The background of the slide is a photograph of Earth from space, showing the blue atmosphere and white clouds. Several bright, diagonal streaks, resembling meteor trails or satellite paths, are visible against the blackness of space. On the left side, there are vertical bars in yellow and blue.

FOSTER INTEROPERABILITY
SIMEX
EVOLVE CONOPS

Overview

NSEL* and Simulation Experiments (SIMEXs)

Joint Concept of Operations Refinement and Spiral Development

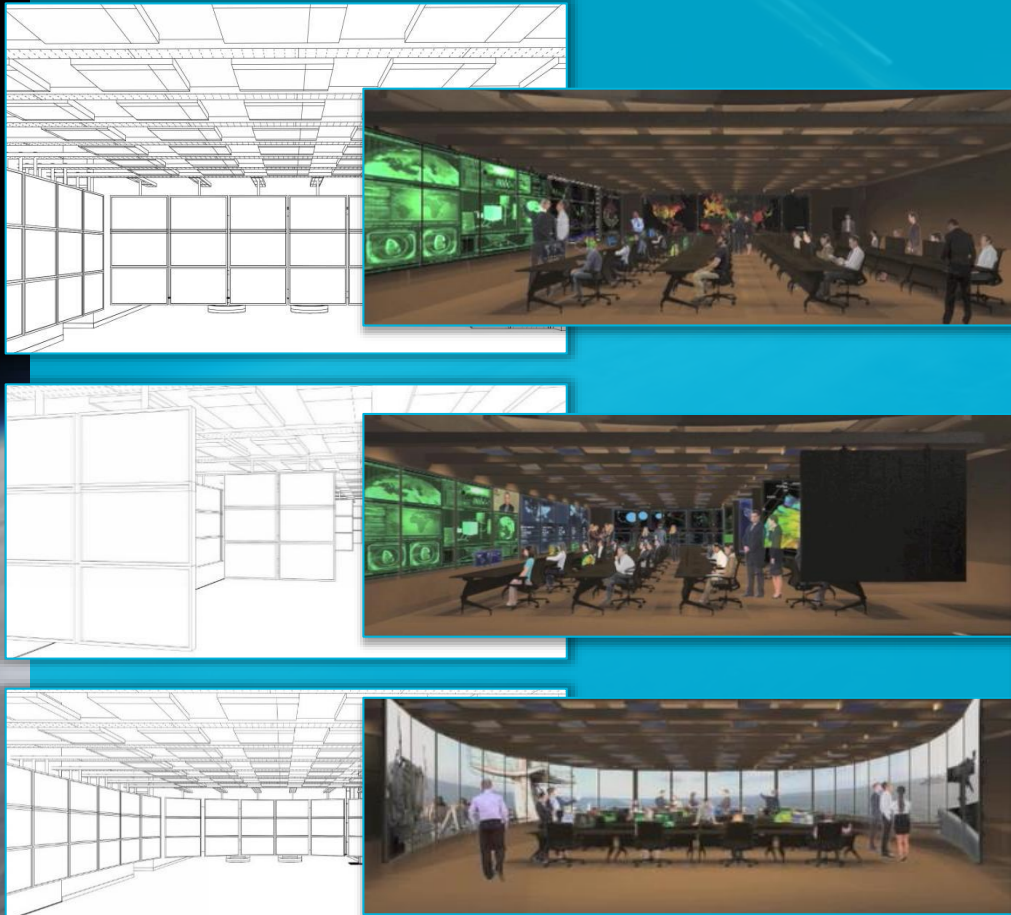
- Joint Surface Warfare (JSuW)
- Joint Time Sensitive Targeting
- ISR Management
- Small Combatant Joint Command Ctr
- Joint Chemical/Bio Security
- BMD
- UAS Ops
- Border Security
- Emergency Management
- Special Ops
- Cyber Warfare
- Advanced Weapons
- Census Operations
- Tax Refund Fraud
- ASW
- Strategic TCT
- Electronic Warfare
- Tactical Logistics
- CUAS Operations

