

OBJECT MANAGEMENT GROUP®

Technology update on the Unified Architecture Framework (UAF)

Matthew Hause, SSI/INCOSE



Presenter

Matthew Hause

Principal @ Systems Strategy Inc.



- 45 years in Enterprise Architectures, Software and Systems Engineering
- UAF chairman in OMG, member of INCOSE
- Author of over 100 technical papers and presentations
- 20 years experience in SCADA, Energy management, Process Control
- 25 years experience with MBSE, Enterprise Architecture, Software
- Project experience in multiple diverse domains
- Presentations, consulting, training, on 6 continents.



- Brief Introduction to UAF
- What's new in UAF v1.2
- UAF Roadmap



UAF Updates and Resources

- OMG UAF Summit Actionable Architecture
 - https://www.linkedin.com/feed/update/urn:li:activity:6917453115994632192
 - https://lnkd.in/guNa8VdQ



- UAF is now approved as international ISO standard
 - https://www.iso.org/standard/65314.html
 - https://www.iso.org/standard/65315.html



ISO/IEC 19540-1:2022

Information technology — Object Management Group
Unified Architecture Framework (OMG UAF) — Part 1:
Domain Metamodel (DMM)

Information technology — Object M
Unified Architecture Framework (OMG UAF)



Information technology — Object Management Group Unified Architecture Framework (OMG UAF) — Part 2: Unified Architecture Framework Profile (UAFP)

- UAF 1.2 Approved 3/31/2022
 - https://www.omg.org/techprocess/meetings/schedule/UAF 1 3.html#Base Document(s)
- Relevant documents:

```
dtc/21-12-16 (UAF 1.2 --- Model File, ancillary)
dtc/21-12-15 (UAF 1.2 - XMI Measurements library)
dtc/21-12-14 (UAF 1.2 - XMI file)
dtc/21-12-13 (UAF 1.2 - Appendix C)
dtc/21-12-10 (UAF 1.2 - Appendix B)
dtc/21-12-10 (UAF 1.2 - Appendix A clean)
dtc/21-12-07 (UAF 1.2 Modeling Language (UAFML) clean)
```



UAF is a Standard...

- To develop architectural descriptions in commercial industries, federal governments and military organizations
- Has many different use cases from Enterprise as a System to SoS and Cyber-Systems engineering or enabler for Digital Transformation planning
- Developed by Object Management Group (OMG) with the leadership from Dassault Systemes, Lockheed Martin, and SSI/INCOSE.
- Is an international ISO standard ISO/IEC 19540:1 and ISO/IEC 19540:2
- Current version of UAF specification is 1.1 https://www.omg.org/spec/UAF/1.1/About-UAF/
- UAF version 1.2 to be officially published this month



Members of the UAF Group

Tool vendors:

- Dassault Systemes
- IBM
- KDM
- MEGA
- Orbus Software
- PTC
- Sparx Systems
- Tom Sawyer

Contributors:

- Airbus
- Aerospace Corporation
- BAE Systems
- Boeing
- Department of Navy (US)
- Lockheed Martin
- MITRE
- Northrop Grumman
- Rolls-Royce Corporation
- Syntell
- Thales
- INCOSE and GfSE

Leadership



Laura E. Hart



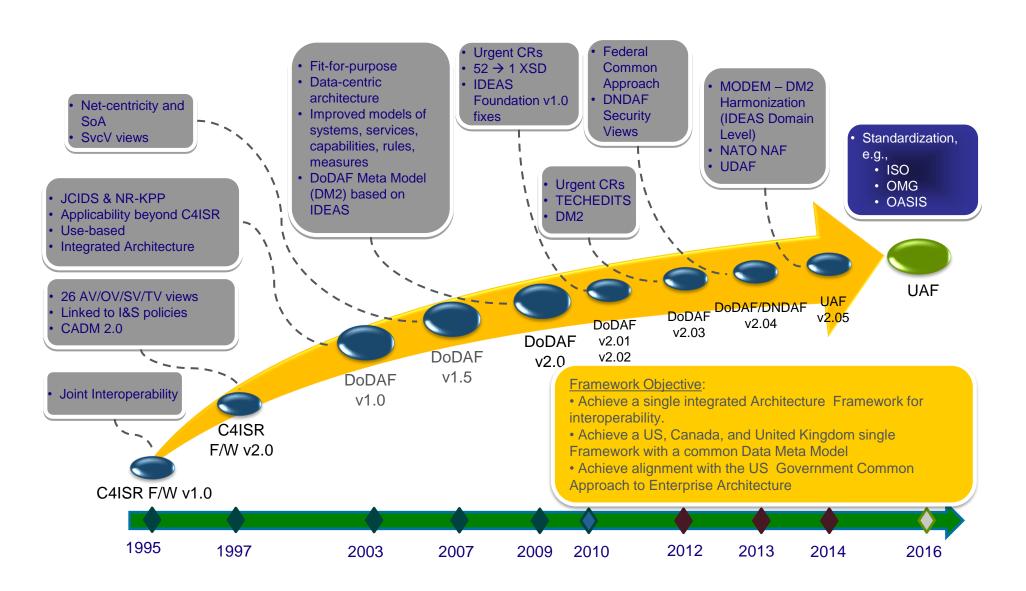
Dr. Aurelijus Morkevicius



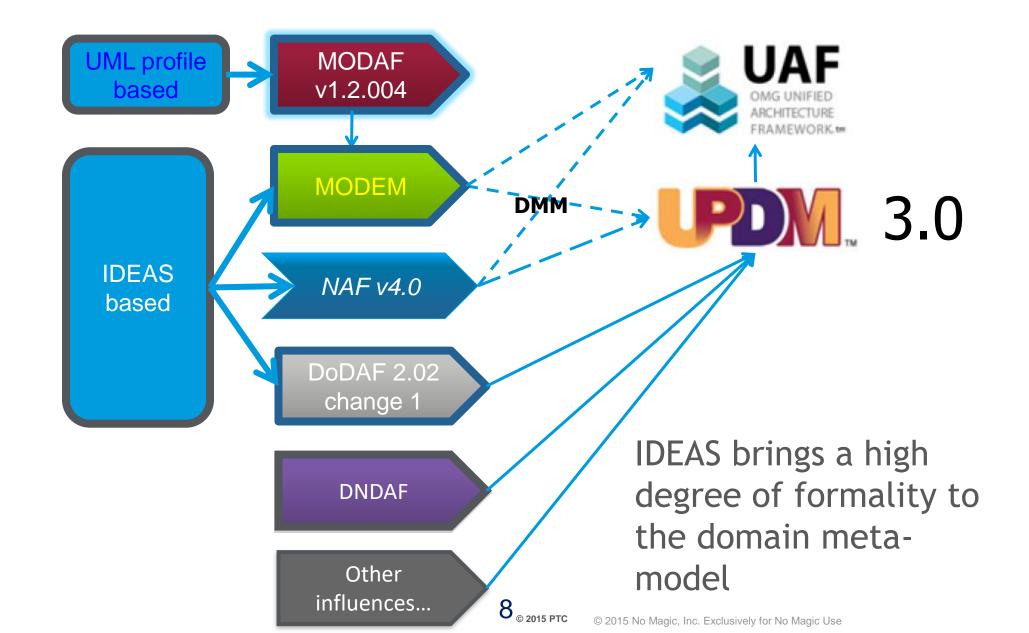
Matthew Hause

Unified Direction of USG and NATO Achieving Strategic Goals and Capability











Why Use Frameworks?

Frameworks such as Unified Architecture Framework (UAF):

- •Supports semantic interoperability through the use of a common vocabulary enabling:
 - Portfolio and capability management
 - SoS Operational planning, Mission Engineering and Acquisition
- •UAF is methodology-agnostic (structured, OO, etc.)
- •Extends UPDM with additional architectural dimensions: Security, Personnel, Requirements, Analysis, Simulation with full cross-cutting Traceability using a common semantic vocabulary



Architecture Framework: Conventions, principles and practices for the description of architectures established within a specific domain of applications and/or community of stakeholders. ISO/IEC/IEEE 42010:2011

UAF Specification Explained

The grid is a graphical way of organizing the various view specifications (cells), using viewpoints (prev. known as domains) (horizontal rows) and aspects (prev. known as model kinds) (the columns).



EA Guide

Size 1 Comment Comment

The UAF Enterprise
Architecture Guide (EAG)
provides guidance on how
to use the UAFML to model
an architecture.

