Overview

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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

- Census Operations
- Tax Refund Fraud
- ASW
- Strategic TCT
- Electronic Warfare
- Tactical Logistics
- CUAS Operations

- UAS Ops
- Border Security
- Emergency Management
- Special Ops
- Cyber Warfare
- Advanced Weapons









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

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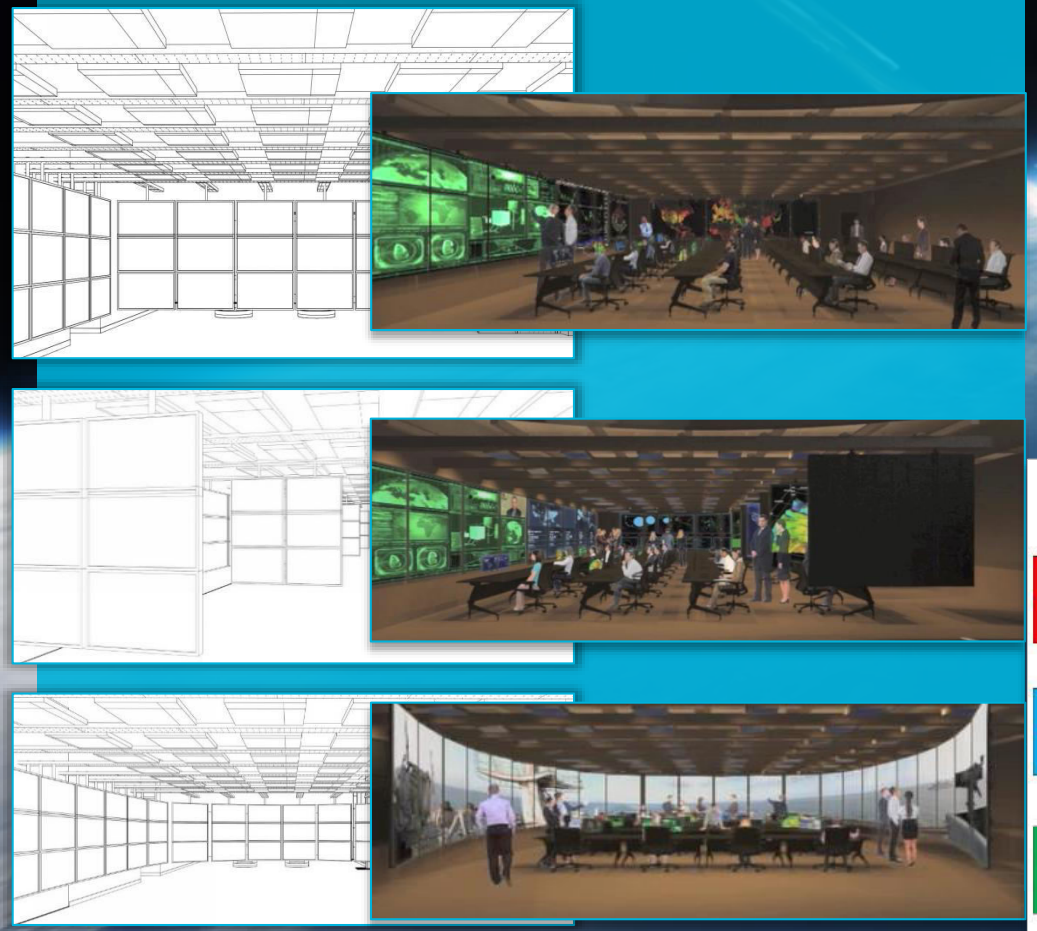
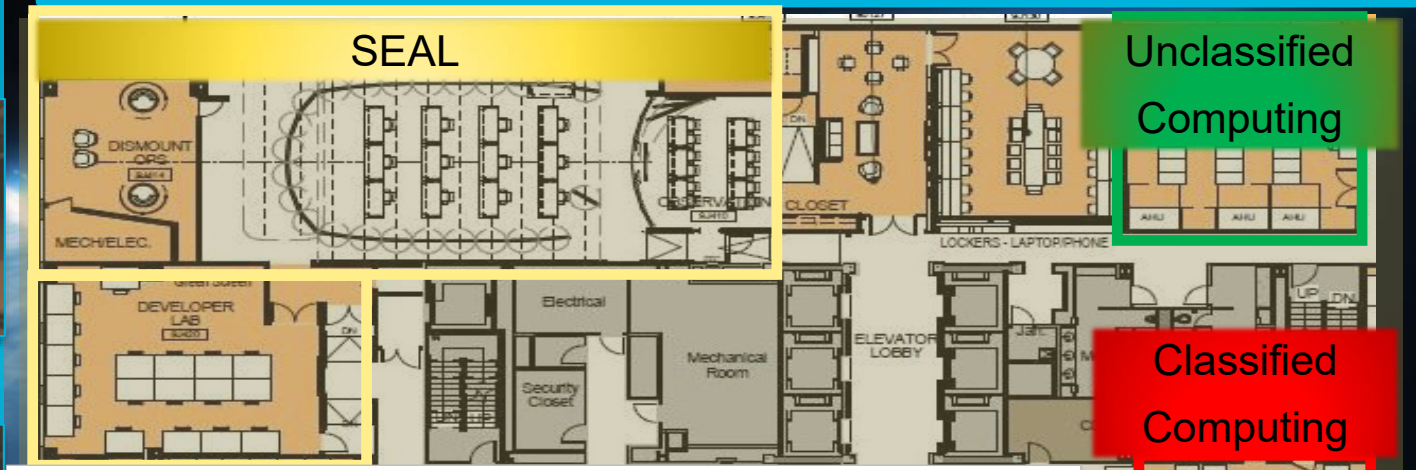
Simulation, Experimentation and Analytics Lab (SEAL): New Home for NSEL and the SIMEXs

