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Transitioning UPDM to the UAF

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OMG UAF Information day
March 23 rd, Hyatt, Reston

Agenda

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- Why do we need UPDM
- What was
- What is, and
- What will be
- Questions?

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Why?

The Tower of Babel
A Communications Fable for our Time

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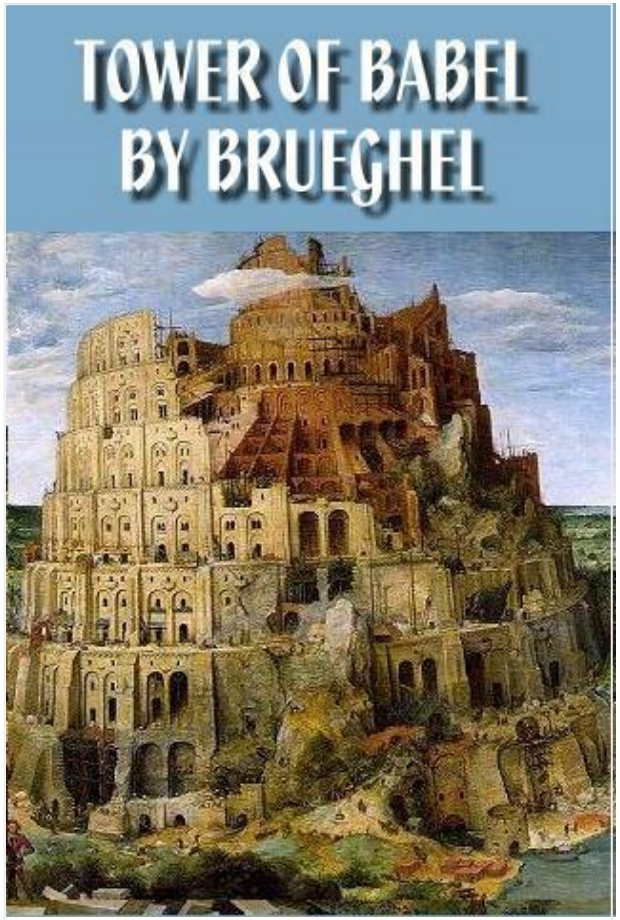
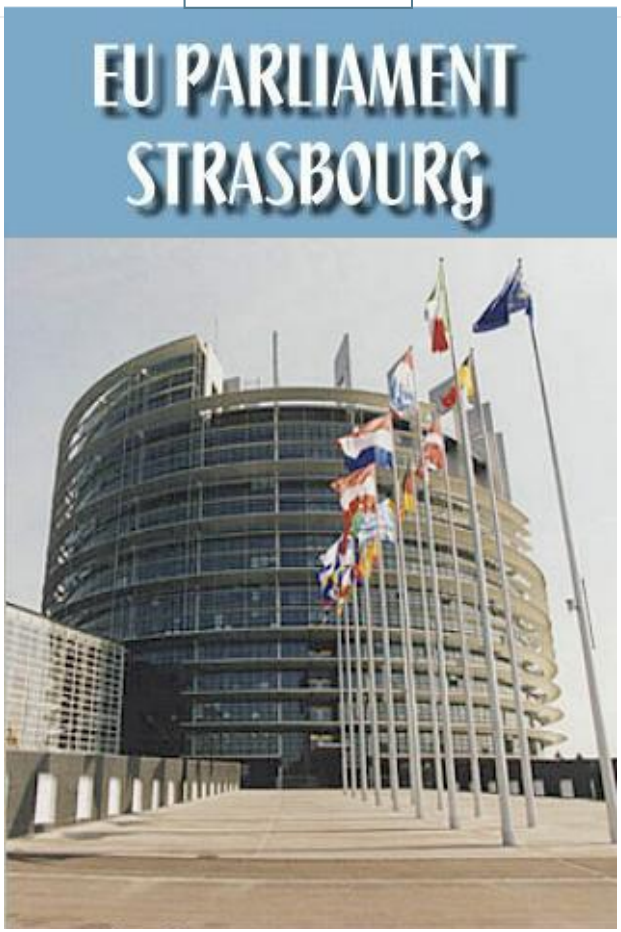
Ancient



Modern



Does this solve the problem?

