

Modeling & Simulation

How Can M&S Team Better With DT&E?

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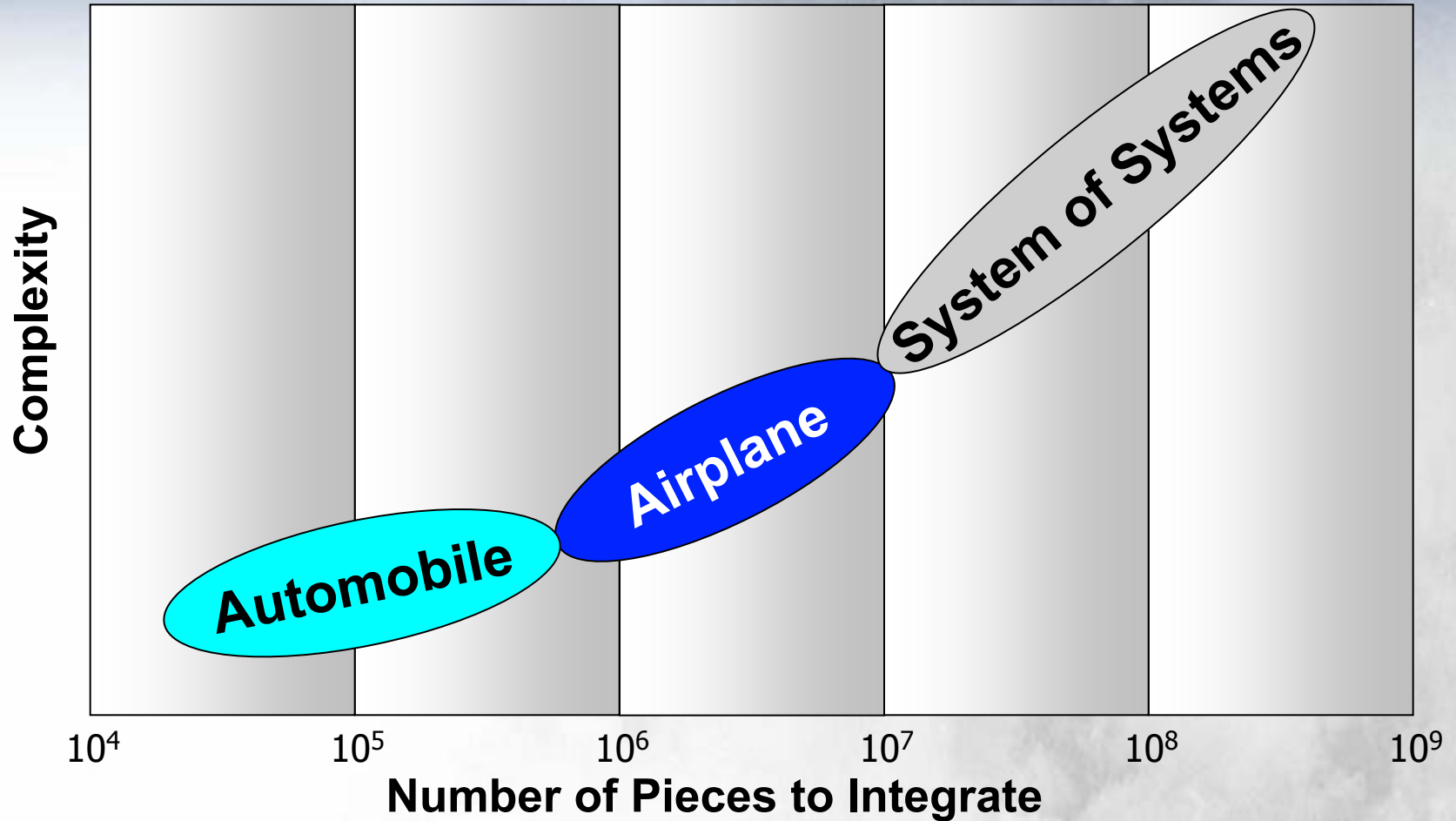
NDIA T&E Forum, Jacksonville, FL

