DoDAF 2.0 Meta Model (DM2)

Walkthrough

DoD EA Conference

1 June 2009
Briefing Outline

- Background
  - Why an EA meta model?
  - History and Lessons Learned
  - So – DM2 Methodology

- Walkthroughs:
  - Conceptual Data Model
  - Logical Data Model
  - Physical Exchange Specification

- How to get engaged
Background
DoDAF 2 Goals

- Support the Department’s core processes:
  1. Capabilities Integration and Development (JCIDS)
  2. Planning, Programming, Budgeting, and Execution (PPBE)
  3. Acquisition System (DAS)
  4. Systems Engineering
  5. Operations Planning
  6. Capabilities Portfolio Management (CPM)

- Establish guidance for architecture content as a function of purpose – “fit for purpose”

- Increase precision of architectures by defining architectures principally in terms of data with diagrams (presentations) related to the data – the DoDAF Meta Model (DM2)
DoDAF Meta Model (DM2)

- **Purposes:**
  - The *vocabulary for description and discourse about DoDAF models* (formerly “products”) and core process usage
  - The basis for generation of the “physical” exchange specification for exchange of data between architecture tools and databases.
  - Supports discovery and understandability of architecture datasets:
    - Discovery DM2 categories of information
    - Understandability thru precise semantics augmented with linguistic traceability

- **Form:**
  - VOLUME I, DoDAF Conceptual Data Model (CDM)
  - VOLUME II, DoDAF Logical Data Model (LDM)
  - VOLUME III, DoDAF Physical Exchange Specification (PES)
Volume II is Organized Around the DM2

Vol II
1. Perspectives
2. Metamodel Data Groups
3. Views

DM2 Data Groups
1. Performer
2. Resource Flow
3. Information & Data
4. Activity
5. Training / Skill / Education
6. Capability
7. Services
8. Project
9. Goals
10. Rules
11. Measures
12. Location

for each data group:
- x.y.1 Data – what are the concepts and how are they related
  - Diagram and definitions from DM2
  - Discussion
- x.y.2 Method
  - Data collection and model construction methods -- how is such information collected and assemble
  - Usage in Core Processes – how is such information used in budgeting, acquisition, capabilities integration and development, systems engineering, capabilities portfolio management, and operations planning
- x.y.3 Presentation – what are ways this kind of information can be presented
DM2 Workgroup

- Weekly Sessions on DCO
- Collaboration Site:
  - Current DM2 walkthrough briefing
  - Baseline DM2 CDM, LDM, and PES
  - Developmental DM2
  - IDEAS Foundation
  - Reference and Research folders
- Now the DM2 Configuration Management (CM) body

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DoDAF Metamodel Walkthrough 2009-04-17.ppt

Baseline

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<td>24-Apr-09</td>
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Logical Data Model

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Working Copy

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IDEAS Foundation 1.0

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</table>

Miscellaneous

- Research folders for different topics the DM2 WG has researched
- Reference folders for many source models such as UML
- TACIS Flows and Briefings folder with latest DM2 and Data TACIS briefings and meeting documents

Next meeting scheduled for:

Friday, May 29, 2009, 1:00-5:00 PM EDT

https://meet.google.com/abcd-efgh-ijkl

Meeting ID: 795-456-987

Other links:

- DoDAF website
- DoDAF Wiki (with links to) IDEAS and BORO website
- Link to BORO methodology book, “Business Objects Re-engineering for Reuse” by Chris Partridge
Coordination with many related activities

- Cross group coordination:
  - Object Management Group (OMG) Unified Profile for DoDAF and MODAF (UPDM) & System Modeling Language (SysML) teams
    - DM2 Coordination with teams in mutual telecons, OMG meetings, DM2 Working Group,…
    - Future – UPDM 2 based on DoDAF 2.0
  - Business Transformation Agency (BTA) Primitives and Lexicon
  - Core Enterprise Services – to – Tactical Edge (CES2TE)
  - ASN RDA and JFCOM Modeling and Simulation
  - Joint Test and Evaluation Methodology (JTEM)
  - DoD Meta Data Working Group (MDWG)
  - MODAF and NAF (via IDEAS)

