



Streamlining Semantics from Requirements to Implementation through Agile Mind Mapping Methods

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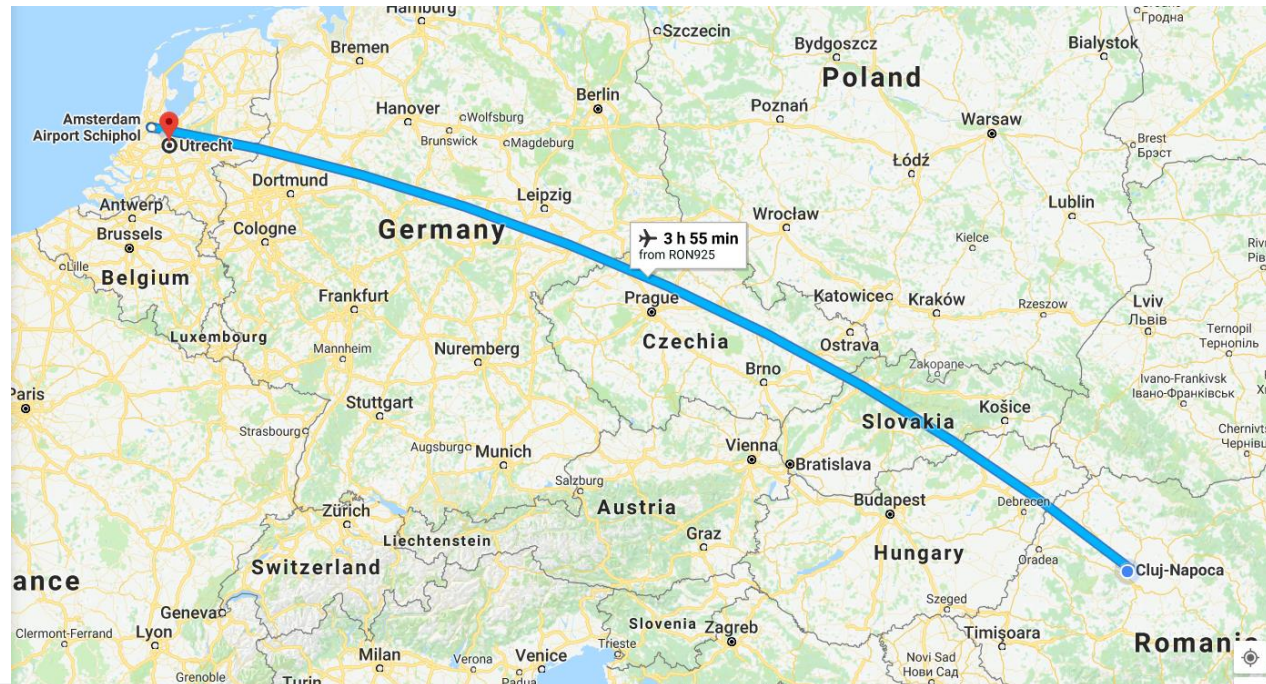
University Babeș-Bolyai of Cluj Napoca, Romania

Dimitris Karagiannis

University of Vienna, Austria

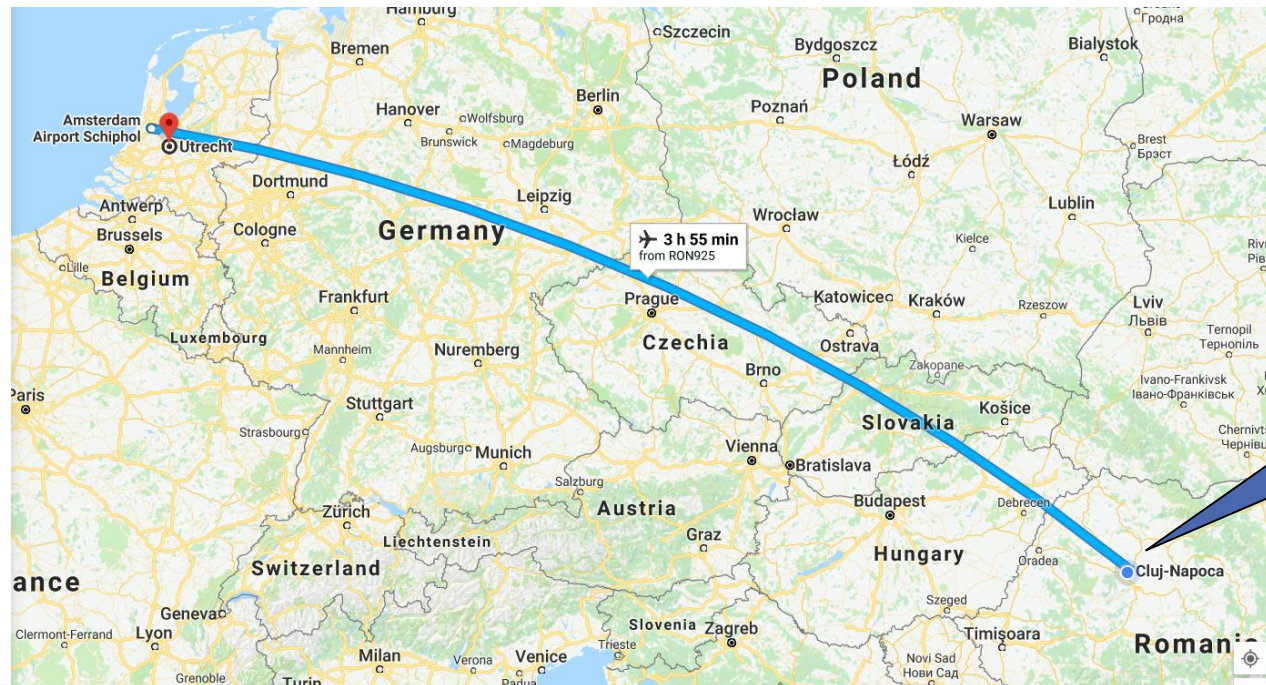
Where am I from?

- **Babeş-Bolyai University** of Cluj-Napoca, Romania
 - biggest city in Transylvania
 - largest and oldest Higher Education Institution in Romania
- **Business Informatics Research Center**, Faculty of Economics and Business Administration
 - research topics: Knowledge Management, Business Process Management, Distributed Computing



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Agenda

- Background
 - on Mind Mapping
 - on Zachman Framework
 - on Agile Modelling Method Engineering
 - on Resource Description Framework
- Key Proposal and Application Method
- Design Decisions
- Required Enablers
- Conclusions

Background on Mind Mapping as RE Enabler

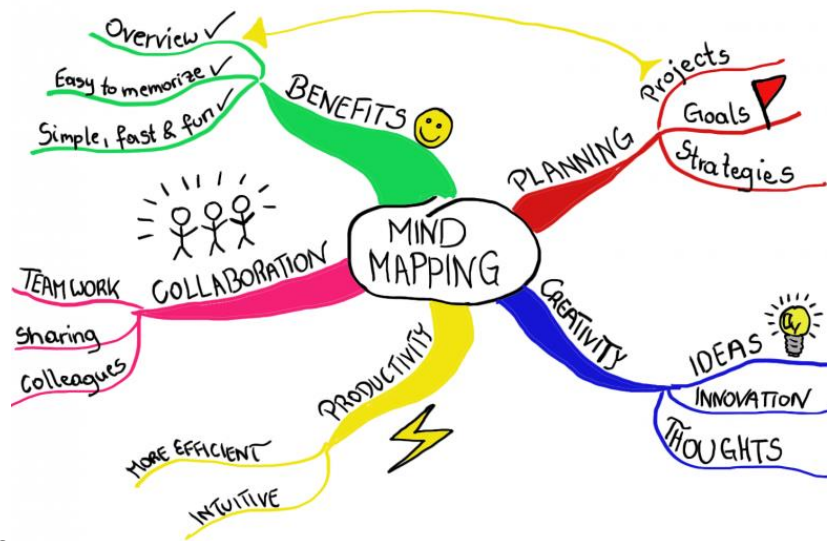
Mind Mapping:

- ...from **information visualisation method** - roots in psychology (not necessarily software based)
- ...to **RE-support method** - means of (loosely) structuring RE artefacts and context

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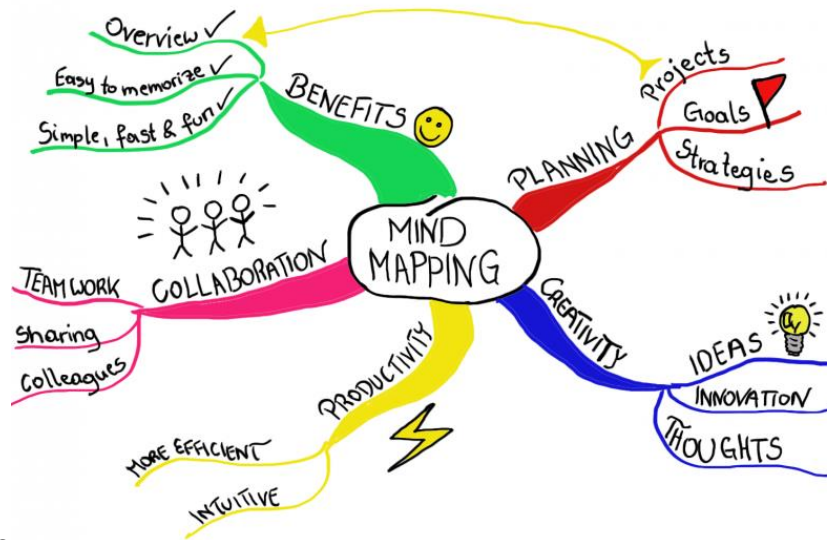
Source:

<https://www.mindmeister.com/blog/why-mind-mapping/>

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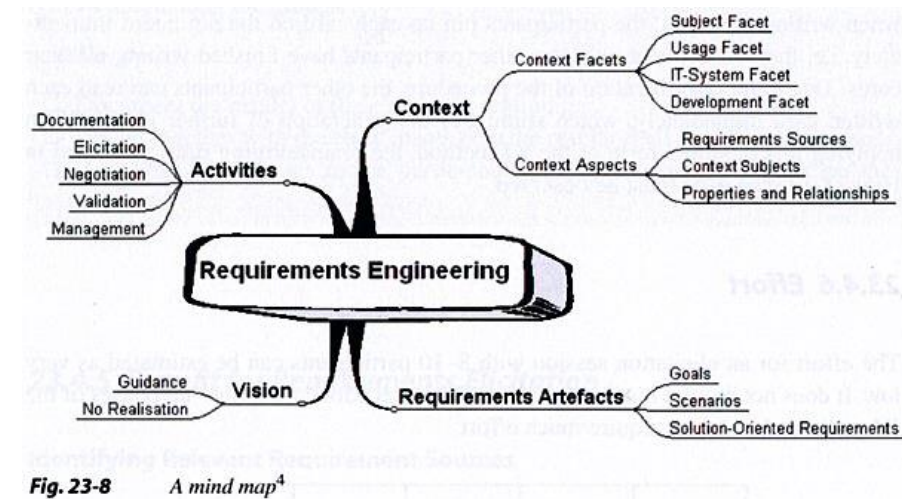
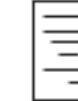
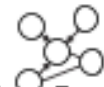
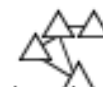
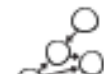
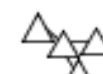


Fig. 23-8 A mind map⁴

Source:
Pohl, K.,
Requirements Engineering: Fundamentals, Principles, and Techniques, Springer, 2010

Background on Zachman Framework

The Zachman Framework – a popular enterprise ontology -
provides meaning for some prescribed mind map branches

	WHAT	HOW	WHERE	WHO	WHEN	WHY	
SCOPE CONTEXTS	Inventory Identification  Inventory Types	Process Identification  Process Types	Network Identification  Network Types	Organization Identification  Organization Types	Timing Identification  Timing Types	Motivation Identification  Motivation Types	STRATEGISTS AS THEORISTS
BUSINESS CONCEPTS	Inventory Definition  Business Entity Business Relationship	Process Definition  Business Transform Business Input	Network Definition  Business Location Business Connection	Organization Definition  Business Role Business Work	Timing Definition  Business Cycle Business Moment	Motivation Definition  Business End Business Means	EXECUTIVE LEADERS AS OWNERS
SYSTEM LOGIC	Inventory Representation 	Process Representation 	Network Representation 	Organization Representation 	Timing Representation 	Motivation Representation 	ARCHITECTS AS DESIGNERS

