UML Profiles for the Federal Enterprise Architecture (FEA), DoD and MoD Architecture Frameworks

Dec. 2006
Fatma Dandashi, Ph.D.
Outline

- Motivation and Definitions
  - Why an Architecture Framework
  - Why Standards
  - What are DoDAF, MODAF
- UML Profile for DoDAF/MODAF
  - Scope
  - Requirements Summary
- FTF and UPDM + OMG
- UPDM Info Day
Why an Architecture Framework?

- There is no industry standard for SoS architecture modelling for the military domain
  - DoDAF and similar frameworks specify essential elements and how they are related to arrive at an Architecture Model of the systems architecture (Systems View) within the context of the business or enterprise architecture (Operational View)

- There is a recognized need for architecting:
  - Within the federal government (Clinger-Cohen Act - CCA),
  - Government contractors (e.g., system of systems architecture-capability based acquisition)
Why Standards?

- Standards can offer
  - Broader acceptance
  - Improved integration with other frameworks
  - Improved tool interoperability
  - Reduced training requirements
What is DoDAF?

- The Department of Defense (DoD) Architecture Framework (DoDAF)
  - Defines a common approach for modeling, presenting, and comparing a System-of-Systems (SoS) architecture (Systems View) along with associated standards (Technical View) within the context of the mission capabilities (Operational View).

- The principal objective of the Framework is to
  - Ensure that SoS architecture models can be compared and related across organizational boundaries, including Joint and multi-national boundaries, to determine/ensure interoperability of systems.
What is MODAF?*

- UK Ministry of Defence Architectural Framework
  - Based on DoDAF with some minor changes to TV-1, OV-1, OV-2, SV-1 and SV-2
  - Adds two new viewpoints:
    - **Strategic Capability Views** – these views define the high level capability vision, the capabilities and sub-capabilities (capability functions) required to support that vision, the dependencies between capabilities, the phasing in and out of systems to support the capabilities, and the organizations in which those systems are to be deployed.
    - **Acquisition Views** – these views define the project team structures required to deliver network enabled capabilities. They also define the inter-project dependencies and specify the lines of development status at significant project milestones.

Source: [http://www.modaf.com/](http://www.modaf.com/)
System-of-systems Characteristics

SoSs typically:
- Are not usually managed or funded under a singular authority
- Composed from complex systems that provide independent functionality
- Are hard to bound
- Are distributed over time and space
- Are often dynamically assembled, ‘on-the-fly’ by operational commanders
- May compete with other SoSs for the same resources
- Have a relatively short lifecycle, compared to traditional systems

The increased use of architectures, as a basis for making programmatic decisions, raises the bar for their level of consistency, precision and scalability.
System-of-systems Characteristics:
Requires Collaboration of many Communities or Stakeholders

Architecture data can be used by collaborating stakeholders, thereby improving communications, analyses, and tradeoff decisions!
Why DoDAF/ MoDAF?

Military Capabilities
Expressed as:
• Concepts
• Means (op resources)
• Ways (Behavior /op activities)
• Outcomes

SoS and System Components
Expressed as
• Components
• Functions
• Interfaces
• Interactions

DoD/ MoD’s frameworks for defining mission capabilities and related system-of-systems architectures
Problem Statement

- DoDAF v1.0 Volume II provides guidance on using UML
  - UML is used extensively to represent DoDAF architecture products across *industry*
  - Vol II guidance not sufficiently precise resulting in multiple interpretations (no one-to-one mapping between UML diagrams and DoDAF products)
  - Based on UML 1.x which has been superseded by UML 2
- Tool interoperability impeded by DoDAF adaptations, such as MODAF & NAF

DoDAF v1.0 UML guidance is inadequate to facilitate communications, architecture product reuse & maintainability, and tool interoperability
Solution Statement

- DoDAF v1.0 exposed a need for architecture-based model-driven systems engineering
- SysML is a UML profile for model-driven systems engineering
- Initial analysis indicates good coverage of all DoDAF/MODAF views with SysML*

* see Bailey et al in references section
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Motivation for UPDM

- Significantly enhance the quality, productivity, and effectiveness associated with architecture and SoS modeling
- Promote architecture model reuse and maintainability
- Improve tool interoperability and communications between stakeholders
- Reduce training impacts due to different tool implementations and semantics
Industry and Coalition Feedback

- Presented architecture framework standardization effort through the OMG in early February 2005
- Resistance to immediate standardization of a UML profile for a generic Architecture Framework
  - Scope is too large to complete in a reasonable amount of time
  - Tool Vendors concerned about lack of market and technical risks
- Strong request for a UML profile that implements standard representations for DoDAF/MODAF
- Support for follow-on effort to establish standards for the specification of generalized architecture frameworks
- Coalition partners (NATO, Australia, ... France) and their industry partners requested that their requirements be included
Target Audience

