Metadata4Ing

Ansatz zur Modellierung interoperabler Metadaten für die Ingenieurwissenschaften

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Subject-Specific Metadata for Engineering

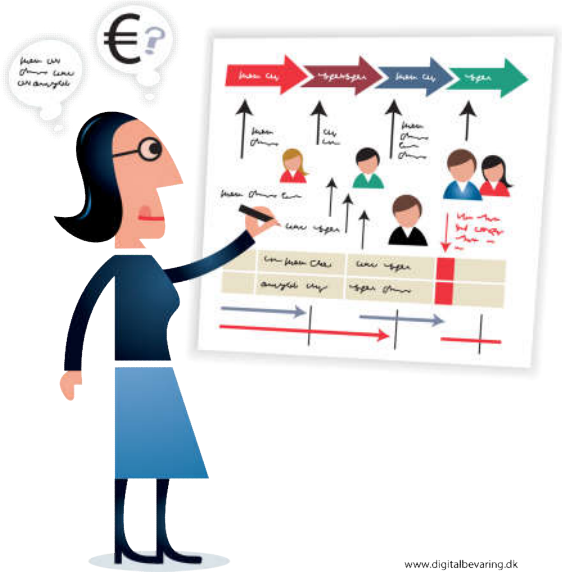
Starting point

- very heterogeneous subjects, methods, tools already within NFDI4Ing
- high variability of setups
- no subject-specific standards available

Subject-Specific Metadata for Engineering

Goals / requirements

1. General
   - Standardization
   - Machine-actionability
2. Local perspective
   - Flexibility
   - Specificity
   - Ease of use + benefits



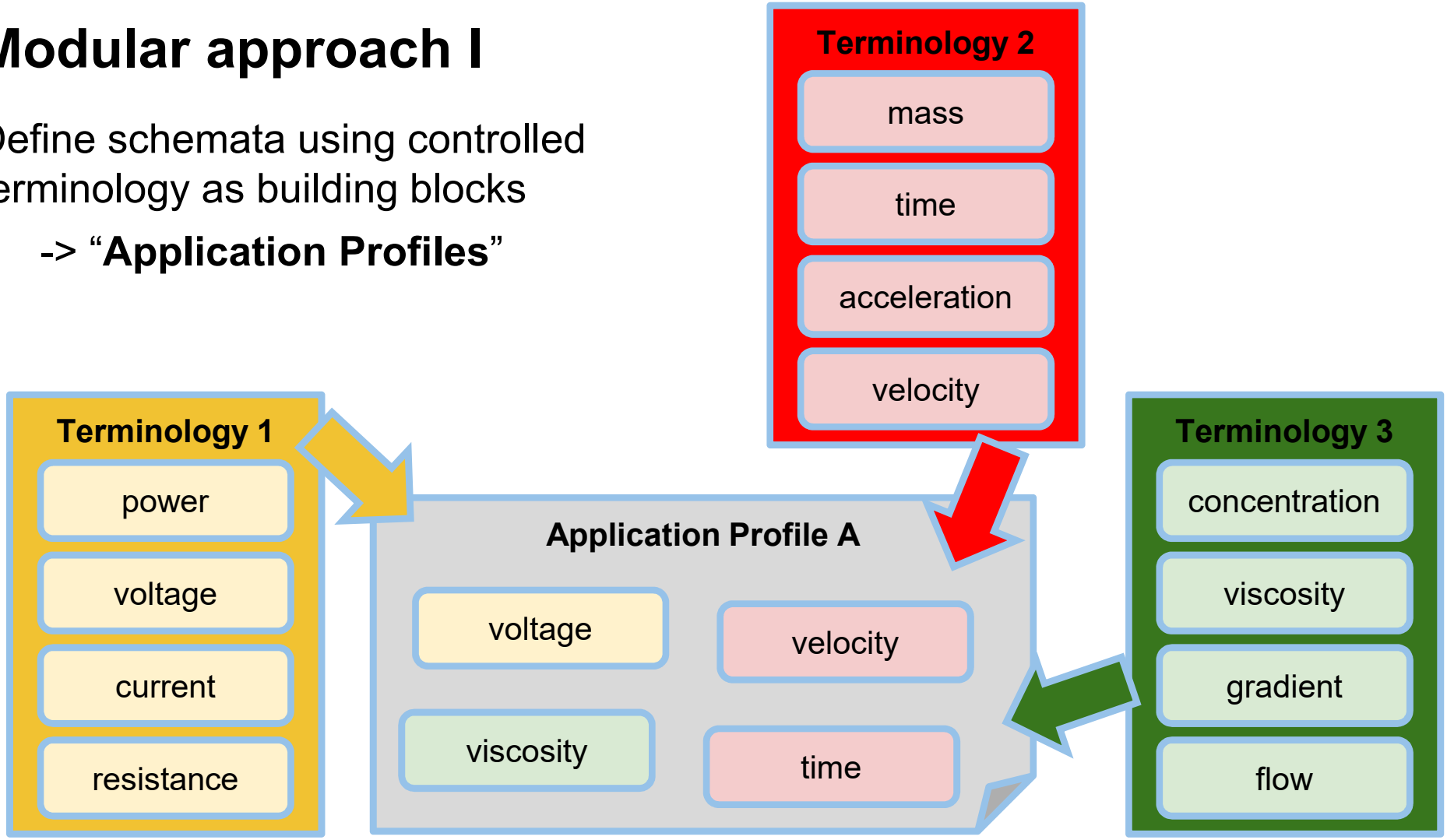
3. Global perspective
   - Interoperability
   - High reusability
   - Broad applicability

