Department of Homeland Security Science & Technology

HSSTAC -- S&T 101

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Under Secretary (Acting)
Science & Technology Directorate

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Homeland Security

Homeland Security
Science and Technology

S&T At A Glance

DHS S&T Mission: Strengthen America's security and resiliency by providing knowledge products and innovative technology solutions for the Homeland Security Enterprise (HSE)

- **One of 10 DHS Components**
  - Provides key technical & analytical capacity for DHS
  - Supports DHS, Component and HSE requirements with innovation
  - Operationally focused
- **S&T statistics:**
  - ~1.2% of DHS Budget
  - ~1,100 personnel
    - Federal, contractor, IPAs
    - Highly technical staff
- **Six primary commodity areas**
  - First responders, borders & maritime, cyber, chem-bio defense, explosives, resilience
- **Highly collaborative**
  - Components & HSE
  - State & Local
  - Interagency & International
  - Industry & Private sector
- **Laboratories**
  - 5 Internal Labs
    - Explosives, biodefense, chemical, urban environment
    - Adding new agricultural biodefense lab
  - Responsible for usage of DOE Labs & FFRDCs

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DHS Mission Guidance

Complex & Dynamic Environment

Globalization & Transportation

Border Security & Immigration

Violent Extremism

Cyber Domain

Nature of Innovation

Natural Disasters

More Threats, Less Resources

Strategic Guidance (Examples)

HSPD-5 National Incident Management System (2003)

HSPD-7 Critical Infrastructure Identification & Protection (2003)

PPD-8 National Preparedness (2011)

Cyber Executive Order (EO) and PPD-21 Critical Infrastructure EO (2013)

U.S Law & Interagency

Homeland Security Act 2002

National Response Framework (2008)

QHSR (Feb 2010)

Energy Sector Plan (2010)

Quadrennial Homeland Security Review (QHSR) 2010

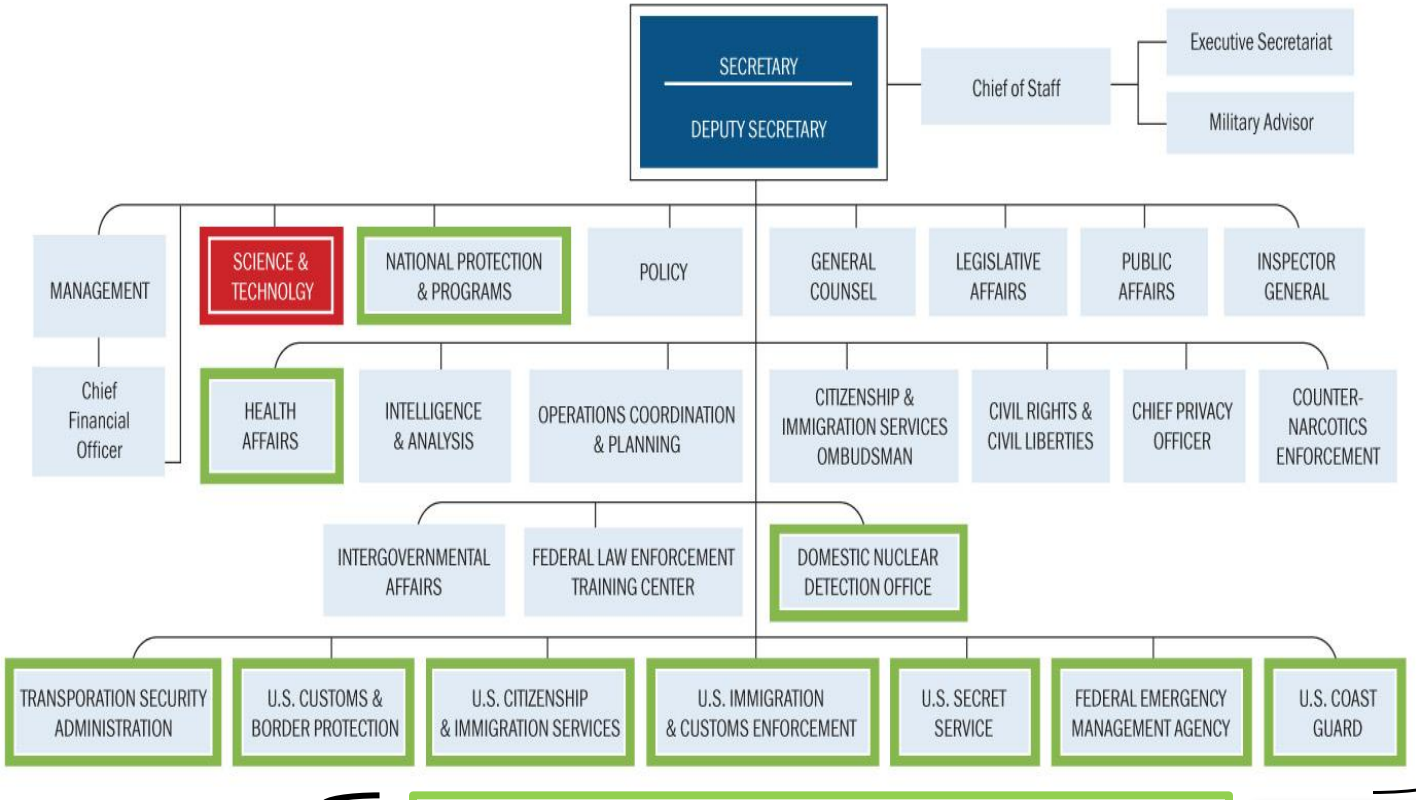
Threats

- ❑ Smaller Scale Terrorism
- ❑ Trafficking & Crime
- ❑ Pandemics, Accidents, Natural Hazards
- ❑ Violent Extremism
- ❑ High Consequence WMD

Core Missions

1. Preventing terrorism & enhancing security
2. Securing and managing our borders
3. Enforcing & administering immigration laws
4. Safeguarding and securing cyberspace
5. Ensuring resilience to disasters

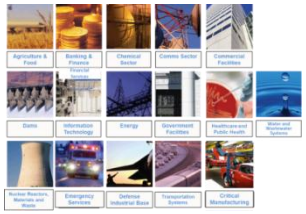
Department of Homeland Security



- *International*
- *Federal*
- *State*
- *Local*
- *Tribal*
- *Territorial*

Homeland Security Enterprise (HSE)

- ❑ **Department of Homeland Security**
- ❑ **First Responders across U.S.**
- ❑ **Critical Infrastructure**



… the 16 critical infrastructure sectors

<u>The Department</u>

- ❑ ***Organization: 22 to 1***
- ❑ ***Personnel: DHS = ~230K; HSE = ~3.5M***
- ❑ ***Culture of law enforcement***
- ❑ ***Coordination vs. direction***

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Organization of DHS Science & Technology (S&T) Aligned with Mission

Under Secretary
Deputy Under Secretary

↔ **TSA, CBP, CIS, ICE, USSS, FEMA, USCG, NPPD, DNDO, OHA, First Responders**

First Responders Group (FRG)

- Interoperability & Compatibility
- Technology Clearinghouse
- National Urban Security Technology Lab (NUSTL)

Homeland Security Advanced Research Projects Agency (HSARPA)

- Borders & Maritime
- Chemical/Biological
- Cyber Security
- Explosives
- Resilient Systems

Acquisition Support & Operations Analysis (ASOA)

- Research & Development Analysis & Assessment
  - Transportation Security Lab (TSL)
- Federally Funded Research & Development Centers Program Management Office
- Standards
- Test & Evaluation

Research & Development Partnerships (RDP)

- Interagency
- International
- National Labs
  - Plum Island (PIADC)
  - National Biodefense Analysis & Countermeasures Center (NBACC)
  - Chemical Security Analysis Center (CSAC)
  - National Bio & Agro-Defense Facility (NBAF)
- Public-Private Partnerships
- University Programs

S&T's Value Added Proposition …

- ***Operationally focused*** **… focused technology options & operational process enhancements**
- ***Innovative*** **… develop innovative, systems-based solutions to complex homeland security problems**
- ***Building partnerships*** **… technical depth and reach to leverage technology solutions from federal, state, local and tribal governments, universities, and the private sector - across the US and internationally**

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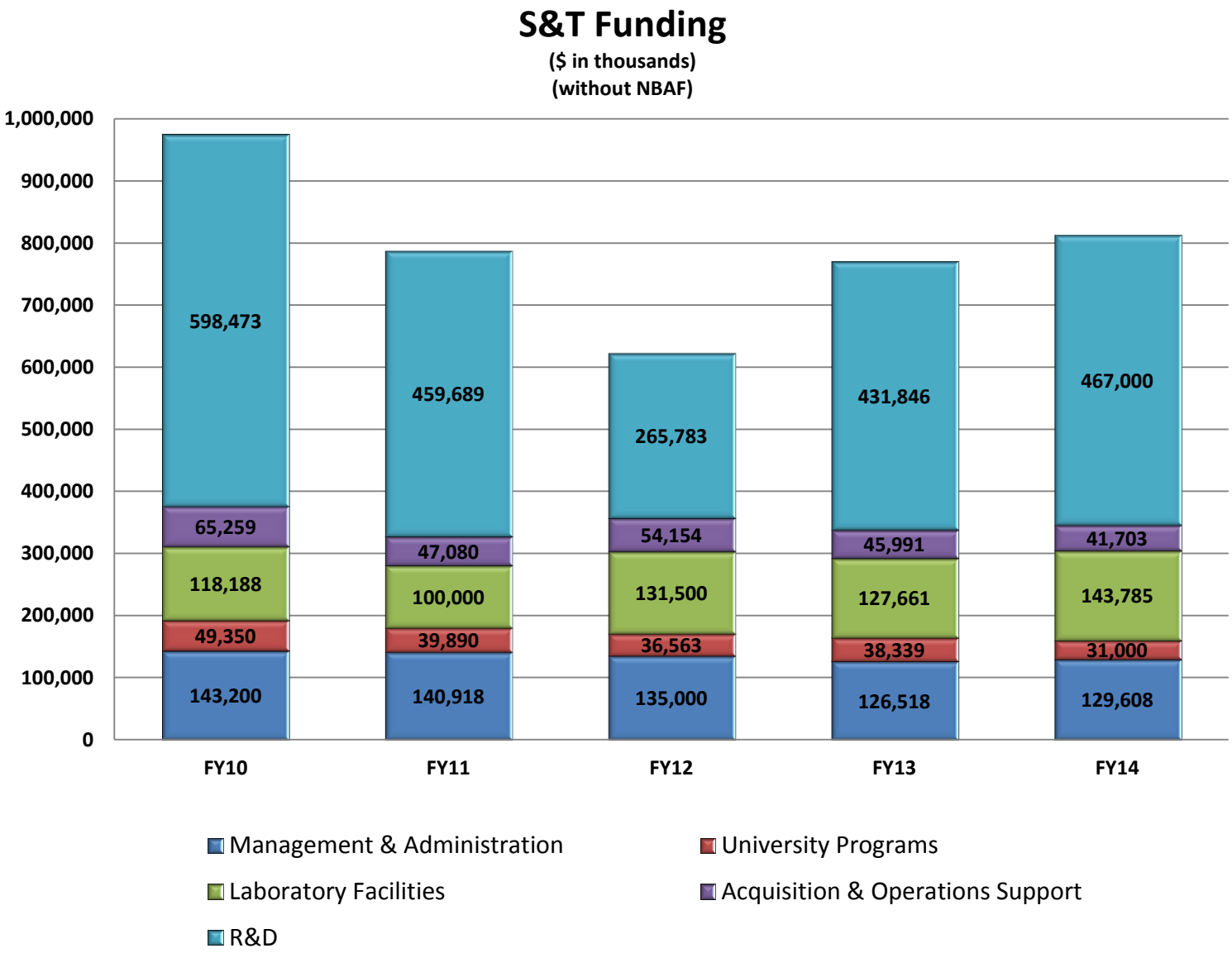
Budget



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S&T Funding

- R&D programs benefit from stable funding profiles
- S&T's budget has not been stable
- From FY10 to FY12, S&T's discretionary R&D cut 57%
- S&T prioritized four key areas:
  - Aviation Security;
  - Bio-Threat;
  - Cyber Security;
  - and First Responders
- In addition, FY12 included little funding for the following areas:
  - Border Security;
  - Infrastructure protection;
  - Chemical threat security;
  - Biometrics;
  - Advanced materials for explosive resiliency;
  - Natural disaster resiliency;
  - Hostile behavior detection; and
  - Violent extremism prediction
- As a result of the budget cuts, the number of RD&I projects dropped from nearly 200 in FY10 to about 60 in FY12
- Since FY12, S&T's budget has recovered to FY11 levels--an 86% increase in discretionary R&D
- R&D projects up to about 100
- This has opened S&T's R&D priorities to include Border Security and Infrastructure Protection

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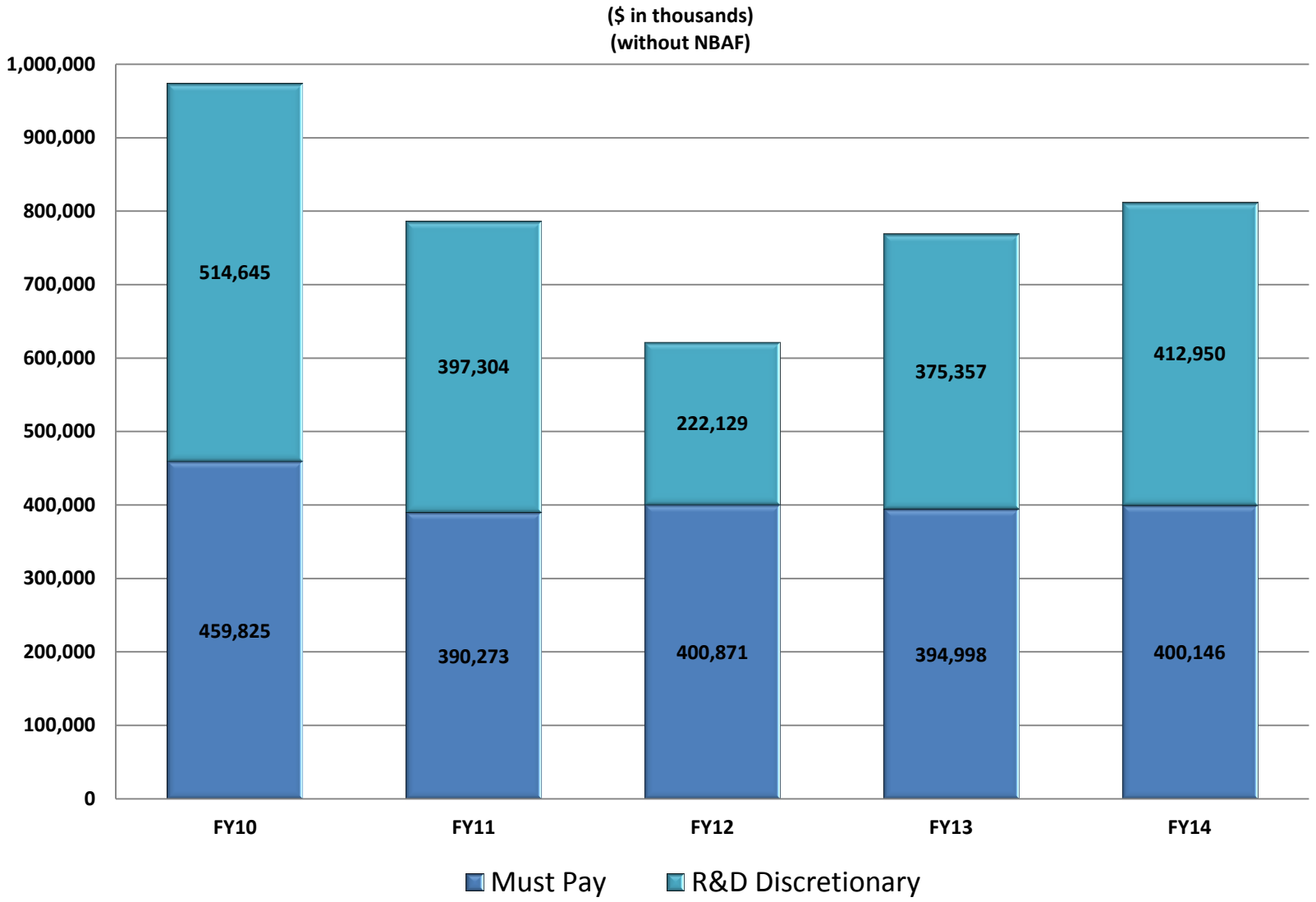
S&T Funding

- Approximately 50% of the total S&T budget is "must fund" and includes programs such as:
  - Laboratory facilities maintenance and operations;
  - Interagency and international cooperative programs;
  - Bio and other risk assessments mandated in law or Executive Order;
  - Safety Act and other programs mandated in the 2002 Homeland Security Authorization Act;
  - University Programs;
  - R&D infrastructure such as testbeds and research databases;
  - Federal employee salaries and benefits; and
  - Working Capital Fund

S&T Funding by "Must Fund" and Discretionary



Operational Focus

- Rio Grande Valley
- Secure Transit Corridor
- Rapid DNA
- Mobile Biometrics

- Multi-Band Radio
- Virtual USA
- Next Generation PPE
- FiRST

State/Local … FEMA

TSA … FPS

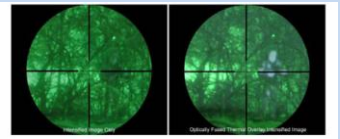
USSS … FBI

- STORE
- Cyber Forensics
- National Bioforensics Analysis Center (NBFAC)

- Explosives Detection
- Checked Baggage
- Future Checkpoint

Cross Cutting Areas

- Big Data
- DoD Tech Transfer
- SAFETY Act
- International programs
- Joint Interagency Exercises



Systems Analysis | Program Management | Team Effort

Operational Need | Appropriate Resources | Leadership Focus

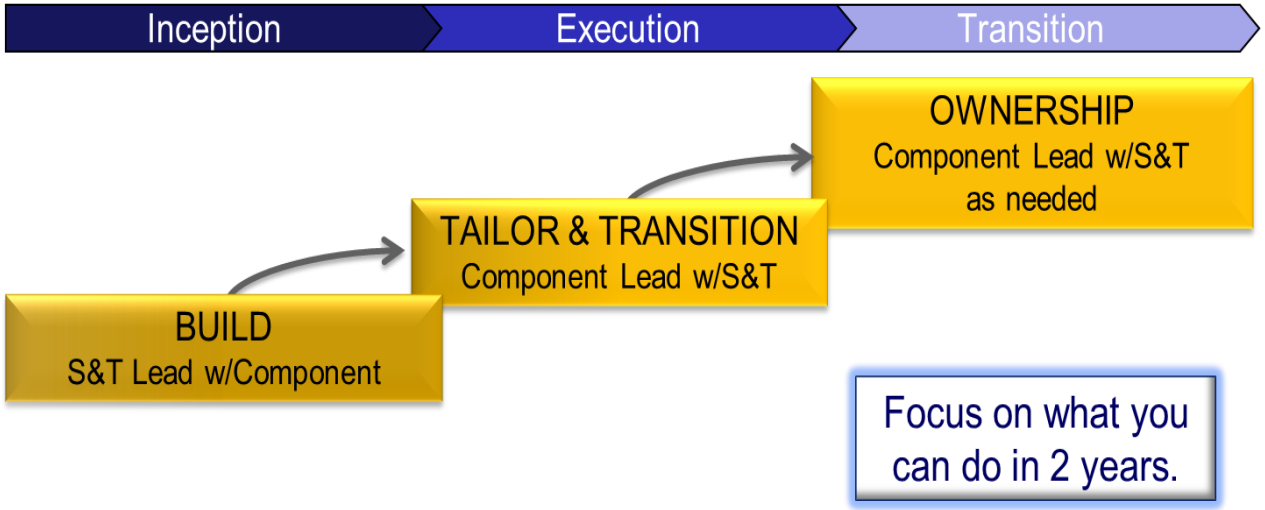
Leads to a Successful Program

S&T Operational Enhancements (STORE)

- Focus on near term, mission-critical issues
- Senior leadership direct involvement
- Collaborative partnership
- Joint staffing and joint accountability
- Innovative usable solutions in 24+ months

11 Technology & Knowledge Products

- Prioritized with USSS
- Understood Operational Context
- Technology Foraging
  - COTS/GOTS
  - Next Generation
  - New Capability
- Leveraged Other Investments (~$11M)
- Nat'l Labs, DoD, IN-Q-TEL, Industry
- Internal Collaboration



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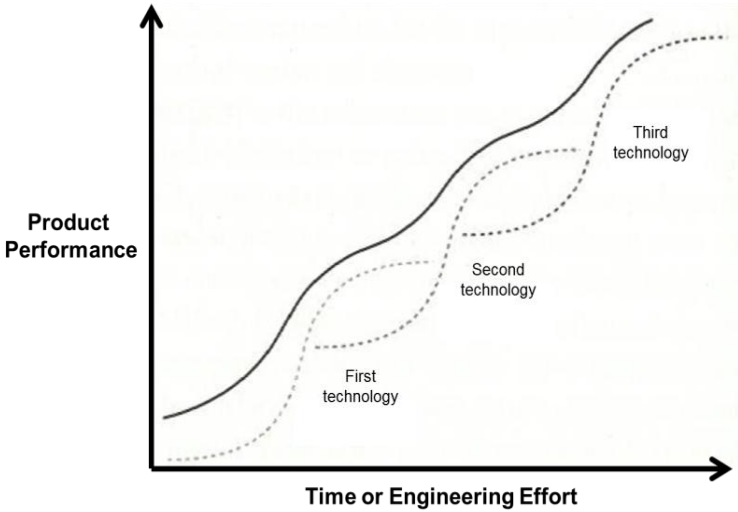
Innovation

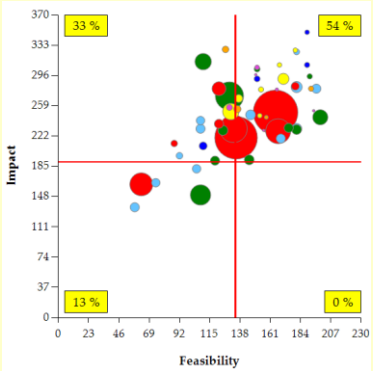
Nature of Innovation: Both sides get to innovate … potential for individuals with state-like capabilities

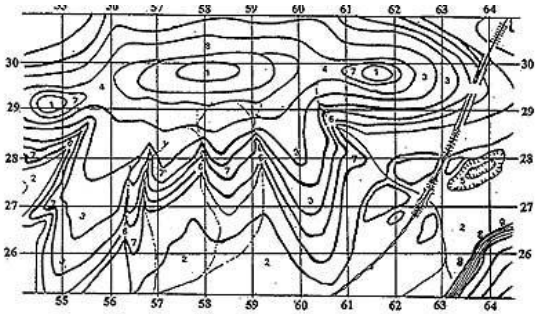
S&T Game Changers

- Advanced Manufacturing including 3D printing, Nanotechnology, Micromanufacturing
- Information and Communication Technology (ICT) and Data Proliferation
- Biological Sciences
- Weapons Technology and Robotics
- Energy
- Scientifically Informed, Technologically Based Decisions … then modeling, simulation

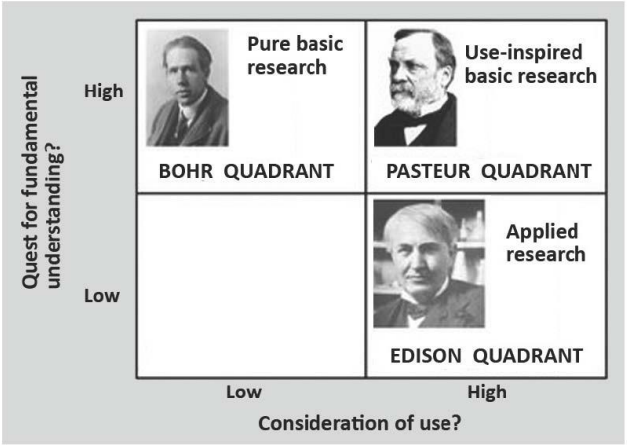


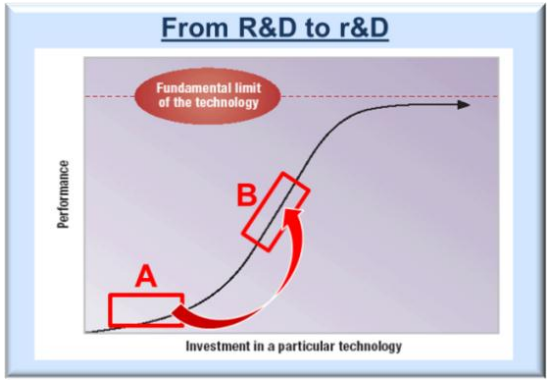
Where should S&T be with investments?





Looking out 2 terrain features …

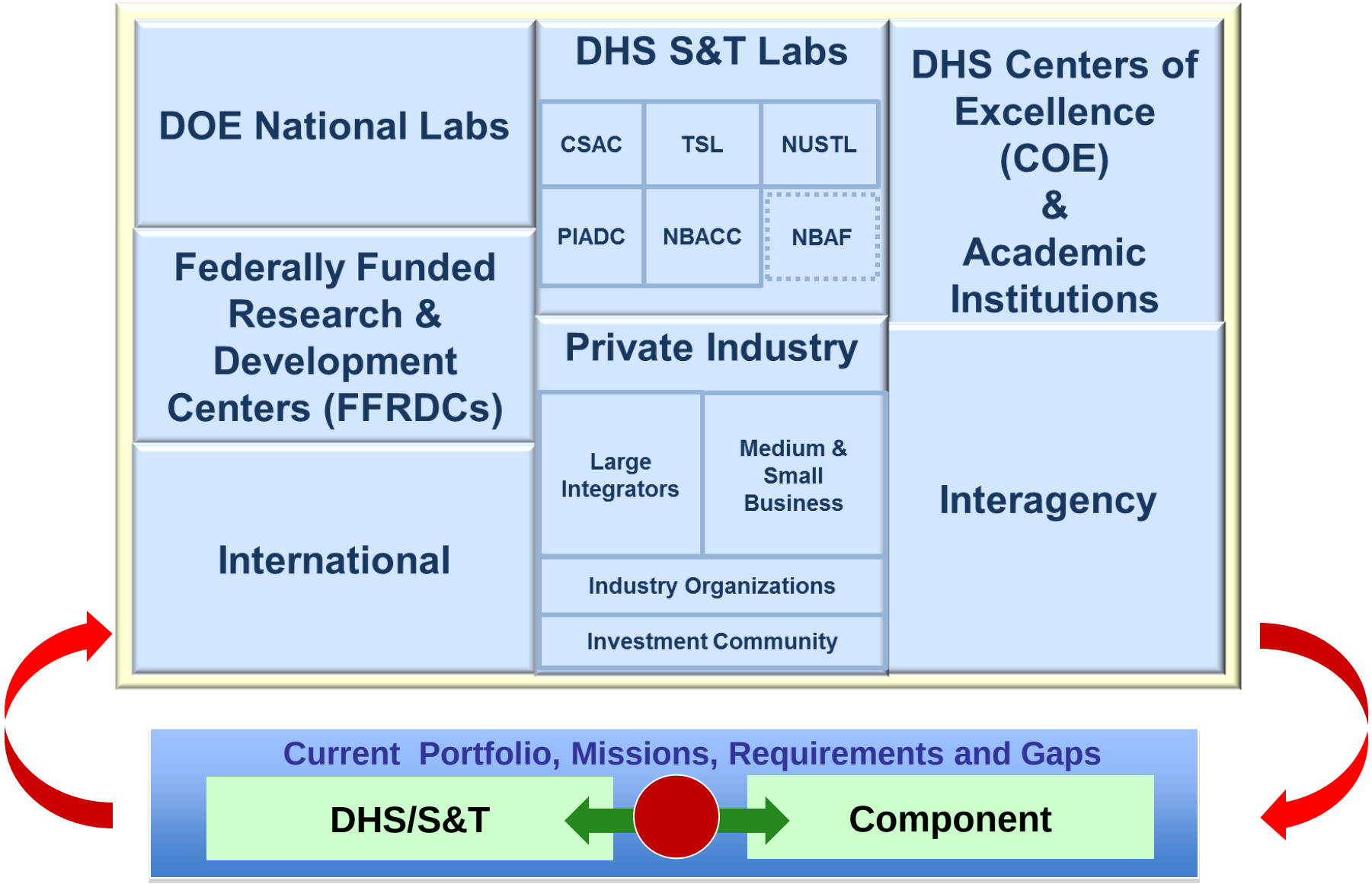




Deliverables

- Technological Capabilities & Knowledge Products
- Acquisition Support & Operational Analysis
- Process Enhancements & Gain Efficiencies
- Understanding of Homeland Security Risks & Opportunities

S&T Partnerships



Building Partnerships for Technology Transition to Operational Use

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Tools

Industry Collaboration

Cooperative R&D Agreements (CRADA)
Long Range Broad Area Announcement (BAA)
Small Business Innovation Research (SBIR)
Safety Act
Technology Foraging
Systems Analysis
Webinars

DoD/DHS differences

VALLEY OF DEATH

S&T Value Added Proposition

Operational Relevance …

Innovation ….

Partnerships …

1: Early

S&T Priorities → Informs →
- LRBAA & White Papers
- SBIR
- Centers of Excellence

2: Mid

S&T R&D → Industry Partner through CRADA → Joint S&T and Industry Effort

3: Late

S&T R&D → Transition to Industry

4: As Needed

S&T R&D → (Just In Time Transition????)

Examples

ARMOR

FMD Vaccine

CIRT

RECX

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Departmental Support … Why S&T is Important to DHS!

S&T provides key technical & analytical capacity for DHS …

- ❑ **Scientific and Technical Arm of the Department (and the HSE)**
- ❑ **Coordinate R&D across DHS**
- ❑ **Definition of R&D for DHS**
- ❑ **Integrated Investment Lifecycle Model (IILCM)**
- ❑ **Export Control Policy**
- ❑ **Intellectual Property**
- ❑ **Quadrennial Homeland Security Review (QHSR)**
- ❑ **Joint Interagency Field Exercises (JIFX)**
- ❑ **Portfolio Reviews**
- ❑ **Test and Evaluation Oversight**
- ❑ **Treaty Compliance (and Other Compliance)**
- ❑ **Liaison with National Labs and S&T Labs**
- ❑ **International Bilats**
- ❑ **FFRDC interface**
- ❑ **SAFETY ACT**
- ❑ **University Programs**
- ❑ **Interagency**
  - ➢ **Biodefense**
  - ➢ **Research & Development Activities**

What else? Are we appropriately organized for these missions?

