



3DEXPERIENCE®

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Modeling Capabilities and CONOPS using UAF

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Director of Professional Services
CATIA/No Magic

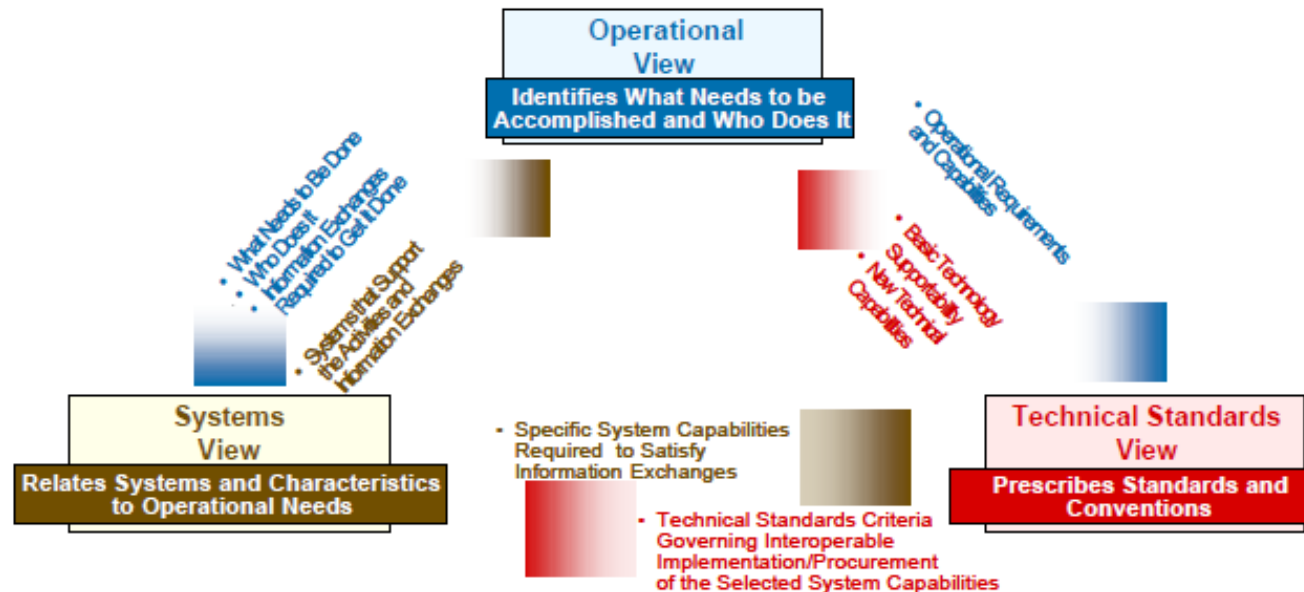
Course Outline

- ▶ Relationship between UAF, UPDM and DoDAF
- ▶ Representation of ICD/JCD contents in UAF
 - ▷ Strategic Domain
 - ▶ Capabilities, Performance Standards and Conditions
 - ▷ Operational Domain
 - ▶ CONOPS
 - ▷ Resource Views
 - ▶ Capability Realization and Deployment
- ▶ Demonstration of Traceability Across Domains

No Magic

In the beginning, there was DODAF!

- ▶ DODAF began as the Command, Control, Communication, Intelligence, Surveillance and Reconnaissance (C3ISR) Framework in 1996.
- ▶ Its focus was on the end-to-end flow of critical information through systems and systems-of-systems to ensure that required data produced by one system would reach the consuming system within the time, accuracy, content and format required.
- ▶ It introduced the concept of thinking about the system in terms of an Operational, Systems and Standards perspective.

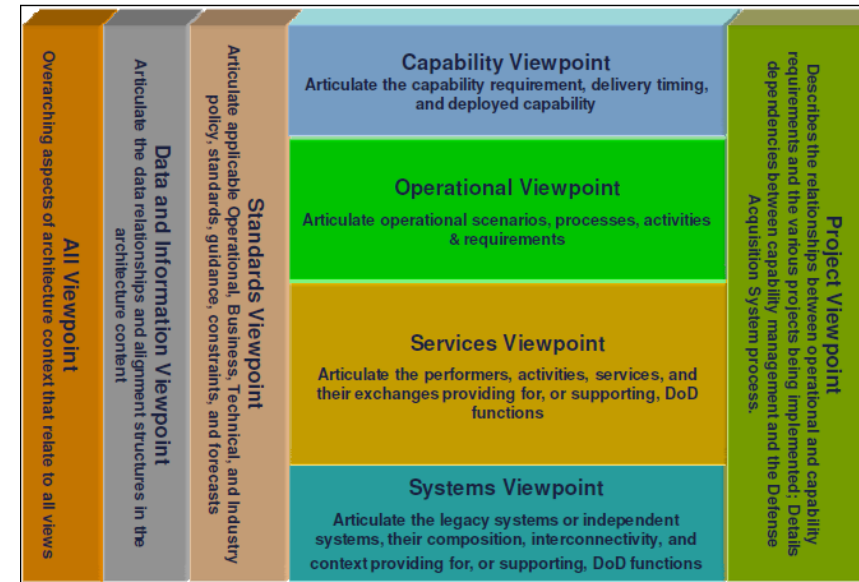


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DODAF 2.0 - Enterprise Architecture

► As an Enterprise Architecture a DODAF 2.0 architecture is really a collection of related architectures:

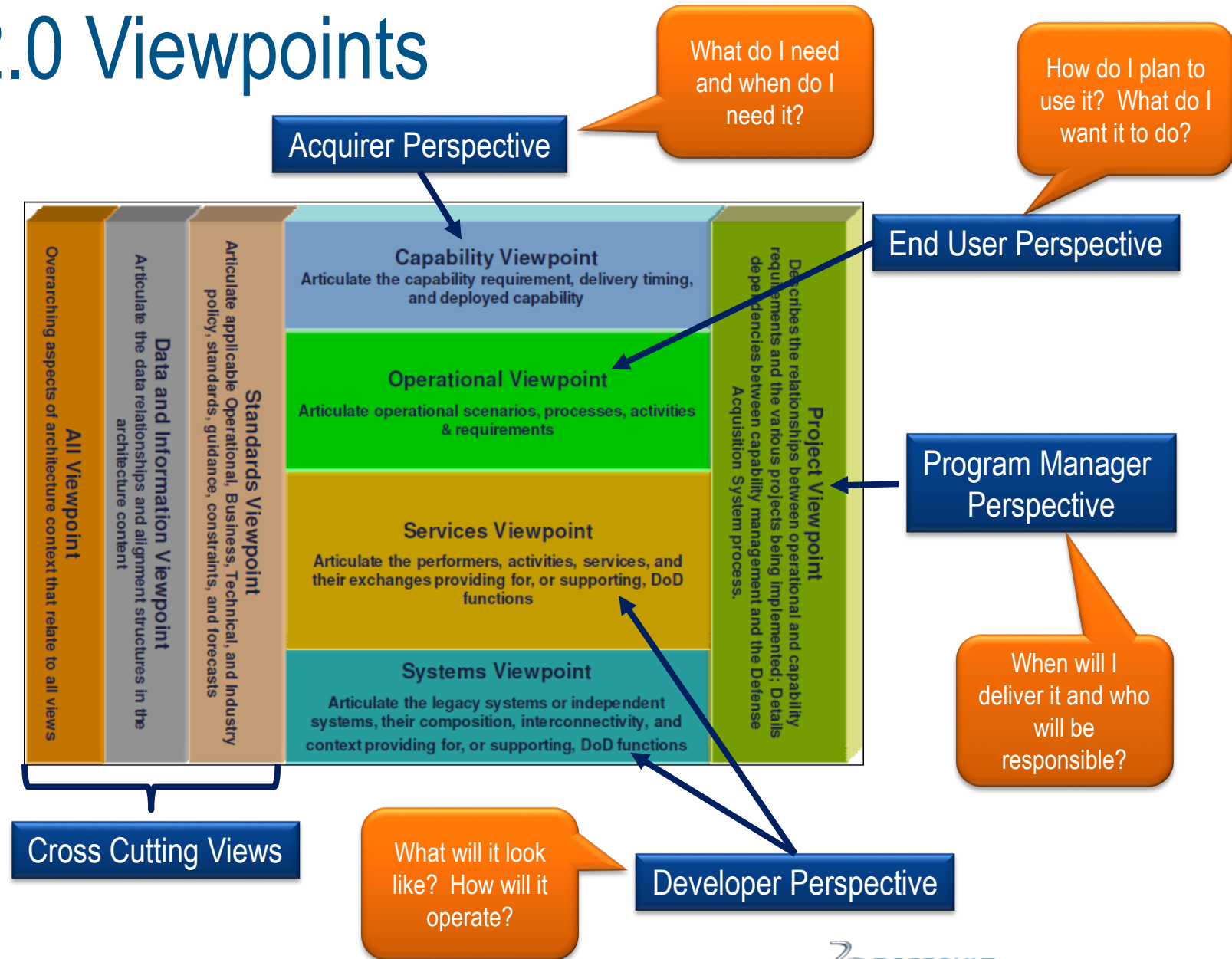
- ▷ The Capability Architecture
- ▷ The Operational Architecture
- ▷ The Service Architecture
- ▷ The System Architecture
- ▷ The Data Architecture
- ▷ The Project Architecture



