Research Project of the Federal Ministry of Transport, Building and Urban Development

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“Preparation of a study on dangerous goods telematics”

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Research project and its work packages

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Research project and its work packages

Background

- **Regulatory frameworks for Dangerous Goods Transport**
  - Inland waterways (ADN), Road (ADR), Rail (RID)
- **Regulation principles**
  - Classification, packaging and labelling of dangerous goods
  - Construction, equipment and monitoring of vehicles and tanks
  - Training of safety officers, drivers and other people involved in the transport of dangerous goods
- **Growing influence of telematics systems on technical, organisational and administrative processes in DGT is obvious**
  - Therefore the Joint Meeting of the RID Committee of Experts and the Working Party on the Transport of Dangerous Goods established a working group (WG Telematics)
  - Because telematics systems offer a great potential for improvement of both, safety and security of such transports, the Federal Ministry of Transport, Building and Urban Development (BMVBS) has launched a study on the application of *Telematics in Dangerous Goods Transport*.
  - Main questions
    - How to regulate telematics systems in DGT?
    - Are there different requirements compared to “traditional” items of regulation?
    - What framework conditions are required to enable integration of telematics regulation into ADN / ADR / RID?

Project “Study on dangerous goods telematics”

- Timeframe: 20 months
- Start of the project: June 2010
- Budget provided by the Federal Ministry of Transport, Building and Urban Development
- Working Group on Telematics is proposed to act as review committee
- Results to be provided in two languages (DE & EN)

Project outline

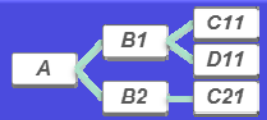
WP100 Project Management & General Approach

WP200 Relevant Standards

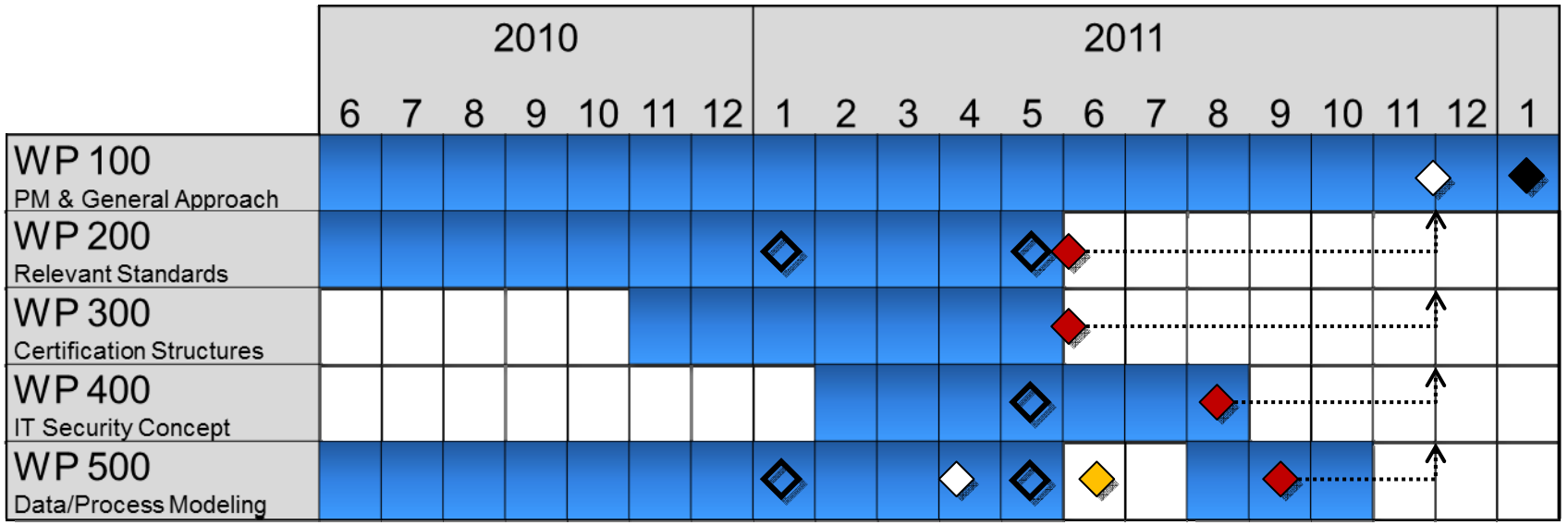
WP300 Certification Structures

WP400 IT Security Concept

WP500 Data/Process Modelling



Time schedule



Key

- Presentation
- Draft
- Revised Results
- Final Results
- General Approach

WG Telematics Bordeaux, 17 to 19/01/2011

project presentation on transport logistic Munich, 11/05/2011

p.r.n. WG Telematics

Work Package 500 - Data/Process Modelling

WP 500 Expected results

- **Models – extracted from and/or based on the *WHO DOES WHAT* spreadsheet – that can serve several needs in the future**
  - A high level overview of the domain of dangerous goods transport ("domain model" or "ontology" – basic concepts, not tied to particular applications)
  - An input to future standardisation / certification processes (on lower, more technical level)
  - A reference framework to align with external, relevant standardisation processes (i.e. mapping models used in external standards / systems into the logical domain of dangerous goods transport, without necessarily claiming syntactical structure)
- **Focus is on a data / information model, but processes will be included as far as possible under the given project constraints → only for processes dealing with DGT – modelling business processes in Freight & Logistics in general is out of scope**
- **Models shall be aligned with selected relevant external specifications (from standards or systems)**