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



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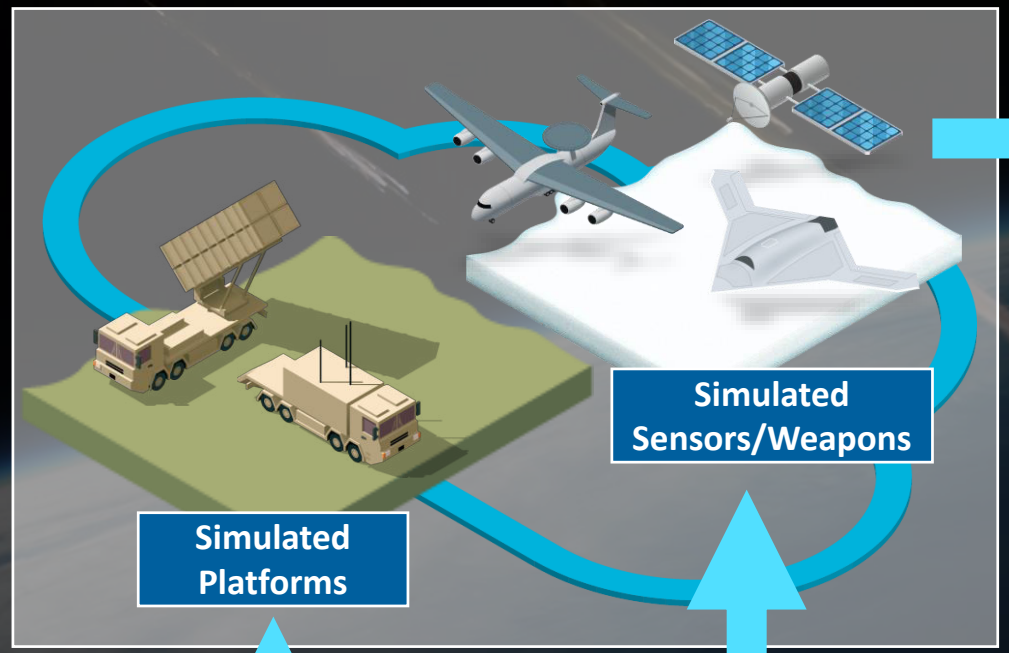
NSEL and Simulation Experiments (SIMEXs)