DODAF 2.0

► Each Architecture represents a subset of the overall enterprise with the model elements and relationships relevant to that specific perspective.

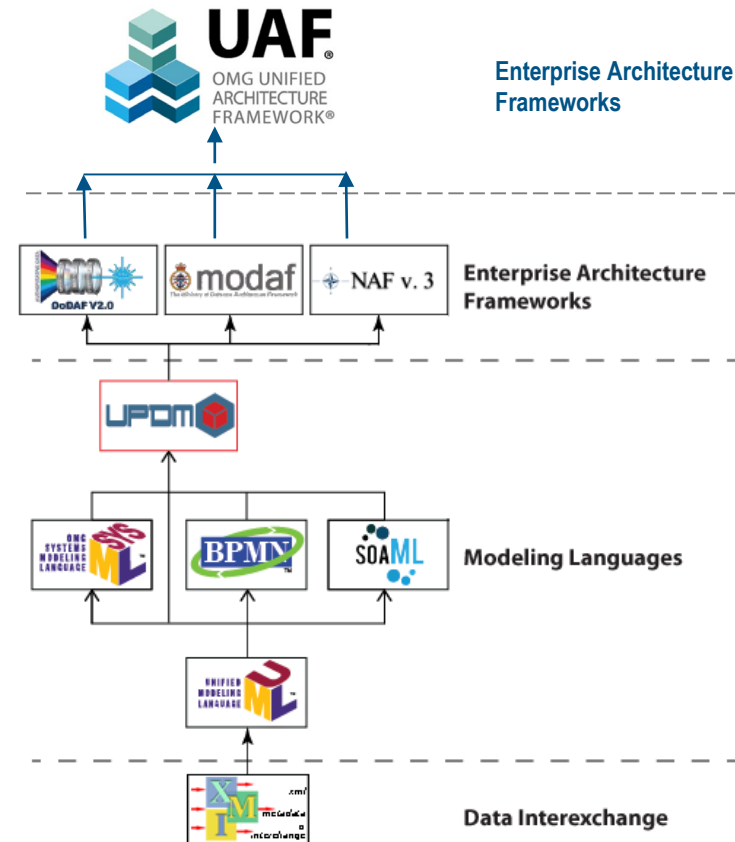
DODAF 2.0 Viewpoints



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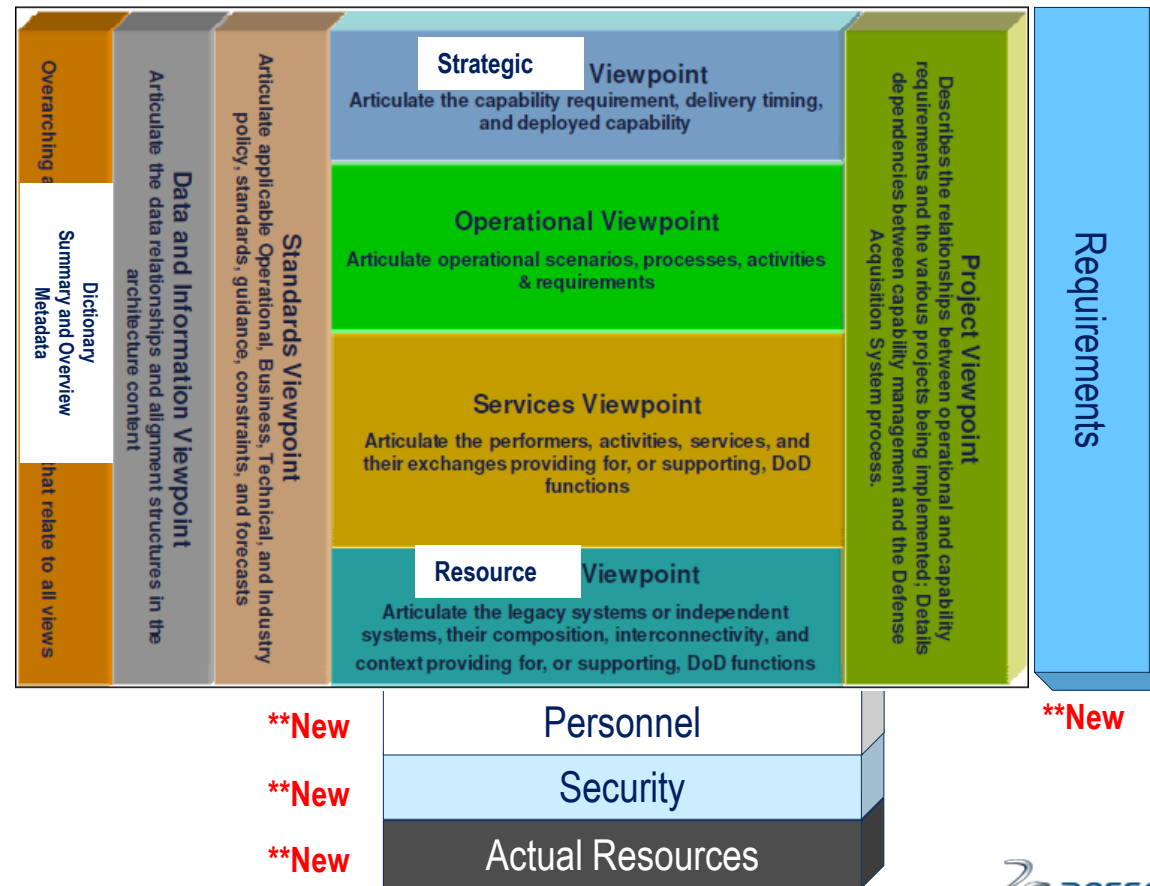
What is UAF?

- ▶ UAF is a profile extension of UML and SysML.
- ▶ UAF is an OMG standard.
- ▶ It provides a common language and notation for model elements, views, and viewpoints across multiple frameworks for describing an enterprise architecture.



