
THE MIP INFORMATION MODEL

A Platform-Independent Reference Data Model
for a Future Interoperability Solution



Nico Bau

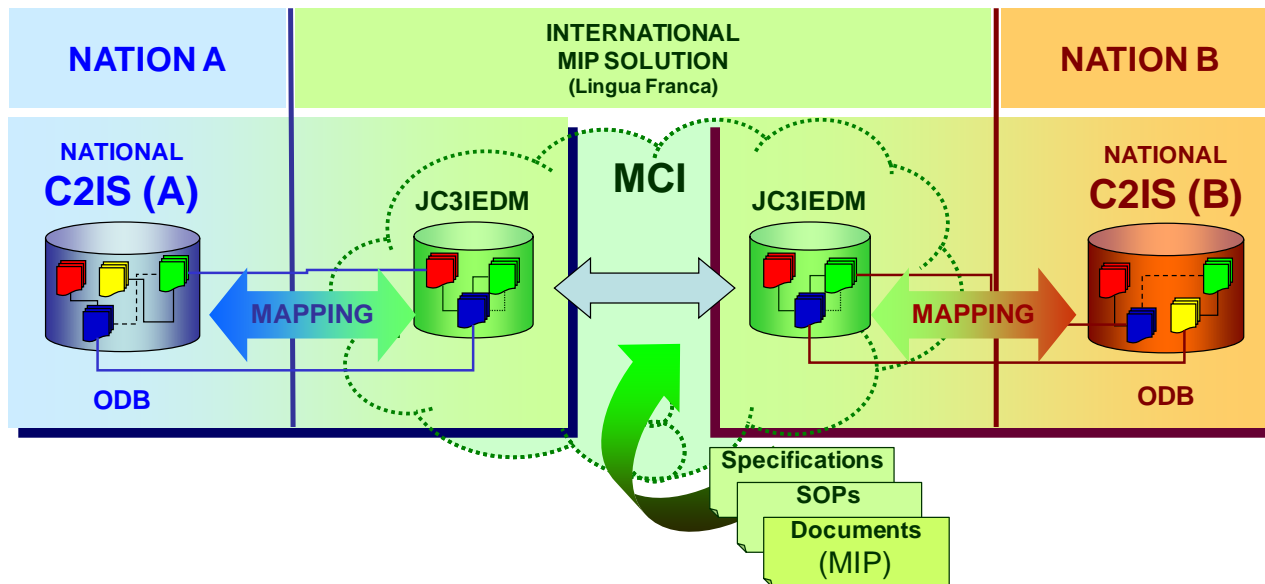
nico.bau@fkie.fraunhofer.de

OUTLINE

- Multilateral Interoperability Programme (MIP)
- Introducing the MIP Information Model
- Restructuring the Model
- Additional Transformations
- Summary and Outlook

Multilateral Interoperability Programme

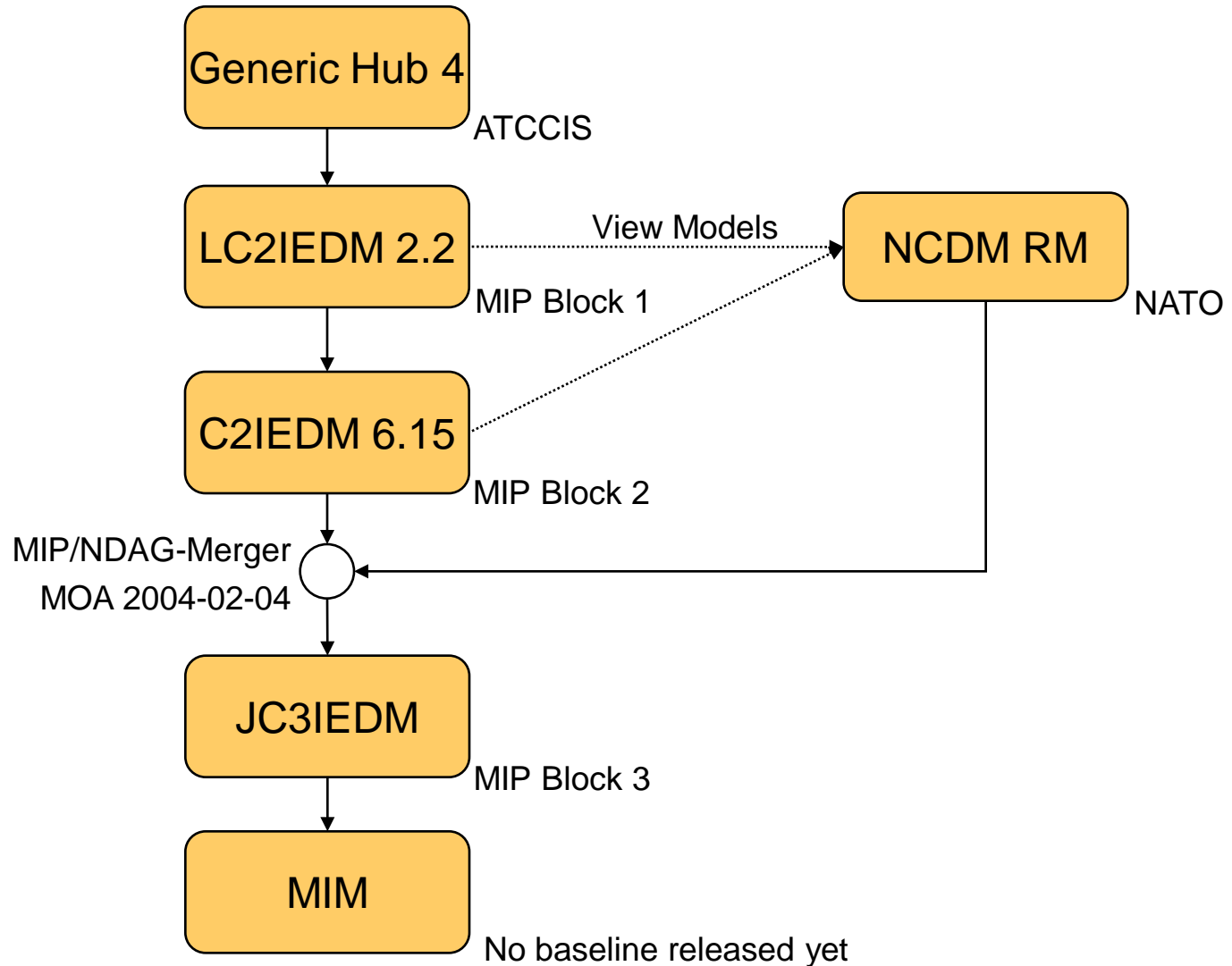
“The aim of the Multilateral Interoperability Programme (MIP) is to achieve **international interoperability** of Command and Control Information Systems (C2IS) **at all levels** from corps to battalion, or lowest appropriate level, in order to **support multinational (including NATO), combined and joint operations** and the advancement of digitization in the international arena.”



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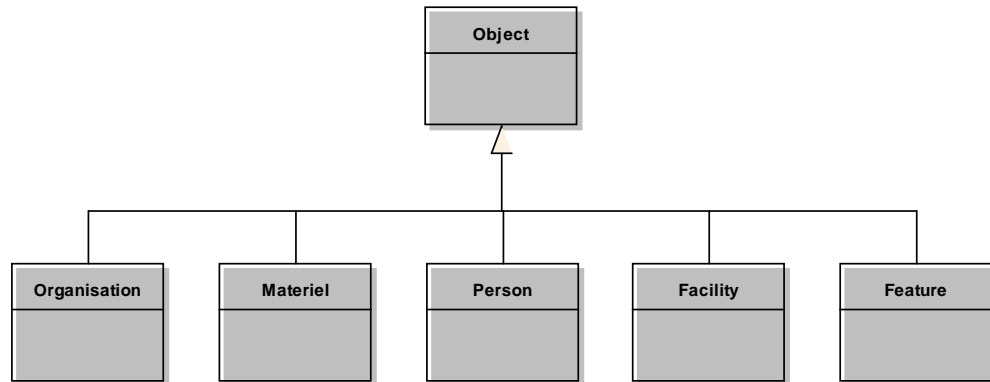
History of the MIP Information Model