Simulated Systems



Real World

Platform Tasking

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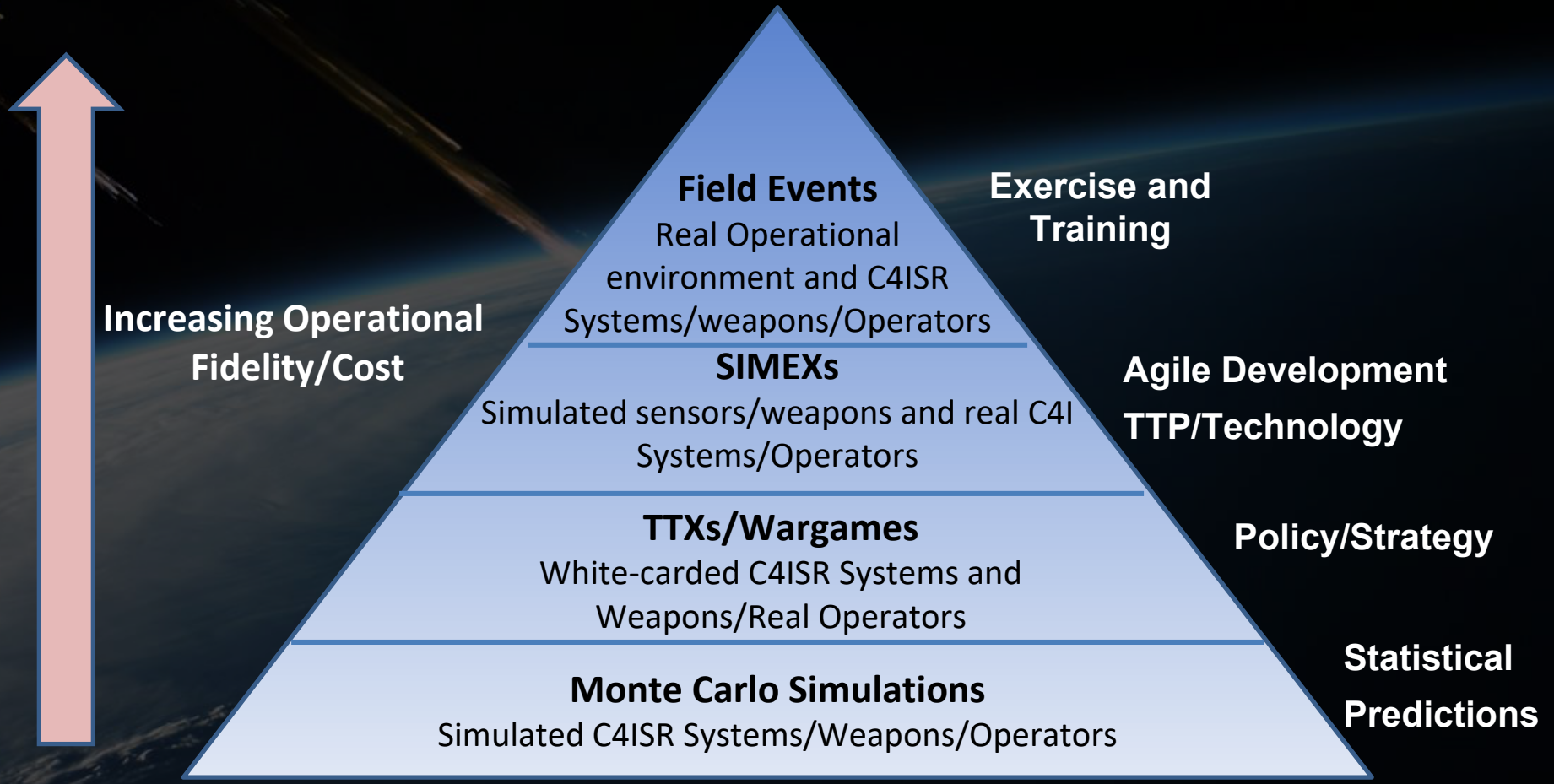
Levels of Experimentation