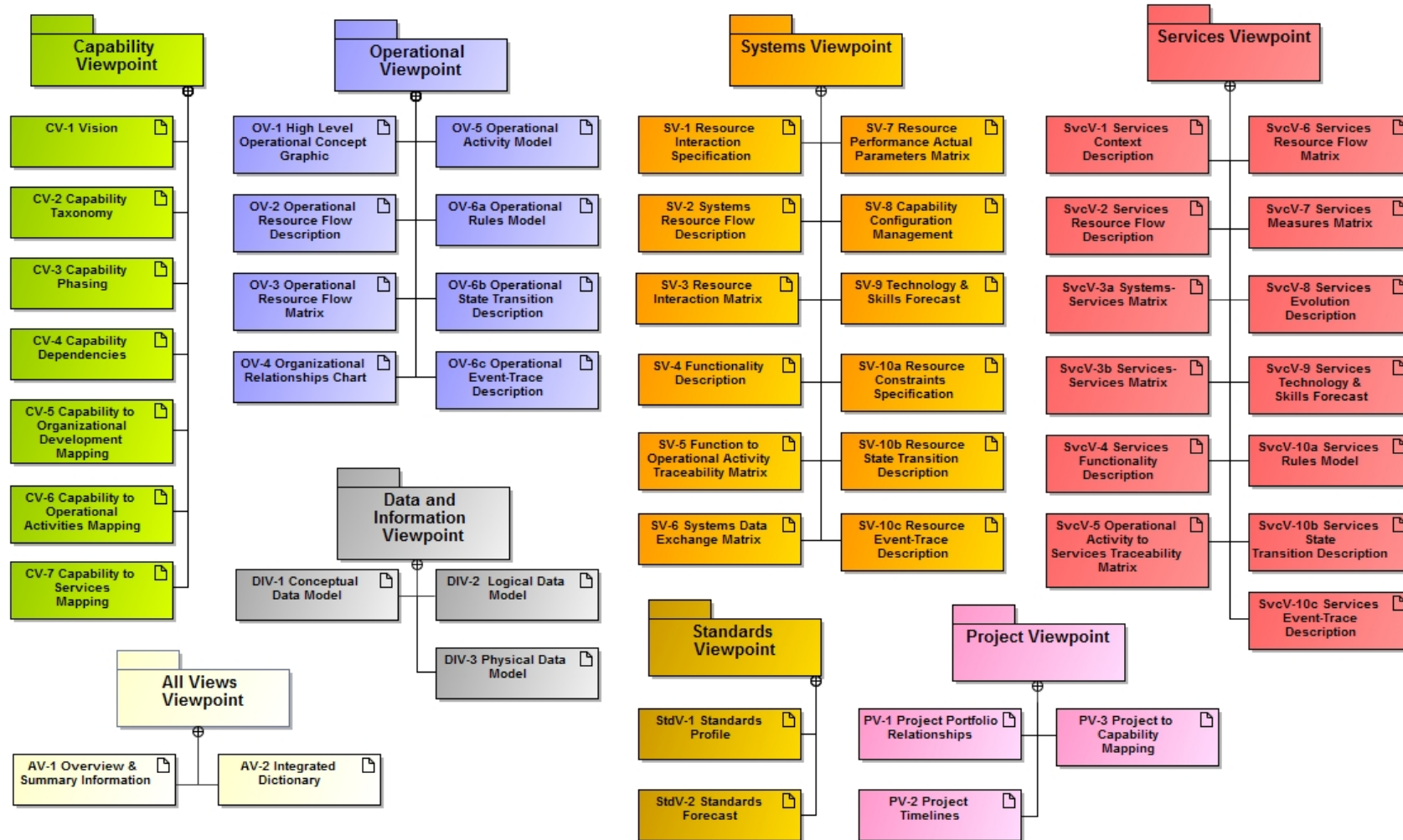
UAF Expanded the DODAF/UPDM Framework

- UAF leveraged the existing frameworks (DODAF, MODAF, NAF, DNDAF, etc.) and lessons learned from 15 years of industry usage, and combined best practices to create the next generation enterprise architecture framework.



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DODAF/UPDM – Views and Viewpoints



UAF Grid

Model Kind

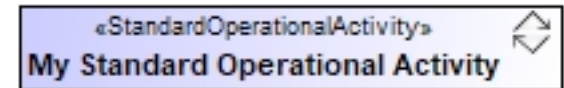
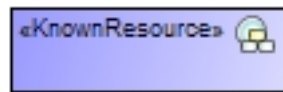
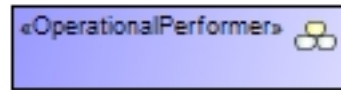
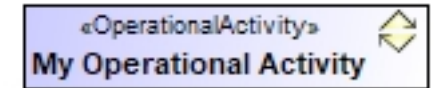
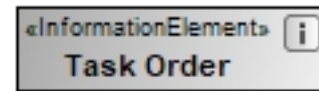
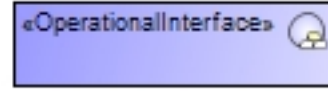
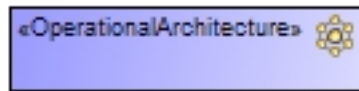
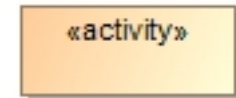
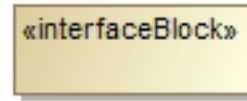
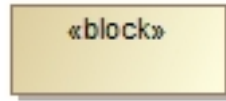
		Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Interaction Scenarios Is	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr		
Domain	Metadata Md	Metadata Taxonomy Md-Tx	Architecture Viewpoints Md-Sr	Metadata Connectivity Md-Cn	Metadata Processes Md-Pr	-	-	Conceptual Data Model	Environment Pm-En	Metadata Constraints Md-Ct	-	Metadata Traceability Md-Tr		
	Strategic St	Strategic Taxonomy St-Tx	Strategic Structure St-Sr	Strategic Connectivity St-Cn	-	Strategic States St-St	-			Strategic Constraints St-Ct	Strategic Deployment Strategic Phasing St-Rm	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 Interaction Scenarios Op-Is			Operational Constraints Op-Ct	-	Operational Traceability Op-Tr		
	Services Sv	Service Taxonomy Sv-Tx	Service Structure Sv-Sr	Service Connectivity Sv-Cn	Service Processes Sv-Pr	Service States Sv-St	Service Interaction Scenarios Sv-Is			Service Constraints Sv-Ct	Service Roadmap Sv-Rm	Service Traceability Sv-Tr		
	Personnel Pr	Personnel Taxonomy Pr-Tx	Personnel Structure Pr-Sr	Personnel Connectivity Pr-Cn	Personnel Processes Pr-Pr	Personnel States Pr-St	Personnel Interaction Scenarios Pr-Is			Competence	Personnel Availability	Personnel Traceability Pr-Tr		
										Drivers	Personnel Evolution			
										Performance Pr-Ct	Personnel Forecast Pr-Rm			
	Resources Rs	Resource Taxonomy Rs-Tx	Resource Structure Rs-Sr	Resource Connectivity Rs-Cn	Resource Processes Rs-Pr	Resource States Rs-St	Resource Interaction Scenarios Rs-Is			Physical Data Model	Measurements Pm-Me	Resource Constraints Rs-Ct	Resource evolution Resource forecast Rs-Rm	Resource Traceability Rs-Tr
	Security Sc	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 Activity Pj-Pr	-	-					-	Project Roadmap Pj-Rm	Project Traceability Pj-Tr
	Standards Sd	Standard Taxonomy Sd-Tx	Standards Structure Sd-Sr	-	-	-	-	-	Standards Roadmap Sd-Rm			Standards Traceability Sd-Tr		
Actuals Resources Ar	-	Actual Resources Structure Ar-Sr	Actual Resources Connectivity Ar-Cn	Simulation			Parametric Execution/ Evaluation	-	-					
	Dictionary Dc													
	Summary & Overview Sm-Ov													
	Requirements Rq													

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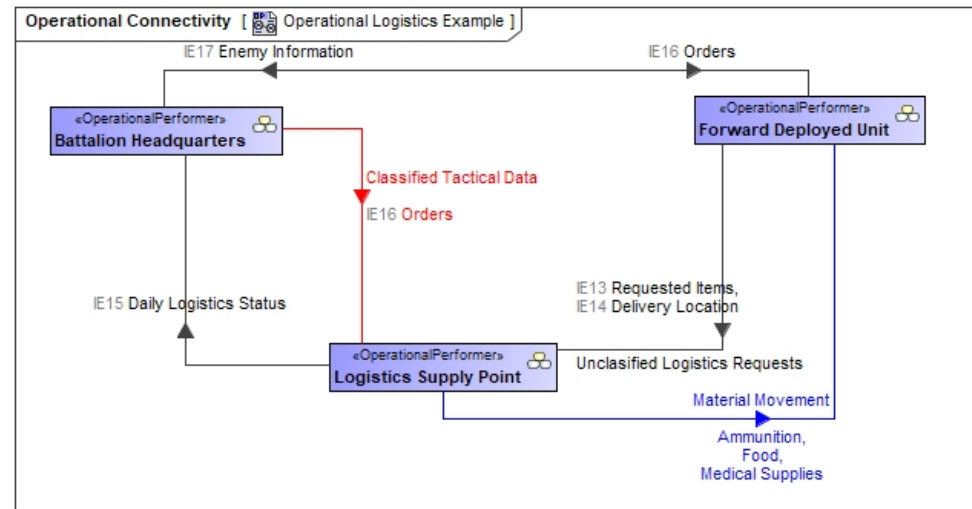
Domain Specific Elements, Relationships and Diagrams

