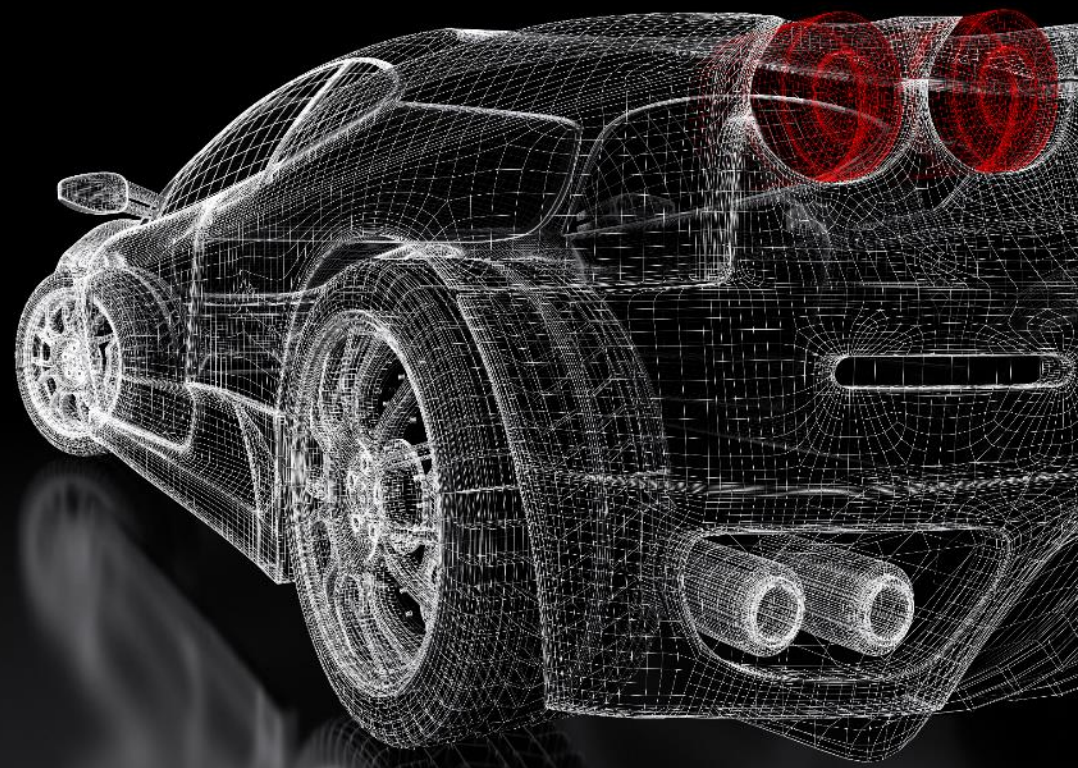
The Unified Architecture Framework (UAF) – Past, Present, and Future



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DRIVING DIGITAL DEVELOPMENT

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About the Speaker

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Matthew Hause is an SSI Principal and MBSE Technical Specialist, a former PTC Fellow, a co-chair of the OMG UAF group, a member of the OMG SysML specification team, a co-chair of the OMG Reusable Asset Specification (RAS) team, and a thought leader in the use of MBSE. He has been developing multi-national complex systems for over 45 years as a systems and software engineer. He started out working in the power systems industry and has been involved in military command and control systems, process control, manufacturing, factory automation, communications, SCADA, distributed control, office automation and many other areas of technical and real-time systems. His roles have varied from project manager to developer. His role at SSI includes mentoring, sales presentations, standards development, presentations at conferences, specification of the UAF profile and developing and presenting training courses. He has authored over 100 technical papers on architectural modeling, project management, systems engineering, model-based engineering, human factors, safety critical systems development, mission engineering, virtual team management, product line engineering, systems of systems, systems and software development with UML, SysML and Architectural Frameworks such as UAF, DoDAF and MODAF. He has been a regular presenter at INCOSE, NDIA, the IEEE, BCS, the IET, the OMG, AIAA, DoD Enterprise Architecture, Embedded Systems Conference, the Dassault MBSE Cyber Systems Symposium, and many other conferences. He is also a proud recipient of the INCOSE MBSE Propeller Hat Award.

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- 2014

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- Professional Services
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CAPABILITIES
- Digital Transformation
- Systems Engineering
- Decision & Data Science
- Augmented Intelligence

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OVERVIEW:

SSI is a privately held professional services and solutions firm headquartered in Metro Detroit. Our engagements include small to large Fortune 500 businesses and the federal government. We partner with clients to design and institutionalize digital engineering solutions.

SYSTEMS | STRATEGY | INNOVATION

Abstract

- For Enterprise and Systems of Systems modeling, UAF provides enterprise architects an ideal set of tools for capturing the essential aspects of the context, motivation, capabilities and solutions. They need to interpret, evaluate, and analyze the architecture from many different viewpoints and levels of abstraction over multiple timelines to a variety of stakeholders. The UAF provides strategic, operational, services, system, personnel, project, standards, information, and security views at multiple levels of abstraction over time to support multiple diverse stakeholders and their needs. The cross-domain viewpoints also provide a means to cut across the different viewpoints, aspects and concerns. UAF architecture models provide a means to develop an understanding of the complex relationships that exist between organizations, systems, and systems-of-systems and enable the analysis of these systems to ensure that they meet the expectations of the user community. The UAF has its roots in military frameworks such as DoDAF and MODAF but is equally applicable to commercial organizations as well. In fact, the DoD is planning on replacing DoDAF with UAF. This presentation will provide an overview UAF, where it comes from, future developments, and examples of where it is used, and how it results in tangible engineered systems.

Agenda

- Systems and Enterprises
- UAF Introduction
- The Past
- The Present
  - Challenges and Opportunities for Infrastructure
  - Industrial Enterprises
  - Social Enterprises
  - Military Enterprises and Long-Term Support
- The Future
- Questions and Answers

Systems and Enterprises

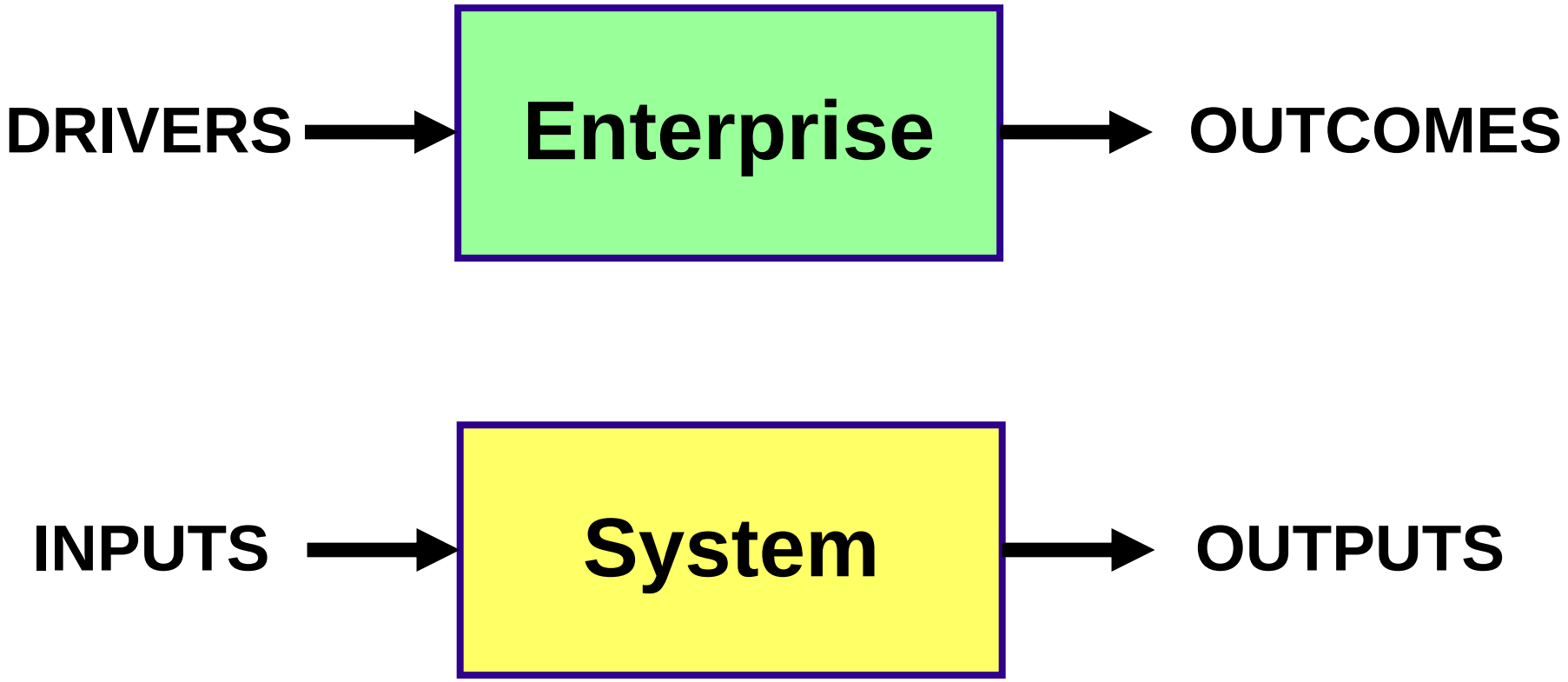
Enabling Enterprise Transformation Using Enterprise Architecture Principles and Concepts

James N Martin, PhD
Distinguished Engineer
Enterprise Systems Engineering
The Aerospace Corporation

UAF Summit: Actionable Architecture in the 21st Century
20 March 2024

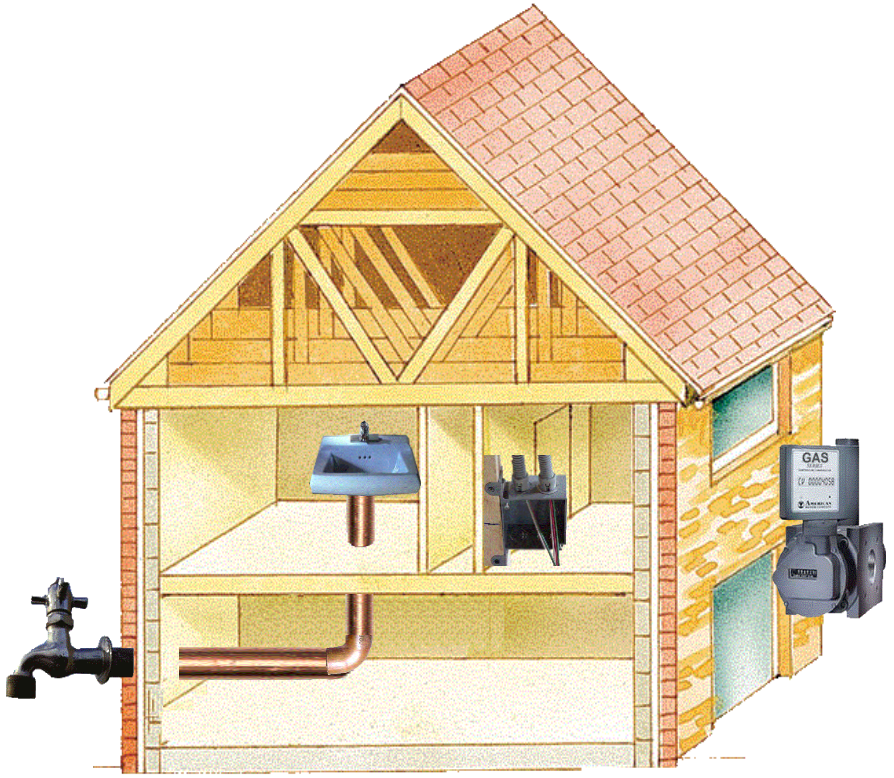
Approved for public release: OTR 2024-00493

Systems vs. Enterprises



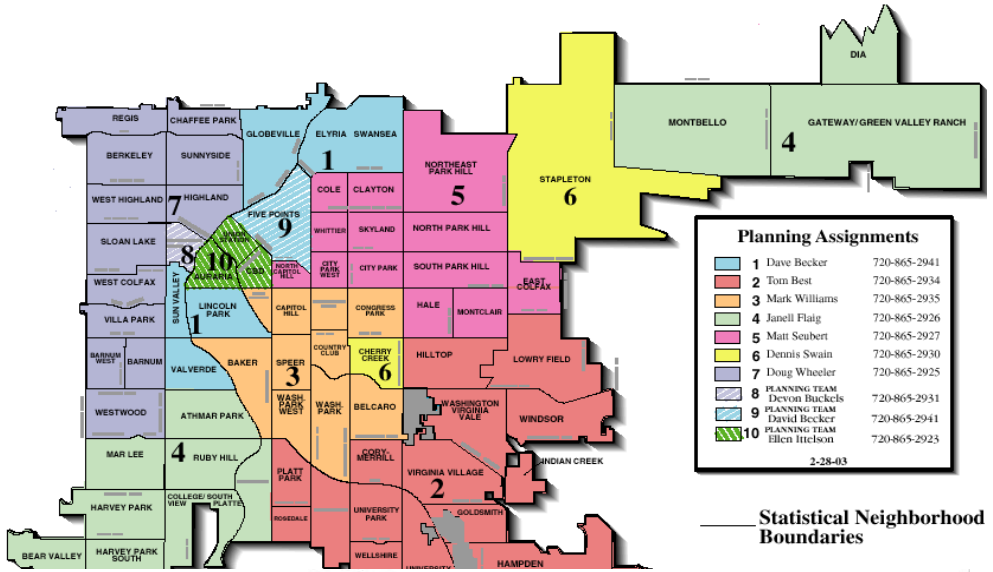
Primary aim of the Enterprise is to maximize Positive Outcomes and minimize Negative Outcomes…

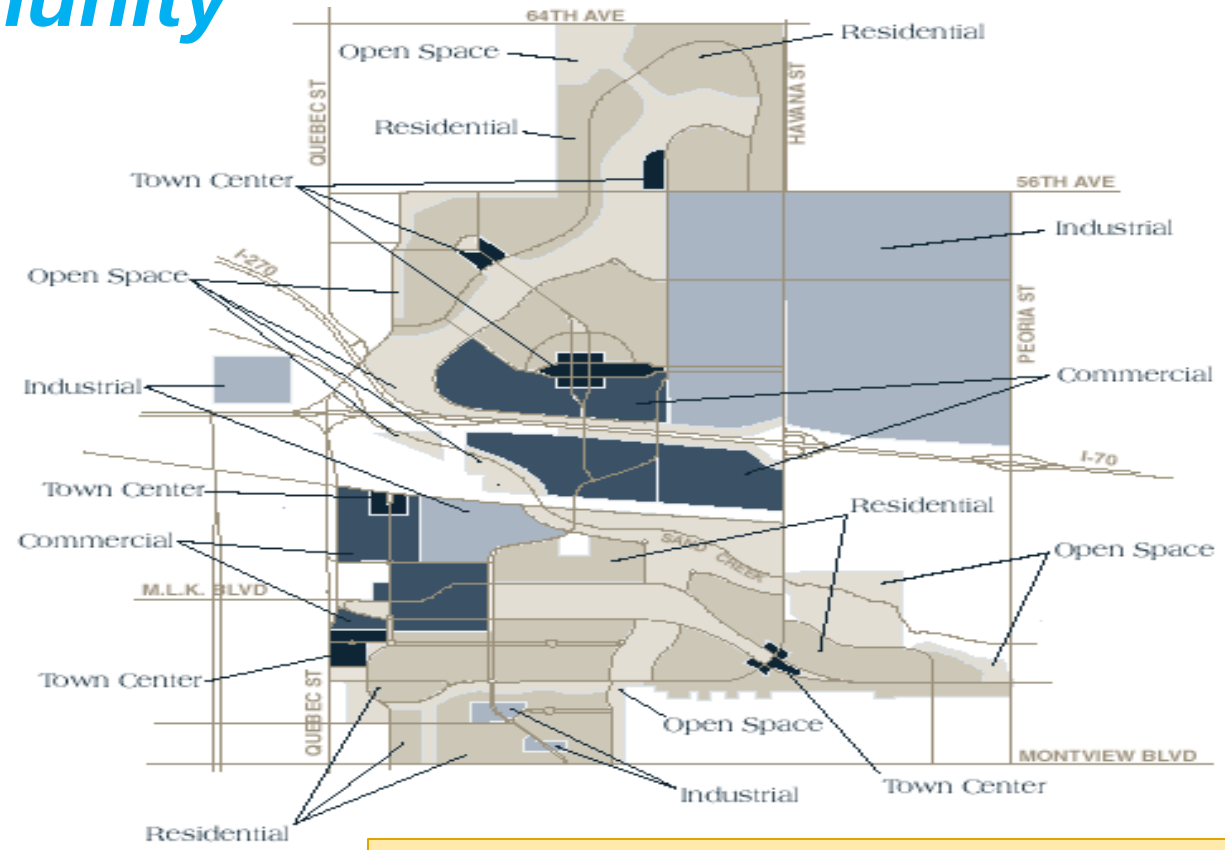
System Architecture is Like Blueprints for a Building



Outputs for a System tend to be the same over its lifetime. The requirements are established early on and tend not to change very much. Results for a system are more readily predicted.

Enterprise Architecture is More Like Urban Planning for a Community



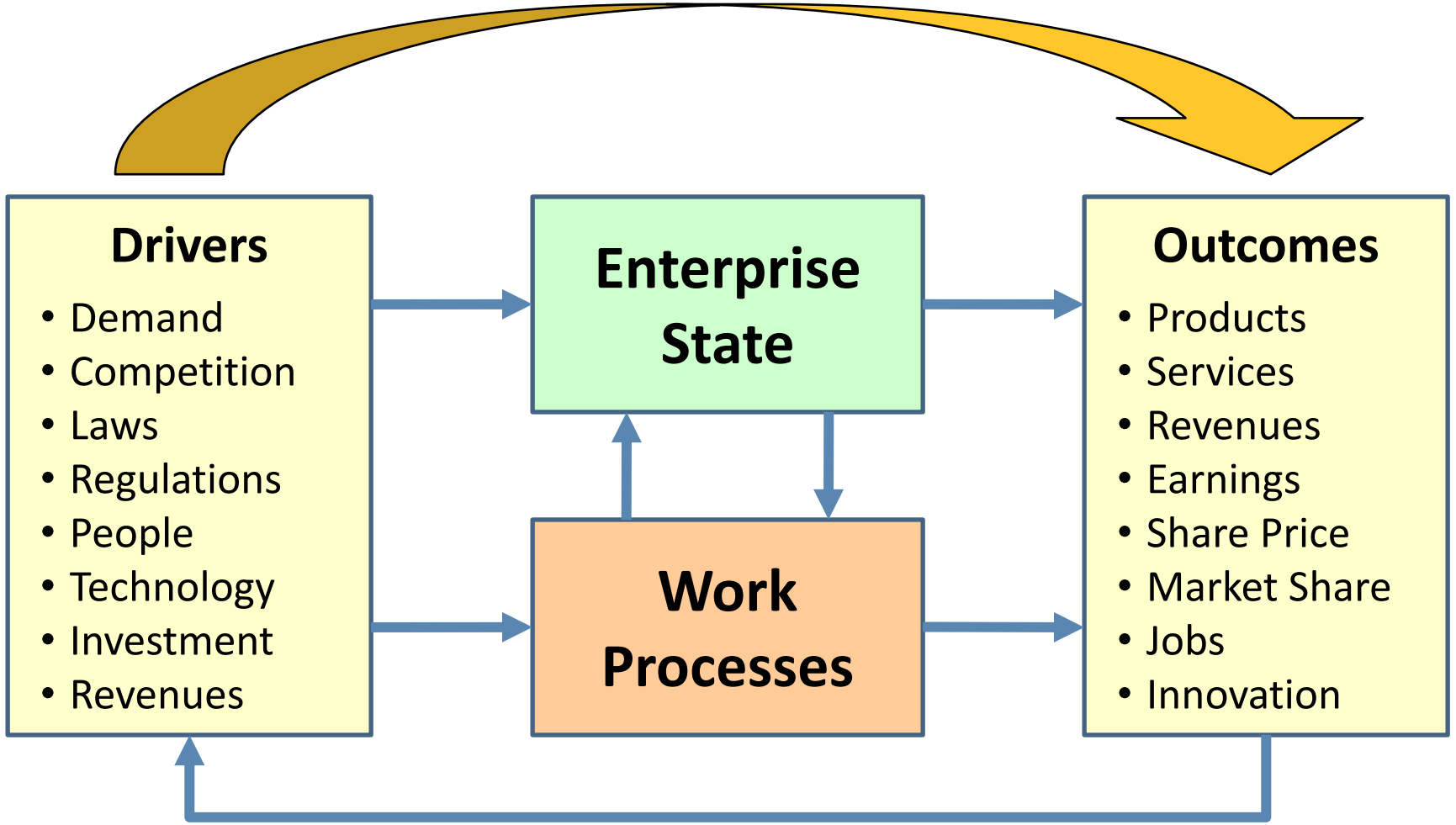


Outcomes for an Enterprise are very complex and are shifting over time…

- *Usually a "sequence" of outcomes is laid out in a Capability Roadmap*
- *The Enterprise can even change its own Objectives and Priorities!*

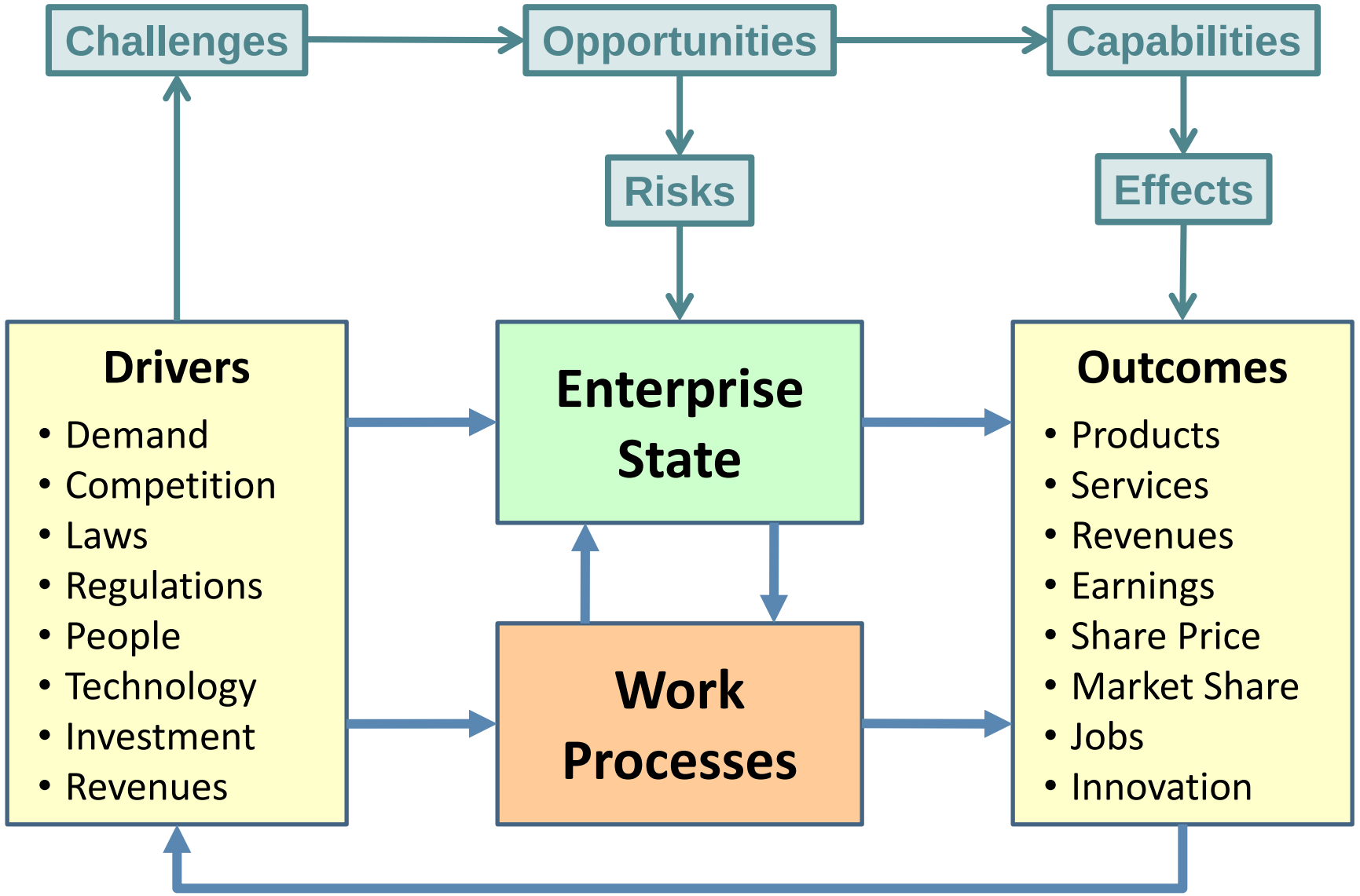
Transforming the Enterprise to Achieve Desired Outcomes

Finding the Optimal States and the Right Processes



Architecture Models can help understand the landscape and how to change things for the better

Challenges & Opportunities to be Identified for Achieving Enterprise Transformation



The Past

UPDM – Unified Profile for DoDAF/MODAF

UPDM RFC Group

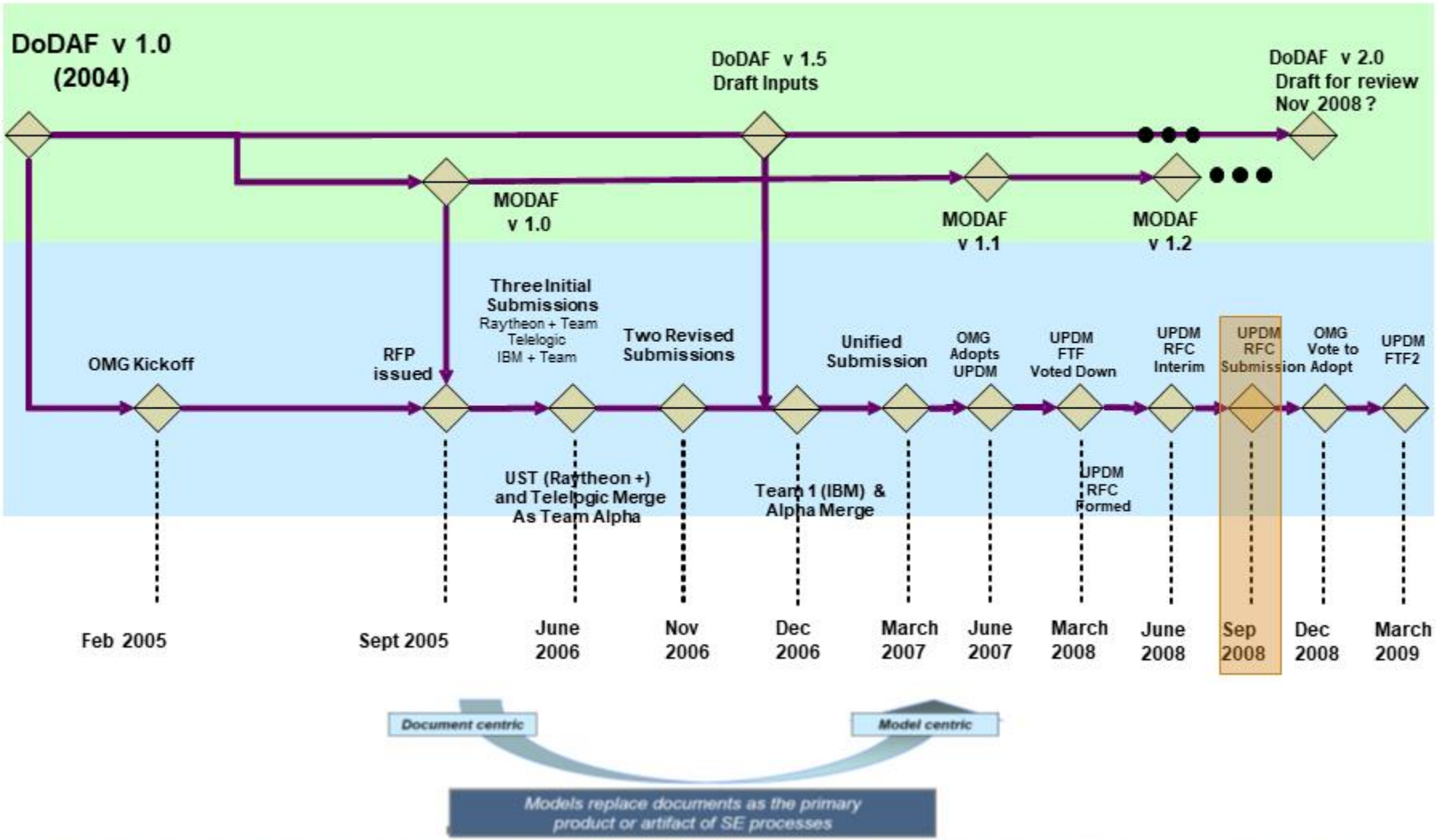
Adaptive
Artisan Software
ASMG
BAE Systems
DoD
embeddedPlus
Generic
Lockheed Martin Co
Mitre
MOD
NoMagic
Raytheon
Rolls Royce
Sparx Systems
VisumPoint