Thoughts

- **Industry-government teaming—early and often**
- **Refinement of Live, Virtual, and Constructive M&S capability**
- **Industry access to government systems**
- **Organizational support of M&S in DT&E**
- **Lifecycle perspective**
- **Open Standards**

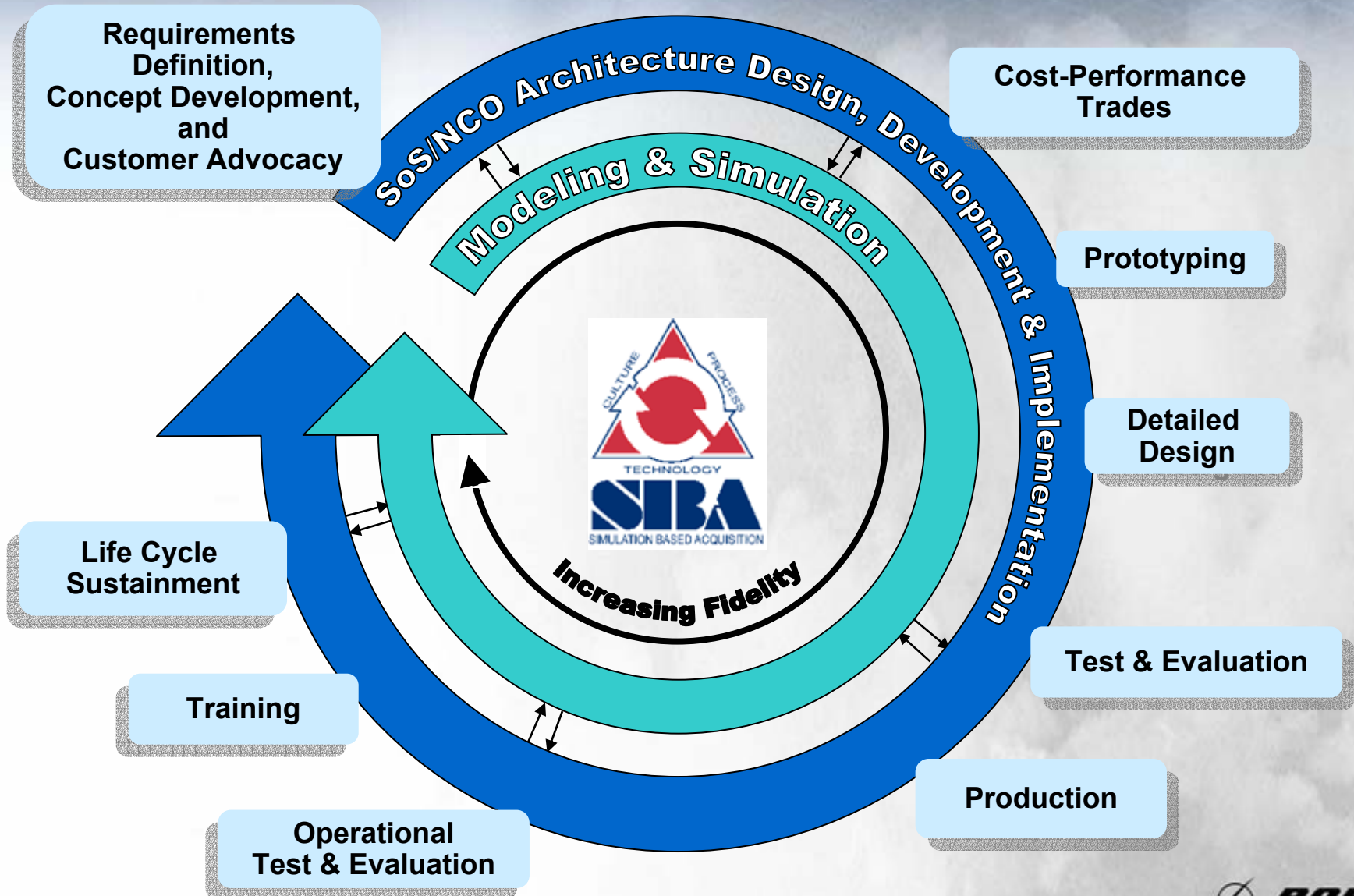
M&S isn't a nicety, but a necessity

Complexity drives the need for M&S



Complex Systems of Systems demand M&S in development process.

