Defense Advanced Research Projects Agency

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Special Assistant to the Director

19th Annual NDIA S&ET Conference

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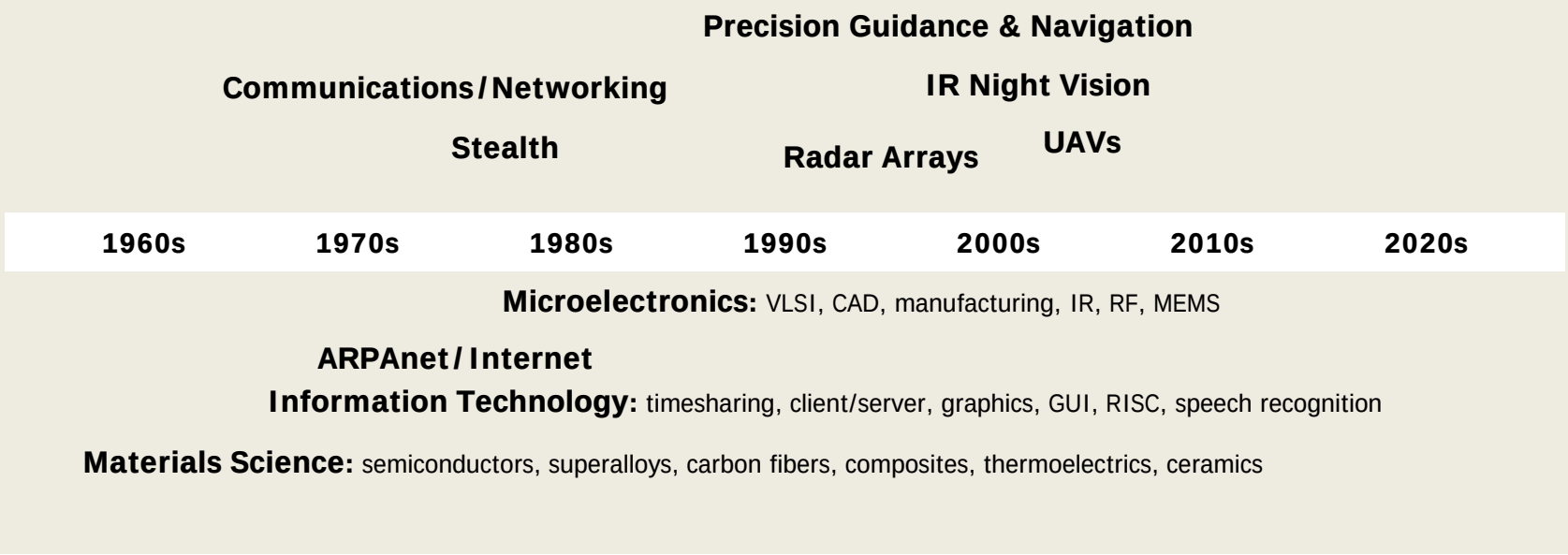
DARPA's Mission

Breakthrough Technologies and Capabilities for National Security



DARPA's role: Pivotal early investments that change what's possible

Major Factors Shaping DARPA Investments Today

Wide range of threats to the nation:

Enemy states, non-state actors, shifting networks, WMT

Peer competitions on land (Europe), at sea (Asia), and in the EM and space domains

Continuous and persistent counter-terrorism and counter-insurgency operations world-wide

Powerful, globally available technologies

set a fast pace

DARPA's Portfolio

Multi-varied threats to the nation

Defend the homeland

Cyber deterrence
Bio threat detection and mitigation
Defense against WMT
Countering hypersonic weapons

Peer competitor confrontations in Europe and Asia

Deter and prevail against high-end adversary

Adaptive lethality for air, land & sea
Control of the EM spectrum
Long range effects
Robust space