** OSD-sponsored National Security Experimentation Lab (NSEL) that has conducted 62 SIMEXs since 2001

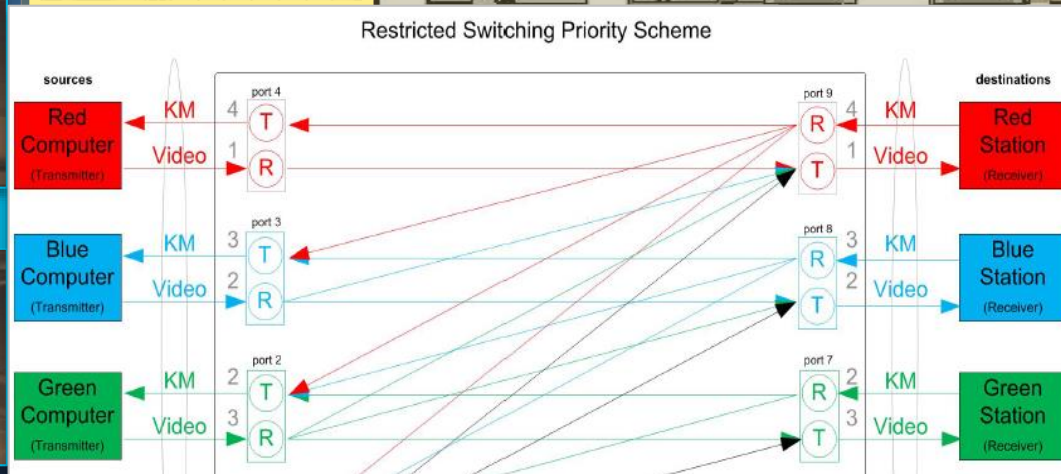
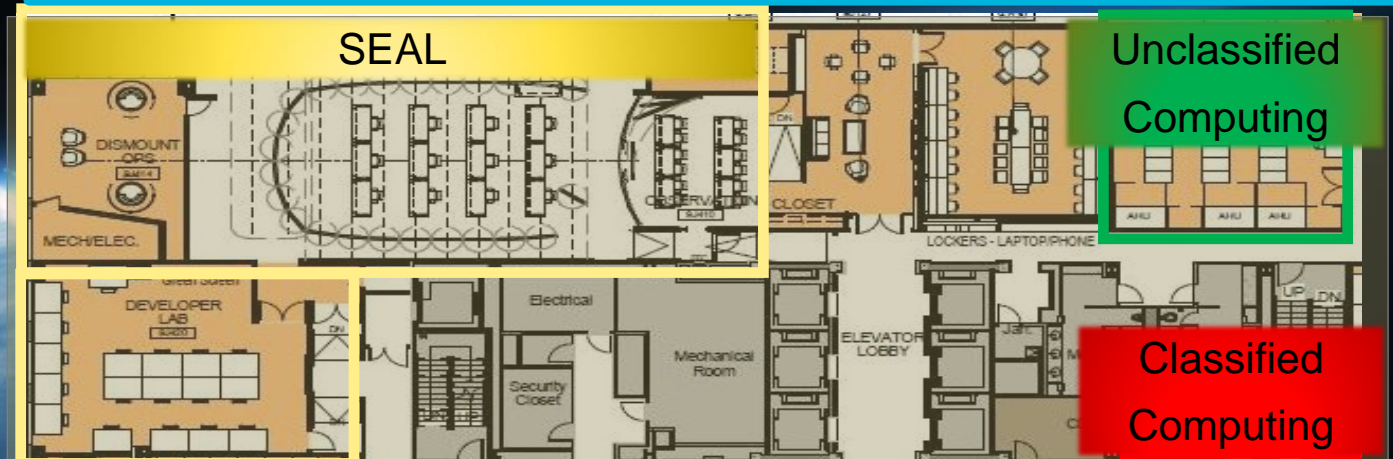


Simulation, Experimentation and Analytics Lab (SEAL): New Home for NSEL and the SIMEXs

