ArchiMate® for NAF v4

Update from The Open Group NATO/NAF ArchiMate Mapping Working Group

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Agenda

1. Mapping NAFv4 to the ArchiMate® standard: background and challenges
2. Addressing the challenges using ArchiMate®

Mapping ArchiMate® to NAFv4

» NAFv4: One framework, two metamodels:

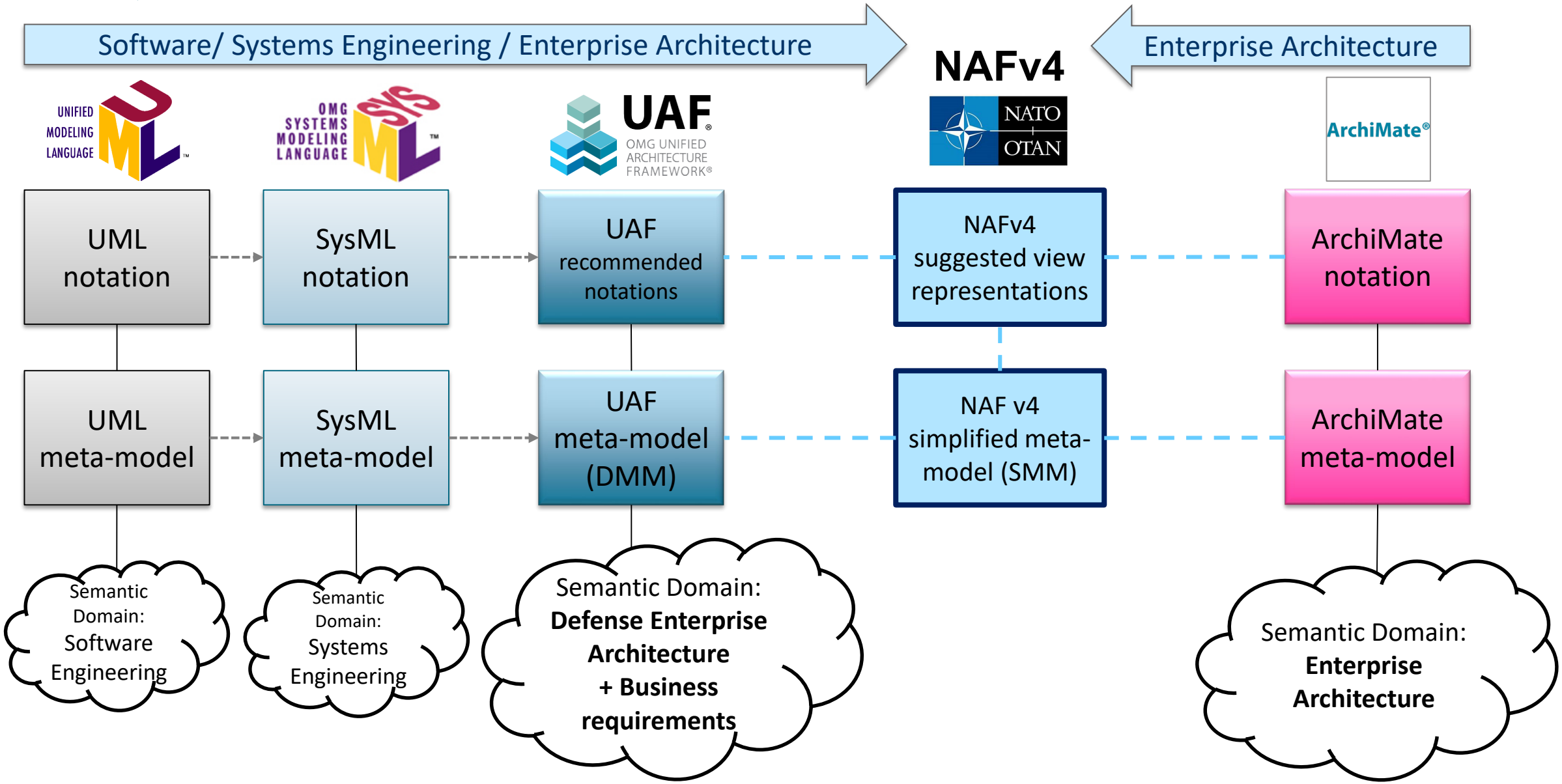
> 1.3 NAFv4 compliant architectures can be creating using the following meta-models; The Open Group®'s ArchiMate® and the Object Management Group®'s Unified Architect Framework (UAF) ® Domain Meta-model (DMM)®.

NATO Architecture Framework Version 4

» Not prescribed in the standard:
  – The mapping of NAF viewpoints and concepts to ArchiMate and UAF
  – How to implement the suggested representations for viewpoints using the metamodels

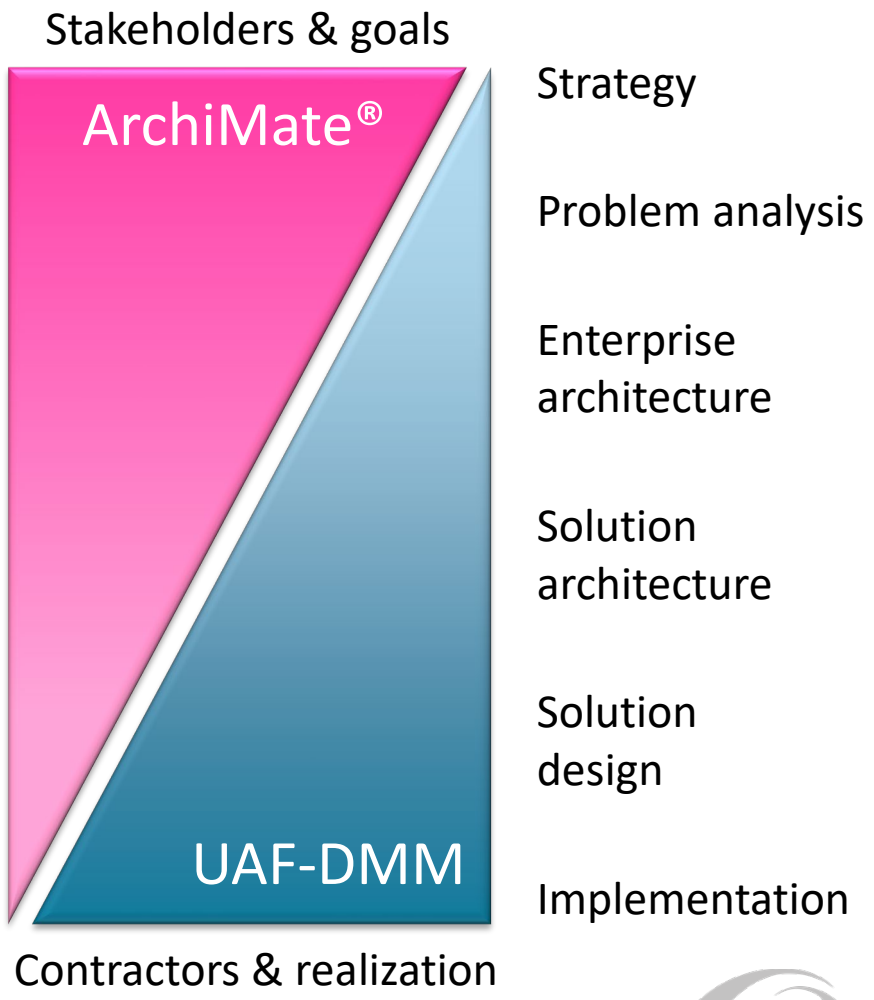
» The Open Group is working to establish a standardized mapping for the ArchiMate standard and NAFv4