Continuous counter-terrorism and counter-insurgency operations

Effectively prosecute stabilization efforts

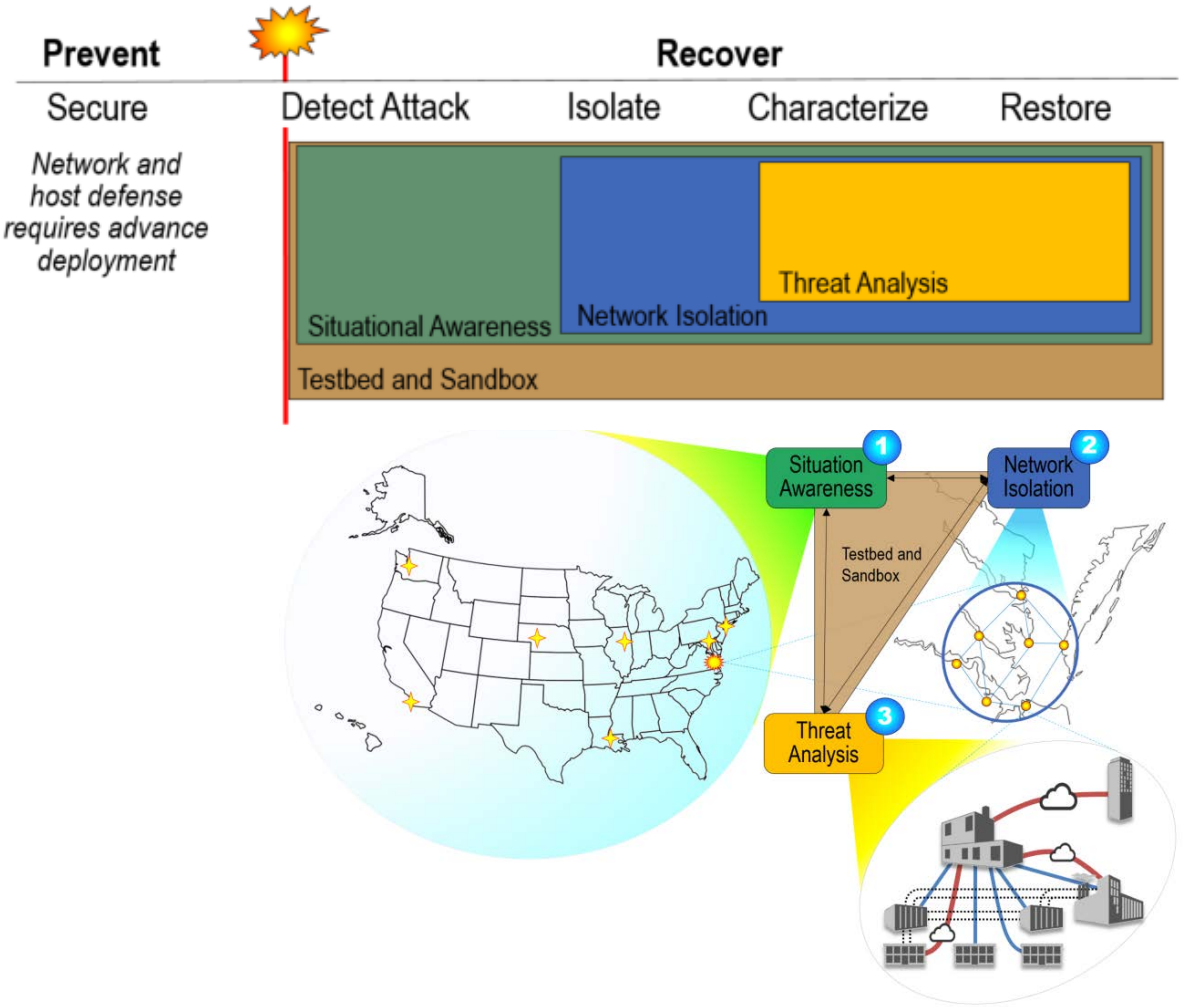
Gray warfare experimentation
Behavior modeling & influence
3D city-scale operations
Warrior performance

Foundations

Understanding complexity, composable systems, advanced materials and electronics, trusted hardware and software, human-machine symbiosis, 3rd wave artificial intelligence, data and social science, new computing, and engineered biology

Increasing the pace of developing technologies and capabilities for the U.S. and allied warfighter