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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

The British Image

Vest

UK: Waistcoat

Suspenders

UK: Braces

Pants

UK: Trousers

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

The Afghanistan Mission Network

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Reference Document 3195

NATO Consultation, Command and Control Agency

Agence de Consultation, de Commandement et de Conduite des Opérations de l'OTAN

NATO C3 AGENCY

DEVELOPMENT OF THE AMN ARCHITECTURE IN 2010 – LESSONS LEARNED

Torsten Graeber, NATO C3 Agency

June 2011

The Hague

SCIENTIA PRO VIGILIA

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AMN Issues

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- **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.**

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What was

UPDM version 1

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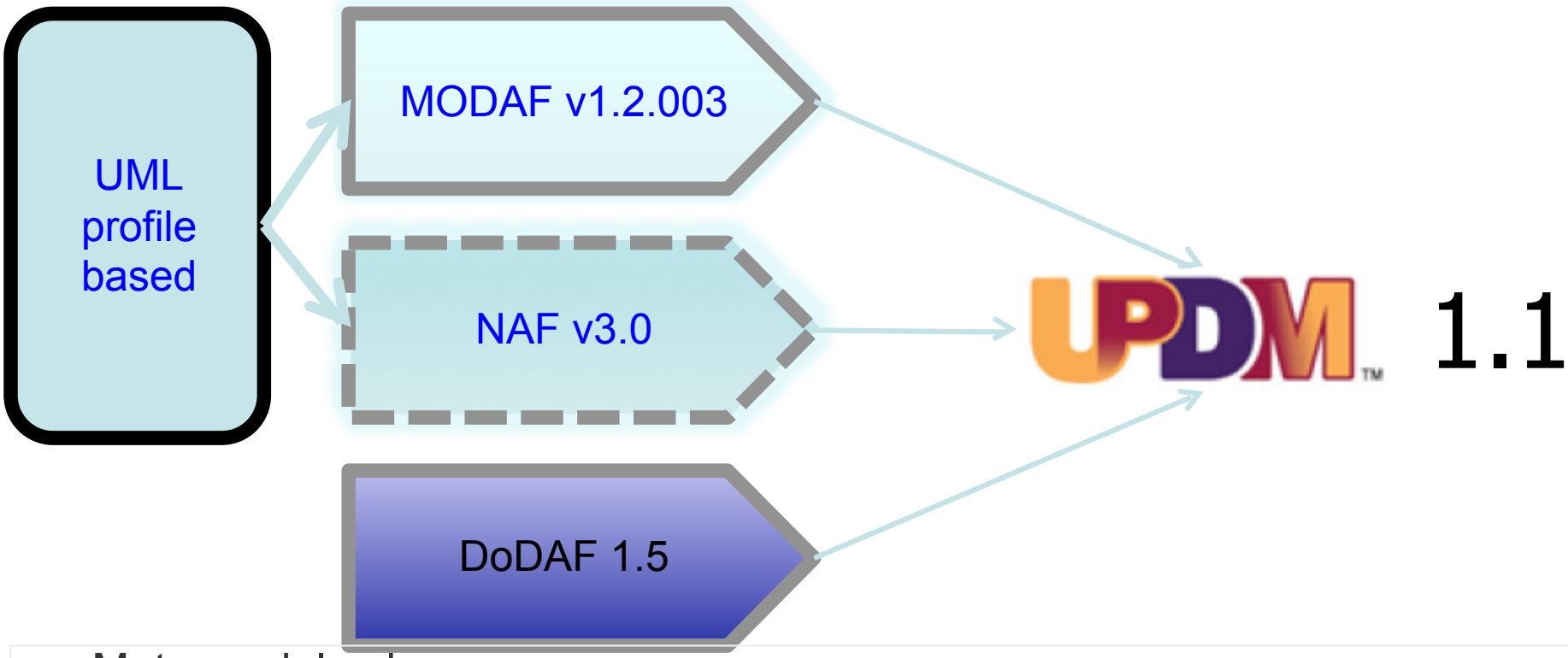

