



DoD Architectures and Systems Engineering Integration

NDIA 15th Annual Systems Engineering Conference

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Office of the Chief Information Officer

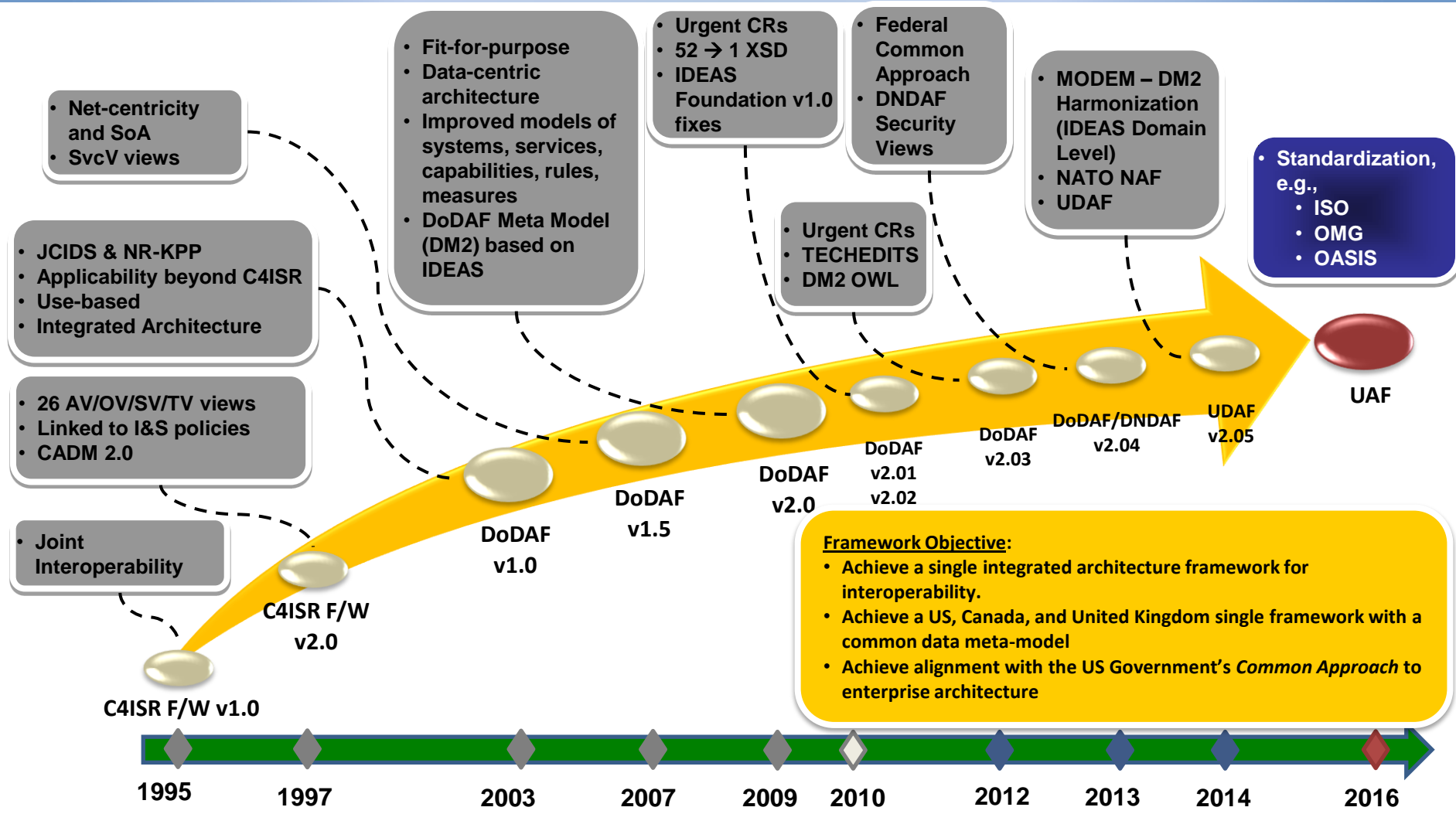


Five Topics

1. DoDAF evolution plan
2. Fit-for-purpose (FFP) and legacy views
3. DoDAF reification, requirements, and SE “V” model
4. DoDAF meta-model for:
 - DOTMLPF
 - temporality, behavior, scenarios, M&S, executable architectures
5. DoDAF artifacts X SE documents and artifacts



DoDAF Evolution Plan





Initiatives: Federal Government Common Approach

primary outcomes (4)

levels of scope (8)

basic elements of an EA program (8)

THE COMMON APPROACH TO FEDERAL ENTERPRISE ARCHITECTURE

May 2, 2012



sub-architecture domains (6)

50 document artifacts

reference models (6)



Draft Artifact Working Group

Strategy Domain Artifacts			Business Domain Artifacts		
S-1	Strategic Plan	DoDAF CV-1, 2, 3, 5, 6 (Capability Effects, Hierarchy, Schedules, Deployments, and Activities)	B-1	Business Service Catalog	DoDAF SvcV-1 (Service Composition)
S-2	Concept Overview Diagram	DoDAF OV-1 (Operational Concept)	B-2	Business Service Capabilities	DoDAF CV-7 (Capabilities Services)
S-3	Capability Effects	DoDAF CV-1 (Capability Effects)	B-3	Business Case / Alternatives Analysis	OMB Exhibit 300
S-4	Capability Deployments and Dependencies	DoDAF CV-3, 4, 5 (Capability Schedules, Dependencies & Deployments)	B-4	Business Value Chain	DoDAF OV-2 (Organizations and Resources)
S-5	Capability Hierarchies	DoDAF CV-2 (Capability Hierarchies)	B-5	Business Process Model	DoDAF OV-5a&b (Operational Activities), Operational Activity Diagram, Business Process Diagram
S-6	Organization Chart	DoDAF OV-4 (Organizational Relationships)	B-6	Business Process Services	DoDAF SvcV-5 (Service Operational Activities Support)
S-7	SWOT Analysis		B-7	Business Process Sequences	OV-6c (Operational Activity Sequences)
S-8	Knowledge Management Plan		B-8	Concept of Operations (CONOPS)	DoDAF OV-6c (Operational Activity Sequences)
S-9	Architecture Summary	DoDAF AV-1 (Executive Summary)	B-9	Business Transition Plan	DoDAF PV-2 (Project Schedules), Business Operating Plan
S-10	Architecture Dictionary	DoDAF AV-2 (Dictionary)	B-10	Operational Performance Measures	DoDAF OV-6a (Operational Rules)
S-11	Balanced Scorecard (BSC)	Performance Measures Scorecard	B-11	Project Plan	DoDAF PV-2 (Project Schedules) and PV-3 (Projects and Capabilities)



Convergence Approach for NAF: IDEAS Layered Approach



1. Foundation (upper ontology)

- ✓ 1. Ontologic concepts and relationships
- 2. Commonly used patterns (e.g., resource flow, exchange)
- 3. Consensus concepts and relationships (e.g., person, organization, material)

