

Digital Mission Architectures

Challenges and Opportunities for Mission Engineering and Integration

Mr. Jaime J. Bestard

Chief Engineer for Digital Mission Architecture

Office of the Assistant Secretary of Defense for Mission Capabilities

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Outline

- Organization and Mission
- Digital Mission Architectures for Mission Engineering
- Challenges
- Opportunities
- Discussion



Our Mission



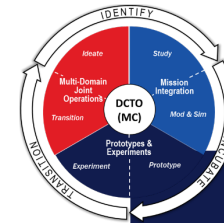
Department of Defense

To provide the military forces needed to deter war and ensure our nation's security.



Under Secretary of Defense for Research and Engineering

To ensure continuous advancement of technology and innovation within the Defense enterprise.

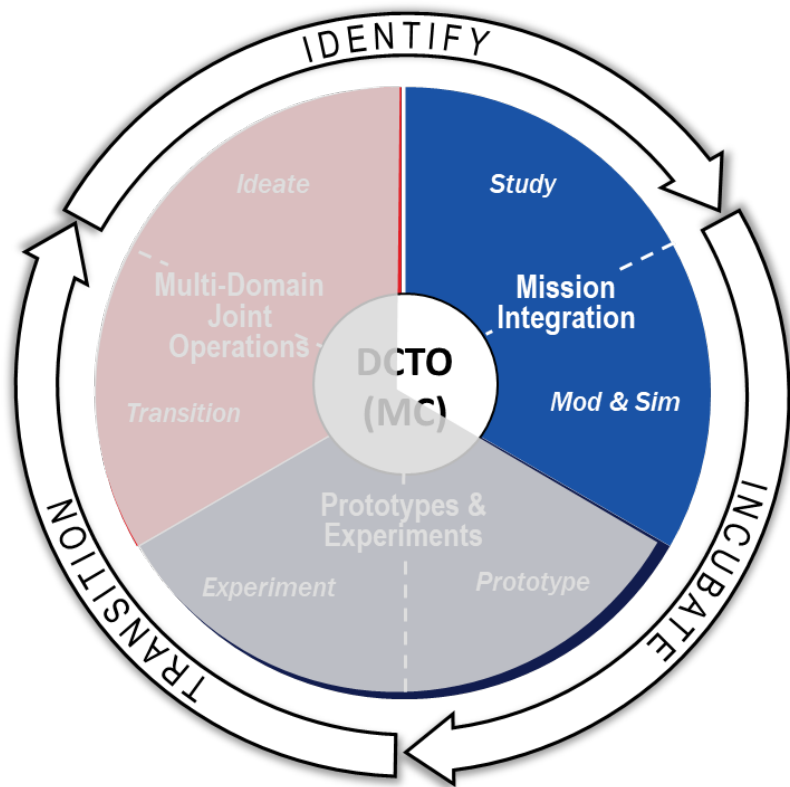


Assistant Secretary of Defense for Mission Capabilities

Deliver Joint Warfighting Concepts to Prototype Capabilities. Transition the Valley of Death.