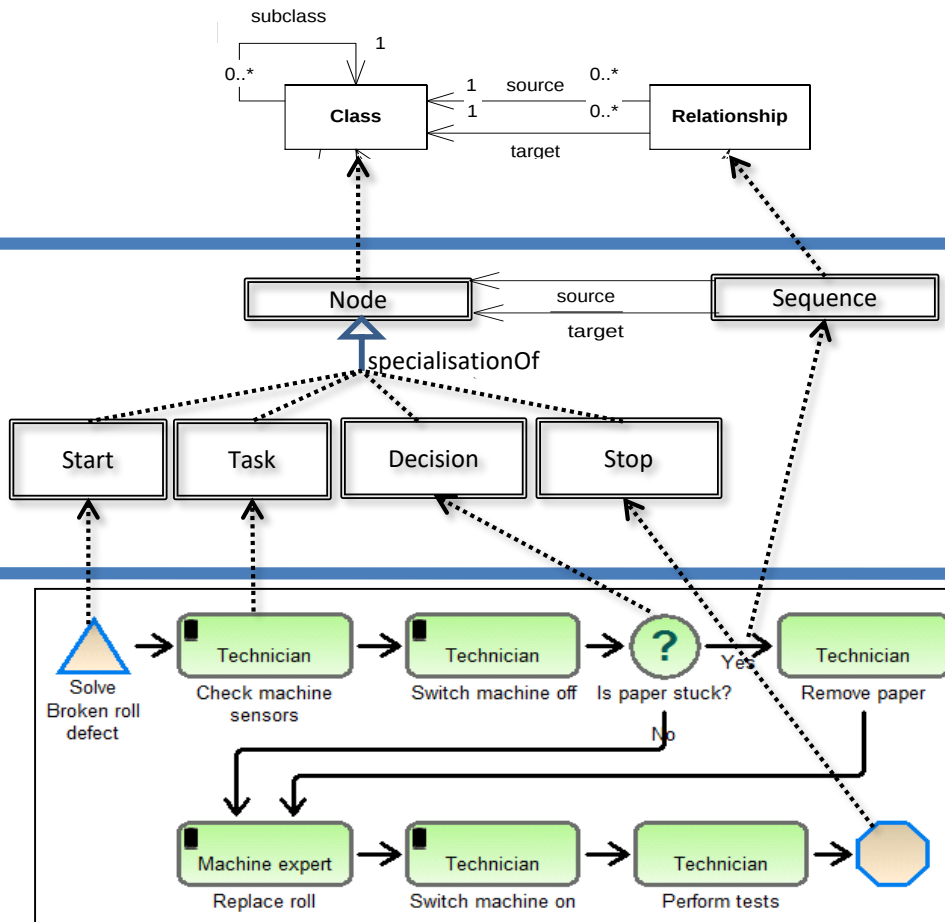
Source:

<https://www.visual-paradigm.com/guide/enterprise-architecture/what-is-zachman-framework/>

Background on Agile Modelling Method Engineering

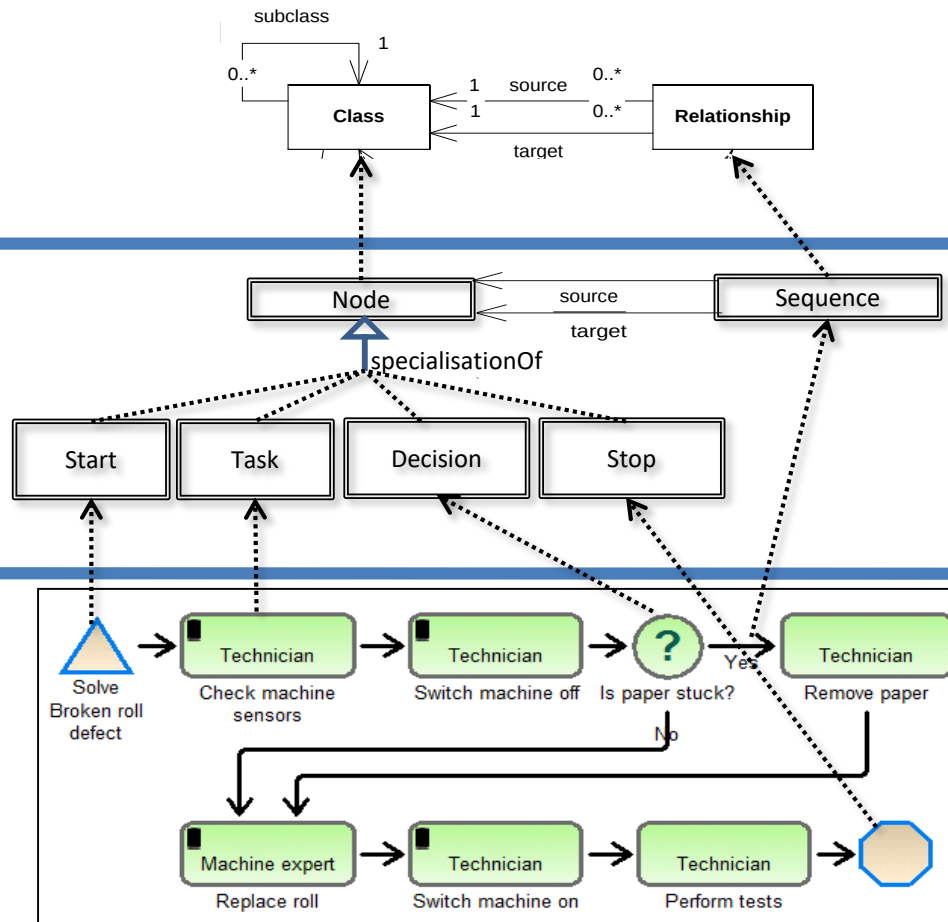
* cf. Karagiannis, D. (2015). "Agile modelling method engineering" In: *Proceedings of the 19th Panhellenic Conf. on Informatics*. Ed. by N. Karanikolas, D. Akoumianakis, N. Mara, D. Vergados, X. Michalis, ACM, p. 5-10.

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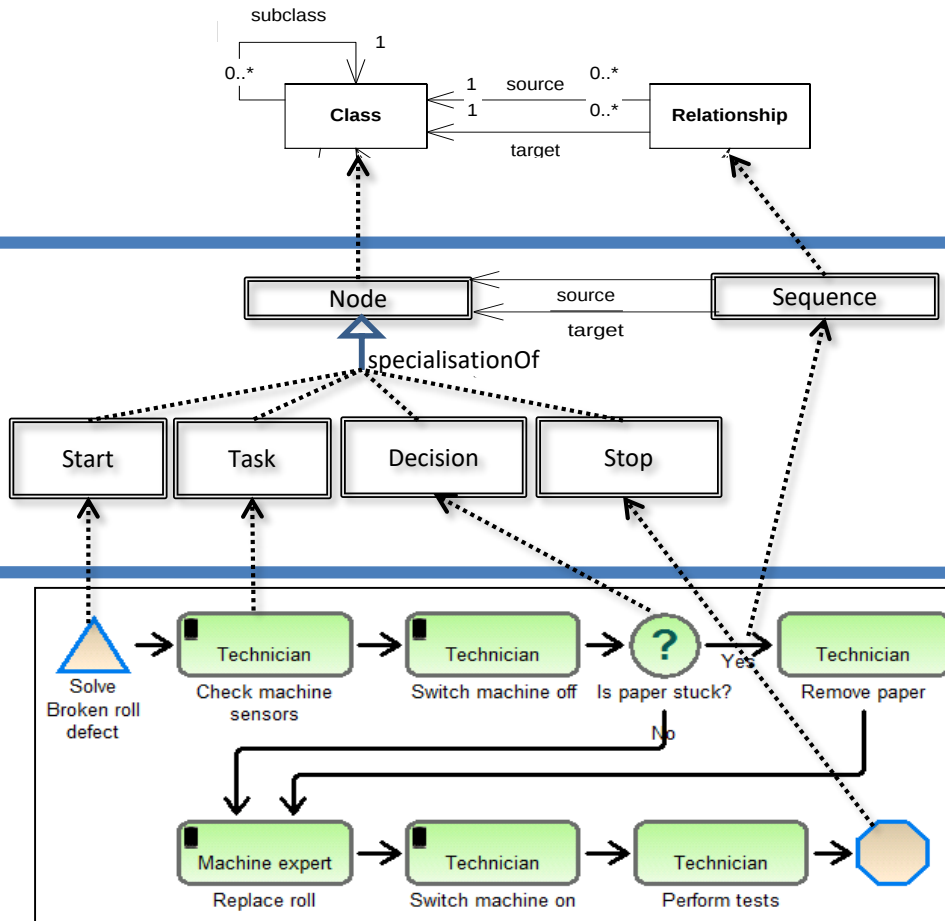


MODELS LAYER

Models describing
application case knowledge

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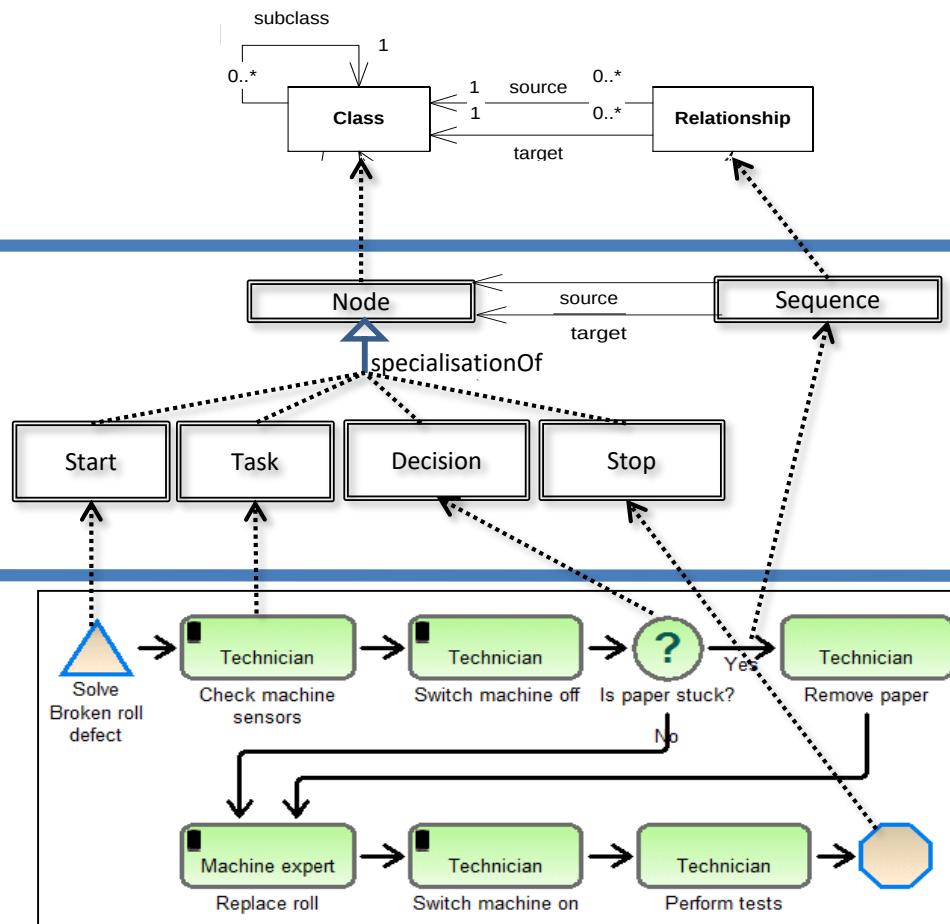
The modelling language terminology
agilely customized for targeted
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Background on Agile Modelling Method Engineering



META-META LAYER

The (fixed) concepts that can be used to agilely tailor modelling languages (metamodels)

