture of preparedness and readying the nation for catastrophic disasters. The new tools S&T is working on in the areas of modeling and simulation, data analytics, and artificial intelligence will provide unparalleled capabilities to FEMA and the SLTT community to understand their hazards and risks, mitigate, respond, and recover.

With the pace of innovation only accelerating, the power of information and technology in the hands of our first responders will increase dramatically over the next decade. S&T research, driven by the requirements of FEMA, other DHS operational components, and the first responder community, will be an indispensable part of this acceleration of first responder capabilities. As first responders become safer and ever more efficient in the mission, the capability of communities to withstand, recover from, and respond to catastrophic events will increase.

Combine these advancements with more effective insurance coverage and tools, mitigation programs enhanced with better analytics and products, and far more efficient and effective interoperable communications, and we can be optimistic for a future characterized by increasing disaster resilience at the local and state level.

S&T is adding value at the intersection of Smart Cities and Internet of Things (IoT) through the integration of new and existing technologies applied to public safety needs with an emphasis on commercialization through industry partners. S&T funded programs to advance technologies and implement a streamlined process for getting capabilities commercialized and available to first responders and industry investment partners. In fact, we are funding 13 small businesses to integrate Smart City and IOT technologies in the following areas:

- Unmanned Aerial Systems for indoor search and rescue;
- Building sensors for detection and situational awareness; and
- SmartHubs for responder-focused mobile communication and sensor suites.

Four small businesses are showcasing their prototype SmartHub technologies today (July 25th) in Chicago to public safety officials, building/real estate and insurance industry partners, and the venture capital community.

Some of our planned Smart City development includes: Tampa, FL, and St. Louis, MO, as well as supporting public safety with established stakeholder communities (e.g. Torrance, CA; Ellicott City, MD; Charlotte-Mecklenburg, NC; Norfolk, VA; and the States of Kentucky, North Carolina, South Carolina, and Texas).

Chairman Donovan, Ranking Member Payne, and distinguished members of the committee, thank you again for your attention to this important mission and for the opportunity to discuss S&T's work in the area of preparedness. I believe that the preceding examples are representative of how DHS S&T is making a tangible difference in the work that America's first responders do every day. I look forward to answering your questions.