Initial considerations

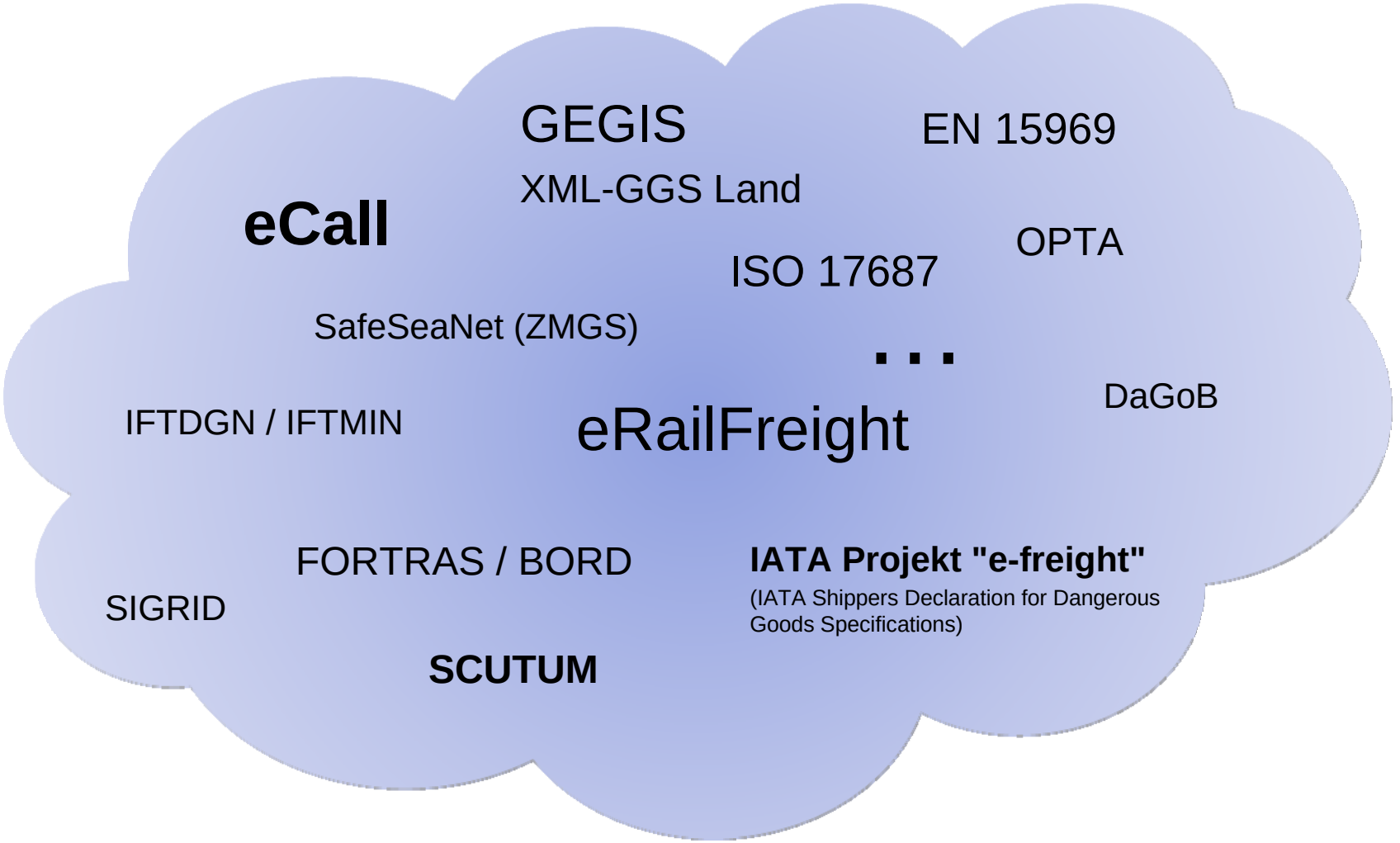
- **What is a model?**
  A model can be characterised by three features*
  - ***Mapping*** – the model is a mapping of something real
  - ***Reduction*** – the model is (potentially) less complex than the original because it reflects only relevant features
  - ***Pragmatism*** – the model behaves like the original for the purpose of the modelling effort
- **Especially the latter is difficult since it requires good knowledge about the purpose of the modelling effort, whereas we are fairly vague on this point in this phase of the study and the modellers are no domain experts**
- **Suitable data modelling methods and approaches seem much clearer than for the process modelling domain, especially given that regulation of underlying business processes will only be partial, i.e. full modelling of these processes is out of scope**

Herbert Stachowiak. *Allgemeine Modelltheorie.* Springer-Verlag, Wien & New York, 1973.