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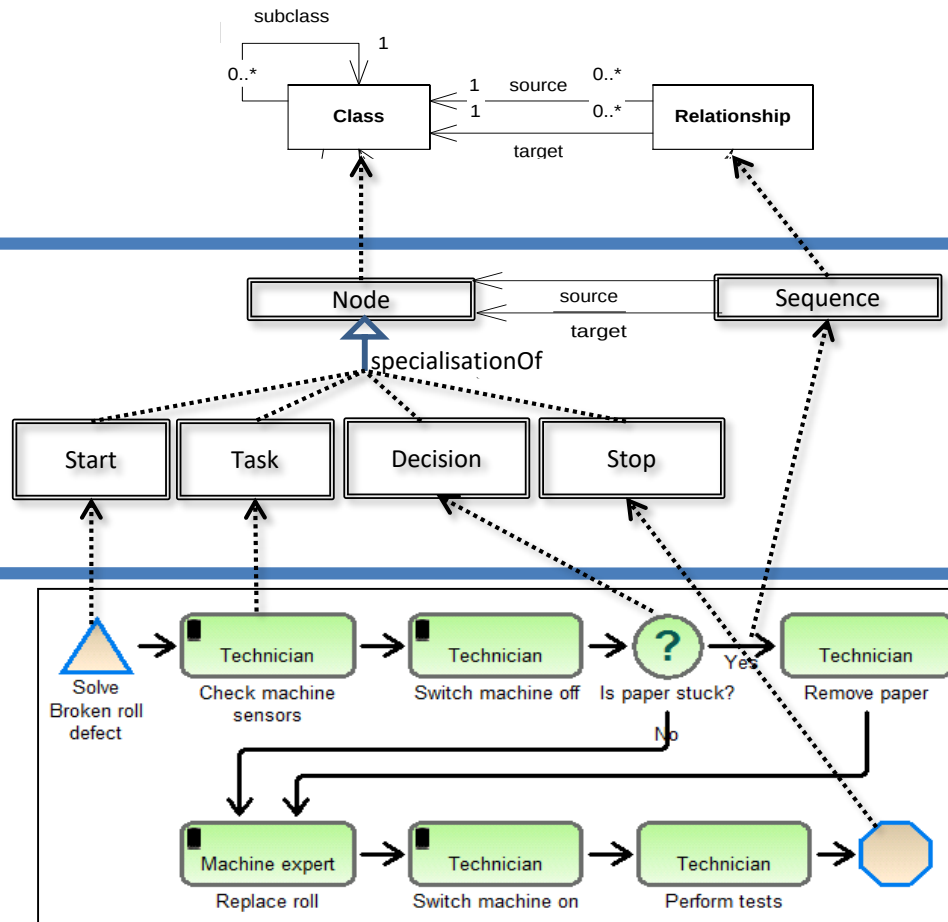
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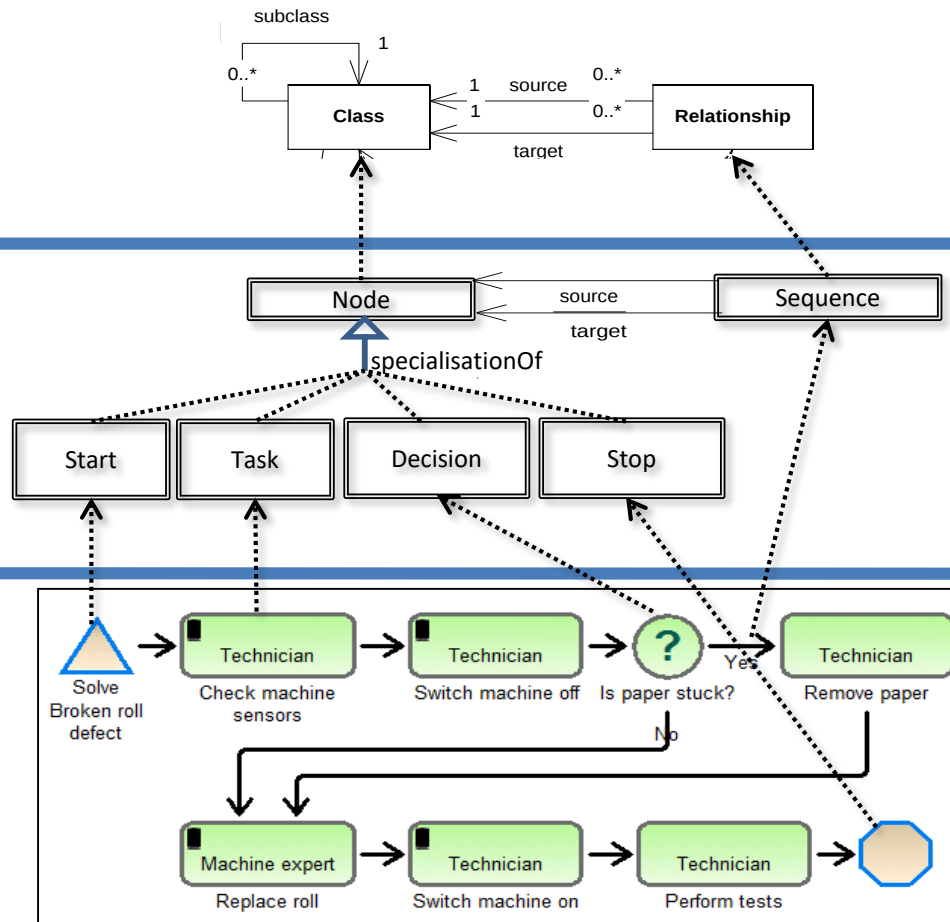
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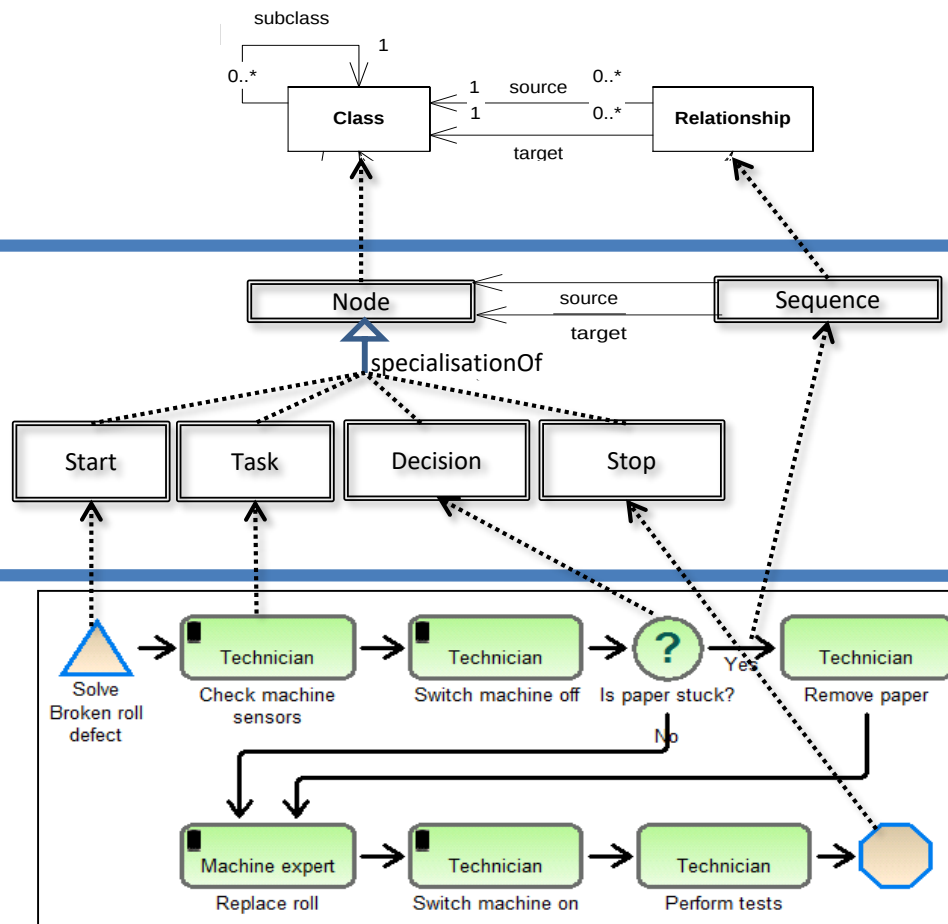
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Modelling language increments (AMME iterations)

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Background on Resource Description Framework

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Background on Resource Description Framework

:Robert :worksAt :UNIVIE.
:Dan :hasHairColor :Black.

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*Graph-based
knowledge
representation*

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*Graph-based
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Upload to
GDBMS

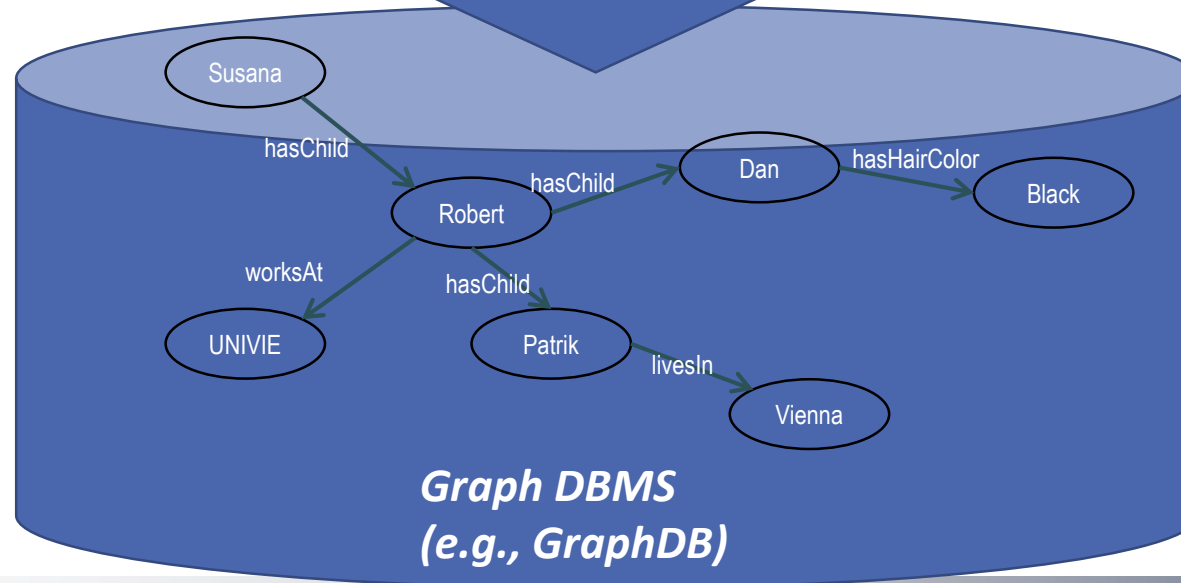


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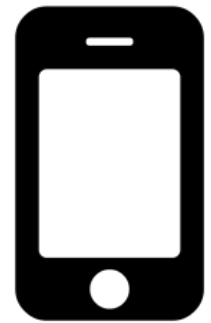
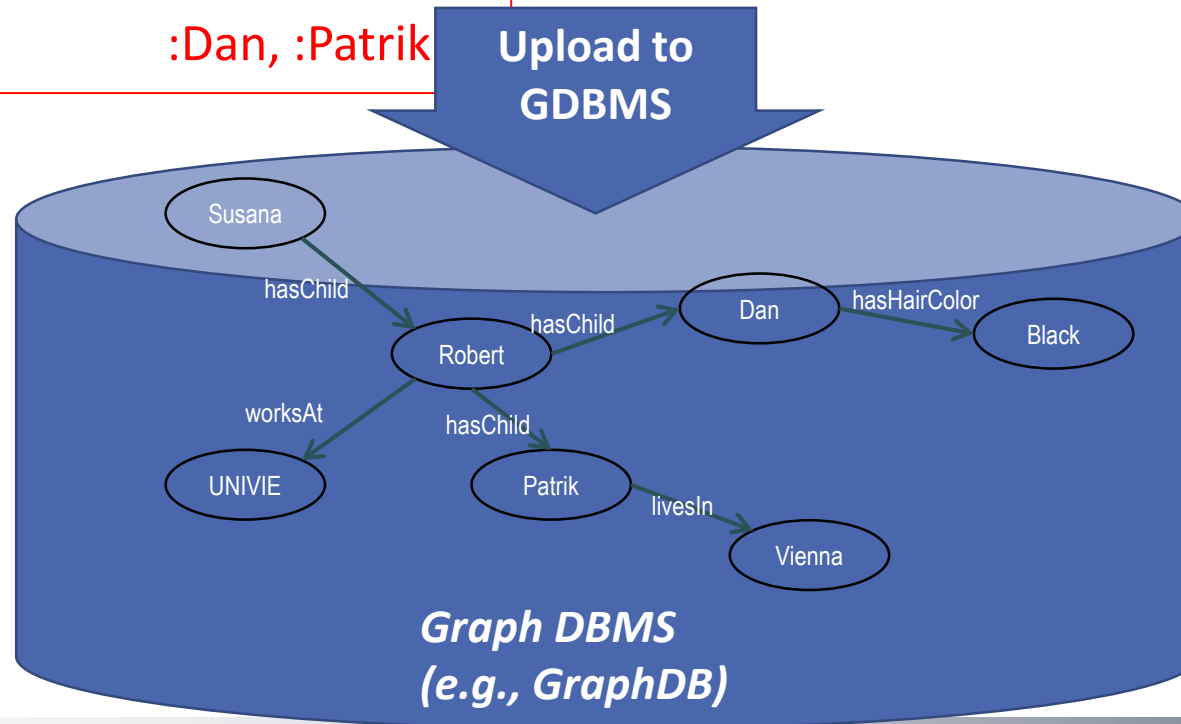