National Bio and Agro-Defense Facility (NBAF) Update

NBAF -- a new state-of-the-art biosafety level 3 & 4 facility -- will enable the U.S. to conduct comprehensive research, develop vaccines and anti-virals, and provide enhanced diagnostic capabilities to protect our country from numerous foreign animal, emerging and zoonotic diseases

To Be Located in Manhattan, KS

Current Status:

- ❑ **Design is 100% complete -- has been peer reviewed by the scientific & international community**
- ❑ **Mission Need Assessment was recently completed by the National Academy of Science and affirmed the nation's need for the NBAF**
- ❑ **Construction Manager is on board and preparing construction planning documents**
  - **Site preparation completed in August 2012**
  - **Construction of the Central Utility Plant underway since early 2013**
- ❑ **Plum Island will be operational (with minimum investments) until the necessary accreditations are achieved by the NBAF**
- ❑ **Current planning for full operational status is 2021**

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"Big Data"

Every 24 hours…

- 2M passengers pre-screened
- 1.8M passengers screened at 448 airports
- 200 inspections of air carriers & airport infrastructure
- 3.4M sq. miles patrolled on U.S. waterways
- 54 search & rescue cases
- $500k of counterfeit currency seized
- 3,200 citizens naturalized
- 109k identities verified for border crossing
- 31,800 containers screened at seaports

Examples

S&T: Biodefense … signaling pathways of the human genome

FEMA: Historical data analysis and predictive modeling

USCIS: Immigration systems consolidation

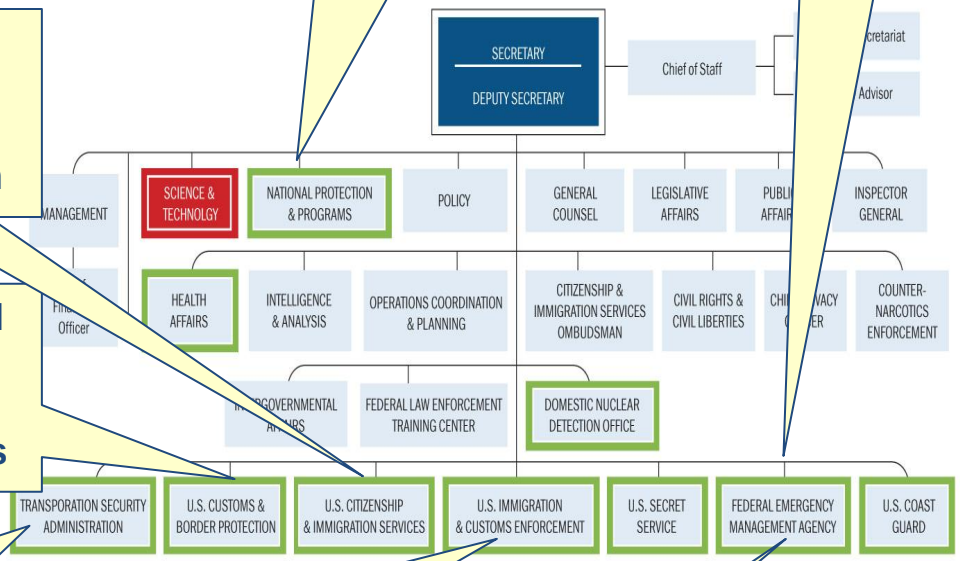
CBP: National Targeting Center improvements

TSA: Real-time data fusion and analysis for improved detection

Non-proliferation Export Control

FEMA & First responder information for emergencies

Department of the Interior is responsible for developing the federal cloud



Superstorm Sandy & Resilience

- Largest Atlantic hurricane on record
  - At its peak, hurricane-force winds extended 175 miles (280km) from center
  - Tropical storm-force winds felt 520 miles (835km) away
- 24 states affected … entire U.S. eastern seaboard
  - 131 fatalities in U.S.
- Massive flooding from storm surge in New York City, New Jersey
  - $63 billion in estimated damage
  - 8.5 million without power at peak
    - ~1 million without power after one week

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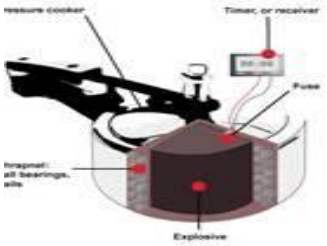
Event Security: Boston Lessons Learned



- Importance of immediate care & evacuation by first responders and bystanders
- Planning & exercises critical to preparedness and response
- Keeping communication channels open during a crisis
- The use of social media during emergencies
- Balancing tightened security with free public movement and convenience during a high-attendance spectator event
- Managing the public's personal and patient privacy while preventing or responding to emergencies
- Business continuity during and immediately following an emergency

Layered Security Solutions

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OUTSIDE

Recovery Transformer

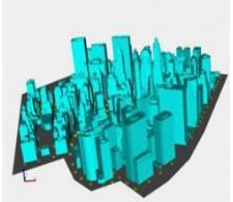
Baggage Screening

Screening & Vetting

Detect to Protect Bio Sensors

Mobile Biometrics

INSIDE

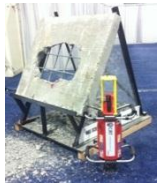


Urban Blast Tool Simulation

SAFETY Act

Large Public Event

ISIS



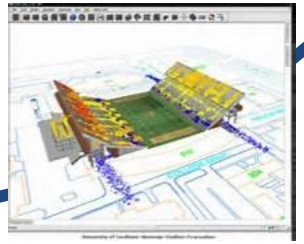
Concrete Breach Tool

FiRST Bomb App for First Responders

Backboard Cover

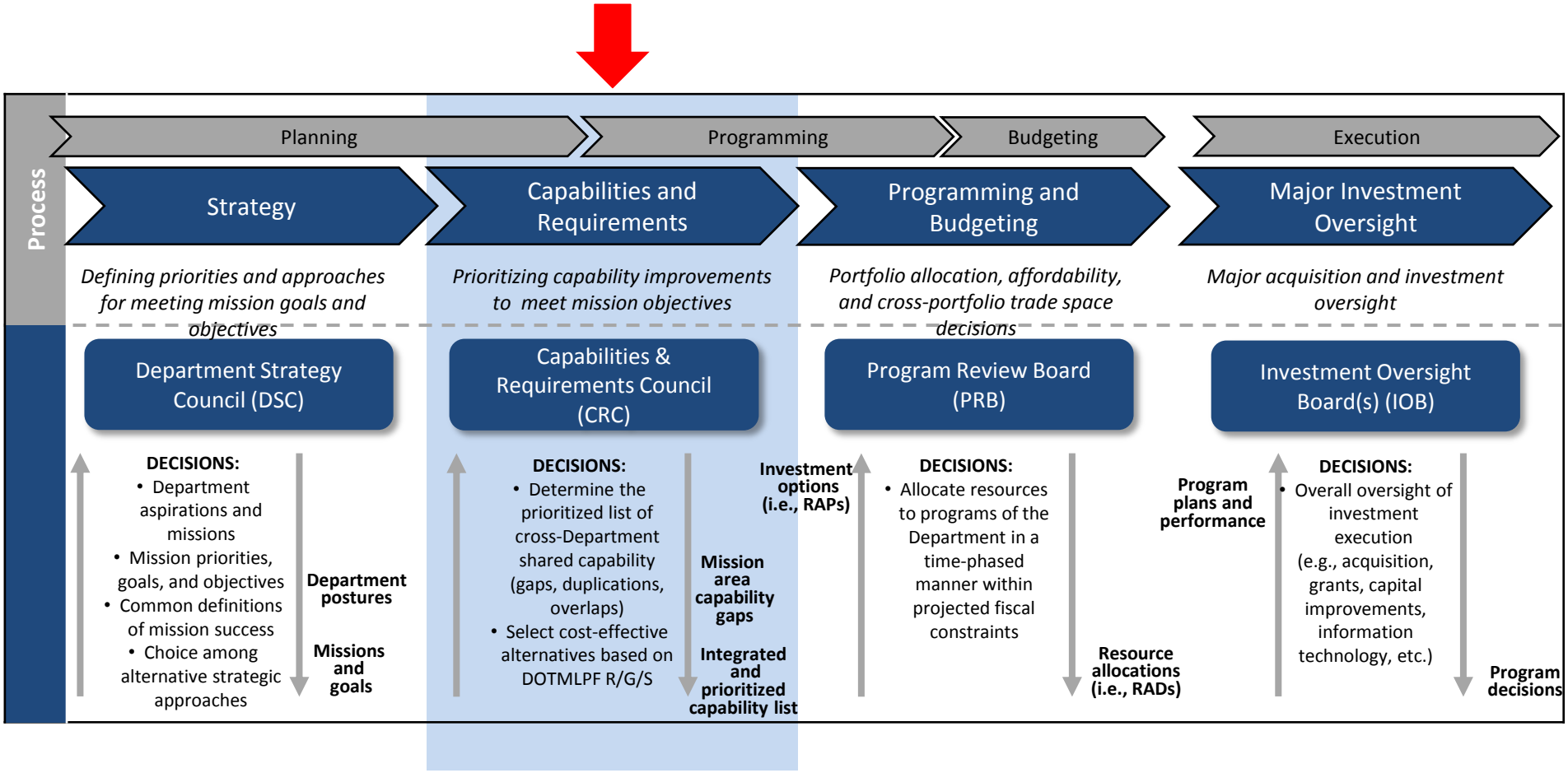
Multi-Band Radio

Pipe Bomb End-Cap Remover



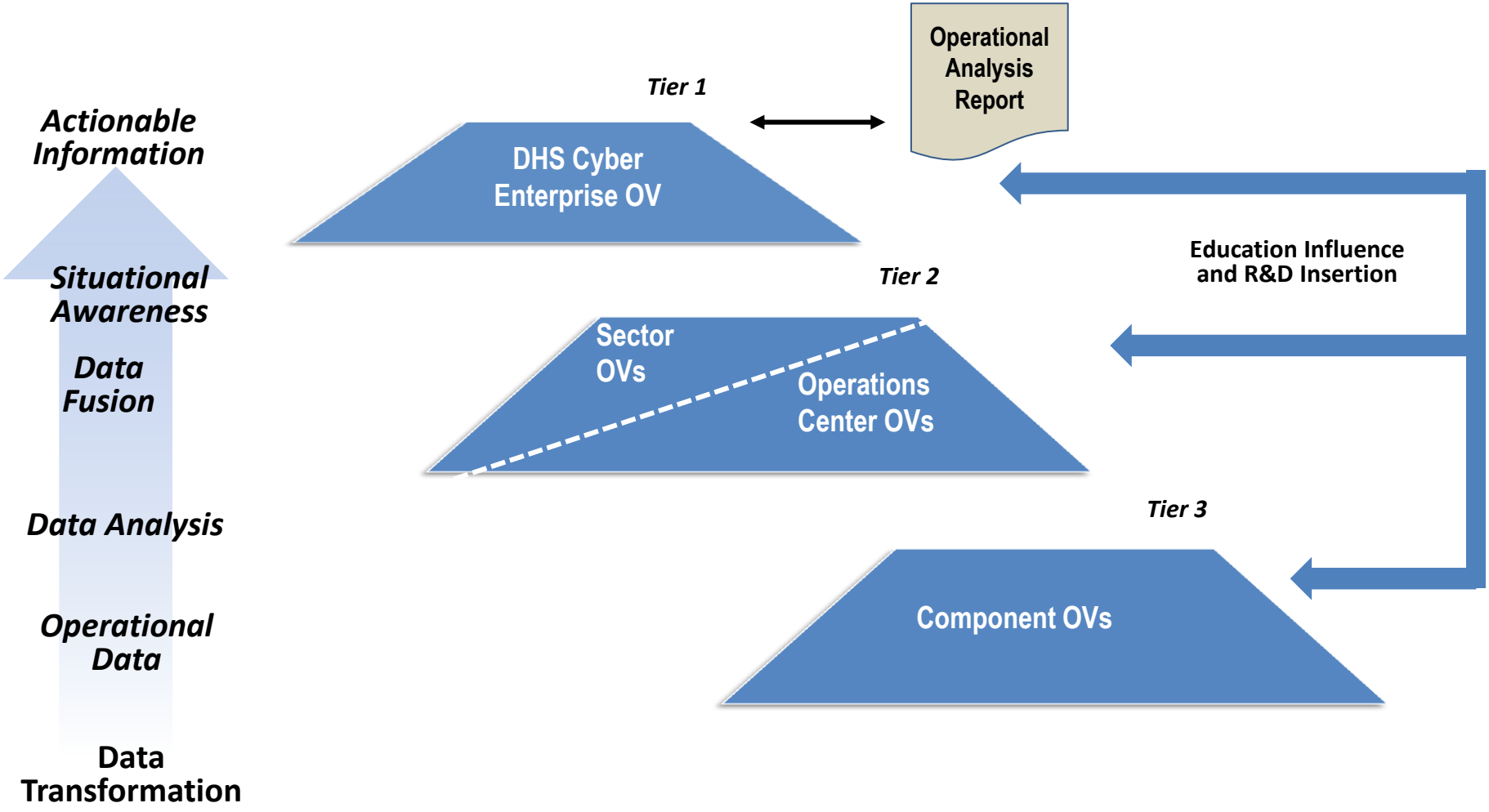
Stadium Evacuation Modeling

IILCM Overview: Process Flow Diagram

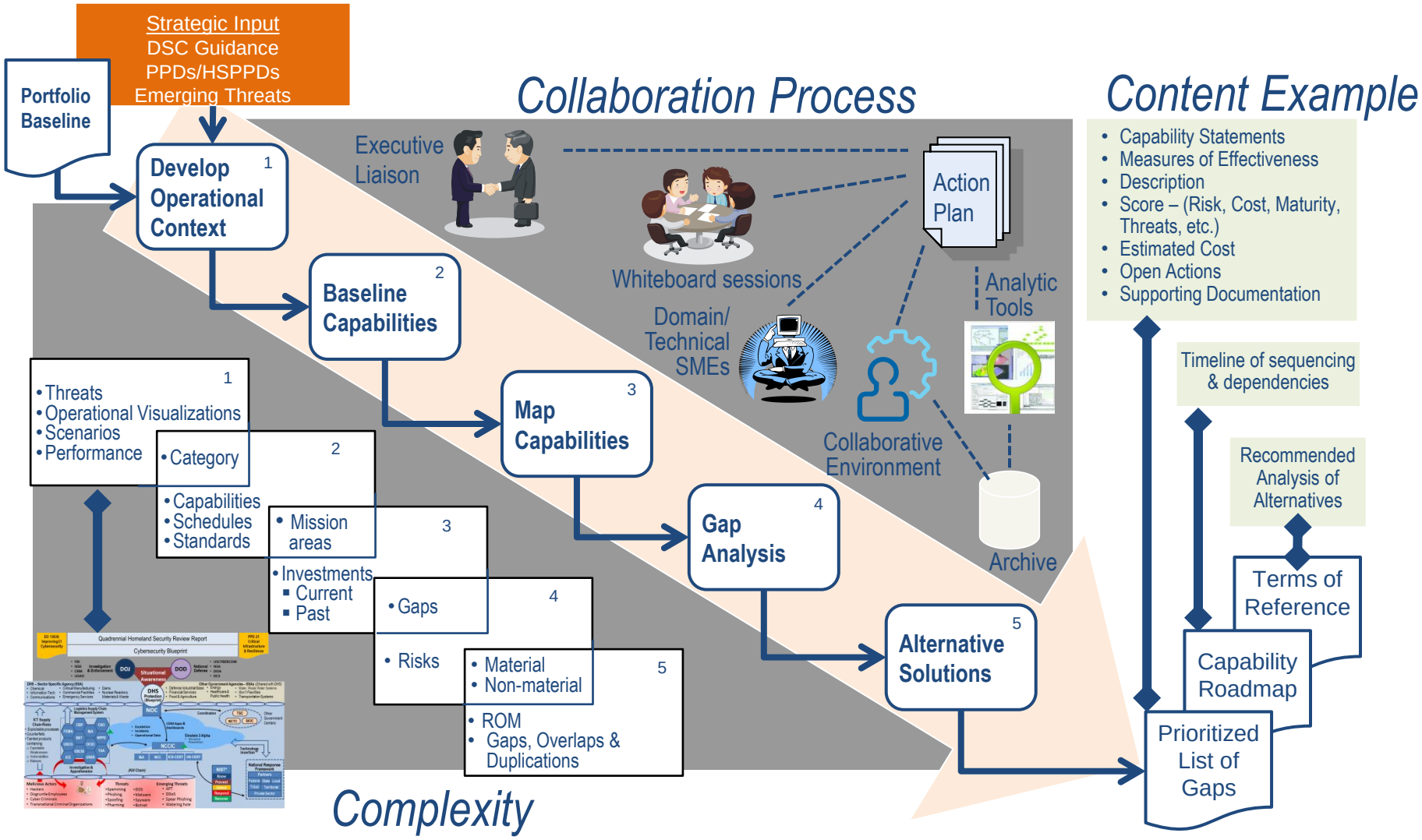


- **QHSR Pilot in IILCM:**
  - **Cyber**
  - **Biodefense**
  - **Common Vetting**

Cyber Security Operational Visualization (OV) Approach Example



Cybersecurity Pilot Capability Analysis



Provides the Program Review Board with data driven analysis to support investment allocations

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R&D Definition

Issue

DHS Research and Development Under Scrutiny -- September 2013

There are 35 cases of overlapping research-and-development programs totaling about $66 million at the Department of Homeland Security, the Government Accountability Office has found.

There is a lack of visibility on who is working on what projects across the 22 agencies, Dave Maurer, GAO director of homeland security and justice issues, testified on Capitol Hill.

In many cases, one agency was working on similar studies without necessarily being informed of the other's research, he said. (MORE>>>)

http://www.nationaldefensemagazine.org/archive/2013/September/Pages/DHSResearchandDevelopmentUnderScrutiny.aspx

Way Forward

- **Develop definition of R&D … based on the GAO and DoD definitions**
- **For use in dialogue with Components – will also be used to drive portfolio development and reviews for the Components**
- **Intended to respond to the Congressional and Departmental leadership requests for R&D framework**

Basic Research		Applied Research		Technology Development	Technology Demonstration	System Development
TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7
Basic Principles Observed/ Reported	Technology Concept/ application formulated	Critical Function or Characteristic proof of concept	Validation in lab Environment	Validation in Relevant Environment	System Prototypes in relevant environment	System Prototypes in operational environment

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S&T Portfolio Review Analysis

Goals of the Portfolio Reviews are to:

- ❑ Improve the quality of the portfolio
- ❑ Rationally manage the resources of S&T
- ❑ Increase partner alignment and ensure that technologies & knowledge products transition to operational use

Operational Focus

Systems Analysis?

How well does the project's product(s) align with a customer's existing operational context/concept of use or an alternative that is agreeable to the customer?

Customer Buy-in?

Have the project objectives been developed through close consultation with appropriate decision authorities?

Innovation

Impact (Eff./Cap.)?

Efficiency: What level of savings can be achieved by this project with respect to the customer's operations?

Capability: To what extent does this project provide risk or threat reduction and/or improved fidelity, performance, etc.?

Novel Approach?

Does the project attempt to realize its objectives in a way that others have not previously considered or exploited?

Technical Feasibility?

Is this a feasible project given the current state of science/technology/research?

Partnerships

Resource Leverage?

What level of commitment exists between the project team and the target component or customer?

Foraging?

Does the project exploit existing technology or research, and/or new or existing partnerships to minimize time and expense?

Project Quality

Project Clarity?

How well is the project described, laid-out – is it clear what the team will do? Is the problem well defined and the approach clear? Has a letter of intent or TTA been obtained?

Cost Realism?

Is the cost projection credible?

Timeline?

When will the project achieve either an efficiency or capability improvement…?

Transition Likelihood?

Is there a clear path/mechanisms to enable transition/commercialization? Customer readiness? Are there any secondary issues…

Plan is to assist the Components in conducting R&D portfolio reviews (as appropriate) …

Science & Technology's Resource Allocation Strategy (STRAS) – Component Perspective

Work with Component to validate:

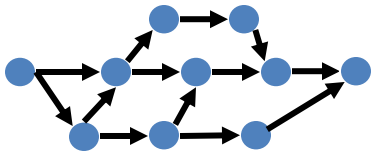
- ❑ Current Component/HSE efforts
- ❑ Mission, priorities and gaps
- ❑ Assist in developing requirements
- ❑ S&T investment in the correct solutions

Coordination (DUS' Office)

First Responders Group (FRG)	*Homeland Security Advanced Research Projects Agency (HSARPA)*	*Acquisition Support & Operations Analysis (ASOA)*	*Research & Development Partnerships (RDP)*
First Responders Resources Group (FRRG)	HSARPA R&D Strategies	T&E TSL Ops Acq Spt	Labs Universities

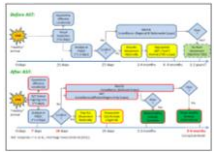
Systems Engineering

Systems Analysis

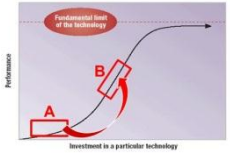


And/ Or

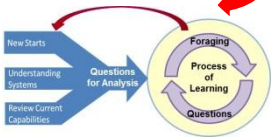
Operational Context



Technology Foraging



- Interagency
- International
- PPP
- Universities



Gain Component Head & USST Support

- Agree upon Mutual Goals
- Agree upon Co-Ownership
- Commit organizations to solution development and transition

GO / NO GO DECISION

Sign Formal Strategy

- Document understanding
- Document expectations
- Document approach

Current Portfolio

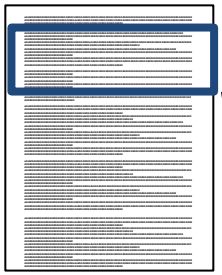
DHS/S&T ⟷ **Component**

Portfolio Review

STRAS Also Includes (Internal Perspective) …

… Internal focus on S&T R&D activities is essential for understanding how strategies translate to resources which in turn translate to achieving stated (and measurable) objectives

S&T Strategic Planning Guidance

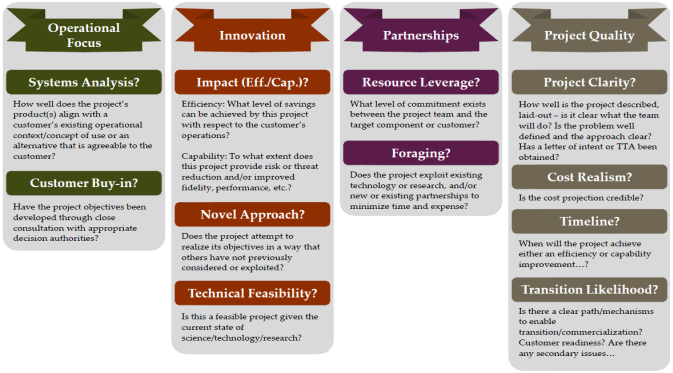


(Examples)

4. We will fully fund area X at 100% of requirements
5. Labs will be funded at _____
6. The priorities for biodefense funding will be _____

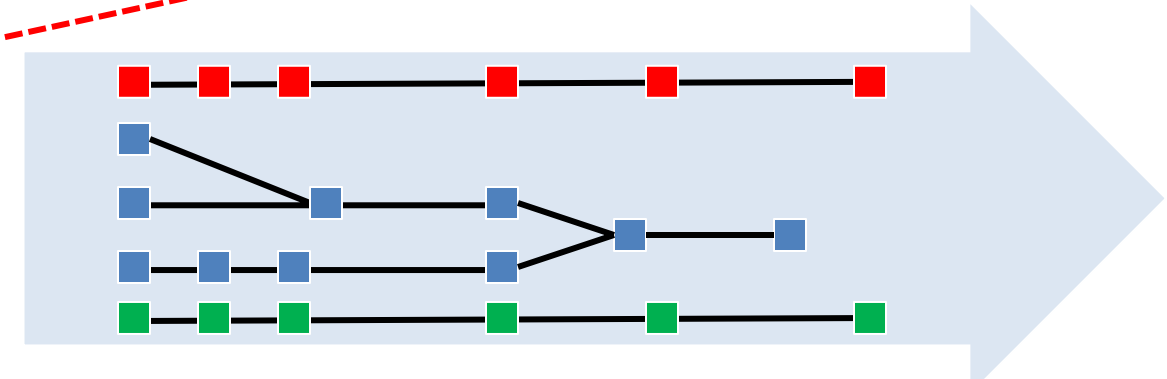
Internal focused prioritization for program & budget

Cost, Schedule, Performance



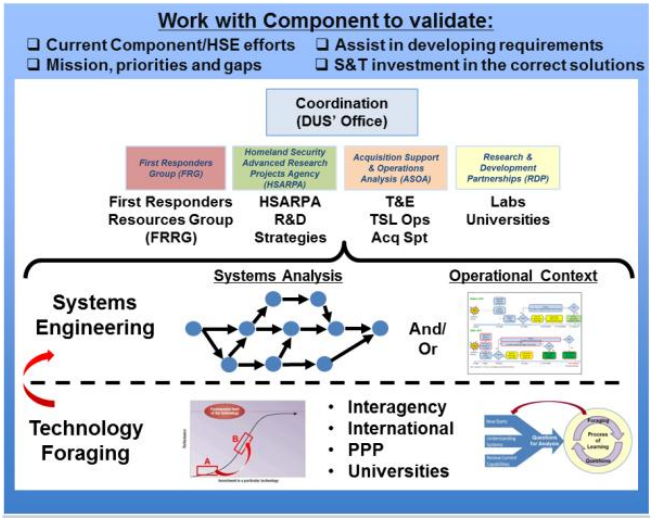
Employing Earned Value Management System (EVMS) characteristics

Technology Roadmaps



Objectives to be achieved through S&T's R&D efforts

Science & Technology's Resource Allocation Strategy (STRAS)



Annexes

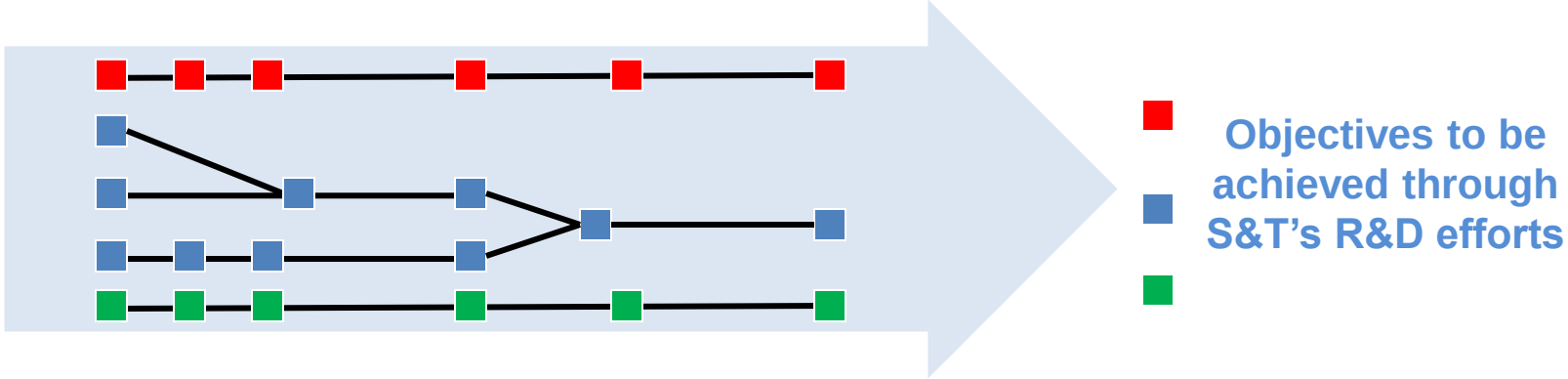
- Signature Document
- A Previous Year Support & Funding
- B R&D Strategies
- C First Responders Initiatives
- D Systems Analysis Support
- E T&E Support
- F National Laboratory Support
- G COE Interface
- H Interagency Coordination
- I Technology Foraging
- J Public-Private
- K Others?

Update:

- ❑ Will use HSSTAC on 4-5 December and FEMA meeting on 16 December to prototype
- ❑ All groups are developing their presentations

STRAS Also Includes (Internal Perspective) …

Technology Roadmaps



- ❑ **Agricultural Screening Tools: Will provide tools needed to rapidly: (1) detect and respond to Foreign Animal Disease (FAD) outbreak; (2) cargo inspections at ports of entry**
- ❑ **Outcomes/payoffs**
  - **Trusted tools and assays:**
    - **For use during outbreak to handle anticipated sample surge**
    - **Reduced sample transport logistics**
    - **Swifter answers to allow continuity of business for industries**
    - **Reduced impact to export and quicker return to trade status**
    - **Eventual adoption into pre-event surveillance activities**
- ❑ **Transition**
  - **USDA APHIS National Veterinary Services Laboratory**
    - ➢ **Dossier via National Animal Health Laboratory Network Methods Technical Working Group (NAHLN MTWG)**
  - **Livestock Industry's (Dairy, Pork)**

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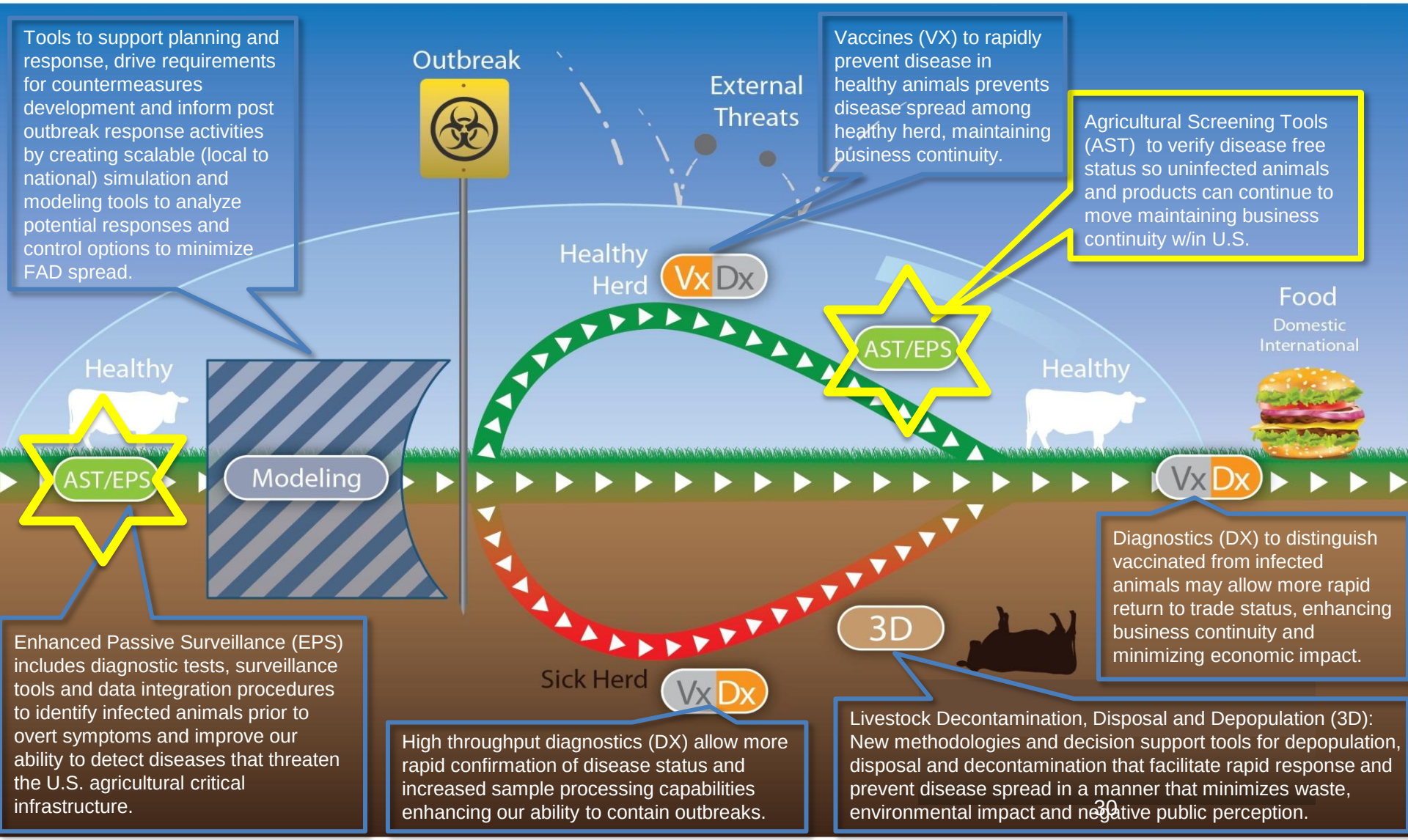
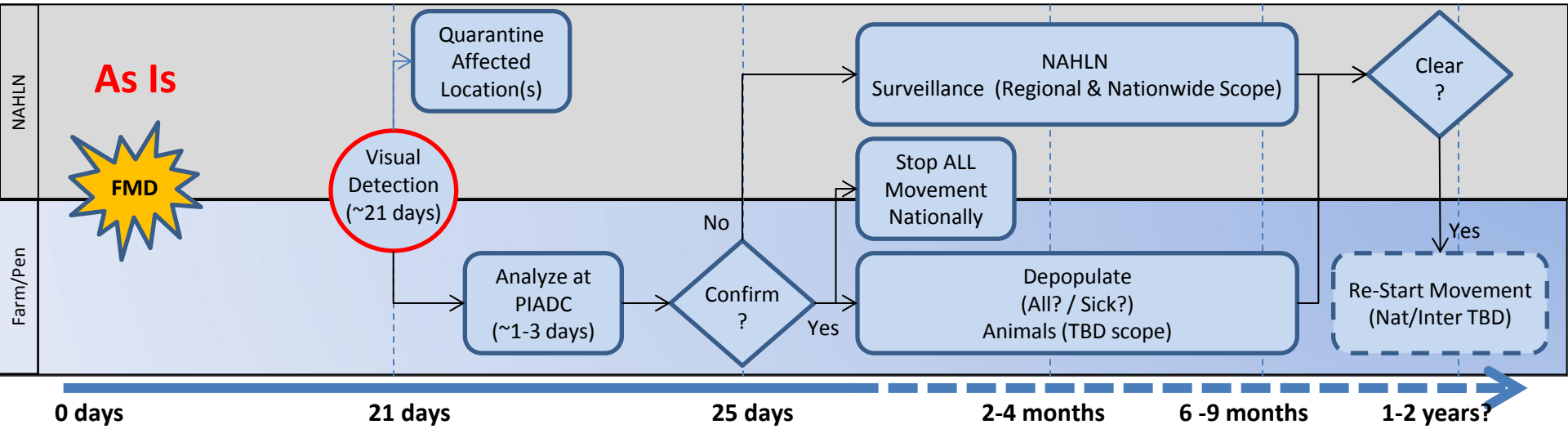
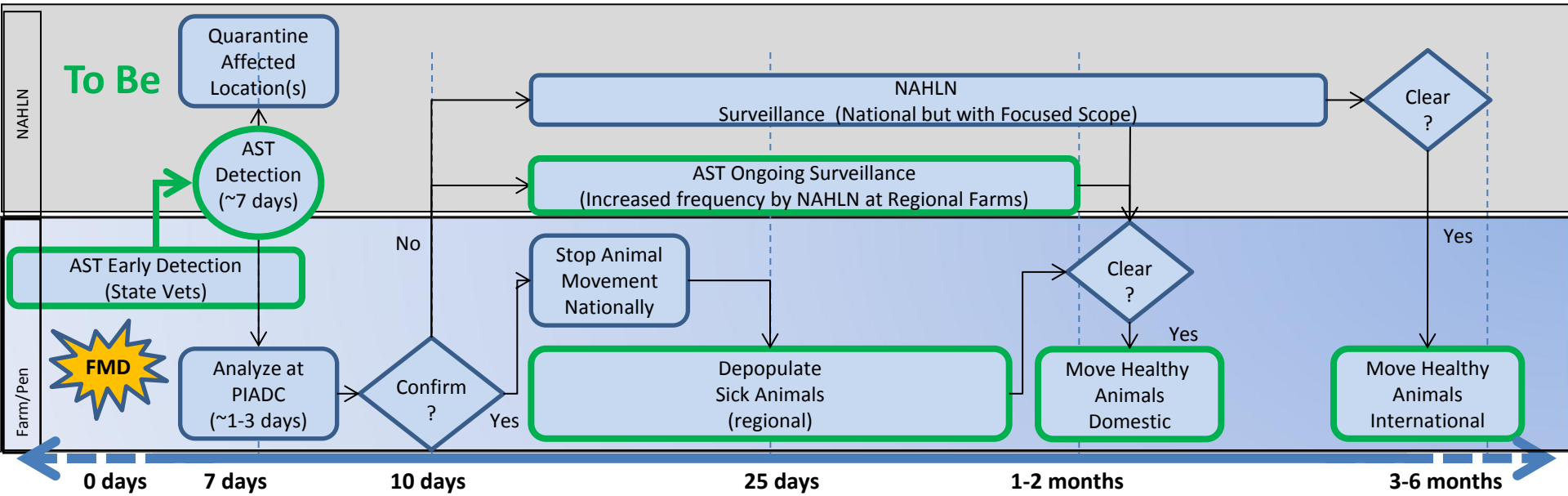
Science and Technology

