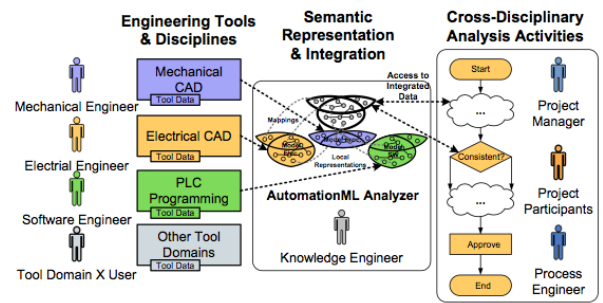# AutomationML Analyzer:
An Intelligent Gateway to Interlinked Engineering Data

The AutomationML Analyzer enables efficient integration, browsing, querying, and cross-disciplinary analysis of diverse engineering models represented as *AutomationML* data.

Challenges

During the engineering of complex mechatronic systems (e.g., power plants), multiple engineering tools from different engineering domains are used (see figure above). These create diverse, yet somewhat overlapping and interlinked, models of the projected system. Such tools exchange data point-to-point – an approach that makes cross-disciplinary data analysis activities difficult to automate. In particular, this kind of data exchange:

- does not sufficiently enable consistency management;
- makes data not easily accessible on the project level, e.g. for risk management or for test automation.

AutomationML is an emerging IEC 62714 standard for facilitating uniform data exchange between engineering tools. It enjoys an intense industry adoption, especially in relation to the Industrie4.0 movement. However, even when tool networks use *AutomationML*, exchanged data:

- may still not be available for querying via a unified interface, and
- cannot easily be linked to support advanced applications that rely on querying project-level data.

Criteria for a good solution

1. Data must be easy to link and process across disciplines.
2. Project-level access to engineering data should be possible both in terms of navigation and querying.

Implementation

The **AutomationML Analyzer**, uses Linked Data technology to:

1. create an **interlinked engineering data space** by automatically transforming AutomationML files into Linked Data formats, enriching these with ontologies and making implicit links across disciplines explicit. This lead to the **integration** of engineering data from different disciplines and tools

2. provide **intuitive an intelligent access gateway** to this project-level data space through **browsing and navigating** interfaces and **querying** facilities.

Results

The approach systematically integrates tool data that use the *AutomationML* standard and enables the automation of cross-disciplinary analysis activities.

In a representative standard example, the storage of *AutomationML* data was evaluated by the cooperation partner *IAF*, at the *Otto-von-Guericke University Magdeburg*. The example shows how data from three disciplines and from run time can be provided as Linked Data structure that can be browsed and queried efficiently.

Improvements

- **Domain experts can upload engineering models represented in the *AutomationML* standard and automatically transform these into Linked Data.**
- **Users can browse engineering data from different disciplines by following links made explicit during transformation to Linked Data**
- **Users can query data across disciplines to perform cross-disciplinary data analysis activities.**
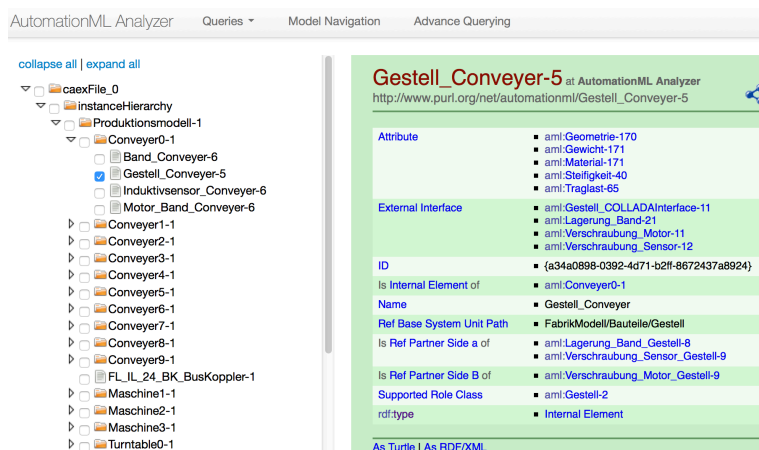
Technologies

The **AutomationML Analyzer** is based on Linked Data technologies:

- Automatic generation of ontologies and explicit links between data from different disciplines.
- Storage in the Sesame semantic store.
- Linked Data interface generated for intuitive data navigation at project, rather than individual discipline level.
- Extendable set of predefined queries that support engineering data analytics. These translate into SPARQL queries.

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