NAF, UAF® and ArchiMate®

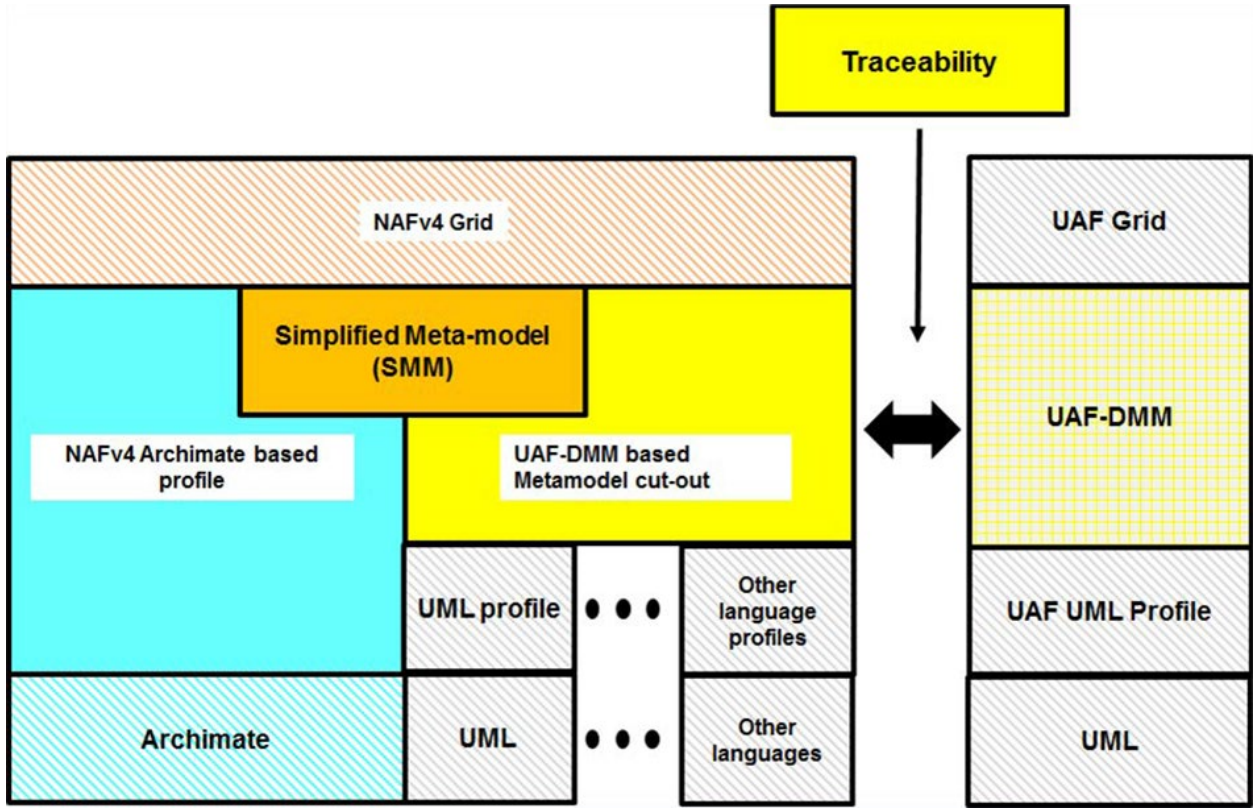


ArchiMate® vs. UAF® Domain Metamodel (UAF-DMM)

- ArchiMate standard:
  - Focused on **enterprise architecture**, stakeholders & goals, translating strategy into action, **problem space**
  - Upstream, communication of the essentials
- UAF-DMM:
  - Focuses on **acquisition** and **enterprise architecture**
  - Can handle **systems engineering**, requirements of contractors & realization in the **solution space**
  - Upstream, communication of acquired capabilities
  - Downstream, implementation-level details

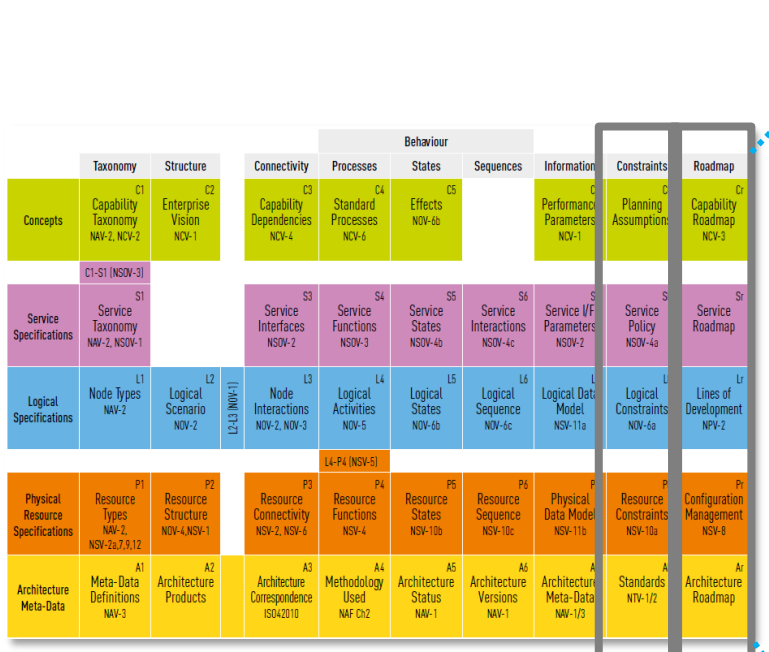


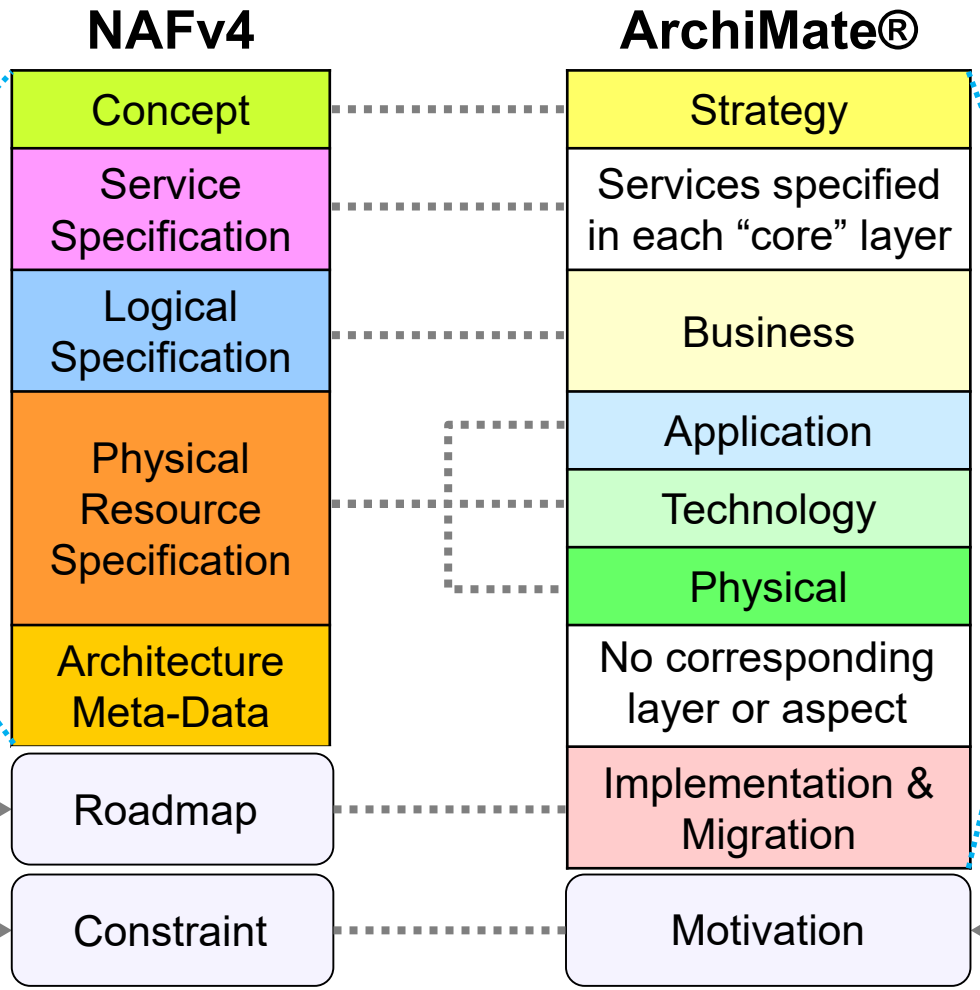
ArchiMate®, UAF® and the NAFv4 Simplified Meta-Model (SMM)