View Specifications organized in Viewpoints and Aspects (Grid)



UAF Domain MetaModel (DMM)



UAF Modeling Language (UAFML) based on SysML



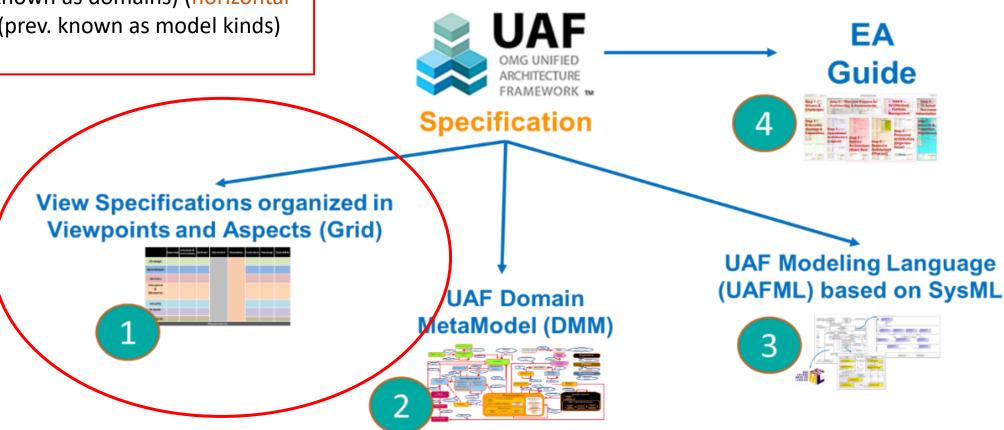
The UAF Modeling Language (UAFML) is a UML/SysML specification for implementing the UAF DMM

The UAF Domain Metamodel (DMM) establishes the underlying foundational modeling constructs to be used in modeling an enterprise and major entities within the enterprise. It provides the definition of concepts, relationships and viewpoints for the framework. The UAF DMM is the basis for any implementation of UAF including non-UML/SysML implementations.



1 The Grid

The grid is a graphical way of organizing the various view specifications (cells), using viewpoints (prev. known as domains) (horizontal rows) and aspects (prev. known as model kinds) (the columns).



UAF Grid

Model Kinds (aspects)

The following is the UAF grid. It specifies the different aspects across the top and the viewpoints along the side.

OAG GINTIED OAGHTECTURE FRAMEWORK TO	Motivation Mv	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Sequences Sq	Information ^c If	Parameters ^d Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Architecture Management ^a Am	Architecture Principles Am-Mv	Architecture Extensions Am-Tx ^e	Architecture Views Am-Sr	Architecture References Am-Cn	Architecture Development Method Am-Pr	Architecture Status Am-St		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		Strategic Constrain St-Ct	Strategic Deployment, St-Rm-D Strategic Phasing St-Rm-P	Strategic Traceability St-Tr
Operational Op		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 Constraints Op-Ct		Operational Traceability Op-Tr
Services Sv		Services Taxonomy Sv-Tx	Services Structure Sv-Sr	^s View S	pecifica	ations" ^{tes}	Services Sequences Sv-Sq	Operational Information	Soviessoment	Services Constraint Sv-Ct	s Services Roadmap Sv-Rm	Services Traceability Sv-Tr
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	Perso Abad Configuration : Yacht	Emergency Towing Interface Assistance Request C Radio Instruction		Competence, Driver Performance Ps-Ct	Personnel Availabilit Ps-Rm-A s, Personnel Evolutior PS-Rm-E Personnel Forecast Ps-Rm-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	Reso Alleanne Compon Comm Device : Voic Transmitor Receive	Emergency Towing Interface	Persons Componers		Resources evolution Rs-Rm-E Resources forecast Rs-Rm-F	Resources Traceability
Security Sc	Security Controls Sc-Mv	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr		Transmitter Receive Medical Advice Intert Message Message		Requirements Specification & Requirements Engineering & Apper & Design & Market Launch Plan & Marketing & Comment & Design Chap & Lot & Development & Development & A	centring Operational Performer Design Design Specify Requirements Modular Development Design Marketing Decision Group	Consuming Operational Activity Confidentially © Identify Functional Prototope Confidential © Develop Module Confidential © Launch Product © Evaluate Product © Manufacture Product © Confidential	Security Traceability Sc-Tr
Projects Pj		Projects Taxonomy Pj-Tx	Projects Structure Pj-Sr	Projects Connectivity Pj-Cn	Projects Processes Pj-Pr		Receiver Transmit	7 OE4	cope & Concepts & RAD & Status statuse & Design & Design ea & Decision Crosp & Decision Crosp	Decision Group Design Create Prototype Standard Venezity Functional Prototype R&D Design About Standard Venezity Functional Prototype	↑ Evaluare Scope & Concepts Confidential Tap Review Prototype ↑ Create Prototype ↑ Develop Scope & Concepts ↑ Confidential	Projects Traceability Pj-Tr
Standards Sd		Standards Taxonomy Sd-Tx	Standards Structure Sd-Sr				effesoure Congo Comm Device : Voi	12 0E2	Routements Flaw & Quality Assurance & Seign Flaw & Quality Assurance & Constitution Flam & Quality England Flam & Constitution	Modular Devisipment Requirements Engineering Regard Flaw Chestip Regard Flaw Chestip Regard Flaw Chestip Regard Flaw Chestip Send Feedback Chestip C	© Devisio Models © Seedis Requirements © Internit's Nuclional Prototogie © Internit's Nuclional Prototogie © Preform Quality Obods © Devisio Models © Seedis Requirements © Seedis Requirements © Seedis Requirements © Seedis Requirements	Standards Traceability Sd-Tr
Actual Resources Ar			Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn		Simulation ^b		20 GEIS □ □ M		Parametric Execution/ Evaluation	Confidential	

UAF OMC UNITED ARCHITECTURE FRAMEWORK.**	Motivation Mv	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Sequences Sq	Information ^c If	Parameters ^d Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Architecture Management ^a Am	Architecture Principles Am-Mv	Architecture Extensions Am-Tx ^e	Architecture Views Am-Sr	Architecture References Am-Cn	Architecture Development Method Am-Pr	Architecture Status Am-St		Dictionary Am-If	Architecture Parameters Am-Pm	Architecture Constraints Am-Ct	Architecture Roadmap Am-Rm	Architecture Traceability Am-Tr
					Sum	mary & Overview Sr	n-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		Strategic Constraints St-Ct	Strategic Deployment, St-Rm-D Strategic Phasing St-Rm-P	Strategic Traceability St-Tr
Operational Op		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 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	Operational Information Op-If	Environment En-Pm-E and Measurements Me-Pm-M	Services Constraints Sv-Ct	Services Roadmap Sv-Rm	Services Traceability Sv-Tr
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		and Measurements Me-Pm-M	Competence, Drivers, Performance Ps-Ct	Personnel Availabilit Ps-Rm-A Personnel Evolution PS-Rm-E Personnel Forecast Ps-Rm-F
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	Information	and Risks Rk-Pm-R	Resources Constraints Rs-Ct	Resources evolution Rs-Rm-E Resources forecast Rs-Rm-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					Security Constraints Sc-Ct		Security Traceability Sc-Tr
Projects Pj		Projects Taxonomy Pj-Tx	Projects Structure Pj-Sr	Projects Connectivity Pj-Cn	Projects Processes Pj-Pr						Projects Roadmap Pj-Rm	Projects Traceability Pj-Tr
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 ^b				Parametric Execution/ Evaluation ^b		



Definitions of the Viewpoints (Rows)

Viewpoint	Acronym	Description
Architecture Management	Am	Identifies the metadata and views required to develop a suitable architecture that is fit for its purpose.
Strategic	St	Capability management process. Describes the capability taxonomy, composition, dependencies and evolution.
Operational	Ор	Illustrates the Logical Architecture of the enterprise. Describes the requirements, operational behavior, structure, and exchanges required to support (exhibit) capabilities. Defines all operational elements in an implementation/solution independent manner.
Services	Sv	The Service-Orientated View (SOV) is a description of services needed to directly support the operational domain as described in the Operational View. A service within MODAF is understood in its broadest sense, as a unit of work through which a provider provides a useful result to a consumer. DoDAF: The Service Views within the Services Viewpoint describe the design for service-based solutions to support operational development processes (JCIDS) and Defense Acquisition System or capability development within the Joint Capability Areas.
Personnel	Ps	Defines and explores organizational resource types. Shows the taxonomy of types of organizational resources as well as connections, interaction and growth over time.
Resources	Rs	Captures a solution architecture consisting of resources, e.g., organizational, software, artifacts, capability configurations, and natural resources that implement the operational requirements. Further design of a resource is typically detailed in SysML or UML.
Security	Sc	Security assets and security enclaves. Defines the hierarchy of security assets and asset owners, security constraints (policy, laws, and guidance) and details where they are located (security enclaves).
Projects	Pj	Describes projects and project milestones, how those projects deliver capabilities, the organizations contributing to the projects and dependencies between projects.
Standards	Sd	MODAF: Technical Standards Views are extended from the core DoDAF views to include non-technical standards such as operational doctrine, industry process standards, etc. DoDAF: The Standards Views within the Standards Viewpoint are the set of rules governing the arrangement, interaction, and interdependence of solution parts or elements.
Actual Resources	Ar	The analysis, e.g., evaluation of different alternatives, what-if, trade-offs, V&V on the actual resource configurations. Illustrates the expected or achieved actual resource configurations.