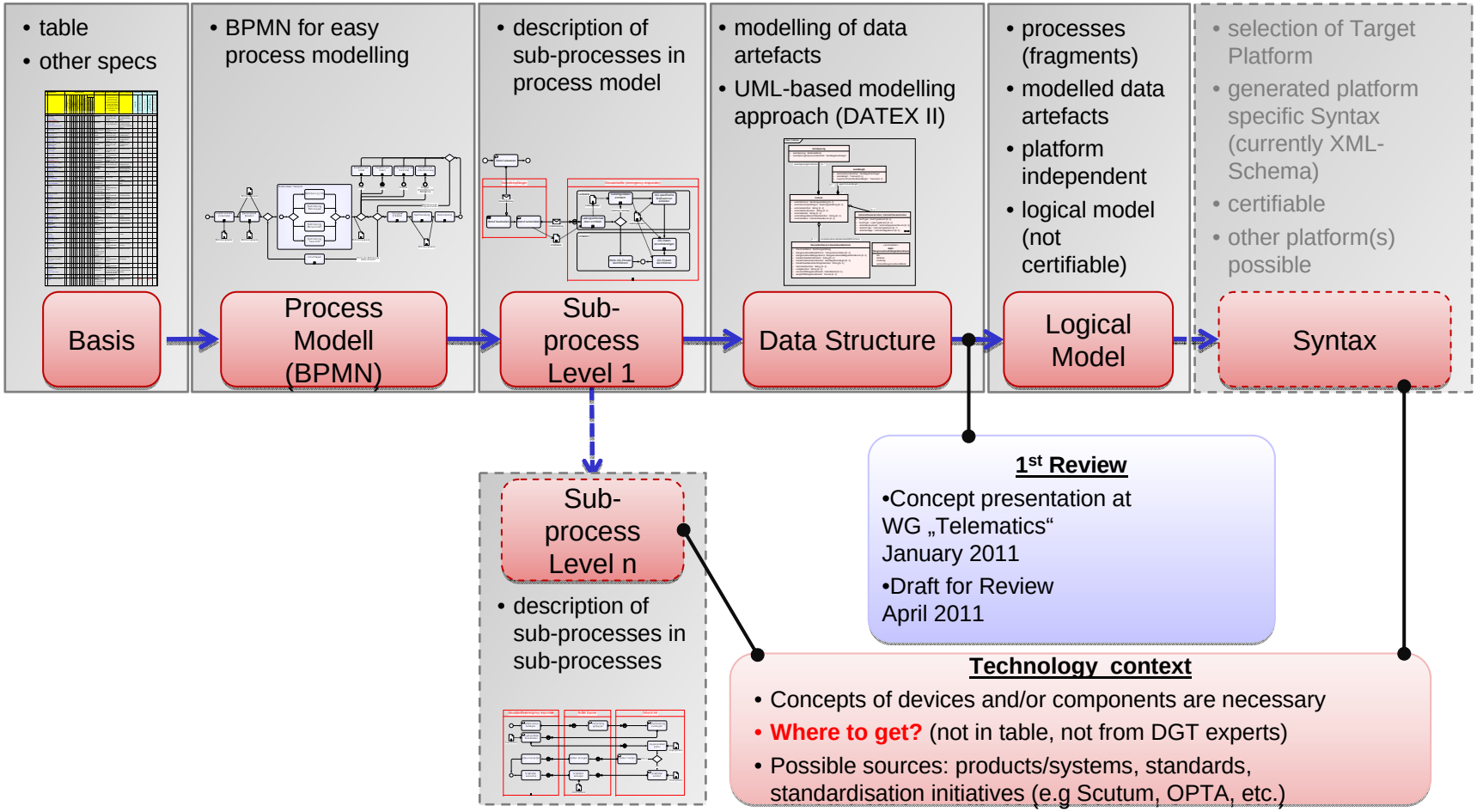
Required input

- WP500's most important input is the *WHO DOES WHAT* table
- WP200 will have to provide the relevant set of standards and activities that potentially will provide new standards
- WP300 *&* WP400 *may* set model restrictions due to security and certification reasons
- Modelling the *WHO DOES WHAT* table requires stakeholder feedback from WG Telematics and other relevant organisations / projects
  (e.g. eRailFreight, IATA e-freight, SCUTUM… – a potentially wide range that needs scope and focus!)