- Individuals and organizations that use Military Architecture Frameworks (MAF) to model systems and their architectures
- Tool vendors who might implement a MAF in their tools
- Methodologists and researchers involved with systems modeling and architecture frameworks
UPDM RFP Status

- RFP was issued by OMG Sept. 2005
  - Several comment iterations
    - January-Feb, June, Aug 05
    - A result of collaboration with DoD and MOD representatives
  
- Incorporates numerous inputs from
  
  - **Tool Vendors**: Adaptive, Artisan Software, Borland, I-Logix, IBM-Rational, Proforma Corp., Telelogic/Popkin Software
  
  - **Industry**: e.g., BAE Systems, Boeing, Fujitsu, Hitachi, Lockheed Martin, Raytheon, Thales, Unisys
  
  - **Gov**: DoD, MOD, NATO, and positive feedback from Canadian and Australian Defence
  
  - **Not-for-profit Organizations**: Sandia Labs, SEI, Mitre, Middlesex University
UPDM RFP Scope

- Use DoDAF V1.0 as a baseline
- Incorporate MODAF’s additional views (Acquisition and Strategic views)
- Incorporate additional requirements from DoDAF WG (none officially published to date)
- Support for modeling system-of-systems architectures
  - Systems that include hardware, software, data, personnel, procedures, and facilities (DOTMLPF & MOD Lines of Development)
  - Service oriented architectures and net-centricity

Mandatory: Develop profile that specifies

- Metamodel (abstract syntax and constraints)
- UML2 Profile
- Notation (concrete syntax)
- DoDAF and MODAF artifacts
- Additional views and viewpoints
- Element taxonomy reference
- Data interchange
Reference Taxonomy Requirement – Relationship to FEA

- UPDM shall specify a mechanism to dynamically extend UPDM architecture elements with reference taxonomies that are commonly used by a particular community of interest
Initially, three teams formed to respond to the RFP

The teams made great progress:
- Defined a metamodel for the profile that reflects DoD and MOD requirements,
- Finalizing mapping the metamodel to UML, SysML, and possibly BPMN & IDEF0, with tool implementations

There are two teams remaining. Revised submissions were submitted in Nov. 2006
Next Steps

- Expecting one submission in early 2007
  - An evaluation team will be formed to provide feedback

- Expected Adoption date: 2Q 2007
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The Federal Transition Framework (FTF) provides clear and consistent information to describe government-wide IT policy objectives and cross-agency initiatives.

The FTF … provides a simple structure to organize and publish existing information to:
- Enhance the quality and consistency of information on cross-agency initiatives
- Increase the level and speed of adoption of cross-agency initiatives
- Improve the overall effectiveness and efficiency of IT investments and programs related to cross-agency initiatives.

* OMB
Summary: FTF and UPDM + OMG

- UPDM activity has shown that industry and tool vendors are willing to spend their time and resources to produce standards that support federal Government.
- UPDM long-term stated goal is to generalize approach to produce a standard specification for an architecture framework for any domain.
- FTF is federal government's first step towards that goal.
- OMG/industry consortia can help carry this work to completion.
UPDM Information Day
Wednesday Dec. 2006

1400 – 1530
- Mr. Brian Wilczynski, OASD/NII – Evolution of the DoDAF in Support of Net-Centricity
- Major Bryan Canter, U.S. Army TRADOC – Using the UML and an Object Oriented Methodology to Develop Operational Architectures for the Warfighter
- UK Ministry of Defense (MOD) – Overview of MOD Architecture Framework (MODAF) extensions to DoDAF needed to achieve Net Enabled Capabilities

1545 – 1800
- UPDM Developers: Preview of UML Profile for DoDAF & MODAF (UPDM) Capabilities
- Q & A Panel Discussion: Your chance to ask the experts how UPDM capabilities will increase your ability to model architectures and overcome many challenges associated with development of complex systems

1800 – 2000 OMG Technical Meeting Reception
# Letters of Intent (To Implement) List

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UPDM Timeline

- Need: Feb. 05
- LOI: Feb. 06
- Issue RFP: Sept. 05
- Initial Submissions: June 06
- Revised Submission(s): Dec. 06
- Evaluate Submissions
- Evaluate Submission
- Implementation: ~2Q 07
- Tools
- Vote Adoption of a Specification: March 07
## Voting List

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For More Information

- Background on UPDM
  - http://syseng.omg.org/UPDM.htm

- UPDM Request for Proposals (RFP)
  - http://www.omg.org/techprocess/meetings/schedule/UPDM_RFP.html

- UPDM OMG meeting agendas

- Revised Submissions:
References