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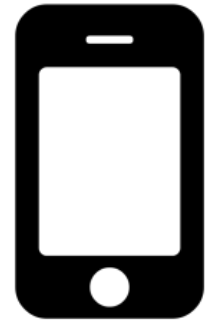
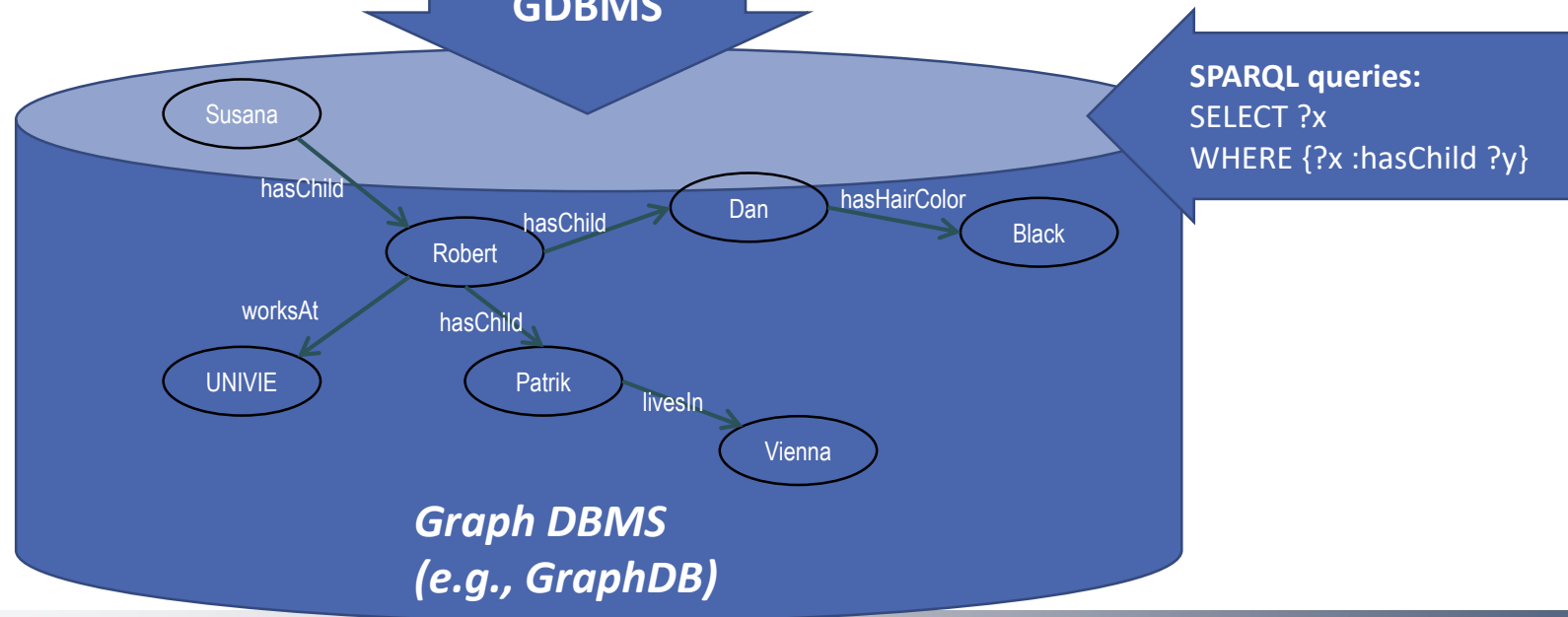
***Client
applications***

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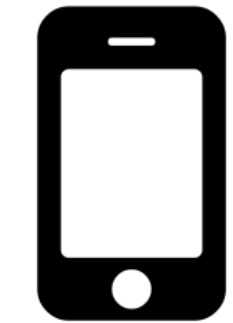
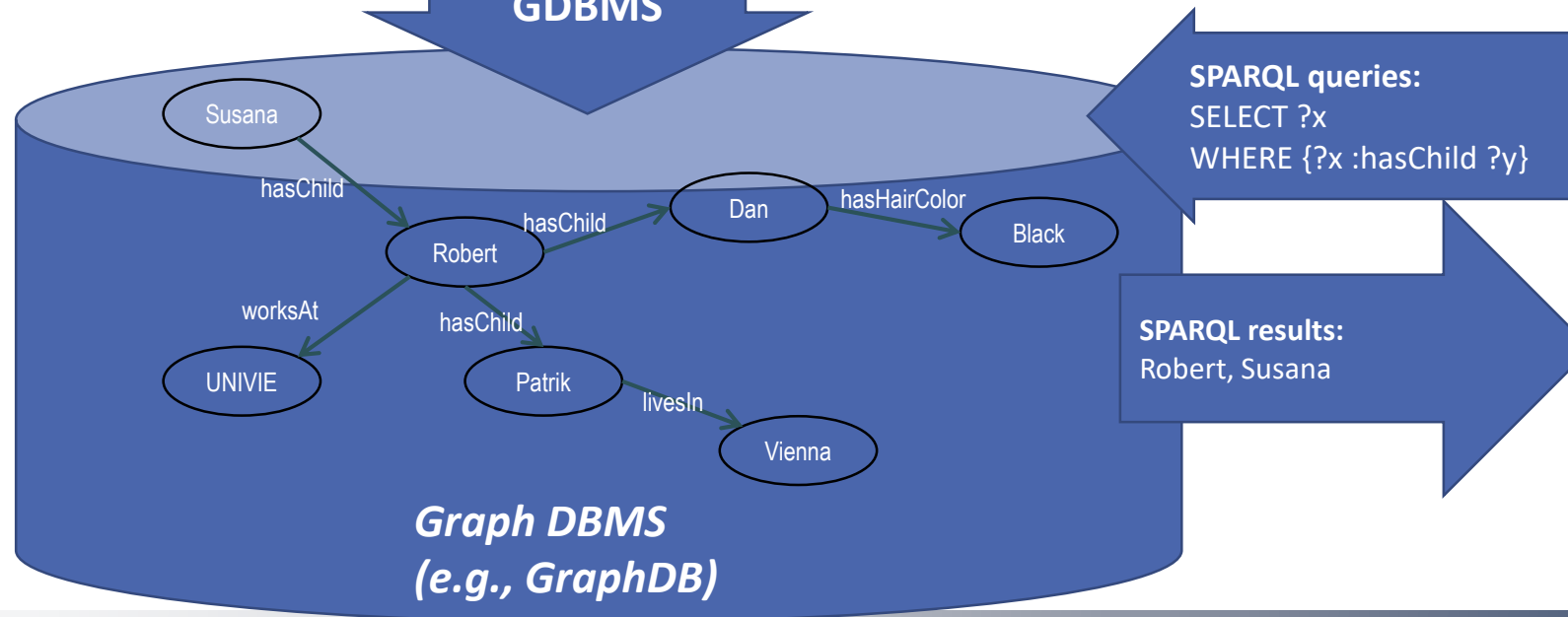
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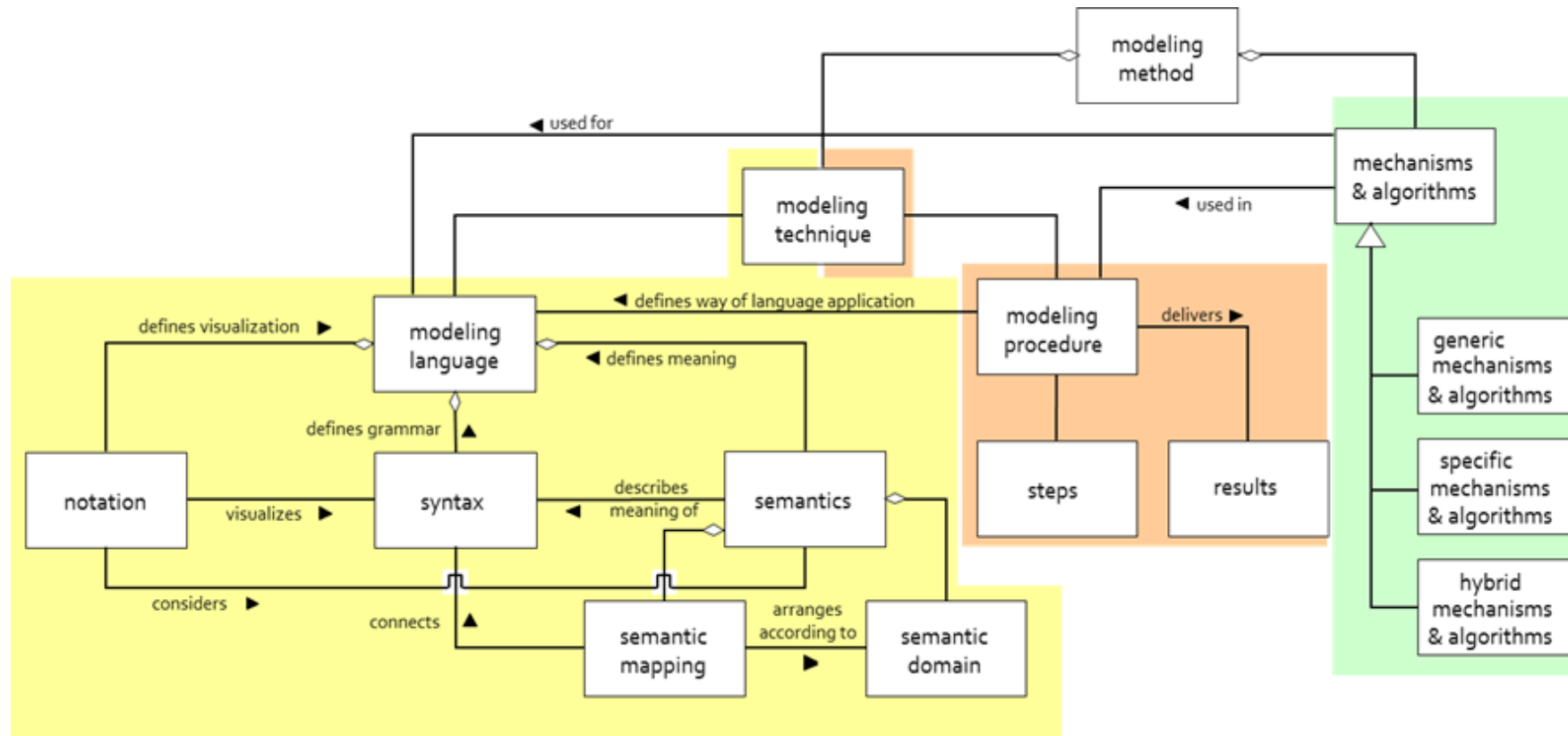
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**Upload to
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**Client
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Key Proposal: extending the notion of Modelling Method to Agile Mind Mapping Method

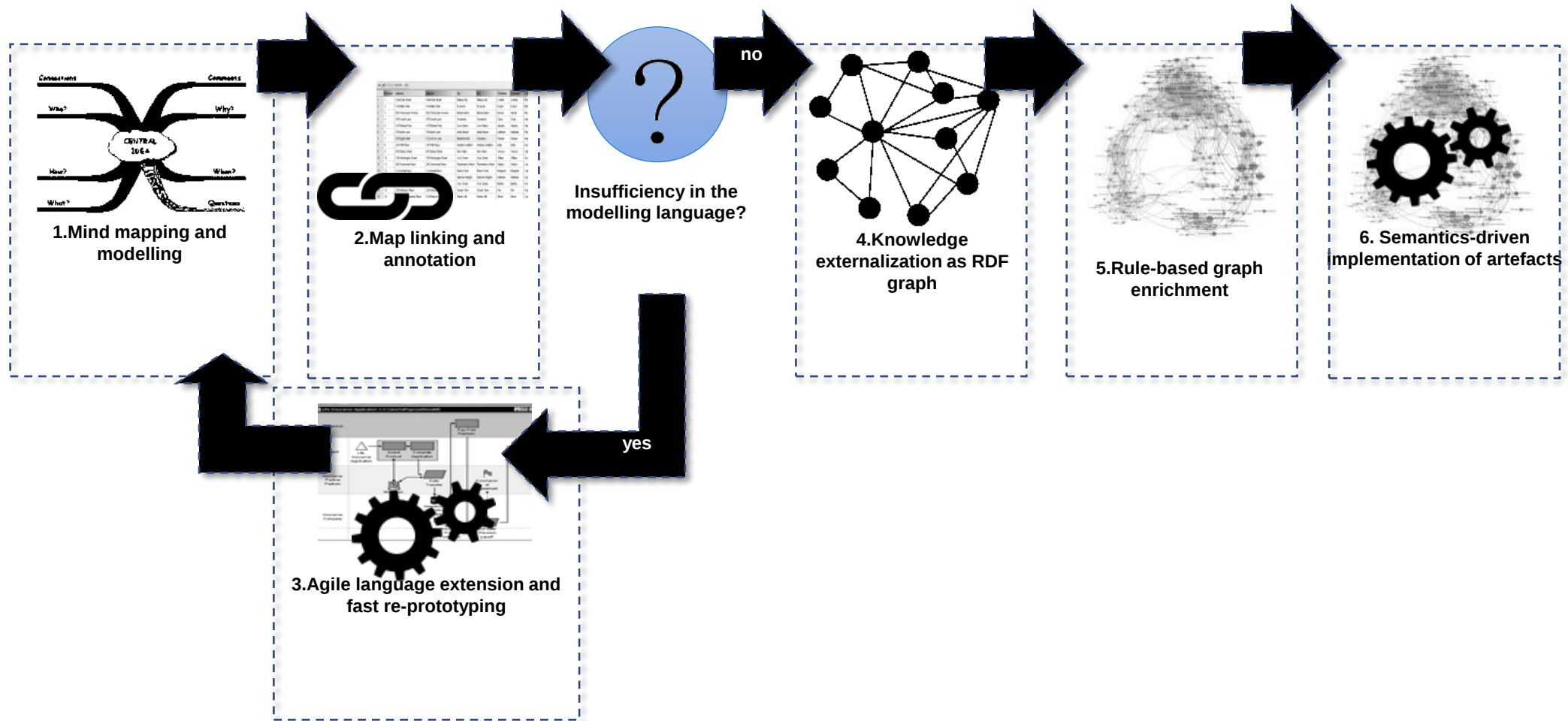


cf. Karagiannis, D., Kühn, H.: Metamodelling platforms. In: Bauknecht, K., Tjoa, A.M., Quirchmayr, G. (eds.), Proceedings of the Third International Conference EC-Web 2002 – DEXA 2002. LNCS 2455, pp 182, Springer (2002)

