A Pattern-Based Core Ontology for Product Lifecycle Management based on DUL

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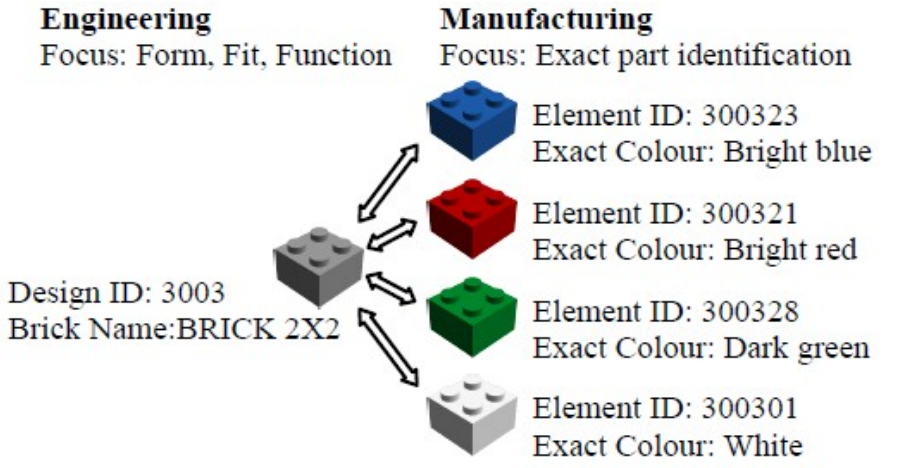
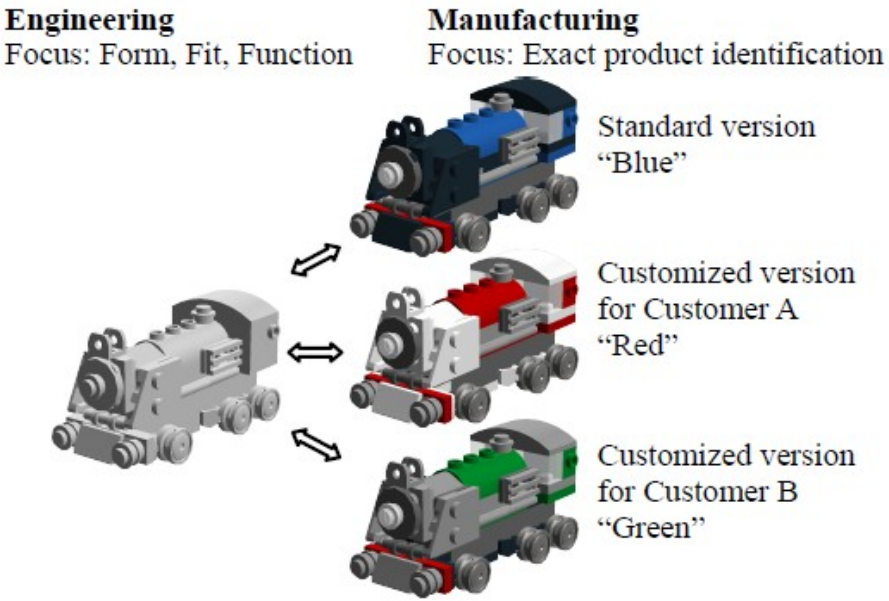
Problem Description