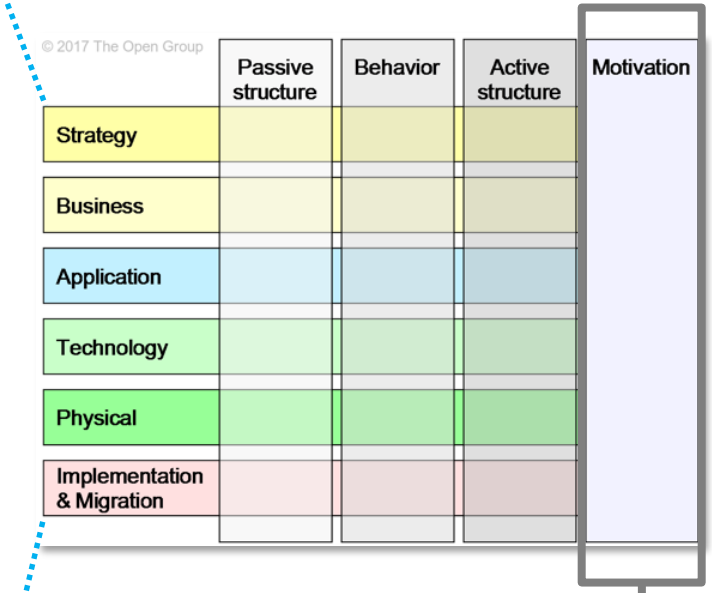


- ArchiMate® and UAF-DMM have a different focus but have the potential to be combined
- ArchiMate is a single language, allowing different visualizations (views)
- Uaf-DMM is an open meta-model that can be implemented by different language profiles

Correspondences between frameworks





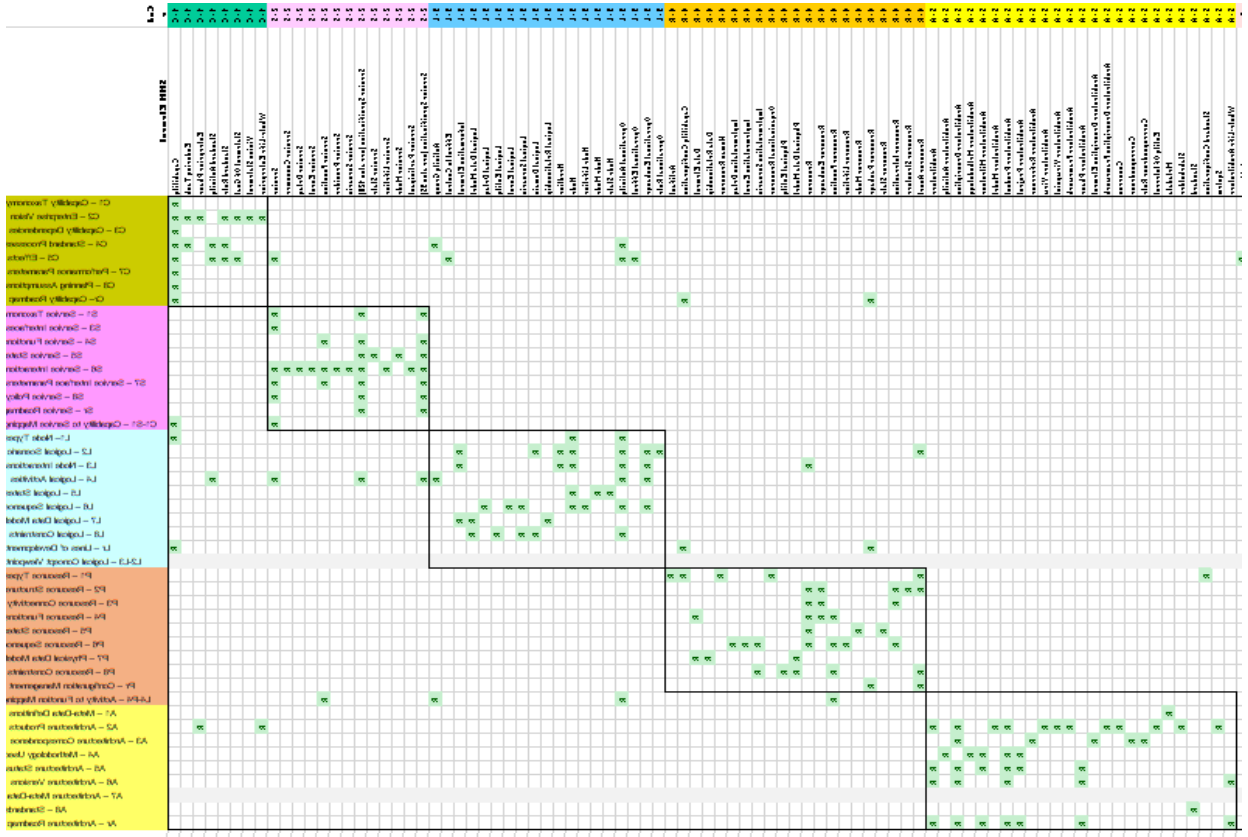


Layers and viewpoints

NAF v4

NAFv4 SMM Elements (by layer)

Prescribed viewpoints



» Most viewpoints are defined for specific cells in the grid, with relatively few elements from other layers.

ArchiMate®

ArchiMate Elements (by layer)

Example viewpoints (informative)

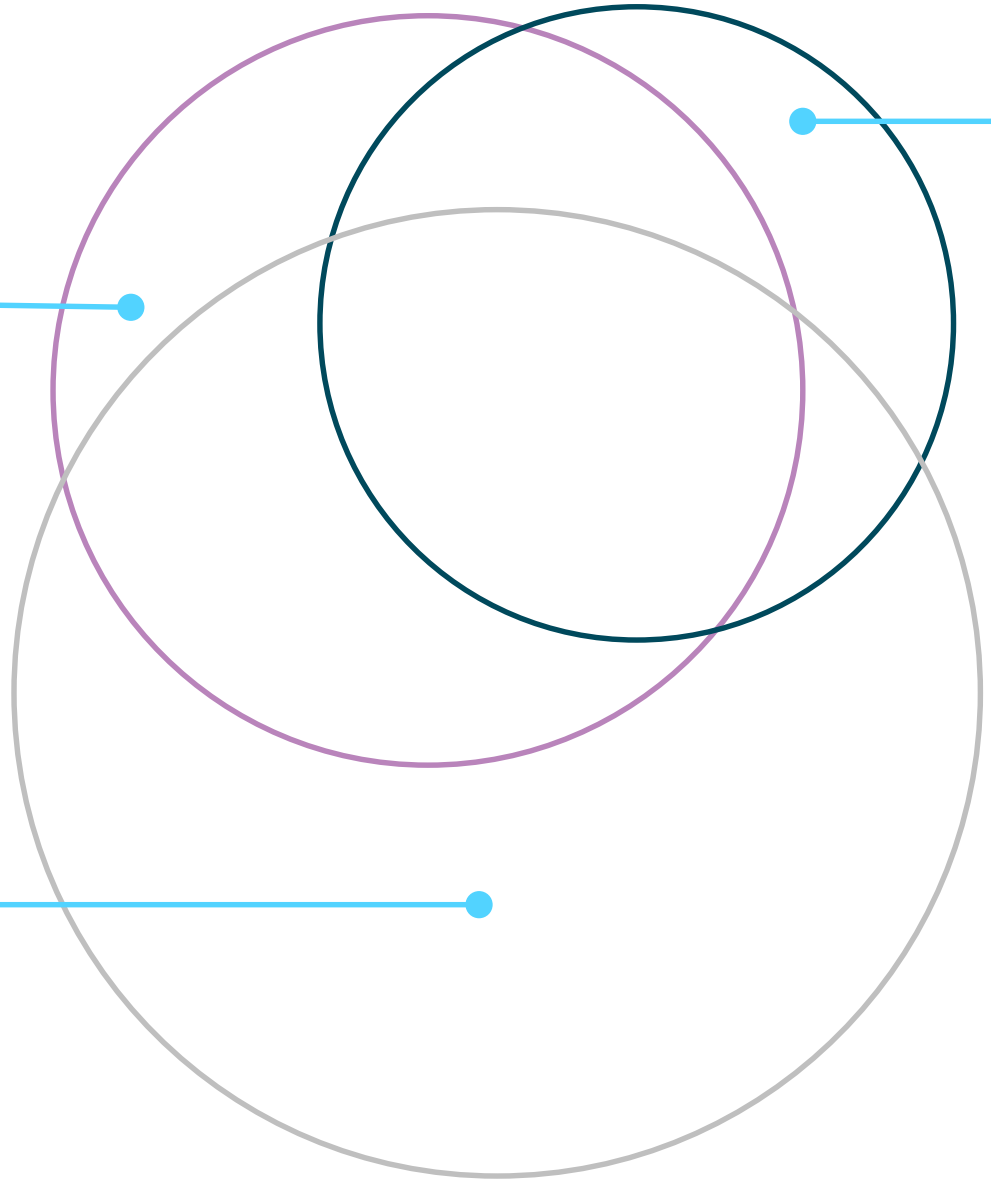
Element	Stakeholder	Goal Realization	Requirements Realization	Motivation	Strategy	Capability Map	Outcome Realization	Resource Map	Organization	Business Process	Product Viewpoint	Application Cooperation	Application Usage	Implementation and	Technology	Technology Usage	Information Structure	Service Realization	Physical	Layered	Project	Migration	Implementation and
	C2.1	C2.2	C2.3	C2.4	C3.R	C3.2	C3.3	C3.4	C1.1	C1.2	C1.3	C1.4	C1.5	C1.6	C1.7	C1.8	C1.9	C1.10	C1.11	C1.12	C4.1	C4.2	C4.3
Capability					R	R	R	R															
Course of action					R																		
Resource					R	R	R	R															
Business actor			R				R		R	R	R		R					R		R	R		R
Business collaboration			R				R		R	R	R		R					R		R			R
Business event			R				R			R	R		R					R		R			R
Business function			R				R			R	R		R					R		R			R
Business interaction			R				R			R	R		R					R		R			R
Business interface			R				R		R	R	R							R		R			R
Business object			R				R			R	R		R				R	R		R			R
Business process			R				R			R	R		R					R		R			R
Business role			R				R		R	R	R		R					R		R	R		R
Business service			R				R			R	R							R		R			R
Contract			R				R				R									R			R
Product			R				R				R									R			R
Representation			R				R			R							R	R		R			R
Application collaboration			R				R			R	R	R	R	R		R		R		R			R
Application component			R				R			R	R	R	R	R		R		R		R			R
Application event			R				R			R	R	R	R	R		R		R		R			R
Application function			R				R			R	R	R	R	R		R		R		R			R
Application interaction			R				R			R	R	R	R	R		R		R		R			R
Application interface			R				R			R	R	R	R	R		R		R		R			R
Application process			R				R			R	R	R	R	R		R		R		R			R
Application service			R				R			R	R	R	R	R		R		R		R			R
Data object			R				R			R	R	R	R	R		R	R	R		R			R
Artifact			R				R				R			R	R	R	R			R			R
Communication network			R				R							R	R	R			R	R			R
Device			R				R							R	R	R			R	R			R
Node			R				R							R	R	R			R	R			R
Path			R				R							R	R	R			R	R			R
System software			R				R							R	R	R				R			R
Technology collaboration			R				R								R	R				R			R
Technology event			R				R								R	R				R			R
Technology function			R				R							R	R	R				R			R
Technology interaction			R				R							R	R	R				R			R
Technology interface			R				R							R	R	R				R			R
Technology process			R				R							R	R	R				R			R
Technology service			R				R				R									R			R
Technology service			R				R							R	R	R				R			R
Distribution network																			R				
Equipment																			R				
Facility																			R				
Material											R								R				

