Open Systems: State of the Practice

for

NDIA Simulation-Based Acquisition/Advanced Systems Engineering Environment Conference

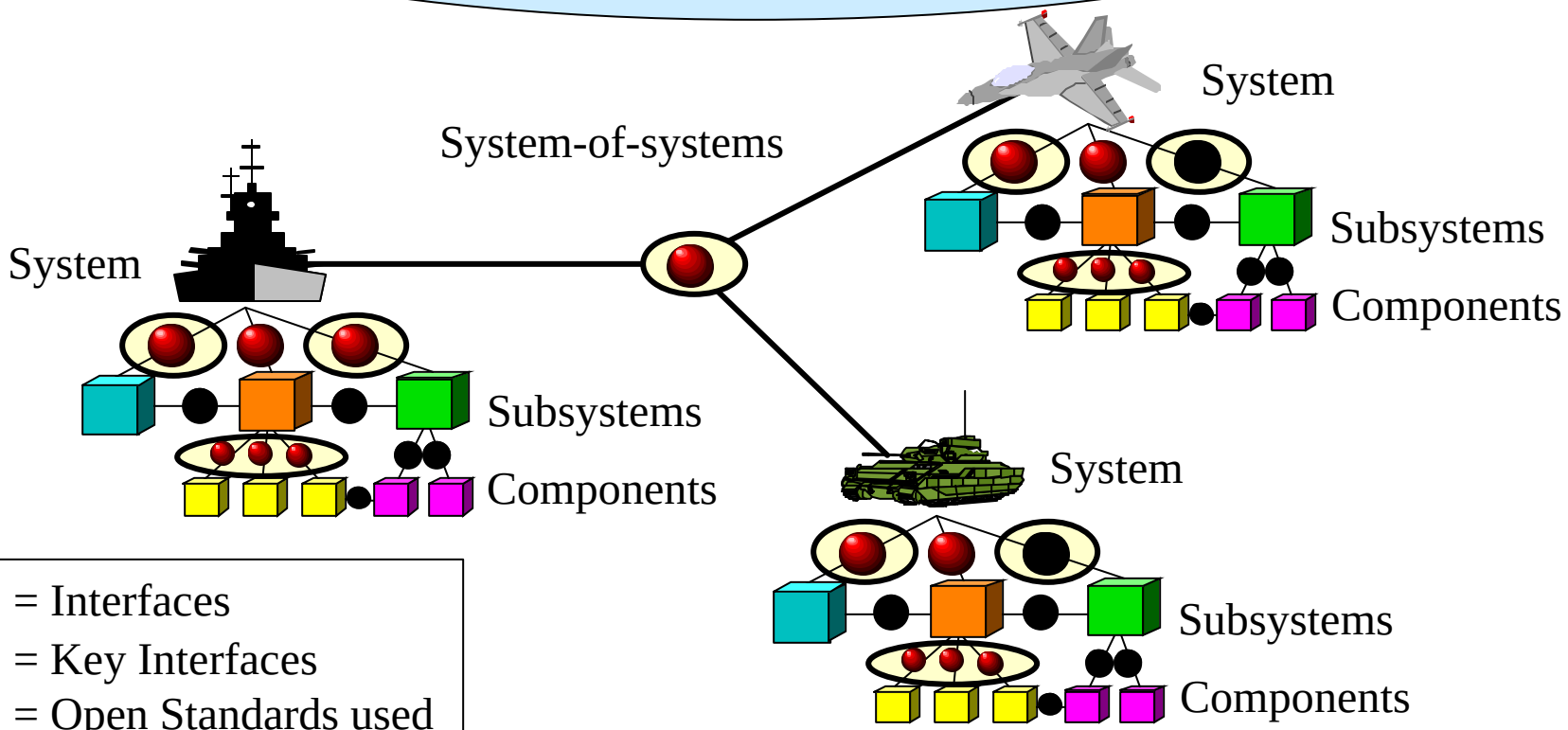
25 June 2002

Overview

- Open Systems Vision and End State
- Transformation
- Characteristics/Indicators
- Implementation
- Summary

