Enabling Operational Innovation and Building Resilience

National Geospatial Preparedness Summit

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Science and Technology Directorate
S&T Visionary Goals

SCREENING AT SPEED:
Security that Matches the Pace of Life

A TRUSTED CYBER FUTURE:
Protecting Privacy, Commerce, and Community

ENABLE THE DECISION MAKER:
Actionable Information at the Speed of Thought

RESPONDER OF THE FUTURE:
Protected, Connected, and Fully Aware

RESILIENT COMMUNITIES:
Disaster-Proofing Society
Enable the Decision Maker

- Predictive analytics, risk analysis, and modeling and simulation systems will enable critical and proactive decisions to be made based on the most relevant information, transforming data into actionable information.
- Even in the face of uncertain environments involving chemical, biological, radiological, or nuclear incidents, accurate, credible, and context-based information will empower the aware decision maker to take instant actions to improve critical outcomes.
Resilient Communities

• Critical infrastructure of the future will be designed, built, and maintained to withstand naturally occurring and man-made disasters.
• Decision makers will know when a disaster is coming, anticipate the effects, and use already-in-place or rapidly deployed countermeasures to shield communities from negative consequences.
• Resilient communities struck by disasters will not only bounce back, but bounce forward.
Protected from life-threatening hazards

- Enhanced duty uniforms and PPE keep responders safe, no matter the emergency
- Fire, tear, splash and biohazard resistant fabrics protect responders from frequent hazards
- Physiological and environmental sensors to alert responders to hazards

Connected

Having a lifeline when it’s needed most

- Fully interoperable communications equipment reliably exchanges messages
- Deployable networks give connectivity anywhere, anytime, in any conditions
- Universal data standards make info sharing easy and secure

Fully Aware

Making informed decisions that save lives

- Integrated wearables, sensors and remote monitoring convey the right information at the right time
- Situational awareness tools provide critical context even before responders arrive on scene, saving vital time
TRADITIONAL FIRST RESPONDERS

SUPPORT RESPONSE AGENCIES

EXTENDED EMERGENCY ENTERPRISE

OUR STAKEHOLDER COMMUNITY
Solution Development Process

1. Identify and Prioritize FR Needs
2. Stakeholders Identify Requirements
3. Identify and Prioritize Proposed Projects
4. Select and Approve Projects
5. Manage and Complete Projects
6. Transition Solutions into Use
First Responder Resource Group (FRRG)

- More than 120 fire service, law enforcement, EMS, emergency management, communications, and medical practitioners from across the country

- Several national associations represented

- Based on Project Responder priorities and their own experience and expertise, develop Operational Requirements Documents (ORDs) that specify what technologies and knowledge products must do to fill capability gaps

- ORDs incorporated in FRG Broad Agency Announcement
FRRG Membership

Regional Representation

- Northeast: 32%
- Southeast: 23%
- Midwest: 18%
- Southwest: 16%
- West: 11%

Level of Government

- Local: 45%
- State: 15%
- Tribal: 20%
- Federal: 18%
- Association: 2%

Disciplines of Non-Federal Members

- Fire: 31%
- Law Enforcement: 25%
- Medical: 20%
- Emergency Management: 15%
- Other: 9%
How FRG Generates Requirements

Input also solicited from recognized emergency response and preparedness authorities
Determining Which Projects to Undertake

1. What are we trying to do? What problem are we are trying to solve?

2. How is it done today, and what are the limitations of current practice?

3. What is our new approach, and why do we think it will be successful?

4. If we are successful, what difference will it make?

5. How long will it take, what will it cost, and what are the milestones?

Questions posed by George Heilmeier, former DARPA Director, at the start of every project.
Requirements Considered for PPE

Stakeholders Identify Requirements

Thermal
Location Tracking
Weather
Respiratory Apparatus

Threats
Focus Areas
Capabilities
Collaborators

Government
Materials Developers
Standards Developers

Protection
Gloves
Garments

First Responders
Vendors
Academia

Comfort
Comm Devices
Stabbing/Penetration
Versatility

Durability
Warning Devices
Ballistic

Science and Technology
Example Products

**Improved Structure Firefighting Glove:**
New glove that is lightweight, fits better, and allows for more precise movements

**FINDER:**
Microwave-radar tool that detects breathing and heartbeats under rubble

**FiRST App:**
Smart phone app for bomb-threat response

**Golden-i:**
Integrated voice/data/comms prototype – wearable computer and comms backbone for the responder of the future
## Most Critical Capability Gaps

1. The ability to know the location of responders and their proximity to risks and hazards in real time.

2. The ability to communicate with responders in any environmental conditions (including through barriers, inside buildings, and underground).