Operation Domain

SysML
Stereotypes



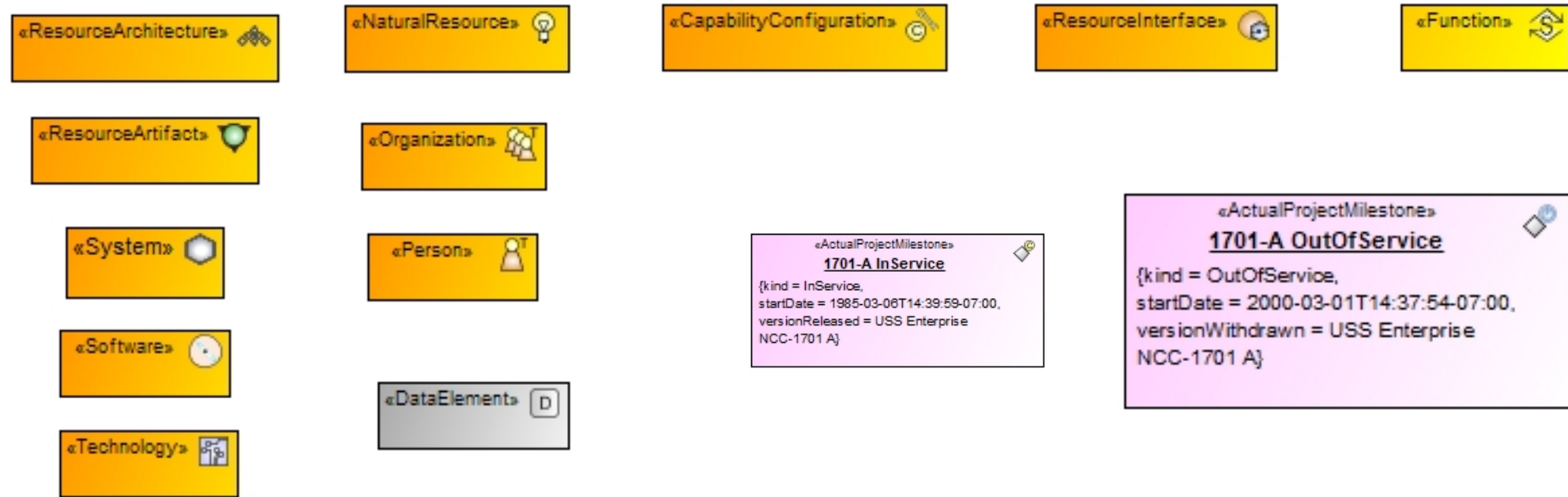
UAF
Stereotypes



No Magic

Domain Specific Elements, Relationships and Diagrams

Resource Domain

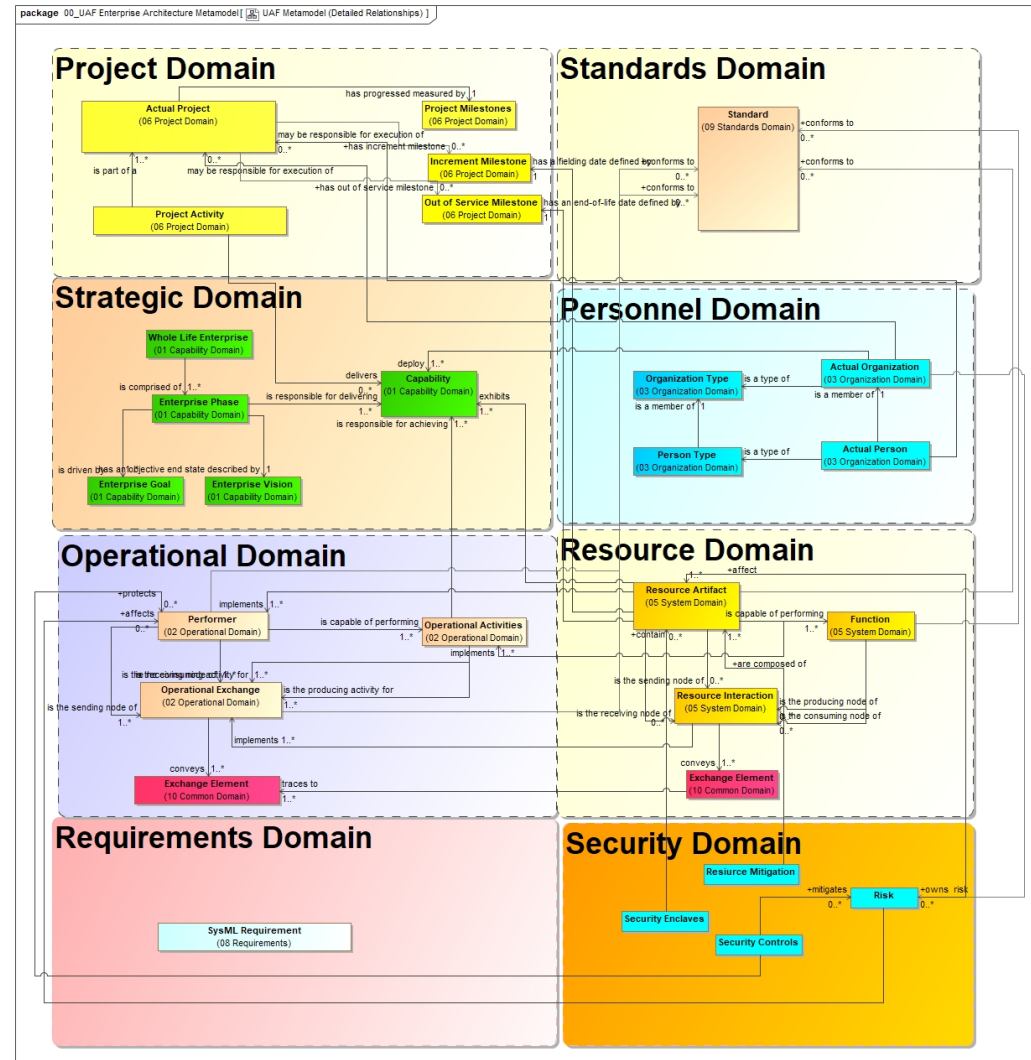


Addition of SysML Concepts

- ▶ In addition to new Views and Viewpoints, UAF added a number of SysML concepts to the framework that were missing from UPDM:
 - ▷ A UAF stereotype of Interface Blocks
 - ▷ Parametric Diagrams and Constraint Blocks for analysis of Measurement Properties
 - ▷ Instances

UAF Model Elements and Relationships

- ▶ As an enterprise architecture framework, UAF defines:
 - ▷ A set of viewpoints (domain perspectives).
 - ▷ **Model elements and relationships internal to that viewpoint.**
 - ▷ **Relationships between model elements across viewpoints.**
- ▶ Model elements and relationships within domains common to UPDM are identical (or at least very similar) in UAF.



JCIDS ICD and UAF

► Key ICD Components

1. ICD Main Body

A. Concept of Operations Summary

- i. Describe the Concept, CONOPS, Unified Command Plan-assigned mission to which the capabilities in the ICD contribute.