- Meta model coherence
  - Same meta-model,
  - Different presentation layers
- Took an MBSE approach
- UPDM could choose between a pure UML or UML and SysML approach.
- UPDM contained both a profile and a domain meta-model

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Why Model Based Systems Engineering

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- **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**

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What is

Current UPDM V 2.1

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- **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

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UPDM version 2 (2012-present day)

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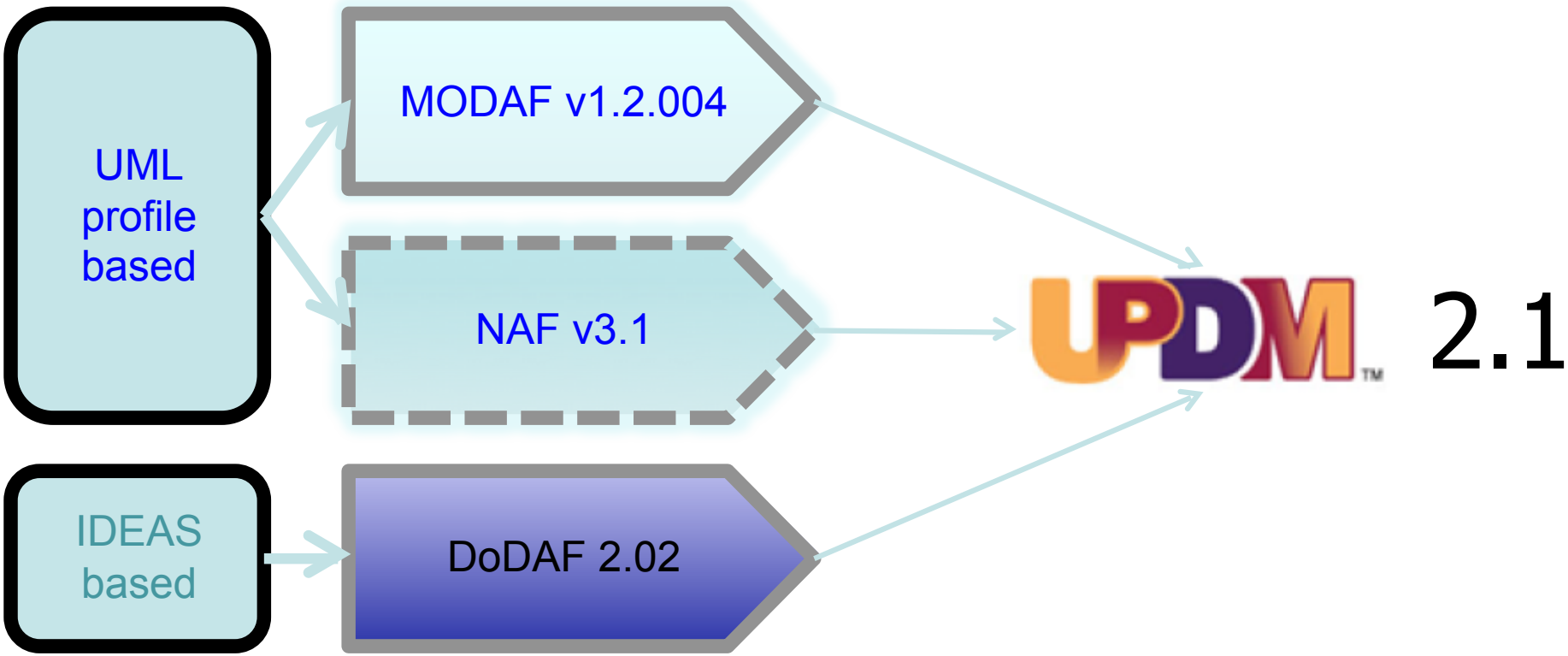

- IDEAS is a formal way for defining a metamodel
  - Allows you to reason across the information

IDEAS – International Defence Enterprise Architecture Specification
Supported by US, UK, SW, Australia, Canada

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Unification with UPDM 2

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- 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

MBSE and Engineering Analysis

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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

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- 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 Lifecylce, Human System Integration, Risk etc.)

