Implementing DoDAF and UAF

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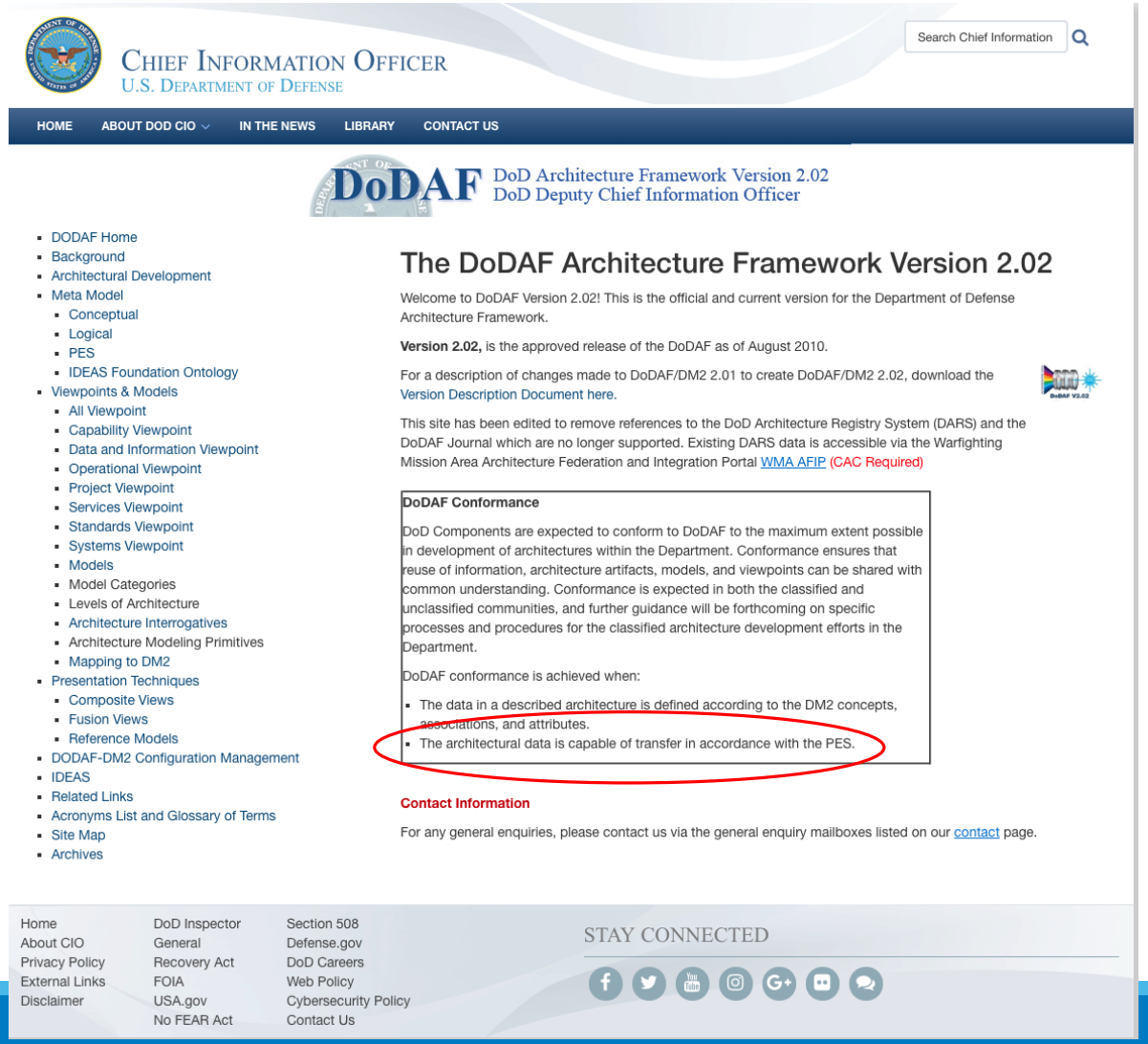
Agenda

- What Is DoDAF Today?
- How Does UAF Expand on DoDAF?
- What Are the Strengths and Weaknesses of these Frameworks?
- How Does Systems Engineering Support these Frameworks?
- How Can We Implement these Frameworks?