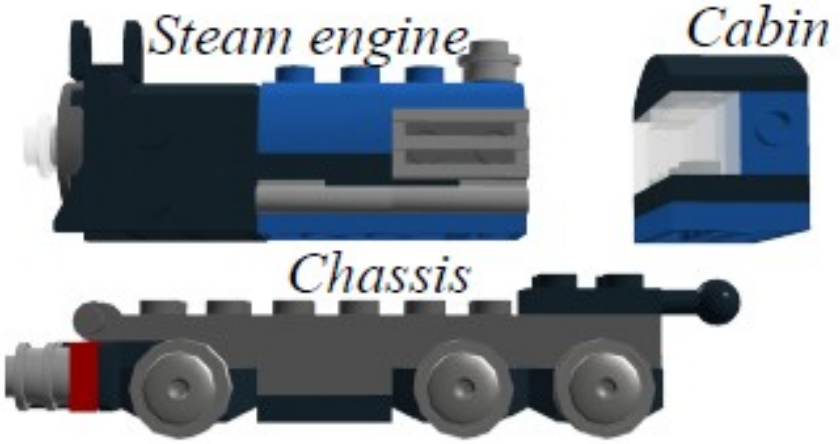


(a) Design and Element IDs of BRICK 2X2

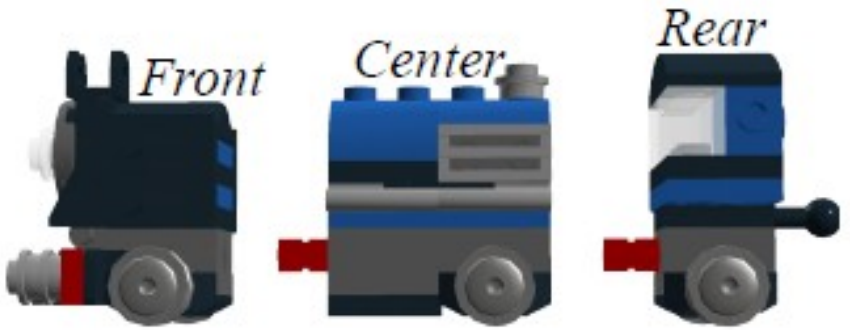


(b) Product Variants

Problem Description (2)



(a) Engineering View of LEGO Train based on Functionality



(b) Manufacturing View of LEGO Train based on Manufacturing steps

Goals and Approach

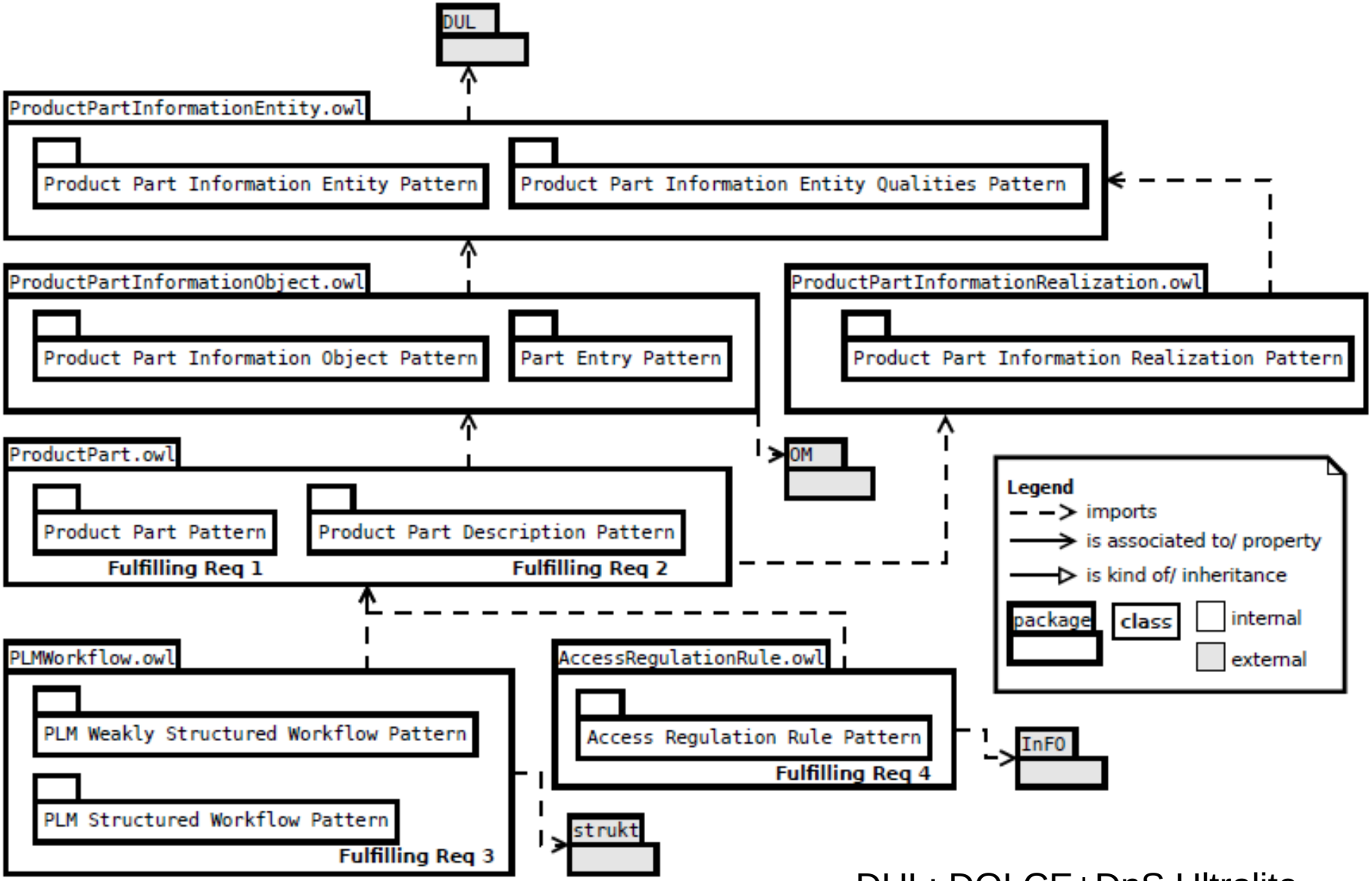
- Goals
  - Provide formal basis to express different views product (part)s
  - Integrating existing and new ontologies

