



OMG Model-based Acquisition (MBAcq) User Group: *A Government & Industry Collaboration Overview & Update*

NDIA SE Division Conference 19 Oct 2023

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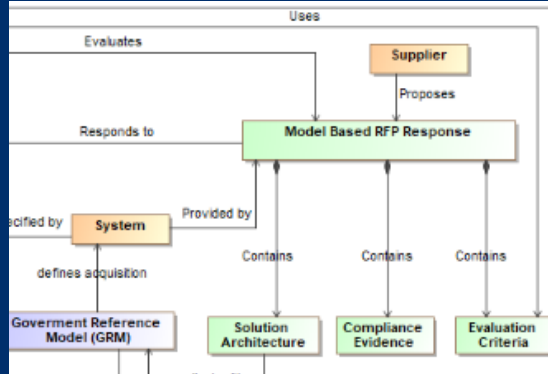
MBACQ UG CO-CHAIR/OMG UAF CO-CHAIR

OCT 17, 2023

Model-Based Acquisition (MBAcq) User Group Introduction

About MBAcq

Model-based acquisition is the Technical approach to acquisition that uses models and other digital artifacts as the primary means of information exchange, rather than document-based information exchange.

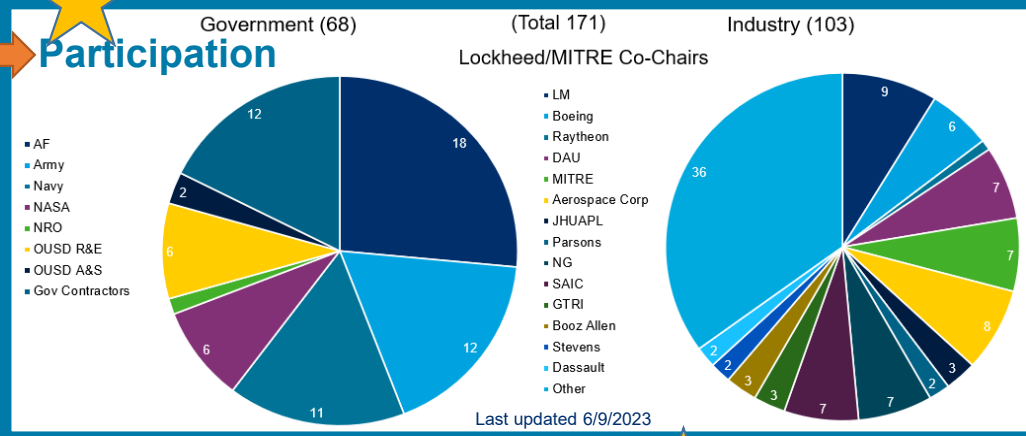


Why MBAcq Matters

Customers are increasingly specifying MBSE in RFPs
Customers are increasingly requiring models in proposals
Lack of standardization raises proposal learning curves & compliance risk

- Model Based Acquisition will be disruptive
- Increased interest to organize around the MBAcq UG to define and standardize approach
- Broad government and industry participation
- Gov & Industry have an opportunity to shape future MB Acquisitions & Compliance together

Participation



Expected Timeline

- 2022: Formed Team & Framework
- 2023: Q4 Govt Ref Arch
- 2024: Q2 Acquisition Users Guide
- Q2/3 DAU Acquisition Training
- Q4 Acquisition Model Example
- Ongoing: Curate and Create Reusable Content (Reference Architectures, Domain Overlays, ...)

For more information contact:

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- rahaselden@mitre.org
- toni.m.nolder@aero.org

Full lifecycle should be addressed during Acquisition!

MBAcq User Group is an OMG Managed Community

OMG Managed Community Charter

1. Mission and Scope of the Community.

1.1. Purpose. The purpose of the Model Based Acquisition (MBAcq) User Group (the “Community”) is to enable collaboration in support of various professional or open collaboration activities including:

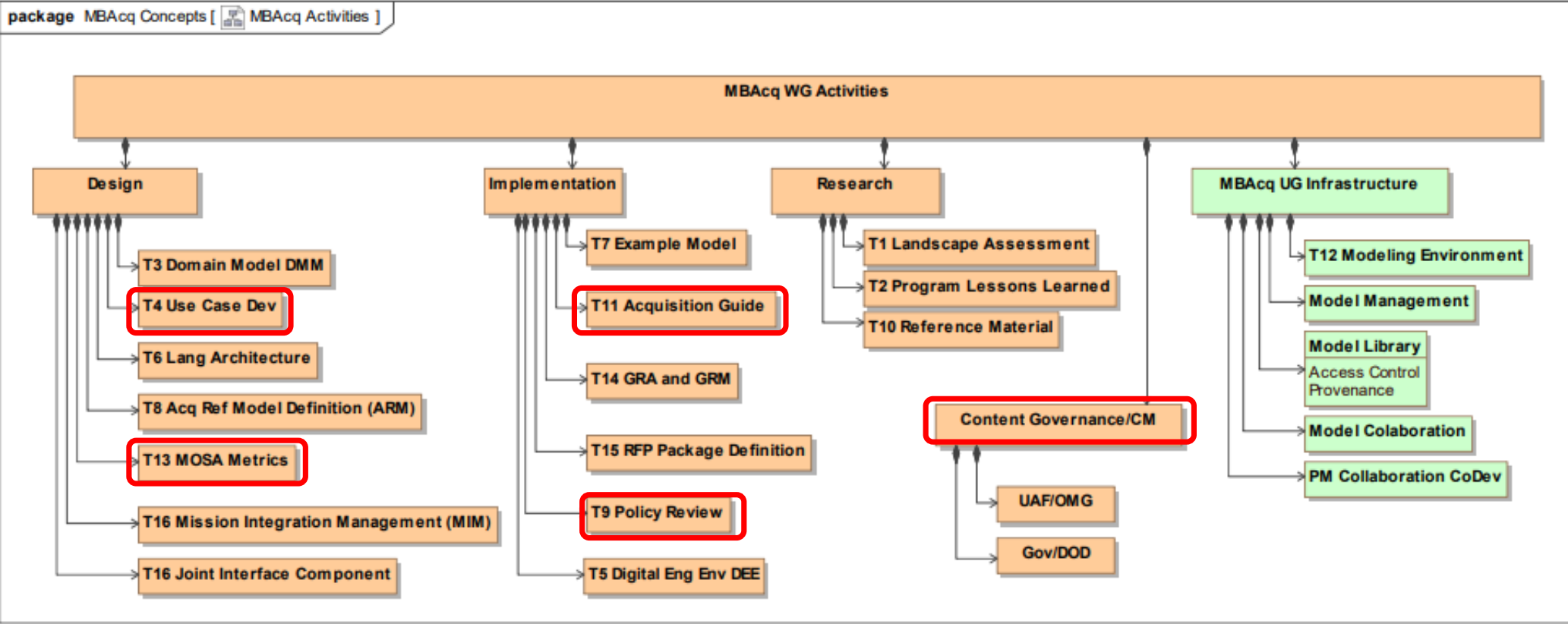
- Provide a forum to address standardization in the use of Model-Based Engineering (MBSE) and subsequent models during the acquisition process thereby reducing the learning curve for every MB-RFP and OEM proposal response.
- Act as a bridge to the OMG Standard Development Organization (SDO) process, assess and provide validated inputs to the SDO to update relevant specifications based on evolving user needs, including Systems Engineering (SE) and Architecture standards, such as SysML, UAF and Systems Modeling Architecture & Services as it pertains to Acquisition.
- Provide a forum for cross-industry end users, gov services, FFRDCs, academia and tool vendors to share and develop practices that promote the adoption and advancement of Architecture and Model Based Systems Engineering (MBSE) including the definition and use of new Reference Architectures as patterns.
- Provide associated process guidance for both engineering and acquisition professionals to use the Reference Architectures for RFP creation, response, evaluation, and program execution thereby introducing MBSE principles earlier during the RFP phase.
- Provide support for building other modeling languages and domain-specific extensions based on KerML, SysML, UAF when required.

- Approved by the OMG BOD 26 September 2023 as an enduring OMG Entity

Founding Members

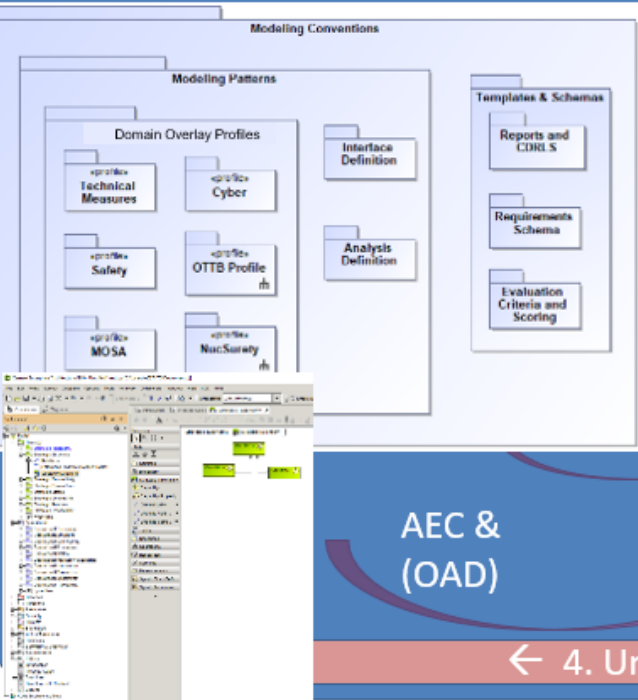
- Lockheed Martin (Laura Hart)
- The MITRE Corporation (Rae Anderson)
- The Aerospace Corporation (Toni Nolder)