The MIM

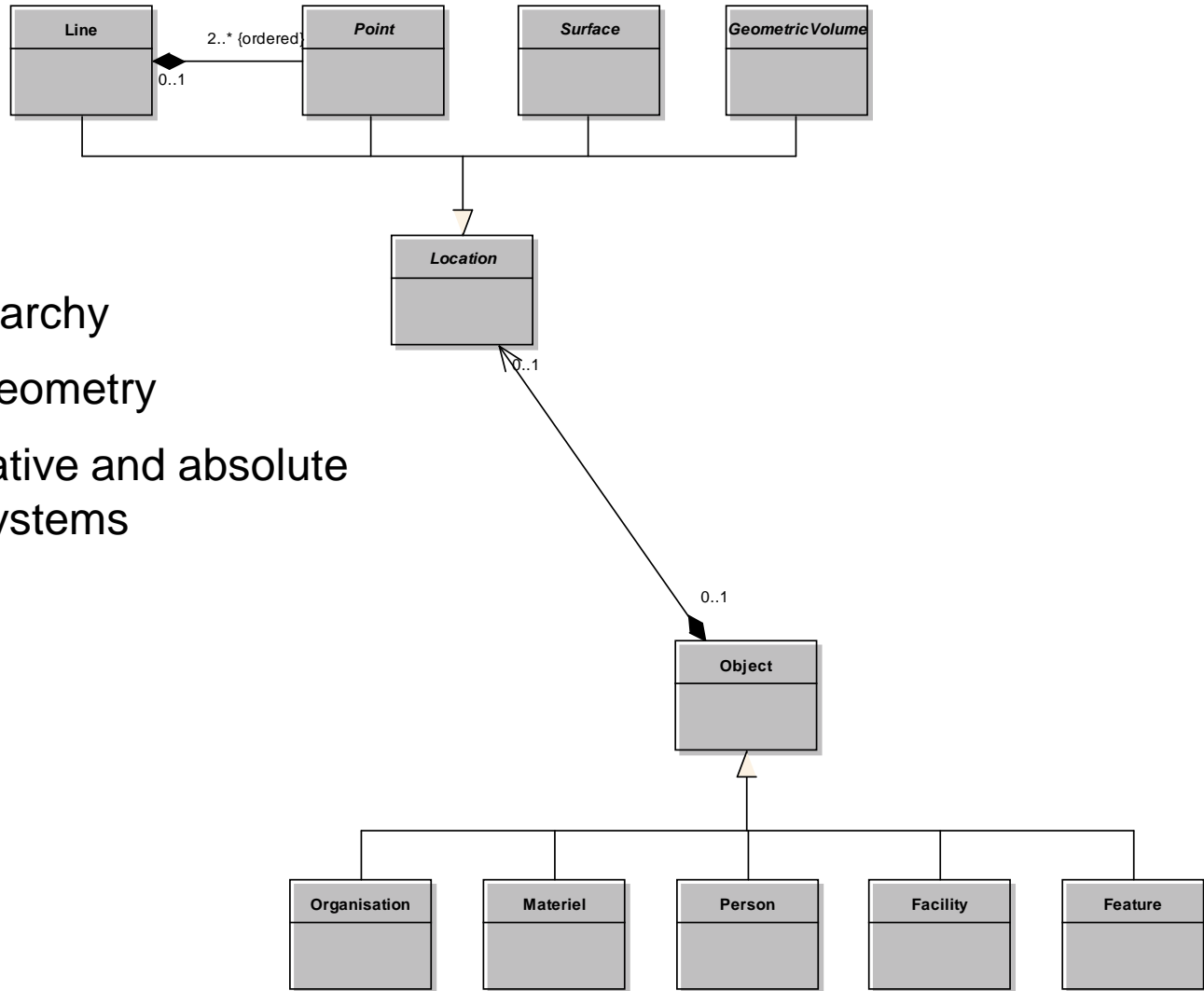
Core Elements

- Extensive hierarchy of battle space objects (147 subclasses)
 - Classification
 - Status



