Transitioning UPDM to the UAF

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Agenda

- Why do we need UPDM
- What was
- What is, and
- What will be
- Questions?
Why?
The Tower of Babel
A Communications Fable for our Time

Ancient

Modern

Does this solve the problem?
USA/UK: Two Countries Separated by a Common Language

• Even speaking the same language doesn’t always help. Picture this:
  – A man wearing a vest, pants, and a pair of suspenders.

  The American Image
  Vest
  Suspender
  Pants

  The British Image
  UK: Waistcoat
  UK: Braces
  UK: Trousers

So, if communication is hard with spoken language, are models the answer?
AMN Issues

- These issues included:
  - Different expectations on content and usage of the architecture leading to ever changing requirements and deliverables
  - No enforcement of the architecture during implementation
  - Usage of different architecture frameworks
  - Usage of different architecture tools.
  - No interchange between the tools

- In late 2010, a governance structure for the AMN was endorsed by Chief Of Staff SHAPE and the AWG was included in this governance structure. As a direct consequence, the situation regarding clearer expectations, deliverables and enforcement of architecture has been improved in 2011.

- However, as the architects are sponsored by their respective nations they have to implement national policies and requirements, so that improvements regarding the usage of a single framework and tool are not to be expected.
What was
• **Meta model coherence**
  – Same meta-model,
  – Different presentation layers

• **Took an MBSE approach**

• **UPDM could choose between a pure UML or UML and SysML approach.**

• **UPDM contained both a profile and a domain meta-model**
Why Model Based Systems Engineering

- Pictures paints a thousand words
  - Visio is good at this
  - Language is not controlled
- Modeling languages add semantics and constraints
  - Control what is being said and how it is said
- MBSE is a common language of expression that captures
  - Structure
  - Behaviour
  - Requirements
    - Functional
    - Non Functional
- Models can be quantifiable and executable
What is
Current UPDM V 2.1

- UPDM is the Unified Profile for DoDAF and MODAF + NAF (starting v2)
- UPDM is **NOT** a new Architectural Framework
- UPDM is **NOT** a methodology or a process
- UPDM is a graphical **enterprise modeling language**
- UPDM was developed by members of the OMG with help from industry and government domain experts

- DOD (US)
- MOD (UK)
- SWAF (Swedish Armed Forces)
- DND (Canada)

- MITRE
- Raytheon
- Lockheed Martin
- General Dynamics
- L3
UPDM version 2 (2012-present day)

- IDEAS is a formal way for defining a metamodel
  - Allows you to reason across the information

IDEAS – International Defence Enterprise Architecture Specification
Supported by US, UK, SW, Australia, Canada
Unification with UPDM 2

- Common metamodel to build DoDAF, MODAF, and NAF models
  - Viewpoints (e.g.
    Capability (DoDAF & NAF) vs.
    Strategic (MODAF))
  - Views (e.g.
    OV-2 Operational Resource Flow Description (DoDAF) vs.
    OV-2 Operational Node Relationship Description (MODAF) vs.
    NOV-2 Operational Node Connectivity Description (NAF))
  - Concepts (e.g.
    Performer (DoDAF) vs.
    Node (MODAF & NAF))

- Infrastructure for tools to be able to provide different environments for DoDAF, MODAF, NAF – underlying metamodel is the same
  - Common Meta-model, different presentation layers

- Easy transition among DoDAF, MODAF, and NAF models
Why UPDM is popular with practitioners of MBSE?

- No standardized frameworks for MBSE
- Integration with existing OMG standards, e.g. SysML, UML
  - Common repository (Integrated Architecture Repository)
  - Application of engineering analysis methods
    - Impact Analysis
    - Coverage Analysis
    - Trade-off Analysis
    - Behavioral execution
    - Requirements compliance analysis
    - Model-based testing
  - Interoperability
Adoption

- Tool Vendors: UPDM was adopted by majority of UML, SysML tool vendors.

- Defense:
  - Used by DOD and its contractors on various MBSE and IT projects
  - Being picked up outside of the US
    - Used in Europe, Australia, Asia, S. America

- Industry (external to Defense):
  - European research projects (DANSE)
  - Starting to be looked at by European industrial companies familiar with MBSE

- Industry needs:
  - Commercialised/Industrialised whilst keeping features used by current users
  - Wider scope (SoS Lifecycle, Human System Integration, Risk etc.)
What will be UPDM 3-> UAF 1.0
Framework developments

- UPDM RFP requirement: "The UPDM V3.0 domain metamodel shall be derived from MODEM and DM2, both of which are based upon the International Defence Enterprise Architecture Specification Foundation [IDEAS]."

- Mandatory requirements (excerpt):
  - Provide Domain Metamodel derived from MODEM and DM2 ✔
  - An Architecture Framework Profile Using SysML ✔
  - Supports BPMN 2.0 ✔
  - Use of SysML Requirements Elements and Diagrams ✔
  - Use of SysML Parametric Elements and Diagrams Mapped to Measurements ✔
  - Traceability Matrix to Supported Frameworks ✔

- Non mandatory features (excerpt):
  - UML Profile for NIEM ✔
  - Information Exchange Packaging Policy Vocabulary (IEPPV) ✔
  - Viewpoints in Support of SoS Life Cycle Processes and Analyses ✔
  - Support for Fit for Purpose Viewpoints beyond those defined in DoDAF, MODAF/MODEM, NAF, and the Security Viewpoint from DNDAF. ✔
  - Human Systems Integration (HSI) ✔
The Use of IDEAS brings a high degree of formality to the domain meta-model, with most of it working from the same basis.

- UAF is the DMM Basis of the UAF For all tool vendors
- UAfp the SysML based profile

- DoDAF 2.02 change 1
- NAF v4.0
- MODAF v1.2.004
- MODMA
- IDEAS based
- UML profile based
Why a Unified Architecture Framework

• Proliferation of frameworks that UPDM was being asked to support
• Need to support industry and federal usage as well as military
  – Commercialisation, whilst still supporting Warfighter needs
• Ability to support other frameworks
  – By Extension
  – By Mapping
• IDEAS based format for DMM Allows implementation by non-SysML based tools
  – Same format as DoDAF 2.0.2 Change 1
Why the Grid?

- Very hard to manage the views with so many contributing frameworks
  - Lead to very complex mapping tables
  - Unwieldy descriptions
- Provides an abstraction layer so it is possible to map many other frameworks onto the MM
  - HSI views and SoS Lifecycle views
- Commercialises the UAF whilst supporting Warfighter needs
  - Still the same underlying architectural data structures and view constructs that support
    - DoDAF
    - MODAF/MODEM
    - NAF
- Same data model, different presentation layer
Conclusions

- UAF has the potential to improve communication, collaboration and interoperability between
  - Nations
  - Government and Industry
  - Industry to Industry
- Grid approach allows different industries to reuse, extend or create new views appropriate to them (Fit for purpose)
- New technologies can and will be applied to extend the use of UAF architectures to enable
  - Architecture Federation
  - Tool Federation
  - Improved interoperability
- Improving the discovery and reuse of architectural artifacts