Definitions of the Aspects (Columns)

Aspect	Acronym	Description
Motivation	Mv	Captures motivational elements e.g., challenges, opportunities, and concerns, that pertain to enterprise transformation efforts, and different types of requirements, e.g., operational, services, personnel, resources, or security controls.
Taxonomy	Тх	Presents all the elements as a standalone structure. Presents all the elements as a specialization hierarchy, provides a text definition for each one and references the source of the element
Structure	Sr	Describes the breakdown of structural elements e.g., logical performers, systems, projects, etc. into their smaller parts
Connectivity	Cn	Describes the connections, relationships, and interactions between the different elements.
Processes	Pr	Captures activity based behavior and flows. It describes activities, their Inputs/Outputs, activity actions and flows between them.
States	St	Captures state-based behavior of an element. It is a graphical representation of states of a structural element and how it responds to various events and actions.
Sequences	Sq	Expresses a time ordered examination of the exchanges as a result of a particular scenario. Provides a time-ordered examination of the exchanges between participating elements as a result of a particular scenario.
Information	If	Address the information perspective on operational, service, and resource architectures. Allows analysis of an architecture's information and data definition aspect, without consideration of implementation specific issues.
Constraints	Ct	Details the measurements that set performance requirements constraining capabilities. Also defines the rules governing behavior and structure.
Roadmap	Rm	Addresses how elements in the architecture change over time.
Traceability	Tr	Describes the mapping between elements in the architecture. This can be between different viewpoints within domains as well as between domains. It can also be between structure and behaviors.



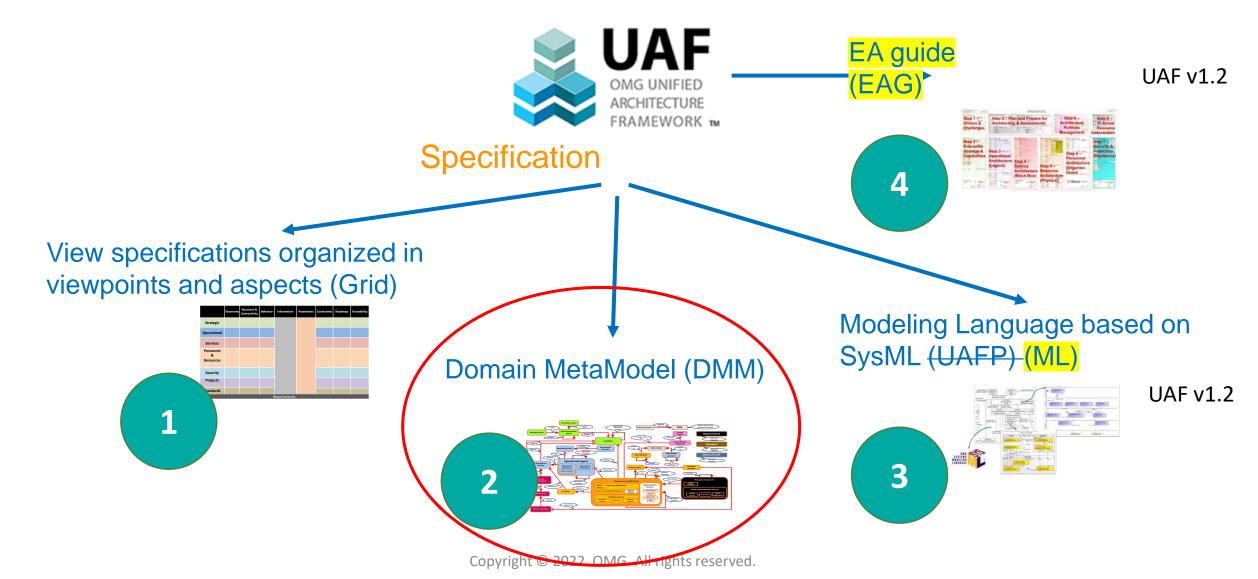
Overlay of DoDAF Views onto the UAF Grid

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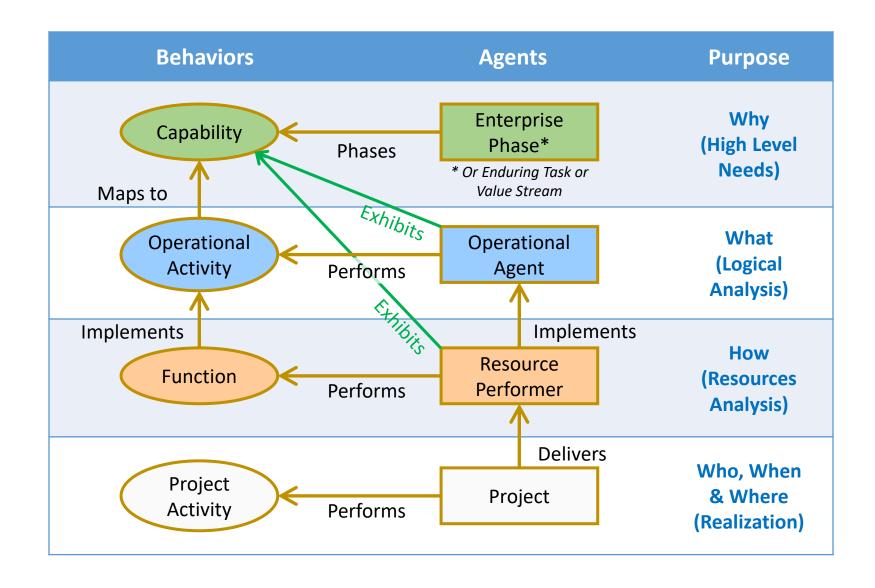
	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Interaction Scenarios Is	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Metadata Md	-		-	-	-	-			-	-	-
Strategic St	CV-2	CV-1	CV-4	-	-	-			-	CV-3 CV-5	CV-6
Operational Op	OV-2 OV-1	OV-2	OV-2 OV-3	OV-5a OV-5b	OV-6b	OV-6c	DIV-1		OV-6a		
Services Sv	SvcV-1	SvcV-1 SvcV-2	SvcV-3a SvcV-3b SvcV-6	SvcV-4	SvcV-10b	SvcV-10c	DIV-2	ScV-7	SvcV-10a	SvcV 8 SvcV-9	SvcV-5 CV-7
Personnel Pr	OV-4	OV-4	OV-4 SV-6	SV-4	SV-10b	SV-10c	DIV-3		OV-4 SV-10a SV-7	PV-2 SV-8 SV-9	SV-5a SV-5b
Resources Rs	SV-1 SV-2	SV-1 SV-2	SV-3 SV-6	SV-4	SV-10b	SV-10c		SV-7	SV-10a	SV-8 SV-9	SV-5a SV-5b
Security Sc	-	-	-	-	-	-			-	-	-
Projects Pj	PV-1	PV-1	PV-2	-		-			-	PV-2	PV-3
Standards Sd	StdV-1	StdV-1	-			-			-	StdV-2	StdV-1
Actual Resources Ar		OV-4	OV-4 SV-1 & SV-2		Simulation				Parametric Execution/Evalu ation		-
						nary Dc (AV					
				Sumr		rview SmOv Juirements -	(AV-1, OV-1)				