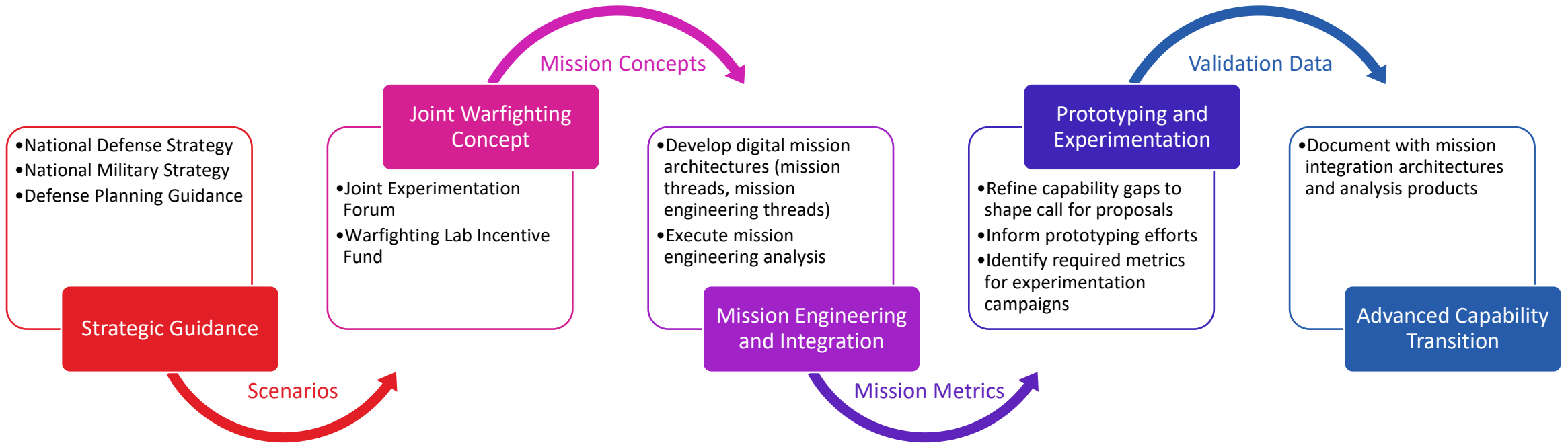
Mission Integration in the Continuous Innovation Cycle



- The **Mission Integration** office conducts mission engineering to identify and evaluate emerging capabilities and their ability to close operational gaps in high-priority scenarios.
- **Mission Engineering** efforts include development and analysis of:
 - Model-based (digital) mission architectures
 - Constructive models and simulations
- Products from Mission Engineering efforts include:
 - Model-based mission threads to assess capabilities and technologies in operationally-relevant environments
 - Mission analysis and related metrics to evaluate success and capability performance



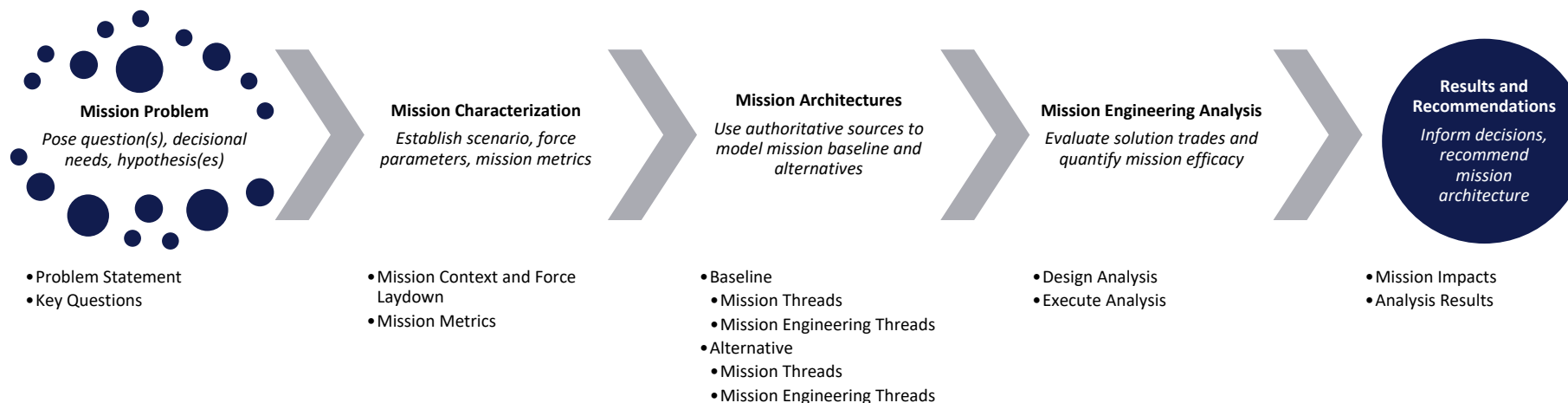
How do we do this?