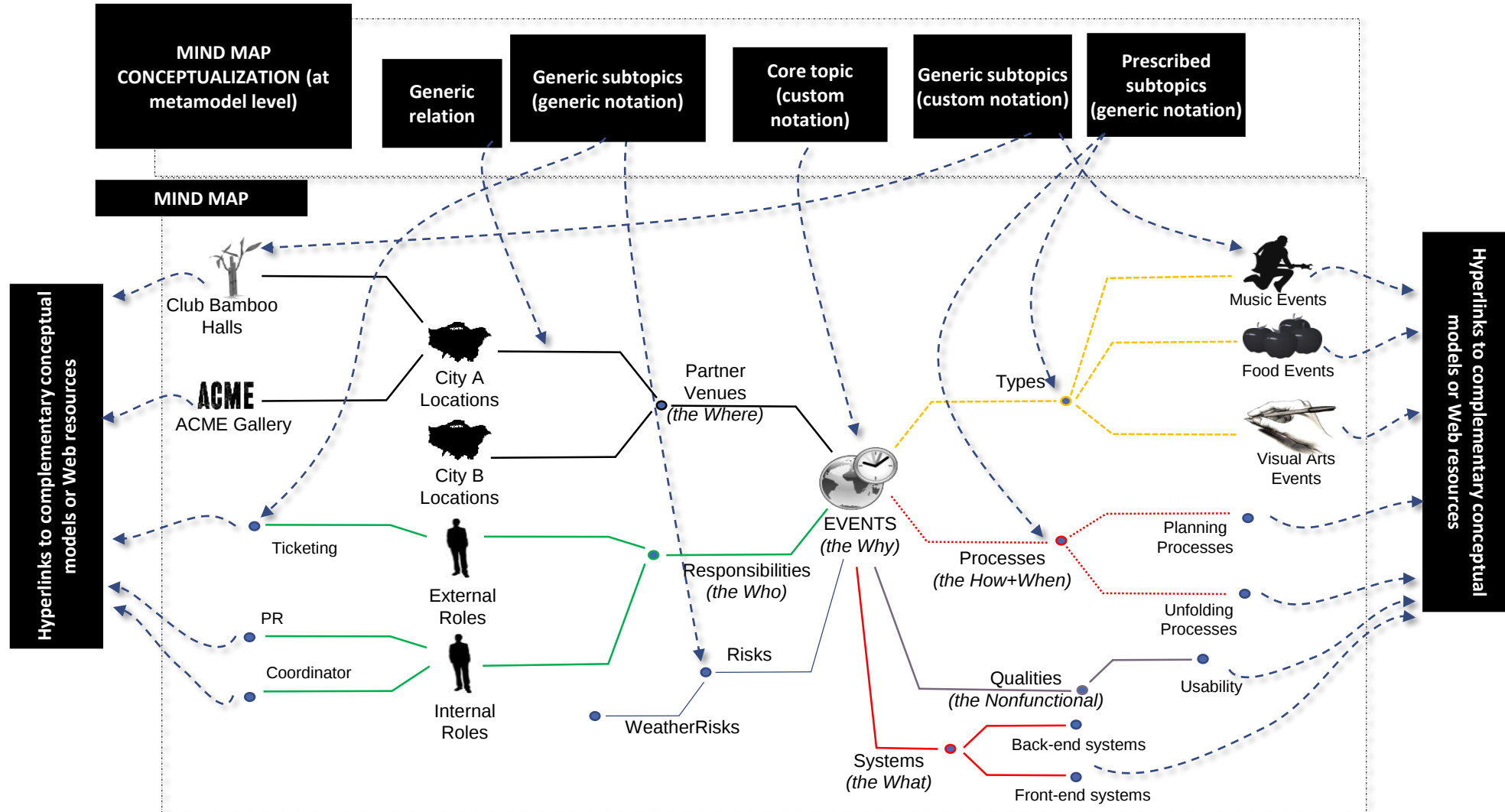
The Method Building Blocks

- **Language:**
 - A core mind mapping language (goal-centric) branching to ZF-based model types (other hybridisations may be considered as well)
- **Procedure:**
 - The application method (detailed on the next slide)
- **Mechanisms:**
 - The mind map and all linked models exported as RDF to expose the semantics to run-time
- **Output:** modelling tool