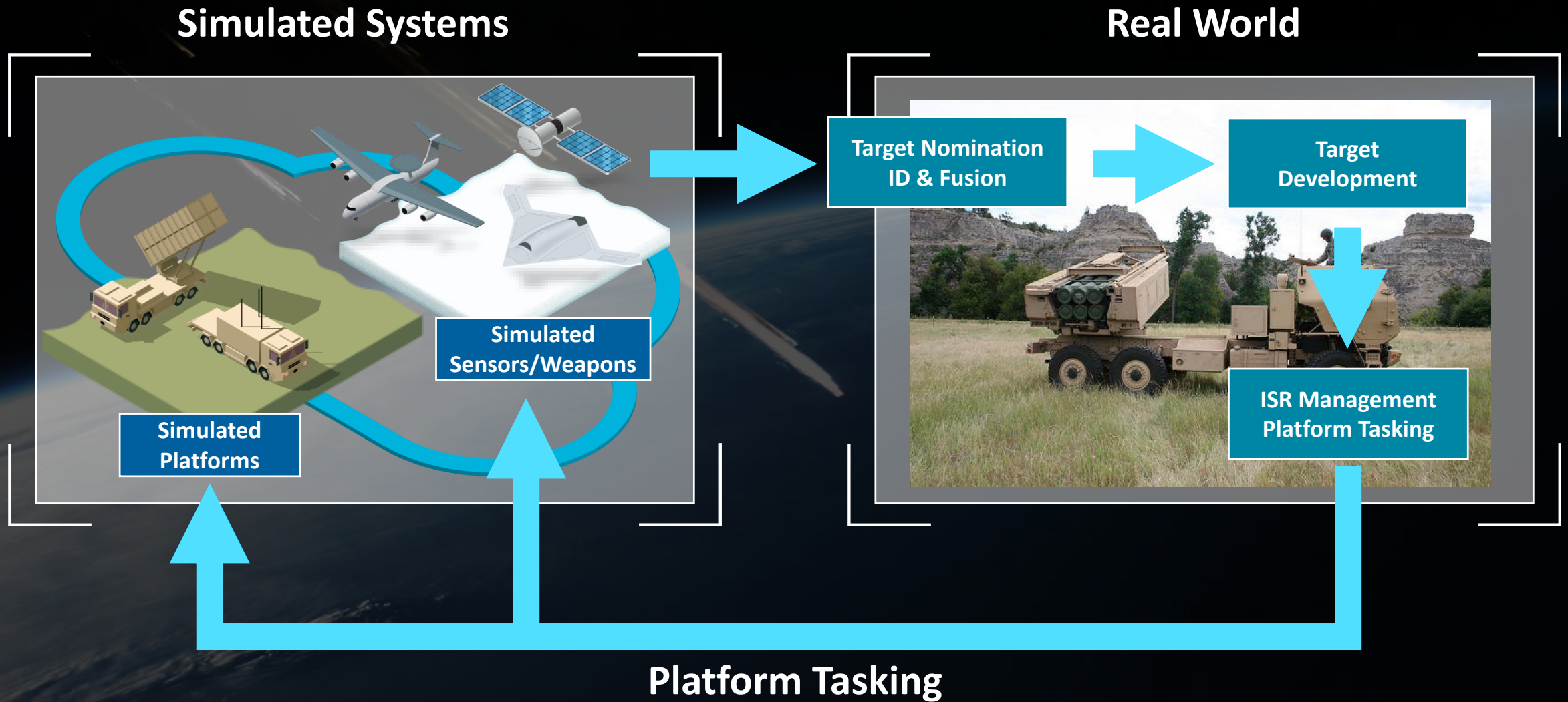
Large scale motorized, reconfigurable data wall allows for replicating different operating environments.