UAF specification at a glance



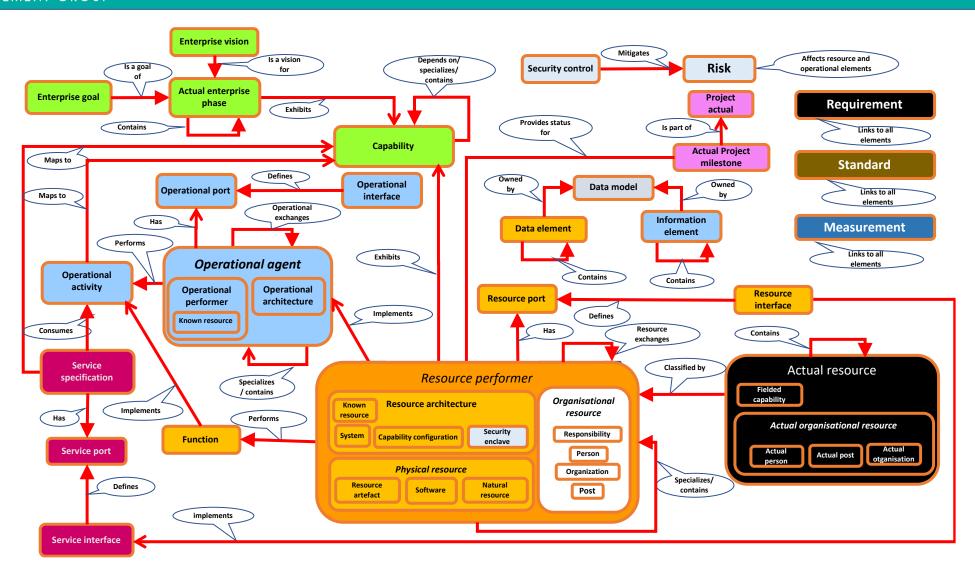
UAF Key Relationship





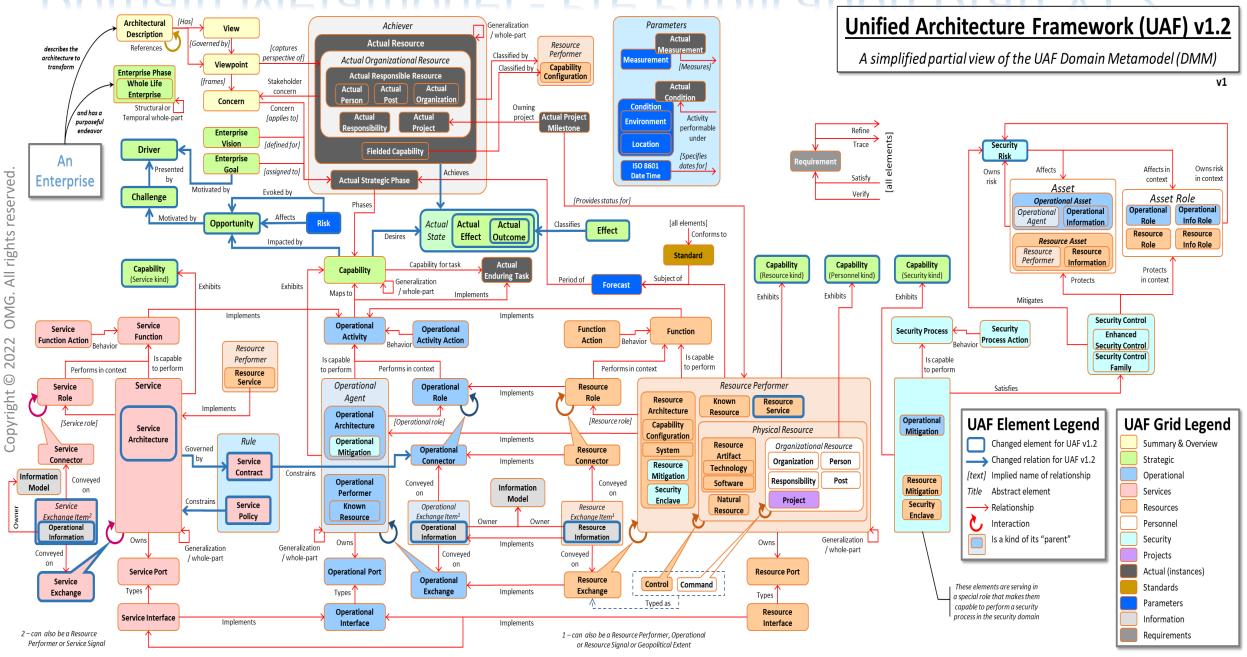
UAF Metamodel (DMM)

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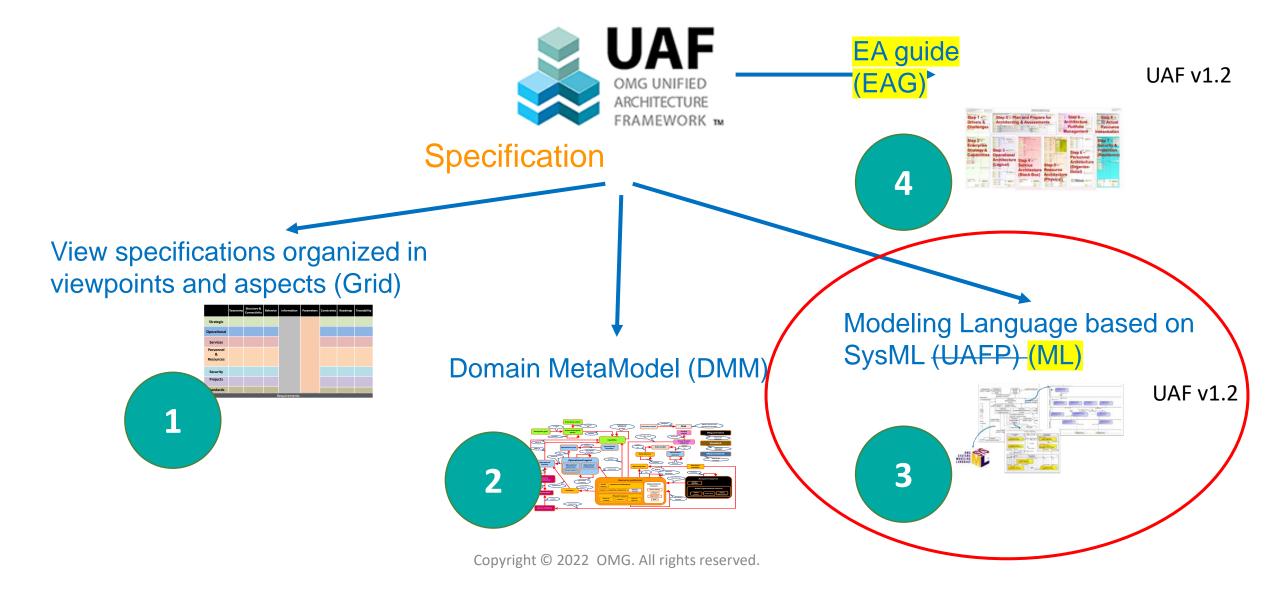
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Domain Metamodel - Pre Publication Praft v1.2





UAF specification at a glance



UAFML— Specification Excerpt

3.1.3 <u>UAF::</u>Strategic

Stakeholders: Capability Portfolio Managers. Concerns: capability management process.

Definition: describe capability taxonomy, composition, dependencies and evolution.

UAF::Strategic::Motivation

Contains the elements that contribute to the Strategic Motivation View Specification.

Challenge

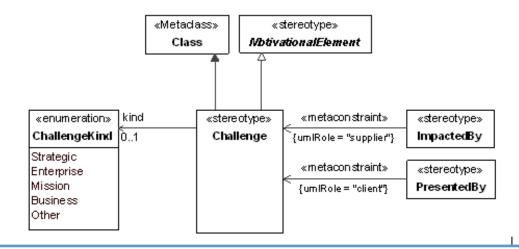
Package: Motivation

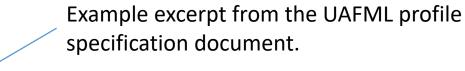
isAbstract: No

Generalization: MotivationalElement

Extension: Class Description

An existing or potential difficulty, circumstance, or obstacle which will require effort and determination from an enterprise to overcome in achieving its goals.