Vision and End State

Modular open systems design is an integral part of any acquisition strategy to achieve affordable evolutionary combat capability and system-of-systems interoperability



Open Systems Transformation

- Past
  - DoD Open Systems Advocate
    - ✓ Viability proven
      - ✓ Pilots, demos, and standards (26/16)
      - ✓ Training
    - ✓ Industry is on board
    - ✓ Most of the policy is in place
- Present & Future
  - Ensure weapon systems are open
    - Institutionalize open system indicators
    - Provide on demand expertise across the spectrum of the acquisition process
    - Apply open system design principles at system-of-systems level
  - Streamline and focus policy
  - Focus on architecture process
  - Maintain dialog with industry
  - Sponsor targeted studies and analyses
  - High-payoff demonstration

Desired End State Characteristics

- An open system design that is characterized by (DoDI 5000.2 para 4.6.1.1.2)
  - **M**odular architecture
    - DoDD 5000.1 para 4.3.1, DoD 5000.2-R C5.2.3.5.5.1
  - **K**ey interfaces
    - DoD 5000.2-R para C5.2.3.5.5.1 and C5.2.3.5.5.1
  - **O**pen interface standards, where appropriate
    - DoD 5000.2-R para C5.2.3.5.5.1, C.2.7.1, and C5.2.3.5.5.1

- Approach to Ensuring Open Systems
  - Business and technical indicators (14) to predict achievement of desired end state
    - **E**ssential (6)
    - **D**esired (8)
  - Institutionalize in acquisition process

Modular Open Systems
Business Indicators

- Uses a documented procurement approach (DoD 5000.2-R para. C.2.7.1) that:
  - (E) Assesses feasibility of using widely supported commercial interfaces standards
    - DoD 5000.2-R, para C.2.7.1 (**O**)
  - (D) Uses market research to determine industry support for interface standards
    - DoD 5000.2- R para C.2.9.1.4.1
  - (D) Documents order of preference for various types of interface standards (e.g., open, de facto, proprietary, etc.) to be used for key interfaces and selecting commercial and non-developmental item
    - DoD 5000.2- R para C5.2.3.5.5.1 and C2.9.1.4.2.2
  - (D) Sets the priority to the most cost effective solution over the system life cycle
    - DoDD 5000.1 para 4.2.3
  - (D) Conducts a business case analysis to assess the economic impacts of not using open standards for key interfaces
    - DoD 5000.2- R para C2.9.1.4.2.2
  - (E) Formulates a support strategy that addresses technology insertion and refreshment
    - DoD 5000.2- R para C.2.7.1 and C2.8.1.1.7 (**M,K**)