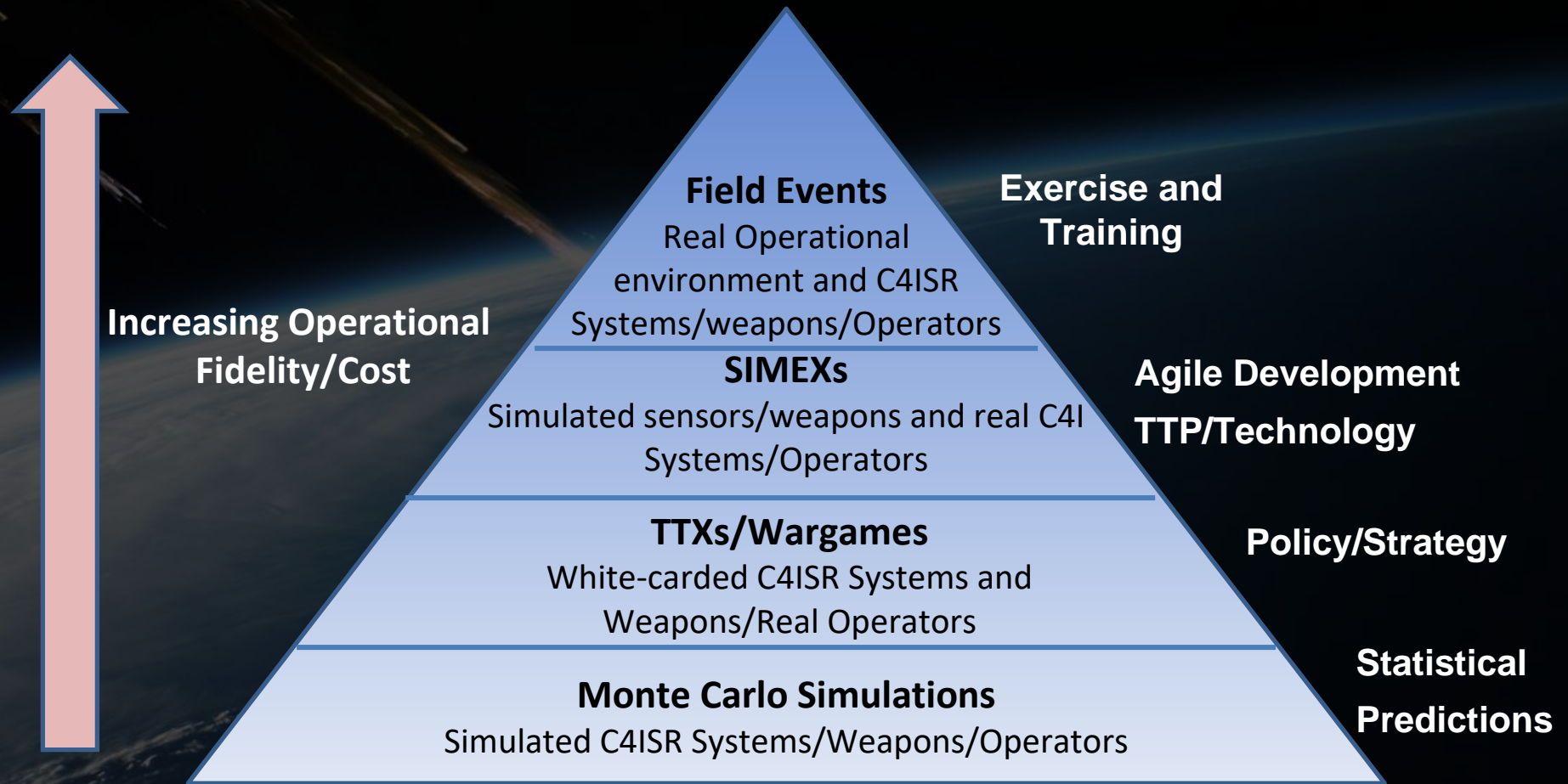
All computing for the SEAL is extrinsic to lab, leveraging a Multi-Level Security KVM to allow for easy transition between unclassified and classified NSEL computing environments