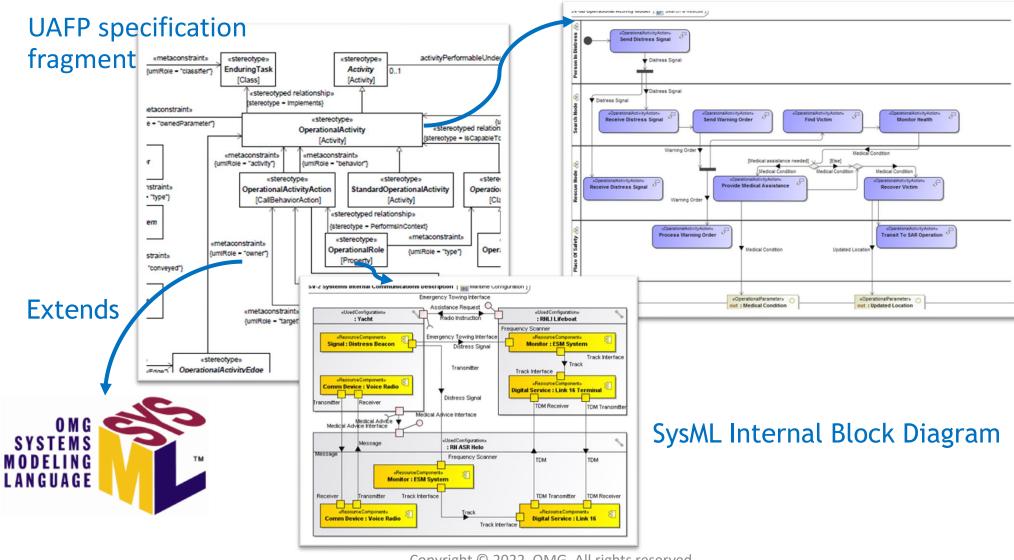
The UAF Modeling Language (UAFML) document specifies the UML/SysML implementation of the UAF DMM in terms of profiling mechanism.

This is what the tool vendors use to implement the UAF DMM within UML/SysML tools.



UAF Profile (ML) – Implementation in SysML

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UAFML— Specification Design Principles

Language Architecture

The UAFML specification reuses a subset of UML 2.5.1 and SysML 1.7 and provides additional extensions needed to address requirements in the UPDM 3.0 RFP Mandatory Requirements. Those requirements form the basis for this document. This document describes the language architecture in terms of the UML 2.5.1 and SysML 1.7 parts that are reused and the defined UML 2.5.1 extensions; and specifies how to implement UAFML. This clause explains design principles and how they are applied to define the UAFML architecture.

Core Principles

The fundamental design principles for UAFML are:

- **Requirements-driven**: UAFML is intended to satisfy the requirements of the UPDM 3.0 RFP Mandatory Requirements.
- **UAF Domain Metamodel (DMM) driven**: The DMM served as a foundation for profile development.
- **Reuse of existing specifications**: UAFML reuses UML/SysML wherever practical to satisfy the requirements of the UAFP 3.0 RFP and leverage features from both UML and SysML to provide a robust modeling capability. Consequently, UAFML is intended to be relatively easy to implement for vendors who support UML 2.x and SysML 1.x.
- Compliance levels: UAFML has a single compliance level based upon a combination of the reuse of UML and SysML elements. It is expected that the views that are created as result of this profile have frames that reflect the underlying SysML diagram type that is used as the basis for the view. It also expected that the graphical notation used to display elements within those views correspond to the standard SysML graphical notation of the SysML/UML metaclass that the stereotype extends.
- Interoperability: UAFML inherits the XMI interchange capability from UML. The UAFML specification reuses a subset of UML 2.5.1 and provides additional extensions needed to address requirements in the UPDM 3.0 RFP Mandatory Requirements.



DoD Positioning



Defense Information Standards Registry (**DISR**) record

Standard Reference Number	Standard Identifier	Standard Title	Standard Class	DoD Status
301131	OMG UPDM v2.1	Unified Profile for the Department of Defense Architecture Framework (DoDAF) and the Ministry of Defence Architecture Framework (MODAF), Version 2.1, formal/2013-08-04	DISR	Retired
302737	OMG UAFP v1.0	Unified Architecture Framework Profile (UAFP) v1.0, OMG formal/2017-12-01, November 2017 including all normative appendices.	Nover 10, 2 DISR	

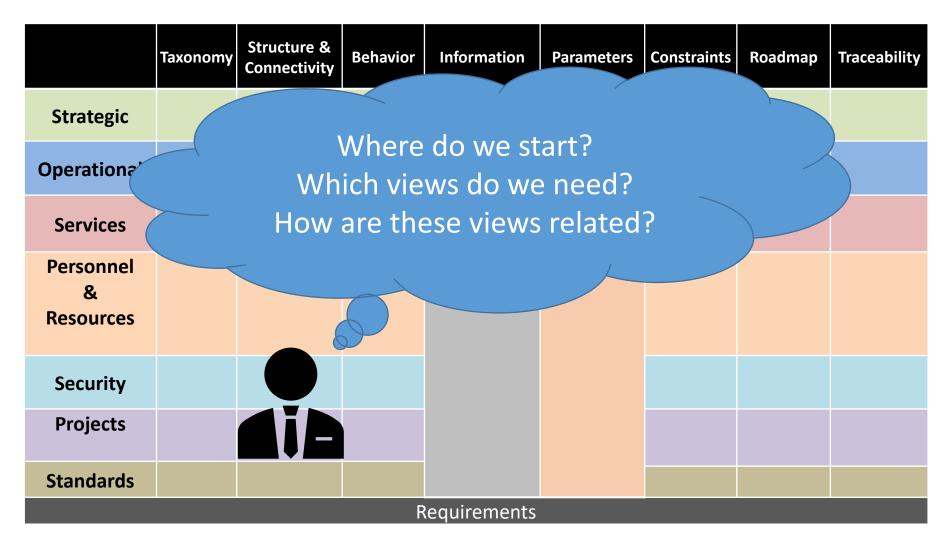


UAF specification at a glance

OBJECT MANAGEMENT GROUP® UAF **EA** guide **UAF v1.2** (EAG) ARCHITECTURE FRAMEWORK TM **Specification** View specifications organized in viewpoints and aspects (Grid) Modeling Language based on SysML (UAFP) (ML) Domain MetaModel (DMM) **UAF v1.2**



EA Guide



4



EA Guide Steps

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4



Who Uses UAF?

- 1. Aerospace Corp.
- 2. Airbus
- 3. BAE Systems
- 4. Boeing
- 5. Bundeswehr
- 6. Deloitte
- 7. DISA
- 8. DGA
- 9. Leonardo
- 10. Lockheed Martin
- 11. MITRE
- **12. NATO**

- 13. Northrop Grumman
- 14. Norwegian Air Traffic Control
- 15. Raytheon
- 16. Rolls Royce
- **17. SAAB**
- 18. Swedish Defense Materiel
- Administration
- 19. US Airforce
- 20. US Navy
- 21. US Army
- 22. Vencore
- 23. Volvo Construction Equipment









- Brief Introduction to UAF
- What's new in UAF v1.2
- UAF Roadmap



What's New in UAF 1.2

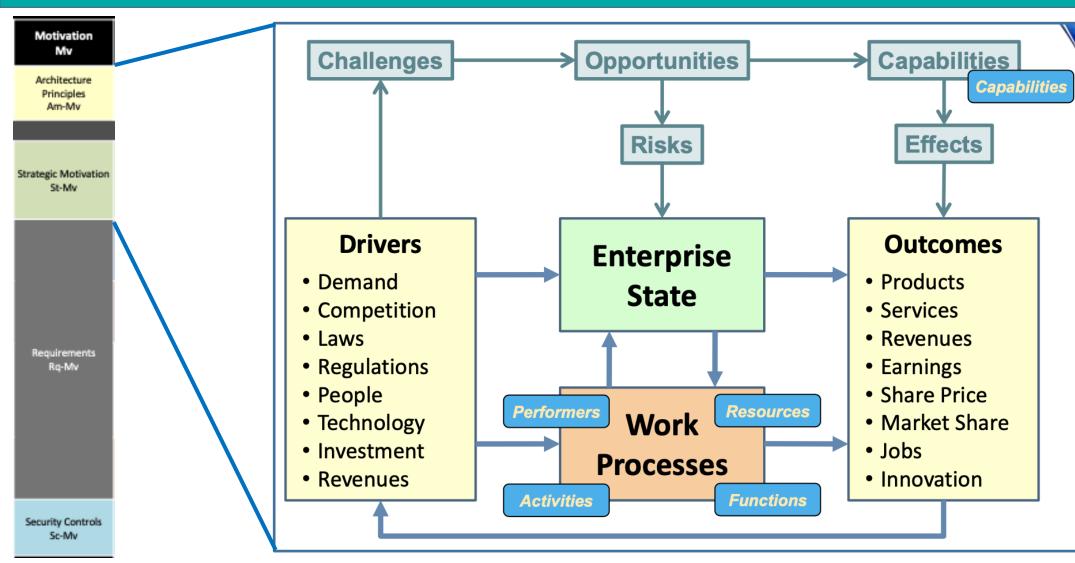
- **►**UAF EA Guide
- ► UAF Grid and Metamodel Improvements
 - Architecture Management Domain
 - Improvements in Strategic and Services Domains (clarify semantics, add new concepts, improve exposition)
 - Support of Value Streams and updates to the Strategic Phasing
 - Risk becomes cross-cutting construct
- ► Future Roadmap