MBAcQ – UG ACTIVITIES

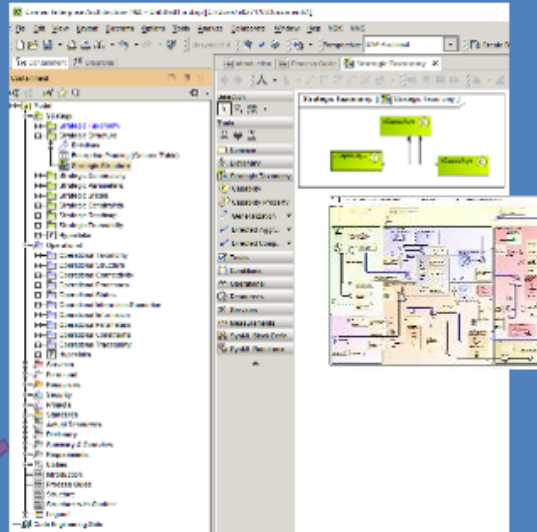


Model-Based Acquisition

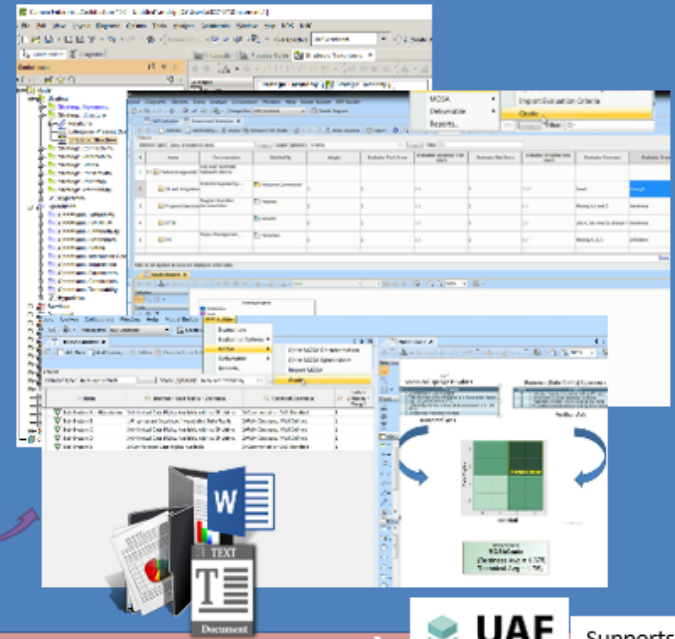
1. Architecture Evaluation Criteria (AEC)



2. Objective Architecture Description (OAD)



3. Model-based RFP Package



AEC & (OAD)

Populated with Program & contract Data

← 4. Unified Architecture Framework (UAF) Process Guide for Acquisition →



Supports DoDAF

1. The AEC provides model structure for RFP content and evaluation tools:

- Modeling Patterns
 - DO Profiles (i.e. MOSA, Data Rights, certs)
 - Interface & Analysis Definitions
- Templates & Schemas
 - Evaluation Criteria & Scoring (Section K, L, M)
 - Reports & CDRLS

2. The OAD is a descriptive model containing the program requirements, constraints and context

- High-level Capabilities, mapped to Operational scenarios, traced to requirements (e.g. CDD, SRD, Conops)
- Technical performance measures (i.e. KPPs, KSAs, MOEs..)
- Any required architectural partitioning including structural and functional

(Based on UAF acquisition process guide and template)

3. The Model-based RFP model contains the populated OAD&AC providing **RFP evaluation content, CDRL definitions** for documentation generation and **scoring tools** for solution validation and evaluation

4. UAF Process Guide provides the Acquisition Guidance for using MBAcq to **create, respond and evaluate a Model-based RFP.**

Descriptive vs Analytical Models

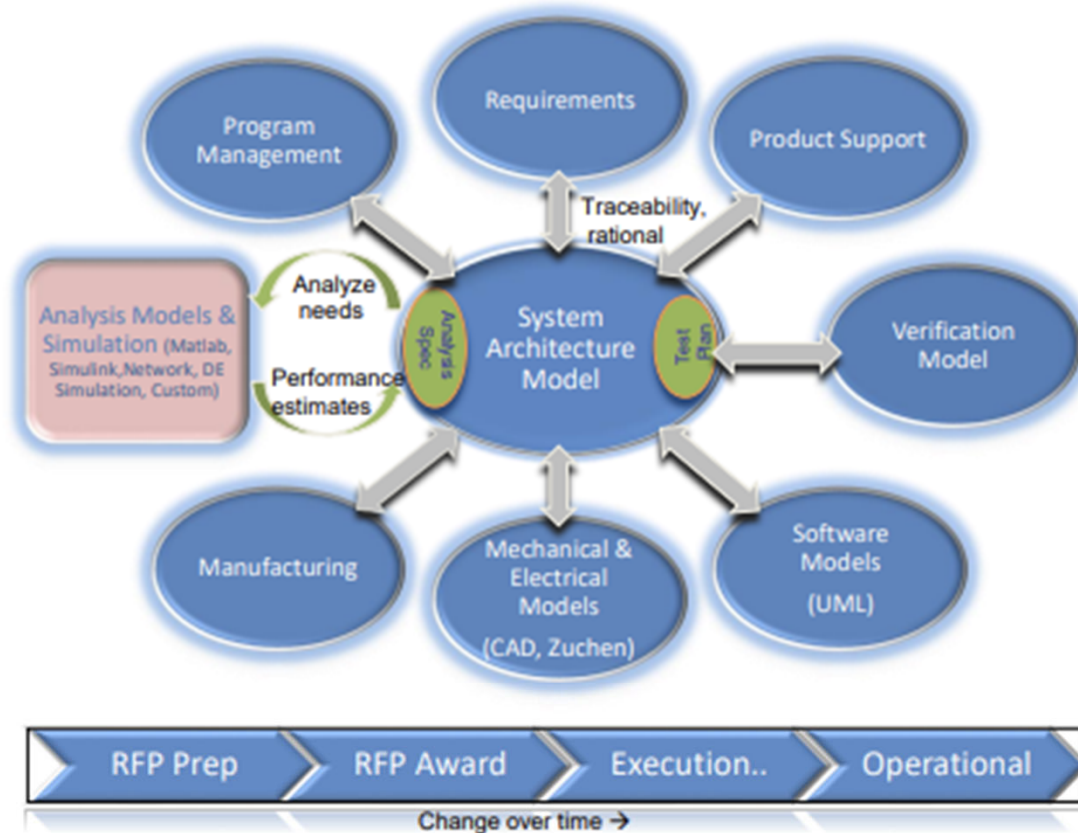


System Architecture Model (SAM)

- Descriptive in nature
- Emphasizes how pieces fit together into a consistent whole
- Provides context for analysis

Analysis Models and Simulation Models

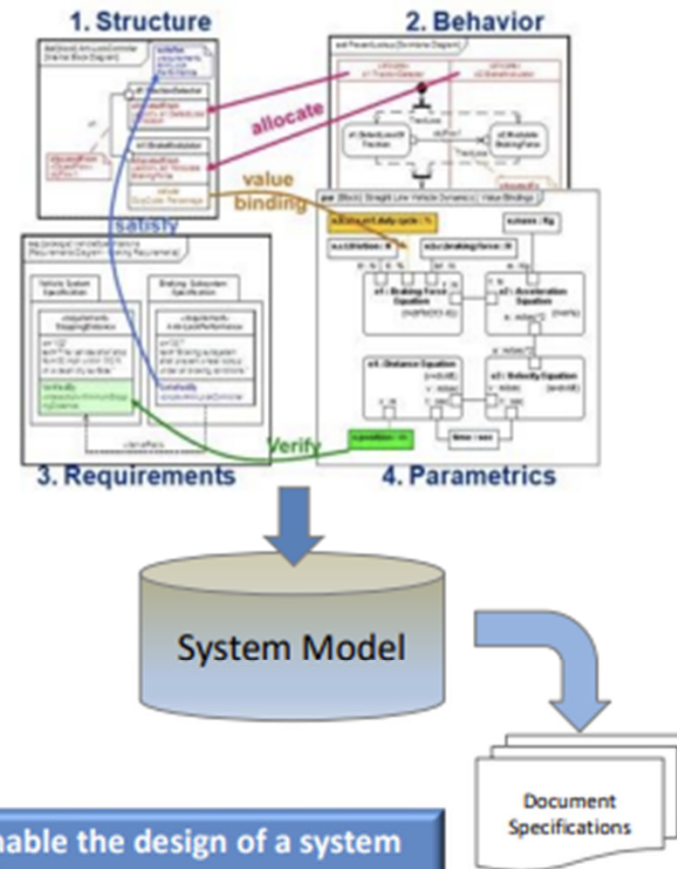
- Emphasize specific aspects of performance, consistent with the Architecture Model.
- Mathematically-based computation or simulation
- Reduces risks thru analysis, validation and optimization of:
 - MOE, MOP, KPP, TPM timing, probability of hit/survival reliability/availability, MTBF cost, total cost of ownership
- A vehicle to solve some problem or verify a solution



SAM provides a "hub" for data integration and transformation across the product lifecycle