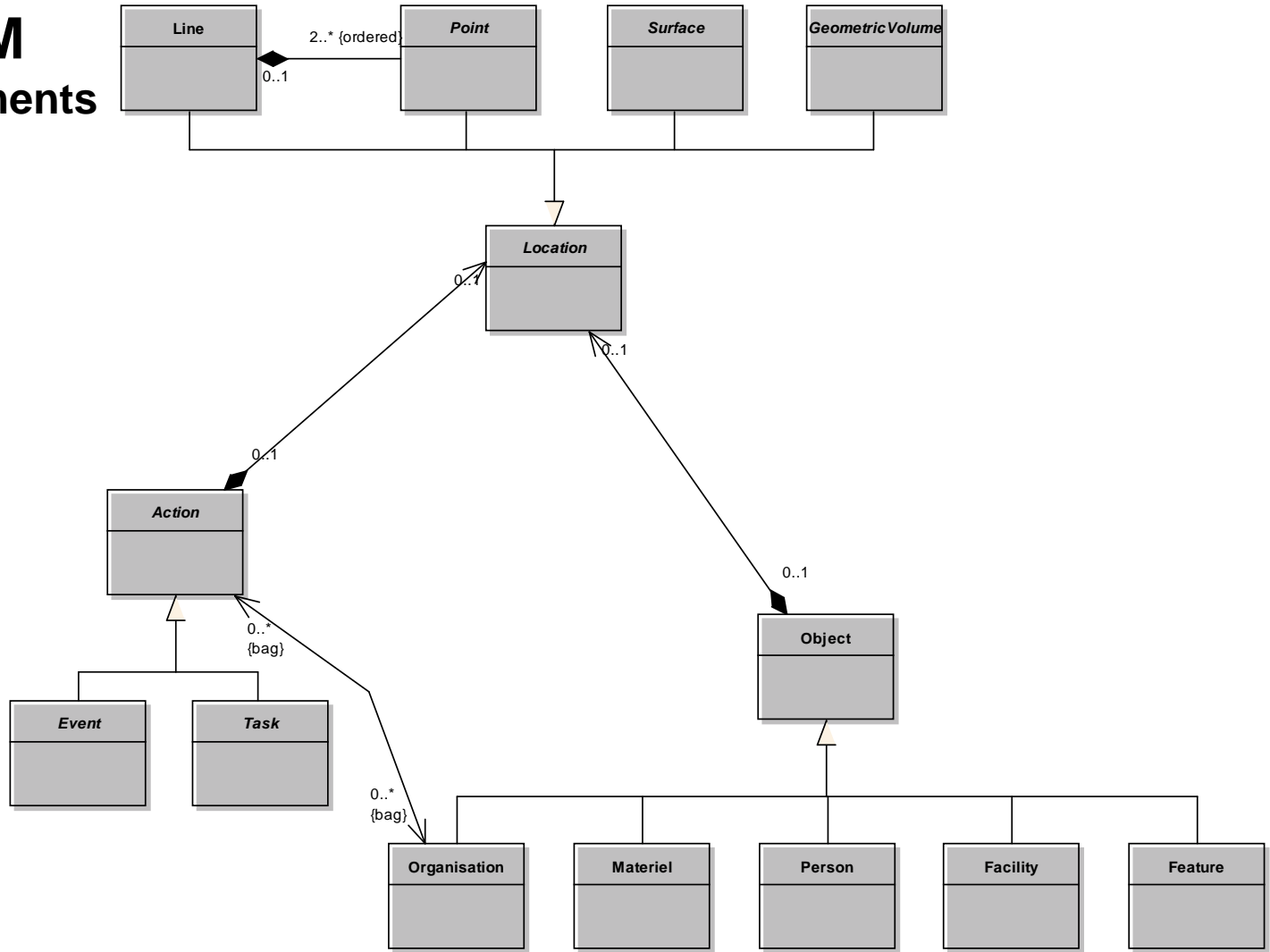
The MIM

Core Elements

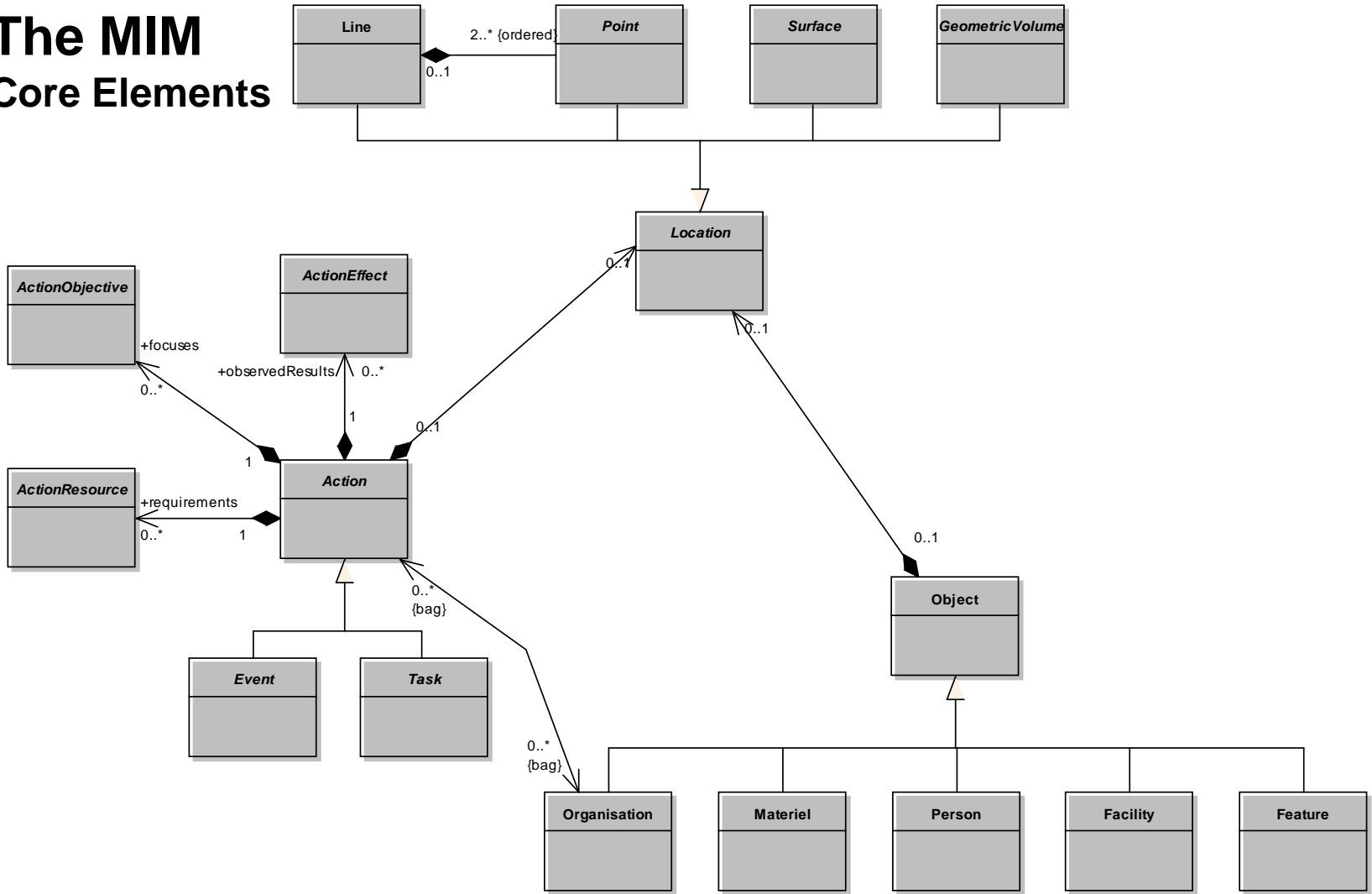


- Location hierarchy
- 2D and 3D geometry
- Including relative and absolute coordinate systems