Flexibility, Specificity, Interoperability

Modular approach I

Define schemata using controlled terminology as building blocks

-> “**Application Profiles**”



Flexibility, Specificity, Interoperability, Reusability

Modular approach II

Treat metadata for separable realms independently

- e.g., separate information for:

Object of Research | **Method** | **Tool**

etc.

- smaller “micro”-schemata and terminology classes
  - will be combined for “full” description
    - can be referenced by each other
  - enable high flexibility and specificity
  - increase applicability, reusability and manageability

Flexibility, Specificity, Interoperability, Reusability

non-modular → non interoperable “macro” schemata / classes

Methode 1

Simulation von Verbrennungsprozess

≠

Methode 2

Experimentelle Messung von Verbrennungsprozess

modular → interoperable “micro” schemata / classes

Methode 1

Simulation

≠

Methode 2

Experimentelle Messung

Object of Research 1

Verbrennungsprozess

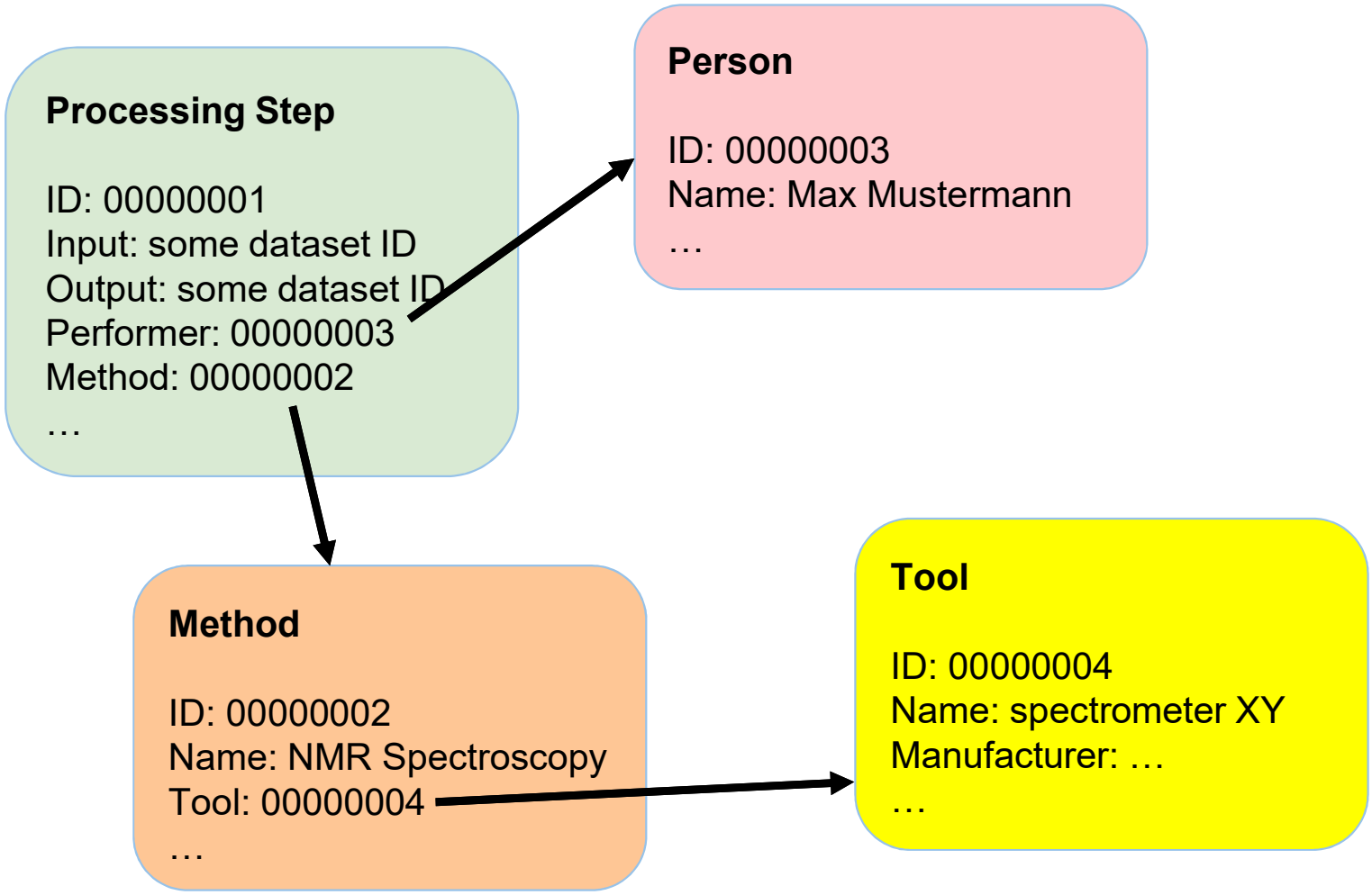
=

Object of Research 2

Verbrennungsprozess

Flexibility, Interoperability, Reusability

modular: referencing network of “micro” schemata / classes

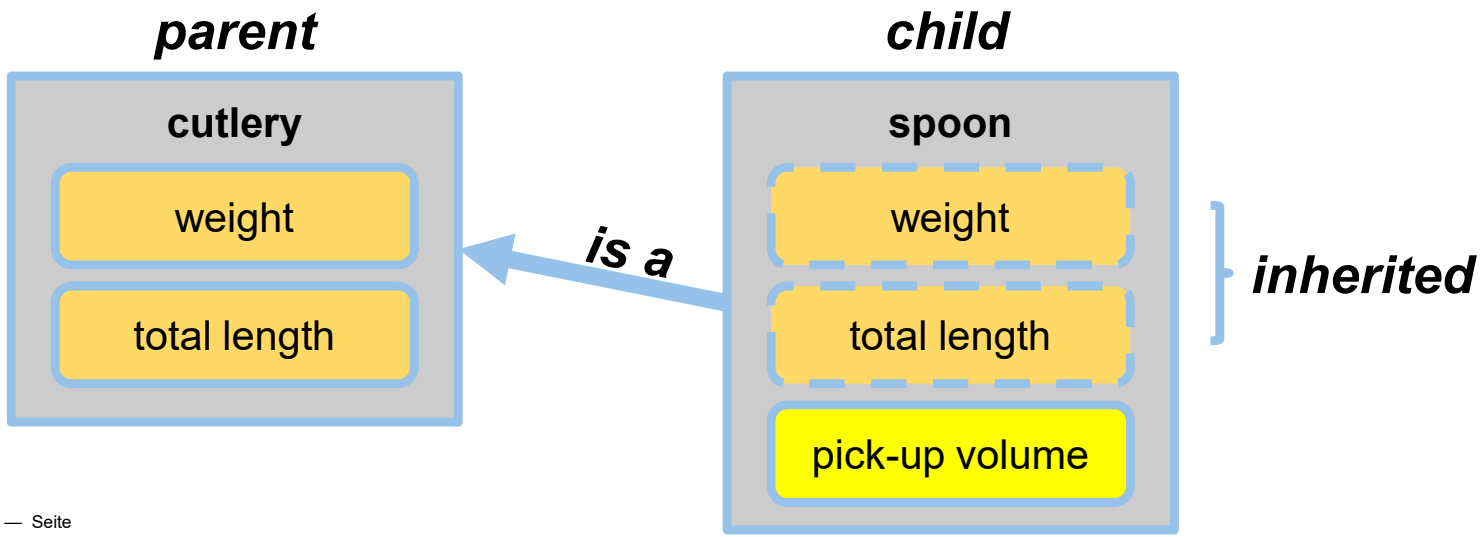


Interoperability, Specificity, Applicability, Reusability

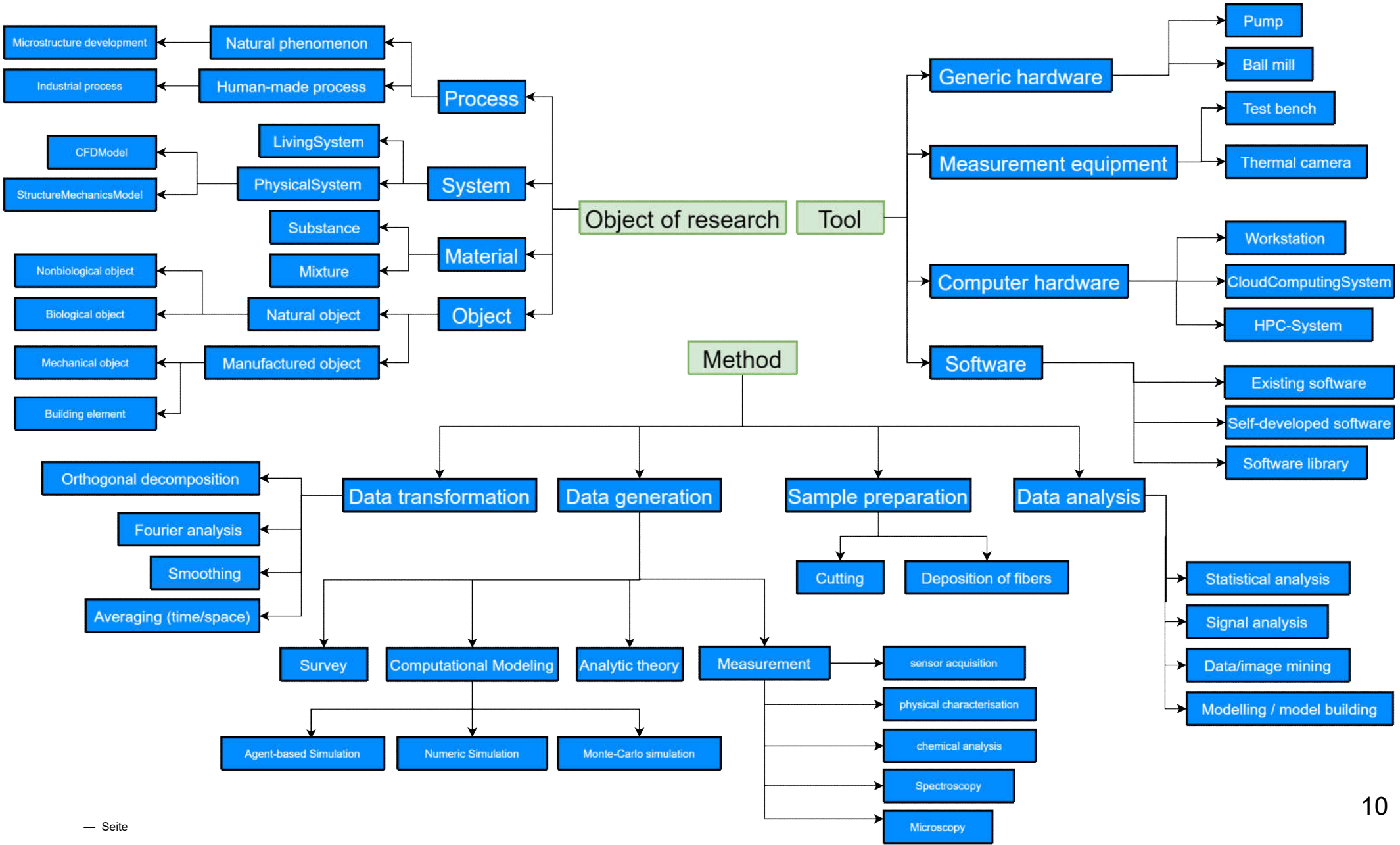