E = Essential D = Desired

Modular Open Systems
Technical Indicators

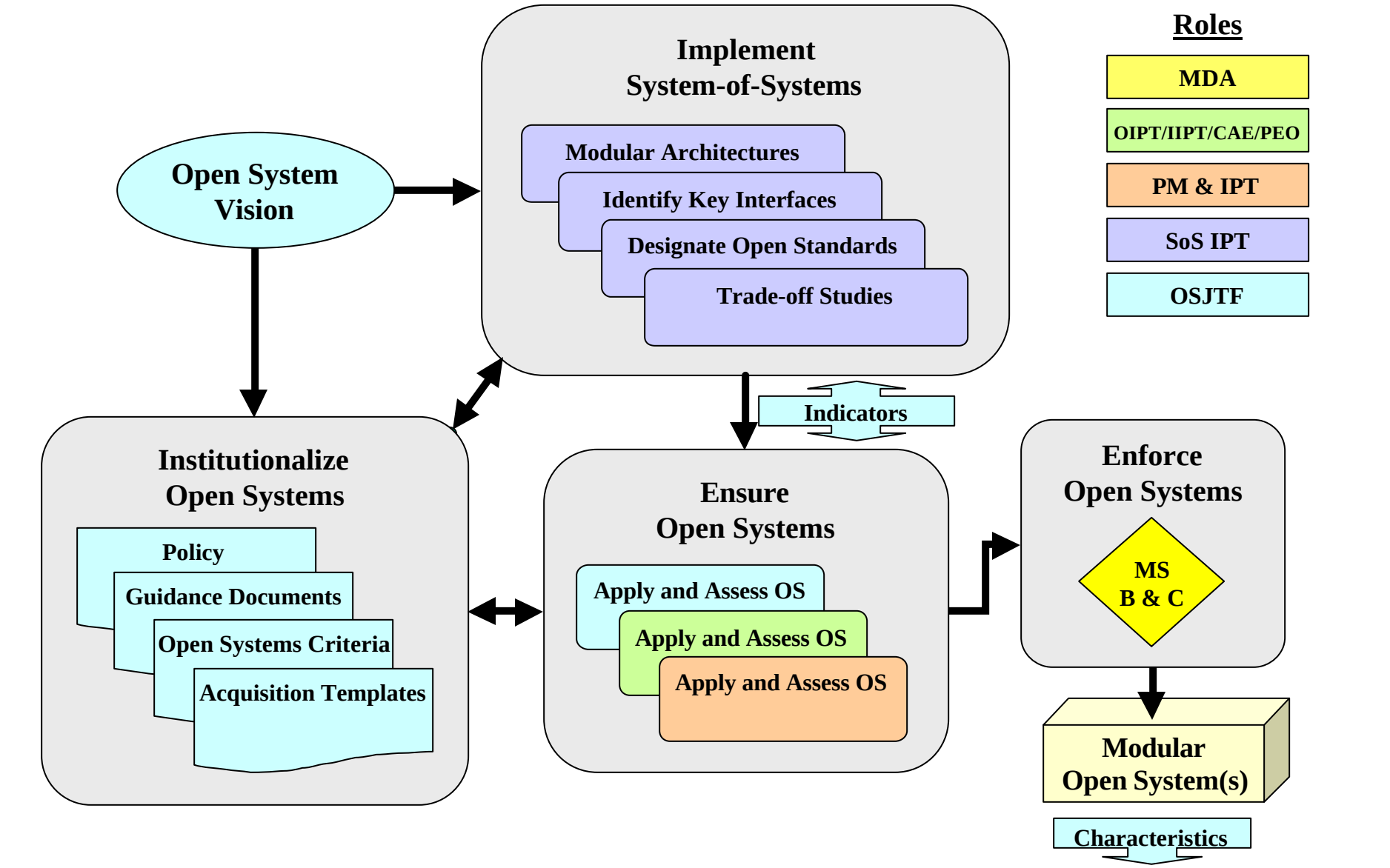
- Uses a sound systems engineering process (DoD 5000.2- R para C.5.2.3.1) that:
  - (D) Facilitates the use of commercial or non-developmental items
    - DoDI 5000.2, para 4.7.2.1.1.5
  - (D) Avoids early commitment to system-specific solutions
    - DoDI 5000.2, para 4.7.2.1.1.2
  - (D) Mitigates risks associated with technology obsolescence and dependence on single source of supply
    - DoD 5000.2- R para C.2.7.1
  - (E) Identifies key interfaces of the system architecture to the desired level
    - DoD 5000.2-R, para C5.2.3.5.5.1 and DoDI 5000.2, para 4.7.2.1.1.2 (**M,K**)
  - (E) Designates open standards for appropriate key interfaces
    - DoD 5000.2-R, para C5.2.3.5.5.1 (**O**)
  - (E) Uses standards selection process that gives preference to widely supported open interface standards
    - DoDD 5000.1 para. 4.2.4, DoD 5000.2-R, para C2.6.3.1.2 (**O**)
  - (D) Manages system interfaces as a part of the overall configuration management process
    - DoD 5000.2- R para C.5.2.3.4.5, .9
  - (E) Employs a modular standards based architecture for the system design
    - DoD 5000.2- R para C5.2.3.5.5.1 (**M**)

