

Ontology Building for Collaborative Embedded Systems

Application and Use

What is an Ontology?

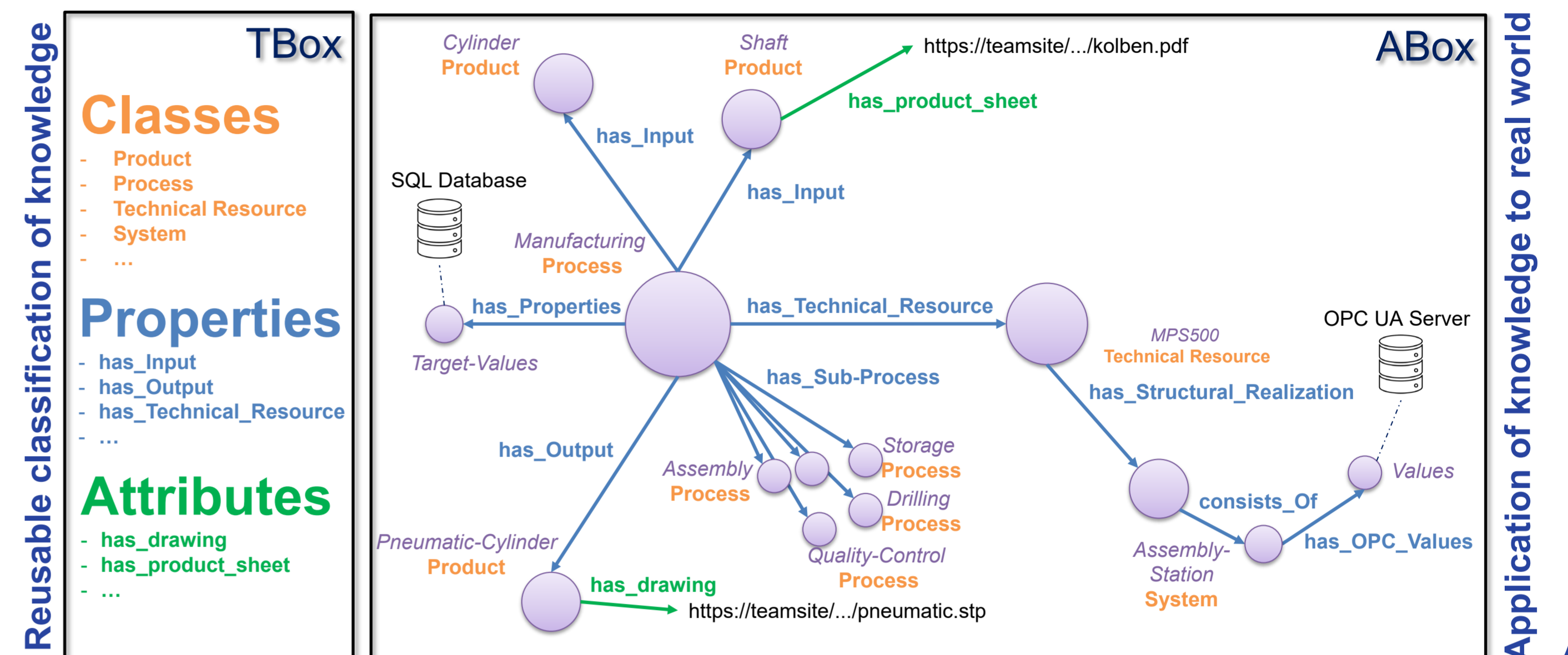
- Mathematical formal knowledge model
- Set of Triples (Subject, Predicate Object) in RDF / RDFS / OWL, serialized in Turtle syntax for instance
- TBox -> Terminological Box, ABox -> Assertional Box

What can we do with it?

- Specification of shared/distributed knowledge
- Connect and access heterogenous data sources
- Ontology-based search of information, also in different data sources
- Inference of facts, hidden in data

What is the pain in building ontologies?