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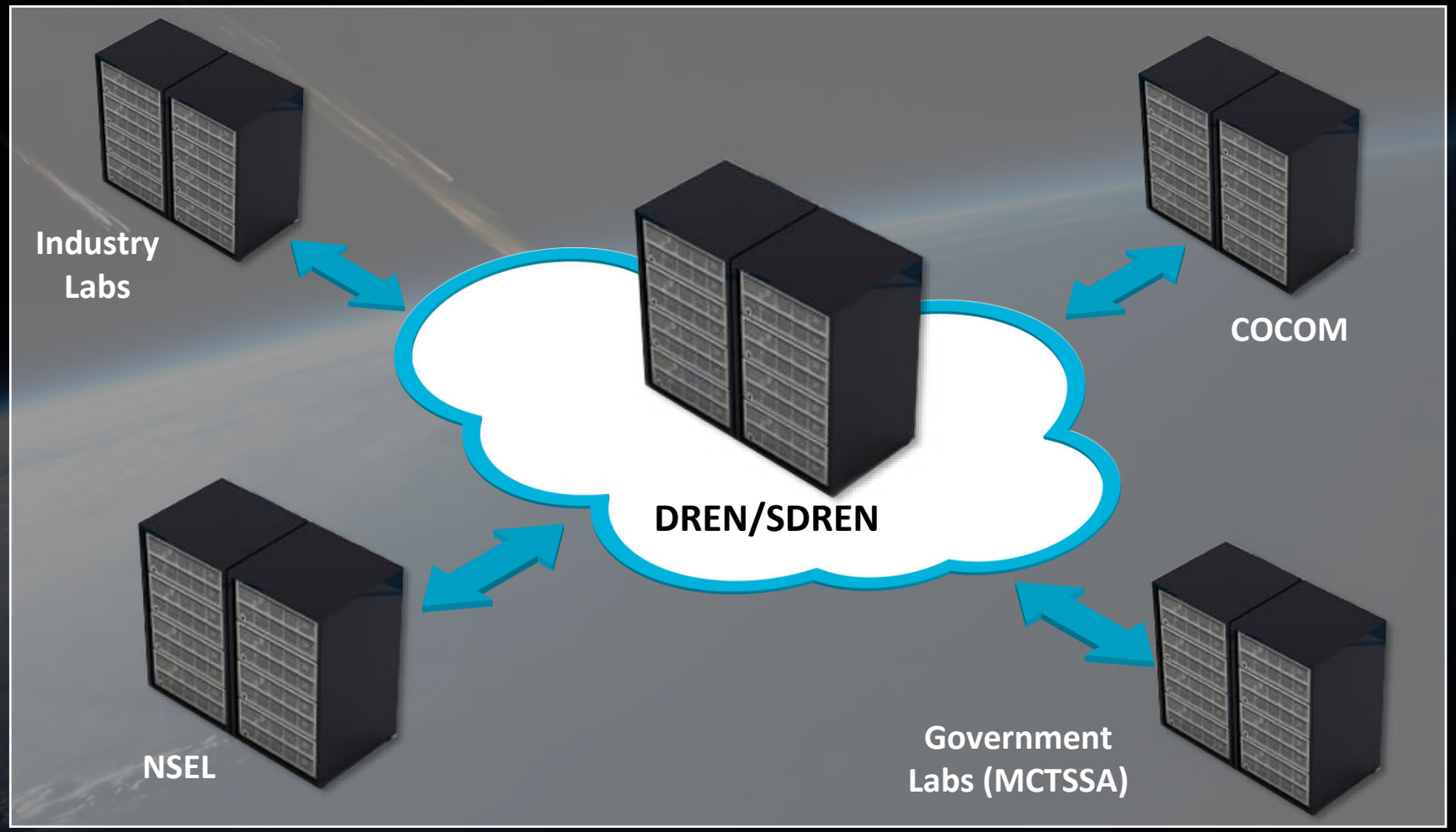
Employ SDREN/DREN for Distributed SIM/C4I



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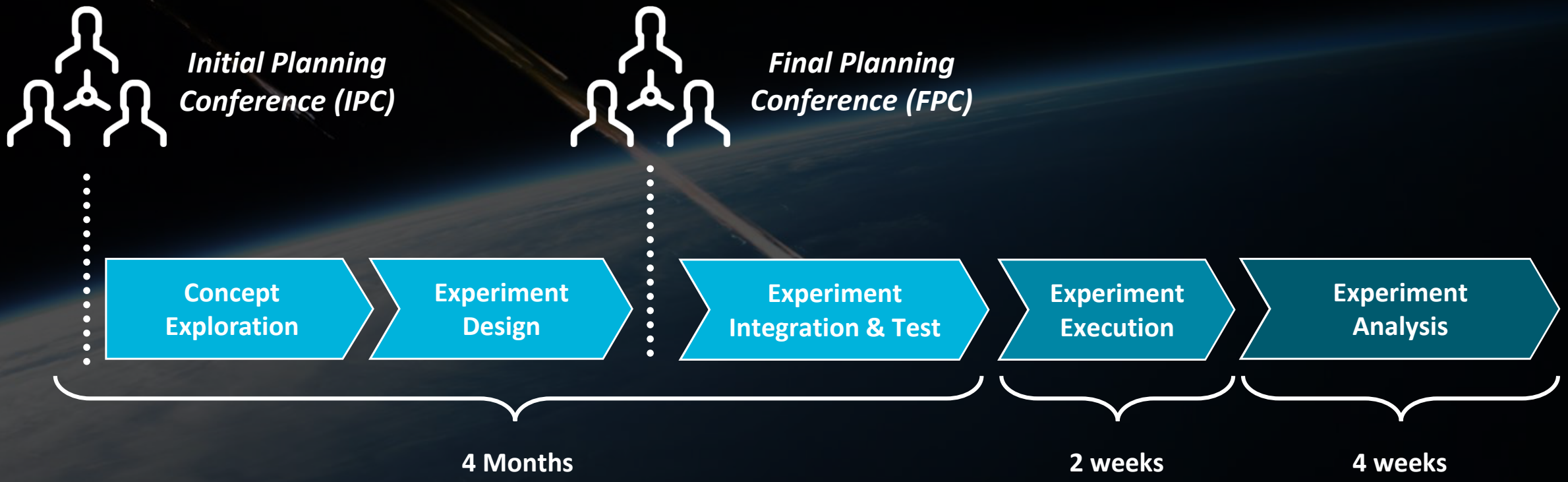
The MITRE SIMEX™ Schedule: Activities/Output



