Enterprise Architecture Guide for the Unified Architecture Framework (UAF)

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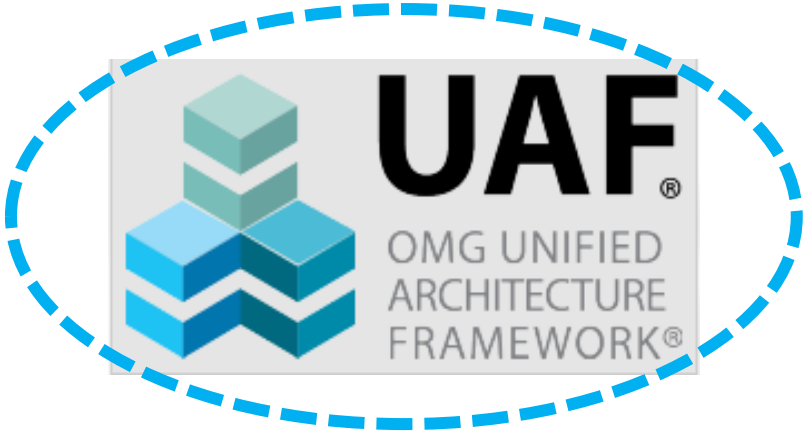
OMG Modeling Standards

Modeling Languages

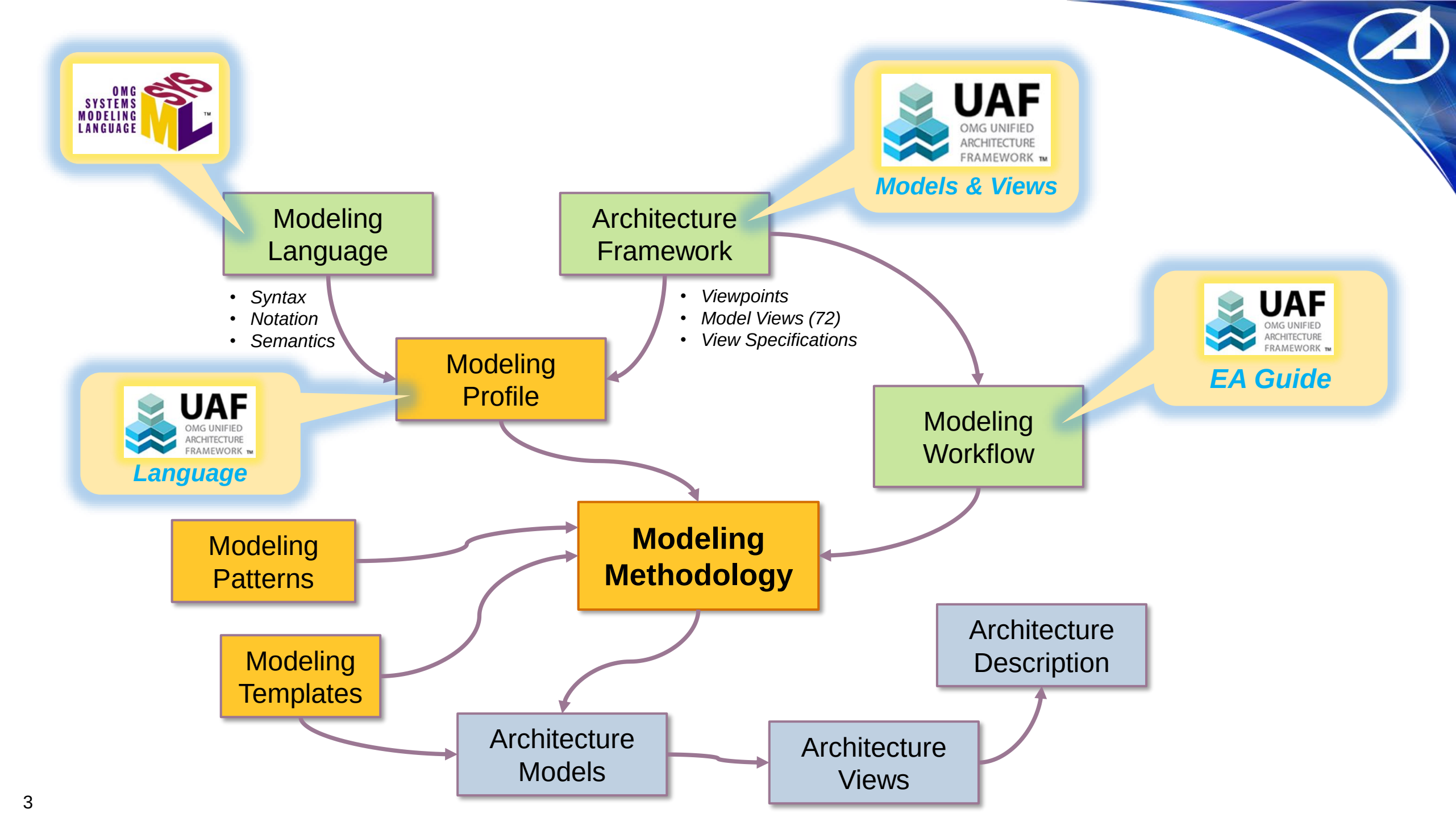
For modeling complex **Software Architectures** and applications

For modeling complex **System Architectures** that may include hardware, software, personnel, processes and facilities

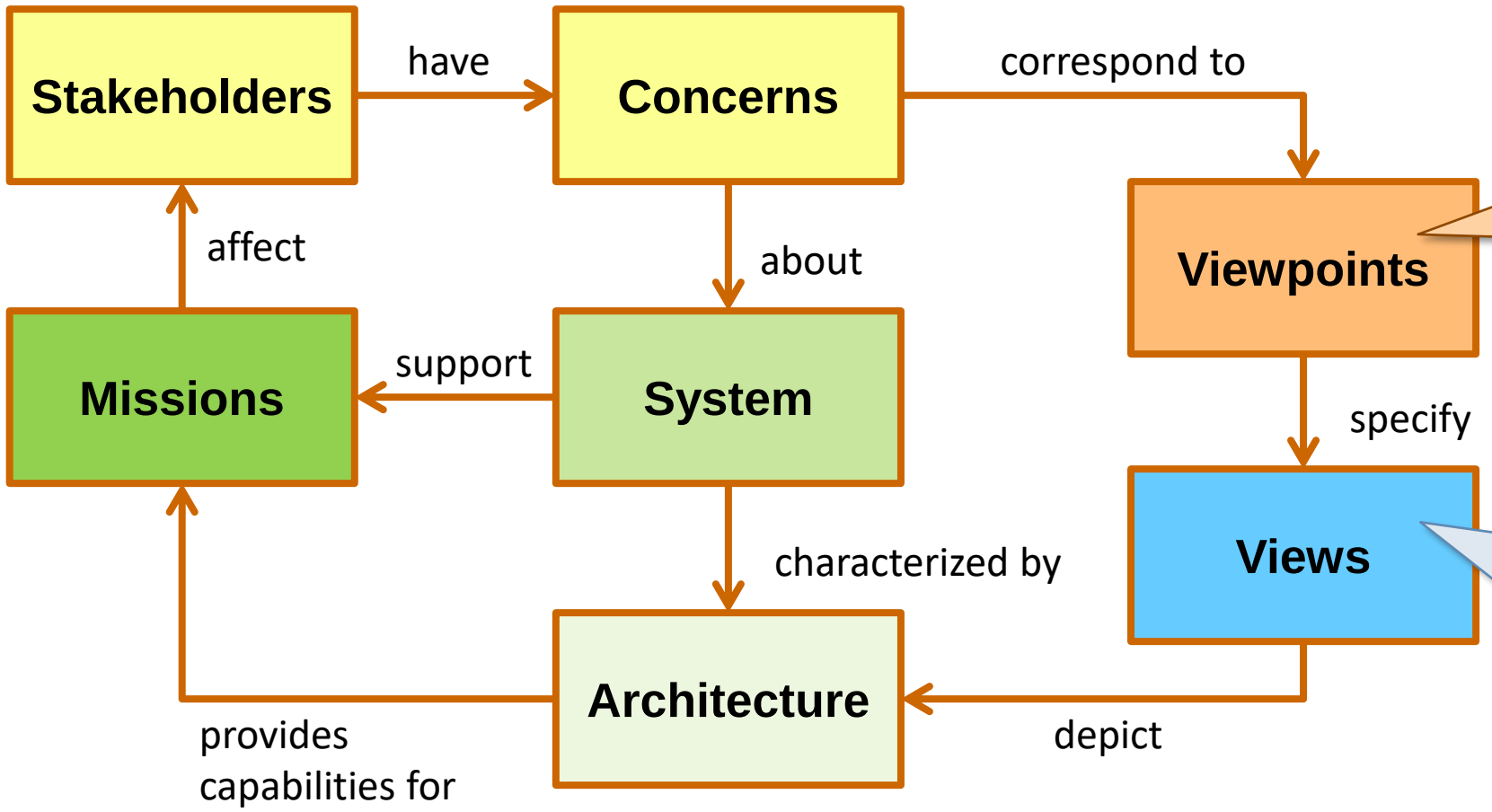
For modeling complex **Business Processes**



For modeling complex **Enterprise Architectures** that includes strategy, capabilities, operations, programs/projects, services, resources, security, personnel, organizations and standards


OMG SYSTEMS MODELING LANGUAGE
Modeling Language
Syntax
Notation
Semantics
Architecture Framework
UAF OMG UNIFIED ARCHITECTURE FRAMEWORK
Models & Views
Viewpoints
Model Views (72)
View Specifications
Modeling Profile
UAF OMG UNIFIED ARCHITECTURE FRAMEWORK
Language
Modeling Workflow
UAF OMG UNIFIED ARCHITECTURE FRAMEWORK
EA Guide
Modeling Patterns
Modeling Methodology
Modeling Templates
Architecture Description
Architecture Models
Architecture Views

The UAF Standard Provides Stakeholder-Based **Viewpoints** & Aspect-Oriented **Views** to Characterize an Architecture



UAF Viewpoints

- Strategic
- Operational
- Services
- Personnel
- Resources
- Security
- Projects
- Standards

UAF Aspects

- Motivation
- Taxonomy
- Structure
- Connectivity
- Processes
- States
- Sequences
- Information
- Parameters
- Constraints
- Roadmaps
- Traceability

The Two-Dimensional UAF Grid

Architecture Aspects

Stakeholder Viewpoints

UAF	Motivation Mv	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Sequences Sq	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Architecture Management Am	Architecture Principles Am-Mv	Architecture Extensions Am-Tx	Architecture Views Am-Sr	Architectural References Am-Cn	Architecture Development Method Am-Pr		-	Dictionary Am-If	Architecture Parameters Am-Pm	Architecture Constraints Am-Ct	Architecture Roadmap Am-Rm	Architecture Traceability Am-Tr
Summary & Ove…												
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		Strategic …onstraints St-Ct	Strategic Roadmaps: Deployment, Phasing St-Rm-D, -P	Strategic Traceability St-Tr
Operational Op	Requirements Rq-Mv	Operational Taxonomy Op-Tx	Operational Structure Op-Sr	Operational Connectivity Op-Cn	Operational Processes Op-Pr	Operati… State… Op-St		Operational Information Model Op-If	Environment En-Pm and Measurements Me-Pm and Risks Rk-Pm	…erational …nstraints Op-Ct	-	Operational Traceability Op-Tr
Services Sv		Services Taxonomy Sv-Tx	Services Structure Sv-Sr	Services Connectivity Sv-Cn	Services Processes Sv-Pr	Services States Sv-St	Services Sequences Sv-Sq			Services Constraints Sv-Ct	Services Roadmap Sv-Rm	Services Traceability Sv-Tr
Personnel Ps		Personnel Taxonomy Ps-Tx	Personnel Structure Ps-Sr	Personnel Connectivity Ps-Cn	Personnel Processes Ps-Pr	Personnel States Ps-St	Personnel Sequences Ps-Sq	Resources Information Model Rs-If		Competence, Drivers, Performance Ps-Ct-C, -D, -P	Availability, Evolution, Forecast PS-Rm-A,-E,-F	Personnel Traceability Ps-Tr
Resources Rs		Resources Taxonomy Rs-Tx	Resources Structure Rs-Sr	Resources Connectivity Rs-Cn	Resources Processes Rs-Pr	Resources States Rs-St	Resources Sequences Rs-Sq			Resources Constraints Rs-Ct	Resources Roadmaps: Evolution, Forecast Rs-Rm-E, -F	Resources Traceability Rs-Tr
Security Sc	Sc… Cont… Sc-Mv	Security Taxonomy …Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr	-				Security Constraints Sc-Ct	-	Security Traceability Sc-Tr
Projects Pj		…s …vity			Projects Processes Pj-Pr	-					Projects Roadmap Pj-Rm	Projects Traceability Pj-Tr
Standards Sd		…Sd-Tx	…Sd-Sr		-	-					Standards Roadmap Sd-Rm	Standards Traceability Sd-Tr
Actual Resources Ar	-	-	Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn	Simulation…					Evaluation	-	-

Processes Aspect of the Architecture Entity

Resources Viewpoint of Stakeholders

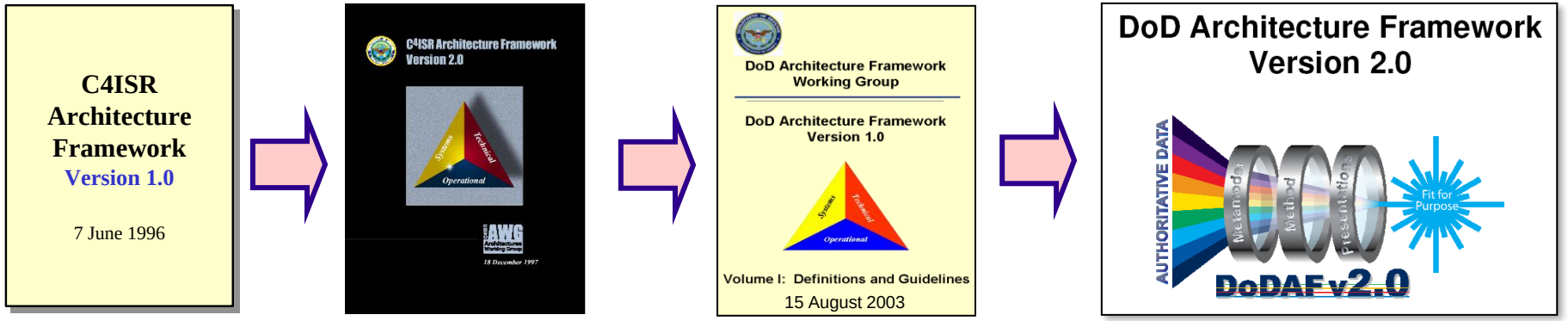
View Specification for the Resources Viewpoint & the Processes Aspect (Rs-Pr)

Evolution of Architecture Frameworks

UAF is a 5th Generation Framework

2017

UAF
OMG UNIFIED ARCHITECTURE FRAMEWORK ™



1996 **1997** **2003** **2009**

Using UAF will automatically provide DODAF views while also providing enhanced expressiveness of the architecture

The 52 Views in DODAF

VP	ID	Models
All VP	AV-1	Overview and Summary Information
	AV-2	Integrated Dictionary
Capability Viewpoint	CV-1	Vision
	CV-2	Capability Taxonomy
	CV-3	Capability Phasing
	CV-4	Capability Dependencies
	CV-5	Capability to Org Development Mapping
	CV-6	Capability to Opnl Activities Mapping
	CV-7	Capability to Services Mapping
Data & Info VP	DIV-1	Conceptual Data Model
	DIV-2	Logical Data Model
	DIV-3	Physical Data Model
Operational Viewpoint	OV-1	High Level Operational Concept Graphic
	OV-2	Operational Resource Flow Description
	OV-3	Operational Resource Flow Matrix
	OV-4	Organizational Relationships Chart
	OV-5a	Operational Activity Decomposition Tree
	OV-5b	Operational Activity Model
	OV-6a	Operational Rules Model
	OV-6b	State Transition Description
	OV-6c	Event-Trace Description
Project VP	PV-1	Project Portfolio Relationships
	PV-2	Project Timelines
	PV-3	Project to Capability Mapping
Stds VP	StdV-1	Standards Profile
	StdV-2	Standards Forecast

VP	ID	Models
Services Viewpoint	SvcV-1	Services Context Description
	SvcV-2	Services Resource Flow Description
	SvcV-3a	Systems-Services Matrix
	SvcV-3b	Services-Services Matrix
	SvcV-4	Services Functionality Description
	SvcV-5	Opnl Activity to Services Trace Matrix
	SvcV-6	Services Resource Flow Matrix
	SvcV-7	Services Measures Matrix
	SvcV-8	Services Evolution Description
	SvcV-9	Services Technology & Skills Forecast
	SvcV-10a	Services Rules Model
	SvcV-10b	Services State Transition Description
	SvcV-10c	Services Event-Trace Description
Systems Viewpoint	SV-1	Systems Interface Description
	SV-2	Systems Resource Flow Description
	SV-3	Systems-Systems Matrix
	SV-4	Systems Functionality Description
	SV-5a	Opnl Activity to Sys Func Trace Matrix
	SV-5b	Opnl Activity to Systems Trace Matrix
	SV-6	Systems Resource Flow Matrix
	SV-7	Systems Measures Matrix
	SV-8	Systems Evolution Description
	SV-9	Systems Technology & Skills Forecast
	SV-10a	Systems Rules Model
	SV-10b	Systems State Transition Description
	SV-10c	Systems Event-Trace Description

The 72 Views in UAF

Kinds of Views
(Architecture Aspects)

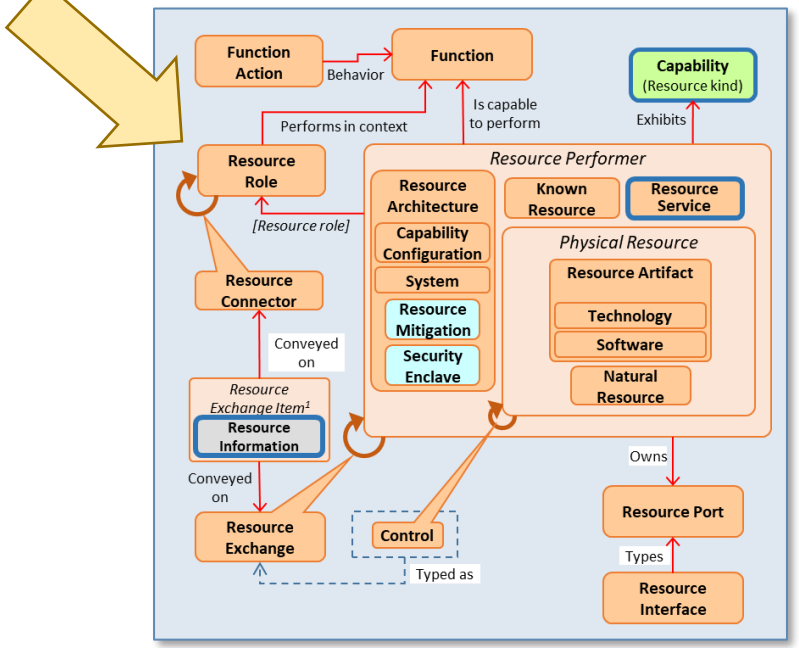
Architectural Viewpoints
(Stakeholder Perspectives)

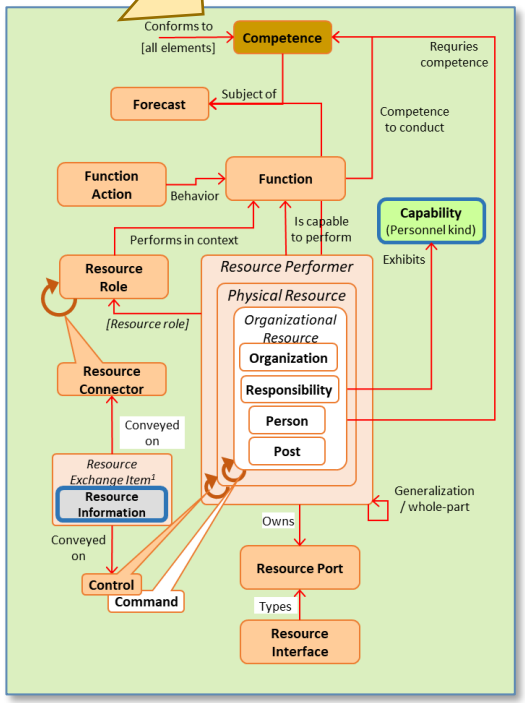
UAF	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Interaction Scenarios Is	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Metadata Md	Metadata Taxonomy Md-Tx	Architecture Viewpoints [a] Md-Sr	Metadata Connectivity Md-Cn	Metadata Processes [a] Md-Pr	-	-	Conceptual Data Model, Logical Data Model, Physical Data Model	Environment Pm-En, Measurements Pm-Me	Metadata Constraints [a] 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, St-Rm; 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, Drivers, Performance Pr-Ct	Personnel Availability, Personnel Evolution, Personnel Forecast Pr-Rm	Personnel Traceability Pr-Tr
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			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 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 [b]					Parametric Execution/ Evaluation [b]	-	-
Dictionary * Dc											
Summary & Overview Sm-Ov											
Requirements Req											

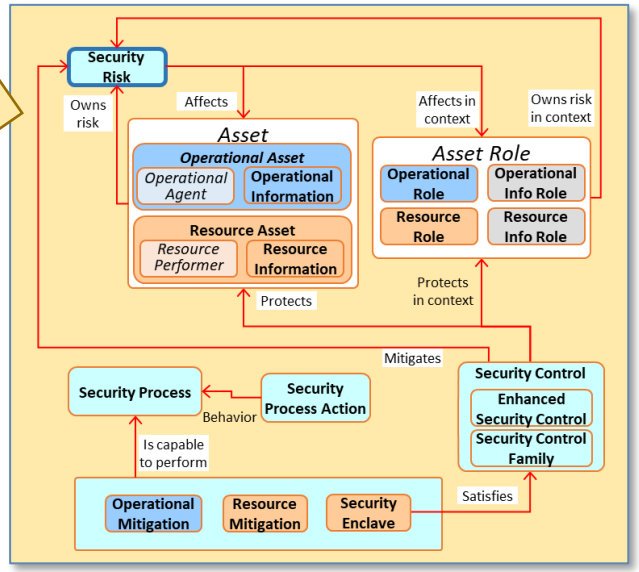
UAF Provides Additional Features Beyond DODAF…

New viewpoints to address other important stakeholders and their concerns

- **Security Views:** rules and constraints, enclaves and levels, threat analysis, security weaknesses and strongpoints
- **Personnel Views:** roles and responsibilities, knowledge and skills, organizational constructs, role dependencies
- **Resources Views:** kinds of resources (including Systems) that can implement functions and activities, interactions and dependencies, mapping to requirements

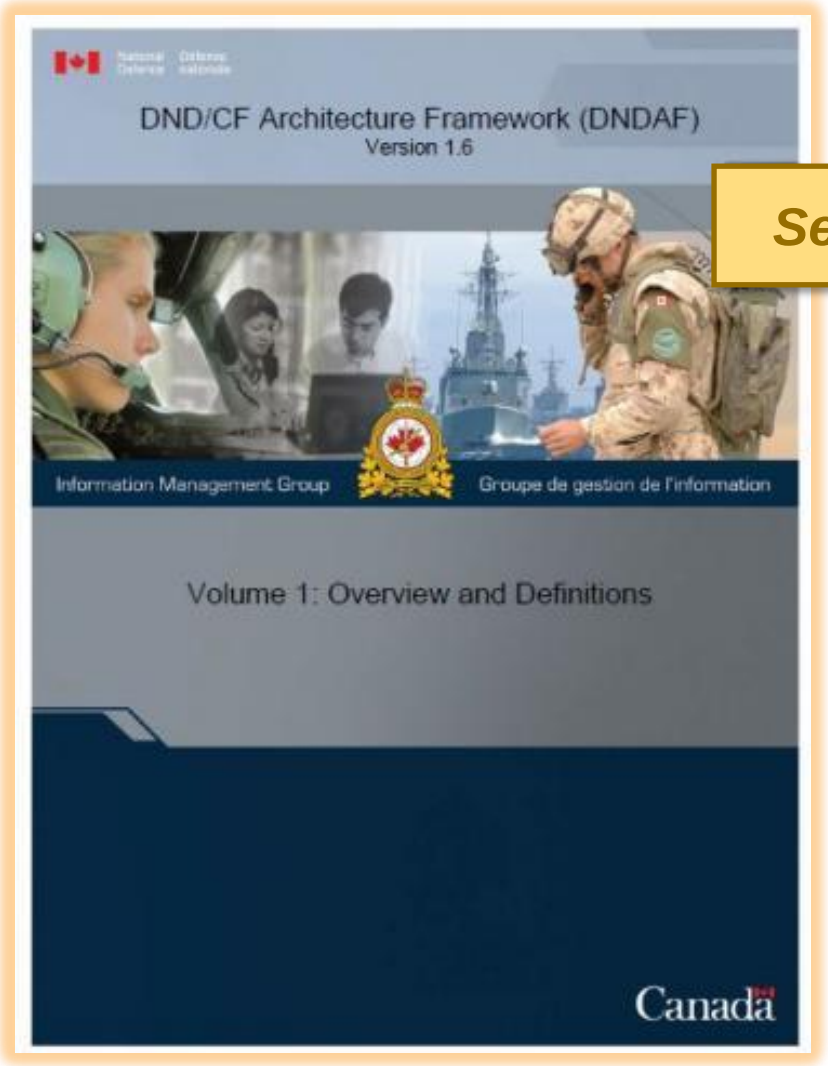






Evolution of Architecture Frameworks

UAF is a 5th Generation Framework



Security Views

2017

UAF

OMG UNIFIED ARCHITECTURE FRAMEWORK ™

DoD Architecture Framework Version 2.0

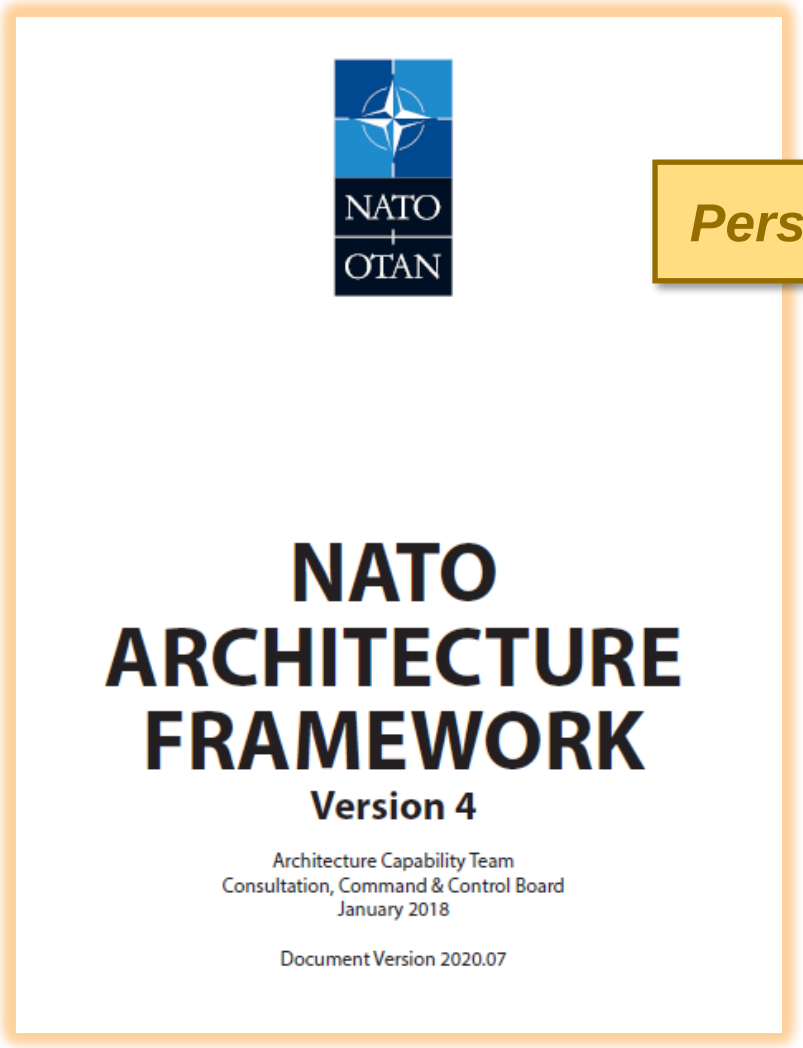
AUTHORITATIVE DATA
Metamodel
Method
Presentations
Fit for Purpose
DoDAF v2.0