Roles of Modeling & Simulation

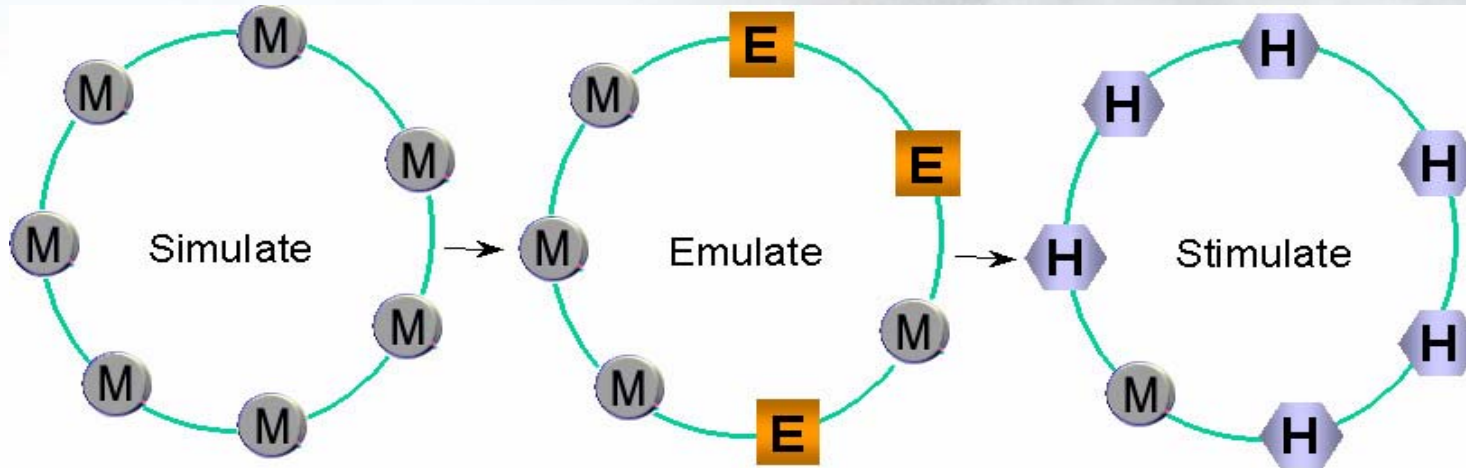


Building Block SoS Test Approach

Systems simulated to comprise subset of SoS

System simulations upgraded and coupled with early emulations comprise subset of SoS with SoS interfaces

System simulations and emulators upgraded and coupled with prototype hardware to comprise SoS