- Solution Approach
  - Pattern-based Ontology Engineering
  - Based on Foundational Ontology
  - Integrated into joint semantic and software engineering process

Requirements

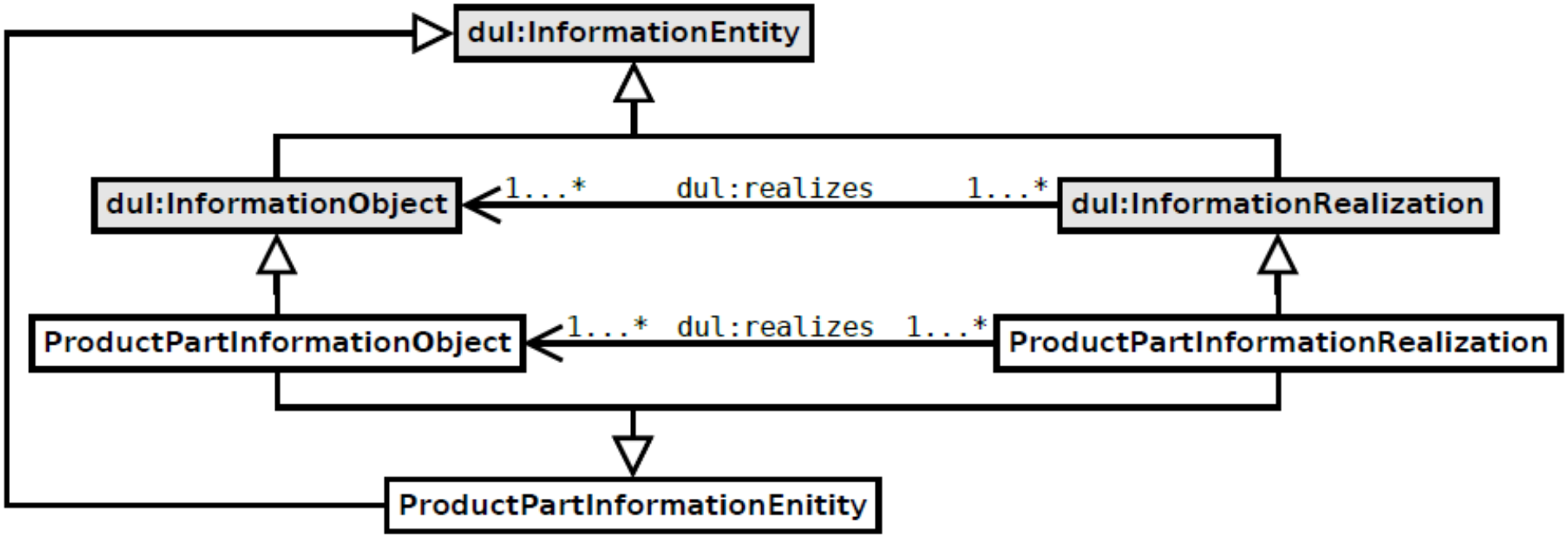
- Req 1: Differentiating between product concepts and product instance
- Req 2: Different views on parts depending on context
- Req 3: Distributed workflow models and workflow executions
- Req 4: Secure distributed group management and acces right management