UPDM GROUP

September 23, 2008

OMG OBJECT MANAGEMENT GROUP

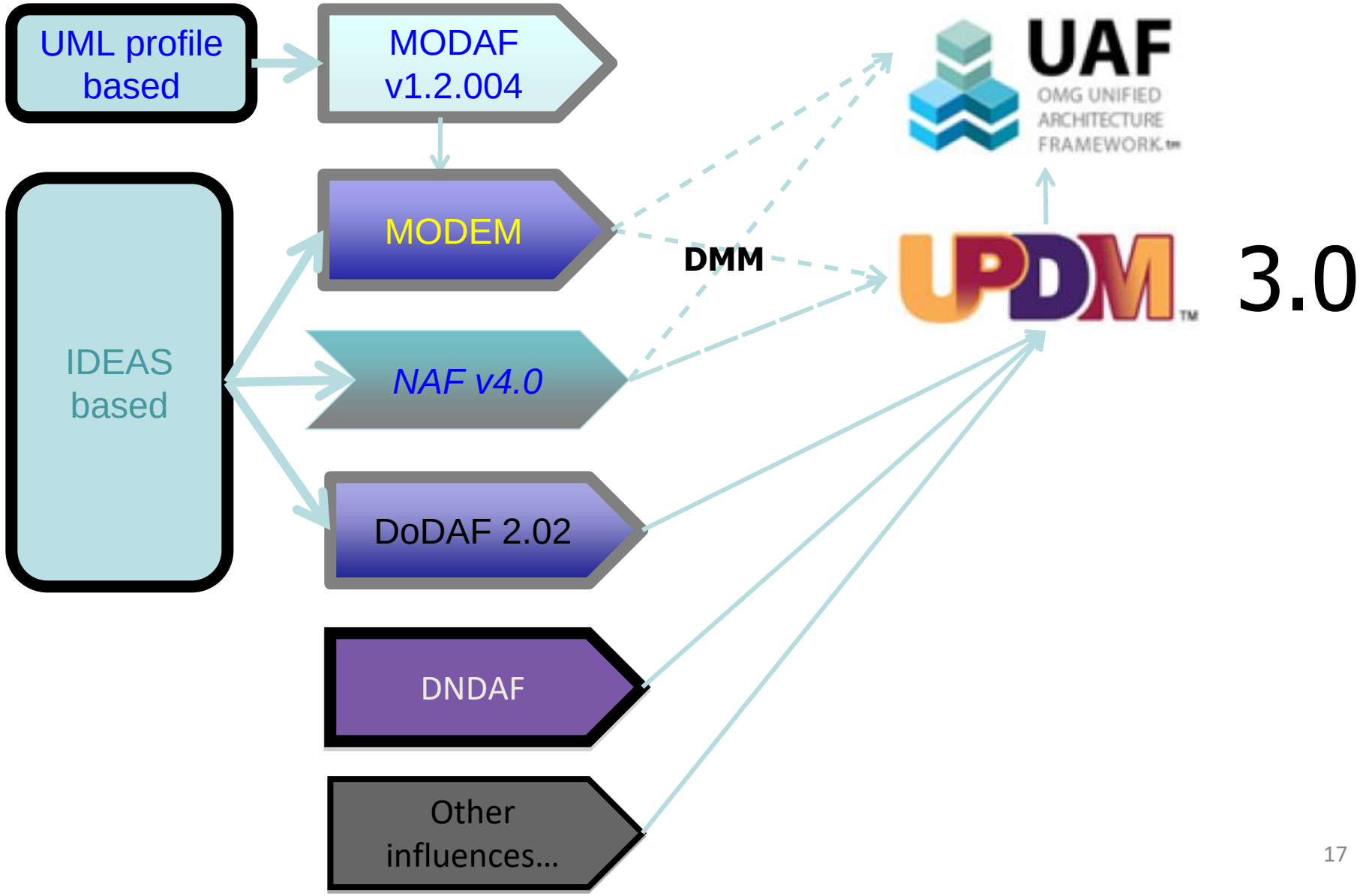
When: UPDM History



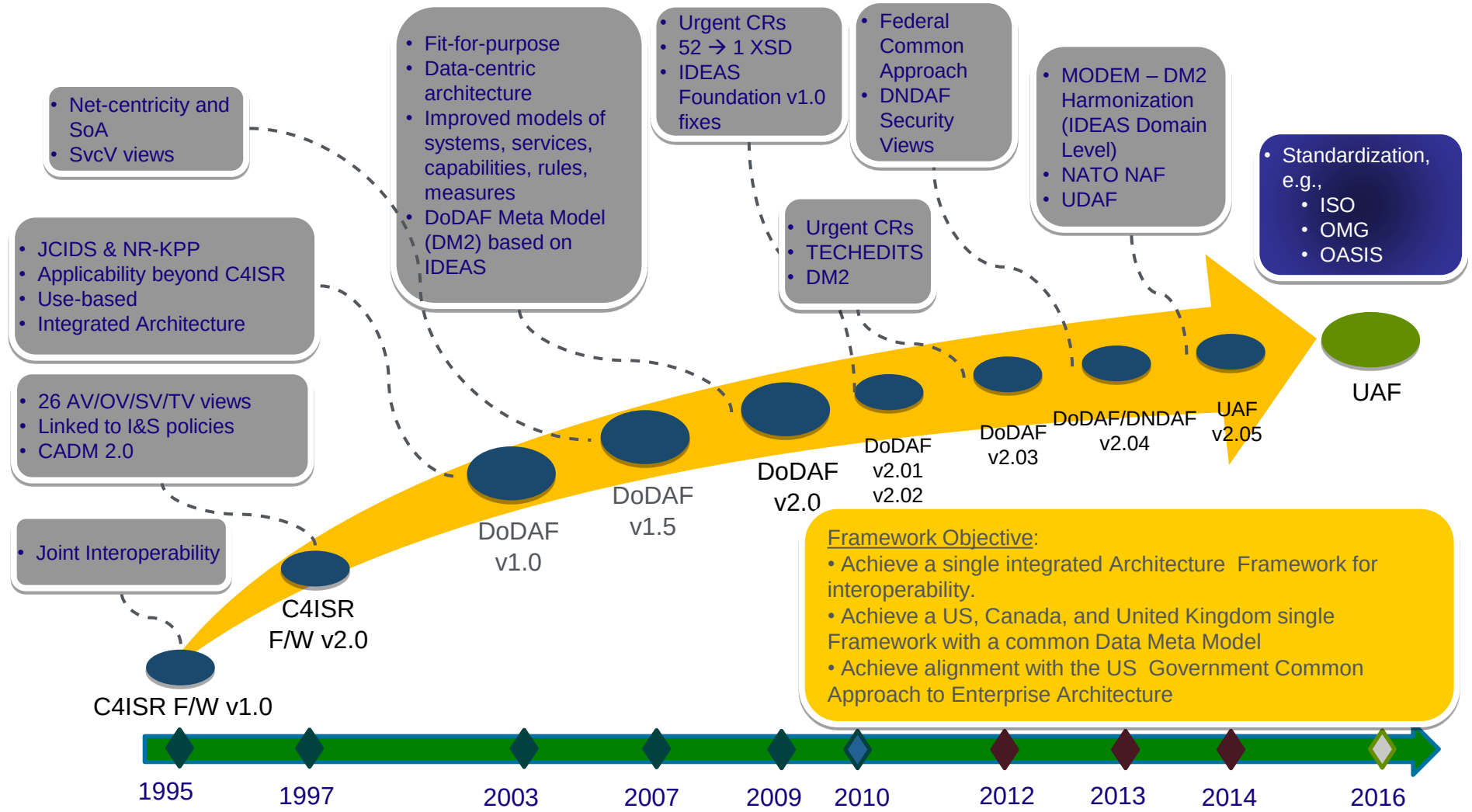
Why: The need for UPDM.

- Motivation
  - Significantly enhance the quality, productivity, and effectiveness associated with enterprise and system of systems architecture modeling, promote architecture model reuse and maintainability, improve tool interoperability and communications between stakeholders, and reduce training impacts due to different tool implementations and semantics.
  - Improve the integration between system of systems modeling and system modeling to support post acquisition life cycle design modeling.
  - Already being used and demonstrated to be useful
- UPDM fully supported by DoD, MOD, IDEAS
  - Statement and slides available on OMG website

UPDM 3.0->UAF 1.0



Unified Direction of USG and NATO Achieving Strategic Goals and Capability



18

The Present

UAF is a Standard…

- To develop architectural descriptions for **commercial industries**, **federal governments** and **military organizations**
- Is compatible with **DoDAF** and **NAF**
- The UAF task force within OMG has identified **58 distinct use cases** spanning systems, missions, enterprise, and System of Systems (SoS) engineering
- Developed by Object Management Group (OMG) with the leadership from Dassault Systemes, Lockheed Martin and System Strategy
- Is an international ISO standard ***ISO/IEC 19540:1*** *and* ***ISO/IEC 19540:2***
- Current version of UAF specification is 1.2
  https://www.omg.org/spec/UAF/1.2/About-UAF

Components of the UAF Specification (v1.2)

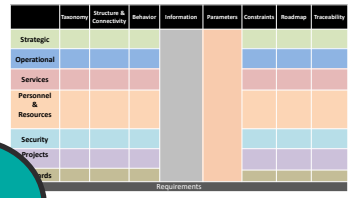
UAF
OMG UNIFIED ARCHITECTURE FRAMEWORK ™

Specification

EA Guide

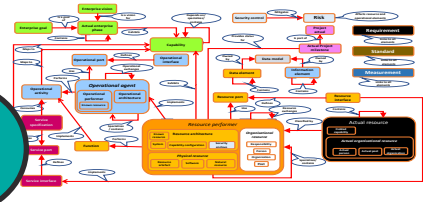
4

View Specifications organized in Viewpoints and Aspects (Grid)



1

UAF Domain MetaModel (DMM)



2

UAF Modeling Language* (UAFML) based on SysML

3

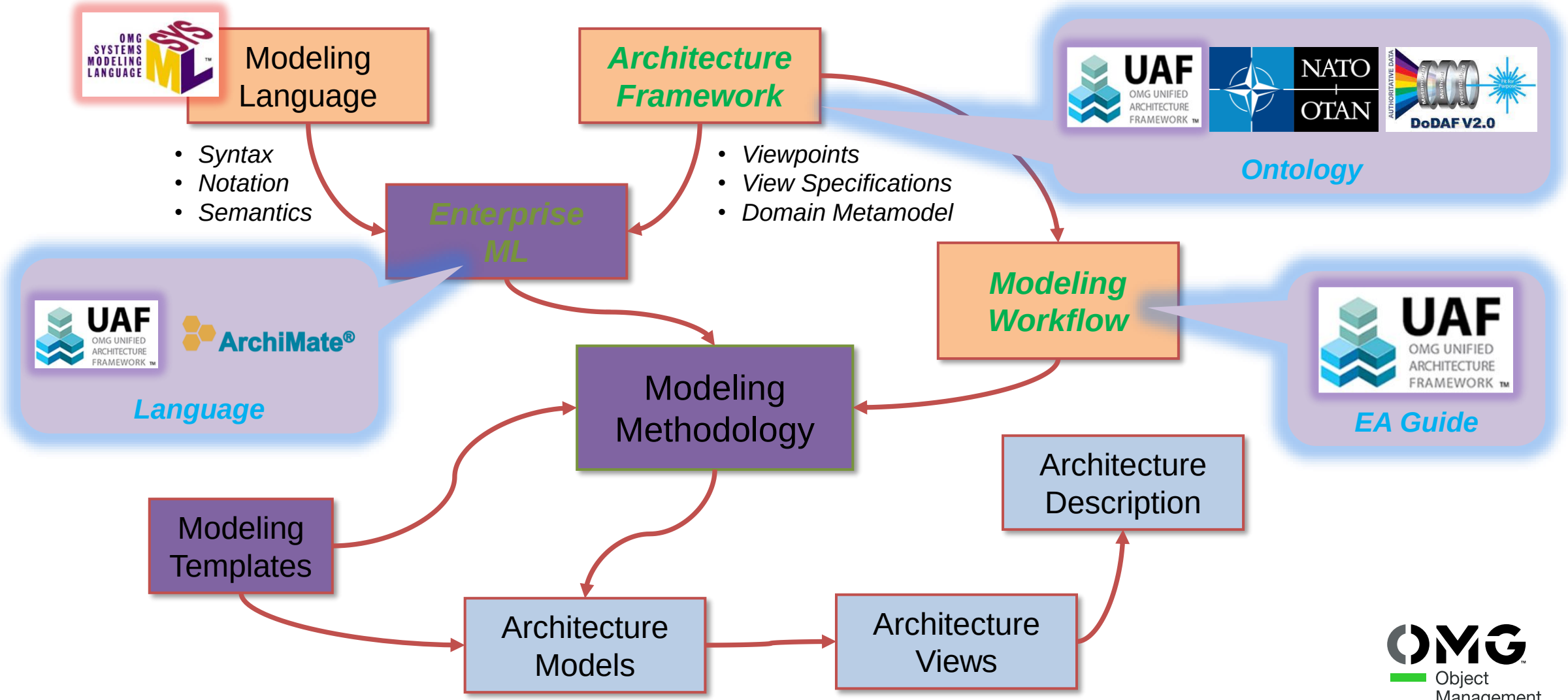
** Formerly called the "UAF Profile (UAFP)" in version 1.1 of the UAF specification*

https://www.omg.org/spec/UAF/

UAF Use Cases

15288 System Lifecycle Processes
Acquisition Decision Making
AOA (Analysis of Alternatives)
Application Portfolio Management
Budget Planning
Business and Mission Analysis - INCOSE
Business Process Reengineering
Business Transformation Planning
Capability Gaps Analysis
Capability Planning
Capability Portfolio Management
Capability-based Assessment
Certification Planning
Defense Acquisition System
Define and analyze problem space
Describe SoS
Design Surety
Digital Engineering Planning and Execution
Digital Transformation Planning
Digital Twin
Doctrine Development
Ecosystem Sustainability
Enterprise Planning
Enterprise Systems Engineering - INCOSE
Federated Mission Network (FMN)
JCIDS
Logistics Support Planning
Mission Assurance
Mission Criticality
Mission Engineering
Operational Analysis
Operational Sustainability
Operations
Operations Planning
Optimization
Organizational and Strategic Planning
Performance Management
Policy Formulation
Portfolio Management
PPBE
Predictive Analytics
Program Assessment and Evaluation
Program Formulation
Program Planning
Requirements Development and Flowdown
Risk and Opportunity Management
Security Analysis
Simulation Support
Strategic Planning and Execution
Sustainability
Sustainment Engineering
System Lifecycle Management
System Security Engineering
System Sustainability
Technology Planning and Assessment
Test Planning and Execution
Training

The Modeling Landscape



UAF OMG UNIFIED 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
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	Environment En-Pm-E and Measurements Me-Pm-M and Risks Rk-Pm-R	Strategic Constraints St-Ct	Strategic Deployment, St-Rm-D Strategic Phasing St-Rm-P	Strategic Traceability St-Tr
Operational Op	Requirements Rq-Mv	Operational Taxonomy Op-Tx	Operational Structure Op-Sr	Operational Connectivity Op-Cn	Operational Processes Op-Pr	Operational States Op-St	Operational Sequences Op-Sq	Operational Information Op-If		Operational Constraints Op-Ct		Operational Traceability Op-Tr
Services Sv		Services Taxonomy Sv-Tx	Services Structure Sv-Sr	Services Connectivity Sv-Cn	Services Processes Sv-Pr	Services States Sv-St	Services Sequences Sv-Sq			Services Constraints Sv-Ct	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 Rs-If		Competence, Drivers, Performance Ps-Ct	Personnel Availability 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			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]		

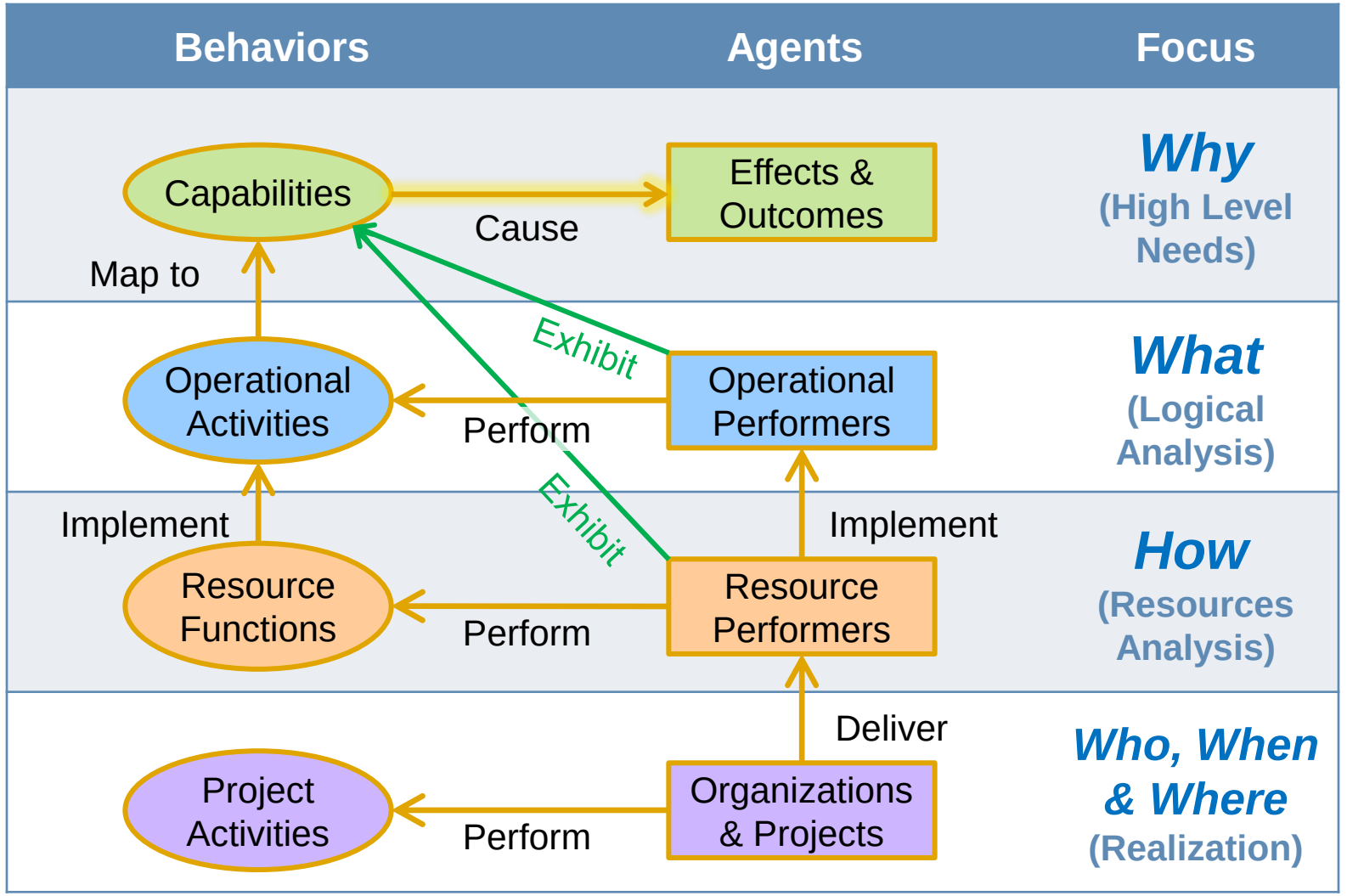
The Four Layers of Enterprise Modeling

Behaviors & Agents (ie, Doing and Being) at Different "Levels of Abstraction"

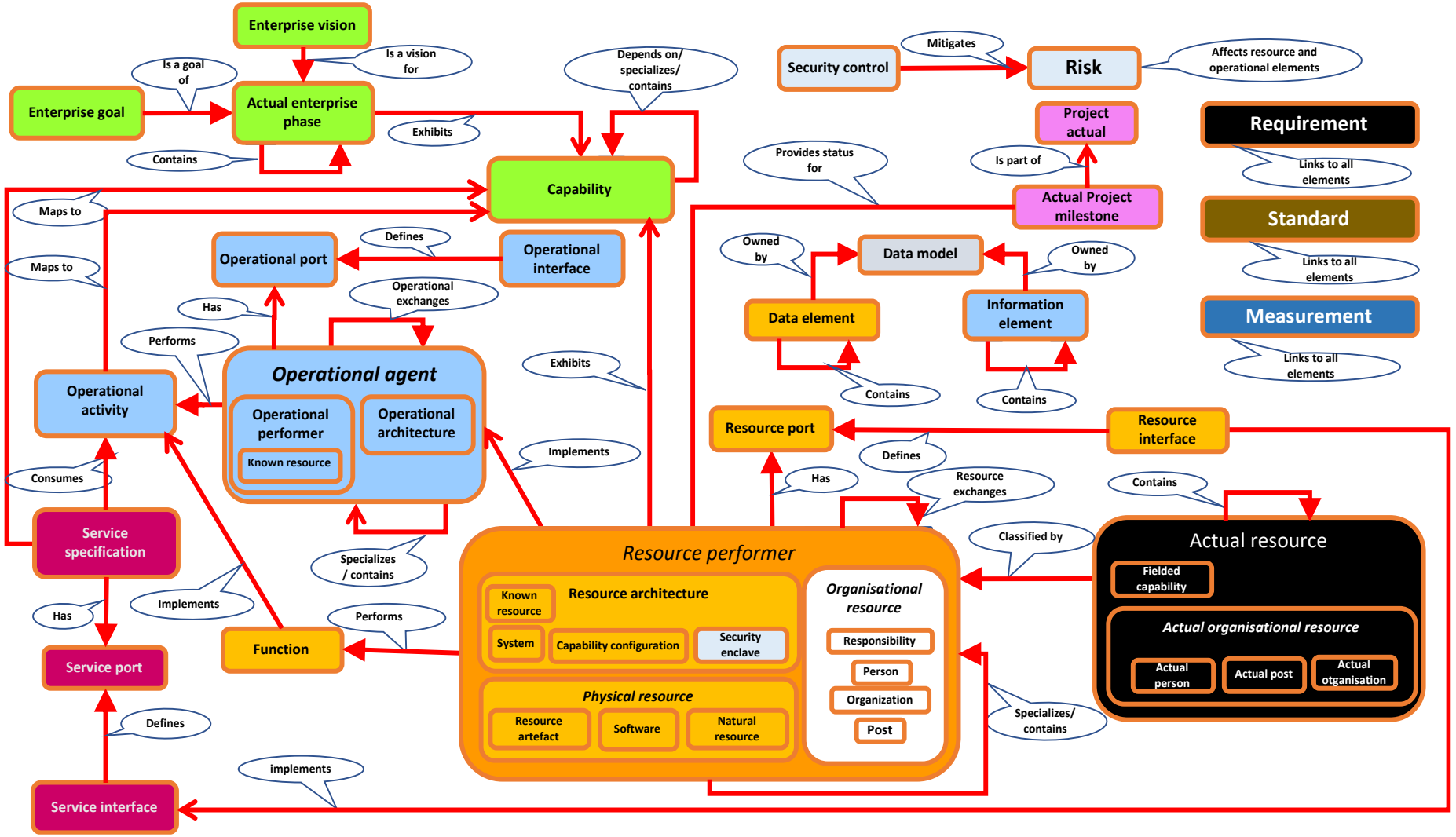
Behaviors	Agents	Focus
Capabilities	Effects & Outcomes	***Why*** **(High Level Needs)**
Operational Activities	Operational Performers	***What*** **(Logical Analysis)**
Resource Functions	Resource Performers	***How*** **(Resources Analysis)**
Project Activities	Organizations & Projects	***Who, When & Where*** **(Realization)**

The Four Layers of Enterprise Modeling

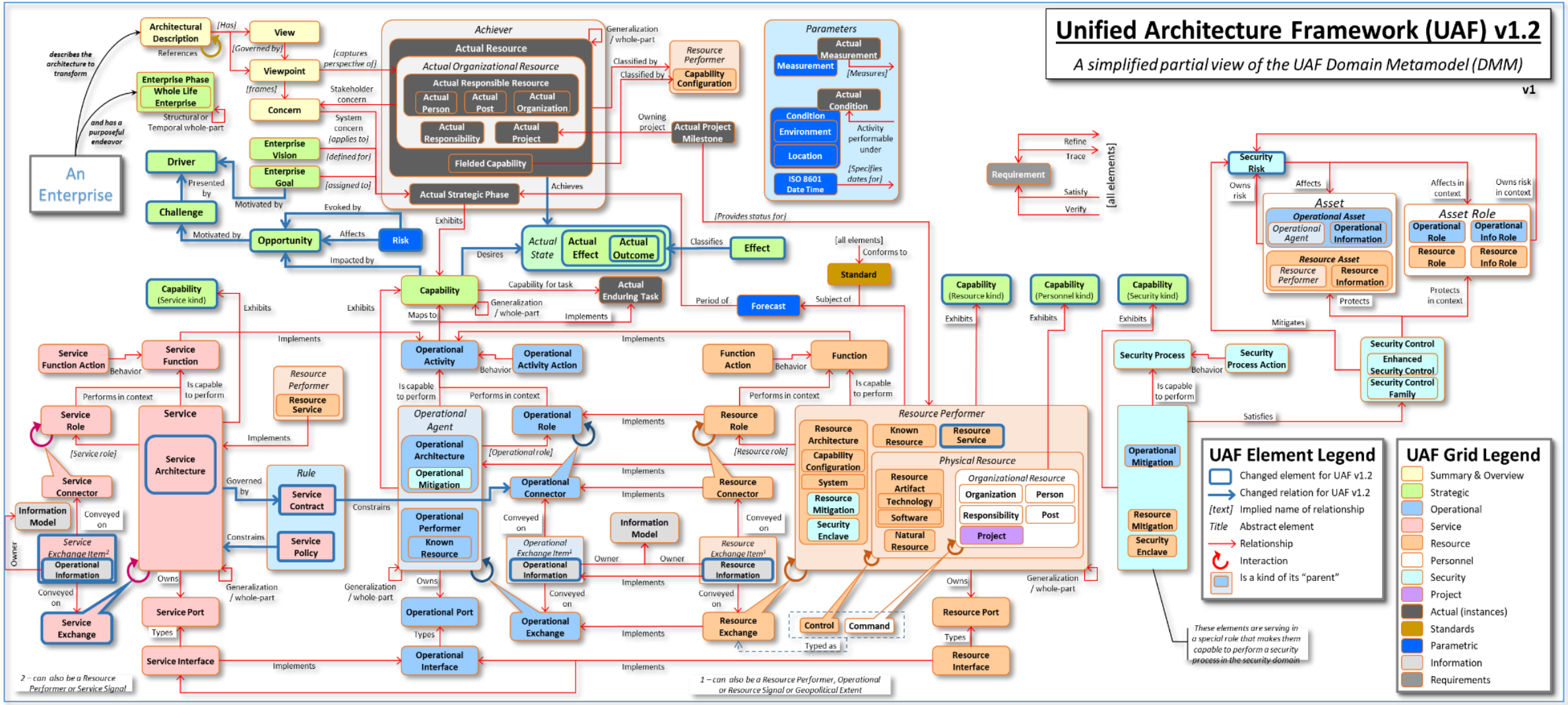
Key Relationships Between Behaviors & Agents



UAF Simplified Metamodel



UAF Less-Simplified Metamodel



Challenges & Opportunities for Infrastructure

32nd Annual INCOSE international symposium

hybrid event

Detroit, MI, USA
June 25 - 30, 2022

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

www.incose.org/symp2022

10/20/2021

What Are the Facts?

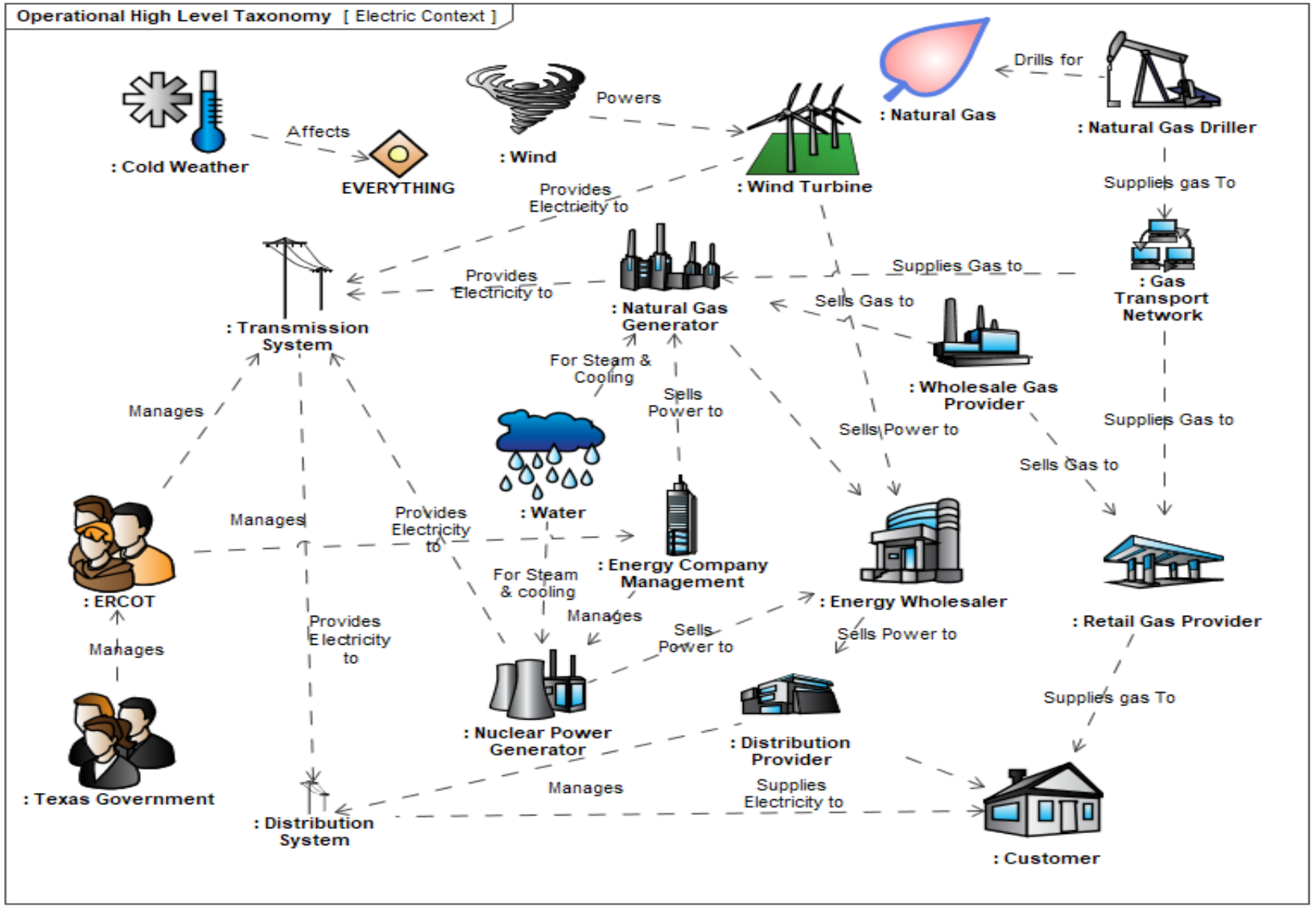
- Winter storm Uri hit Texas causing freezing temperatures.
- Generators, and generator power sources (Coal, Gas, Nuclear, Water) failed
- Loss of generation put the grid stability at risk
- Load shedding to protect the grid cut off power from millions
- Almost 300 people died, many homes and businesses destroyed.
- The emergency lasted 4 days
- Texas was not prepared.

Why Weren't the Systems Winterized?

- There was insufficient incentive and ROI to do so
  - Winterization of infrastructure was not mandated by the government.
  - Similar cold snaps happen roughly every 40 years
  - The initial investment and maintenance for winterization is expensive
  - There was no effective business case to winterize unless required
- The same reasoning was universally applied
  - Homes, businesses, infrastructure, apartments, condominiums, etc.
- Preparation for the next storm needs to be driven by both business and engineering.
  - So, how to express these concepts?