Hierarchical approach

Inheritance concept

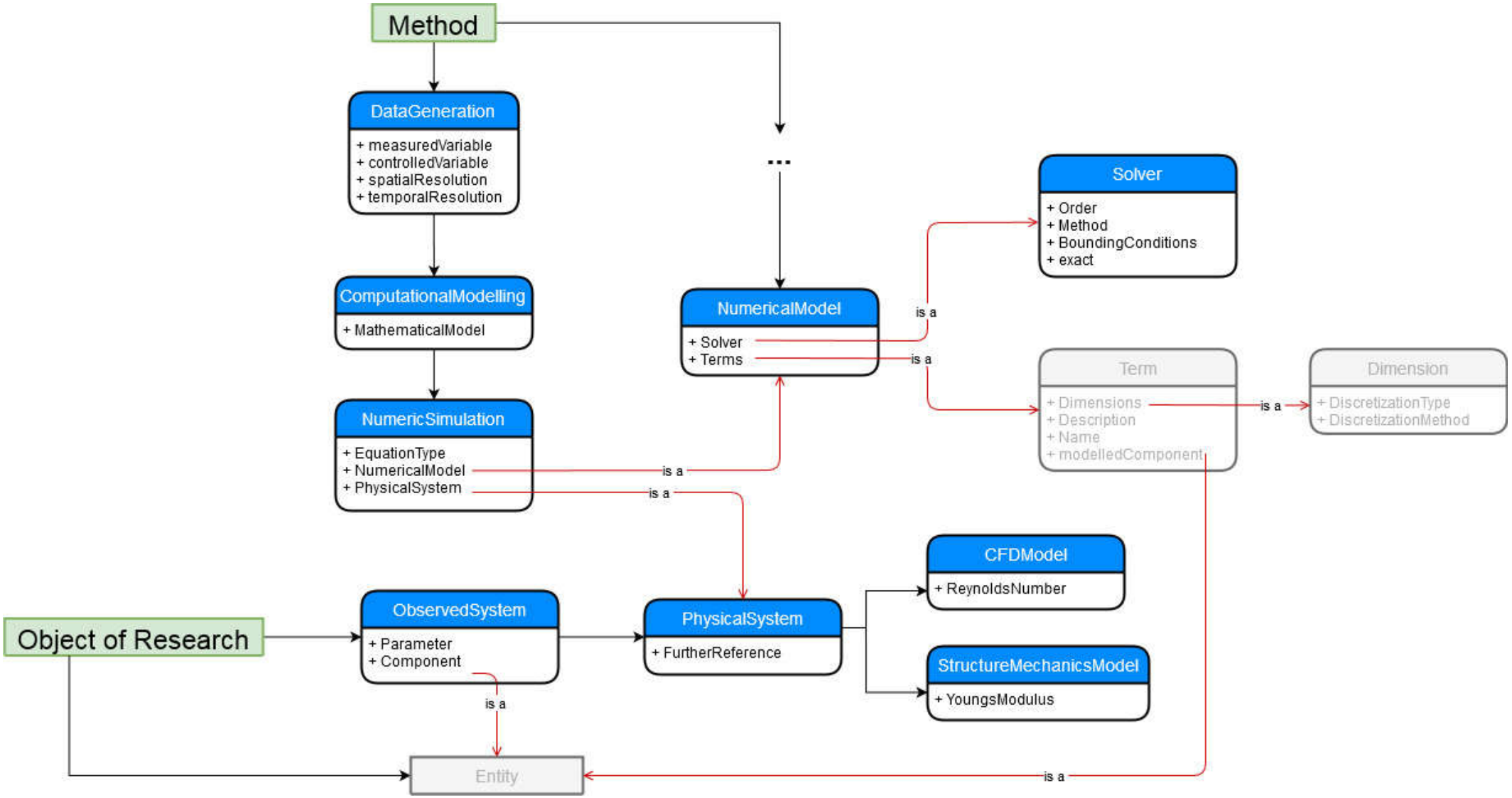
- Specific schemata / classes are derived as extensions from more generic ones
  - Children inherit all elements from parents (like object oriented programming)
  - Gradual process, multiple hierarchical levels
- Related schemata / classes always overlap via their closest common parent
- Reuse possible at highest applicable level of specificity



