The contribution of the Platform MaterialDigital (PMD) in building up a Materials Data Space

Application to glass design and manufacturing

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Die Plattform für die Digitalisierung von Materialien

Ein Verbundprojekt von:

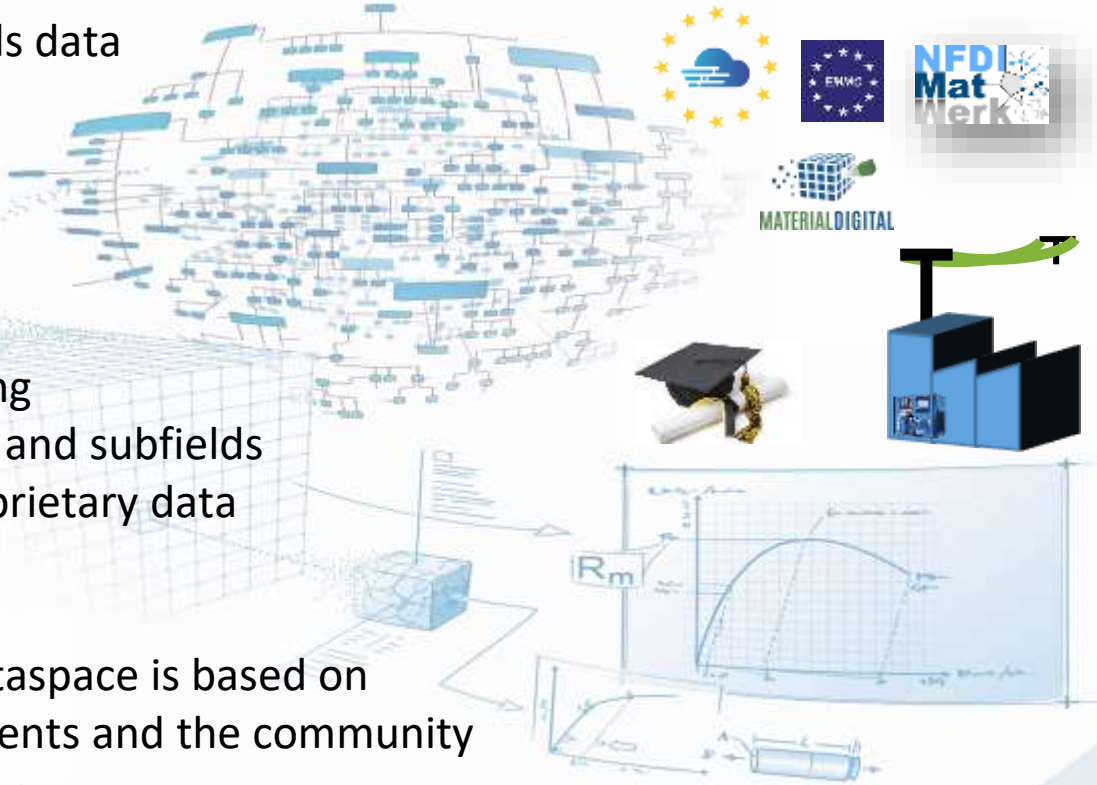
MaterialDigital – working towards a (global) materials data space

- Encompassing all available materials data

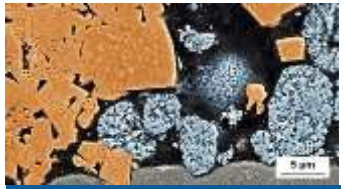
- Semantic interoperability
- Standardization and conformity
- FAIR data

- Comprehensive searching combining information from different sources and subfields
- Data analysis beyond the own/proprietary data
- Applicability of tools, scaling

- Implementation of the material dataspace is based on standardized architectural components and the community