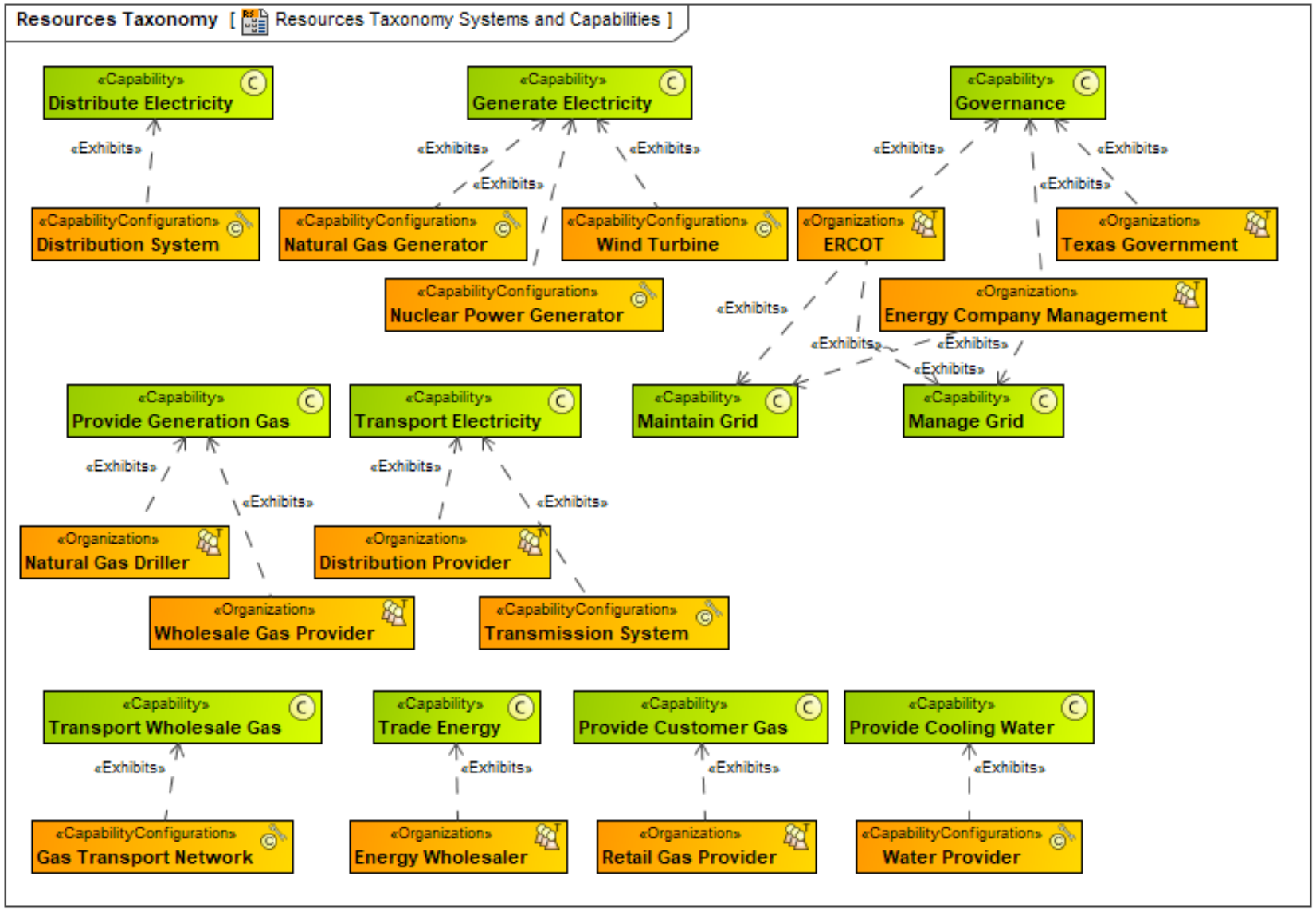
The Texas Energy System of Systems

- High-Level concept diagram
- Shows high level Texas grid concepts
- Demonstrates Simple Interactions



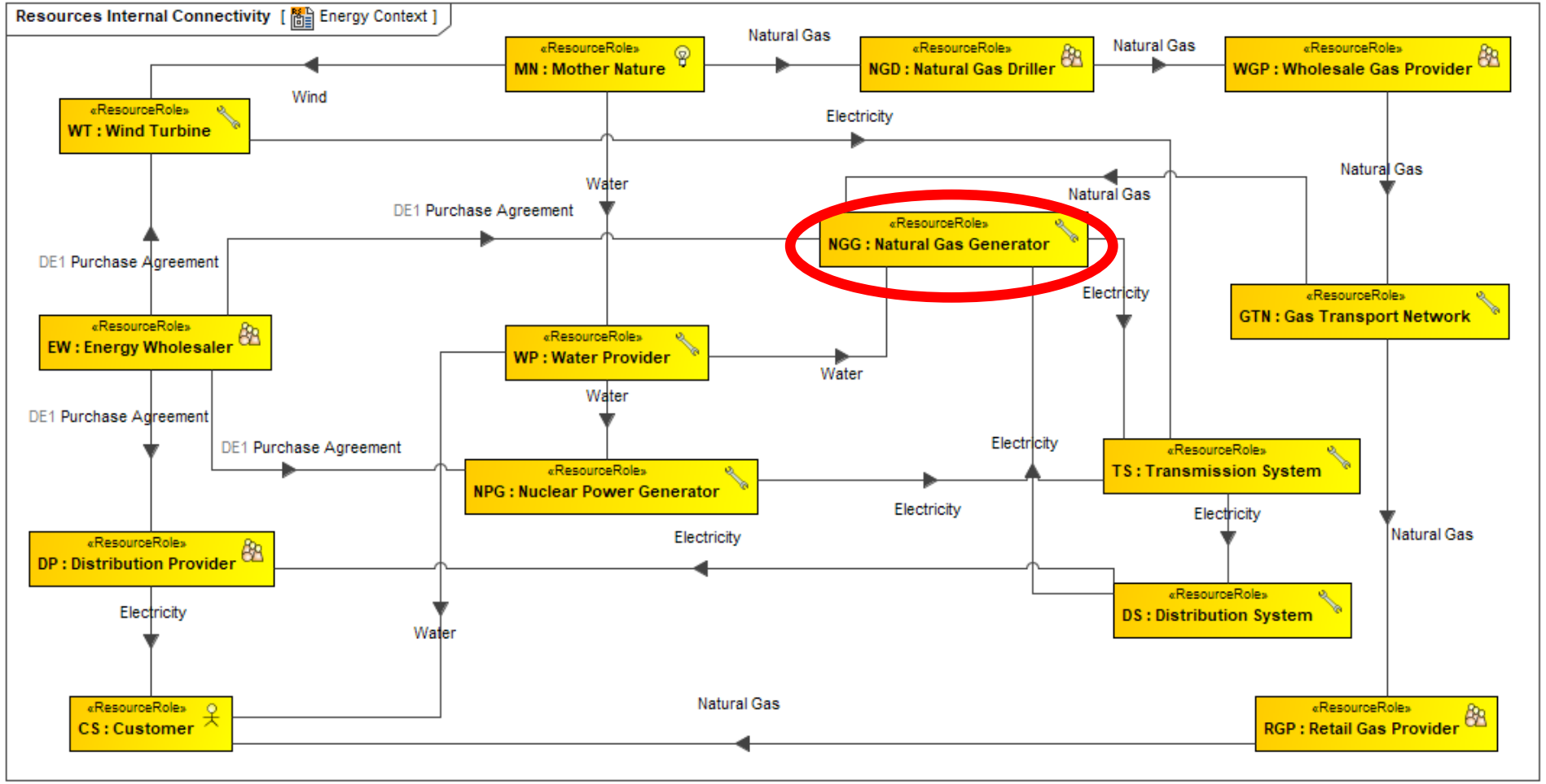
Capabilities and Implementing Resources

- Systems implement the capability by creating the desired effects
- Multiple systems implement a capability
- Capabilities and systems depend on one another



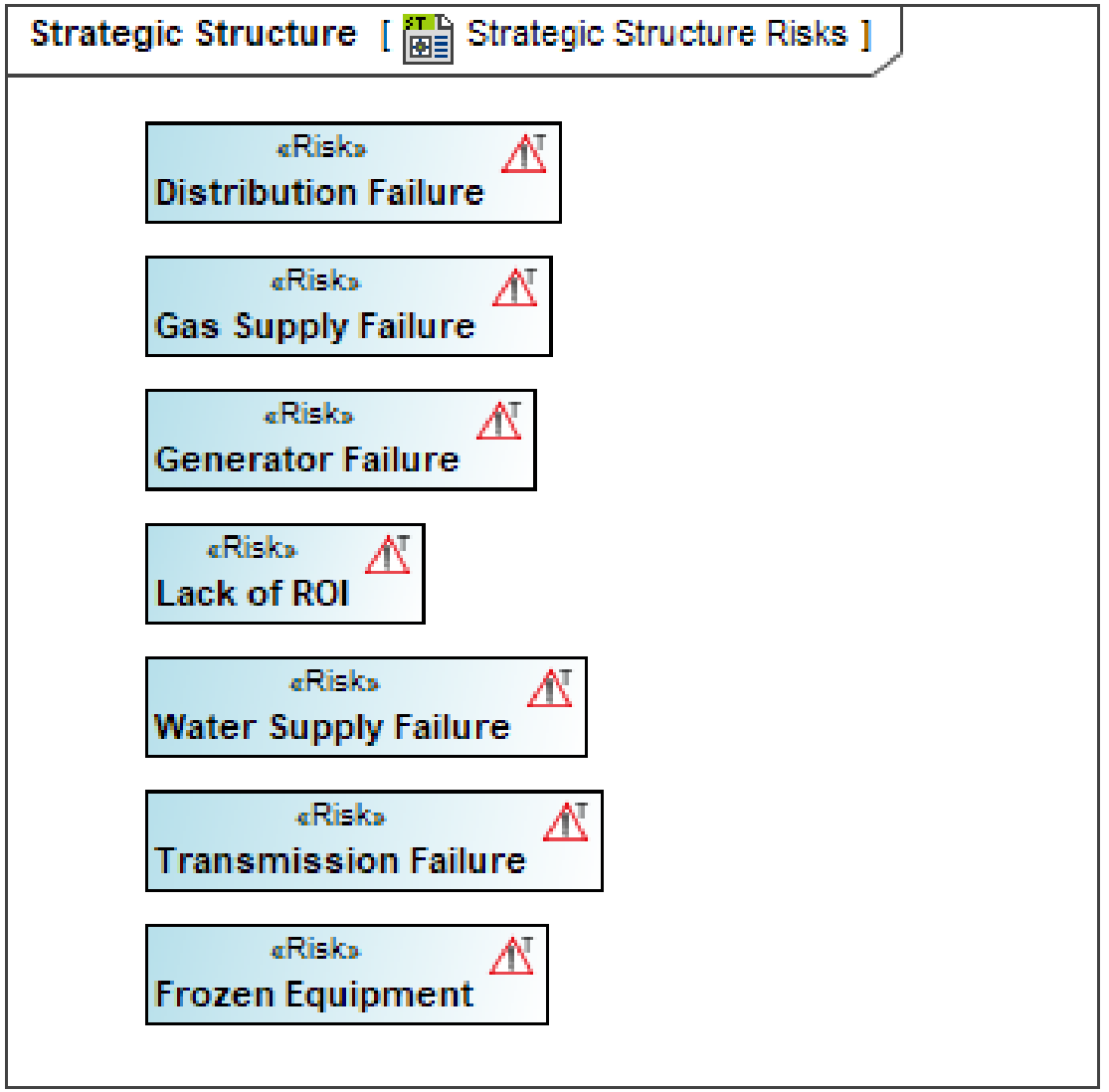
Energy System Architecture

- System connections and flows
- Demonstrates the interconnected-ness of the systems
- Failure of any connection will ultimately affect everything



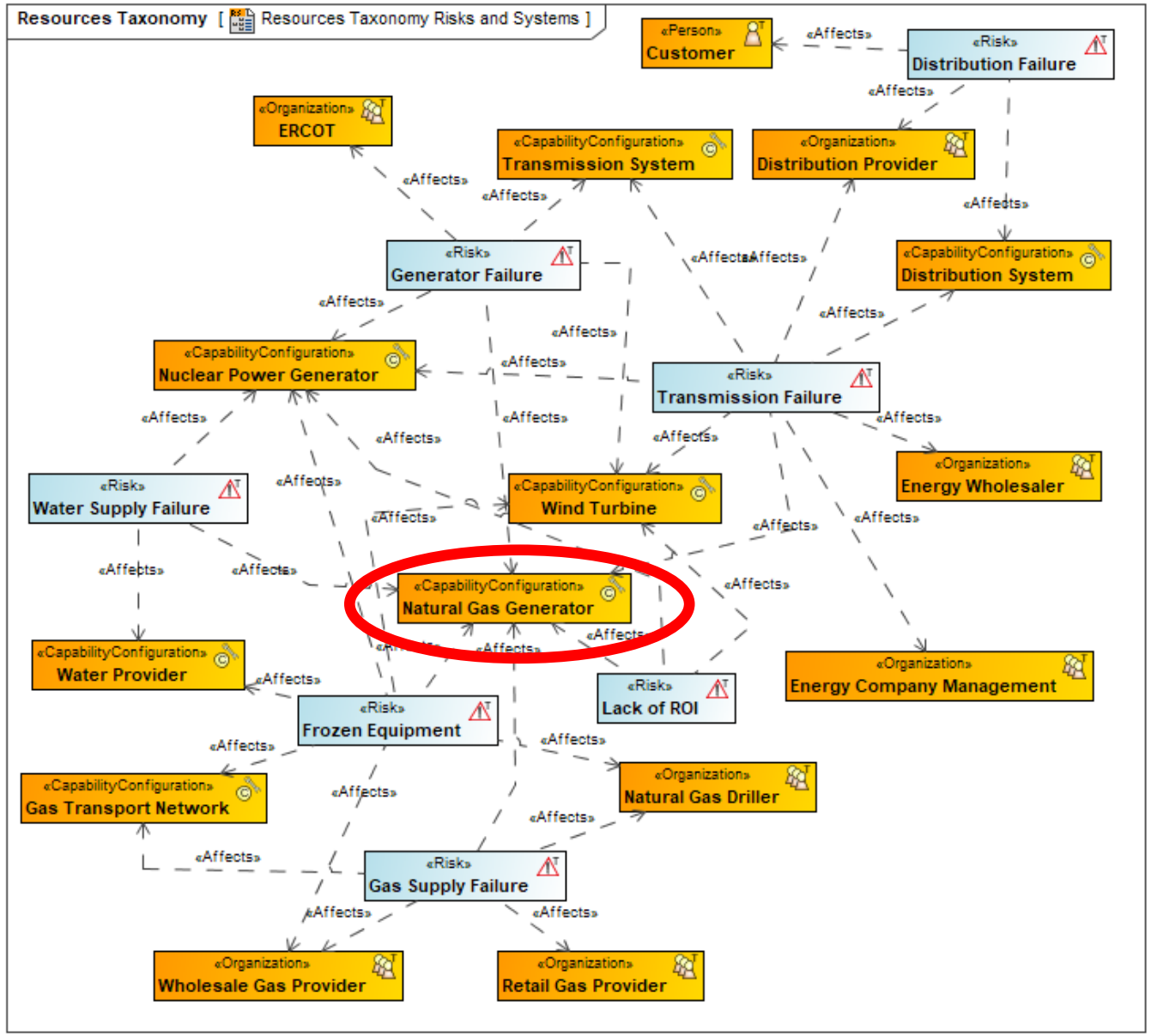
Energy System Risks

- Risk: The chance or probability that an adverse event will occur. Risk analysis examines probability of risk as well as the adverse effect.



Risks and Affected Resources

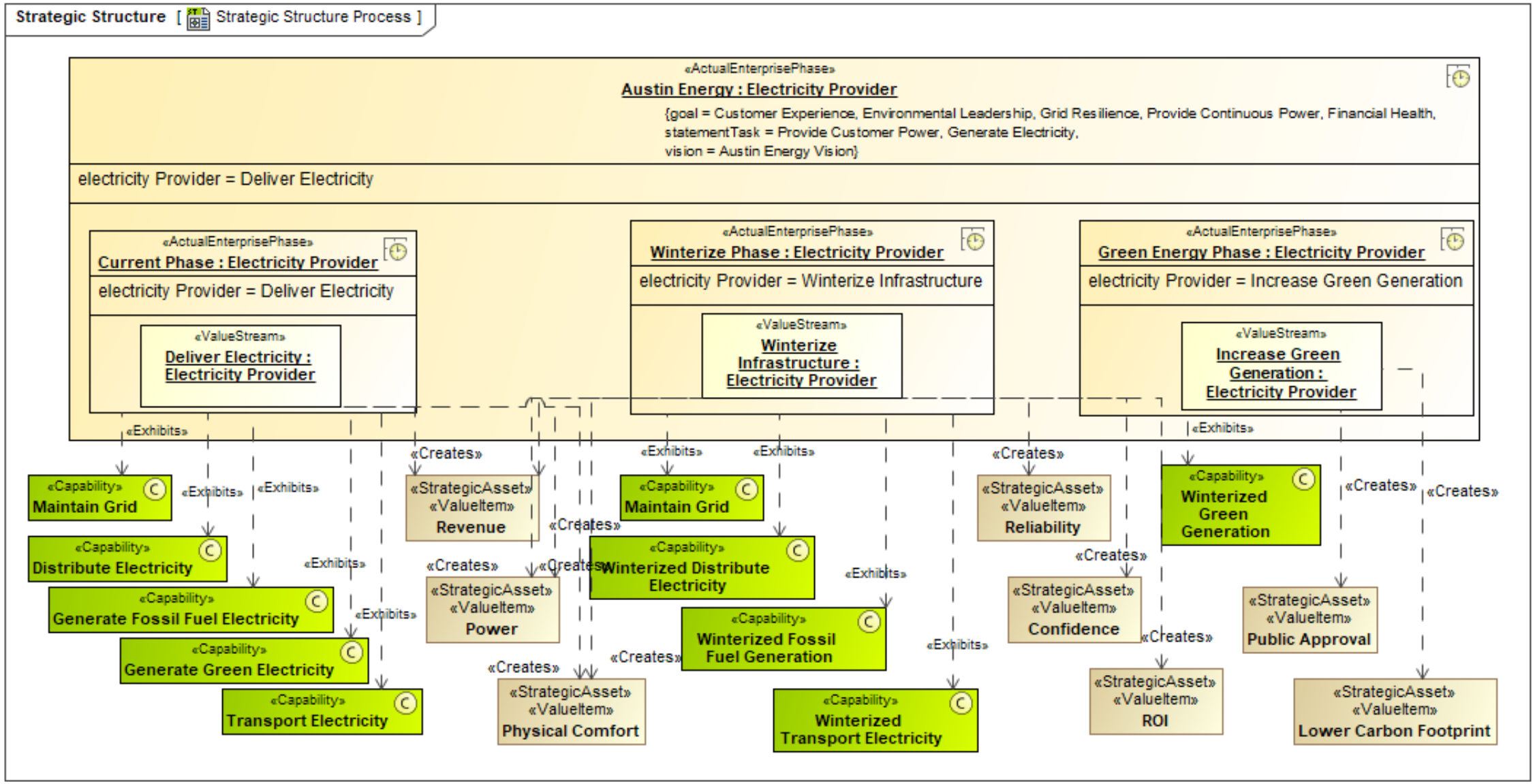
- System Risks and elements they affect
  - Gas supply failure affects Generation, Transportation, Wholesales, Retail, Driller and Customer.
  - Frozen Equipment affects almost everything
  - Lack of ROI affects generation infrastructure
- So, can we mitigate these risks?

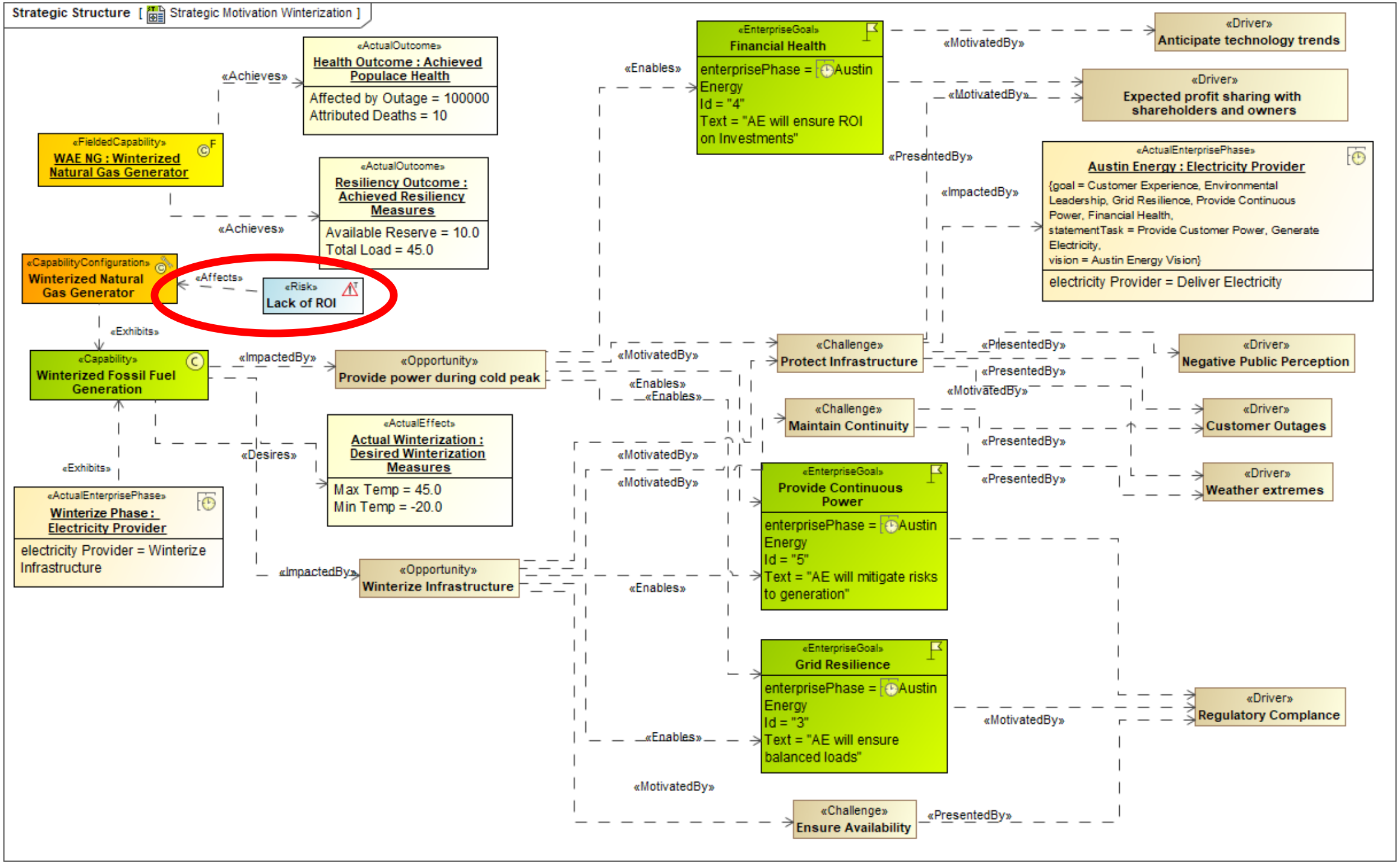


Definition of Concepts

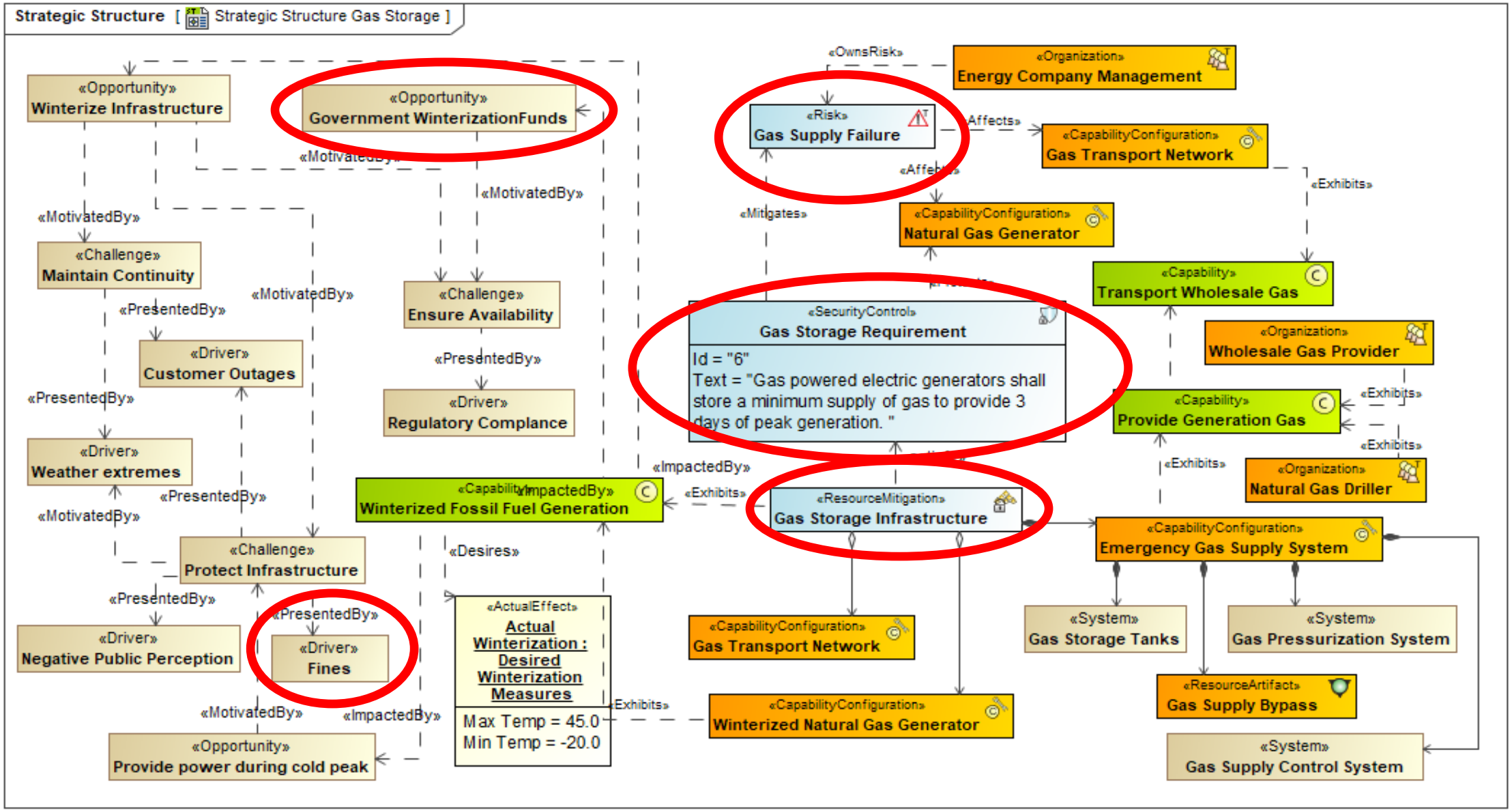
Concept	Definition
Driver*	Thing that forces us to work or act; that which urges you forward
Challenge*	A demanding or stimulating situation; a call to engage in a contest or fight
Enterprise State*	Condition with respect to circumstances or attributes
Capability	Ability to do something under particular 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

Phased Improvements and Value Streams




Strategic Structure [Strategic Motivation Winterization]
«ActualOutcome»
Health Outcome : Achieved Populace Health
Affected by Outage = 100000
Attributed Deaths = 10
«Achieves»
«FieldedCapability»
WAE NG : Winterized Natural Gas Generator
«Achieves»
«ActualOutcome»
Resiliency Outcome : Achieved Resiliency Measures
Available Reserve = 10.0
Total Load = 45.0
«CapabilityConfiguration»
Winterized Natural Gas Generator
«Affects»
«Risk»
Lack of ROI
«Exhibits»
«Capability»
Winterized Fossil Fuel Generation
«ImpactedBy»
«Opportunity»
Provide power during cold peak
«Desires»
«ActualEffect»
Actual Winterization : Desired Winterization Measures
Max Temp = 45.0
Min Temp = -20.0
«Exhibits»
«ActualEnterprisePhase»
Winterize Phase : Electricity Provider
electricity Provider = Winterize Infrastructure
«ImpactedBy»
«Opportunity»
Winterize Infrastructure
«Enables»
«EnterpriseGoal»
Financial Health
enterprisePhase = Austin Energy
Id = "4"
Text = "AE will ensure ROI on Investments"
«MotivatedBy»
«Driver»
Anticipate technology trends
«MotivatedBy»
«Driver»
Expected profit sharing with shareholders and owners
«PresentedBy»
«ImpactedBy»
«ActualEnterprisePhase»
Austin Energy : Electricity Provider
{goal = Customer Experience, Environmental Leadership, Grid Resilience, Provide Continuous Power, Financial Health,
statementTask = Provide Customer Power, Generate Electricity,
vision = Austin Energy Vision}
electricity Provider = Deliver Electricity
«MotivatedBy»
«Enables»
«Challenge»
Protect Infrastructure
«PresentedBy»
«Driver»
Negative Public Perception
«PresentedBy»
«MotivatedBy»
«Challenge»
Maintain Continuity
«Driver»
Customer Outages
«PresentedBy»
«PresentedBy»
«Driver»
Weather extremes
«MotivatedBy»
«MotivatedBy»
«EnterpriseGoal»
Provide Continuous Power
enterprisePhase = Austin Energy
Id = "5"
Text = "AE will mitigate risks to generation"
«Enables»
«EnterpriseGoal»
Grid Resilience
enterprisePhase = Austin Energy
Id = "3"
Text = "AE will ensure balanced loads"
«MotivatedBy»
«Driver»
Regulatory Complance
«Enables»
«MotivatedBy»
«Challenge»
Ensure Availability
«PresentedBy»

Updated Incentives and Mitigations



Conclusion

- Virtually all the entities involved (including homeowners) failed to invest in winterization due to lack of motivation and incentives.
- This resulted in frozen systems, degraded electric provision, & eventually frozen pipes and houses and several deaths.
- The Texas Grid failure of 2021 was a system of systems failure
- The Texas Legislature has provided fines and funds for winterization of the generation systems.
- However, a wholistic winterization approach to the supply chain is required (including the windmills)
- Understanding the drivers, challenges, opportunities, and goals will help prevent another occurrence of this.