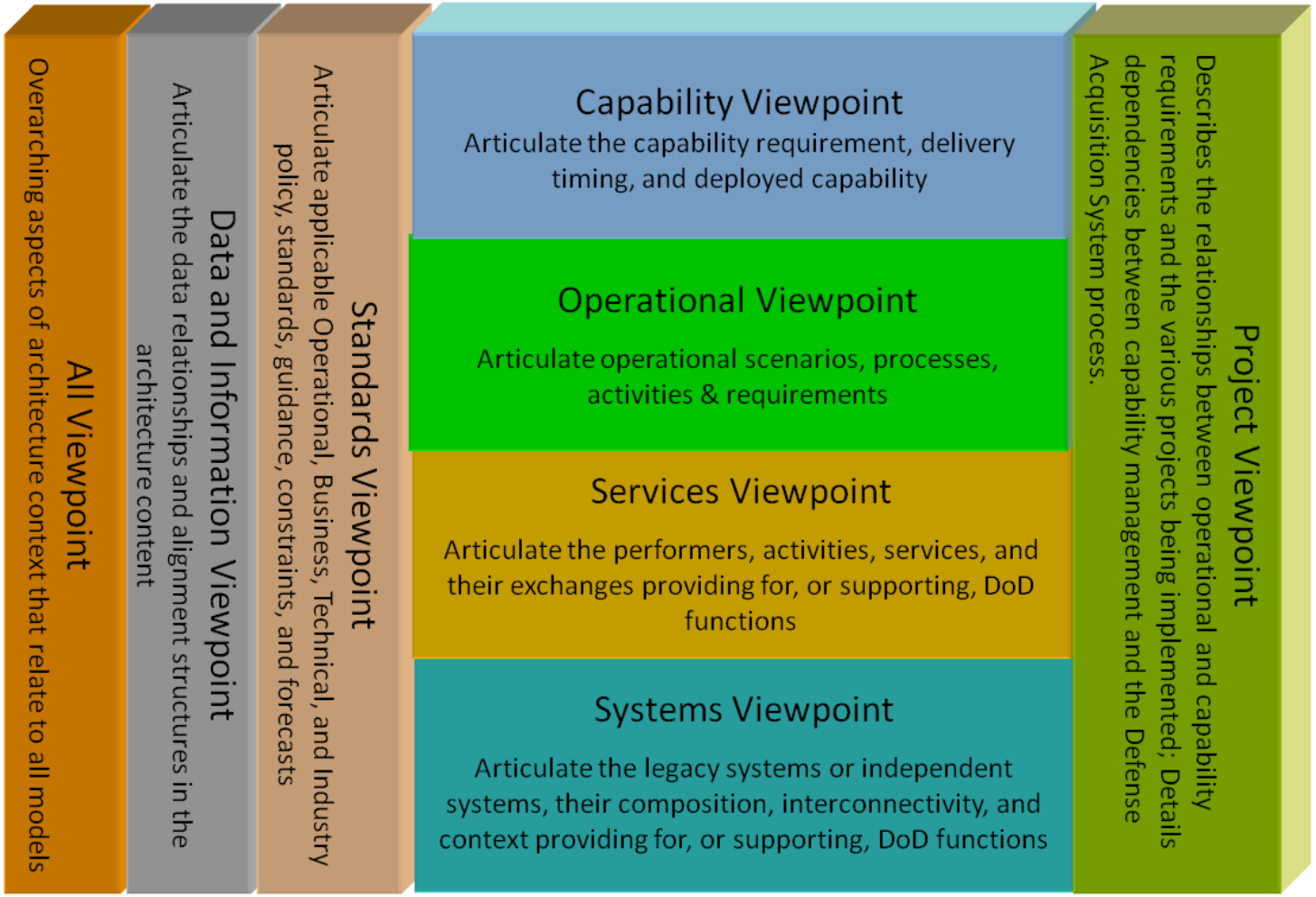
DoDAF Today

- A website
- Link to PDF, which may be out of date
- DoDAF is integral to the DoD Acquisition System through the JCIDS policy
  - Different views required at different points in the lifecycle
- Conformance requires Physical Exchange Specification (PES)



DoDAF Today

- Viewpoints: collections of views
- Hierarchy from capability level to systems
- Different groups responsible for different viewpoints
  - e.g., Operations – Capability and Operational Views



