Ontology-driven semantic interoperability in practice

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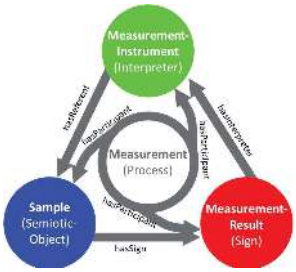
Background story

Ontology development EMMO + domain specific

Need to exchange and re-use data

- Increasing requirements on FAIR data.
- Promotion of material and model marketplace.
- Going beyond syntactic interoperability due to multiple actors (poor scalability)
- Semantic interoperability as a key enabler

→ Definition of a common language: EMMO and domain ontologies
→ Tools are needed to exploit ontologies
What are the tools that can be used? How would it look like on a simple case like tensile strength measurement?



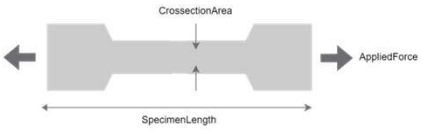
Key concepts

Data content description	Structure of the data, units, meaning of the variables
Data context description	Model, equipment used, material, sample, conditions
Semantic data mapping	Connecting the definition to ontological concepts
Data parsing	Extracting and structuring the data from the source
Semantic pathfinder	Transformation path between two (or more) relatable concepts

Technologies

DLite	Semantic Interoperability Framework
Ontologies	Knowledge Base, data-models and common vocabularies
OTEAPI	Data Documentation and Data Flow
Tripper	Generic interface to triple stores
Databases	Resource Management (security, access and integrity)

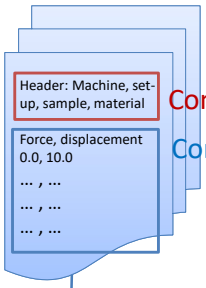
Practical application – tensile test



The data generator provides …

Data is semantically described …

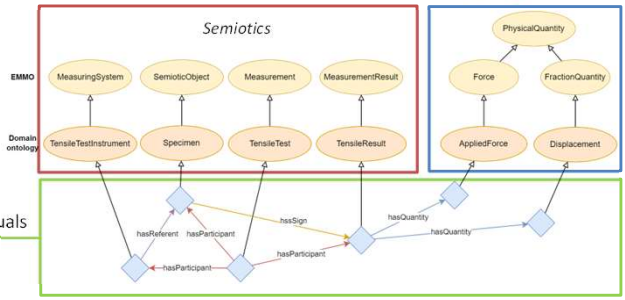
Data model and strategy …



Context

Content

Individuals



TensileMeasurement 1
Dimensions:
- nmeasurements

Properties:
- Force (N)
- Displacement (mm)

DLite OTEAPI

Parse strategy

Data are stored in database …

Access → Parse → Mapping

Semantic path finder

Database of semantically described functions

Route finding with Tripper.mappings

$\sigma = \frac{F}{A_0}$

$\varepsilon = \frac{L - L_0}{L_0} = \frac{\Delta L}{L_0}$

L_0 *from context*

Partial OTEAPI pipeline
Documenting the raw data

Object store Triple store

The user finds the data …

Mapping → Serialise → Deposit

Partial OTEAPI pipeline
Documenting how we want the data

Another user gets the data in his own format…

TensileMeasurement 2
Dimensions:
- nmeasurements

Properties:
- Strain (-)
- Stress (MPa)

SINTEF ONTOTRANS PhysMet