- Pilots:
  - JFCOM JC2 Architecture and Capability Assessment Enterprise (JACAE) – MARCORSYSCOM MCAE – TRADOC Capabilities, Analysis, Development, and Integration Environment (CADIE) federated data exchange pilot
  - SPAWAR / ASN RDA Naval Architecture Elements Reference Guide (NAERG)
  - OPNAV N6 SoA “dashboard”
  - Army G6
  - Enhanced Information Support Plan (EISP)
Conceptual Data Model
Conceptual Data Model Development Process

1. Overviews of Models
2. Collect the terms
3. Make a pass on the “Core” Terms
   - 1 = Core, critical to process or very common in architectures
   - 2 = Derived or less common
   - 3 = TBD
   - 4 = TBD
   - 5 = TBD
4. Gather authoritative definitions for “Core” terms
5. Group related terms
6. Proposed definitions (+rationale, examples, and aliases)
7. Relationships
8. Relationship Types

Partial Draft – proposed definitions, some harmonization (e.g., via super/subtyping, determining aliases)
Interim Draft – Initial relationships (e.g., “performs”, “part-of”, …)

CDM version 0.1
1. Concepts (defined)
2. Relationships (some typing, e.g., super/sub, cardinality)

12/3 Strawman – list of important or recurring “core” words/terms/concepts with source definition(s)

5/1 Overviews of Models
6/1 Proposed definitions
7/1 Relationships
Sources

Models
a. CADM 1.5  
b. IDEAS  
c. UPDM  
d. BMM  
e. Hay/Zachman  
f. ASM  
g. CRIS  
h. Conceptual CADM in DoDAF 1.0 / prototype CADM 2.0  
i. M3  
j. NAF Meta Model  
k. DoI Meta Model  
l. JC3IEDM  
m. GML  
n. UCORE 1.1  
o. GEIA 927  
p. AP233  
q. SUMO and ISO 15926 (via IDEAS)  
r. FEA Reference Models  
s. JFCOM JACAE

Definitions
1. IEEE  
2. ISO  
3. W3C  
4. OMG  
5. EIA  
6. DODD & DODI  
7. JCS Pubs, especially CJCSI's  
8. Models in the Source_Candidates_071115.ppt  
9. DoDAF  
10. Other frameworks: Zachman, MODAF, TOGAF, NAF, ...  
11. FEA  
12. BMM  
13. Wordnet  
15. English dictionaries  
16. DoDAF Glossary
Modeling Principles