E = Essential D = Desired

Opportunities for Influence

- Products & Processes
  - Acquisition strategy and program documentation
  - Milestones B and C
  - Source selection criteria
  - Program reviews
  - Testing
- Organizations/Individuals
  - OIPT/WIPT (System, System-of-Systems)
  - Program management and IPTs
  - PEO
  - Milestone Decision Authority

Transforming Open Systems



Goals

- Institutionalize open systems in the acquisition process
- Support programs in achieving evolutionary combat capability
- Use open systems design to implement system-of-system interoperability

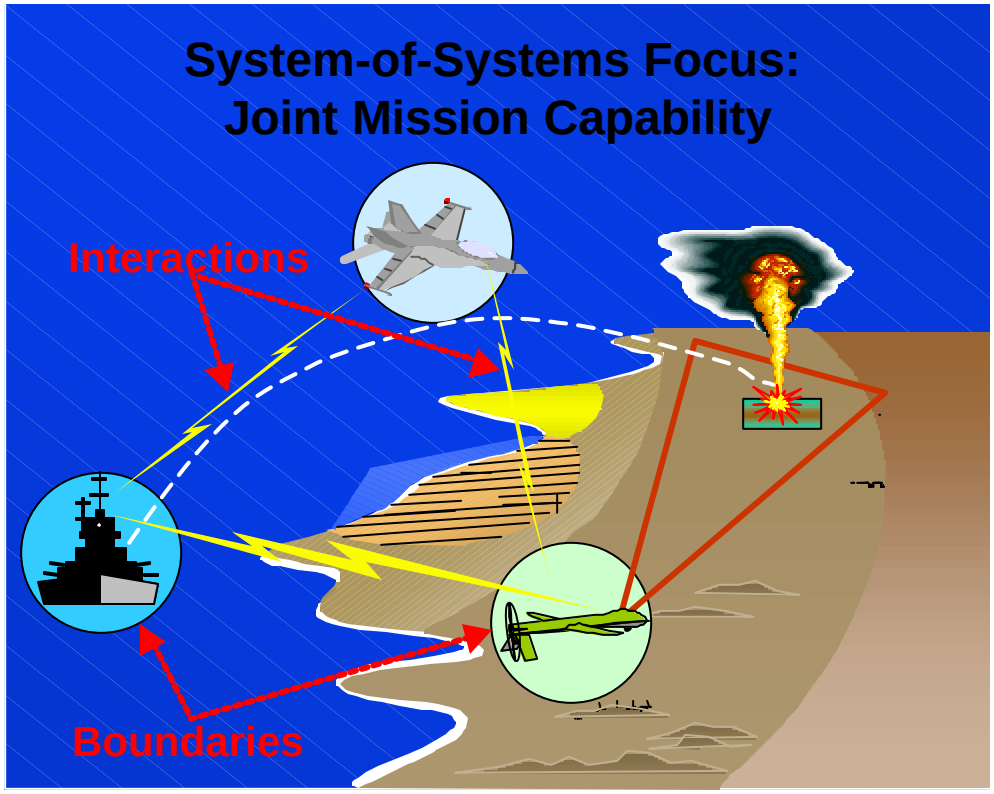
An Open Systems Approach

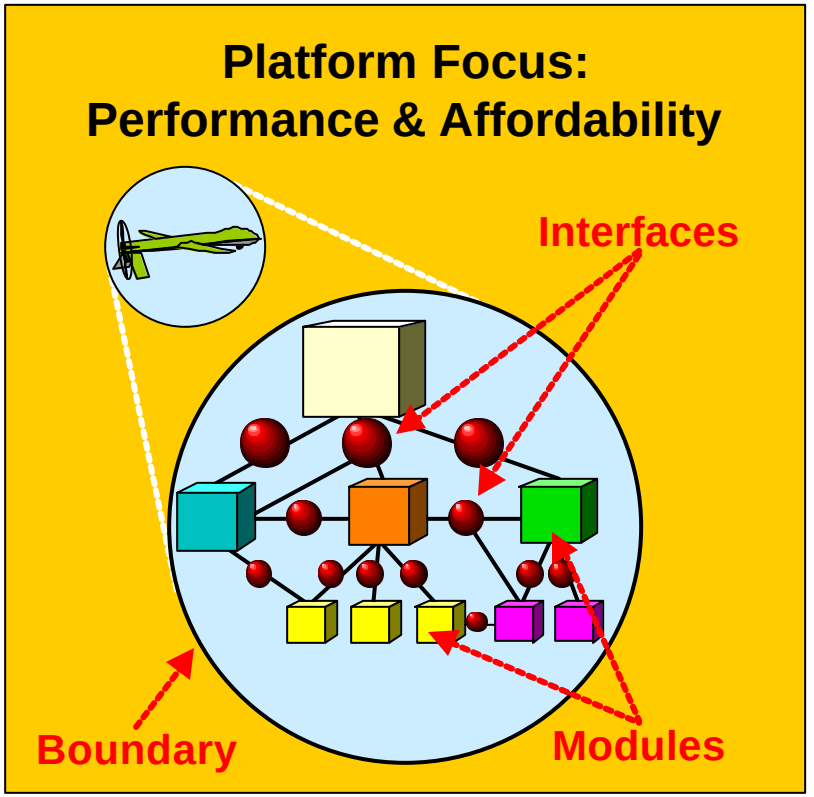
A business and technical strategy that

- Identifies system modules using a reference model or architecture
- Identifies internal interfaces (between system modules) and external interfaces (to other systems that must be interoperable)
- Identifies key interfaces based on both operational and acquisition considerations that are germane to the system