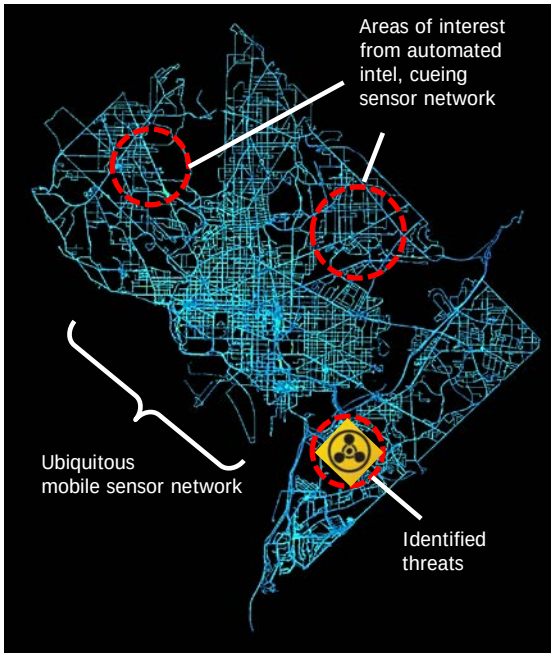
Cyber Deterrence

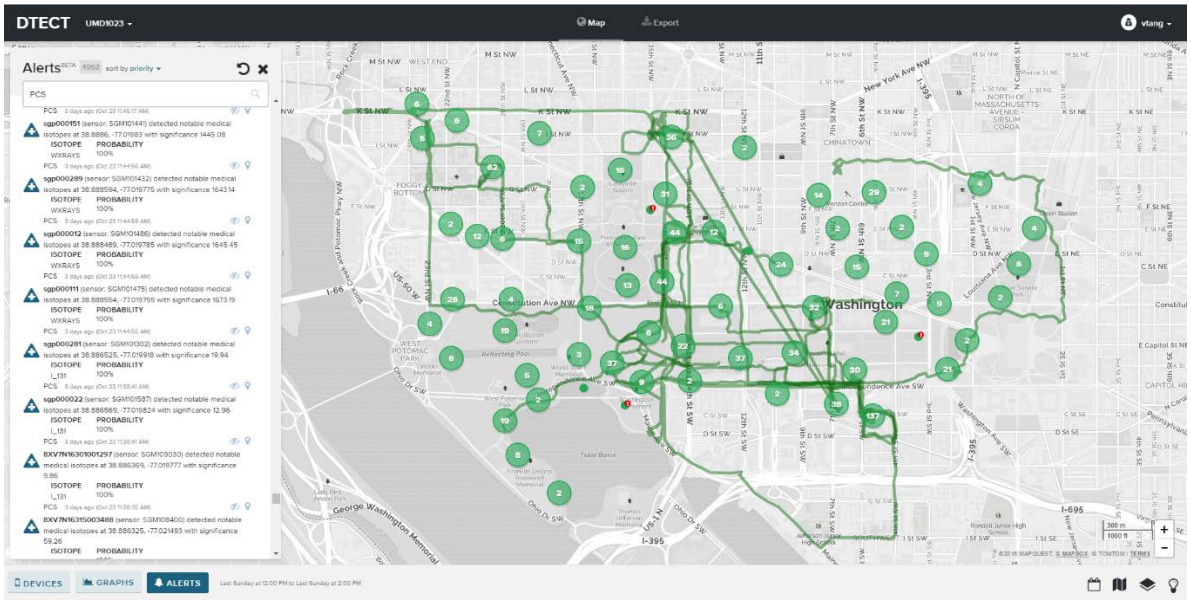


Rapid Attack Detection Isolation & Characterization System (RADICS)

Enable black start recovery of the U.S. power grid within 7 days after a cyber attack

Countering WMT





Command and control and analytics at scale

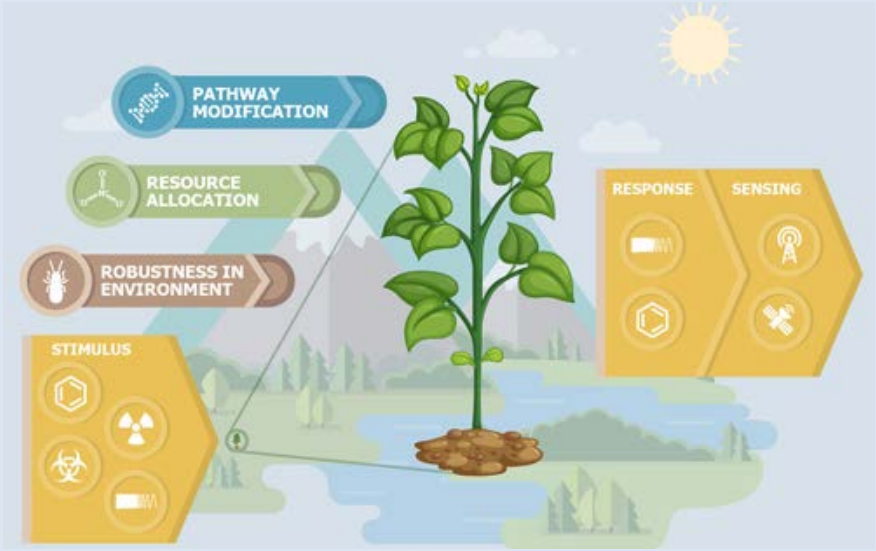
SIGMA+

Persistent, early detection system for the spectrum of CBRNE WMD/WMT threats at city-to-region scales