Industrial Systems

32nd Annual INCOSE international symposium

hybrid event

Detroit, MI, USA
June 25 - 30, 2022

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

www.incose.org/symp2022

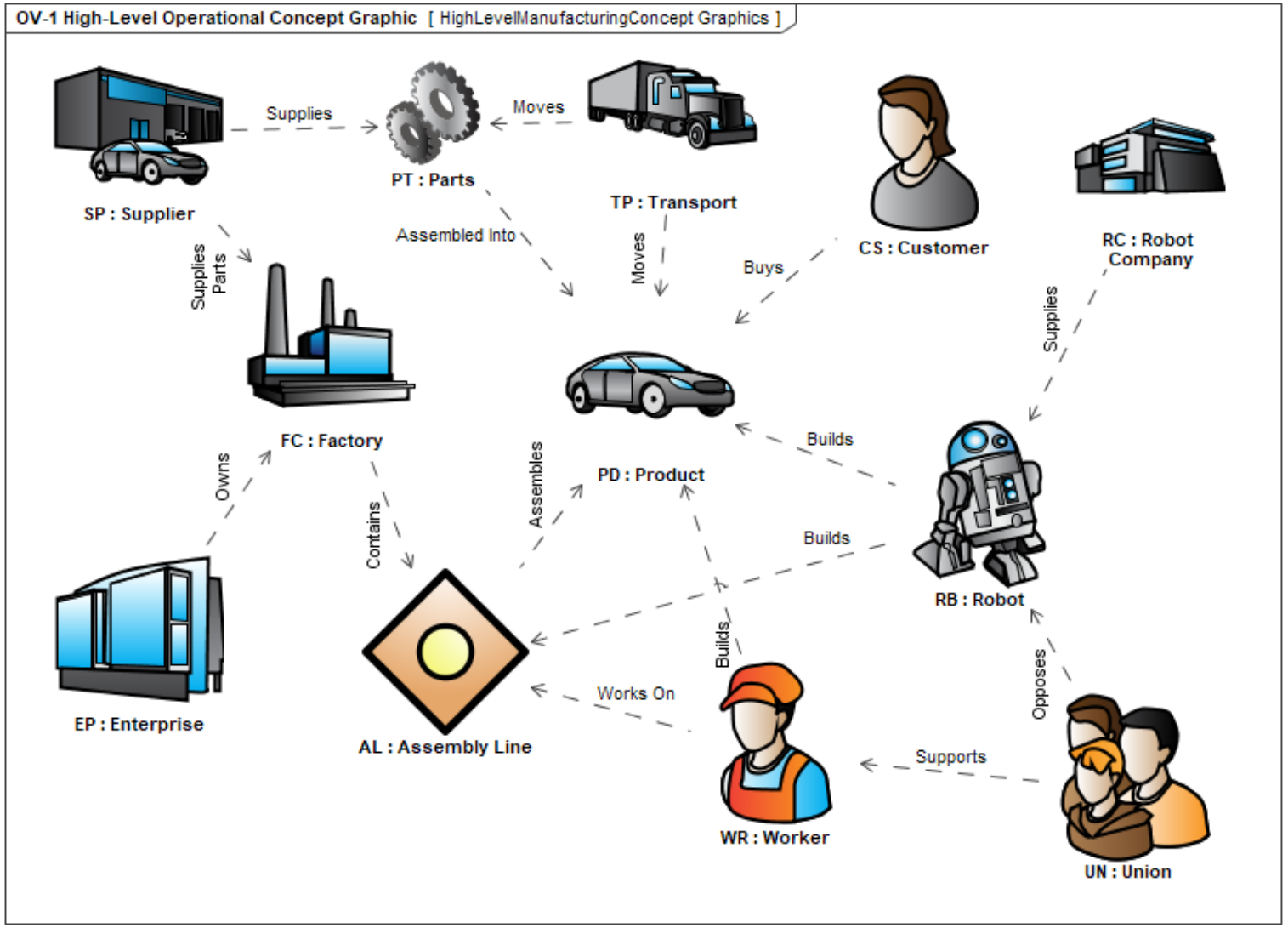
10/20/2021

Example Automotive Factory Model

- Problem Statement: Powerhouse Engines (PE Inc.) is an automotive supply company providing internal combustion engines. PE Inc. finds that it has gradually become less competitive over the years largely due to their outdated technology and largely manual processes. Foreign and domestic competitors have started to cut into their business and the stakeholders are concerned that the company's loss of market share will accelerate and that they will eventually become insolvent. To combat this, the shareholders have proposed an investigation into strategies and technologies such as Augmented reality, Robotic assembly systems, 5G, AI, Additive manufacturing, outsourcing of select manufacturing and IT systems, Battery technology, Data analytics, Hybrid/electric engines, etc. These technologies will be rolled out over a 3-phase technology deployment plan.

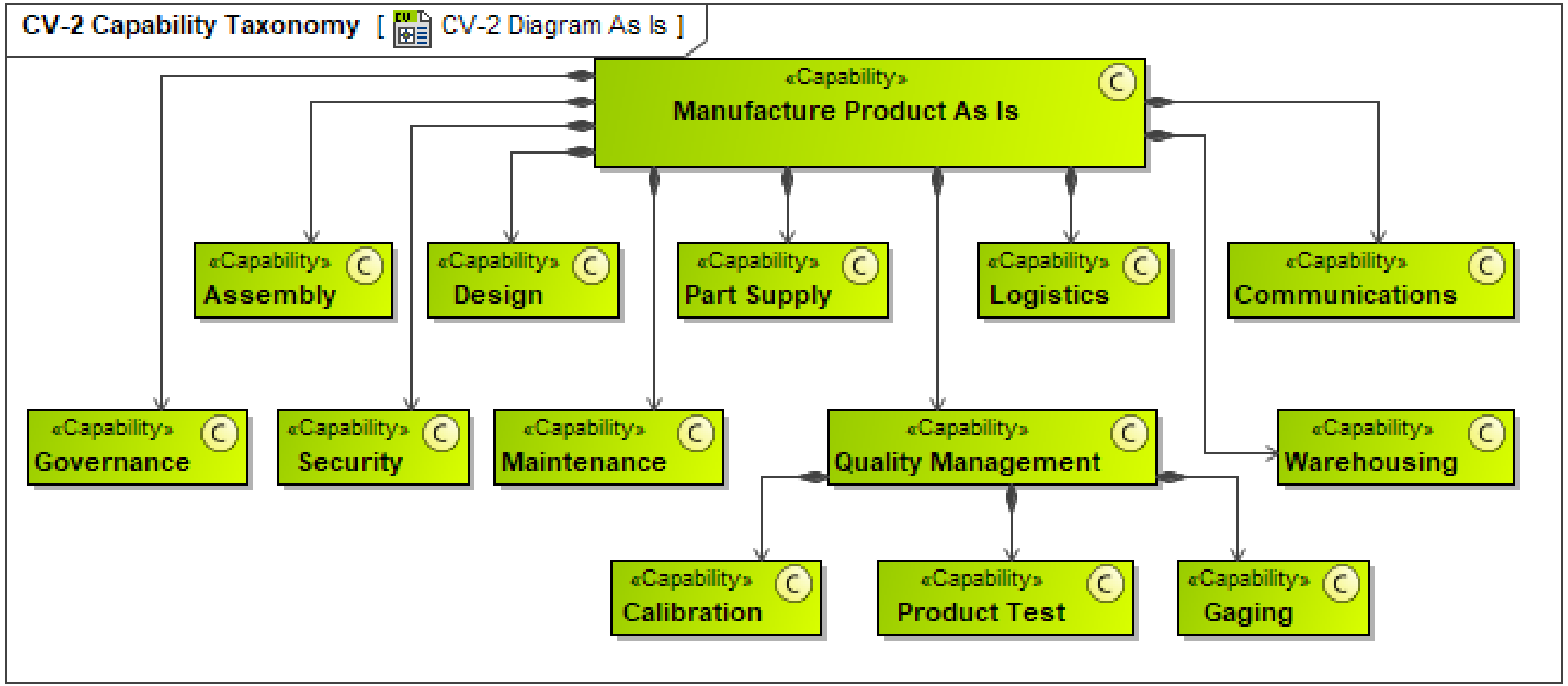
High Level Manufacturing Concept for Powerhouse Engines

- Solution independent concepts in the architecture
- The part supplier could be an external company, an internal casting department, or an in-house 3D printer.
- All supply parts, and each has advantages and disadvantages regarding supply chain delays, cost, flexibility, etc.
- All 3 will be deployed over the 3 phases of technology introduction.



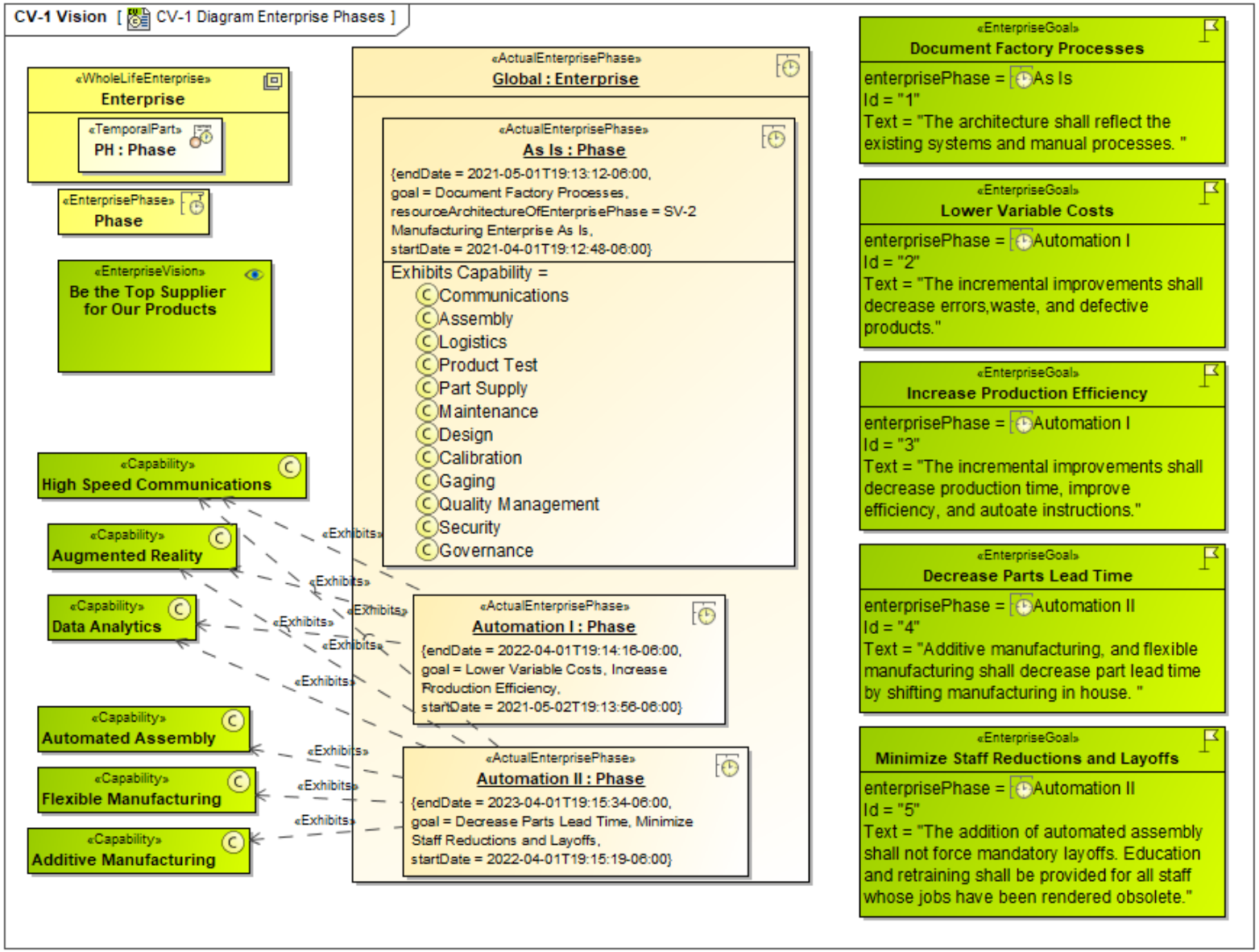
Powerhouse Engines Enterprise Capabilities

- Defines what the enterprise can do, not how it does it.
- Linked to effects that implementing systems accomplish



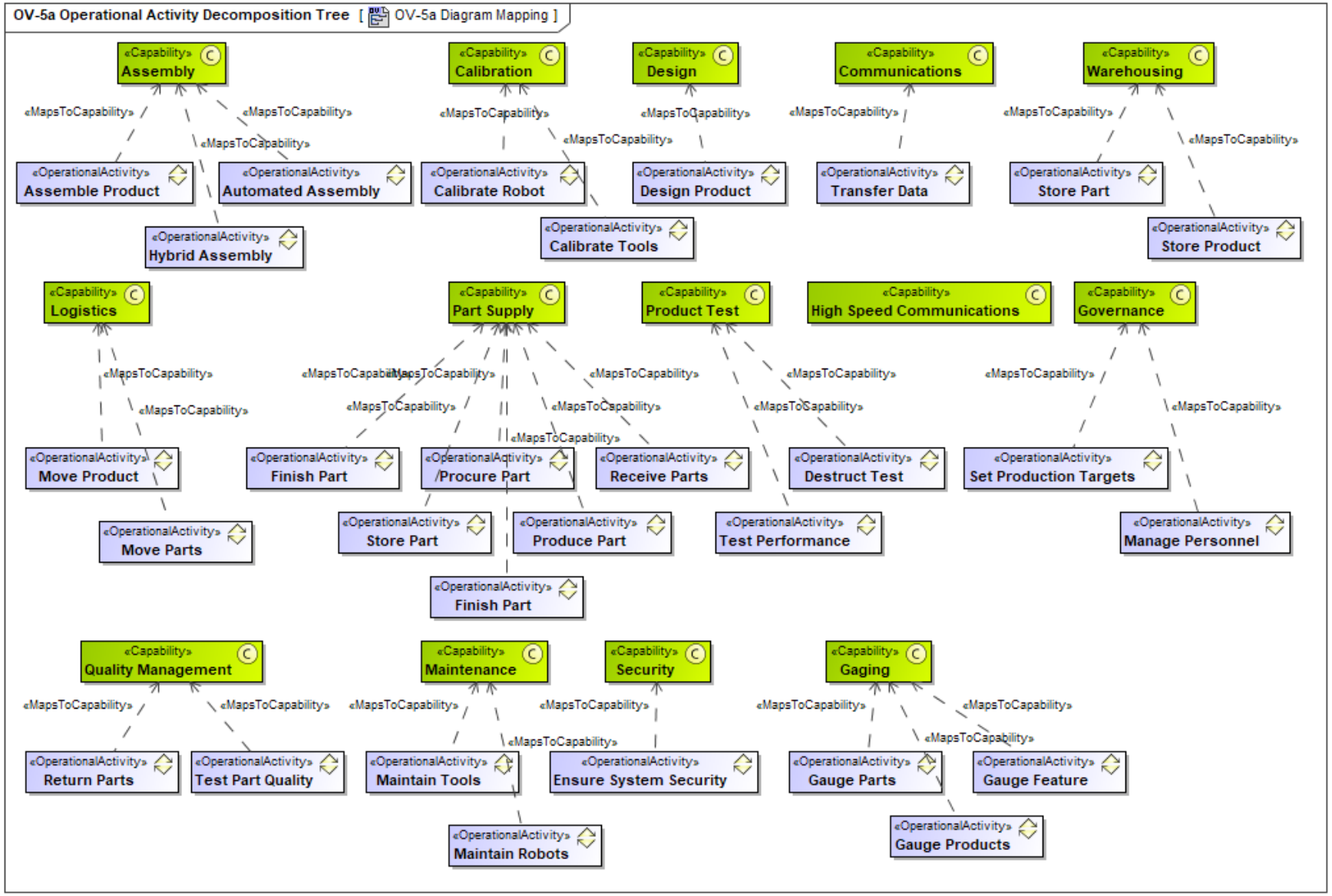
Phased Rollout of Capabilities

- Automation 1 Phase adds
  - High Speed Comms
  - Augmented Reality
  - Data Analytics
- Automation Phase II adds
  - Automated Assembly
  - Additive Manufacturing
  - Flexibly Manufacturing



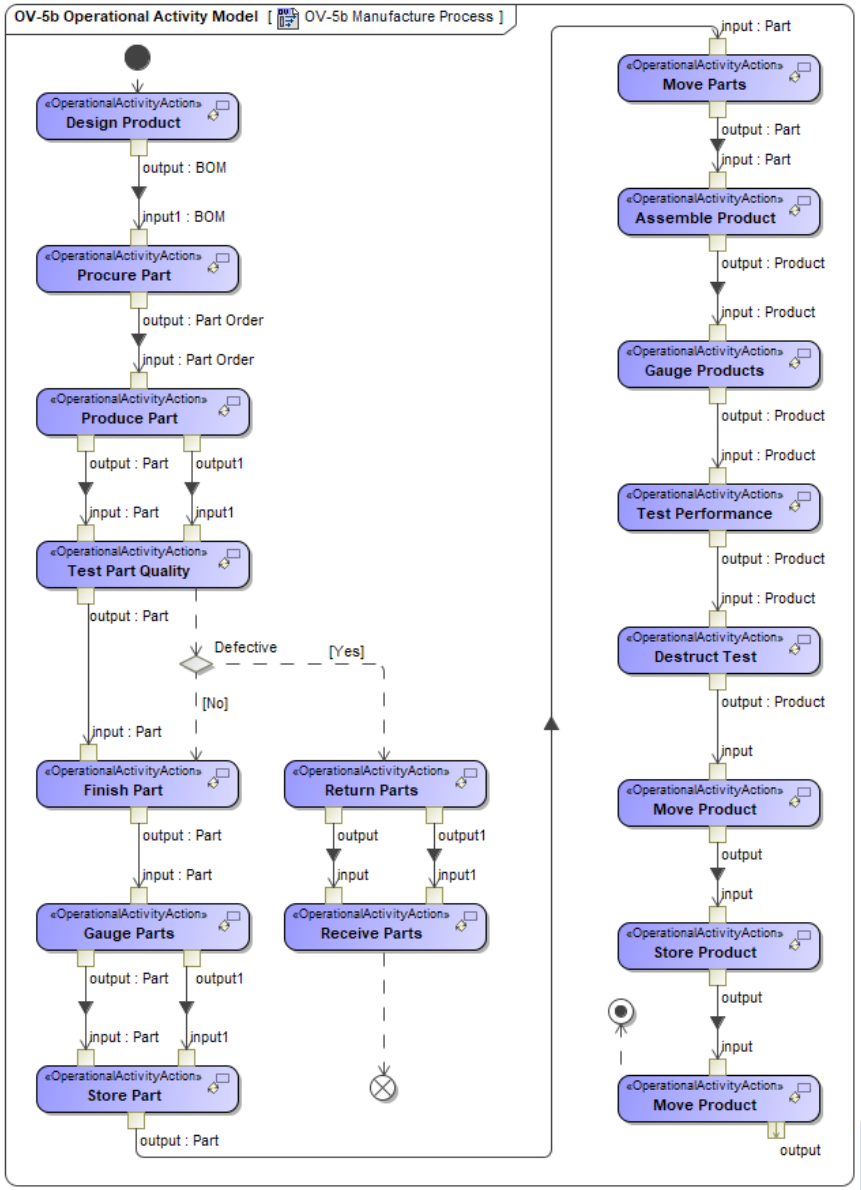
Capability Mapping to Operational Activities

- Operational activities are solution-independent behaviors that realize the capability
- These are further defined in activity diagrams



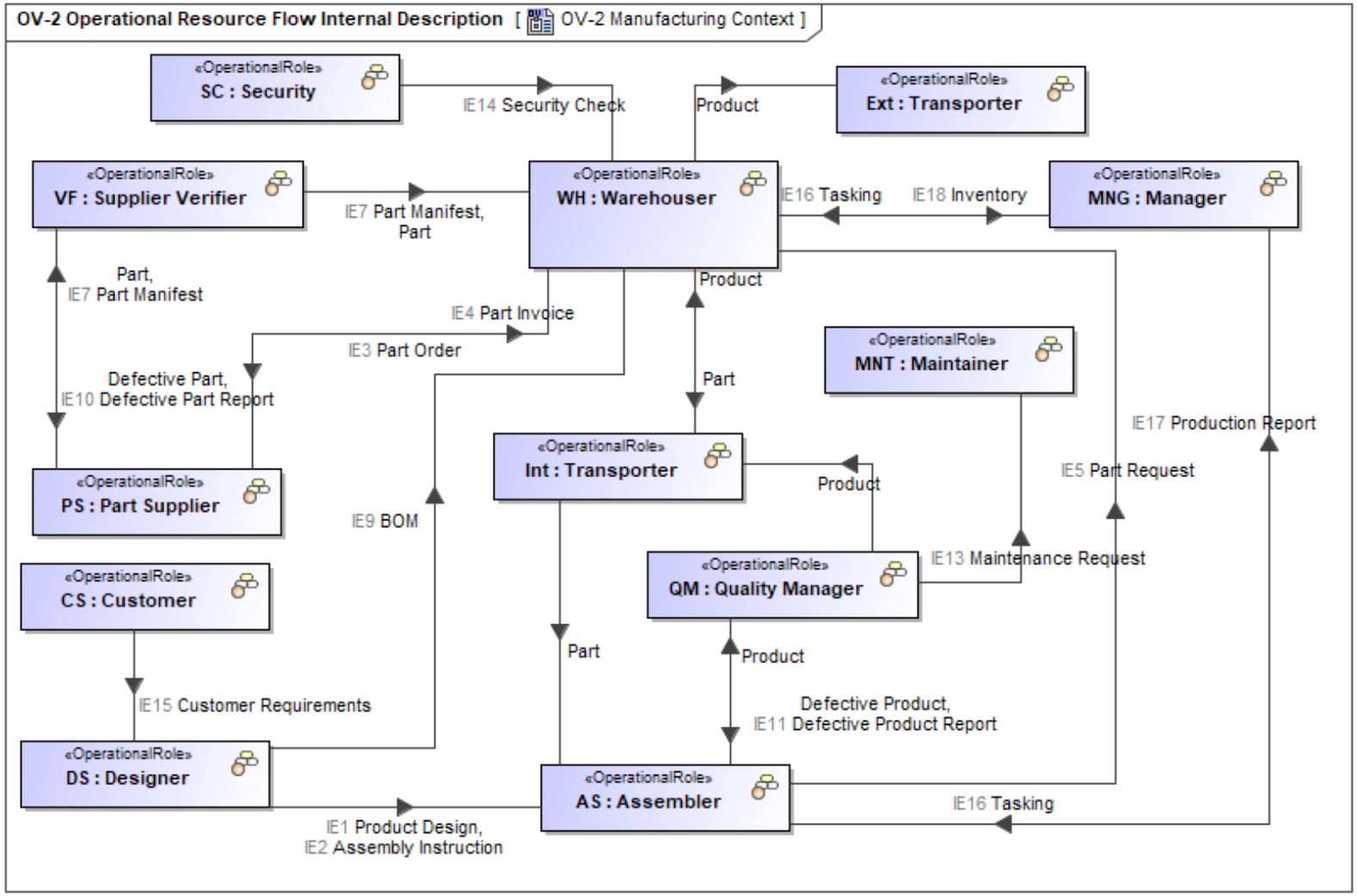
Manufacture Process Operational Activity Diagram

- Operational activities are further decomposed into steps.
- They are then placed in order
- Inputs & outputs for each activity are defined.
- Logical controls, (decision, fork, merger, join) are added.
- Signals and timing can also be defined.
- Swimlanes are added after the performers have been defined

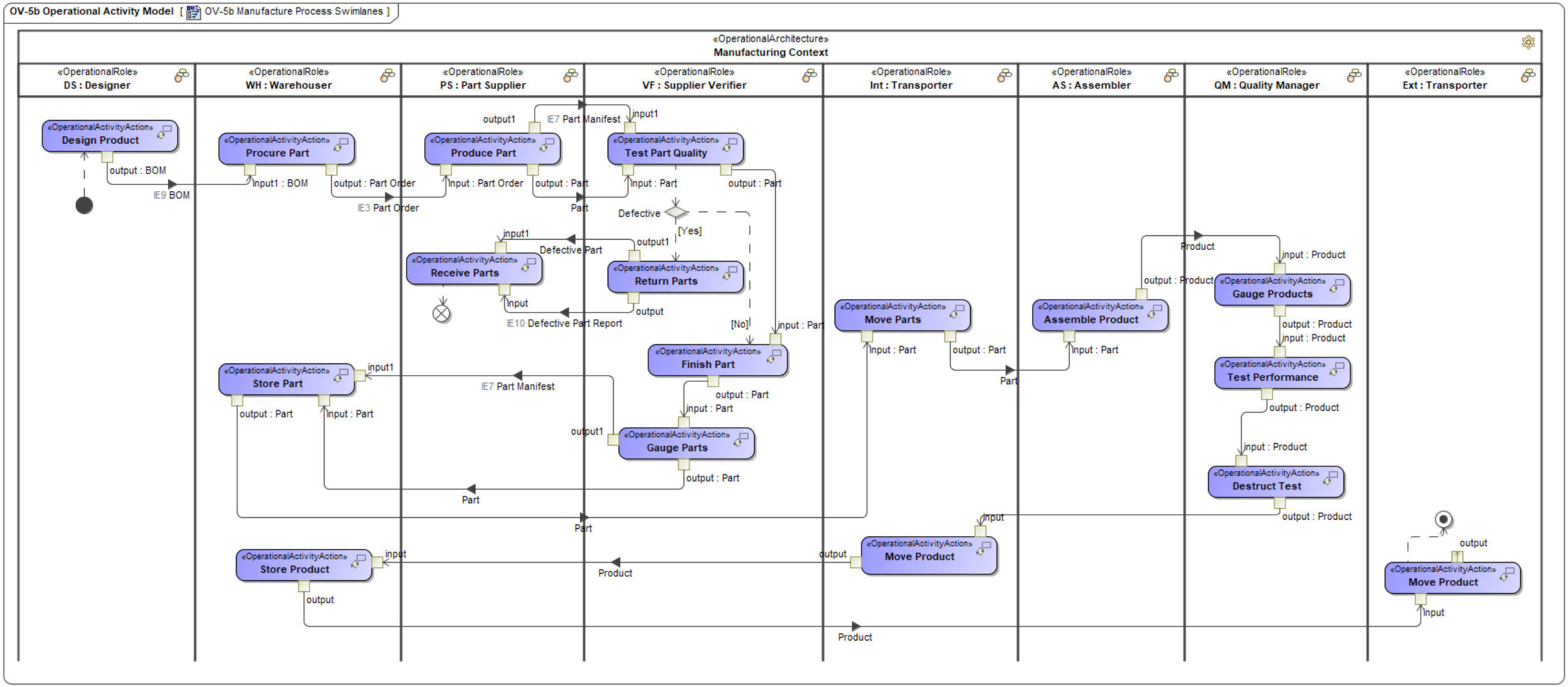


Manufacturing Logical Performers

- Operational activities are grouped together to define operational performers
- Deriving performers from their activities concentrates on behavior before structure
- Helps prevent “Solutioneering”



Manufacture Process with Swimlanes

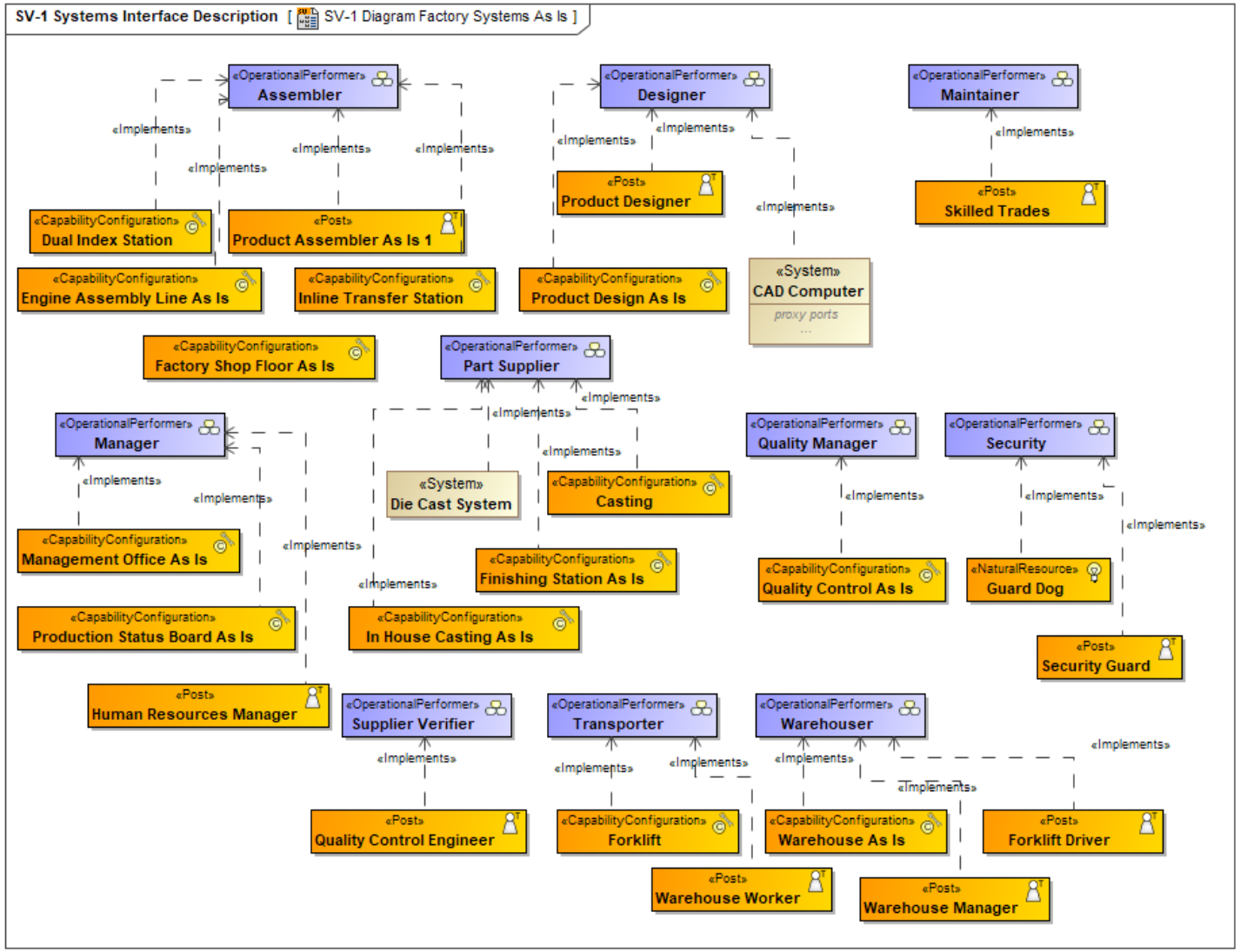


Solution Independent

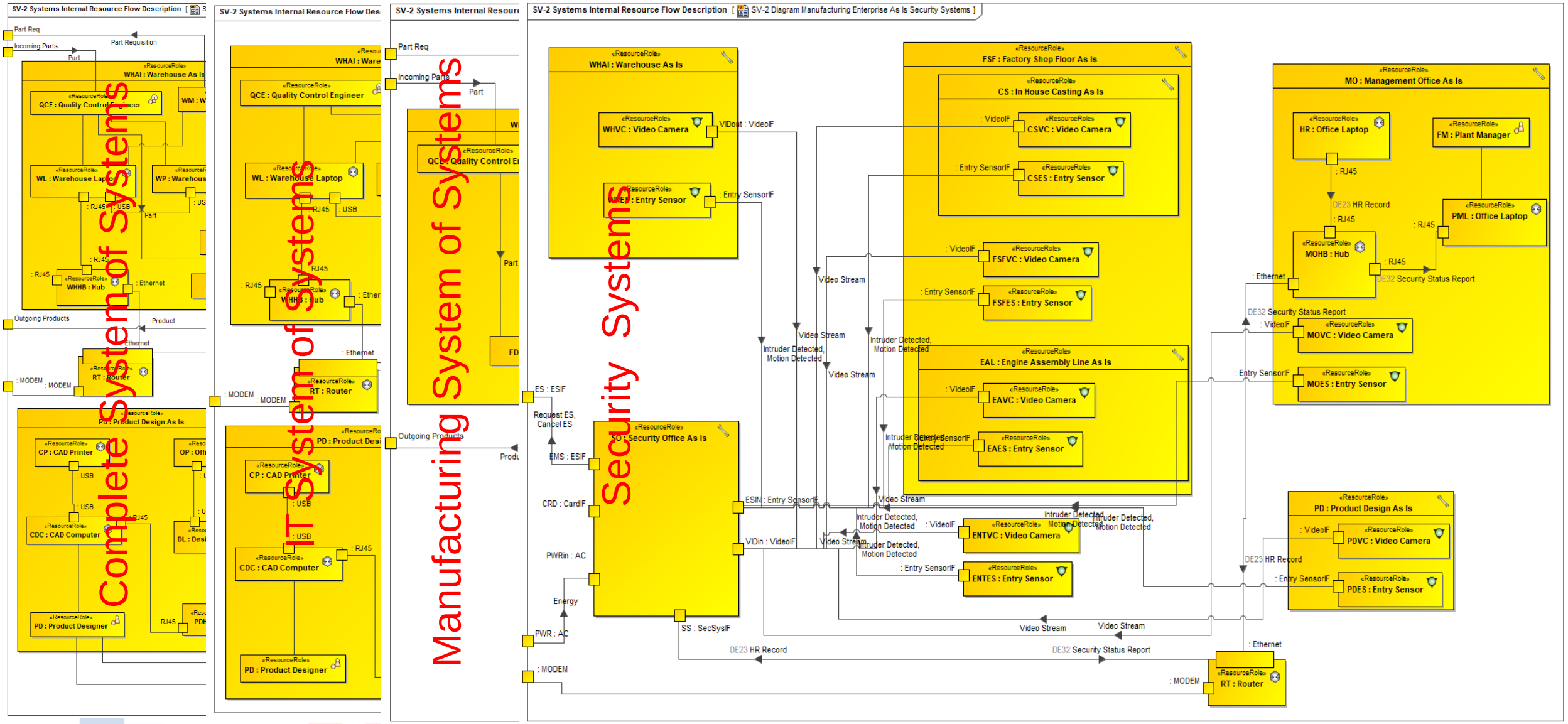
- The exchanges in the previous slides are non-specific.
  - A product is assembled using parts rather than a specific type of engine made of specific parts.
  - Product design and assembly instructions formats are not specified.
  - This provides flexibility for the solution architecture.
  - The logical architecture is valid for all 3 solution phases
- Behaviors are also solution-independent
  - Test part, procure part, assemble part, move part, design product, etc.
  - These are implemented by solution-specific function corresponding to the implementing systems.