- Integration of requirements specification with application development process
- Reusability of ontological artifacts (especially TBox)
- Efficient ontology building (especially ABox)



Ontology Building Method

Requirements Specification

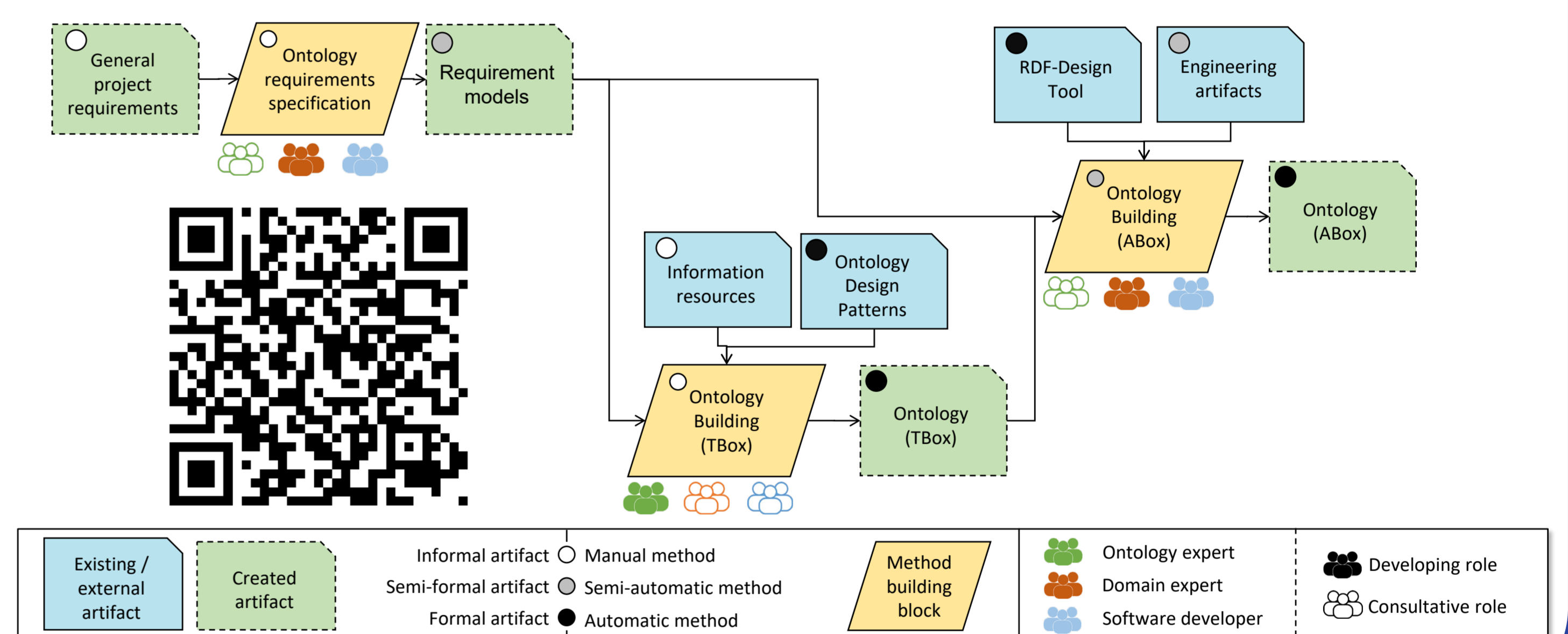
- Model-based specification of information flow in Use Case with UML/SysML diagrams
- Analysis of required data / information / knowledge formalization by an ontology
- Specification of Competency Questions (CQs), e.g. "What is the structure of plant "X"?" as informal queries

TBox Building

- Search for information resource, use their terms and relations for ontology building (i.e. answering CQs)
- Build Ontology-Design Patterns for each information resource, i.e. for each standard vocabulary, to increase reuseability of the TBox through modularization
- Reuse existing Ontology-Design Patterns if possible

