The UPDM RFC Development Project
An Exercise in Model-Based, Virtual Team Development or "Practicing What We Preach"

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Agenda

- Background to the UPDM Group
  - Introduction to Military Architectural Frameworks
  - OMG (Object Management Group) Procedures
- Team Structure
- Use of Tools
- Lessons Learned
- Questions?

The Goal: The UPDM Specification

- The UPDM team was reformed in March 2008 to produce a specification to new requirements.
  - Submission date was September 2009 (5 months!)
  - Specifications normally take 2 years (SysML took 3 years)
- Mandatory Requirements
  - Domain Metamodel
  - Metamodel (abstract syntax and constraints)
  - Profile
  - Notation (concrete syntax)
  - DoDAF 1.5 and MODAF 1.2 artifacts
  - Additional views and viewpoints
  - Element taxonomy reference
  - Data interchange
- Optional Requirements
  - Extensibility to Other Architecture Frameworks
  - Representation of Architectural Patterns

The Goal: UPDM Specification

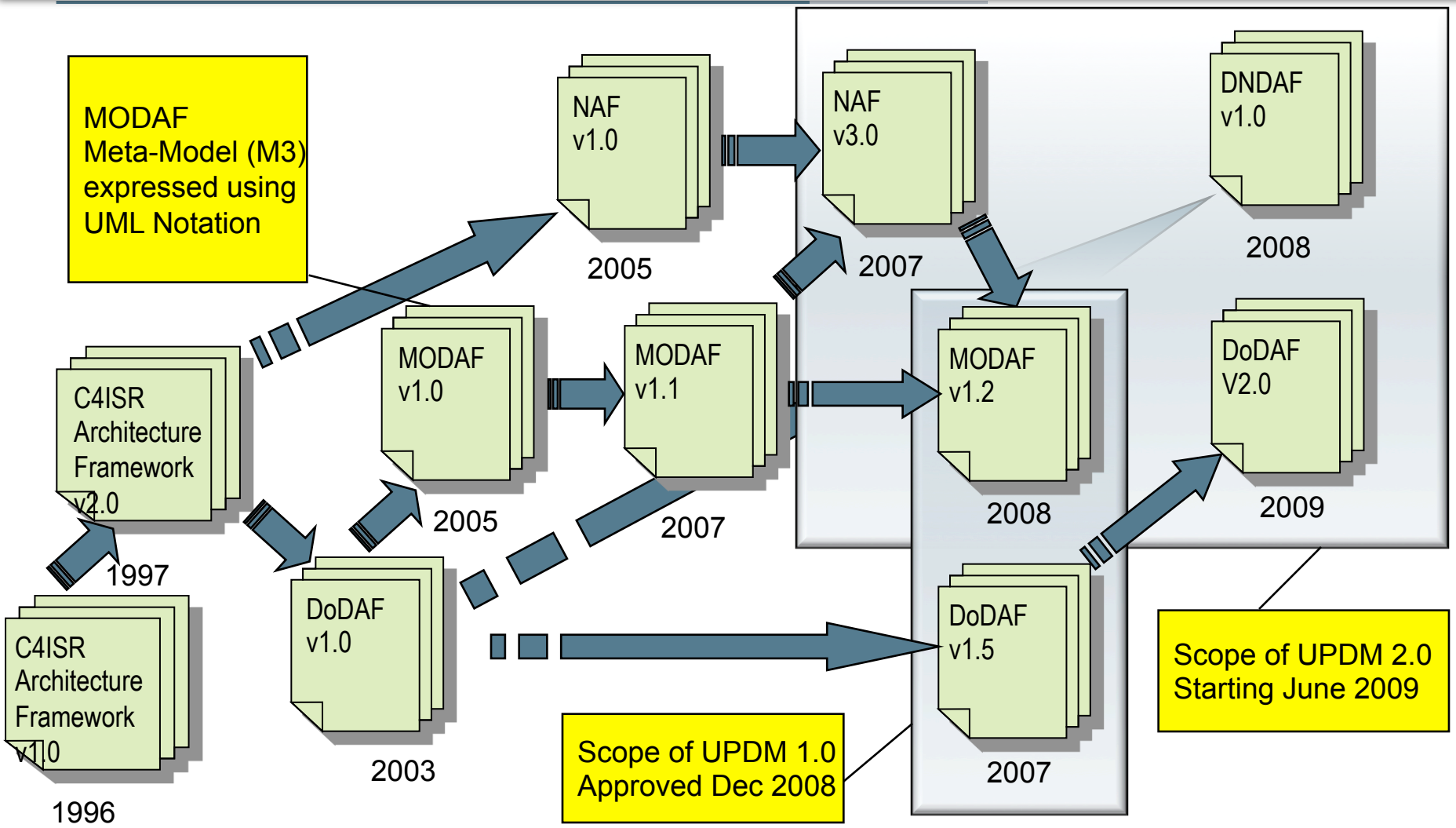
The Object Management Group (OMG)