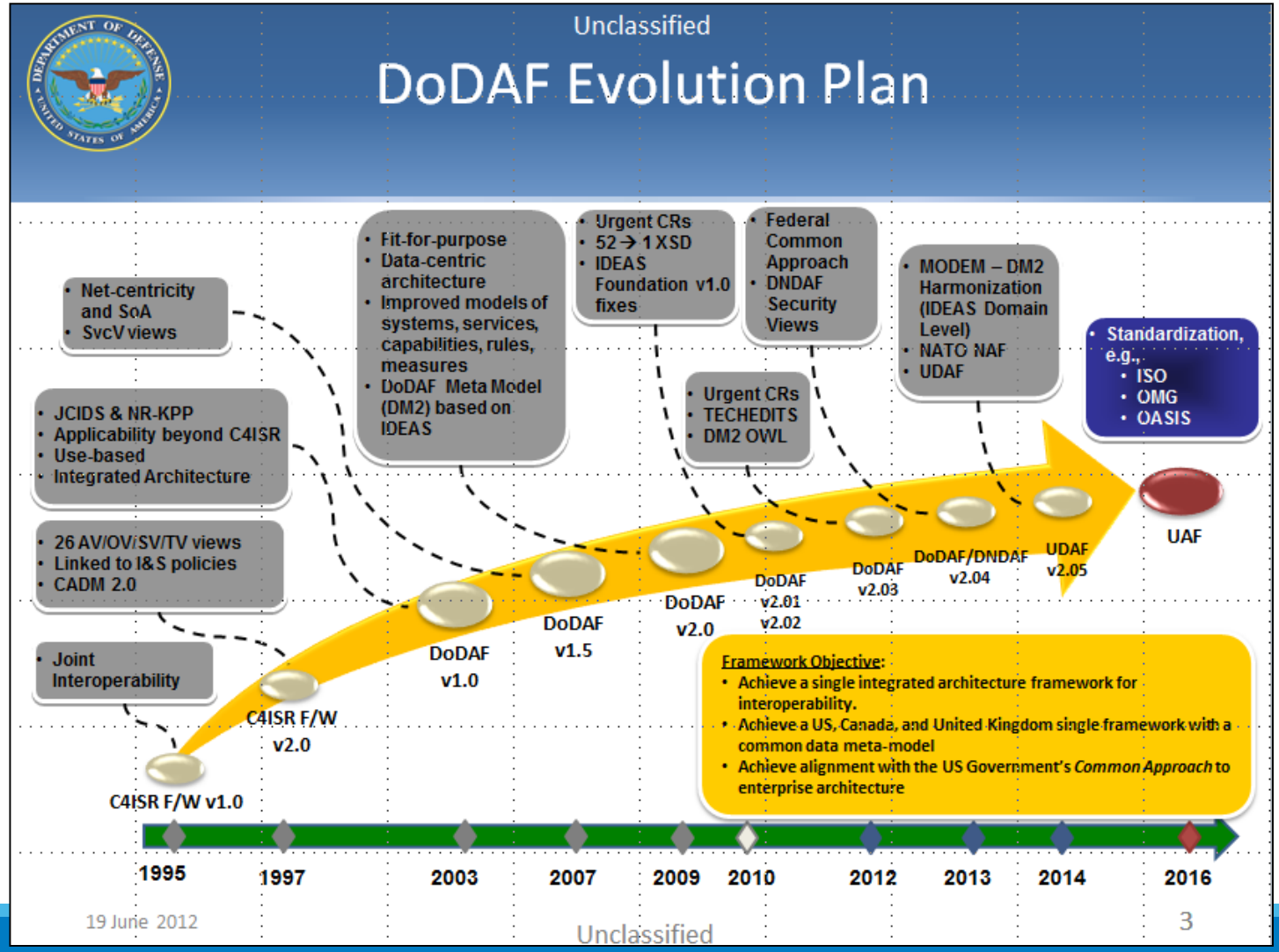
DoDAF Today

- Collections of models to make the products
- Descriptions of each product
- No templates, only suggested diagram types
- Does not include “fit-for-purpose” views

All VP	AV-1	Overview and Summary Information	Describes a Project's Visions, Goals, Objectives, Plans, Activities, Events, Conditions, Measures, Effects (Outcomes), and produced objects
	AV-2	Integrated Dictionary	Architecture data repository with definitions of all terms used throughout the architecture data and presentations
Capability Viewpoint	CV-1	Vision	Overall vision for transformational endeavors, provides a strategic context for the capabilities described, and provides a high-level scope
	CV-2	Capability Taxonomy	A hierarchy of capabilities specifies all the capabilities that are referenced throughout one or more architectures
	CV-3	Capability Phasing	Planned achievement of capability at different points in time or during specific periods of time
	CV-4	Capability Dependences	Dependencies between planned capabilities and defines logical groupings of capabilities
	CV-5	Capability to Organizational Development Mapping	The fulfillment of capability requirements shows the planned capability deployment and interconnection for a particular Capability Phase
	CV-6	Capability to Operational Activities Mapping	Mapping between the capabilities required and the operational activities that those capabilities support
	CV-7	Capability to Services Mapping	Mapping between capabilities and the services that these capabilities enable
Data and Info VP	DIV-1	Conceptual Data Model	Required High level data concepts and their relationships
	DIV-2	Logical Data Model	Documentation of the data requirements and structural business process rules (In DoDAF V1.5, this was the OV-7)
	DIV-3	Physical Data Model	Physical implementation of the Logical Data Model entities, e.g., message formats, file structures, physical schema (In DoDAF V1.5, this was the SV-11)

DoDAF Today (or Tomorrow?)

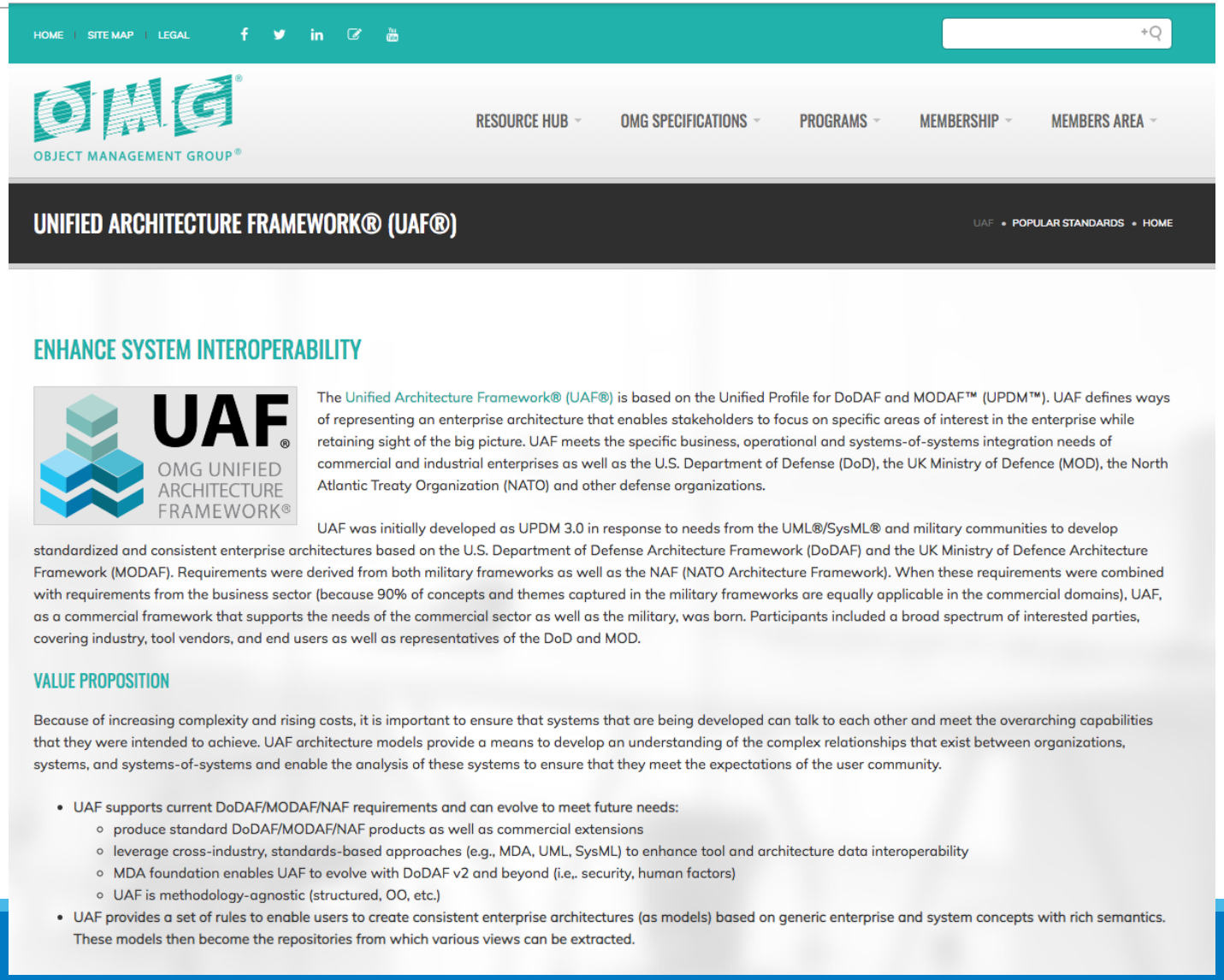
- Last published “roadmap” from Walt Okon
- DoDAF was frozen at the 2.02 version
- Unified Architecture Framework (UAF) is intended to replace DoDAF
- Not clear how DoD policy is viewing UAF