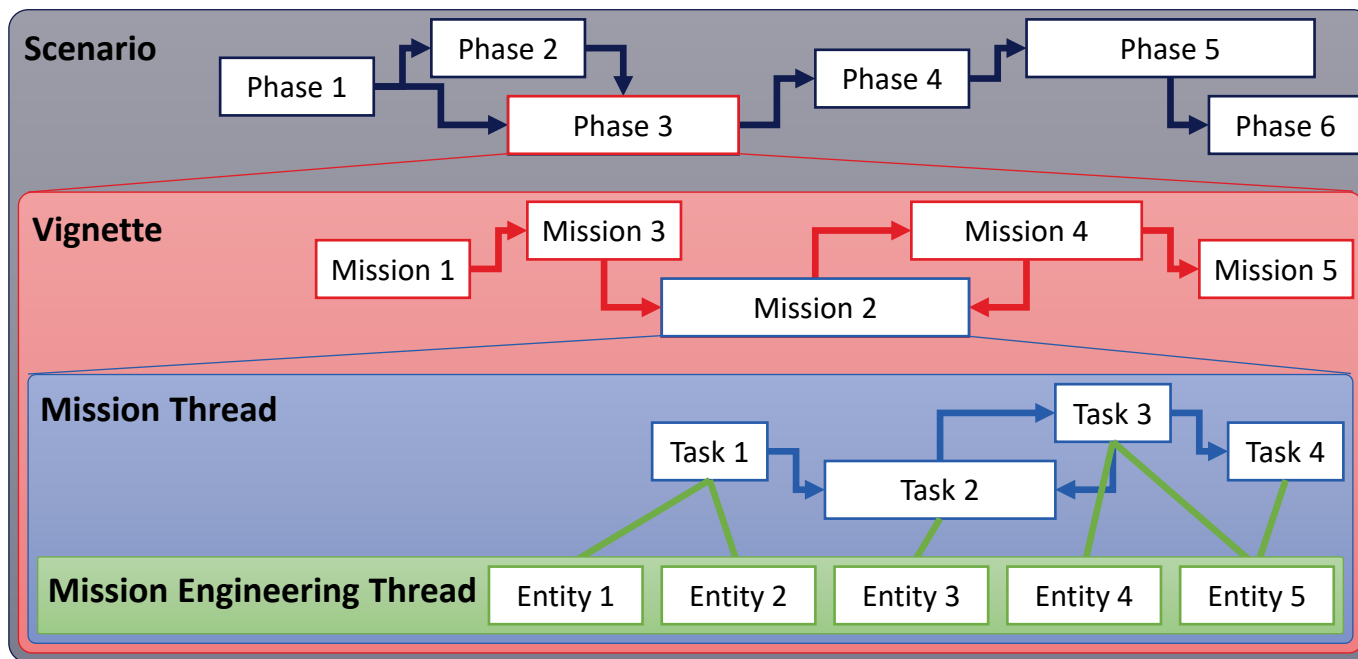
What is Mission Engineering?

- Deliberate planning, analysis, organization, and integration of current and emerging capabilities to achieve mission effects
- Analytical and data-driven approach to decompose and analyze constituent parts of a mission to identify measurable trade-offs and draw conclusions





Elements of Mission Architectures



Metrics Examples	
Unit	Description
Campaign Measures of Success	
Days	Before clear indications target government modified its position
Days	Before target nation begins to modify their targeted behavior
Mission Measures of Success	
Percent	Of enemy theater missile forces destroyed
Percent	Of required personnel airlifted to designated locations
Measures of Effectiveness	
Nautical Miles	Required weapon range
Probability	Required weapon effect (P_k)
Minutes	Required time on station
Measures of Performance	
Nautical Miles	Weapon range
Pounds	Weapon payload
Minutes	Time on station