ONG UNIFIED ACCHITECTURE FRAMEWORK **	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-	Architecture References m-Cn	Architecture Development Method Am-Pr	Architect An	5	Dictionary Am-If	Architecture Parameters Am-Pm	Architecture Constraints Am-Ct	Architecture Roadmap Am-Rm	Architecture Traceability Am-Tr		
Strategic St	Strategic Motivation St-Mv	Strategic Taxonomy St-Tx	Strategic Struc St-Sr	crategic Connectivity St-Cn	Strategic Processes St-Pr	mary & Over Strategic States St-St		Strategic Information St-If				Strategic Constraints St-Ct	Strategic Deployment, St-Rm-D Strategic Phasing St-Rm-P	Strategic Traceability St-Tr
Operational Op		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 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	Operational Information Op-If		Services Constraints Sv-Ct	Services Roadmap Sv-Rm	Services Traceability Sv-Tr		
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	Environment En-Pm and Measurements Me-Pm and	Personnel Competence Ps-Ct-C Personnel Drivers PS-Ct-D Personnel Performance Ps-Ct-P	Personnel Availabilit Ps-Rm-A Personnel Evolution PS-Rm-E Personnel Forecast Ps-Rm-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	Information Rs-If	Risks	Resources Constraints Rs-Ct	Resources evolution Resources forecast Rs-Rm			
Security Sc	Security Controls Sc-Mv	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr					Security Constraints Sc-Ct		Security Traceability Sc-Tr		
Projects Pj		Project Taxonomy Pj-Tx	Project Structure Pj-Sr	Project Connectivity Pj-Cn	Project Processes Pj-Pr							Project Roadmap Pj-Rm	Project Traceability Pj-Tr	
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	V	1.2		



Motivation Model Kind

OBJECT MANAGEMENT GROUP®



1



Tilting at Windmills: Drivers, Risk, Opportunity, Resilience and the 2021 Texas Electricity Grid Failure



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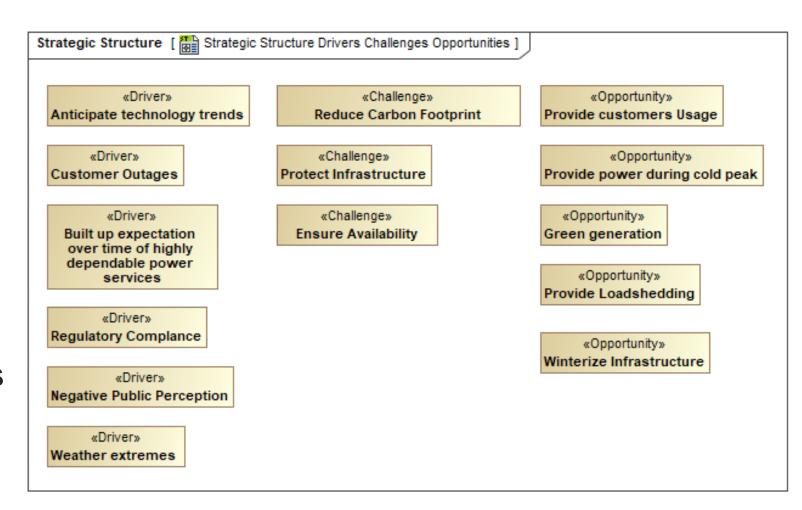
Definition of Concepts

Concept	Definition					
Driver*	Thing that forces us to work or act; that which urges you forward					
Challenge*	A demanding or stimulating situation; a call to engage in a contest or fight					
Enterprise Stat	e* Condition with respect to circumstances or attributes					
Capability	Ability to do something under particular conditions and environments, to achieve a desired effect.					
Opportunity*	A possibility due to a favorable combination of circumstances					
Risk*	A source of danger; a possibility of incurring loss or misfortune					
Effect	A phenomenon that follows and is caused by some previous phenomenon					
Outcome*	Something that happens or is produced as the final consequence or product					



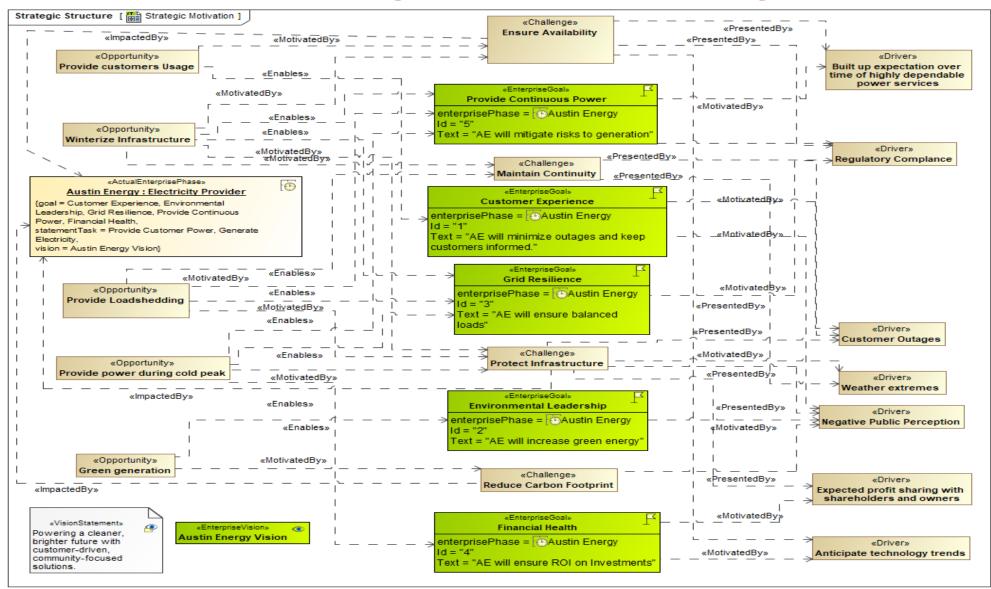
Strategic Motivation Diagram

- Drivers present Challenges to the enterprise
- Challenges are conditions that can be addressed by Opportunities
- Each Opportunity can present the circumstances for new Risks to the Enterprise
- Existing or new Capabilities can help the enterprise pursue these Opportunities





Strategic Motivation Diagram



Architecture Management Domain



SUAF	Motivation	Taxonomy	Structure	Connectivity	Processes	States	Sequences	Information	Parameters	Constraints	Roadmap	Traceability
	Mv	Tx	Sr	Cn	Pr.	St	Sq	If	Pm	Ct	Rm	Tr
Architecture Management Am	Architecture Principles Am-Mv	Architecture Extensions Am-Tx	Architecture Views Am-Sr	Architecture References Am-Cn	Architecture Development Method Am-Pr	Architecture Status Am-St		Dictionary Am-If	Architecture Parameters Am-Pm	Architecture Constraints Am-Ct	Architecture Roadmap Am-Rm	Architecture Traceability Am-Tr

- Align the domain with NAF V4
- Provide View Specifications for Architecture Management Domain
- Dictionary is now a part of Architecture Management Domain
- Architecture Principles is a new View Specification. Principle is a special kind of a Driver.