2. Common patterns

3. Common architecture domain objects & relationships

X X X X

NAF views

national views

national views

national views

Views for:

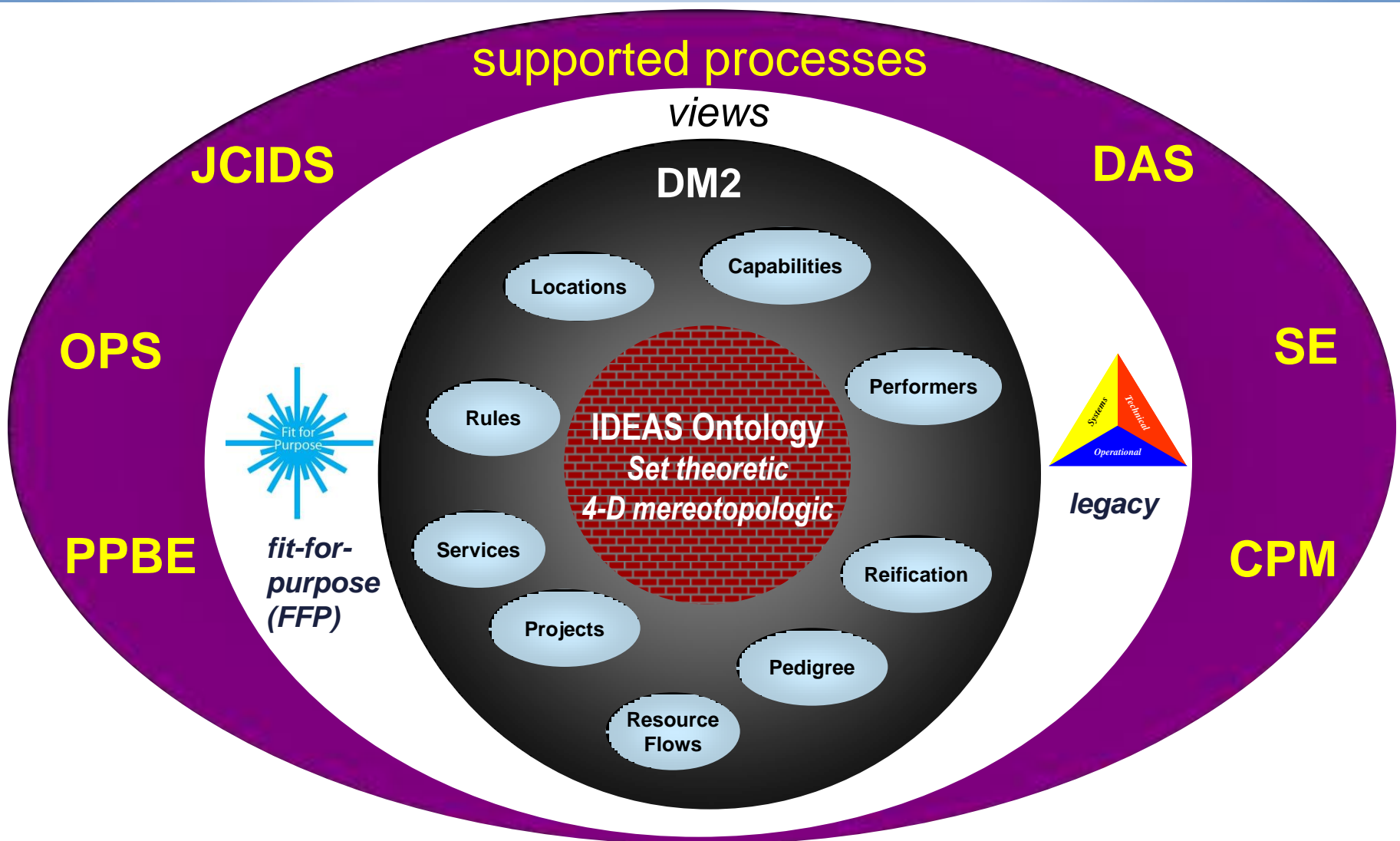
- 1. NATO "core" architecture views
- 2. specific to needs and policies of individual nations



Fit For Purpose (FFP) Views



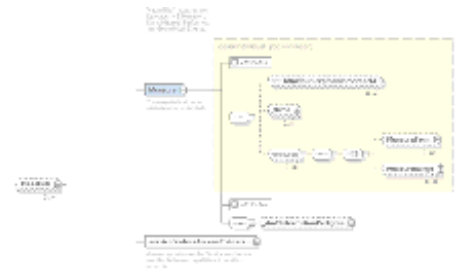
Fit For Purpose (FFP) and Legacy Views





DM2 Has Three Model Levels

- Conceptual Data Model (CDM)
 - Concepts and concept relationships
 - Propositions and definitions validated by SMEs
- Logical Data Model (LDM)
 - Reified and formalized relationships
 - This is where almost all DoDAF design and analysis work is done
- Physical Exchange Specification (PES)
 - XML encoding of LDM
 - Auto-generated from the LDM
 - No need to look at (unless you are a tool programmer)