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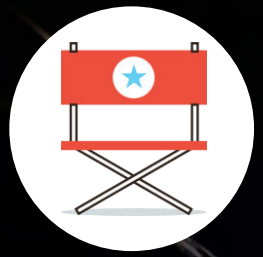
SIMEX Team

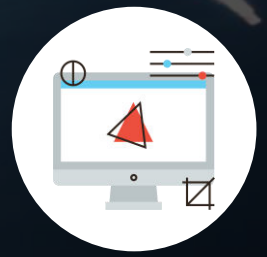


SIMEX Director
Manages planning & execution of individual SIMEXs

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

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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

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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

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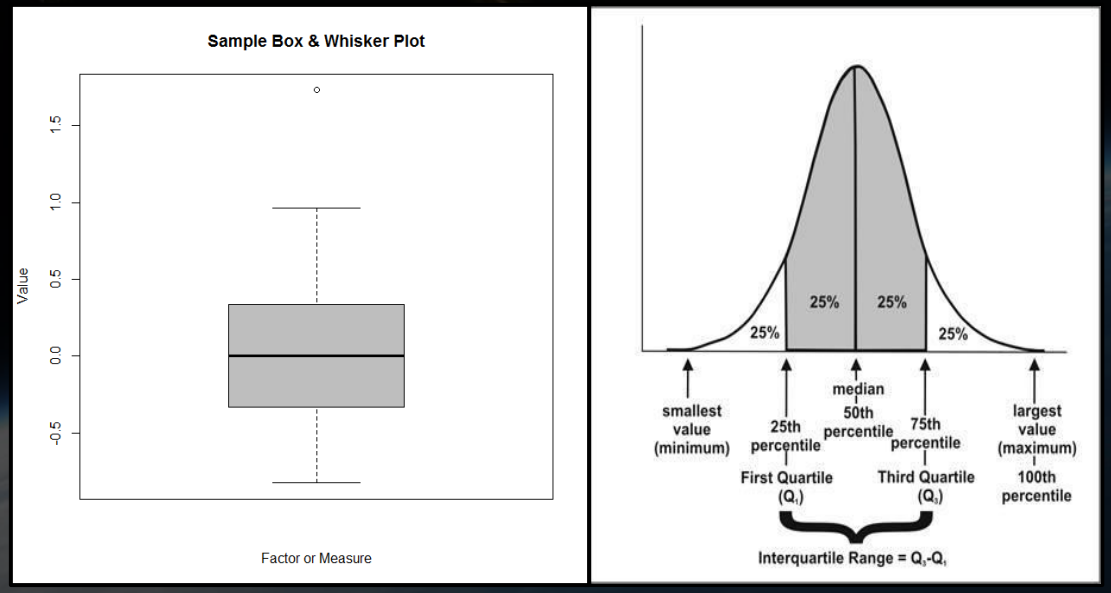
SIMEX Approach: Analysis of Variance (ANOVA)



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

Null Hypothesis H_0: Factor X will have <u>no</u> 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).

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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)

