DHS SCIENCE AND TECHNOLOGY

Paradigm Shift: First Responders Impact on 5G

Homeland Security
Science and Technology

October 7, 2019

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Case Study: Response to Fire

Fire crews called to a fire on upper floors of an apartment building in Northern D.C. More than 50 firefighters responded. Firefighters from neighboring jurisdictions were sent into the District to staff empty fire stations.

On scene: Flames and heavy smoke could be seen near the top floor. A second alarm was called within minutes, and firefighters tended to the blaze in approximately 50 minutes.

Response followed routing protocols until a 25-year veteran firefighter exited the building, collapsed and went into cardiac arrest on scene. CPR was started immediately. The firefighter passed away shortly thereafter.

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Case Study: Response to Active Shooter

Two officers from nearby jurisdictions respond to a high school active shooter reports. Due to different jurisdictional departments and different 911 dispatch centers and radio systems, officers could not coordinate.

“We need to get these radios patched.”
“We’re kind of running two separate operations.”

Evident confusion on radio about suspect’s whereabouts delayed first responders. Authorities watched footage of the shooter’s movements on a **20-minute delay** from the school’s security room — **however, they communicated over the radio as if the video were live.** Officers rushed toward the building where the shooting happened but **did not know the location of the on-scene deputies**.

Dispatch reported that the shooter was seen on **video** leaving the building. Another officer responded that the suspect left **20 minutes ago.**

S&T MISSION

Enable effective, efficient and secure operations across all homeland security missions by applying scientific, engineering, analytic and innovative approaches to deliver timely solutions and support departmental acquisitions.

DHS FIVE MISSION AREAS

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CURRENT PRIORITIES

- Situational Awareness
- Communications and Information Sharing
- Command, Control, and Coordination
- Responder Health and Security
- Logistics and Resource Management
- Training and Exercise
- Risk Assessment and Planning
- Intelligence and Investigation

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S&T FIRST RESPONDERS

USING SCIENCE TO STRENGTHEN FIRST RESPONDERS & THE NATION

18,000+
IMPROVED **FIREFIGHTER GARMENTS** IN USE

1.25 MILLION
THREATS DETECTED AT AIRPORTS

2,000+
STATE & LOCAL **LAW ENFORCEMENT OFFICERS TRAINED** TO DETECT RADIATION

HELPING LAW ENFORCEMENT **SEIZE MORE THAN**
$10 MILLION
IN CRIMINAL FUNDS

INDUSTRY SOLD OVER
40,000
PRODUCTS DEVELOPED BY S&T ACCOUNTING FOR
$19 MILLION
IN **SALES REVENUE**

SUPPORTING OVER
3 MILLION
PUBLIC SAFETY USERS WITH LAND MOBILE RADIO INTEROPERABILITY

30+ STATES
USING OUR **ENHANCED INFORMATION SHARING TOOLS, TECHNOLOGIES, RESOURCES & EXERCISES**

488+
STATE & LOCAL BOMB SQUADS
USING S&T TECHNOLOGY & TECHNIQUES

9%
IMPROVEMENT IN IMPOSTER DETECTION
THROUGH INNOVATIVE TRAINING TECHNOLOGY

HELPING SAVE
475
CHILD SEX TRAFFICKING VICTIMS

21
STATES & TERRITORIES USING **HURRICANE EVACUATION TOOL**

DIVERSE PERSPECTIVES + SHARED GOALS = POWERFUL SOLUTIONS

Operational Testing with Responders

To fully understand how emerging technologies both support and impact first responders' performance capabilities, ***it's critical to assess those technologies in first responder environments***

DHS S&T APPROACH

- Place technologies **directly in the hands of first responders**
- Test the technologies with responders in a **realistic operational environment**
- **Facilitate direct feedback** between first responders & technology developers

IMPACT

- First responders are highly engaged with technology developers & have seen real-world value of the products
- Improved technologies are **more likely to successfully transition**
- First responders are **invested in results** of the testing & may act as champions of new capabilities

First Responders are the Technology “End-users”

Success is more likely when the technology development uses a **systems engineering approach**:

- An iterative or “spiral” process in which developers and engineers work closely with the end-users throughout the technology development process
- End-users provide feedback that drives product features and ensure solutions align with their needs and requirements, and integrates with their existing systems

Compact Multi-Gas & Particulate Matter Detector
N5 Sensors, Inc. (Rockville, MD)
Project Funded by DHS S&T

December 2018

First responders in Harris County, TX, tested the N5 Sensors, Inc. Compact Multi-Gas and Particulate Matter Detector at a DHS S&T-hosted operational experimentation. They told the developer the sensors were “**too big and clunky, difficult to carry with their gear, hard to read and needed a longer battery life**”

July 2019

N5 Sensors, Inc. brought an updated prototype to DHS S&T’s next responder field test in Birmingham, AL, that addressed all of the first responder feedback, **making the gas sensor smaller, lighter, easier to read, easier to carry, and with a longer battery life**