B. Joint Capability Area (JCA)

C. Required Capability

1. Definitions of the identified capabilities should satisfy two rules:

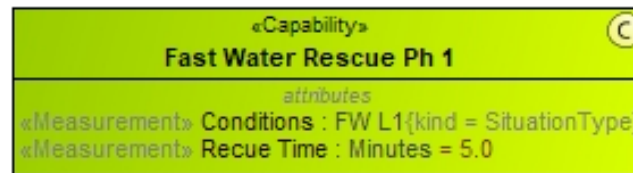
- i. Capability definitions must contain the required operational attributes with appropriate qualitative parameters and metrics, e.g., outcomes, time, distance, effect (including scale), obstacles to be overcome, and supportability.
- ii. Capability definitions should be general enough so as not to prejudice decisions in favor of a particular means of implementation but specific enough to evaluate alternative approaches to implement the capability.

D. Capability Gaps and Overlaps or Redundancies

Capability Representation

► Capability

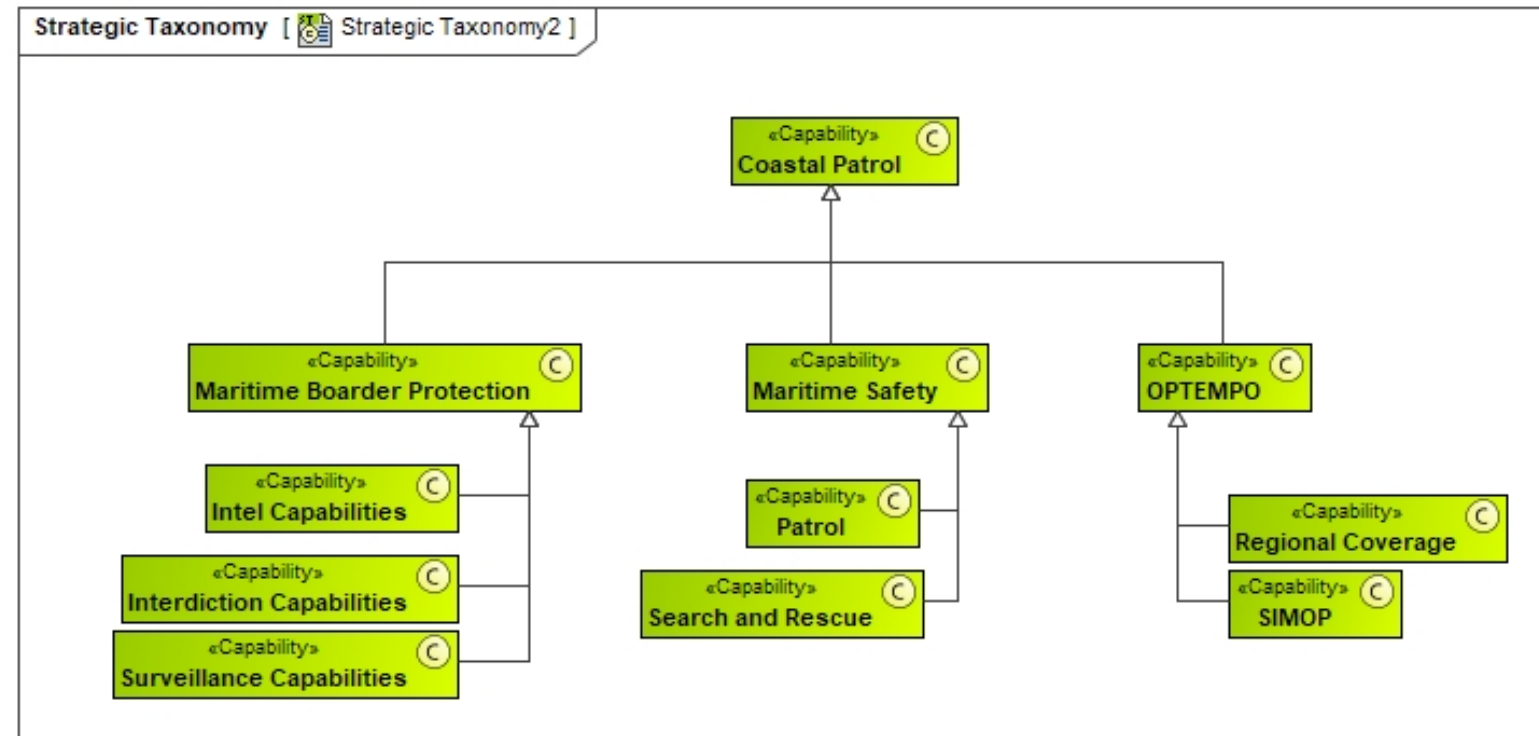
- ▷ A high level specification of the enterprise's ability to execute a specified course of action.
- ▷ The ability to achieve a desired effect under specified [performance] standards and conditions through combinations of ways and means [activities and resources] to perform a set of activities.



Capability Taxonomy

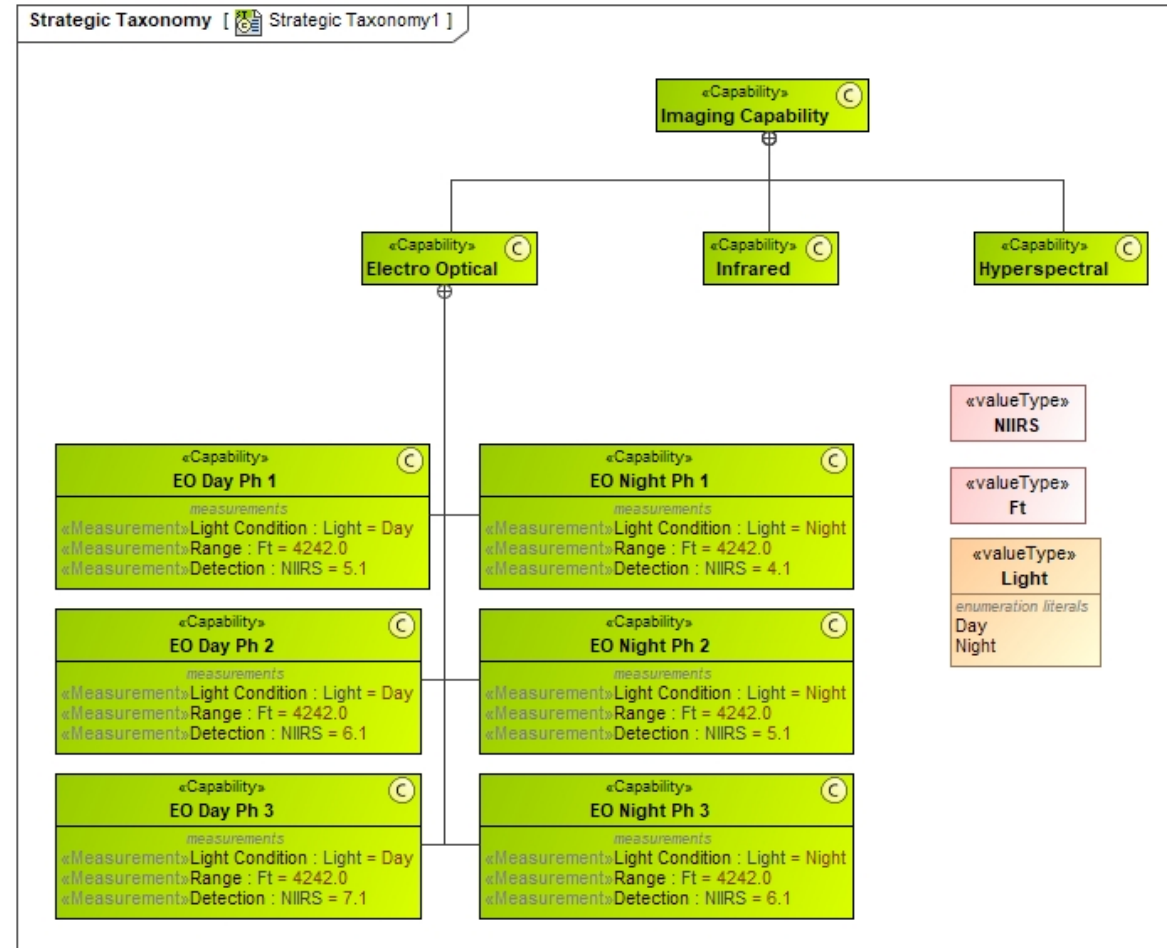
► Taxonomy relationships may be:

- ▷ Generalization
- ▷ Composition
- ▷ Containment



Modeling Specified Performance Standards and Conditions

- Conditions and specified performance standards should be represented by Measurements.
- Measurements that represent performance standards can be typed by Value Types.
- Measurements that represent conditions can be typed by Conditions, Environments and/or Locations.
- Measurement Values should be defined as Default Values.