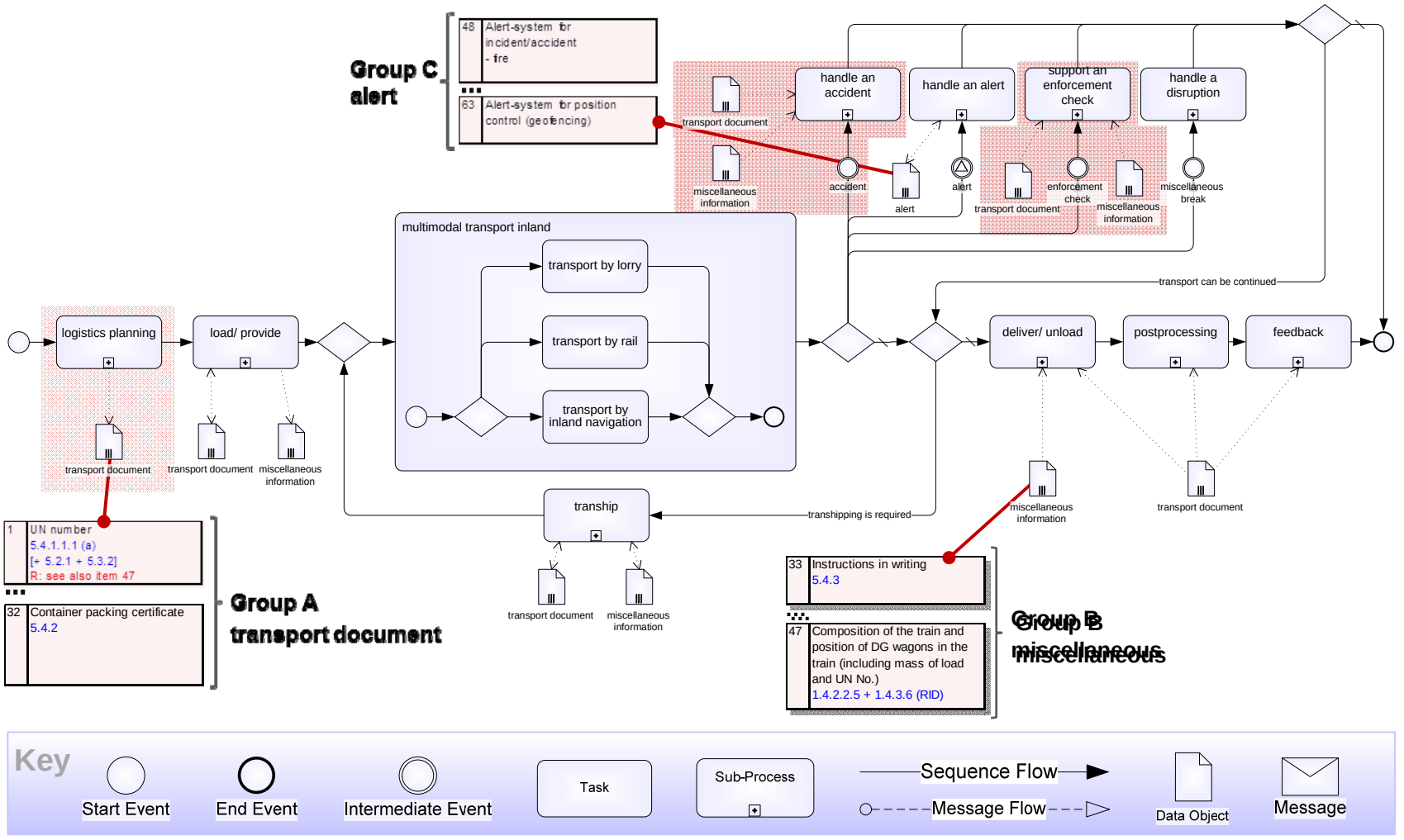
An abundance of (potential) influences on the model