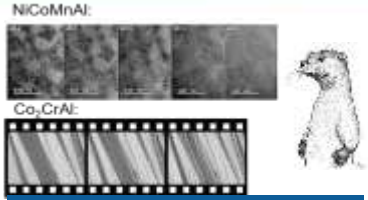
MaterialDigital – Phase 1



DigitBatMat

z.B. Gummidichtungen

DIGITRUBBER



DiProMag

DiStAl

GlasDigital

iBain

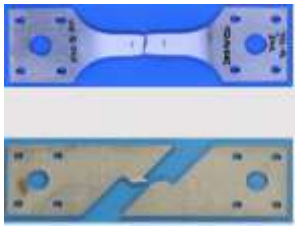
MATERIALDIGITAL

SensoTwin

KNOW-NOW

ODE_AM

SmaDi

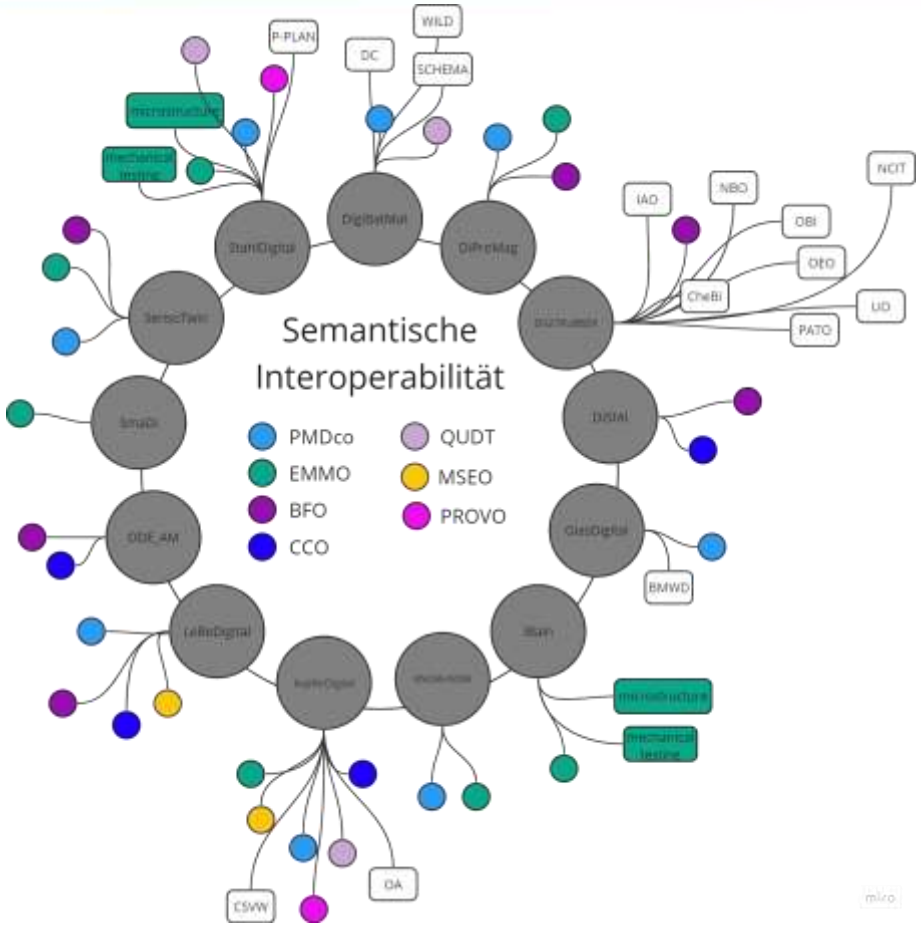


StahlDigital

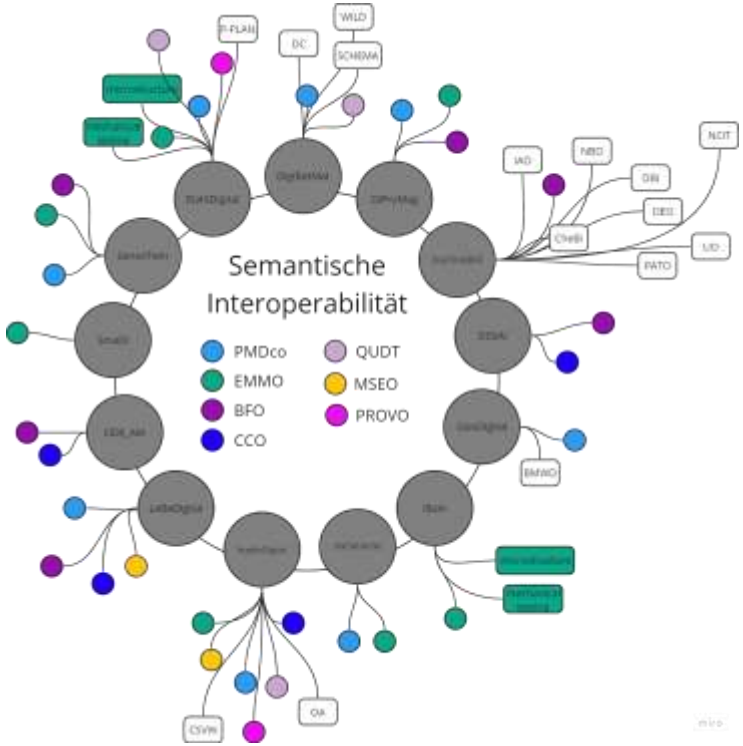
LeBeDigital

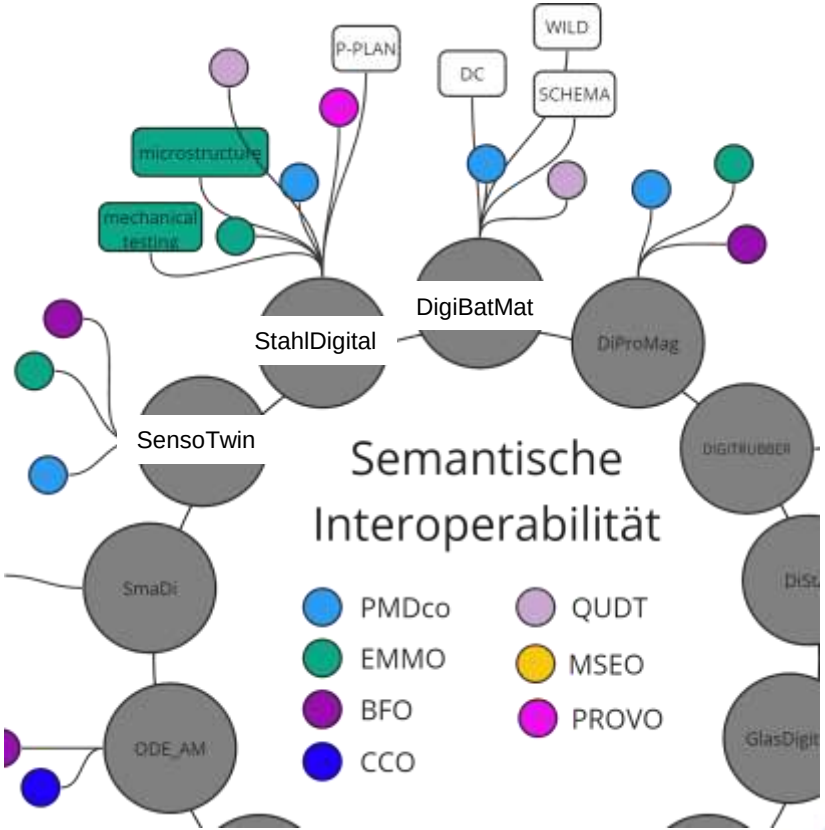
KupferDigital

MaterialDigital – Phase 1 – Interoperability