Agricultural Screening Tools Roadmap



Operational Context Chart (As Is -- To Be)





Homeland Security
Science and Technology

Conclusions (& Recurring Tensions in R&D)

- ❑ Infrastructure versus R&D
- ❑ Doing more with less
- ❑ Balancing needs of Department, State and Local, Components, national missions
- ❑ Nature of innovation
- ❑ Becoming too conservative in the portfolio
- ❑ Transitioning technologies, capabilities and knowledge products

S&T's Value Added Proposition …

- ❑ ***Operationally focused*** **… focused technology options & operational process enhancements**
- ❑ ***Innovative*** **… develop innovative, systems-based solutions to complex homeland security problems**
- ❑ ***Building partnerships*** **… technical depth and reach to leverage technology solutions from federal, state, local and tribal governments, universities, and the private sector - across the US and internationally**

Homeland Security
Science and Technology

S&T Themes and Priorities

Themes

- Value Added Proposition …
  - Operationally Focused, Innovative, Building Partnerships
- S&T as the analytical and scientific core of DHS …
  - Place to go with the hard problems
- S&T increases the effectiveness and efficiency of the Department
- Trusted technical advisors
- Need stable funding

Priorities

- Our priority is improving operational effectiveness and efficiency in the following mission areas ….
  - First Responders
  - Borders & Maritime
  - Chemical/Biological
  - Cyber Security
  - Explosives
  - Resilient Systems

Department of Homeland Security Science & Technology

HSSTAC -- HSARPA 101

Dr. Adam Cox
Director, HSARPA
Science & Technology Directorate

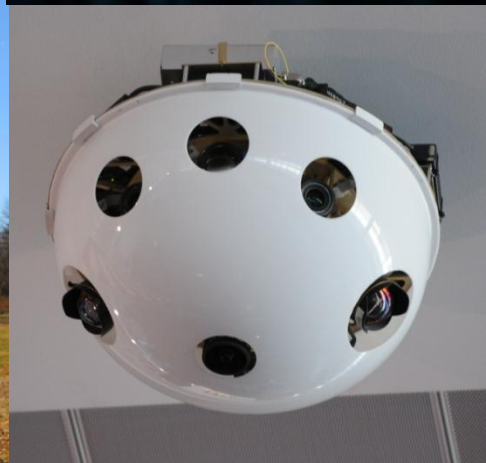
December 5, 2013

Homeland Security

Homeland Security
Science and Technology

HSARPA

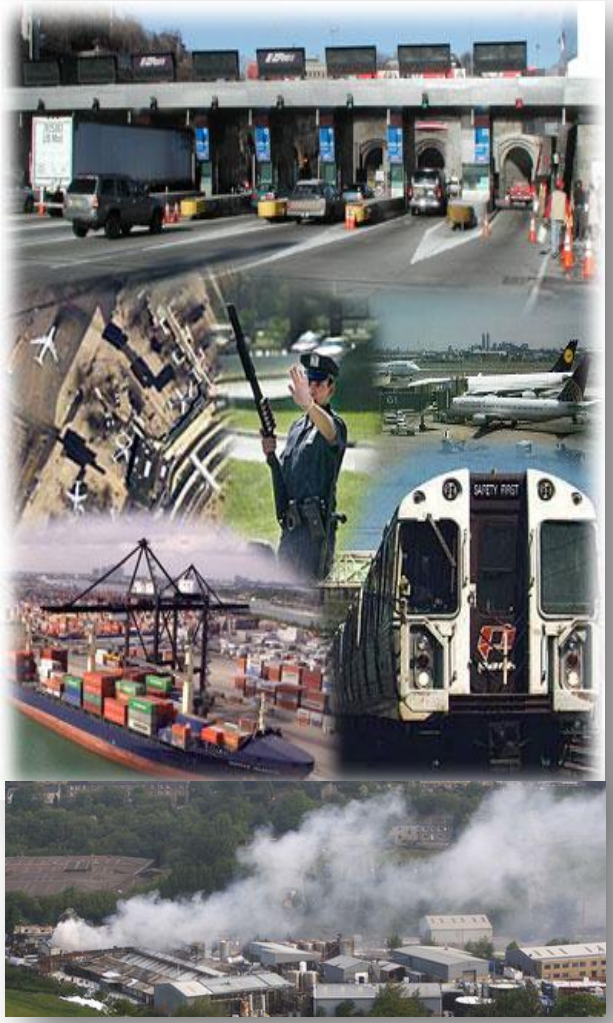
Research & development to produce compelling and affordable technologies and capabilities for homeland security



Broad Range of Customers and Stakeholders

Responders Emergency Management

DHS components
(CBP, TSA, USSS, FEMA, USCG, ICE, CIS, OHA, NPPD)



Federal Interagency
(FBI, EPA, HHS, USDA, DoD, FPS, GSA)

Homeland Security
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Cultural Shift at HSARPA

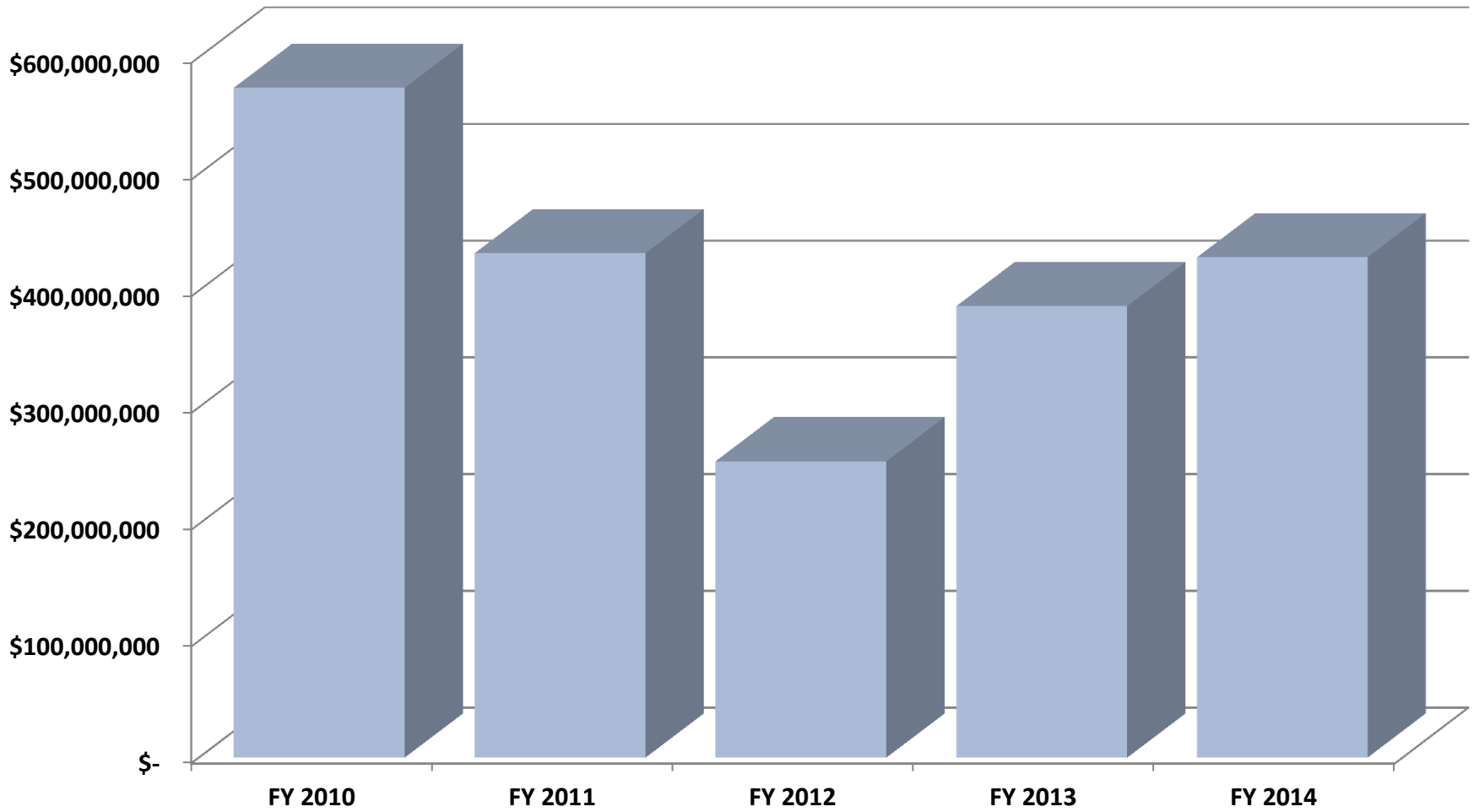
- Enhance the level of innovation in the portfolio
- Stimulate strategic new starts / new directions
- Improve planning & execution
- Create and enhance internal & external collaboration opportunities
- Establish mechanisms to avoid failed transitions

Realign portfolio to strike a better balance between near term lower risk technologies and longer term, high-risk/high-payoff technologies

Spurring Innovation and Transition

- More innovation, but still applied research
- Transition to a project based culture with well defined success metrics and completion points
- Encourage more opportunities for new ideas and competition through greater number of new starts and BAAs
- Increase the cycling of new ideas; attrition can be a good thing
- Become “best-in-class” at technology foraging – find and use opportunities when they are available

HSARPA Funding



Near Term Transition Focus

Rebalancing Investment Portfolio

HSARPA Technical Divisions

- **Borders and Maritime Security Division (BMD)** - Prevent contraband, criminals and terrorists from entering the United States while permitting the lawful flow of commerce and visitors
- **Chemical/Biological Defense Division (CBD)** – Detect and protect against, respond to, and recover from potential biological or chemical events
- **Cyber Security Division (CSD)** - Create a safe, secure and resilient cyber environment
- **Explosives Division (EXD)** - Detect, prevent and mitigate explosives attacks against people and infrastructure
- **Resilient Systems Division (RSD)** - Identify and analyze threats, enhance societal resilience, and integrate human capabilities in technology development. Strengthen situational awareness, emergency response capabilities, and critical infrastructure protection

Border and Maritime Security

- **Mission:**

  Develop, integrate and evaluate technologies to detect, track and classify threats crossing air/land/water borders in between ports of entry.

- **Research Areas:**
  - Buried tripwires
  - Mobile surveillance systems
  - Tunnel detection and monitoring
  - Air-based sensor technologies
  - Maritime security of surface and underwater contraband threats

BMD Future Focus Land and Maritime Border Security

- Next-generation sensors/scanners/analytic/ communication tools and alternate power schemes/sources for:
  - Surveillance in extreme environments (terrain, weather, maritime)
  - Change detection
  - Mobility
  - Automation
  - Dark targets (ex: ultra lights, submersibles)
- Fusion/integration of air, land, maritime, cargo sensors & data streams across agencies / components at local, regional, and national levels
- Fusion of hard data (sensors), soft data (HUMINT, open text…), context (policies, cultural understanding), and forensics (learned data)
- Real-time info sharing/distribution to users at various entitlement levels (field, Op center, HQ, local, state…)

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BMD Future Focus Cargo and Supply Chain Security

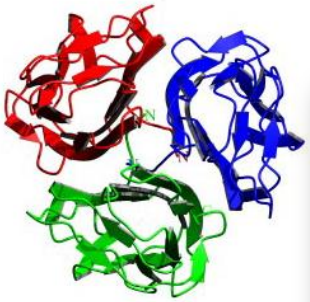
- Improved data/algorithms for CBP targeting systems being used to identify high-risk cargo
- Improved automatic target recognition for detection of explosives and contraband
- Advanced scanning methods for non-containerized cargo (ULD, bulk, break bulk…)
- Integrated sensors/combined portals
- Improved tools/methods/algorithms/databases to validate cargo and enforce trade compliance and detect invasive species
- Improved positive identification of land/maritime cargo (containerized, palletized, parcel, bulk/break-bulk, Ro-Ro, air, etc.) and detection of unauthorized access for land/rail/maritime
- Reliable and secure global communications and tracking of containers.
- Improved ability to quickly configure resources in response to supply chain disruptions

Chemical and Biological Defense

- **Mission:**

  Protect the Nation's population and infrastructure against chemical, biological and agricultural threats and disasters.

- **Research Areas:**
  - Comprehensive understanding of chem-bio threats
  - Pre-event assessment, discovery, and interdiction capabilities
  - Warning, notification, and timely analysis capabilities
  - Recovery tools & processes
  - Attribution of attacks
  - Medical countermeasures against foreign animal diseases

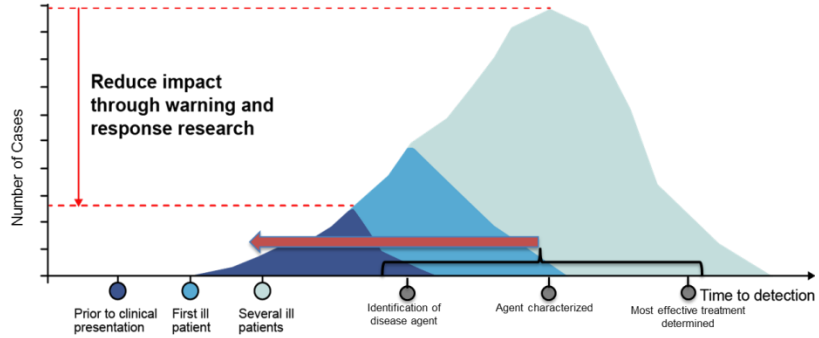


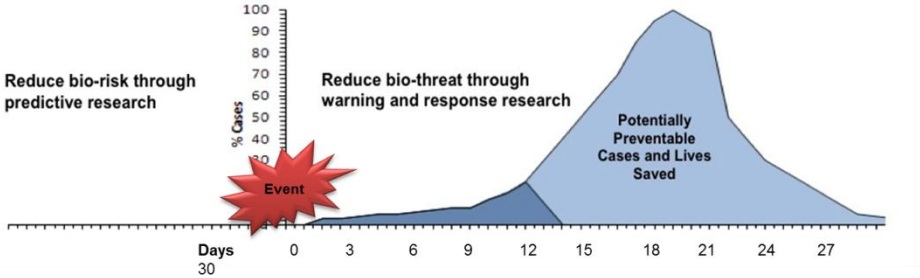
CBD Thrust Areas

- Traditional Bio/chem
  -- High priority known threats to human and animal populations

- X-Bio/chem
  -- Address unknown and emergent threats

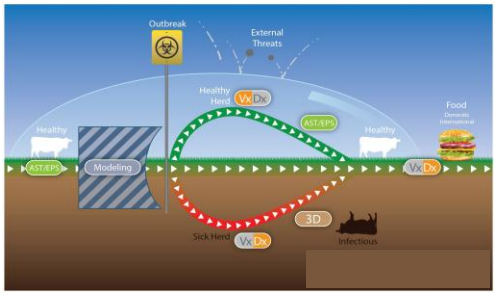
- Urban
  -- Bio/chem planning, surveillance, and response for mass transit, buildings, etc.



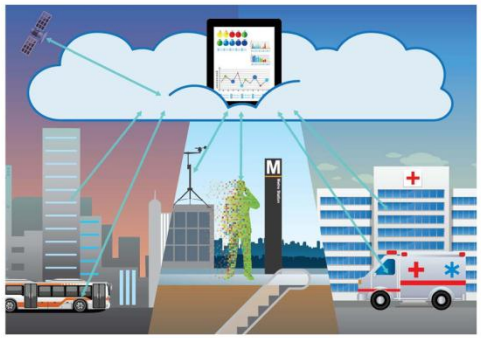


CBD Crosscutting Areas of Emphasis

- System level approaches to chemical and biodefense



- Bioinformatics - Integration of new data streams and analysis techniques to improve timeliness and accuracy of detection, identification, response, and forensics



- Surveillance and diagnostics - leveraging commercial technologies to enable low cost, widely available diagnostic and surveillance tools and networks

- Vaccines – Broad spectrum animal vaccines

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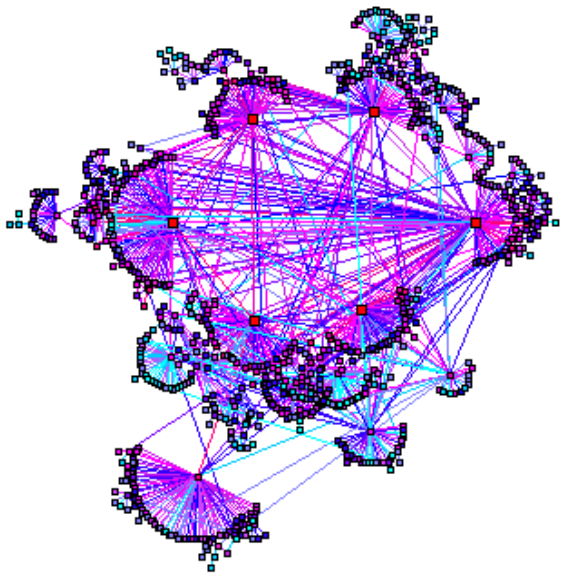
Cyber Security



Mission:

Secure cyber systems and networks that are resilient to cyber threats. Protect users, infrastructure, and the Internet.

Research Areas:

- Ensure infrastructure and the Internet are secure and less vulnerable to malicious and natural events
- Develop protocols essential to trustworthy cyber systems
- Provide safe cyber arenas to enable research on discovery, testing, and analysis of tools, technologies and software
- Provide R&D activities for users to attract next generation cyber security warriors, provide tools cyber criminal and terrorist investigations

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Cyber Security Thrust Areas

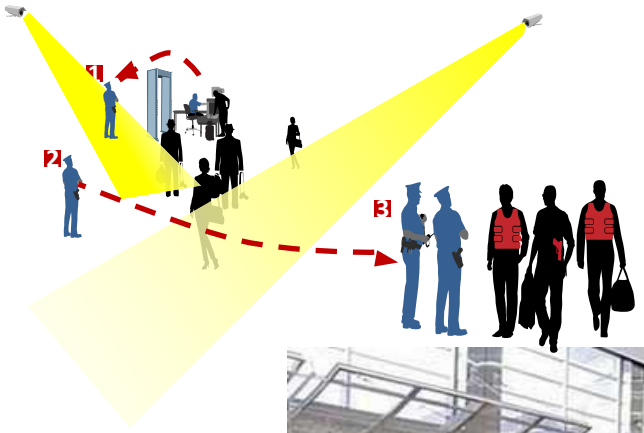
- CNCI and Federal R&D Plan Programs
  - Executing R&D programs with support from WH, OMB, OSTP
- Trustworthy Cyber Infrastructure
  - Working with the global Internet and critical infrastructure communities to secure cyberspace
- Research Infrastructure to Support Cybersecurity
  - Supporting national-level research with necessary R&D infrastructure
- Network and System Security
  - Technologies for next-generation networks and systems
- Law Enforcement R&D Needs
  - Capabilities to support F/S/L law enforcement requirements
- Cybersecurity Education
  - Leading National and DHS cybersecurity education initiatives, including Cyber Skills Task Force (CSTF)

Explosives

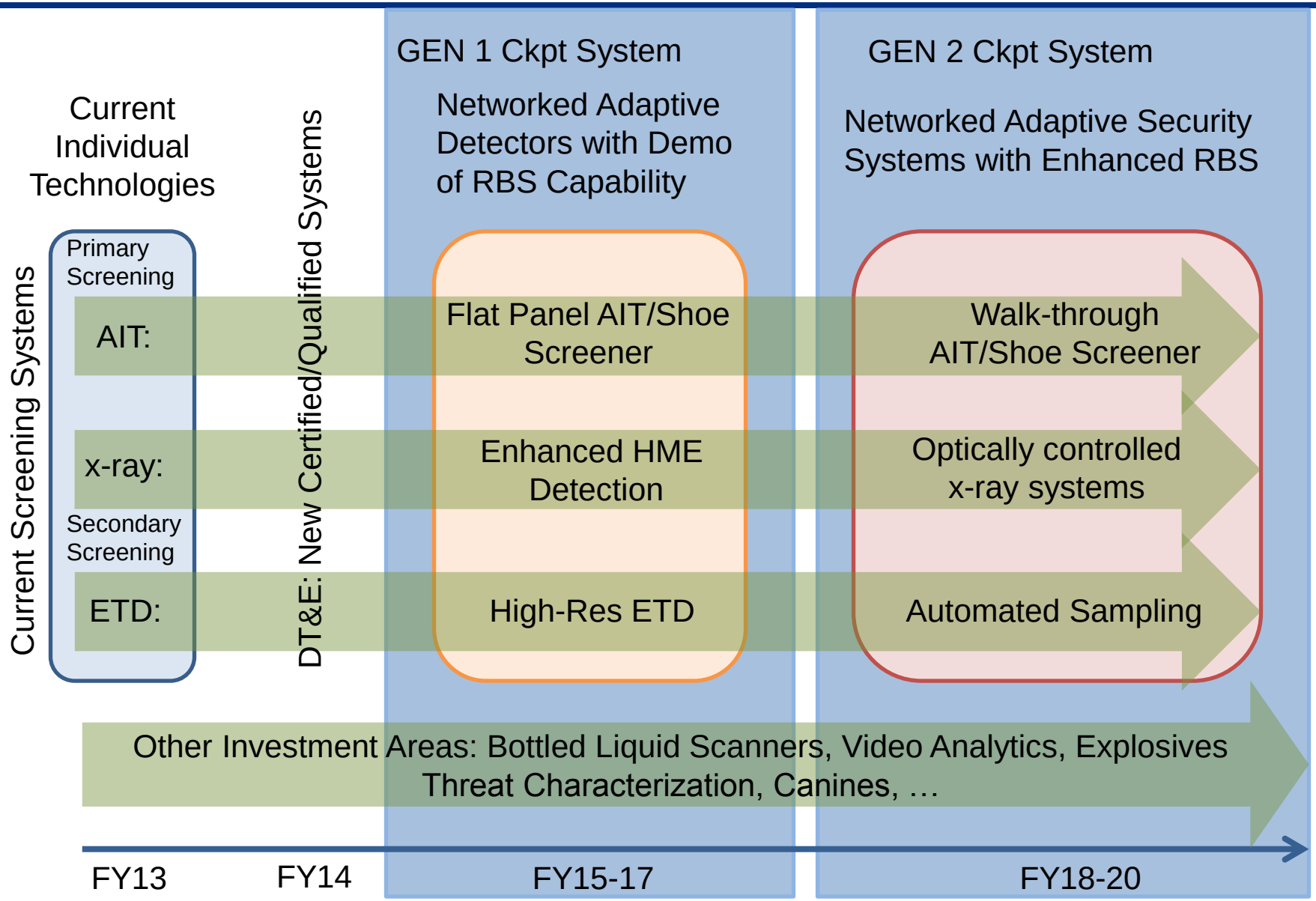
- **Mission:**

  Develop technical capabilities to detect, respond, defeat, and mitigate non-nuclear explosives terrorism.

- **Research Areas:**
  - Secure passenger and cargo safety at airports and checkpoints
  - Protect national infrastructure and treasures from explosive threats
  - Protect people and facilities in high volume, fast-paced environments such as trains and subways
  - Support first responders and TSA, US Secret Service, and Customs and Border Protection agents



Aviation Security Technology Development Plans



EXD Program Vision

<2 year goals:

- Enhanced HME detection capability in fielded systems and establish broad-based HME detection capability enhancements with low false alarm rate
- Demonstration of low cost, high throughput personnel screening solutions
- Alignment of EXD RDT&E 5 yr plans with ETD, x-ray and AIT DHS acquisition plans

5 year goals:

- High throughput (250+ pph) checkpoint screening with minimal divestiture for aviation and facilities security
- Demonstrated risk-based security systems to maximize efficiency for checkpoint screening operations
- Realized 30% reduction in security system false alarm labor costs

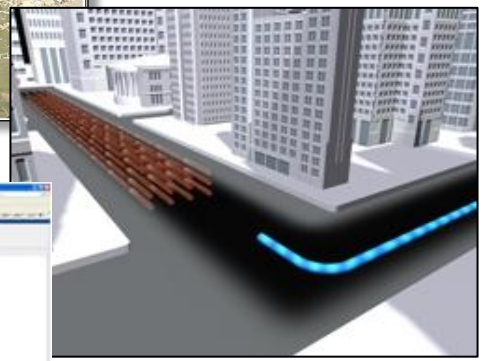
10 year goals:

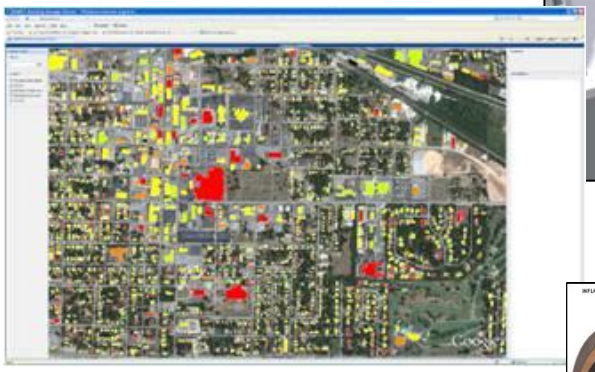
- Fully integrated, risk-based checkpoint screening for aviation and facilities security
- Demonstrated walk through (400+ pph) screening without divestiture for all operational environments

Resilient Systems

Mission:

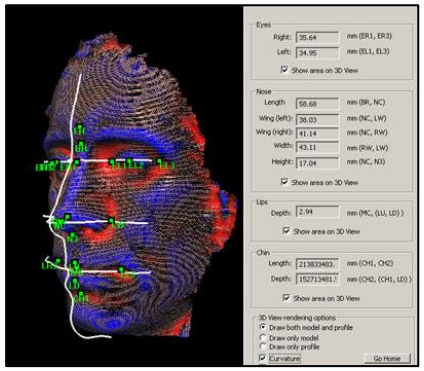
Rapidly develop and deliver innovative solutions that enhance the resilience of individuals, communities, and systems by enabling the whole community to prevent and protect against threats, mitigate hazards, effectively respond to disasters, and expedite recovery.

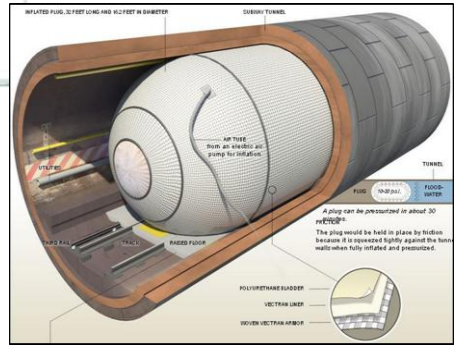




Research Areas:

- Adaptive risk mitigation
- Agile disaster management
- Resilient infrastructure
- Effective training, education, and performance
- PPD-8 & PPD-21





Homeland Security
Science and Technology

RSD Potential Future Program Areas

Adaptive Risk Mitigation

- Environment for analyzing alternative scenarios, impacts of cascading effects, and cost/benefit implications of various responses in near real-time
- Scalable Integration of Geo-dispersed Monitoring Assets **(SIGMA)**, e.g., pictures, video, analytics, etc., to accelerate forensics and rapidly respond to evolving risks
- Countering Violent Extremism (CVE) repository for appropriate personnel at all levels of government to understand/mitigate violent extremism

Agile Disaster Management

- **Predictive Analytics Toolbox** for national/regional response coordination centers and state/local EOCs, enabling users to understand cascading effects and make decisions faster/better (real time)
- **Secured, cloud-based access to imagery** for ongoing disaster tagged with source, time, and location, etc., to ***expedite*** recovery operations
- **Unified Supply Chain/Logistics System** to manage / distribute critical supplies (hours)

Resilient Infrastructure

- **Agile Energy System:** Self-healing new distribution grid architectures and devices to enable rapid restoration and increased resilience to multiple threats. Interoperability among micro-grids to support restoration of services.
- Critical infrastructure integration of **Built-in Resilience**: inexpensive sensor webs broadcast health/warning information to mitigate catastrophes
- Securing of critical infrastructure key sectors (power, water, transportation, etc.) through deployment of **Cyber-Physical System solutions**

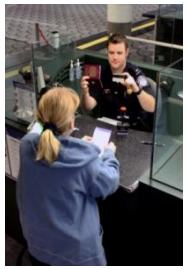
S&T Apex Programs

Collaboration between S&T and components to solve problems of strategic operational importance and deliver technology solutions that are integrated into homeland security operations.

APEX Entry/Exit Re-Engineering

Air Entry

- Minimize processing time for travelers entering the United States at U.S. airports

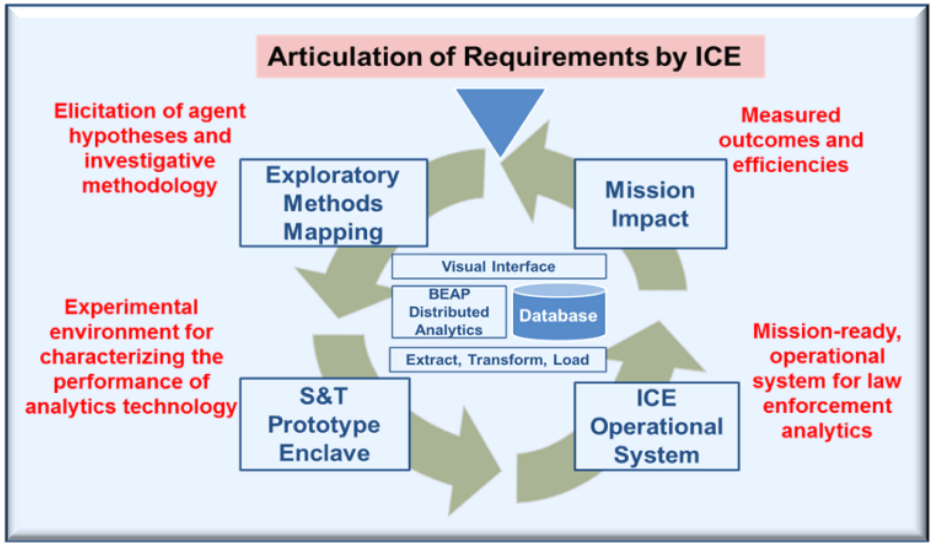


Air Exit

- Implement an agile and cost-effective biometric exit capability

Goal: Biometrically verify the foreign national who entered the United States is the same foreign national who exited the United States

Border Enforcement Analytics Program (BEAP)



Goal: Deliver data driven business models to support ICE Homeland Security Investigations

Homeland Security
Science and Technology

Summary

- HSARPA offers great opportunities
  - An important mission
  - Money to invest
  - Staff that is empowered
  - A willingness to adapt
  - An opportunity to make a difference
- You can help
  - Bring us great ideas
  - Write compelling proposals
  - Put your best people on our projects
  - Work with us to commercialize & sustain our products
  - Help us find the talent that we need to enable & sustain success

Department of Homeland Security Science & Technology

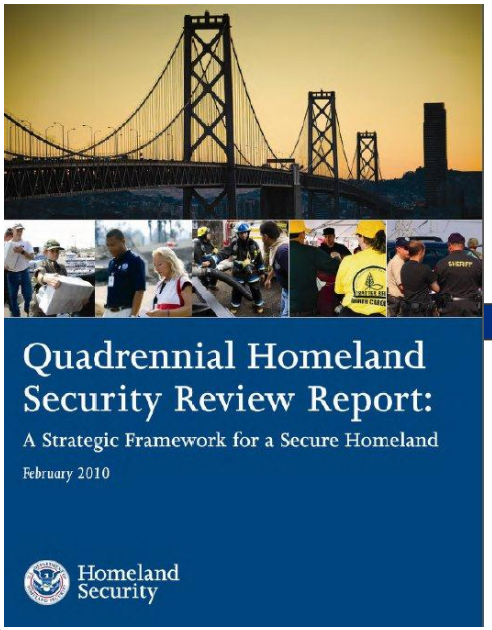
HSSTAC -- FRG 101

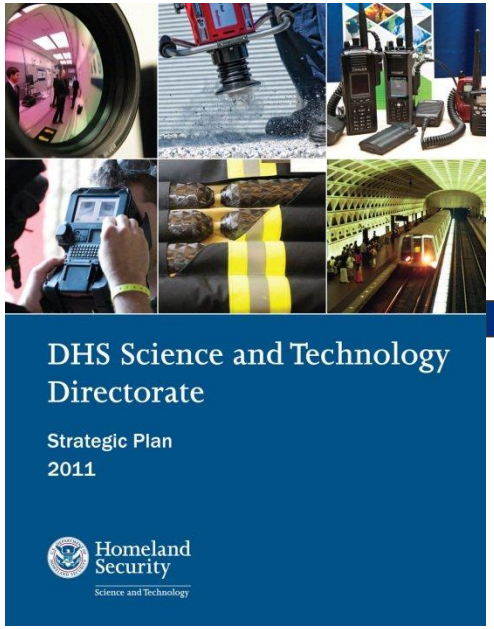
Joseph "Jay" Martin
Deputy Director, FRG
Science & Technology Directorate

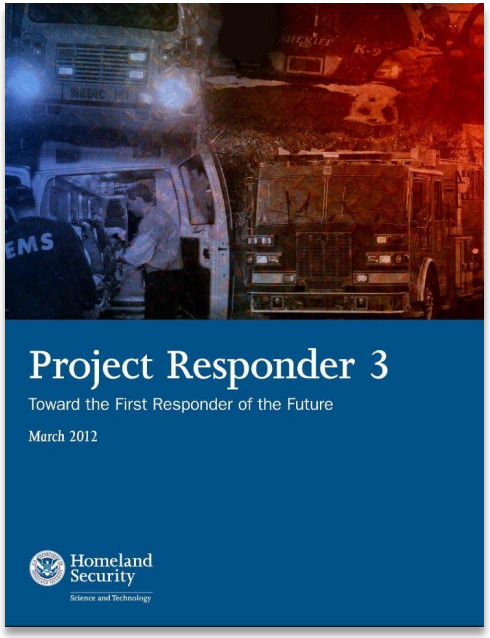
December 5, 2013

Homeland Security

DHS Policy


Quadrennial Homeland Security Review Report:
A Strategic Framework for a Secure Homeland
February 2010
Homeland Security


DHS Science and Technology Directorate
Strategic Plan
2011
Homeland Security
Science and Technology


Project Responder 3
Toward the First Responder of the Future
March 2012
Homeland Security
Science and Technology

DHS Science and Technology Mission

To strengthen America's security and resilience by providing knowledge products and innovative technology solutions to the Homeland Security Enterprise

Homeland Security
Science and Technology

DHS S&T Goals

1. Rapidly develop and deliver knowledge, analyses, and innovative solutions that advance the mission of the Department
2. Leverage technical expertise to assist DHS components' efforts to establish operational requirements and select and acquire needed technologies
3. Strengthen the Homeland Security Enterprise and first responders' capabilities to protect the homeland and respond to disasters
4. Conduct, catalyze, and survey scientific discoveries and inventions relevant to existing and emerging homeland security challenges
5. Foster a culture of innovation and learning, in S&T and across DHS, that addresses challenges with scientific, analytic, and technical rigor

DHS S&T Goal Three

3 Strengthen the Homeland Security Enterprise and first responders' capabilities to protect the homeland and respond to disasters

Objectives

- Better understand first responders' needs and requirements, including those related to border protection and transportation security
- Create high-impact technologies and knowledge products, such as standards and protocols, that facilitate the safety, effectiveness, and ease with which first responders conduct their work
- Advance the operability and interoperability of public safety communications equipment
- Increase first responders' access to information about best practices and product performance standards

Our Stakeholder Community

Departments
14,800

Utilities
16,960

Colleges & Universities
6,900

Insurance Companies
308,500

EMPLOYERS
7,601,160

Federal Agencies
16,960

Mental Health Services
15,000

Doctors' Offices, Nursing Homes
19,286

Social Services
210,427

URGENT CARE
and similar health facilities
5,000

PORT AUTHORITY
327

Public Works
~24,000

Media
14,650

Transportation
217,926

Chemical, Oil and Gas
2,500

NGOs
>1.5 million

Schools
132,656

Restoration & Repair
402,440

Sports Facilities
1,965

Veterinarians
21,731

Telecom & IT
11,000

State, Tribal, Local Govts
39,3130

Telematics Providers
16,960

NATIONAL WEATHER SERVICE
178

5,815

47

10,000

Victim Services
4,360

3,637

POISON Help 1-800-222-1222
61

CERT COMMUNITY EMERGENCY RESPONSE TEAM
3,479

NATIONAL GUARD
178

HAZMAT
1,120

DEPARTMENT OF DEFENSE UNITED STATES OF AMERICA
440

34 National 24K stations

19,902

SEARCH AND RESCUE TEAM
170

Fire - 30,170

EMS - 20,000

LE - 17,000

COMM/911
6,153

FRG Mission and Guiding Principles

Mission: Strengthen responders' ability to protect the homeland

Guiding Principles:

- ❑ Our collaborations save lives
- ❑ The operational needs of first responders drive our projects
- ❑ We build on existing investments
- ❑ We support easy-to-use solutions
- ❑ We transition technologies to operations

Providing solutions that save lives

Homeland Security
Science and Technology

FRG's Strategic Focus Areas

Communications

Data Gathering/Sharing

Responder Safety & Effectiveness

Radiological/Nuclear Response & Recovery

First Responders Group (FRG)

OIC

Office for Interoperability and Compatibility

Technical solutions to public safety communication challenges

NUSTL

National Urban Security Technology Laboratory

Testing, evaluation, analysis, technical assistance; leads Radiological/Nuclear Response and Recovery effort

IA

Information Applications

Technologies that access critical incident information wherever and whenever needed.