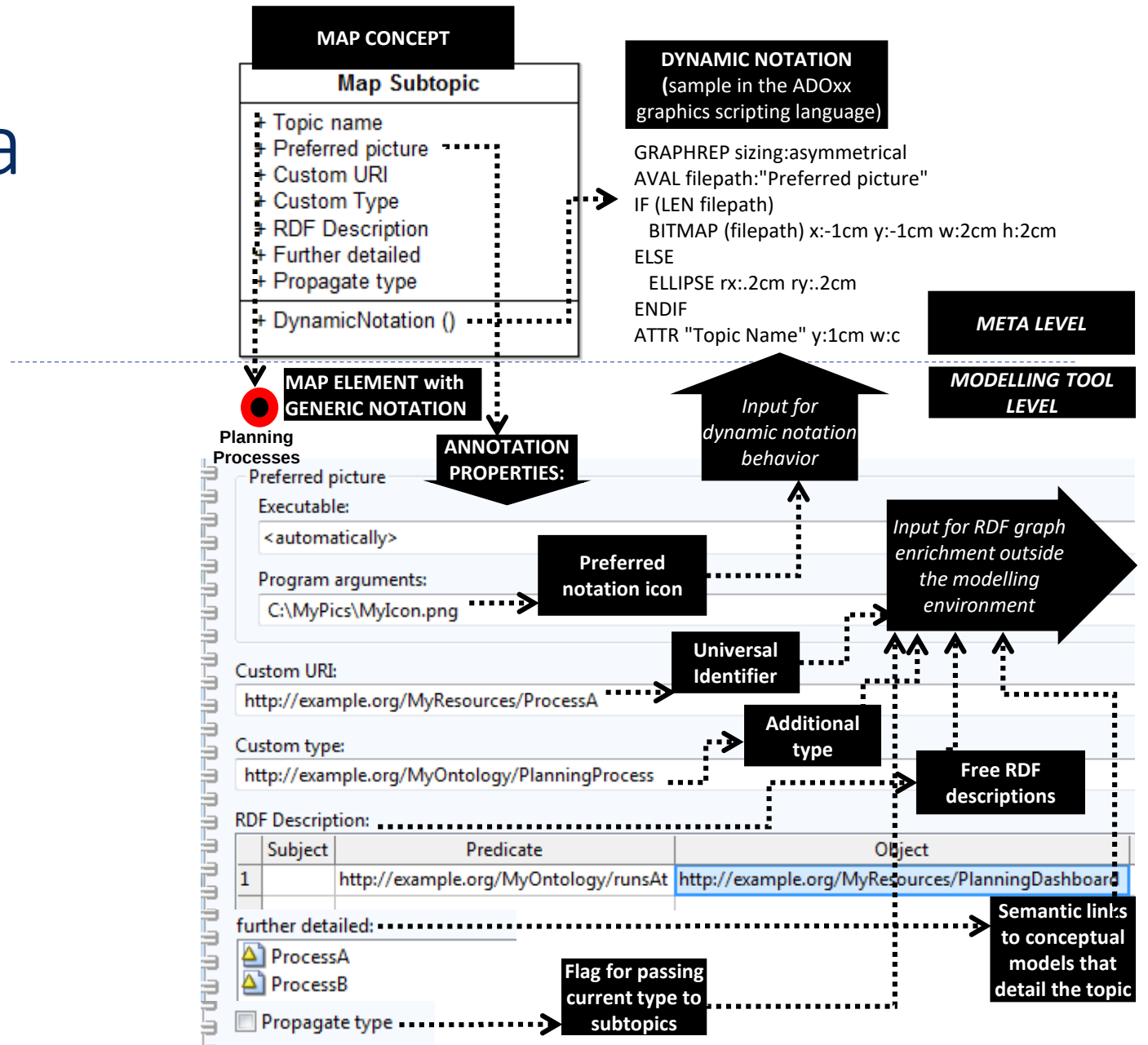
Application Method



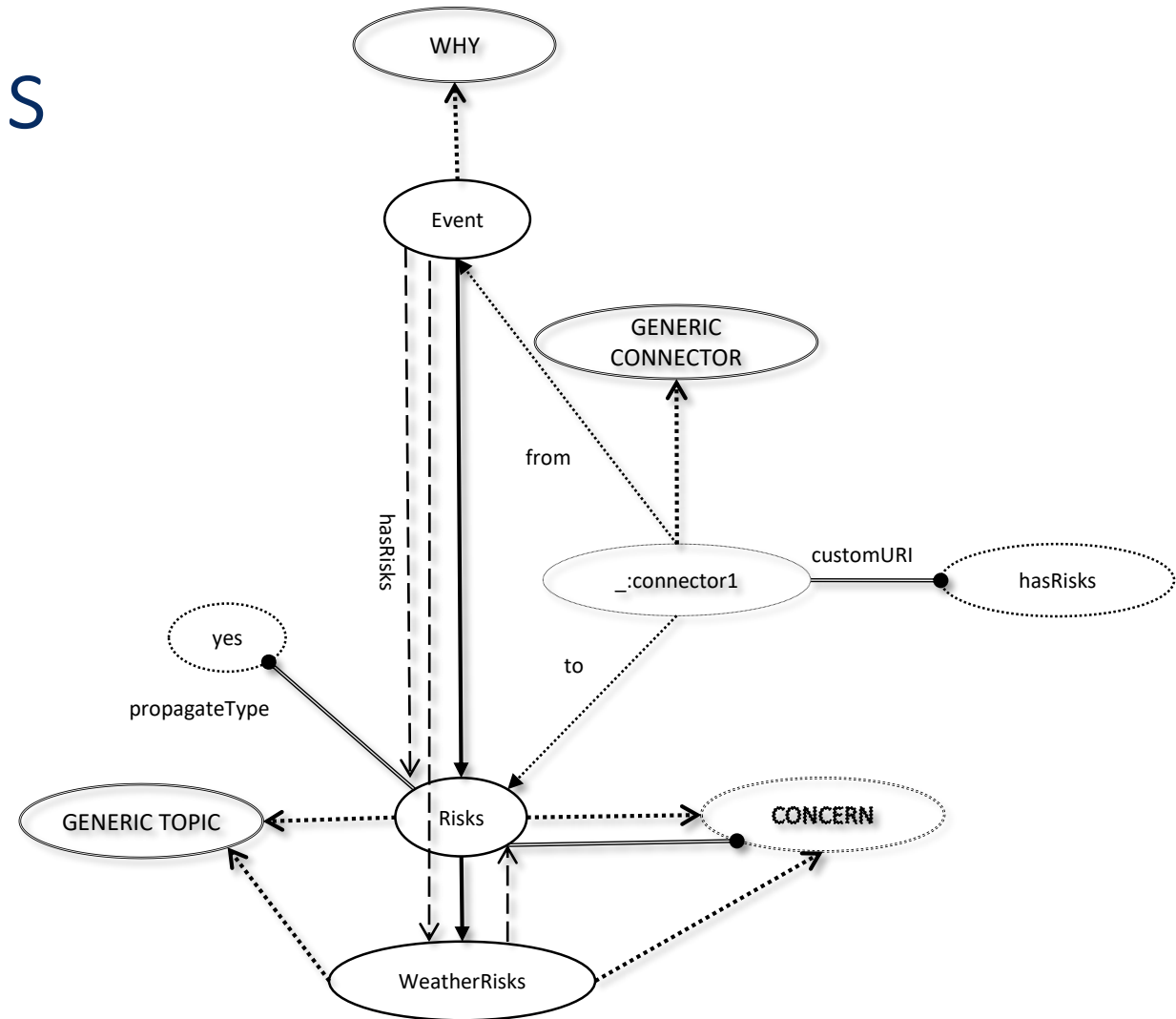
Mind Map Structure



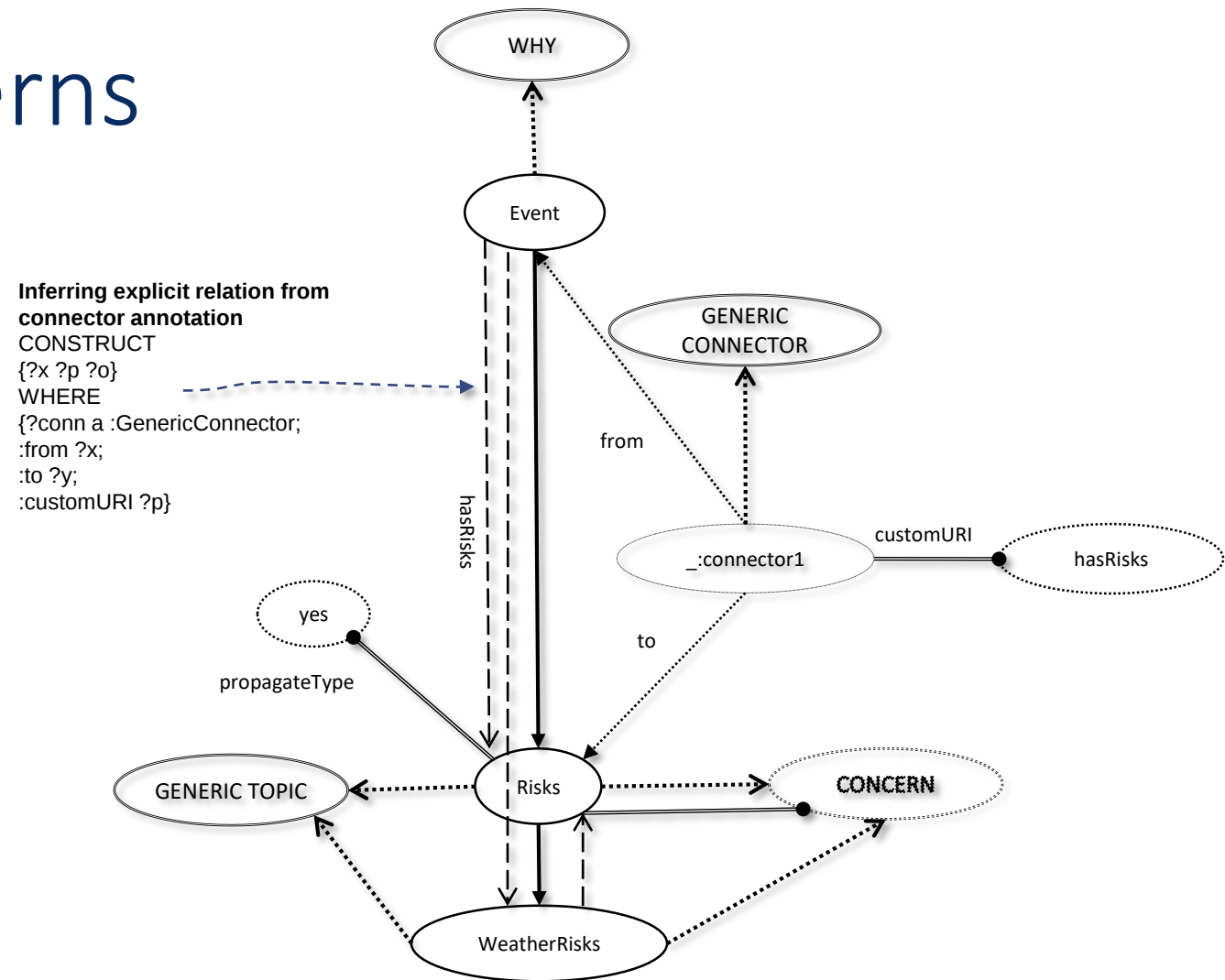
Map Item Schema



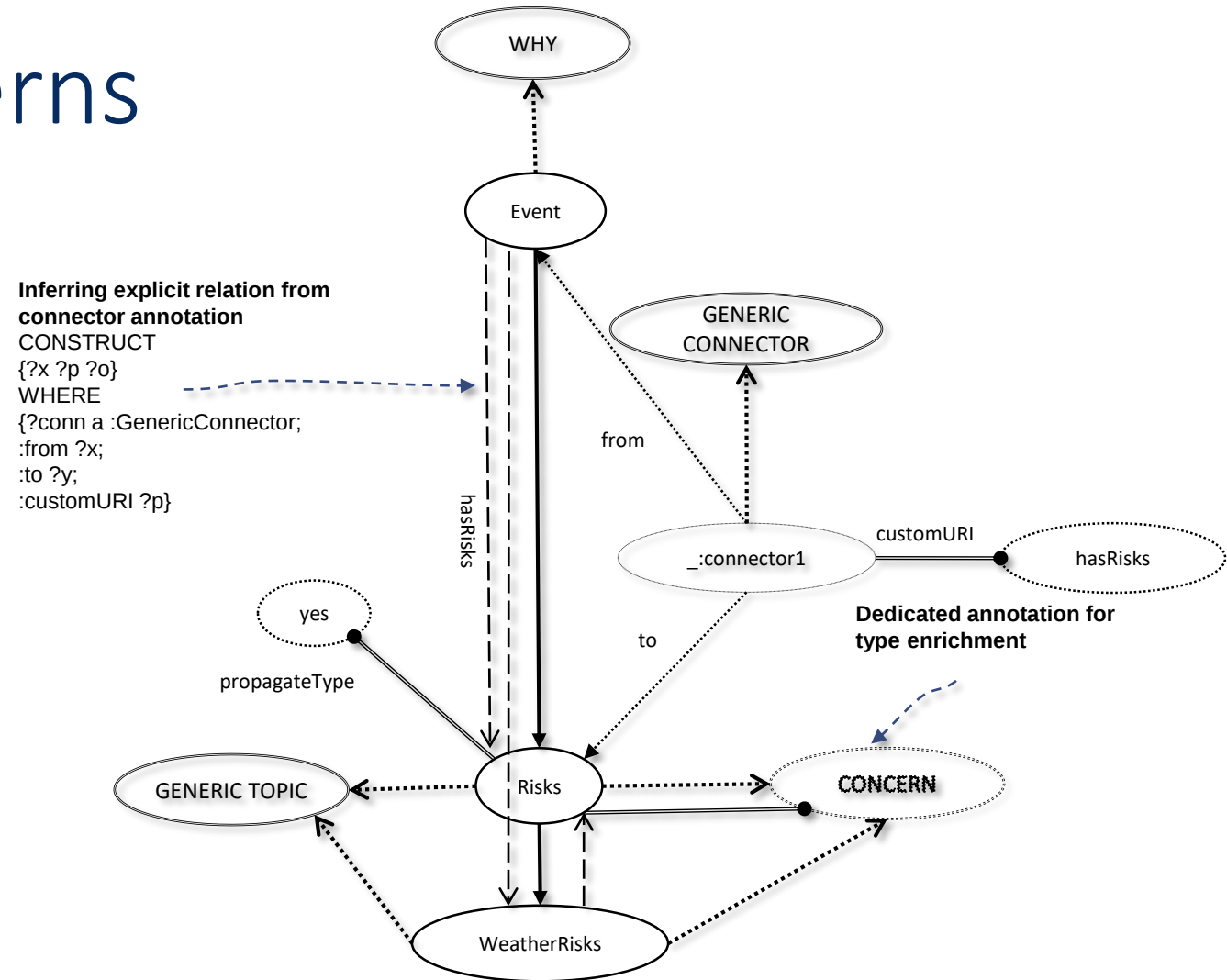
Inference Patterns



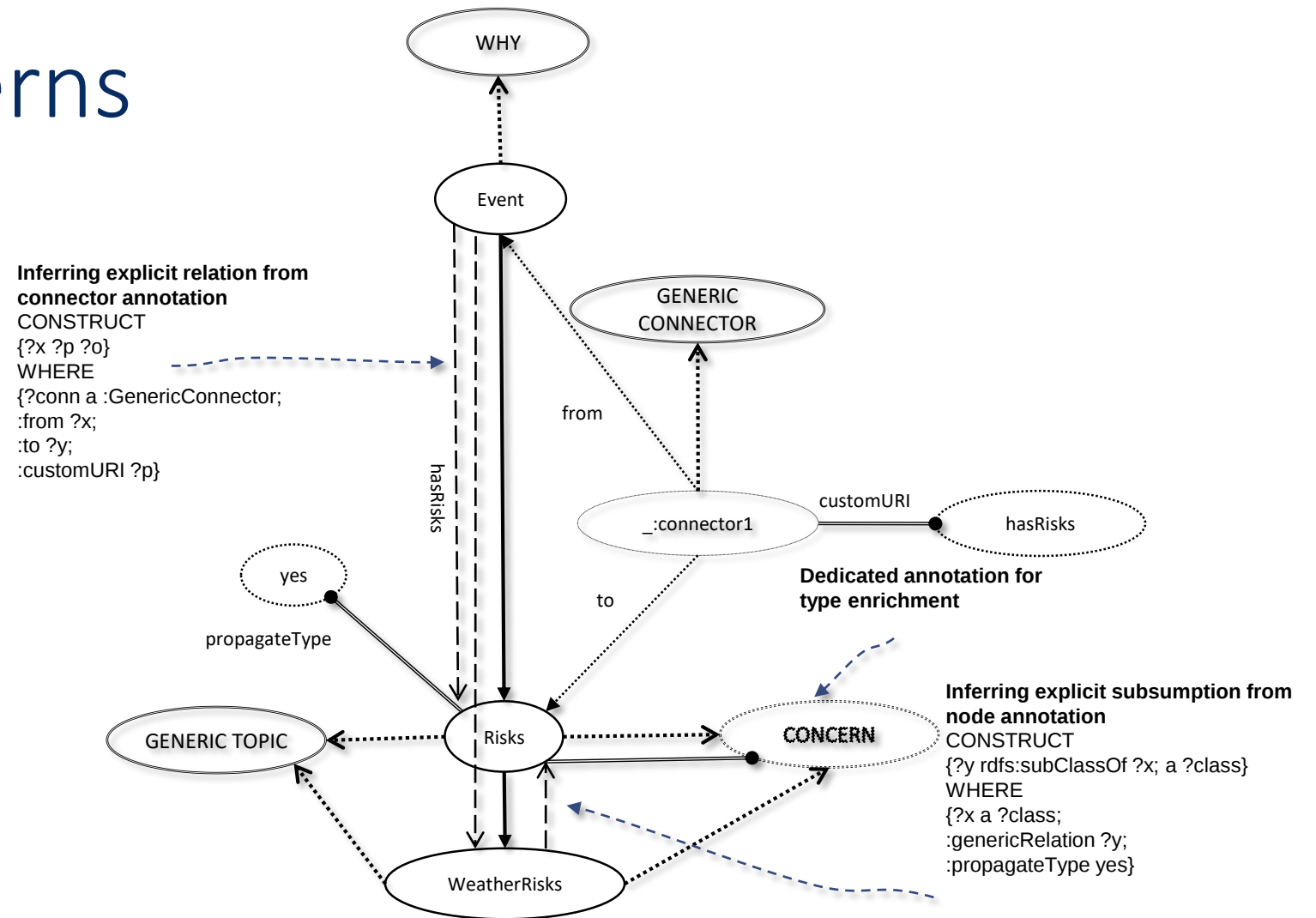
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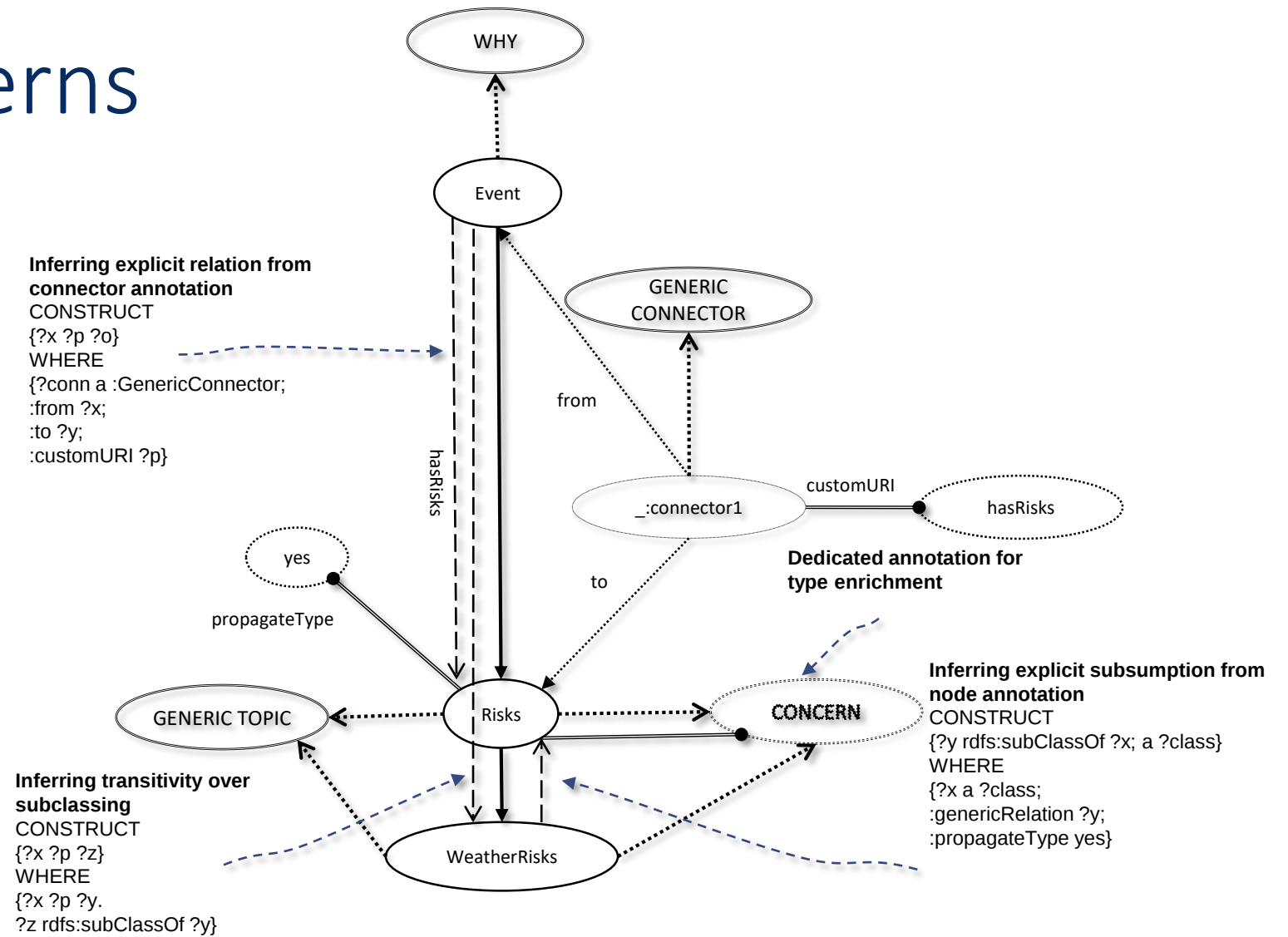
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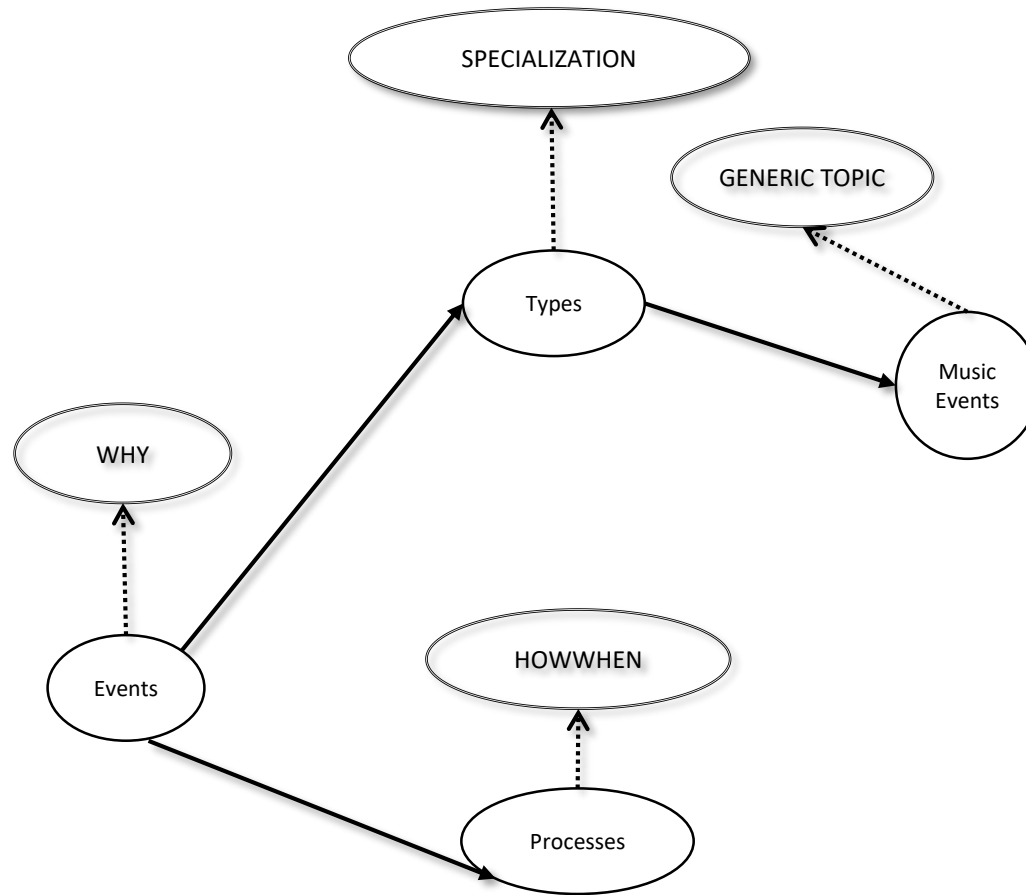
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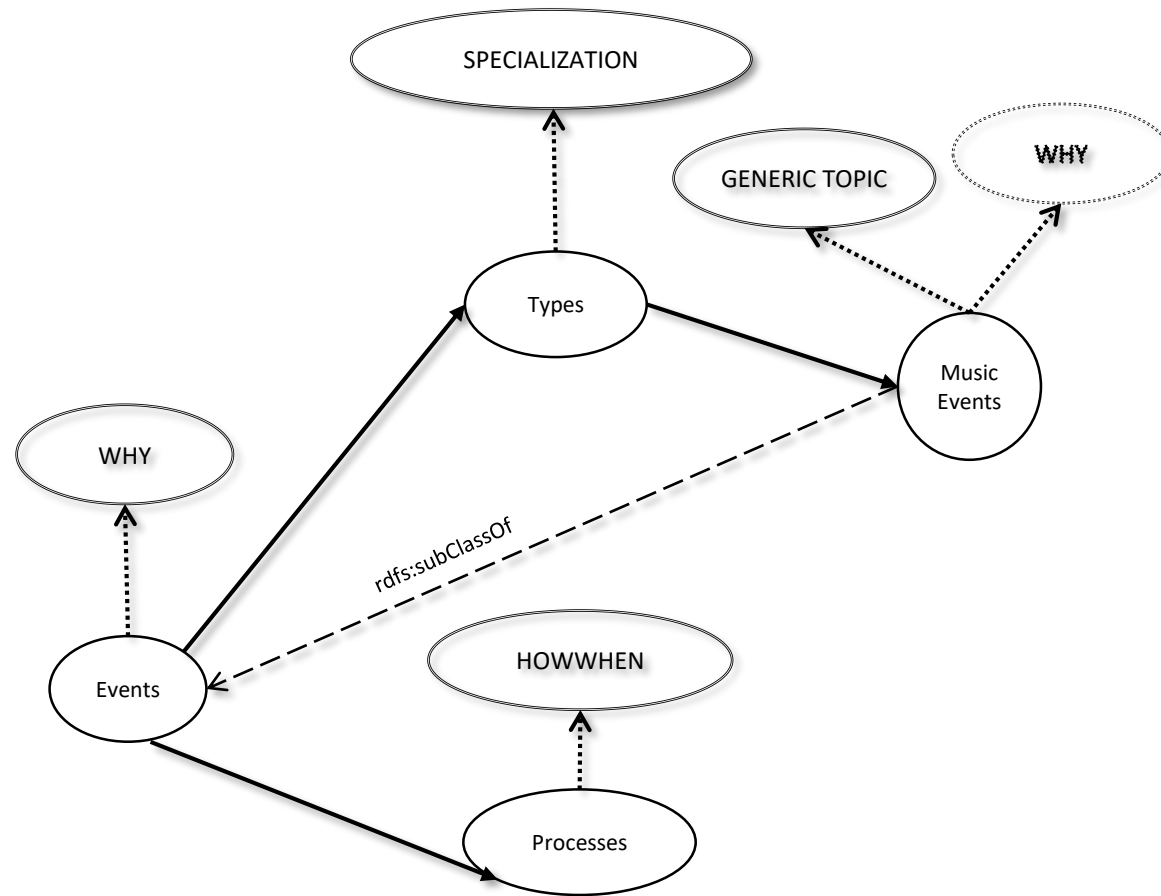