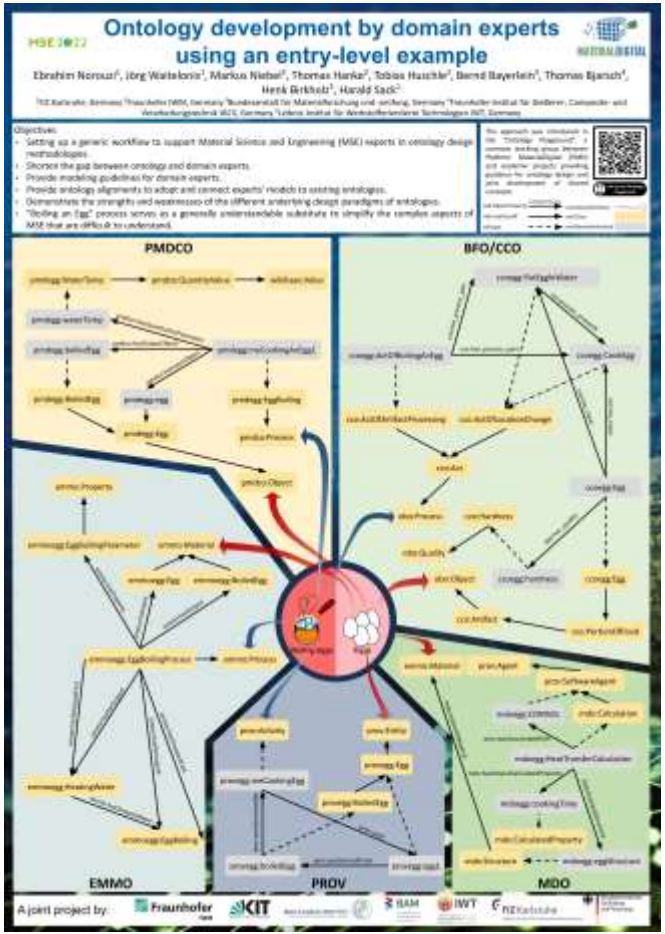


MaterialDigital – Phase 1 – Interoperability





PMD Core Ontology – PMDco

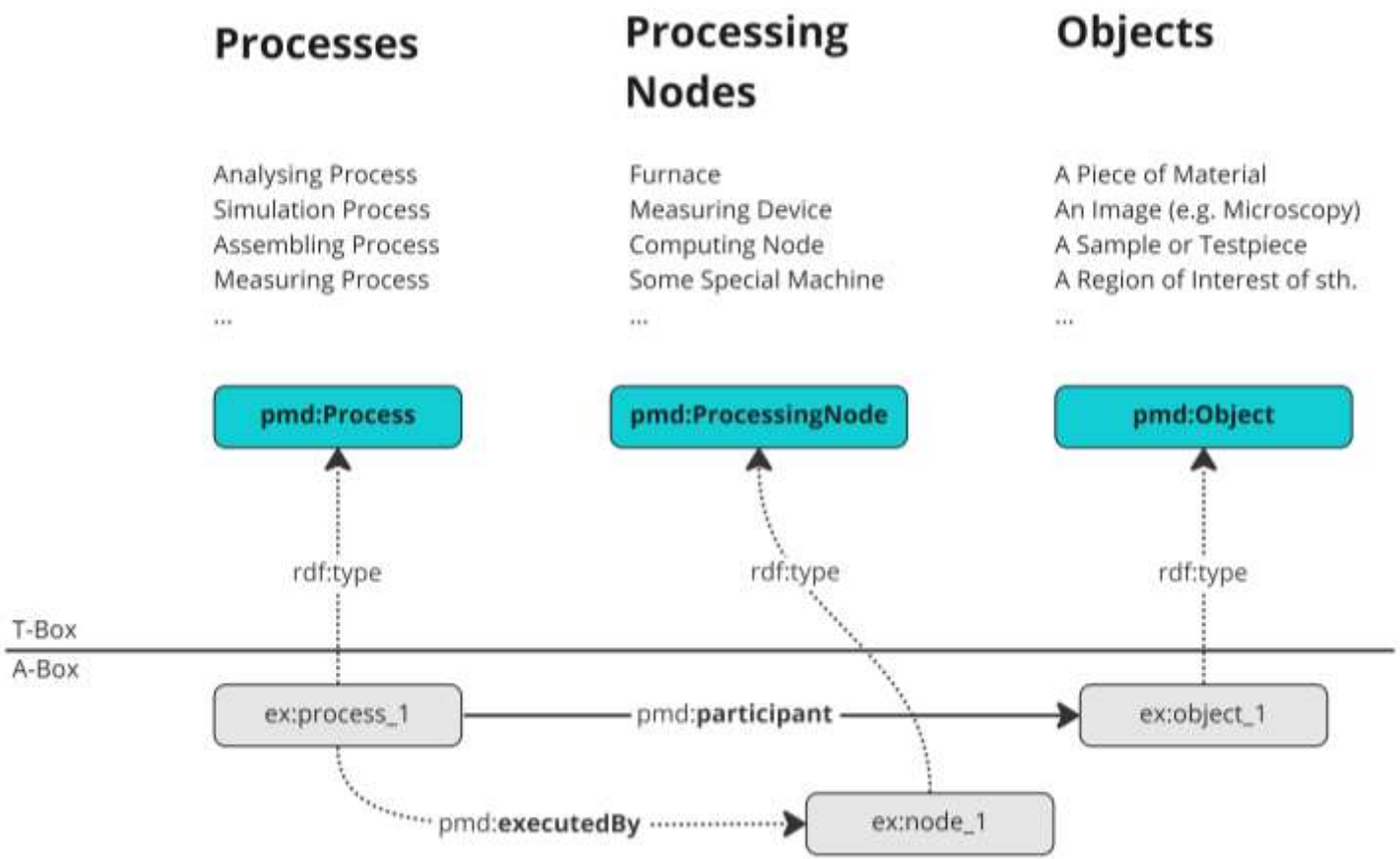


PMDco

- Semantic umbrella for MSE
- Mapping to higher level ontologies

GitHub

PMD Core Ontology – PMDco



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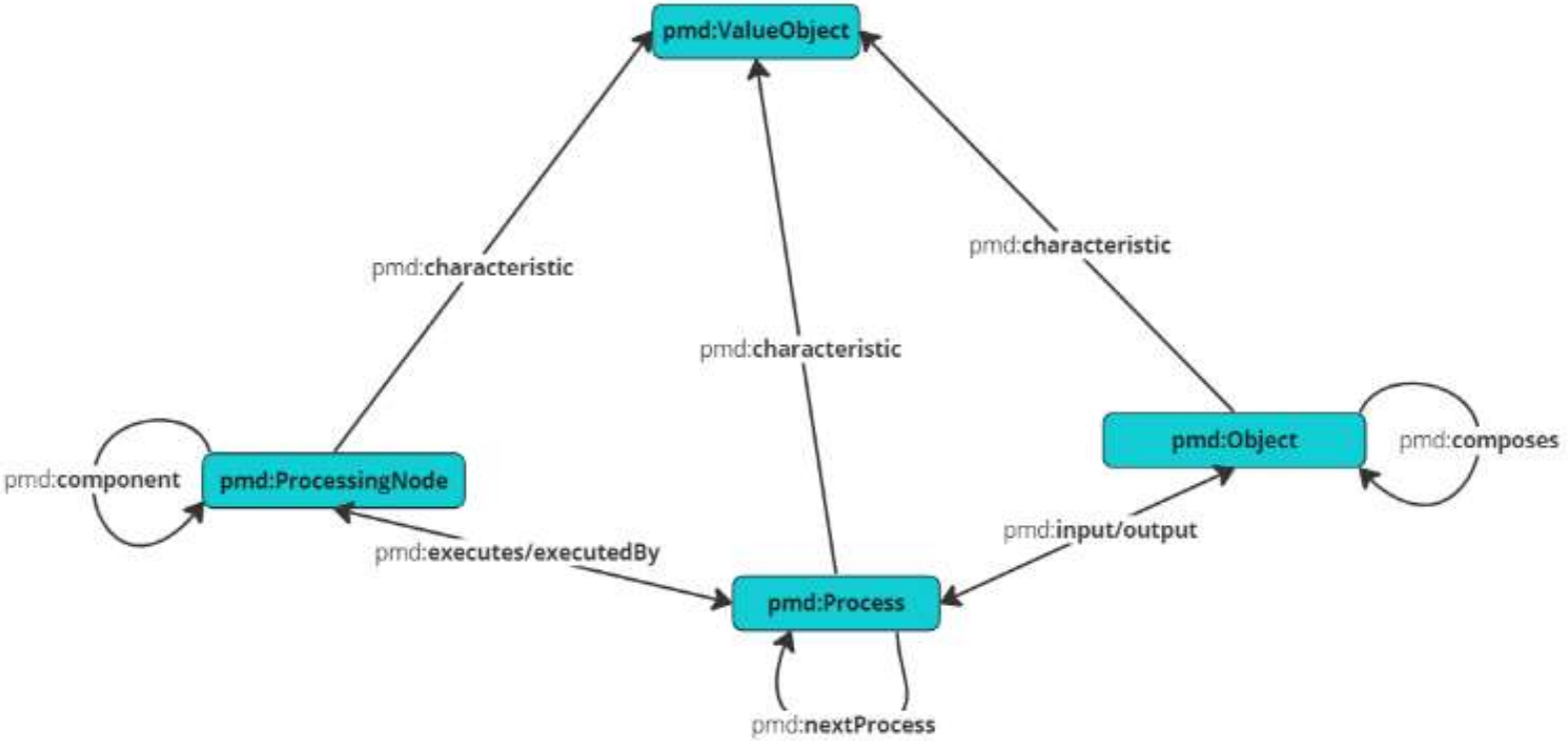

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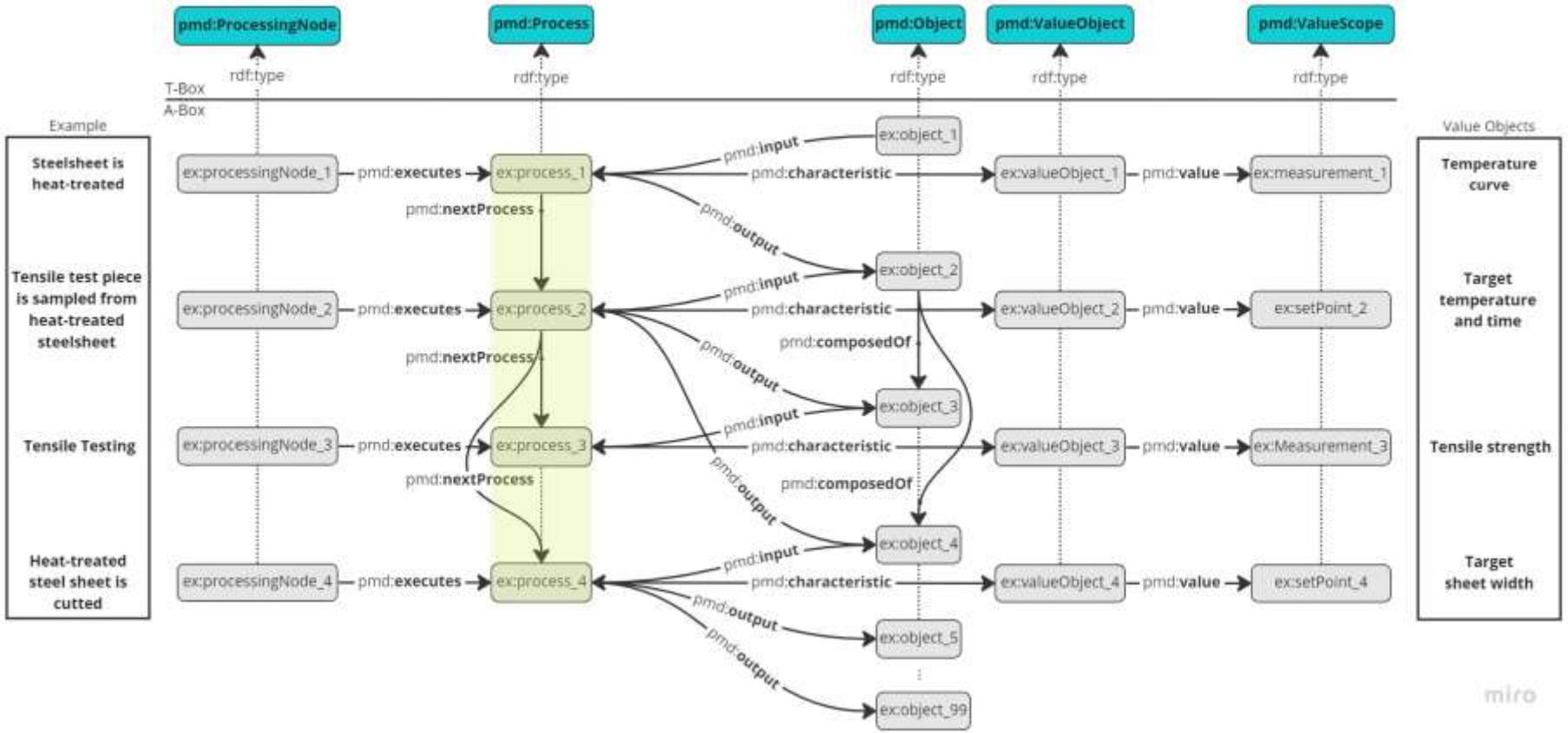