Our Solution: CO-PLM

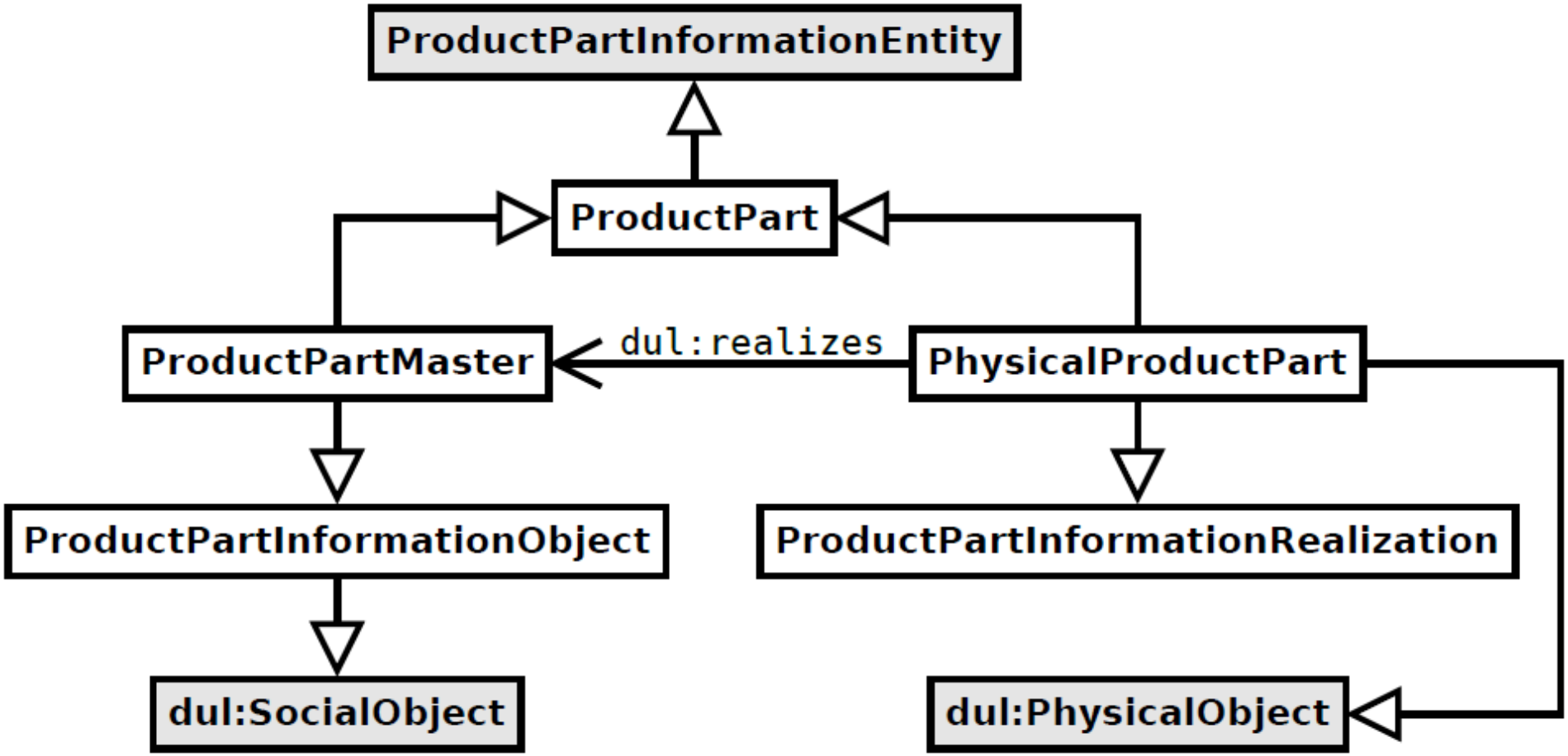


DUL: DOLCE+DnS Ultralite

Product Part Information Entity Pattern



Product Part Pattern



Product Part Pattern

Product Part Master
(Product Part
Information Object)