2009

UAF was enhanced by contributions from several Architecture Frameworks – including this one from Canada…

Evolution of Architecture Frameworks

UAF is a 5th Generation Framework



Personnel Views

2017

UAF

OMG UNIFIED ARCHITECTURE FRAMEWORK ™

DoD Architecture Framework Version 2.0

2009

NATO Architecture Framework Views can be created using the UAF Domain Metamodel

Mapping DODAF Views to UAF

UAF views will be automatically compatible with DODAF views

	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Interaction Scenarios Is	Information[c] If	Parameters[d] Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Metadata Md	Metadata Taxonomy[ff] Md-Tx	Architecture Viewpoints[a] Md-Sr	Metadata Connectivity Md-Cn	Metadata Processes[a] Md-Pr	-	-			Metadata Constraints[a] Md-Ct		Metadata Traceability Md-Tr
Strategic St	CV-1 CV-2	CV-1	CV-4	-	Strategic States St-St	-				CV-5	
Operational Op	OV-2	OV-1a OV-2	OV-3/ OV-6	OV-5	OV-6b	OV-6c					
Services Sv	ScV-1	ScV-1 ScV-2	ScV-3 ScV-6	ScV-4	ScV-10b	ScV-10c	DIV-1				
Personnel Pr	OV-4	OV-4	OV-4 SV-6	SV-4	SV-10b	SV-10c	DIV-2 DIV-3				
Resources Rs	SV-1, SV-2	SV-1, SV-2	SV-3, SV-6	SV-4	SV-10b	SV-10c					
Security Sc	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr	-	-					
Projects Pj	PV-1	PV-1	PV-2	-	-	-					
Standards Sd	StdV-1	StdV-1	-	-	-	-					
Actuals Resources Ar		OV-4	OV-4 SV-1 & SV-2	Simulation[b]							
Dictionary * Dc (AV-2)											
Summary & Overview SmOv (AV-1, OV-1 graphi											
Requirements Rq											

2.2 UAF 1.0 to DoDAF 2.02 Mapping

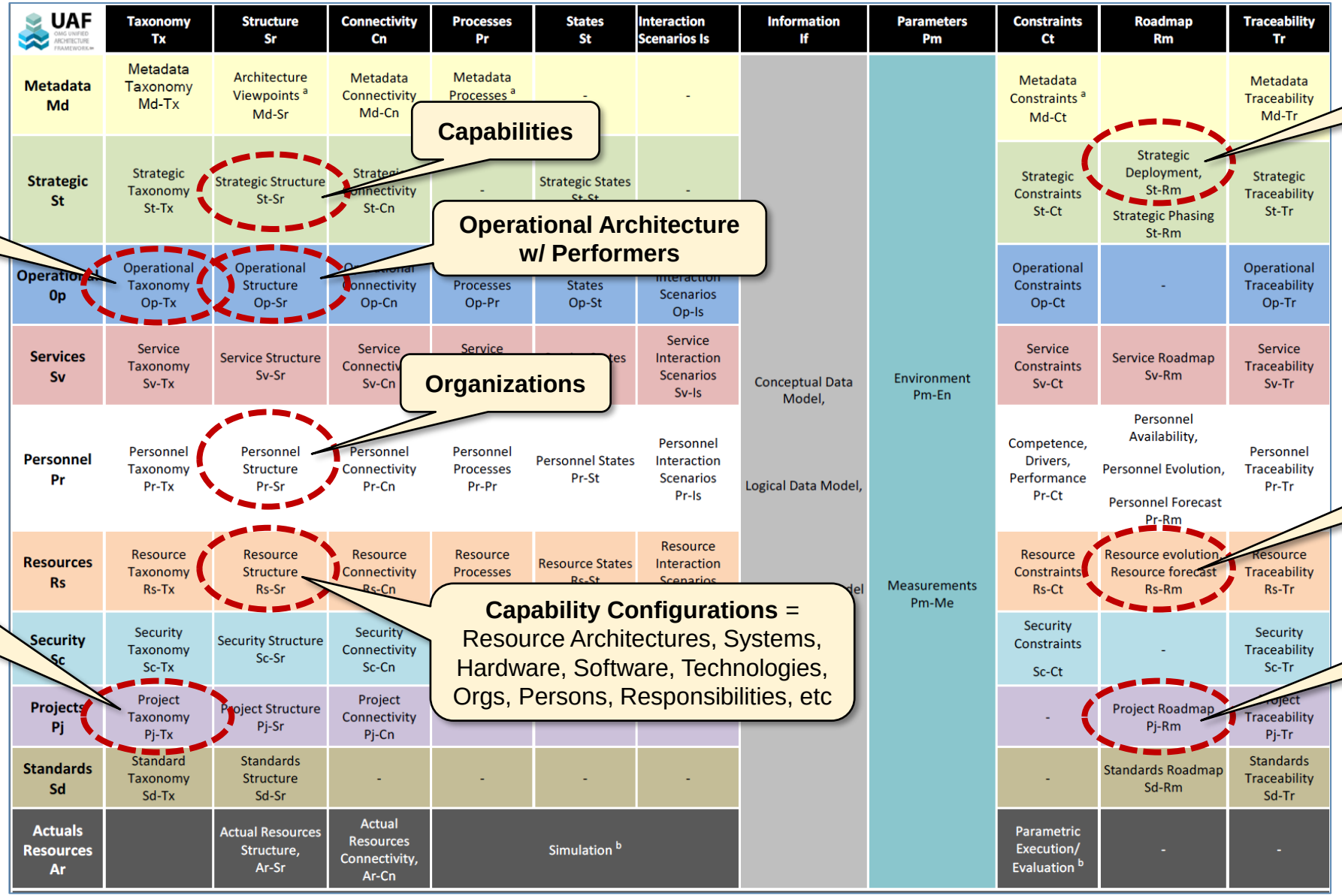
Table 2.1 - UAF 1.0 to DoDAF 2.02 Mapping

UAF Viewpoint Name	DoDAF 2.02	DoDAF 2.02 Long Name
Actual Resource Connectivity	Combination of OV-4/SV-1.2	Actual Organisational Relationships Systems interface description, Systems resource flow description (IBD, Parametrics)
Actual Resource Structure	OV-4	Actual Organisational Relationships (IBD, Parametrics)
Dictionary	AV-2	Integrated Dictionary
Information Model	DIV-1/DIV-2/DIV-3	Conceptual Data Model/Logical Data Model/ Physical Data Model
Operational Connectivity	OV-3	Operational Resource Flow Matrix
Operational Constraints	OV-6a	Operational Rules Model
Operational Interaction Scenario	OV-6c	Event-Trace Description
Operational Processes	OV-5a/OV-5b	Operational Activity Decomposition Tree/Operational Activity Model
Operational States	OV-6b	State Transition Description
Operational Structure	OV-1, OV-2	High-level Operational Concept Graphic (Structured version), Operational Resource Flow Description (IBD)
Operational Taxonomy	OV-1, OV-2	High-level Operational Concept Graphic (Structured version), Operational Resource Flow Description (IBD)
Operational Traceability	-	
Parameters Environment	-	

Source: UAF Specification, Appendix B – Frameworks Traceability

Typical Selection of Enterprise Architecture Views

Each architecting effort must tailor UAF to meet needs of that effort



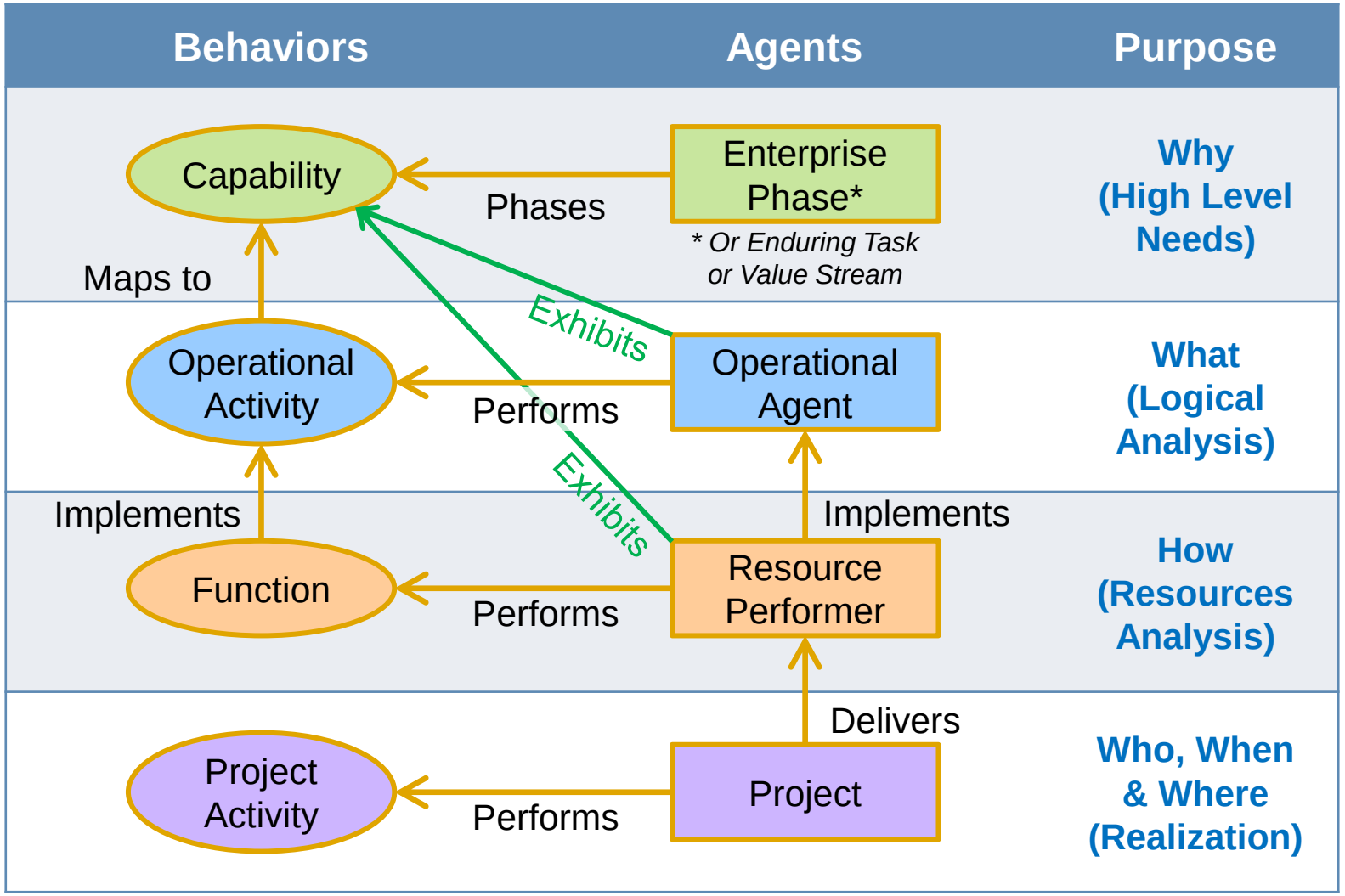
UAF Basic Building Blocks

Behaviors & Agents (ie, Doing and Being)

Behaviors	Agents	Purpose
Capability	Enterprise Phase* ** Or Enduring Task or Value Stream*	**Why (High Level Needs)**
Operational Activity	Operational Agent	**What (Logical Analysis)**
Function	Resource Performer	**How (Resources Analysis)**
Project Activity	Project	**Who, When & Where (Realization)**

UAF Basic Building Blocks

Key Relationships Between Behaviors & Agents



Components of the UAF Specification

UAF
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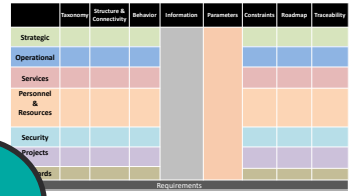
Specification

EA Guide

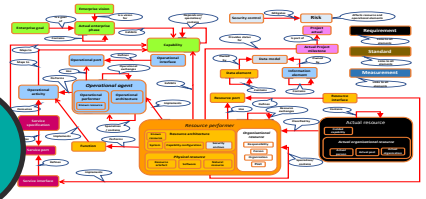
4

View Specifications organized in Viewpoints and Aspects (Grid)



1

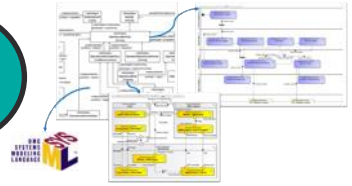
UAF Domain MetaModel (DMM)



2

UAF Modeling Language* (UAFML) based on SysML

3



** Formerly called the "UAF Profile (UAFP)"*

Potential Uses of EA Guide for UAF

Opportunity for unifying various MBSE & DE activities

- **Basis for building Architecture Views and Models**
  - Agreement between Upper Enterprise and Lower Enterprises on the proper division of responsibility and dependencies between models, eg…
    - ✓ Department of Defense → Air Force
    - ✓ Corporate Headquarters → Business Unit
    - ✓ Missile Defense Agency → Missile XYZ Program
  - Agreement between Acquisition Agency/Office and Prime Contractor…
  - Agreement between Prime Contractor and Suppliers…
  - Organization of training for Architecture Modeling classes and workshops
  - Assessment of EA modeling capabilities and competencies
- **Basis for creating an Organization's Modeling Methodology**
  - Methodology = Process + Methods + Tools + Techniques + Templates…
- **Process Guide instantiated in UAF Modeling Tool plug-ins**
  - Navigation Panel, Dashboard, Landing Page, etc for the Model
  - Model Management WBS and resource planning

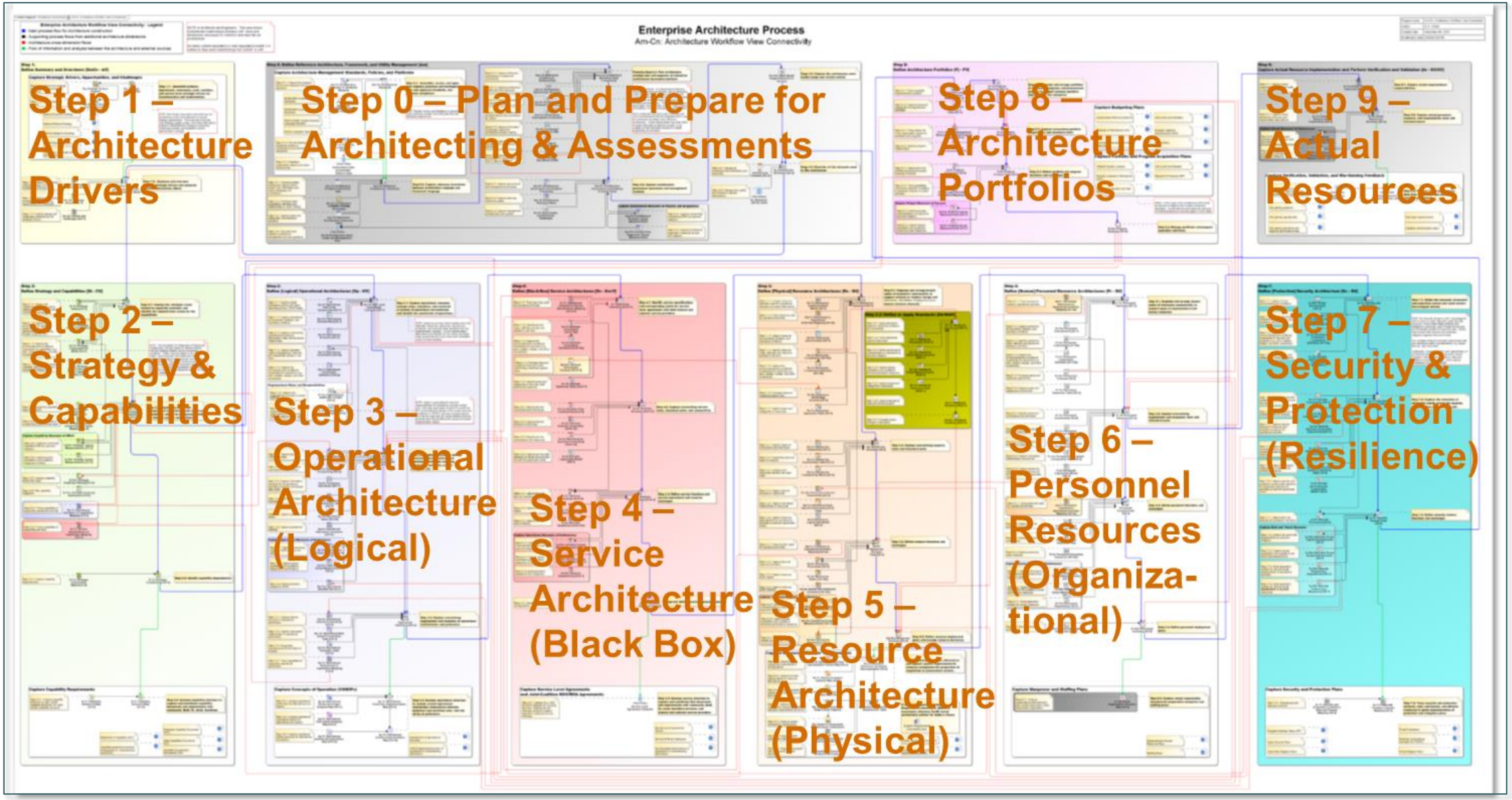
Standardized modeling guide for UAF needed to better enable more effective and efficient enterprise modeling activities and initiatives

UAF	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	Metadata Taxonomy Md-Tx	Architecture Viewpoints [a] Md-Sr	Metadata Connectivity Md-Cn	Metadata Processes [a] Md-Pr	-	-			Metadata Constraints [a] 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, St-Rm Strategic Phasing St-Rm	Strategic Traceability St-Tr
Operational Op	Operational Taxonomy Op-Tx								Operational Constraints Op-Ct	-	Operational Traceability Op-Tr
Services Sv									Service Constraints Sv-Ct	Service Roadmap Sv-Rm	Service Traceability Sv-Tr
Personnel Pr									Competence, Drivers, Performance Pr-Ct	Personnel Availability, Personnel Evolution, Personnel Forecast Pr-Rm	Personnel Traceability Pr-Tr
Resources Rs	Resource Taxonomy Rs-Tx	Resource Structure Rs-Sr	Resource Connectivity Rs-Cn	Resource Processes Rs-Pr	Rs-St	Resource Interaction Scenarios Rs-Is	Physical Data Model	Measurements Pm-Me	Resource Constraints Rs-Ct		Resource Traceability Rs-Tr
Security Sc	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr	-	-			Sc-Ct		Sc-Tr
Projects Pj	Project Taxonomy Pj-Tx	Project Structure Pj-Sr	Project Connectivity Pj-Cn	-	-	-			-		Project Traceability Pj-Tr
Standards Sd	Standard Taxonomy Sd-Tx	Standards Structure Sd-Sr	-	-	-	-			-		Standards Traceability Sd-Tr
Actuals Resources Ar		Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn	Simulation [b]							-
Dictionary * Dc											
Summary & Overview Sm-Ov											
Requirements Req											

Where do we start?
Which views do we need?
How are these views related?

Enterprise Architecture Guide for UAF

9-Step Modeling Workflow Developed as Basis for the Guide



Progression from Architecture Drivers to Implementation and Deployment of Capabilities

The domains present a logical and systematic flow of architecting precepts:

I. Stakeholder concerns drive a strategic plan

II. The strategic plan deploys capabilities in phases addressing capability gaps and shortfalls

III. Capabilities are implemented by operations in an operational (logical) architecture

IV. Concepts are implemented through services, resources and personnel in a set of resources (physical) architectures

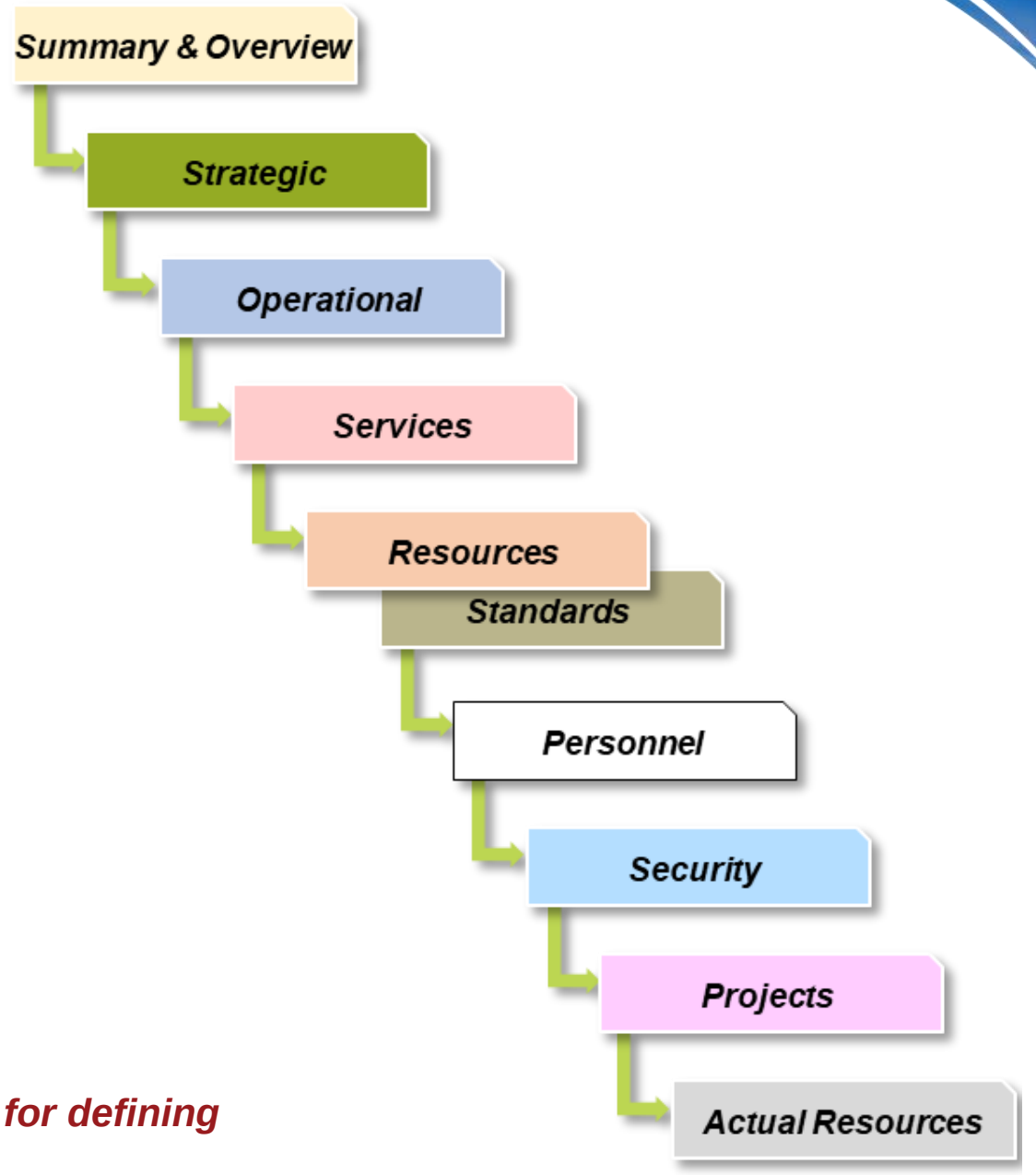
V. Resources comply with standards

VI. Risk and threats are mitigated through security & protection controls (of resources and operations)

VII. Requirements are captured, understood and communicated

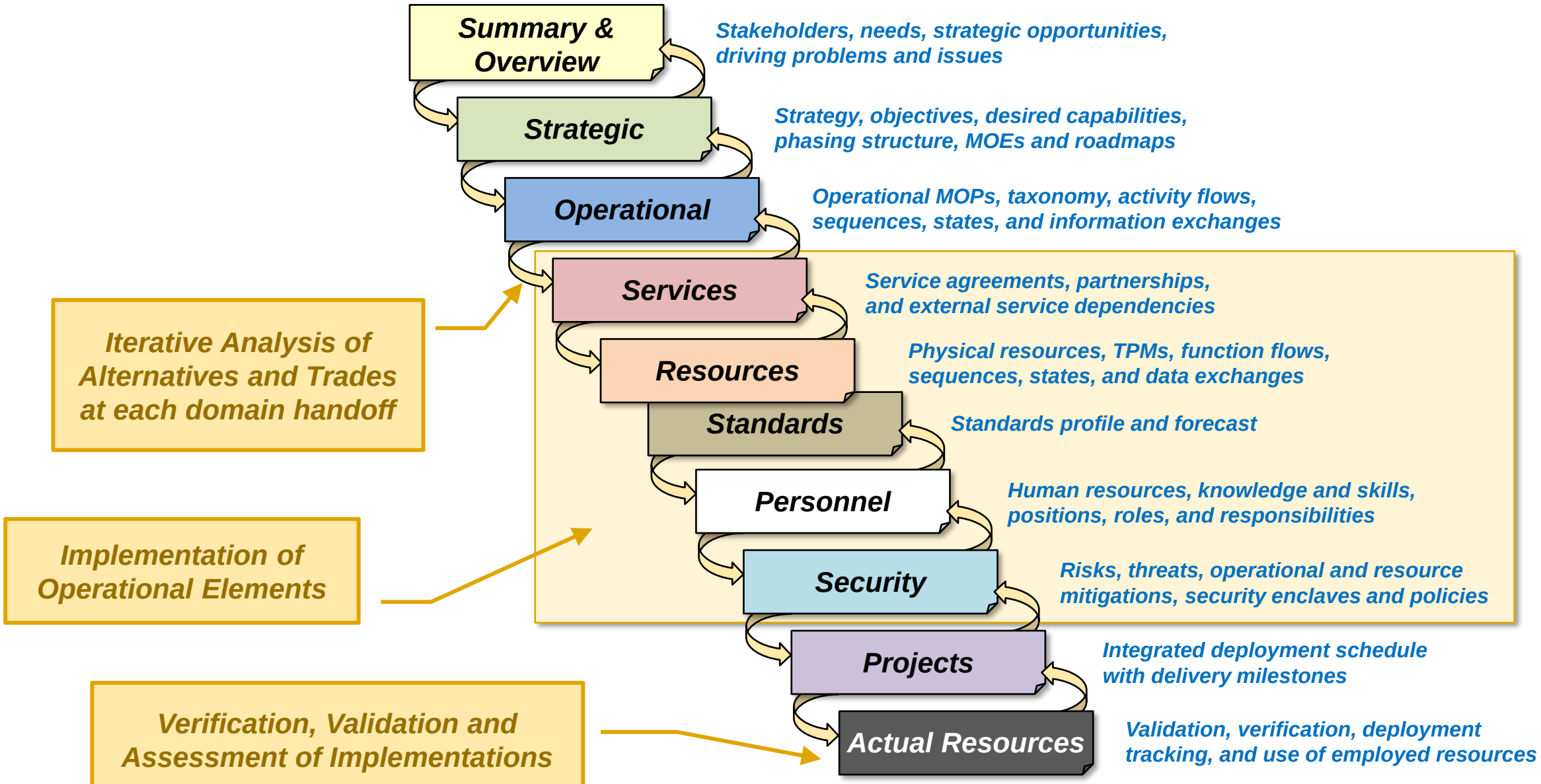
VIII. Plans deliver the resources

IX. Resources are verified



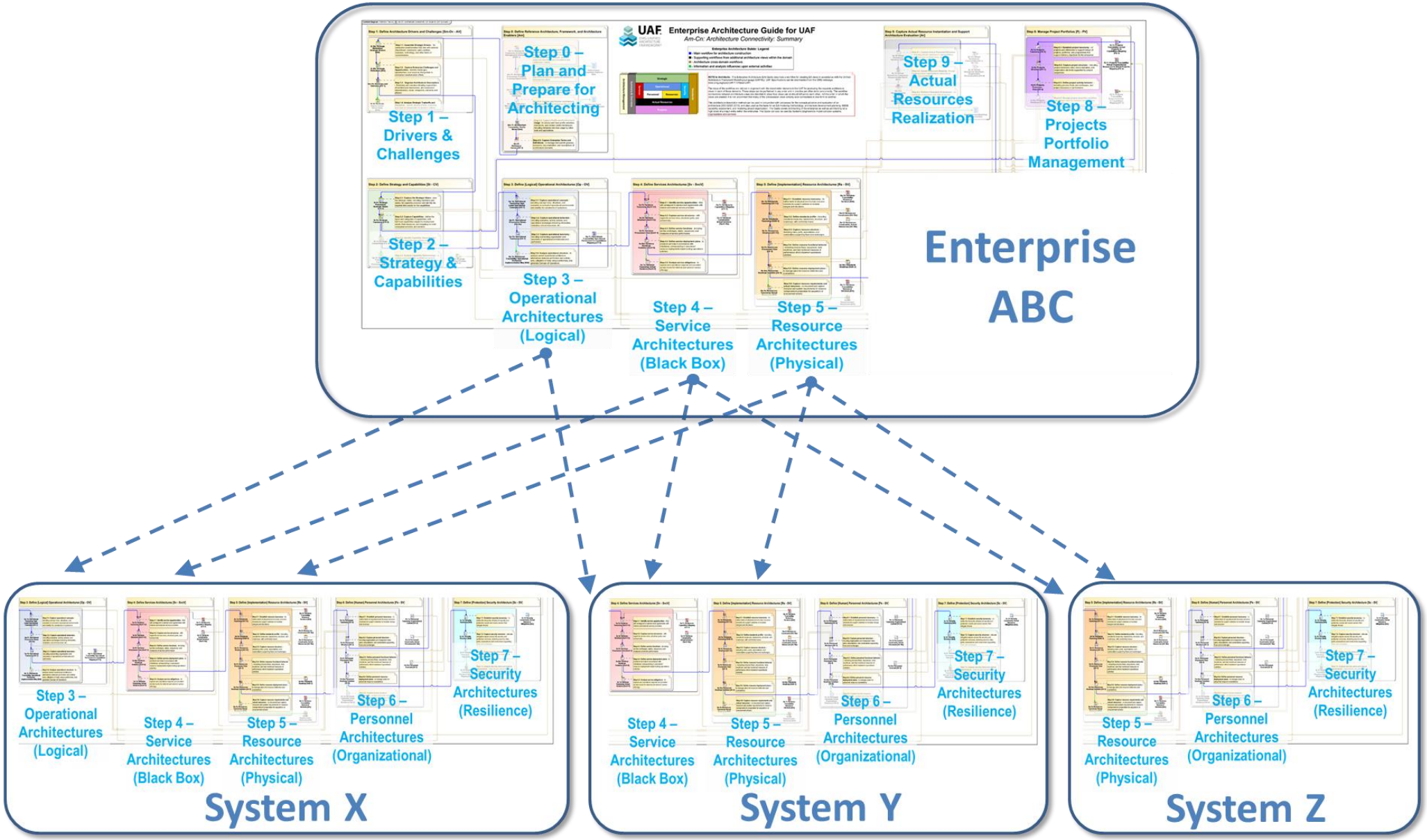
UAF provides a complete set of modeling domains as basis for defining the necessary architecture views of an Enterprise

Architectural Domains are Typically Addressed Concurrently with Iterations



Multi-Tier Enterprise Modeling

Only use the steps needed for each level and situation



EA Guide Document Outline

Intended to be easy to use and compact (ie, low page count)

- **Front Matter** (eg, copyrights, caveats, etc, TOC)
- **Preface** (OMG boiler plate)
- **Introduction** (purpose, background, UAF overview, key concepts) – 12 pages
- **Overview of the Guide** – 8 pages
- **Workflow Details** for each top-level step (10 chapters) – 80 pages total
  - One page graphic for each top-level step plus one page overview of that step
  - Narrative for each of 2nd level steps (~1 page each)
  - Table of steps and outputs
- **Appendices** – 40 pages

Only about 145 pages, designed to be easy to read with minimal use of jargon – ideal for managers and those who are new to Enterprise Architecture and Digital Engineering

Step 3 – Operational Architecture

Example of a Workflow Chapter in the EA Guide for UAF

Sample Chapter: Step 3 – Operational Architecture

Table of Contents

Sample Page Layout: Step 3.1 – Operational Concepts

Narrative, Terms, Workflow Diagram, List of Steps with View Outputs

5.3.3 Step 3.1 – Operational Concepts

Narrative

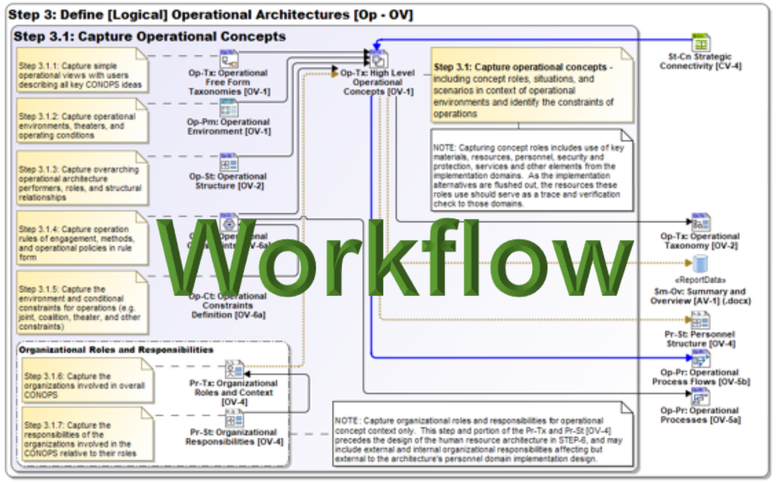
Step 3.1 – Capture Operational Concepts – First, an overarching set of performers are described in ***high-level operational concepts*** by their ***concept roles*** and their ***connections*** with each other, in a scoped context composed of ***conditions***, ***environments***, and ***locations***. All ***rules***, ***policies*** and other ***operational constraints*** are listed and applied to all ***operational agents***, and then later expanded to their associated actions and exchanges. When ***concept roles*** come from pre-existing ***known resources*** as well as other ***resources*** and ***organizations***, those are captured as well as their representing known scoping ***constraint***.

Known ***responsibility*** assignments of ***organizations*** or ***personnel*** are assumed. The set of ***operational agents***, scoped by participating ***concept roles***, are then structured into logical relationships where they are grouped or made parts of each other. A review is done to ensure all ***capabilities*** and their ***conditions*** and contexts have been covered or addressed within the ***high-level operational concepts***.

Key Terms

- **High-Level Operational Concept** – an element containing an integrated view of an operational scenario of participants, stakeholders, conditions, resources, and their conceptual roles with each other
- **Concept Role** – an element representing the part played by a logical or physical performer, asset, or condition which guides the accounting of necessary operational agents in an operational architecture
- **Known Resource** – a pre-existing entity, such as a physical resource or other operational agent which participates in an operational scenario, and is already known and described outside the context of the operational architecture
- **Conditions** – types of circumstances such as locations and environments and their characteristics
- **Operational Constraint** – a type of rule stemming from a policy, guidance, contract or other source

Workflow



Step Summary

57	**Step 3.1: Capture operational concepts** - including concept roles, situations, and scenarios in context of operational environments and identify the constraints of operations	Op-Tx: High Level Operational Concepts [OV-1]
58	Step 3.1.1: Capture simple operational views with users describing all key CONOPS ideas	Op-Tx: Operational Free Form Taxonomies [OV-1]
59	Step 3.1.2: Capture operational environments, theaters, and operating conditions	Op-Pm: Operational Environment [OV-1]
60	Step 3.1.3: Capture overarching operational architecture performers, roles, and structural relationships	Op-St: Operational Structure [OV-2]
61	Step 3.1.4: Capture operation rules of engagement, methods, and operational policies in rule form	Op-Ct: Operational Constraints [OV-6[illegible]]
62	Step 3.1.5: Capture the environment and conditional constraints for operations (e.g. joint, coalition, theater, and other constraints)	Op-Ct: Operational Constraints Definition [OV-6a]
63	Step 3.1.6: Capture the organizations involved in overall CONOPS	Pr-Tx: Organizational Roles and Context [OV-4]
64	Step 3.1.7: Capture the responsibilities of the organizations involved in the CONOPS relative to their roles	Pr-St: Organizational Responsibilities [OV-4]

5.3.4 Step 3.2 – Operational Activities

Step 3.2 – Capture Operational Activities – Second, one or more activities are mapped from each ***capability***, corresponding to and covering all the operational concepts, to ensure a complete library of ***operational activities***. This library may be arranged by activity groupings, operational agents capable to perform them, or some other useful organization. All of the ***operational agents*** are associated with each other wherever ***operational exchanges*** make ***operational connections*** that may exist between them.

An ***information conceptual data model*** is created to define the ***information elements*** which are exchanged. ***Operational exchanges*** are placed on all associations, with groupings of ***operational exchange items*** in accordance with logical actions or sequences of the performers. Multiple associations may exist between operational agents which represent different types of exchanges in terms of time, sequence, interface definition, or kinds of items that are exchanged (which for the operational architecture consist of ***information elements, resource performer, signals***, and ***geopolitical extents***).

Process flow diagrams are then constructed for all ***operational activities***, and are amplified, when needed, with ***operational state descriptions*** and sequenced timelines of ***operational messages***. Formal ***operational interfaces*** may be defined and declared for interface points of any operational agent.

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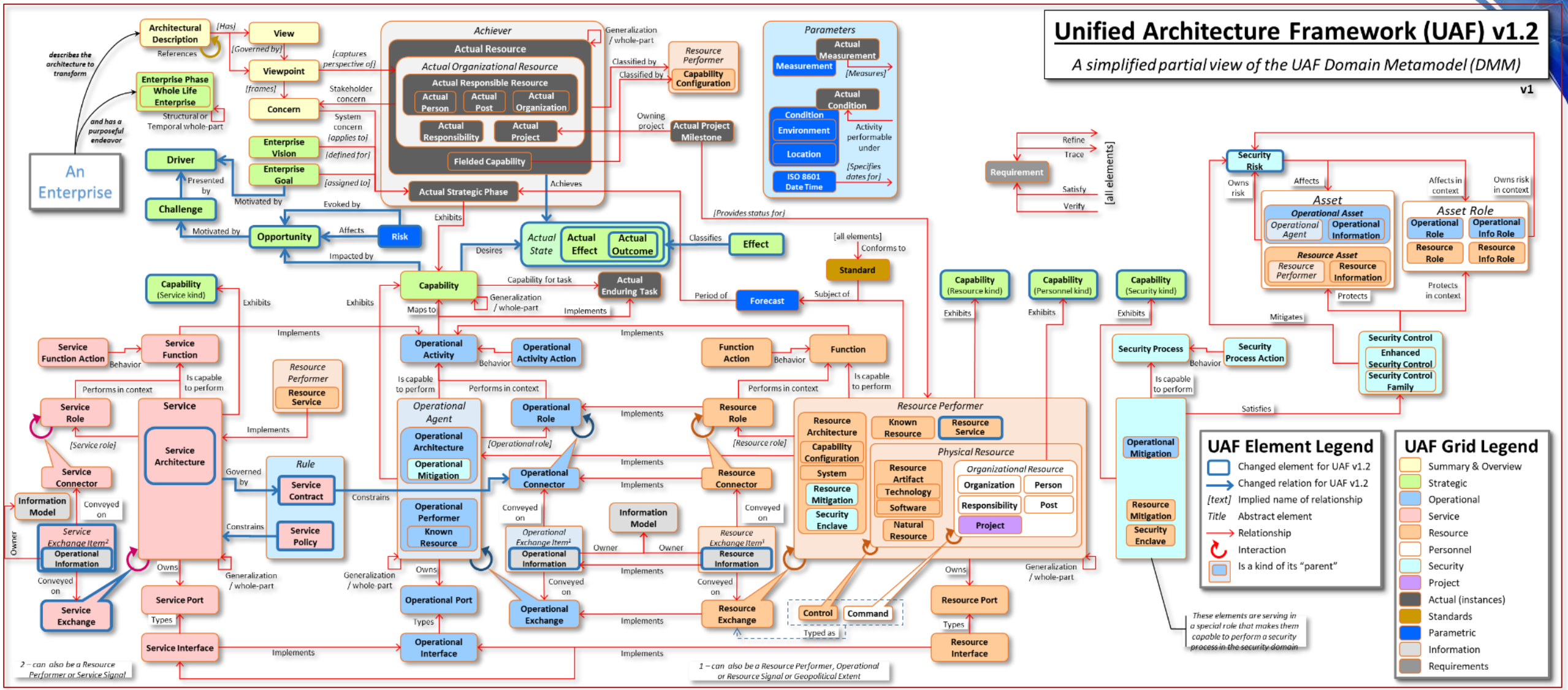
A review is done to ensure all ***operational concepts*** have been covered by ***operational activities***, and that all ***concept roles*** have now been covered by use of their ***performers*** that classified their ***concept roles***.

- **Operational Activity** – contains a view of a logical process flow
- **Operational Exchange** – a flow of information, people, material or energy
- **Operational Exchange item** – an information element or resource that is exchanged
- **Operational Message** – a sequenced message between two operational agents which may convey operational exchanges or methods

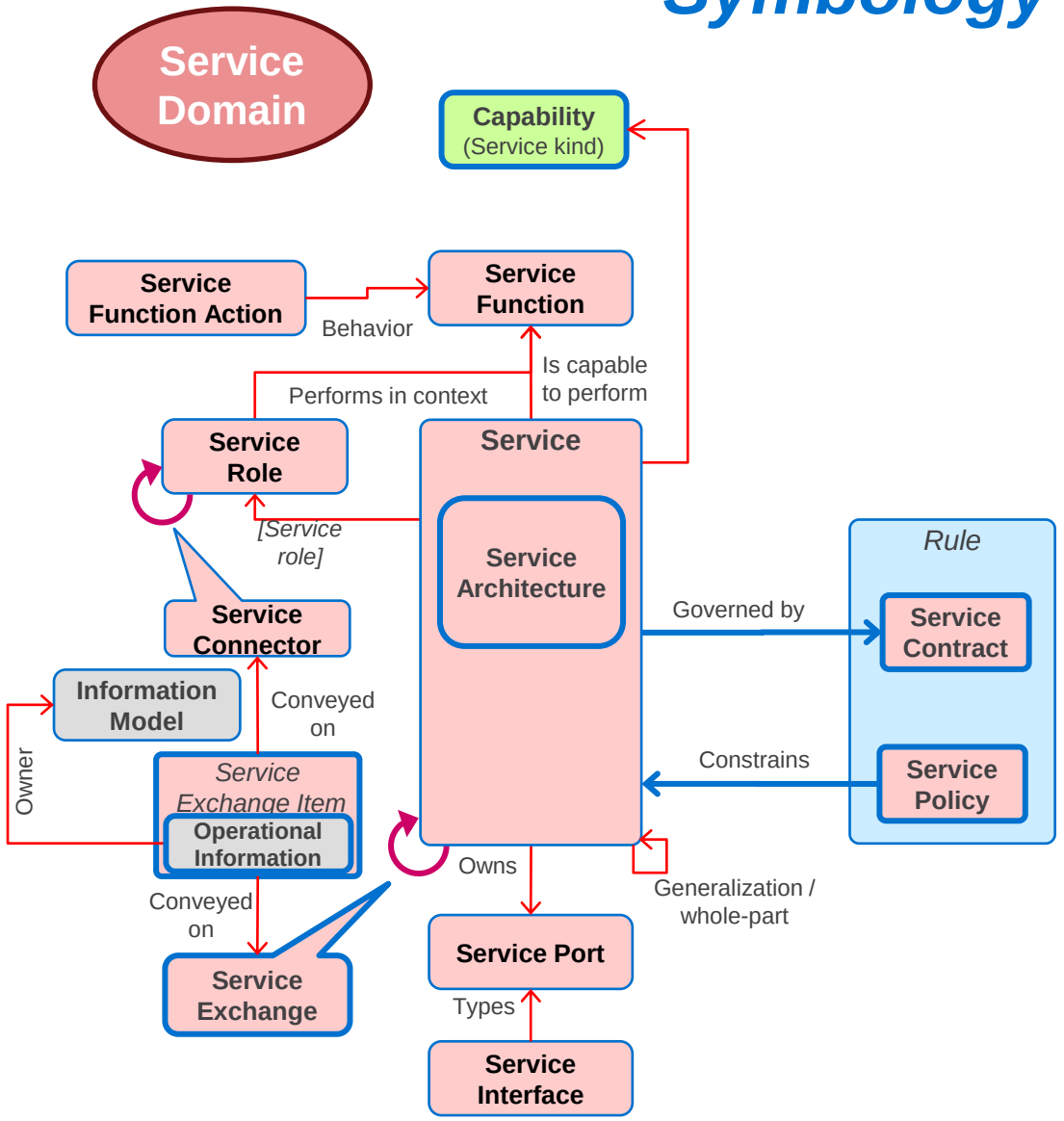
Guide intended to be used in conjunction with the UAF Sample Model