Roadmap: From table to model



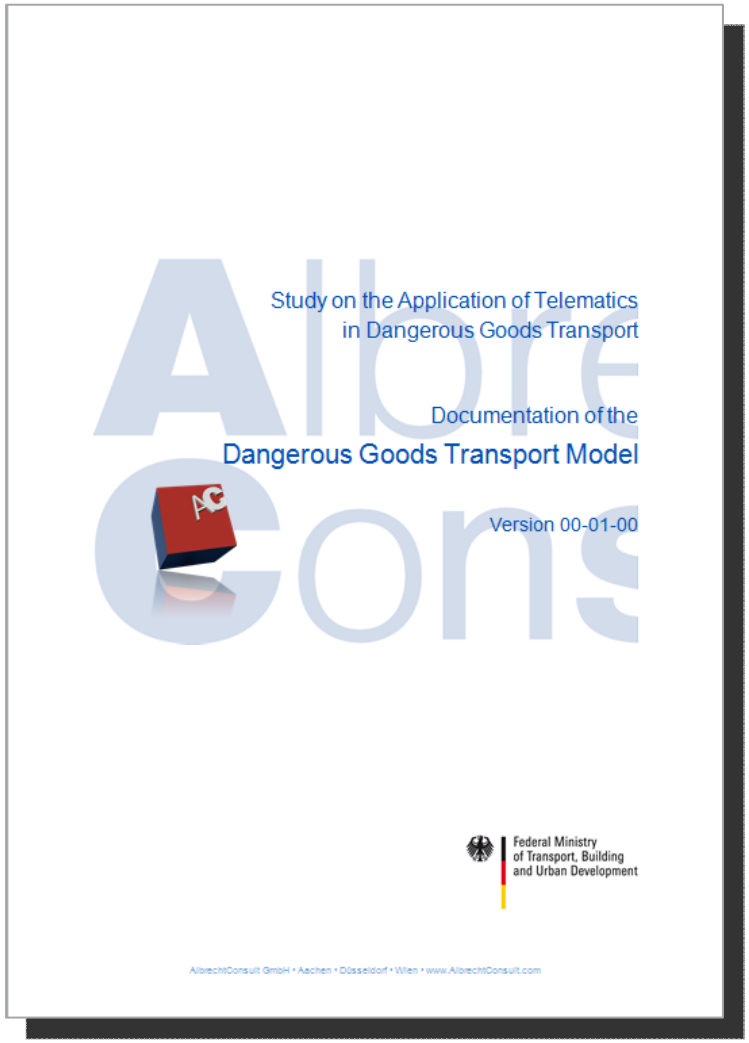
Process Dangerous Goods Transport



Work package approach
Basic modelling requirements

- **The *WHO DOES WHAT* spreadsheet needs to be processed further to provide more suitable input into standardisation and certification processes**
  - Human language must be transformed into a formal description language
    example:
    (No. 1) "UN number" → *UnNumberType ::= Digit[4]* or better *{0001..10000}*
  - Domain concepts taken from other specifications need to be obtained from the quoted source and compiled into self-sustained (IT-)definitions
    example:
    (No. 46) "Tunnel category (road)" → *TunCatType ::= {'A'–'E'} // ADR 8.6.2*
  - Entities, relations and attributes need to be fully qualified
    - Which elements are related to which other elements (e.g. *PressureSensor* related to *Tank*)
    - What is the nature of the relationship in the model (association, aggregation, composition…)
    - In which direction is the relationship navigable in the model?
    - Multiplicities
    - Permissible values for (primitive) attributes
  - Domain concepts not fully specified (either inside the table or in the quoted sources) need to be expanded and fully modelled (relying on expert advise or external input from other projects, e.g. e-freight, eRailFreight, SafeSeaNet, etc.)

Documentation of the dangerous goods transport model



- **The document comprises …**
  - Way from the WHO DOES WHAT table to the data model
  - Methods
  - Semantics of the dangerous goods transport model
  - Data dictionary
- **First draft currently under review**

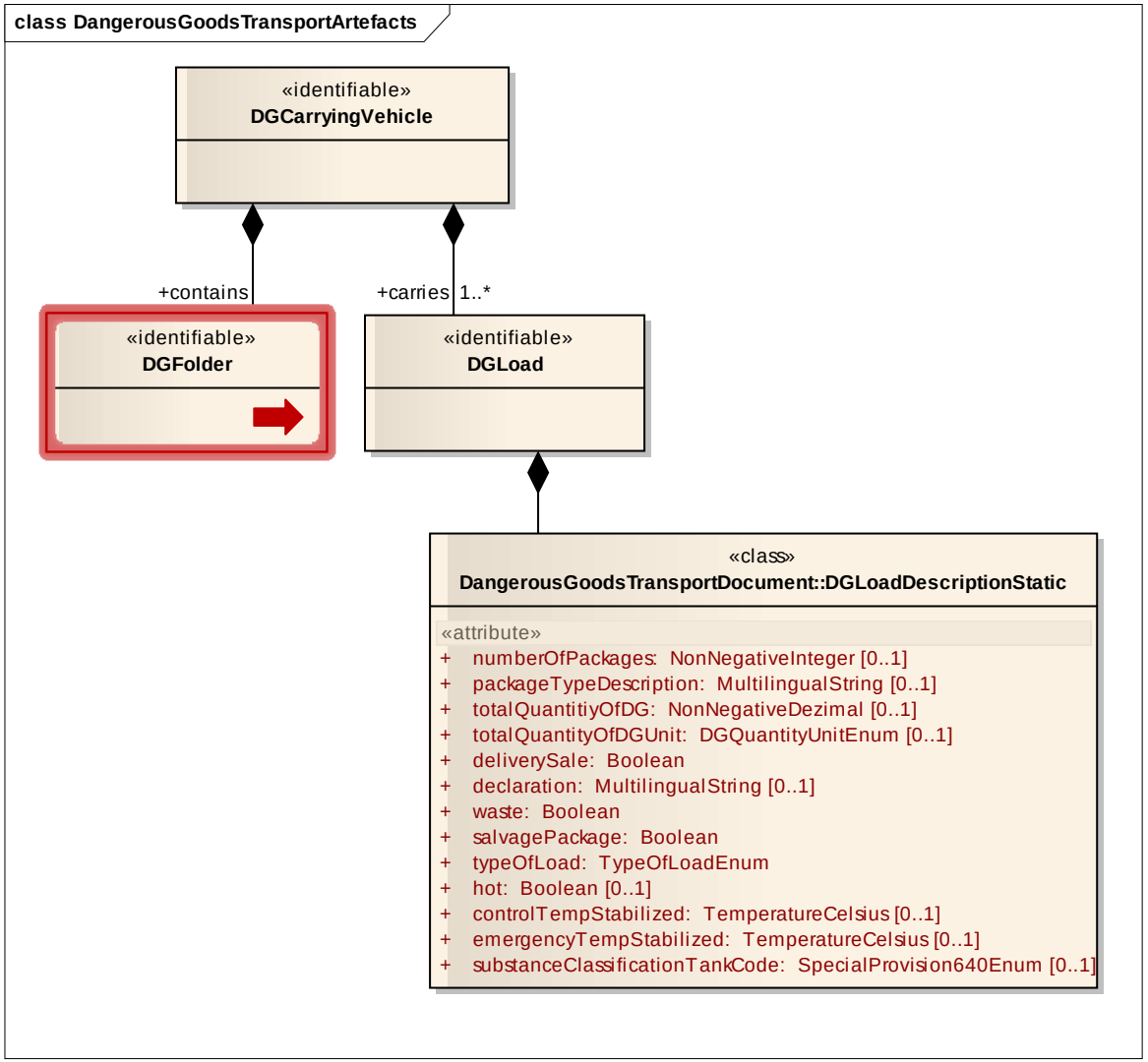
WDW-table – Starting point for the aspect of data modelling