Information Model Kind



- Dictionary is a part of Information Model Kind
- Strategic Information to capture:
 - Knowledge Capital (Intellectual Property, Personnel & Organizations (eg, expertise, skills), Policies & Practices (patents, trade secrets, etc), Financial Good Will)
 - Know-How in developing and operating Enterprise Resources (Platforms, Services, Facilities, Networks, Equipment, Infrastructure)
 - Know-Who and Know-Where (Partners, Suppliers, Distributors, Markets, Users)
- Use of Operational Information and Resources Information clarified
 - Services are using Operational Information

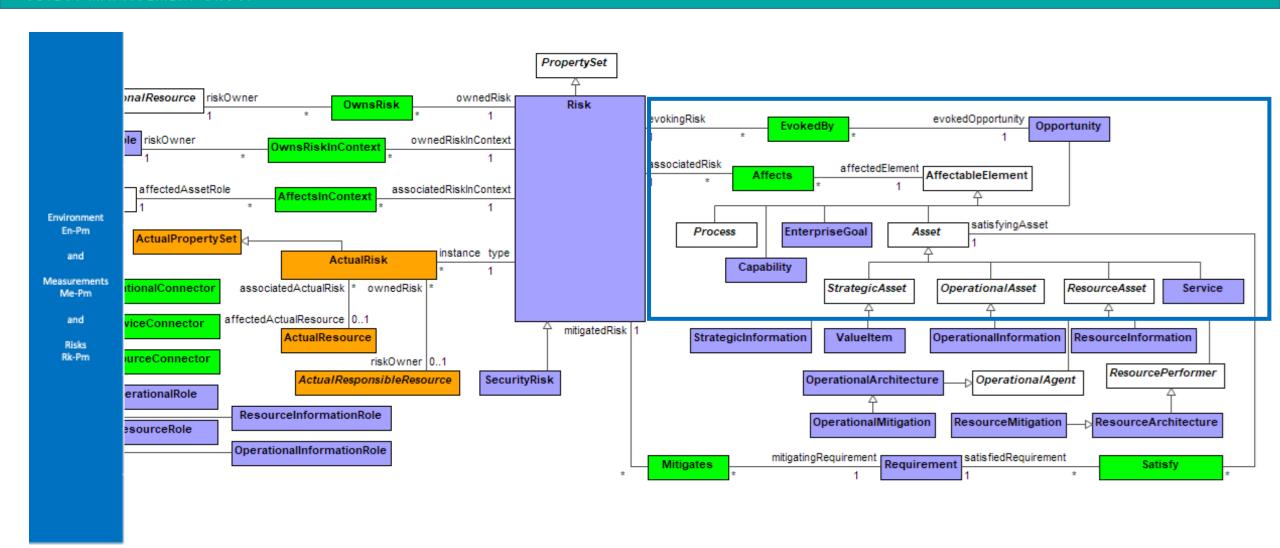
Resources Information

Information



Risk – Cross Cutting Construct

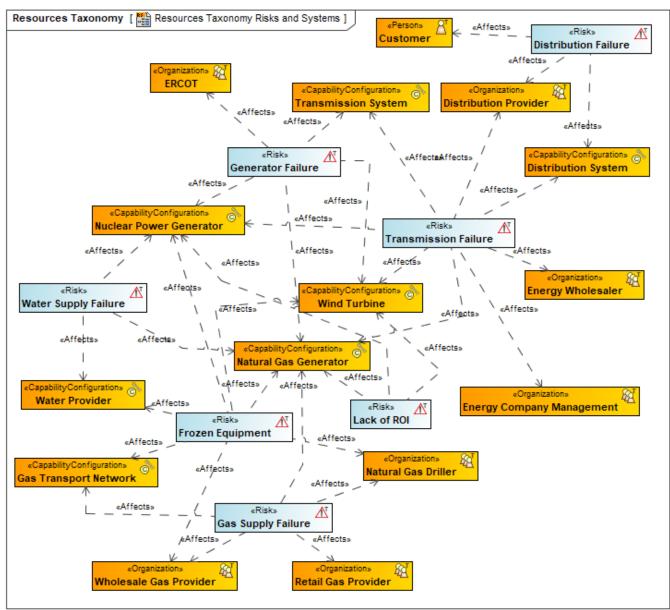
OBJECT MANAGEMENT GROUP®





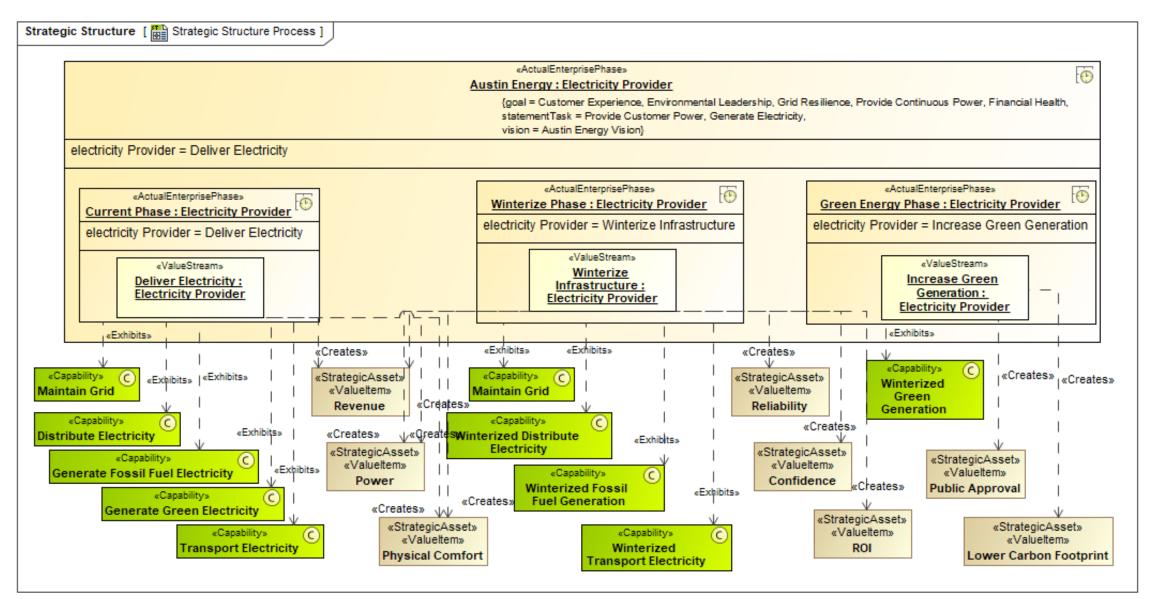
Risks and Affected Resources

- System Risks and elements they affect
 - Gas supply failure affects
 Generation, Transportation,
 Wholesales, Retail, Driller and
 Customer.
 - Frozen Equipment affects almost everything
 - Lack of ROI affects generation infrastructure
- So, can we mitigate these risks?



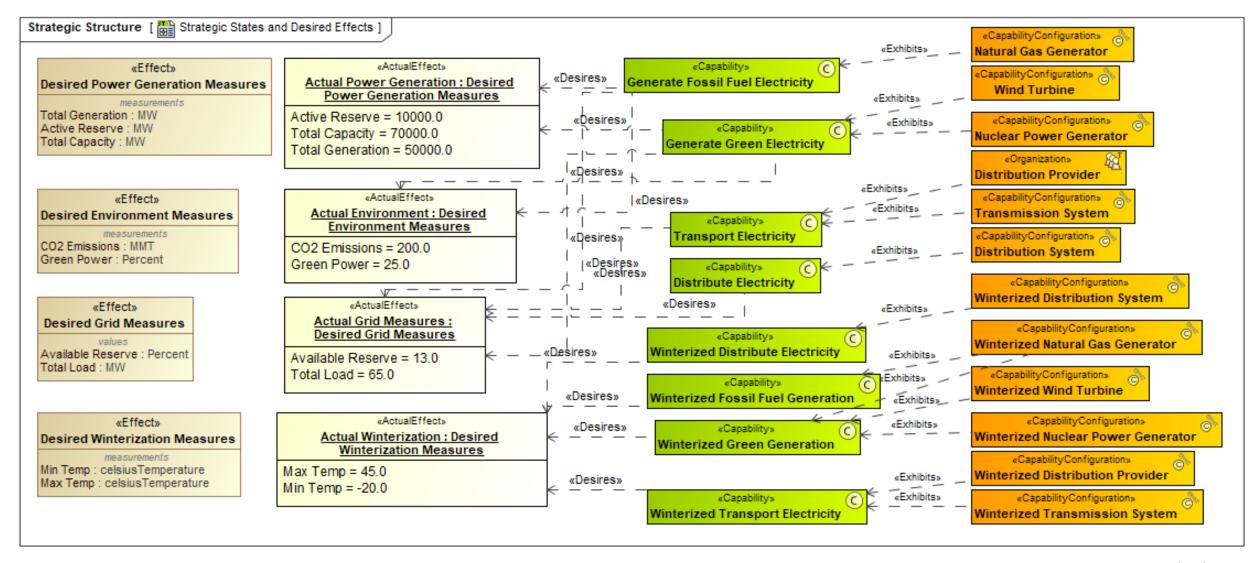


Strategic Structure Diagram





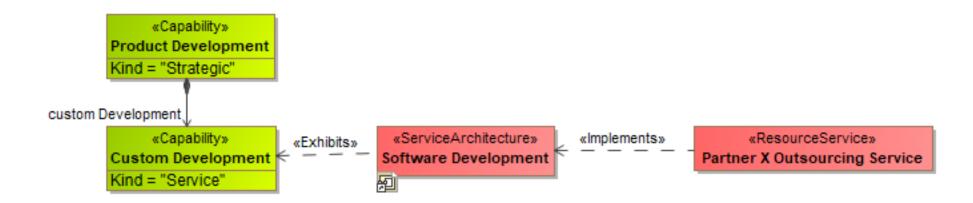
Strategic States Diagram (Effects)





Services Domain

- ► Improved Traceability between Service Layer and Operational and Resource layers.
- ► Service Specification renamed to Service
- ➤ Resource Service introduced to model technical services like web services, etc.