- Designates open interface standards (with sufficient application and implementation guidance) that will guide and influence the system's design
- Uses an IPT to achieve and document these objectives

Two Predominate Perspectives

for Applying an Open System Approach





The standards to be selected for either of these perspectives are governed by different considerations.

What is the purpose of designating standards?

Interface Standards

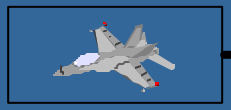
Open Systems OS Joint Task Force

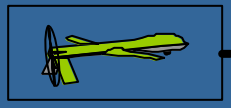
Joint Vision

Tactics, Doctrine Procedures

Mission Capability Packages

System and Functional Domain Standards





Domain N

Candidate Standards

Combat Id | Tactical Data Link | Situational Awareness | Time Critical Strike | Precision Engagement

System of System Architects

Designate Joint Mission Capability Interface Standards Profiles from Domain Candidates

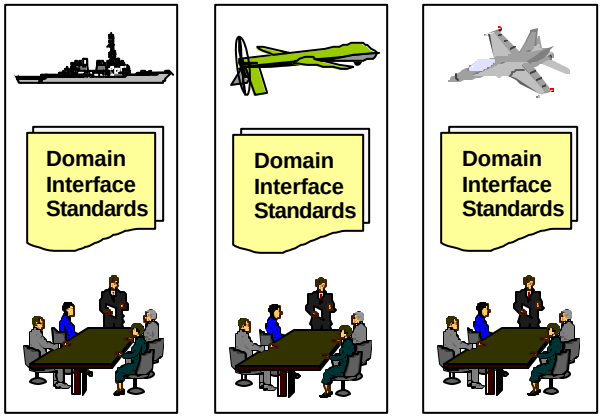
Impose Choices

Systems would only need to implement the standards profiles for those mission areas where they participate.