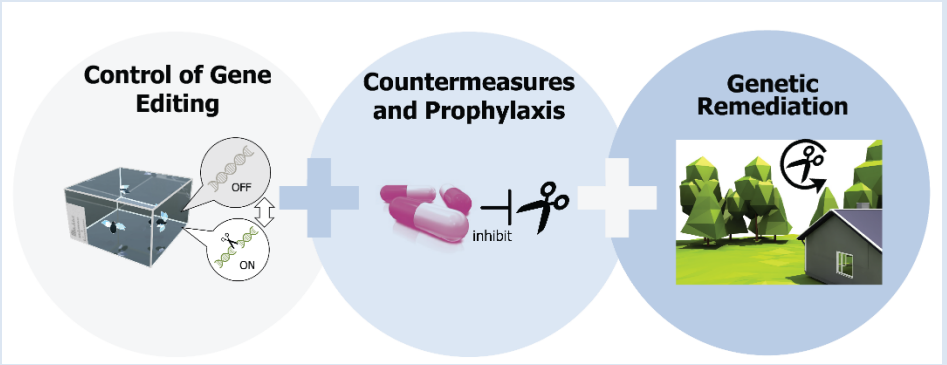
CBRNE: Chemical, biological, radiological, nuclear, and explosives

Bio Threat Detection & Mitigation

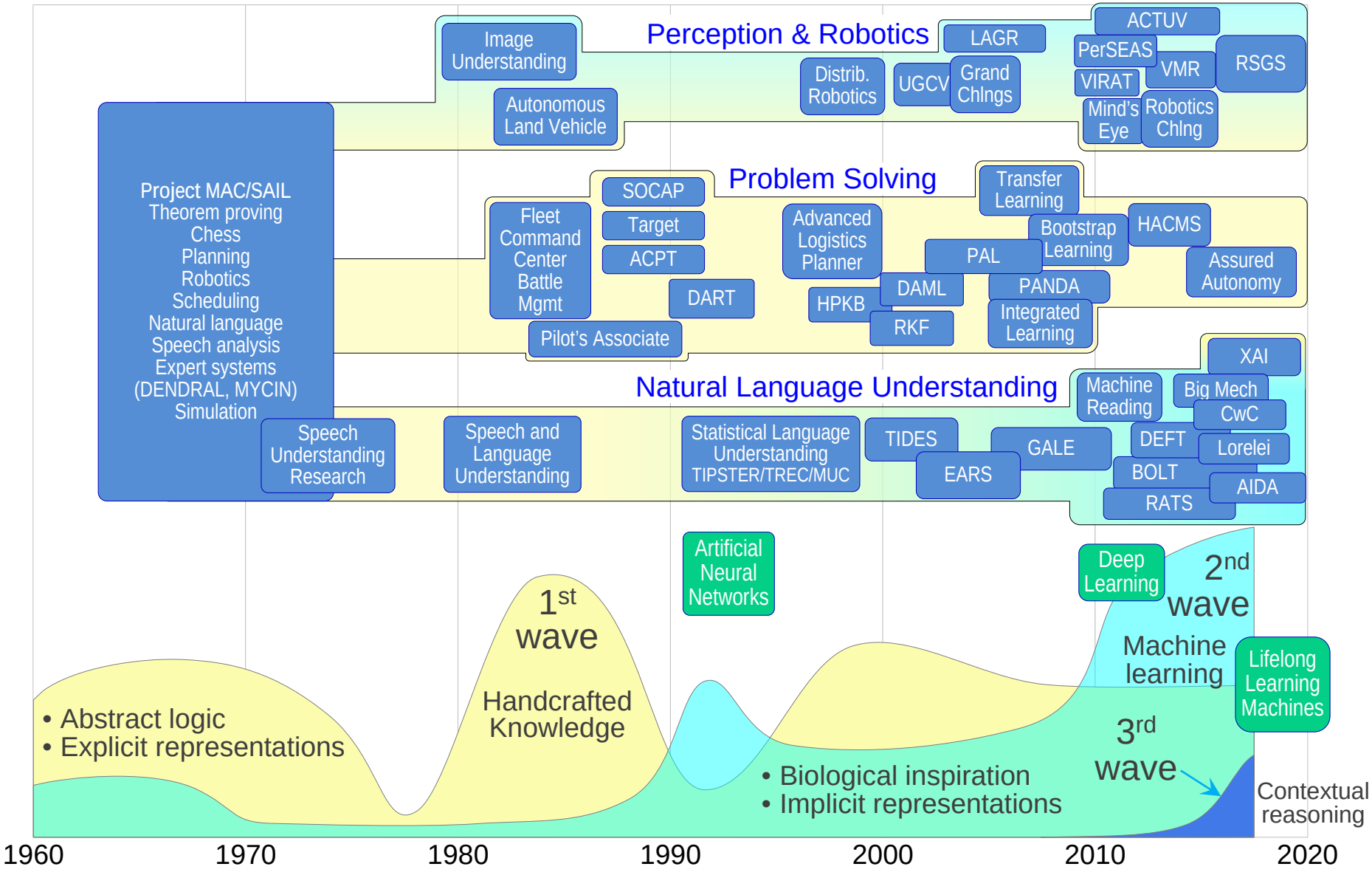
Advanced Plant Technologies



Safe Genes



DARPA Has Funded the Foundations of AI



Select Small UAS Programs

Aerial Dragnet

Persistent wide-area surveillance of multiple small UASs in complex terrain

- Early I&W of UAS threats in urban environments before in line of sight
- Signal processing algorithms for NLOS detect, track, classify

Offensive Swarm-Enabled Tactics (OFFSET)

Develop a swarm system architecture to advance swarm tactics

- Generate / assess 100+ swarm & counter-swarm tactics in game-based settings
- Demonstrate real-time interactions with swarm sizes w/over the air tactics <1 min

Select Autonomy Programs

Aircrew Labor In-Cockpit Automation System (ALIAS)

Drop-in system to automate aircraft operation

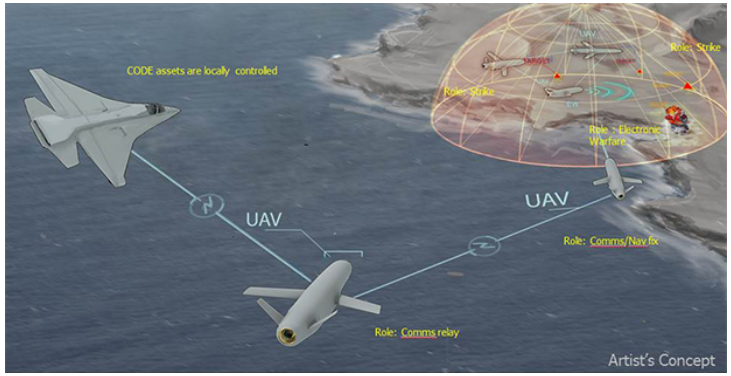