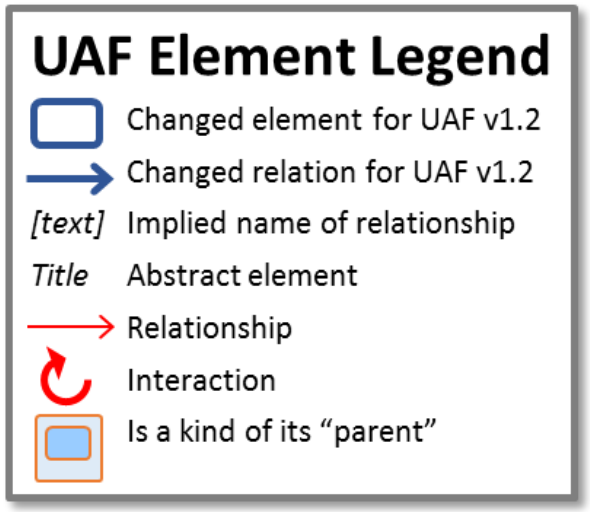
UAF Conceptual Schema

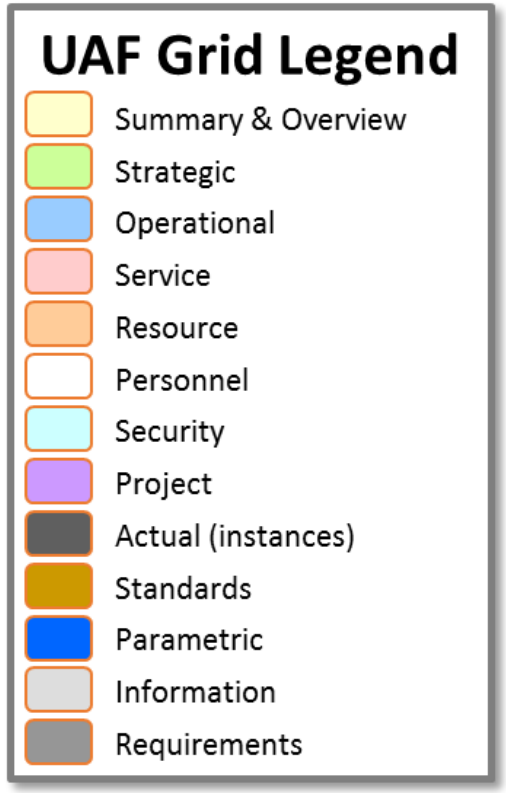


UAF Conceptual Schema

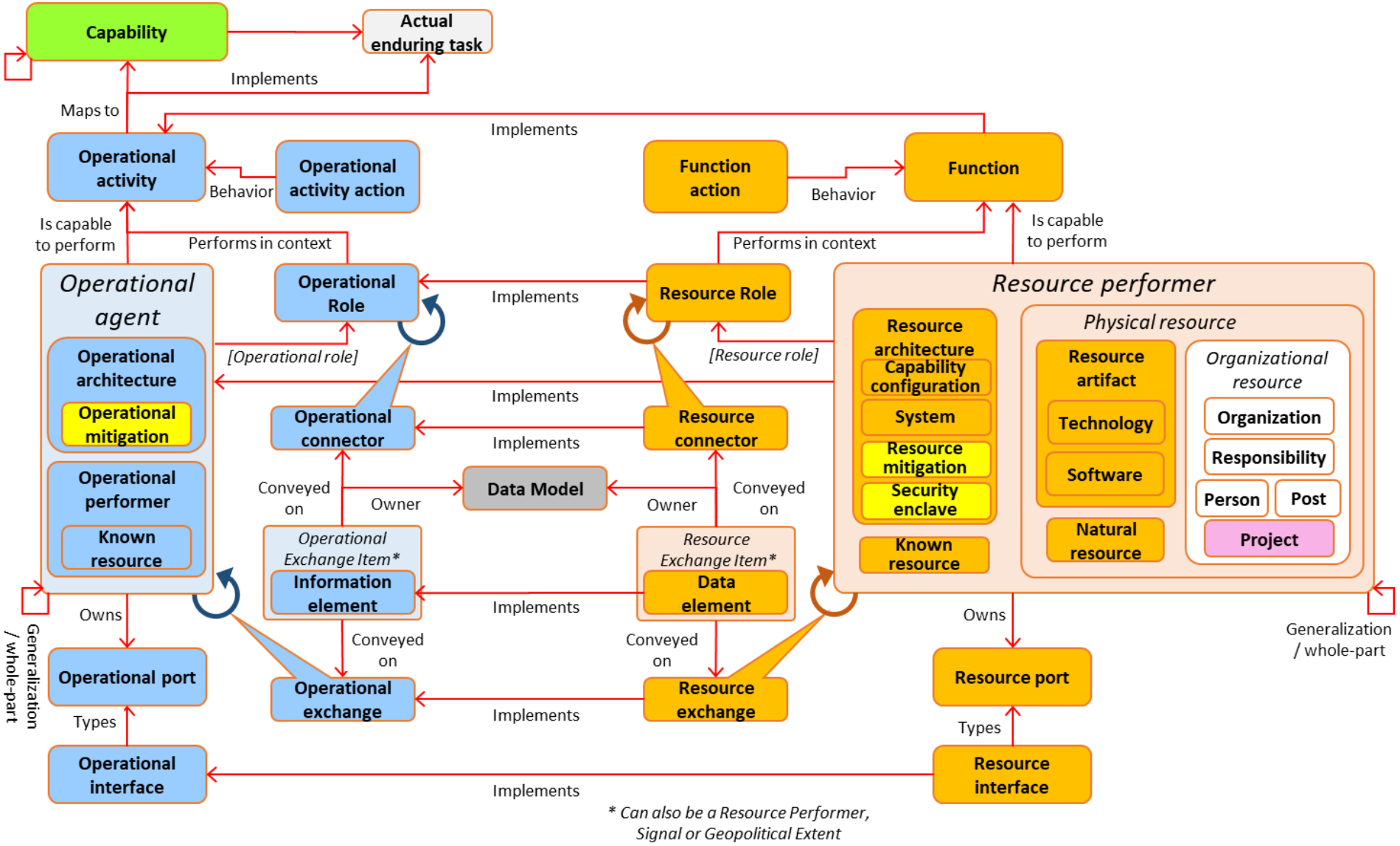
Symbology & Color Scheme



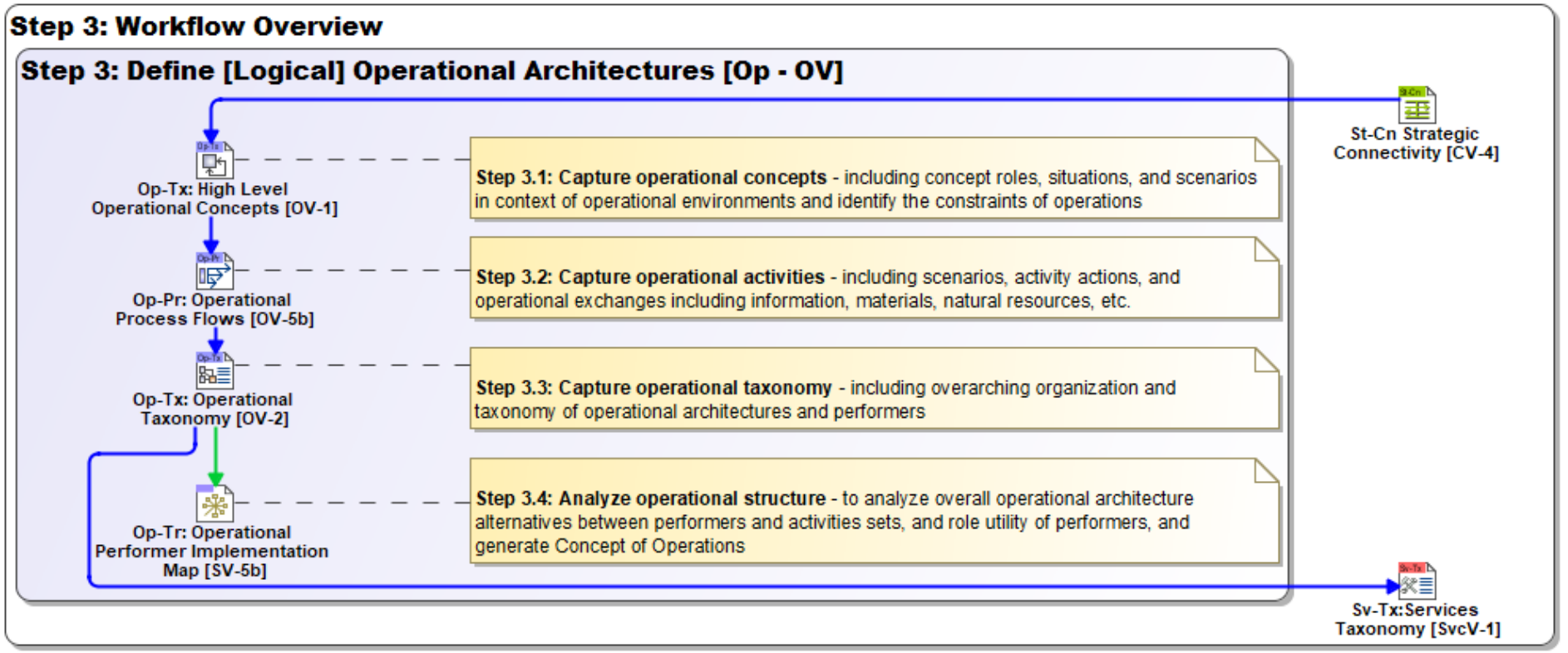




Conceptual Schema – Operational & Resource Modeling Entities and Relationships



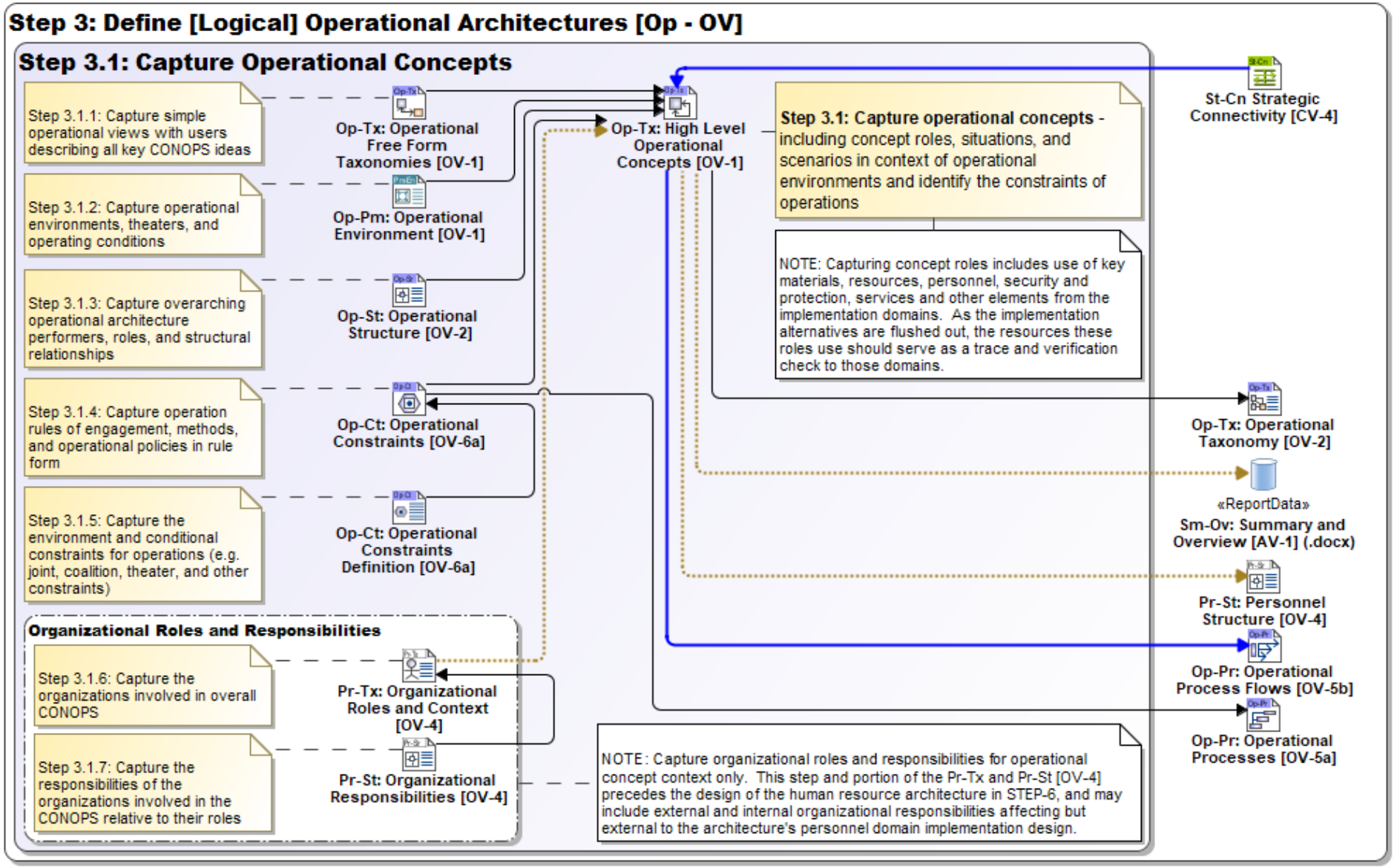
Step 3 – Operational Architecture (Top Level Flow)



Enterprise Architecture Workflow View Connectivity: Legend

- Main process flow for architecture construction
- Supporting process flows from additional architecture views within the domain
- Architecture cross-domain flows
- Flow of information and analysis between the architecture and external sources

Step 3.1 – Capture Operational Concepts



Sample View for Operational Taxonomy (Op-Tx)

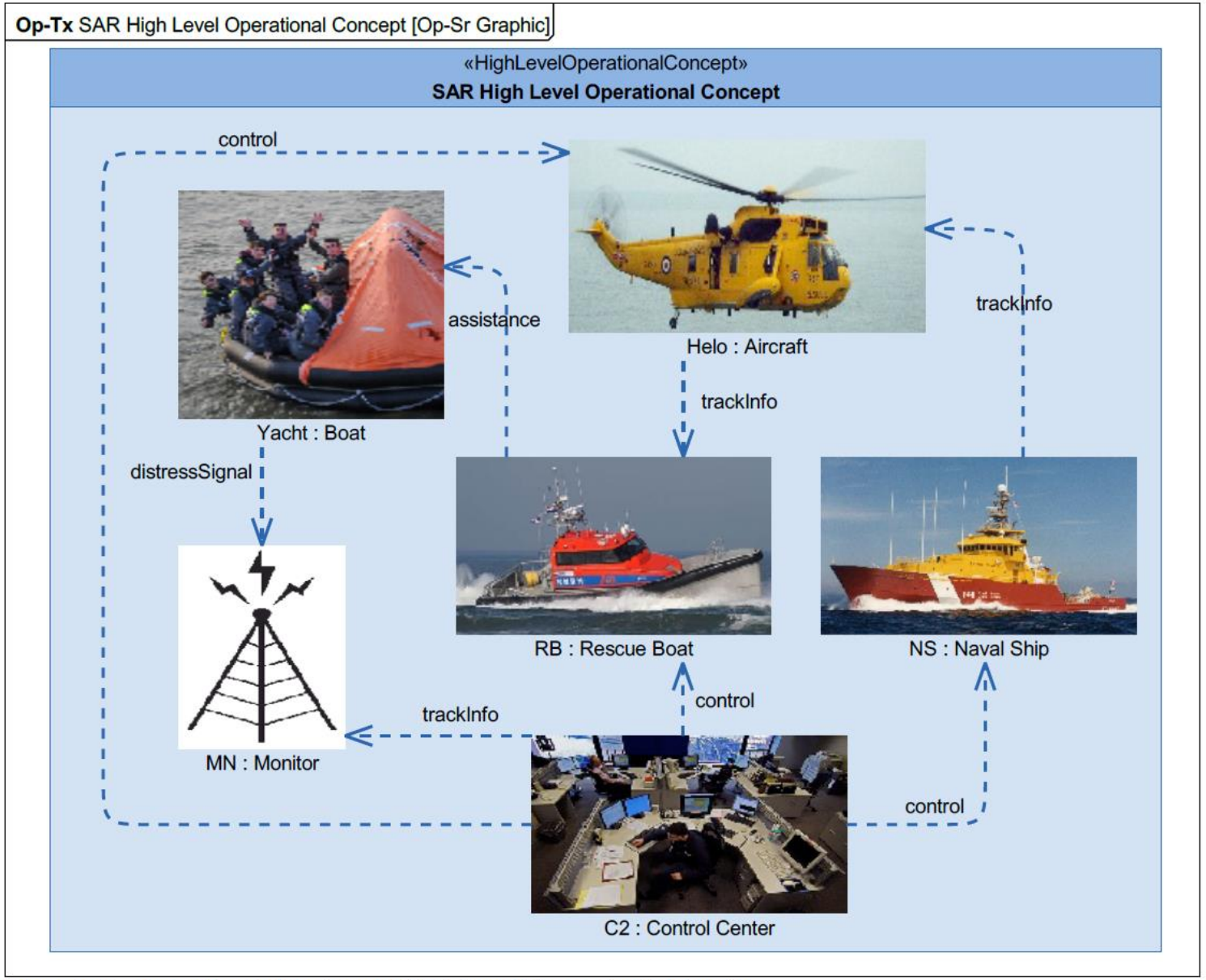
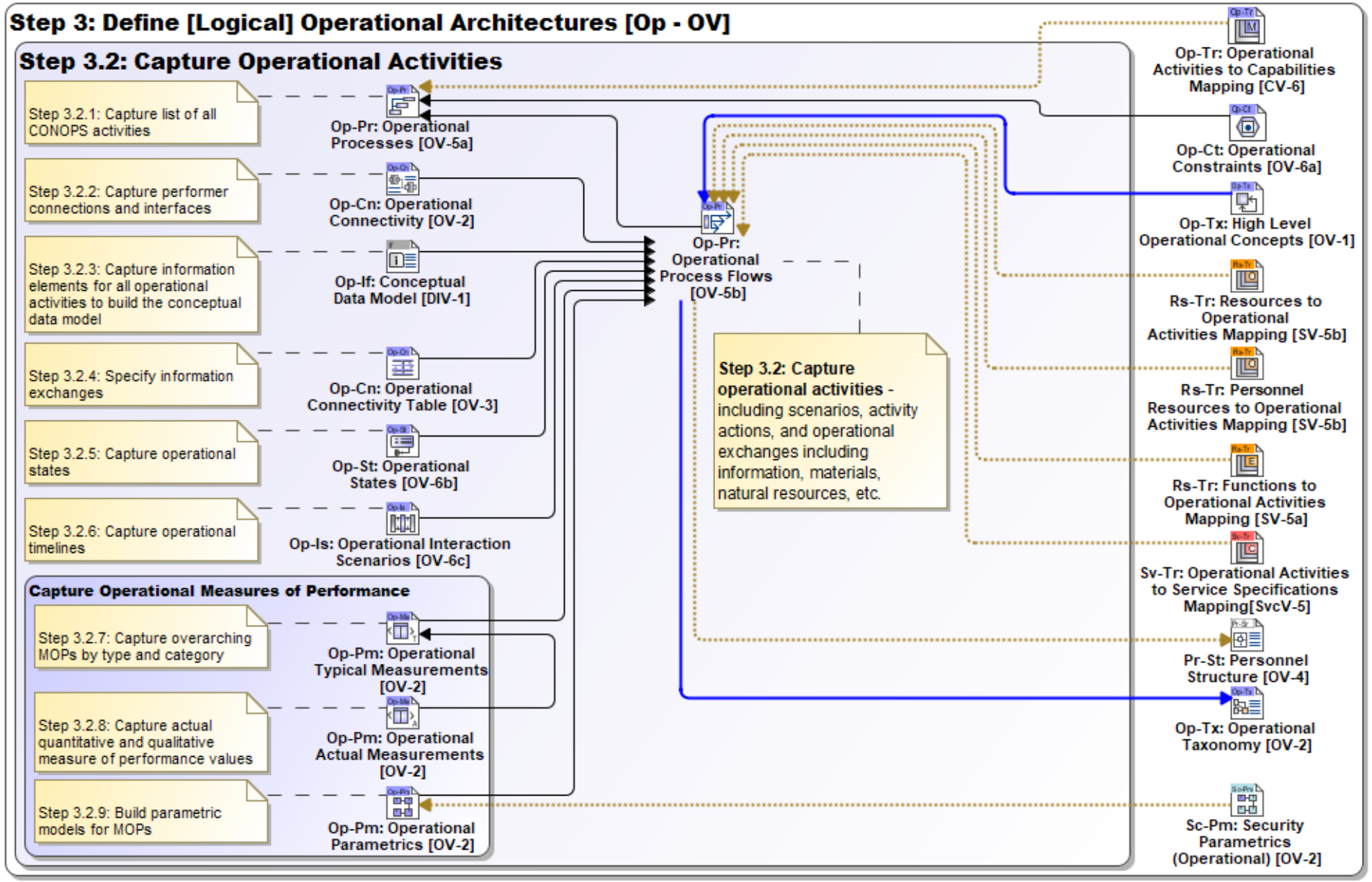


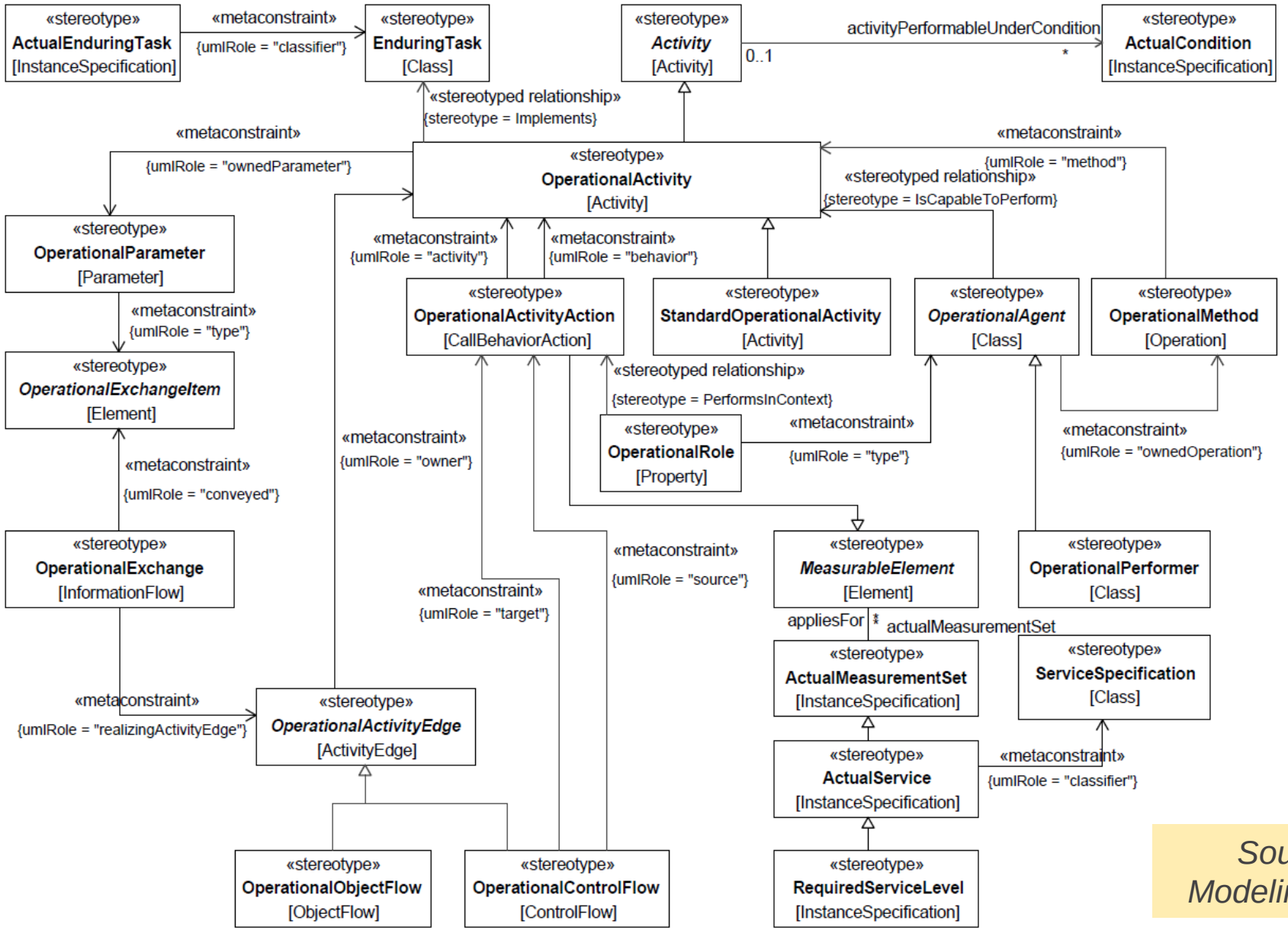
Figure 9:4 - Operational Structure of High-Level Concept with Graphics

Source: UAF Sample Problem

Step 3.2 – Capture Operational Activities



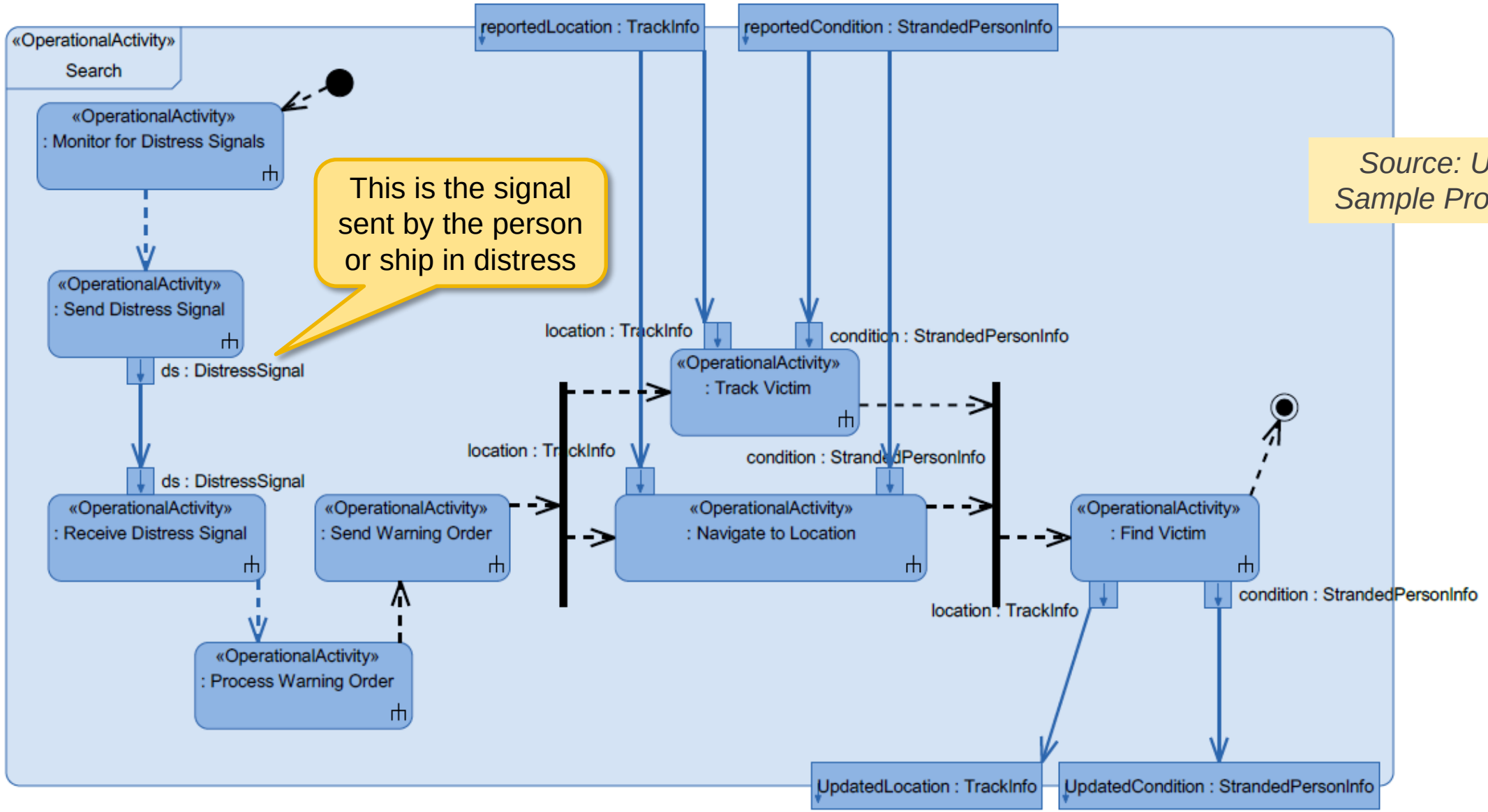
View Specification for Operational Processes (Op-Pr)



Source: UAF Modeling Language

Figure 4:12 - Operational Processes

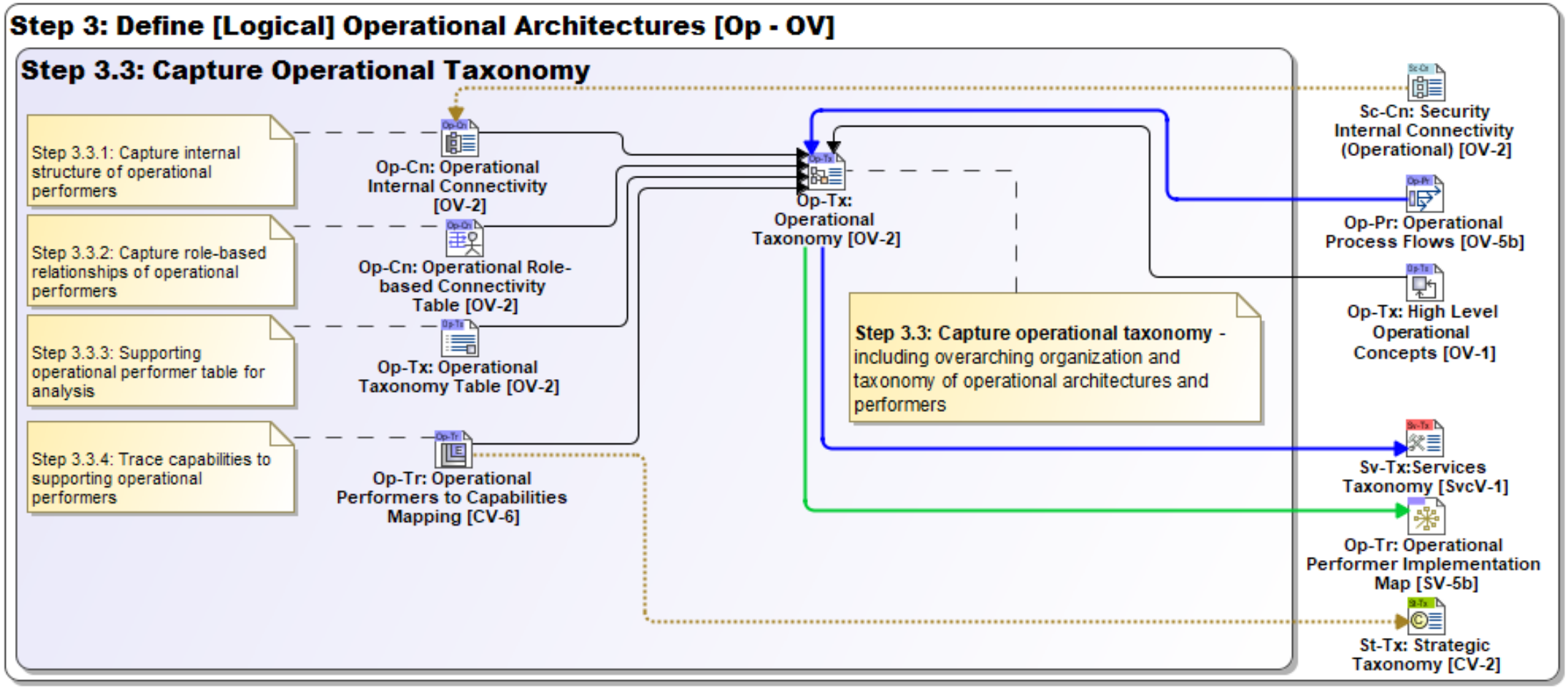
Sample View for Operational Processes (Op-Pr)



Source: UAF Sample Problem

Figure 9:9 - Operational Processes for the Search Activity (Activity Diagram)

Step 3.3 – Capture Operational Taxonomy



View Specification for Operational Taxonomy (Op-Tx)