From "DoD Architectures and Systems Engineering Integration" presentation by Mr. Walt Okon at NDIA Systems Engineering Conference, October 2012

How Does UAF Expand on DoDAF?

- UAF integrates views from DoDAF, MoDAF, and NAF
- It is based on the Unified Profile for DoDAF and MoDAF (UPDM)
- UPDM is heavily influenced by SysML



UAF Expands Number of Viewpoints and Views

- 10 viewpoints (rows)
  - Resources, Security, Personnel
- 11 “visualizations” (columns)
- Also includes “Dictionary,” Summary & Overview, and Requirements
- Not clear why items, such as operational and security traceability, are missing from table
- Is Security a separate viewpoint or is it embedded in others?

	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 Structure Op-Sr	Operational Connectivity Op-Cn	Operational Processes Op-Pr	Operational States Op-St	Operational Interaction Scenarios Op-Is			Operational Constraints Op-Ct	-	-
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	Conceptual Data Model,	Environment Pm-En	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	Logical Data Model,		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	Physical schema, real world results	Measurements Pm-Me	Resource Constraints Rs-Ct	Resource evolution, Resource forecast Rs-Rm	Resource Traceability Rs-Tr
Security Sc	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr	-	-			Security Constraints Sc-Ct	-	-
Projects Pj	Project Taxonomy Pj-Tx	Project Structure Pj-Sr	Project Connectivity Pj-Cn	Project Activity Pj-Pr	-	-			-	Project Roadmap Pj-Rm	Project Traceability Pj-Tr
Standards Sd	Standard Taxonomy Sd-Tx	Standards Structure Sd-Sr	-	-	-	-			-	Standards Roadmap Sr-Rm	Standards Traceability Sr-Tr
Actuals Resources Ar		Actual Resources Structure, Ar-Sr	Actual Resources Connectivity, Ar-Cn	Simulation [b]					Parametric Execution/ Evaluation [b]	-	-
Dictionary * Dc											
Summary & Overview SmOv											
Requirements Rq											

A new periodic table or Tower of Babel?

UAF to DoDAF Mapping

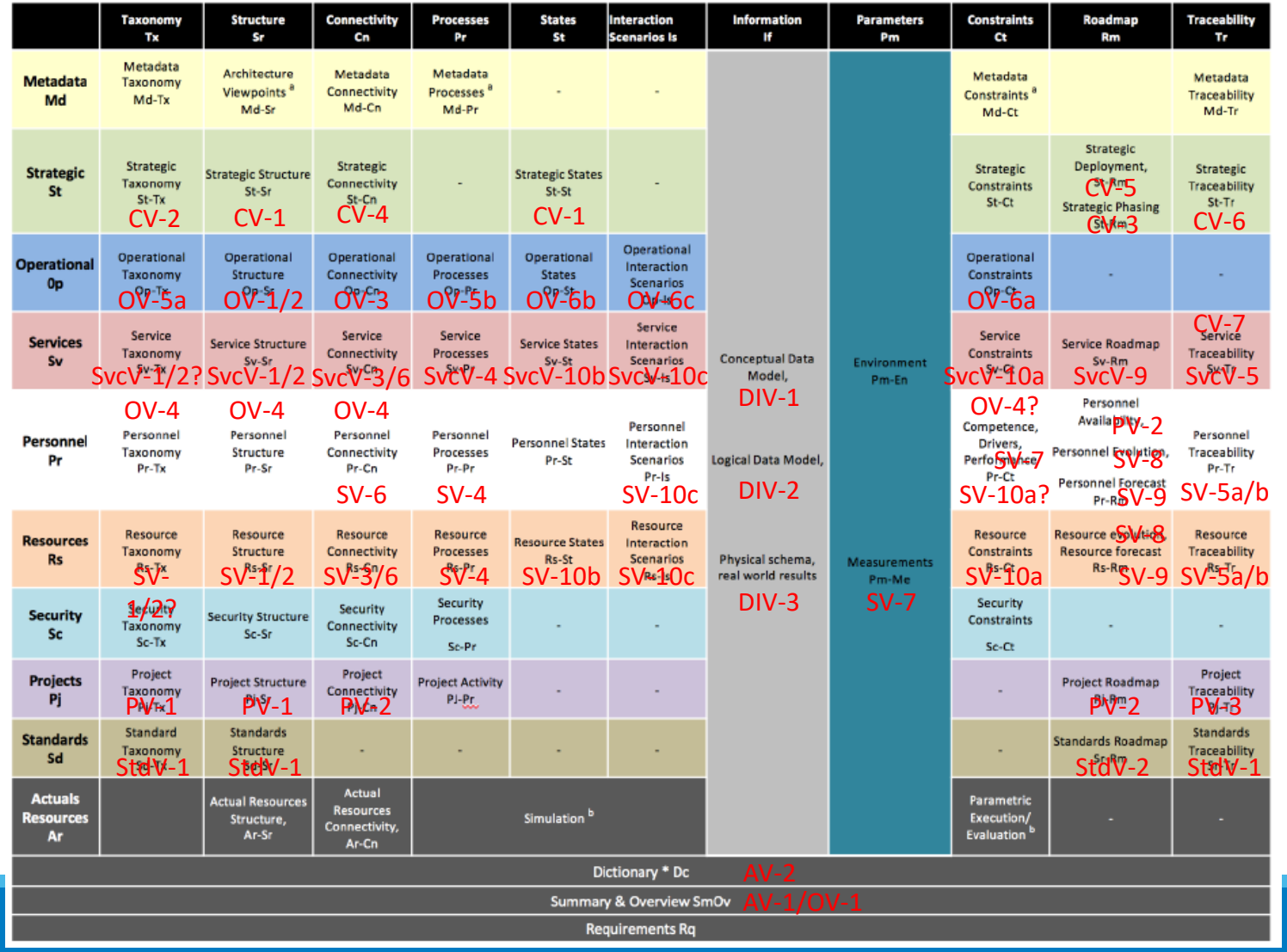
- Table 2.1 in the “Unified Architecture Framework (UAF)Traceability between Framework Views and Elements Version 1.0 - Appendix B (Informative)” provides a complete mapping between UAF and DoDAF
- Other mappings to MODAF, NAF, and DNDAF are also available in this document
- Unfortunately, this table does not include the UAF designators (e.g., Dc for the Dictionary, Op-Cn for Operational Connectivity), but you can add them yourself quickly