- Model Core Process (PPBE, DAS, JCIDS, CPM, SE, Ops) business objects
- Terms enter model through thorough semantic research:
  - Assignment to a researcher
  - Collection of authoritative definitions, documenting source
  - Assessment of redundant (alias) or composite terms
  - Formulation / selection of definition based on authoritative definitions
  - Examples
  - Outbrief to team
  - Recording of research and decision rationale
- No need to distinguish / label concepts that differ only in level of aggregation – e.g., subfunction – function. Whole-part relationship covers the need without different names for different types of wholes and parts. When a user has need to label, the naming pattern accommodates.
- Typed Relationships, e.g., using IDEAS
- No commitment to an implementation type. Support RDBMS, XSD, Java, etc. from core model
- Goal is a core that can be extended by user communities, not to try to cover all user detail. Extenders should be careful to not create redundant representations.
- Model will enter a CM process
<table>
<thead>
<tr>
<th>Technical Term</th>
<th>Composite Definition</th>
<th>Source/Current Definition (source) definition</th>
<th>Definition / Exclusion Rationale and other Comments</th>
<th>Examples</th>
<th>Potentially Related Terms or Aliases</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>A functionally, physically, and/or behaviorally related group of regularly interacting or interdependent elements.</td>
<td>(DoDAF): Any organized assembly of resources and procedures united and regulated by interaction or interdependence to accomplish a set of specific functions. (DoDAF/CADM): An organized assembly of interactive components and procedures forming a unit (DDDS Counter (19607/1)(A)). (MODAF): Any organized assembly of resources and procedures united and regulated by interaction or interdependence to accomplish a set of specific functions. (IEEE): A collection of components organized to accomplish a specific function or set of functions. (BEA): Any organized assembly of resources and procedures united and regulated by interaction or interdependence to accomplish a set of specific functions. (NAF): A collection of components organized to accomplish a specific function or set of functions. (GEN TERM) (JCS 1-02): A functionally, physically, and/or behaviorally related group of regularly interacting or interdependent elements; that which serves a particular purpose and is identified by the service it provides rather than by its content. (NAF): Physical Asset: A &lt;&lt;Resource&gt;&gt; that can host systems and/or people. Note 1: synonyms for &lt;&lt;PhysicalAsset&gt;&gt;: would be &quot;platform&quot;, &quot;facility&quot;, or &quot;host&quot;. This is the original intent for the SystemsNode concept in DoDAF. (MM) (JCS 1-02): A real property entity consisting of one or more of the following: a building, a structure, a utility system, pavement, and underlying land. See also air facility. (Webster’s): 1. Something designed, built, installed, etc., to serve a specific function affording a convenience or service. 2. Something that permits the easier performance of an action, course of conduct, etc.</td>
<td>JP 1-02 is most authoritative. Agree we can use &quot;system&quot; for now; suggest we’re going to need the other two Real Quick.</td>
<td>DDDS + JCS + 4165</td>
<td></td>
</tr>
<tr>
<td>Facility</td>
<td>Real property, having a specified use, consisting of one or more of the following: a building, structure, or linear structure. Facilities are parts of Sites which are parts of Installations.</td>
<td>(DoDAF/CADM): Real property, having a specified use, that is built or maintained by people. (DDDS Counter (334/1)(A)). (JCS1EDM): An ObjectItem that built, installed or established to serve a particular purpose and is identified by the service it provides rather than by its content.</td>
<td></td>
<td>weapon system, UAV, GCSS, JOPES, GSORTS, GTN, any specific DCGS</td>
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### Definitions and Aliases Record Excerpt

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| Actor          | A performer that is external to and invokes the performer to be architected. | (DoDAF): A coherent set of roles that users of use cases play when interacting with these use cases. An actor has one role for each use case with which it communicates.  
(NAF): An actor is an implementation independent unit of responsibility that performs a certain role. (ARCH ELEM)  
(Webster’s): 1. One who takes part; a participant. 2. A person who does something | Since we have "performer" to stand for the general concept, it makes sense to define "actor" law UML.  
Comment #1: Since we don't need to support specific methodologies at this point, recommend delete.  
Comment #2: I don't see ACTOR as a candidate. Because DoD is not in the movie, television or theatre business and because this term is used in the context | A customer who triggers an organizational process ("end-to-end" or value chain); a user who invokes an automated function | User, customer, agent, performer |
| Role           | A set of similar or otherwise logically related activities, implying a set of skills or capabilities, to which a performer may be assigned. | (DoDAF): A function or position. (Webster’s)  
(DoDAF/CADM): OperationalRole: The specification of a set of abilities required for performing assigned activities and achieving an objective. (DDDS Counter (19607/1)(A))  
(MODAF): A function or position filled by a person or organisation.  
(NAF): An aspect of a person or organisation that enables them to fulfill a particular function. (MM)  
(IDEAS): An AgentRole is an AgentState where the agent is conducting processes.  
(Webster’s): 1. A function or position. 2. The actions and activities assigned to or required or expected of a person or group. | The role is not the performer, but we have other concepts to capture a logical structure of activities. Useful, however, to be able to extract activities by performer.  
Cross-reference between two more basic concepts is derivative; recommend delete until we go to logical. | Any set of activities to which a single performer may be assigned; an MOS or any other definition of a set of related skills that a single performer might have | composite term |
Key Concepts

- Activity
- Agreement
- Architecture Description
- Capability
- Condition
- Constraint
- Data
- Desired Effect
- Guidance
- Information
- Location
- Materiel
- Measure