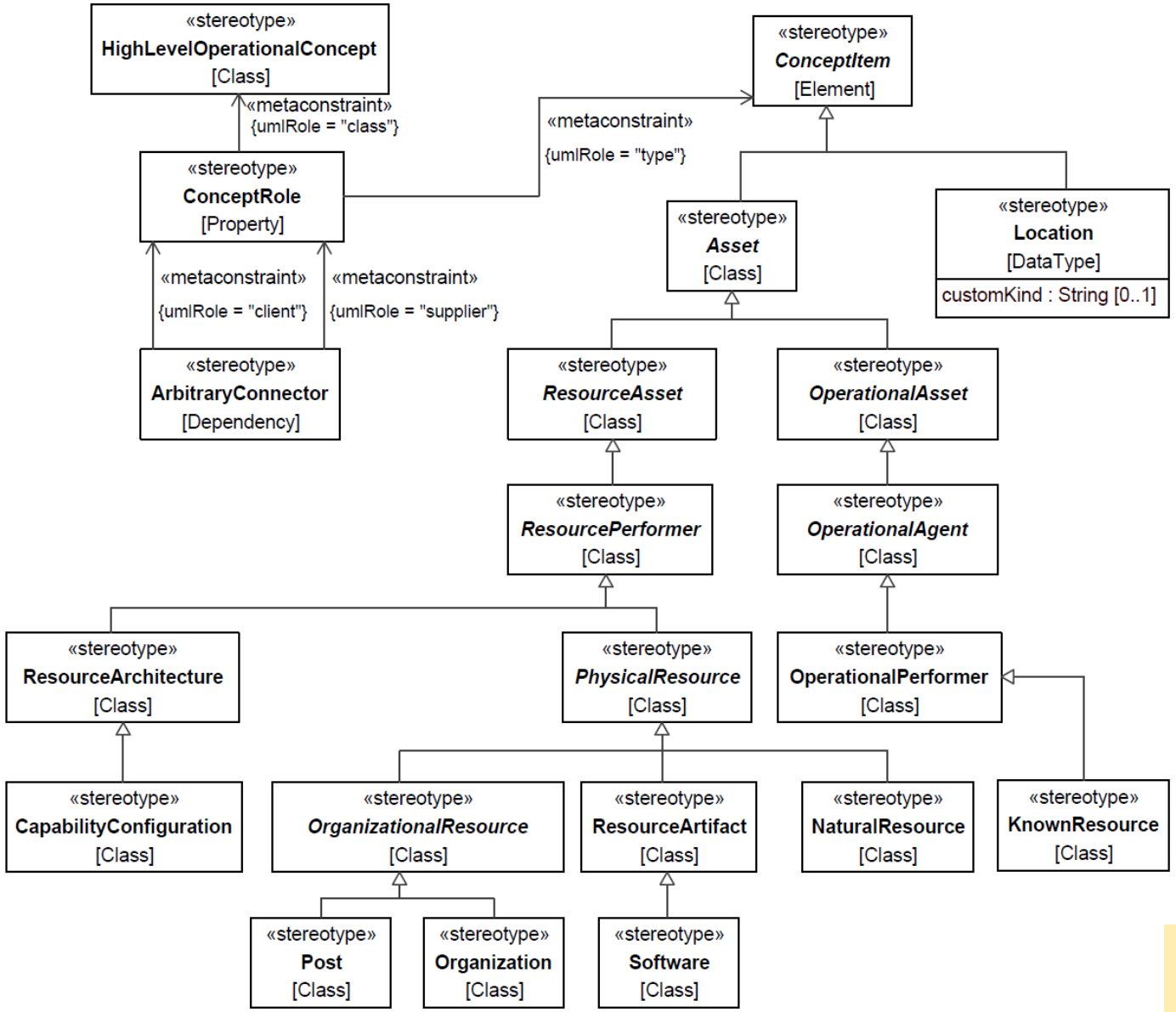
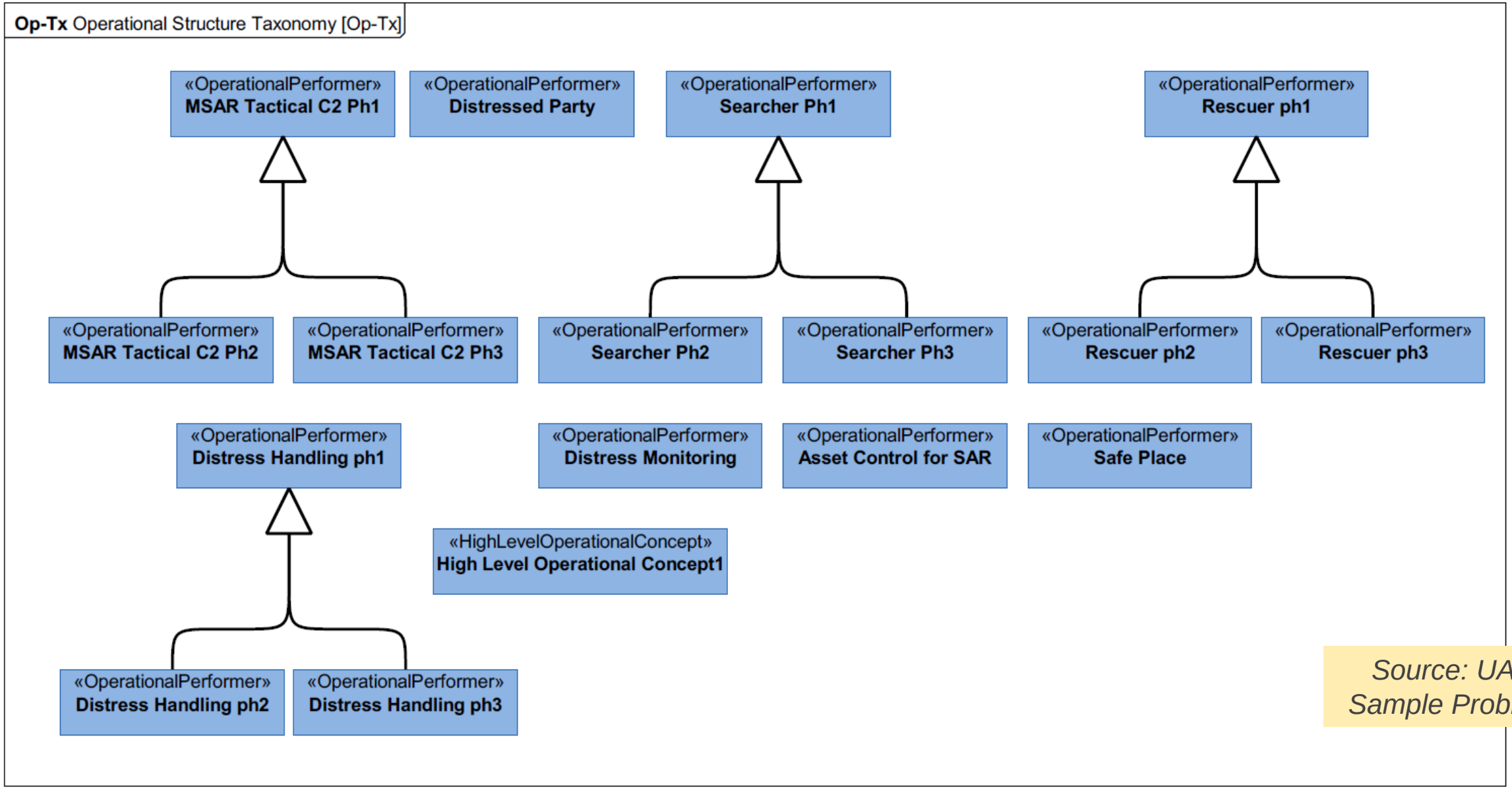


Figure 4:9 - Operational Taxonomy

Source: UAF Modeling Language

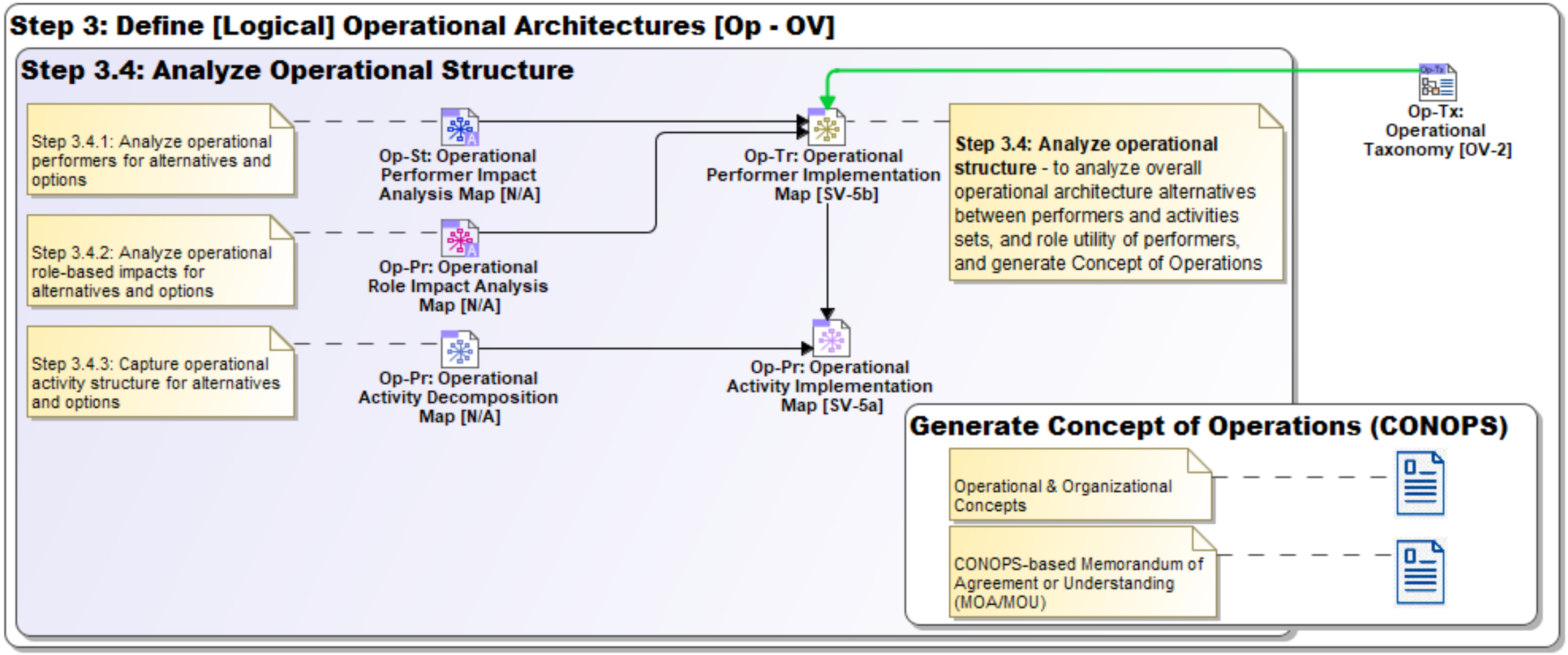
Sample View for Operational Taxonomy (Op-Tx)



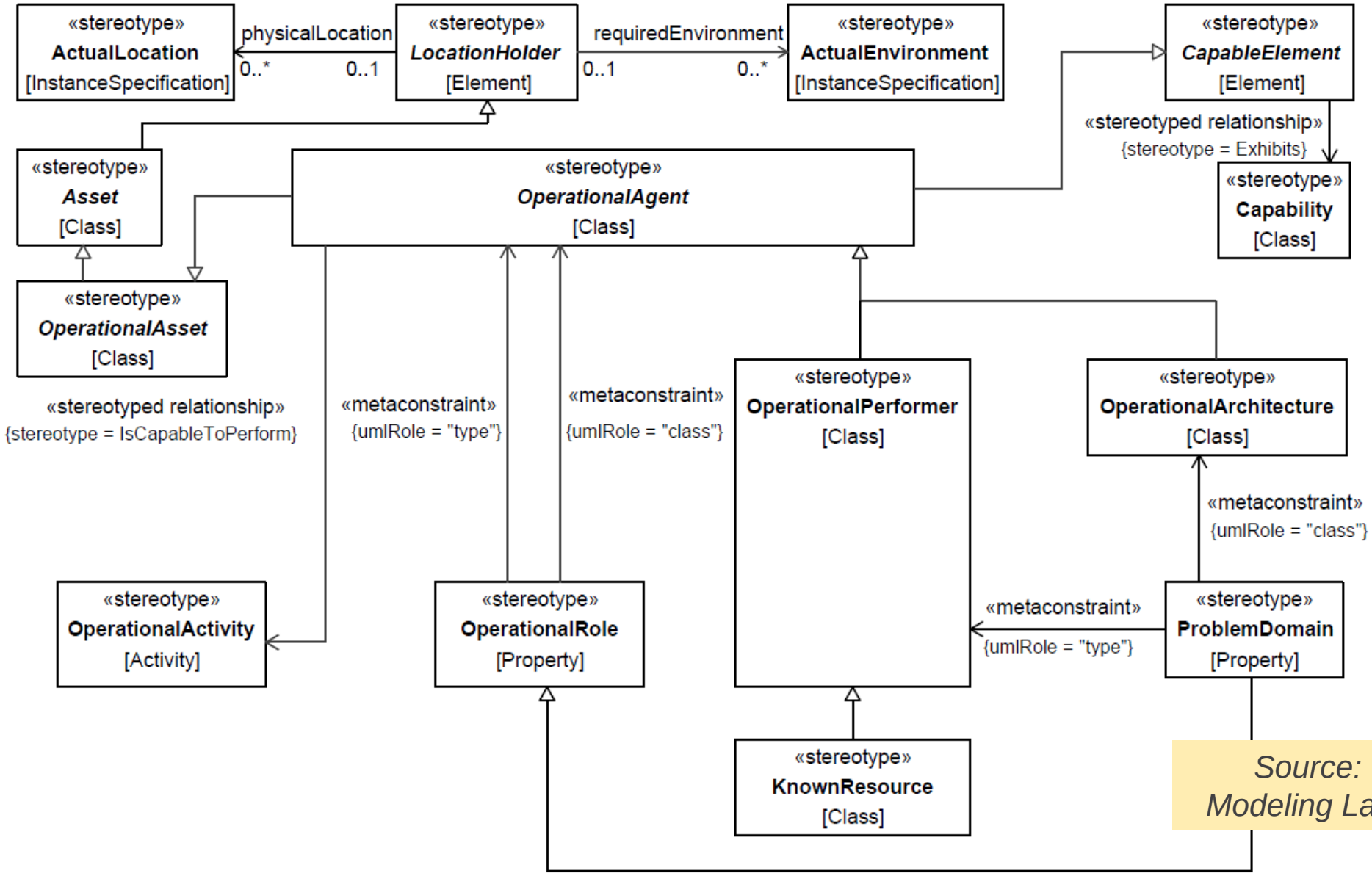
Source: UAF Sample Problem

Figure 9:1 - Operational Taxonomy

Step 3.4 – Analyze Operational Structure



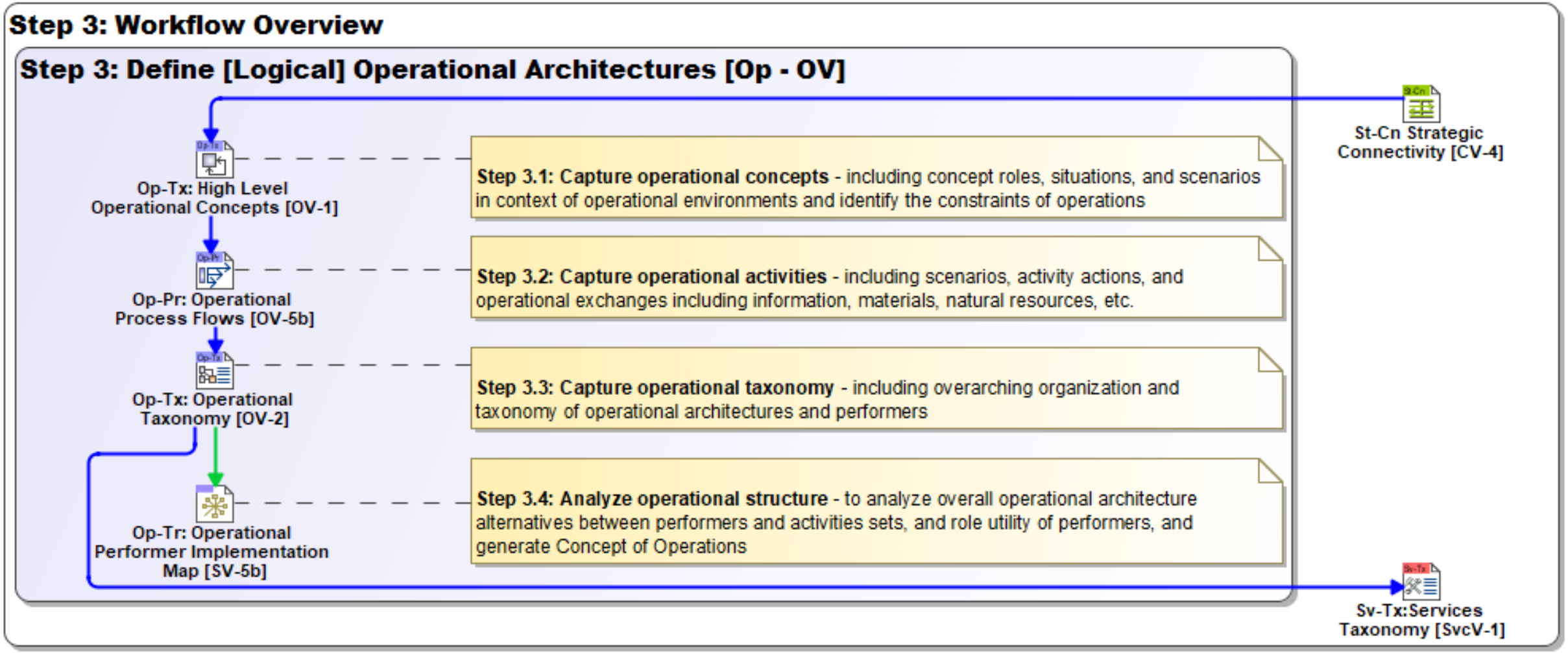
View Specification for Operational Structure (Op-Sr)



Source: UAF Modeling Language

Figure 4:10 - Operational Structure

Step 3 – Operational Architecture (Top Level Flow)



Step 3 – Summary List with Views

68	Step 3: Define [Logical] Operational Architectures [Op - OV]	Views
69	**Step 3.1: Capture operational concepts - including concept roles, situations, and scenarios in context of operational environments and identify the constraints of operations**	**Op-Tx: Operational Taxonomy: High Level Operational Concepts [OV-1]**
70	Step 3.1.1: Capture simple operational views with users describing all key CONOPS ideas	Op-Tx: Operational Taxonomy: Operational Free Form Diagram [OV-1]
71	Step 3.1.2: Capture operational environments, theaters, and operating conditions	En-Pm: Environment: Operational [N/A]
72	Step 3.1.3: Capture overarching operational architecture performers, roles, and structural relationships	Op-Sr: Operational Structure [OV-2]
73	Step 3.1.4: Capture operational rules of engagement, methods, and operational policies in rule form	Op-Ct: Operational Constraints [OV-6a]
74	Step 3.1.5: Capture the environment and conditional constraints for operations (e.g., operational areas, planning scenarios, threats, locations, etc.)	Op-Ct: Operational Constraints: Definition [OV-6a]
75	Step 3.1.6: Capture the organizations involved in the overall CONOPS	Ps-Tx: Personnel Taxonomy: Organizational Context [OV-4]
76	Step 3.1.7: Capture the responsibilities of the organizations involved in the CONOPS relative to their roles	Ps-Sr: Personnel Structure: Organizational Responsibilities [OV-4]
77	**Step 3.2: Capture operational behaviors - including scenarios, activity actions, and operational exchanges including information, materials, natural resources, etc.**	**Op-Pr: Operational Processes: Flows [OV-5b]**
78	Step 3.2.1: Capture definition of all CONOPS activities	Op-Pr: Operational Processes [OV-5a]
79	Step 3.2.2: Capture performer connections and interfaces	Op-Cn: Operational Connectivity [OV-2]
80	Step 3.2.3: Capture information elements for all operational activities to build the conceptual data model	Cd-If: Operational Information Model [DIV-1]
81	Step 3.2.4: Specify information exchanges	Op-Cn: Operational Connectivity: Table [OV-3]
82	Step 3.2.5: Capture operational state machines	Op-St: Operational States [OV-6b]
83	Step 3.2.6: Capture operational timelines	Op-Sq: Operational Sequences [OV-6c]
84	Step 3.2.7: Capture typical MOPs by type and category	Me-Pm: Measurements: Operational Typical Measurements [N/A]
85	**Step 3.3: Capture operational taxonomy - including overarching organization and taxonomy of operational architectures and performers**	**Op-Tx: Operational Taxonomy [OV-2]**
86	Step 3.3.1: Capture internal structure of operational performers	Op-Sr: Operational Structure: Internal Connectivity [OV-2]
87	Step 3.3.2: Capture role-based relationships of operational performers	Op-Sr: Operational Structure: Role-based Connectivity Table [OV-2]
88	Step 3.3.3: Supporting operational performer table for analysis	Op-Tx: Operational Taxonomy: Table [OV-2]
89	Step 3.3.4: Trace capabilities to supporting operational performers	Op-Tr: Operational Traceability: Opnl Perf to Capab Mapping [CV-6]
90	**Step 3.4: Analyze operational structure - to analyze overall operational architecture alternatives between performers and activity sets, utilization of roles versus performers, and generate Concept of Operations**	**Rs-Tr: Resources Traceability: Operational Performer Implementation Map [N/A]**
91	Step 3.4.1: Analyze operational performers for alternatives and options	Op-Sr: Operational Structure: Opnl Perf Impact Analysis Map [N/A]
92	Step 3.4.2: Analyze operational role-based impacts for alternatives and options	Op-Sr: Operational Structure: Opnl Role Impact Analysis Map [N/A]
93	Step 3.4.3: Define risk assessments by type and category	Rk-Pm: Risks: Operational Risk Typical Assessments [N/A]
94	Step 3.4.4: Capture actual quantitative and qualitative measure of performance values	Me-Pm: Measurements: Operational Actual Measurements [N/A]
95	Step 3.4.5: Build parametric models for MOPs	Pm: Parameters: Operational Parametric Models [N/A]
96	Step 3.4.6: Capture operational requirements	Rq-Mv: Requirements: Operational [N/A]
97	Step 3.4.7 Capture operational activity implementations to cross-check performer implementations	Rs-Tr: Resources Traceability: Opnl Activity Implem Map [SV-5a/b]
98	Step 3.4.8: Capture operational activity structure for alternatives and options	Op-Pr: Operational Processes: Opnl Activity Decomp Map [OV-5a]

Simple Organization of Information in the Guide

Narrative, Terms, Workflow Diagram, List of Steps with View Outputs

5.3.3 Step 3.1 – Operational Concepts

Step 3.1 – Capture Operational Concepts – First, an overarching set of performers are described in ***high-level operational concepts*** by their ***concept roles*** and their ***connections*** with each other, in a scoped context composed of ***conditions***, ***environments***, and ***locations***. All ***rules***, ***policies*** and other ***operational constraints*** are linked and applied to all ***operational agents***, and then later expanded to their associated actions and exchanges. When ***concept roles*** come from pre-existing ***known resources*** as well as other ***resources*** and ***organizations***, those are captured as well, and the representation follows according ***constraint***.

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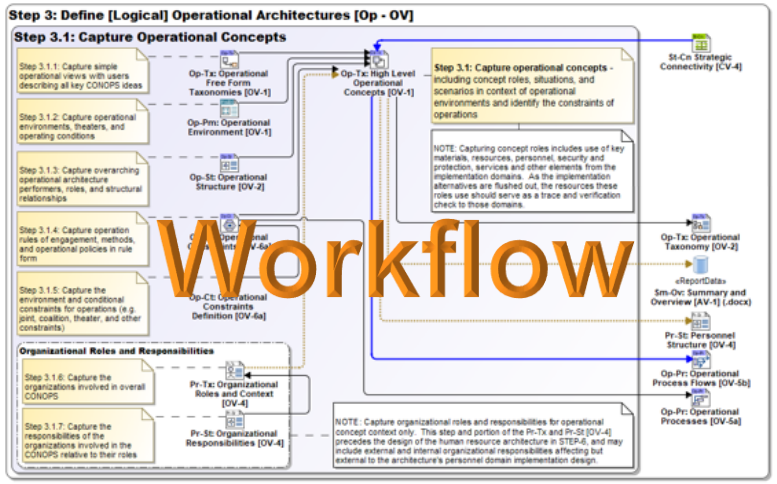

Narrative

Key Terms

Workflow

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Step Summary

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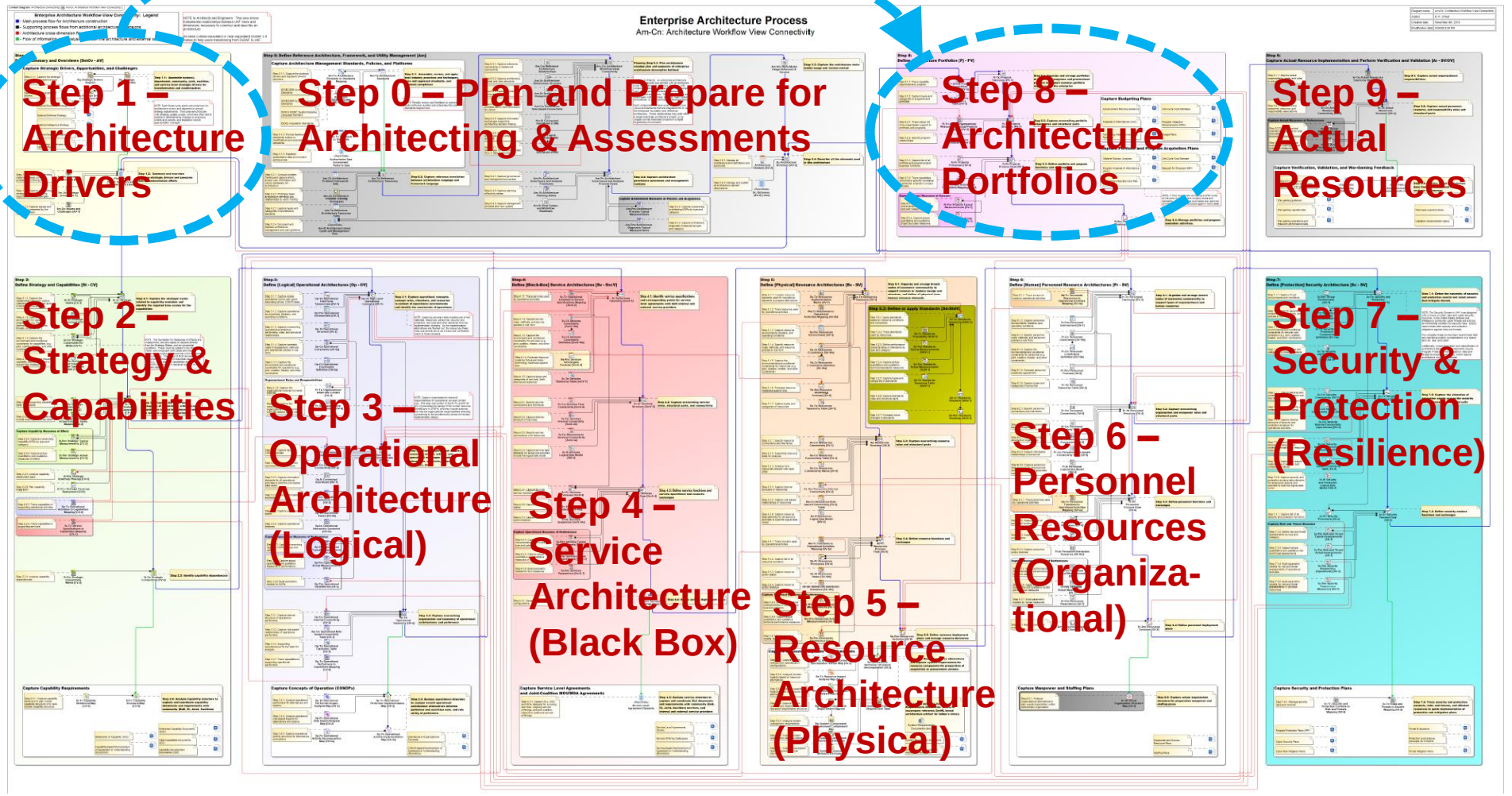
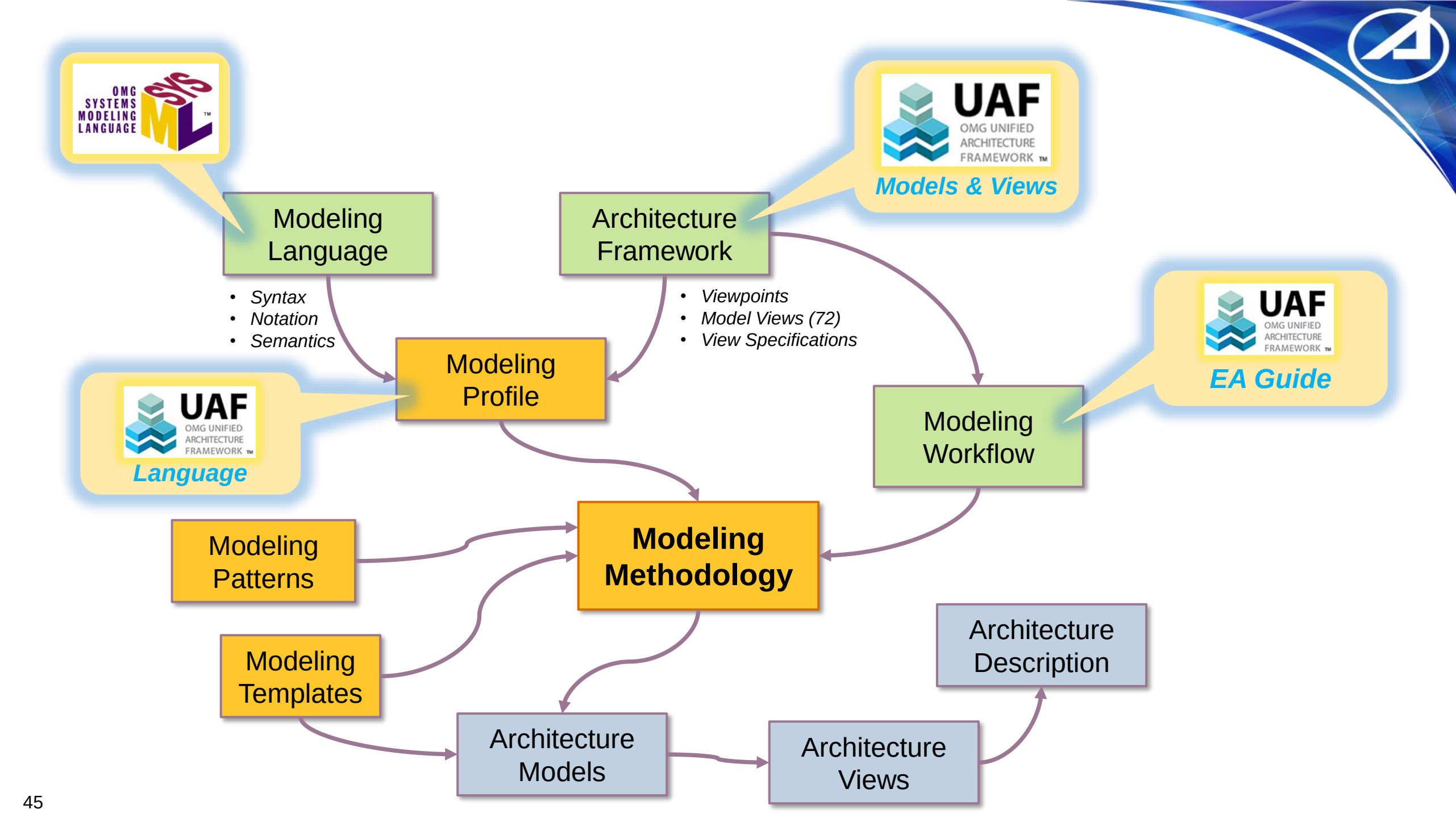
Guide intended to be used in conjunction with the UAF Sample Model & Modeling Language documents