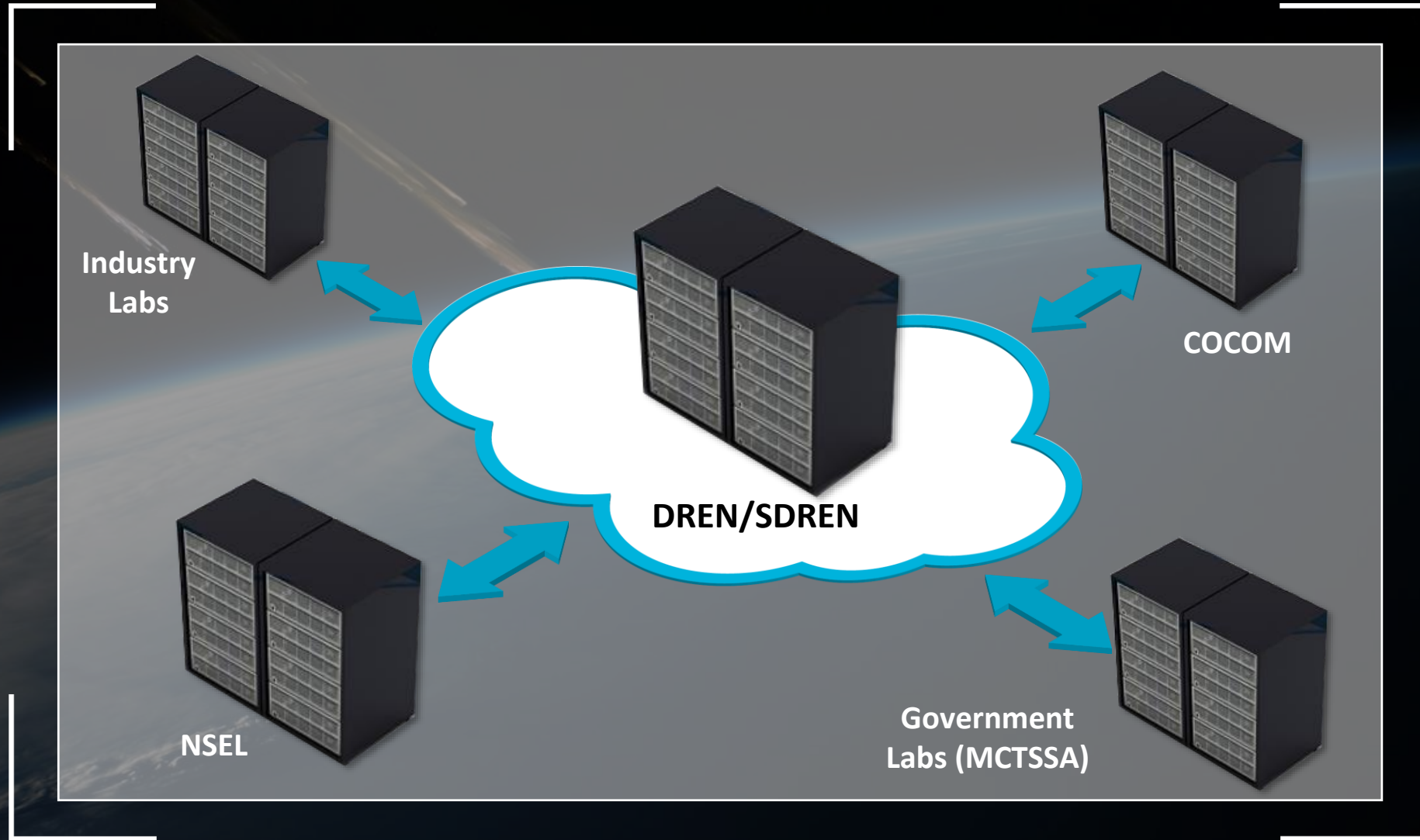
NSEL and Simulation Experiments (SIMEXs)