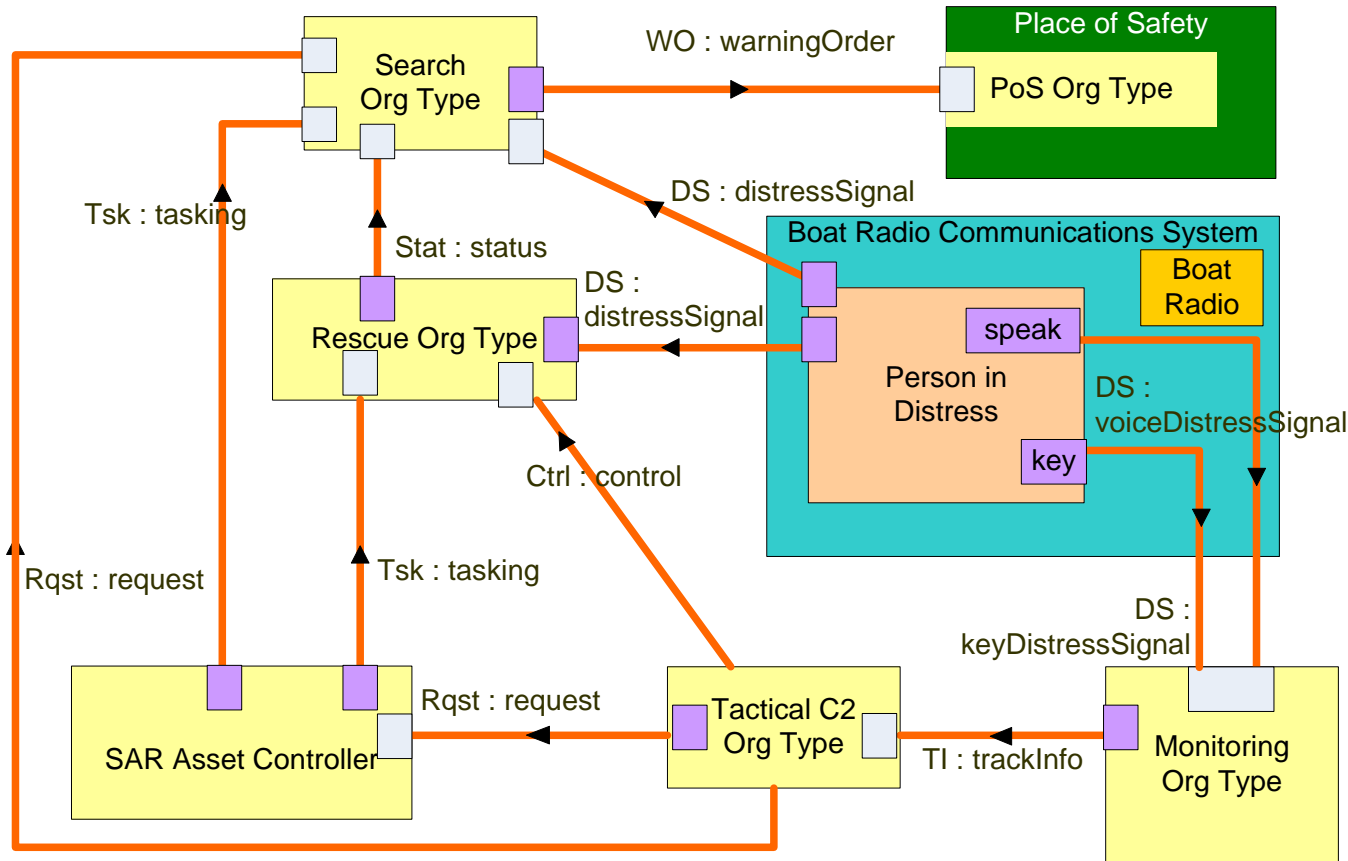




Example FFP: OV-2 / SV-1 Hybrid

OV-2 [Architectural Description] Organizational Interactions

Bounding box means Resource at Location



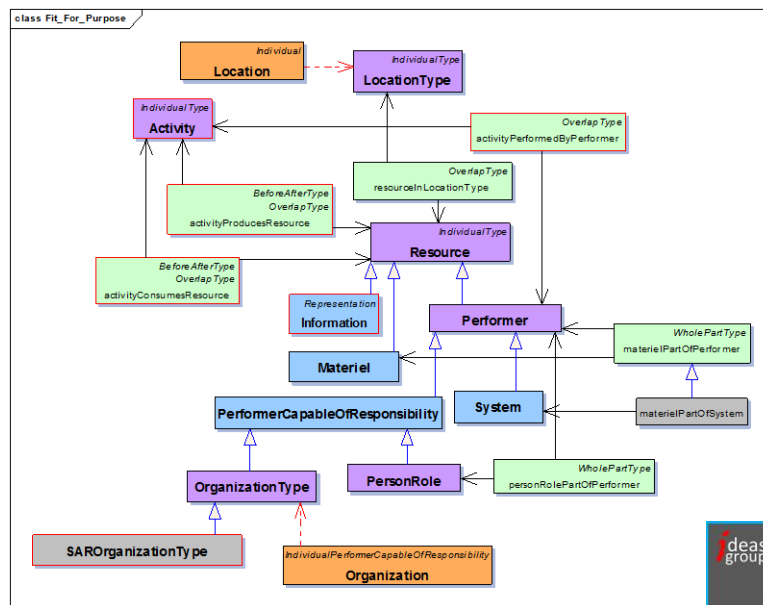
Legend:

- Location Type (Green box)
- PersonType (Orange box)
- Organization Types (Yellow box)
- Resource Flows (Orange arrow)
- Information (Resource) (Grey square)
- Consume (Activity) (Grey square)
- Produce (Activity) (Purple square)
- System (Cyan box)
- Materiel (Yellow box)



Creating a FFP Model

- Use the DM2 Logical Data Model.
- Create a new diagram. Drag DM2 elements onto the diagram.
- Extend classes (including relationship classes) as needed.
- Use the IDEAS Profile to generate XSD.
- Develop narrative documentation.
- Share XSD and documentation with your COI.



IDEAS Ontology Plug-In
Model Futures Ltd 2005-2010
All executable code copyright Model Futures Ltd 2005-2010
This Plug-In uses the Model Futures Desktop Ontology Engine (Demonstration License)
Beta 1 - Build: []

FFP.XSD
W3C XML Schema
412 KB

FFP.XML
XML Document
14 KB

Tutorial at www.rdte.us/FFP tutorial

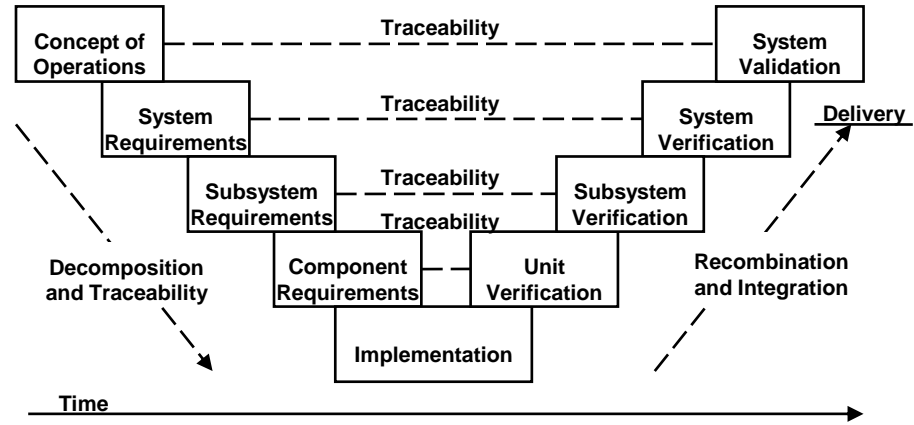
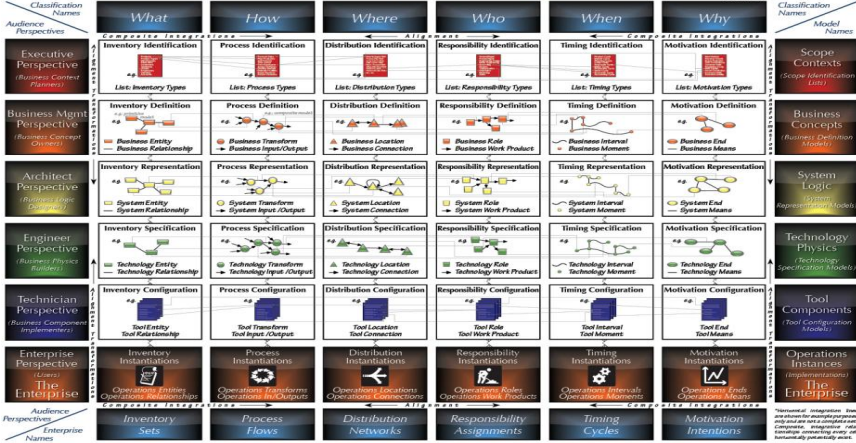


