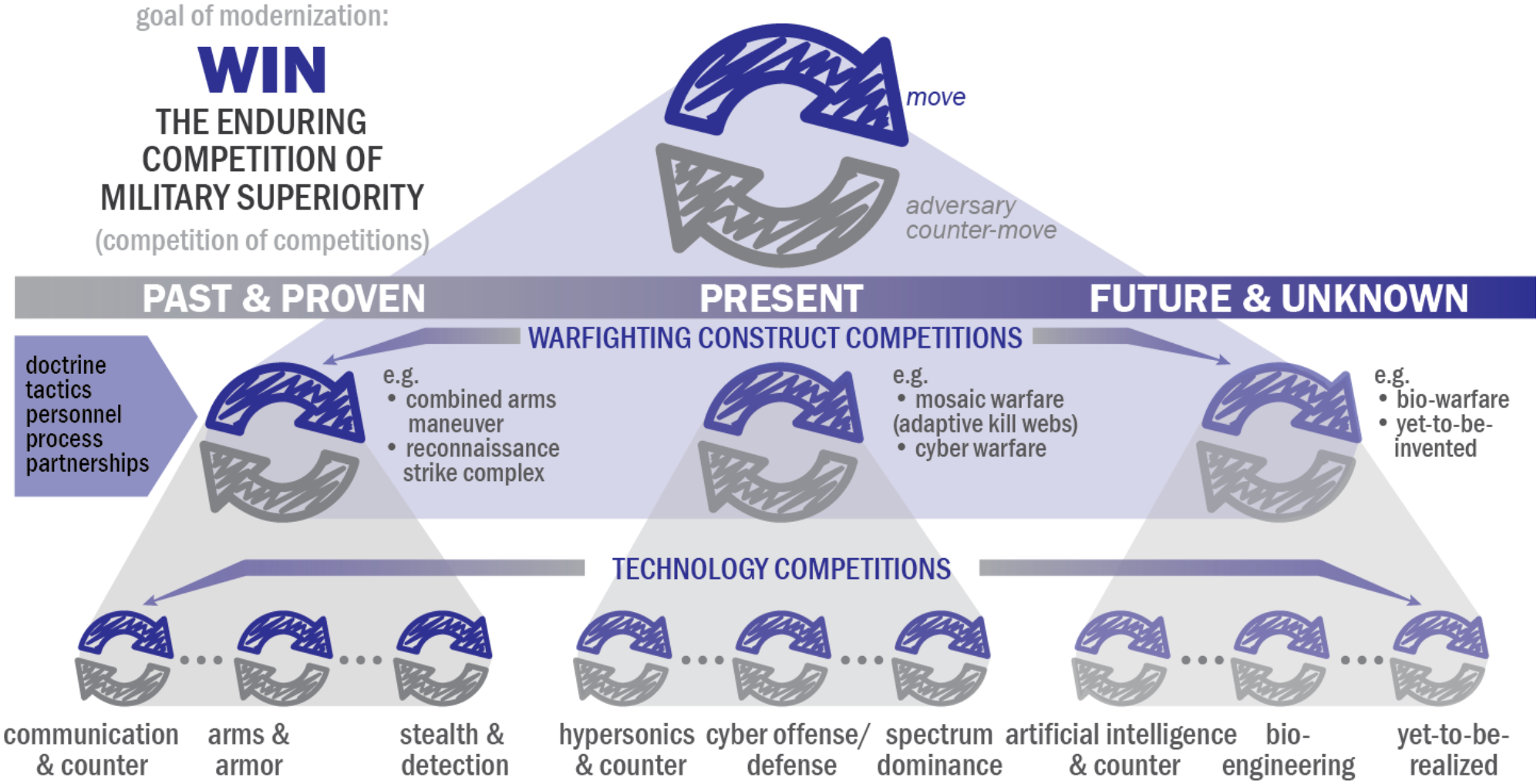
Department of the Air Force

Integrity - Service - Excellence

Mission Engineering and the DAF Operational Imperatives

Dr. Timothy Grayson
Special Assistant to the Secretary of the Air Force
1 November 2022