Modeling Specified Performance Standards and Conditions

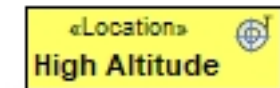
► Environment

- ▷ A definition of the environmental factors in which something exists or functions.
- ▷ Environment properties are typed by an Environment, Condition or Location.
- ▷ Environment have a property called “Kind”:
 - Terrain Type
 - Weather Conditions
 - Light Conditions
 - CBRNM Environment
 - Situation Type



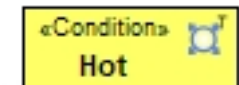
► Location

- ▷ A specification of the generic area in which a Location Holder is required to be located.
- ▷ Structural Elements are Location Holders.



► Condition

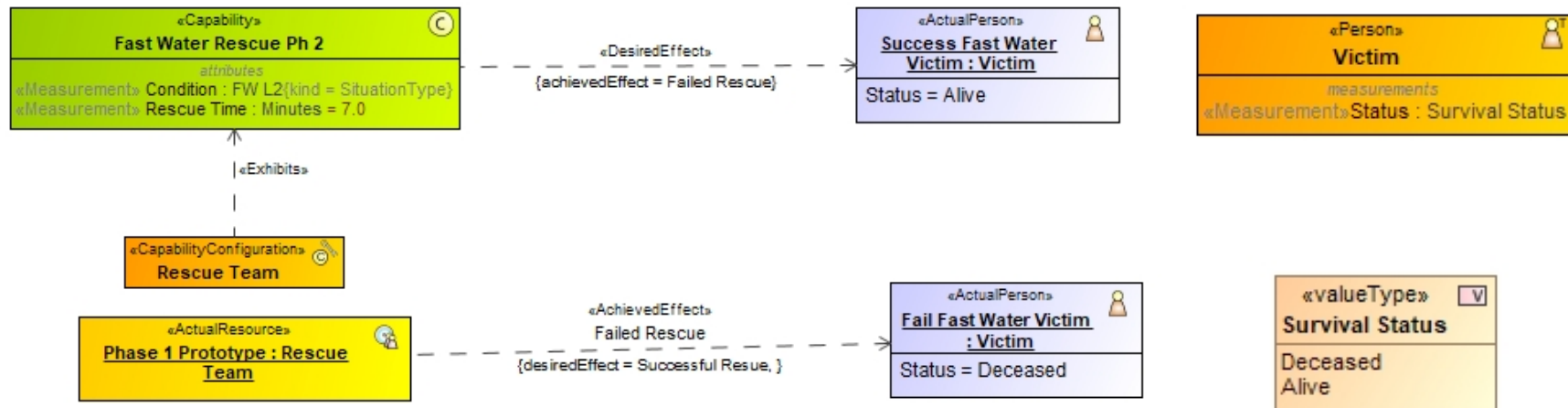
- ▷ Defines the Location, Environment, and/or Geopolitical Extent under which a Performer, Resource, Service must operate or in which an Operational Activity, Function or Service Function can be performed.



No Magic

Desired Effects

- ▶ Desirer - Capability, Operational Element, Organization Element, or Resource Element that desires a particular effect.
- ▶ Achiever - An Actual Resource, Organization, Person, Post, or Enterprise Phase that can deliver a Desired Effect.
- ▶ Effect - A model element that represents the actual state of something that is desired or achieved.
 - ▷ Desired Effect - A dependency relationship between the Desirer and the Effect desired.
 - ▷ Achieved Effect - A dependency relationship between the Achiever and the Effect achieved.



No Magic

Operational Domain - CONOPS

- ▶ System Engineering Applications for a CONOPS (from the MITRE Systems Engineering Guide)
 - ▷ A means of describing a user's operational needs without becoming bogged down in detailed technical issues that shall be addressed during the systems analysis activity.
 - ▷ A mechanism for documenting a system's characteristics and the user's operational needs in a manner that can be verified by the user without requiring any technical knowledge beyond that required to perform normal job functions.
 - ▷ A place for users to state their desires, visions, and expectations without requiring the provision of quantified, testable specifications.
 - ▷ A mechanism for users and buyer(s) to express thoughts and concerns on possible solution strategies. The CONOPS document allows users and buyer(s) to record design constraints, the rationale for those constraints, and to indicate the range of acceptable solution strategies [1].

[1] IEEE Computer Society, March 19, 1998, [IEEE Guide for Information Technology—System Definition—Concept of Operations \(ConOps\) Document](#) (IEEE Std 1362-1998).

Operational Domain - CONOPS

- ▶ The CONOPS addresses the leadership's intended way of operating the organization.
- ▶ It may refer to the use of one or more systems (as black boxes) to forward the organizations goals and objectives.
- ▶ The CONOPS (document) describes the organization's assumptions or intent in regard to an overall operation or series of operations of the business with using the system to be developed, existing systems, and possible future systems.

ISO/IEC/IEEE 29148

Operational Domain - CONOPS

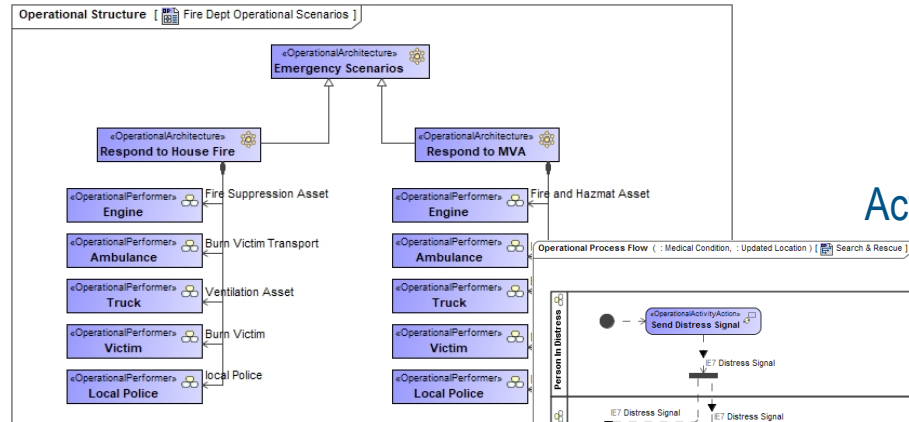
- ▶ The Operational Domain is where we describe how we want the system or collection of systems in the enterprise to operate from the users/operators perspective.
 - ▷ It is solutions independent.
 - ▷ It describes what, not how.
 - ▷ It describes how we want things to work together, not how they work inside.
 - ▷ It provides requirements and constraints on any proposed solution.
- ▶ In addition to a CONOPS, there are other architectural concepts that may require elaboration in the Operational Views:
 - ▷ Concept of Maintenance
 - ▷ Concept of Training
 - ▷ Concept of Deployment
 - ▷ Concept of Disposal

