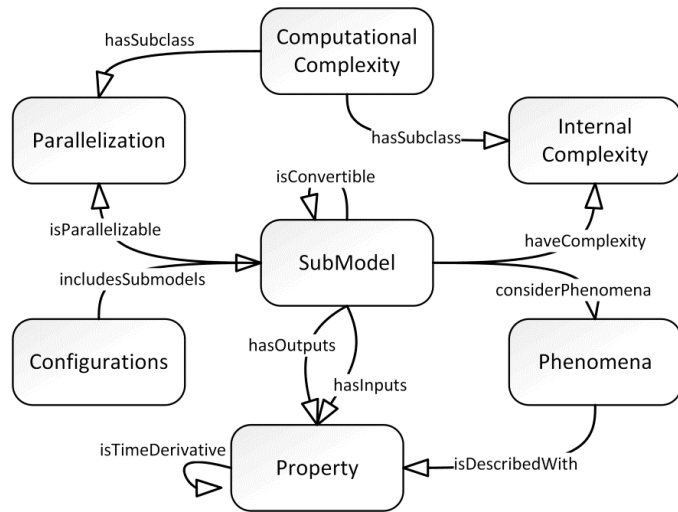
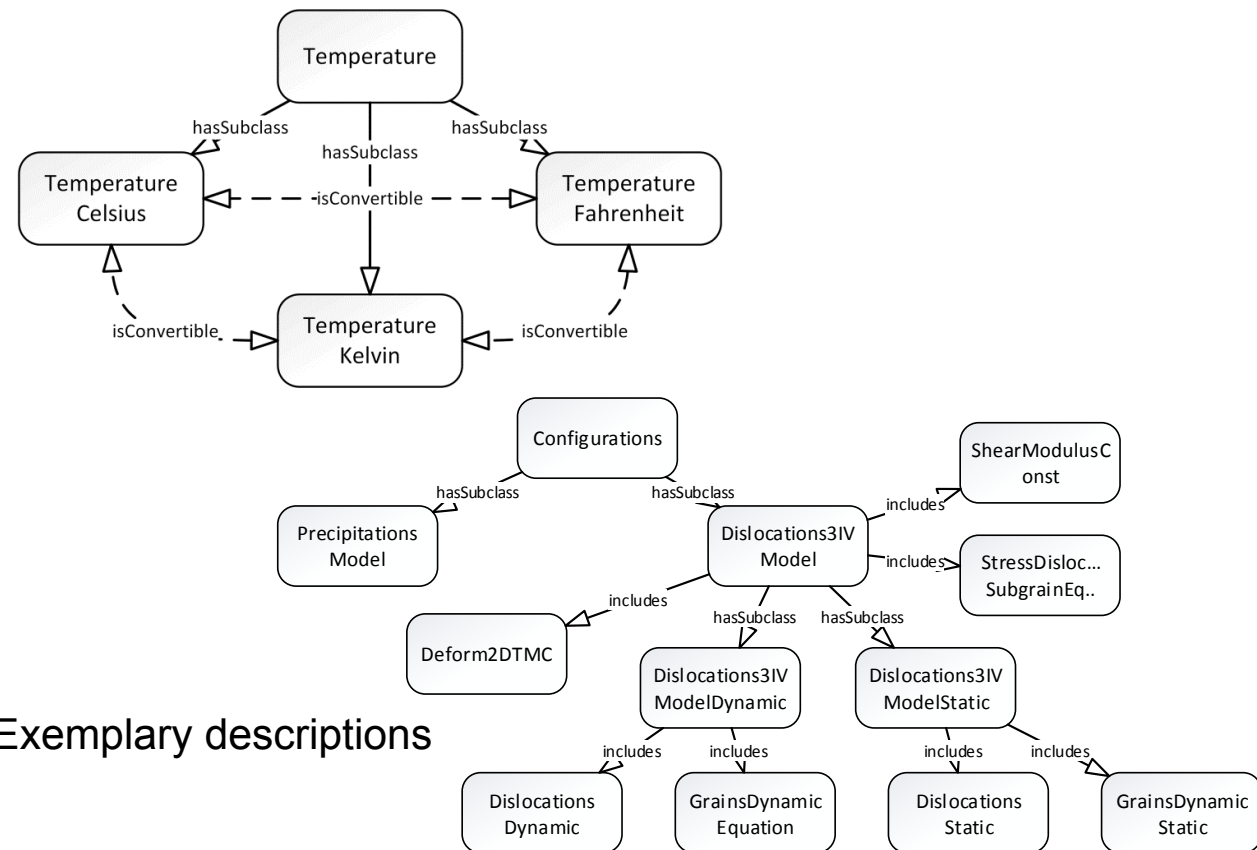


Multiscale Modelling Framework Ontology

- » Goal: common semantics for a multiscale modeling framework (Adaptive Multiscale Modelling Methodology AM3, including large number of alternative single-phenomena sub-models)
- » Solution: OWL2-based ontology, Multiscale Modelling Framework Ontology
- » Two abstraction levels (metaontology describing relationships between "abstract concepts" and ontology for particular problems)
- » May be automatically converted into rules for Knowledge-Based System (with additional translating ontology)