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	-	

Overlay of DoDAF with UAF

- Made some adjustments from suggested ones in the standard (e.g., OV-5a is clearly a type of taxonomy or decomposition of the higher levels of information, not a process)
- Not clear that all of these fit well
- What do these products look like according to the UAF specification?



Example Product Specification: Operational Processes (Op-Pr)

- "The UAF Profile uses an enhanced standard notation to represent metaconstraints graphically in the UAF profile diagrams to improve readability of the UAF Profile specification and overcome limitations of being unable to visualize constraints diagrammatically in UML"
- Does this make sense to you?
- Does this make any sense to your customer or other domain engineers?
- You absolutely need a tool to implement this for you

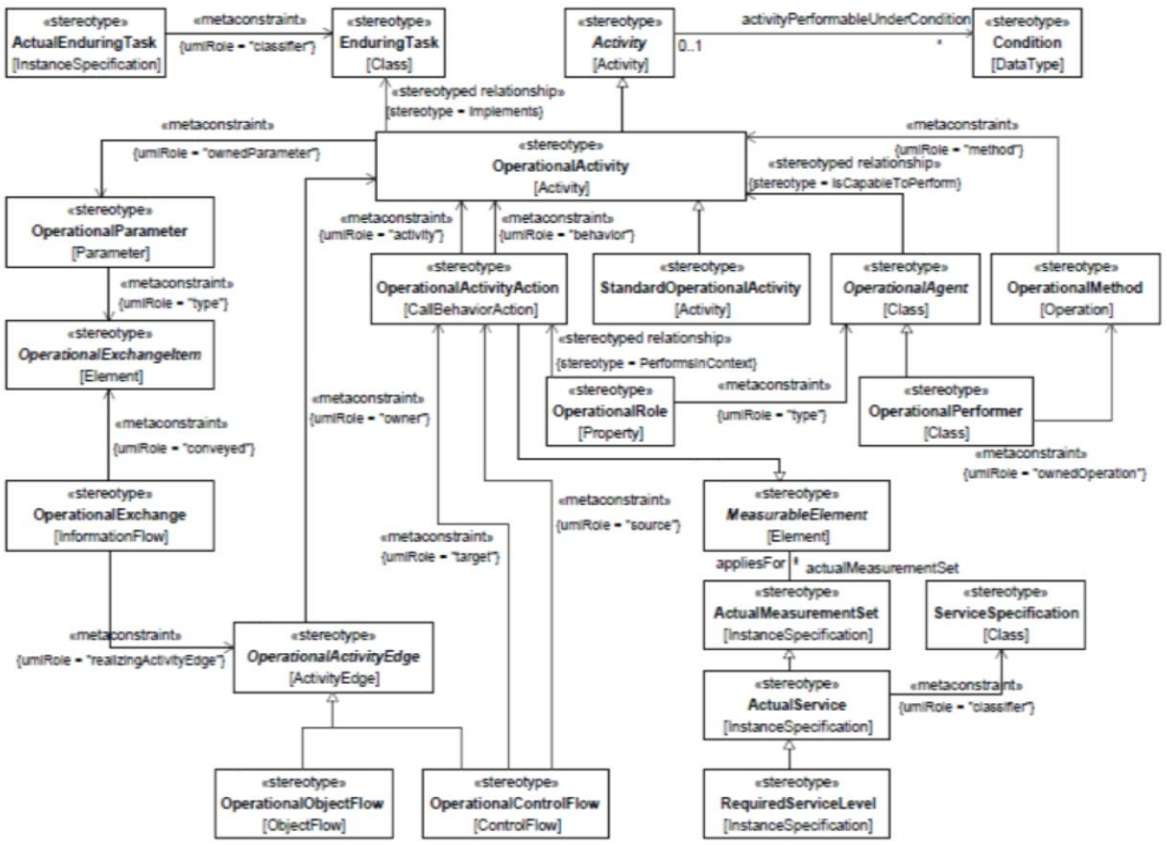


Figure A.12 - Operational Processes

Unified Architecture Framework Profile (UAFP) Version 1.0, p. 229

But that means I'm completely dependent on the tool!