DoDAF reification, requirements, and SE “V” model

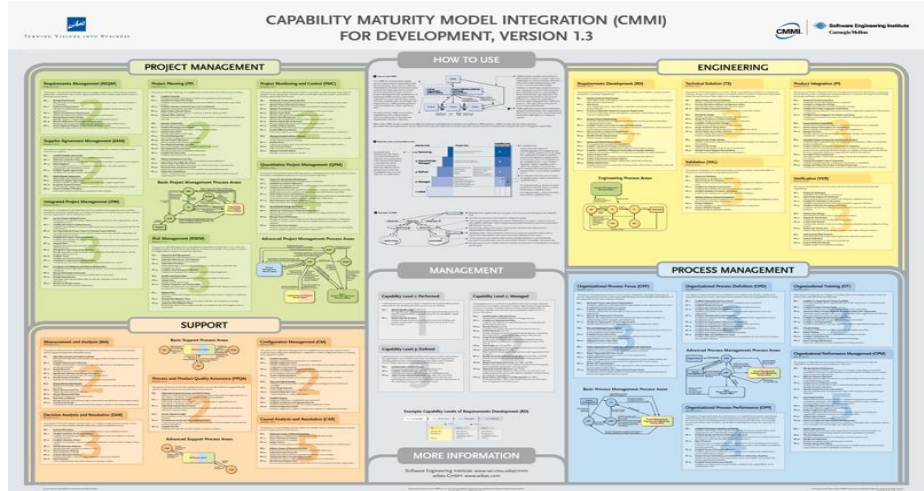
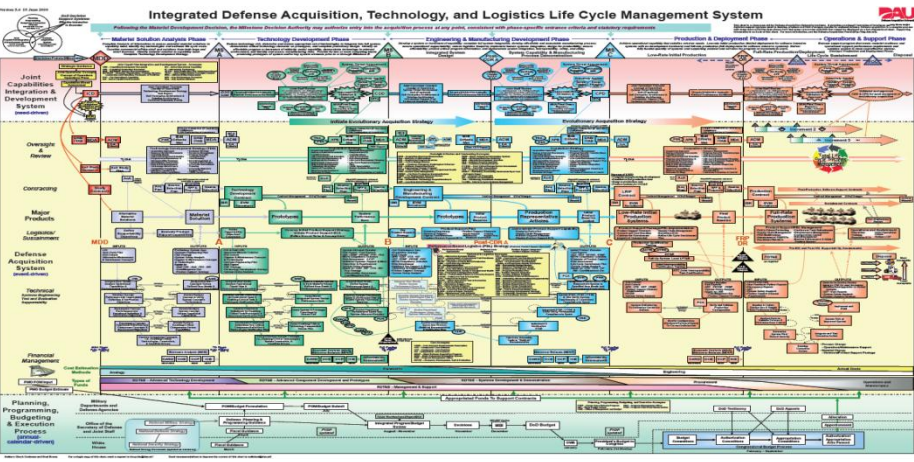


Some Life-Cycle Models

The Zachman Framework for Enterprise Architecture™ The Enterprise Ontology™



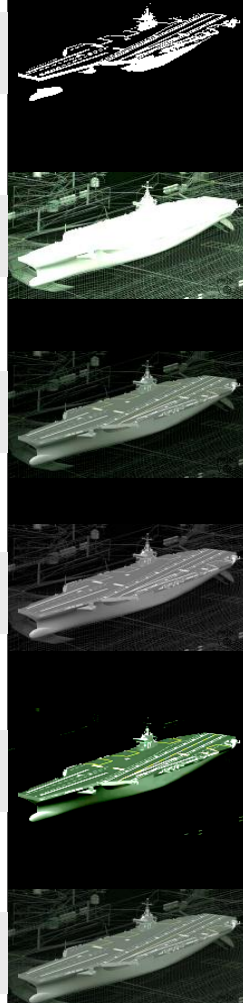
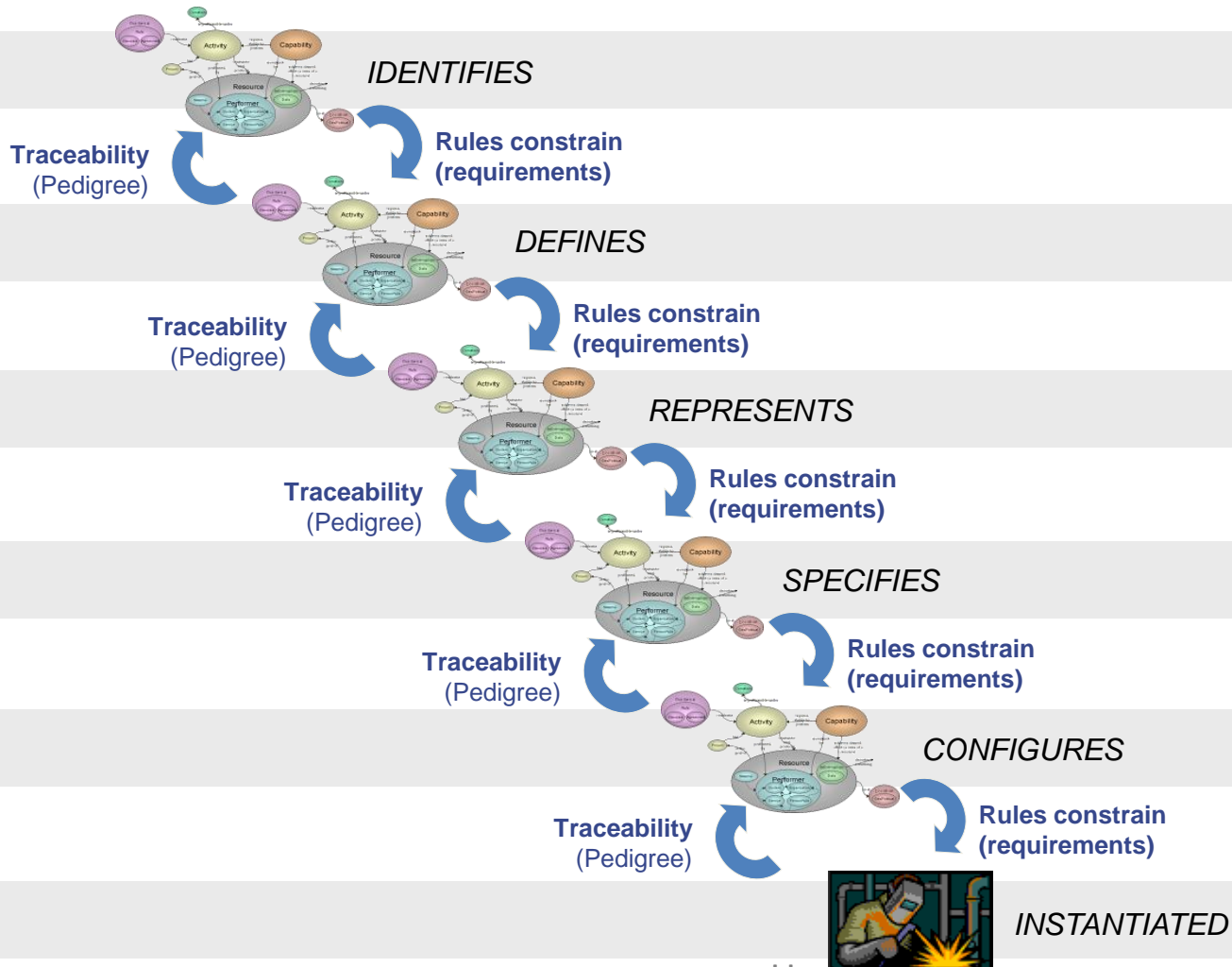
When you look up it's requirements
When you look down it's design