- Measure Type
- Organization
- Performer
- Person Type
- Port
- Project
- Resource
- Rule
- Service
- Skill
- Standard
- System
- Vision

(see handout or briefing notes for definitions)
(see handout or briefing notes for relationship key descriptions)
Interrogatives Relationship
UCORE 2.0 Who, What, When, Where
Logical Data Model
IDEAS is more than OWL:

- Based on mathematics
  - set & 4D meronymy theory
- Deals with issues of states, powertypes, measures, space
  - what is truly knowable vs. what is assumed

Domain concepts are extensions to the formal foundation

- Everything in the EA Domain inherits from the foundation
- Rigorously worked-out common patterns are reused
- Saved a lot of repetitive work – "ontologic free lunch"
- Result is higher quality and consistency throughout

Examples:

- System A1 (part) wholePart System A (whole)
- Activity A (before) beforeAfter Activity B (after)
- Capability Increment temporalWholePart of Capability
- Organization typeInstance Organization Type
- Location A overlap Location B
- System (subtype) superSubType System (supertype)
1 June 2009

The BORO book is downloadable from DM2 site.
Why Formal Ontology?

Corresponds to the real world being modeled:

- Physical objects that have parts, can be aggregated into larger wholes – both spatially and temporally
  - The parts don’t have to be contiguous, e.g., parts of a squadron
  - The objects have a lifetime (temporal extent) that can be broken into temporal states
  - Only one object can occupy the same spatio-temporal extent
  - Examples: \( A \text{ part-of } B \land B \text{ part-of } C \Rightarrow A \text{ part-of } C \)
    \( A \text{ before } B \land B \text{ before } C \Rightarrow A \text{ before } C \)

- Things are categorized
  - Multiply
  - Categorization should follow the rules to set theory, e.g.,
    \[
    A \subseteq B \land B \subseteq C \Rightarrow A \subseteq C
    \]
    \[
    a \in A \land A \subseteq B \Rightarrow a \in B
    \]
    \[
    \text{if } \{A_i\} \text{ forms a partition of } A \text{ then } a \in A_j \Rightarrow a \notin A_k \forall j \neq k
    \]
Why Formal Ontology (cont’d)

- **Why is this better? “is-a” example:**
  - Not mathematically rigorous:
    
    Vladimir Putin is-a human is-a mammal is-a species $\Rightarrow$ Putin is-a species
  - More precise: Putin $\in$ human $\subset$ mammal $\in$ species
    
    $\Rightarrow$ Putin $\in$ mammal; Putin $\in$ species

- “Has” – the basis of fields and attributes is flawed too

- **More precise:** Define the powerset of $A$ as the set of all subsets of $A$:
  
  $\mathbf{P}(A) = \{\emptyset, \{a_1\}, \{a_2\}, \ldots, \{a_n\}, \{a_1, a_2\}, \{a_1, a_3\}, \ldots, \{a_1, a_2, a_3\}, \ldots\}$

  Then:
  
  $B \subset A \Rightarrow B \in \mathbf{P}(A)$

  if $A \subset \mathbf{P}(A) \exists \forall a_m \in A \exists A_i \in A \exists a_m \in A$

  then $A$ is called a "property-of" $A$ or $A$ "has" $A$

  If $A \equiv \{A_i\}, A_i \subset A \exists A$ is a partition over $A$

  then $A$ is called a "unique property-of" $A$

- **Does this really matter – all the time – fouls queries, analysis algorithms, and interoperability**

- **Why did this happen?** Database design had in origins in form automation, not mathematical analysis – good for storing stuff to be processed by humans – terrible for automated processing as in data fusion
Diagram Conventions and Use of UML