Mapping Between Operational & Resource Elements

- "Implements" relationship shows implementing systems and behavior
- Can be added between behavior, structure, data, interactions, etc.
- Demonstrates that the abstract is made concrete
- Mapping tables and diagrams can be generated.

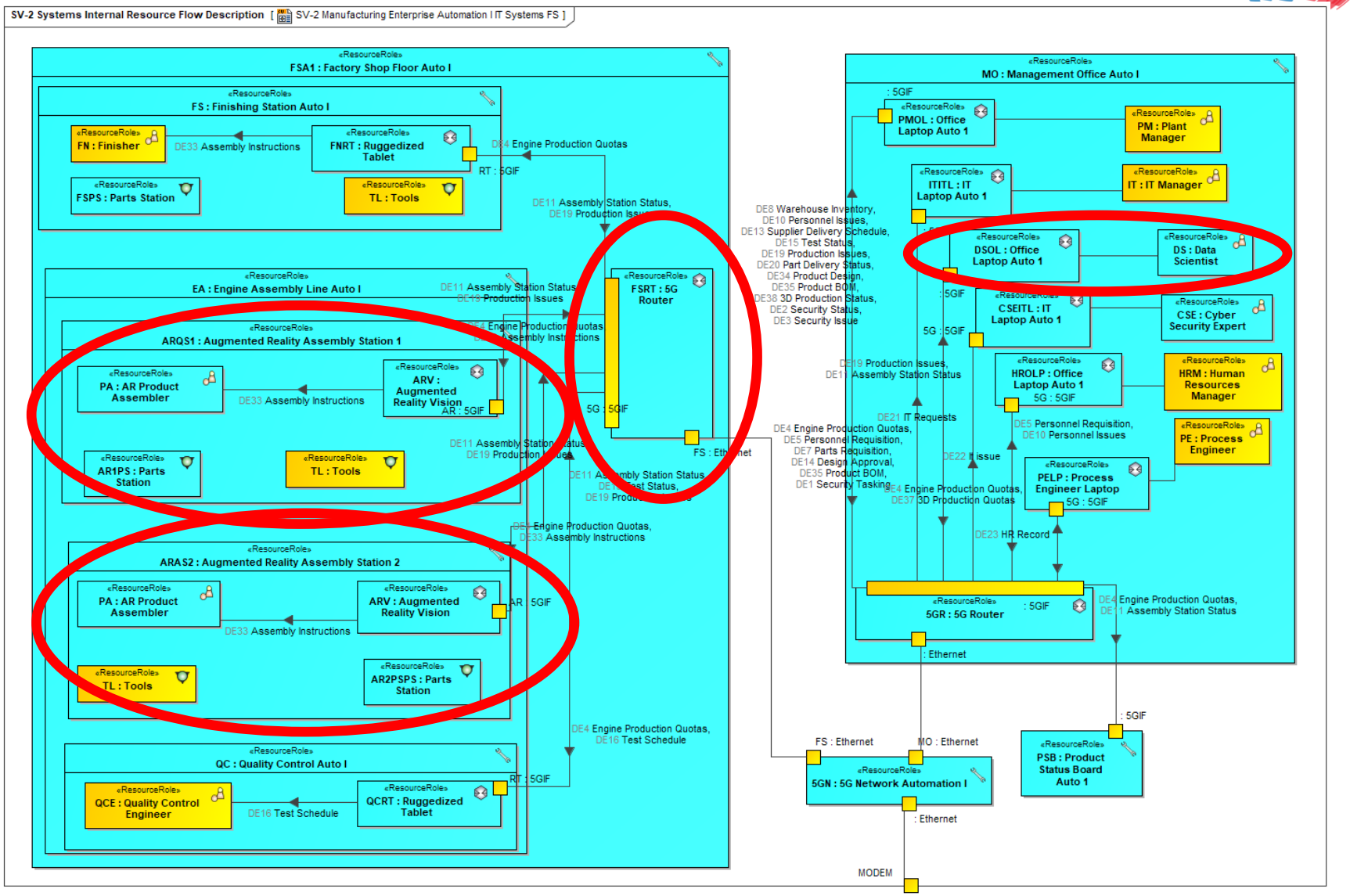


Systems Multiple Viewpoints



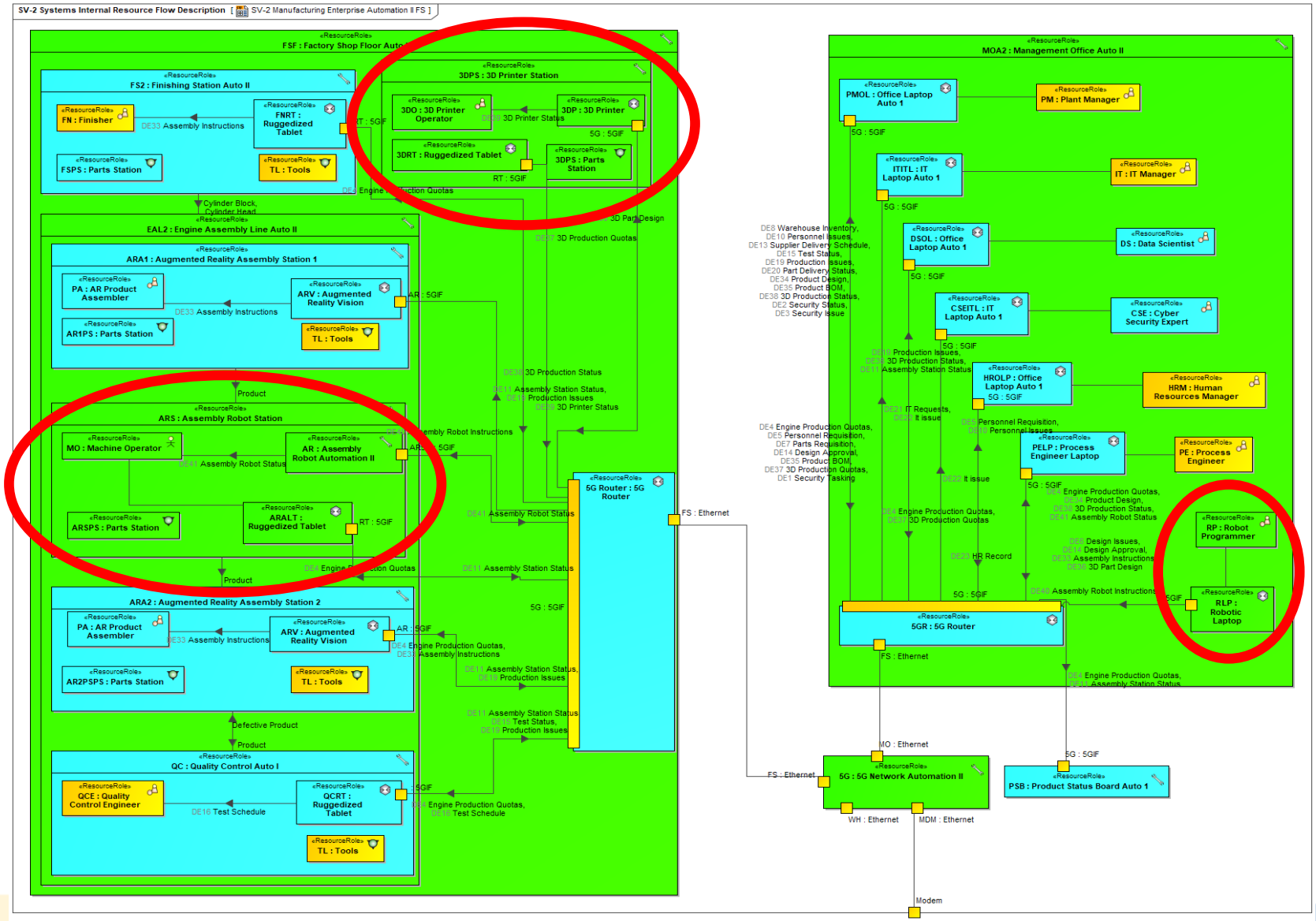
Automation I Phase

- High Speed Comms
- Augmented Reality
- Data Analytics
- Color coded
  - Yellow: As Is
  - Blue: Automation I



Automation II Phase

- Automated Assembly
- Additive Manufacturing
- Flexible Manufacturing
- Color coded
  - Yellow: As Is
  - Blue: Automation I
  - Green: Automation II



Conclusions

- Documenting the as-is systems helps to understand issues.
- Identifies time consuming interactions
- Helps to plan how new technology can help in the manufacturing process.

Securing Your Eggs in Multiple Baskets – Assuring a Resilient and Secure Supply Chain

26th Annual Systems & Mission Engineering Conference

16-19 October 2023

Matthew C. Hause Mitchell Brooks Robert Kennedy

System Strategy, Inc.

Applying UAF for SoS Modelling

OMG UAF Summit | 20-Mar-24 | Dr. C. von Holst

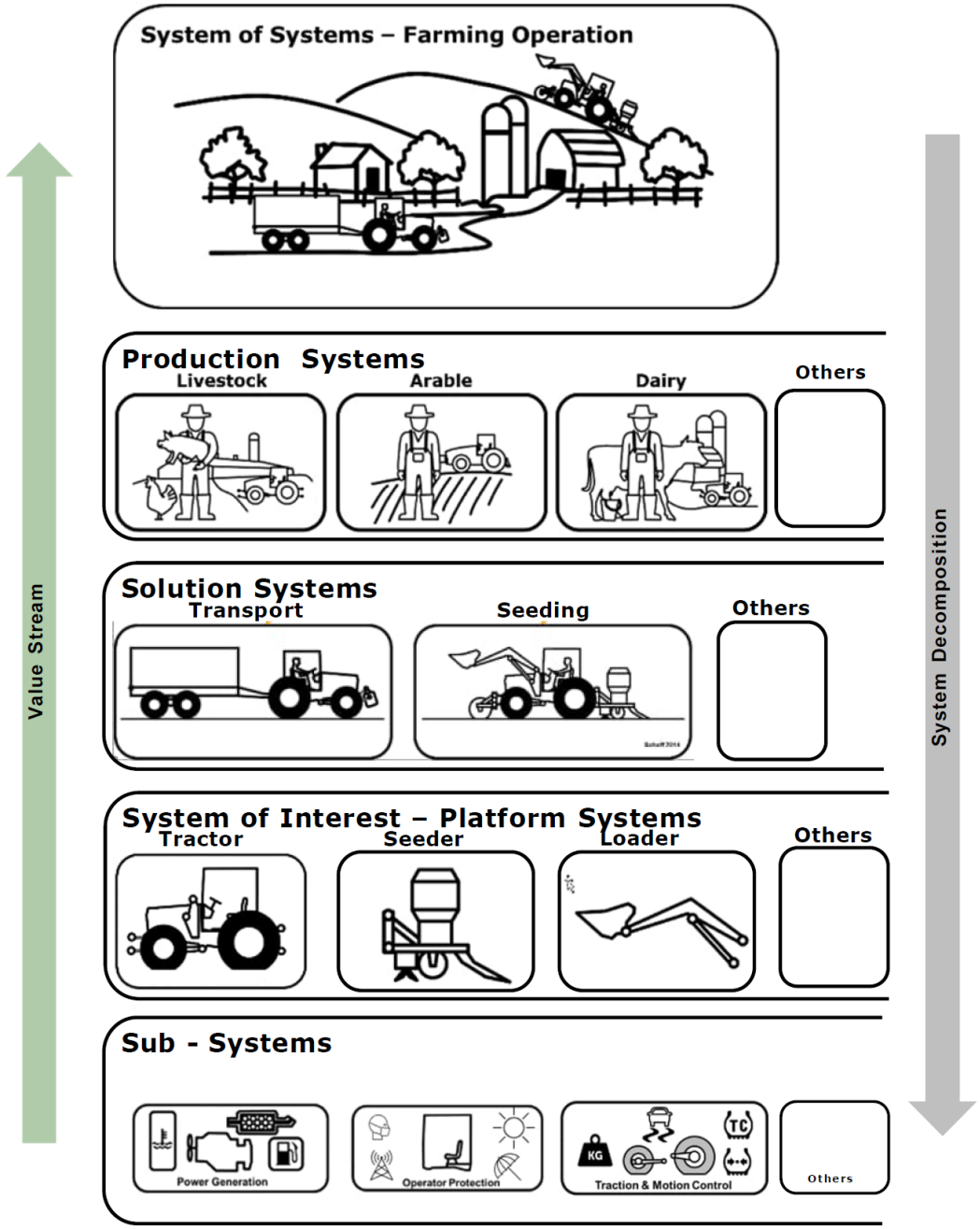
JOHN DEERE

John Deere's System Decomposition

Customer Focus

John Deere's customer operate farms. That's, where their money is made.

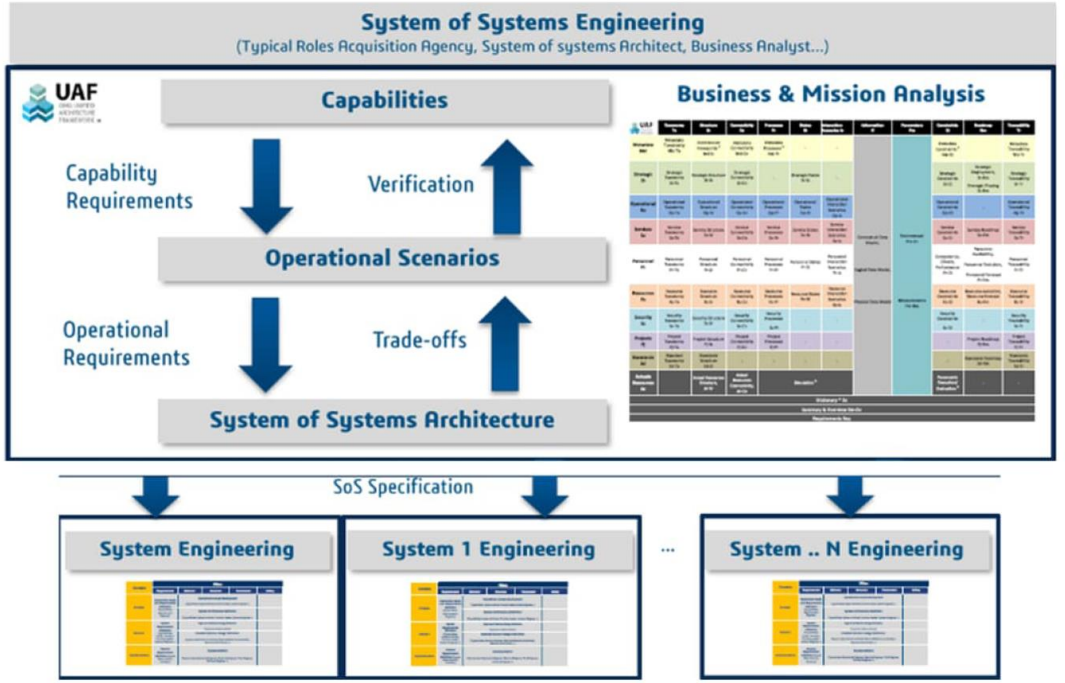
- To serve our customers needs, we have to understand farming operations
- Farm sites are our System-of-Systems (SoS). Here is the value stream to be understood to generate customers business opportunities
- The platform systems are a decomposition of the SoS. They receive its requirements out of the higher-level systems
- Modeling the platform systems (Systems-of-Interest or SoI) benefits from modeling the higher-level systems, up to the SoS.



Unified Architecture Framework Summary

Why Choosing UAF?

- SE Industry standard and managed by OMG
- Commercial Tool Packages available
- **Focused on Systems of Systems** or Enterprise Architecting
- Higher Enterprise Goals
  - Capabilities
  - Operational scenarios
  - Resource configurations
- Provides multiple viewpoints for SoS
- Plugin is pre-populated for diagrams and analysis
- Plugin is SysML based, so compatibility JD system
- Comprehensive documentation, trainings and experts available

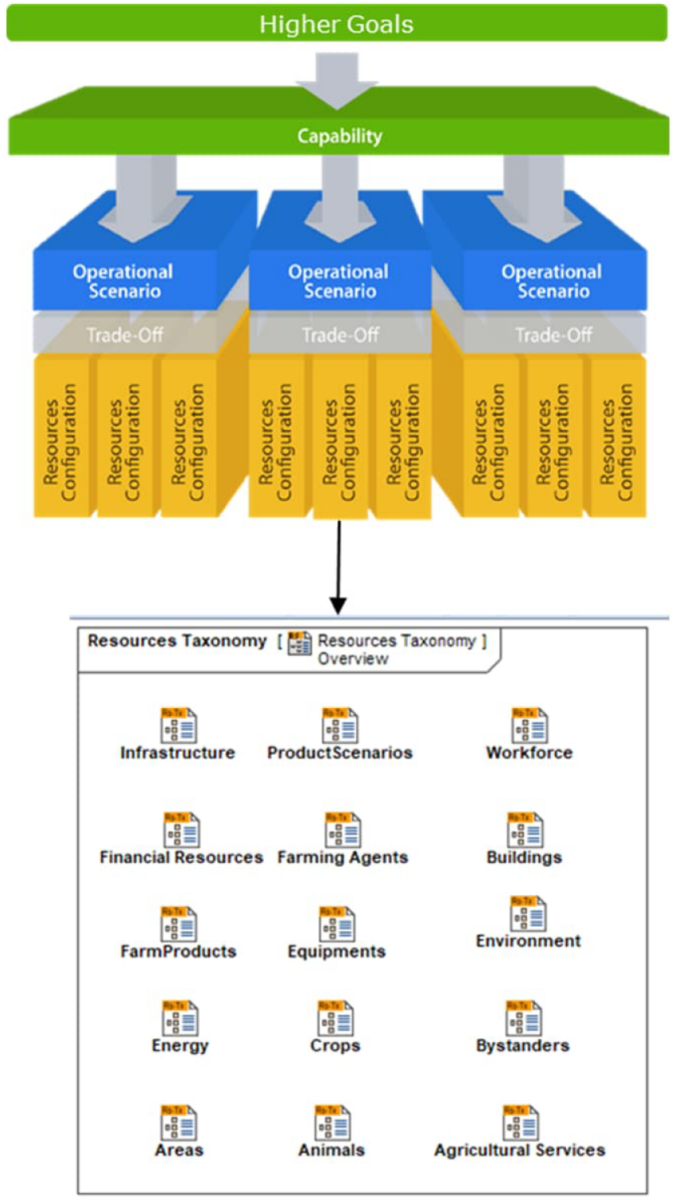


The UAF Model of the D&L Farm

SoS Model

UAF offers all we need for our Farm modelling:

- Farm Goal & Capabilities → e. g. Sustainability Goal(s)
- Operational Activities → e. g. Farm Operations
- Resources → e. g. Land, Labor, etc.
- Farm Products → e. g. Grass Silage
- Operational Scenarios → e. g. Jobs, Production Steps
- Resource configurations → e. g. Solutions
- Measures → e. g. Performance, CO2E, etc.
- Simulation
- Traceability



Social Enterprises
Part of Smart Cities INCOSE Project

Keeping People First in the Smart Cities Enterprise

Smart Cities Initiative

Jennifer Russell EISE, CSEP *Jennifer.Russell@incose.net*

Matthew Hause *mhause@systemxi.com*

Lars-Olof Kihlstrom *lars.olof.kihlstrom@cag.se*

UAF Summit

March 21, 2023

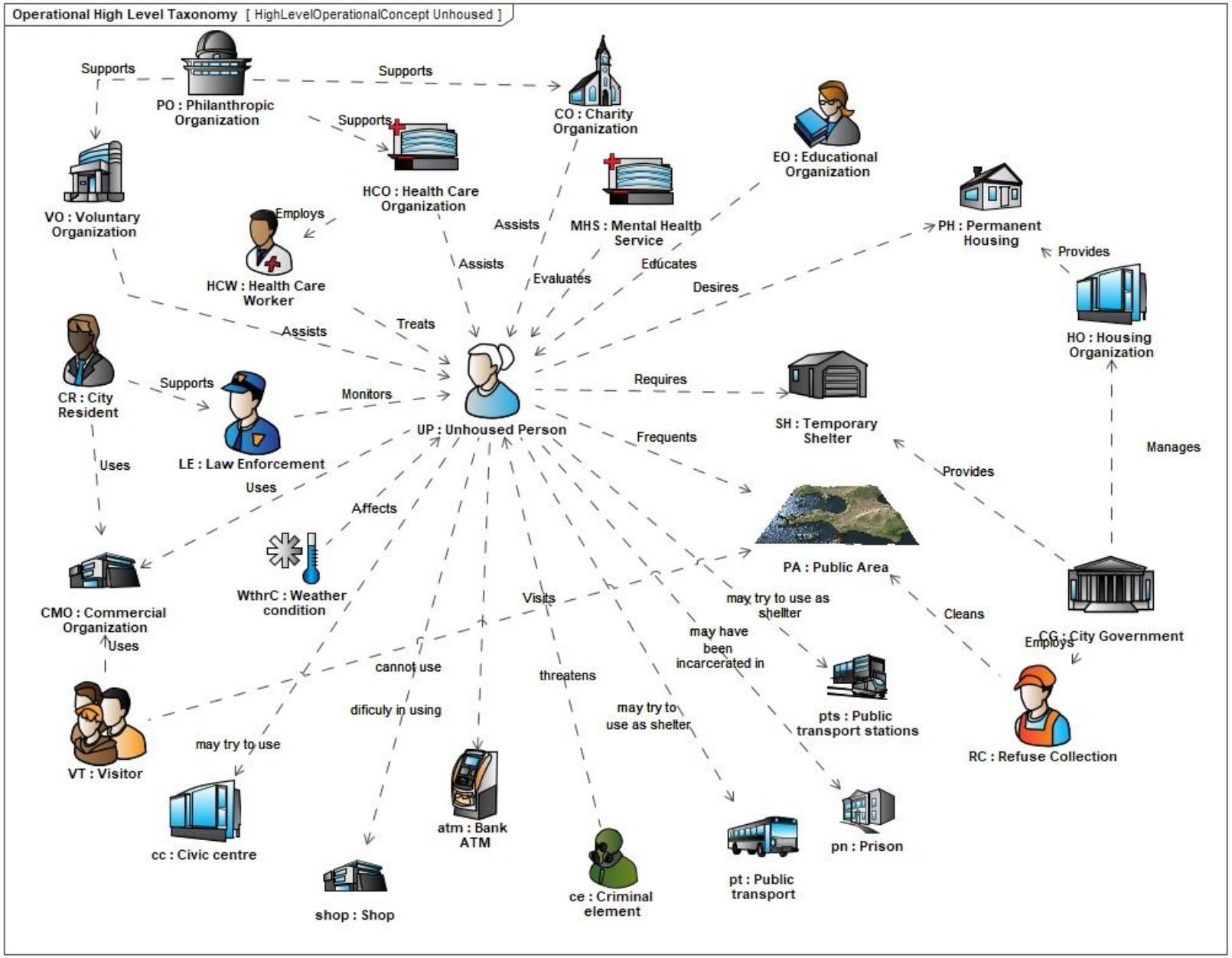
Washington, D.C.

Autoville Unhoused Persons Project

- Autoville has been experiencing an increasing number of unhoused people. They reside in city parks, under bridges, in makeshift encampments, and on the city streets. This has caused increased crime, increased police interactions, overloaded courts, resident complaints, and decreased tourism. Sadly, an increasing number of unhoused people have been dying from violence, overdose, alcohol poisoning, and exposure. The city administration has decided to study the situation and provide services to improve the situation. These include housing, treatment, counseling, and education rather than increased law enforcement or ignoring the problem.

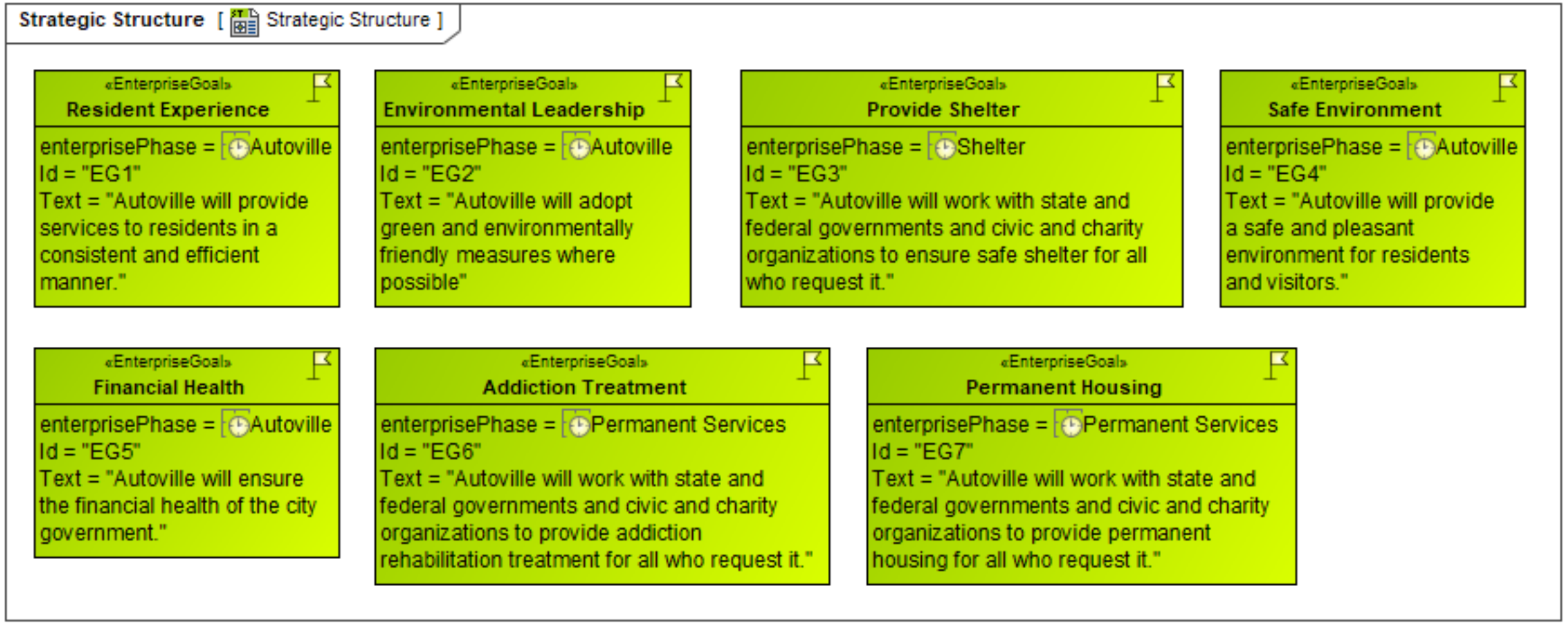
Autoville Unhoused Person Concept Diagram

- Unhoused people have interactions with multiple organizations and systems in Autoville.
- This helps to understand the positive and negative effects that unhoused people have on city elements, and vice versa.
- Understanding this will help to frame solutions.



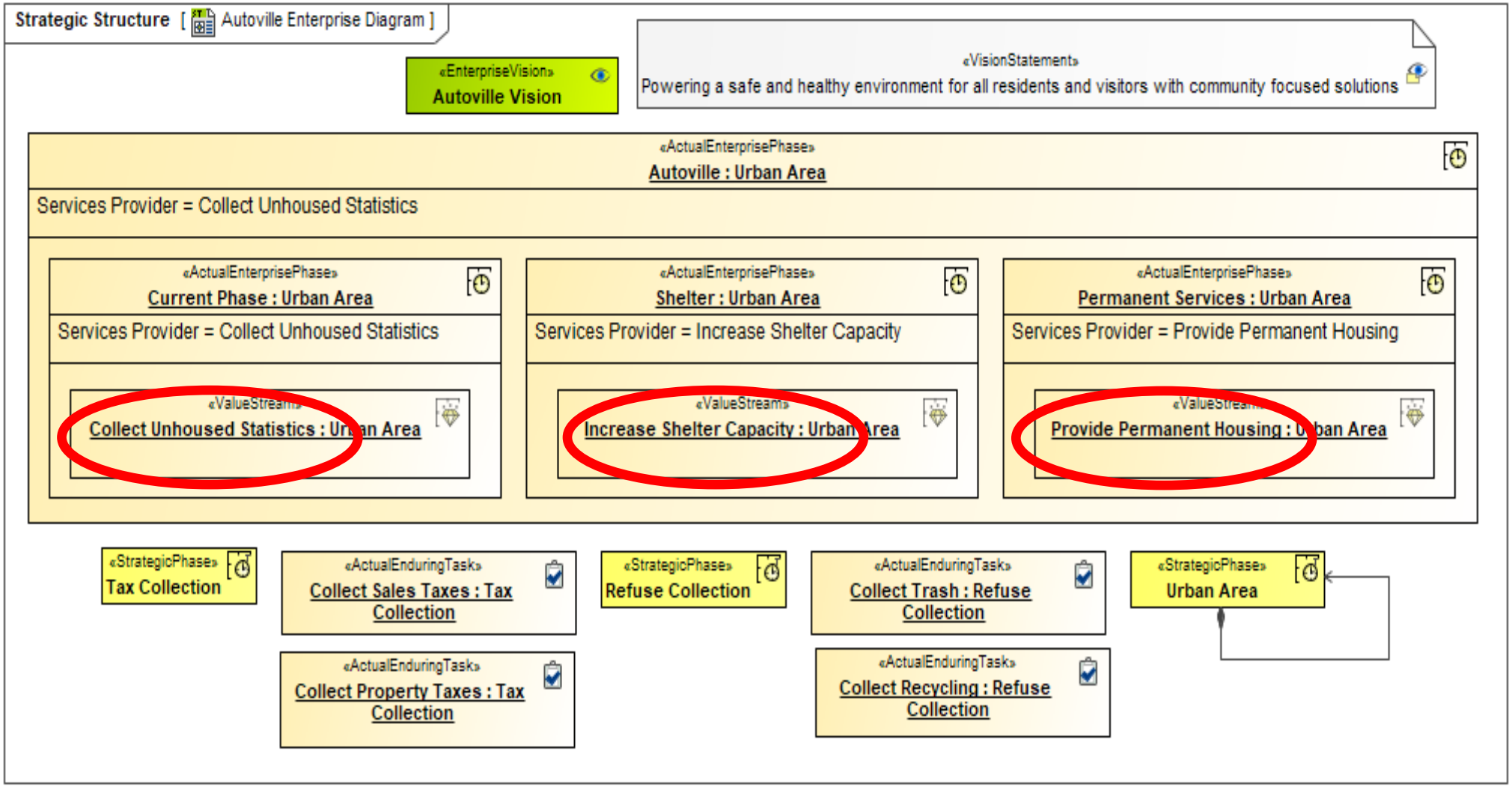
Initial Project Goals

- Setting goals defines what Autoville wants to achieve
- These can be phased over time.