- An open membership, not-for-profit computer industry standards consortium that produces and maintains computer industry specifications for interoperable, portable and reusable enterprise applications in distributed, heterogeneous environments.
- Membership includes Information Technology vendors, end users, government agencies, and academia.
- OMG member companies write, adopt, and maintain its specifications following a mature, open process.
- OMG's specifications include: UML® (Unified Modeling Language™), SysML, UPDM, CORBA, etc.
- OMG teams are provided facilities to develop specifications.
- Process is still largely document driven.

Why: The need for UPDM.

- Motivation
  - US DoD and UK MOD interested in leveraging commercial standards for their Military Architecture Framework
  - Military Architecture Framework Tool Interoperability
    - Key Goal for DoD, MOD, Enterprise and System Architects and Engineers
  - 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.
- Proliferation of Military Architectural frameworks
  - DoDAF, MODAF, DNDAF, NAF, AGATE, ADOAF, etc.
  - Defence organizations, contractors and tool vendors are hoping to find a way out of the alphabet soup.

Why: Historical Development of AF's.



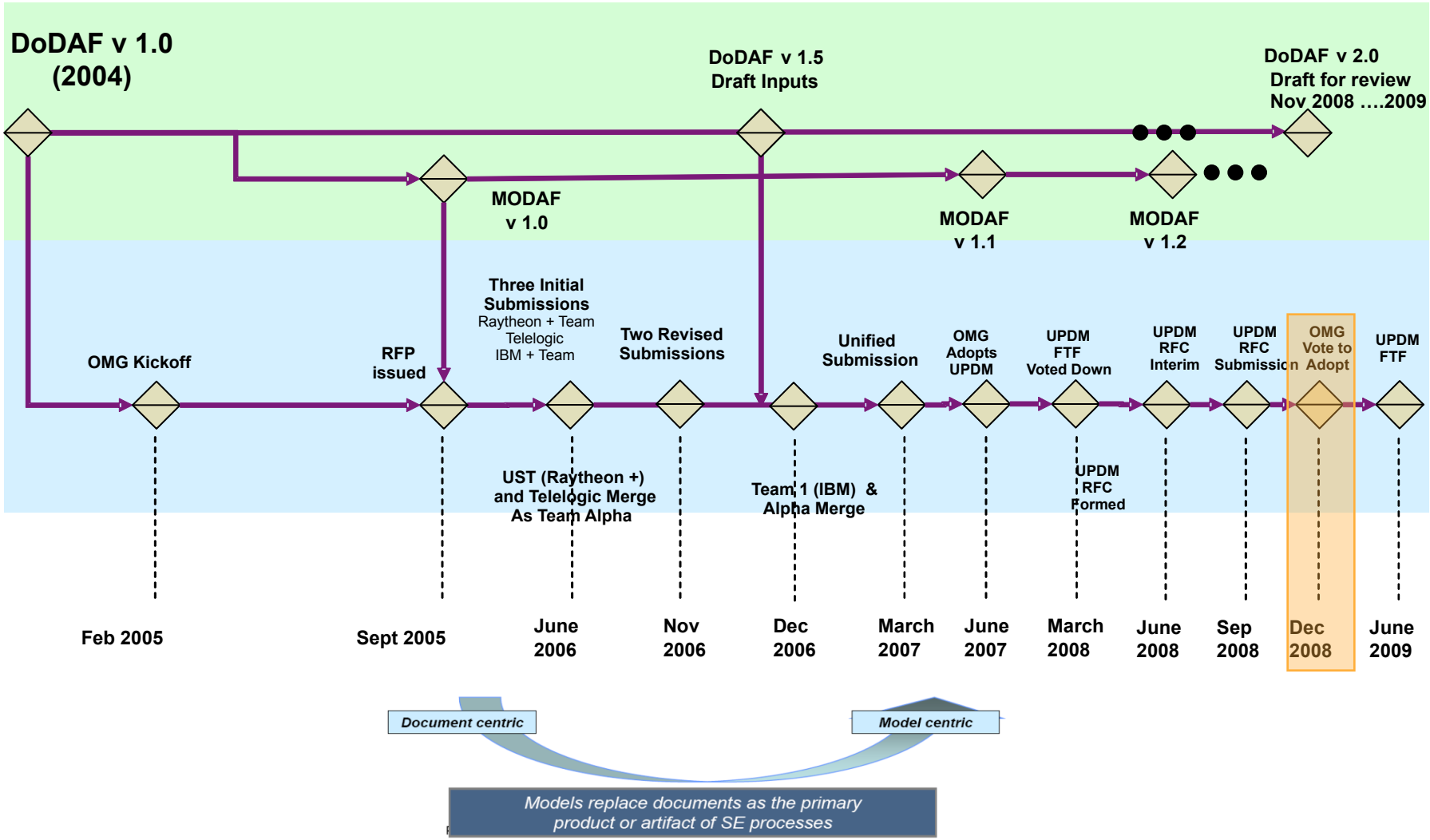
How: UPDM Principles

- Model-Based Development of the Specification
  - Specification and XMI generated from the model
- Open, Collaborative Process
  - Include all stakeholders in decision making
  - Open membership
- All Member Inputs Considered
  - Discuss, Debate, Decide, Prioritize, Defer
- 80-20 Rule
- “Keep it Simple”
- Re-Use Rather than Re-Define
  - MODAF 1.2/M3, DoDAF 1.5/2.0, NAF
  - UML 2, SysML 1, BMM, UPMS, BPMN, SoaML
  - Domain Meta-Model based on the above

Who and Where: UPDM Team Members

- US DoD Liaison - DoD/DISA, OSD CIO, Mitre, Silver Bullet
- UK MOD Liaison - UK MOD, ModelFutures
- Canada DND Liaison – DND and ASMG Ltd
- NATO – Generic AB on behalf of SwAF and on contract by FMV
- Tool Vendors – Adaptive, Atego (Co-Chair), EmbeddedPlus, IBM (Co-Chair), Mega, NoMagic (Co-Chair), Sparx Systems, Visumpoint
- Aerospace – BAE Systems, General Dynamics, L3 Communications, Lockheed Martin, Northrop Grumman, Raytheon, Rolls-Royce, Selex SI, Thales, Unisys
- Advisors – Decisive Analytics
- Distributed multi national team (US, UK, France, Sweden, Lithuania, Australia, Canada, Thailand, Italy)

When: UPDM History



Virtual Teams