What are the Strengths and Weaknesses of These Frameworks?

- Strengths
  - They both provide a formal way to specify products
  - They are both well defined
  - They both cover a lot of the information needed by systems engineers
  - UAF includes Requirements specifically
- Weaknesses
  - Highly dependent on tool implementations
  - Limited product set
  - Complex set of diagrams
  - UAF separates out “security” views
  - Limited program management views (e.g., no risk or cost views called out)
  - Limited acceptance outside SE community

Can We Simplify UAF to Make It More Understandable to Others?

- If we recognize that the columns are really mainly types of diagrams or information, its fairly easy to map other languages or ontologies to it
- For example, Lifecycle Modeling Language (LML) provides such an ontology/diagram set
- Types are used in LML to distinguish the different Viewpoints – Innoslate® uses labels to implement types

	Hierarchy Diagram	Asset Diagram	Asset Diagram	Action Diagram	State Diagram	Action Diagram	Class Diagram	Characteristic/ Measure Class		Timeline Diagram	Spider Diagram
	Taxonomy Tx	**Structure Sr**	**Connectivity Cn**	**Processes Pr**	**States St**	**Interaction Scenarios Is**	**Information If**	**Parameters Pm**	**Constraints Ct**	**Roadmap Rm**	**Traceability Tr**
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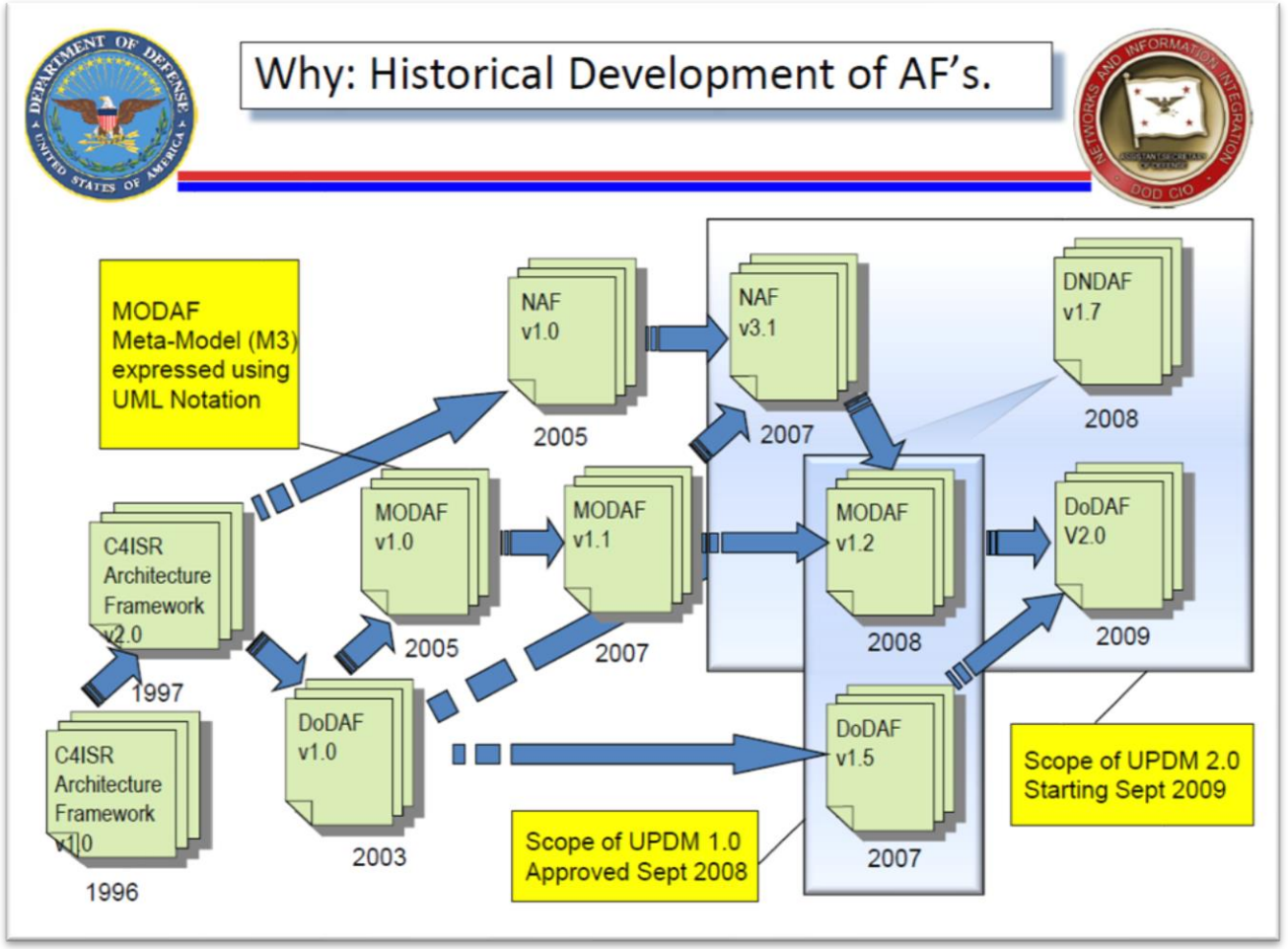
Requirements Rq											

Requirement Class

How Does Systems Engineering Support these Frameworks?