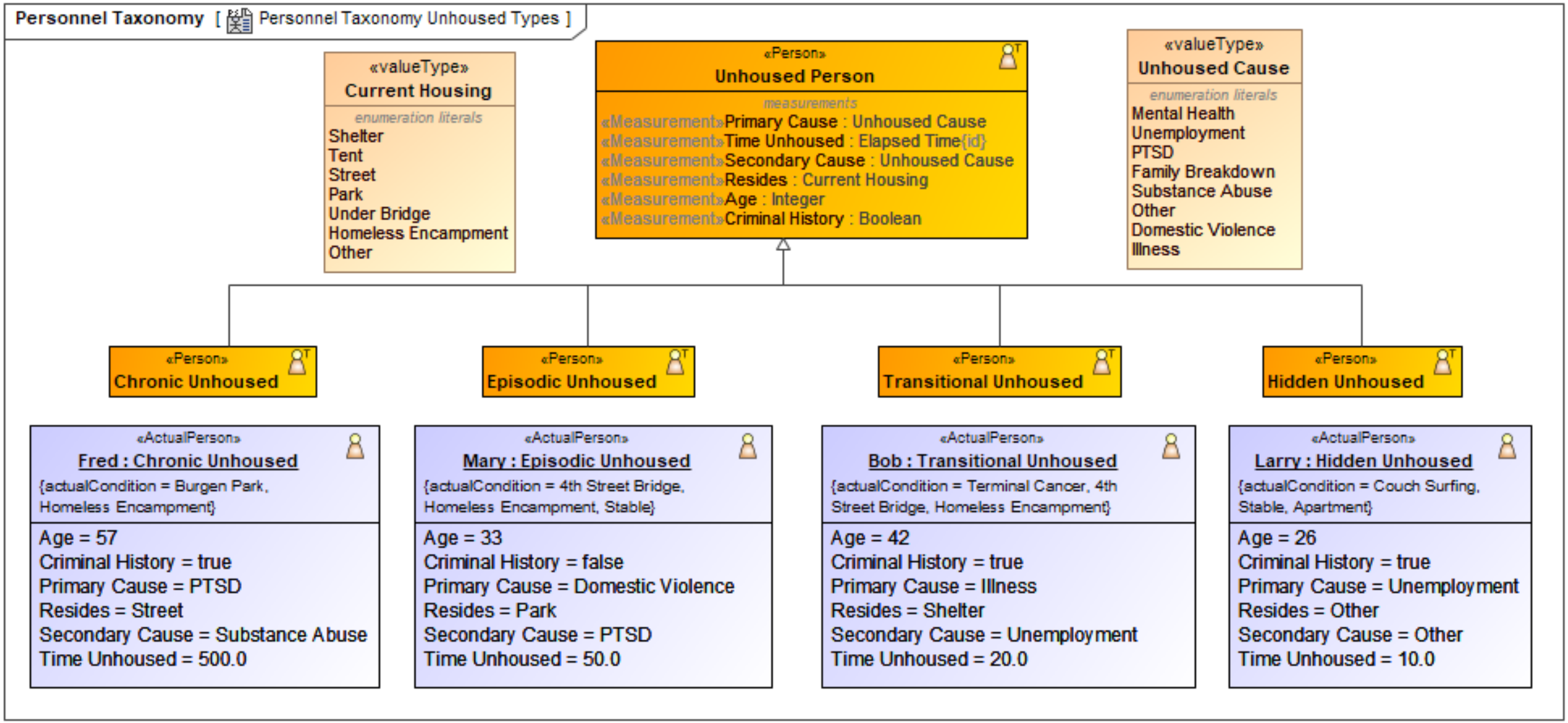


Autoville Three Phase Project

- Collect Statistics and study the problem
- Increase shelter capacity
- Provide addiction treatment
- Provide permanent housing.
- Increase employment training

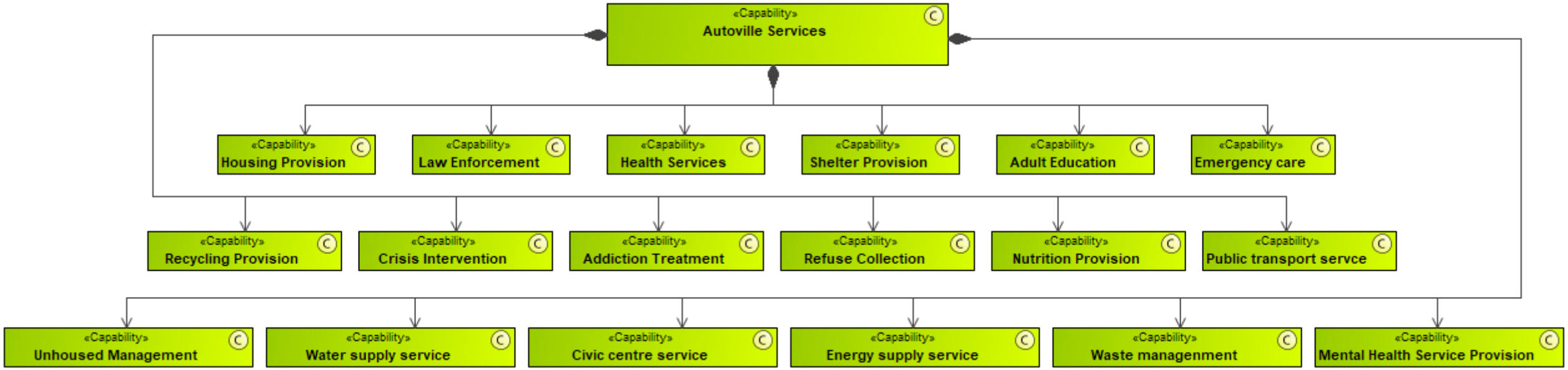


Types of Homeless People and Their attributes

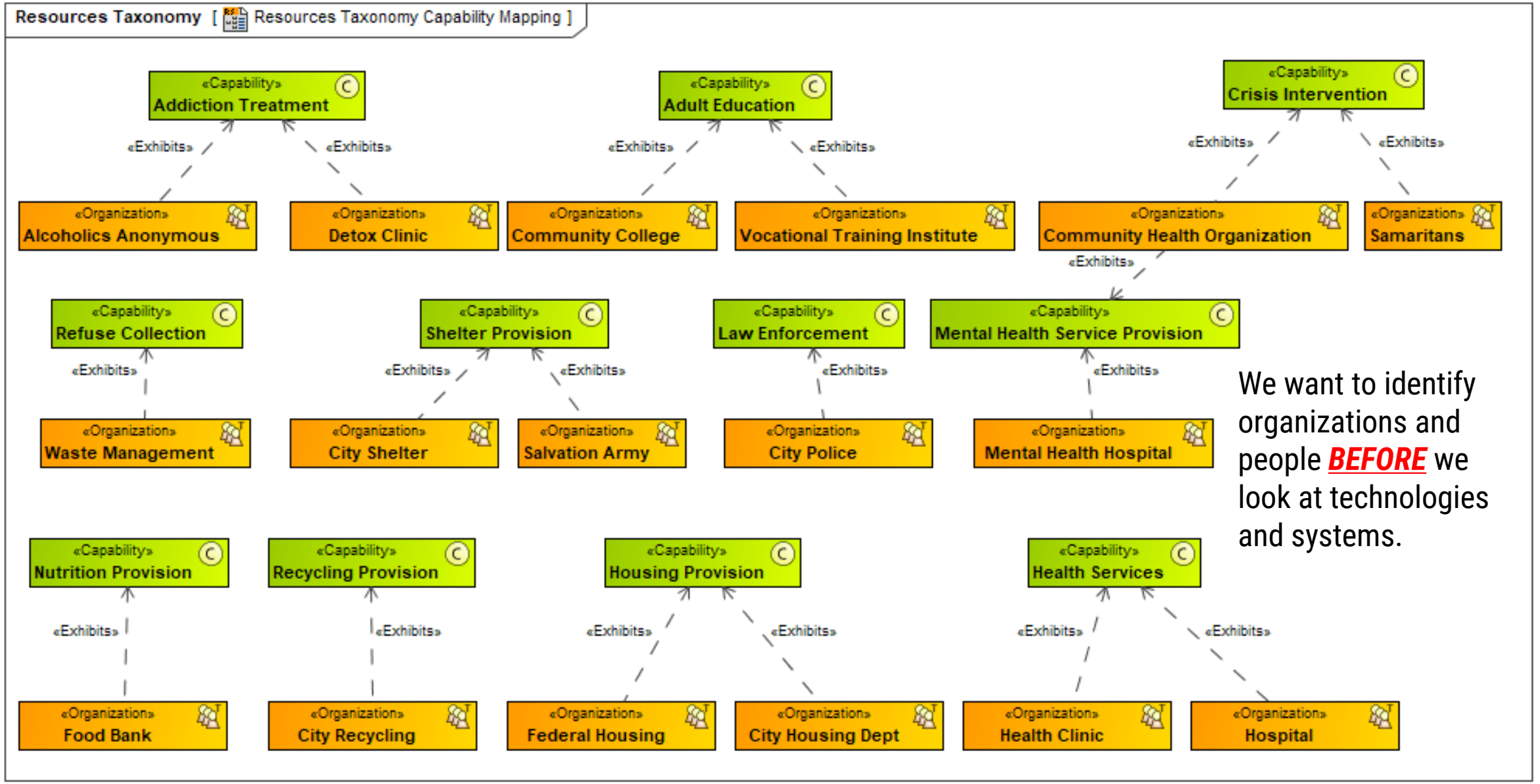


Autoville Capabilities

- Existing Autoville Capabilities are identified
- These are provided by the government, volunteer organizations and industry



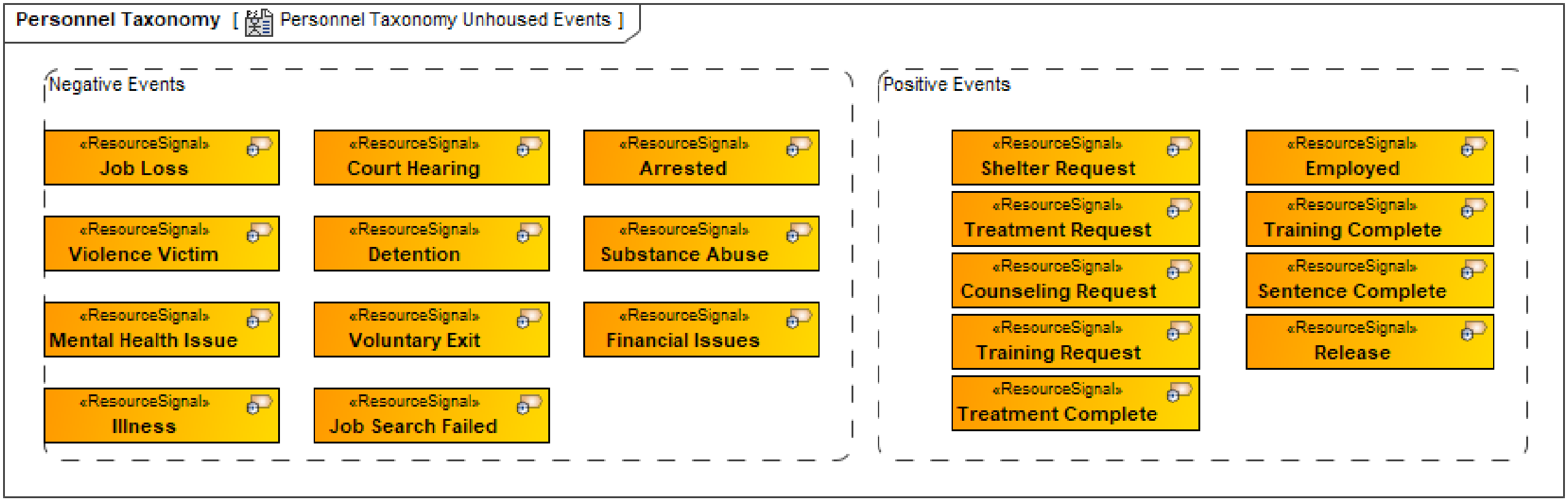
Organizations Providing These Capabilities



We want to identify organizations and people ***BEFORE*** we look at technologies and systems.

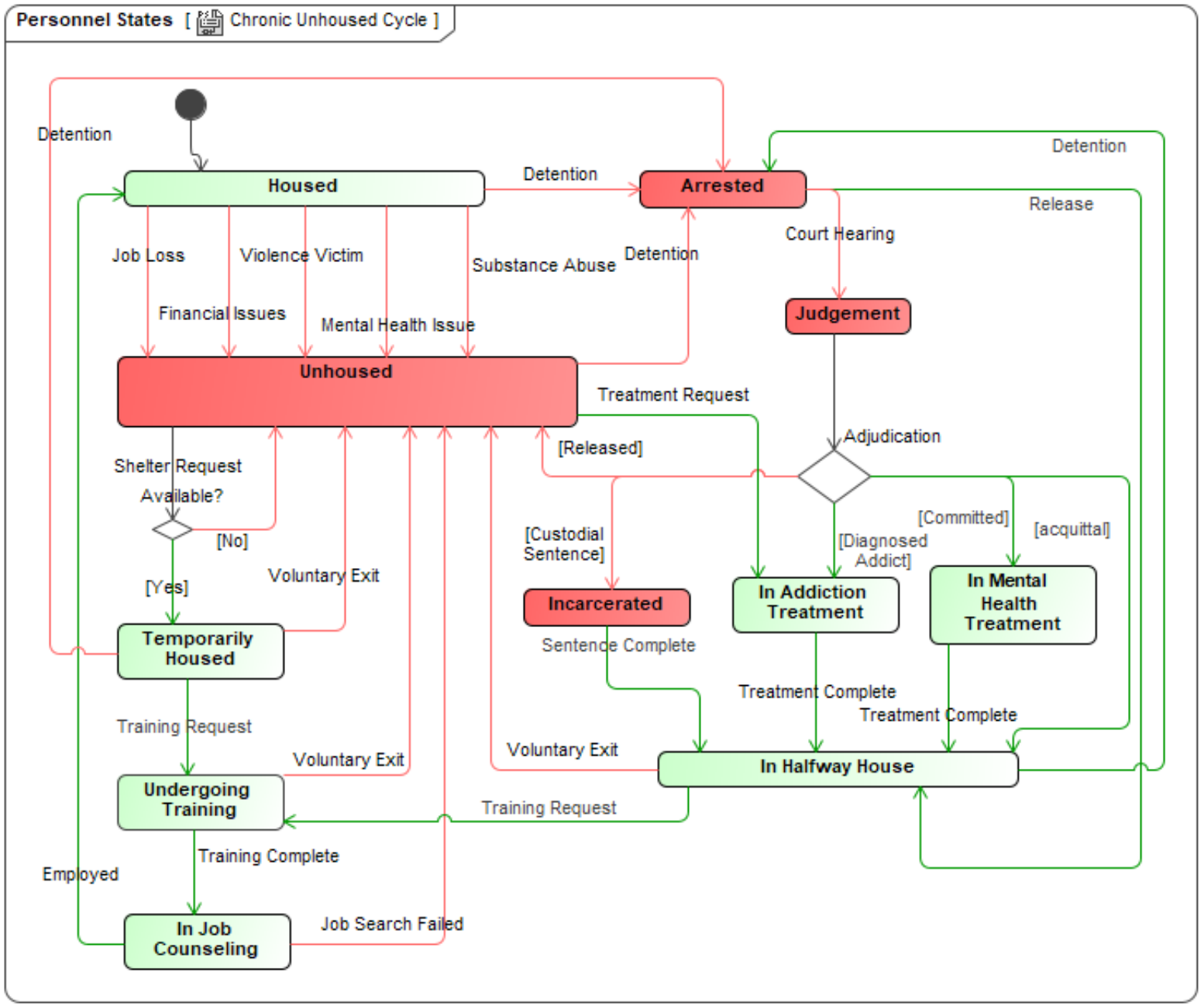
Events in an Unhoused Person's Life

- Positive and negative events occur in the life of an unhoused person.
- These can either escalate the problem, or work towards a solution.
- Understanding this interaction is essential.



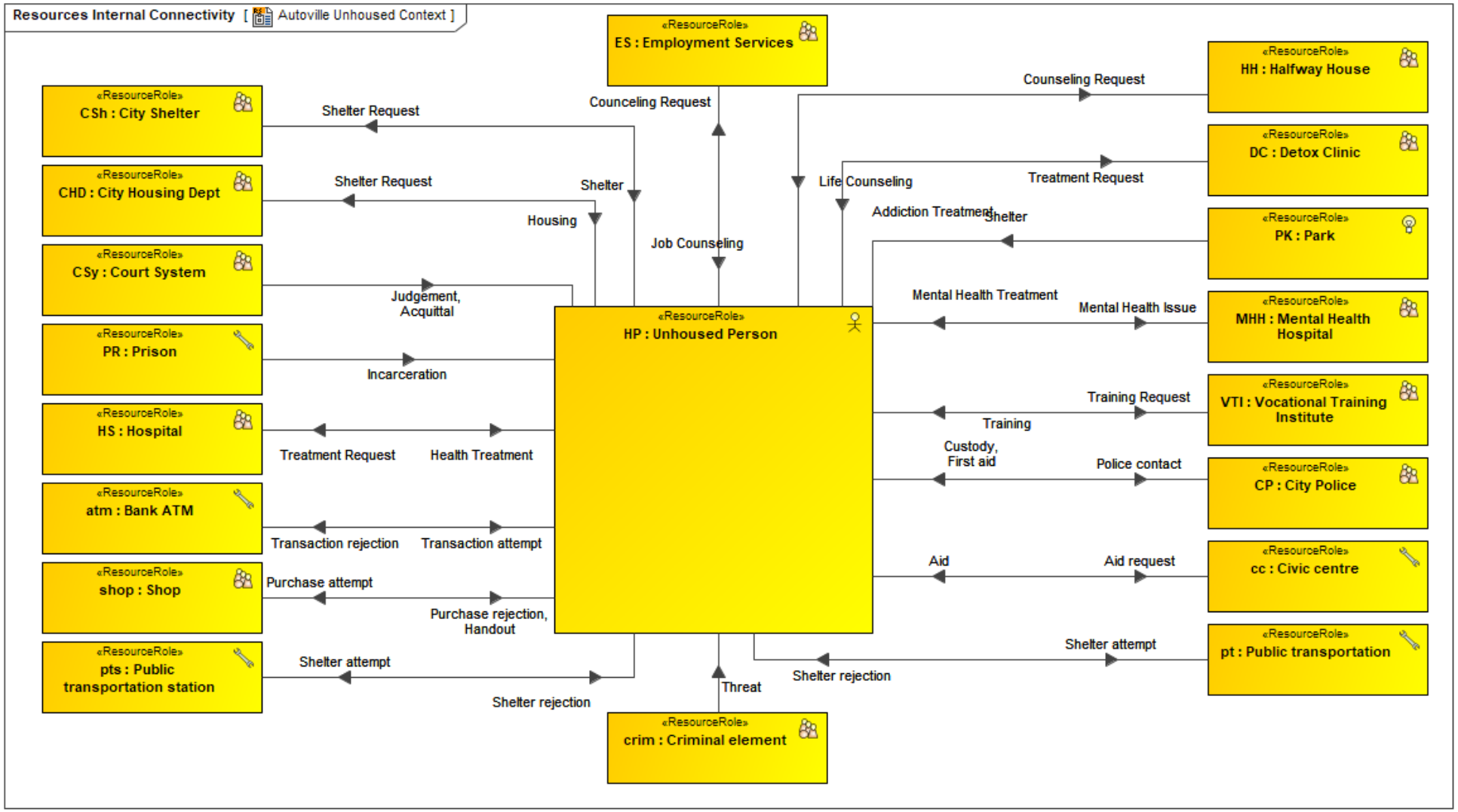
Chronic Unhoused Cycle

- The previous events have been studied to determine the unhoused vicious and virtuous cycles.
- By documenting these cycles, experts can determine where to intervene to improve things
- This can move the person from the vicious to virtuous cycle



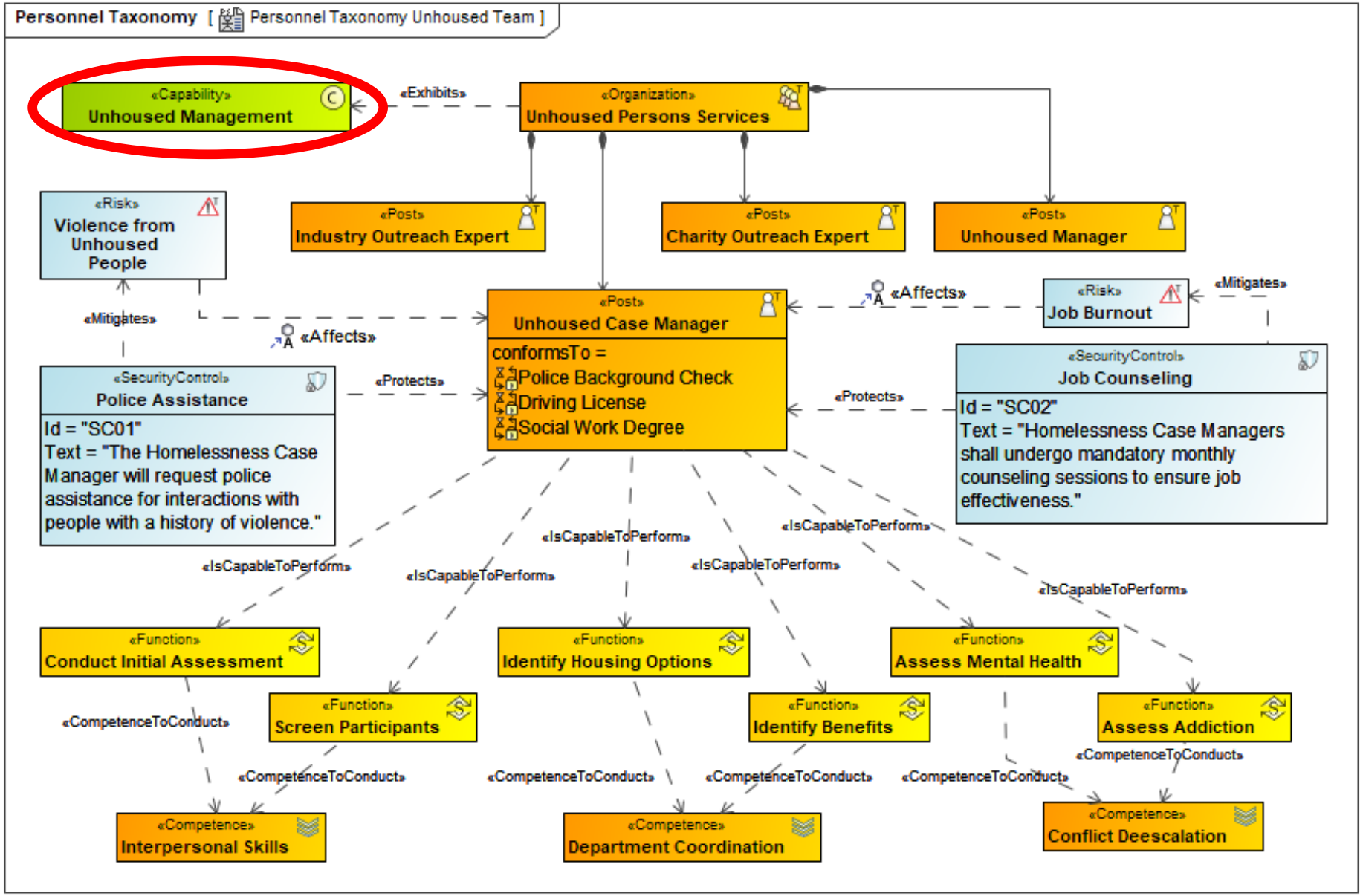
An Unhoused Person's Interactions With Autoville Organizations

- A more concrete model has been created for the unhoused person interactions.
- The diagram shows a subset.
- This would be overwhelming for anyone.
- A dedicated capability needs to be created to address unhoused residents.



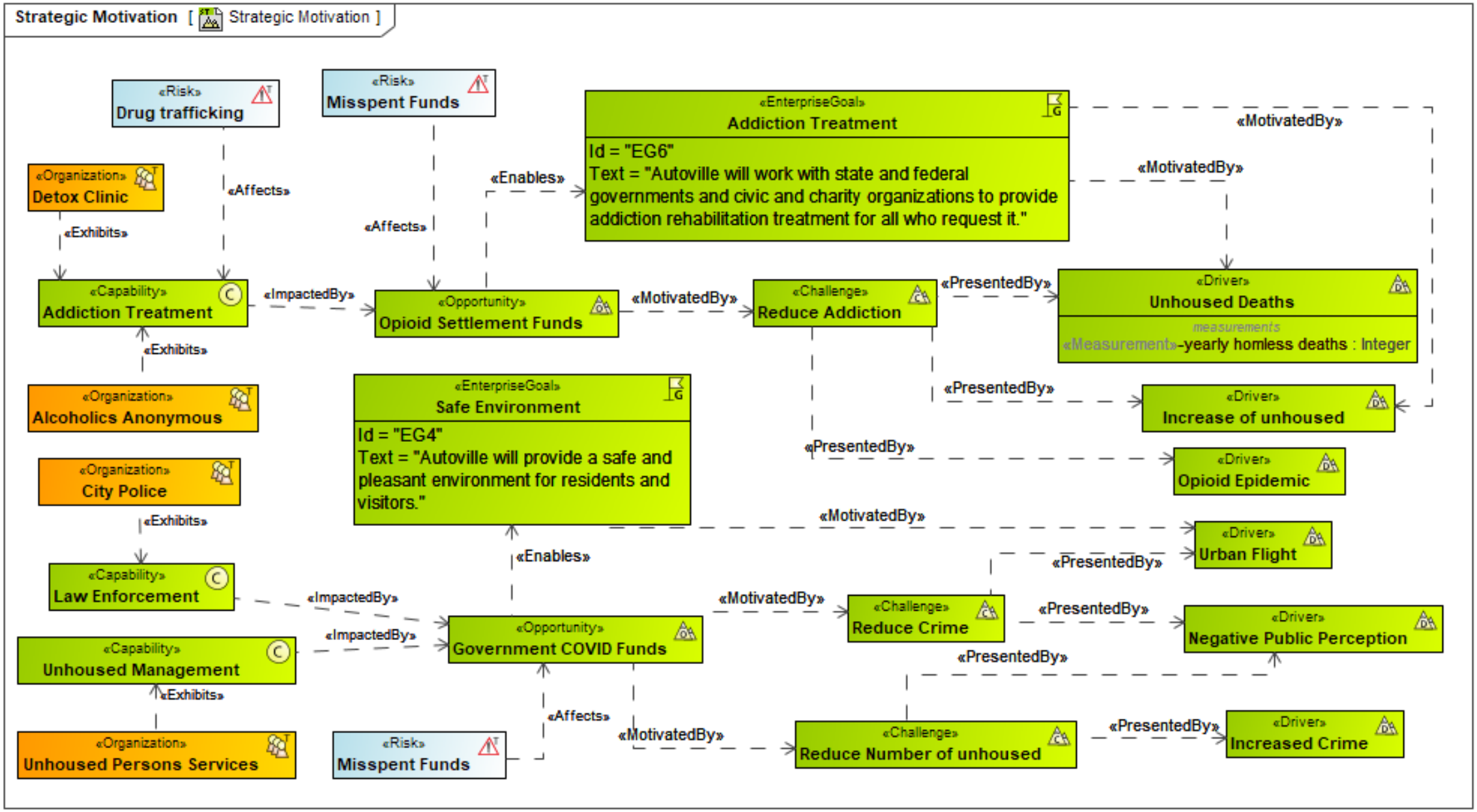
Unhoused Persons Services Organization

- Currently, unhoused residents are everyone's and no one's problem.
- A specialized team will be created to serve unhoused residents.
- They will work with government departments, industry, medical facilities, and addiction services to find solutions
- Risks and mitigations have been identified and proposed.