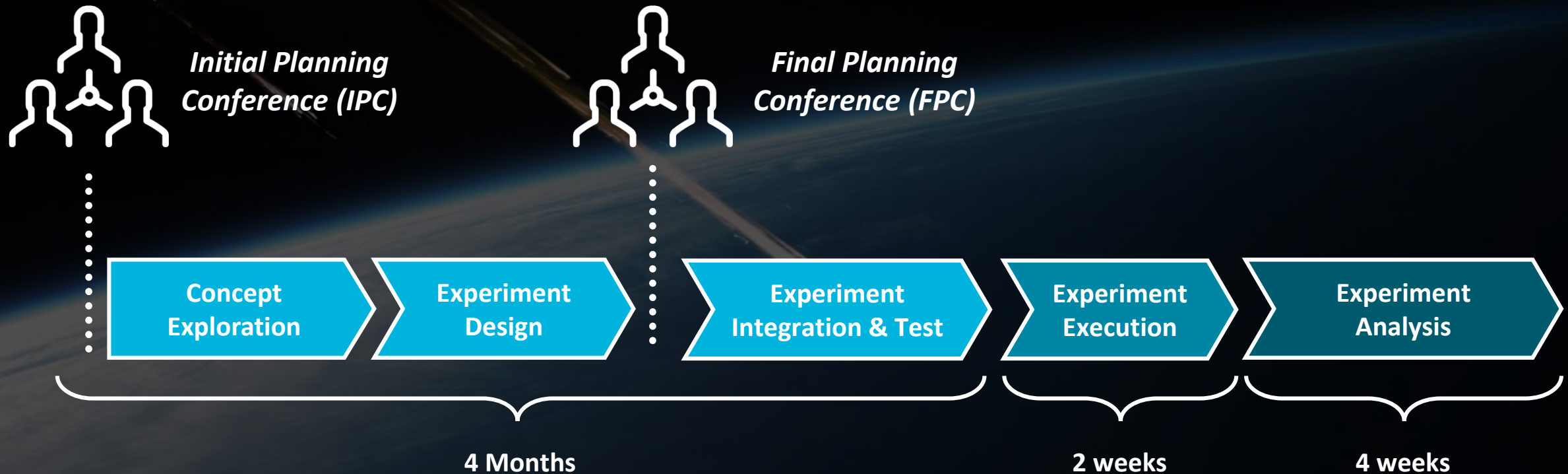
Levels of Experimentation



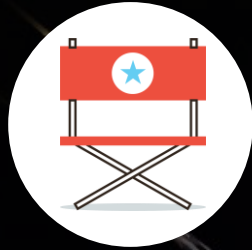
Employ SDREN/DREN for Distributed SIM/C4I



The MITRE SIMEX™ Schedule: Activities/Output

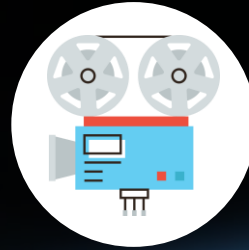


SIMEX Team



SIMEX Director

Manages planning & execution of individual SIMEXs



Technical Director

Manages technical integration & testing



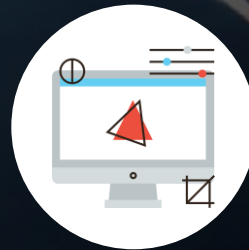
Data Collection/Analysis Lead

Develops/executes data collection & analysis plan & authors reports



CONOPS/Scenario Lead

Develops scenarios & simulation architecture



Development Lead

Develops and integrates new SIMEX software



Portfolio Manager

Manages project staff & coordinates NSEL sponsorship

Sample SIMEX Week *



Daily Schedule

0830-0900: In-brief
0900-1200: Morning Run
1200-1300: Break for lunch
1300-1500: Afternoon Run
1500-1600: Hot Wash

Analysis Overview – How Many Variables?



Meaningful statistical analysis requires full pair-wise comparison of each variable with all other variables



The limited number of runs available in a SIMEX necessitates choosing very few variables to test.