PMD Core Ontology – Publications

PMD Core Ontology: Towards Semantic Interoperability in Materials Science

Bernd Bayerlein, Markus Schilling, Henk Birkholz, Matthias Jung, Jörg Waitelonis, Lutz Mädler, Harald Sack

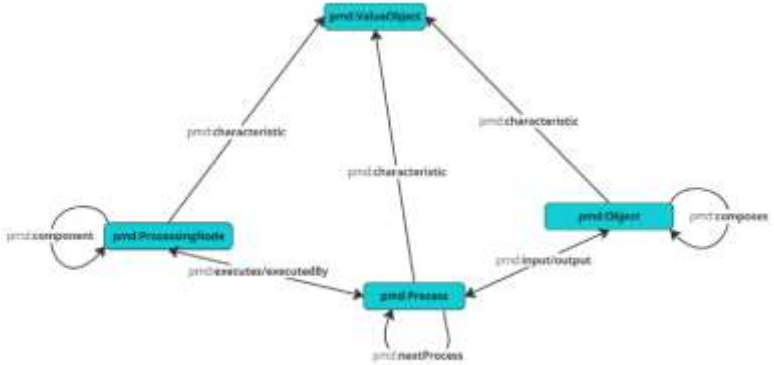
The Intersection between Semantic Web and Materials Science

Andre Valdestilhas, Bernd Bayerlein, Benjamín Moreno Torres, Ghezal Ahmad Jan Zia, Thilo Muth

Accepted for publication in Advanced Intelligent Systems

PMDco

https://github.com/materialdigital/core-ontology



Tensile Test – ISO Standard

INTERNATIONAL STANDARD

ISO 6892-1

Third edition
2019-11

Metallic materials — Tensile testing —

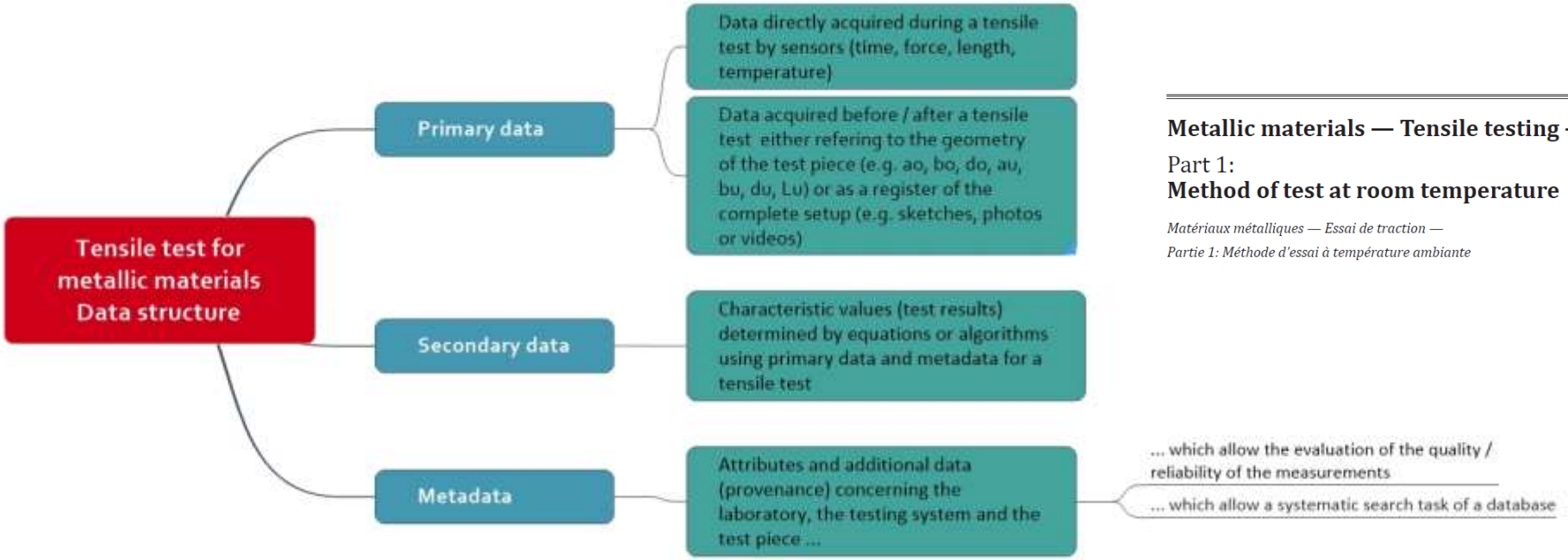
Part 1:
Method of test at room temperature