CORE

Communications, Outreach, and Responder Engagement

Links FRG to practitioners; identifies responder requirements; informs stakeholders about FRG projects

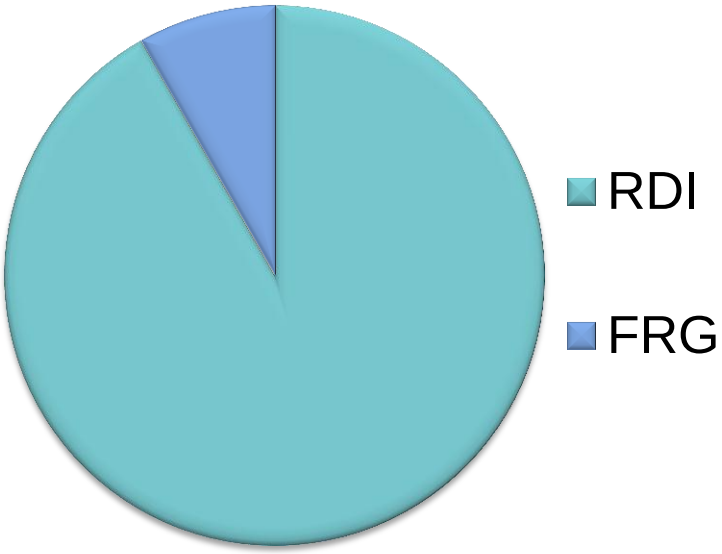
R-Tech

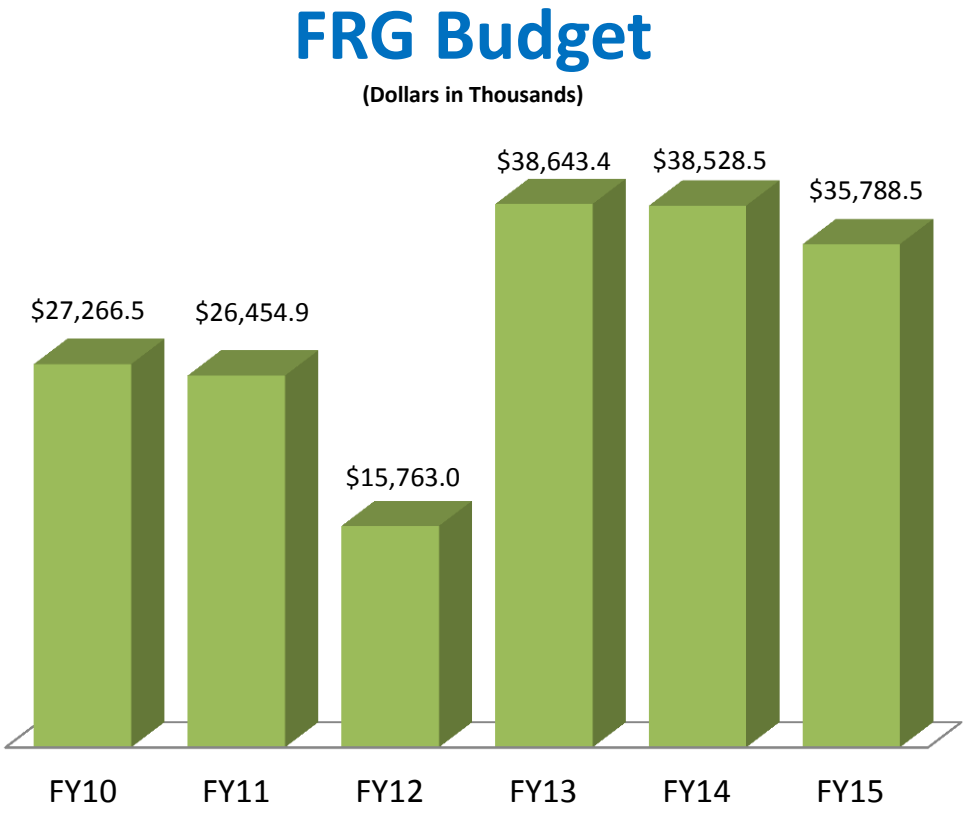
Responder Technologies

Manages technology development; disseminates information on products and services; facilitates innovation

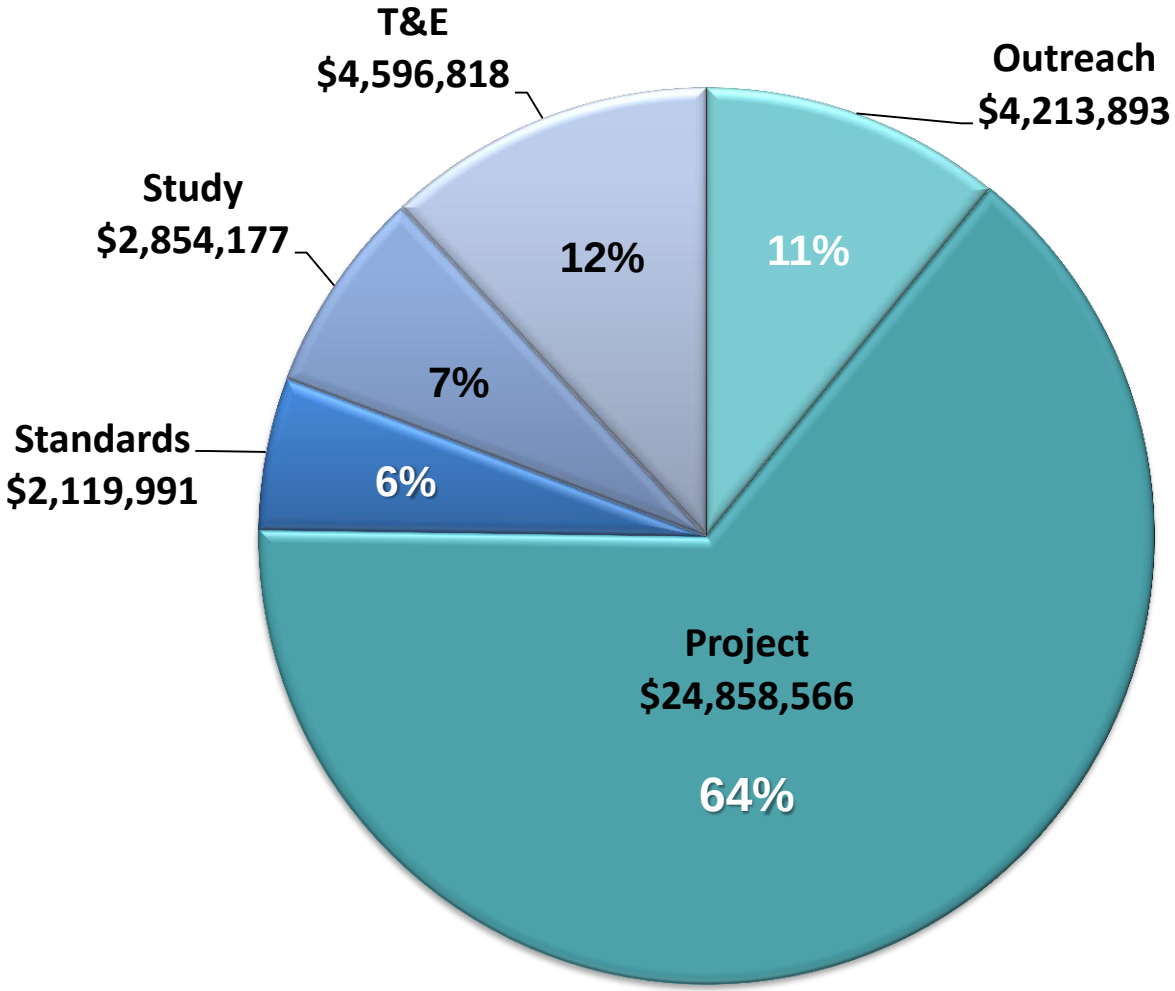
FY13 Budget Allocation

	RDI	FRG
Dollars	$431,845,710	$38,643,445
%	92%	8%

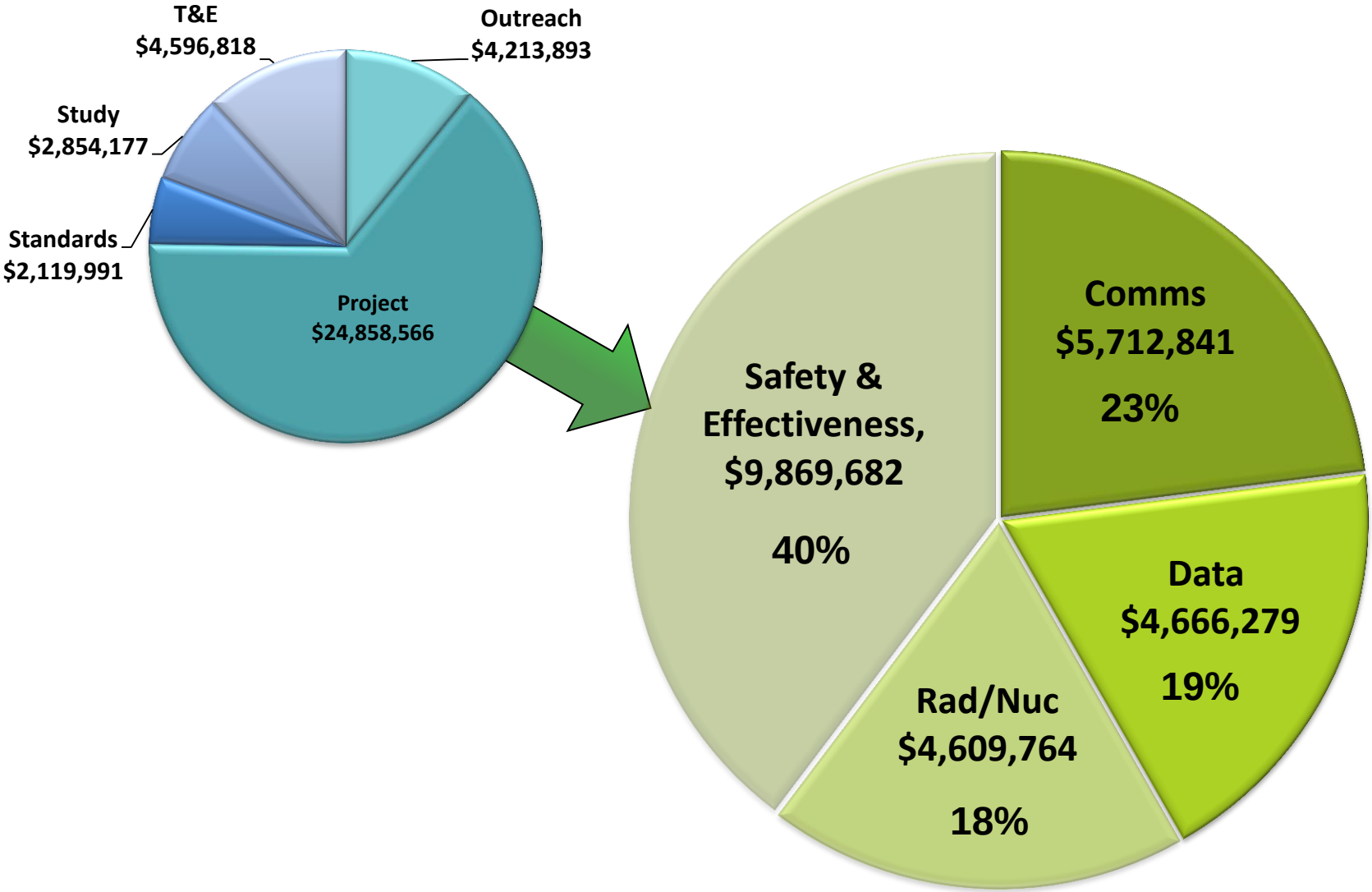




FY13 FRG Budget by Project Type

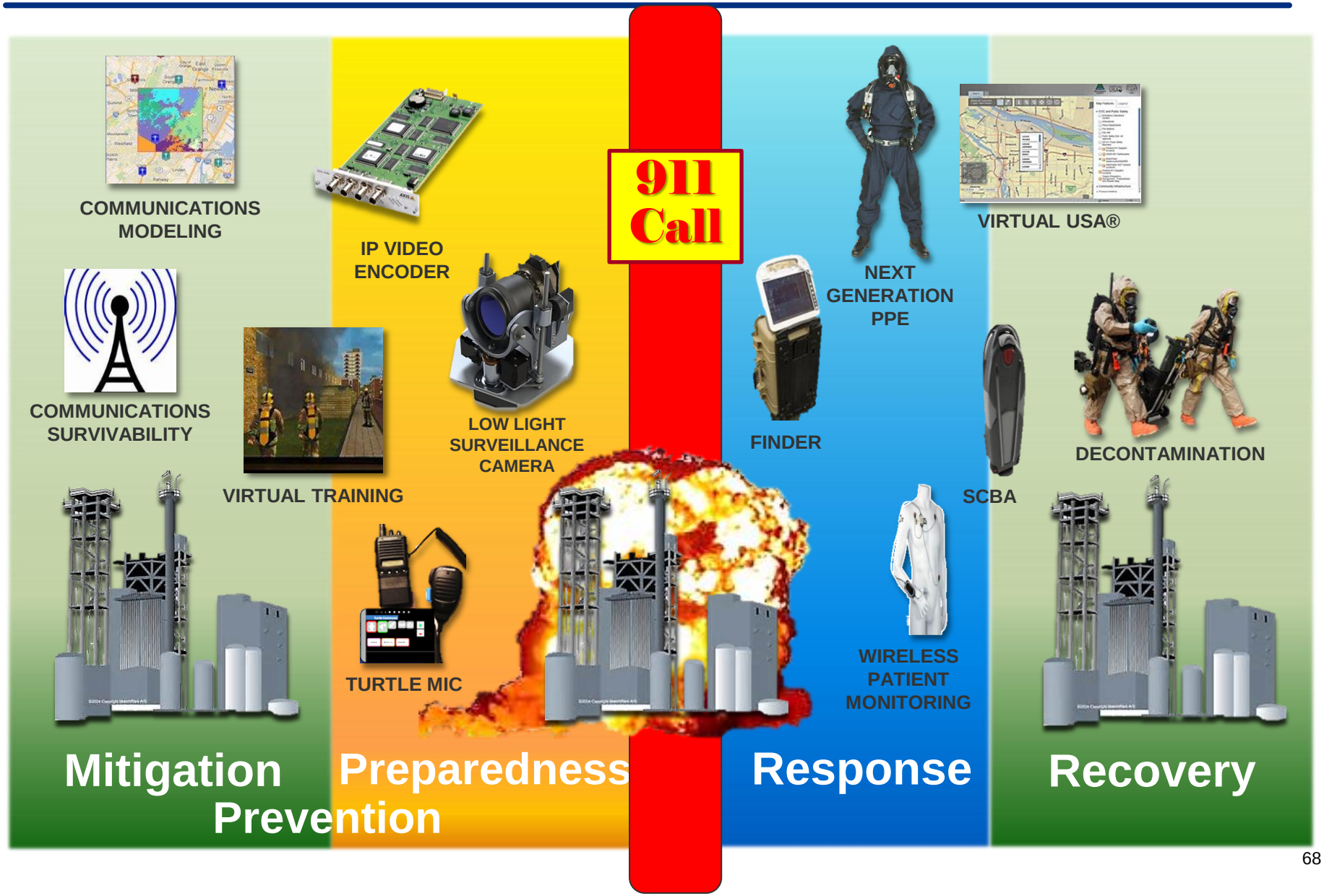


FY13 Project Funding by Priority Areas



Note: Total funding for FRG "Projects" equals $24.9M

FRG Technologies in an Incident Cycle

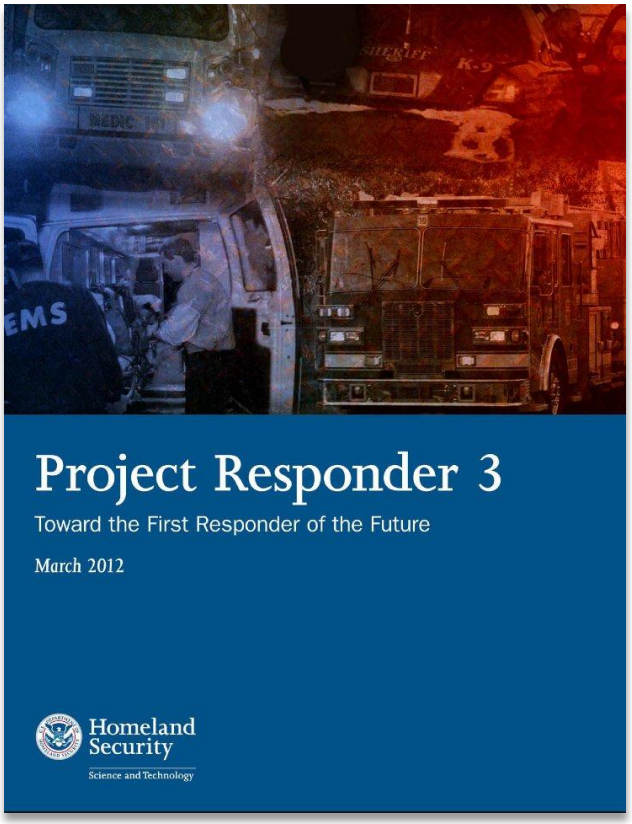


How FRG Identifies Responder Needs

Identify and Prioritize FR Needs

Project Responder

- Systematic effort to identify gaps between current emergency response capabilities and capabilities required to respond to catastrophic incidents
- Collaboration among DHS S&T, Federal Emergency Management Agency (FEMA), and state and local response agencies
- Over 250 responders from spectrum of agencies and non-traditional partners have participated in three phases since 2001



How FRG Generates Requirements

FRG's First Responders Resource Group (FRRG)

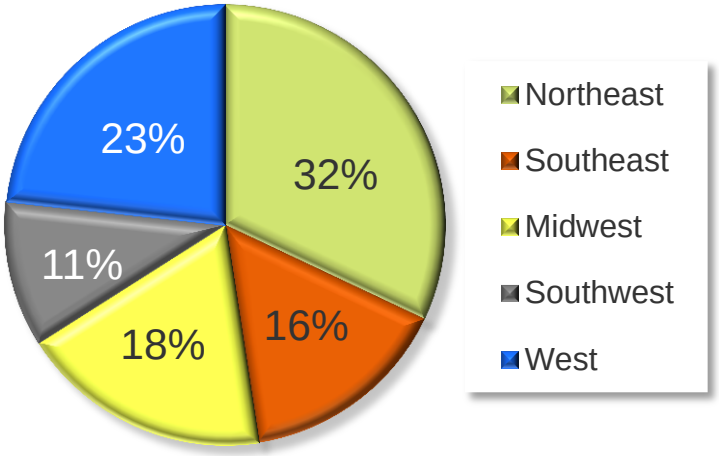
Stakeholders Identify Requirements

- 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

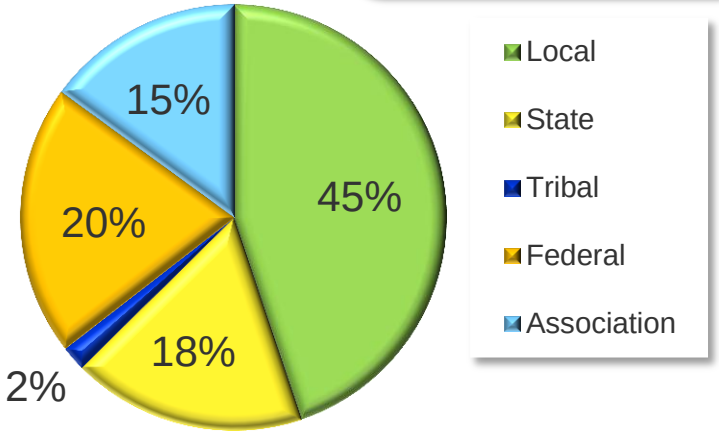
FRRG Membership

Stakeholders Identify Requirements

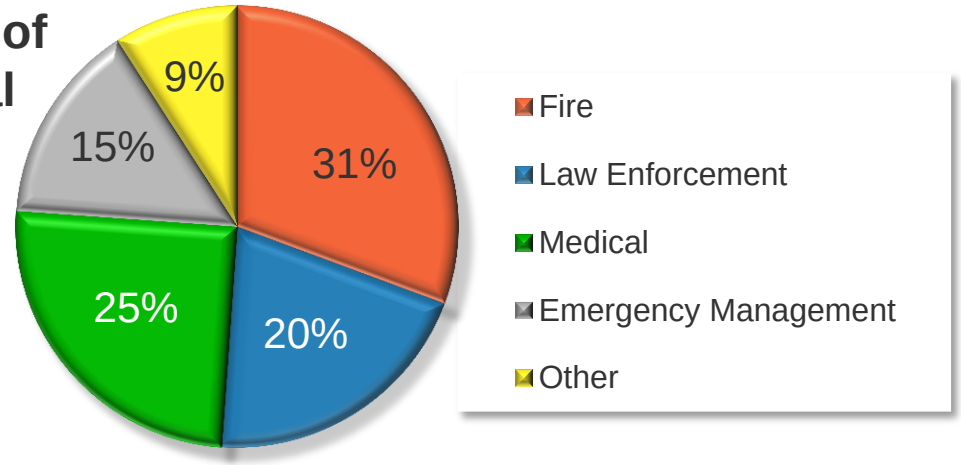
Regional Representation



Level of Government



Disciplines of Non-Federal Members



How FRG Generates Requirements

Are Face-to-Face Meetings Necessary?

Stakeholders Identify Requirements

- In 2013, FRG participated in 22 webinars with 1,655 participants, saving $442K in travel expenses
- FRRG using webinars and tele-conferencing more, to reduce costs, but efficiency suffers
- In April 2013 feedback about preferred meeting formats, FRRG members commented:

"I don't believe you can properly debate an issue without visual contact."

"Some [projects] can be done via con-call or telecon; however, others require F2F so brainstorming can take place or specific details can be worked on."

"While costs are a factor–face to face meetings are the most effective and productive engagements for us."

How FRG Generates Requirements

Input also solicited from recognized emergency response and preparedness authorities

Stakeholders Identify Requirements

THE INTERAGENCY BOARD

APCO PUBLIC SAFETY 75 YEARS LEARN ACT CONNECT

NPSTC

SAFECOM

Requirements Considered for PPE

Stakeholders Identify Requirements

Government

Materials Developers

Standards Developers

Threats

Focus Areas

Capabilities

Collaborators

Location Tracking

Thermal

Comfort

Comm Devices

Stabbing/ Penetration

Versatility

Boots

Chem/Bio

Weather

Respiratory Apparatus

Durability

Warning Devices

Ballistic

Gloves

Protection

Garments

First Responders

Vendors

Academia

Class 2 Bauer Multi-Threat Suit

Determining Which Projects to Undertake

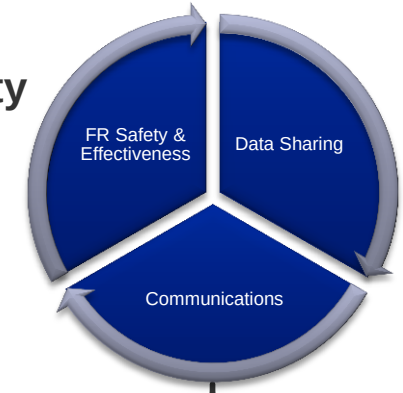
Identify and Prioritize Proposed Projects

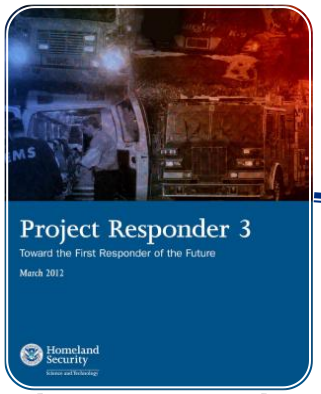
1. What are we trying to do? What problem are we are trying to solve?
2. How is it done today, and what are the limitations of current practice?
3. What is our new approach, and why do we think it will be successful?
4. If we are successful, what difference will it make?
5. How long will it take, what will it cost, and what are the milestones?