3. The ability to detect, monitor, and analyze passive and active threats and hazards at incident scenes in real time.

4. The ability to rapidly identify hazardous agents and contaminants.

5. Protective clothing and equipment for all responders that protects against multiple hazards.

6. Communications systems that are hands-free, ergonomically-optimized, and can be integrated into personal protective equipment.

7. The ability to incorporate information from multiple and non-traditional sources (e.g., crowdsourcing and social media) into incident command and operations.

8. The ability to monitor the status of resources and their functionality in current conditions, in real time.
## Most Critical Capability Gaps

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<thead>
<tr>
<th>Number</th>
<th>Description</th>
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<tr>
<td>9</td>
<td>The ability to remotely scan an incident scene for signs of life and decomposition to identify and locate casualties and fatalities.</td>
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<td>10</td>
<td>The ability to identify what resources are available to support a response (including resources not traditionally involved in response), what their capabilities are, and where they are, in real time.</td>
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<td>11</td>
<td>Readily accessible, high-fidelity simulation tools to support training and exercises in incident management and response.</td>
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<td>12</td>
<td>The ability to identify trends, patterns, and important content from large volumes of information from multiple sources (including non-traditional sources) to support incident decision-making.</td>
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<td>13</td>
<td>The ability to monitor the status of resources and their functionality in current conditions, in real time.</td>
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<td>14</td>
<td>The ability to identify, assess, and validate emergency-response related software applications.</td>
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Next Generation First Responder
Protected, Connected, Fully Aware

• Convergence of personal protective equipment with communications, sensors, analytics, and display
  ▪ Electronic Fabrics
  ▪ Autonomous vehicles of all types (UAS to self driving responder vehicles and equipment

• Cyber Security
  ▪ Including securing of devices and machine to machine

• Future of Communications
  • FirstNet
  • Data Casting
  • Personal Area Networks
  • Sensor Networks (established and ad-hoc)
From First Responder Personal Area Networks to Smart Cities

- S&T is performing research and development focused on local first responder needs and sensor networks, including PAN and local ad-hoc incident site networks.

- Standards developed and operationalized will then be extended to Ops Centers and full integration of sensor networks with first responders.

- This work will provide foundation for first responder interoperability with Smart Cities, IoT, sensor hubs and other capabilities.
How do we take Big Data and create actionable, timely, information, and get it to the right responder in time to make a difference?
Smart Cities: Interoperability

Traffic Management - Building Access / Controls – Sensor Data – Real Time Analytics – Infrastructure Status - …

Smart Cities System Environment

Public Safety Subset: FRG’s Focus Areas

- Emergency Management Operations Centers
  - Situational Awareness
  - Resource Management
  - Information Sharing
  - Alerts, Warnings
    - IdAM

- First Responder Incident Environment
  - On body sensors and comms
  - Deployed Sensors
  - LMR / FirstNet / Broadband
  - Autonomous systems
    - IdAM
Public Safety Cloud Concept

GeoPlatform
- FEMA
- NOAA
- DOI
- GeoCONOPS
- GIRA

DHS Geospatial Information Infrastructure
- DHS COP
- RissNet
- LEO
- HSIN

Data Analytics Services
- Apps Store

State local, NGO, CI/KR, other partner data and services (NEMA, Red Cross, …)

Other systems, tools and data sources

Public Internet

User Community
FirstNet Impact

Public Safety Broadband - FirstNet

Unified Identity and Access Management Solution

First Responder Personal Area Networks (LMR, LTE, on body sensors and devices)

Sensors and Machines IoT, Smart Cities ...

Autonomous ISR … Autonomous Modeling ...

Other users, devices, data feeds, ...

GeoPlatform

DHS Geospatial Information Infrastructure

DHS COP

RissNet

Apps Store

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GIRA
How prepared are we?
Objective assessment methods

SAFECOM Interoperability continuum