What's in the System Architecture Model

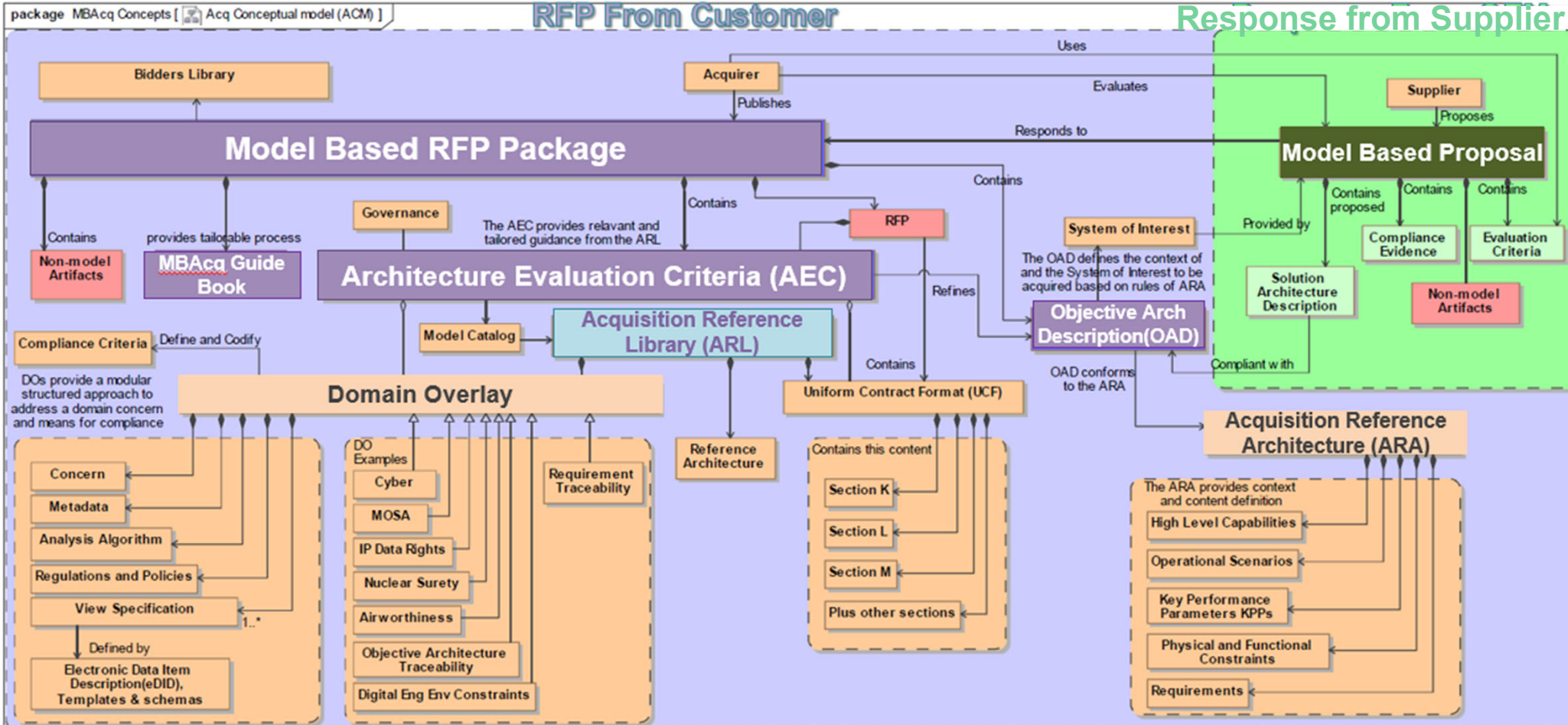
- **A System Architecture Model is an Integrated Structured Representation of the Requirements, Behaviors, Structure, Properties, and Interconnections**
 - Requirements
 - What are the mission operations, stakeholders' goals, purposes, and success conditions for the system?
 - Behavior
 - What the system needs to do to meet requirements
 - Transformation of inputs to outputs
 - Responses to External stimulus
 - Structure
 - The parts of the system that are responsible for the behaviors
 - The component hierarchy, elements and stores
 - Properties
 - The performance, physical characteristics and governing rules that constrain the structure and behaviors
 - Interconnections
 - The ability of the structured elements to exchange information and achieve their required behaviors



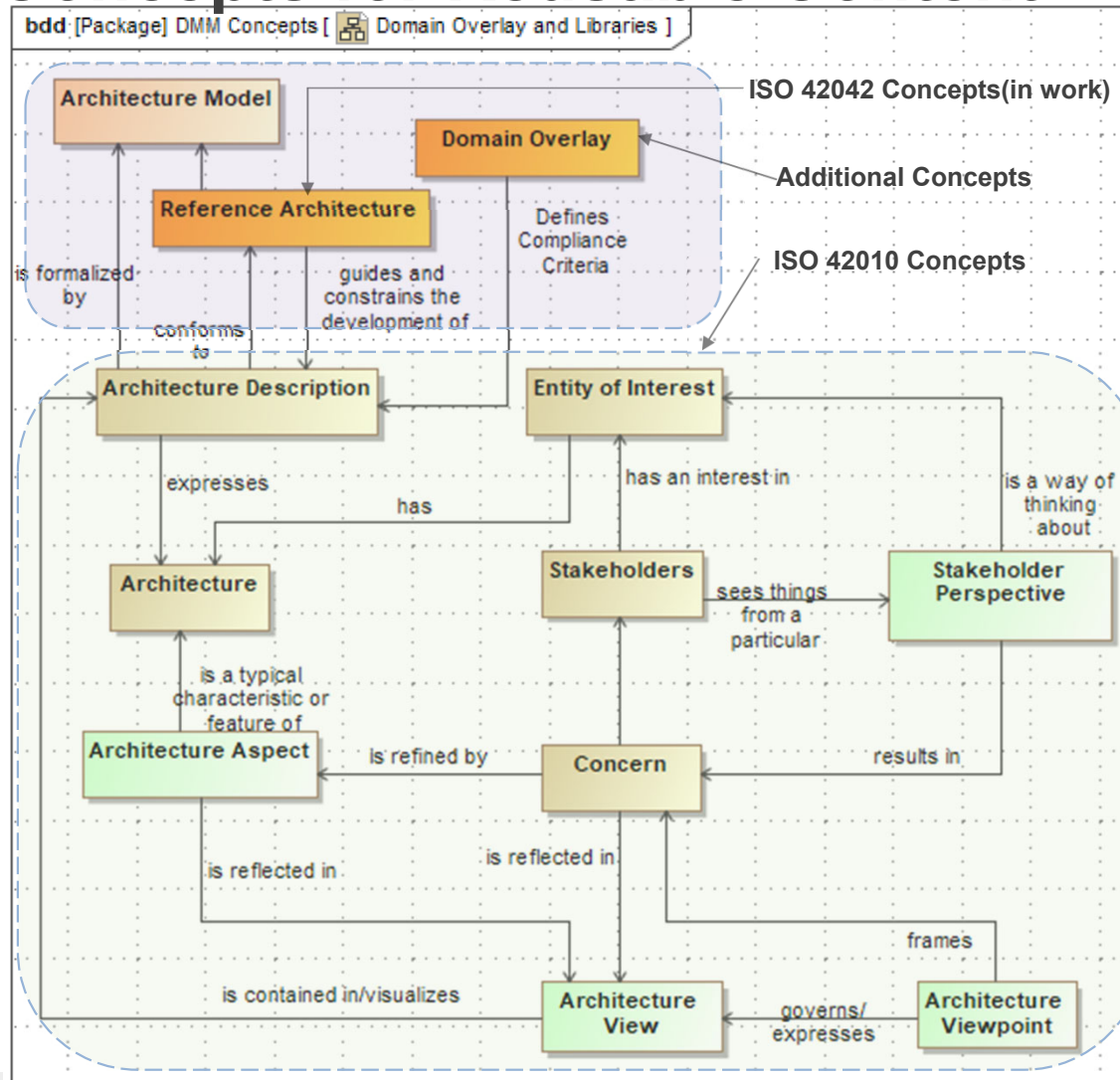
Primary use of the system model is to enable the design of a system that satisfies its requirements

MBAcq Future State

Bringing it all together!



Standardized Concepts for Reusable Content



Domain Overlays (DOs)



Domain Overlay (DO) Description: A collection of constructs needed to support analysis for a **domain specific concern** using a standardized modular approach. Typical construct elements include:

Previously called Aspect Viewpoint Overlays (AVO)

- A set of regulations, constraints, rules.... driving the analysis (i.e. MOSA, safety, certification, airworthiness, Space ...)These could be provided as an instrumented lib
- A set of Data/Metadata required to address or support analysis, compliance or fit-for-purpose. Implementation example (Domain model/profile)
- Logic/algorithm needed to perform analysis using the metadata and regulations
- A set of Viewpoints to support various analysis (Certification plan, coverage, design trades, schedule and resources...)