- To answer this question, we need to step back and understand where these frameworks originally came from
- The main driver initially was to replace MIL-STD-499 with “architecture”
- A set of systems engineering diagrams formed the basis for the C4ISR Architecture Framework



Examples from C4ISR Architecture Framework

- A variety of examples were provided by the members of the working group
- These formats were the basis for many of the diagrams used throughout the DoDAF implementation
- Templates for each product (now called model) were derived from these types of diagrams

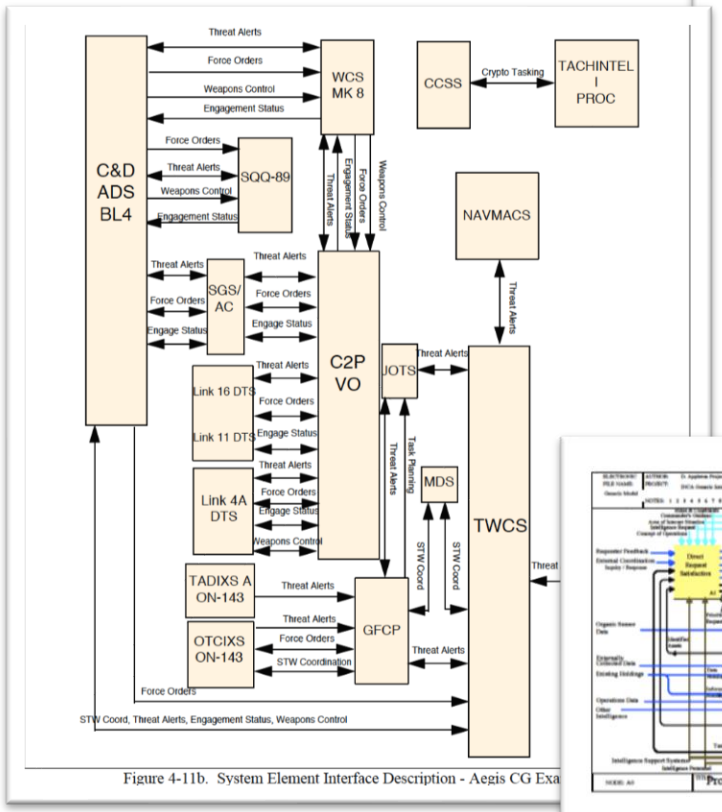


Figure 4-11b. System Element Interface Description - Aegis CG Exa

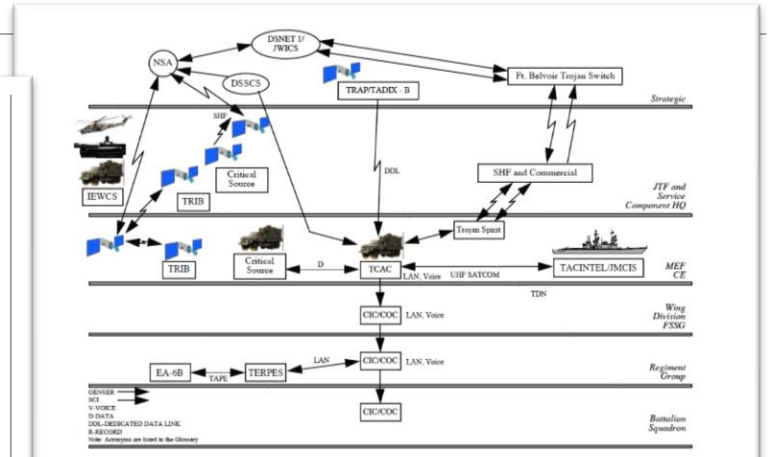


Figure 4-9b. Systems Node Connectivity Description Example - USACOM CIAD

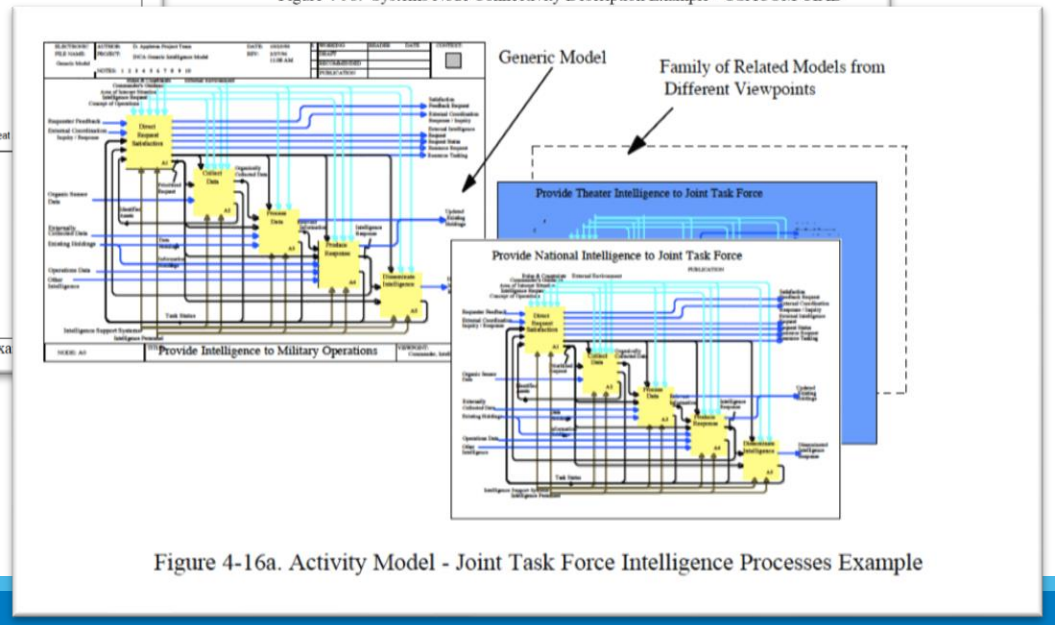


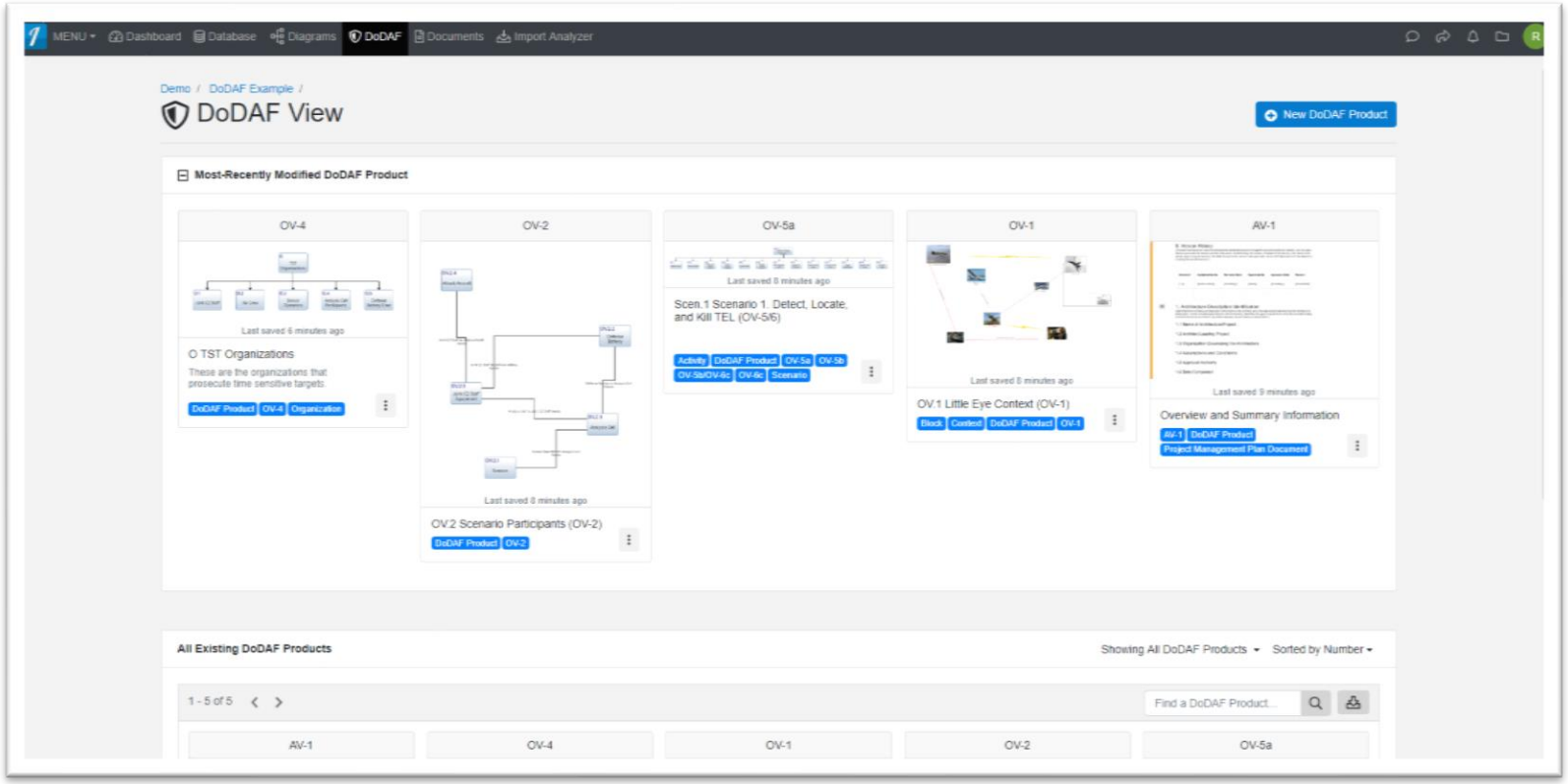
Figure 4-16a. Activity Model - Joint Task Force Intelligence Processes Example

How Can We Implement these Frameworks?

- The complexity of the Frameworks, as now described by OMG, means that we need to rely on tools to implement them
- It also means that using these Frameworks may force systems engineers to use their other standard: SysML
- Since SysML itself is a very complicated “language” that few outside the systems engineering community understand or accept, DoD should be cautious of this approach