How DoDAF Supports Reification

AN ARCHITECTURAL DESCRIPTION:





Reification Pattern Applies To:

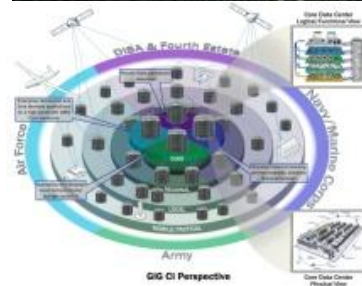
- Capabilities
- Acquisitions
- Consolidations
- Migrations
- Life-Cycle Sustainment



JIE



CVN-79



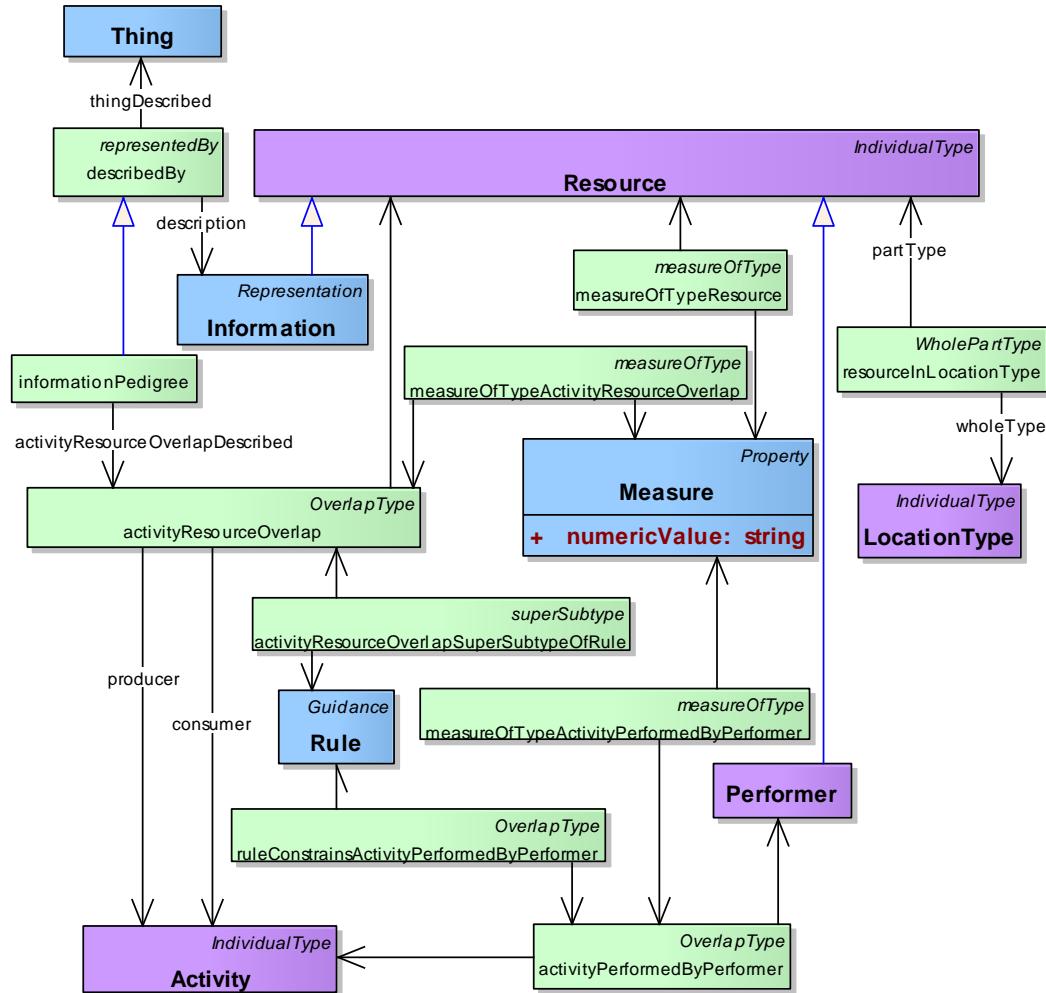
Data Center Consolidation



DoD Enterprise Cloud Environment



Plumbing is via Pedigree (Provenance)



- workflow model, e.g., open provenance model (provenance = linked together pedigrees)
- = activity model (OV-5 + 6c)
- “link while you think”