- Virtual teams are groups that are formed for executing a specific, normally long-term project.
  - Airbus 380
  - Eurofighter
- All groups:
  - Share information and development artefacts
  - Communicate both synchronously and asynchronously on a variety of subjects
  - Develop social relationships normally found in teams
- Virtual teams have the same dynamics, issues, interactions, and social lifecycles as co-located teams

Project Organization

- Group Chairs: 2 tool vendors
  - One did general team and project management
  - Another managed model and document updates
- Architecture group: 4 tool vendors
  - Detailed specification of the meta-model
- Sample Model: Vendor and Industry
- Traceability to requirements: Government and Industry
- Documentation of model elements: All
- Oversight, review and compliance: All

Tools Used

- UML Modelling tools
  - Model the Domain Meta Model (DMM)
  - Model the UPDM profile
  - Generate the XMI
  - Generate the specification
  - Model the sample problem
- Excel
  - DoDAF/MODAF/NAF to DMM mapping
  - DoDAF/MODAF/NAF to UPDM profile mapping and each other
- Word
  - Creating introductory chapters
  - Reports

Problems with Tools

- UML tool
  - Generously provided free to group by tool vendor
  - Documentation generation difficult due to complex document format
  - Sharing difficult due to lack of merge facility
  - Web hosting not possible due to security issues for some members
- Configuration management
  - Attempted but not implemented due to security issues (again)
- Virtual document sharing
  - Done by handoff. Parallel edits sometimes took place.
- Mac vs. PC versions of Word
  - Mac version 10x size of word version causing it to crash
  - Interchange difficult
- Size of the generated specification
  - 300 pages with embedded graphics, 10 megs

Project Meetings

- Virtual meetings
  - Held weekly via teleconference and web-based collaboration tools such as Net Meeting and WebEx.
    - Commercial tools required payment, installation of applications and long download times
    - Not always possible due to security issues.
    - VOIP also not always possible, so cost an issue
  - Time zones required people at the far ends to get up early and/or work late
- Face to Face meetings still necessary
  - April, June and Early August
  - Still necessary due to the visual nature of models.
  - Ensured that the group was on track and cohesive.
  - Meet with other stakeholders to ensure buy-in.