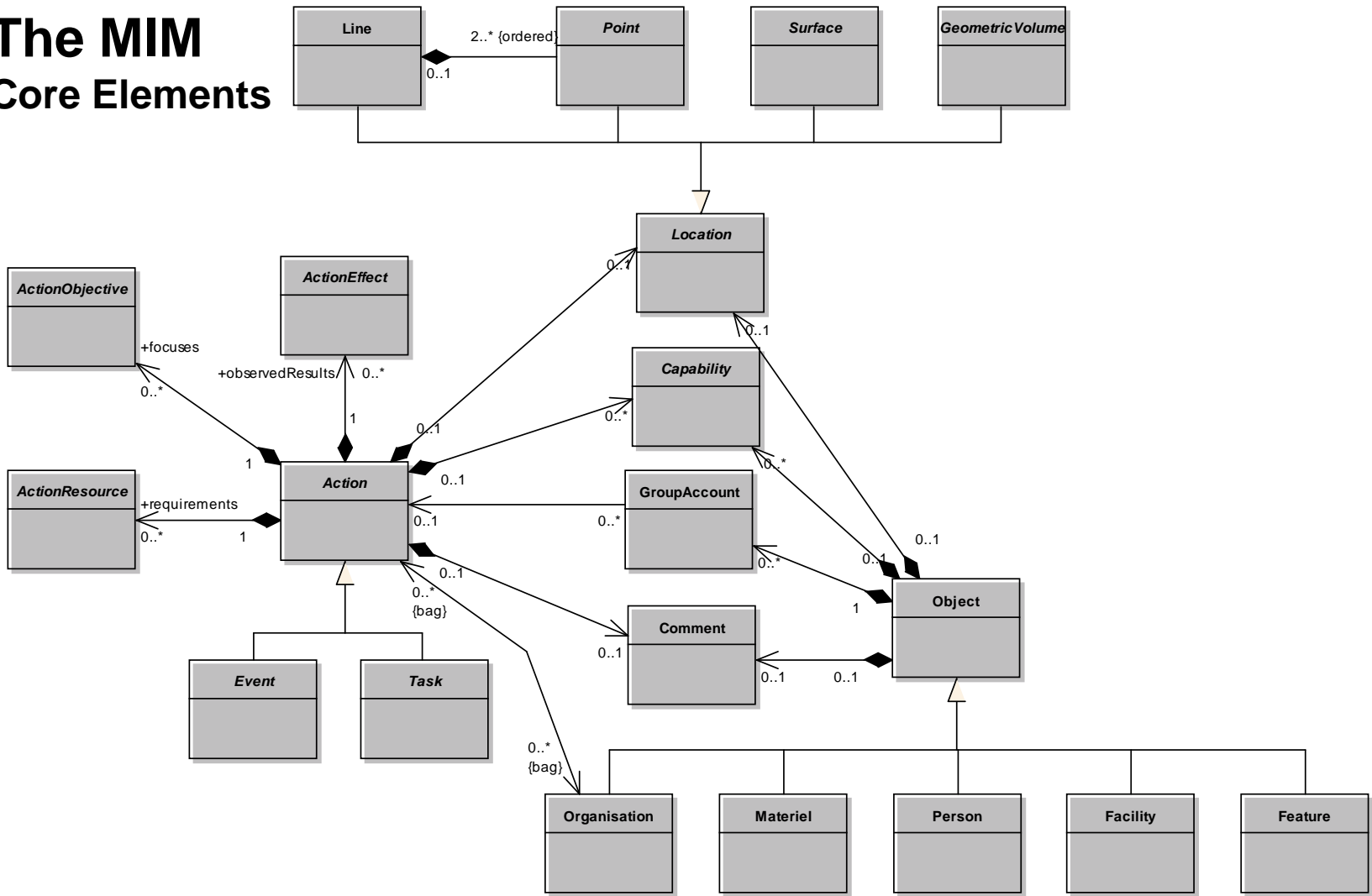
The MIM Core Elements



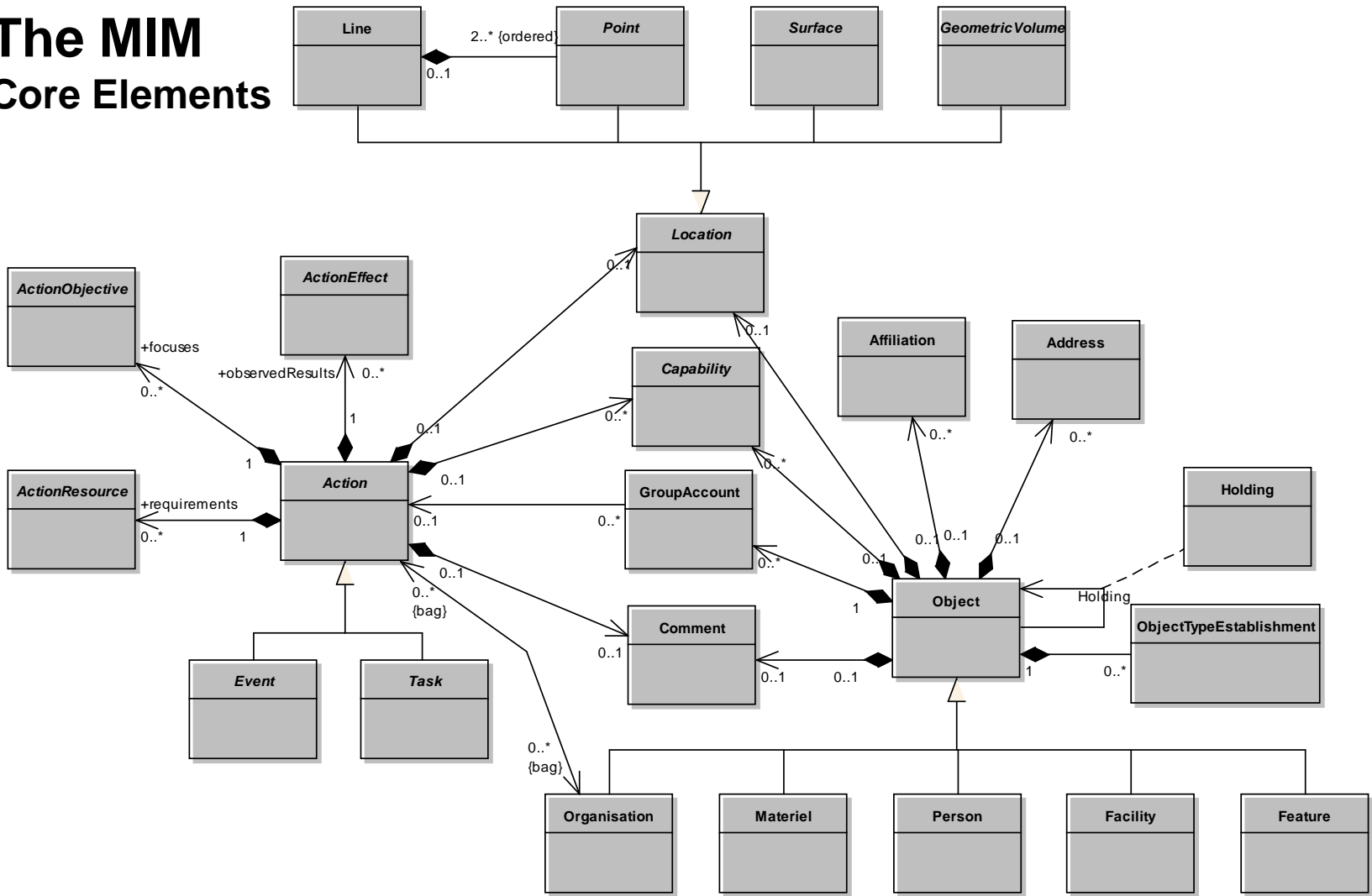
The MIM Core Elements



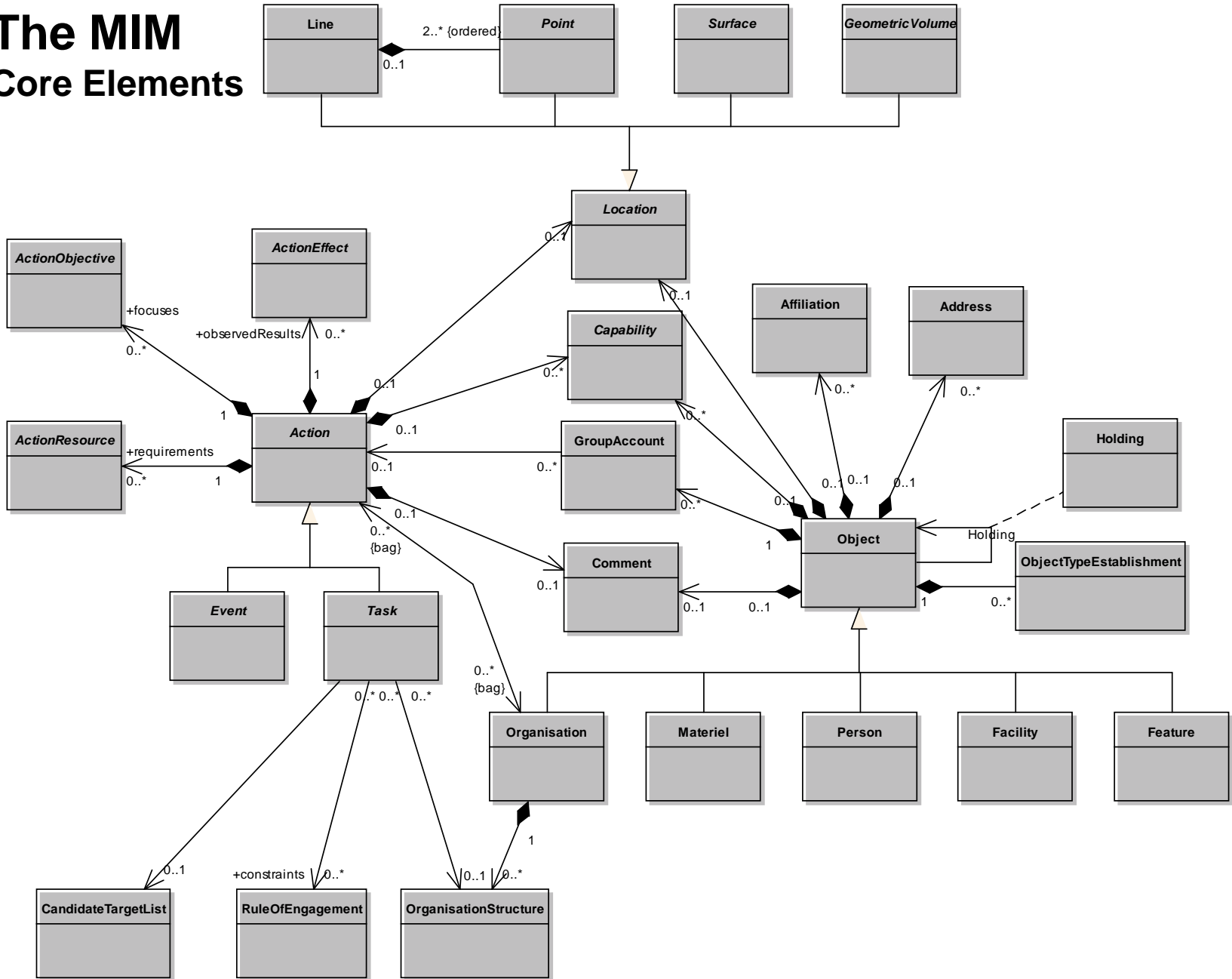
The MIM Core Elements



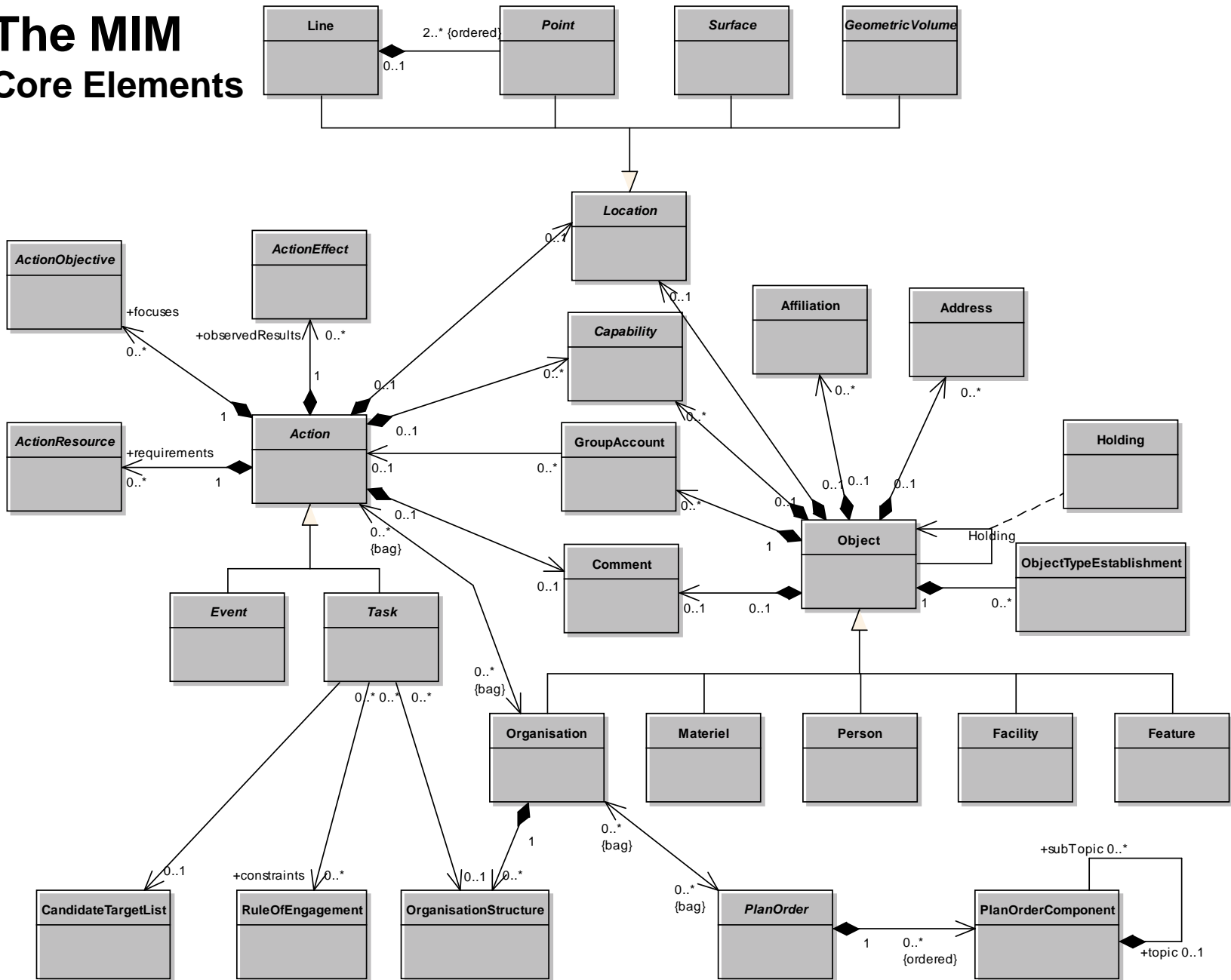
The MIM Core Elements



The MIM Core Elements

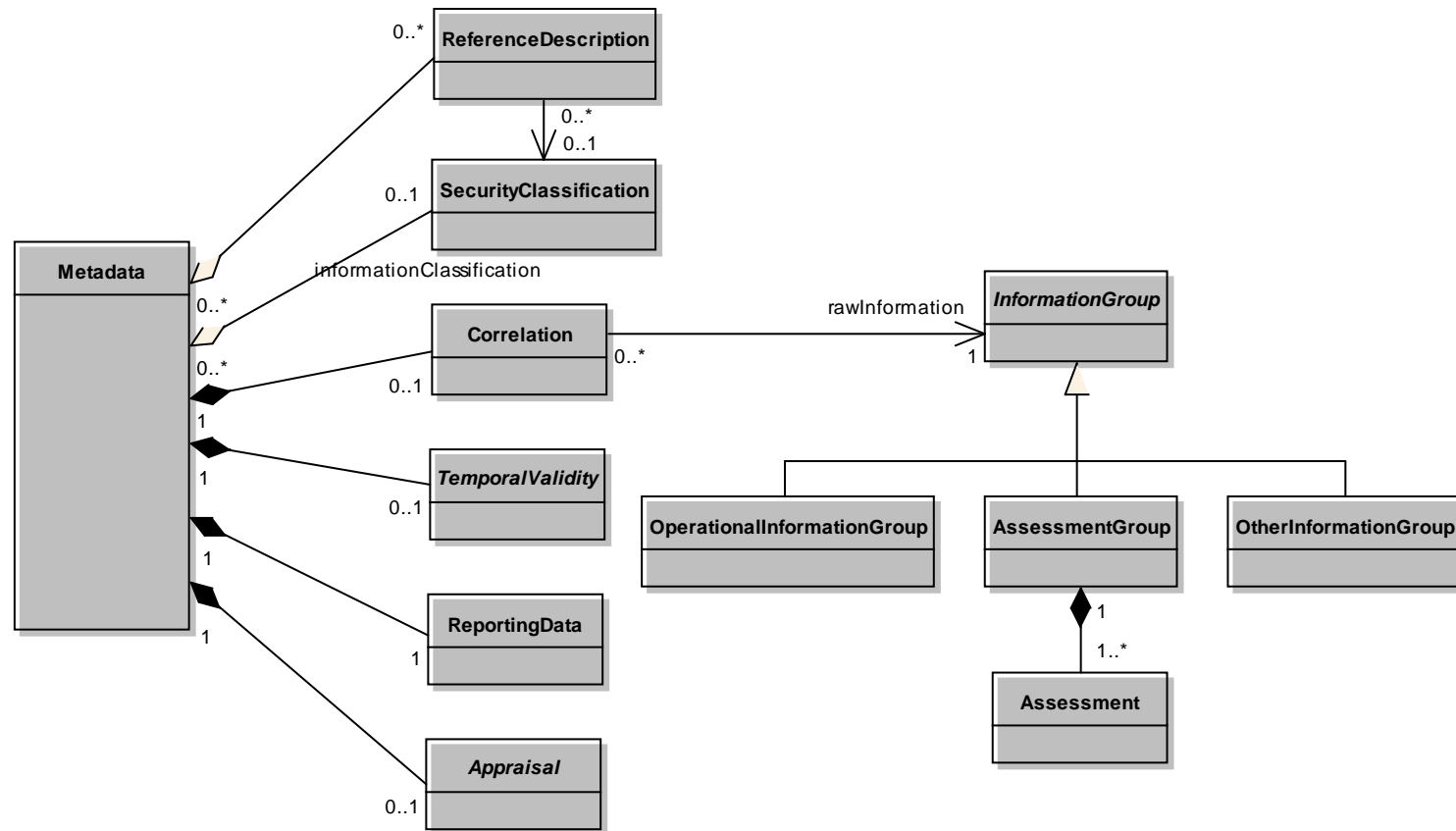


The MIM Core Elements



The MIM