» Viewpoints often cross layers to provide an overview. New viewpoints can be defined as required

Metamodel concepts

NAFv4

> 120 concepts
(in SMM)



ArchiMate®

71 concepts
(60 elements +
11 relationship types)

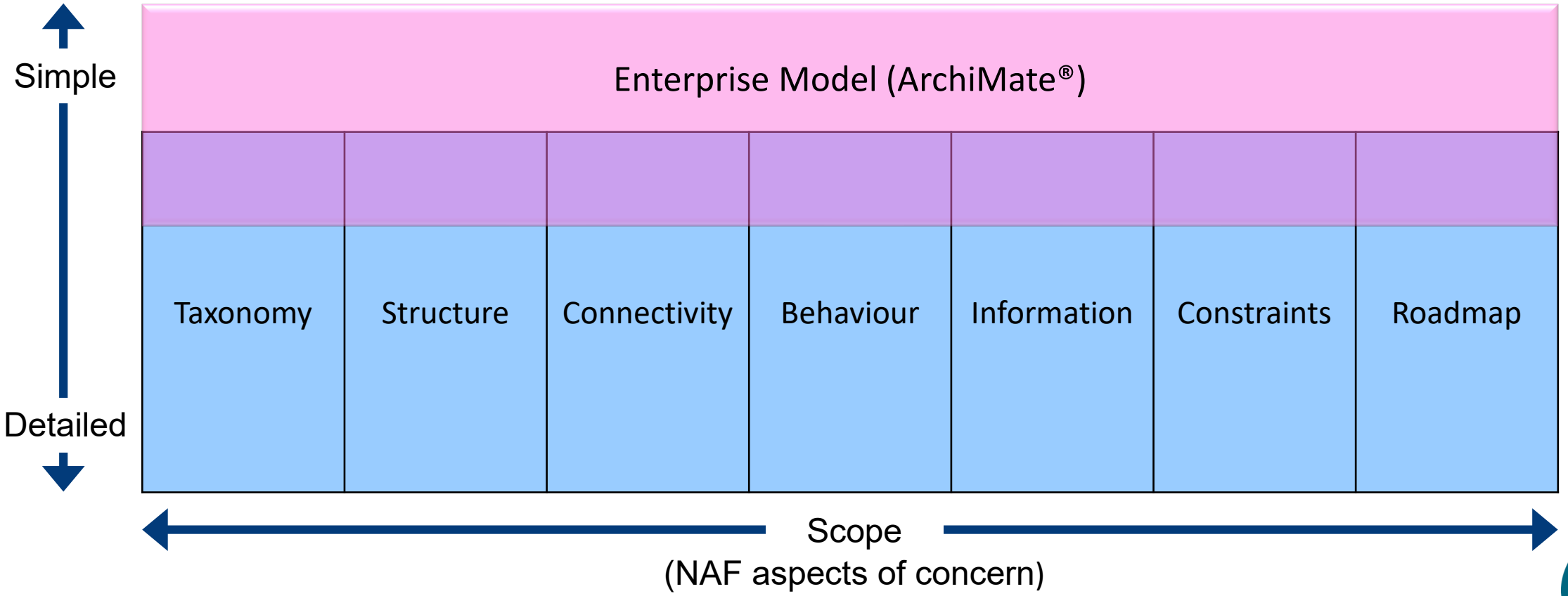
UAF®
OMG UNIFIED ARCHITECTURE FRAMEWORK®

> 200 concepts
(including type/ instance and composite structures)

- A one-to-one mapping for all concepts in the different metamodels should not be expected
- The underlying ontologies are different

Scope

The ArchiMate standard provides a way to show dependencies between models of different architecture domains that are typically created using specialized notations



Some differences between the ArchiMate language and UML/SysML

- The ArchiMate language was designed with **communication** in mind, more than engineering
- UML supports additional specificity that is not available in the ArchiMate language. e.g.
  - **UML Class Diagrams** can be used to elaborate ArchiMate Active Structure Elements such as Application Components, and information elements such as business and data objects.
  - **UML State Machine Diagrams** can be used to represent state transitions of elements defined in ArchiMate models.
  - **UML Sequence Diagrams** express object interactions and can be used to elaborate ArchiMate behaviour elements.
- No type-instance distinction
  - The ArchiMate language intentionally does not support a difference between types and instances. This is less relevant in enterprise architecture (which is mostly concerned with types) and makes models more difficult to understand for non-technical audiences.
- Simple composition model
  - In comparison, SysML has a structured composition model (block/part) with structured boundaries (ports etc.)
  - ArchiMate interface and service concepts can be used to model such boundaries but you may need to enforce a modeling convention

Challenges

1. How should the ArchiMate metamodel be used to construct NAF-compliant architectures?
   - How can NAF viewpoints be expressed in the ArchiMate language?
   - Should the language be extended to enable the use of concepts and/or viewpoint representations that are not supported in the ArchiMate standard ?
2. How can NAF architectures be constructed in a way that enables the best use of both the ArchiMate® and UAF® metamodels?
   - How should teams using different metamodels exchange model content?
   - How should teams using both metamodels integrate their work to produce a consistent architecture?
3. How to encourage adoption and promote best practice for using the ArchiMate and UAF standards for NAF?