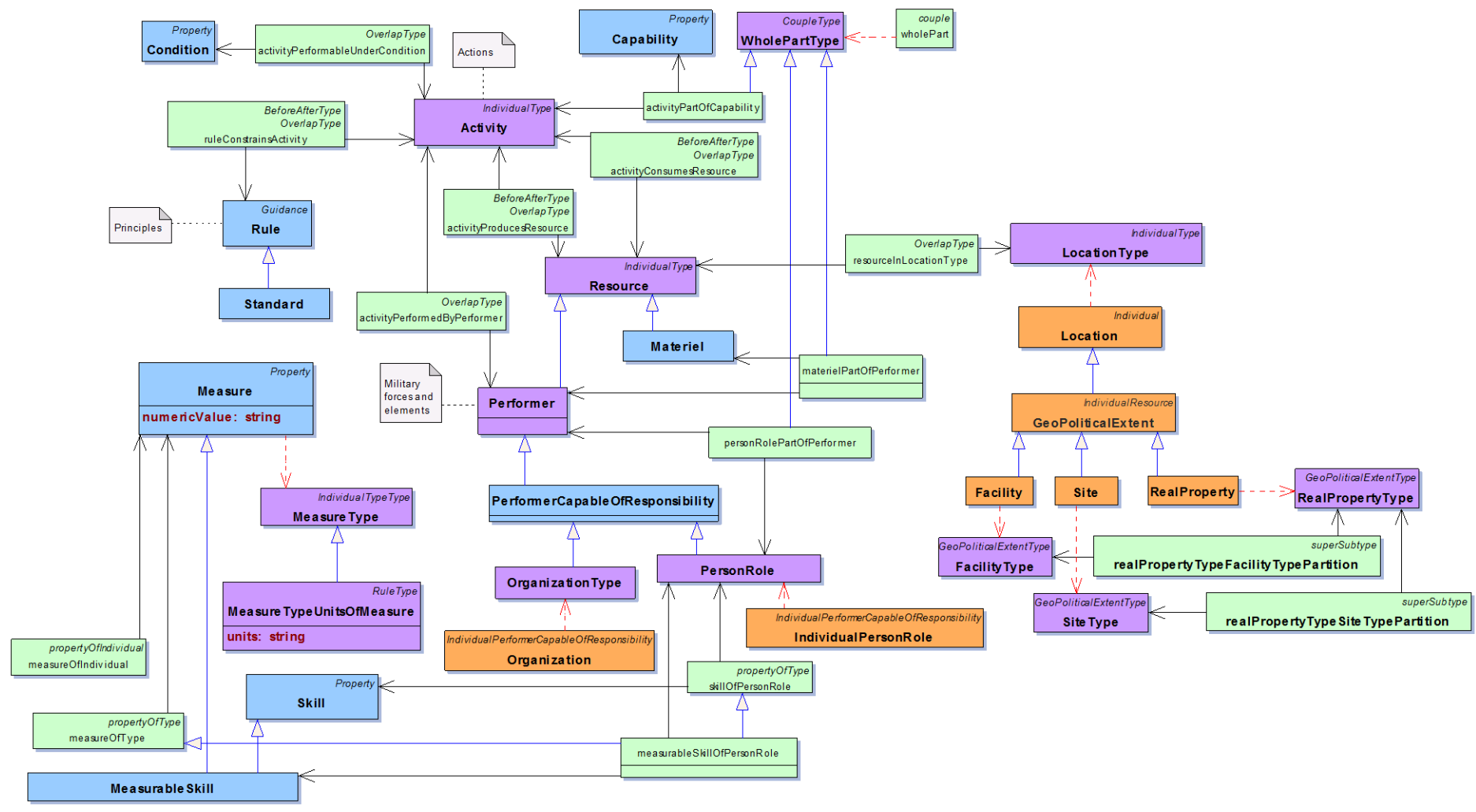
DoDAF meta-model for:

- DOTMLPF
- temporality, behavior, scenarios, M&S, executable architectures



DOTMLPF

class DOTMLPF

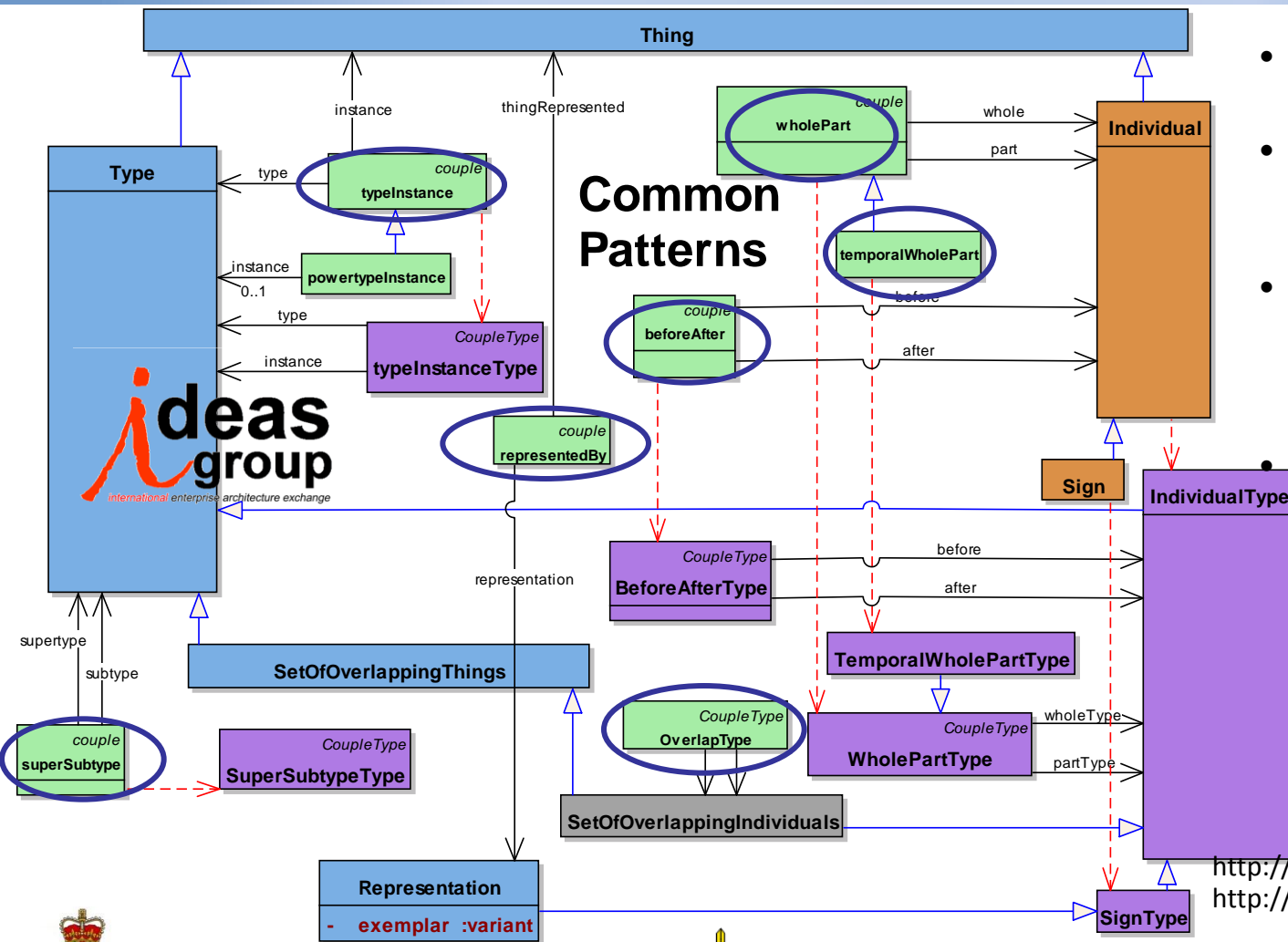




Temporality, Behavior, Scenarios, M&S, Executable Architectures



DM2 is founded on 4D ontology



- Four dimensionalist -- xyzt
- Extensional -- physical existence is the criterion for identity
- Signs and representations are separated from referents