- **<<Individual>>** An instance of an Individual - something with spatio-temporal extent [Grey(80%) R40G40B40]
- **<<Type>>** The specification of a Type [Pale Blue R153 G204 B255]
- **<<IndividualType>>** The specification of a Type whose members are Individuals [Light Orange R255 G173 B91]
- **<<TupleType>>** The specification of a Type whose members are tuples [Light Green R204 G255 B204]
- **<<TupleType>>** The specification of a Type that is the set of all subsets of a given Type [Lavender R204 G153 B255]
- **<<Name>>** The specification of a name, with the examplar text provided as a tagged value [Tan R255 G254 B153]
- **<<NamingScheme>>** The specification of a Type whose members are names [Yellow R255 G255 B0]

(see handout or briefing notes for complete set of stereotypes)
DoDAF Domain Concepts are Specializations

- So they inherit associations (can occupy association place positions)

(zoom-in or see wall chart to read)
All Associations are Typed

- So their mathematical meaning is formally modeled – a first in DoDAF meta models
Naming and Description Pattern

- Multiple names for same thing (aliases) – must tell Naming Scheme
- Information (formerly Information Element) linked to the Things it describes
A functionally, physically, and/or behaviorally related group of regularly interacting or interdependent elements.
Note the term does not distinguish a producing from a consuming activity. Producing a resource does not mean the producing activity is different from the consuming activity.
Activity Model in this Terminology

Performers

Performer A
Activity 1A
Activity 11A
Resources a, b, c
Conditions in which applicable
Performers to which applicable

Performer B
Activity 1B
Activity 11B
Resources x, y, z

Measures and metrics

Rules, constraints, standards, …
### IER “Matrix” in this Terminology

<table>
<thead>
<tr>
<th>Information Resource Description</th>
<th>Information Production</th>
<th>Information Consumption</th>
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<tbody>
<tr>
<td><strong>Name(s) and Description(s) of the information</strong></td>
<td>Associated with the information, e.g., language</td>
<td>Larger activities the producing and/or consuming activity are part of (e.g., mission, UJTL, or METL)</td>
</tr>
<tr>
<td></td>
<td>Producer performing the producing activity</td>
<td>Performers and resources used to produce and consume the information (e.g., transaction type)</td>
</tr>
<tr>
<td></td>
<td>Consumer performing consuming activity</td>
<td>Activity prior to producing/consuming activity (e.g., triggering event)</td>
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<td>Criticality</td>
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<td>Availability</td>
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<td>Integrity</td>
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<tr>
<td></td>
<td></td>
<td>Associated Information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measures applicable to the exchange of the information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assurance rules applicable to the information flow</td>
</tr>
</tbody>
</table>

- **Name(s) and Description(s) of the information**
  - Structure (scope) e.g., WholePart, Super-Subtype, Before-After, Type-Instance relationships for the Things described by the Information
  - Measures associated with the Information, e.g., size, accuracy, precision
  - Security rules associated with information -- Security Attributes Group (IC-ISM)

- **Rules (Standards)**
  - Associated with the Information, e.g., language

- **Performing Activity**
  - Producer performing the producing activity
  - Consumer performing consuming activity

- **Consuming Activity**
  - Performer performing consuming activity

- **Larger activities**
  - The producing and/or consuming activity are part of (e.g., mission, UJTL, or METL)

- **Interoperability Level**
  - Required
  - Criticality
  - Periodicity
  - Timeliness

- **Access Control**
  - Availability
  - Confidentiality
  - Dissemination Control

- **Integrity**
  - Information assurance rules applicable to the exchange of the information

- **Associated Information**
  - Measures applicable to the exchange of the information
  - Assurance rules applicable to the information flow
This does not intend to replicate details of the DoD MDR.
Project