Constructive

Virtual/Constructive

Live/Virtual/Constructive

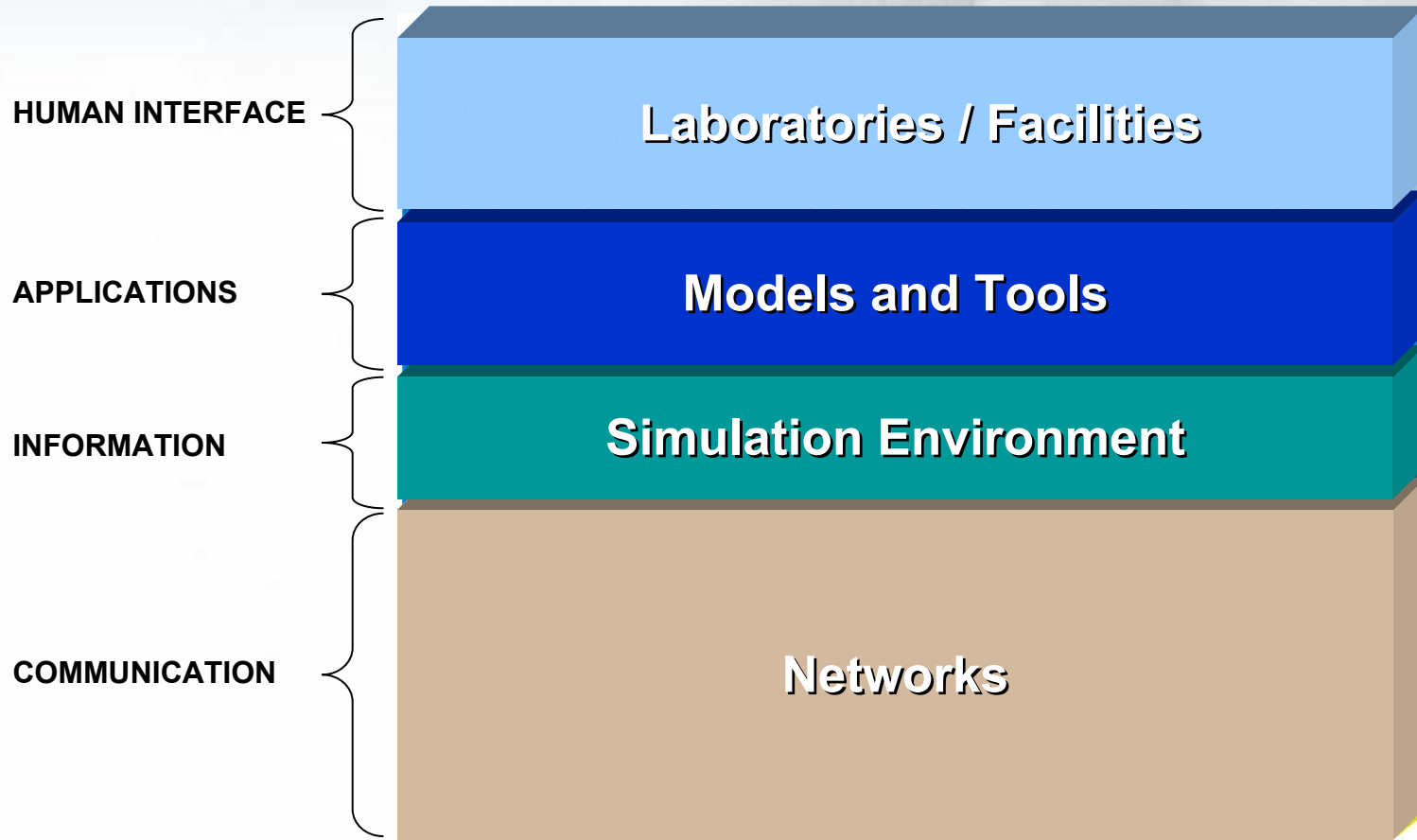


Early phases are simulation and emulation based to gain knowledge for Design & Development to set up for Test success