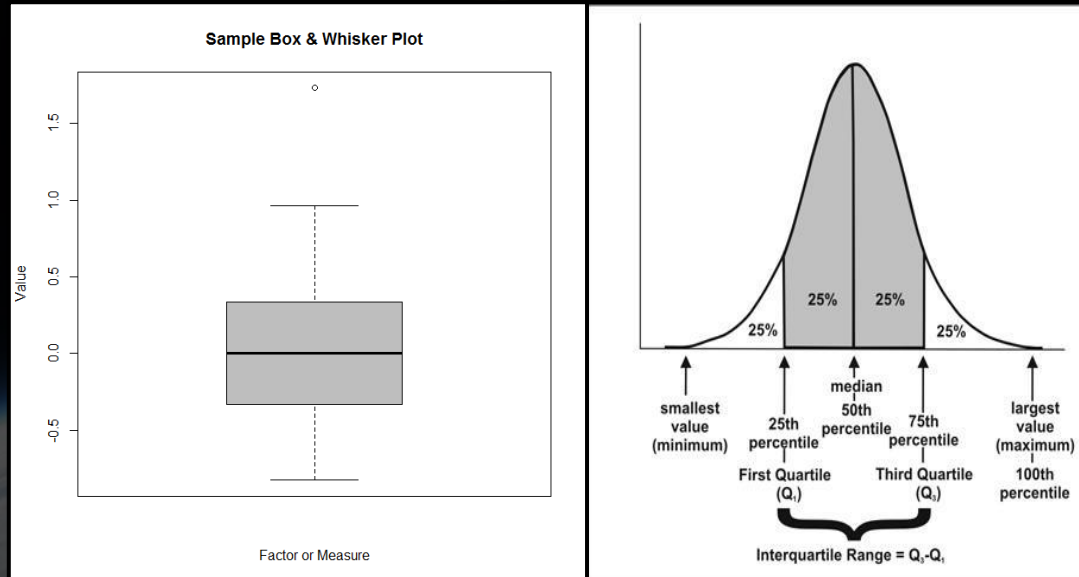


Run matrix complexity increases with the number of variables and the number of values tested for each variable



“Hidden” variables can complicate the analysis and must be taken into account

SIMEX Approach: Analysis of Variance (ANOVA)



Box-Whisker plots are a 'satellite view' of the data's distribution

Null Hypothesis H_0 : Factor X will have no impact on system performance

- The independent variance of each factor contributes to the total variance measured.
- ANOVA helps us differentiate between what is the result of normal variation and what is an actual effect.
- We isolate the effects by turning each factor OFF and ON in every combination.
- We test if changes observed are greater than what we would expect given each factor's variance.
- We assume there will be no impact and reject H_0 if there is an impact (i.e. rejection means we found something interesting).

SIMEX Waterfall

| SIM | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | IPC | S&C | I&T | DR | EX | Rep | | | | | | | |
| 2 | | IPC | S&C | I&T | DR | EX | Rep | | | | | | |
| 3 | | | IPC | S&C | I&T | DR | EX | Rep | | | | | |
| 4 | | | | IPC | S&C | I&T | DR | EX | Rep | | | | |
| 5 | | | | | IPC | S&C | I&T | DR | EX | Rep | | | |
| 6 | | | | | | IPC | S&C | I&T | DR | EX | Rep | | |
| 7 | | | | | | | IPC | S&C | I&T | DR | EX | Rep | |
| 8 | | | | | | | | IPC | S&C | I&T | DR | EX | Rep |

Legend:

Initial Planning Conference (IPC)

Scenario & CONOPS (S&C)