Agenda

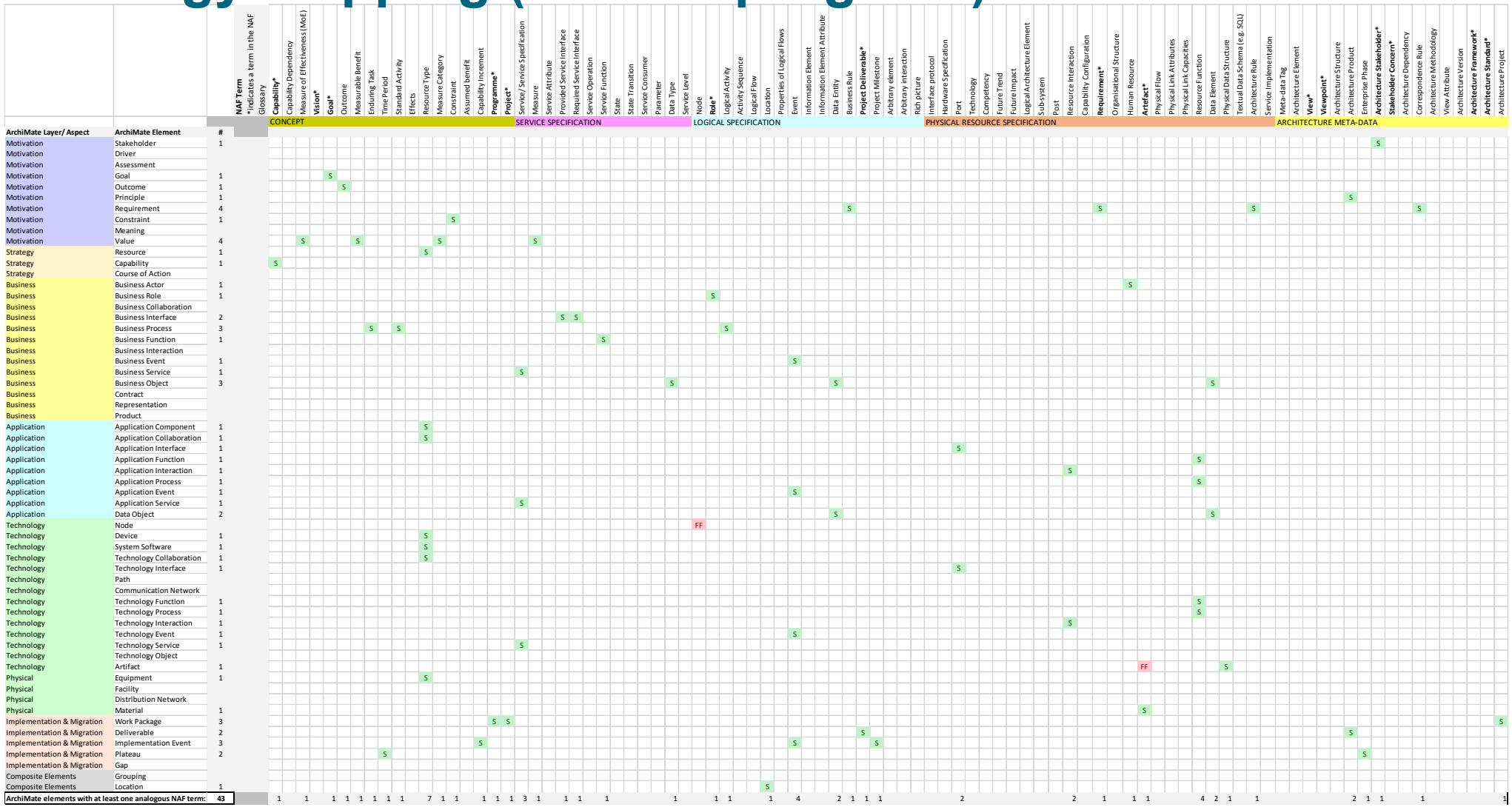
1. Mapping NAFv4 to the ArchiMate® standard: background and challenges
2. **Addressing the challenges using the ArchiMate language**

How to make the ArchiMate language work for NAF?

Work in progress by The Open Group ArchiMate Forum Working Group:

1. Map NAF terms to corresponding ArchiMate concepts
   - Close match found (so far) for many of the NAF terms, and more with some specializations
2. Express NAF v4 views in ArchiMate notation
   - Mapping of applicable views
   - Good examples are key, e.g. the Federated Mission Networking architecture is already being expressed in ArchiMate
3. Let ArchiMate notation work with other standards
   - It was designed to do so from the beginning

Terminology mapping (work in progress)



ArchiMate Layer/ Aspect	ArchiMate Element	#
Motivation	Stakeholder	1
Motivation	Driver	
Motivation	Assessment	
Motivation	Goal	1
Motivation	Outcome	1
Motivation	Principle	1
Motivation	Requirement	4
Motivation	Constraint	1
Motivation	Meaning	
Motivation	Value	4
Strategy	Resource	1
Strategy	Capability	1
Strategy	Course of Action	
Business	Business Actor	1
Business	Business Role	1
Business	Business Collaboration	
Business	Business Interface	2
Business	Business Process	3
Business	Business Function	1
Business	Business Interaction	
Business	Business Event	1
Business	Business Service	1
Business	Business Object	3
Business	Contract	
Business	Representation	
Business	Product	
Application	Application Component	1
Application	Application Collaboration	1
Application	Application Interface	1
Application	Application Function	1
Application	Application Interaction	1
Application	Application Process	1
Application	Application Event	1
Application	Application Service	1
Application	Data Object	2
Technology	Node	
Technology	Device	1
Technology	System Software	1
Technology	Technology Collaboration	1
Technology	Technology Interface	1
Technology	Path	
Technology	Communication Network	
Technology	Technology Function	1
Technology	Technology Process	1
Technology	Technology Interaction	1
Technology	Technology Event	1
Technology	Technology Service	1
Technology	Technology Object	
Technology	Artifact	1
Physical	Equipment	1
Physical	Facility	
Physical	Distribution Network	
Physical	Material	1
Implementation & Migration	Work Package	3
Implementation & Migration	Deliverable	2
Implementation & Migration	Implementation Event	3
Implementation & Migration	Plateau	2
Implementation & Migration	Gap	
Composite Elements	Grouping	
Composite Elements	Location	1
ArchiMate elements with at least one analogous NAF term:		43

Terminology mapping (work in progress)

ArchiMate Layer/ Aspect	ArchiMate Element	#	NAF Term *indicates a term in the NAF Glossary	**Capability***	Capability Dependency	Measure of Effectiveness (MoE)	**Vision***	**Goal***	Outcome	Measurable Benefit	Enduring Task	Time Period	Standard Activity	Effects	Resource Type	Measure Category	Constraint	Assumed benefit	Capability Increment	**Programme***	**Project***	Service/ Service Specification	Measure	Service Attribute	Provided Service Interface	Required Service Interface	Service Operation	Service Function	State	State Transition	Service Consumer	Parameter	Data Type	Service Level
				CONCEPT																		SERVICE SPECIFICATION												
Motivation	Stakeholder	1																															
Motivation	Driver																																
Motivation	Assessment																																
Motivation	Goal	1						S																									
Motivation	Outcome	1							S																								
Motivation	Principle	1																															
Motivation	Requirement	4																															
Motivation	Constraint	1															S																
Motivation	Meaning																																
Motivation	Value	4				S				S						S							S										
Strategy	Resource	1													S																		
Strategy	Capability	1		S																													
Strategy	Course of Action																																
Business	Business Actor	1																															
Business	Business Role	1																															
Business	Business Collaboration																																
Business	Business Interface	2																							S	S							
Business	Business Process	3									S		S																				
Business	Business Function	1																										S					
Business	Business Interaction																																

Viewpoint mapping

Many possible representations:

1. Lists, matrices and other tables can of course be generated from models in any modeling language, including ArchiMate
2. ArchiMate standard notation is well-suited for many NAF views
3. Next to the standard notation, the ArchiMate language also allows for other representations. See the chapter on *Architecture Views & Viewpoints* in the standard

Mapping on the next slides is provisional!