5G: Expanded Capability

5G AS WE UNDERSTAND IT

1. **>10 to 100x** improvement over 4G networks
2. **1**-millisecond latency
3. **1000x** bandwidth per unit area
4. **Up to 100x** number of connected devices/unit area
5. **100% 5G overlay**
6. **90%** reduction in network energy usage
7. **Up to 10-year** battery life for low power IoT devices

PERCEIVED IMPACT ON PUBLIC SAFETY

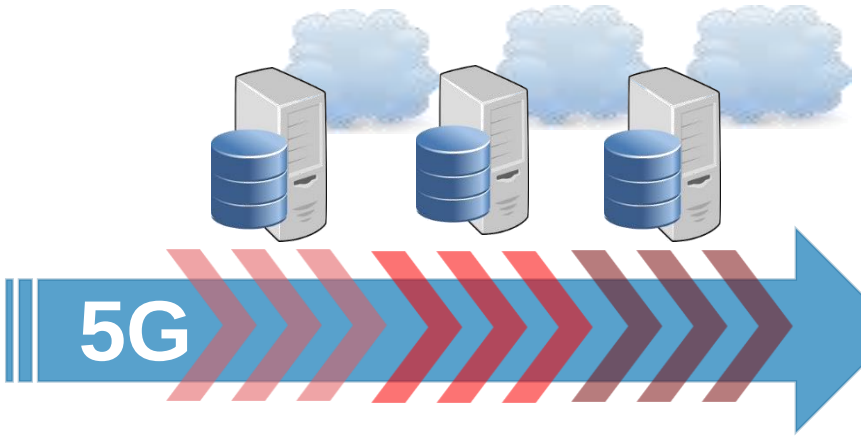
1. **More Data:** Streaming video, texting, photos, social media, first responder location and health accountability, exponentially more IoT data
2. **Higher Speeds:** Multiple video feeds from multiple locations aggregated with other data for comprehensive assessment and response management
3. **Decreased Latency:** Near real-time situational awareness and system controls

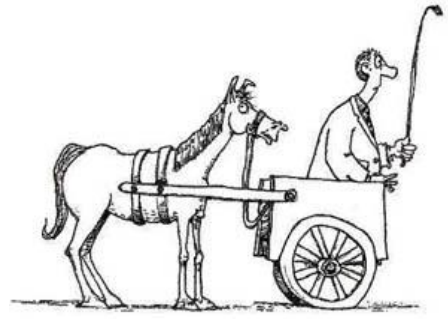
- Cellular network data rate will increase so that we can send and receive massive files at 200 Gb/s
- Enable connection to multiple devices, sensors, objects, etc. in a massive IoT network
- Capability to build infrastructure for remote controls (“tactile” internet)
- Reliability and resiliency will lead to a higher probability of availability

5G: Real Impact on Public Safety

5G will enable exponentially more data to be collected

Capabilities for first responders to process more information with greater speed and accuracy is paramount





Collaboration Required for Our Common Goal

Tech Developers, Researchers, Engineers

- First responder-defined use cases
- Vetted and prioritized gaps and requirements
- Access to end-users and operators
- Market size and readiness levels identified
- Starting points for solutions identification and/or technology development

First Responders

- Scalable, interoperable and integrated solutions
- More effective and efficient
- Enhanced safety
- Limited to no impact on human performance
- Provide direct feedback to industry to tailor solutions to their needs and mission space

Common Goal: Securing Our Communities

Better public safety technology → **global impact on responders' ability to save lives and protect property**

We Need a Paradigm Shift

FACT: 5G is arriving before first responders have the capability to process the benefits it has to offer

Responsibility of Researchers, Developers And Engineers:

1. Allow first responders' needs and challenges to influence work, continuously
2. Experience public safety operational challenges first-hand
3. Be sure development and support teams employ end-user driven processes, always

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DIVERSE PERSPECTIVES + SHARED GOALS = POWERFUL SOLUTIONS

Responder Engagement Action Plan

Involve first responders in every stage of the tech development process to ensure that products and services meet operational requirements and can be easily adopted by public safety agencies

1. Connect with local first response agencies to discuss their gaps and priorities
2. Compare local gaps with responder needs published by DHS S&T, the InterAgency Board, or responder associations
3. Identify and incorporate data standards that will support solution interoperability when deployed in the field
4. Develop the solution, incorporating end-user requirements and data standards
5. Conduct testing with responders throughout the development process to gather feedback and incorporate it as course corrections
6. Partner with responder agencies for long-term operational testing of final solution, confirming the product is ready for deployment

Engaging with Industry to Solve Homeland Security Challenges

Long Range Broad Agency Announcement

Provides a standing invitation to scientific and technical communities to propose solutions for DHS end-users .

Prize Challenge Program

Uses public crowd-sourcing to incentivize innovation.

Small Business Innovation Research Program

Helps small businesses develop and commercialize innovative solutions.

Silicon Valley Innovation Program

Reaches out to innovation communities worldwide to harness commercial R&D for government applications, co-invest in, and accelerate the transition of technology to the commercial market.

BIRD
Israel-U.S.
Binational Industrial Research and Development Foundation

BIRD Foundation

Provides funding for the development of advanced technologies between U.S. and Israeli companies.

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