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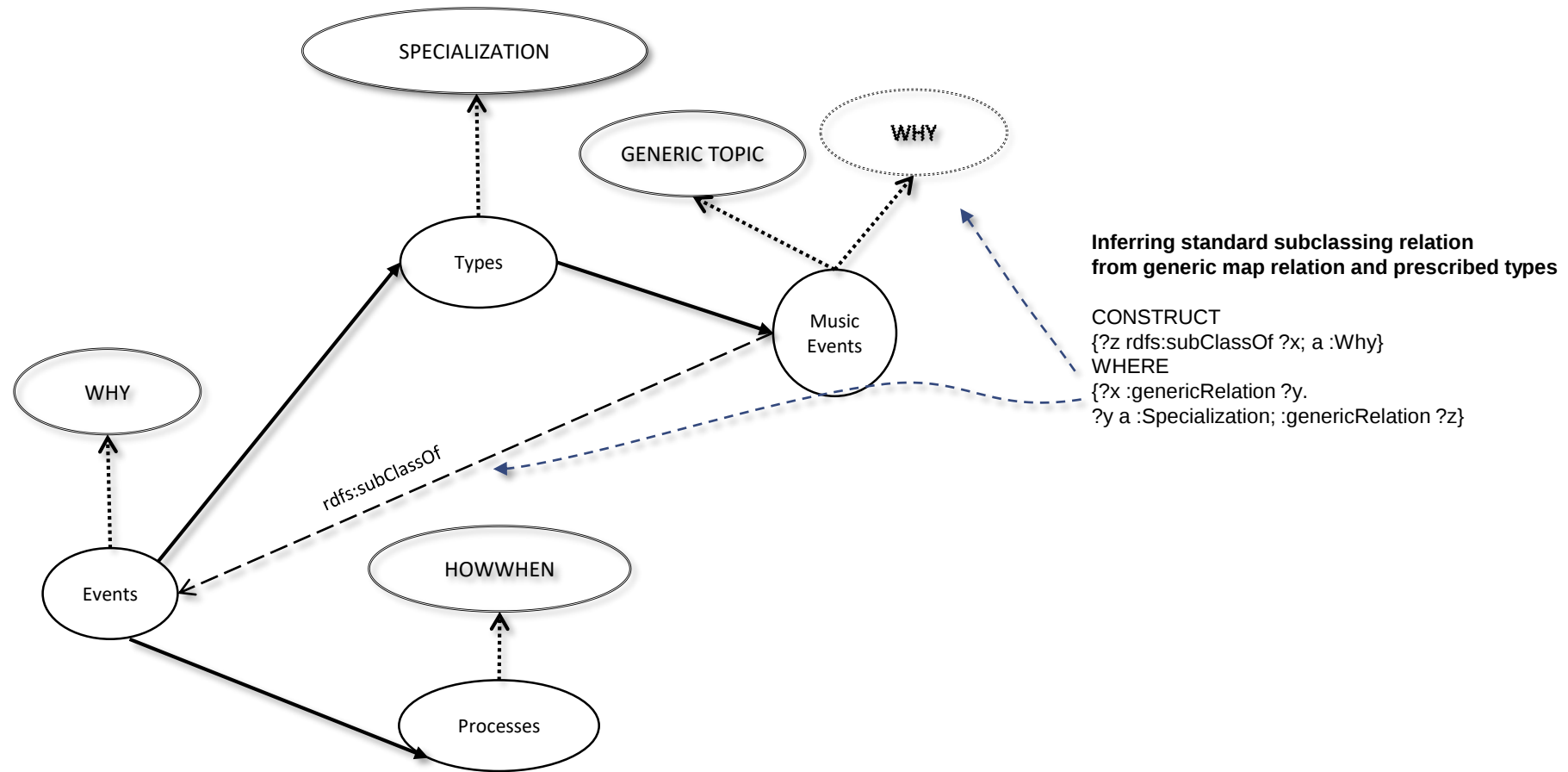
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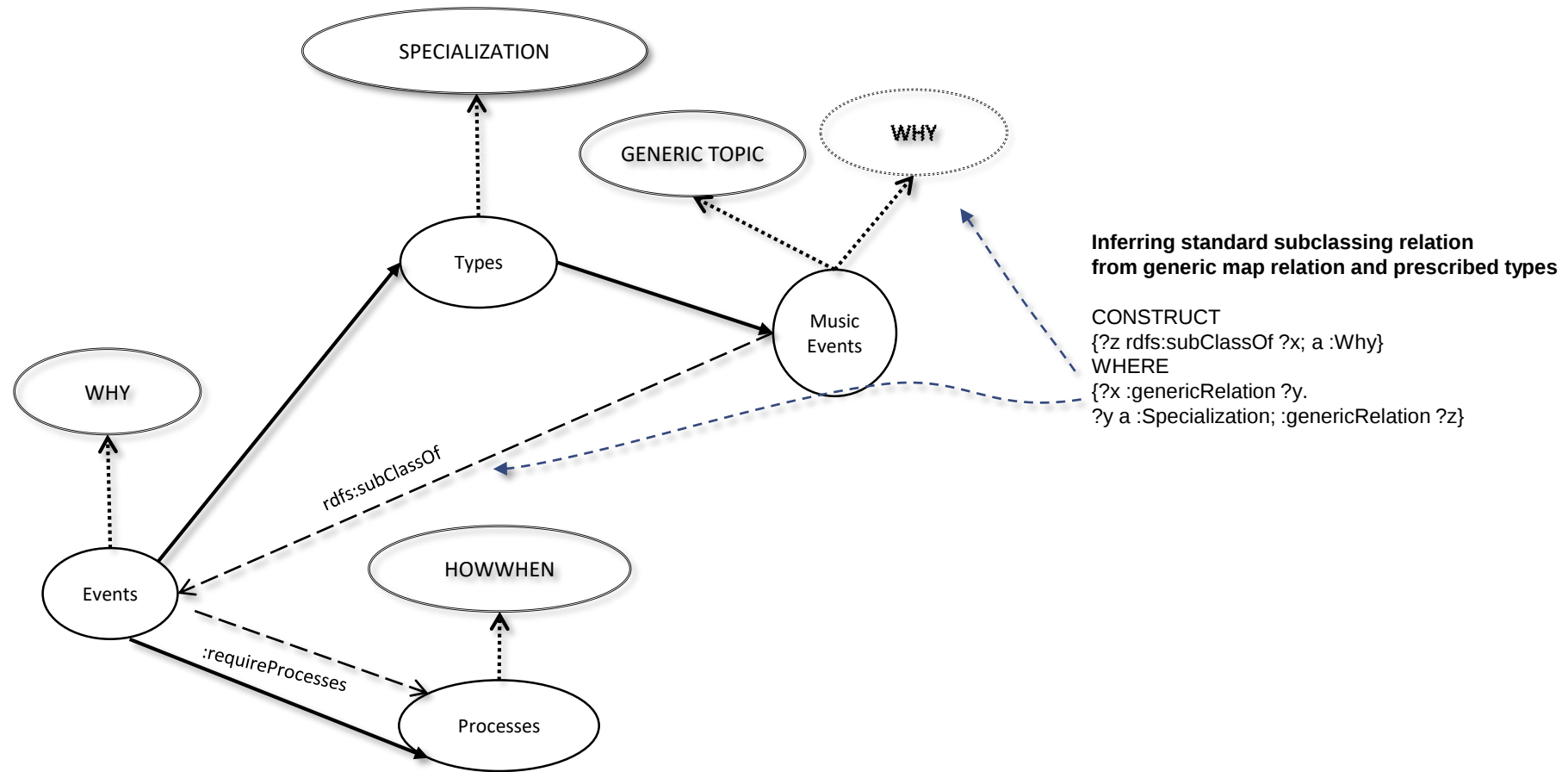
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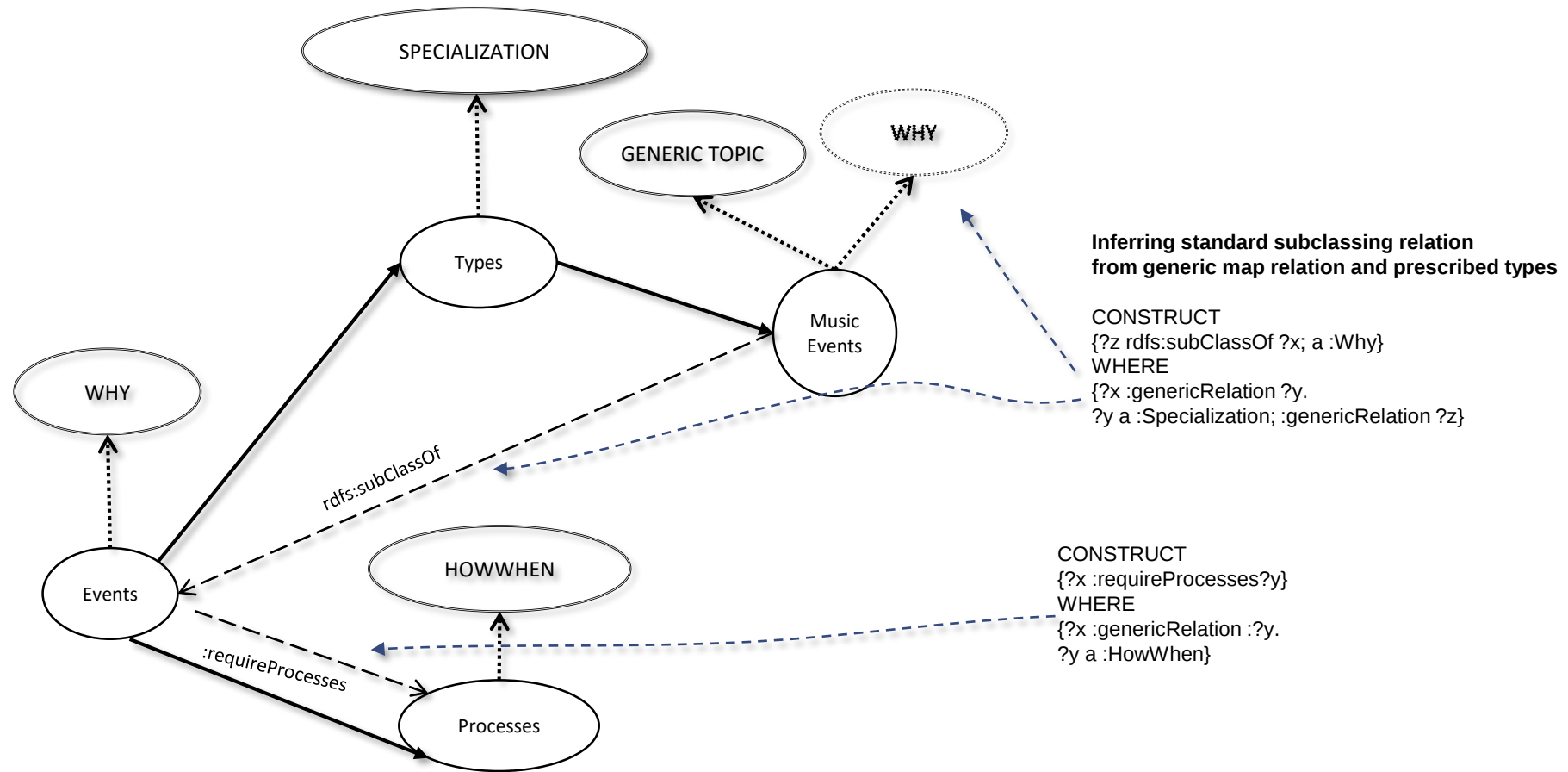
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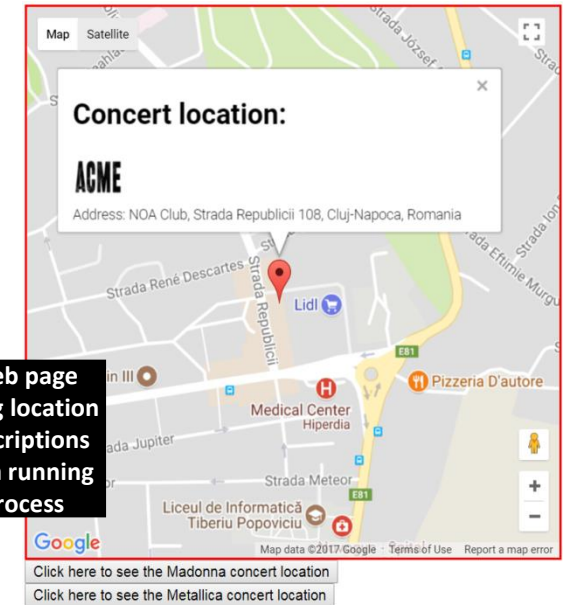
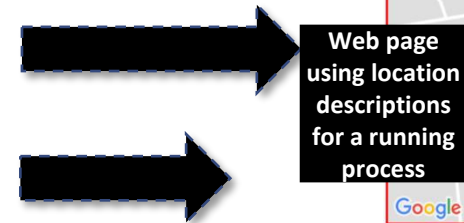
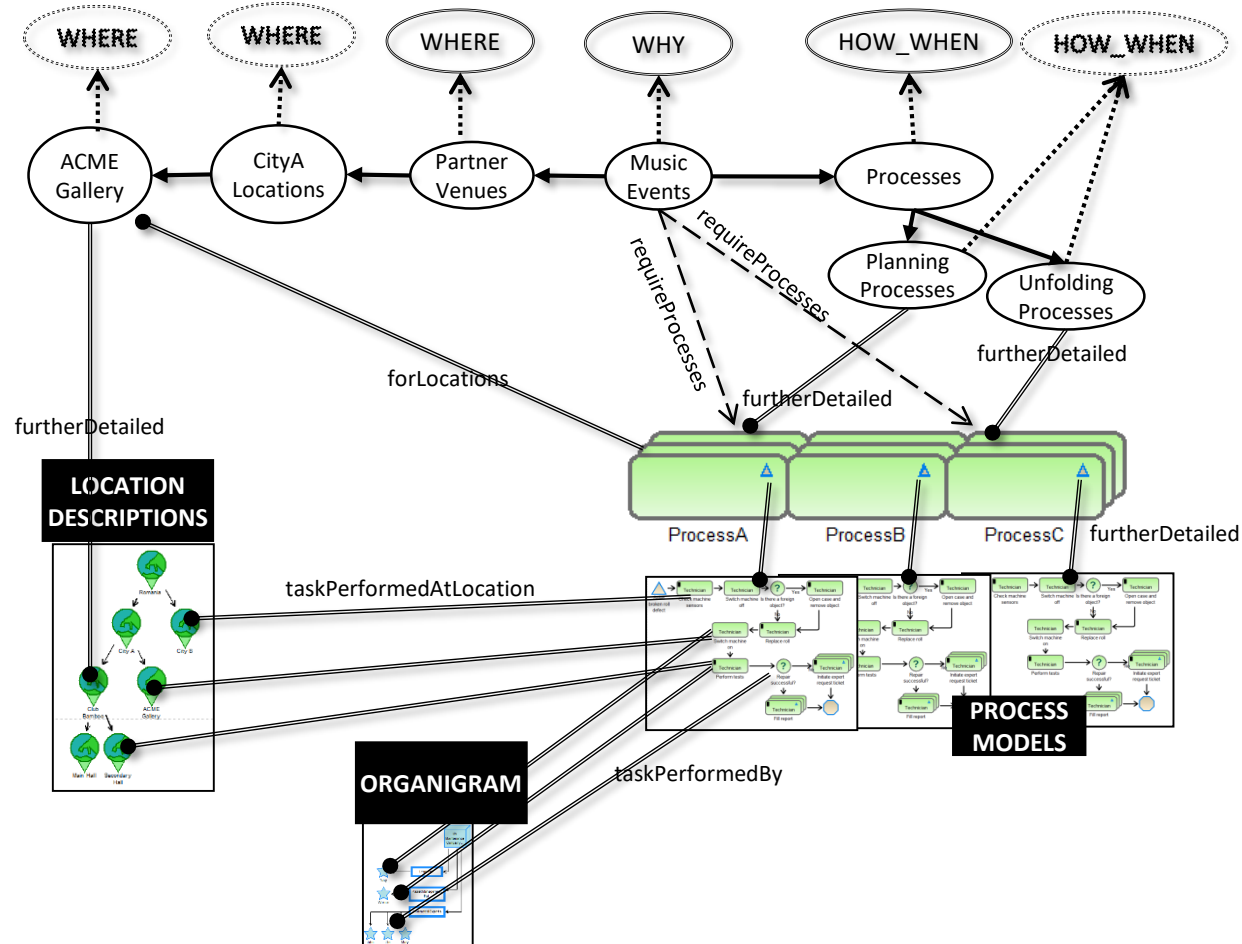
Inference Patterns