Matériaux métalliques — Essai de traction —

Partie 1: Méthode d'essai à température ambiante

Tensile Test – Data structure

DIN NA 062-01-42 AA “Zug- und Duktilitätsprüfung für Metalle“



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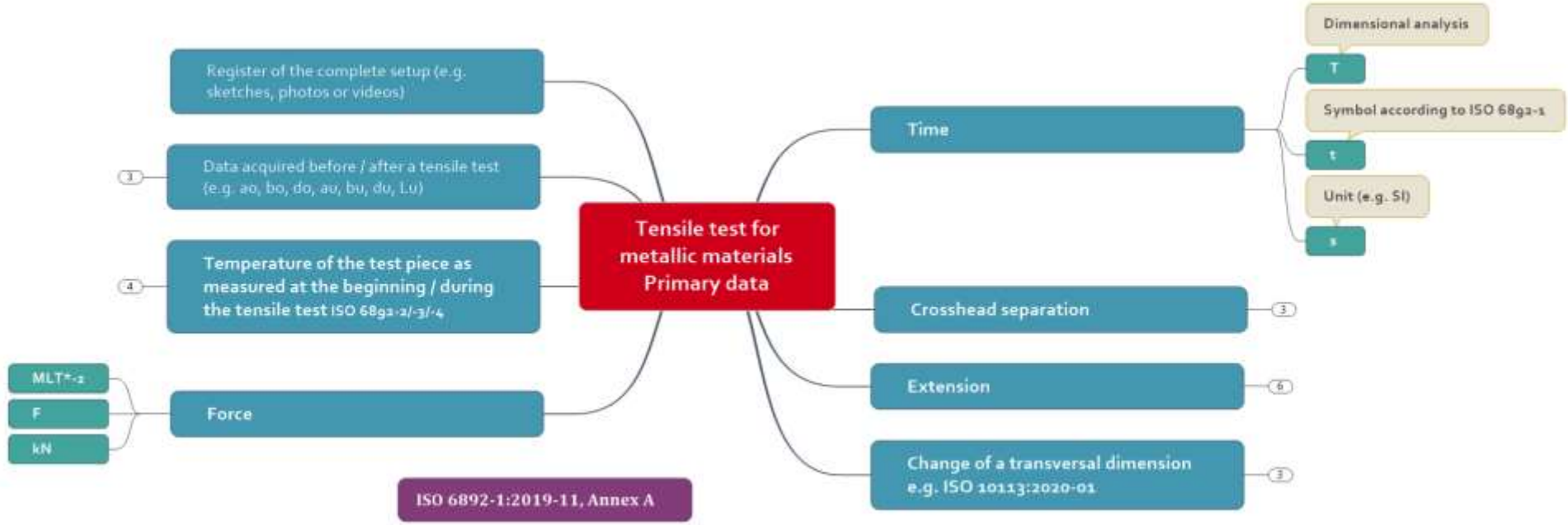
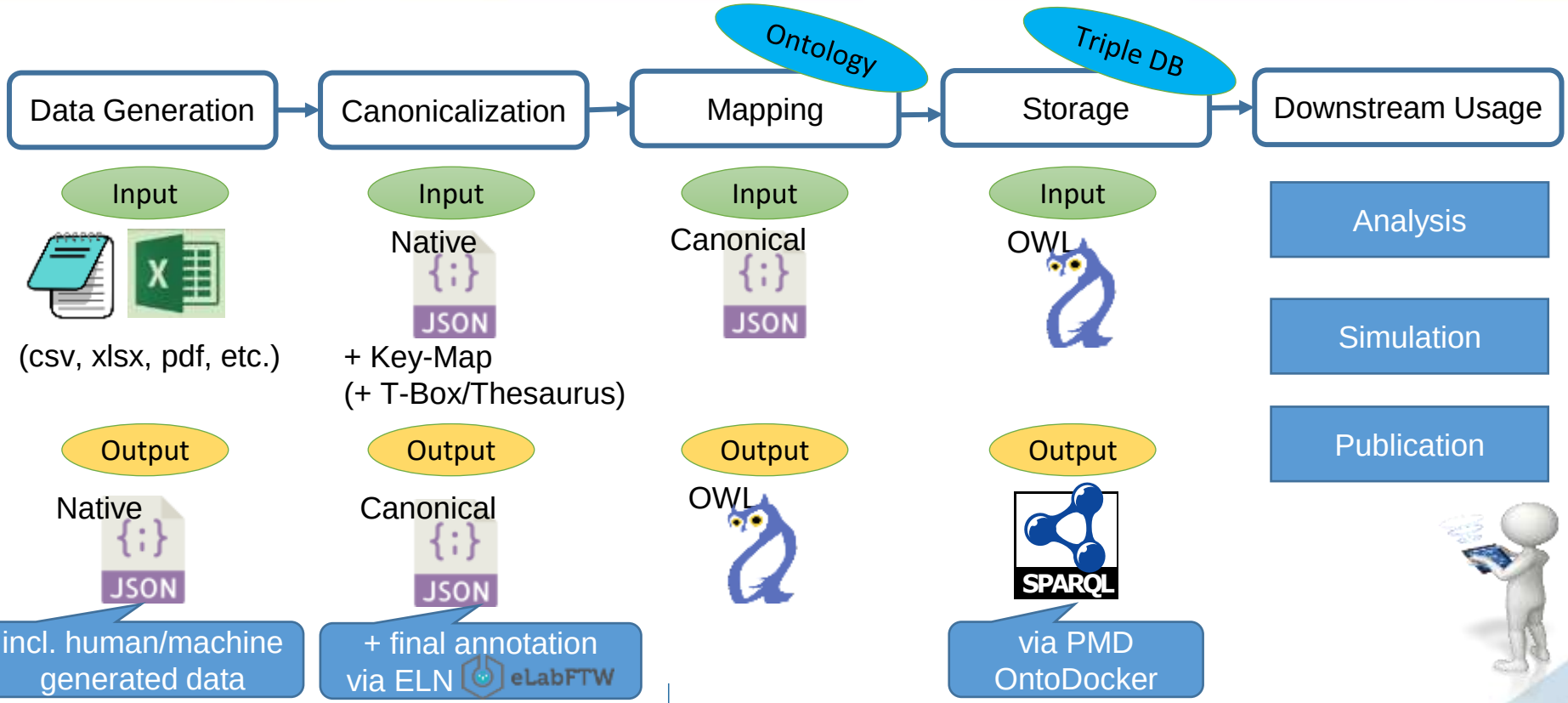
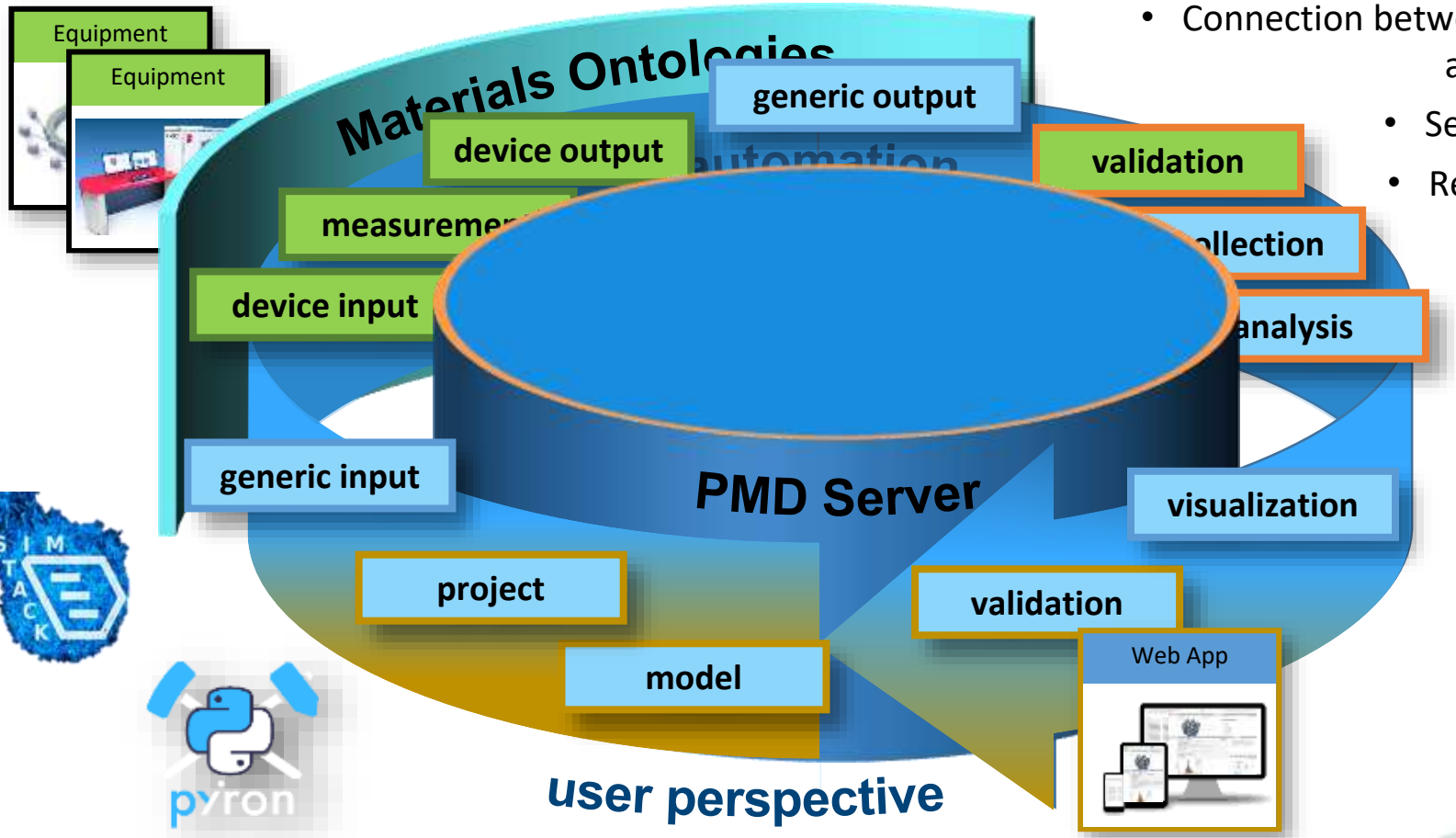


