

Reference: QSE-RTE-TIDE

Topic: Round-Trip-Engineering – XML/spreadsheet import/export transformation

Lecture-Type: Practical course, Bachelor thesis, Master Thesis

Start: As soon as possible

End: To be defined

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Background

In the automation system domain (e.g., production automation or steel mill engineering) engineers coming from different disciplines have to collaborate and exchange data. Typically engineers in the electrical, mechanical, and software domain (see Figure 1) work in parallel in their individual context applying individual tools and data models. These data need to be synchronized along the product development life cycle.

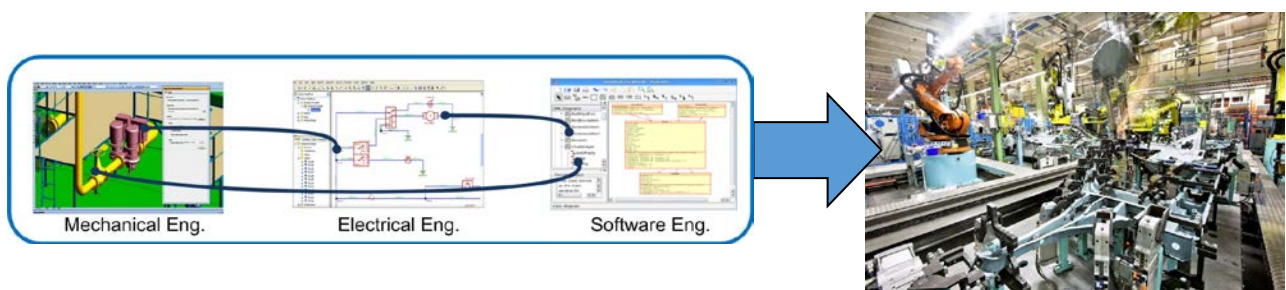


Figure 1: Heterogeneous Engineering Domains as foundation for Automation Systems Engineering

The round-trip-engineering (see Figure 2) illustrates the basic process approach for concurrent engineering activities that need to be synchronized via an integrated data model, e.g., a common data base such as BaseX. In this example, the plant planner provides the basic plant structure; mechanical and electrical engineers as well as PLC programmer update their engineering artifacts concurrently and update the common data base.

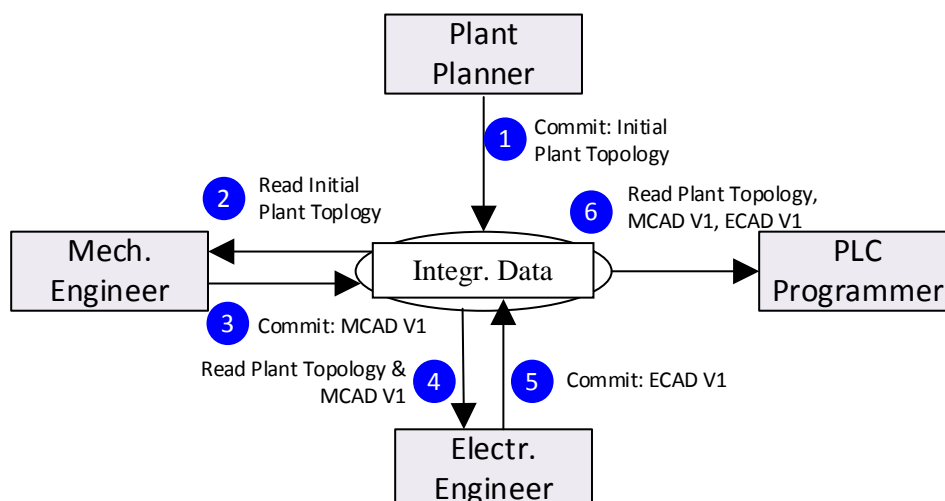


Figure 2: Round-Trip-Engineering Process in Automation Systems Development.

Goal of this project is to give an overview of existing and established techniques for XML/spreadsheet model transformation (e.g. ATL [2][3]). The findings are evaluated on a given use-case. Finally, a prototype that is capable to demonstrate the feasibility of the chosen approach needs to be implemented.

Tasks

Based on the overall goal, specific tasks include:

- Eliciting the state of the art and the state of the practice in production system engineering with domain experts.
- Derive tool requirements and expected capabilities and import / export formats.
- Development of an RTE concept that is capable of handling these requirements.
- Prototype implementation.
- Evaluation of prototypes with real-world engineering data coming from production system engineering.

Expertise and Skills Needed

Based on different tasks, required expertise and skills may vary. For this project, the following skill set is recommended:

- Software Engineering Skills
- Java and the standard technology stack (e.g., Build Tools, Issue tracker, SCM)
- Basic data integration knowledge, model transformation (e.g. ATL [2][3])
- Nice to have: basic knowledge in data representation languages such as AutomationML [1].
- Nice to have: Basic automation engineering skills.

You will learn

- Automation systems engineering basics.
- AutomationML and OPC UA in practice.
- Engineering process design and improvement in the automation systems domain.

References

[1] AutomationML: www.automationml.org.

[2] Jouault, Frédéric, and Ivan Kurtev. "Transforming models with ATL." International Conference on Model Driven Engineering Languages and Systems. Springer, Berlin, Heidelberg, 2005.

[3] Jaouault, Frédéric, et al. "ATL: A model transformation tool." Science of computer programming 72.1-2 (2008): 31-39.