NAF v4 viewpoint representations (work in progress)

NAFv4 View	NAFv3 ID	Suggested Representation	Representation Type
C1 – Capability Taxonomy	NAV-1, NCV-2	Tabulation.	Table
C1 – Capability Taxonomy	NAV-1, NCV-2	Hierarchical (Connected Shapes).	Hierarchical (Connected Shapes)
C1 – Capability Taxonomy	NAV-1, NCV-2	ArchiMate Capabilities	ArchiMate view
C1 – Capability Taxonomy	NAV-1, NCV-2	Class Diagram (with generalization relationships and property definitions).	UML Class diagram
C2 – Enterprise Vision	NCV-1	Structured Text.	Structured Text
C2 – Enterprise Vision	NCV-1	ArchiMate Stakeholder, Goal, Outcome concepts	ArchiMate view
C2 – Enterprise Vision	NCV-1	UML Composite Structure Diagram.	UML Composite Structure Diagram
C2 – Enterprise Vision	NCV-1	SysML Structural Diagrams.	SysML Structural Diagram
C3 – Capability Dependencies	NCV-4	ArchiMate Capabilities	ArchiMate view
C3 – Capability Dependencies	NCV-4	"Nested box" diagram.	"Nested box" diagram
C3 – Capability Dependencies	NCV-4	UML Class diagram.	UML Class Diagram
C3 – Capability Dependencies	NCV-4	UML Composite Structure diagram.	UML Composite Structure Diagram
C3 – Capability Dependencies	NCV-4	SysML Structural diagram.	SysML Structural Diagram
C4 – Standard Processes	NCV-6	ArchiMate Business Processes	ArchiMate view
C4 – Standard Processes	NCV-6	Tabular.	Table
C4 – Standard Processes	NCV-6	Tracing Diagram.	Tracing Diagram
C5 – Effects	NOV-6b	Tabular.	Table
C5 – Effects	NOV-6b	Structural diagram.	Structural diagram
C5 – Effects	NOV-6b	Histogram.	Histogram
C5 – Effects	NOV-6b	Finite state diagram.	State Diagram
C6 – Not Used			
C7 – Performance Parameters	NCV-1	ArchiMate concepts with attribute definitions.	ArchiMate model
C7 – Performance Parameters	NCV-1	Tabular (capabilities on one axis, measure categories on the other).	Table
C7 – Performance Parameters	NCV-1	UML Classes with property definitions.	UML Class Diagram
C8 – Planning Assumptions		ArchiMate Stakeholder, Goal, Outcome concepts	ArchiMate view
C8 – Planning Assumptions		Tabular.	Table
C8 – Planning Assumptions		Benefits diagram	Benefits diagram
C9– Capability Roadmap	NCV-3	A time based chart in the style of a Gantt chart.	Gantt Chart
C9– Capability Roadmap	NCV-3	ArchiMate Implementation & Migration concepts (e.g. Plateau, Impl. Event, Deliverable, Work Package)	ArchiMate view
S1 – Service Taxonomy	NAV-2, NSOV-1	ArchiMate Business & Application Service concepts	ArchiMate view
S1 – Service Taxonomy	NAV-2, NSOV-1	Tabulation.	Table
S1 – Service Taxonomy	NAV-2, NSOV-1	Hierarchical (connected shapes).	Hierarchical (Connected Shapes)
S1 – Service Taxonomy	NAV-2, NSOV-1	UML class diagram.	UML Class Diagram
S2 – Not Used			
S3 – Service Interfaces	NSOV-2	Tabular.	Table
S3 – Service Interfaces	NSOV-2	ArchiMate Application/Technology Interfaces	ArchiMate view
S3 – Service Interfaces	NSOV-2	UML	UML
S4 – Service Functions	NSOV-3	Tabular.	Table
S4 – Service Functions	NSOV-3	UML	UML
S4 – Service Functions	NSOV-3	ArchiMate Application/Technology Functions	ArchiMate view
S5 – Service States	NSOV-4b	UML	UML
S5 – Service States	NSOV-4b	Other state transition models.	State Diagram
S6 – Service Interaction	NSOV-4c	ArchiMate Flow relationships	ArchiMate view
S6 – Service Interaction	NSOV-4c	Sequence Diagram	UML Sequence Diagram
S7 – Service Interface Parameters	NSOV-2	Tabular.	Table
S7 – Service Interface Parameters	NSOV-2	ArchiMate Application/Technology Interfaces with attributes	ArchiMate view
S7 – Service Interface Parameters	NSOV-2	UML	UML
S8 – Service Policy	NSOV-4a	Tabular.	Table
S8 – Service Policy	NSOV-4a	ArchiMate Contract concept	ArchiMate view
S8 – Service Policy	NSOV-4a	UML	UML
S9 – Service Roadmap		ArchiMate Implementation & Migration concepts (e.g. Plateau, Impl. Event, Deliverable, Work Package)	ArchiMate view
Sr – Service Roadmap		A time based chart in the style of a Gantt chart.	Gantt Chart
Sr – Service Roadmap		Tabular.	Table
CI-S1 – Capability to Service Mappi	NSOV-3	Matrix (with capabilities on one axis, and services on the other one).	Matrix
CI-S1 – Capability to Service Mappi	NSOV-3	ArchiMate Capabilities & Business/Appl./Tech. Services	ArchiMate view
CI-S1 – Capability to Service Mappi	NSOV-3	UML	UML
L1– Node Types	NAV-2	Topological (connected shapes).	Topological (connected shapes)
L1– Node Types	NAV-2	ArchiMate (various concepts)	ArchiMate view
L1– Node Types	NAV-2	Tabular.	Table
L2 – Logical Scenario	NOV-2	Topological (connected shapes).	Topological (connected shapes)
L2 – Logical Scenario	NOV-2	ArchiMate (various concepts)	ArchiMate view
L2 – Logical Scenario	NOV-2	UML composite structure diagram.	UML Composite Structure Diagram
L3 – Node Interactions	NOV-2, NOV-3	Tabulation.	Table
L3 – Node Interactions	NOV-2, NOV-3	ArchiMate concepts connected with Flow relationships.	ArchiMate view
L3 – Node Interactions	NOV-2, NOV-3	Information flow diagram.	Information flow diagram
L4 – Logical Activities	NOV-5	ArchiMate Bus. Processes, Appl. Functions, etc. with Aggregation, Composition & Flow relationships	ArchiMate view
L4 – Logical Activities	NOV-5	Hierarchy chart.	Hierarchical (Connected Shapes)
L4 – Logical Activities	NOV-5	IDEF0 Diagram.	IDEF0
L4 – Logical Activities	NOV-5	UML activity diagram.	UML Activity Diagram
L4 – Logical Activities	NOV-5	UML activity diagram (with swim-lanes).	UML Activity Diagram
L5 – Logical States	NOV-6b	Topological (Connected Shapes).	Topological (connected shapes)
L5 – Logical States	NOV-6b	UML state diagram.	UML Statechart diagram
L6 – Logical Sequence	NOV-6c	ArchiMate behavior elements with Triggering relationships	ArchiMate view
L6 – Logical Sequence	NOV-6c	UML sequence diagram.	UML Sequence Diagram
L6 – Logical Sequence	NOV-6c	Event-trace diagram.	UML Sequence Diagram
L6 – Logical Sequence	NOV-6c	Timing diagram.	Timing Diagram
L7 – Logical Data Model	NSV-11a	ArchiMate Business & Data Objects	ArchiMate view
L7 – Logical Data Model	NSV-11a	Entity-Relationship diagram (e.g. IDAF1X).	IDAF1X/IE
L7 – Logical Data Model	NSV-11a	UML class diagram.	UML Class Diagram
L8 – Logical Constraints	NOV-6a	Structured Text.	Structured Text
L8 – Logical Constraints	NOV-6a	ArchiMate Requirements & Constraints	ArchiMate view
L8 – Logical Constraints	NOV-6a	UML diagram with associated UML constraints.	UML
L8 – Logical Constraints	NOV-6a	Business rules diagram.	Business rules diagram
Lr – Lines of Development	NPV-2	ArchiMate Implementation & Migration concepts (e.g. Plateau, Impl. Event, Deliverable, Work Package)	ArchiMate view
Lr – Lines of Development	NPV-2	Timeline View.	Timeline
Lr – Lines of Development	NPV-2	Augmented Gantt Chart.	Gantt Chart
L2-L3 – Logical Concept Viewpoint	NOV-1	Graphic.	Operational Concept Diagram
L2-L3 – Logical Concept Viewpoint	NOV-1	Rich Picture.	Operational Concept Diagram
L2-L3 – Logical Concept Viewpoint	NOV-1	Concept diagram.	Operational Concept Diagram
L2-L3 – Logical Concept Viewpoint	NOV-1	Project context diagram.	Project context diagram
P1 – Resource Types	NSV-2a, 7, 9, 12	Tabulation.	Table
P1 – Resource Types	NSV-2a, 7, 9, 12	Mapping (matrix).	Matrix
P1 – Resource Types	NSV-2a, 7, 9, 12	Topological – connected shapes.	Topological (connected shapes)
P1 – Resource Types	NSV-2a, 7, 9, 12	ArchiMate Technology & Physical concepts	ArchiMate view
P1 – Resource Types	NSV-2a, 7, 9, 12	UML Composite Structure Diagram.	UML Composite Structure Diagram
P1 – Resource Types	NSV-2a, 7, 9, 12	SysML block diagram.	SysML block diagram
P1 – Resource Types	NSV-2a, 7, 9, 12	Timeline View.	Timeline
P1 – Resource Types	NSV-2a, 7, 9, 12	"Herringbone" diagram.	"Herringbone" Diagram
P2 – Resource Structure	NOV-4, NSV-1	Topological (connected shapes).	Topological (connected shapes)
P2 – Resource Structure	NOV-4, NSV-1	UML composite structure diagram (typical)	UML Composite Structure Diagram
P2 – Resource Structure	NOV-4, NSV-1	ArchiMate Technology & Physical concepts with Aggregation & Composition relationships	ArchiMate view
P2 – Resource Structure	NOV-4, NSV-1	UML instances (actual).	UML Object Diagram
P2 – Resource Structure	NOV-4, NSV-1	SysML block diagram.	SysML block diagram
P3 – Resource Connectivity	NSV-2, NSV-6	Topological (connected shapes).	Topological (connected shapes)
P3 – Resource Connectivity	NSV-2, NSV-6	ArchiMate Technology & Physical concepts with Triggering & Flow relationships	ArchiMate view
P3 – Resource Connectivity	NSV-2, NSV-6	UML composite structure diagram.	UML Composite Structure Diagram
P3 – Resource Connectivity	NSV-2, NSV-6	SysML structural diagram.	SysML Structural Diagram
P3 – Resource Connectivity	NSV-2, NSV-6	Tabulation.	Table
P4 – Resource Functions	NSV-4	Topological (connected shapes).	Topological (connected shapes)
P4 – Resource Functions	NSV-4	ArchiMate Technology & Physical (behavior) concepts with Triggering & Flow relationships	ArchiMate view
P4 – Resource Functions	NSV-4	UML activity diagram (with swim lanes to represent resources).	UML Activity Diagram
P4 – Resource Functions	NSV-4	Functional breakdown (decomposition).	Hierarchical (Connected Shapes)
P4 – Resource Functions	NSV-4	SysML activity diagram.	SysML Activity Diagram
P5 – Resource States	NSV-10b	UML state diagram.	UML Statechart diagram
P6 – Resource Sequence	NSV-10c	Topological (connected shapes)	Topological (connected shapes)
P6 – Resource Sequence	NSV-10c	ArchiMate Technology & Physical (behavior) concepts with Triggering relationships	ArchiMate view
P6 – Resource Sequence	NSV-10c	UML Sequence Diagram (preferred).	UML Sequence Diagram
P7 – Physical Data Model	NSV-11b	Formal text data modelling language (e.g. SQL, ISO10303-11, etc.).	Formal Text
P7 – Physical Data Model	NSV-11b	Topological (connected shapes).	Topological (connected shapes)
P7 – Physical Data Model	NSV-11b	ArchiMate Data Objects & Artifacts	ArchiMate view
P7 – Physical Data Model	NSV-11b	UML class diagram.	UML Class Diagram
P8 – Resource Constraints	NSV-10a	Text (preferably specified in a computer-interpretable constraint language such as OCL).	Structured Text
P8 – Resource Constraints	NSV-10a	Tabular.	Table
P8 – Resource Constraints	NSV-10a	ArchiMate Requirements & Constraints	ArchiMate view
P8 – Resource Constraints	NSV-10a	<Note: The example given in NAF uses none of the specified representations>	Miscellaneous
Pr – Configuration Management	NSV-8	Timeline View.	Timeline
Pr – Configuration Management	NSV-8	ArchiMate Implementation & Migration concepts (e.g. Plateau, Impl. Event, Deliverable, Work Package)	ArchiMate view
Pr – Configuration Management	NSV-8	"Herringbone" diagram.	"Herringbone" Diagram
L4-P4 – Activity to Function Mappin	NSV-5	Tabular.	Table
A1 – Meta-Data Definitions	NAV-3	Tables.	Table
A1 – Meta-Data Definitions	NAV-3	Text.	Text
A2 – Architecture Products		NAF grid representation.	NAF Grid
A2 – Architecture Products		Other representations suitable for the architect.	Miscellaneous
A3 – Architecture Correspondence		Tabular.	Table
A3 – Architecture Correspondence		Graphical elements linked by tracing lines.	Topological (connected shapes)
A4 – Methodology Used		Tabular.	Table
A4 – Methodology Used		Text Document.	Text
A5 – Architecture Status	NAV-1	Tabular.	Table
A5 – Architecture Status	NAV-1	Text Document.	Text
A6 – Architecture Versions	NAV-1	Timeline representation.	Timeline
A6 – Architecture Versions	NAV-1	<Note: The example given in NAF uses none of the specified representations>	Miscellaneous
A7 – Architecture Meta-Data	NAV-1, NAV-3	Tabular.	Table
A7 – Architecture Meta-Data	NAV-1, NAV-3	Text document.	Text
A8 – Standards	NTV-1, NTV-2	Tabular.	Table
A8 – Standards	NTV-1, NTV-2	ArchiMate Principles, Requirements & Constraints	ArchiMate view
Ar – Architecture Roadmap		An Ar View is usually shown as a timeline annotated with architecture releases and meta-d	Timeline
Ar – Architecture Roadmap		ArchiMate Implementation & Migration concepts (e.g. Plateau, Impl. Event, Deliverable, Work Package)	ArchiMate view
Ar – Architecture Roadmap		<Note: The example given in NAF uses none of the specified representations>	Miscellaneous