Removable kit that would promote the addition of high levels of automation into existing aircraft, enabling operation with reduced onboard crew

- Support execution of an entire mission from takeoff to landing even in the face of contingency events
- A platform for integrating additional automation or autonomy capabilities

Collaborative Operations in Denied Environment (CODE)

Cooperative autonomy algorithms

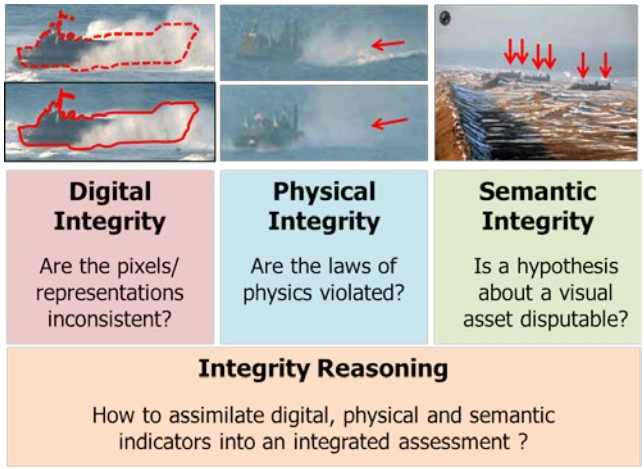
- Navigate, find, track, ID, & engage targets under established rules of engagement
- Recruit other CODE-equipped UASs from nearby friendly forces to augment their own capabilities
- Adapt to dynamic situations such as attrition of friendly forces or the emergence of unanticipated threats



Select Information Programs

Media Forensics (MediFor)

Enhance and scale indicators of digital, physical or semantic manipulation in images and video to enable automatic assessment of their integrity