Model-based Portfolio Management

Responding to new or modified Drivers by adjusting Architecture Portfolios




OMG SYSTEMS MODELING LANGUAGE
Modeling Language
Syntax
Notation
Semantics
Architecture Framework
UAF OMG UNIFIED ARCHITECTURE FRAMEWORK
Models & Views
Viewpoints
Model Views (72)
View Specifications
UAF OMG UNIFIED ARCHITECTURE FRAMEWORK
EA Guide
UAF OMG UNIFIED ARCHITECTURE FRAMEWORK
Language
Modeling Profile
Modeling Workflow
Modeling Patterns
Modeling Methodology
Modeling Templates
Architecture Description
Architecture Models
Architecture Views

The Enterprise Architecture Guide for UAF

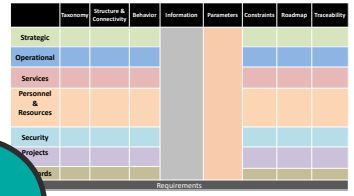
UAF
OMG UNIFIED ARCHITECTURE FRAMEWORK ™

Specification

EA Guide

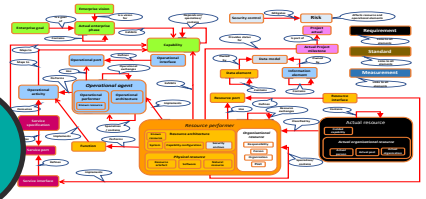
4

View Specifications organized in Viewpoints and Aspects (Grid)



1

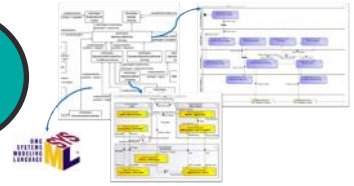
UAF Domain MetaModel (DMM)



2

UAF Modeling Language* (UAFML) based on SysML

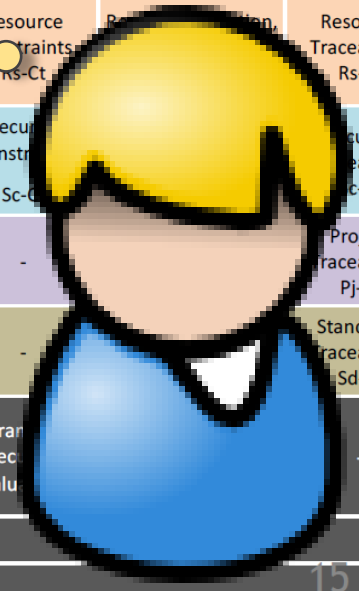
3



** Formerly called the "UAF Profile (UAFP)"*

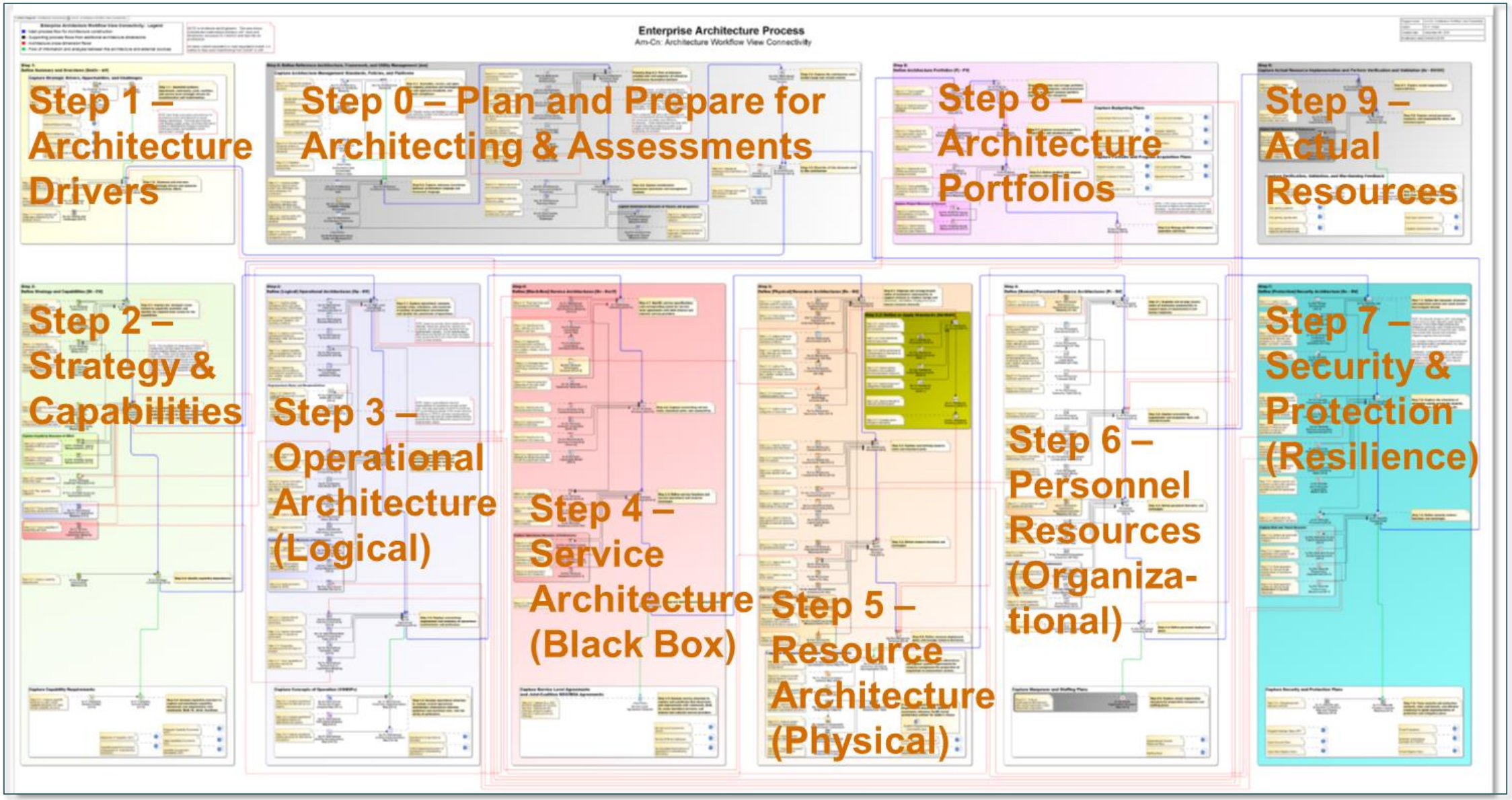
UAF	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Interaction Scenarios Is	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr
Metadata Md	Metadata Taxonomy Md-Tx	Architecture Viewpoints [a] Md-Sr	Metadata Connectivity Md-Cn	Metadata Processes [a] Md-Pr	-	-			Metadata Constraints [a] 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, St-Rm Strategic Phasing St-Rm	Strategic Traceability St-Tr
Operational Op	Operational Taxonomy Op-Tx								Operational Constraints Op-Ct	-	Operational Traceability Op-Tr
Services Sv									Service Constraints Sv-Ct	Service Roadmap Sv-Rm	Service Traceability Sv-Tr
Personnel Pr									Competence, Drivers, Performance Pr-Ct	Personnel Availability, Personnel Evolution, Personnel Forecast Pr-Rm	Personnel Traceability Pr-Tr
Resources Rs	Resource Taxonomy Rs-Tx	Resource Structure Rs-Sr	Resource Connectivity Rs-Cn	Resource Processes Rs-Pr	Rs-St	Resource Interaction Scenarios Rs-Is	Physical Data Model	Measurements Pm-Me	Resource Constraints Rs-Ct		Resource Traceability Rs-Tr
Security Sc	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr	-	-			Sc-Ct		Sc-Tr
Projects Pj	Project Taxonomy Pj-Tx	Project Structure Pj-Sr	Project Connectivity Pj-Cn	-	-	-			-		Project Traceability Pj-Tr
Standards Sd	Standard Taxonomy Sd-Tx	Standards Structure Sd-Sr	-	-	-	-			-		Standards Traceability Sd-Tr
Actuals Resources Ar		Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn	Simulation [b]							-
Dictionary * Dc											
Summary & Overview Sm-Ov											
Requirements Req											

Where do we start?
Which views do we need?
How are these views related?



Enterprise Architecture Guide for UAF

9-Step Modeling Workflow Developed as Basis for the Guide



Progression from Architecture Drivers to Implementation and Deployment of Capabilities

The domains present a logical and systematic flow of architecting precepts:

I. ***Stakeholder concerns drive a strategic plan***

II. ***The strategic plan deploys capabilities in phases addressing capability gaps and shortfalls***

III. ***Capabilities are implemented by operations in an operational (logical) architecture***

IV. ***Concepts are implemented through services, resources and personnel in a set of resources (physical) architectures***

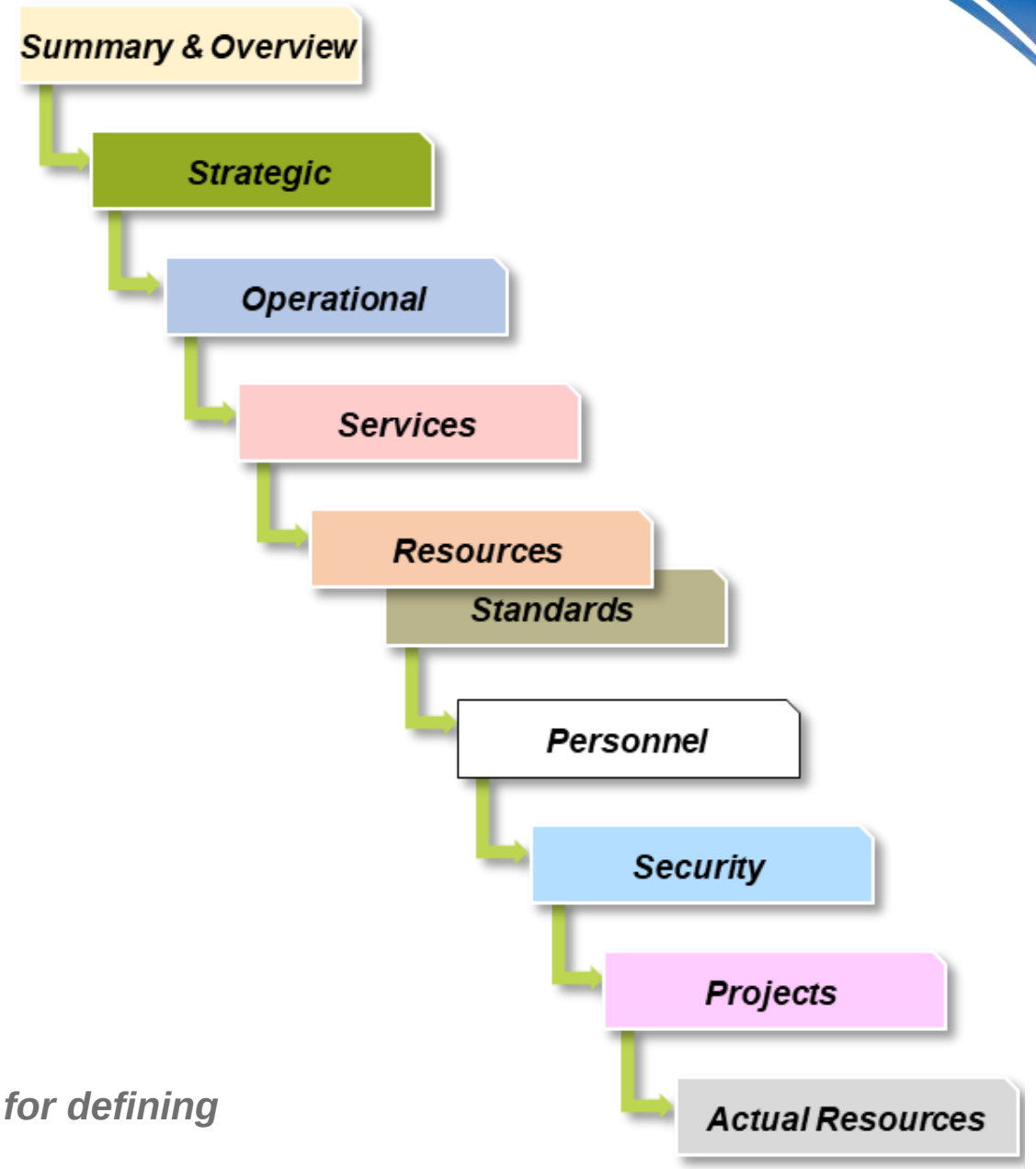
V. ***Resources comply with standards***

VI. ***Risk and threats are mitigated through security & protection controls (of resources and operations)***

VII. ***Requirements are captured, understood and communicated***

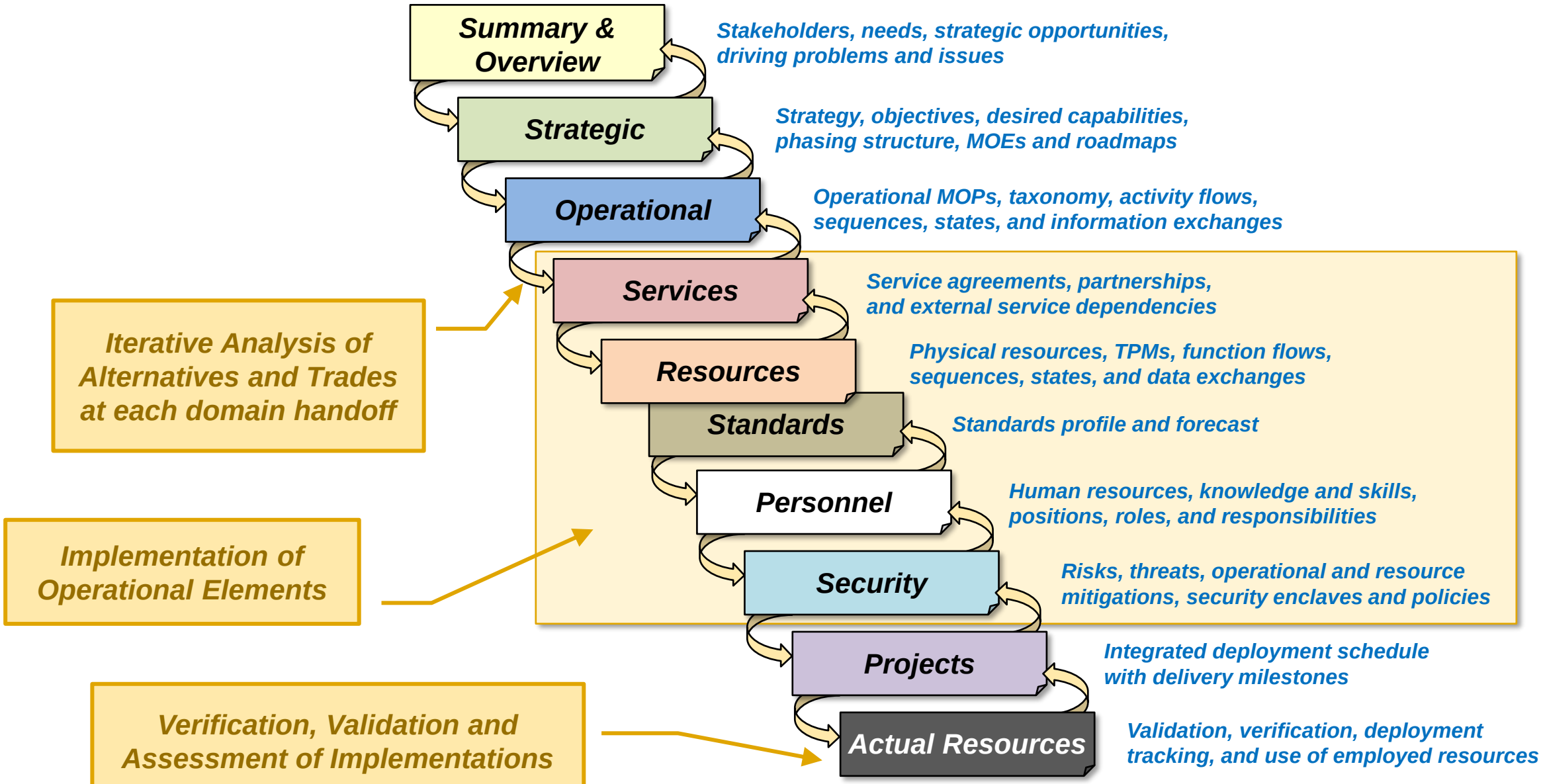
VIII. ***Plans deliver the resources***

IX. ***Resources are verified***

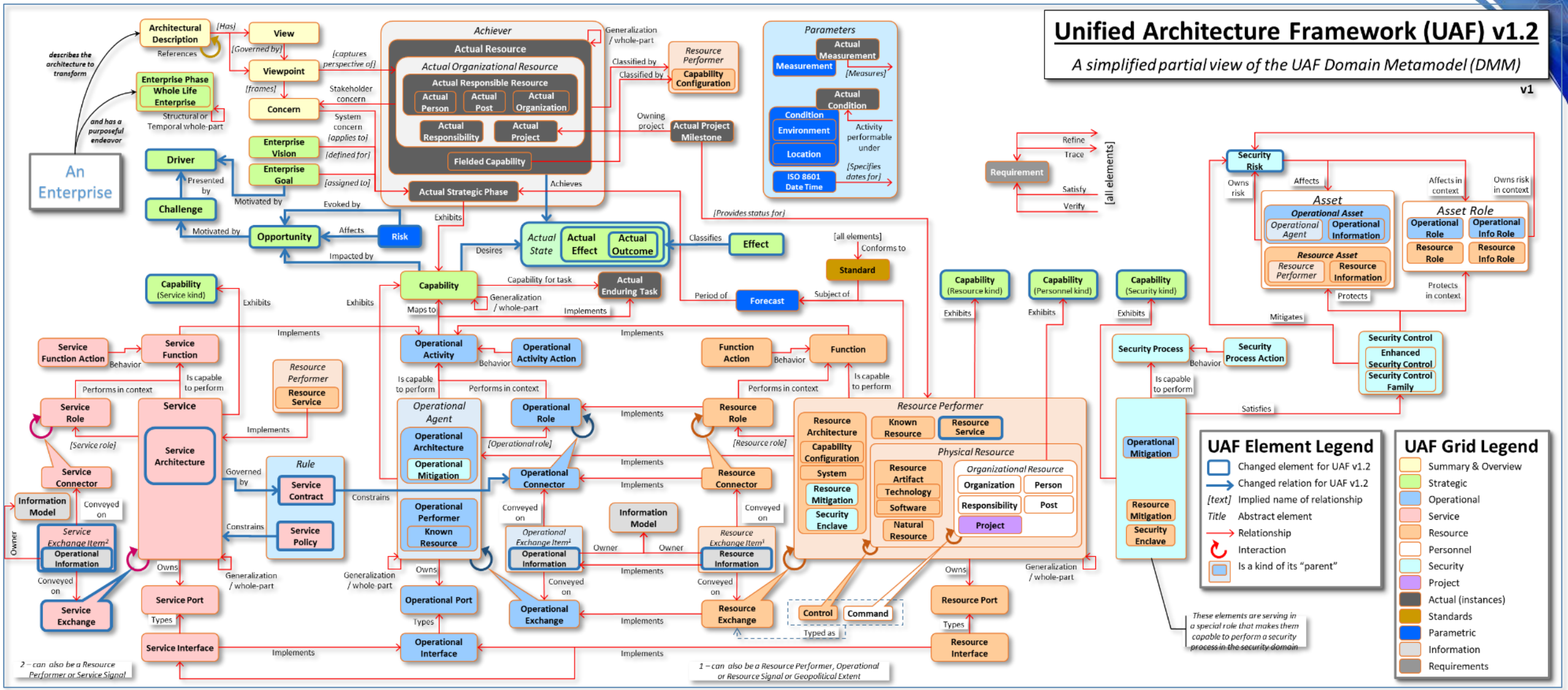


UAF provides a complete set of modeling domains as basis for defining the necessary architecture views of an Enterprise

Architectural Domains are Typically Addressed Concurrently with Iterations



UAF Conceptual Schema



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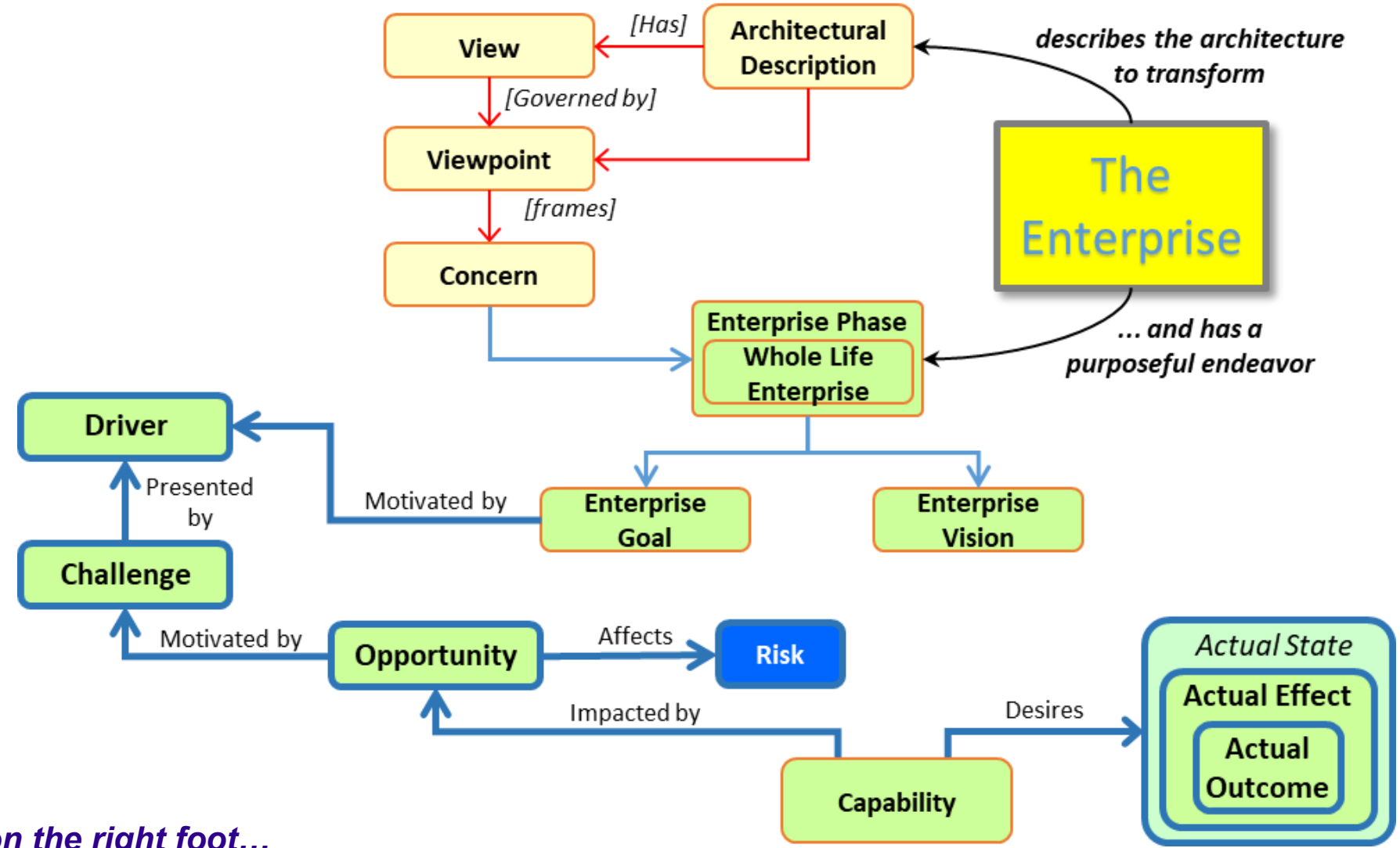
Workflow Steps

- ✓ **Step 1 – Architecture Drivers and Challenges**
- ✓ **Step 2 – Enterprise Strategy and Capabilities**
- ✓ **Step 3 – Operational Architectures (Logical)**
- ✓ **Step 4 – Service Architectures (Black Box)**
- ✓ **Step 5 – Resource Architectures (Implementation)**
- ✓ **Step 6 – Personnel Architectures (Organizational)**
- ✓ **Step 7 – Security and Protection (Resilience)**
- ✓ **Step 8 – Architecture Portfolio Management**
- ✓ **Step 9 – Actual Resource Instantiation and V&V**