Metaontology



Exemplary descriptions

Knowledge comprised in foundry technical standards

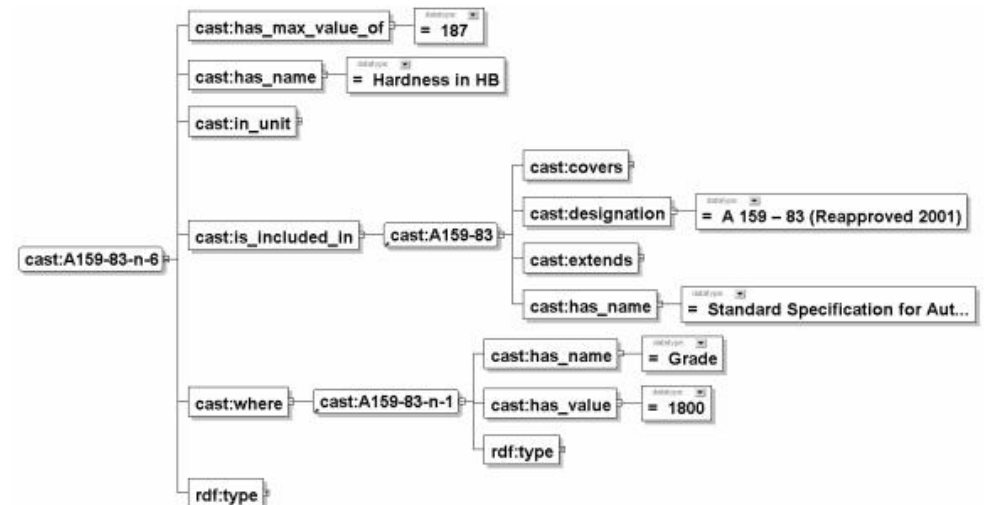
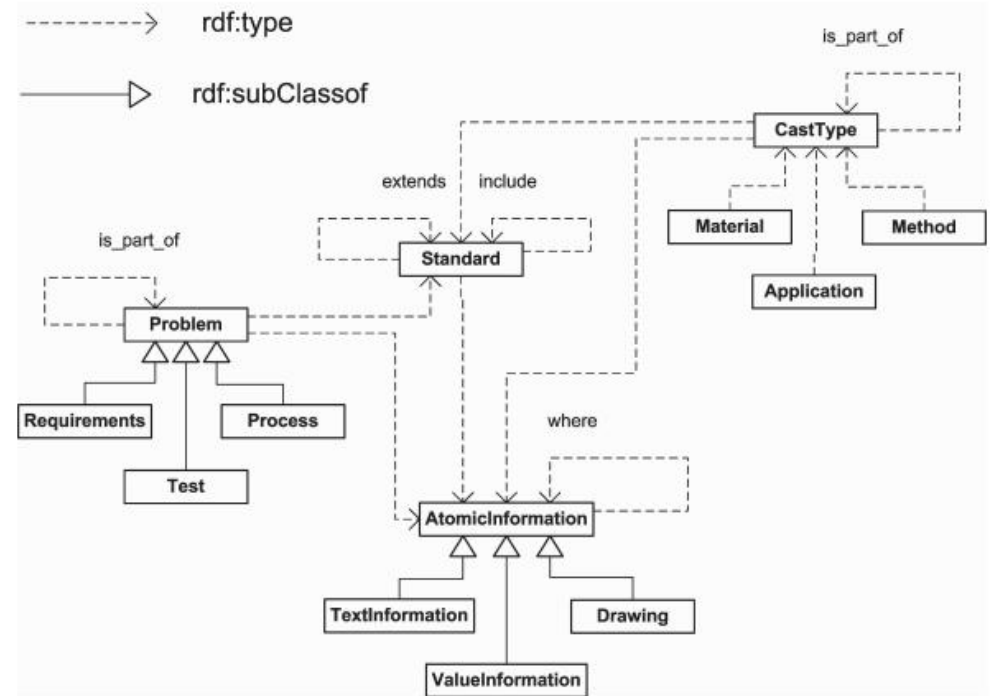
Proposed ontology reflects ASTM standards for iron castings with simultaneous comparison with European standards

Only the Volume entitled Ferrous Castings; Ferroalloys has been used – it includes 111 standards of different types

The standards can be classified into the following groups:

- » requirements imposed on castings (various types)
- » cast alloys
- » auxiliary materials, e.g. standard specification for molybdenum oxide products,
- » selected technological procedures, e.g. standard practice for steel castings, welding,
- » methods of testing the properties of castings and melts,
- » general standards, e.g. standard terminology relating to iron castings

AGH-UST research team also developed *INFOCAST* and *OntoGRator*, information-diagnostic systems based on the knowledge about surface defects in castings





AGH-UST experience

- » Knowledge-controlled multiscale model (MMFO, previous slide)
- » Ontology-based description (A-Box) conversion to rules for reasoning engine; Ontology Dedicated to Knowledge-Driven Optimization for ICME Approach, in: Proc. of the 4th World Congress on Integrated Computational Materials Engineering (ICME 2017)
- » A multi-agent approach to computational optimization of metal forming processes, Procedia Computer Science 96 (2016) 531 – 539
 - Multi-agent system combining optimization algorithm and numerical model:
 - Several autonomous “agents” exchanges knowledge of material state, technology and optimization process
 - The communication language currently hard-coded, common ontology should be applied
- » Integration of modeling-based technology optimization framework (**ManuOpti**) with multiscale modelling framework (AM3)
 - Ongoing project
 - Currently JSON files applied for communication, common ontology should be applied
- » Iron castings ontology for 1) order processing 2) description of defects 3) production planning
- » Contact:
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