Challenges

Differences in terminology, taxonomy, and ontologies

Disparate and inconsistent data sources

Duplication of modeling efforts across the Department

Limited value proposition of digital mission architectures



Digital Mission Architecture Integration Workshop





Opportunities

Federation and
integration across the
Defense Enterprise

Actionable digital
mission architectures

Knowledge
management and
documentation

Automation of
systems, system-of-
systems, and
enterprise analyses

Digital mission threads
as the foundation of
enterprise
architectures



Federation and Integration Across the Defense Enterprise

UAF	Motivation Mv	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Sequences Sq	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr	
Architecture Management Am	Architecture Principles Am-Mv	Architecture Extensions Am-Tx	Architecture Views Am-Sr	Architectural References Am-Cn	Architecture Development Method Am-Pr	-	-	Dictionary Am-If	Architecture Parameters Am-Pm	Architecture Constraints Am-Ct	Architecture Roadmap Am-Rm	Architecture Traceability Am-Tr	
Summary & Overview Sm-Ov													
Strategic St	Strategic Motivation St-Mv	Strategic Taxonomy St-Tx	Strategic Structure St-Sr	Strategic Connectivity St-Cn	Strategic Processes St-Pr	Strategic States St-St	-	Strategic Information St-If	MOE's Environment and MOP's Environment	Strategic Constraints St-Ct	Strategic Roadmaps: Deployment, Phasing St-Rm-D, -P	Strategic Traceability St-Tr	
Operational Op	Requirements Rq-Mv	Operational Taxonomy Op-Tx	Operational Structure Op-Sr	Operational Connectivity Op-Cn	Operational Processes Op-Pr	Operational States Op-St	Operational Sequences Op-Sq	Operational Information Model Op-If		Operational Constraints Op-Ct	-	Operational Traceability Op-Tr	
Services Sv		Services Taxonomy Sv-Tx	Services Structure Sv-Sr	Services Connectivity Sv-Cn	Services Processes Sv-Pr	Services States Sv-St	Services Sequences Sv-Sq			Services Constraints Sv-Ct	-	-	
Personnel Ps	Requirements Rq-Mv	Personnel Taxonomy Ps-Tx	Personnel Structure Ps-Sr	Personnel Connectivity Ps-Cn	Personnel Processes Ps-Pr	Personnel States Ps-St	Personnel Sequences Ps-Sq	Resources Information Model Rs-If		Personnel Constraints Ps-Ct	Personnel Roadmaps: Evolution, Forecast Ps-Rm-E, -F	Personnel Traceability Ps-Tr	
Resources Rs		Resources Taxonomy Rs-Tx	Resources Structure Rs-Sr	Resources Connectivity Rs-Cn	Resources Processes Rs-Pr	Resources States Rs-St	Resources Sequences Rs-Sq			Resources Constraints Rs-Ct	Resources Roadmaps: Evolution, Forecast Rs-Rm-E, -F	Resources Traceability Rs-Tr	
Security Sc	Security Controls Sc-Mv	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr	-	-	Risks Rk-Pm		Security Constraints Sc-Ct	-	-	
Projects Pj	-	Projects Taxonomy Pj-Tx	Projects Structure Pj-Sr	Projects Connectivity Pj-Cn	Projects Processes Pj-Pr	-	-			Projects Constraints Pj-Ct	-	-	
Standards Sd	-	Standards Taxonomy Sd-Tx	Standards Structure Sd-Sr	-	-	-	-	-		-	Standards Roadmap Sd-Rm	Standards Traceability Sd-Tr	
Actual Resources Ar	-	-	Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn	Simulation			-		-	Parametric Execution/Evaluation	-	-