Characteristics

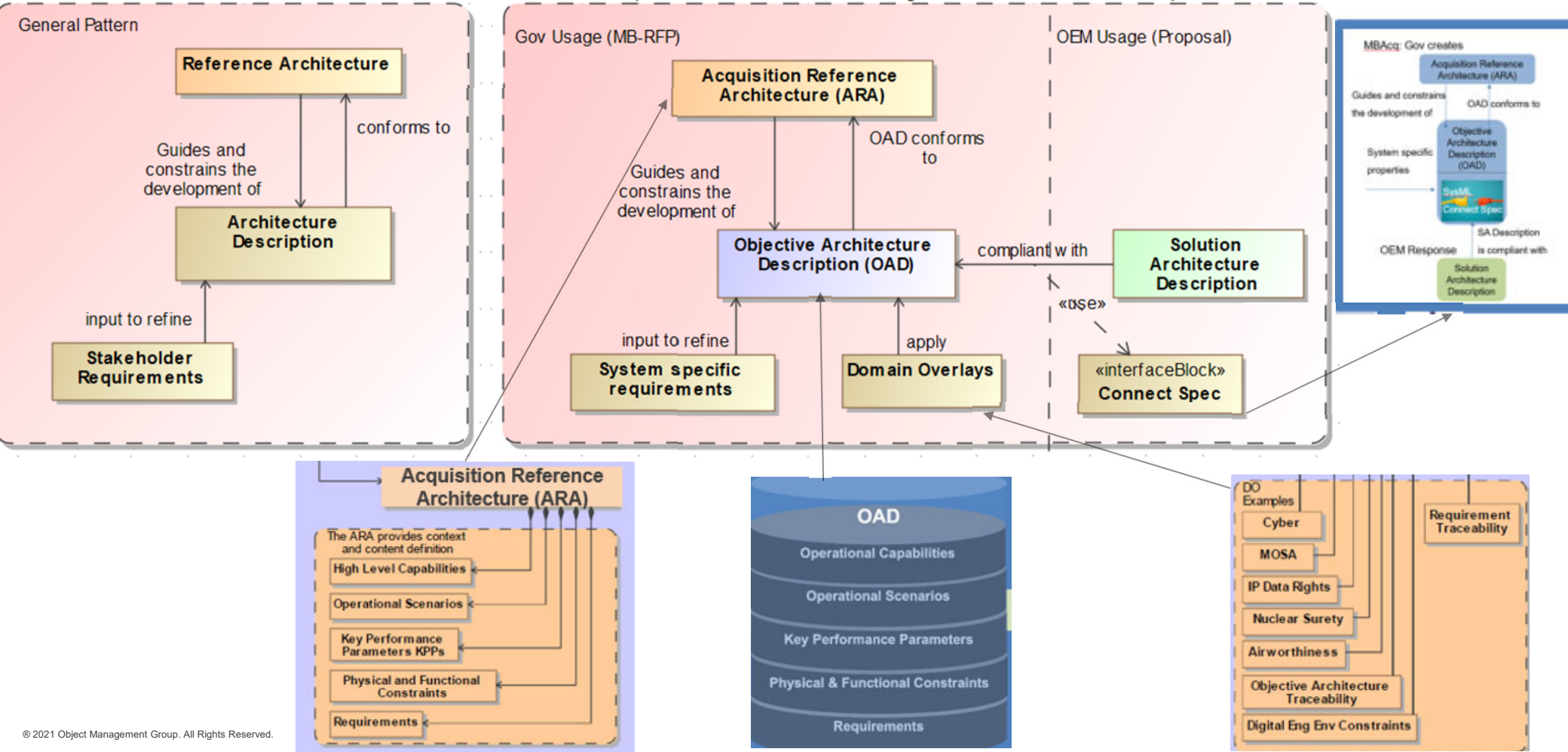
- Usually has associated regulations, governance that can be treated as pseudo requirements or constraints
- Cross-cutting both viewpoints/rows & aspects/columns
- Supports specific analysis associated with a Domain-Specific concern
- Can be created independent of a specific solution architecture description
- Can be applied or removed from a specific architecture description without impacting the AD, hence an overlay

Based on NDIA Actionable Architecture Using Aspect Modeling, L Hart 2018

Modular structured pattern to support standardization

Usage of Standardized Concepts

MBAcq Reference Architectures and Usage to create an Architecture Description

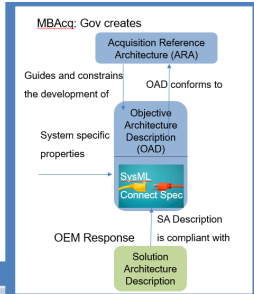
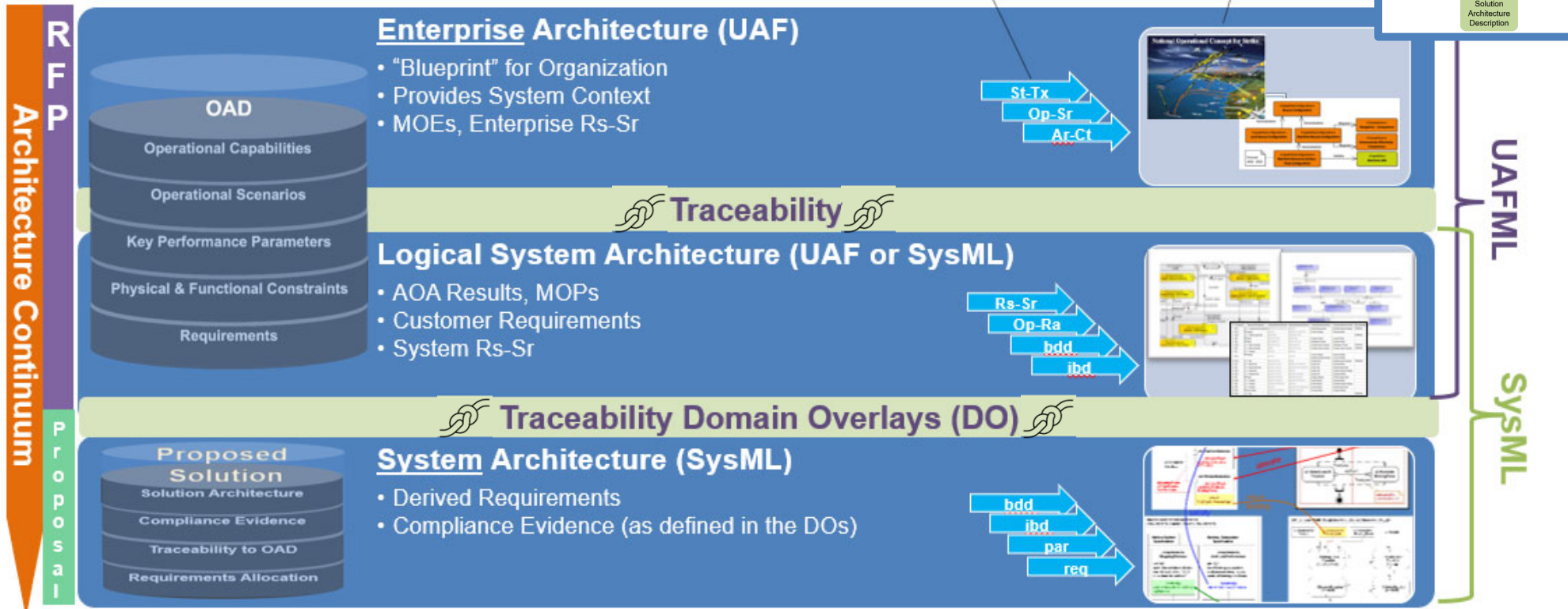


The Architecture Continuum

Defining Guidance!

View Specifications

Views



R&E SE&A Collaboration

SE Modernization Recommendations: LOE 2 – Policy & Guidance Review and Update

“Guide for Integrating Systems Engineering into DoD Acquisition Contracts” (2006)

Does not include model based, digital, MOSA and other modern practices

OMG MBAcq Use Case Development & Role-Based Acquisition guide

**Guide
for
Integrating Systems Engineering
into
DoD Acquisition Contracts**

Version 1.0



December 11, 2006

Department of Defense

Section 1 – Existing & Sample Content

- Appendix A
Sample Technical Content for Section C
- Appendix B
Dev of SE Input for Sections L, M & Proposal Eval
- Appendix C
Other Transactions for Prototype Projects
- Appendix D
Intellectual Property & Data Rights
- Appendix E
Abbreviations & Acronyms
- Appendix F
Government Reference Architecture Best Practices

R&E SE&A contact: Dr Kelly Alexander

Workforce & Policy Team

Section 2 - Emerging Content Topics & References

- Appendix G
Model Based Acquisition Resources & Best Practices –collaboration with OMG MBAcq UG
- Appendix H
Systems Engineering Modernization Best Practices
SERC research & roadmaps
Agile Systems Engineering Process Transformation
Lessons Learned Database
- Appendix I
MOSA Contracting Best Practice
- Appendix J
Specialty Engineering
- Appendix K
SW Modernization (API etc)
- Appendix L
Digital Engineering
- Appendix M
Mission Engineering

MBAcq Activity Alignment

T11: Acquisition Guide Outline

1. Executive Summary
2. Introduction
 1. Purpose
 2. Scope
 3. Target Audience
 1. Acquirers
 2. Contractors/Suppliers
3. Acquisition Strategy
 1. Acquisition Process: Acquisition Pathways
 2. Acquisition Objectives (e.g., MOSA, Cost Savings, Technology Improvements, Digital Engineering, etc.)
 3. Joint Requirements Oversight Council (JROC) Directives
4. Transitioning from Existing Acquisition to Model-Based Acquisition
 1. Solicitation / RFP
 1. FAR 15.203 Request for Proposals
 2. Each RFP section affected by model-based acquisition.
 2. Response / Offer

T4: Use Case Development

Task summary: Identify and document set of primary UCs that describe how the MBAcq guidance will be used. Our starting point UCs are:

- Create Precise RFP
- Respond to RFP
- Evaluate Proposal Response
 - Contractor Self Evaluation
 - Government Evaluation
- Mature Technical Baseline

What are the viewpoints for the use cases?

Collaboration and Transparency in an Open Env

wiki.codev.mitre.org/display/UAF/T3%3A+High-Level+Domain+Model

OMG UAF Task Force

Pages / ... / Activities and Deliverables

T3: High-Level Domain Model

Created by Laura Hart, last modified about 22 hours ago

Special Task Description: Capture the core high-level concepts

Task Leader: @Laura Hart @Matthew Hause , Monty

Members: Yvette Rodriguez, Jeff Banks

RFP From C

Model Based RFP Pack

Acquisition Reference Model

Analysis Algorithm, Metadata, Regulations, Viewpoint, Compliance, Analytic Viewpoint Overlay (AVO), Data Item Description Templates & schema

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- Membership and Attendance
- Agenda/Meeting Minutes
- Activities and Deliverables
 - T1/2: Landscape Assessment
 - T3: High-Level Domain Model
 - Sustainment
 - T4: Use Case Development
 - T5: Digital Eng Env (DEE) ass
 - T6: Language Architecture
 - T7: Updates to the Example I
 - T8: (ARM) Acq Ref Model: Te
 - T9: Policy Review Group
 - T10: Identify Reference Reso
 - T11: Acquisition Guide Outlin
 - T12: Modeling Environment
 - T13: MOSA Metrics
 - T14: Define (ARA & OAD): pr
 - T15: Define Model Based RFI
 - T16: Joint interface compone
 - MBAcq Shared Files

09/02/2022 Agenda/Minutes

Created by Laura Hart, last modified on Sep 02, 2022

All Attendees put your name/org/email in the chat window. That allows us to capture attendance and if you need access to the MITRE CoDev Collaboration Site (Confluence).