- Brief Introduction to UAF
- What's new in UAF v1.2
- UAF Roadmap



Future Roadmap

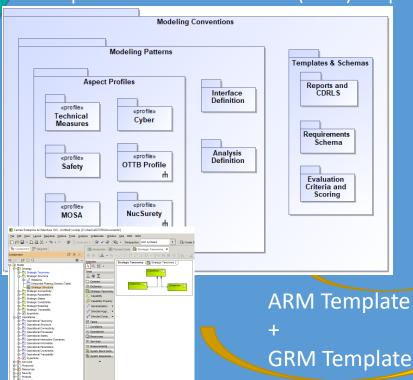
►UAF 1.3

- Improvements in Portfolio management
- Security Viewpoint improvements
- Process Guide for Acquisition (Acquisition Reference Model)
- Small fixes
- **►**UAF 2.0
 - Implementation in SysML v2
 - •Other requirements?

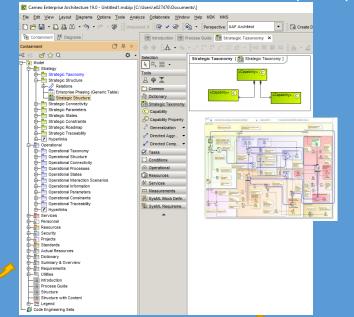


Acquisition Process Tode Contents

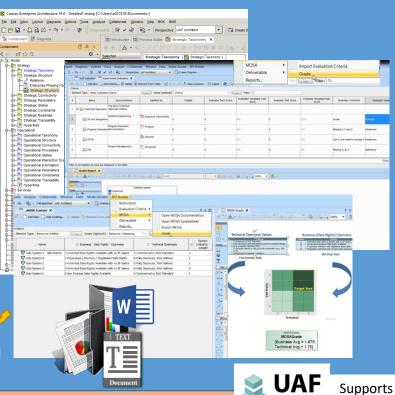
Acquisition Reference Model (ARM)Template



2. Government Reference Model (**GRM**)



3. Model-based RFP Model



Populated with Program & contract Data

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

- 1. The Acquisition Ref Model Template provides model structure for RFP content and evaluation tools:
- **Modeling Patterns**
 - Aspect Profiles (i.e. MOSA, Data Rights, certs)
 - Interface & Analysis Definitions
- **Templates & Schemas**
 - Evaluation Criteria & Scoring (Section K, L, M)
 - Reports & CDRLS

- 2. The **GRM** is a descriptive model containing the program requirements. & constraints
- 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 GRM and ARM template providing RFP evaluation content, CDRL definitions for documentation generation and scoring tools for solution validation and evaluation

DoDAF 2.1

4. UAF Process Guide provides the Acquisition Guidance for using the UAF Framework for GRM and ARM template to create, respond and evaluate a Model-based RFP.



Annual events

- 1. UAF and MBSE Information Day, 2015, Reston, VA
- 2. UAF and MBSE Summit, 2016, Reston, VA,
- 3. UAF and MBSE Summit, 2017, Reston, VA,
- 4. UAF, UPDM, and MBSE tutorials, 2017, Reston, VA,
- 5. UAF and MBSE Summit, 2017, Brussels, Belgium
- 6. UAF and MBSE tutorials, 2017, Brussels, Belgium
- 7. UAF and MBSE Summit, 2018, Reston, VA
- 8. UAF and MBSE tutorials, 2018, Reston, VA
- 9. MBSE-inspired Actionable Enterprise Architectures Summit, 2018, Ottawa, Canada
- 10. MBSE-inspired Actionable Enterprise Architectures Tutorials, 2018, Ottawa, Canada
- 11. MBSE-inspired Actionable Enterprise Architectures Summit, 2019, Reston, VA
- 12. UAF in the context of the NATO Architecture Framework (NAF), 2019, Amsterdam, Netherlands
- 13. UAF Summit: Actionable Architecture in the 21st century, 2020, Virtual
- 14. UAF Summit: Actionable Architecture in the 21st century and beyond, 2021, Virtual
- 15. UAF Summit: Actionable Architecture in the 21st century Hybrid event, 2022, Reston, VA





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- Private or public online course
- 9 week extended or 5 day intensive courses available
- Click on the link below to learn more.

http://www.systemxi.com/UAF.html

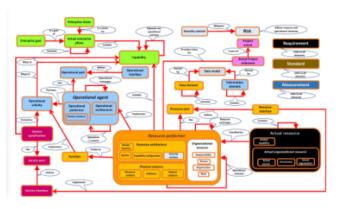
UNIFIED ARCHITECTURE FRAMEWORK® (UAF®) COURSE





With a growing emphasis on Model Based Systems Engineering and enterprise architecture, knowledge of the Unified Architecture Framework (UAF) is quickly becoming one of the most effective tools a systems engineer can have at their disposal. Constructed and taught by Matthew Hause, one of the original architects of UAF, this course offers a unique insight into the design, purpose, and use of UAF and the construction of UAF models. Over nine sessions of four hours each, complemented by weekly office hours, this course will walk through UAF, its viewpoints, and its diagrams. Students will be guided via in-class exercises and individualized feedback on homework. Attendees will construct a UAF model which represents a simulated enterprise transformation project designed to explore the full range of UAF features.





REVIEW UAF COURSE OUTLINE



Thank You!

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Unified Architecture Framework (UAF)

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Thank You!

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Discussion

Evolution of UAF and how it is to be addressed by NAF?

UAF V2 and switch to SysML V2 formalism. How that affects NAF V4?

UAF for NAF guidance needs to be updated. Who will take responsibility ACaT or OMG?

Precision on NAF termilogy



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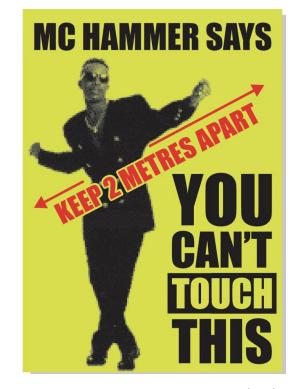






You Can't Touch This!: Logical Architectures in MBSE and the UAF

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An Elaboration of Service Views within the UAF



Using Security Views in UAF







Orlando, FL, USA July 20 - 25, 2019



Frenemies: OPM and SysML Together in an MBSE Model

Matthew Hause

Engineering Fellow, MBSE Specialist

Robert Day

Engineering Fellow, MBSE Specialist

July, 2019







Orlando, FL, USA July 20 - 25, 2019

The Digital Twin throughout the System Lifecycle

Matthew Hause

Engineering Fellow, MBSE Specialist

July, 2019
 www.incose.org/symp2019

THE OIL AND GAS DIGITAL ENGINEERING JOURNEY



Matthew Hause
PTC Engineering Fellow, MBSE Specialist

July 2018



From Empire Strikes Back to Electric Site

An industrial example of using Enterprise Architecture to speed up systems development

USING MBSE TO EVALUATE AND PROTECT THE ELECTRICAL GRID AS A SYSTEM OF SYSTEMS

Matthew Hause Engineering Fellow, MBSE Specialist MHause@PTC.com



INTERFACE MANAGEMENT WITH MBSE – FROM THEORY TO MODELING

Matthew Hause Engineering Fellow, MBSE Specialist October, 2017



DECISION-DRIVEN PRODUCT DEVELOPMENT

Matthew Hause PTC Engineering Fellow, MBSE Specialist

Andreas Korff PTC Director Business Development MBSE

October 2017





MB-PLE to Plan and Track Submarine Configurations

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Transitioning UPDM to the Unified Architecture Framework

MC Hause (Mhause@PTC.com)



UNIFIED ARCHITECTURE FRAMEWORK (UAF) HUMAN VIEWS



Matthew Hause
PTC Engineering Fellow

July 2017



Architecting in the Fourth Dimension Temporal Aspects of DoDAF 2.0

Matthew Hause - Atego, Lars-Olof Kihlstrom - Generic





All For The Want of a Horseshoe Nail An Examination of Causality in DoDAF

Matthew Hause - Atego, Lars-Olof Kihlström - Syntell AB