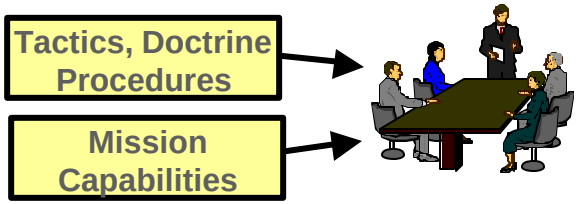
Interactions Among Systems
An Example

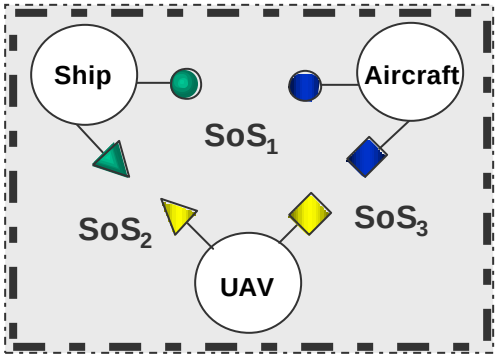
Open Systems OS Joint Task Force

System and Functional Domains



System-of-systems Architects





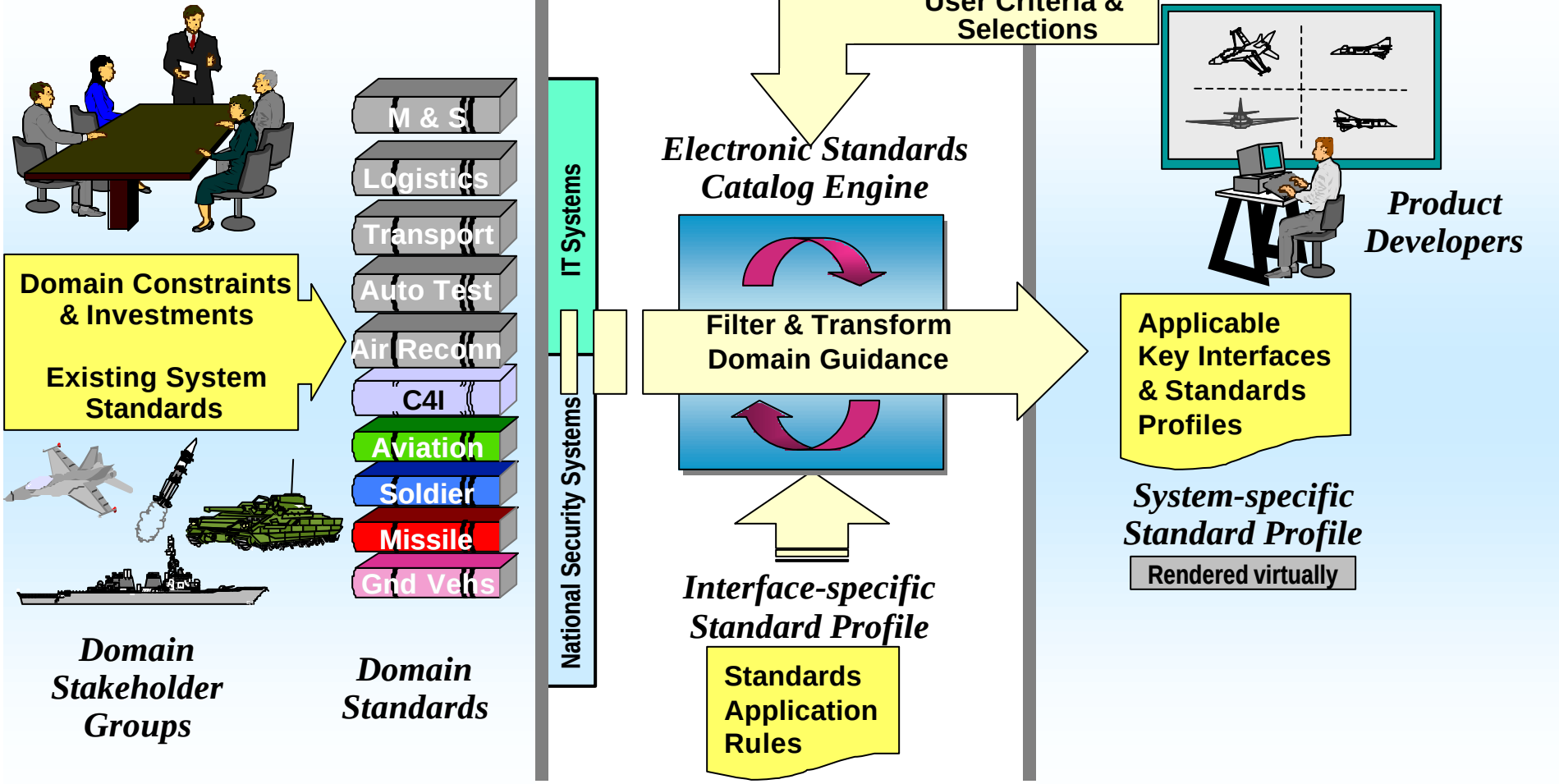
Candidate Standards

Mission Capability X			Standards Profiles for Key Interfaces		
Standard ID	Service Exchanged	Standard	SoS-I_1	SoS-I_2	SoS-I_3
SoS-S_1	Geo Data	UTC	X		X
SoS-S_2	Video	NTSC		X	
SoS-S_3	Track Quality	Mil-X02	X		
SoS-S_4	Combat ID	Mil-X03			X

Collaboration Environment

for Creating & Using Key Interface Standards Profiles

Open Systems JOINT TASK FORCE



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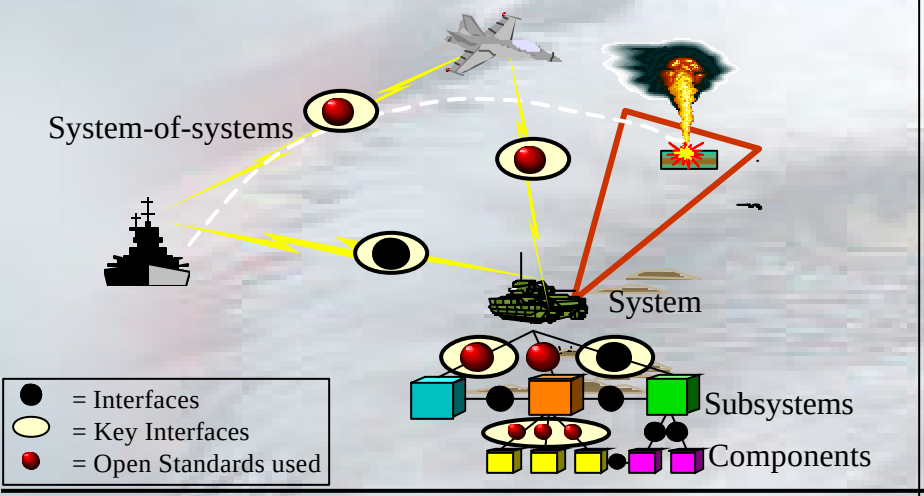

Task Force Transformation

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  - ✓ Viability proven
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  - ✓ Most of the policy is in place

Present & Future

- Ensure weapon systems are open
  - Institutionalize open system indicators
  - Provide on demand expertise across the spectrum of the acquisition process
  - Apply open system design principles at system-of-systems level
- Streamline and focus policy (DoD 5000, etc.)
- Simplify complex and inefficient architecture process (JTA, ACC)
- Maintain dialog with industry
- Sponsor targeted studies and analyses (NCAT, Industry experts)
- Complete one high-payoff demonstration (Time Critical Targeting)

Desired End State Characteristics & Indicators

- An open system design that is characterized by (DoDI 5000.2 para 4.6.1.1.2)
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Ensuring Modular Open Systems Design