Development of new military concepts must take a mission-centric approach



DAF Operational Imperatives

- Defining Resilient Space Order of Battle and Architectures.
- Achieving Operationally-Optimized Advanced Battle Management System (ABMS) / Air Force Joint All Domain Command and Control.
- Achieving Moving Target Indication and Tracking at Scale.
- Defining the Next Generation Air Dominance Family of Systems.
- Defining Optimized Resilient Basing, Sustainment, and Communications in a Contested Environment.
- Defining the B-21 Long Range Strike Family of Systems.
- Ensure the Ability of the DAF to Transition to a Wartime Posture Against a Peer Competitor.

Adaptive System of Systems drive the need for Mission Engineering

DARPA System of Systems (SoS) delivers lethality by busting the use of only monolithic platforms and networks STO

Implementing Scales of Integration

Govt (buyer) as Integrator

Approach

- One or more program offices acquire individual elements of a SoS as a collection of stand-alone programs
- In-house engineers attempt to integrate based upon common standards

Outcome

- Reference architecture limiting and burdensome
- Results in interoperability challenges and loose integration at best

Implementing Scales of Integration

Large System Integrator — **Govt (buyer) as Integrator**

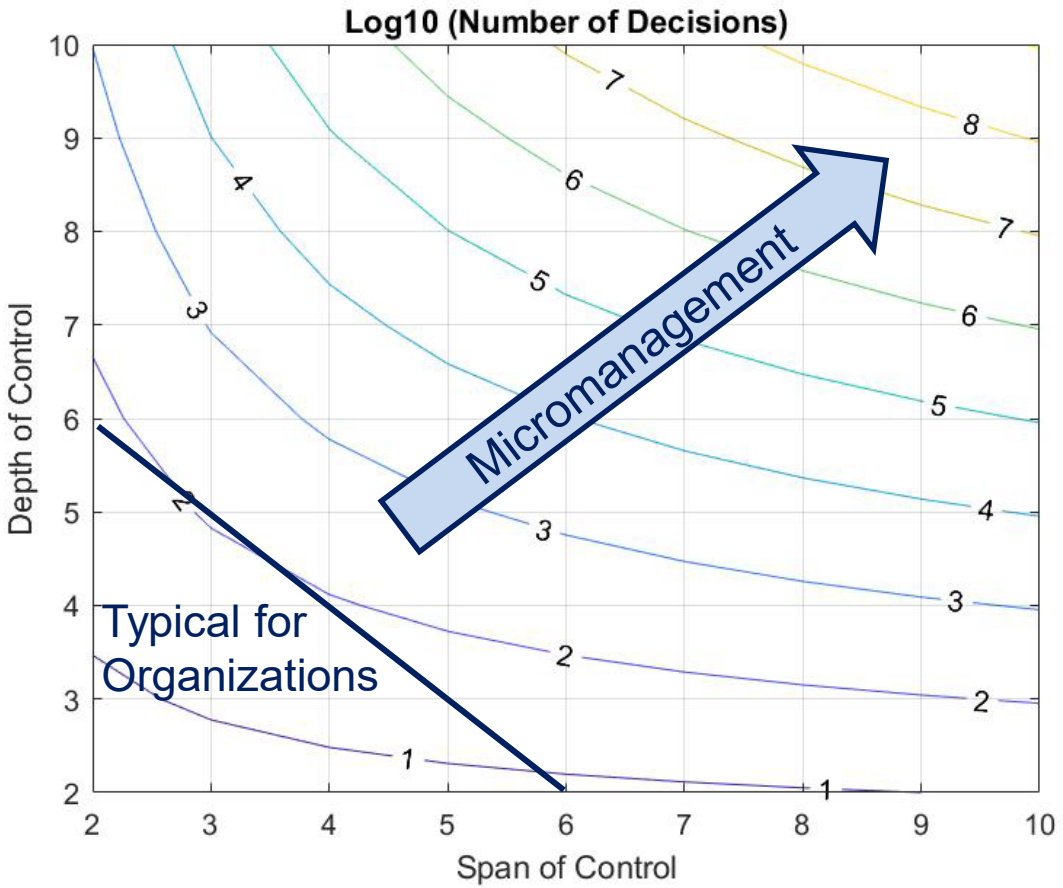
Approach
- Large RFP for highly specified full system of systems
- Single award (usually to large prime) to implement as a major platform program