IndividualType

Vision

typeInstance

desiredEffectTypeInstanceOfMeasure

beforeAfterType

desiredEffectIsRealizedByDesiredEffect

IndividualType

ProjectType

typeInstance

projectTypeTypeInstanceOfMeasure

overlapType

activityPerformedByPerformer

Guidance

Rule

typeInstance

activityPerformedByPerformerTypeInstanceOfRule

Resource

beforeAfterType

activityChangesResource

activityChangesResourceTypeInstanceOfMeasure

typeInstance

resourceTypeInstanceOfMeasure

overlapType

activityResourceOverlap

wholePartType

activityWholeProducingPartOfActivity

wholePartType

activityWholeConsumingPartOfActivity

overlapType

ruleConstrainsActivity

ruleConstraintOfActivityValidUnderCondition

Project

typeInstance

projectTypeTypeInstanceOfMeasure

part

whole

Condition

DesiredEffect

typeInstance

desiredEffectTypeInstanceOfMeasure

beforeAfterType

visionIsRealizedByDesiredEffect

Individual

Project

beforeAfterType

desiredEffectDirectsActivity

activityResourceOverlapTypeInstanceOfRule

typeInstance

activityResourceOverlapTypeInstanceOfMeasure

overlapType

activityResourceOverlap

 overlapType

performer

wholePartType

activityWholeConsumingPartOfActivity

wholePartType

activityWholeProducingPartOfActivity

overlapType

ruleConstrainsActivity

ruleConstraintOfActivityValidUnderCondition

IndividualType

PerformingPartOfActivity

IndividualType

ConsumingPartOfActivity
the untrained PersonnelType is “consumed” by induction, admission, ... Activities
the trained PersonnelType is produced by teaching Activities
e.g., one Performers could be a trainer while the other is a student
Information Pedigree

- **Thing**
  - thingDescribed
  - tuple
  - tuplePlace1
  - tuplePlace2

- **Resource**
  - activityResourceOverlap
  - overlapType
  - typeInstance
    - activityResourceOverlapType
    - activityResourceOverlapTypeInstanceOfMeasure
    - activityResourceOverlapTypeInstanceOfRule
  - producingPartOfActivity
  - consumingPartOfActivity
  - wholePartType
    - activityWholeProducingPartOfActivity
    - activityWholeConsumingPartOfActivity

- **Information**
  - exemplarText: String
  - description

- **IndividualType**
  - performerPerformsAtLocationType
  - overlapType
  - performerPerformsAtLocationType

- **Measure**
  - numericValue: string
  - typeInstance
    - activityPerformedByPerformerType
    - activityPerformedByPerformerTypeInstanceOfMeasure
    - activityPerformedByPerformerTypeInstanceOfRule

- **Guidance**
  - Rule

- **Activity**
  - activityPerformedByPerformer

- **LocationType**
  - overlapType
  - producerPerformsAtLocationType

- **Perform**
  - overlapType
  - producerPerformsAtLocationType

- **PerformingPartOfActivity**
  - wholePartType

- **ConsumingPartOfActivity**
  - wholePartType
Physical Exchange Specification
## Mapping of Models Basis for XSDs

### Technical Term

| Activity                             | AV-1 | AV-2 | AV-3 | AV-4 | AV-5a | AV-5b | AV-6a | AV-6b | AV-6c | SV-1 | SV-2 | SV-3 | SV-4 | SV-5a | SV-5b | SV-6 | SV-7 | SV-8 | SV-9 | SV-10a | SV-10c | SV-11 | SV-12a | SV-12b | SV-12c | SV-13 | SV-14 | SV-15 | SV-16 |
|--------------------------------------|------|------|------|------|-------|-------|-------|-------|-------|------|------|------|------|-------|-------|------|------|------|------|--------|--------|-------|--------|--------|--------|-------|-------|-------|
| activityChangesResource              | n    | n    | n    | n    | n     | n     | n     | n     | n     | n    | n    | n    | n    | n     | n     | n    | n    | n    | n    | n      | n      | n     | n      | n      | n      | n     | n     | n     |
| activityChangesResourceTypeInstanceOfMeasure | o    |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityPartOfCapability             |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityPartOfCapabilityTypeInstanceOfMeasure |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityPartOfProjectType            |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityPerforableUnderCondition     |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityPerforableUnderConditionTypeInstanceOfMeasure |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityPerformedByPerformer         |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityPerformedByPerformerTypeInstanceOfMeasure |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityPerformedByPerformerTypeInstanceOfRule |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityResourceOverlap              | n    | n    | n    | n    | n     | n     | n     | n     | n     | n    | n    | n    | n    | n     | n     | n    | n    | n    | n    | n      | n      | n     | n      | n      | n      | n     | n     | n     |
| activityResourceOverlapTypeInstanceOfMeasure |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityResourceOverlapTypeInstanceOfRule |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityTypeInstanceOfMeasureType    |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| activityWholeConsumingPartOfActivity | n    | o    | n    | n    | n     | n     | n     | n     | n     | n    | n    | n    | n    | n     | n     | n    | n    | n    | n    | n      | n      | n     | n      | n      | n      | n     | n     | n     |
| activityWholeProducingPartOfActivity | n    | n    | o    | n    | n     | n     | n     | n     | n     | n    | n    | n    | n    | n     | n     | n    | n    | n    | n    | n      | n      | n     | n      | n      | n      | n     | n     | n     |
| AdaptableMeasure                     |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Address                              |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| Agreement                            |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| axesDescribedBy                      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| beforeAfter                          |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| beforeAfterType                      |      |      |      |      |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |

### In DoDAF Vol II

(see wall chart to read entire matrix)
Components

- One per DoDAF model (52) with necessary and optional parts
- 1 comprehensive with all optional for “fit for purpose” models
- 3 references – IDEAS Foundation, Security marking (IC-ISM), and Pedigree
  - Everything is tied to the IDEAS Foundation
  - Everything has a classification marking – a “portion mark”
  - Everything has a pedigree – who, how,… it came into being
IDEAS Foundation
Structure

- Wrapper, describing that the document is
- Independent entities with naming and aliases
- Associations
- Constraints
OV-5a Elements

- Activity
- activityWholeConsumingPartOfActivity
- activityWholeProducingPartOfActivity
- ConsumingPartOfActivity
- ProducingPartOfActivity
OV-5b Elements

- Activity
- activityPartOfCapabilityTypeInstanceOfMeasure
- activityPerformableUnderCondition
- activityPerformableUnderConditionTypeInstanceOfMeasure
- activityPerformedByPerformer
- activityPerformedByPerformerTypeInstanceOfRule
- activityResourceOverlap
- activityResourceOverlapTypeInstanceOfMeasure
- activityResourceOverlapTypeInstanceOfRule
- activityTypeInstanceOfMeasureType
- activityWholeConsumingPartOfActivity
- activityWholeProducingPartOfActivity
- AdaptabilityMeasure
- Condition
- conditionTypeInstanceOfMeasure
- Constraint
- ConsumingPartOfActivity
- Country
- desiredEffectTypeInstanceOfMeasure
- DomainInformation
- EffectsMeasure
- FunctionalStandard
- individualDesiredEffectTypeInstanceOfMeasure
- InformationType
- MaintainabilityMeasure
- Measure
- measurePowertypeInstanceOfMeasureType
- MeasureType
- NeedsSatisfactionMeasure
- Organization
- OrganizationalMeasure
- OrganizationType
- PerformanceMeasure
- Performer
- PhysicalMeasure
- ProducingPartOfActivity
- Resource
- ResourceType
- resourceTypeInstanceOfMeasure
- Rule
- ruleConstrainsActivity
- rulePartOfMeasureType
- ServiceLevel
- skillPartOfPersonTypeTypeInstanceOfMeasure
- SpatialMeasure
- TemporalMeasure
- wholePartTypeInstanceOfMeasure
OV-5b
Root

IdeaEnvelope

The root element of an IDEAS data exchange file.

IdeasData

1, \infty

activity

activityProducingPartOfAction

A whole-part association between an Activity and the part of it that produces a Resource.

activityPartOfCapability

activityPartOfCapability is a member of Measure.

ConsumingPartOfActivity

A part of an Activity that consumes a Resource.

Organization

A specific real-world assembly of people and other resources organized for an ongoing purpose.

rulePartOfMeasureType

The range of permissible states for an object.

EffectsMeasure

Category of measures on Effect Objects.

AdaptabilityMeasure

A measure of the ease with which Performer satisfies Operating Constraints and Capability and Service needs.