https://wiki.codev.mitre.org

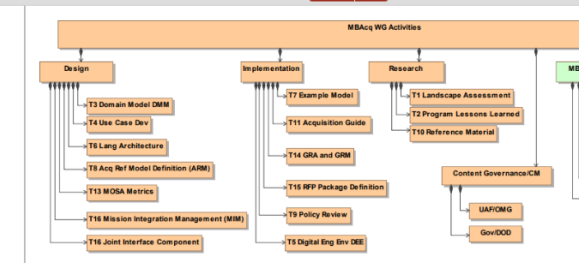
General Request:

- If this was your first meeting, please send me your Chat Introduction
- To request an MBAcq collaboration site account, send email request to Rae Anderson:
 - Gaining access to the OMG UAF Task Force Confluence site is a THREE STEP process

- 1) follow the link and register either using a password or enrolling your phone number
- 2) You must log in to the MITRE CoDev network to create an account on it
- 3) Once you do, please email me (rahalsiden@mitre.org), and I will invite you to the site

Agenda:

- Topic:
 - Report from the subgroups: What can we get done in the next 30, 60, 90 days?
 - Rae Anderson: T1/2: Landscape Assessment and Lessons Learned
 - Monty will provide rolled up Lessons Learned
 - Hart/Hause: T3: High-Level Domain Model
 - Rae/Tom: T4: Use Case Development
 - Review UC document and instructions
 - Hart: T7 Example Model Definition
 - Tom M and Barry P: T9: Policy Review Group - The SERC has complete
 - Yvette Rodriguez: T10: Identify Reference Resource Authoritative Source
 - Bob Scheurer/John Quintana: T11: Acquisition Guide Outline
 - This will be a distributed effort: all please review and provide feedback
 - T5: Digital Eng Env (DEE) associated with primary System
 - Rae Anderson/Dave McDaniel: T14: Define (GRA & GRM): proposed
 - Daniel Brookshier: T12: Modeling Environment Tool Support
 - Gene Sherve: T6: Language Architecture
 - General conversation around the room:
 - Nadine: new OSD Architecture group is being formed lead by Lt Col
 - Ed Moshinsky (OUSD R&E and NDIA Arch co-chair) stated that a MKC these deliverables will be pivotal to the MOSA standardization approach
 - Frank Salvatore: Are you planning to start with what was done in the past?
 - Keith provided new contract for ASDP -> "Frood" SCHNEIDER, MICH
 - Monty Porter - PSD MIS: I'm interested in the govt reference model
 - Frank Salvatore: I will sign up to be a reviewer of the concept map.
 - Mike Guba to support GRA/GRM development
 - Frank Salvatore: There is a digital engineering measurement framework
 - Keith Siders: AFLCMC/EZSI, working to get AF legal/contract support
- Actions:
 - Frank: can you get us a copy of the Skyscr model?
 - Ed Moshinsky: provide MOSA Implementation Guide
 - Ed Moshinsky: provide NDIA Arch MOSA Metrics from Steve Henry
 - Get SATCOM RM
- Acquire existing Arch models to build upon (NAVAIR, AF MBSE, AFC, SATCOM...) who can get these for us?



Topic ID#	WG Name	Leader(s)	Description
T1/2 Landscape Assessment & Lessons Learned	Research	@Rae Anderson	Identify Existing activities and organizations associated with T3
T3 Domain Model	Design	Laura Hart Matthew Hause	Capture the core high-level concepts, definitions, relationships, and a Metamodel
T4 UC Development	Design	@Rae Anderson	Identify and define major MBAcq Use Case set
T5 Digital Eng Env	Implement		Examine the special considerations for addressing the Digital Engineering support the larger strategic goals expected from Digital Engineering address DEE requirements/specificity in a MBAcq context. Develop the enabling system and a lighter version of requirements. Develop
T6 Lang Arch	Design	Gene Sherve	Define the implementation of the ACQ DMM for inclusion into

MB Acquisition Summary

- MBSE can be inserted earlier in the acquisition lifecycle to facilitate agile response to change during the acquisition lifecycle and beyond.
- Government enterprises can respond to opportunities and risks grounded in well-formed models based on data driven decisions
- Formalize the development, integration, and use of models to inform enterprise and program decision making.
- Existing processes will need to be examined to determine where and how MBE/MBSE can be inserted, adopted and improved.
- Prototype processes to determine which work best, find issues, and socialize results.
- Stable mature patterns can be incorporated into existing standards/frameworks such as UAF, SysML
- New patterns can be considered as an independent standards

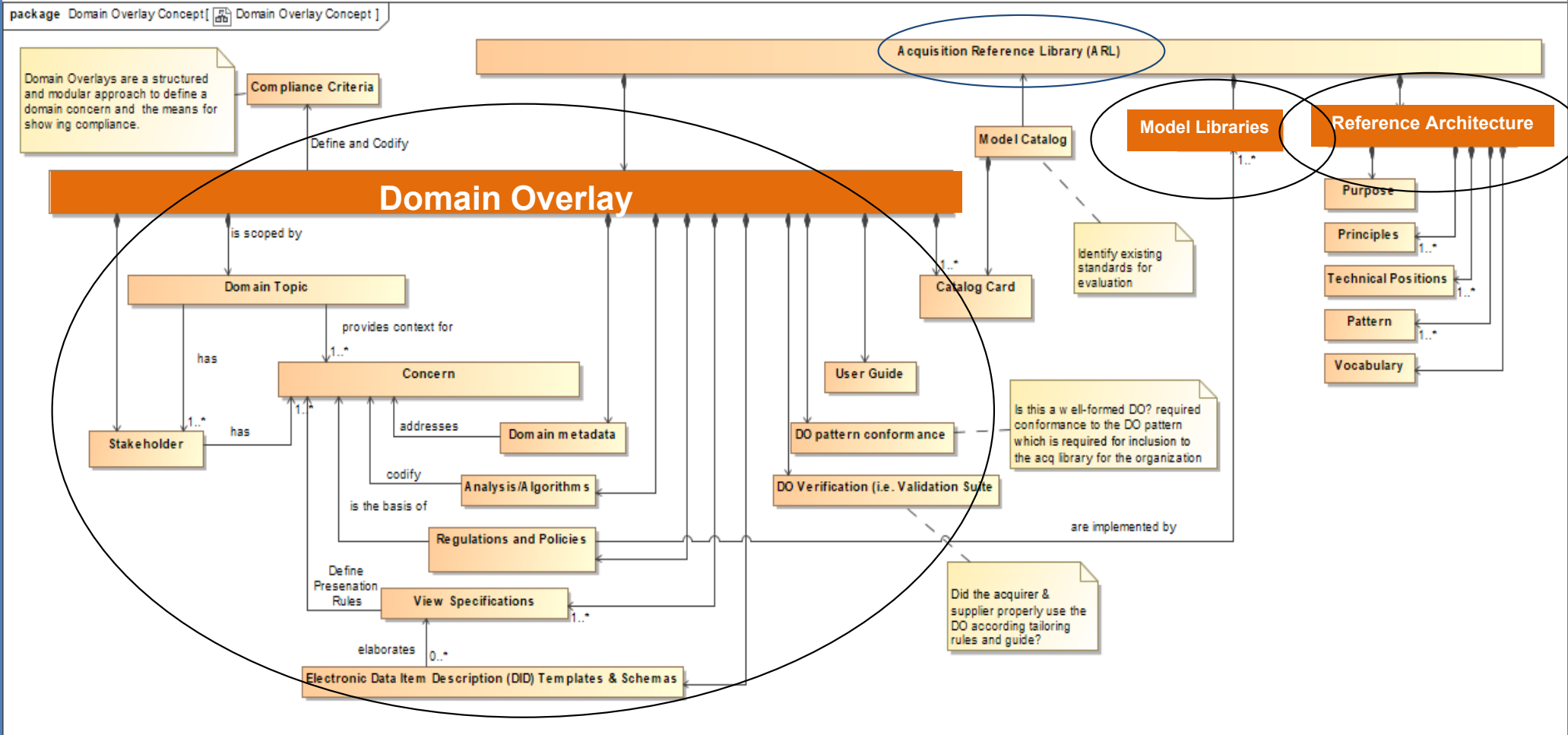
MBAcq is not just a Proposal Packaging Choice. It's about applying Effective SE practices!

Focus on Solutions Instead of Reinventing Modeling and Process!