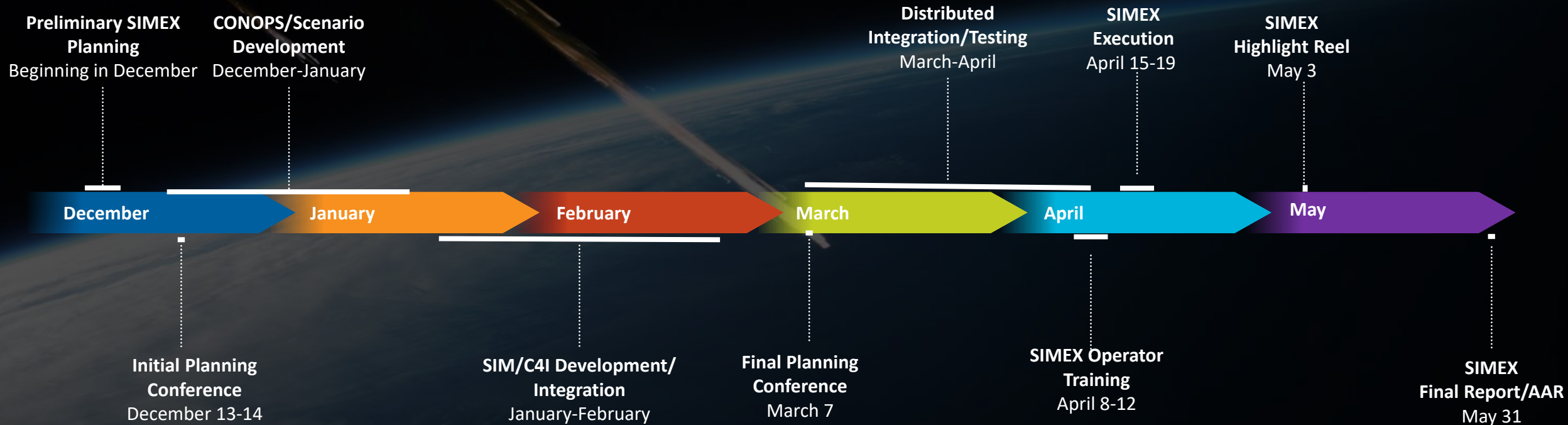
Integration & Testing (I&T)

Dry Runs (DR)

SIMEX Execution (EX)

SIMEX Reporting and Analysis (Rep)

SIMEX 19-X Sample Schedule (Slot 3)



SIMEX Sponsor Responsibilities



Participate in Planning
Conferences



Provide C3/sensor/weapon
technical parameters
as able



Guide Scenario
Development



Evolve CONOPS
and TTP



Review Proposed
C4ISR Environment



Provide Operators
for the SIMEX
(Red and Blue Cells)



Review Post-SIMEX
Briefing/Report

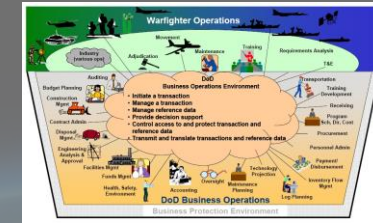


Tailor results to
influence CONOPS/TTP
and Acquisition

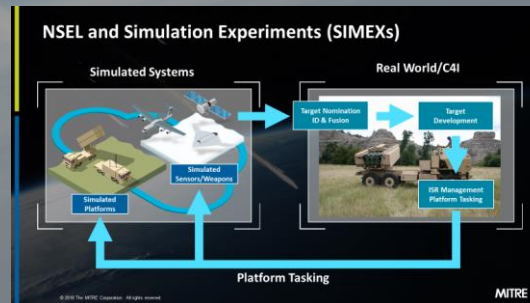
SIMEX Outcomes/Products



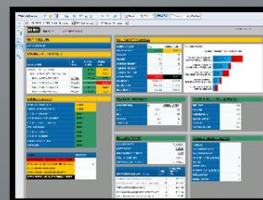
The SIMEX Experience



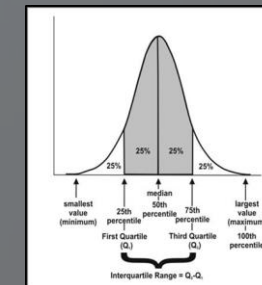
CONOPS Development



SIMEX Process



Application Evolution



Data Analysis/pair-wise comparison

MITRE SIMEXs: A Differentiating Capability

An even playing field to industry and Government for distributed experimentation

A state-of-the-art venue for strategic/tactical experimentation for sponsors

— FOSTER INTEROPERABILITY —
SIMEX
— EVOLVE CONOPS —

A cost-effective mechanism for risk reduction events leading up to live demonstrations and exercises

An environment for emulating current and future C4I, Sensor and Weapon systems in realistic scenarios



MITRE's mission-driven teams are dedicated to solving problems for a safer world. Through our federally funded R&D centers and public-private partnerships, we work across government to tackle challenges to the safety, stability, and well-being of our nation.

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