PMD – Data Pipeline | Ontologie

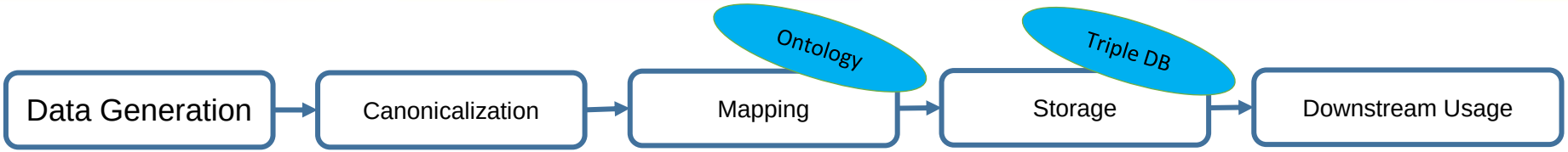


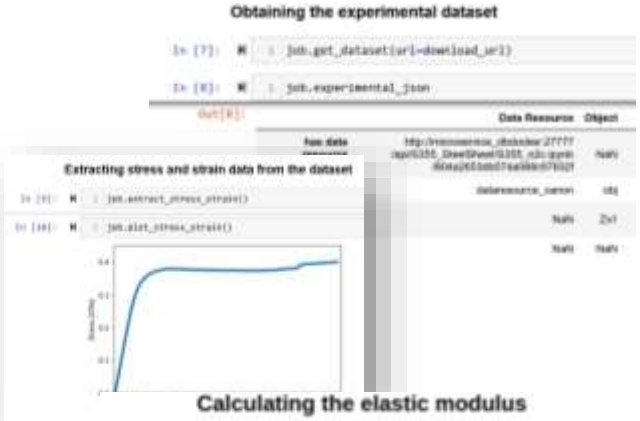
PMD – Workflow

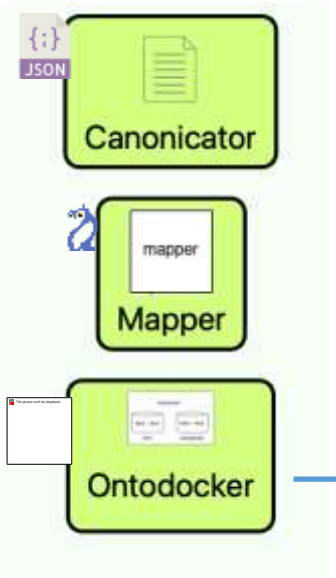


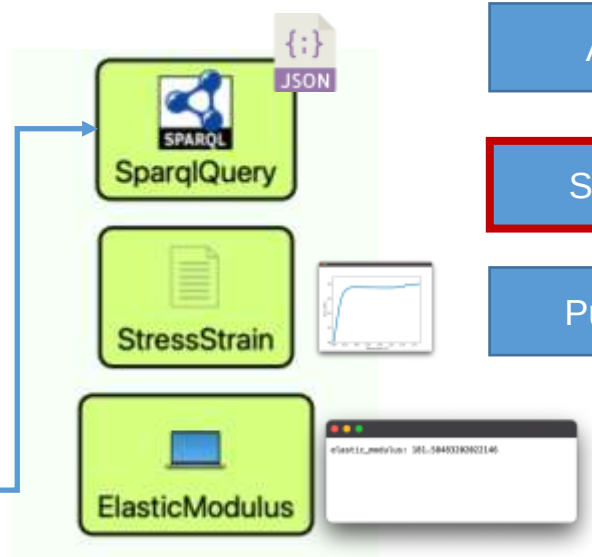
- Connection between Ontology and Workflow
- Server network
- Reproducibility
- Flexibility