- **Section A (elements No. 1 to 32): Entry in the transport document or documents attached to the transport document**
  - All information elements were modelled
- **Section B (elements No. 33 to 47): Miscellaneous**
  - It is much more difficult to assess the relevance of the content of section B of the table.
  - Some entries are similarly obvious, e.g. the tank certificate and the test report for packaging, at least for the enforcement scenario.
  - For other entries it might however be questioned whether they need at all to be included in a data model, e.g. it is not clear whether the model actually needs to describe labels and markings.
- **Section C (elements No. 48 to 70): New information**
  - This information elements the data model does not cover yet
  - In the future new standards should influence the data model (e.g. positioning information from SCUTUM CWA)

The data model – dangerous goods transport artefacts Considerations

- A vehicle carries dangerous goods.
- The driver has a dangerous goods folder, which include all necessary documents (certificates, transport document, instructions in writing, etc.).
- The vehicle carries one or more dangerous goods loads.
- The model emphasises the distinction between different aspects of dangerous goods transport
  - Documentation in the transport document vs. description of the physical load itself
  - Static vs. dynamic description of dangerous goods load
  - Attribute of particular dangerous goods load vs. attribute of the hazardous materials

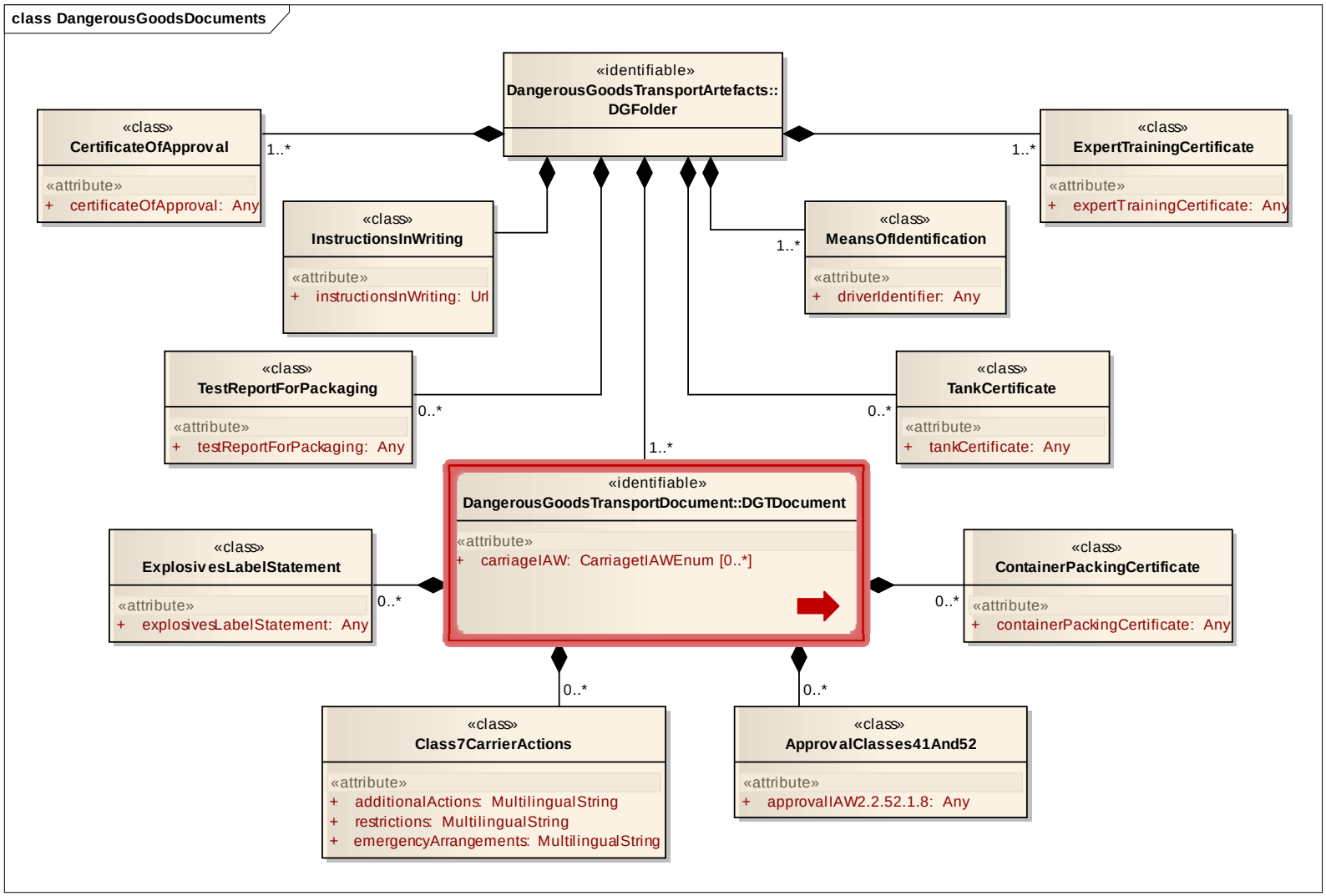
The data model – dangerous goods transport artefacts



The data model – dangerous goods documents Considerations

- The dangerous goods folder contains all the necessary documents for the transport of dangerous goods.
- Documents defined in part A of the WDW table (explosive label statement, container packing certificate etc.) were associated with the transport document.
- Documents listed in part B (tank certificate, test report for packagings, etc.) are associated with the dangerous goods folder.
- Definition of the certificates in terms of the WDW table is mostly unstructured and does not support detailed modelling.