53

Step 0 – Architecture Planning & Preparation

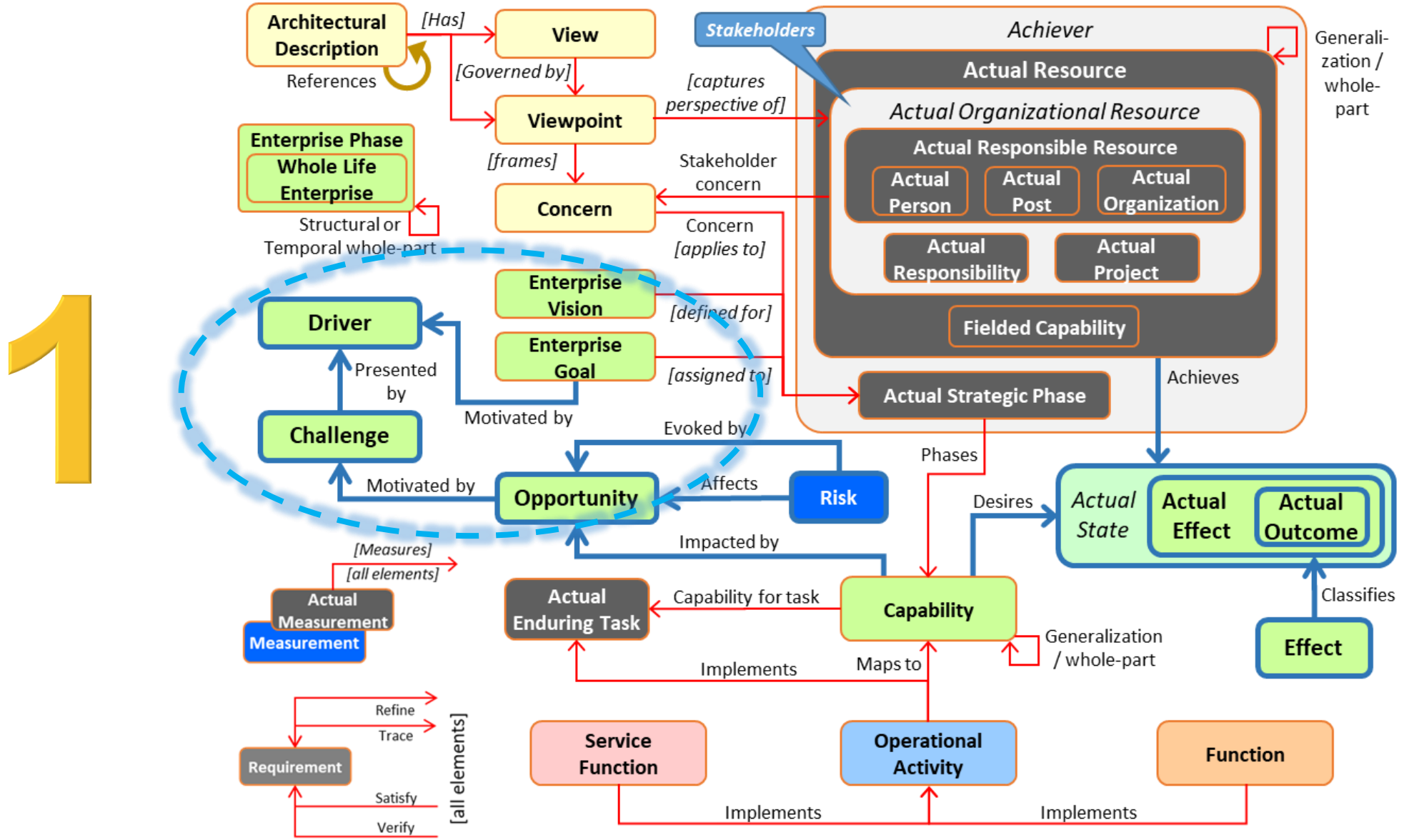
Key Model Elements involved in this step of the workflow…



Starting off on the right foot…

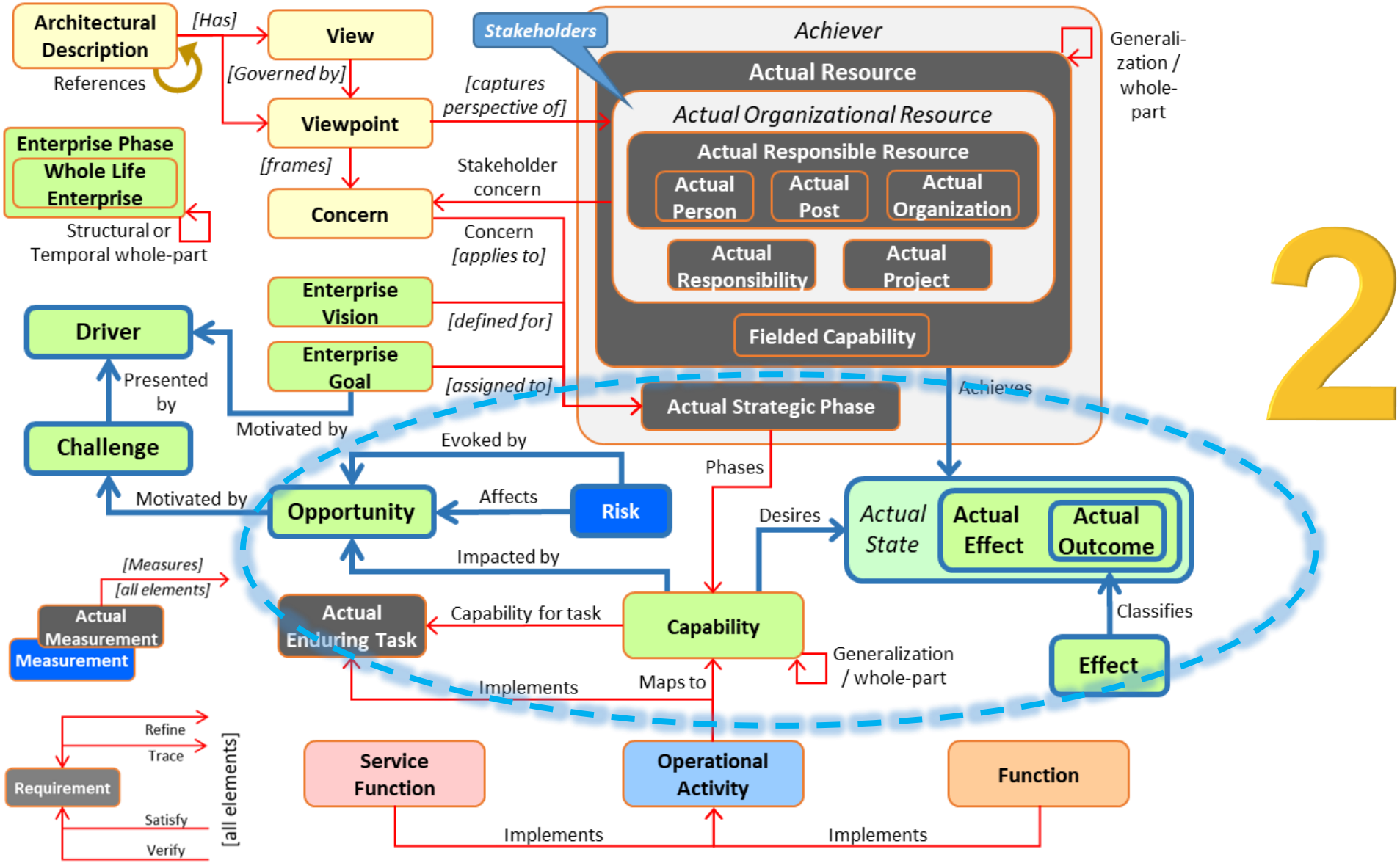
Step 1 – Architecture Drivers and Challenges

Key Model Elements involved in this step of the workflow…



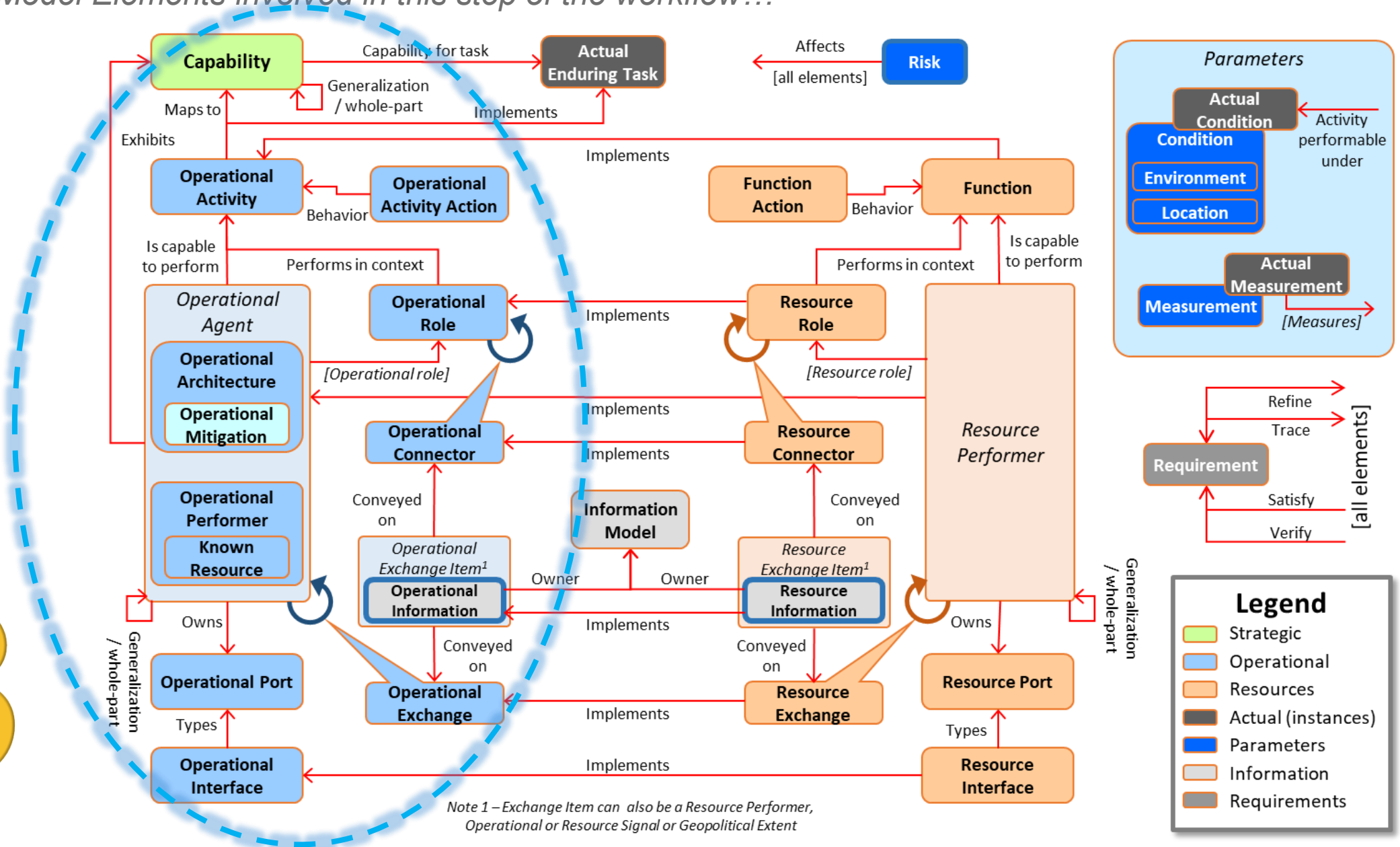
Step 2 – Enterprise Strategy and Capabilities

Key Model Elements involved in this step of the workflow…



Step 3 – Operational Architectures (Logical)

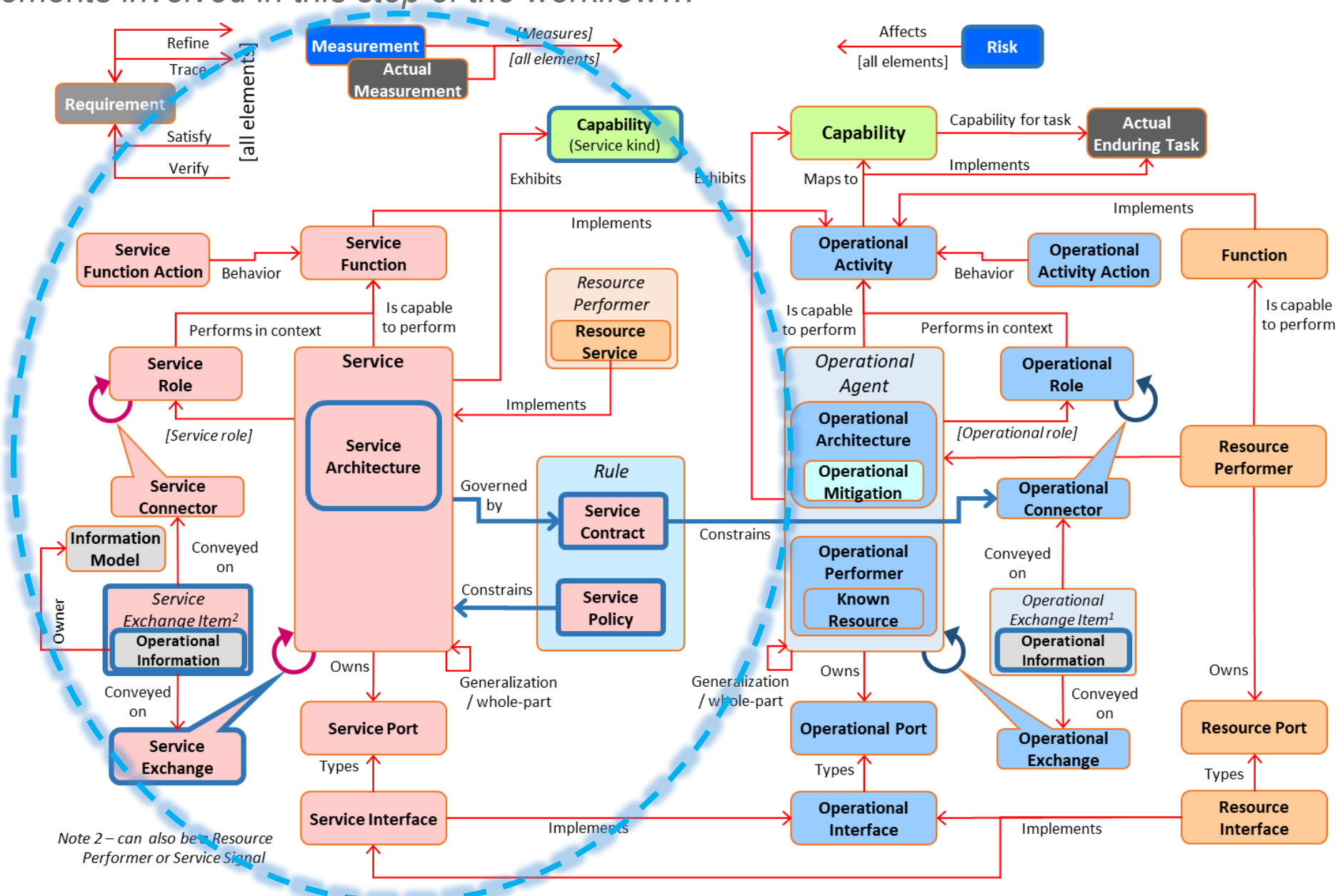
Key Model Elements involved in this step of the workflow…



3

Step 4 – Service Architectures (Black Box)

Key Model Elements involved in this step of the workflow…



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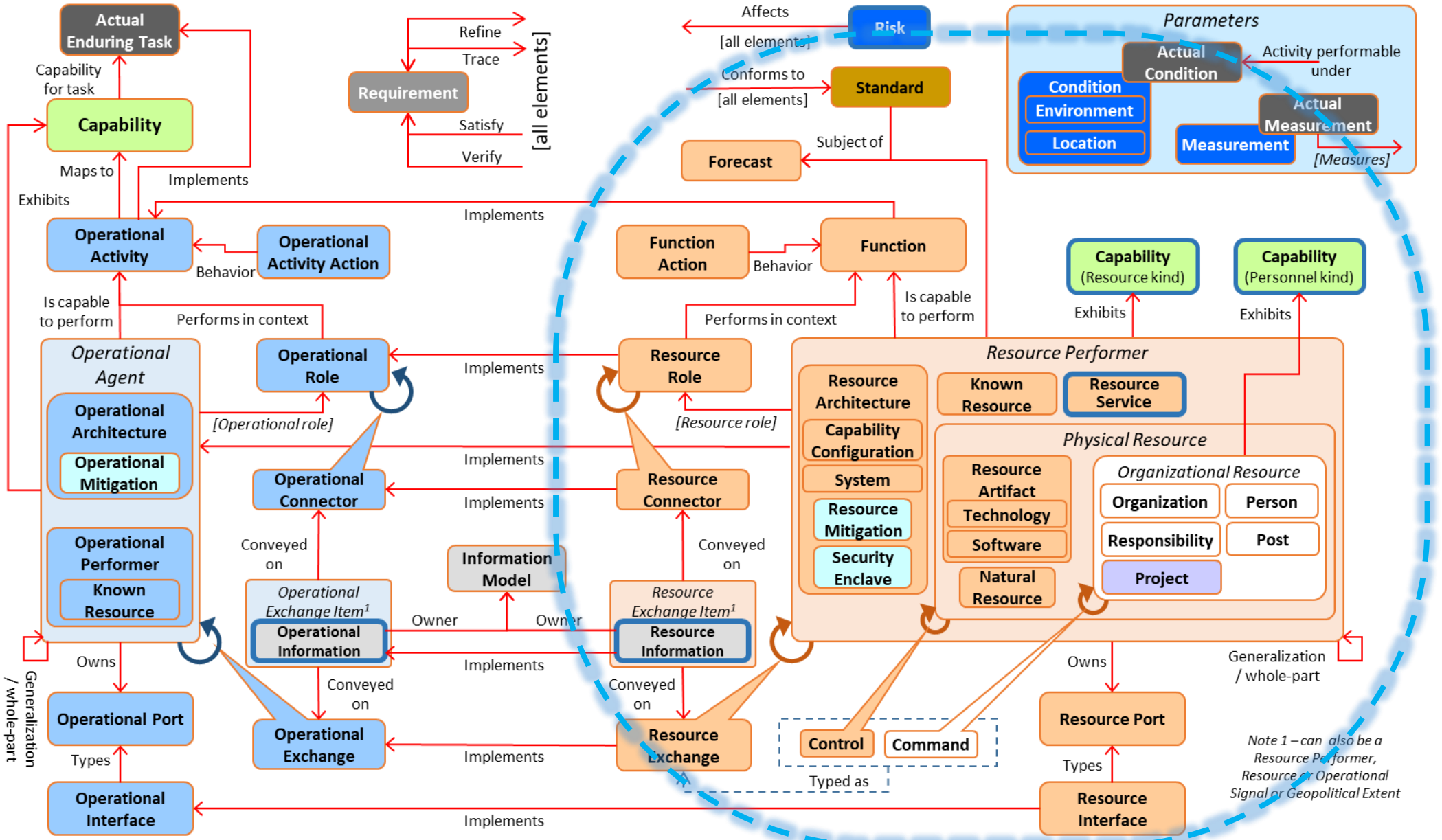
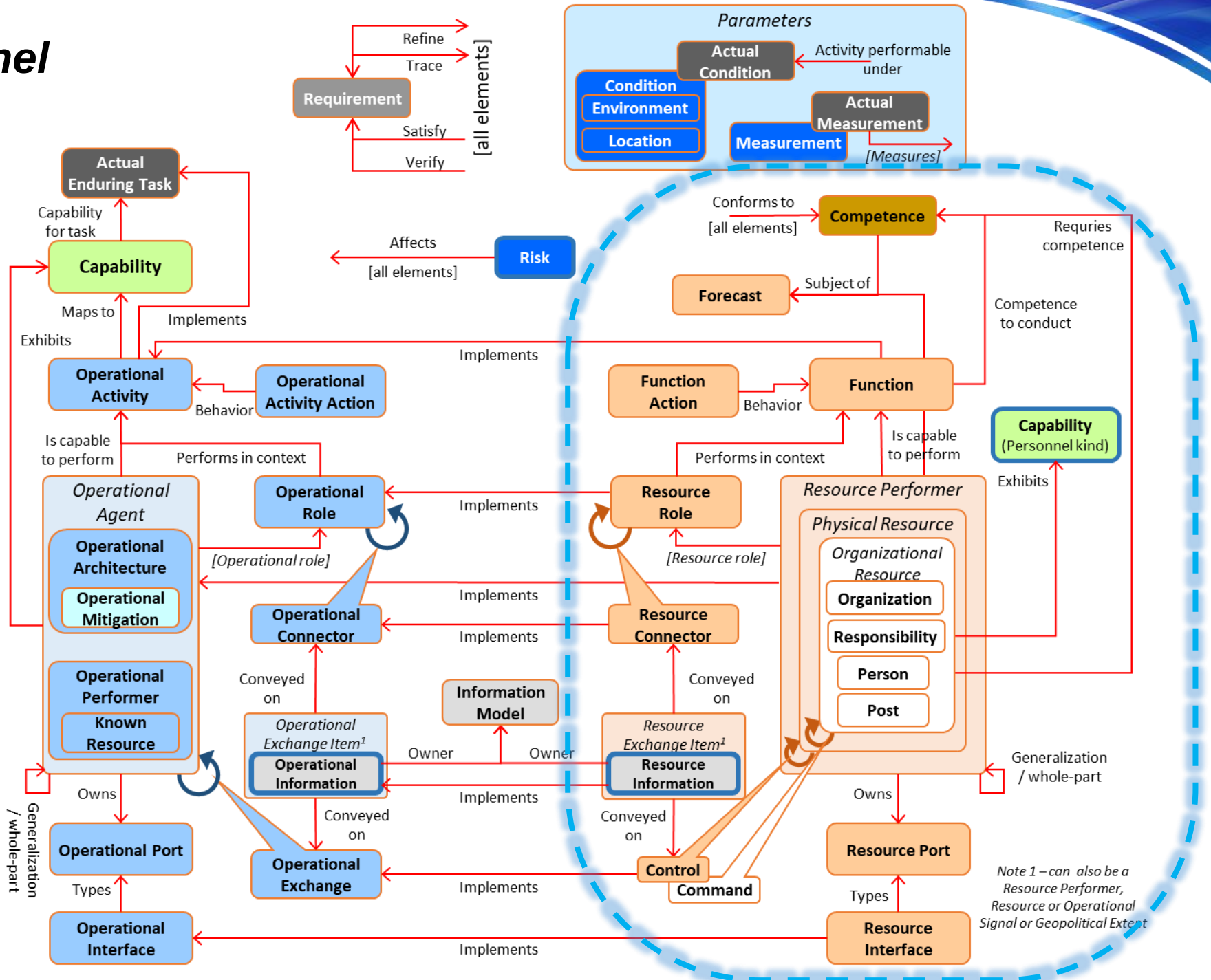
Step 5 – Resource Architectures (Implementation)

Key Model Elements involved in this step of the workflow…

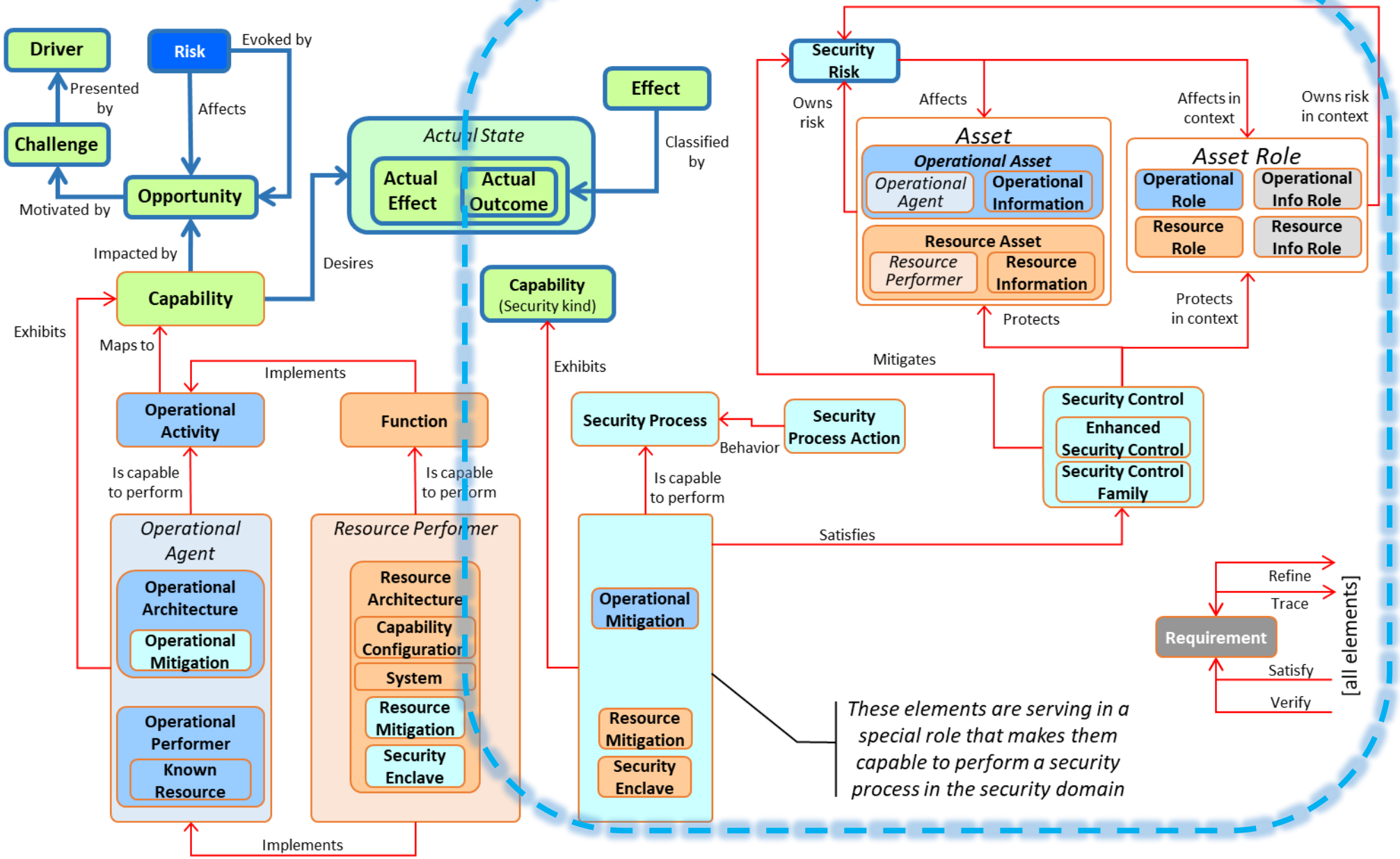


Step 6 – Personnel Architectures (Organizational)



Step 7 – Security and Protection (Resilience)

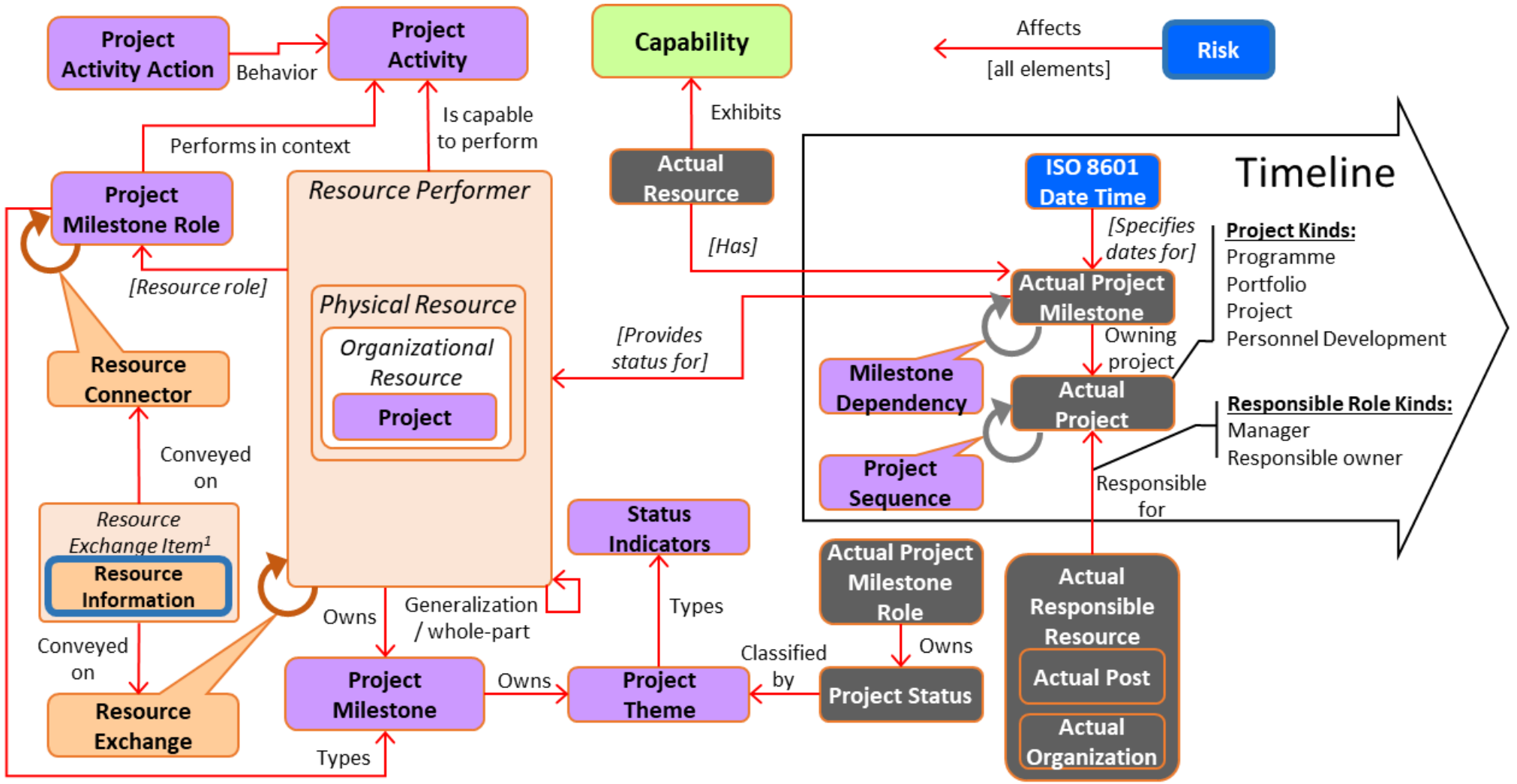
Key Model Elements involved in this step of the workflow…