Smart Cities Initiative

Strategy to Help Unhoused People and Improve Autoville



San Diego

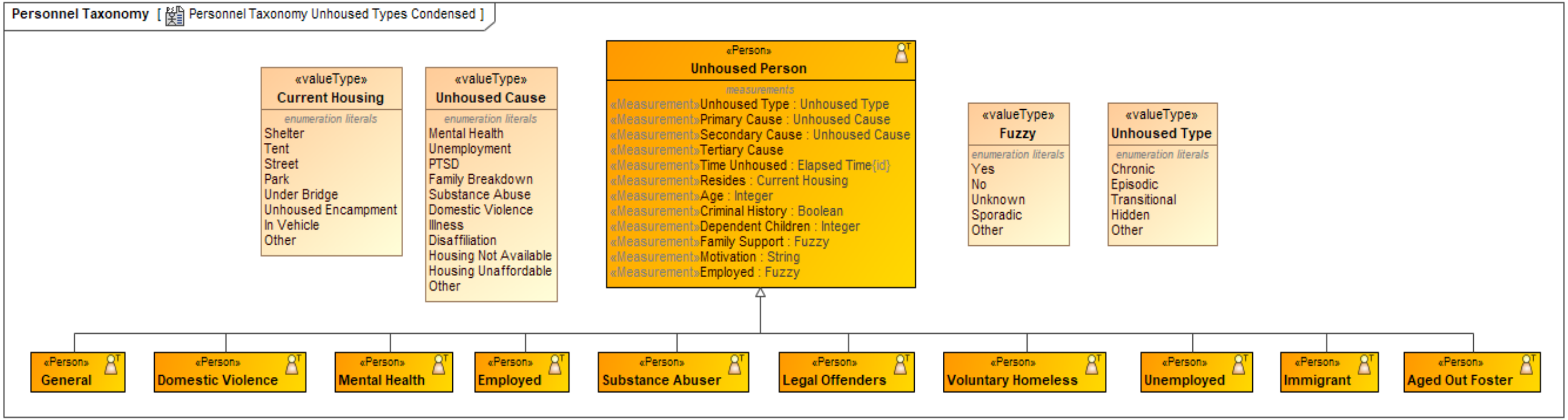
San Diego - Spreadsheet

Clipboard | Font | Alignment | Number | Styles | Cells | Editing | Sensitivity | Add-ins

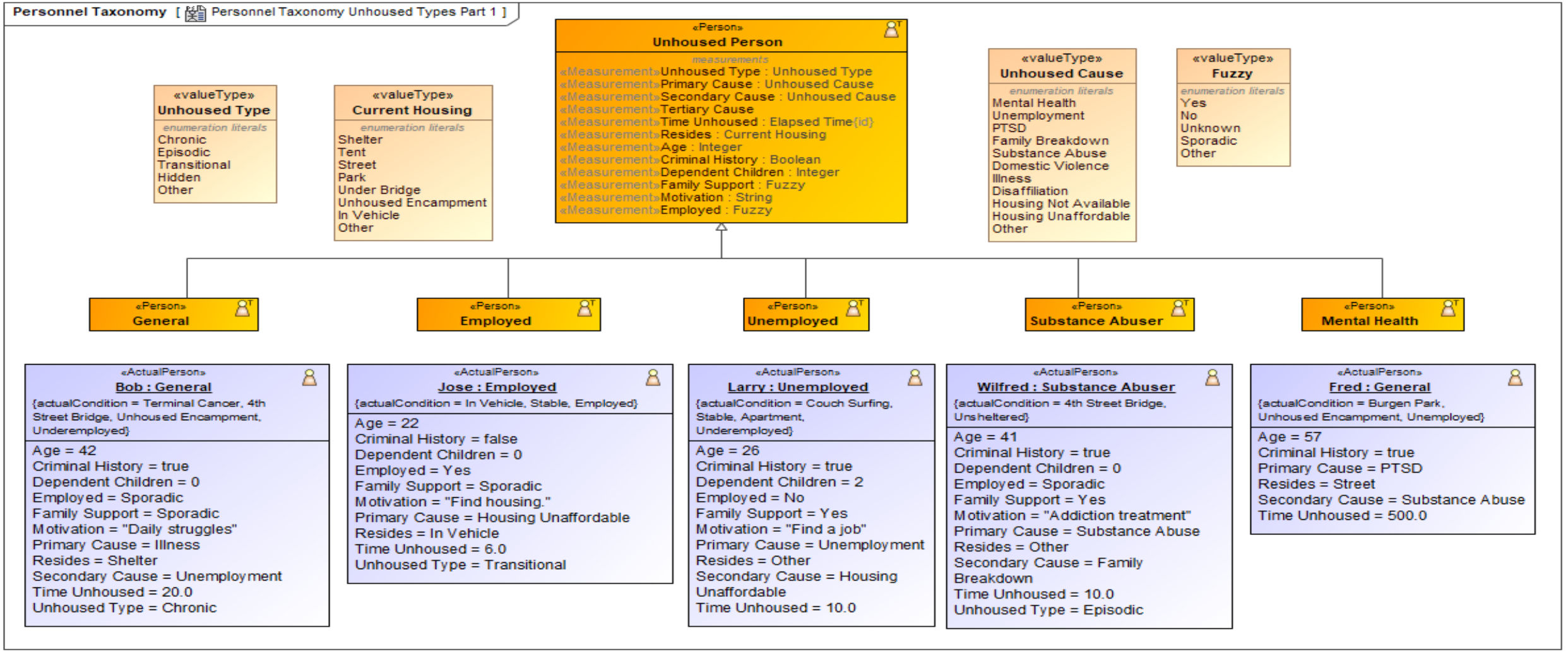
D6 | (949) 263-8676

	A	B	C	D	E	F	G	H	I	J
1	Homelessness Prevention - Poverty									
2	**Name**	**Service**	**Website Link**	**Phone Number**	**Contact Info Link**		These organizations have direct involvemement			
3	Center for Employment Training	Job Training	cetweb.edu	(619) 527-4895	cetweb.edu/contact		that help prevent extreme cases of poverty withi			
4	Chelsea Investment Corp	Affordability	chelseainvestco.com	(760) 456-6000	chelseainvestco.com/contact					
5	Employment Development CA	Job Training	eddca.gov	-	eddca.gov/contact					
6	Jamboree Housing	Affordability	jamboree.com	(949) 263-8676	jamboree.com/contact		Some poverty prevention measures include buil			
7	People Assisting The Homeless	Affordability	epath.org	(619) 810-8600	epath.org/contact		houses or providing rent assistance			
8	Regional Task Force for Homelessness	Strategies & Solutions	rtfhsd.org	(858) 292-7267	rtfhsd.org/contact					
9	Roommates San Diego	Affordability	roommates.com	-	roommates.com/contact					
10	SD Housing Commission	Affordability	sdhc.org	(619) 231-9400	sdhc.org/contact-us					
11	Self Sufficiency Programs	Less Financial Stress	sdcounty.gov	(866) 262-9881	sdcounty.gov/contact		All of these measures only apply to low-income			
12	Solutions For Change	Strategies & Solutions	sfc.org	(760) 941-6545	sfc.org/contact		are placed here under the poverty label			
13	Timmy's Place	Job Opportunity	-	(619) 269-2272	-					
14	Uplift San Diego	Affordability	upliftsd.org	(619) 234-4504	upliftsd.org/contact					
15										
16										
17	Homelessness Prevention - Disaffiliation									
18	**Name**	**Population Served**	**Website Link**	**Phone Number**	**Contact Info Link**		These organizations target groups of people wh			
19	211 San Diego	Everyone	211sandiego.org	211	211sandiego.org/contact		ties or connections from others for support or a			
20	Doors of Change	Youth	doorsofchange.org	(760) 415-0009	-					
21	Elderhelp San Diego	Seniors	elderhelp.org	(619) 284-9281	elderhelp.org/contact					
22	First 5 San Diego	Youth	first5.org	1-888-534-7785	first5.org/contact					
23	Home Start	Families	home-start.org	(619) 692-0727	home-start.org/contact-us		Programs under this category give minority grou			
24	Immigrant and Refugee Affairs	Immigrants	sdcounty.gov	(619) 731-3371	-		to push them towards transitioning into better li			
25	Legal Aid Society	Families	lassd.org	1-877-734-3258	lassd.org/contact					
26	Purple Heart Homes	Veterans	phh.org	(704) 838-4044	phh.org/contact					
27	San Diego Wesley House	Students	sdwesleyhouse.org	(619) 582-0773	sdwesleyhouse.org/contact					
28	San Diego Youth Services	Youth	sdyouthservices.org	(619) 221-8600	sdyouthservices.org/contact		Many progams already exist to help these minor			

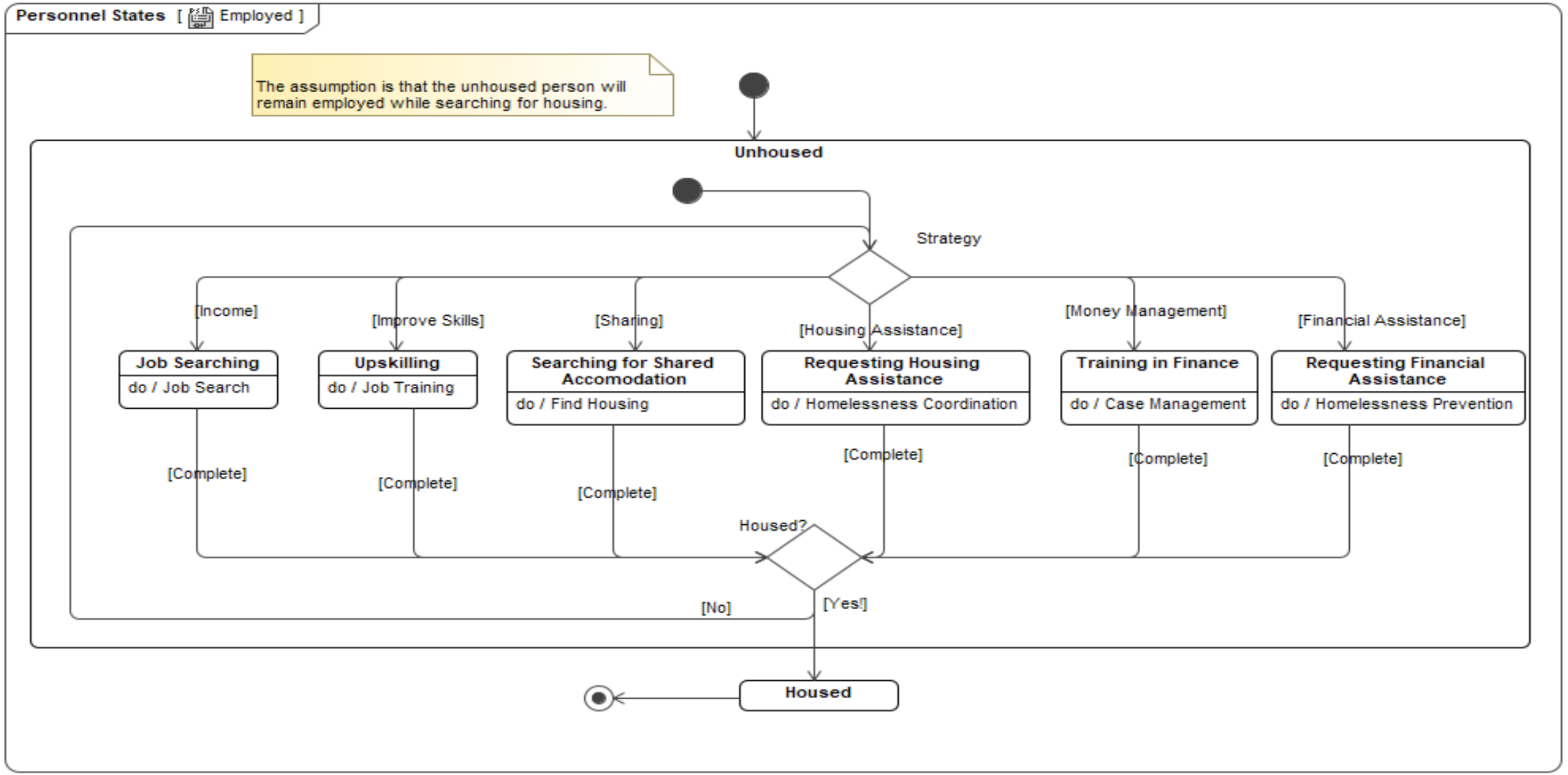
Personnel Taxonomy
Unhoused Types Condensed



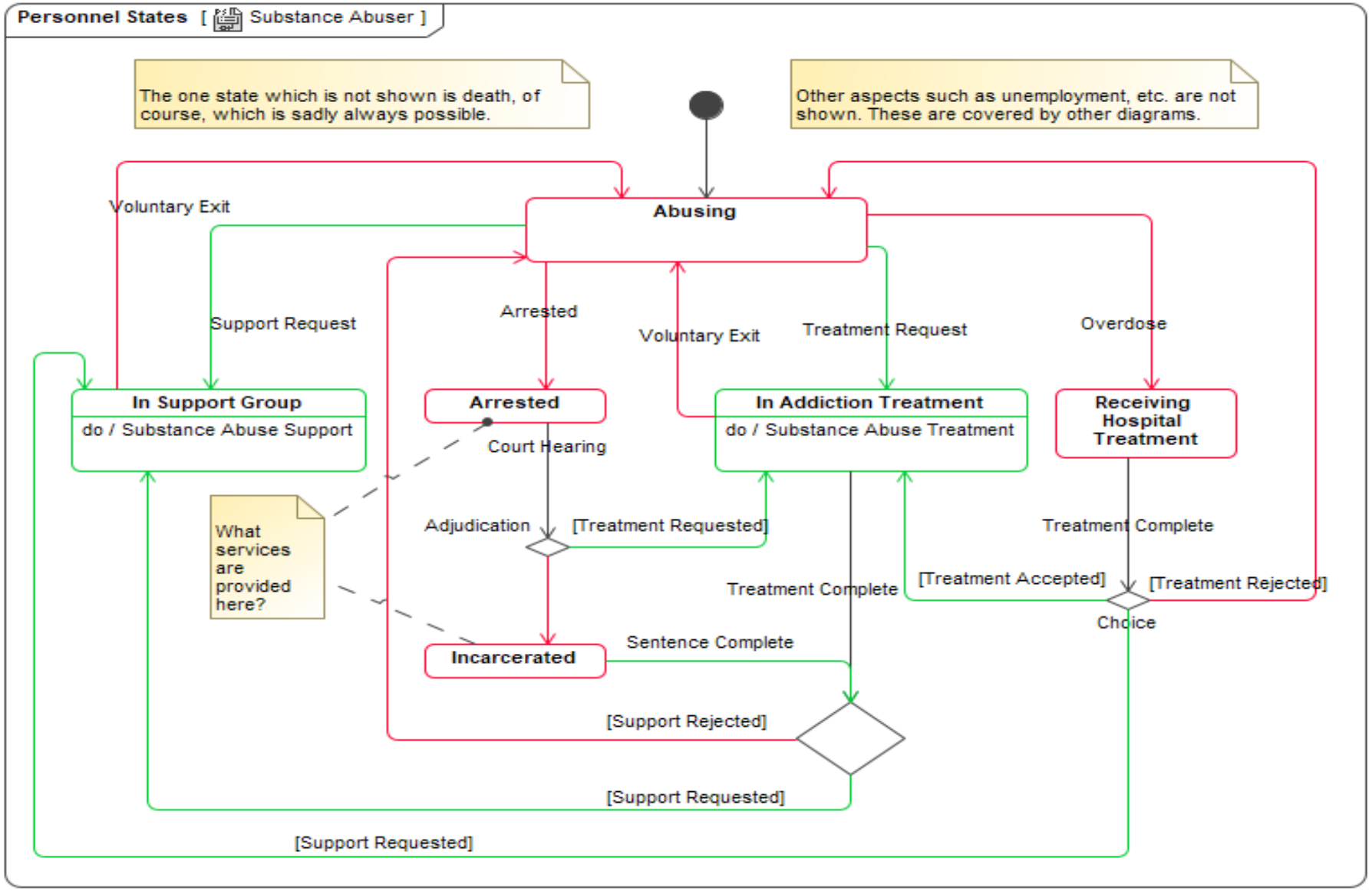
Personnel Taxonomy
Unhoused Types Part 1



Employed


Personnel States [Employed]
The assumption is that the unhoused person will remain employed while searching for housing.
Unhoused
Strategy
[Income]
[Improve Skills]
[Sharing]
[Housing Assistance]
[Money Management]
[Financial Assistance]
Job Searching
do / Job Search
Upskilling
do / Job Training
Searching for Shared Accomodation
do / Find Housing
Requesting Housing Assistance
do / Homelessness Coordination
Training in Finance
do / Case Management
Requesting Financial Assistance
do / Homelessness Prevention
[Complete]
[Complete]
[Complete]
[Complete]
[Complete]
[Complete]
Housed?
[No]
[Yes!]
Housed

Substance Abuser



Conclusion

- By understanding the causes of homelessness, what the major events are, and the cycle of homelessness, Autoville leaders can attempt to intervene and end the cycle.
- A specialized department will be created and funded with authority and responsibility to address the problem.
- Help will be provided with treatment, counseling, jobs and shelter.
- Funds made available will be used to improve the city.
- Autoville will monitor the situation to ensure that the money is well spent, and that the situation is improving for the both the city and the homeless people.
- Understanding the human dimension allows us to evaluate technology that might help – people before systems.

Graduate School of System Design and Management
Keio University

NismLab
Symbiotic and Safety System Design Laboratory

UAF-Based System Architecture Definition of Japanese MaaS: A Study of Snow-Country MaaS

Hiroki Ikegaya

BIG Models are not Always Better Models

"…All models are wrong, but some are useful"

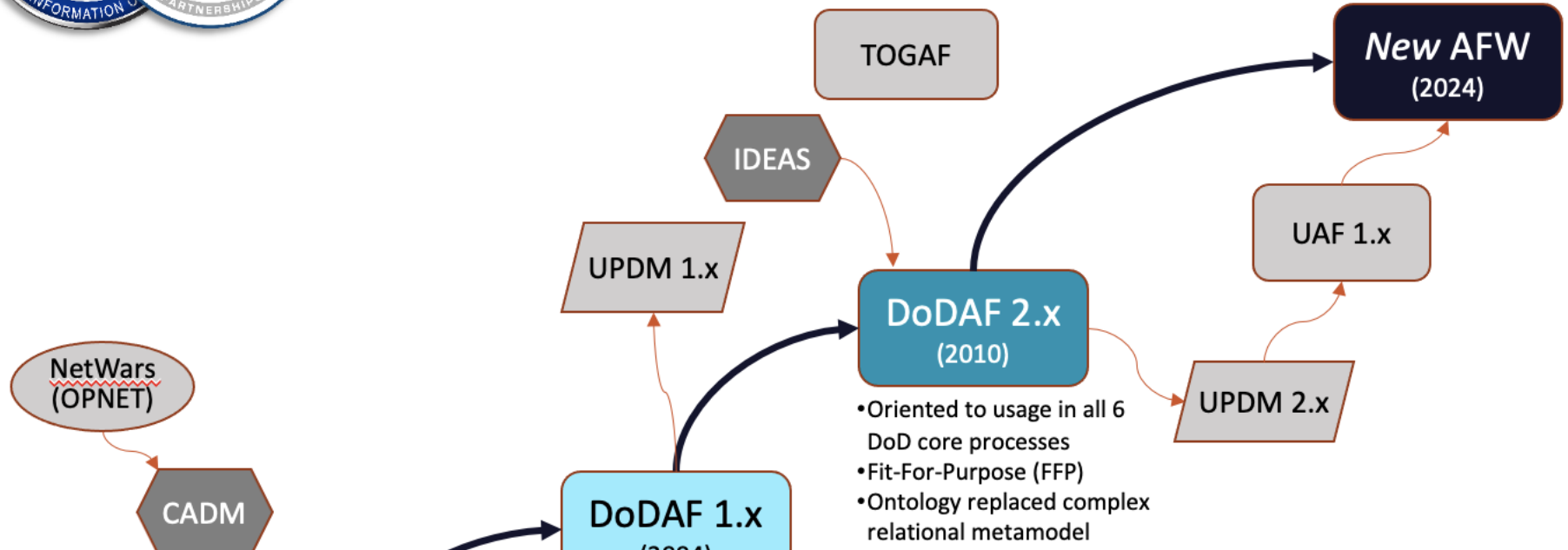
"Since all models are wrong the scientist cannot obtain a "correct" one by excessive elaboration. On the contrary following William of Occam he should ***seek an economical description*** of natural phenomena. Just as the ability to devise simple but evocative models is the signature of the great scientist so ***overelaboration and over parameterization*** is often the mark of mediocrity."

George E. P. Box

"…seek an economical description…"

The Future

DoD AFW History



Legend:	
UAF	Unified Architecture Framework
UPDM	Unified Profile for DoDAF and MODAF
TOGAF	The Open Group Architecture Framework
IDEAS	International Defence Enterprise Architecture Specification
DoDAF	DoD Architecture Framework
MBSE	Model Based Systems Engineering
CADM	Core Architecture Data Model

OMG Model-based Acquisition (MBAcq) User Group:
A Government & Industry Collaboration Reference Architecture and Patterns

OMG UAF Summit 2024 Reston VA

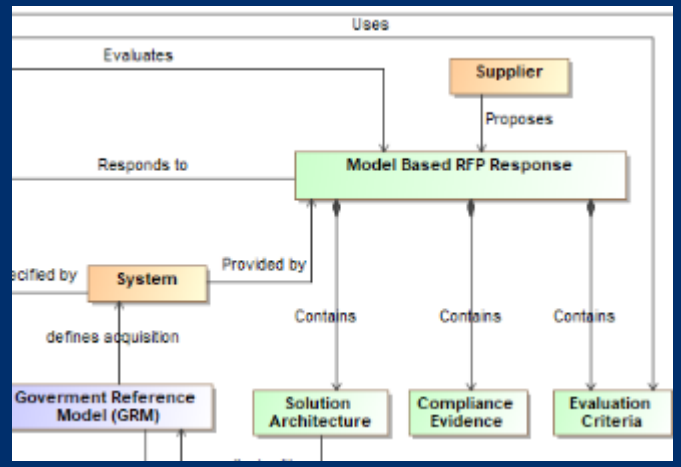
LAURA E HART LAURA.E.HART@LMCO.COM

MBACQ UG CO-CHAIR/OMG UAF CO-CHAIR

Model-Based Acquisition (MBAcq) User Group Introduction

About MBAcq

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

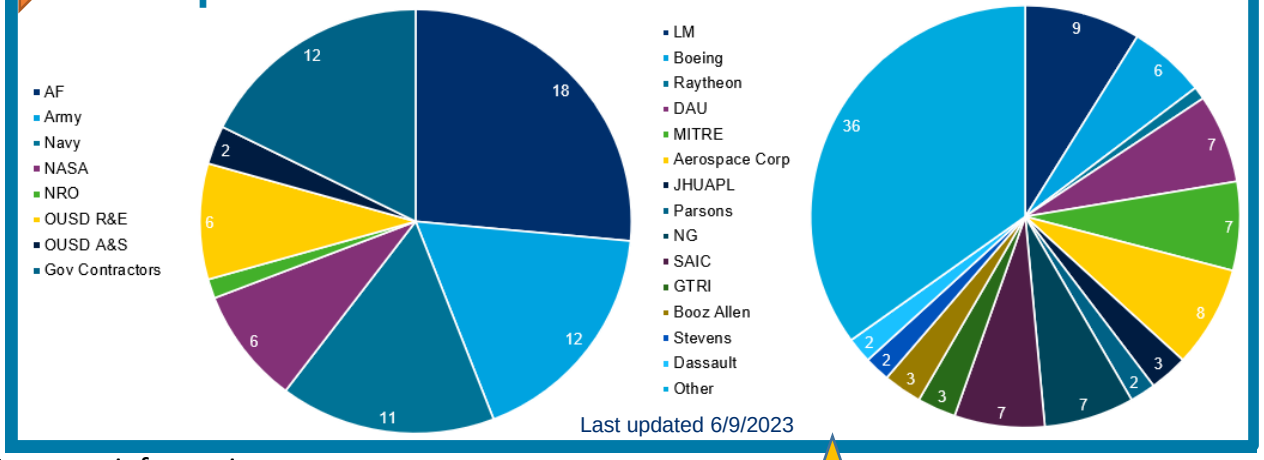


Why MBAcq Matters

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

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

Participation



Expected Timeline

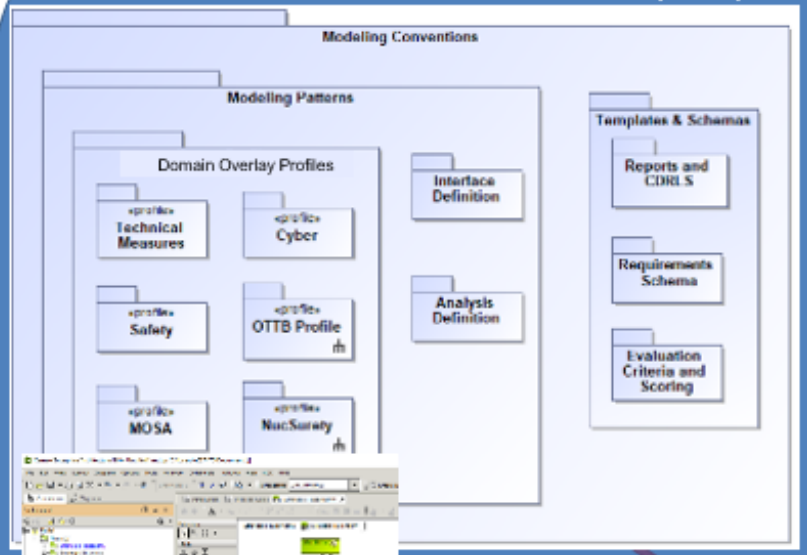
2022: Formed Team & Framework
2024: Q2 Govt Ref Arch
2024: Q4 Acquisition Users Guide
Q2/3 DAU Acquisition Training
Q4 Acquisition Model Example
Ongoing: Curate and Create Reusable Content (Reference Architectures, Domain Overlays, …)

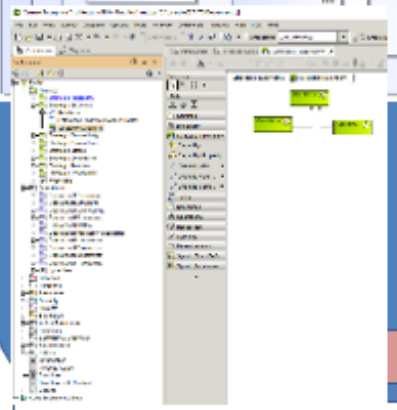
For more information contact:
laura.e.hart@lmco.com
rahaselden@mitre.org
toni.m.nolder@aero.org

Full lifecycle should be addressed during Acquisition!

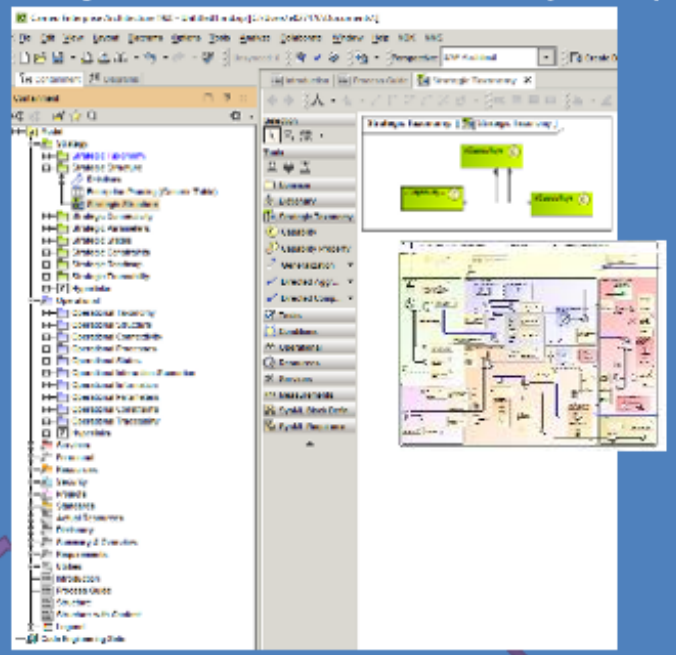
Model-Based Acquisition

1. Architecture Evaluation Criteria (AEC)

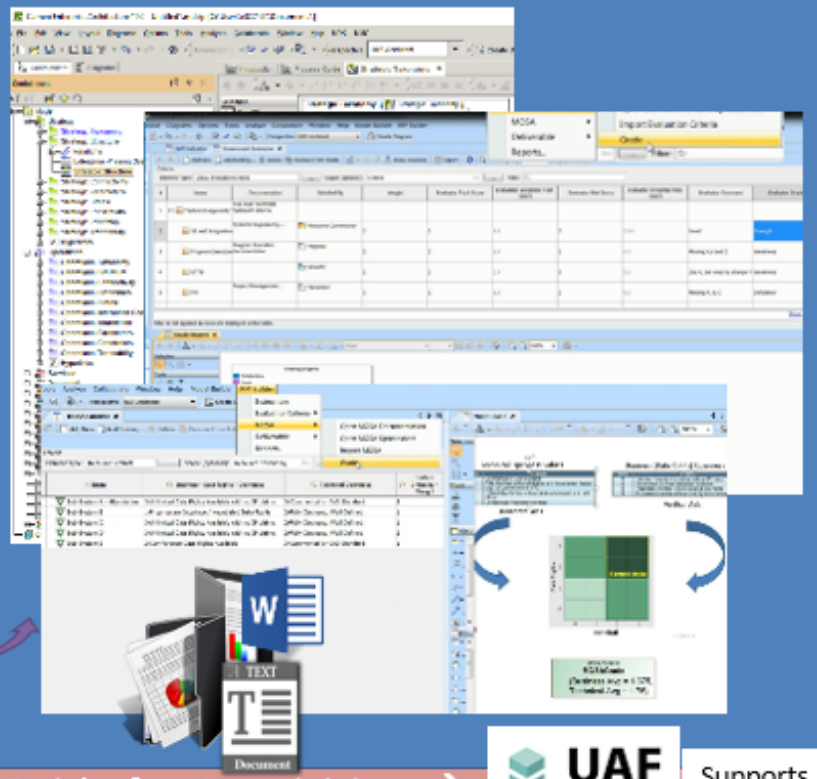




2. Objective Architecture Description (OAD)



3. Model-based RFP Package



AEC & (OAD)

Populated with Program & contract Data

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

UAF OMG UNIFIED ARCHITECTURE FRAMEWORK

Supports DoDAF

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

2. The OAD is a descriptive model containing the program requirements, constraints and context
- High-level Capabilities, mapped to Operational scenarios, traced to requirements (e.g. CDD, SRD, Conops)
- Technical performance measures (i.e. KPPs, KSAs, MOEs..)
- Any required architectural partitioning including structural and functional

(Based on UAF acquisition process guide and template)

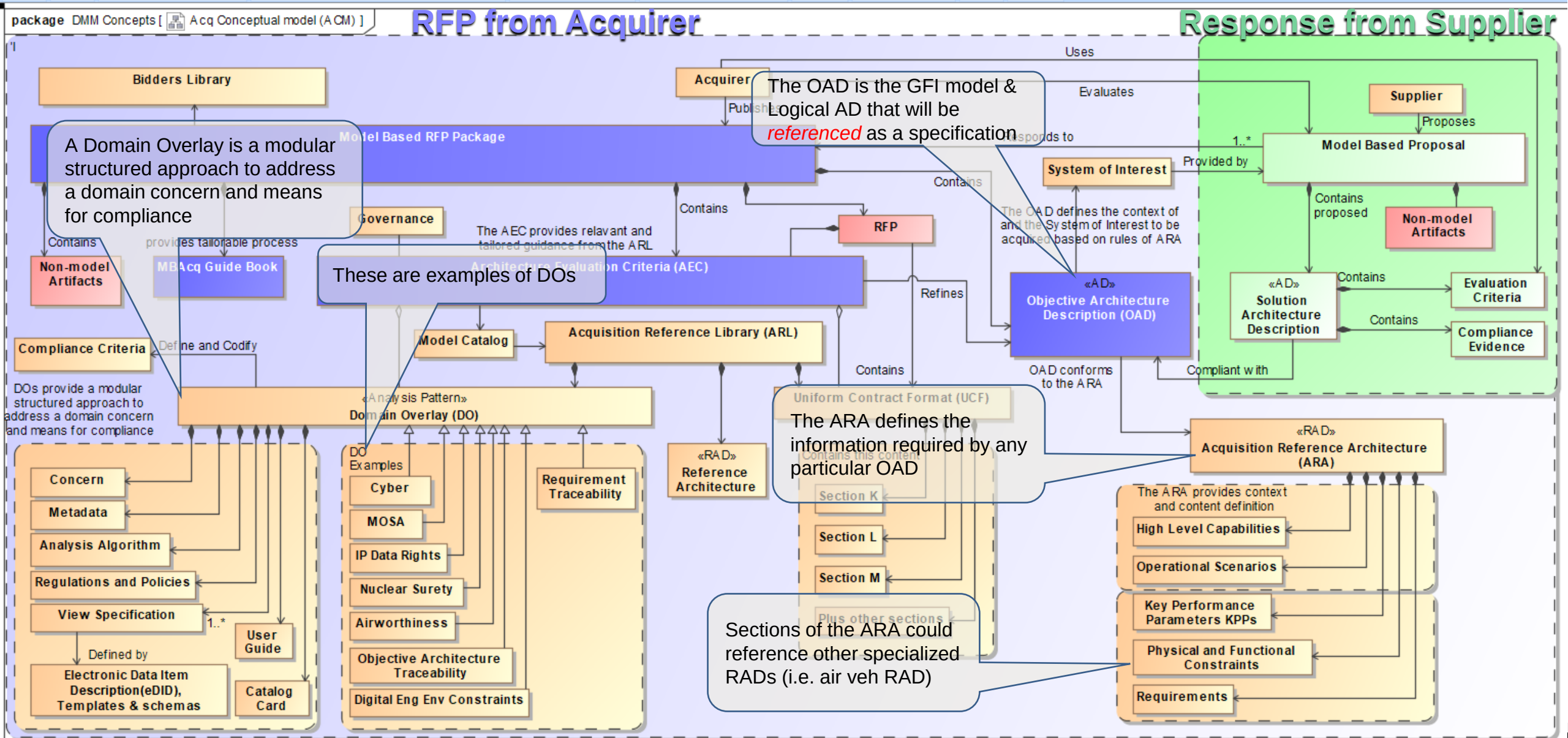
3. The Model-based RFP model contains the populated OAD&AC providing **RFP evaluation content, CDRL definitions** for documentation generation and **scoring tools** for solution validation and evaluation

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

SOURCE: Laura Hart, MITRE 2017

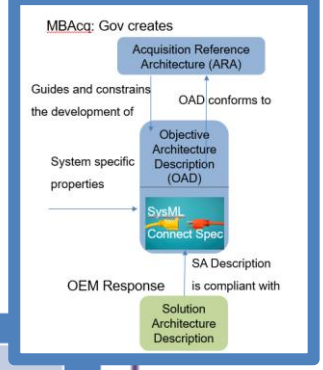
MBAcq Future State

Bringing it all together!