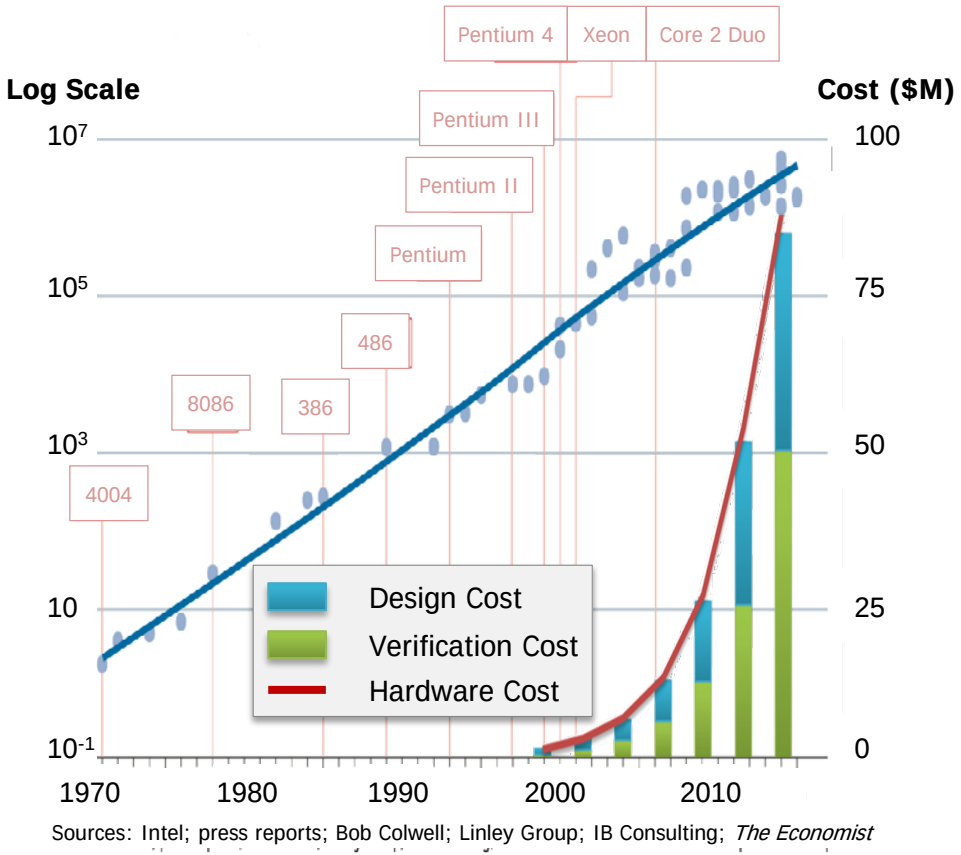
Robust Automatic Transcription of Speech (RATS)

Finding Intel Streams in noisy/distorted Channels across the Spectrum

- Improving DoD capability to find and make use of intercept data in Arabic, Farsi, Dari, Pashto and Urdu
- Funded by Rapid Reaction Technology Office for operations in theater

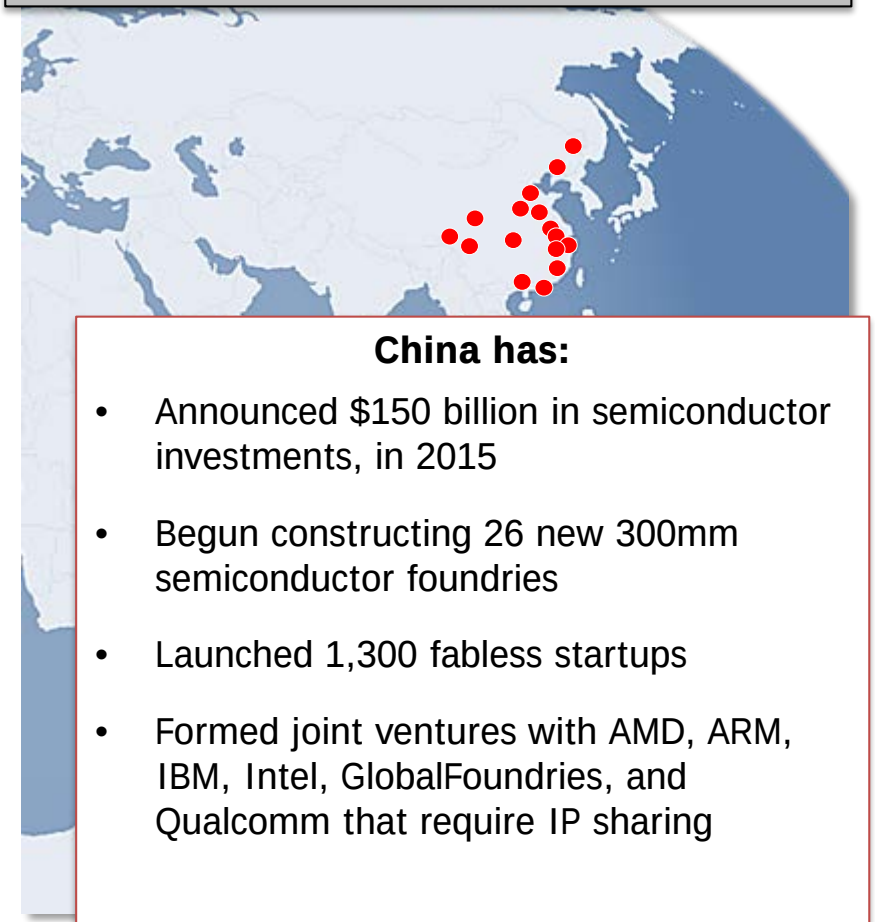
Advanced Electronics

Moore's Law faces an inflection point, where transistor cost stops going down and electronics stop improving as quickly (ISAT)