Issues List

- Used to coordinate problems, omissions, disagreements, etc. in the model.
  - Originally an excel table was used.
    - Problems with cell size, embedded graphics, no spell checker in older versions
  - Changed to a word table.
    - Cell size, embedded graphics and spelling now OK.
    - Instead created problems document width.
    - Size of document cause some machines to freeze even though there were only 80 issues and it was 1 meg in size.
  - Handover was problematic
    - Baton passing due to CM issues.
    - Raiser of issue had to hand verify correct implementation.

Did the project employ MBSE?

- "Model-based Systems Engineering (MBSE) is the formalized application of modeling to support system requirements, design, analysis, verification, and validation activities beginning in the conceptual design phase and continuing through-out development and later lifecycle phases." (INCOSE, 2007).
- Modeling is
  - at the heart of all aspects of the development effort,
  - covering the complete lifecycle, and
  - has a direct effect on project artifacts.

Did the project employ MBSE?

- Models created for:
  - The requirements (the Domain Meta-Model)
  - The design (the profile itself)
  - The implementation (to be implemented by the tool vendors)
  - The proof of concept (the example model.)
  - Links between the DMM and the UPDM profile were maintained in the model and traceability tables were generated to ensure compliance.
  - The specification was generated from the model
  - The XMI profile description was generated from the model
  - Discussions of virtually issues were centered around the model
  - The source requirements architecture frameworks were sourced in models

Lessons learned

- MBSE Works!
  - Normally the document generation takes at least 6 months.
  - We did it in 2 weeks.
- Virtual communication requires more time.
  - Lack of body language, the ability to point at an object, email delays, conflicting priorities, etc.
- Ensure that project information is accessible.
  - In our case this was managed by a single individual
  - Now done on the Wiki
- Ensure that the model is both centralized and distributed.
  - Provide a single centralized model to ensure consistency
  - Often done using terminal servers
- Provide Versioning, Variants, and Backups.
  - Best done by the tool and using the complete model rather than model fragments stored in files.

Lessons learned

- If possible, use dynamic model references.
  - Models have diagrams and descriptive text
  - If the text can have embedded model references this ensures consistency when names change
- Maintain the project schedule and ensure it is “trackable”.
  - Ensure that what team members are doing correspond to the model
- Keep communications open and regular.
  - Team building and socializing are just as important as technical discussions to build trust
- Be familiar with the project and process standards.
- Prototype the deliverables throughout the development lifecycle.
- If possible, start small.

Postscript

- The UPDM specification passed through all the votes during the September and December 2008 OMG meetings and is now in its finalization phase.
  - Finalization projected to complete in June.
- All deadlines were successfully met.
- We are now an official OMG group
- As we completed the project on time and to the satisfaction of the stakeholders, the project was a success.
- UPDM 2.0 started in June 2009.

When: The Future of UPDM

- Post submission
  - DoDAF 2.0 Draft Incremental Release Dates 2008/2009 (coordinated)
  - OMG voting to adopt UPDM Dec/Jan 2008/9
    - Start of FTF process
  - Signed and Released DoDAF 2.0 anticipated June, 2009
  - Preparation of RFP for UPDM 2.0
    - Inclusion of DoDAF 2.0
    - Security views from DNDAF
    - Support for NAF 3.0
    - Human Factors/Human Systems Integration
    - Others?

When: The Future of UPDM

- Post submission
  - The group has now adopted Wikis for document sharing
    - Ballots on issues, models, generated specifications, etc.
    - The problem with version management of the model is not solved by this
    - Document management is easier
    - Some projects in industry have adopted the Wiki for document creation
    - Many problems diminished as we now have a documented process
  - DOORS is being used to model traceability
    - Complicated because different tools are used to model the DoDAF, MODAF, and UPDM

Questions, Comments, Discussion