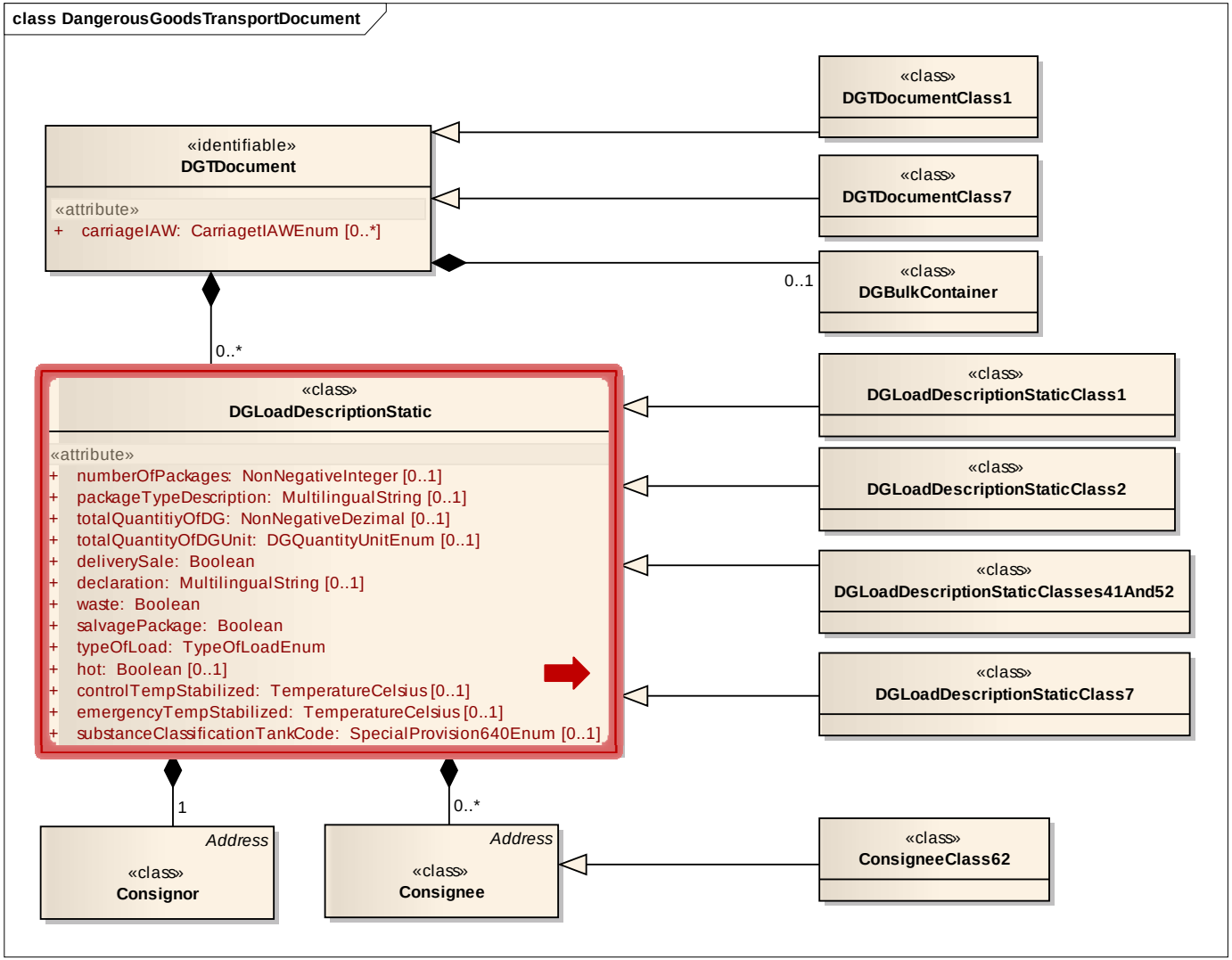
The data model – dangerous goods documents



The data model – dangerous goods transport document Considerations

- Specializations of the transport document according to different classes of dangerous goods
- Potential special characterisations of the transport by reference to chapters of ADN/ADR/RID (e.g. "carriage in accordance with 7.5.8.1") are summarized in an enumeration.
- The transport document includes a description of dangerous goods load(s). Each description of a load refers to just one description of a dangerous good.
- The description of a load has specializations required for dangerous goods classes 1, 2, 4.1 and 5.2 and 7, providing additional class specific attributes.