Information Groups and Metadata



MIM by Numbers

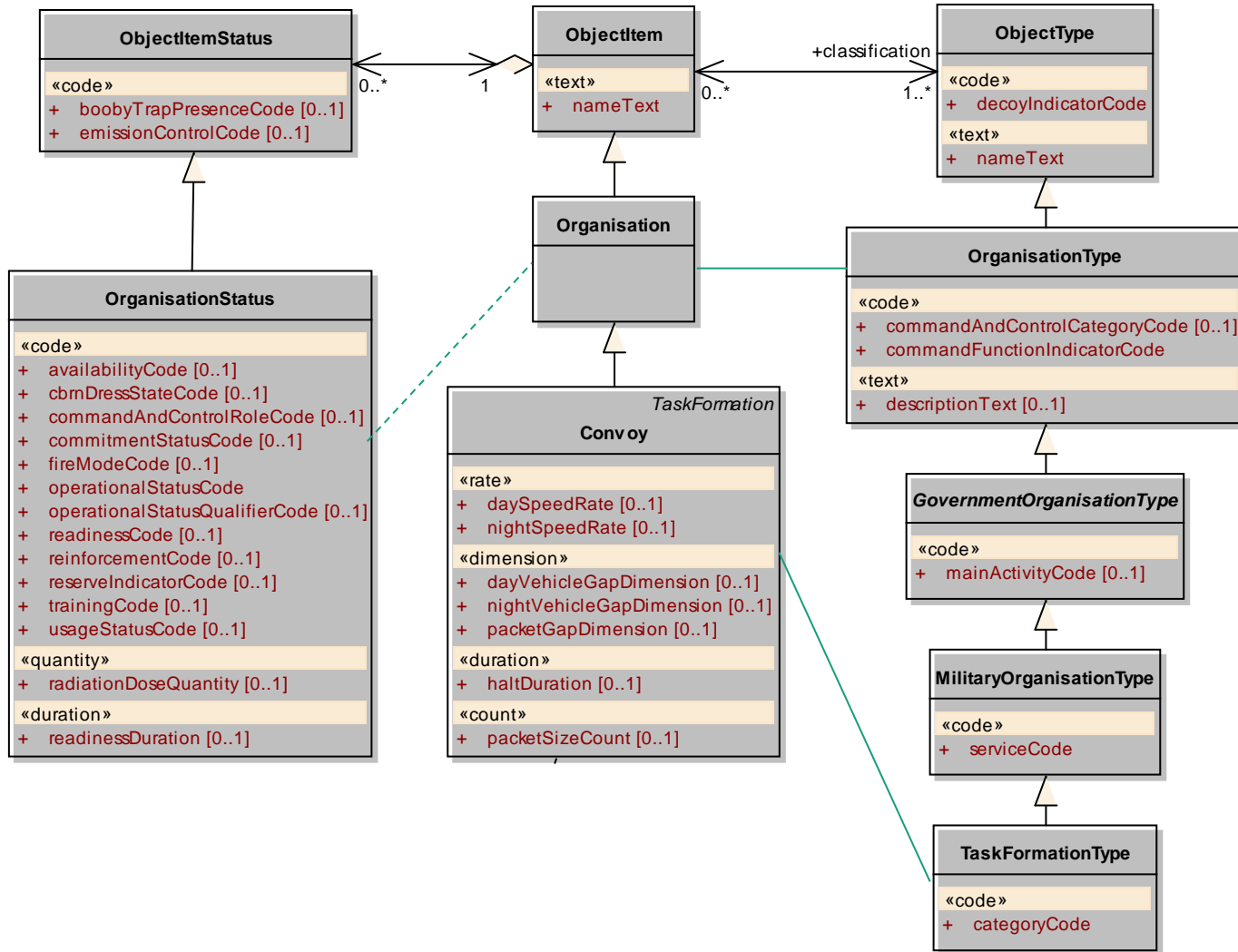
Comparison	JC3IEDM 3.0.2 ER Model	MIM 1.0 UML Model	
Business Rules	14,764 MIRD DB Records	310 OCL Constraints	-98%*
Entities / Classes	273	326	+19%
Attributes	898 (1472 incl. key attributes)	873	-3% (-41%)
Associations (incl. subtyping)	397	394	-1%
Code Types	470	400	-15%