Operational Domain - CONOPS

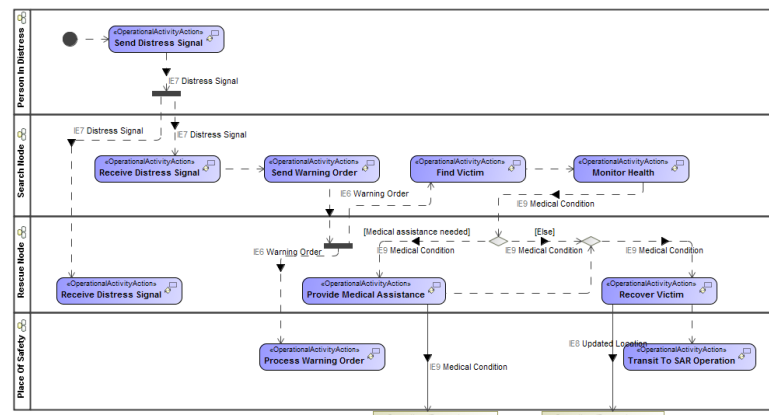
- ▶ Questions we want the Operational Domain to answer:
 - ▷ The operational environment and its characteristics.
 - ▷ Major elements and the interconnections among these elements.
 - ▷ Interfaces to external elements or procedures.
 - ▷ Required capabilities or functions of the proposed elements.
 - ▷ Inputs, outputs, data flow, and manual and automated processes sufficient to understand the proposed concept from the user's point of view.
 - ▷ Cost constraints on the concepts operations.
 - ▷ Operational risk factors.
 - ▷ Required performance characteristics, such as speed, throughput, volume, frequency.
 - ▷ Required quality attributes, such as: reliability, availability, correctness, efficiency, expandability, flexibility, interoperability, maintainability, portability, reusability, supportability, survivability, and usability.
 - ▷ Required provisions for safety, security, privacy, integrity, and continuity of operations in emergencies.

Typical CONOPS Views

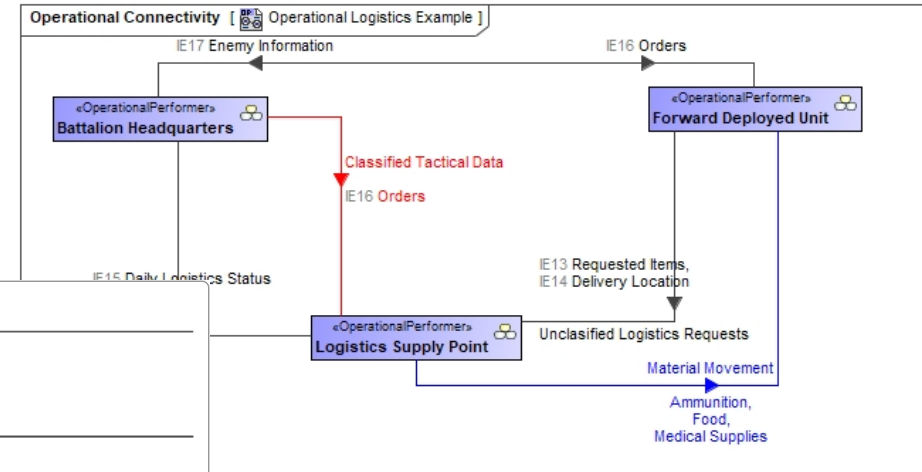
Structure



Activity



Connectivity



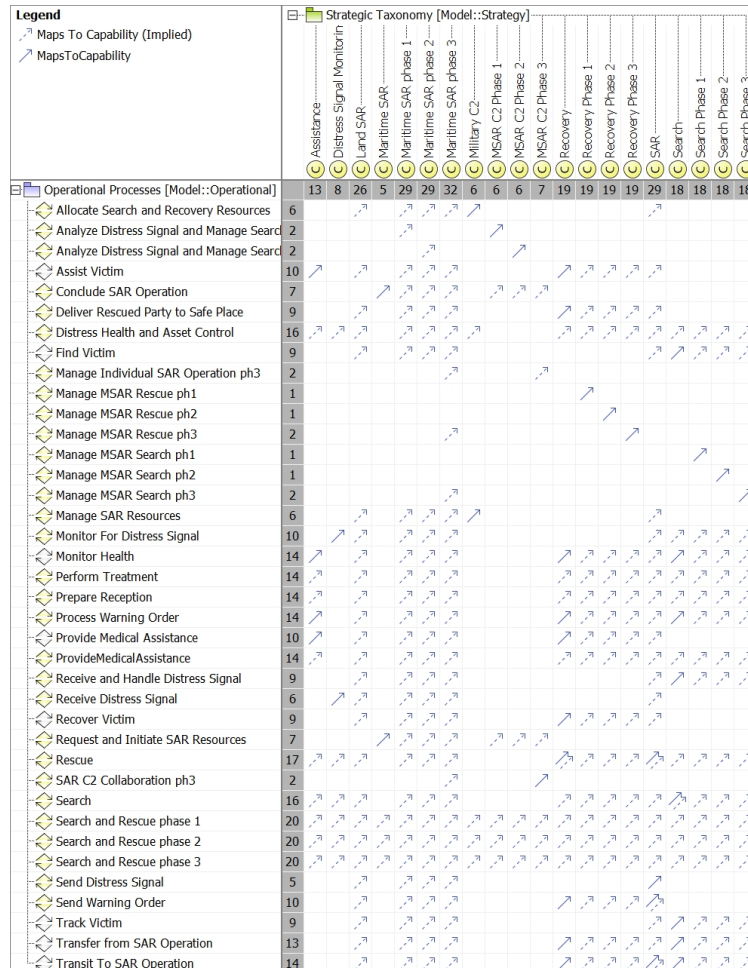
Exchanges

#	Exchange ID	Operational Exchange Item	Sending Operational Performer	Receiving Operational Performer	Producing Operational Activity	Consuming Operational Activity
1	OE43	IE25 Distress Call	Disabled Vessel	Monitoring Station	Call for Help	Coordinate Rescue Mission
2	OE44	IE27 SAR Order	Monitoring Station	Air Operations Center		
3	OE45	IE27 SAR Order	Monitoring Station	Marine Operations Center	Coordinate Rescue Mission	Determine Closest Vessel
4	OE46	IE26 Air Tasking Order	Air Operations Center	Rescue Helicopter		
5	OE47	IE28 Victim Location	Marine Operations Center	Rescue Boat	Send Mission Tasking	Navigate to Search Area
6	OE48	IE29 Instructions	Rescue Boat	Disabled Vessel	Perform Rescue	Follow Instructions
7	OE49	IE30 Situation Update	Disabled Vessel	Rescue Boat	Provide Information	Perform Rescue
8	OE50	IE32 Mission Coordination	Rescue Boat	Rescue Helicopter		
9	OE51	IE31 MEDIVAC Request	Rescue Boat	Rescue Helicopter		
10	OE52	IE33 Medical Data	Rescue Helicopter	Medical Center		
11	OE53	Rescue Victim	Rescue Helicopter	Medical Center		
12	OE54	IE34 Request Status	Rescue Boat	Disabled Vessel	Get Update	Provide Information

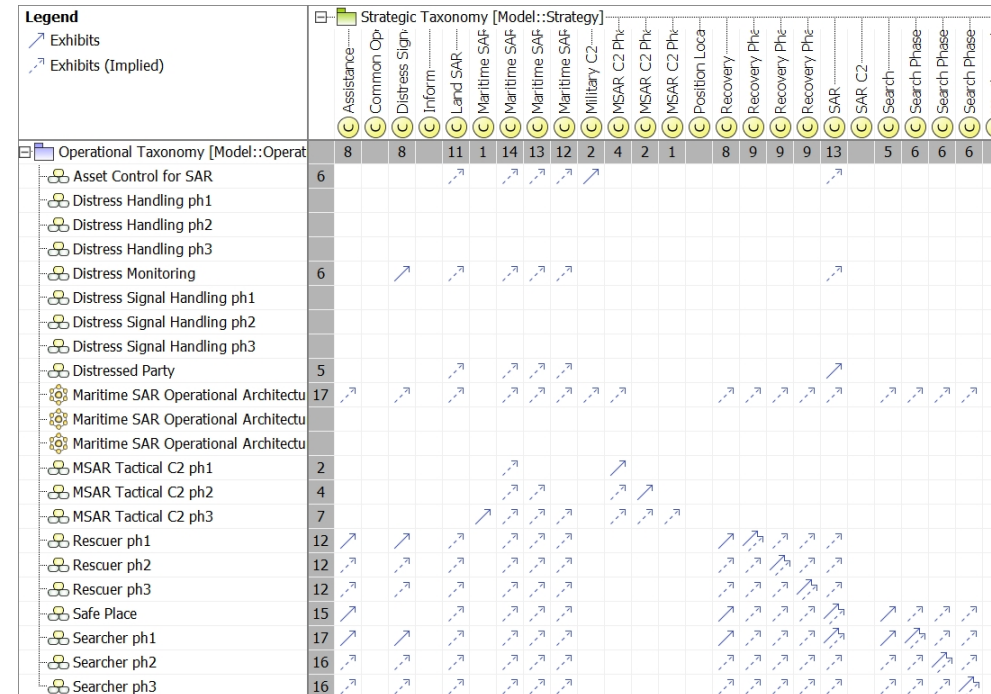
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Operational-Capability Traceability