NAF v4 viewpoint representations (work in progress)

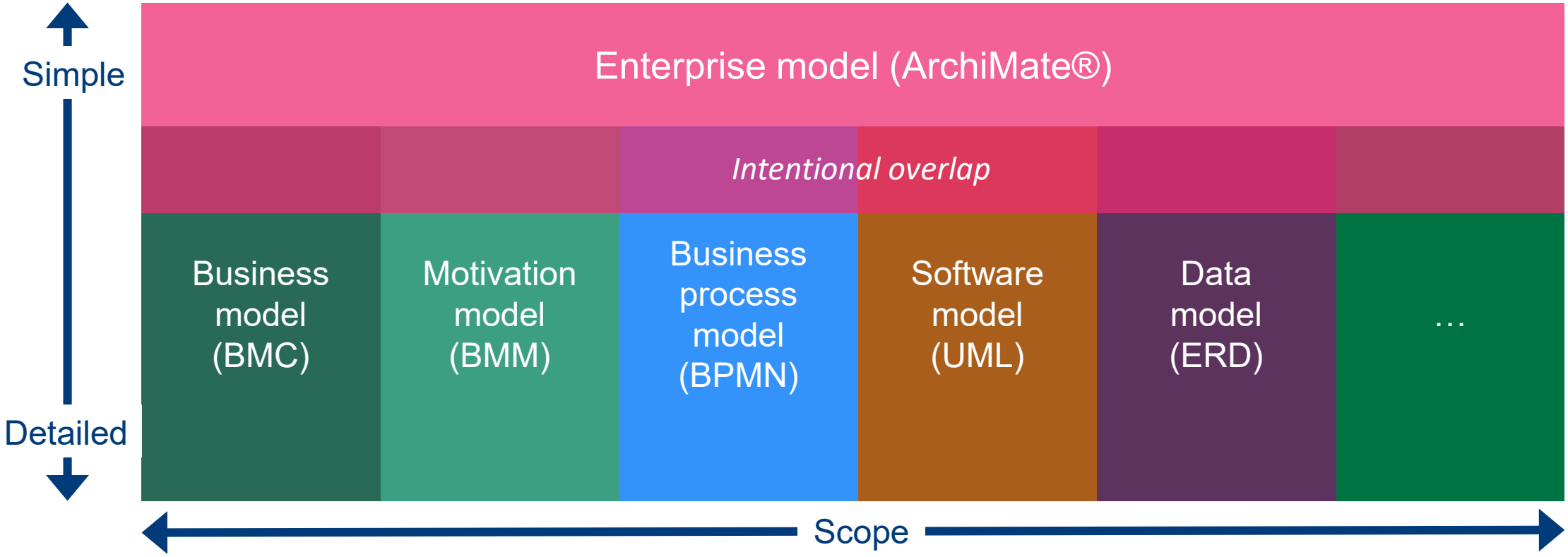
NAFv4 View	NAFv3 ID	Suggested Representation	Representation Type
C1 – Capability Taxonomy	NAV-1, NCV-2	Tabulation.	Table
C1 – Capability Taxonomy	NAV-1, NCV-2	Hierarchical (Connected Shapes).	Hierarchical (Connected Shapes)
C1 – Capability Taxonomy	NAV-1, NCV-2	ArchiMate Capabilities	ArchiMate view
C1 – Capability Taxonomy	NAV-1, NCV-2	Class Diagram (with generalization relationships and property definitions).	UML Class diagram
C2 – Enterprise Vision	NCV-1	Structured Text.	Structured Text
C2 – Enterprise Vision	NCV-1	ArchiMate Stakeholder, Goal, Outcome concepts	ArchiMate view
C2 – Enterprise Vision	NCV-1	UML Composite Structure Diagram.	UML Composite Structure Diagram
C2 – Enterprise Vision	NCV-1	SysML Structural Diagrams.	SysML Structural Diagram
C3 – Capability Dependencies	NCV-4	ArchiMate Capabilities	ArchiMate view
C3 – Capability Dependencies	NCV-4	'Nested box' diagram.	'Nested box' diagram
C3 – Capability Dependencies	NCV-4	UML Class diagram.	UML Class Diagram
C3 – Capability Dependencies	NCV-4	UML Composite Structure diagram.	UML Composite Structure Diagram
C3 – Capability Dependencies	NCV-4	SysML Structural diagram.	SysML Structural Diagram
C4 – Standard Processes	NCV-6	ArchiMate Business Processes	ArchiMate view
C4 – Standard Processes	NCV-6	Tabular.	Table
C4 – Standard Processes	NCV-6	Tracing Diagram.	Tracing Diagram
C5 – Effects	NOV-6b	Tabular.	Table
C5 – Effects	NOV-6b	Structural diagram.	Structural diagram
C5 – Effects	NOV-6b	Histogram.	Histogram
C5 – Effects	NOV-6b	Finite state diagram.	State Diagram
C6 – Not Used			
C7 – Performance Parameters	NCV-1	ArchiMate concepts with attribute definitions	ArchiMate model
C7 – Performance Parameters	NCV-1	Tabular (capabilities on one axis, measure categories on the other).	Table
C7 – Performance Parameters	NCV-1	UML Classes with property definitions.	UML Class Diagram
C8 – Planning Assumptions		ArchiMate Stakeholder, Goal, Outcome concepts	ArchiMate view
C8 – Planning Assumptions		Tabular.	Table
C8 – Planning Assumptions		Benefits diagram	Benefits diagram
Cr– Capability Roadmap	NCV-3	A time based chart in the style of a Gantt chart.	Gantt Chart
Cr– Capability Roadmap	NCV-3	ArchiMate Implementation & Migration concepts (e.g. Plateau, Impl. Event, Deliverable,	ArchiMate view