*some OCL constraints map to multiple MIRD DB records

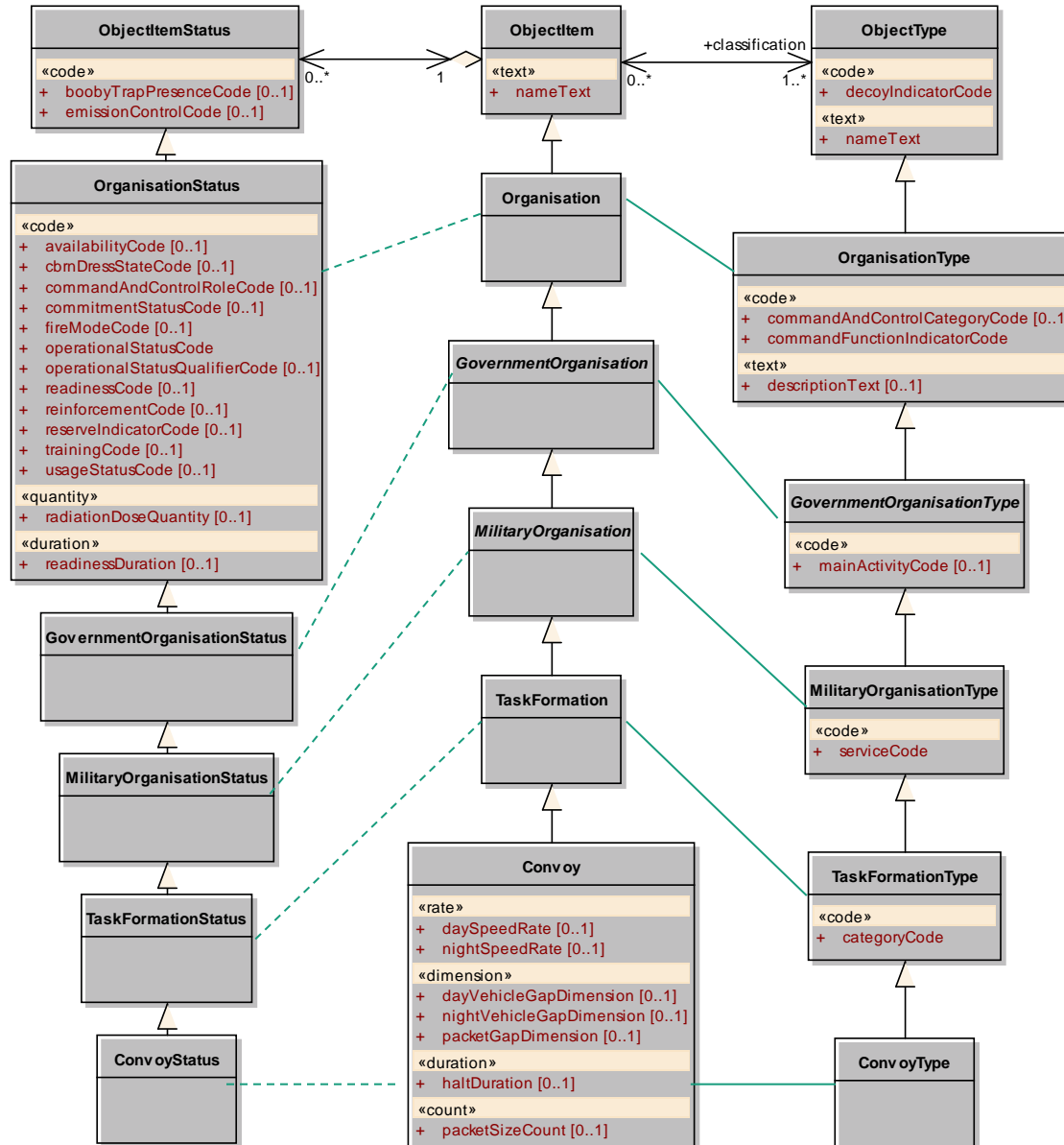
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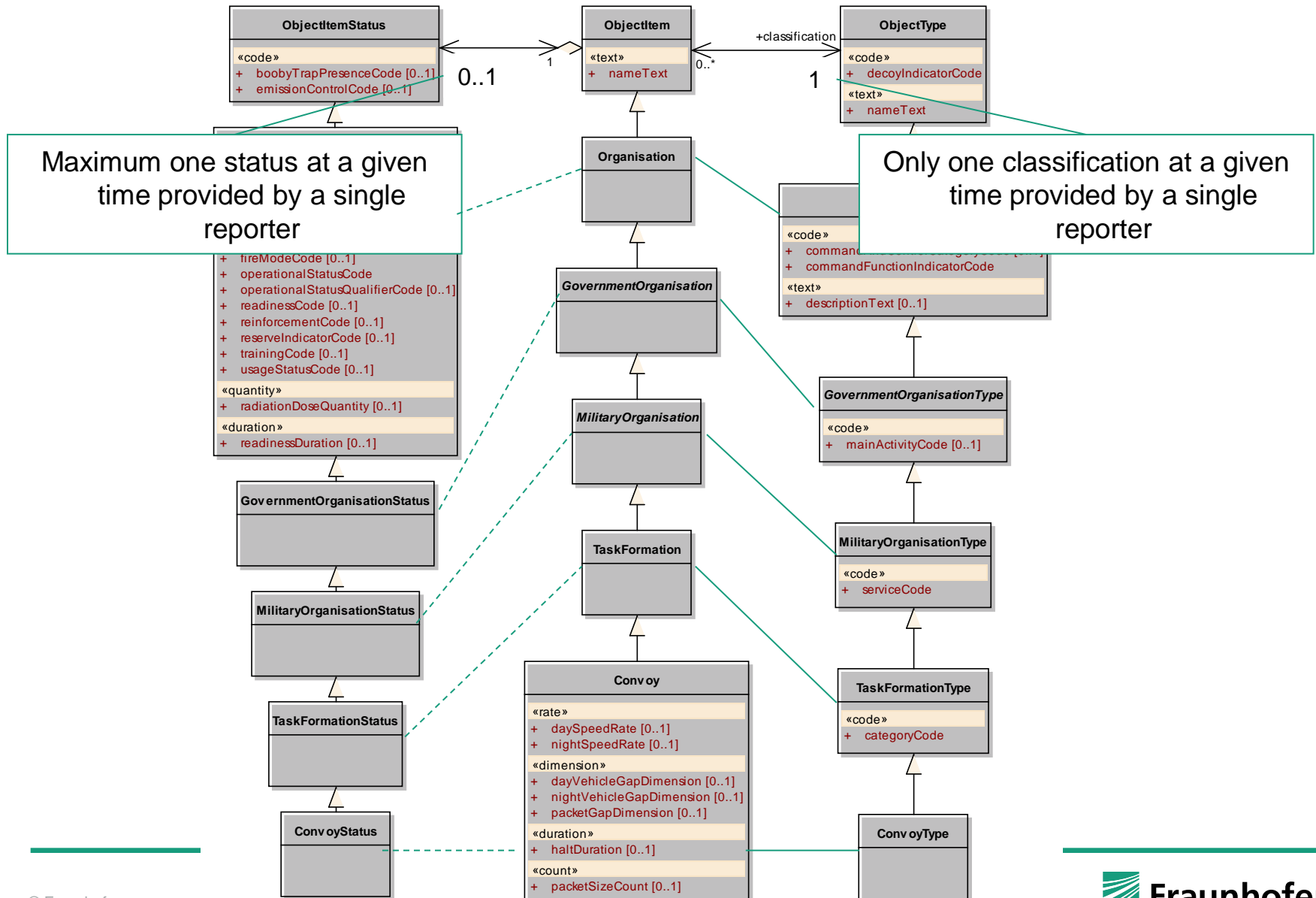
Aligning Hierarchies