Moving towards "Born Digital"

Reusable Assets and Model Curation

Standardized Concepts for Reusable Content



Modeling Concerns as Requirements: Another Example

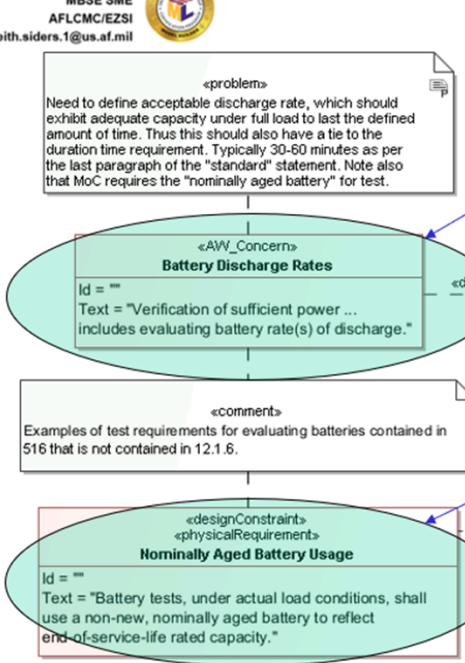
EXAMPLE OF MODEL LIBRARY CONTENT CREATION



Modeling AW Concerns – 12.1.1 Power Quantity

AFLCMC... Providing the Warfighter's Edge

Keith Siders
MBSE SME
AFLCMC/EZSI
keith.siders.1@us.af.mil



`<<requirements>>`
`<<AWC>>`
Power Quantity
criterion = "Verify that sufficient power is available to meet the power requirements during all modes of operation, mission profiles, failure conditions and malfunction recovery procedures. Verification of sufficient power requires consideration of all sources, and includes evaluating battery rate(s) of discharge."
Id = "12.1.1"
method_of_compliance = "The Electrical Loads Analysis properly documents the power requirements and conditions anticipated on the aircraft. Qualification, simulator, ground and flight tests verify that adequate power is available for all operating conditions. Failure conditions are analyzed in the Failure Modes, Effects and Criticality Analysis (FMECA). Analysis of the architecture verifies sufficient electrical flow paths for normal and abnormal conditions.
Analysis of Electrical Loads Analysis substantiates the ability of the backup system components to power required equipment and systems. System tests are successfully performed, including battery tests under actual load conditions using a non-new, nominally aged battery to reflect end-of-service-life rated capacity."
references = "For guidance/principles regarding design and operation of safe electrical generation systems:
JSSG-2009: H.3.4.8, H.4.4.8, H.3.4.8.4, H.4.4.8.4.
MIL-HDBK-454
MIL-STD-464
MIL-PRF-21480
AFGS-87219
ADS-51-HDBK: Chapter/Section 8-7
For guidance/principles regarding/affecting the integrated design and operation of backup power within aircraft electrical systems:
JSSG-2009: H.3.4.8, H.4.4.8, H.3.4.8.5, H.4.4.8.5.
MIL-E-7016
AFGS-87219
14 CFR 23.1351-23.1367, 25.1351-25.1363."
standard = "Electrical load demand for each mission requirement is defined both without and with critical failures. Power supply capacity exceeds load demand for all operating conditions, including transient and probable failure conditions to include multiple power source failures for all combinations of failure conditions.
In the event of a complete loss of the primary electrical power generation system, battery

`<<performanceRequirement>>`
JSSG-2009-8 Electrical Power Subsystem: Requirements::3.4.8 Electrical Power Subsystem: 3.4.8.2 Capacity
Id = "3.4.8.2"
Text = "The electrical power subsystem shall provide electrical power in sufficient quantity for all modes of vehicle operation and additional capacity for growth loads as follows: (TBS)
In addition, the capacity for generating, conversion, emergency and starting equipment shall be defined separately."

`<<extendedRequirement>>`
JSSG-2009-8 Electrical Power Subsystem: Requirements::3.4.8 Electrical Power Subsystem: 3.4.8.6 Uninterruptible Power: Flight-Critical Power
Id = "3.4.8.6.1"
Text = "The electrical power subsystem shall provide uninterruptible power in sufficient quantity for continuous operation of all fly-by-wire flight controls and other flight critical loads that require continuous power to maintain control of the air vehicle."

`<<AW_Concern>>`
Sufficient Source Power Quantity
Id = "21"
Text = "Sufficient source power quantity"

Recurring Issue: Poor separation of concerns = poor architectural abstraction



Airworthiness Domain Overlay

EXAMPLE OF STANDARDS ALIGNMENT

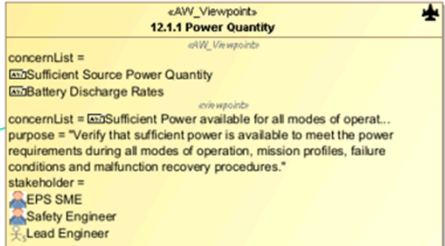
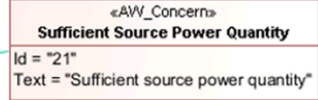
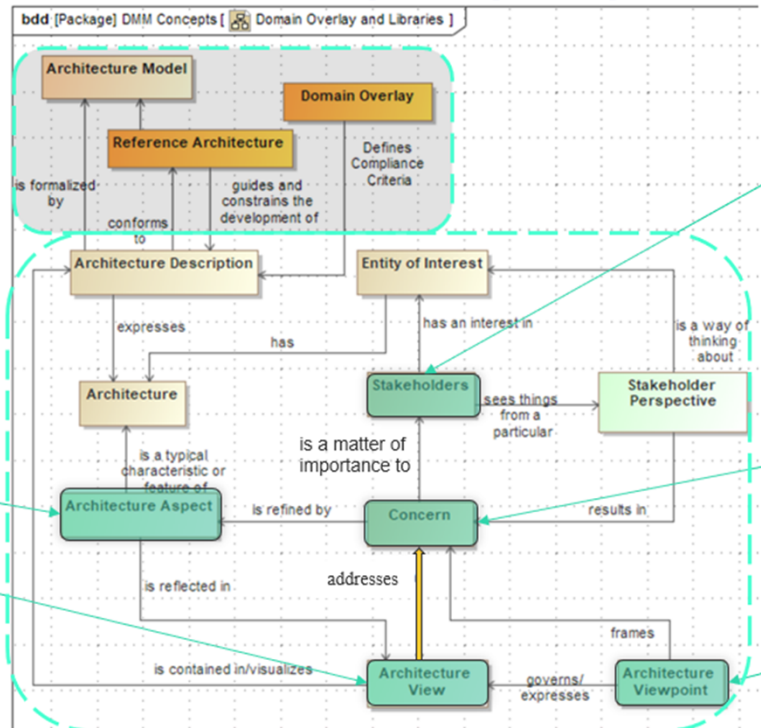
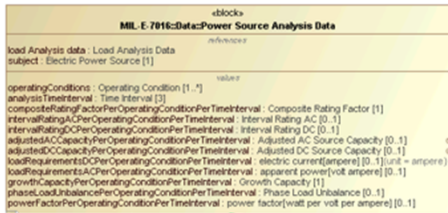


ISO 42010 Alignment

AFLCMC... Providing the Warfighter's Edge

MBSE Support for Airworthiness V3.0 Leveraging Domain Overlays

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Airworthiness Domain Overlay

PROVIDING CLARIFICATION



Tracing Concerns to Criteria via DeriveReq

AFI CMC Providing the Warfighter's Edge

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Legend

- DeriveReq
- DeriveReq (Implied)

Legend	Section 12 Viewpoint Concerns	Section 12.1 Power Generation Viewpoint Concerns
12 Electrical System Typical Certification Source Data		
Requirements		
3.4.8 3.4.8 Electrical Power Subsystem		
3.4.8.1 3.4.8.1 Electrical Power Characteristics		
3.4.8.2 3.4.8.2 Capacity	3	3 3
3.4.8.3 3.4.8.3 External Ground Power Compatibility		
3.4.8.4 3.4.8.4 Power Distribution		
3.4.8.5 3.4.8.5 Control and Protection		
3.4.8.6 3.4.8.6 Uninterruptible Power	3	3
3.4.8.6.1 3.4.8.6.1 Flight-Critical Power	4	4 4
3.4.8.6.2 3.4.8.6.2 Continuous Operation	1	1
3.4.8.6.3 3.4.8.6.3 Fully Active		
3.4.8.6.4 3.4.8.6.4 Allowable Fault Level		
3.4.8.7 3.4.8.7 Emergency Power Sources		
3.4.8.8 3.4.8.8 Auxiliary Power		
3.4.8.9 3.4.8.9 Power Stability		

Model/Asset Reuse: The Problem

So, we need to share, search for, find (hopefully), reuse, publish, update, notify, etc.:

- Models
- Model Libraries
- Reference Architectures
- Components
- Interfaces
- Types
- Patterns
- Keywords
- Solution Elements
- Etc.

What is the solution to this?

Model Curation

“If we build it, they will come.” *Field of Dreams*

- However, “they” need to know that “it” exists.

For a library to be of any use, people need to know where it is, be able to enter it, search through a catalog system, check out the elements that they need, and suggest new items to be added.

Regarding model reuse, most organizations have a hidden library that few people know about, with no doors, card catalogue or search capability, where you can't check out or add any objects. We need a solution for model curation.

Model Curation – The Status Quo

Wu et al (2021) describes a maturity assessment of Systems Engineering reusable assets to facilitate MBSE adoption, basically a Capability Maturity Model (CMM) for model and asset reuse.

Hause (2014), defines how the OMG Reusable Asset Specification (RAS) was used to build an asset library to harvest, curate, and share SysML model assets to promote and enable model asset reuse.