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

FRG Technology Flow

FRG Priority Areas





Capability gaps identified by first responder community

ORDs developed in coordination with first responder community

Tech Foraging

Available Technology

- SAFETY ACT
- FEMA s AEL
- FirstResponder.gov
- SAVER

Technology Development/ Adaption

- SECURE CERTIFIED

Partnerships
- Intra-agency
- Inter-agency
- International
- Private Sector
- Academia

Solution Development Process

Technology Foraging

Identify and Prioritize Proposed Projects

Tech Foraging

- Identifies existing and emerging technologies that might fill first responder requirements
- Evaluates identified technologies against operational requirements
- Assesses whether technologies can be leveraged for first responders, avoiding duplication and saving taxpayers money
- Establishes collaboration opportunities with DoD and other partners
- Facilitates transfer of technologies through field demonstrations
- Informs first responders about available and emerging technologies

Technology Foraging Overview

Systems Analysis	Technology Foraging	Outputs

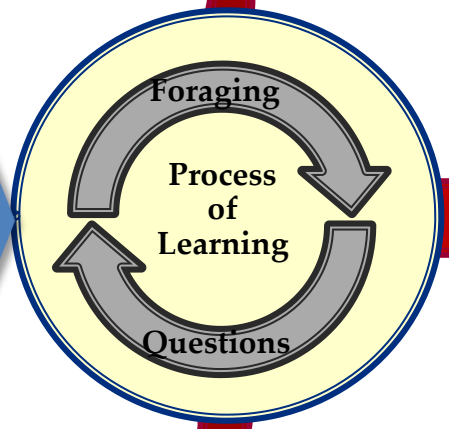
Nodal analysis to …

- Better understand the environment
- Identify questions for analysis
- Indentify requirements
- Identify gaps

New Starts

Understanding Systems

Review Current Capabilities



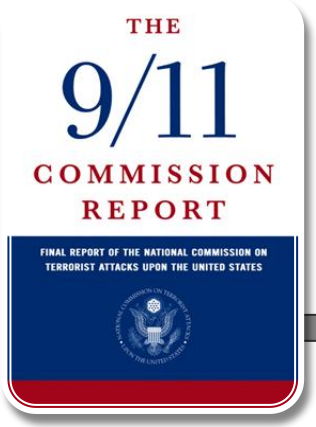
- "System" Definition
- Situational Awareness
- Speed of Execution
- Strategic Partnerships
- Portfolio Refinement
- Resource Management
- Data
- Points of Contact
- New Questions

Multi-Band Radio (MBR)

Problem Agencies cannot communicate with one another during emergencies, because their equipment uses different radio bands

Solution Multi-Band Radio, a mobile radio capable of operating across disparate radio bands

Multi-Band Radio (MBR)



Need identified directly by first responders

Requirements Gathering (SAFECOM ERC; FRRG)

Requirements determined by practitioners

Technology Foraging

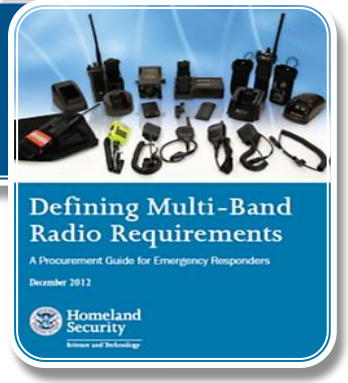
Similar DoD effort identified

Leveraging DoD Resources

DoD investment of ~$6B leveraged

Operational Pilots

Nationwide pilots conducted to test and evaluate MBR

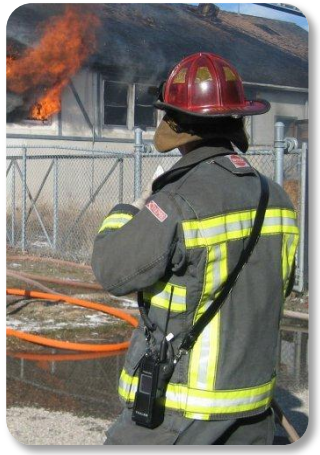


Developed knowledge products to share lessons learned

Multi-Band Radio (MBR)

Operational Successes

- 13 successful pilots, including Kentucky Derby
- Last two Super Bowls
- 2013 Presidential Inauguration
- 2013 State of the Union Address

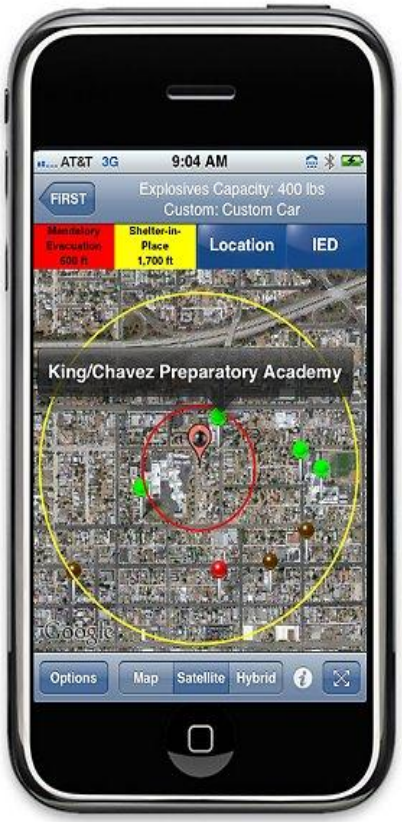


Market Impact

- On FEMA Approved Equipment List; qualifies for FEMA grants
- Market competition (Motorola, Harris, Thales)
- New market in MBR accessories
- Procurements by states, cities, U.S. Marine Corps, Department of Interior, U.S. Capitol Police

Giving first responders new communications capability, while preserving U.S. engineering and manufacturing jobs

First Responder Support Tools (FiRST) Application



Problem Responders need information tool to help them isolate bomb and hazardous material threats, evacuate affected areas, and coordinate their efforts

Solution Easy-to-use application for smartphones and laptops that shows safe standoff distances, nearby areas of concern (e.g., schools, hospitals), and suggested roadblock locations

Status

- ❑ Available on iTunes and Google Play
- ❑ Requires minimal training
- ❑ Listed on Responder Knowledge Base Authorized Equipment List; qualifies for grant funding
- ❑ More than 5,000 users
- ❑ Additional information at www.ara.com

Wildland Firefighter Advanced Personal Protection System

Problem Wildland firefighters suffer more heat stress injuries than burn injuries, due in part to bulky, heavy, uncomfortable protective garments

Solution Turnout gear using innovative materials that increase radiant protection and breathability, and reduce weight

S&T's Approach

- ❑ Leverage $1.7M from DoD, USDA, and FEMA grant
- ❑ FRG invests $330K
- ❑ Provide 1,200+ prototype garment systems to US Forest Service and State of California for trials

Next Steps

- Project Responder 3c/4
- Futures Initiative
- Flexible approach to address emerging communications
- Shift from SOA construction to capacity building for information sharing
- Rad/Nuc Response and Recovery Roadmap
- Social Media
- Convergence

Challenges

- ❑ Rebalance portfolio
- ❑ Fighting the good fight: working with first responders within federal regulations

- ❑ Doing more with less
  - ➢ Reduced budgets (federal, local, and state)
  - ➢ Less travel funding
- ➢ Internal requirements
  - E.g., meeting/ conference approval process

Department of Homeland Security Science & Technology

HSSTAC -- ASOA 101

Ms. Debra Durham
Director, ASOA
Science & Technology Directorate

December 5, 2013

Homeland Security

DHS S&T Acquisition Support & Operations Analysis Group (ASOA)

S&T's Value Added Proposition …

- ***Operationally focused*** **… focused technology options & operational process enhancements**
- ***Innovative*** **… innovative, systems-based solutions to complex homeland security problems**
- ***Partnerships*** **… technical depth and reach to leverage technology solutions from federal, state, local and tribal governments, universities, and the private sector - across the US and internationally**

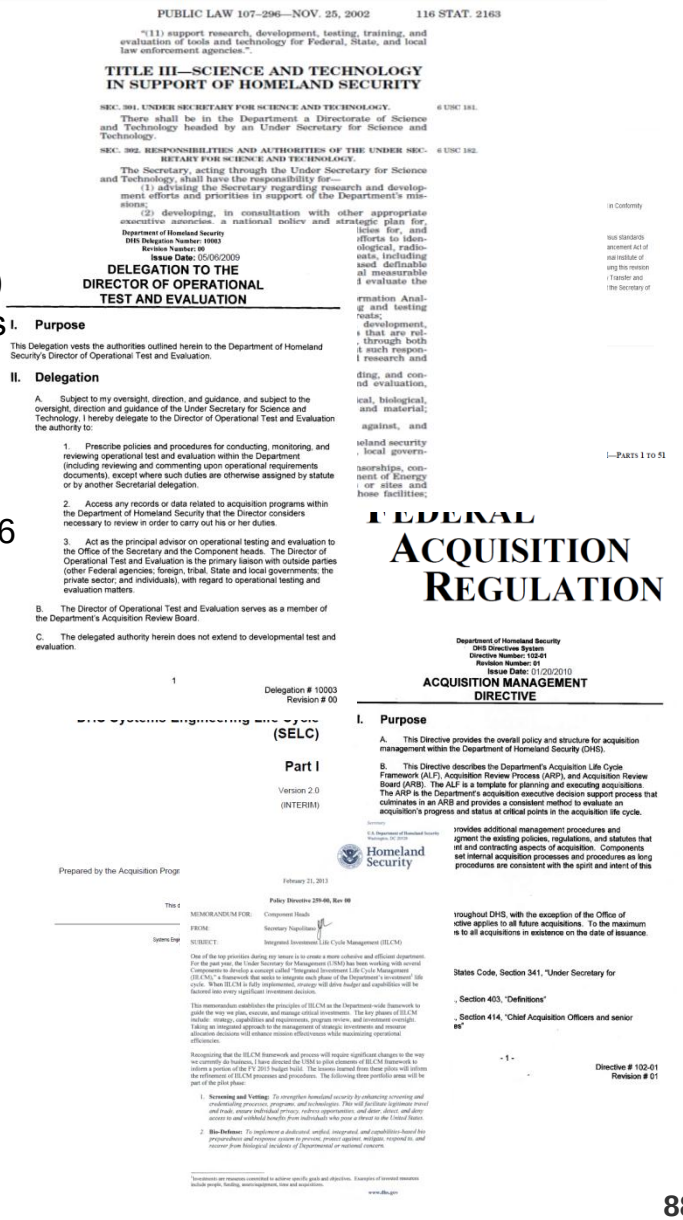
Under Secretary for Science and Technology
Deputy Under Secretary

- ***First Responders Group (FRG)***
- ***Homeland Security Advanced Research Projects Agency (HSARPA)***
- **Acquisition Support & Operations Analysis (ASOA)**
  - **Office of Research & Development Analysis & Assessment**
    - **Transportation Security Lab (TSL)**
  - **Office of Standards**
  - **Federally Funded Research & Development Centers Program Management Office**
  - **Office of Operational Test & Evaluation**
  - **Office of Systems Engineering**
- ***Research & Development Partnerships (RDP)***

Strengthening America's security and resiliency by providing knowledge products and innovative technology solutions for the Homeland Security Enterprise

ASOA Organizational Responsibilities

- **Component Acquisition Executive** – Serves as DHS Senior Acquisition official for S&T (MD 102-01 and Oct. 12 ADM)
- **Acquisition Insight –** Coordinate S&T position on requirements analysis and technology for DHS major acquisitions (MD 102-01)
- **Acquisition Oversight** – OT&E oversight responsibility of all Major DHS Acquisition programs (6 United States Code (U.S.C.), Title 3, Section 112, 182, 188, Delegation 10003, MD 102-01, and MD 026-02)
- **FFRDC Executive Agent** – Oversight and execution of DHS' FFRDCs that includes $130M/yr of work (Federal Acquisition Regulation (FAR) 35.017-4, FAR 35.017-5, 6 U.S.C. §185, and MD 143-04)
- **Standards Executive** – Coordinate and represent all Standards activities across DHS. Supports the development of performance standards and establishes test protocol for equipment and processes (6 U.S.C. §112(g) as they relate to the implementation of Office of Management and Budget Circular A-119 and 15 C.F.R. 287)
- **Operations Analysis** – Provide scientific, engineering and analytical support for strategic investments (6 United States Code (U.S.C.), Title 3, Section 302-5)
- **System Assessment & Validation for Emergency Responders** – Conducts 20+ objective assessment of commercially available responder equipment each year. Meets the intent of Section 509 of the Homeland Security Act (Public Law 107-296. November 25, 2002)
- **DHS Acquisition COEs** – Lead DHS Systems Engineering and Test & Evaluation COEs (MD 102-01 and App B of Acquisition Instruction Guidebook)
- **Developmental T&E** – Performance oversight of TSL and other developmental test efforts (ISO/IEC 17025)
- **Certification Testing –** Explosives Detection (Air Transportation Security Act) (Public Law 93-366)


PUBLIC LAW 107–296—NOV. 25, 2002 116 STAT. 2163

TITLE III—SCIENCE AND TECHNOLOGY IN SUPPORT OF HOMELAND SECURITY

Department of Homeland Security
DHS Delegation Number: 10003
Revision Number: 00
Issue Date: 05/06/2009

DELEGATION TO THE DIRECTOR OF OPERATIONAL TEST AND EVALUATION

I. Purpose

II. Delegation

FEDERAL ACQUISITION REGULATION

Department of Homeland Security
DHS Directive System
Directive Number: 102-01
Revision Number: 01
Issue Date: 01/20/2010

ACQUISITION MANAGEMENT DIRECTIVE

(SELC)

Part I

Version 2.0

(INTERIM)

February 21, 2013

Policy Directive 259-00, Rev 00

ASOA Mission

ASOA strengthens the Homeland Security Enterprise mission to secure the nation by providing analyses, engineering, and test expertise and products connecting Research, Development, and Acquisition to the operational end-user.

Homeland Security
Science and Technology

ASOA Capability Offering

ASOA Capability Key:

- Current Strength
- Limited Capability & Growth
- New Growth Area

Capability Areas

Mission Areas (FY 2010 QHSR)		Systems Analysis	Systems Engineering	Standards	Acquisition Planning	Test & Evaluation
Prevent Terrorism & Enhance Security	**Prevent Terror Attacks** **Prevent CBRN** **Manage Risks CI/KL & Events**	• Mission Analysis • Strategic Planning	• Requirements Engineering • Technology Optimization • Technical Process Integration	• Performance Specifications • Test Methods • Conformity Assessment • Training • Concept of Operations		• Developmental Testing • Certification Testing • Operational Test and Evaluation (OT&E)
Secure & Manage Borders	**Control US Air Land & Sea Borders** **Safeguard Lawful Trade & Travel** **Disrupt & Dismantle Transnational Criminal Organizations**	• Operational Context / Visualization • Mission Analysis • Predictive analytics • Alternatives • Process Improvement	• Requirements Engineering • Technology Optimization • Technical Process Integration	• Performance Specifications • Test Methods • Conformity Assessment • Training • Concept of Operations	• Acquisition Strategy • Transition Planning • Cost Analysis • Technology Insertion	• Field Experimentation • Technology Assessment • Anomaly/Explosives Detection& Screening • OT&E
Enforce & Administer Immigration Laws	**Strengthen & Administer Immigration Systems** **Prevent Unlawful Immigration**	• Process Improvement		• Performance Specifications • Test Methods • Conformity Assessment • Training • Concept of Operations		• OT&E
Safeguard & Secure Cyberspace	**Create Safe, Secure, Resilient Cyber Environment** **Promote Cybersecurity Knowledge & Innovation**	• Predictive analytics • Mission Analysis • Alternatives • Strategic Planning • Policy Studies • Threat and Risk Analysis • Trade-off Studies	• Requirements Engineering • Technology Optimization • Technical Process Integration	• Performance Specifications • Test Methods • Conformity Assessment • Training • Concept of Operations	• Acquisition Strategy • Transition Planning • Cost Analysis • Technology Insertion	• Technology Assessment, Validation, and Certification • OT&E
Ensure Resilience to Disasters	**Mitigate Hazards** **Enhance Preparedness** **Ensure Effective Emergency Response** **Rapidly Recover**	• Predictive analytics • Mission Analysis • Alternatives • Strategic Planning • Policy Studies • Threat and Risk Analysis • Trade-off Studies	• Requirements Engineering • Technology Optimization • Technical Process Integration • Analyses	• Performance Specifications • Test Methods • Conformity Assessment • Training • Concept of Operations		• System Assessment and Validation for Emergency Responders (SAVER)

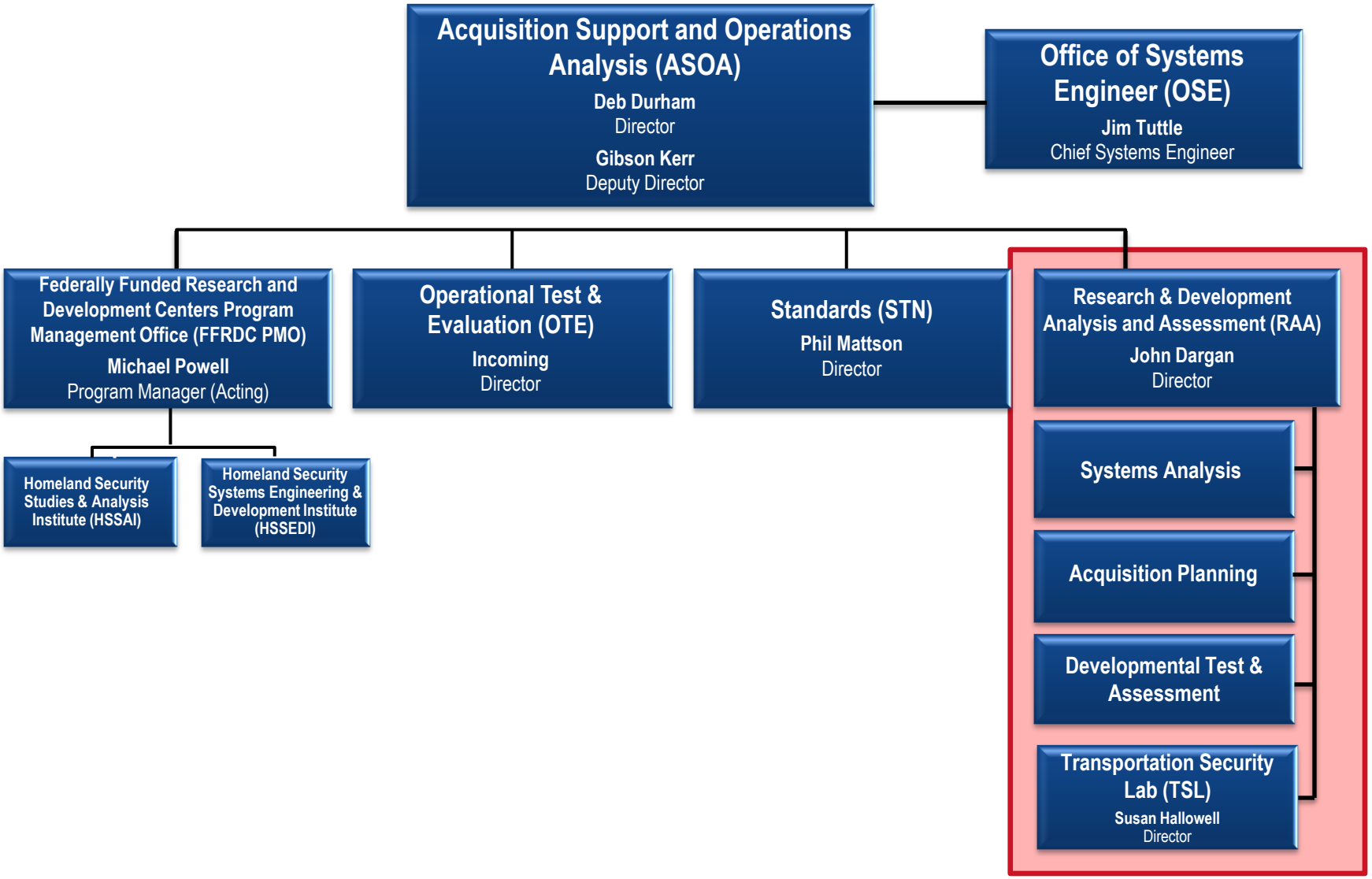
Homeland Security
Science and Technology

ASOA FY 2010-2014 Budget

Executing Office	FY 10	FY 11	FY 12	FY 13	FY 14
ASOA Total	34,948,718	26,487,486	28,452,630	20,415,342	22,368,223
Acquisition Support and Operations Analysis (Research & Development Analysis and Assessment/Office of Systems Engineering)	N/A	4,357,069	2,000,000	2,972,231	5,908,749
Federally Funded Research & Development Centers Program Management Office	5,000,000	4,000,000	5,000,000	4,000,000	3,751,250
Standards Office	18,900,000	11,532,603	14,811,739	7,061,355	7,370,057
Operational Test & Evaluation	11,048,718	6,597,814	6,640,891	6,381,756	5,338,759

Homeland Security
Science and Technology

ASOA Organization



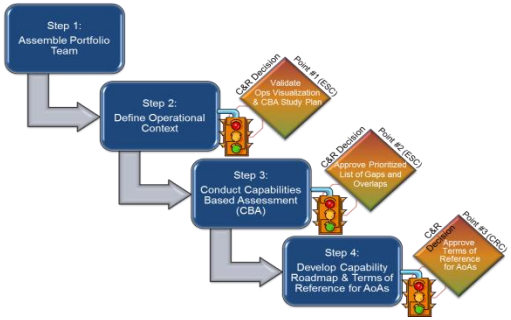
Office of Research & Development, Analysis, and Assessment (RAA)

❑ Value Add

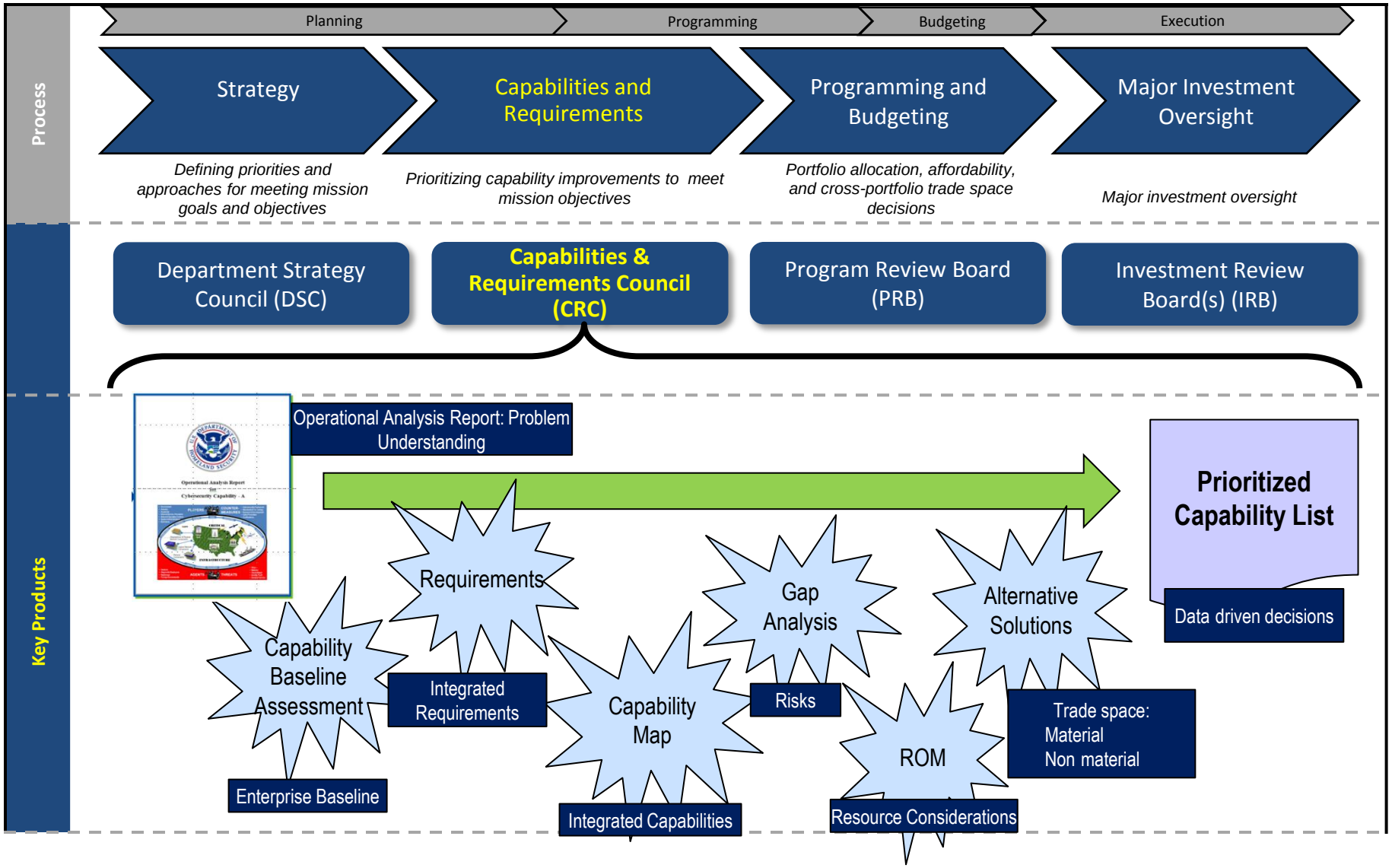
- Operational Context / Visualization
- Mission Analysis
- Predictive Analytics
- Acquisition Strategy
- Transition Planning
- Process Improvement
- Alternatives Analysis
- Technology Insertion

❑ Overview

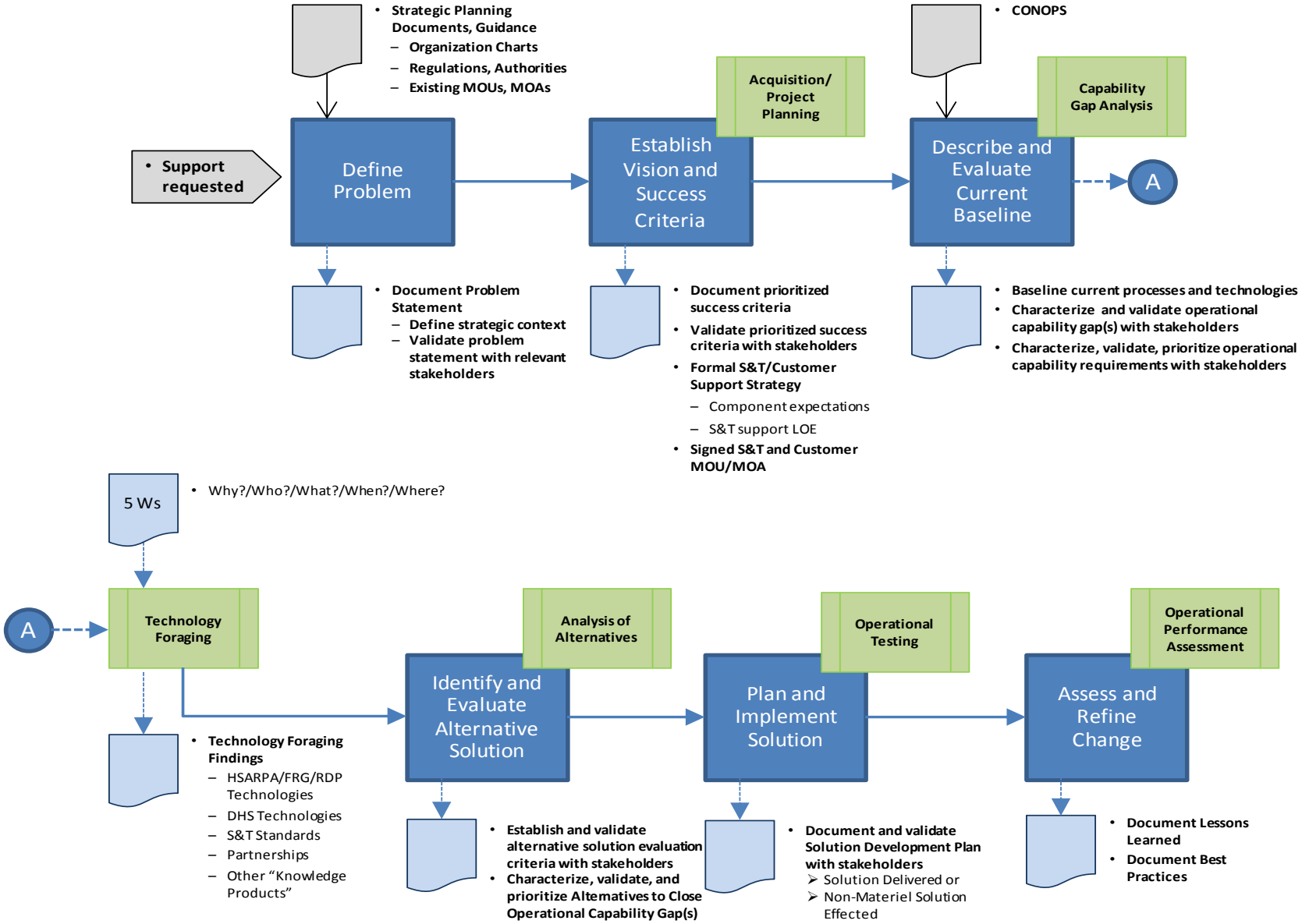
- Using practitioner-driven methodologies, RAA advises S&T and DHS components on how to successfully transition technologies and products to the field
- RAA applies an innovative systems-based approach to complex problems, assisting the Homeland Security Enterprise in defining and analyzing needs, gaps, and alternatives
- RAA defines operational contexts, plans programs, and ensures technical rigor by applying its expertise in systems analysis, acquisition planning, developmental testing, systems engineering, and process improvement



IILCM Capabilities & Requirements Council



Systems Analysis Process



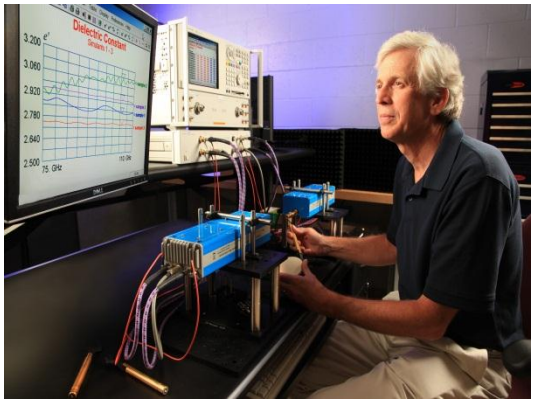
Transportation Security Lab (TSL)

❑Value Add

- Technology Assessment, Validation, and Certification
- Anomaly and Explosives Detection & Screening

❑Overview

- TSL is the leading federal laboratory supporting the development of explosive detection equipment and blast mitigation solutions for aviation security and other DHS operational needs
- TSL is the Transportation Security Administration's (TSA's) designated qualification test authority for all airport security technology
- TSL conducts both developmental test activities for anomaly and explosive detectors and certification testing for technologies to be fielded

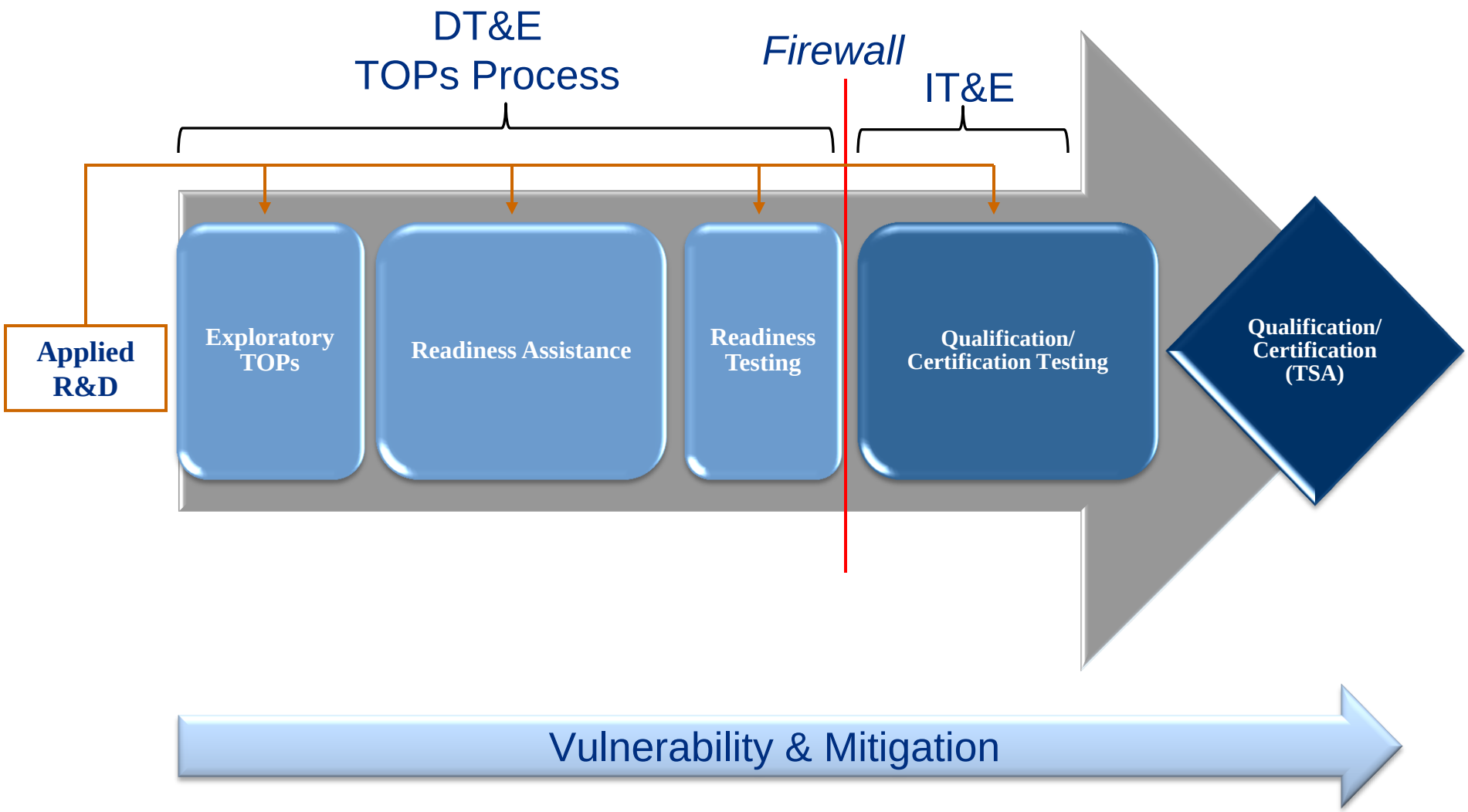


TSL Mission

Transportation Security Laboratory

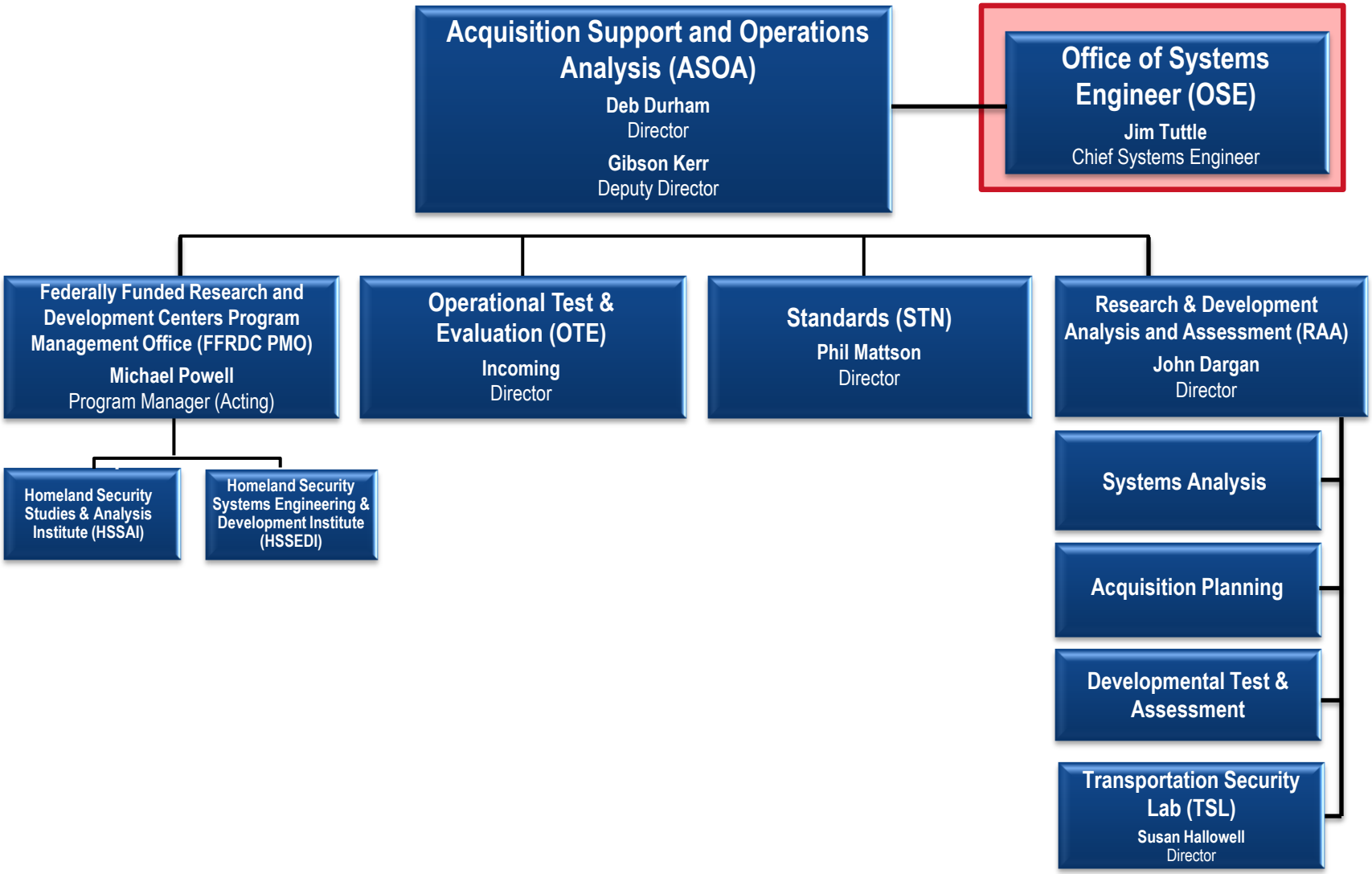
The mission of the TSL is to apply our scientific and technical acumen to advance explosives and contraband detection technologies for the field.