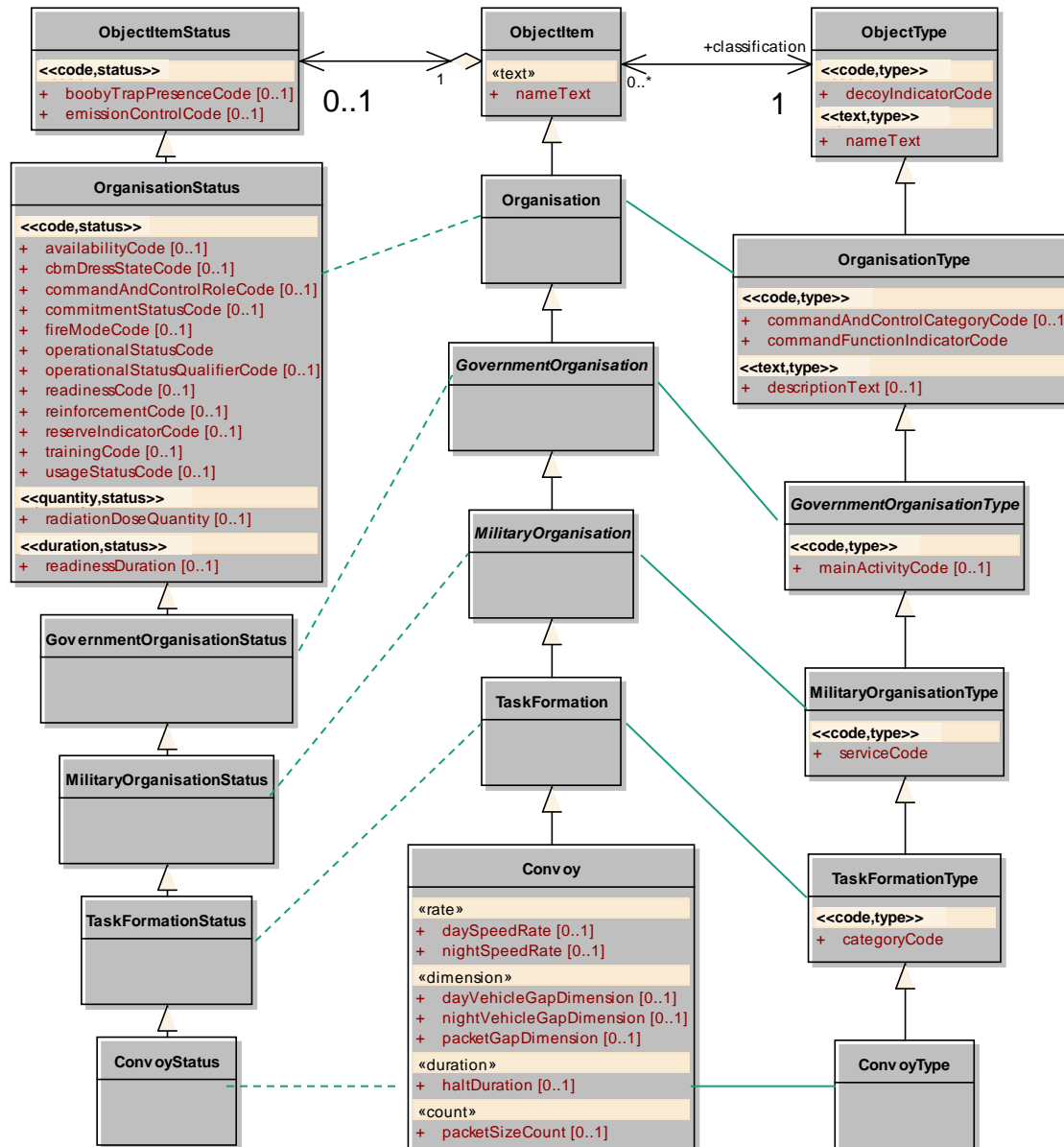
Aligning Hierarchies



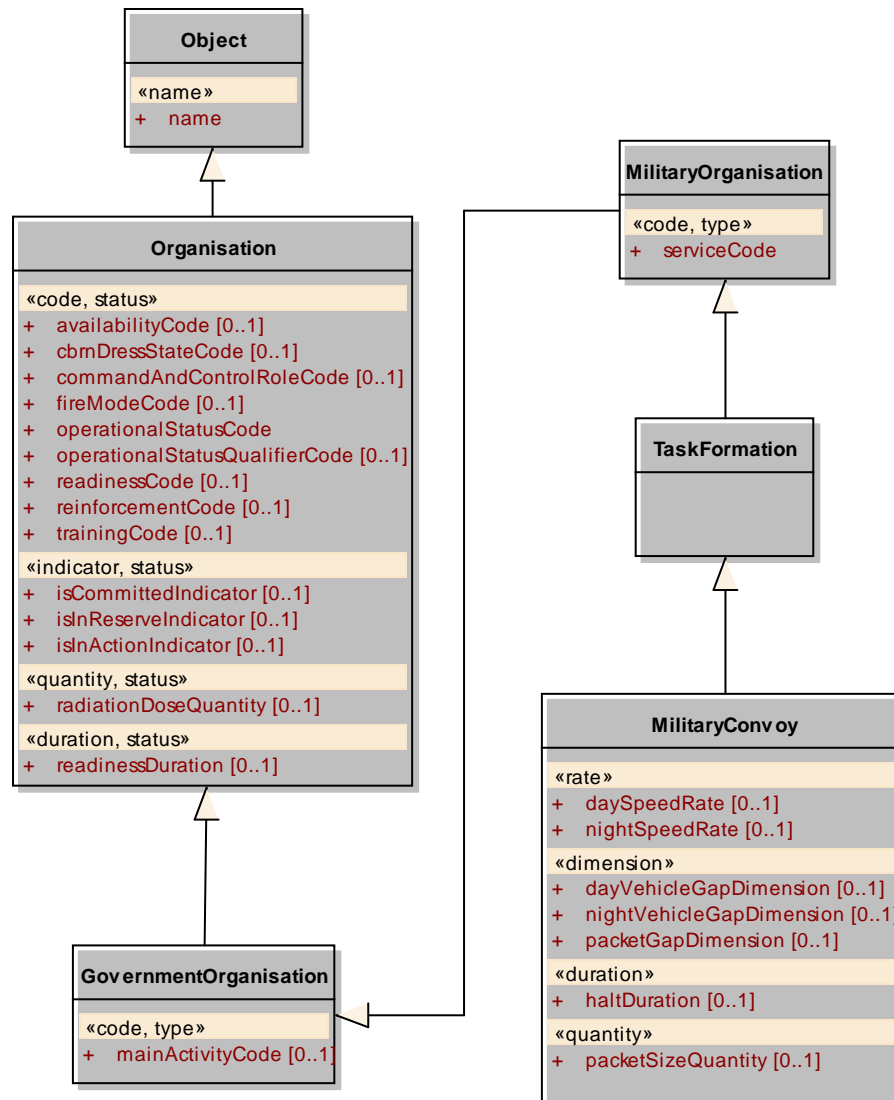
Making the Model Timeless and Sourceless



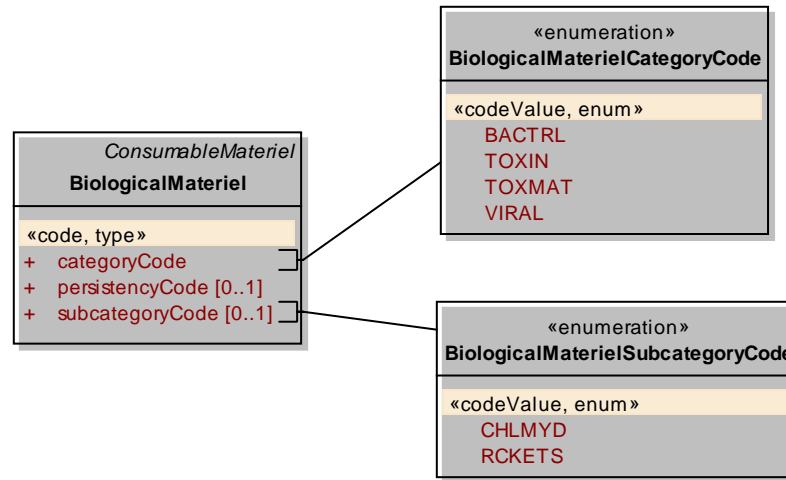
Merging Hierarchies



Merging Hierarchies



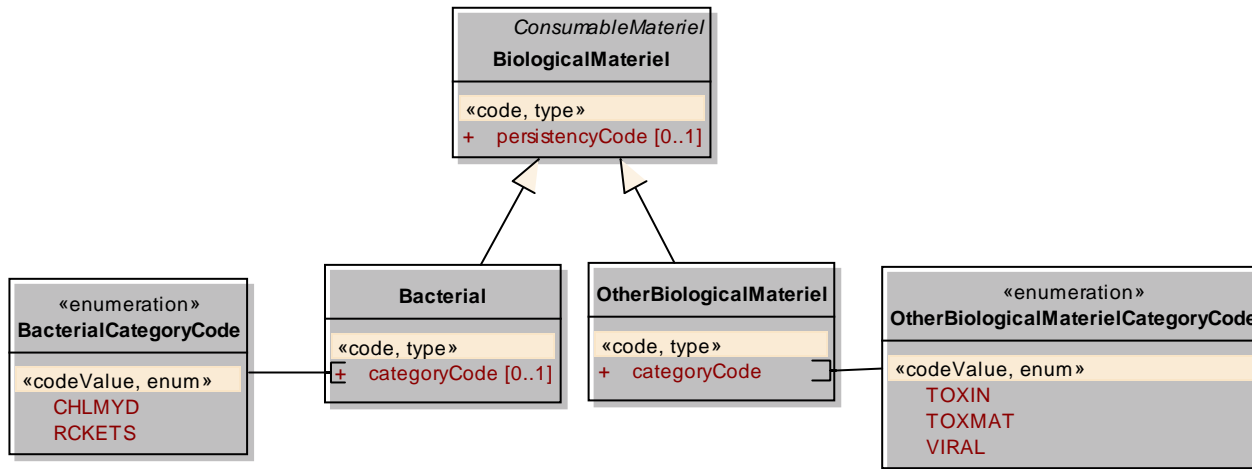
Eliminating Business Rules (1)



Valid combinations of Domain Values for BiologicalMateriel

BiologicalMateriel.categoryCode	BiologicalMateriel.subcategoryCode
Bacterial	Chlamydia Rickettsiae [NULL]
Toxic Industrial Material	[NULL]
Toxin	[NULL]
Viral	[NULL]

Eliminating Business Rules (2)



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MDA Transformation Tool Chain

- MIM as a starting point
- Step 1:
 - Create a subview
- Step 2:
 - Re-introduce versioning if required
 - Re-introduce ObjectType hierarchy if required
- Step 3:
 - Perform additional transformations if required