Sources: Intel; press reports; Bob Colwell; Linley Group; IB Consulting; *The Economist*

Slower innovation benefits China's plan to supplant U.S. leadership (PCAST)



China has:

- Announced $150 billion in semiconductor investments, in 2015
- Begun constructing 26 new 300mm semiconductor foundries
- Launched 1,300 fabless startups
- Formed joint ventures with AMD, ARM, IBM, Intel, GlobalFoundries, and Qualcomm that require IP sharing

ISAT – Information Science and Technology study group
PCAST – President's Council of Advisors for Science and Technology

Advanced Electronics

The Electronics Resurgence Initiative (ERI)

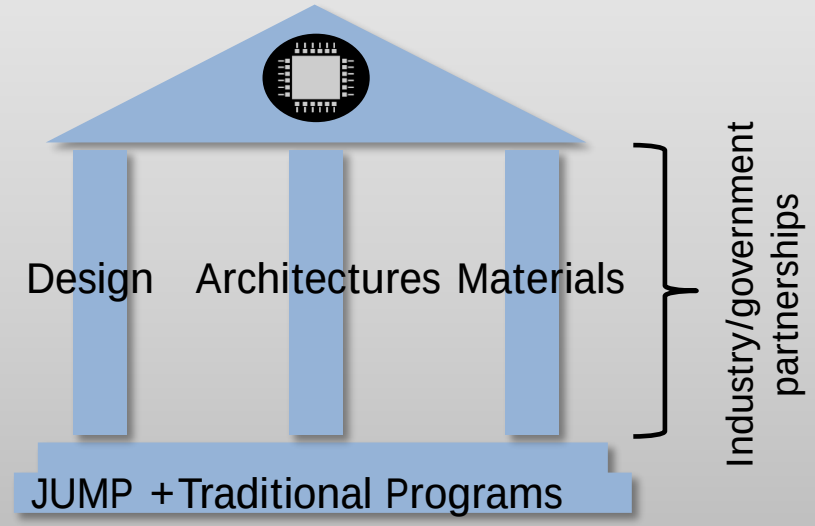
Strategy

Specialize
- Reduce the complexity in leveraging specialized hardware

Decentralize
- Make foreign investments an expensive albatross for manufacturing low-end commodities

Align
- Provide a pipeline of commercially-leveraged electronics for the DoD

2025 – 2030:
National Electronics Capability



JUMP – Joint University Microelectronics Program

Currently in source selection. Kickoff meeting scheduled for July 2018.