- We (SPEC Innovations) have tried to implement these frameworks using the LML ontology, extended to not only DoDAF MetaModel 2.0 (those mappings were outlined in version 1.0 of the LML standard), but also to add entity classes, relationships and attributes (if required) for the UAF
- As a result we are providing a new DoDAF Dashboard capability in Innoslate 4.1

How Do We Implement these Frameworks?

- New DoDAF Dashboard
  - Similar to our Documents and Diagrams Views
- New Timeline Diagram
  - To enhance those views requiring a roadmap
- New OV-3/SvcV-6/SV-6 View using our Database View technology



How Do We Implement these Frameworks?

- These views can easily be extended to the UAF
- Development of a UAF dashboard will occur if sufficient user demand requires it
  - A mapping has already been made and implementation will be simple
- However, it seems unclear to us the value of this new framework
  - Adding complexity on complexity seems to us to be the wrong way to go
  - We need to establish clear, simple language so that anyone we work with can understand what we are trying to say
  - We believe that LML provides a much better approach (data-centric) with a simple and easy to understand ontology, as well as simplified diagrams

Summary

- Frameworks can have value, but only when they are implemented in a way anyone can understand
- We must always remember that as systems engineers our primary role is to act as the translator between all stakeholders
- If these frameworks aid in that goal, then they will have value
  - Obviously if they don’t help communicate, then they are a detriment to all stakeholders