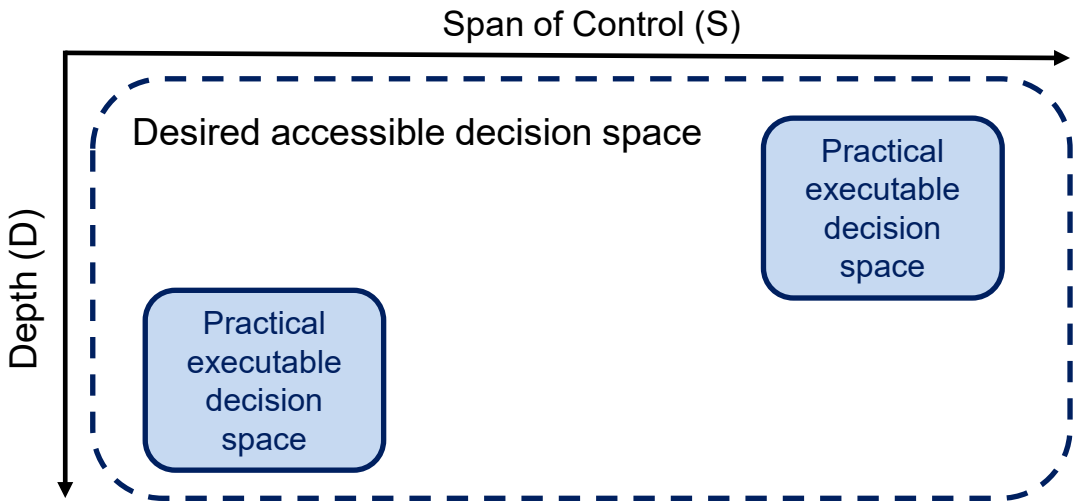
Outcome
- Not aware of any successful examples
- SoS is too complex to system engineer in detail
- Loses flexibility to adapt to mission need
- Unnecessary overhead for little added value

Approach
- One or more program offices acquire individual elements of a SoS as a collection of stand-alone programs
- In-house engineers attempt to integrate based upon common standards

Outcome
- Reference architecture limiting and burdensome
- Results in interoperability challenges and loose integration at best