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What will be UPDM 3-> UAF 1.0

Framework developments

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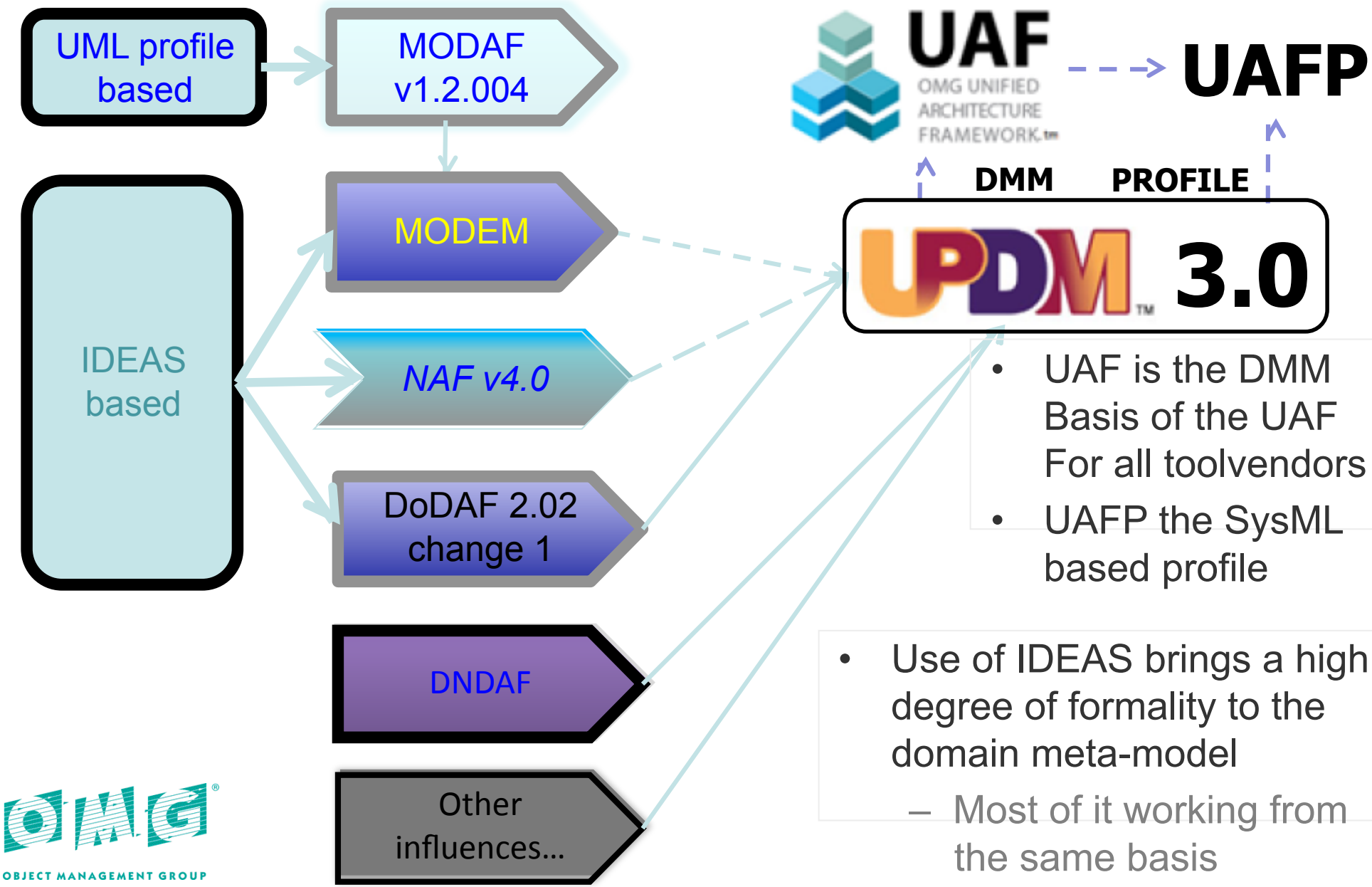
- UPDM RFP requirement: ” The UPDM V3.0 domain metamodel shall be derived from MODEM and DM2, both of which are based upon the International Defence Enterprise Architecture Specification Foundation [IDEAS].”
  - **Mandatory requirements (excerpt):**
    - Provide Domain Metamodel derived from MODEM and 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) ✔