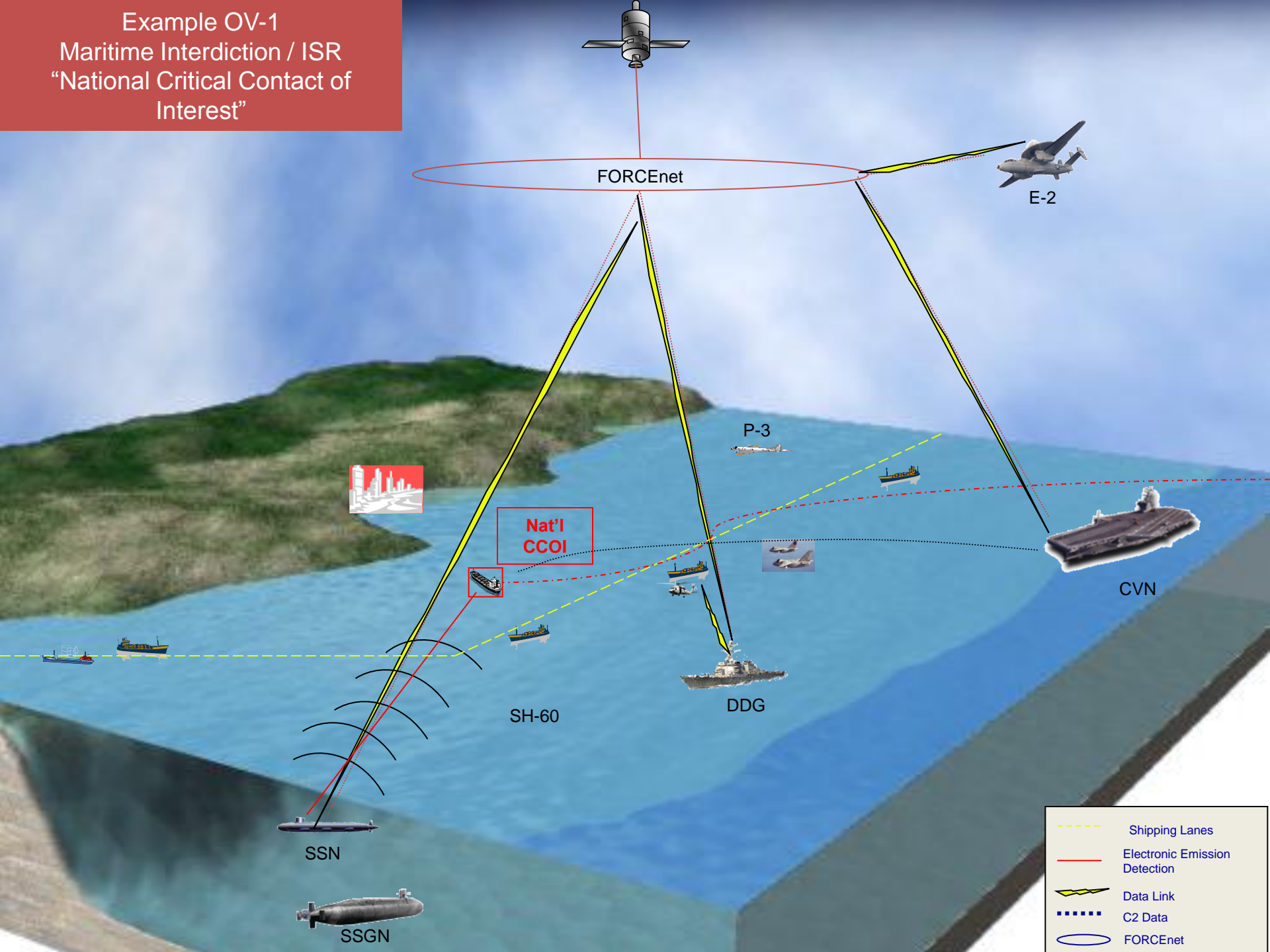
Mathematics:

- Type theory ~ Set theory
- Mereology (wholes and parts)
- 4D Mereotopology (spatio-temporal relations)

<http://www.ideasgroup.org>
http://en.wikipedia.org/wiki/IDEAS_Group



Example OV-1
Maritime Interdiction / ISR
"National Critical Contact of Interest"



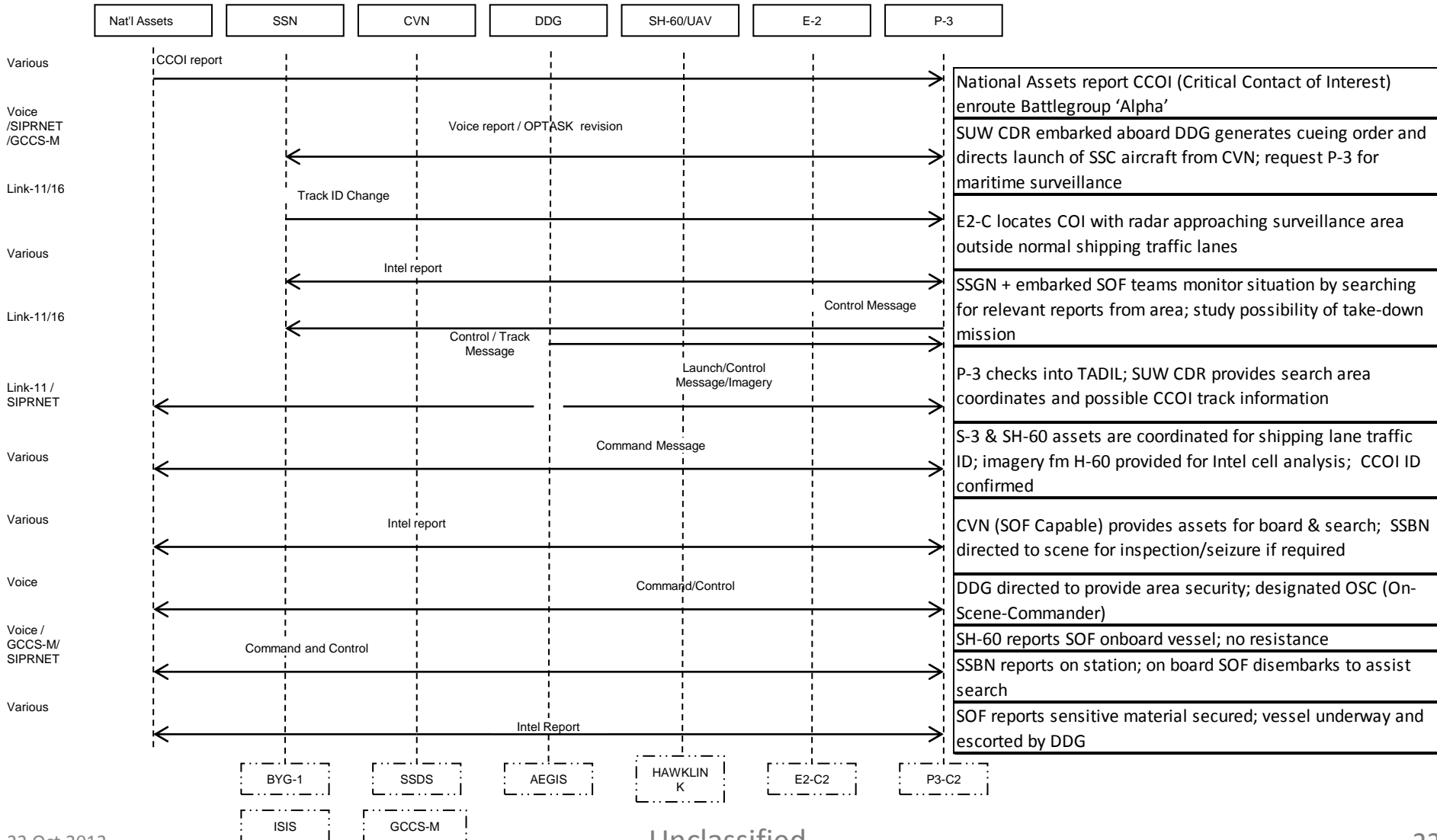


Unclassified

Maritime Interdiction / ISR Scenario

“Critical Contact of Interest Surveillance and Prosecution”