Maximizing options while minimizing complexity



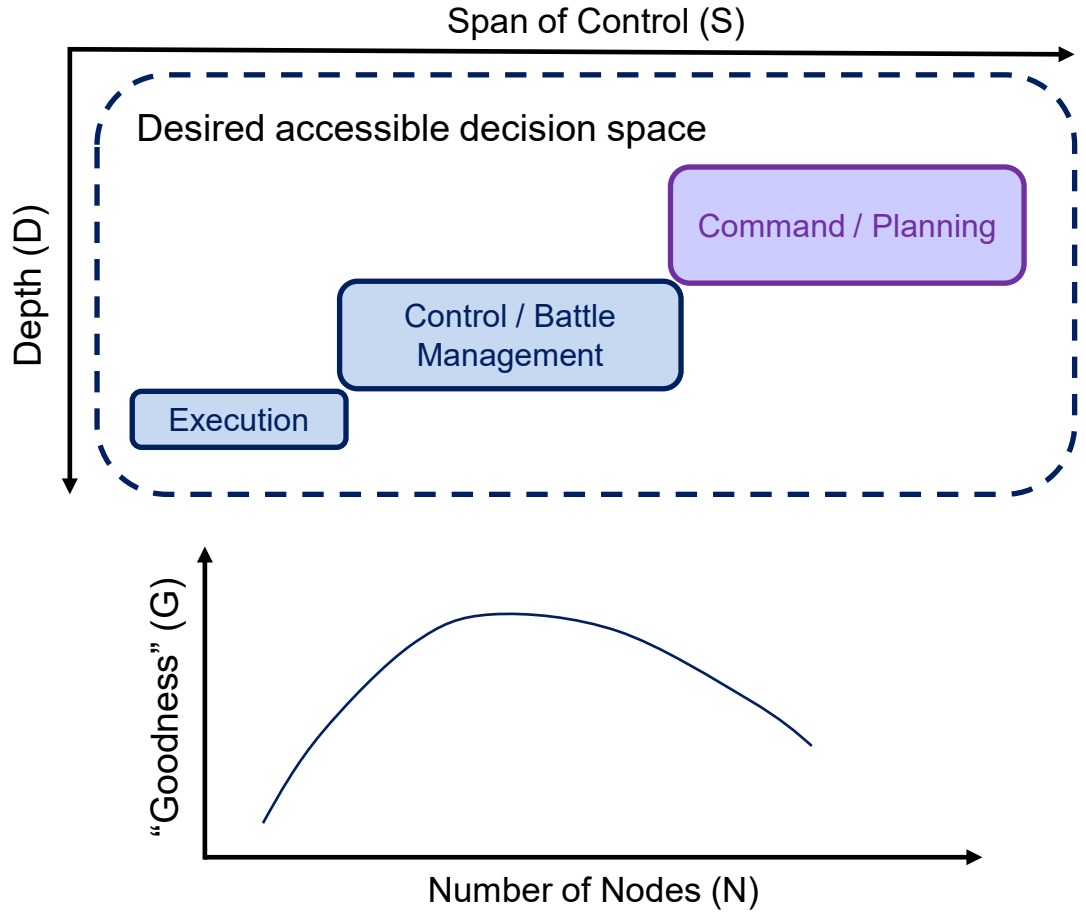


Challenge: ***How to provide the greatest range of options while managing complexity of decision making (for humans and AI)?***

DAF Operational Imperatives #2: Operationally-Optimized Advanced Battle Management System (ABMS) / Air Force Joint All Domain Command and Control (JADC2)

Approach: ***Create Separability of Command from Control, Distributed Battle Management***

- **Objectives:**
  - *Speed* – Must manage complexity
  - *Agility* – Must maintain interoperability
  - *Resilience* – Must maintain redundancy
- **Can start Mission-specific in order to build up to large-scale jointness**



Implementing Scales of Integration

Approach
- Large RFP for highly specified full system of systems
- Single award (usually to large prime) to implement as a major platform program

Outcome
- Not aware of any successful examples
- SoS is too complex to system engineer in detail
- Loses flexibility to adapt to mission need
- Unnecessary overhead for little added value

Approach
- General requirement to engineering services contractor to build platform, integrate tools, and scale
- My bring mix of own and external IP

Outcome
- Commercial-like model
- Taps industry expertise to develop platform and workflow for efficiency
- Risk of vendor lock

Approach
- Technically empowered program office builds platform, buys individual tools, and integrates
- Govt reference architecture, in-house contractors, tool consortia

Outcome
- Agility in selecting tools and adapting/scaling platform
- Can tailor to current mission and operator need (DevOps)
- Avoids vendor lock, but also potentially limited in marketplace and tool sophistication

Approach
- One or more program offices acquire individual elements of a SoS as a collection of stand-alone programs
- In-house engineers attempt to integrate based upon common standards

Outcome
- Reference architecture limiting and burdensome
- Results in interoperability challenges and loose integration at best