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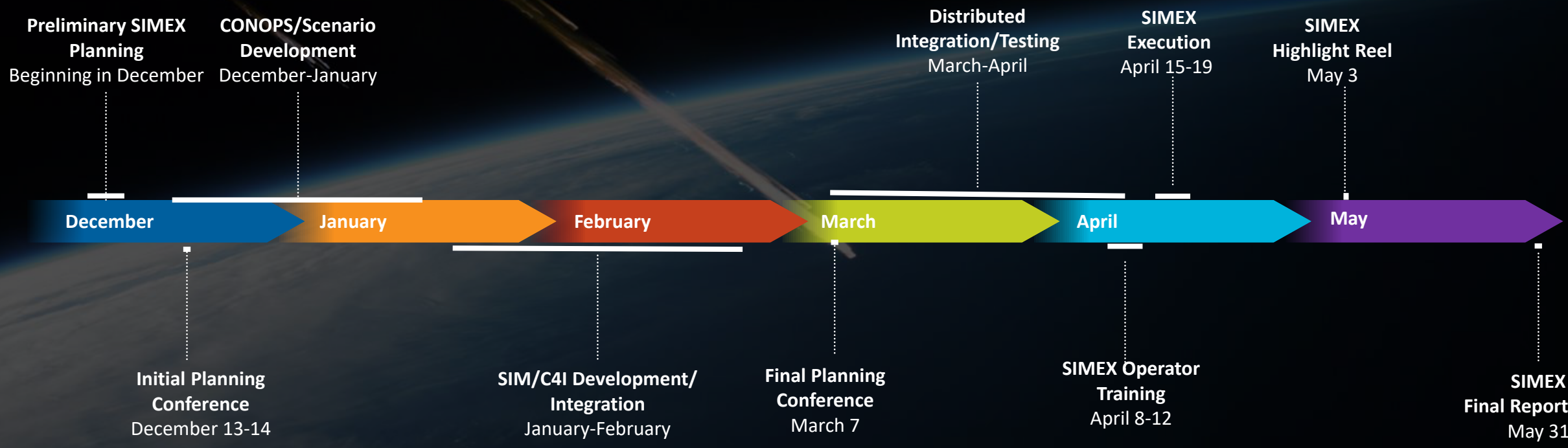
SIMEX 19-X Sample Schedule (Slot 3)



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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

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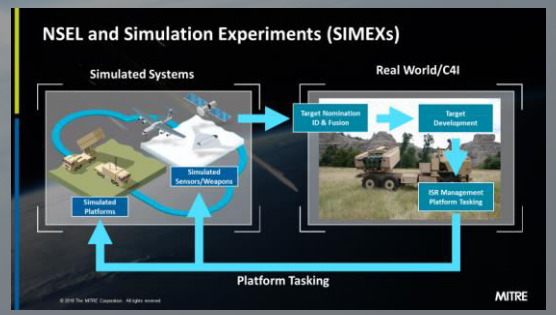
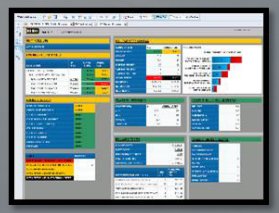
SIMEX Outcomes/Products

The SIMEX Experience

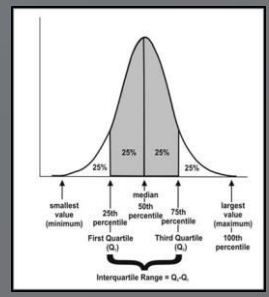
CONOPS Development



SIMEX Process



Application Evolution



Data Analysis/pair-wise comparison

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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

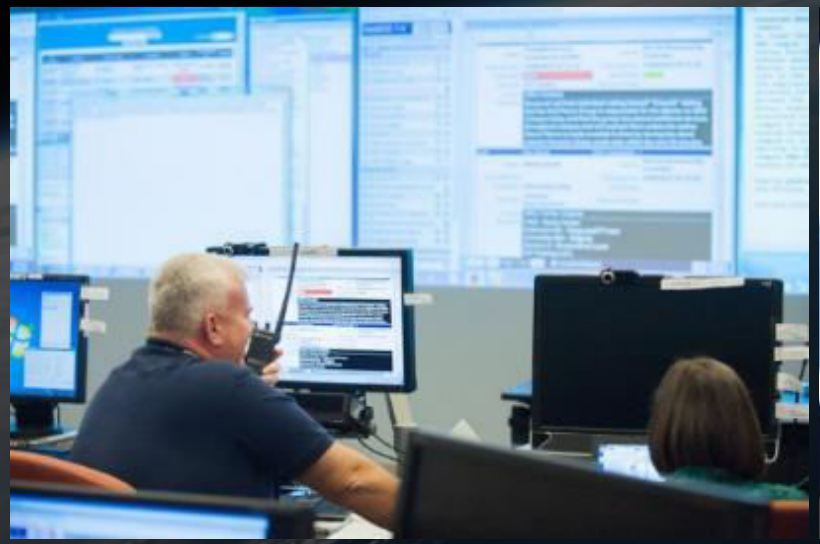
FOSTER INTEROPERABILITY

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



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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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