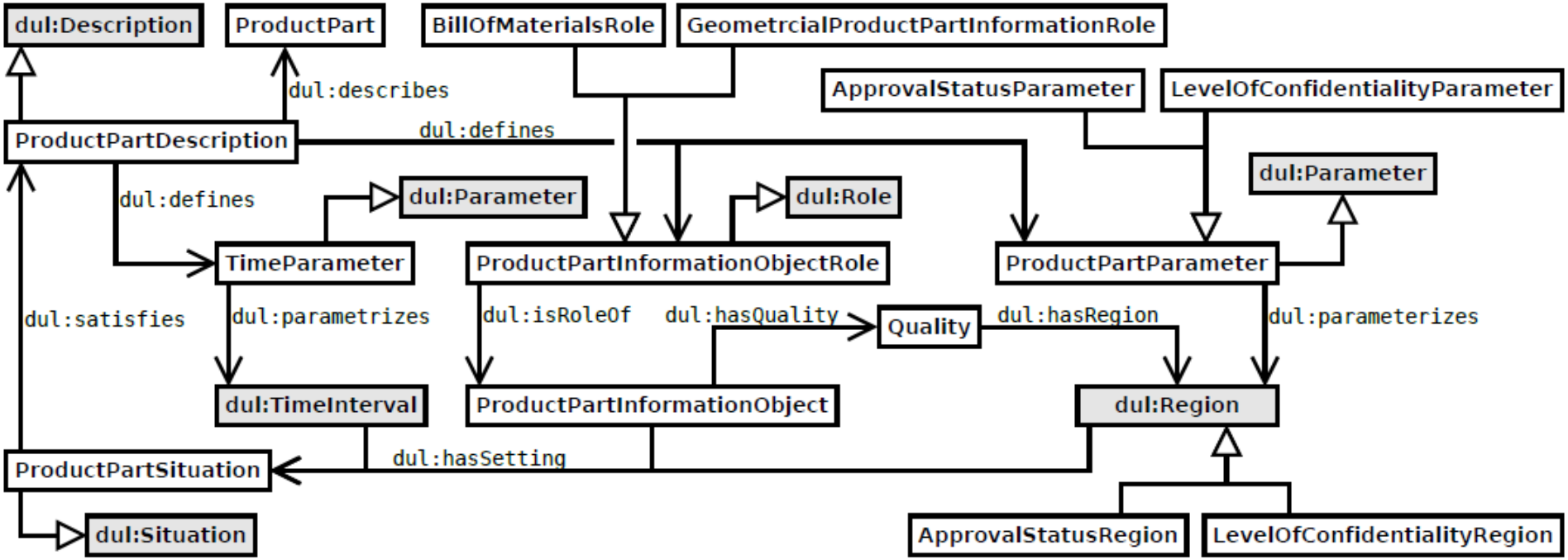
Bill Of Materials
(Product Part
Information Object)

Brick	Name	Picture	Part	Color code	Quantity
4211098	BRICK 1X1		3005	199 - Dark Stone Grey	2
306540	BRICK 1X2 WITHOUT PIN		3065	40 - Transparent	2
4211060	BRICK 2X2		3003	199 - Dark Stone Grey	1
4583862	BRICK 1X1 W. 1 KNOB		87087	23 - Bright Blue	4

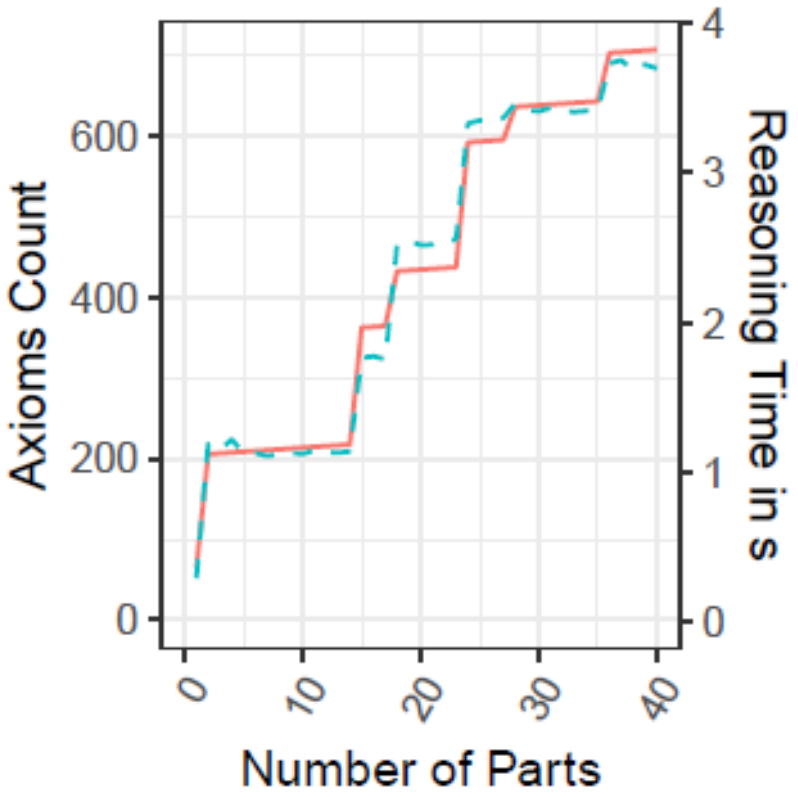
Physical Product Part
(Product Part
Information Realization)