TSL Mission Activities



Homeland Security
Science and Technology

ASOA Organization



Homeland Security
Science and Technology

Office of Systems Engineering (OSE)

❑ Value Add

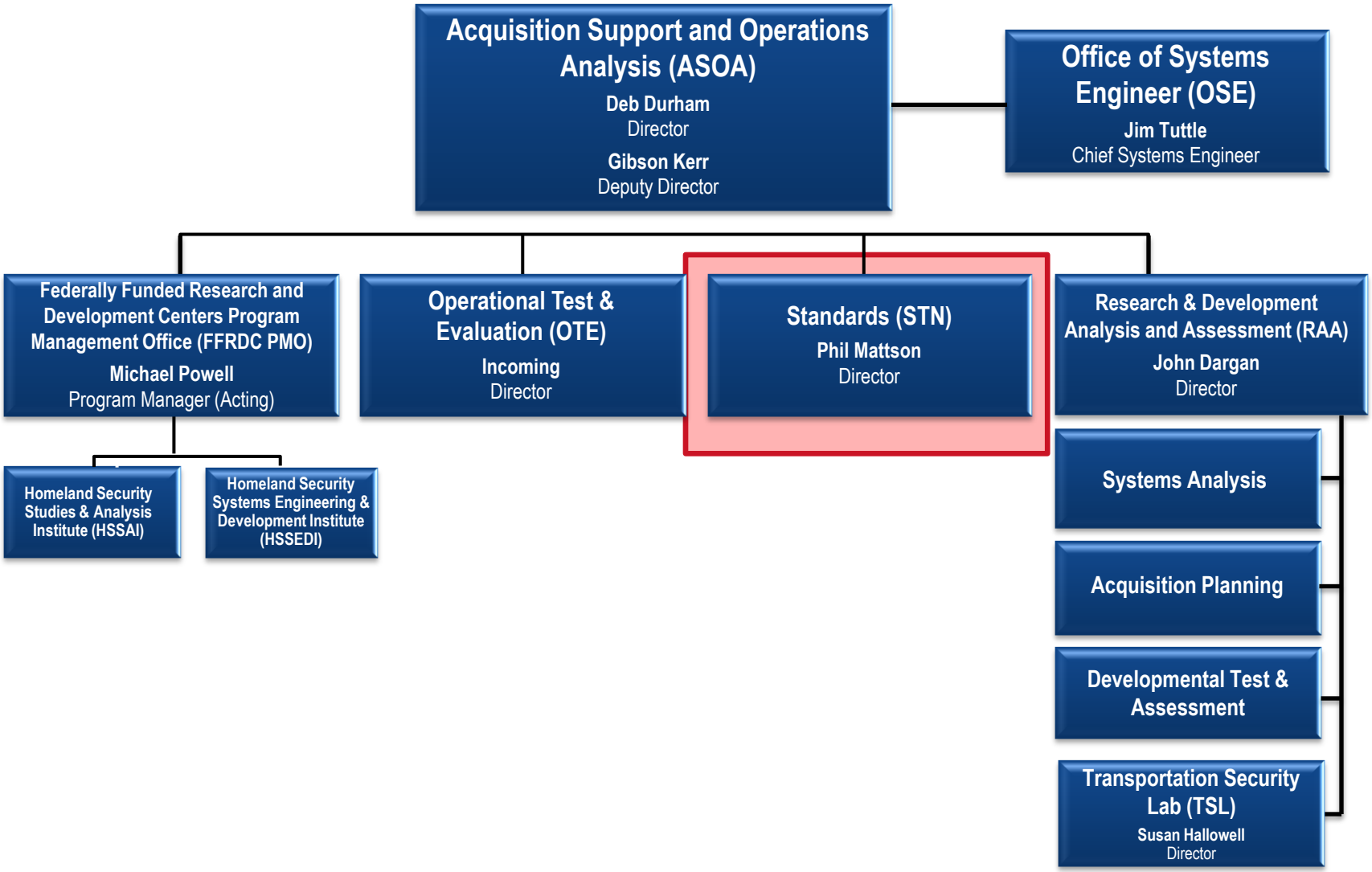
- Requirements Engineering
- Technology Optimization
- Technical Process Integration

❑ Overview

- OSE is coordinating across DHS to institutionalize a "systems thinking" approach for managing programs that increase efficiencies and transform needs and requirements into operational capabilities
- Systems Engineering tools and training guides help managers balance costs, schedules, and performance objectives throughout a program or project's life cycle
- In coordination with the Undersecretary for Management (USM), established the DHS Systems Engineering Center of Excellence—a collaborative forum designed to provide advice to DHS components and connect project managers with systems engineering products and services

Homeland Security
Science and Technology

ASOA Organization



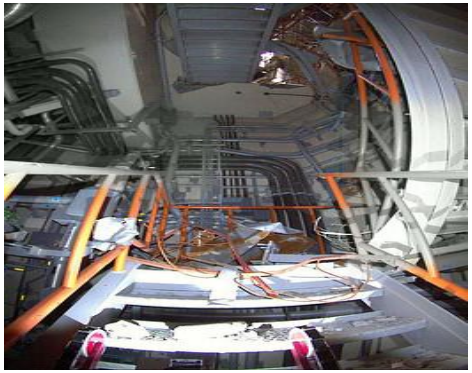
Office of Standards (STN)

❑Value Add

- Performance Specifications
- Test Methods
- Conformity Assessment
- Training
- Concept of Operations Development

❑Overview

- Standards ensure technologies and equipment are safe, stable, and successful in the field
- STN works actively to ensure responders receive quality, high-performing, safe equipment through standards development and testing
- Where standards do not exist but are needed, STN works with end users to develop new standards and test methods
- STN identifies standards and test methods that verify equipment performance and meet acquisition requirements

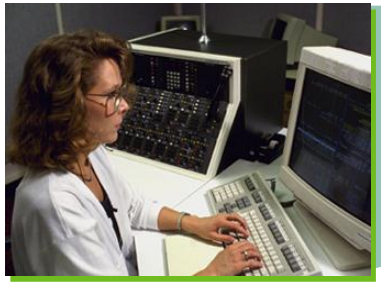


Homeland Security
Science and Technology

The Case for Standards

Does this work?
(Performance Standards)

Does this solve the right problem?
(CONOPS/ standard operations guides)



How do I test this?
(Test Methods)

NOW AVAILABLE!

Radiation/Multi Toxin Detection Meter

$299.99*

- Advanced Radiation and Bio-Chemical Agent Protection!
- Industry Leading Working Duration
- Completely Self-Contained

** Special GSA rates on request*

How do I use this?
(Training)

Will this work with my other devices?
(Test Methods)

Should I buy this? How do I comparison shop?
(Conformity Assessment)

Our Products & Services enable effective capability delivery

Relationship of Standards to the S&T Technology Development Cycle

Homeland Security
Science and Technology

TECHNOLOGY READINESS LEVELS (generic)

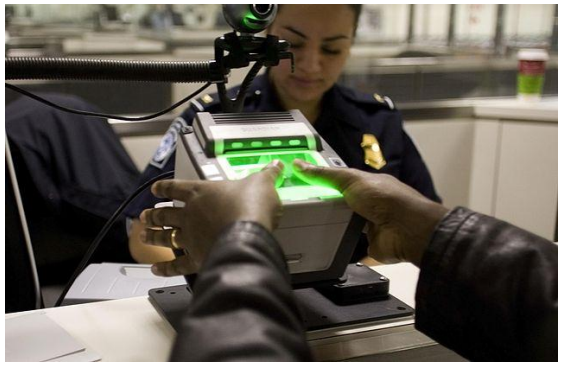
Basic Research		Research to Prove Feasibility	Technology Development		Technology Demonstration	Operational Test & Evaluation		Production & Deployment
Basic R&D to understand the phenomenon	Studies to exploit the phenomenon to develop a useable technology	Lab level R&D for specific elements of the technology that may be used in a system	Integration of the specific elements into basic modules or components	Basic modules or components integrated to point where testing can be done in a simulated environment	Prototype ready for testing in a relevant, high-fidelity lab environment	System prototype ready for testing in an operational environment	Technology proven to work in true operational setting under valid operational conditions	Active application of technology by end users under mission conditions & actual ConOps
TRL – 1	TRL – 2	TRL – 3	TRL – 4	TRL – 5	TRL – 6	TRL – 7	TRL – 8	TRL – 9

STANDARD TYPES AND NOTIONAL RANGES OF APPLICATION

- Management System and Quality Process Standards
- Basic Metrology and Reference Standards
- Standard Datasets
- Product and Process Interoperability/Interface Standards
- Data Exchange-Interchange Protocol Standards
- Standard Test Methodologies
- Personnel Certification Standards
- Product Performance Standards
- Operational & Maintenance Standards
- Accreditation/Certification Standards

Standards Focus Areas

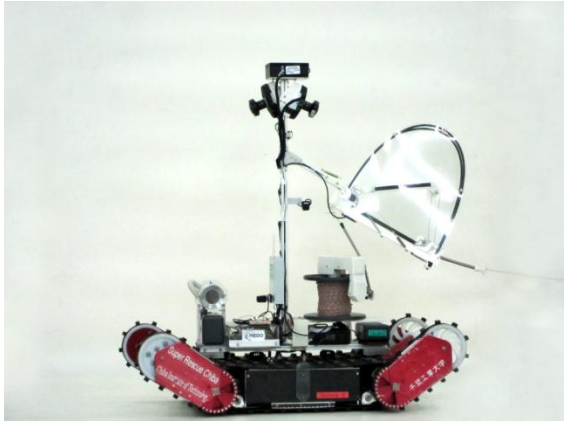
Biometrics

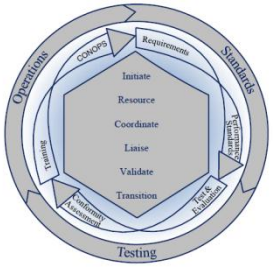


Explosives Countermeasures

Chem/Bio Countermeasures

Robotics

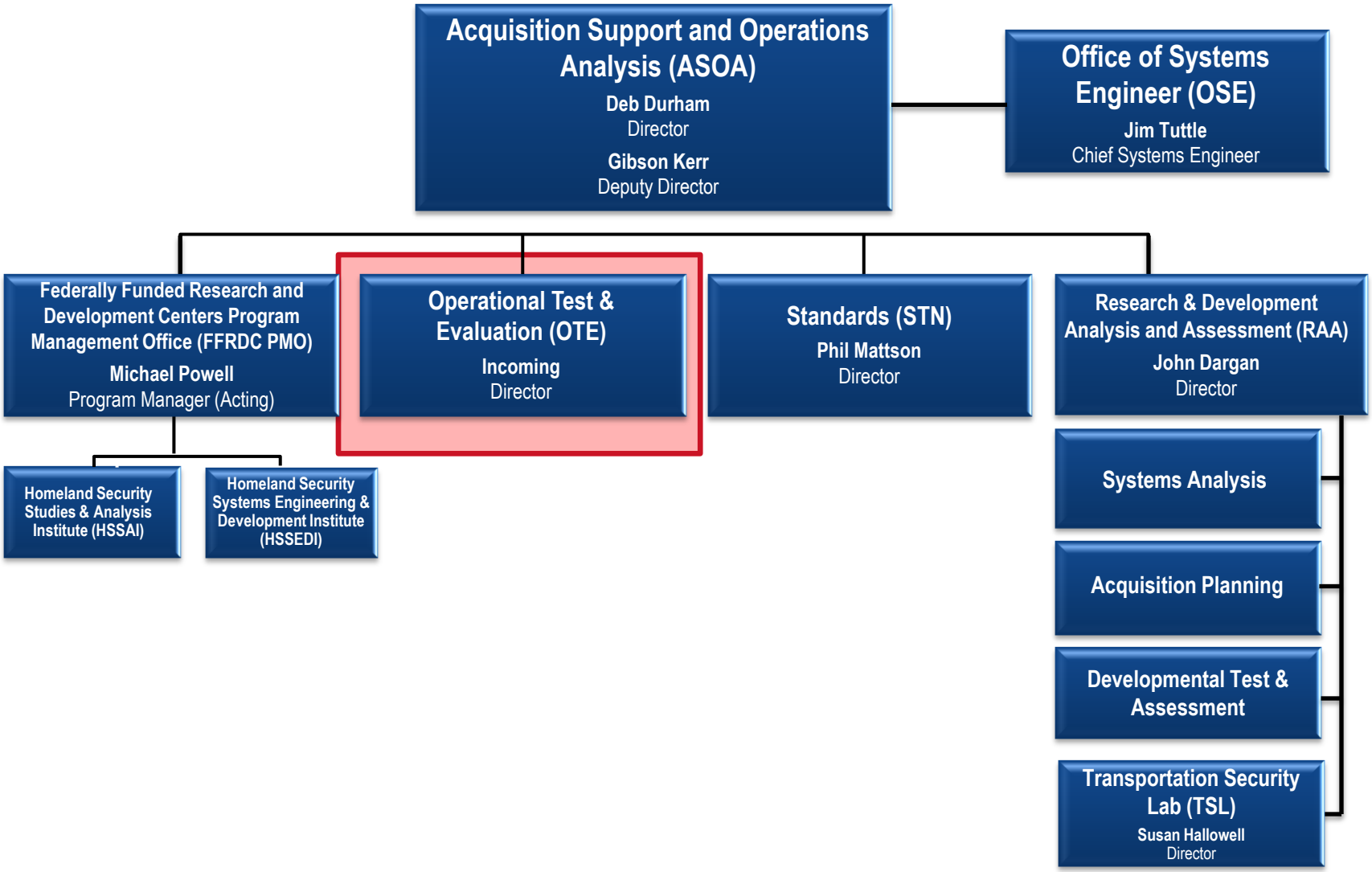




Responder & Resiliency Standards

Homeland Security
Science and Technology

ASOA Organization



Office of Operational Test & Evaluation (OTE)

❑Value Add

- Operational Test

❑Overview

- OTE provides oversight for the entire Department's 135 DHS major acquisition programs
- OTE ensures each acquisition has a robust T&E strategy to test, verify progress towards meeting specific requirements, and ultimately ensure through formal validation via operational test and evaluation that acquisitions meet operational requirements
- OTE also applies a risk-based T&E approach for DHS's major information technology acquisitions that focuses on the acquisition's design, architecture, and impact to the mission if failure occurs

System Assessment & Validation for Emergency Responders (SAVER)

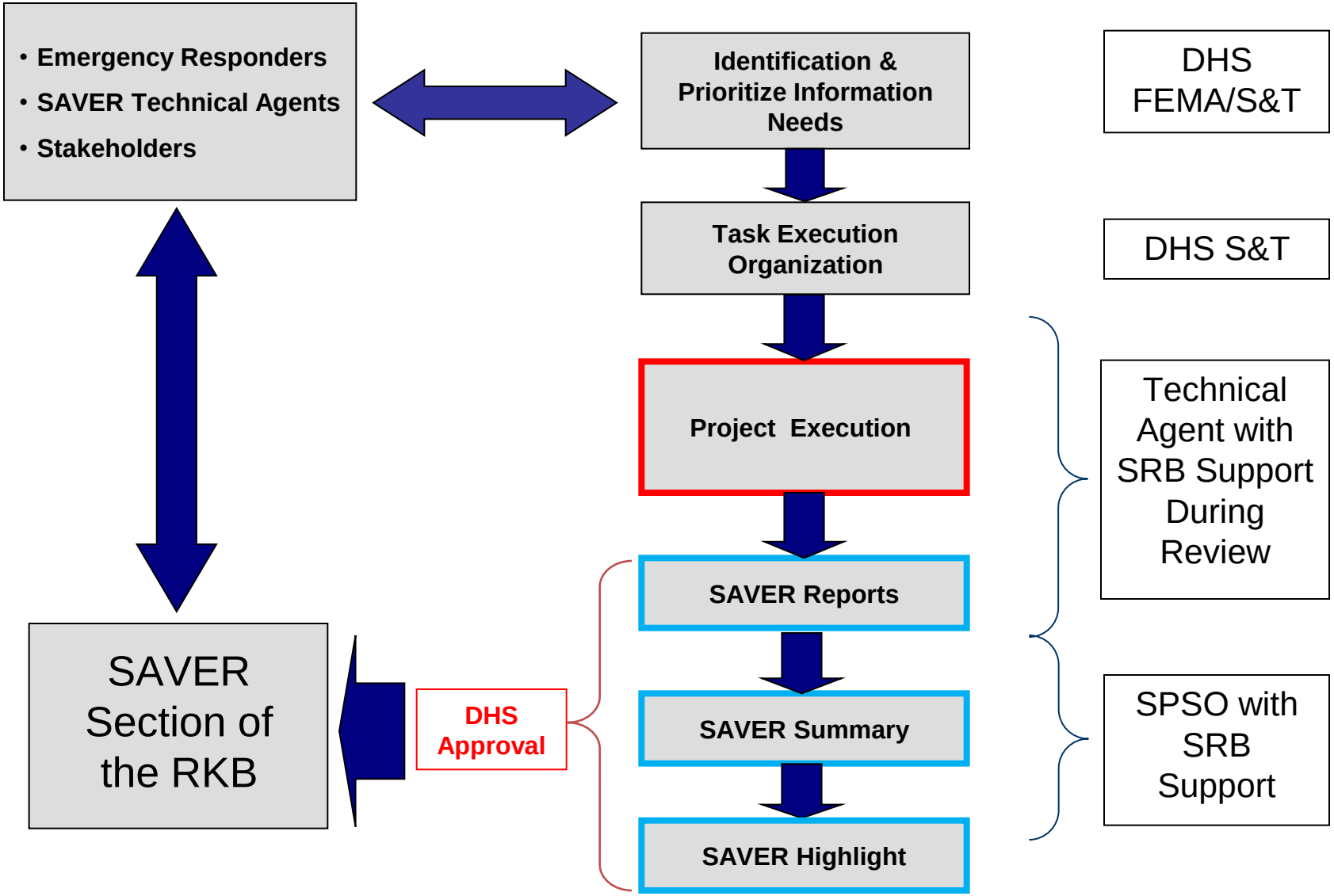
❑Value Add

- ➢ Technology Assessment

❑Overview

- ➢ SAVER assists federal, state, and local first responders with making informed procurement decisions
- ➢ SAVER conducts impartial, practitioner-relevant, operationally--- oriented assessments of responder equipment enabling responders to better select, purchase, use, and maintain emergency response equipment

SAVER Process



Uses for SAVER Products

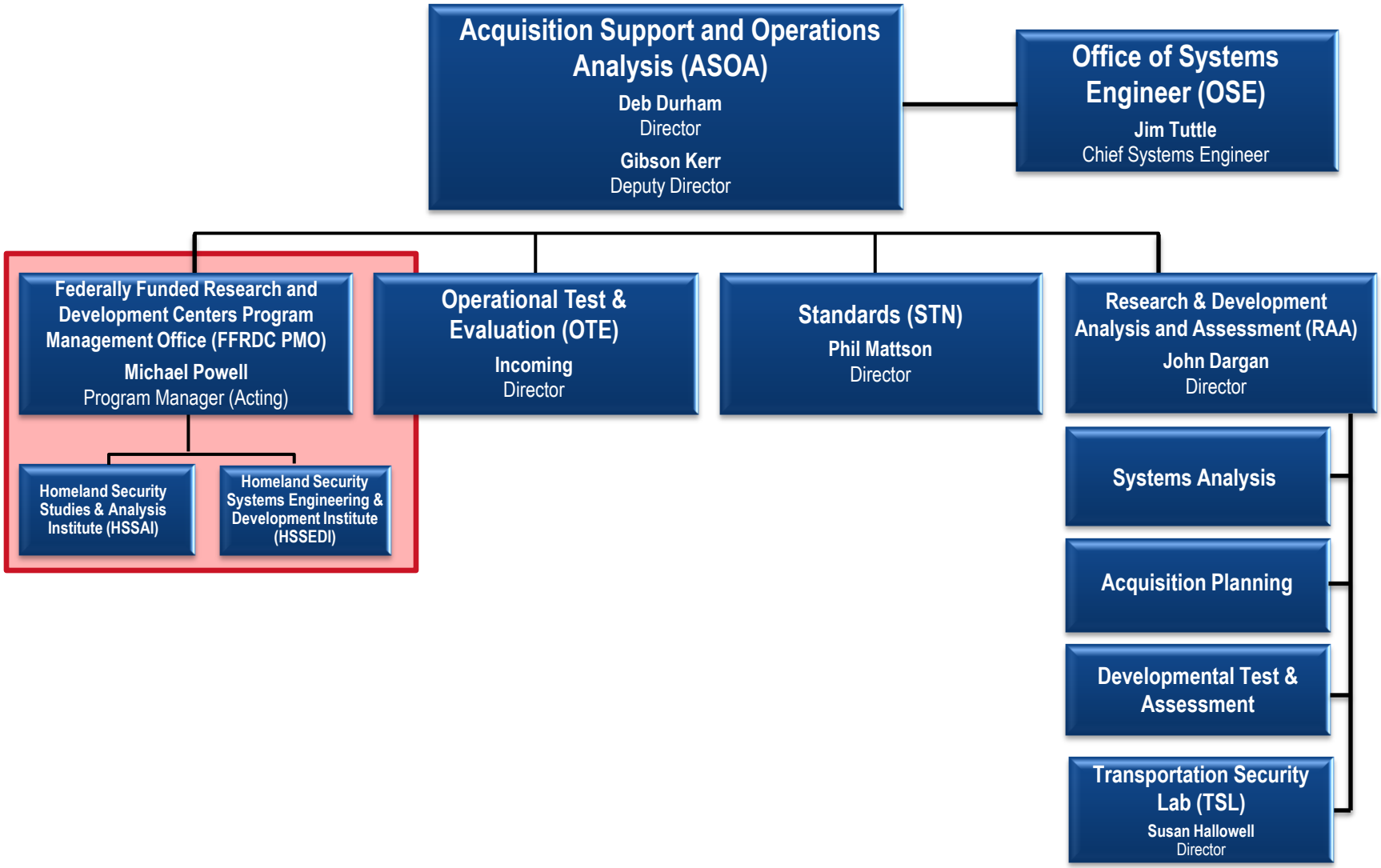
- **Individual Products Provide Important and Useful Information**

Market Survey Reports
Focus Group Reports
Verification Reports
Assessment Reports
SAVER Summaries
Handbooks
Guides
Application Notes

- **Used as Responders Make Procurement Decisions**
- **Used When Preparing for a Competitive Procurement**
- **Other uses Include Reference Material for Training**

Homeland Security
Science and Technology

ASOA Organization



Federally Funded Research & Development Centers Program Management Office (FFRDC PMO)

❑Value Add

- FFRDC Oversight
- Strategic Planning
- Policy Studies
- Threat and Risk Analysis
- Trade-off Studies
- Systems Engineering Analyses

❑Overview

- The FFRDCs PMO provides technical and contractual oversight as well as programmatic support to two FFRDCs, unique entities established to directly support DHS
- FFRDCs provide independent analyses of homeland security issues
- The Homeland Security Studies and Analysis Institute (HSSAI) focuses specifically on homeland security strategy, threats, and policy studies
- The Homeland Security Systems Engineering and Development Institute (HS SEDI) addresses enterprise systems engineering issues and complex acquisition program support

Department of Homeland Security Science & Technology

HSSTAC -- RDP 101

Dr. Keith Holtermann
Director, RDP
Science & Technology Directorate

December 5, 2013

Homeland Security

Homeland Security
Science and Technology

Research & Development Partnerships

- ❑ Fosters collaboration throughout the federal government and private sector, and internationally
- ❑ Creates partnerships and leverages S&T technological resources to deliver needed capabilities to the Homeland Security Enterprise

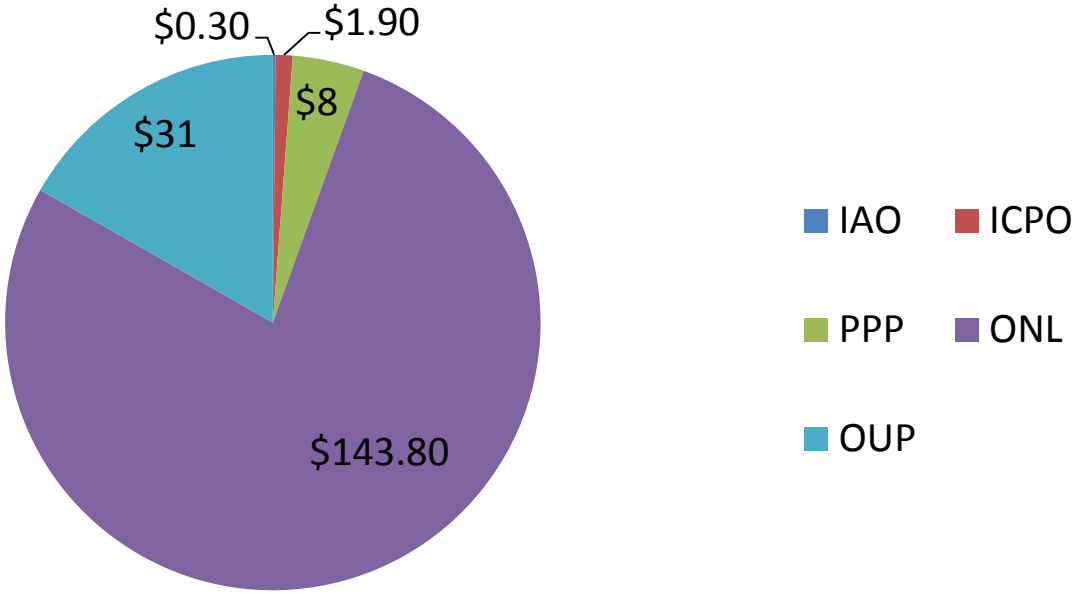
Homeland Security
Science and Technology

Research & Development Partnerships

- **Office of National Laboratories**
  - Administers five state-of-the-art facilities and partners with Department of Energy's National Labs to combat threats to the nation's security
- **Office of University Programs**
  - Leads Centers of Excellence (COE) networks that focus on multidisciplinary research and education to explore key challenges in homeland security
- **Office of Public-Private Partnerships**
  - Works with private industry to communicate the technical needs of DHS Components and enables and leverages partnerships with the business community to find solutions
- **International Cooperative Programs Office**
  - Pairs US entities engaged in homeland security research with foreign counterparts to actively share expertise and resources in cooperative research programs
- **Interagency Office**
  - Coordinates with federal, state, local, and territorial partners to share information and leverage homeland security efforts at all levels of government

Research & Development Partnerships

RDP FY 2014 President's Budget ($M)

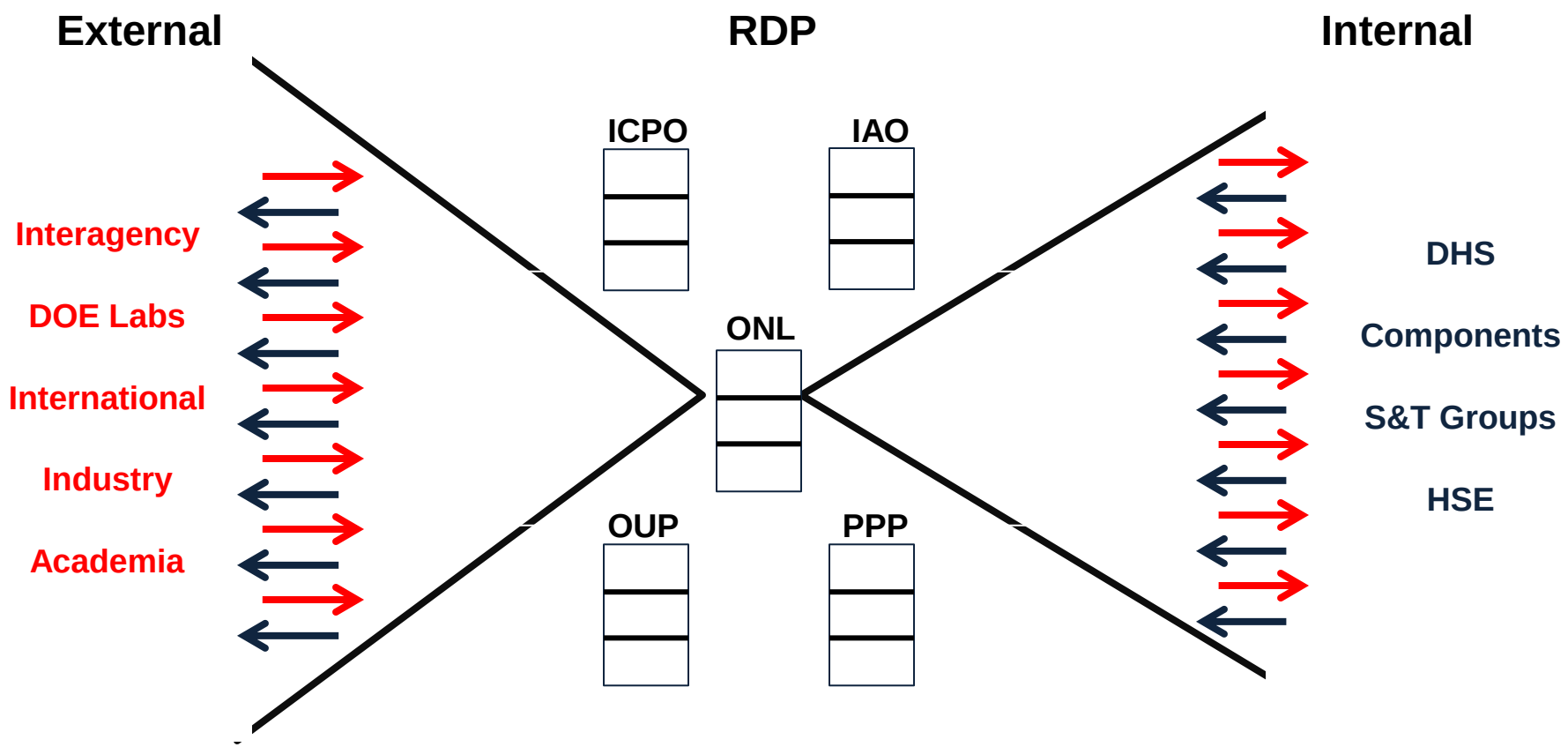


*** excludes NBAF**

RDP Budget: FY 2010 – FY 2014

	FY 2010 ($M)	FY 2011 ($M)	FY 2012 ($M)	FY 2013 ($M)	FY 2014 ($M)
RDP (includes NBAF)	**218.5**	**192.5**	**231.6**	**207.0**	**898.6**
NBAF*	32.0	40.0	50.0	30.7	714.0

Research & Development Partnerships



<u>Easy Access to Science-Based Capabilities Through Mature, Established Partnerships</u>

Homeland Security
Science and Technology

Office of National Laboratories

❑ S&T Mission

- Strengthen America's security and resiliency by providing knowledge products and innovative technology solutions for the Homeland Security Enterprise

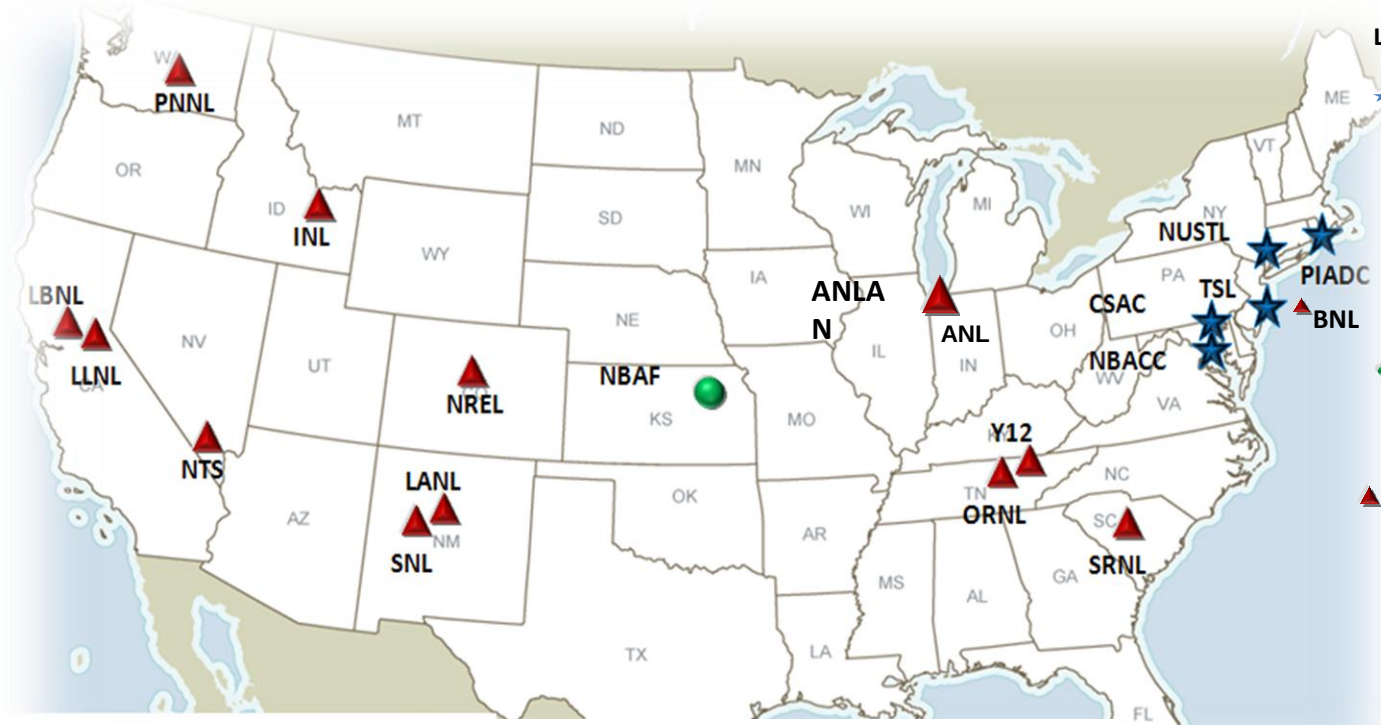
❑ ONL Support to the S&T Mission

- Overseeing, implementing, and leveraging the DOE and DHS S&T laboratory capabilities that support research, testing and evaluation, and technology development needs for DHS and the Homeland Security Enterprise.