PMD – Demonstrator







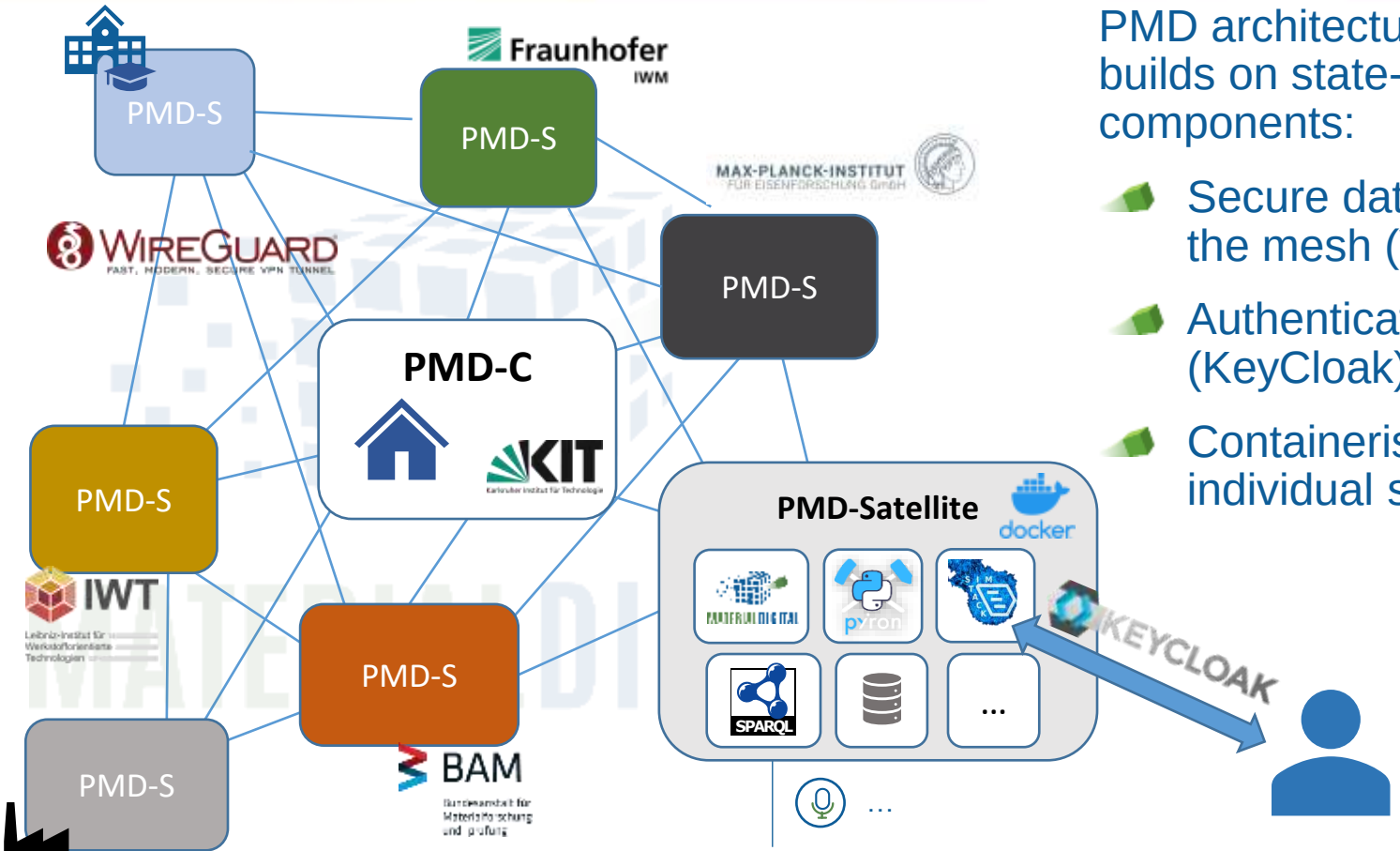


Analysis

Simulation

Publication

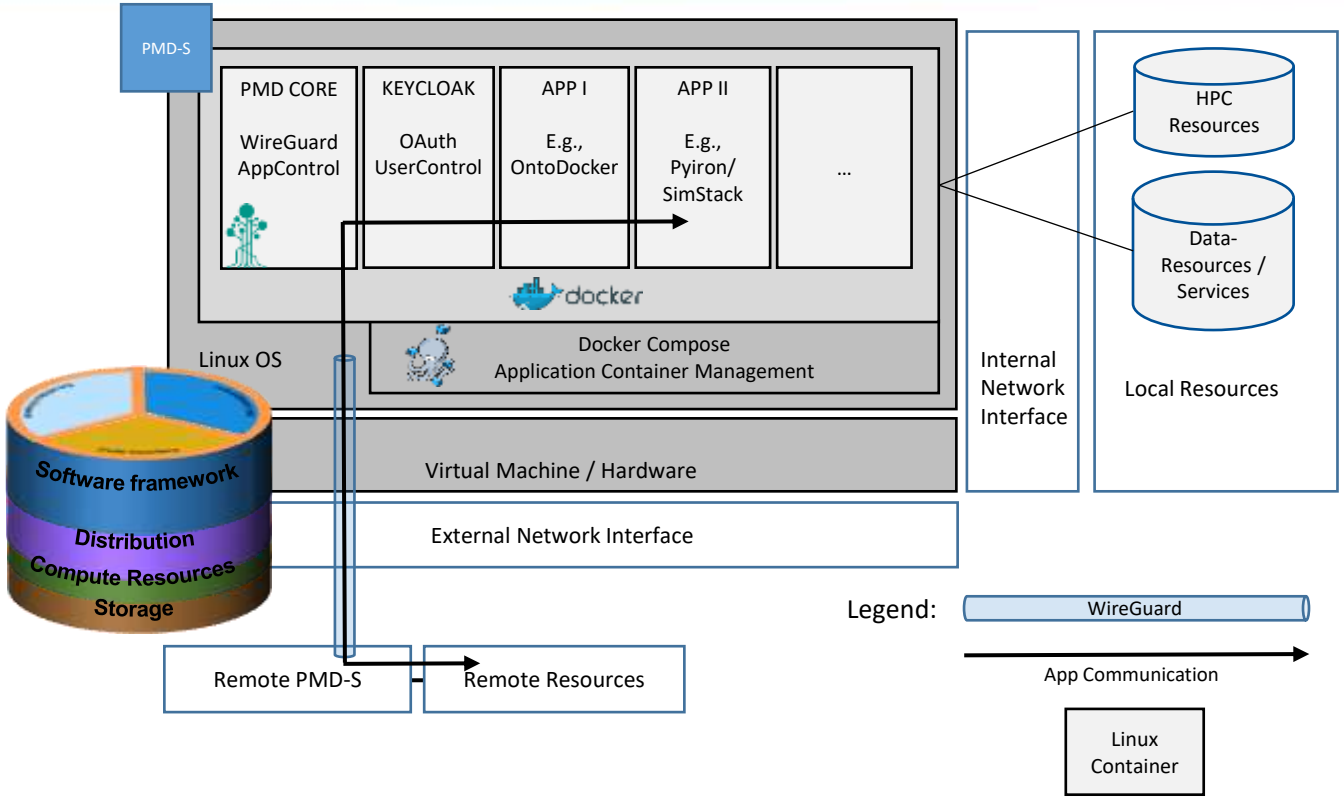
PMD-S – Network Prototype



PMD architecture prototype builds on state-of-the-art components:

- Secure data transfer within the mesh (WireGuard)
- Authentication/Authorisation (KeyCloak)
- Containerisation of individual services (Docker)

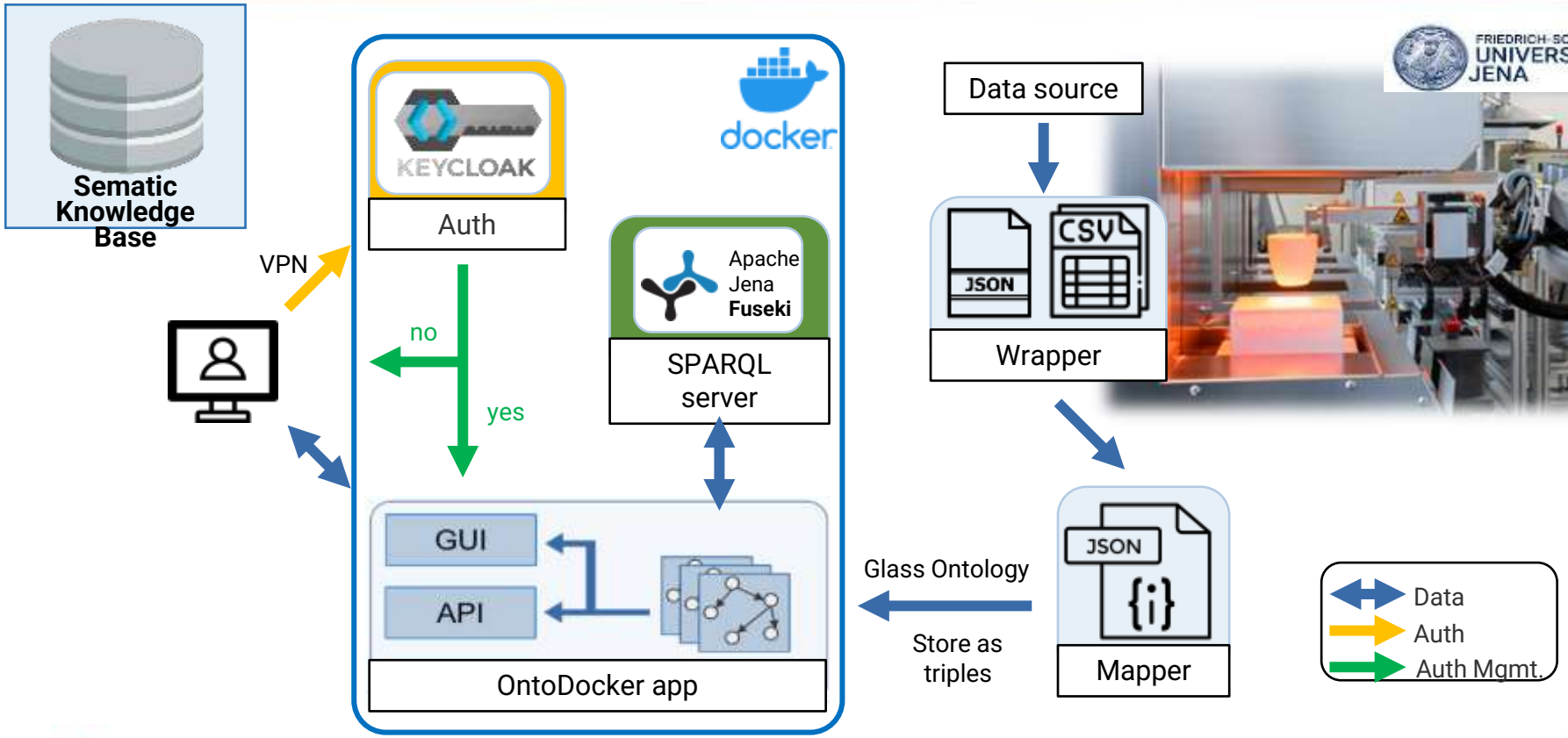
PMD-S – Network Prototype



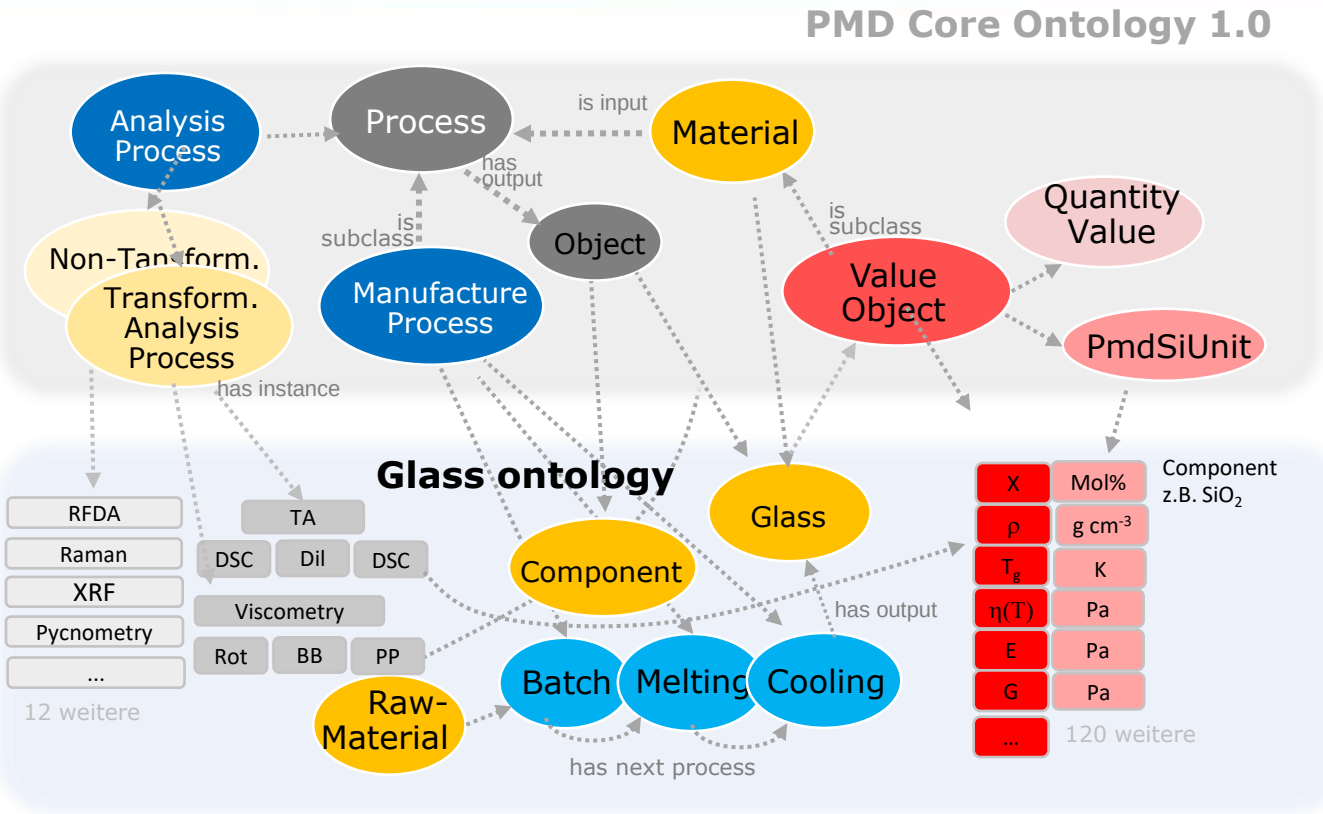
- All PMD-S Server have the same structure
  - Connectivity
  - Security
  - Flexibility