Operational Activity to Capability Mapping



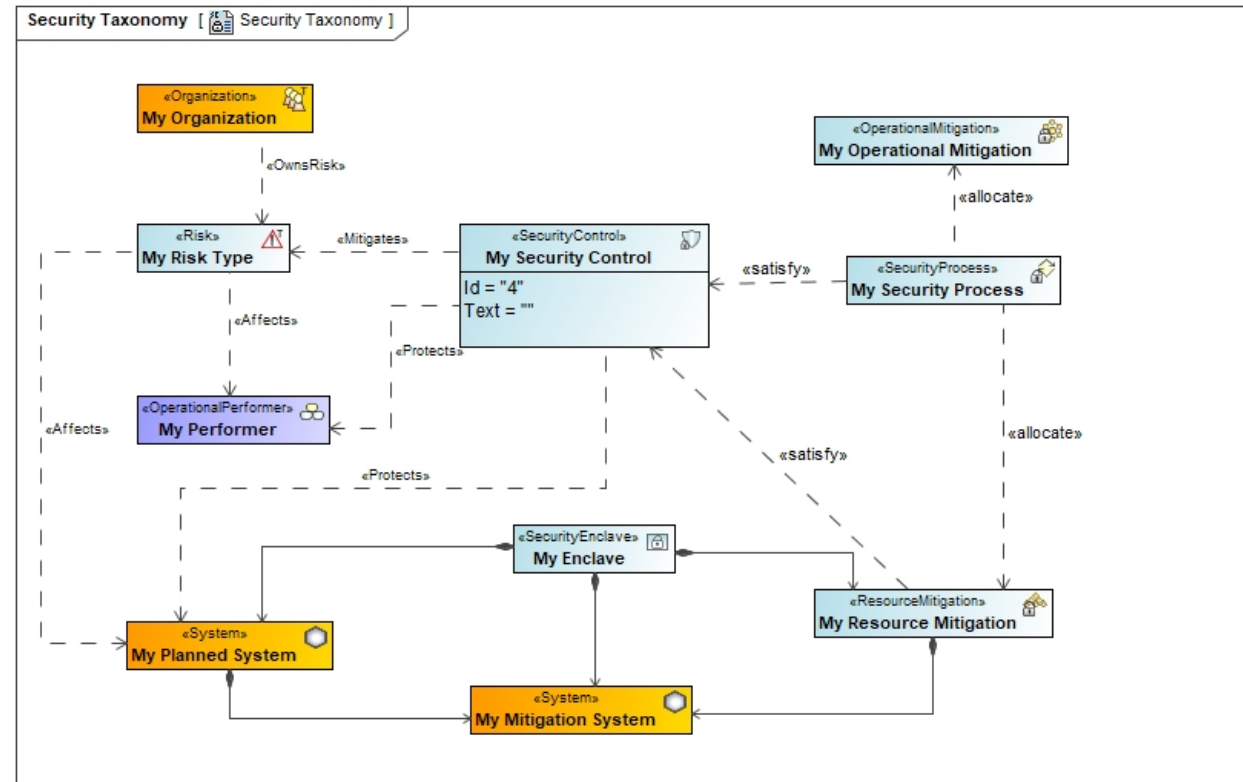
Operational Performers to Capability Mapping



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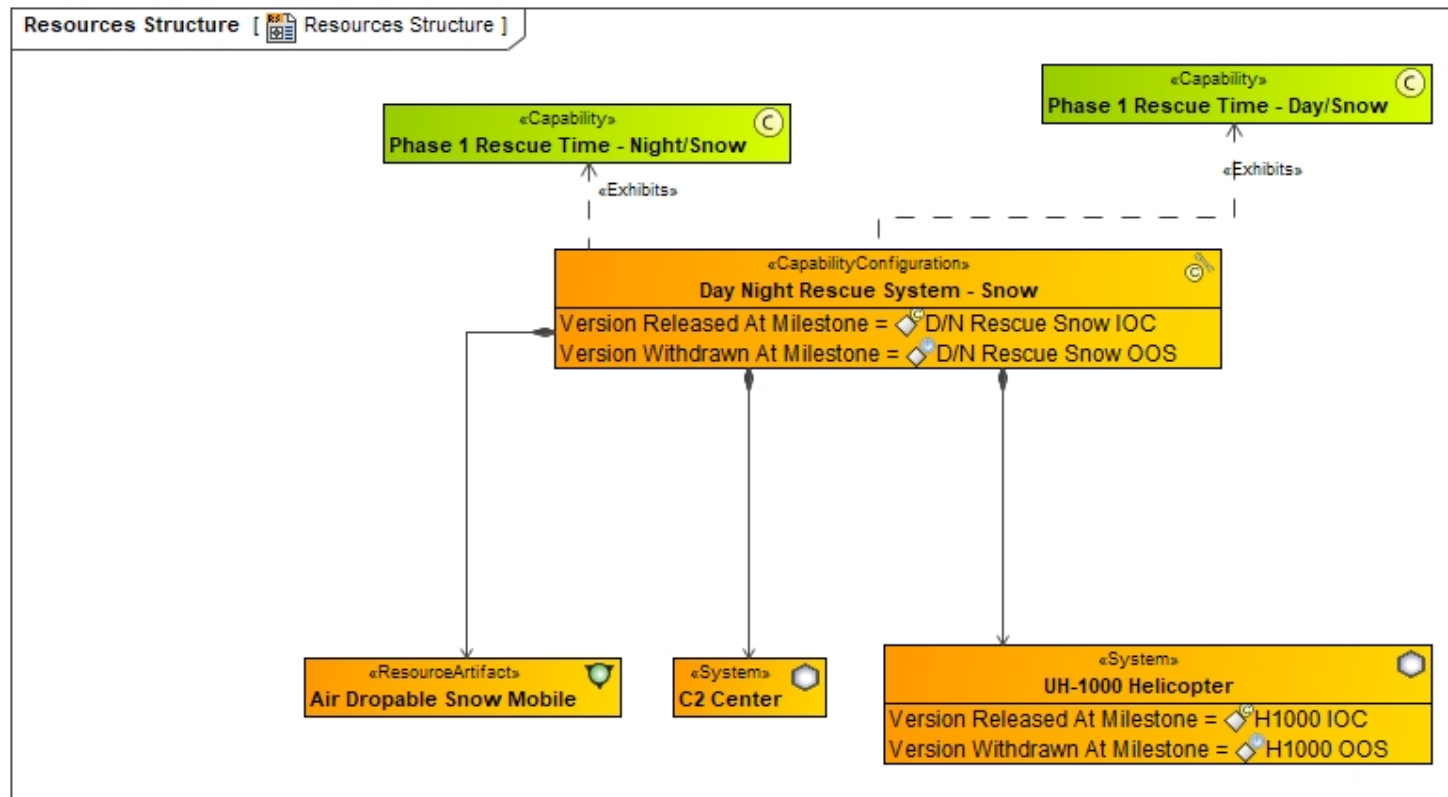
Operational Risks and Mitigations

- Operational Risks and Mitigations can be analyzed and modeled in the Security Domain.



Resource Domain – Material Solution to Enable Capabilities IAW CONOPS

- Resources and Capability Configurations “exhibit” capabilities and own In Service and Out of Service Milestones (time phasing.)



Traceability Demonstration

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Questions??

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