Step 8 – Architecture Portfolio Management

Key Model Elements involved in this step of the workflow…

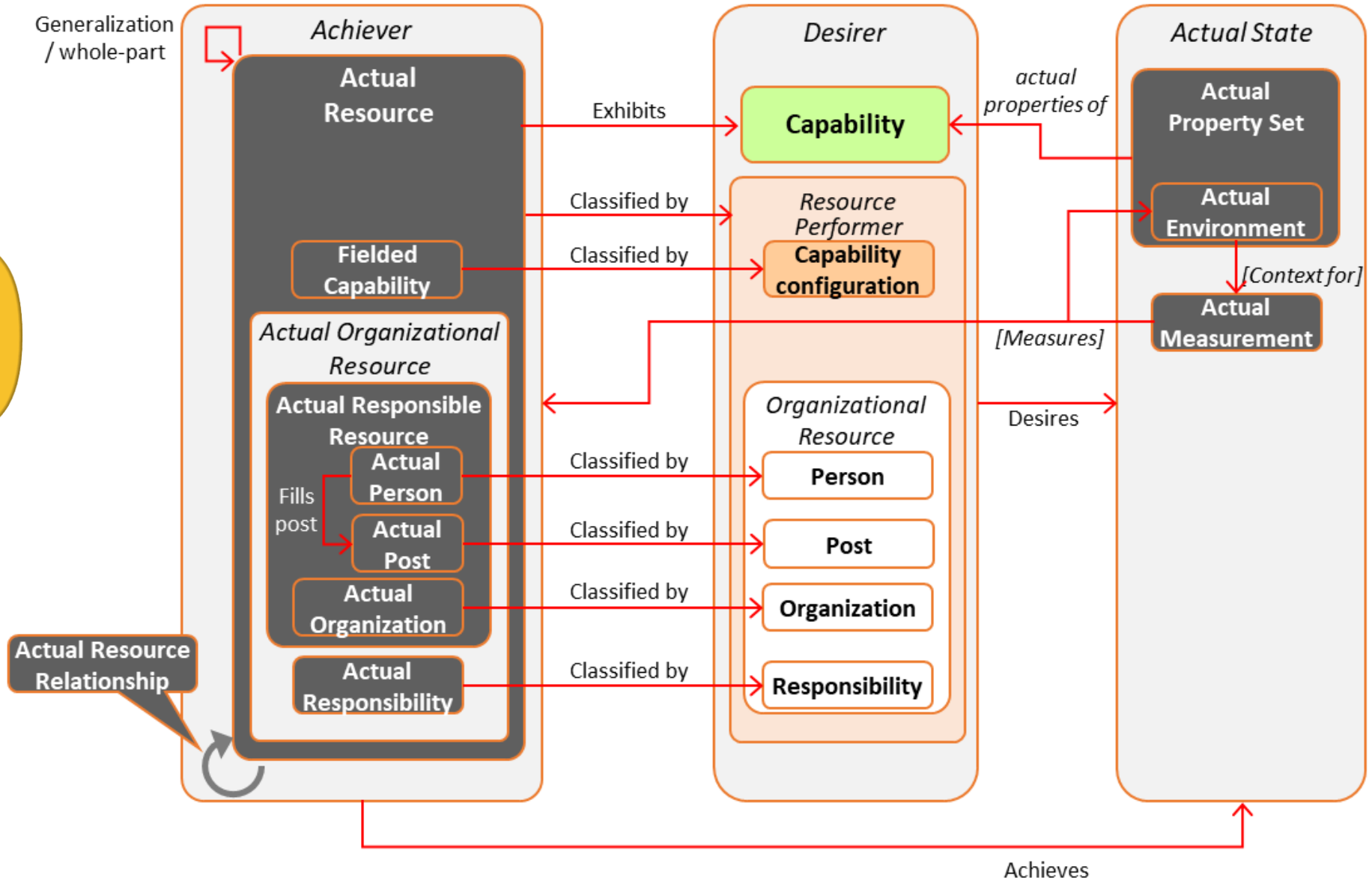
8

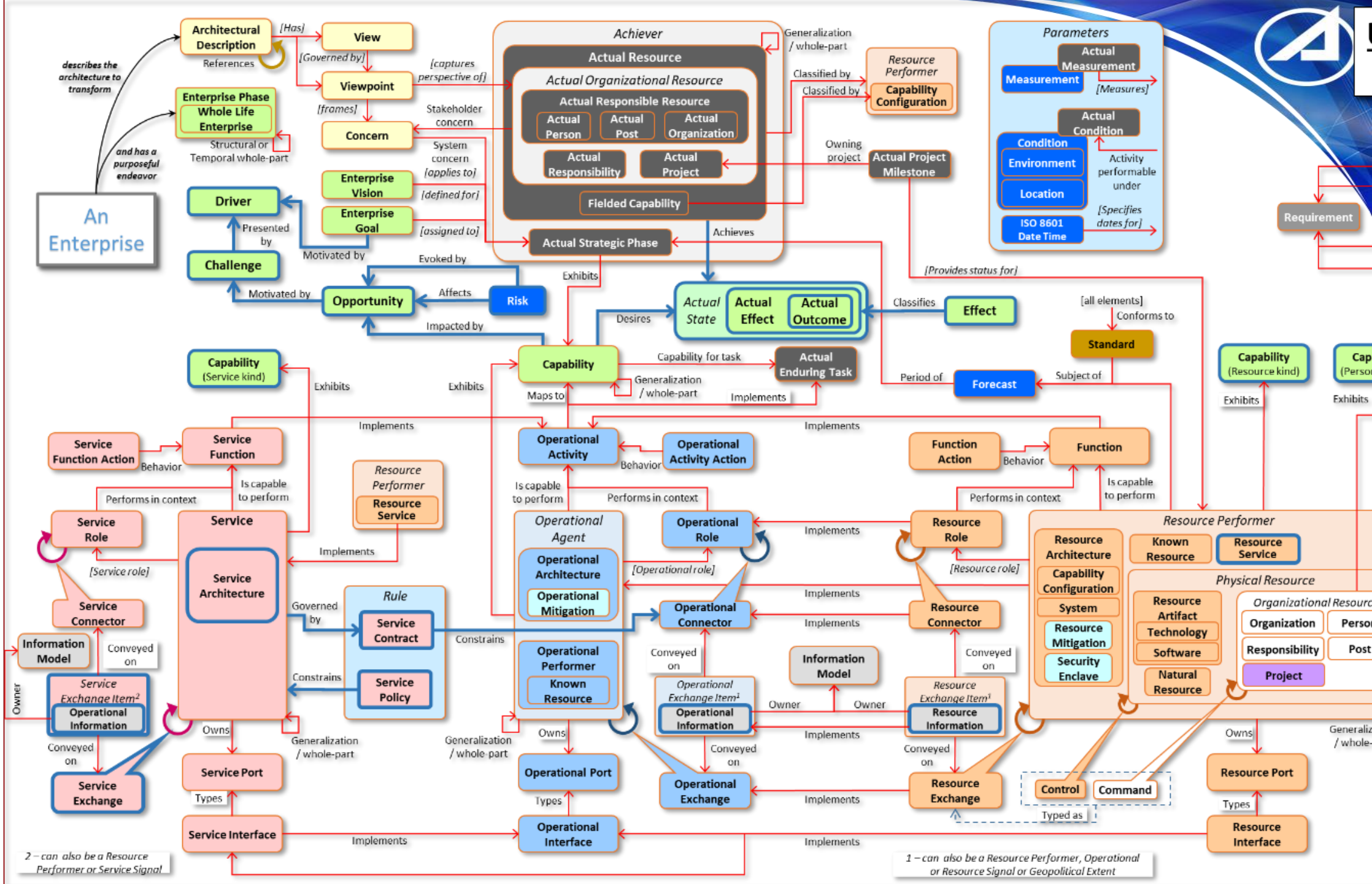


1 – can also be a Resource Performer, Resource Signal or Geopolitical Extent

Step 9 – Actual Resource Instantiation and V&V

Key Model Elements involved in this step of the workflow…

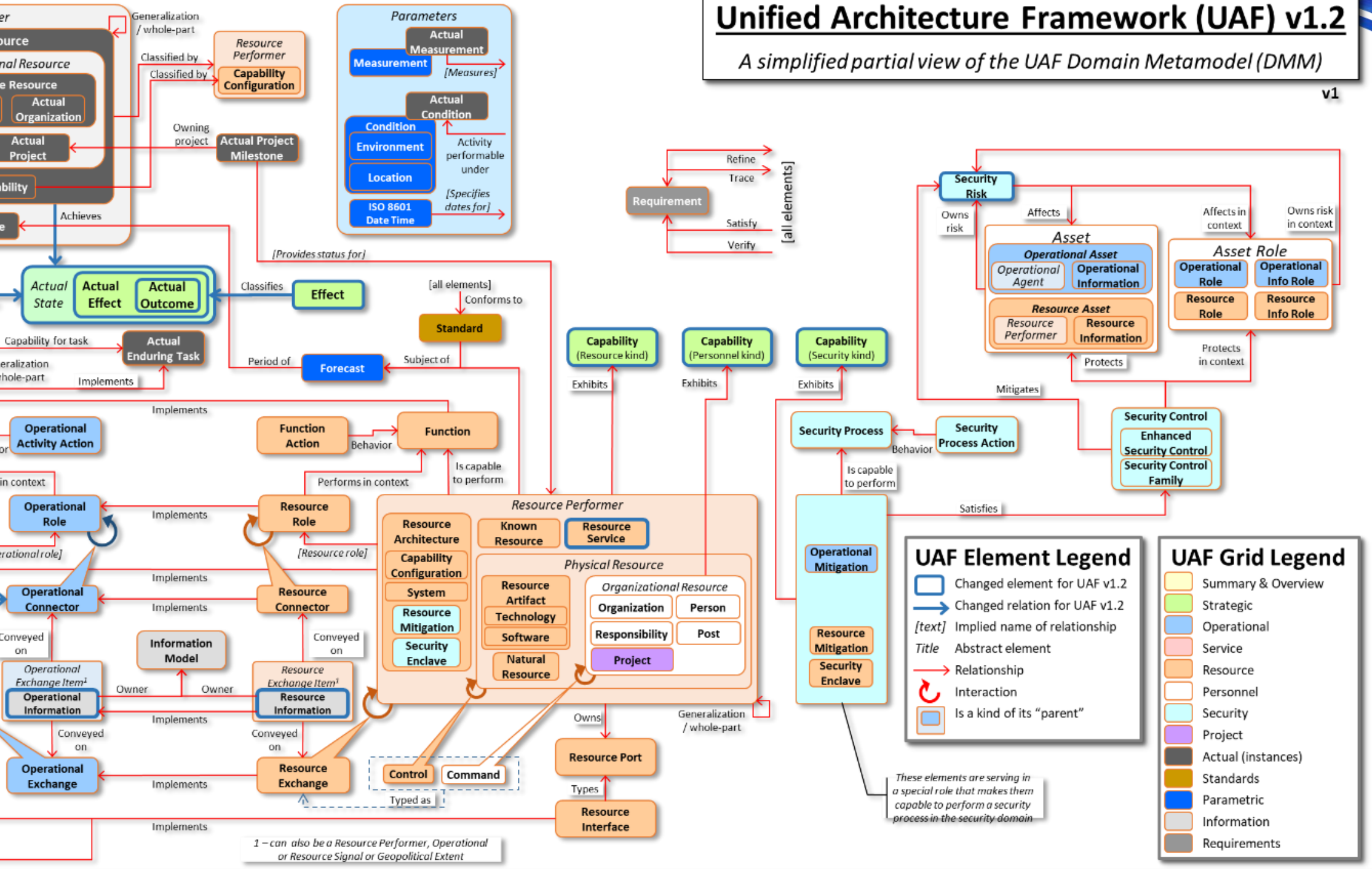



An Enterprise
describes the architecture to transform
and has a purposeful endeavor
Architectural Description
References
[Has]
View
[Governed by]
Viewpoint
[frames]
Concern
[captures perspective of]
Stakeholder concern
System concern
[applies to]
Enterprise Phase
Whole Life Enterprise
Structural or Temporal whole-part
Enterprise Vision
[defined for]
Enterprise Goal
[assigned to]
Driver
Presented by
Challenge
Motivated by
Motivated by
Opportunity
Evoked by
Affects
Risk
Impacted by
Achiever
Actual Resource
Actual Organizational Resource
Actual Responsible Resource
Actual Person
Actual Post
Actual Organization
Actual Responsibility
Actual Project
Fielded Capability
Actual Strategic Phase
Generalization / whole-part
Classified by
Classified by
Resource Performer
Capability Configuration
Owning project
Actual Project Milestone
Achieves
Exhibits
Parameters
Actual Measurement
Measurement
[Measures]
Actual Condition
Condition
Environment
Location
ISO 8601 Date Time
Activity performable under
[Specifies dates for]
Requirement
[Provides status for]
Actual State
Actual Effect
Actual Outcome
Desires
Classifies
Effect
[all elements]
Conforms to
Standard
Capability (Service kind)
Exhibits
Exhibits
Capability
Capability for task
Actual Enduring Task
Generalization / whole-part
Maps to
Implements
Period of
Forecast
Subject of
Capability (Resource kind)
Exhibits
Implements
Implements
Service Function Action
Behavior
Service Function
Operational Activity
Behavior
Operational Activity Action
Function Action
Behavior
Function
Is capable to perform
Performs in context
Is capable to perform
Performs in context
Is capable to perform
Resource Performer
Resource Service
Service Role
[Service role]
Service
Service Architecture
Implements
Operational Agent
Operational Architecture
Operational Mitigation
Operational Performer
Known Resource
Operational Role
[Operational role]
Resource Role
[Resource role]
Resource Performer
Resource Architecture
Capability Configuration
System
Resource Mitigation
Security Enclave
Known Resource
Resource Service
Physical Resource
Resource Artifact
Technology
Software
Natural Resource
Organizational Resource
Organization
Responsibility
Project
Service Connector
Information Model
Conveyed on
Service Exchange Item[2]
Operational Information
Owner
Rule
Governed by
Service Contract
Constrains
Service Policy
Constrains
Operational Connector
Resource Connector
Information Model
Conveyed on
Conveyed on
Operational Exchange Item[1]
Operational Information
Owner
Owner
Resource Exchange Item[1]
Resource Information
Conveyed on
Conveyed on
Service Exchange
Owns
Service Port
Types
Service Interface
Generalization / whole-part
Generalization / whole-part
Owns
Operational Port
Types
Operational Interface
Operational Exchange
Resource Exchange
Control
Command
Typed as
Owns
Resource Port
Types
Resource Interface
Implements
Implements
Implements
Implements
2 – can also be a Resource Performer or Service Signal
1 – can also be a Resource Performer, Operational or Resource Signal or Geopolitical Extent

Unified Architecture Framework (UAF) v1.2

A simplified partial view of the UAF Domain Metamodel (DMM)

v1



Problem Framing

Technique to help with identification of most useful models and views to develop for an architecture effort

Framing the Problem

Helps to identify the right architecture models & views to build

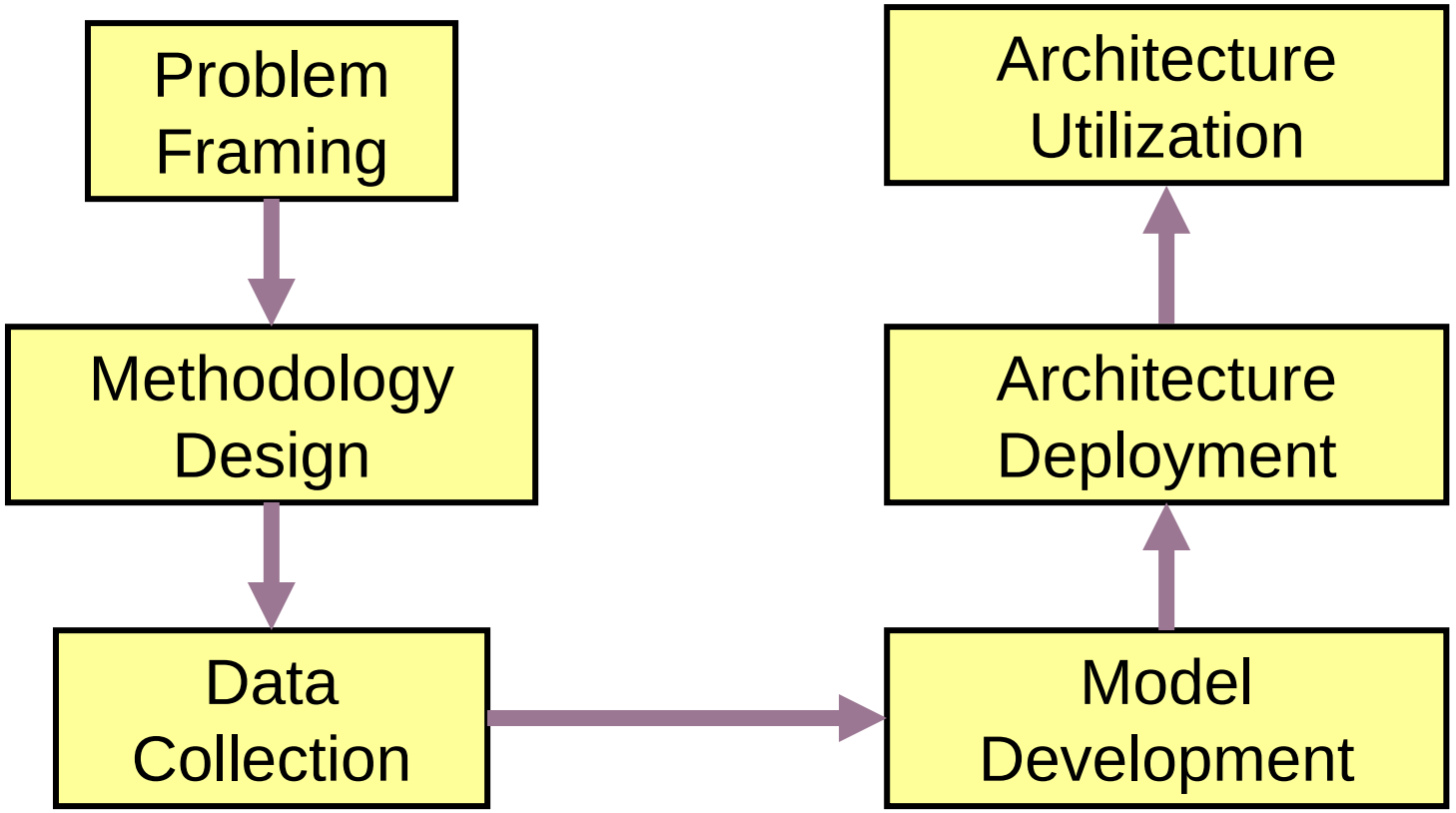
- ❑ 1.1 - Determine the Intended Uses and Users of the Architecture
- ❑ 1.2 - Determine the Scope and Context of the Architecture
  - ✓ *Establish the Point of View*
  - ✓ *Establish the Boundary of the Architecture*
  - ✓ *Establish the Layer (Domain, CONOPS, …)*
  - ✓ *Establish the Time Frame (As Is, To Be, …)*
- ❑ 1.3 - Determine the Information and Data to be Captured
- ❑ 1.4 - Identify the Architecture Views and Products to be Built

Problem Framing

- ❑ Steps 2 & 3 - Model Preparation & Data Collection
- ❑ Steps 4 & 5 - Build the Requisite Models, Views & Products
  - ✓ *Analysis, Evaluation, Comparison, Iteration*
- ❑ Step 6 - Use the Architecture for Its Intended Purpose
  - ✓ *To Make Acquisition Decisions*
  - ✓ *To Design Systems*
  - ✓ *To Migrate Systems, etc…*

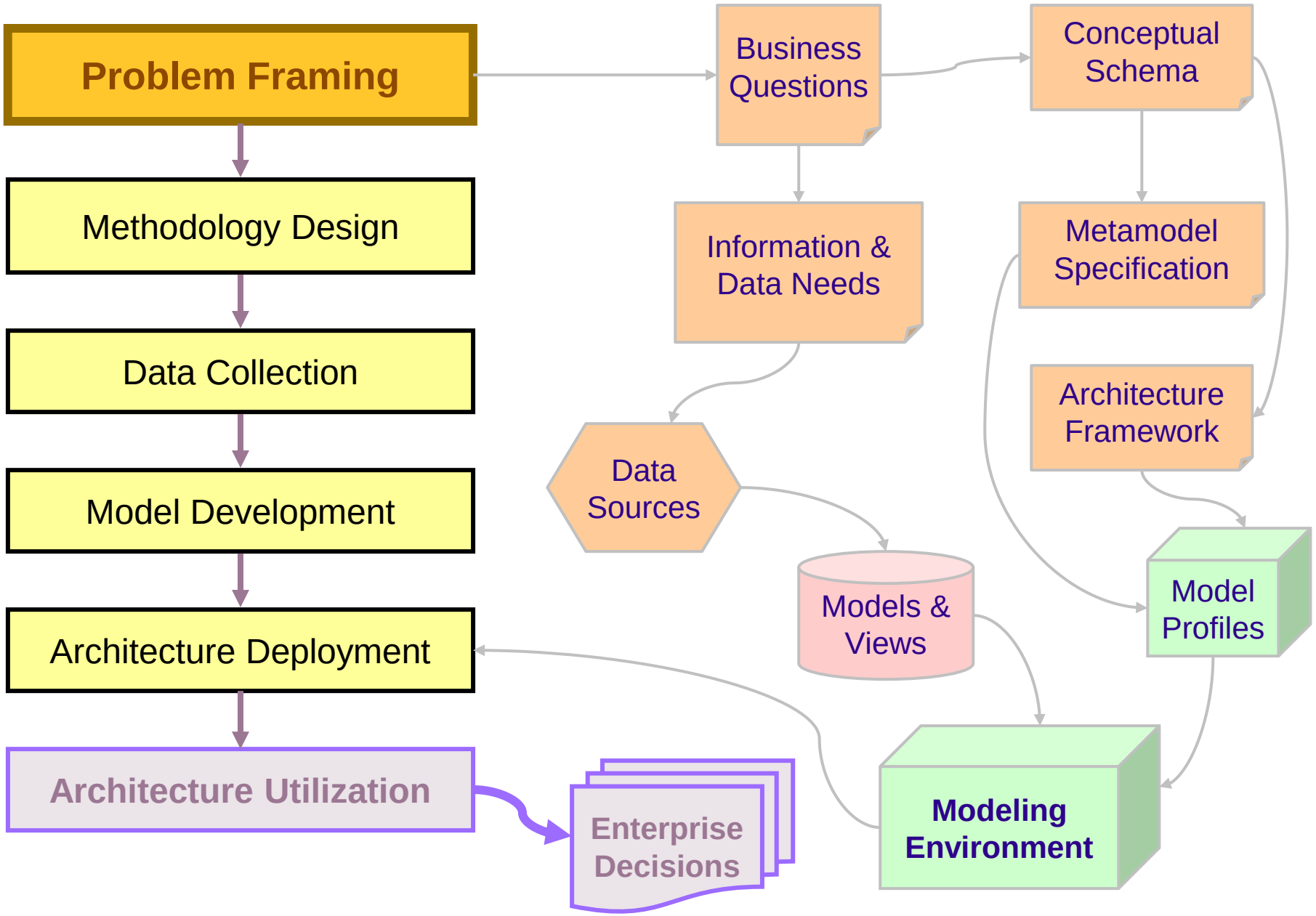
The Six-Step Process for Architecture Development

Based on common practice in the Enterprise Architecture domain



Provides a structured way of building the right models and getting maximum utility

Problem Framing: First step in the journey…



Problem Framing (Steps 1-2)

Laying the foundation…

- **Step 1.1 – Intended Uses & Users of the Architecture**
  - *a) Decisions to be supported by the Architecture (eg, milestone, KDP, activity)*
  - *b) Uses and Users of the Architecture Models and Views*
  - *c) Purpose of the Architecture*
    - ✓ Issues to be explored, along with trade-offs to consider
    - ✓ Questions to be answered using the models and views
    - ✓ Types of analysis to be performed using the models and views
    - ✓ Interests and perspectives of intended audience and users
- **Step 1.2 – Scope & Context of the Architecture**
  - *a) Scope (ie, Activities, functions, organizations, timeframes, boundaries, layers, etc)*
  - *b) Context (ie, What is the bigger picture? Who are mission partners?)*
  - *c) Dependencies (ie, related architectures, systems, programs, initiatives)*
  - *d) Points of view (eg, SE, PM, SPO, end user, operator, maintainer, etc)*
  - *e) Environment (eg, Technology, budget, programmatic)*
  - *f) Operational scenarios, situation(s), geographical areas*
  - *g) Major constraints (eg, mandated products/formats, frameworks/tools)*
  - *h) Other key assumptions*

Problem Framing (Steps 3-4)

Building upon the foundation…

- **Step 1.3 – Information & Data Needs**
  - *a) Information to be collected for use in generating the views and products*
  - *b) Precision and granularity of needed information*
  - *c) Expected presentation form or method*
  - *d) Previous or related architectures that can be "mined" for information or data*
  - *e) Potential sources of this information or related data*

- **Step 1.4 – Architecture Views & Products**
  - *a) Types of products needed (that serve the intended uses from Step 1)*
  - *b) Identify specific products that address the needs*
    - Existing products (if applicable)
    - New products
  - *c) Contents, structure and form of each product*
    - Questions addressed by each product
    - Activities support by each product
  - *d) Tools, models, data and other resources needed to develop these views and models*
  - *e) Frameworks and modeling approaches to be used*

The Critical Questions should drive the Views…