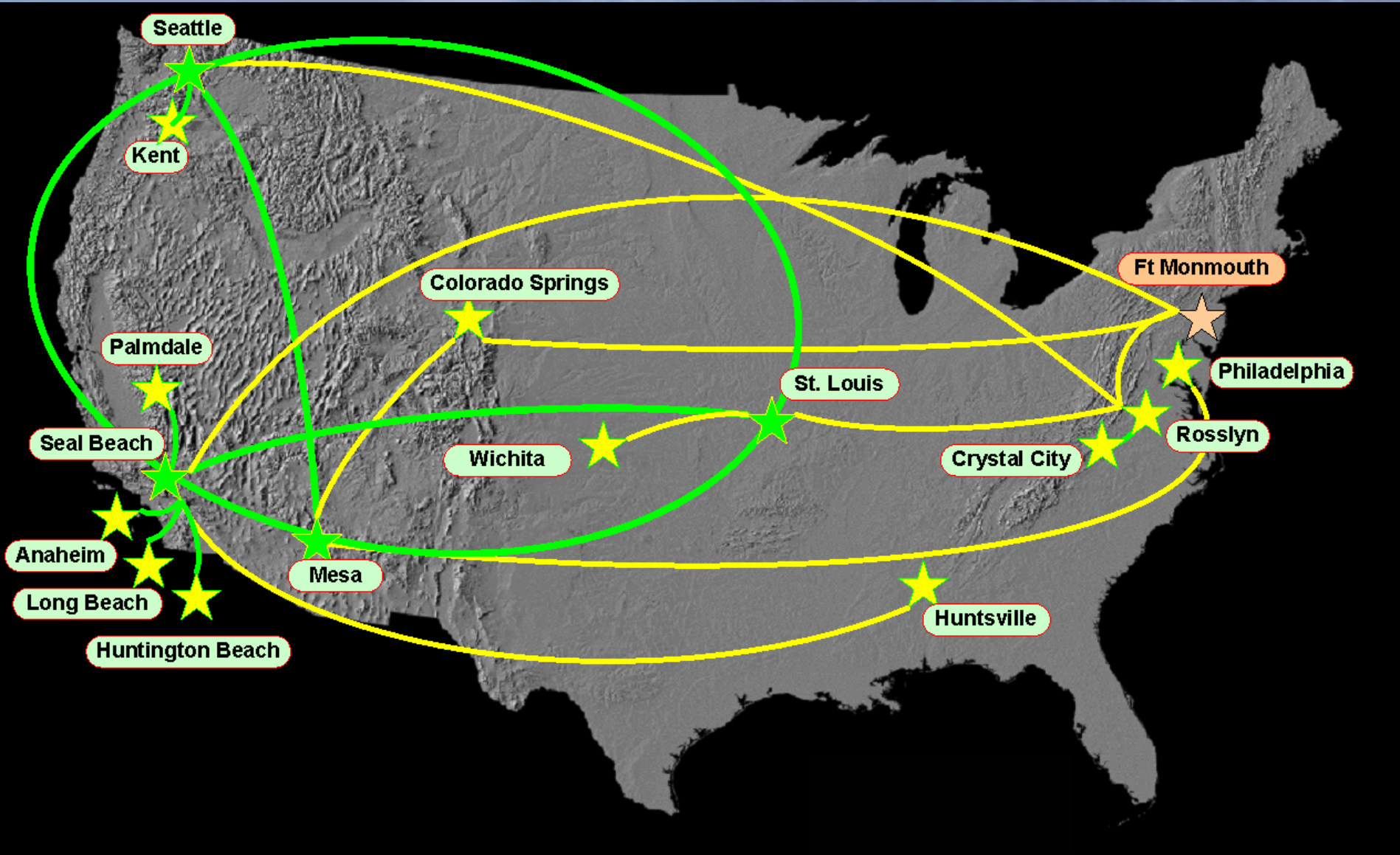
Organization Matters

- **Recognizing the value of M&S, Boeing recently formed an overarching modeling & simulation organization**
 - **Integrates organizations and functions that cross program boundaries, and**
 - **Provides analysis of network enabled systems of systems**
 - **All connected by one knowledge base**
- **M&S Infrastructure formed around NCO Industry Consortium architecture**

M&S Architecture



Boeing LabNet



Three Levels of Military Simulation



- Operators
- F/A-18; EA-18G
- Apache
- AWACS
- CRW
- SBR/Space Assets
- UCAV/UAV
- SHORAD
- Weapons



- Operators
- CONOPS/TTPs
- Systems-of-Systems
- Interoperability
- Tactical S&R/C2/BM



- Operators
- ADV NCO C2
- BMC4ISR
- Interoperability

Virtual Warfare Center



- **65,000 square feet**
- **23 SCIFs**
- **Dual operational capability**
- **Flexible network options**
- **Video-over-internet capability**
- **Ability to simulate more than 2,000 digital bodies**
- **Six F/A-18 cockpits, four F/A-22 cockpits, four F-15 cockpits**
- **Simulate such platforms as AWACS, AEGIS, Patriot and other ISR systems**
- **Various patent pending simulation technologies to expand scenario sizes**