Capabilities & Threats

Mission Threads

Mission Engineering Threads

Roadmaps

Services

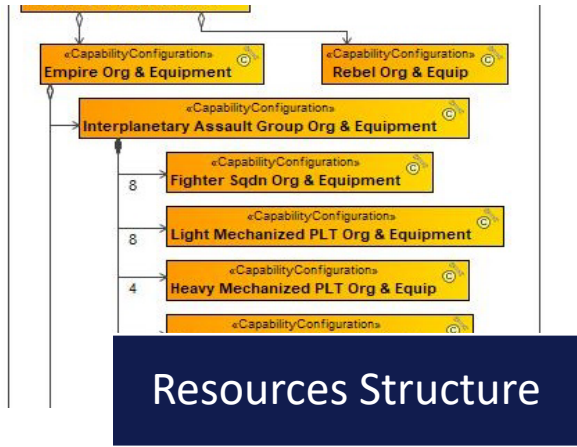
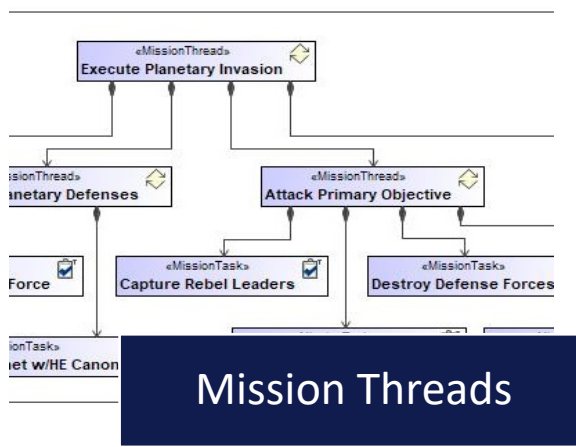
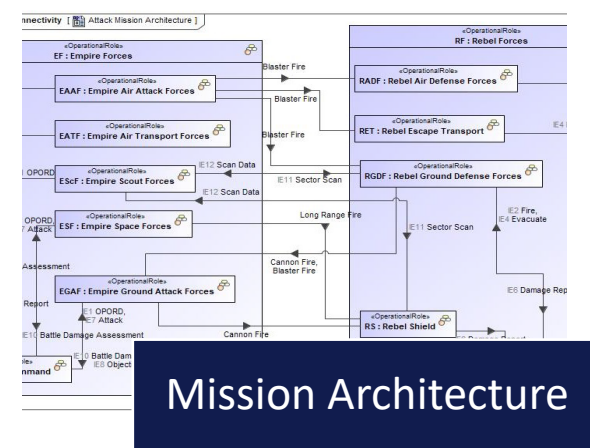
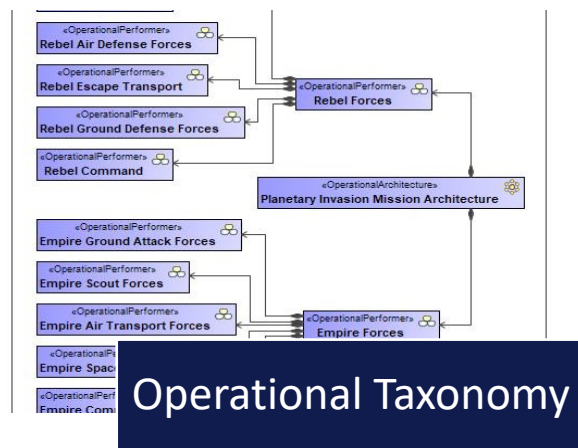
Personnel

Security

Projects



Actionable Mission Architectures





Knowledge Management and Documentation

Executive Summary

- Scope and Purpose
- Epoch
- Scenario
- Vignette
- Missions Modeled

Architecture Description

- Framework (e.g. UAF, DoDAF, SysML)
- Methodology (e.g. UAF EA Guide, Custom Style Guides)
- Classification
- Lead Architect and Modeling Team Members

Assumptions

- Applicable Kill Chain (e.g. F2T2EA, Unified)
- Concept of Operations
- Concept of Employment

Stakeholders

- Office of the Secretary of Defense
 - Acquisition and Sustainment
 - Research and Engineering
- Joint Staff
- Unified Combatant Commands
- Military Departments and Services

Model Description

- View Descriptions
- Capabilities Modeled
 - United States
 - Allies/Partners
 - Competitors/Adversaries/Enemies

Architecture Analysis

- Baseline
 - Gap Analysis
- Alternative
 - Measurements
 - Risk Assessment

References and Sources

- Applicable Security Classification Guides
- Concepts of Operations
- Concept of Employment
- Capabilities/Technical References



Summary

- Digital mission architectures are a foundational element as capabilities evolve across the Defense enterprise
- Flexible guidance enables specialized mission architecture development, but limits smooth integration across large enterprises
- Opportunities to bring rigor and value to mission architectures will enable the Department to conduct timely and insightful analyses



Discussion

Mr. Jaime J. Bestard
Chief Engineer for Digital Mission Architecture

Tel.: +1 (571) 372-7580

NIPRNet: jaime.j.bestard.civ@mail.mil

**Office of the Under Secretary of Defense for Research and
Engineering**

<https://www.cto.mil>