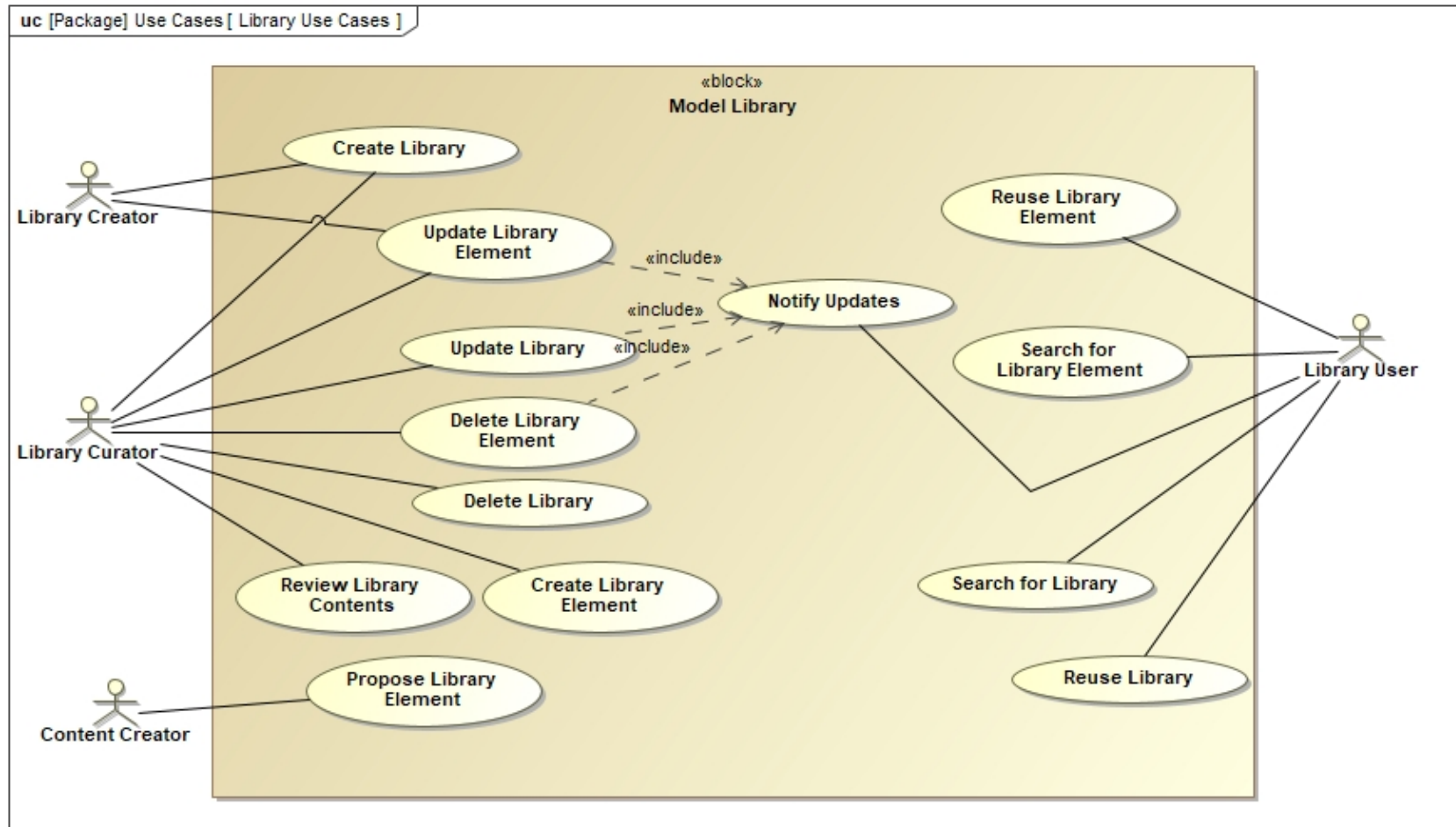
The OMG RAS was published in 2005 and provides a means of categorizing assets for reuse.

- The PTC Asset Library is the only implementation the authors are aware of that is still in use. It does not provide a complete curation solution.
- Other Solutions?

A Few Requirements – NOT A COMPLETE LIST!!

- Standard API – Extended SysML v2 API?
- Multiple libraries with access control
- Permissions at multiple levels - Library, Element, etc.
- Role-based permissions – Curator, user, creator, owner, etc.
- Configuration management of libraries, elements, patterns, ref architectures, etc.
- Search capabilities using keywords, types, purpose, domain, etc.
- Support for Vendor independent/dependent data formats
- Support for UML, SysML, UAF, etc.
- Support for non-UML tools (future?)
- Local, Department, Enterprise, Global, etc. hosted libraries
- Black box & White box sharing
- Interest registration
- Update notifications
- Global element ID's – the same component in multiple models has the same ID
- Etc.

A Few Model Library Use Cases – NOT A COMPLETE LIST!!



Approved for Public Release



Questions?

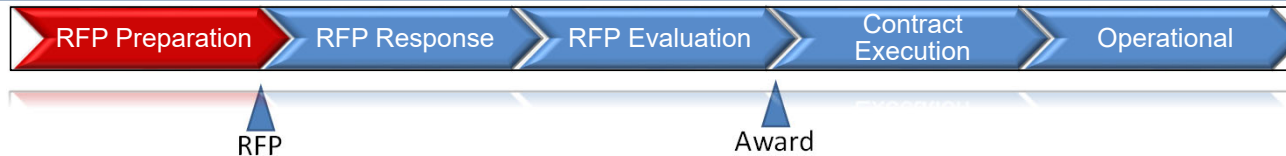
Approved for Public Release



Backup



MBACQ: RFP PREPARATION AND PLANNING



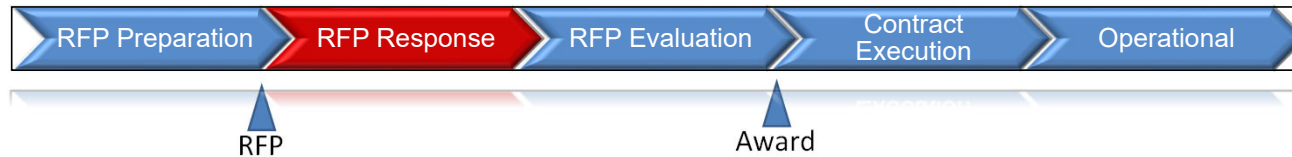
During RFP Preparation and Planning phase, the acquirer (**GOV**) can use **MBAcq** process to:

- Get a clear understanding of the system being acquired through the creation of the Objective Arch Description (OAD) addressing:
 - Operational context, capabilities, requirements, constraints...
- Determine what information will be needed for evaluation & validation of a supplier response such as:
 - MOSA, Certification properties, Data Rights, KPPs
- Determine and codify the supplier instructions expected for a model based response in the Arch Evaluation Criteria (AEC)
 - Use of gov furnished profiles (Domain Overlays), and supplier guidance
- Determine any implications to contract language (i.e. Tagging a component with certain data rights)
- Communicate the RFP content unambiguously to the supplier with a precise RFP Model (handoff or collaboratively)

Identify what is needed, know where to find it, how to use it and how to evaluate it!



MBACQ: RFP RESPONSE BY SUPPLIERS



During the RFP Supplier Response phase, the **supplier** will use the **MBAcq** process to:

- Get a clear understanding of the system being acquired within the operational environment context
- Respond to the RFP with supplier value added approach supporting analysis
- Get a clear understanding of expected modeling response using the provided Arch Evaluation Criteria (AEC)
- Utilize built-in self evaluation methods to support compliance

Focus is on Response and less on process mechanics



MODULAR OPEN SYSTEMS APPROACH (MOSA) EVALUATION

The screenshot shows the RFP Builder interface with the MOSA menu open. The MOSA menu options are: Open MOSA Documentation, Open MOSA Spreadsheet, Import MOSA, and Grade. The main window displays a table of evaluation criteria and a 3x3 matrix chart.

Name	Business - Data Rights - Openness	Technical Openness	System Criticality - Weight
Sub-System A - Alternative	3-Unlimited Data Rights Available with no IP claims	3-Commercial or DoD Standard	3
Sub-System B	1-Proprietary Interface / Negotiated Data Rights	2-Fully Disclosed, Well Defined	1
Sub-System C	3-Unlimited Data Rights Available with no IP claims	2-Fully Disclosed, Well Defined	1
Sub-System D	3-Unlimited Data Rights Available with no IP claims	2-Fully Disclosed, Well Defined	2
Sub-System E	2-Gov Purpose Data Rights Available	3-Commercial or DoD Standard	1

MOSA Documentation
 "The Department of Defense's (DoD) modular" open systems approach (MOSA) is to design systems with highly cohesive, loosely coupled, and severable modules that can be competed separately and acquired from independent vendors. This approach allows the Department to acquire warfighting capabilities, including systems, subsystems, software components, and services, with more flexibility and competition. MOSA implies the use of modular open systems architecture, a structure in which system interfaces share common, widely accepted standards, with which conformance can be verified" - http://www.acq.osd.mil/se/initiatives/init_mosa.html

MOSA Scoring

Business (Data Rights) Openness

- 0 - Proprietary interface/no data rights
- 1 - Proprietary interface/negotiated data rights
- 2 - Gov purpose data rights available
- 3 - Unlimited data rights available with no IP claims

Technical Openness:

- 0 - Undisclosed Proprietary
- 1 - Proprietary with documented API
- 2 - Fully Disclosed, well defined
- 3 - Commercial or DoD standard

MOSA Benefits

DoD seeks five primary benefits of MOSA:

1. Enhance competition – open architecture with severable modules, allowing components to be openly competed.
2. Facilitate technology refresh – delivery of new capabilities or replacement technology without changing all components in the entire system.
3. Incorporate innovation – operational flexibility to configure and reconfigure available assets to meet rapidly changing operational requirements.
4. Enable cost savings/cost avoidance – reuse of technology, modules, and/or components from any supplier across the acquisition life cycle.
5. Improve interoperability – severable software and hardware modules to be changed independently.

The matrix chart shows a 3x3 grid with 'Data Rights' on the vertical axis and 'Technical' on the horizontal axis. A 'Target Area' is highlighted in the center (2,2). Below the chart, the MOSAGrade is calculated as: Business Avg = 1.875, Technical Avg = 1.75.

[Modular Open Systems Approach](#)
[NDIA Paper July 1, 2020](#)



MBACQ: EVALUATION (SUPPLIER/GOV)



During RFP Evaluation phase, the **Supplier & GOV** can use **MBAcq** process to:

- Assist the evaluation process for compliance and scoring using built in evaluation criteria
- Assist in the assessment of key concerns such as MOSA, Security, survivability though the use of Domain Overlays(DOs) provided in the Arch Evaluation Criteria (AEC)
- Capture scoring and rational with standard metrics for future evidence

Grading Rubrics and Scoring are captured in the Model



EVALUATION CRITERIA ARE REPRESENTED AS MODEL ELEMENTS AND GRADED

The screenshot displays a software interface for managing evaluation criteria. At the top, a menu is open with 'Grade' selected. Below the menu is a table of evaluation criteria. The table has columns for #, Name, Documentation, Satisfied By, Weight, Evaluator Tech Score, Evaluator Weighted Tech Score, Evaluator Risk Score, Evaluator Weighted Risk Score, Evaluator Comment, and Evaluator Grade. The table contains 5 rows of data. Below the table, a 'Grade Report' window is open, showing a 'Grading Legend' with four categories: Outstanding (blue), Good (purple), Marginal (yellow), and Unacceptable (red). Two model elements are shown in the report: a purple box for 'SelfGrade' with a grade of 'Good' and a reason, and a yellow box for 'EvaluatorGrade' with a grade of 'Marginal' and a reason.