❑ ONL's Vision

- A safer and more resilient America through an integrated laboratory network that provides advanced scientific capabilities and technology solutions to the Homeland Security Enterprise.

ONL Establishes Strategic Partnerships with the DOE and S&T National Lab Network



LEGEND

DHS Science and Technology Laboratories

- Chemical Security Analysis Center (CSAC)
- National Biodefense Analysis and Countermeasures Center (NBACC)
- National Urban Security Technology Laboratory (NUSTL)
- Plum Island Animal Disease Center (PIADC)
- Transportation Security Laboratory (TSL)

Proposed DHS S&T Laboratory

NBAF is proposed replacement for Plum Island Animal Disease Center

Department of Energy National Laboratories

Innovative scientific and technological capabilities are often developed beyond scope of academia and industry

Operated as FFRDCs

- Argonne National Laboratory (ANL)
- Brookhaven National Laboratory (BNL)
- Idaho National Laboratory (INL)
- Lawrence Berkeley National Laboratory (LBNL)
- Lawrence Livermore National Laboratory (LLNL)
- Los Alamos National Laboratory (LANL)
- National Renewable Energy Laboratory (NREL)
- Nevada Test Site (NTS)
- Oak Ridge National Laboratory (ORNL)
- Pacific Northwest National Laboratory (PNNL)
- Sandia National Laboratories (SNL)
- Savannah River National Laboratory (SRNL)
- Y12 National Security Complex (YNSC)

In FY 2013, DHS funded $340 million to the S&T and DOE National Laboratories for homeland security-related research.

Examples of Homeland Security research conducted:

- Critical Infrastructure/protection analysis
- Radiological and nuclear countermeasures
- Chemical, bio, and nuclear forensics
- Multi-scale modeling and simulation
- Transportation security
- Biodefense countermeasures, bio-detection capability and preparedness
- Nuclear weapons technology, defense and maintenance
- Test and evaluation for first responder technologies
- Foreign Animal Disease research and diagnostics
- Cybersecurity

DHS has equal access to capabilities and technologies at the DOE labs.

Homeland Security
Science and Technology

S&T Labs Support the DHS Mission

- **S&T Labs Support DHS Core Missions Areas:**
  - Securing and managing our borders
  - Ensuring resilience to disasters
  - Maturing and strengthening the Homeland Security Enterprise
- **By Addressing Specific Mission Needs in:**
  - Bioforensic operations and timely biological threat characterization (NBACC)
  - Detection of explosives at transportation hubs (TSL)
  - Test and evaluation of tools for first responders (NUSTL)
  - Timely knowledge products to plan for and respond to chemical threats (CSAC)
  - Diagnostics and vaccines for foreign animal diseases (PIADC)

Core Capabilities - Comprised of a substantial combination of foundational research, specialized infrastructure (facilities and equipment), expertise, and processes (e.g. enabling registration and accreditations) to provide scientific and technological solutions to meet the current and future needs of the HSE

Office of University Programs

❑ Mission

- ➢ OUP provides streamlined access to the expertise of the Nation's colleges and universities to address pressing homeland security needs
- ➢ OUP's university research centers and education programs are integrated with DHS operating agencies through immersion and faculty exchanges.

❑ Key Programs

- ➢ DHS S&T Centers of Excellence (COE)
- ➢ S&T Education Programs
- ➢ Minority Serving Institutions Programs

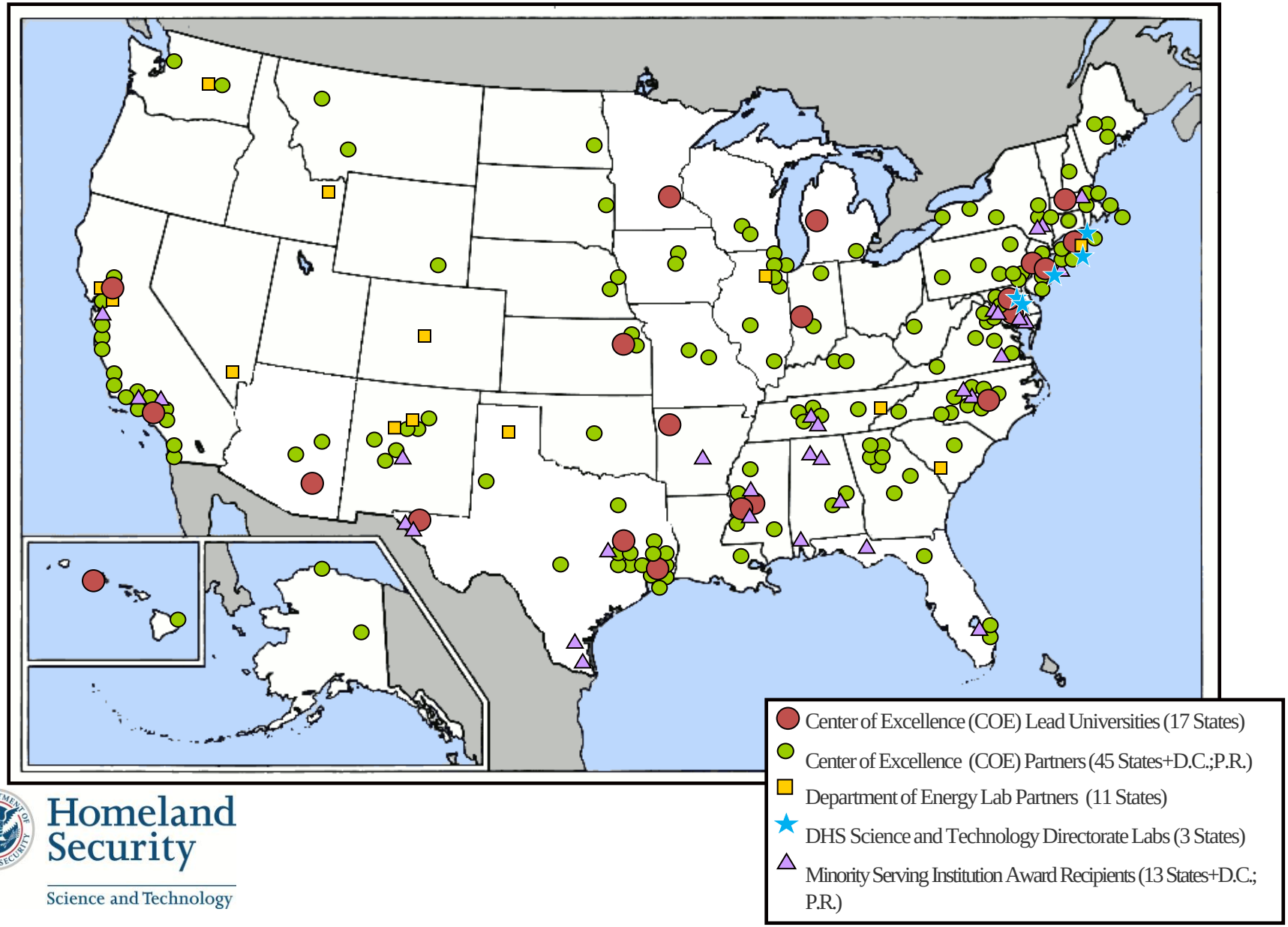
Homeland Security
Science and Technology

Office of University Programs

- **The COEs are a network of university R&D centers addressing DHS's long-term operational needs through:**
  - Partnerships with DHS Components
  - Mission-tailored tools and technologies
  - Subject matter expertise
  - Rapid response coordination and assistance
  - Education programs, workforce development and training
  - Access to world-class laboratories and facilities
- **DHS and Federal agencies can engage the COEs through:**
  - Basic Ordering Agreements and Cooperative Agreements
  - Education and Fellowships
  - Operations-based research and internship opportunities
  - Competitions and Peer Reviews
  - Advisory Councils

Homeland Security
Science and Technology

COE Partnership Network



Homeland Security
Science and Technology

Homeland Security
Science and Technology

COE Leads & Acronyms

Funded in FY 2012 *(Working on Border Security Issues)*

1. ***Center for Risk & Economic Analysis of Terrorism Events (CREATE):***
   University of Southern California
2. **National Center for Zoonotic & Animal Disease Defense (ZADD):**
   Kansas State University and Texas A&M University
3. **National Center for Food Protection & Defense (NCFPD):**
   University of Minnesota
4. ***National Consortium for the Study of Terrorism & Responses to Terrorism (START)***
   University of Maryland
5. ***The Center for Visual and Data Analytics (CVADA):***
   Purdue University and Rutgers University
6. **The Center for Awareness and Location of Explosives-Related Threats (ALERT):**
   Northeastern University
7. ***The National Center for Border Security and Immigration (NCBSI):***
   University of Arizona and University of Texas at El Paso
8. **The Center for Maritime, Island, Remote and Extreme Environment Security (MIREES): University of Hawaii and Stevens Institute of Technology**
9. **Coastal Hazards Center (CHC):**
   University of North Carolina at Chapel Hill and Jackson State University

Homeland Security
Science and Technology

Office of Public Private Partnerships

❑ Mission

- Serve as the primary interface to industry in order to create strategic partnerships that identify, generate, and transfer innovative, cost-effective, proven and safe solutions to the homeland security enterprise (HSE)

❑ Key Activities

- Seek and identify solutions from Industry
- Perform outreach to inform partners of HSE requirements and capability needs
- Link external partners to internal performers and vice-versa

Homeland Security
Science and Technology

Business Partnership Opportunities

❑ S&T Webinar Series

- Variety of desired outcomes on topics across S&T:
  - Information sharing
  - Identification of S&T priorities and potential transition technologies

❑ Office of SAFETY Act Implementation

- Certification Program for Qualified Anti-Terrorism Technologies
- In FY13 60 approved applications were tied to over $1.2B in projected technology revenues, supporting more than 50,000 private sector jobs.

❑ Commercialization Office

- Links stakeholders' articulated requirements to private sector technologies/services/capabilities
- Promotes solutions for DHS at market speeds
- Industry Liaison to connect business with DHS S&T

❑ Technology Transfer

- Facilitate information sharing, licensing, and transition between DHS and Industry
- Popular avenues:
  - Cooperative R&D Agreement (CRADA)
  - Memorandum of Agreement/Understanding (MOA/MOU)
  - Partnership Intermediary Agreements (PIAs)

❑ Long Range Broad Agency Announcement

- Open solicitation vehicle used to select and fund innovative R&D projects
- Provides ~$30-35M annually to small, medium, and large businesses, universities, & other R&D programs
- Preparing for annual release of topics for CY14
  - 67 Topic Areas in current solicitation

❑ Small Business Innovation Research (SBIR)

- Domestic set-aside program to assist small businesses to participate in Federal research/R&D
- Provides ~$12M annually through two solicitations
- Commercialization Assistance Program helps awardees plan for sustained technology delivery
- ~500 projects aligned to S&T priorities supported since 2004

❑ Technology Foraging

- Internal process of identifying research and development activity across numerous communities
- Drives discovery of capabilities and enables identification of potential strategic partners
- Addresses a wide variety of topics and presents findings useful in targeting new audiences

International Cooperative Programs Office

9/11 Commission Act 2007

❑ Mission/Statutory Mandate

SEC. 317. Promoting Antiterrorism Through International Cooperation Program

- **Develop understandings and agreements to allow and to support international cooperative activity in support of homeland security**
- **Develop strategic priorities for international cooperative activity for the Department**
- **Facilitate planning, development, and implementation of the strategic priorities**
  - **Including grants, cooperative agreements, contracts**
- **Facilitate the matching and partnership of U.S. entities engaged in homeland security research with non-United States R&D entities performing research**

International Cooperative Programs Office

❑ Key Activities

➢ International Bilateral Agreements

- Nearly 100 activities underway
- Foreign government partners have provided over $12M USD to S&T
- Cost avoidance through info sharing, access to equipment, personnel and facilities

- **Canada (2004)**
- **Australia (2004)**
- **United Kingdom (2005)**
- **Singapore (2007)**
- **Sweden (2007)**
- **Mexico (2008)**
- **Israel (2008)**
- **France (2008)**
- **Germany (2009)**
- **New Zealand (2010)**
- **European Commission (2010)**
- **Spain (2011)**
- **Netherlands (2013)**

➢ Targeting opportunities through other mechanisms:

- Other U.S. Government Agreements, Contracts with Foreign Entities (i.e. Universities), Cooperative Research and Development Agreements

Homeland Security
Science and Technology

International Engagement Outcomes

Country	Activities Underway	Proposed Activities
Canada	23	11
UK	31	21
Australia	13	14
Singapore	3	6
Sweden	17	13
Mexico	0	0
Israel	5	22
France	2	2
Germany	0	13
New Zealand	0	16
European Commission	0	5
Spain	0	0
Netherlands	4	36
TOTAL	**98**	**159**

Homeland Security
Science and Technology

Interagency Office

- **Mission/Statutory Mandate**
  - *"… coordinating with other appropriate executive agencies in developing and carrying out the science and technology agenda…to reduce duplication and identify unmet needs…" [§302 (13) of the Homeland Security Act of 2002]*
- **Key Activities**
  - **Focused interagency partnerships**
    - Example: DHS-DoD Capability Development Working Group
      - ✓ Leverages DoD's much larger R&D budget for addressing joint DHS-DoD technology requirements
  - **Operational experimentation and demonstrations**
    - Example: Joint Interagency Field Exploration (JIFX)
      - ✓ "Level playing field" for testing potential HSE technologies selected by FEMA, CBP, TSA, USCG, etc.
  - **Special Projects (coordinates sensitive/classified S&T programs)**
    - Example: North American Air Domain Awareness
      - ✓ DHS (Borders), DoD (NORAD), FAA (NEXTGEN), DOE (Wind turbine radar interference)
  - **External Advisory Committees**
    - Example: HSSTAC
      - ✓ TSA Task Force, etc.
  - **White House Liaison**
    - Example: National Science and Technology Council
      - ✓ Committee on Homeland and National Security

Interagency Office

❑ Interagency Experimentation Program

- **Joint Interagency Field Exploration (JIFX)**
  - Explores new and emerging technologies for homeland defense and security gaps: improves products, steers technology development to requirements, reduces the time to transition technology
- **Adaptive Red Team/Technical Support and Operational Analysis (ART/TSOA)**
  - Benefits program managers/component operators with special missions (border protection; maritime security; urban operations; command, control and communications; intelligence and surveillance; sensors; and law enforcement operations)
- **Technical Exploration (TE)**
  - Explores new and emerging technologies for rapid transition to first responders and DHS component special operators
- **Results**
  - New set of aerial imaging/crowd sourcing procedures used during Super Storm Sandy
  - New technology insertion with immediate impact to Moore, OK tornado response

Department of Homeland Security Science & Technology

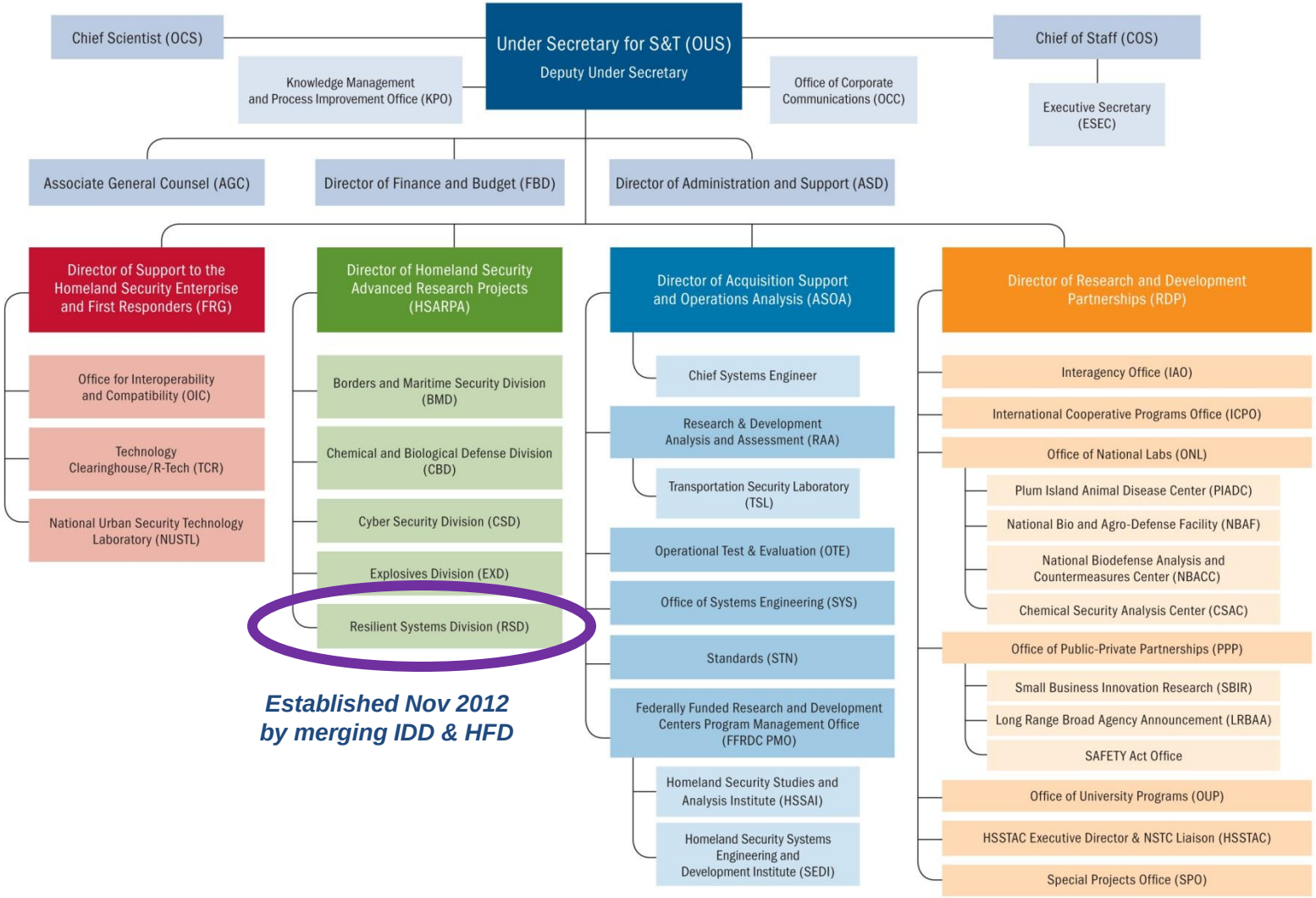
HSSTAC – HSARPA's Resilient Systems Division (RSD) 101

Jalal Mapar
Director, Resilient Systems Division
Science & Technology Directorate

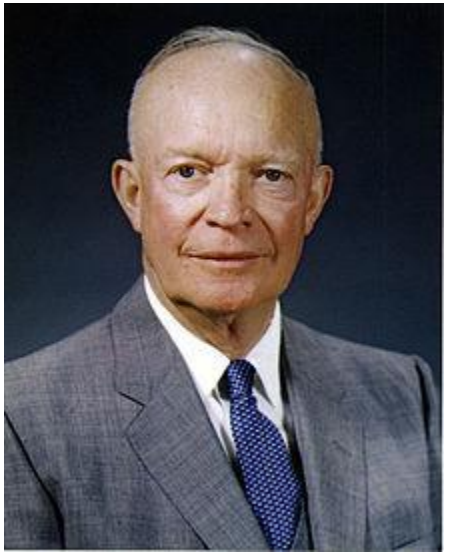
December 5, 2013

Homeland Security

DHS: S&T: HSARPA: *RSD*



Established Nov 2012 by merging IDD & HFD



“Plans are nothing; planning is everything.”

-- Dwight D. Eisenhower

Understanding Resilience

Resilience Definitions:

- *Quadrennial Homeland Security Review*: individual, community, and system **robustness**, capacity for **rapid recovery**, and **adaptability**.
- *Presidential Policy Directive 8*: to **adapt** to changing conditions and **withstand** and **rapidly recover** from disruption due to emergencies.
- *Presidential Policy Directive 21*: to prepare for and **adapt** to changing conditions and **withstand** and **recover rapidly** from disruptions.
- *National Security Strategy*: to **adapt** to changing conditions and prepare for, **withstand**, and **rapidly recover** from disruption.
- *National Academy of Sciences*: the ability to prepare and plan for, **absorb**, **recover** from, and more successfully **adapt** to adverse events.

Common Resilience Attributes

Resilience Definitions:

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- *National Academy of Sciences*: the ability to prepare and plan for, **absorb**, **recover** from, and more successfully **adapt** to adverse events.

Common Resilience Attributes: **Robustness** **Adaptability** **Recovery Capacity**

Homeland Security
Science and Technology

RSD's Mission Space: National Resilience

The United States faces **evolving risks** with increasingly **costly impacts**:

- **Natural Disasters**: *They will keep on coming*
- **Terrorism**: *Coming to a theater near you*
- **Industrial Accidents**: *Cyber Physical Systems*

2012: ***11*** mega-disasters (>$1B in losses); an ***increasing trend*** for both frequency and cost.*

2050: Flooding to cost $1 Trillion

To enhance the nation's resilience against increasing risks, RSD delivers science and technology capabilities that enhance the **robustness**, **adaptability**, and **recovery capacity** of individuals, communities, and systems.

- **Robustness**: *resisting and absorbing shocks*
- **Adaptability**: *managing dynamic risks & emergencies*
- **Recovery Capacity**: *quickly restoring functionality*

Disaster Resilience: An Essential DHS Mission

Hurricane Sandy: $70B+ economic losses

Boston Bombers: Planned more attacks

MN Bridge Collapse: Flawed design kills 13

*NOAA, 2013

RSD Vision & Mission

Vision: Strengthen our homeland resilience to all-hazards through S&T-based solutions.

Mission: Rapidly develop and deliver innovative solutions that enhance the resilience of **individuals**, **communities**, and **systems** by enabling the Whole Community to prevent and protect against threats, mitigate hazards, effectively respond to disasters, and expedite recovery.

RSD Mission Breakdown

Rapidly develop and deliver innovative solutions…

…that enhance the resilience of individuals, communities, and systems…

…by enabling the Whole Community…

…to prevent and protect against threats, mitigate hazards, effectively respond to disasters, and expedite recovery.

Agency
S&T Strategic Plan: Goal 1 (2011)

Department
Quadrennial Homeland Security Review (2010)

Department/Nation
DHS Strategic Plan 2012-16 (2012)
National Preparedness Goal (2011)

Nation
Presidential Policy Directives
PPD-8 (2011) & PPD-21 (2013)

Meeting Agency, End-User, and National Priorities

Homeland Security
Science and Technology

RSD Thrusts

Vision

Strengthen our homeland resilience to all-hazards through S&T-based solutions.

Mission

Rapidly develop and deliver innovative solutions that enhance the resilience of **individuals**, **communities**, and **systems** by enabling the Whole Community to prevent and protect against threats, mitigate hazards, effectively respond to disasters, and expedite recovery.

Prevent and Protect	Mitigate & Respond	Recover	PPD-8
Robustness	Adaptability	Recovery capacity	Resilience

1. **Adaptive Risk Mitigation**
2. **Agile Disaster Management**
3. **Resilient Infrastructure**
4. **Effective Training, Education, and Performance**

RSD Thrusts

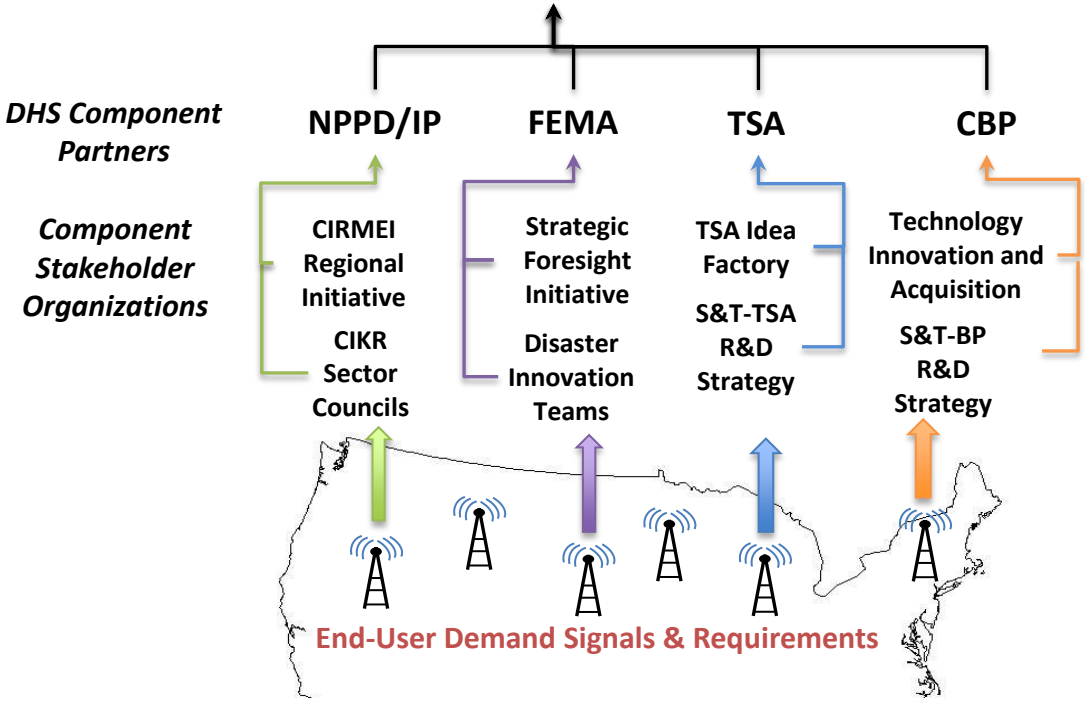
RSD Thrust Areas flow directly from our Vision and Mission

Identifying End-User Requirements, Priorities

Engaging stakeholders through a systemic process to achieve the largest resilience pay-off for the Nation

- Capability gaps, high-priority demands, Operational requirements

RSD Technology Road Map Development



Deliver Risk-Informed, Customer-Driven, Operationally-Focused Solutions

Homeland Security
Science and Technology

Adaptive Risk Mitigation

Reduce the risk to people and infrastructure by fielding **tools and processes** that can adapt to an evolving threat, a changing environment, and shifting demographics; tools that support managing the cascading consequences of interactions among infrastructure and all hazards

Envisioned RSD Solutions for the Next 5-10 Years

- Testbed/Environment/Platform is used to analyze in near real-time alternative scenarios, understand impacts of cascading effects, and assess cost/benefit implications of various responses (**Holodeck** *Lite*)
- Mobile Monitoring Platform is deployed, including rapid integration of Geo-dispersed monitoring assets , e.g. pictures, video, analytics, etc., to accelerate forensics and rapidly respond to evolving risks
- Countering Violent Extremism (CVE) repository of evolving knowledge products is deployed, available, and widely used by appropriate personnel at all levels of government (**CVE Lexis-Nexis**) to discourage/prevent violent extremism

Homeland Security
Science and Technology

Agile Disaster Management

Make disaster response more rapid and effective and reduce recovery times for individuals, communities, and infrastructure with better **tools for situational awareness and real-time decision support**, including logistics (inventory, deployment, distribution)

Envisioned RSD Solutions for the Next 5-10 Years

- **Predictive Analytics Toolbox** is in use at national/regional response coordination centers and state/local EOCs, enabling users to understand cascading effects and make decisions faster/better (real time)

- **Secured, cloud-based access to imagery** for an ongoing disaster, tagged with source, time, and location, etc., is immediately available to ***expedite*** recovery operations: debris/damage/etc., integration with other systems to facilitate disbursement of disaster relief funds

- **Unified Supply Chain/Logistics System** is used by decision makers to manage/distribute critical supplies (hours)

Homeland Security
Science and Technology

Resilient Infrastructure

Increase the resilience of critical infrastructure by fielding **resilient designs** and promulgating resilient **design standards** for all hazards

Envisioned RSD Solutions for the Next 5-10 Years

- **Agile Energy System:** Self-healing new distribution grid architectures and devices enable rapid restoration and increased resilience to multiple threats. Interoperability among micro-grids support the restoration of services.

- Critical infrastructure is designed with **Built-in Resilience**: inexpensive sensor webs broadcast health/warning information to mitigate catastrophes (water/gas network, tunnels, bridges, dams, etc.)