The Spectrum Collaboration Challenge

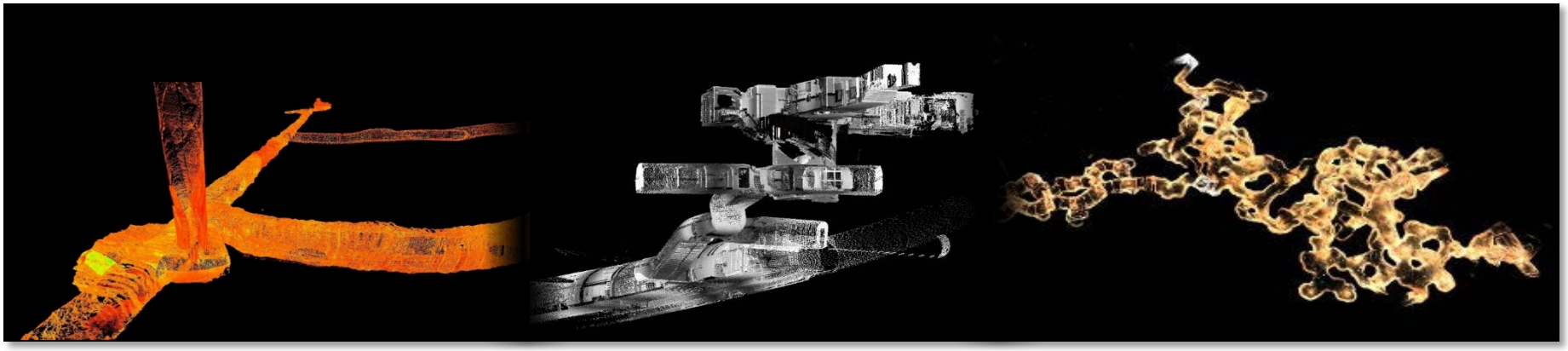
spectrumcollaborationchallenge.com

The DARPA Spectrum Collaboration Challenge (SC2) is the first-of-its-kind collaborative machine-learning competition to overcome scarcity in the radio frequency (RF) spectrum. Today, spectrum is managed by dividing it into rigid, exclusively licensed bands. This human-driven process is not adaptive to the dynamics of supply and demand, and thus cannot exploit the full potential capacity of the spectrum. In SC2, competitors will reimagine a new, more efficient wireless paradigm in which radio networks autonomously collaborate to dynamically determine how the spectrum should be used moment to moment.

SC2 Championship Event September 2019.

3D City-Scale Operations

Border Tunnels **Urban Underground** **Cave Networks**

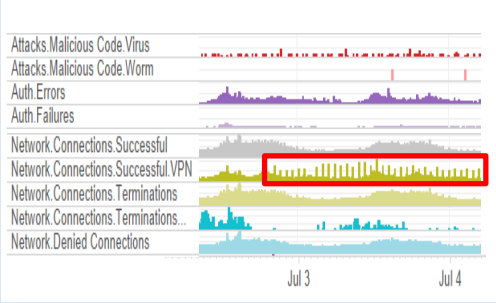


DARPA Subterranean (SubT) Challenge

Discover innovative solutions to map, navigate, and search the diverse subterranean operating environment without and better than humans

Transitions

Net Defense



Detects network infiltration via scalable mathematics to ID anomalous behavior

- Transition of tools and techniques to CYBERCOM and Army Cyber Protection Teams. MOA in place with CYBERCOM

Long-Range Anti-Ship Missile (LRASM)

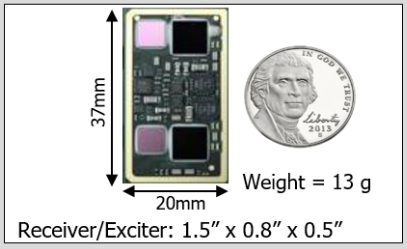
LRASM Deployment Office (LDO) formed in Feb 2014 to address urgent need for Offensive Antisurface Warfare (OASuW) capability in the Pacific Theater

- Early operational capability (EOC) in 2018

Revolutionizing Prosthetics

Recent transition of the "LUKE Arm", a replacement arm for veteran amputees, with near-natural control and capability

- Received FDA clearance (May 2014)
- Transfer Agreement with Walter Reed National Military Medical Center (Dec 2016)
- First two LUKE arms prescribed by VA (Jun 2017)



Arrays at Commercial Timescales (ACT)

Digitally-interconnected building blocks for large, complex antenna arrays; enables rapid development and upgrades for communications, signals intelligence, radar, and electronic warfare systems

- MOAs in place for transition to Navy, Air Force, and Army programs

D60 Symposium

February 7, 1958 - February 7, 2018

Breakthrough Technology
Past | Present | Future

Date: 5-7 Sep, 2018

Location: Gaylord National Harbor, Oxon Hill, MD

Goals:
Strengthen and expand DARPA's innovation
Inform key stakeholders about DARPA's vision
Learn from DARPA's achievements past and present

PLENARY SESSIONS

- BioNext
- Deter Cyber Attack
- Electronics Resurgence
- Enterprise Disruption
- Mosaic Warfare
- Preventing Weapons of Mass Terror (WMT)

BREAKOUT SESSIONS

- Alternative Computing
- Autonomy & Robotics
- Power Behind the AI Surge
- The Future of Space
- Trajectory of Neurotech
- Understanding the Evolving Urban Threat
- DARPA & Academia
- DARPA at the Tactical Edge
- DARPA Grand Challenges
- Why it Matters: New Spin on Spintronics
- X-Planes: Past, Present and Future

SPEAKERS INCLUDING

- Vint Cerf
- Vijay Kumar
- Manuela Veloso
- Pradeep Khosla
- Steve Wax
- Jim Hendler
- Tony Tether
- Brian Nosek
- Yolanda Gil
- Albert Fert

EXHIBITS AND DEMOS

- Microsystems Technology Office
- Tactical Technology Office
- Information Innovation Office
- Strategic Technology Office
- Defense Sciences Office
- Biological Technologies Office
- DARPA Historical Exhibit

Registration Opens April 16, 2018
www.darpa.mil

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