The Architecture Continuum

Defining Guidance!



View Specifications

Views

Architecture Continuum

RFP

Proposal

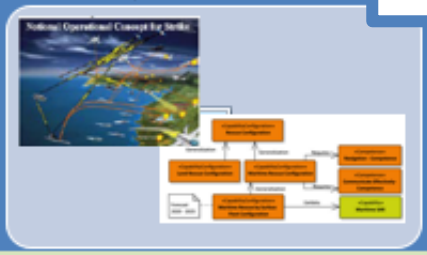
Enterprise Architecture (UAF)

- "Blueprint" for Organization
- Provides System Context
- MOEs, Enterprise Rs-Sr

OAD

- Operational Capabilities
- Operational Scenarios
- Key Performance Parameters
- Physical & Functional Constraints
- Requirements

St-Tx, Op-Sr, Ar-Ct

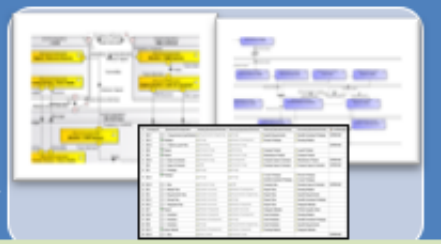


Traceability

Logical System Architecture (UAF or SysML)

- AOA Results, MOPs
- Customer Requirements
- System Rs-Sr

Rs-Sr, Op-Ra, bdd, ibd



Traceability Domain Overlays (DO)

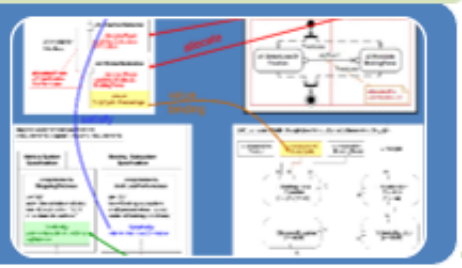
System Architecture (SysML)

- Derived Requirements
- Compliance Evidence (as defined in the DOs)

Proposed Solution

- Solution Architecture
- Compliance Evidence
- Traceability to OAD
- Requirements Allocation

bdd, ibd, par, req

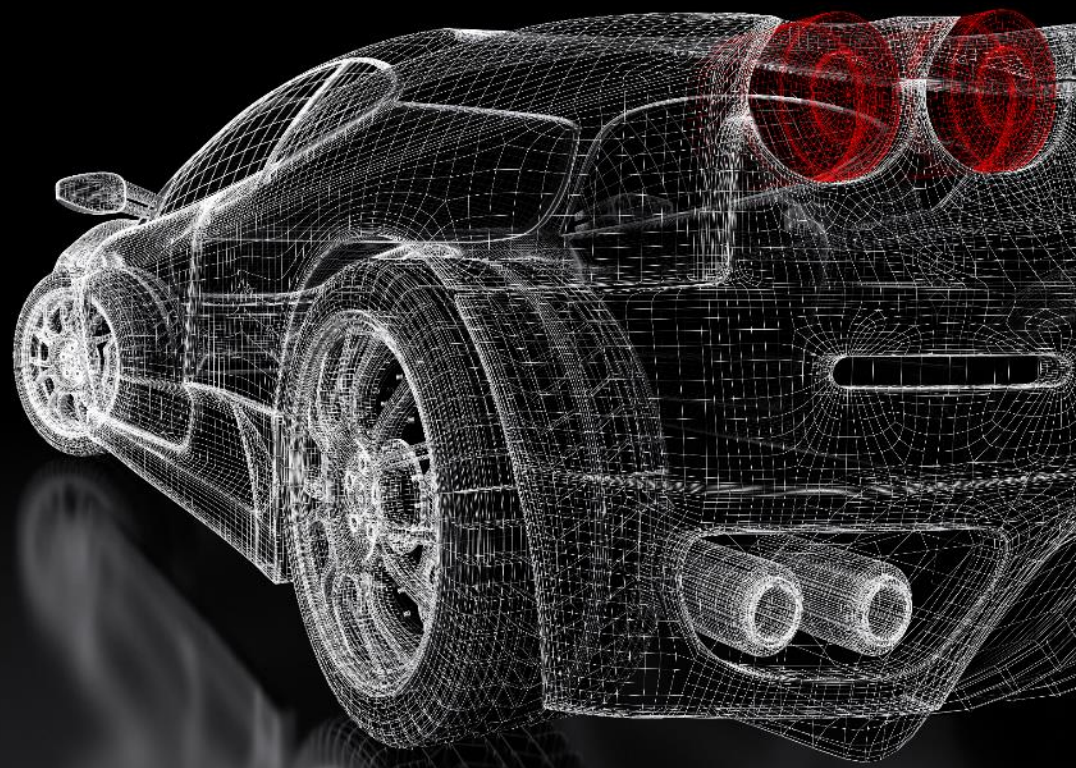


UAFML

SysML

OMG Standards Development Organization.

Darth Vader's Secret Weapon: Implementing Mission Engineering with UAF



SSI

DRIVING DIGITAL DEVELOPMENT

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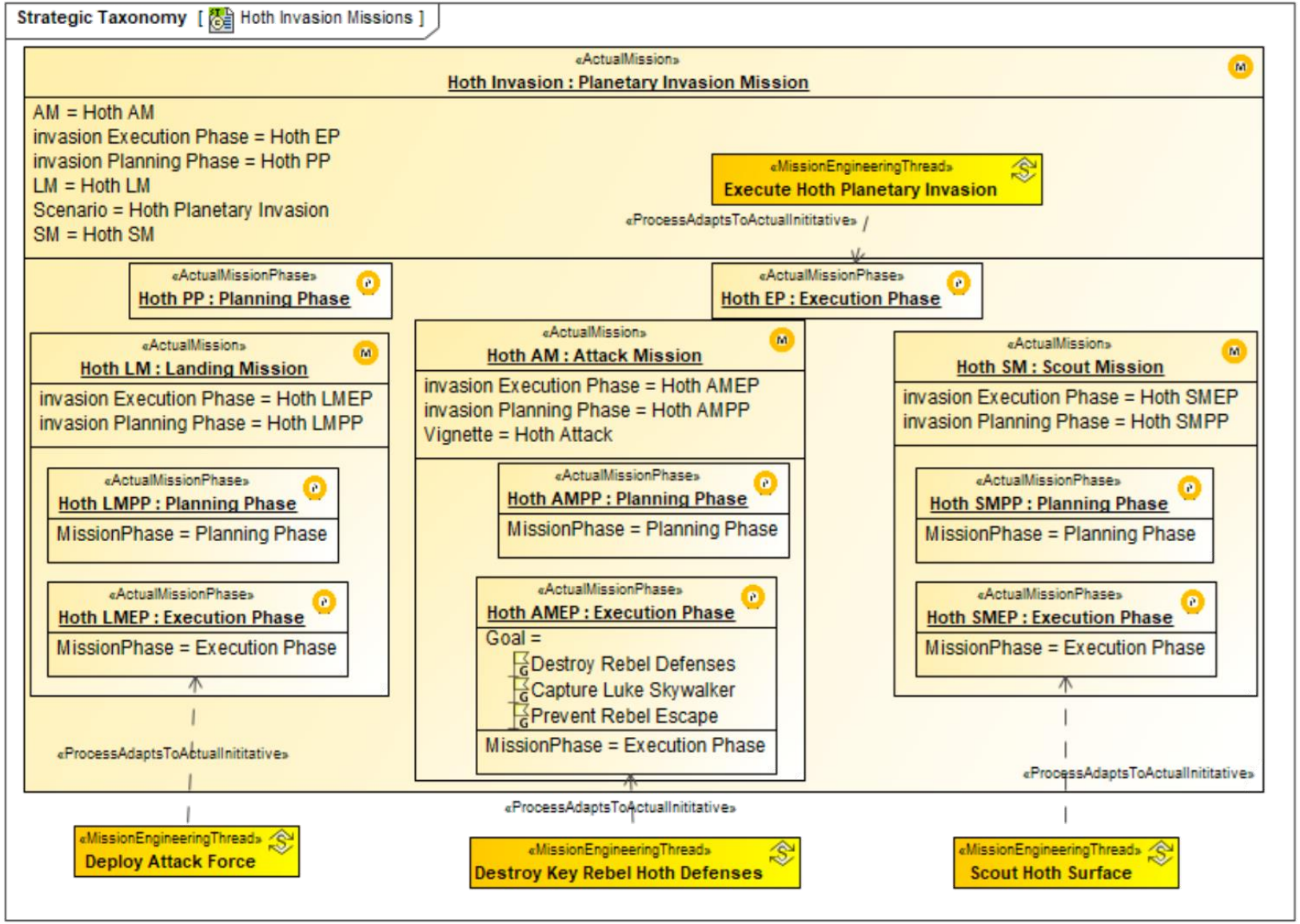
UAF V1.3 RTF Roadmap

Features Missions Engineering Additions Only

Submit RTF report in December 2024

Specification release expected in June 2025

Mission Engineering presentation is available on [Youtube]



UAF V2 REQUIREMENTS

#	Name	Text	Documentation
1	1 Mandatory Requirements		
2	1.1 Provide UAF Metamodel	The standard shall include a normative meta model that captures the concepts of UAF without regard to the target implementation selected. The meta model shall be derived from UAF 1.2 meta model. The meta model shall be expressed in UML. [Note]: The purpose of the meta model is to ensure that the concepts of UAF are adequately covered and provide a basis for communication between the domain stakeholders and the implementers of UAF V2. It serves as the specification for the UAFMLs.	This is most likely replaced by KerML-based metamodel.
3	1.2 Provide UML Profile for UAF	The Standard shall define a normative UML profile for UAF. The profile shall inherit SysML V1.7 stereotypes, to the fullest extent possible. The profile shall provide: A. A list of stereotypes and relationships between them, tag definitions, and constraints. B. Mapping between UAF profile stereotypes and UAF Metamodel concepts.	It is questionable if we are to provide one. We need to see if SysML V2 is going to provide the profile to keep consistency
4	1.12 Provide SysML V2 Model Library for UAF	The Standard shall define a normative SysML V2 Model Library for UAF. The library shall provide: A. A list of elements and relationships between them, properties, and constraints. B. Mapping between elements in the model library and UAF Metamodel concepts.	
5	1.3 Architecture Modeling Support for Defense Organizations	The standard shall provide the ability to represent an internally consistent common core of artifacts for a set of defined viewpoints that support Defense Organizations' modeling needs. Proposals shall provide the ability to represent viewpoints defined in DoDAF and NAF.	
6	1.3.1 DOD Support	The standard shall support DOD needs for mission engineering, Joint Architectures for Capabilities, and Systems (JACS), and Joint Capabilities Integration and Development System.	
7	1.3.2 NATO Support	The standard shall support NATO needs for building NAF compliant architectures.	
8	1.4 Enable the Expression Of Business Process Models	The standard shall utilize the BPMN syntax and semantics to enable the expression of business process models. This requirement shall be met using the UML Profile for BPMN standard. The elements appearing on a business process model shall be integrated and constitute part of the Architecture Description (AD). [Note]: This requirement applies to implementation of UAF meta model based on UML Profile for UAF only.	Critical show stopper with SysML V2.
9	1.5 Use of SysML Parametrics Elements and Diagrams Mapped to Measurements	The standard shall provide the ability to use SysML Parametrics, Elements and Diagrams to specify mathematical constraints on the structural elements of an AD. These elements shall be reflected in the UAF V2 views and constituent models.	

UAF V2 SST Roadmap

Kick-off UAF SST

Submit RFC when SysML V2 is finalized as a new OMG specification

Stop maintaining UAF 1.x right after UAF 2 RFC is accepted by the AB

Overhead in terms of resources

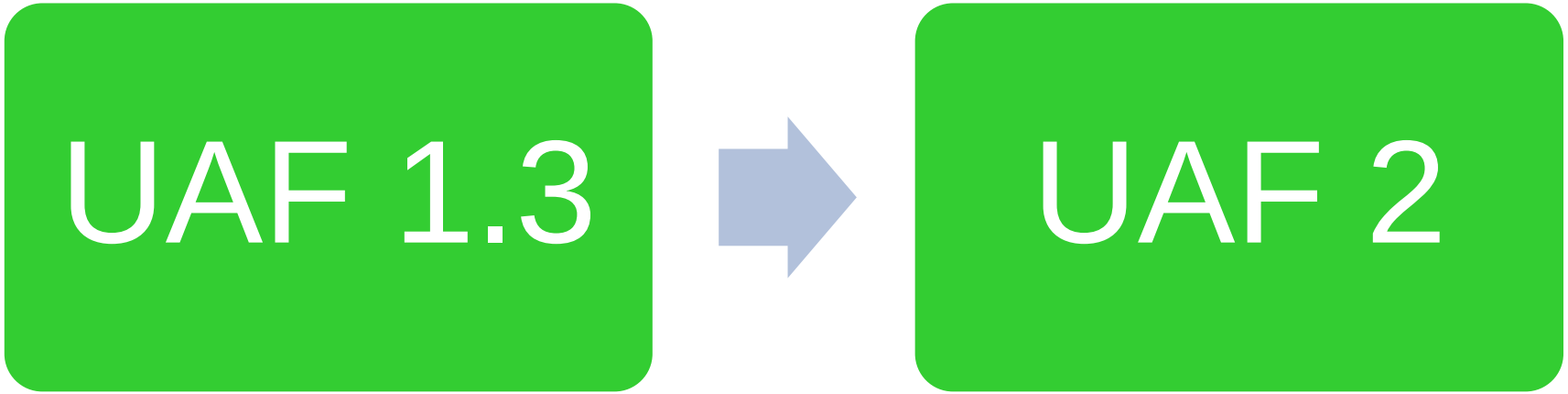
Risk of one deviating far from another. UAF V2 should supersede UAF 1.x completely

Provide continues support of SysML V1.x based UAFML implementation under the umbrela of UAF V2.

Submit V2 for ISO update

Object Management Group

Transition Plan



Normative
- UAF DMM
- UAF ML (SysML V1 based)

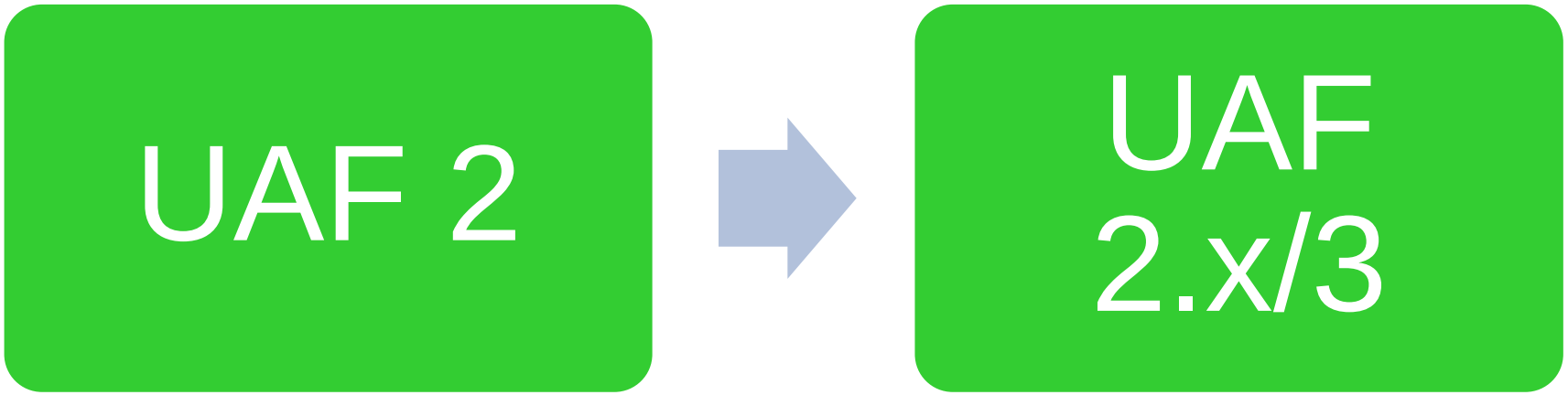
Non-normative
- Traceability
- Example Model
- EA Guide

Normative
- UAF MM
- UAF ML (SysML V1 based)
- **UAF ML V2 (SysML V2 based)**

Non-normative
- Traceability
- Example Model
- EA Guide
- **MBAcq Guide**
- **Mission Engineering Guide**
- **Transition to V2 Guide**

Object Management Group

Transition Plan



Normative

- UAF MM
- UAF ML (SysML V1 based)
- UAF ML V2 (SysML V2 based)

Normative

- **UAF V2.x/3 (SysML V2 based)**
- **UAF API**

Object Management Group

Areas of Improvement

Mission Engineering

Addition of Use Cases

Services Modeling Improvements

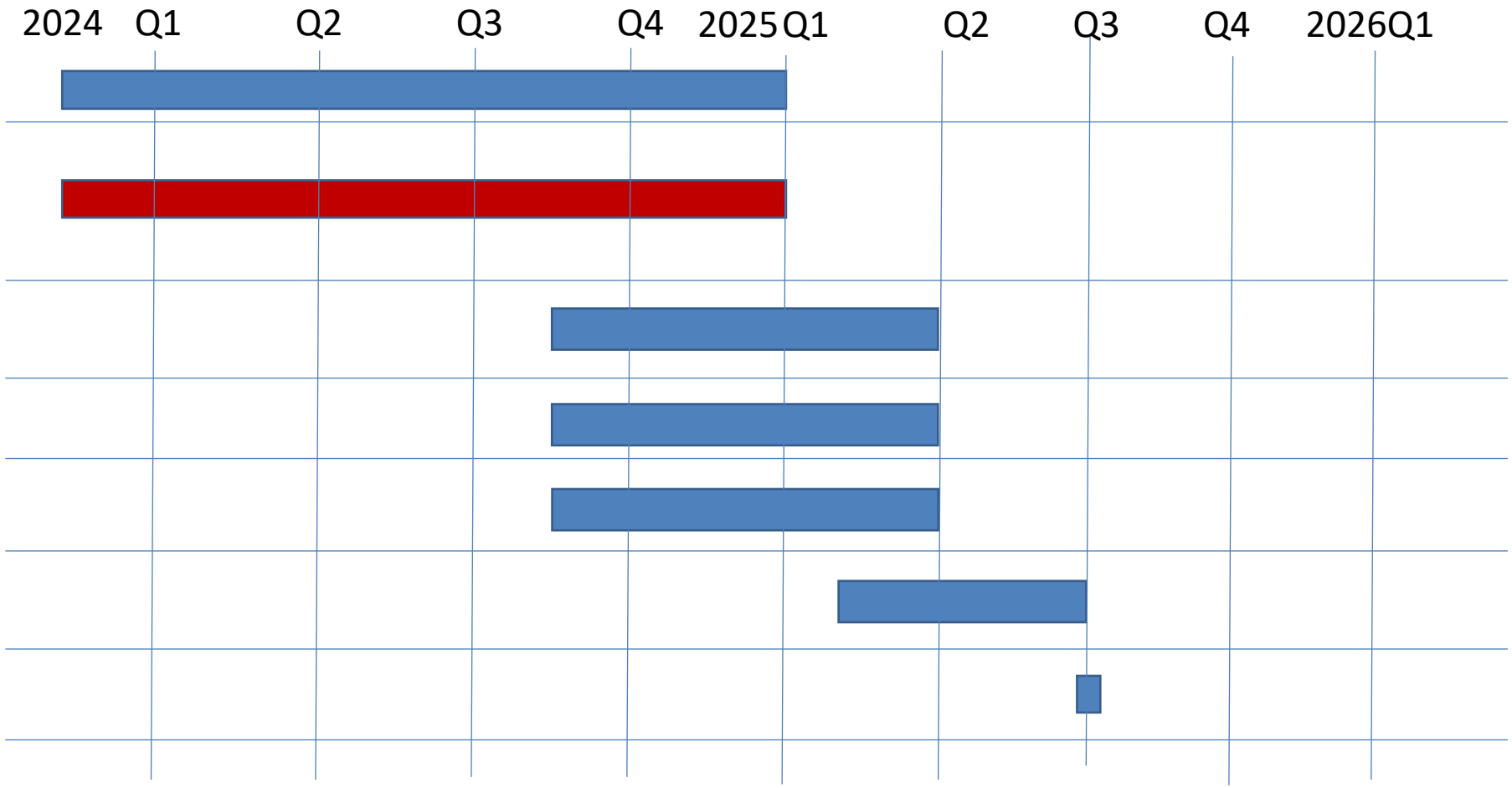
Portfolio concept

Architecture vs. Configuration

Revisit Value Streams

Model-based Acquisition Support

Timeline



Object Management Group

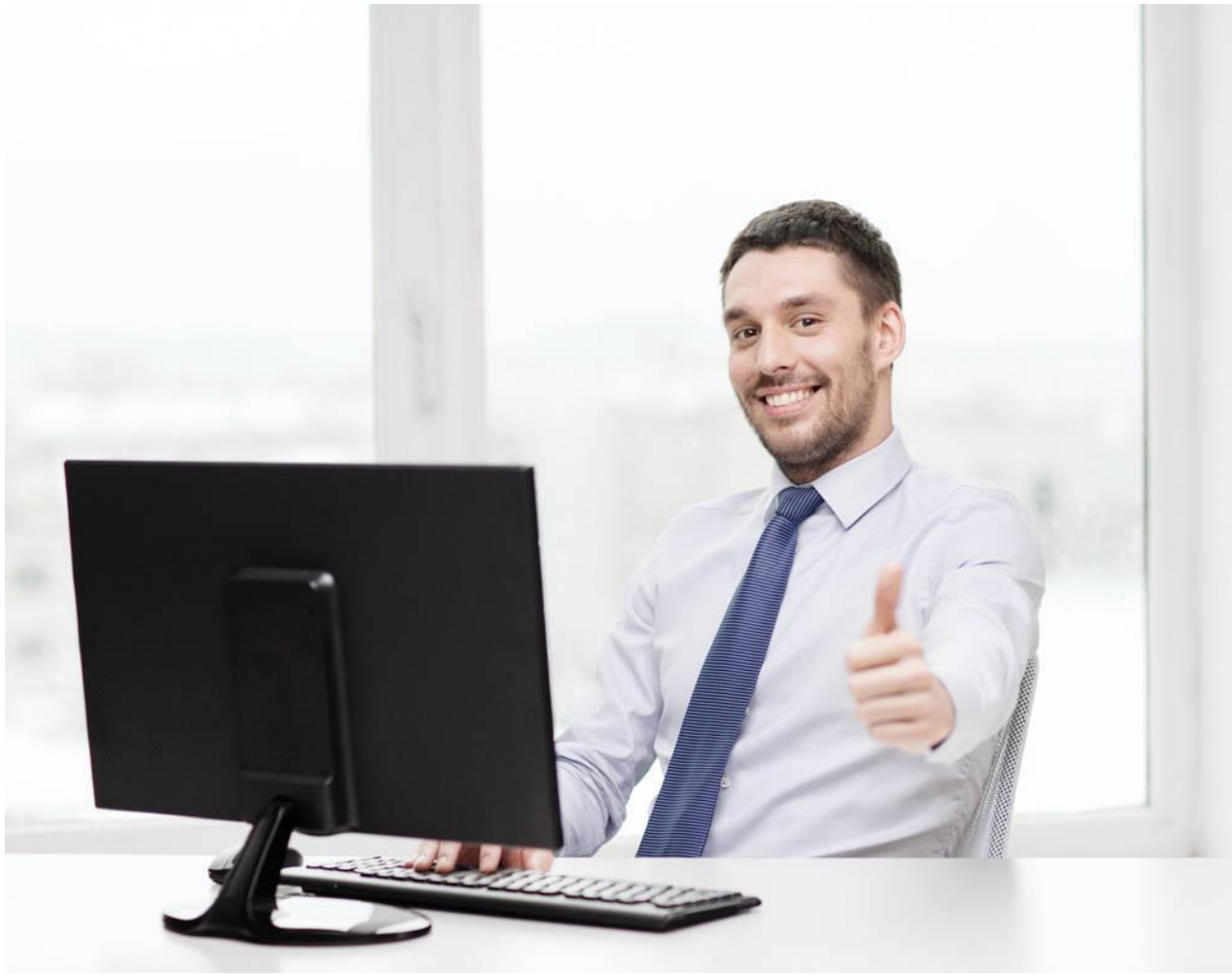
Learn More and Contribute

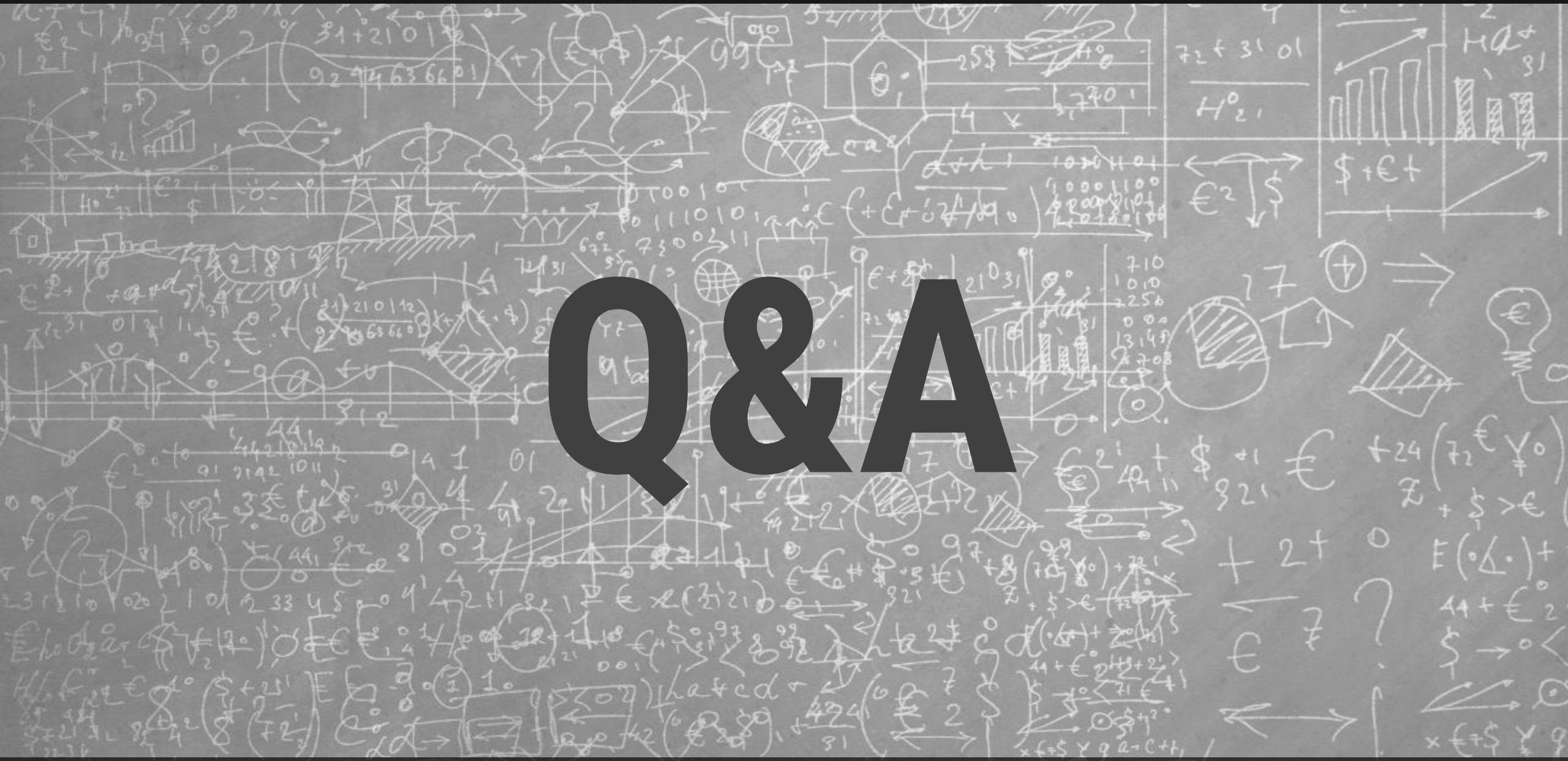
- Resources:
  - UAF Specification: https://www.omg.org/spec/UAF/1.1
  - UAF Example Model: https://www.omg.org/cgi-bin/doc?dtc/19-06-18.pdf
  - Contact your UAF tool vendor: PTC, IBM, Dassault, Sparx
  - UAF/UPDM Wikipedia pages (soon to be updated)
- Groups
  - Join the OMG UAF Revisionary Task Force (info@omg.org)
  - UAF Linked In https://www.linkedin.com/groups/8878655/
  - INCOSE MBSE and Architecture groups
- Conferences and Seminars
  - INCOSE International Symposium: https://www.incose.org/symp2021/home
  - OMG UAF Summit https://www.omg.org/events/2021Q1/index.htm

Tool Myths

Buying tools doesn't make you a carpenter

Buying an MBSE tool doesn't make you a model-based systems engineer.




Q&A

Backup & References

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