- Critical infrastructure key sectors (power, water, transportation, etc.) are made secure through deployment of **Cyber-Physical System solutions**

Sample Projects

Countering Violent Extremism (CVE)

GOAL

- Enhance the capability of the Department to assess and counter violent extremism

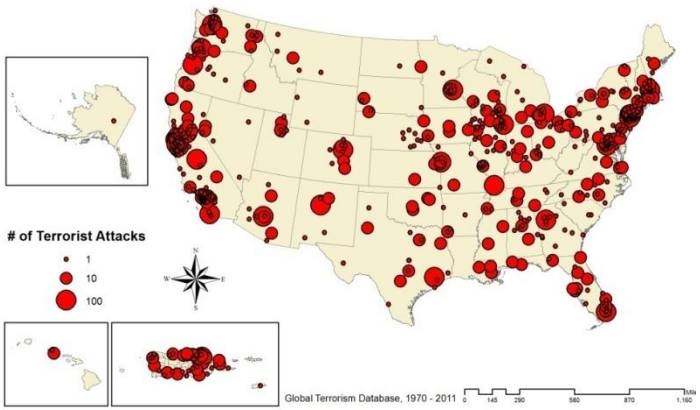
APPROACH

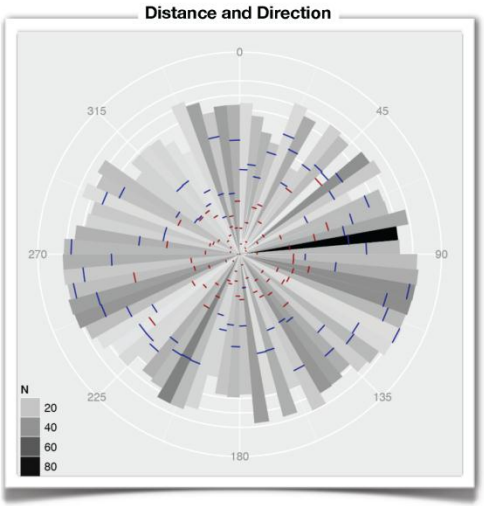
- Develop database on Terrorism and Extremist Violence in the U.S. (TEVUS) that incorporates incident, perpetrator, and geospatial information and is accessible through an easy-to-use portal that includes graphing, mapping, and analysis functions
- Conduct surveys on public attitudes toward terrorism and government countermeasures
- Interview former terrorists to identify how others can be encouraged to disengage

PARTNERS & CUSTOMERS

- DHS Intelligence & Analysis
- DHS Office of the Counterterrorism Coordinator
- DHS Office of Policy
- UK Home Office
- Performers:
  - National Consortium for the Study of Terrorism and Responses to Terrorism (START)
  - University of Massachusetts, Lowell

Terrorist Attacks in the United States, 1970-2011





Residence to Preparatory Activities

PAYOFF

- FY15 World's most comprehensive unclassified database on terrorism and extremist violence in the United States

SUMMIT: ModeSim Platform

GOAL & SOLUTION

- Enables the emergency preparedness community to access modeling and simulation tools to support planning, exercises and operations

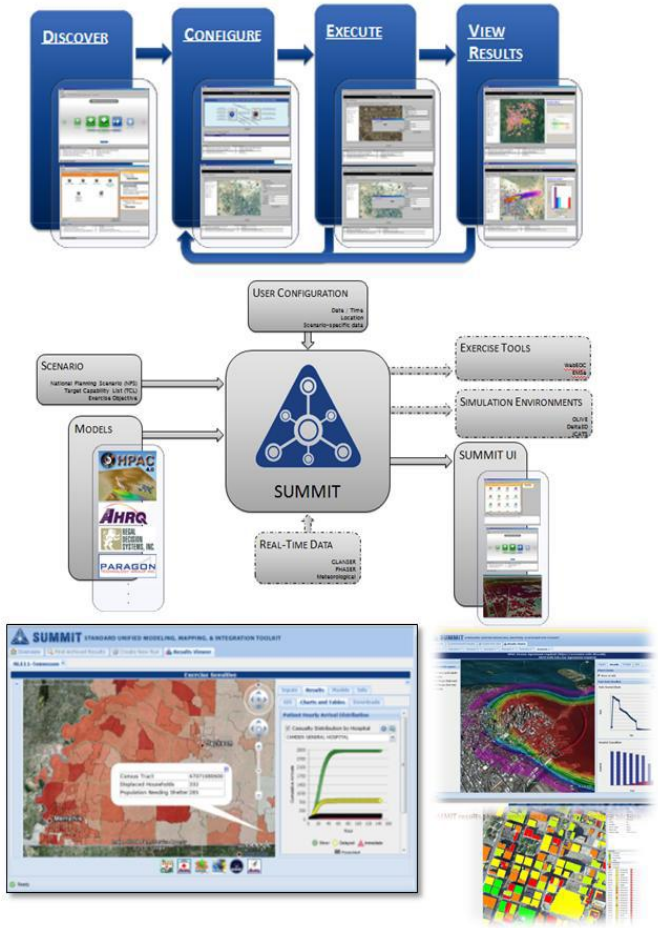
APPROACH

- Provides a modeling and simulation integration platform that enhances national preparedness
- Provides capability to create, test and exercise response tactics, plans and procedures throughout the preparedness cycle, from pre-incident planning through post-incident operations and generations of lessons learned

PARTNERS & CUSTOMERS

- FEMA National Simulation and Exercise Center
- State/local emergency managers
- First Responders

SUMMIT Workflow, Architecture and User Interface



PAYOFF

- M&S support to 14 federal , state and regional exercises and operational planning efforts such as:
- NLE11; NLE12; Planned Capstone
- FEMA Region 2 Blue Surge Tsunami Exercise 2013;
- Utah Shakeout Earthquake Exercise 2012;
- Anaheim /Santa Ana Urban Area Threat and Hazard Identification and Risk Assessment (THIRA) planning process 2012;
- Presidential inauguration planning 2012;
- US-Sweden international exercise
- GA State Surge
- Super Bowl 2014
- Response/Recovery Ops

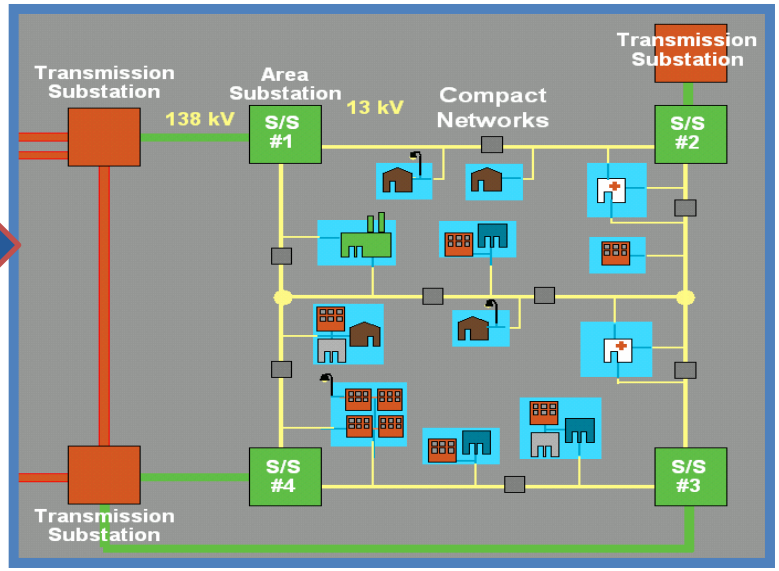
Resilient Electric Grid (REG)

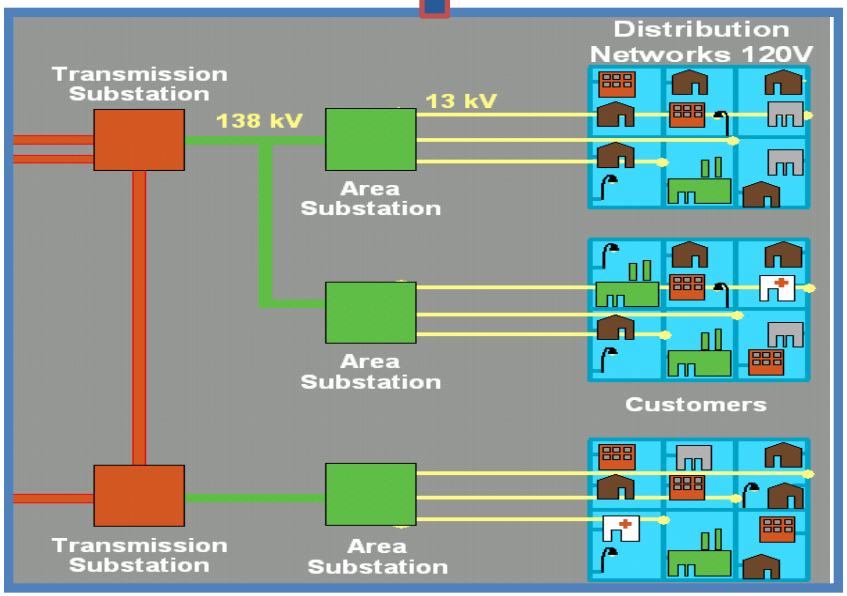
GOAL

- Enable a more resilient electric distribution grid architecture with multiple paths for power to increase the grid's reliability and resiliency to natural and man made disasters while protecting the system from cascading fault currents

APPROACH

- "Keeps the lights on" with an inherently fault current limiting, high temperature superconducting (IFCL-HTS) cable system
- Enables self-healing by allowing substations to interconnect to share power and assets while simultaneously eliminating the risk of fault currents cascading through the system





PARTNERS & CUSTOMERS

- Electric utilities
- ConEd (primary electric utility partner)
- REG Manufacturers: American Superconductor Corporation, Southwire
- Testing facility: Oak Ridge National Lab

PAYOFF

- Increases flexibility, resiliency and reliability of the grid
- Significant savings in equipment and real estate
- Ability to transmit more power with significantly smaller footprint

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Resilient Tunnel Plug

GOAL

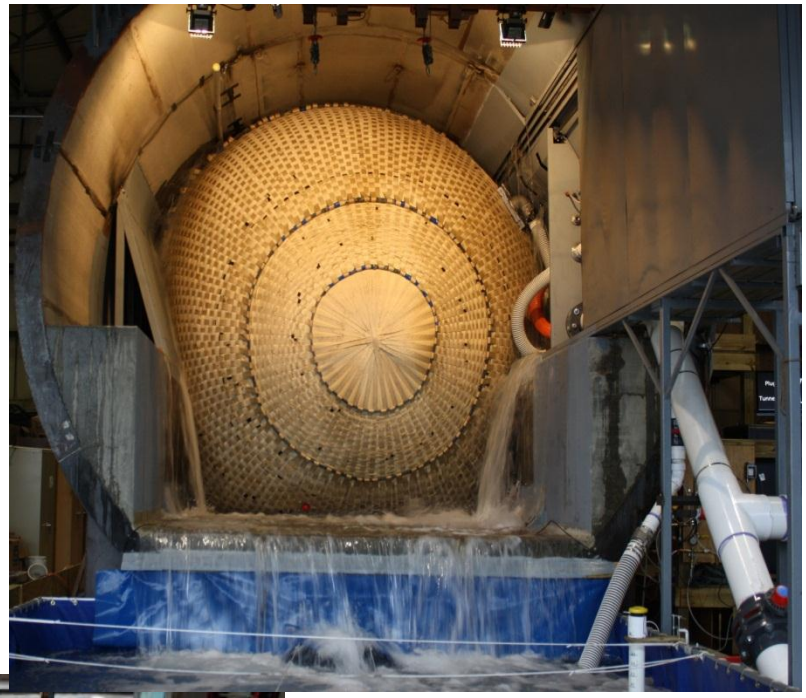
- Reduce the vulnerability of transportation tunnels to flooding, resulting from a terrorist attack or natural disaster

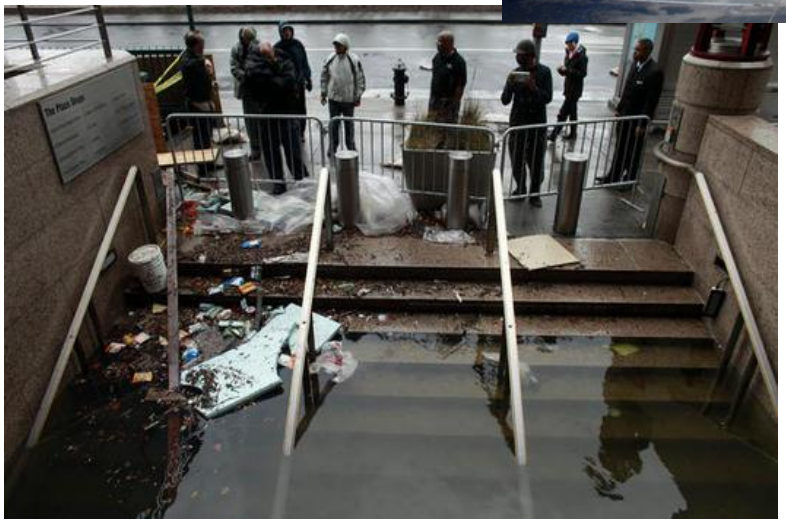
APPROACH

- Withstands water pressures associated with a breach using three-layer fabric plug
- Reduced cost compared to flood gates
- Minimally intrusive, easy to install in complex transit environments

PARTNERS & CUSTOMERS

- Mass Transit Agencies
- Transportation Security Administration (TSA), Port Authority of New York and New Jersey (PANYNJ), Washington Metropolitan Area Transit Authority (WMATA)
- San Francisco's Bay area Rapid Transit, Boston, New York City Metropolitan Area Transportation Authority (NYMTA)
- Plug manufacturer: ILC Dover





PAYOFF

- FY15 installation to mass transit partner
- Prevents millions of dollars of damage to mass transit infrastructure
- Enables more rapid restoration following a disaster

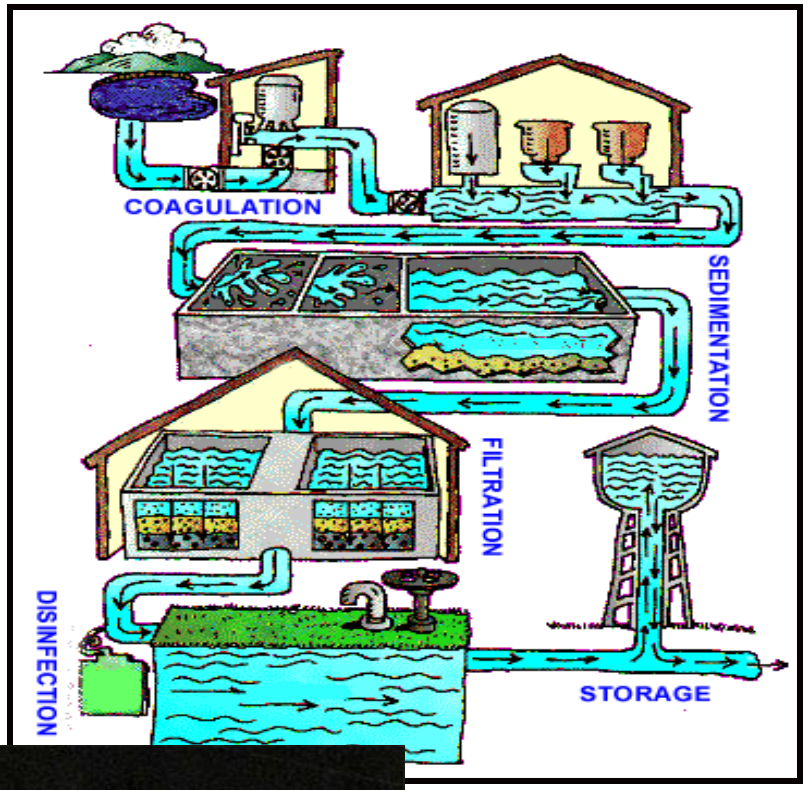
Drinking Water Resilience

GOAL

- Deliver threat, risk and vulnerability assessment capability of the Nation's drinking water infrastructure

APPROACH

- Provides HITRAC with ability to accurately, reliably, and credibly predict threats to drinking water infrastructure, including cyber, physical, biological and chemical contaminants
- Automates and web hosts accredited drinking water utility risk assessment tool



PARTNERS & CUSTOMERS

- National Protection and Programs Directorate (NPPD)/Homeland Infrastructure Threat and Risk Analysis Center (HITRAC)
- Water sector/utilities

PAYOFF

- Enhances robustness of the method, reduces cost and reduces assessment time for each participating utility
- Individual utilities pay small fee to utilize assessment tool

Homeland Security
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Centralized Hostile Intent

GOAL

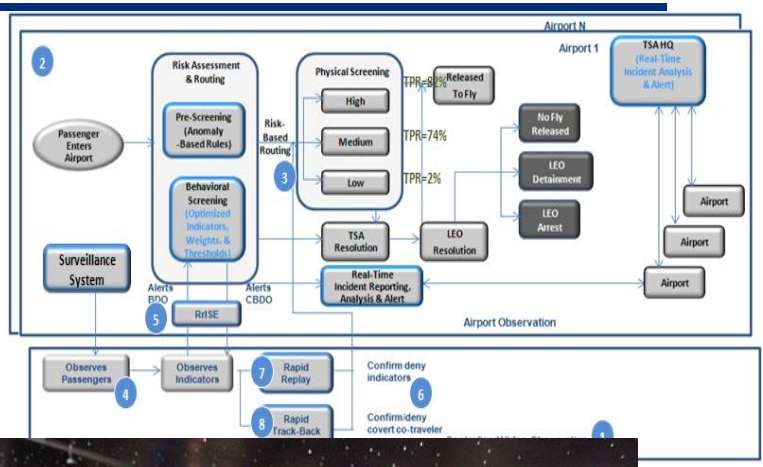
- Improve capability to identify aviation security threats through remote video based behavioral observation and back-tracking

APPROACH

- Comparative analysis of direct-based versus video-based observation and decentralized versus centralized remote observation techniques for identifying high-risk behavior
- Increases the scale of the screening process to accommodate higher passenger volumes across multiple airports
- Extends observation/screening area to include entire airport
- Increases behavior-based screening accuracy and increases capability to identify:
  - High risk passengers
  - Co-travelers and covert co-travelers associated with high risk passengers
  - Observation time

PARTNERS & CUSTOMERS

- Transportation Security Administration (TSA)



PAYOFF

- Increased capability to interdict potential threats to aviation security further from the checkpoint
- Potential cost offsets through behavior-based screening of more passengers using fewer operational personnel employing a centralized remote behavioral screening approach

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Non-Cooperative Biometrics

GOAL

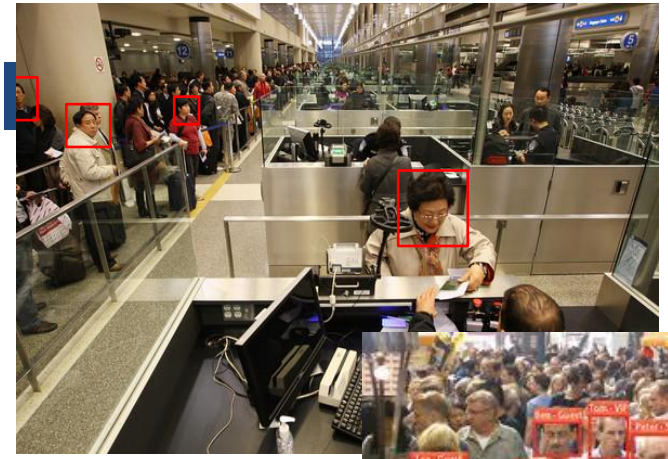
- Augment and advance our DHS Component's pre-screening capabilities of non-cooperative subjects prior to encountering a DHS agent

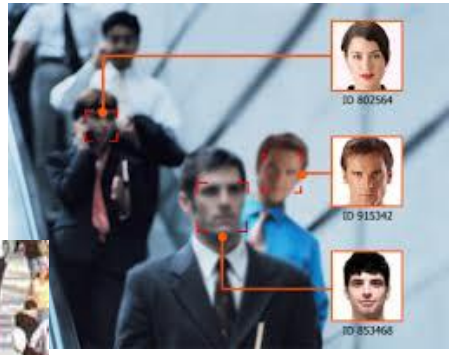
APPROACH

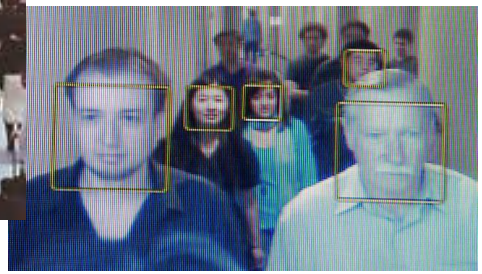
- Collect a corpus of operationally realistic video data to test facial recognition algorithms' ability to identify specific volunteers, which may or may not also be included in a video scene
- Data will be gathered using multiple cameras to capture various and overlapping views at different heights
- Evaluate biometric algorithms submitted by the vendor community against the video data to assess the algorithms' maturity and current performance against various use cases

PARTNERS & CUSTOMERS

- Customs and Border Patrol
- Transportation Security Administration
- United States Secret Service
- Federal Protective Services
- State and local law enforcement, Metropolitan Transit Agencies







PAYOFF

- Video dataset of a realistic operational environment (includes ground truth) to validate a challenge-type of event
- Performance Evaluation Report of current biometric systems against the video dataset that will inform DHS Components on the current state of facial recognition technologies, as well as provide industry areas for improvement

Programs in Practice

Adaptive Risk Mitigation in Practice

Boston Marathon Bombing Revisited with *RSD Solutions:*

- On April 15, 2013, two **improvised explosive devices** (IEDs) detonated near the finish line of the 117th Boston Marathon
- 264 people were injured and three were killed during the attacks

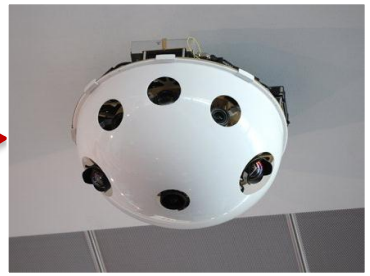
In 2013:

Bombing suspect caught on video but aggregation time-consuming

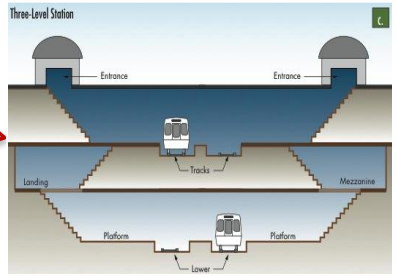
Opportunities for more resilient design features

Dzhokhar A. Tsarnaev, a U.S. citizen, indicted

In the future:



Integrated surveillance quickly enables suspect identification



Resilient CI better withstands hazards

Identify individuals prone to VE before they act

Surveillance Systems Integration (SSI)

- Develop and integrate innovative sensors, displays, algorithms, etc.
- Quickly and efficiently provide actionable information to law enforcement, infrastructure operators

High Performance Resilient Designs

- Provides CIKR analytic tools, resilient design guidance
- Calculates risk & resilience for all-hazards scenarios including costs

Actionable Indicators and Countermeasures

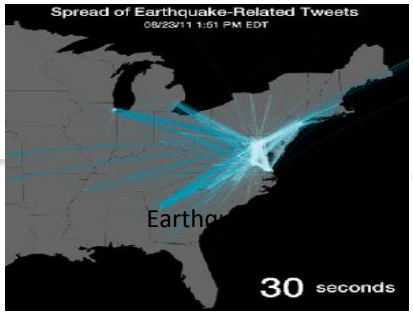
- Indicators of movement toward extremist violence for use by law enforcement, intelligence agencies
- Supports DHS efforts to counter violent extremism

Agile Disaster Management in Practice

East Coast Earthquake Revisited with *RSD Solutions:*

- **Strongest since 1897**
- **5,500 tweets per second, beating Osama bin Laden raid and tying Fukushima disaster**
- **Tweets travelled to NYC faster than earthquake tremors**
- **Distributed structural damages, < $100M**

In 2011:

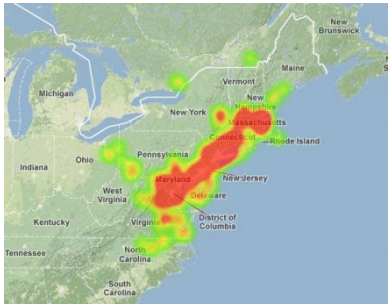


Rapid dissemination via twitter

Epicenter 11 miles from Nuclear Plant

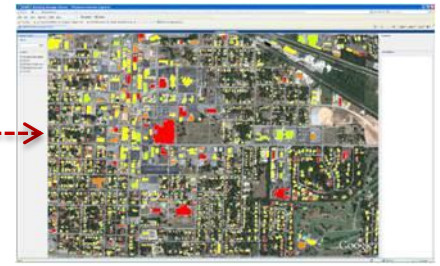
Post-earthquake damage assessment

In the future:



Assistance to areas most in need

Immediate situational awareness



Rapid, thorough assessments speed recovery

Predictive Analytics Toolbox

- Identify Hot Zones: needs/resources
- Identify risks, monitor developments, and provide public risk information

Overhead Imagery Data

- Suite of remote sensing and geospatial information capabilities
- Expedites situational awareness, search & rescue, and damage assessment

Standard Unified Modeling Mapping Integrated Toolkit

- Individual building damage; damage probabilities
- Medical surge data for region
- Casualty counts by county within region of interest

Resilient Infrastructure in Practice

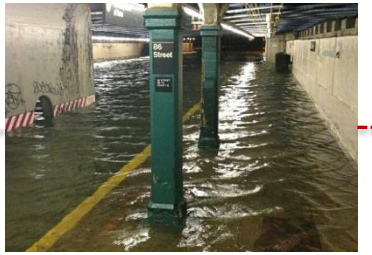
Hurricane Sandy Revisited with *RSD Solutions:*

- **Largest recorded hurricane to develop in Atlantic (1000+ mi.)**
- **$70B+ in economic losses**
- **147 deaths (direct)**
- **475,000+ FEMA assistance applications**
- **Significant infrastructure service failures**

In 2012:

Unsafe Water: 61 community water systems affected in NY State

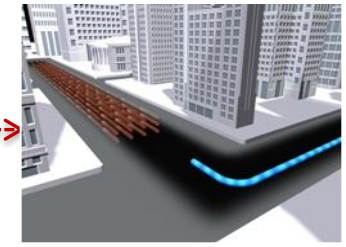
Manhattan Power Outage: $5.7B in lost economic activity



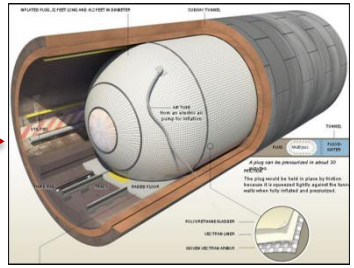
Subway Flooding: $4.8B+ damages & lost revenue

In the future:

Safe drinking water during and after emergencies



REG keeps the lights on



Tunnel flooding prevented, saving billions of dollars

Drinking Water Resilience

- New capability to assess, predict, and recommend preventive action against threats to drinking water infrastructure
- Includes cyber, physical, biological, and chemical contaminants

Resilient Electric Grid

- Advanced grid devices & architecture
- Suppresses fault current and allows substations to share capacity during disasters

Resilient Tunnel

- Three-layer inflatable plug, made of advanced materials
- Stops floodwaters to minimize damage, expedite restoration

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Looking Ahead: Key Challenges

- **Adaptive Risk Mitigation**
  - Technology Readiness Level vs. Timeline
  - Privacy Issues
  - Adoption/Cost to Deploy
  - Technology Effectiveness/Measures of Effectiveness
- **Agile Disaster Management**
  - Customer Changing Requirements
  - Acquisition Path/Adoption/Cost to Buy and Operate
  - Federal Solution vs. Locally Developed Solutions
  - Standards
- **Resilient Infrastructure**
  - Transition to Asset/Sector Owners
  - Adoption/Acceptance
- **Training, Education, and Performance**
  - Deployment/Operations and Maintenance
  - Performance Metrics and Efficiency/Accuracy

Ongoing Activities

- RSD Technology Roadmap: Aligned with HSARPA/S&T
- New Starts: Aligned with Thrust Areas
  - Complex Systems/Cascading Effects
  - High priority infrastructure sectors
  - …
- Collaborative programs: CSD, FRG , others
  - Cyber Physical Systems
- Projects with Transition Objectives
  - Component buy-in, Local User advocacy/acceptance
- Stronger focus on staff Development: PM Expertise/Experience, Mentoring, …

If you don’t know where you’re going, any road will get you there!

Department of Homeland Security Science & Technology

HSSTAC – AM Conclusions

Dr. Daniel Gerstein
Under Secretary (Acting)
Science & Technology Directorate

December 5, 2013

Homeland Security

Working Lunch

Department of Homeland Security Science & Technology

HSSTAC – Industry Engagement

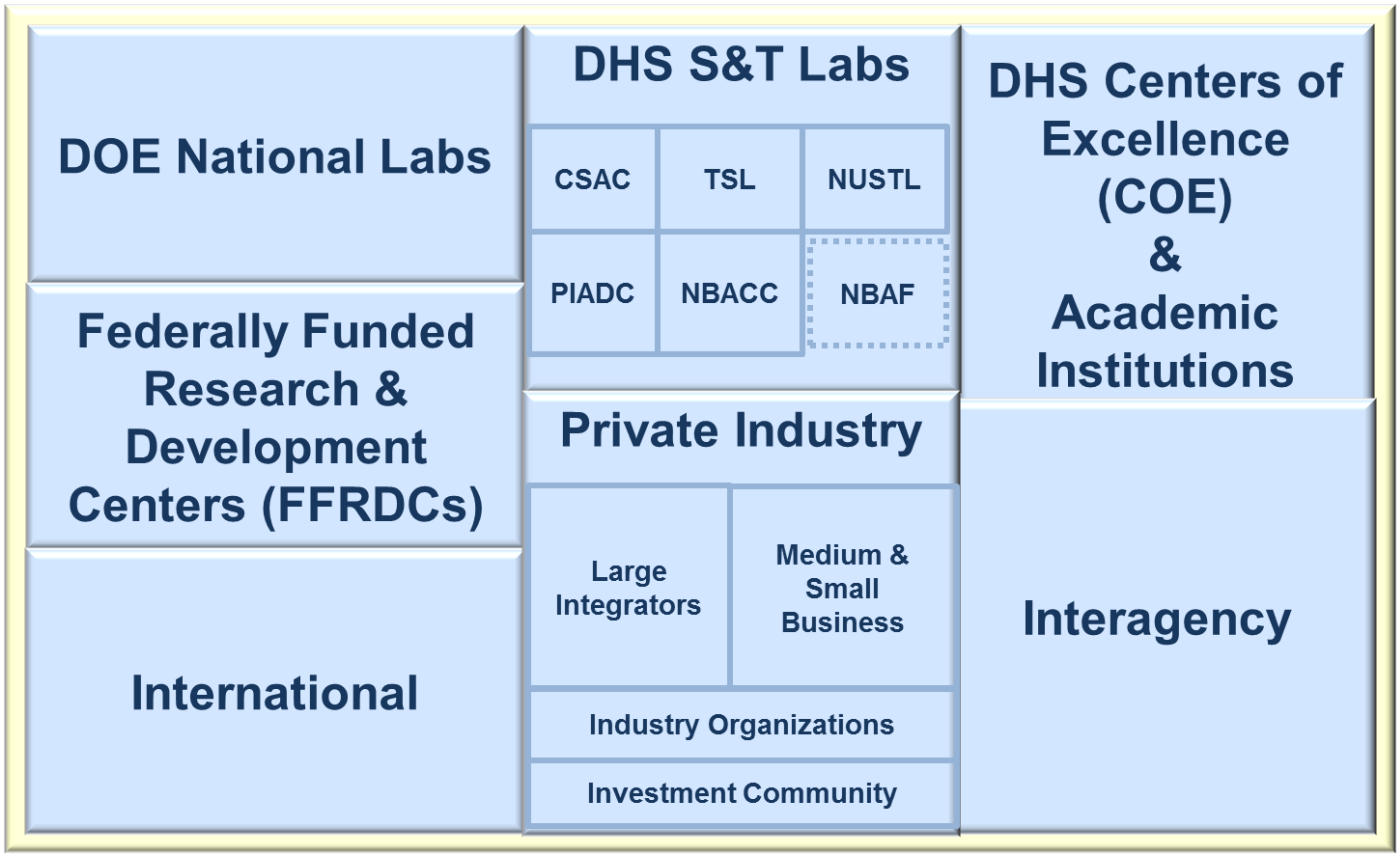
Dr. Daniel Gerstein
Under Secretary (Acting)
Science & Technology Directorate

December 5, 2013

Homeland Security

S&T Partnerships

Vision: Communicate and engage in opportunities that result in the delivery of technologies and capabilities to the Homeland Security Enterprise.



Building Partnerships for Technology Transition to Operational Use

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Tools

Industry Collaboration

Cooperative R&D Agreements (CRADA)
Long Range Broad Area Announcement (BAA)
Small Business Innovation Research (SBIR)
SAFETY Act
SECURE

Technology Foraging

Systems Analysis

DoD/DHS differences

VALLEY OF DEATH

S&T Value Added Proposition

Operational Relevance …

Innovation ….

Partnerships …

1: Early

S&T Priorities:
- Biodefense
- Cybersecurity
- Home-made Explosives
- First Responder Support

Informs

- LRBAA & White Papers
- CRADA
- Centers of Excellence
- International

2: Mid

S&T R&D → Industry Partner through CRADA → Joint S&T and Industry Effort

3: Late

S&T R&D → Transition to Industry

4: As Needed

S&T R&D

(Just In Time Transition????)

Examples

ARMOR

FMD Vaccine

CIRT

RECX

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Strategy

- **Educate –** Provide information to industry on efforts and mechanisms to foster engagements
  - **Full Response Packages distributed by the Commercialization Office**
  - **Webinars**
  - **Speeches**
  - **Technical Support Operational Activity (TSOA) and Joint Interagency Field Exploration (JIFX)**
- **Notify –** Publicize information sharing events
  - **Periodic Outreach Messages**
  - **Cross-promotion of DHS activities**
- **Incentivize –** Provide value to engagement partners
  - **SAFETY Act – Certification, Designation**
  - **SECURE – Product evaluation and certification**
  - **Small Business Innovation Research (SBIR) – Awards, Commercialization Assistance Program**
  - **Long Range Broad Agency Announcement (LRBAA) - Awards**
  - **Grants**
  - **Tech Transfer/Formal Agreements – Information Sharing, Cooperative Research & Development**
  - **Prizes/Grand Challenges**
- **Solicit –** Request targeted information and proposals in response to DHS needs
  - **Small Business Innovation Research (SBIR)**
  - **Long Range Broad Agency Announcement (LRBAA)**
  - **Targeted Broad Agency Announcements (BAAs)**
  - **Requests for Proposals (RFPs)**
- **Elicit –** Gather information to find new ideas, technologies, trends, and identify potential partners
  - **Requests for Information (RFIs)**
  - **Conference Attendance**
  - **Seeking new Audiences (Vendors, Users, R&D Communities)**
  - **Vendor meetings**
  - **Interaction with DHS S&T's partner network**
  - **Technology Foraging**

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Mechanisms

There are many ways that DHS actively engages with the private sector. Each tool provides unique pathways to success:

- **Webinars and Invited Speeches**
  - **SAFETY Act Webinar Series**
  - **Commercialization Office webinars with MOU partners**
- **Industry Days**
  - **HSARPA Big Data and Analytics Workshop**
- **Open Solicitations**
  - **SBIR, LRBAA, Targeted BAAs**
- **Publications and Marketing Materials**
  - **Science & Technology Review 2014, OUP Newsletters**
- **Field Experimentation/Product Demonstrations**
  - **Technical Support Operational Activity (TSOA) and Joint Interagency Field Exploration (JIFX)**
- **Formal Agreements**
  - **Cooperative Research and Development Agreements (CRADAs)**
  - **Memoranda of Agreement/Understanding (MOAs and MOUs)**

Partner Network

DHS S&T boasts a large network of partners internally and externally to reach the private sector

Internal Partners:

- DHS Private Sector Office
- DHS Industry Liaison Council
- NPPD Infrastructure Protection – Sector Coordinating Councils
- DNDO Commercial First Initiative
- Federal Laboratory Network
- Interagency/Intelligence Community Network
- University and Centers of Excellence Network

External Partners:

- MOU Partners:
  - AutoHarvest Foundation
  - Security Industry Association
  - GD EDGE Innovation Network
  - Maryland TEDCO
  - Massachusetts High Technology Council
  - Tech Comm
- Trade Associations
- Non-Profit/Not-for-Profit Organizations
- In-Q-Tel

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Results

The Success of these Engagements can be measured many ways:

- **Formal Agreements –** DHS executed 60 Cooperative Research and Development Agreements (CRADAs) in FY12 and 80 CRADAs in FY13
- **Contracts/Grants –** SBIR and LRBAA provide approximately $25-$50 million per year to their solicitations (depending on budget stability)
- **Information Collection –** Findings from industry outreach contribute to overall Technology Foraging activities at DHS S&T
- **Expansion of Audiences –** Communications distributed to wide audiences result in higher attendance at Industry Days, Webinars, and provide awareness of DHS S&T priorities.
- **SAFETY Act Economic Impact–** As of May 2013, over 600 approvals for products, services and technologies were granted. In FY13, 60 approved applications were tied to more than $1.2 Billion in projected technology revenues, supporting more than 50,000 private sector jobs.
- **Establishment of New Partnerships –** Research & Development Working Groups initiated with Infrastructure Protection Sectors, and MOUs signed with new strategic partners

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Next Steps

- Continue increasing partnership agreements through MOUs, CRADAs, and Partnership Intermediary Agreements (PIAs) with strategic partners
- Expand technology demonstrations, such as TSOA and JIFX, with participation from more industry and government partners
- Educate internal DHS S&T staff on various avenues available for private sector engagements, and validate outreach successes through the Portfolio Review process
- Promote S&T Services – SAFETY Act, Information Sharing Agreements, Grant and Funding Opportunities
- Increase Partnership Opportunities – Gather expertise from professional user communities, work with industry venues as test-beds and partners for technology evaluations
- Create a "Grand Challenge" to address a hard problem at DHS
- Compile a comprehensive list of existing and anticipated capability gaps that can be shared with the private sector

Homeland Security

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