Interoperability, Specificity, Applicability, Reusability



Example – Describing a Numerical Simulation



Terminology development

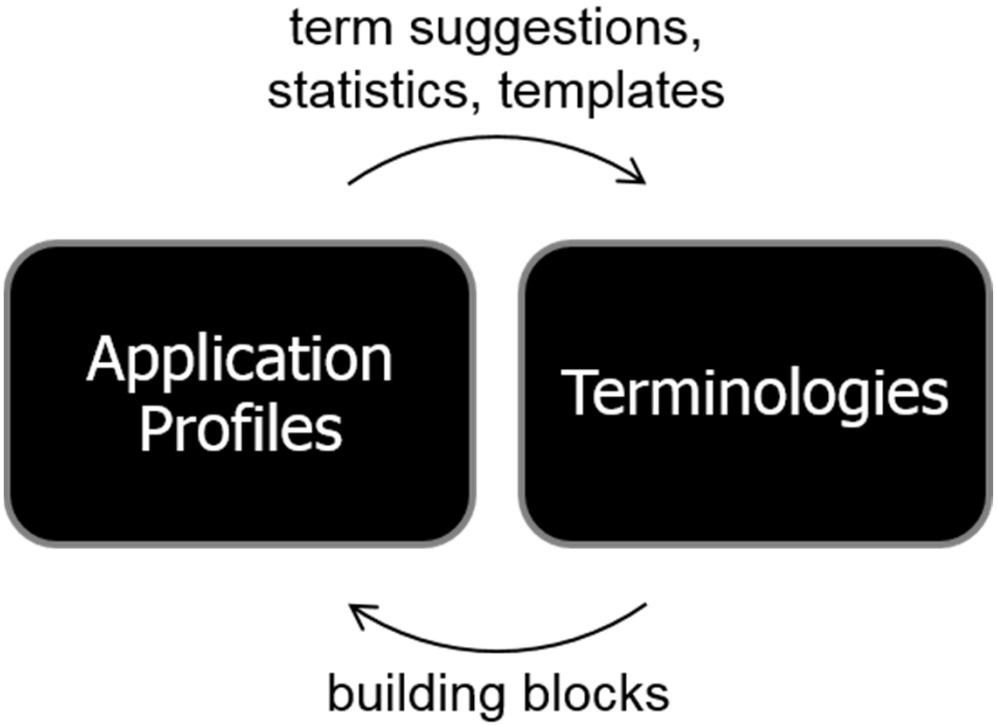
Parallel development of terminology and application profiles

Short-term

- Application profiles
- Fast and flexible
- DIY possible

Long-term

- Develop, manage & curate ontologies
- Ontology look-up



Supporting Infrastructure

Terminology Service

- Data mappings for data integration, exploration, semantic search, visualization

Generator (via AIMS)

- Create application profiles by selecting terms from vocabularies
- Feedback with terminology service for collaborative vocabulary creation
  - provisional terms possible = term suggestions

Repository for metadata standards (via AIMS)

- Store and index application profiles
- Can be re-loaded into generator for adaptation

Metadata Hub (via AIMS)

- Repository for metadata **sets** describing actual research data stored elsewhere
- Suitable GUIs constructed ad hoc based on selected standard

Related Projects

NFDI4Ing

- will include services implemented within AIMS
- adds formalized **Terminology Service** as new, central component

Applying Interoperable Metadata Standards (AIMS)

A Platform for Creating and Sharing Metadata Standards and their Integration into Scientific Workflows in Mechanical Engineering and Related Disciplines

- DFG LIS
- collaboration between TU Darmstadt and RWTH Aachen University
- implements infrastructure indicated on previous slide

The end