#	Name	Documentation	Satisfied By	Weight	Evaluator Tech Score	Evaluator Weighted Tech Score	Evaluator Risk Score	Evaluator Weighted Risk Score	Evaluator Comment	Evaluator Grade
1	Technical Approach	Top level Technical Approach criteria								
2	SE and Integration	Systems Engineering ...	Resource Connectivity	3	3	9.0	5	15.0	Great!	Strength
3	Program Execution	Program Execution documentation	Projects	2	3	6.0	2	4.0	Missing X,Y and Z	Weakness
4	OTTB		Security	1	2	2.0	5	5.0	Like X, but need to change Y	Weakness
5	PM	Project Management...	Personal	3	2	6.0	2	6.0	Missing A, B, C	Deficiency

Filter is not applied. 6 rows are displayed in the table.

Grading Legend

- Outstanding
- Good
- Marginal
- Unacceptable

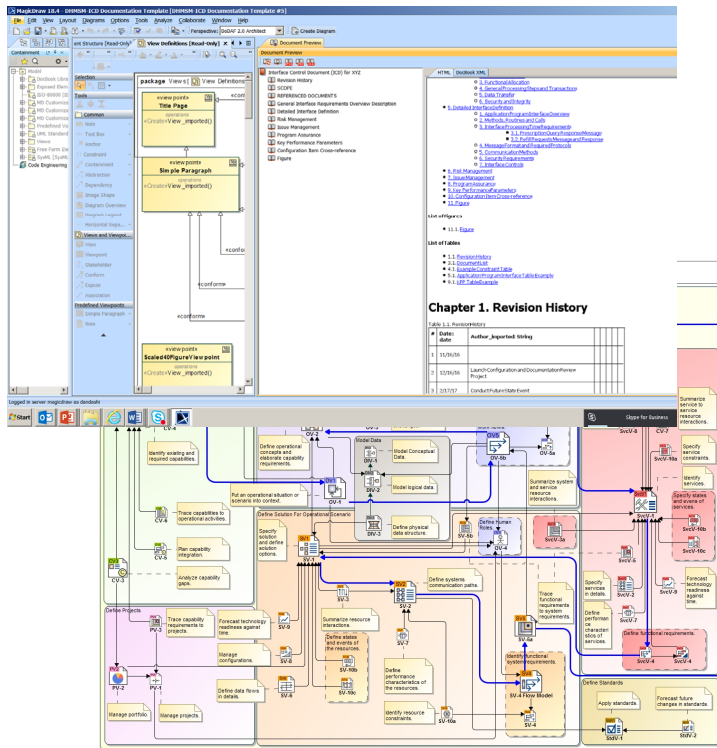
Model Elements:

- SelfGrade**
[grade = "Good",
reason = "No deficiencies and number of strengths with 2 of weaknesses"]
- EvaluatorGrade**
[grade = "Marginal",
reason = "No deficiencies and several (3) more weaknesses than strengths OR 1 deficiency and number of weaknesses within 2 of strengths"]



DOCUMENT GENERATION FROM MODEL

Define Reusable document templates (CDD, AoA Plan...)



Generate Required Documents and Reports



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(Source: Laura Hart, MITRE 2017)



DOCUMENT GENERATION

The screenshot displays a software application window titled "SEMP Documentation Template.mxd [SEMP Documentation Template #4]". The main workspace shows a hierarchical diagram of "Systems Engineering Management Plans". The diagram includes several views such as "INTRODUCTION", "OVERVIEW", "SYSTEMS ENGINEERING MANAGEMENT", "REFERENCES DOCUMENTS", "Work Descriptions", "Requirements and Constraints", "Roles and Responsibilities", "R&R Instructions", and "Example R&R". A dialog box titled "Generating DocBook file..." is open in the center of the workspace. To the right, a "Document Preview" window shows the rendered HTML output, titled "Systems Engineering Management Plans". The preview includes a table of contents with the following structure:

- 1. INTRODUCTION
 - 1.1 Overview
 - 1.2 System Description
- 2. REFERENCED DOCUMENTS
- 3. SYSTEMS ENGINEERING MANAGEMENT
 - 3.1 Work Descriptions
 - 3.1.1 Definition of Work
 - 3.1.2 Requirements and Constraints
 - 3.1.3 Roles and Responsibilities
 - 3.1.4 Interfaces
 - 3.1.5 Schedule
 - 3.2 Technical Control
 - 3.2.1 Process and Procedure
 - 3.2.2 Issue Management
 - 3.2.3 Decision Process
 - 3.2.4 Configuration Management
 - 3.2.5 Training
 - 3.3 Performance Control
 - 3.3.1 Program Approval
 - 3.3.2 Technical Performance Measurement
 - 3.3.3 Risk Management
 - 3.4 Program and Design Reviews
 - 3.4.1 Review Process
 - 3.4.2 Review Schedule
- 4. SYSTEMS ENGINEERING PROCESS
 - 4.1 System Requirements
 - 4.2 Conceptual and Detail Design
 - 4.3 Development
 - 4.4 Test Plan



GENERATED DOCUMENT CONTENT

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1. INTRODUCTION

1.1. Overview

Describe the purpose and scope of the SEMP.

1.2. System Description

At a high level, describe the system to be created, to include the entire system

lifecycle from concept to disassembly/retirement.



Figure 1.1. Lifecycle Example



MBACQ: CONTRACT EXECUTION



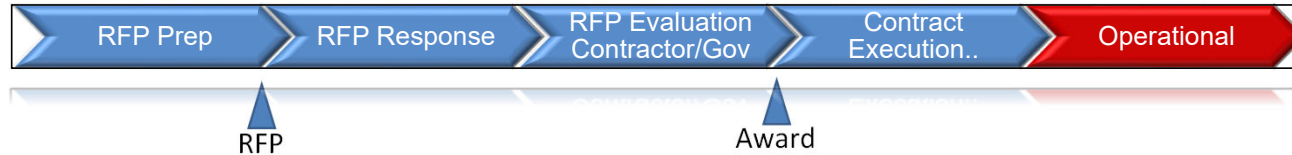
During the RFP Contract Execution phase, the **GOV** will use the **MBAcq** process and evolving model(s) to:

- Collaboration with suppliers
- Monitor progress, maturity
- Assess change impact and manage risks

The evolving model is a source of collaboration



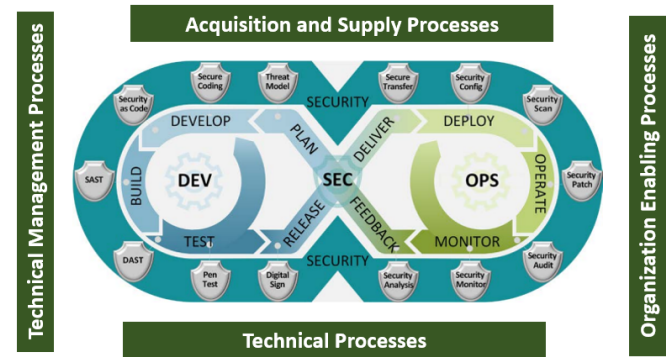
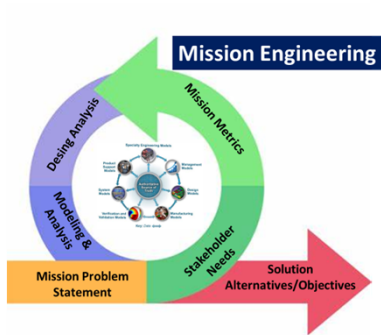
MBACQ: OPERATIONAL SYSTEM



During the Operational phase, the **GOV** and **supplier** will use the matured evolving set of models to:

- Support knowledge management and training
- Assess change impact and manage risks
- Provide the foundation for a digital twin

Living Knowledge Repository Supporting Data-driven decisions



Program MOSA Transformation

Information Needs and Metrics

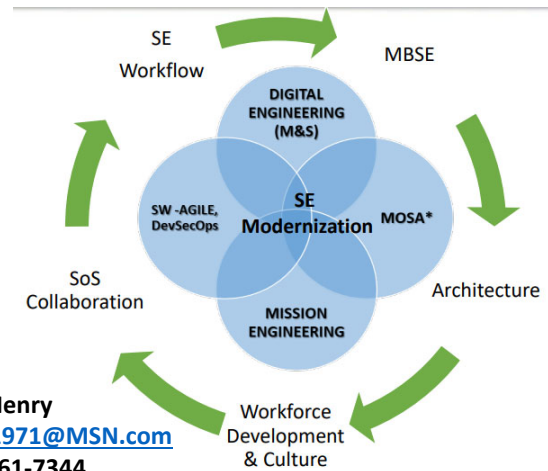
Measuring MOSA Implementation and MOSA Product Value/Success

“What” is needed

Policy to Practice

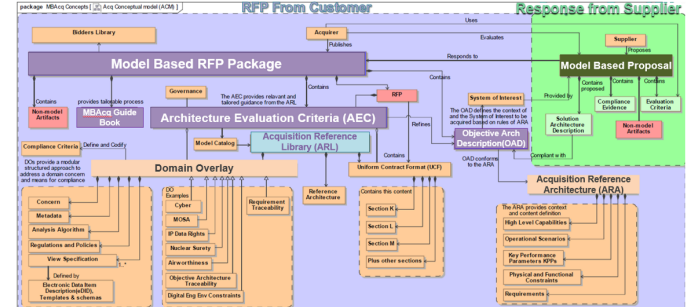
“How” to implement

OMG Model Based Acquisition (MBAcq)



MBAcq Future State

Bringing it all together!



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