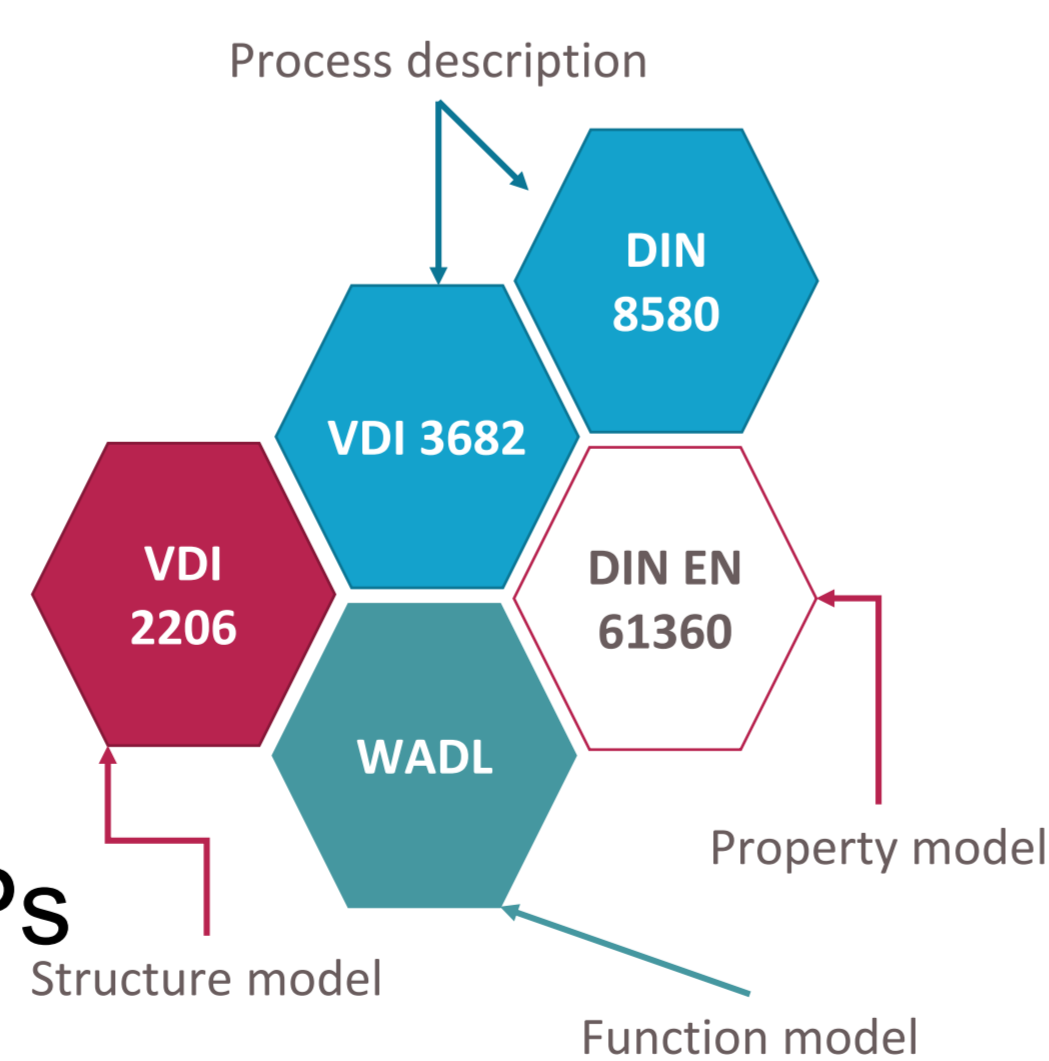
ABox Building

- Evaluate modelling strategy (semi-automatic / automatic)
- Modelling of artifact to RDF mappings (automatic strategy)
- Tool development (semi-automatic strategy)
- Definition of ABox-Building workflow



Ontology-Design Patterns

- An ODP is a reoccurring TBox modelling solution
- ODP is kept modular, e.g. the vocabular of a single standard, like VDI 3682 for process descriptions, is formalized and maintained independently
- For a certain project, these ODPs can be combined individually to fulfill the relevant requirements
- Currently, 9 ODPs are maintained and allow process descriptions, property modelling, modelling of plant structures and more
- The ODPs can be accessed via the QR code ->



Tool Support

- LiOnS is a tool, developed at the HSU, that allows semi-automatic and automatic ABox modelling
- The Semi-automatic approach requires some user input when modelling a manufacturing process for instance
- The automatic approach only requires an Engineering artifact, that is analyzed and used for ABox-Building automatically