GlasDigital – Glass Melting Device

GlasDigital – Ontology-Based Digital Infrastructure

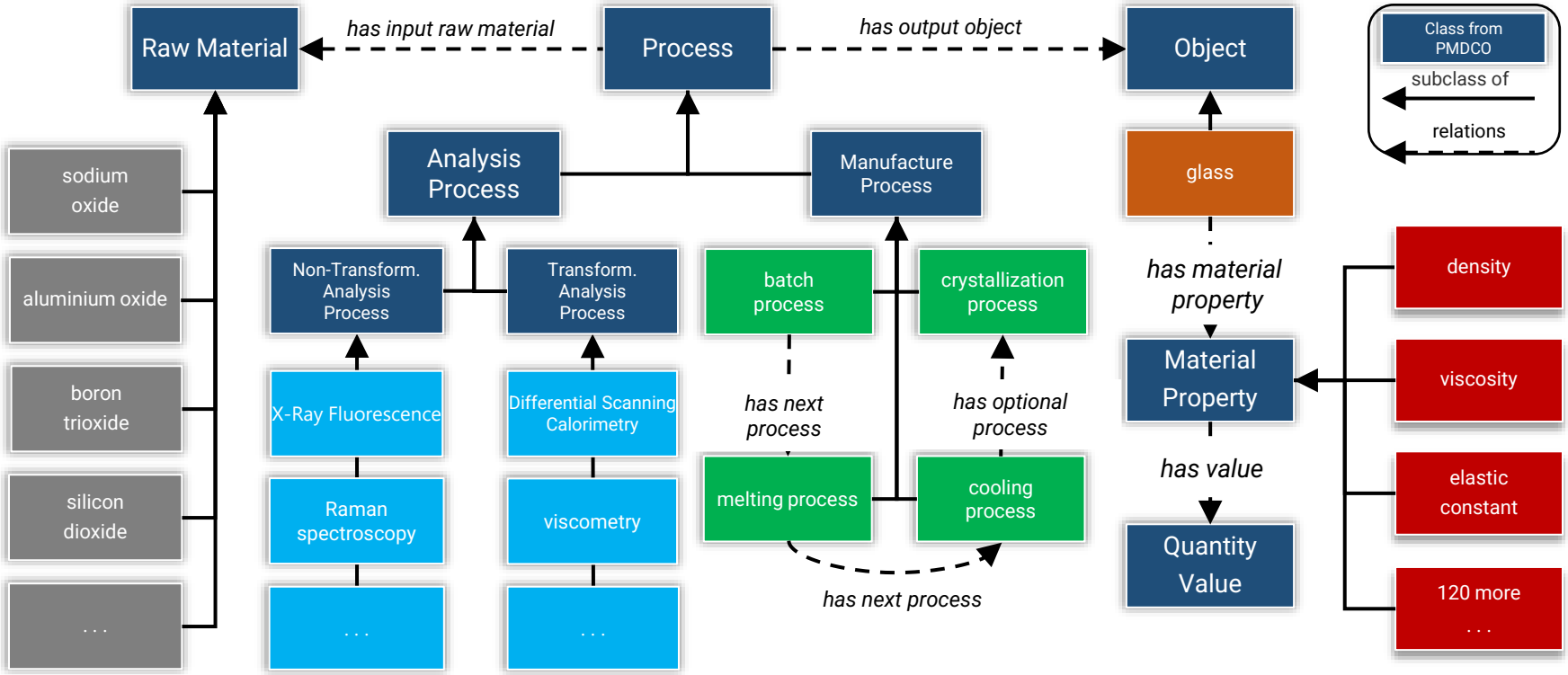


GlasDigital – Glass Data Space



- Data
- Units
- Connectors
- Workflow (Python)

Glass Ontology Based on PMD Core Ontology (PMDco 1.0)



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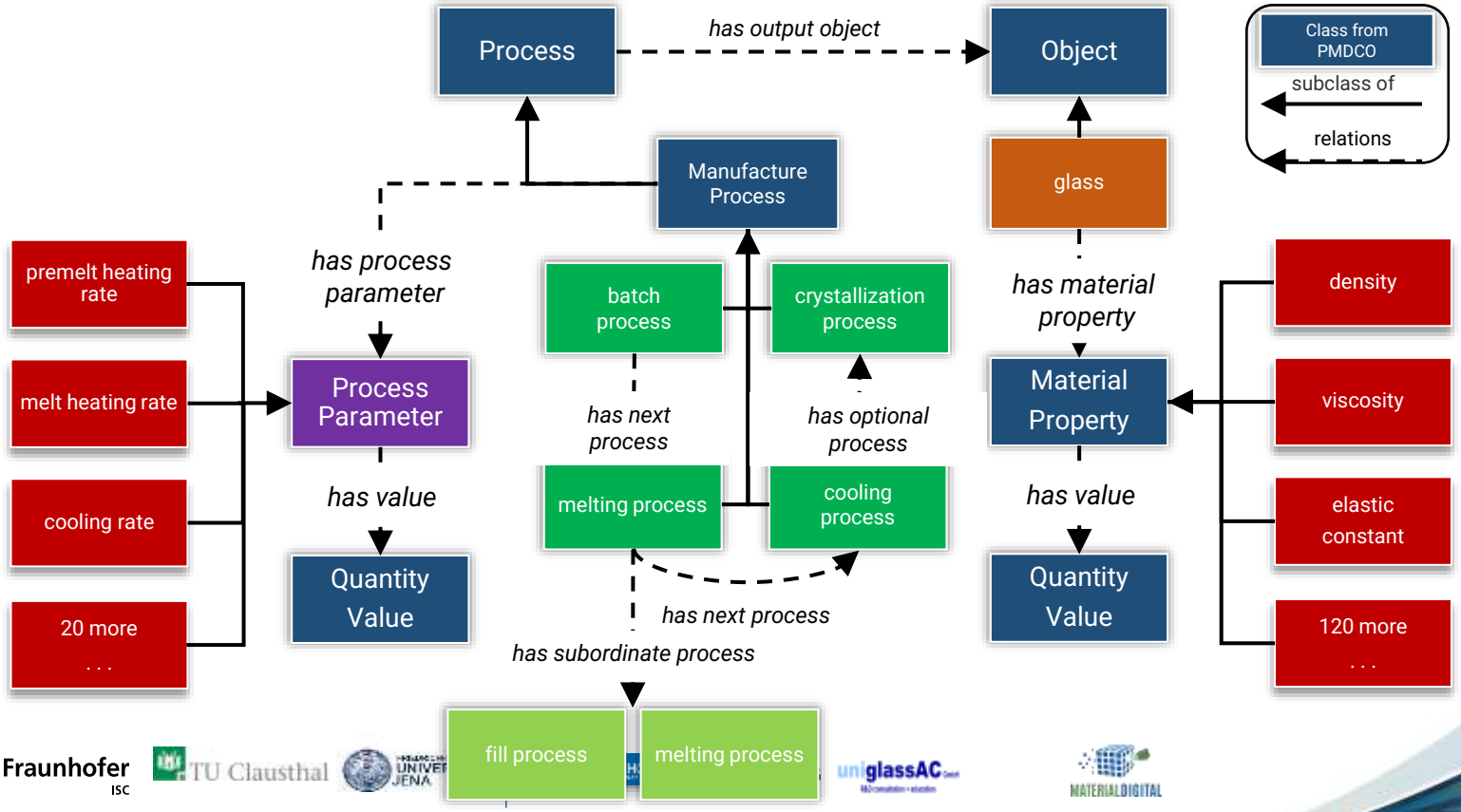

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