UPDM version 3



- UAF is the DMM Basis of the UAF For all toolvendors
- UAFP the SysML based profile

- Use of IDEAS brings a high degree of formality to the domain meta-model
  - Most of it working from the same basis

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Why a Unified Architecture Framework

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- 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

Grid Approach

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	Behaviour								
	Classification	Structure	Connectivity	Processes	States	Sequences	Information	Constraints	Programme
Enterprise	E1 Capability Taxonomy NAV-2, NCV-2 AV-2, StV-2	E2 Enterprise Vision NCV-1 StV-1	E3 Capability Dependencies NCV-4 StV-4	E4 Standard Processes NCV-6 StV-6	E5 Effects		E7 Performance Parameters NCV-1 StV-1	E8 Planning Assumptions	Ep Capability Phasing NCV-3 StV-3
	E1-S1 (NSOV-3)								
Service	S1 Service Taxonomy NAV-2, NSOV-1 AV-2, SOV-1		S3 Service Interfaces NSOV-2 SOV-2	S4 Service Functions NSOV-3 SOV-5	S5 Service States NSOV-4b SOV-4b	S6 Service Interactions NSOV-4c SOV-4c	S7 Service I/F Parameters NSOV-2 SOV-2	S8 Service Policy NSOV-4a SOV-4a	Sp Service Delivery
Logical	L1 Node Types NAV-2 AV-2	L2 Logical Scenario NOV-2 OV-2	L3 Node Interactions NOV-2, NOV-3 OV-2,OV-3	L4 Logical Activities NOV-5 OV-5	L5 Logical States NOV-6b OV-6b	L6 Logical Sequence NOV-6c OV-6c	L7 Logical Data Model NSV-11a OV-7	L8 Logical Constraints NOV-6a OV-6a	Lp Lines of Development NPV-2 AcV-2
				L4-R4 (NSV-5)					
Resources	R1 Resource Types NAV-2, NSV-9 AV-2, SV-9	R2 Resource Structure NOV-4,NSV-1 OV-4, SV-1	R3 Resource Connectivity NSV-2, NSV-6 SV-2, SV-6	R4 Resource Functions NSV-4 SV-4	R5 Resource States NSV-10b SV-10b	R6 Resource Sequence NSV-10c SV-10c	R7 Physical Data Model NSV-11b SV-11	R8 Resource Constraints NSV-10a SV-10a	Rp Configuration Management NSV-8 SV-8
Deployed	D1 Master Data NAV-2 AV-2	D2 Deployed Resources NCV-5, NOV-4 StV-5, OV-4							Dp Deployment Schedule NCV-5 StV-5
Architecture	A1 Meta-Data Definitions NAV-3 AV-1/2	A2 Architecture Products	A3 Architecture Correspondance ISO42010	A4 Methodology Used NAF Ch3	A5 Architecture Status NAV-1 AV-1	A6 Architecture Versions NAV-1 AV-1	A7 Architecture Meta-Data NAV-1/3 AV-1	A8 Standards NTV-1/2 TV-1/2	Ap Architecture Plan

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Why the Grid ?

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- 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

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Conclusions

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- 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