Inference Patterns



Crossing the bridge to Run-time



Retrieve all annotation properties for all locations and persons involved in all types of processes prepared for Music Events in the venues provided by ACME Gallery.

```

SELECT ?b ?prop ?val
WHERE
{
  :MusicEvents :requireProcesses ?proc.
  ?proc :forLocations :ACMEGallery;
  ?proc :furtherDetailed ?processmodel
  GRAPH ?processmodel
  {
    ?a :taskPerformedAtLocation|:taskPerformedBy ?b.
    ?b ?prop ?val
  }
}

```

Required enablers

- **ADOxx as a platform for agile modelling language customization**
 - free at <http://adoxx.org>
- **RDF vocabulary to map concepts to diagrammatic constructs** (nodes, connectors, attributes etc.)
 - see Karagiannis&Buchmann, *Linked Open Models: Extending Linked Open Data with Conceptual Model Information* in *Information Systems* 56, p. 174-197, Elsevier, 2016
 - implemented in a model-to-RDF conversion plug-in for ADOxx
- **Graph Database with reasoning** capabilities (OWL, rules) to store and reason on models
 - free at <http://graphdb.ontotext.com>

Conclusions

- **The paper advocates a hybridisation between visualisation and knowledge representation**
 - Key enablers: AMME and RDF combined as a Mind Mapping Method
 - Key design decision: a structured conceptual core with agile open endedness and editable graphics
- **Opportunities:**
 - Semantic links can be generalised between mind maps and arbitrary types of models (beyond Zachman Framework)
 - Knowledge streamlining across the traditional gap between human-readability and machine-readability
- **Limitations:**
 - Method evaluation still partial (especially wrt productivity)

Takeaway message

The traditional gap between mind mapping and conceptual modelling stems from a perception of modelling languages as being rigid (=standardized)

=> Mind mapping becomes a relevant use case for agile modelling methods (where the balance between freedom and prescription can be fine-tuned)

Thank you!



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