MaintainabilityMeasure

A category of measure of the amount of time a Performer is able to conduct Activities over some time interval.

1 June 2009
Example Use Case

- Activity 1 = Conduct fires
- Activity 2 = Coordinate assault
- Resource = Fire orders
- Performer = Firing Battery
- Rules = ROE
Conduct

Fire orders

Ammo

Firing

Battery

Coordinate assault

Provide ammo

Take fire

Coordinate assault

ROE

Fires

Rounds complete

Rules of Engagement

Take fire

Coordinate assault
DM2 Provides a Neutral Exchange Specification for Many Kinds of Architecture Data

DM2 PES XSD

EA Domain Concepts

- Neutral Implementation
- Common Patterns

Analysis Software

- XMI / MOF Conversant (e.g., UPDM / SysML)

Authoritative Data Sources

- Federal, Coalition, and other EA exchanges

M&S Tools

- EA / ITA Tools

Reporting Tools and Formats

- 4D Mereology
- Set Theory
- Naming
- Pedigree

EA DBMS'}
DM2 (including PES), IDEAS Foundation V1.0, and UPDM 2.0 Vision

1. One format per 52 DoDAF models + any custom “fit for purpose” models
2. One per UPDM tool
Sample XMI

- Neutral format for UML file
- Should allow for use of a UML model by any other UML tool
- Oriented toward full re-creation of the native model:
  - Graphics
  - Layout
  - All UML features
- NOT a neutral format for non-UML tools

ackagedElement xml:type="uml:Class"
xml:id="EAID_1ACDB2AD_F9B8_4027_82A1_C4958A996A15" name="Activity"
visibility="public">
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xml:id="EAID_93CE829E_4313_40a1_A61A_AA877F0EB69A" general="EAID_A95155D1_CA8D_4a1c_9F13_E4C7EE9AF7C8" />
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  memberEnd xml:idref="EAID_srcFE471B_FA52_4d05_B1A0_FC652F38B709" />
  ownedEnd xml:type="uml:Property"
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</ownedEnd>
</packagedElement>
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  memberEnd xml:idref="EAID_src1D3B5D_B5E8_4cd3_91B8_B2A0071D3F85" />
  ownedEnd xml:type="uml:Property"
xml:id="EAID_src1D3B5D_B5E8_4cd3_91B8_B2A0071D3F85" visibility="public" association="EAID_1D1D3B5D_B5E8_4cd3_91B8_B2A0071D3F85" isOrdered="false" isDerived="false" isDerivedUnion="false" aggregation="none">
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</packagedElement>
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  memberEnd xml:idref="EAID_dst099A29_2F56_46e3_87EE_7D95F1FC8D37" />
  memberEnd xml:idref="EAID_src099A29_2F56_46e3_87EE_7D95F1FC8D37" />
  ownedEnd xml:type="uml:Property"
xml:id="EAID_src099A29_2F56_46e3_87EE_7D95F1FC8D37" visibility="public" association="EAID_25099A29_2F56_46e3_87EE_7D95F1FC8D37" isOrdered="false" isDerived="false" isDerivedUnion="false" aggregation="none">
  type xmi:idref="EAID_ACA7CDB7_DE09_4807_BCAB_C6EDE104F60F" />
</ownedEnd>
</packagedElement>
Where to learn more and participate in DM2 evolution

- Join the Data TWG
  - Access to Share site
  - Weekly email message with invitation to participate in DCO telecon
  - Stay in touch with ongoing evolution, pilots, and Configuration Management activities
Questions?
Top-Down / Bottom-Up Development

DoD Core Process Information Requirements Collection

- JCIDS Process Information Requirements
- Ops Planning Process Information Requirements
- SE Process Information Requirements
- PPBE Process Information Requirements
- DAS Process Information
- CPfm Process Information Requirements

Data Model Development

Existing / Emerging Schema, Models, and Databases

UCORE

COI

COI

Coordination

DoDAF 2.0:
- Conceptual Data Model (Vol I)
- Logical Data Model (Vol II)
- Physical Exchange Model (Vol III)