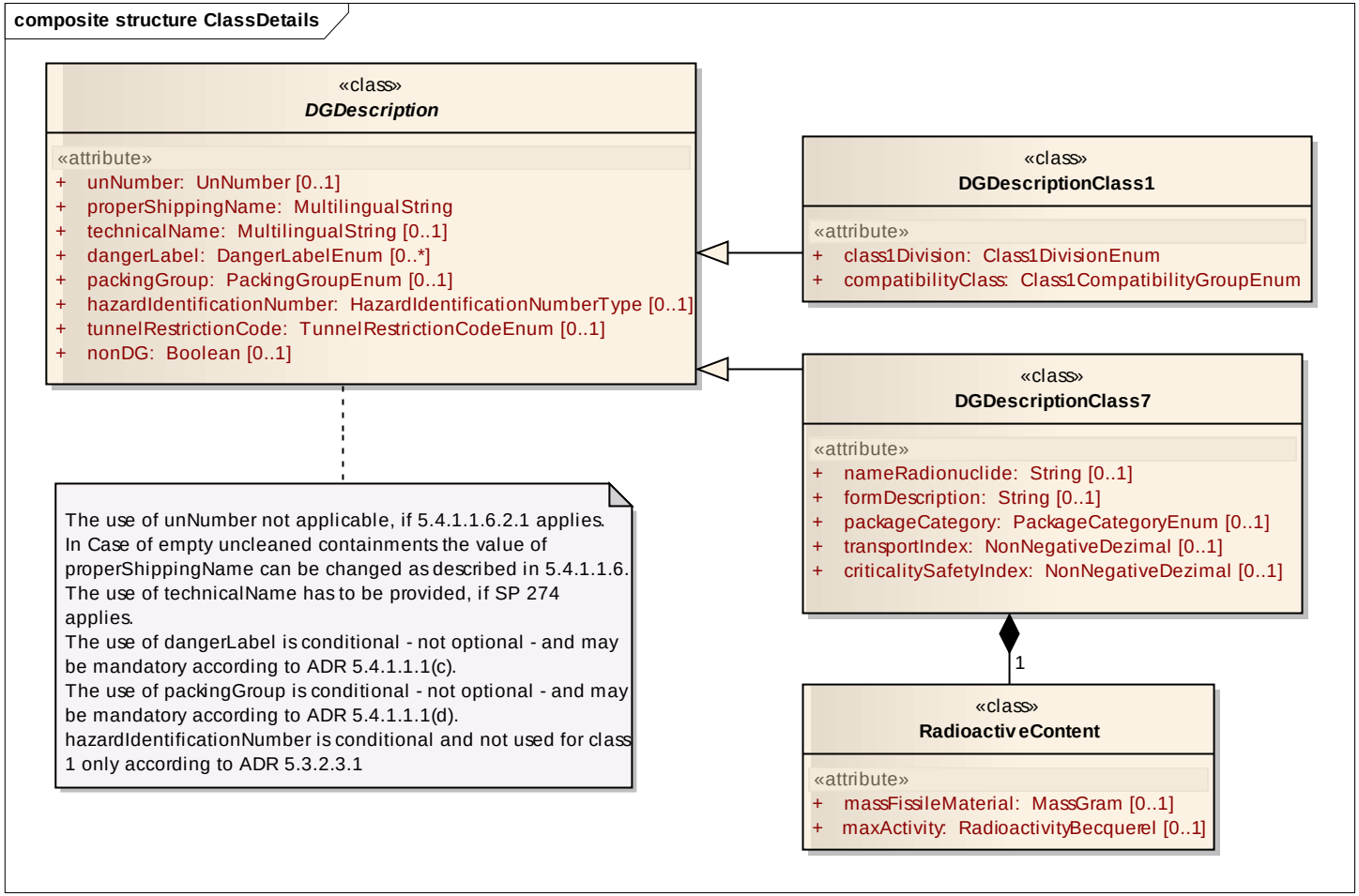
The data model – dangerous goods transport document



The data model – dangerous goods description Considerations

- The dangerous goods description describes a single dangerous good.
- Classes 1 and 7 are considered by specializations.

The data model – dangerous goods description



Recent feedback

- Concerns regarding overly restricted values space or lexical space for permissible values of data types
  (Are temporary derogations able to change the syntactic correctness of individual fields?)
- Similar consideration for multiplicity
- Consideration of Chapter 1.1.3.6 ADR/AND "*Exemptions related to quantities carried per transport unit*" not in the WDW-table and consequently not in the data model
- Consideration of pre- and post-processing (e.g. IMDG-Code) in the transport document in case of multimodal transports

Conclusions / observations

- The modelling method has proven during the first modelling steps to be a sound basis for modelling a Dangerous Goods model based on the WHO DOES WHAT table – plus additional input from ADR, RID & ADN
- Extra input from external stakeholders is helpful in providing input for data structure choices, but also bears potential for divergence and inconsistencies
- The overall amount of input material is overwhelming and stretching the project's resources
- From the first round already we can expect the resulting model to become substantial
- The chosen approach provides a mapping to XML schema which may prove to be helpful for alignment with other backbone specifications like Dakosy, eRailFreight, e-freight, etc.
  (beware that other channels – esp. Radio – need different mapping)

Thank you!

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