OV-6c Sequences



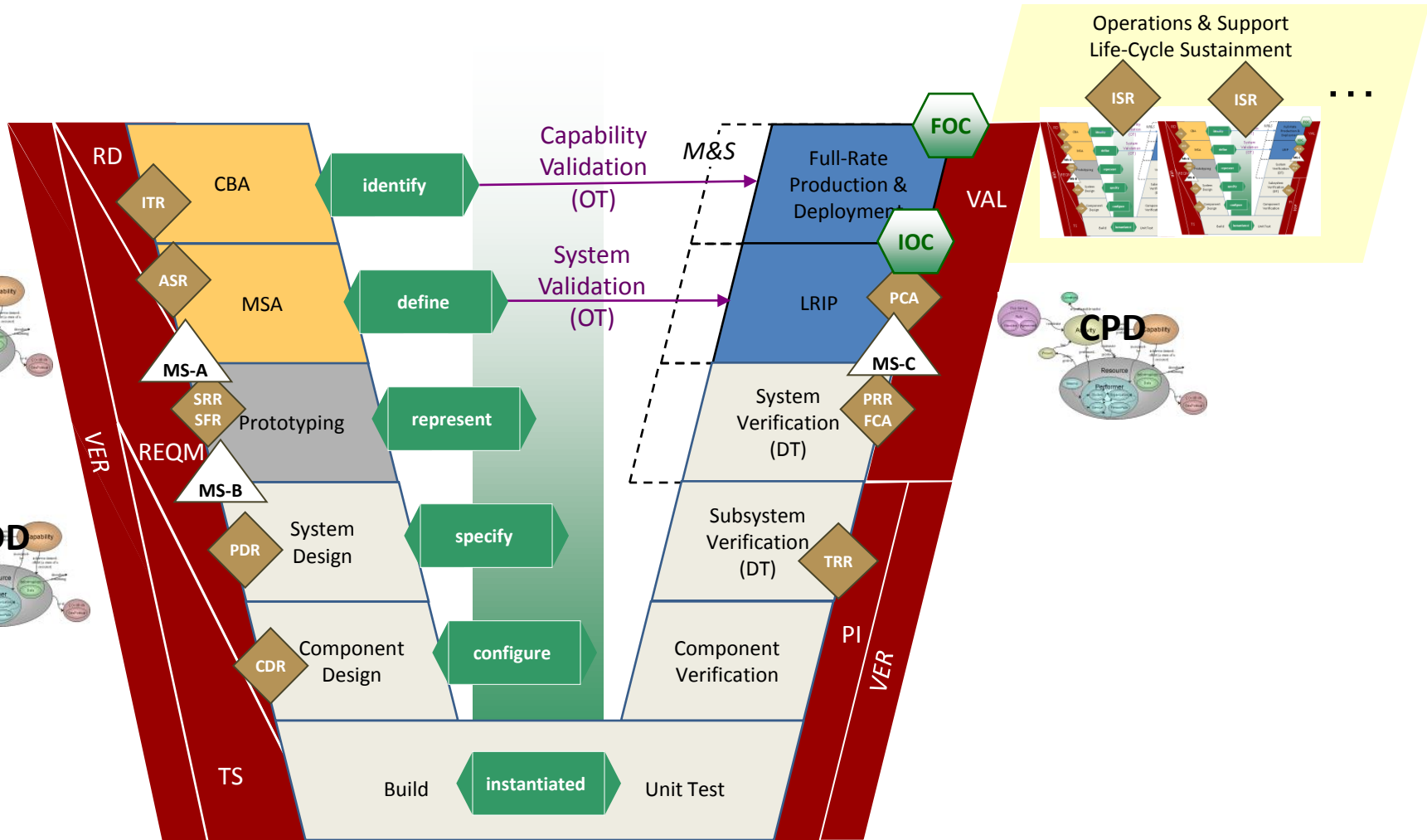
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DoDAF and SE Documents and Artifacts



DoDAF Artifacts Overlaid on "V"





Notional Systems Engineering Documents with embedded DoDAF artifacts

- System Specification (SSS, SDS, SDD, etc.)
 - Functional Description – SV-4
 - Performance Specification – SV-7
 - Interfaces – SV-1, high-level SV-2 and 6
 - Standards to Comply – StdVs mapped to SV's
 - Components – SV-1
- Interface Specification (IRS, ICD, etc.) – SV-2 and 6, possibly linked to DIV-2 and 3

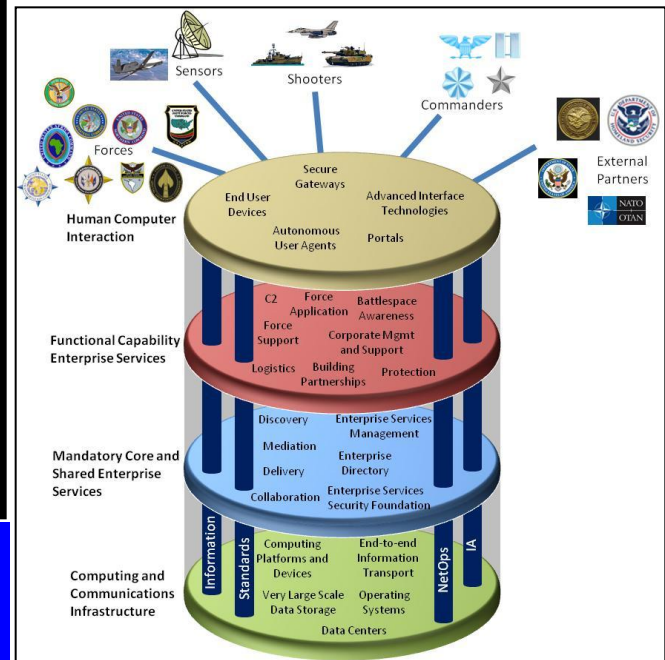


Elements of Quality Architecture

- *Single Architecture Framework*
- *Policy, Direction, Guidance*
- *Exchange*
- *Architecture Tools*
- *Certified Architects*

Enabling efficient and effective acquisition of hardware, software and services used by DoD and Partners in mission performance.

Unified Architecture Framework





Summary

- DoDAF is foundational to Federal Government and NATO
- FFP + DM2 enables more sophisticated modeling than legacy views
- DoDAF's model for reification supports many life-cycle models, including SE "V"
- The DoDAF Meta Model (DM2) was designed to allow modeling beyond the legacy views
- DoDAF artifacts, SE documents, and artifacts should be complimentary



Unclassified

DoD Architectures and Systems Engineering Integration

Questions?