Customization and modeling conventions

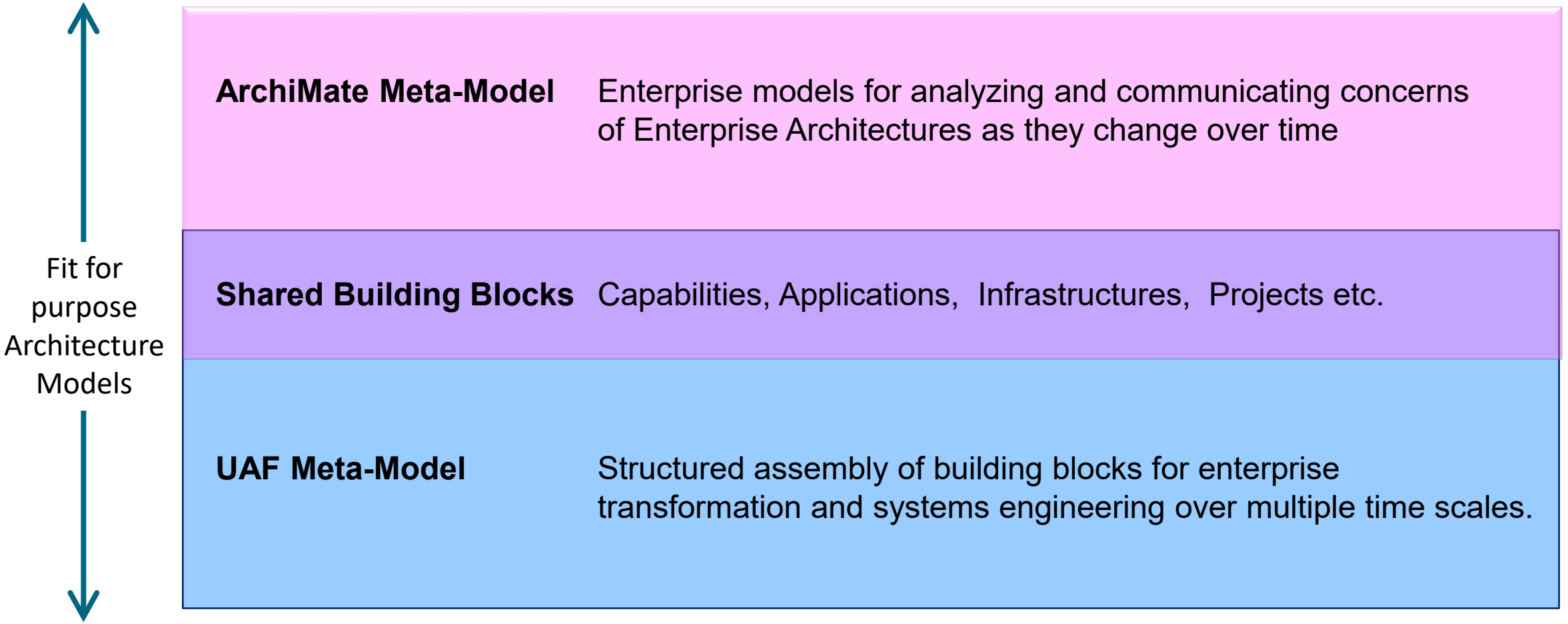
- The ArchiMate language has a built-in **language customization mechanism**, which you can use to define specializations of concepts
  - E.g. ‘Organization Unit’ as specialization of ‘Business Actor’
  - These can have their own specific sets of properties

- In addition, you can define **modeling conventions** to restrict the use of ArchiMate concepts and notation, e.g.:
  - Use services and interfaces instead of ‘direct’ connections between elements
  - Use triggering relationships between processes and flows between functions to express behavior

The ArchiMate language and other standards



Integrated architecture leveraging the two NAF meta-models



How the ArchiMate language works with other standards

- The ArchiMate standard connects architectural domains
  - It doesn't replace other standards but provides an 'umbrella' on top
  - Broader scope, but less detailed
  - Those details can be expressed in other languages
- Some concepts in the ArchiMate standard are taken from BPMN, UML, BMM and others
  - This **intentional overlap** makes it possible to link to e.g. UML descriptions of detailed design or BPMN process models
  - In some cases there are structural differences between the languages that preclude a direct concept-to-concept mapping, requiring a pattern-based approach
- This way you can combine stakeholder-oriented, enterprise-level ArchiMate models with development-oriented, engineering-level models in other standards
- The ArchiMate Model Exchange File Format standard allows ArchiMate models interchange between different tools supporting interoperability and information sharing. This represents a key benefit while interacting with other standards

Conclusions (1)

- Viewpoints from Enterprise Architecture & Systems Engineering are **complementary**
  - You need both in a full design trajectory
  - But there may be a difference in use between ‘upstream’ clients (e.g. from NATO partners) and ‘downstream’ contractors (e.g. the defense industry)
- The ArchiMate language is **well-suited for NAF v4**
  - Initial assessments suggest substantial coverage of concepts and viewpoints
  - In particular for communication, strategy, enterprise architecture, coherence across domains, and other ‘upstream’ products
  - Avoids unnecessary complexity for stakeholders who don’t need that
- NATO’s requirements analysis for NAF v4 shows that neither standard covers all, so a **combination is needed**
  - UAF-DMM satisfied 37%, ArchiMate 65% of weighted requirements

Conclusions (2)

- The ArchiMate standard **plays well with other standards** like UML and SysML
  - It was designed to do so from the start
  - This makes a combined ArchiMate® – UAF-DMM approach feasible
- The ArchiMate Model Exchange File Format makes it **easy to share architecture content** with other organizations (and their tools)
  - A key benefit in a collaborative environment like NATO
- **Good examples** are key!
  - E.g. the Federated Mission Networking (FMN) ArchiMate model being developed by NATO

Thank you!