Government - Industry M&S Connection



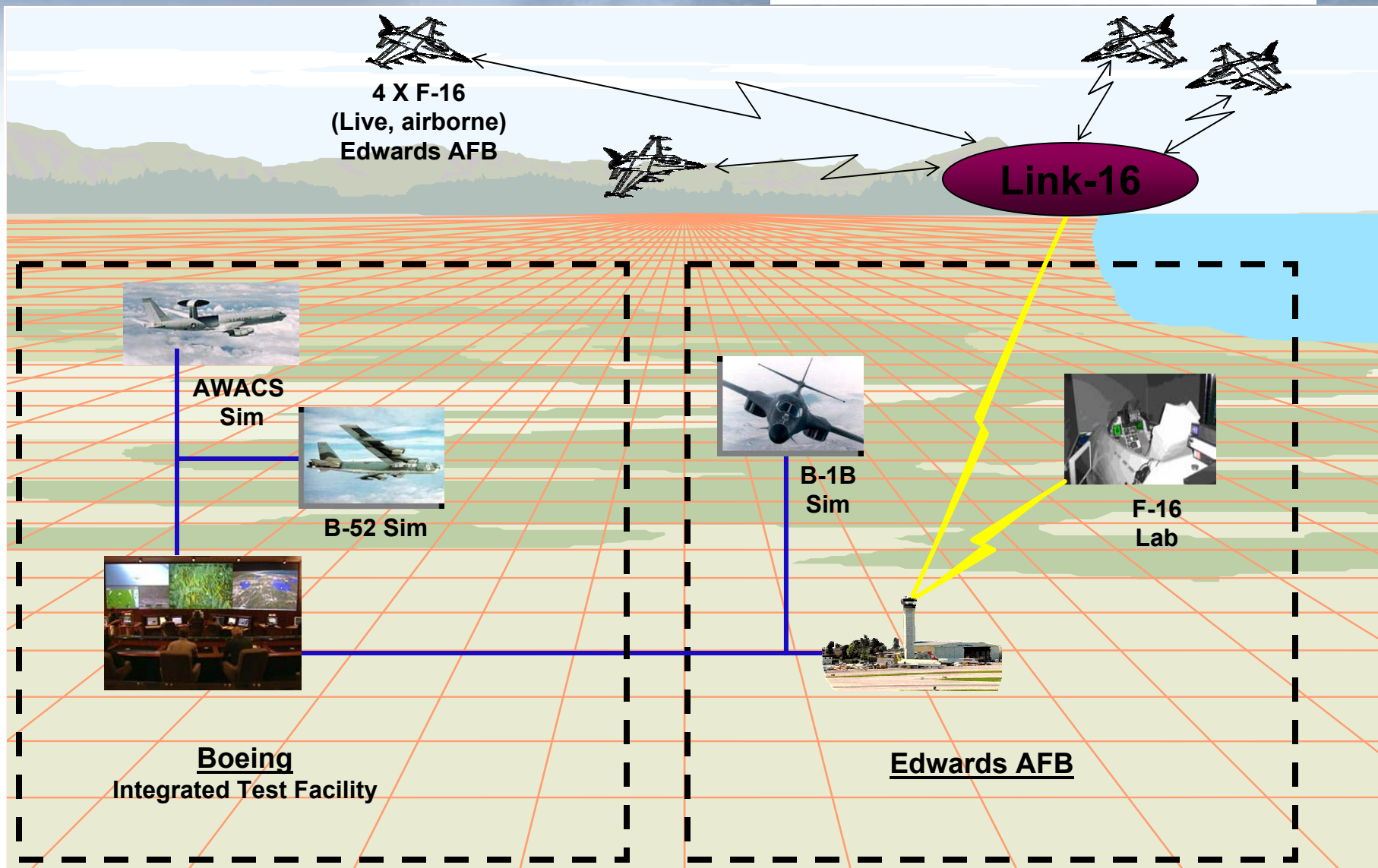
SIMAF
Dayton

BOEING
St. Louis



Live & Virtual Data Link Integration Demonstration – December 2005

Boeing Palmdale/AFFTC Edwards AFB



Impediments

- **Zealotry**
- **Different goals**
 - **Programmatic**
 - **DT&E**
- **Intellectual Property**
- **Security**

Notice the lack of technological impediments.

Summary

- **M&S is critical for successful DT&E of complex, net-enabled systems of systems**
 - **Requires robust application of M&S across the entire product life cycle**
- **M&S is available, today, to provide credible DT&E involving Live, Virtual, and Constructive elements**

Partnerships are key – both government/industry, and industry/industry.