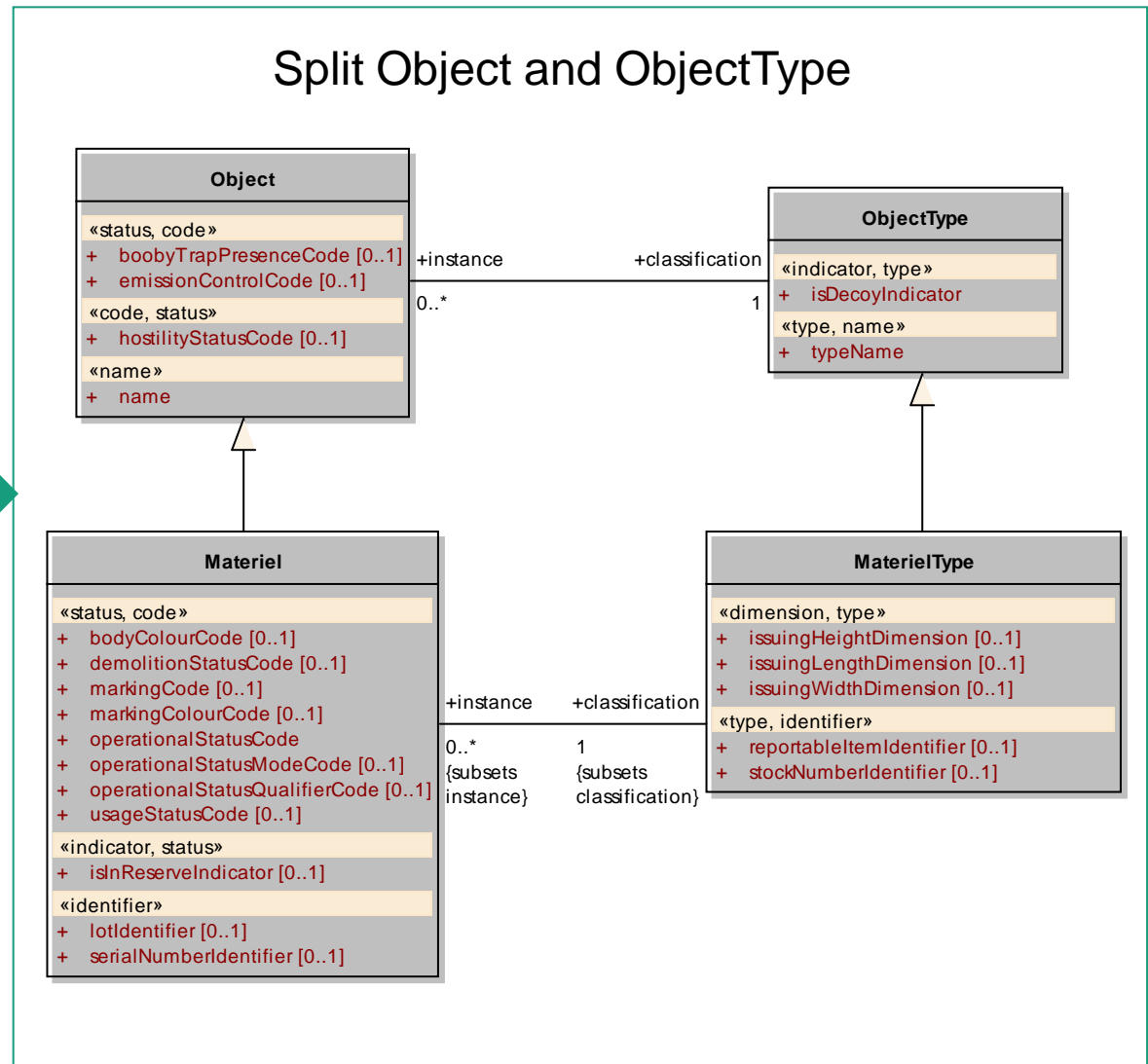
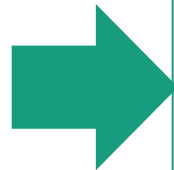
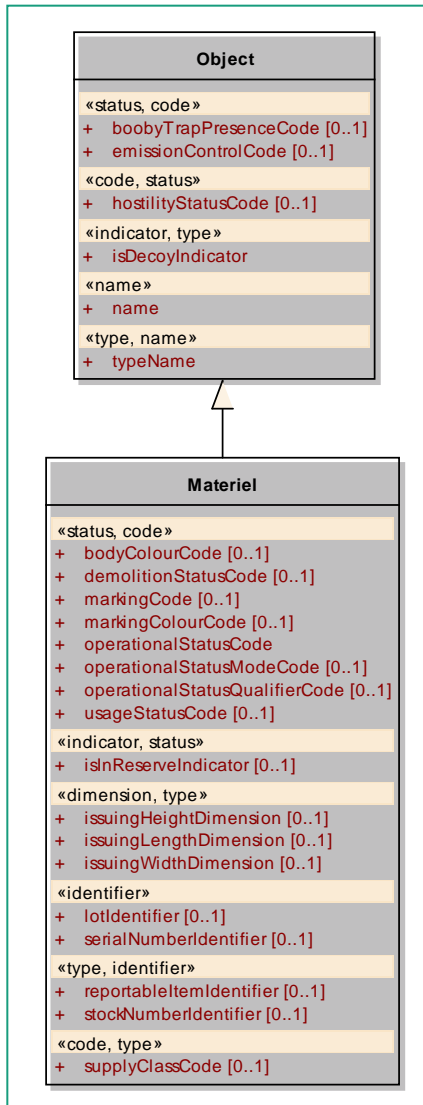
Step 1: Create Conformant Subview

- A conformant subview does not violate constraints of the MIM
 - (i.e. follows Liskov substitution principle)
- Business Rules
 - May be dropped if they result in a constant expression
- Mandatory Attributes
 - May be set to read-only with a given default value
- Mandatory Associations
 - Have to be included
- Optional Attributes / Associations
 - May be ignored

Step 2: Re-introduce versioning and ObjectType (1)

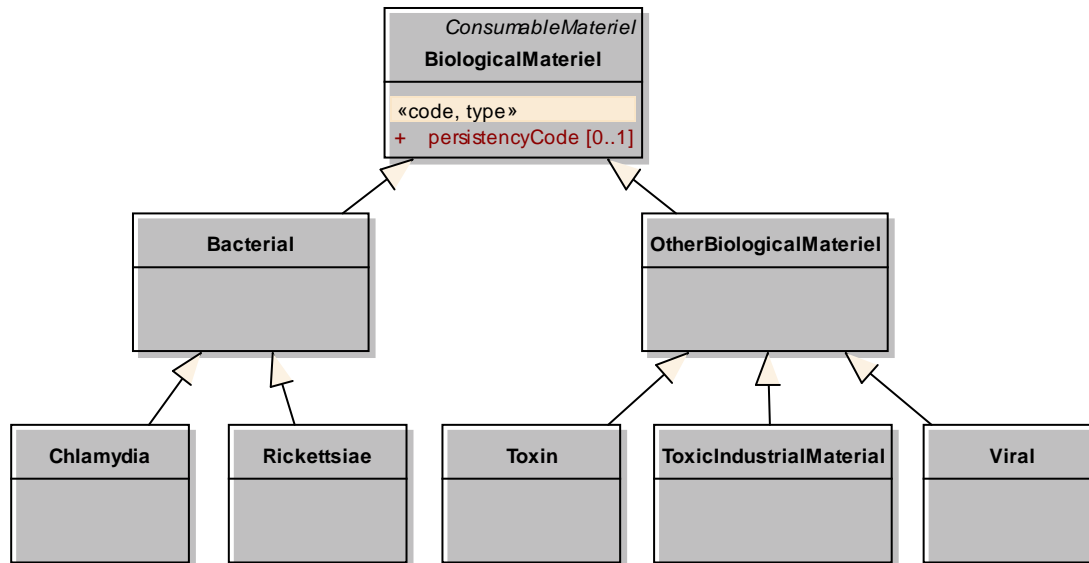
- If the exchange of history is required, versioning needs to be modeled
 - Entities vs. value objects
 - A generic superstructure will enable versioning of entities by allowing multiple instances per identifier
- If the exchange of type information is required, Object and ObjectType will be split again
 - All <<type>> attributes will be moved to the ObjectType hierarchy
 - All <<typerole>> association ends will be moved to the ObjectType hierarchy

Step 2: Re-introduce versioning and ObjectType (2)



Step 3: Additional Transformations (Example)

- ChangeDiscriminatorCodesToSubtypes
 - Changes all categoryCode attributes to subclasses
 - Would add 3300 new subclasses throughout the model



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Summary and Outlook (1)

- MIP Information Model Version 1.0
 - UML Class Model, operational content of JC3IEDM 3.0.2
 - Timeless, sourceless
 - Attributes stereotyped according to UN/CEFACT's Core Components Data Type Catalogue
 - Metadata and Grouping split from core elements
 - Available at
<http://mipcee-svn.lsec.dnd.ca/DEV/SVN/PIM/tags/Releases/MIM%201.0>
- MIP Information Model Version 1.1
 - Work in progress
 - Will include all changes from JC3IEDM 3.1.4 (MIP Block 3.1)

Summary and Outlook (2)

- MDA Tools
 - Java based tools to perform additional transformations on the MIM
 - Documentation of tools and best practices still missing
 - Available at
<http://mipcee-svn.lsec.dnd.ca/DEV/SVN/SRC/trunk/CPPProcessor>
- Further investigation into different transformations ongoing

Questions?

Comments?

Thank you very much for your attention

We would like to thank all
active participants of MIP