PrintedDocument
(Product Part
Information Realization)

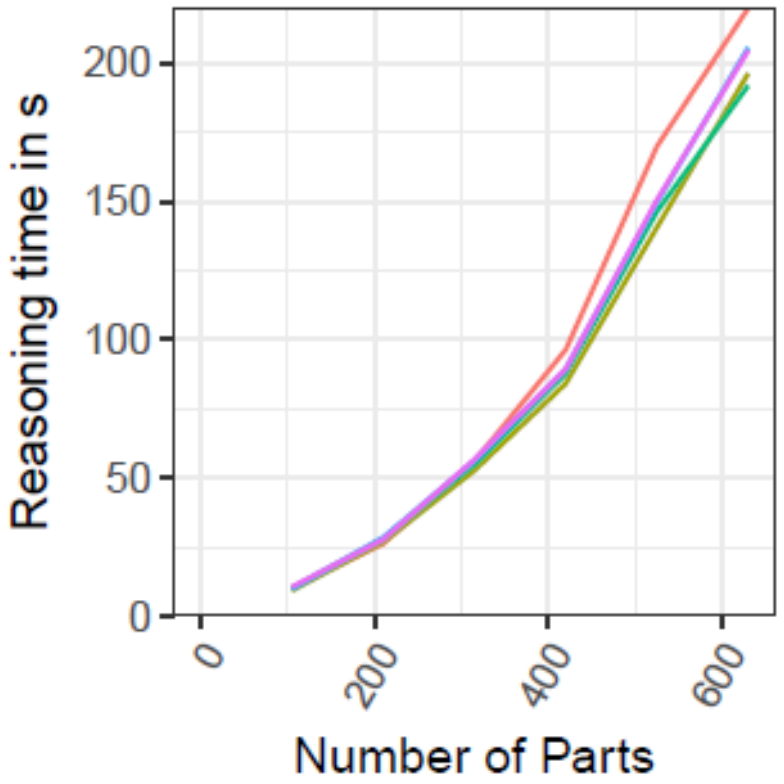
Product Part Description Pattern



Evaluation of Practical Use



(b) Reasoning and Axioms for LEGO Example

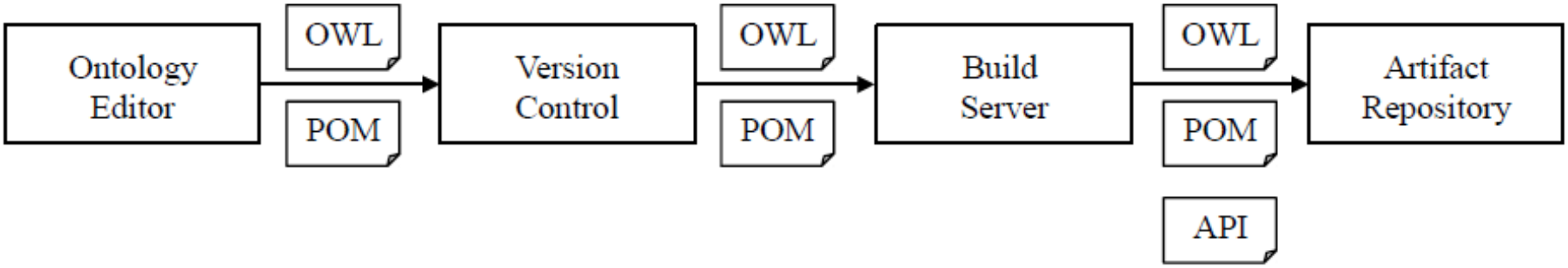


(c) Reasoning Runs for Synthetic Data

Quadratic regression:
$R^2 = 0.9973$ $p < 001$ $df = 3$

Work in Progress / Future Work

- Elaborating our Joint Software and Semantic Engineering Process (JoSSEP) in more detail



- Integrating CO-PLM and JoSSEP into a framework for decentralized protected networks
  - Integrating CO-PLM (and/ or other ontologies) into a decentralized Attribute Based Access, Flow and Usage Control infrastructure
  - Integrate decentralized semantic Group Management

Thank you for your attention!