Institut of Information Systems Engineering
Devision Information & Software Engineering
http://qse.ifs.tuwien.ac.at

Seminar, Project
Bac Thesis
Master Thesis

Reference:	**M3 DSL for PPR**
Topic:	**Textual Domain Specific Language for Product-Process-Resource modeling**
Course-Type:	Seminar, Project, Bac-/Masterthesis
Start:	As soon as possible
End:	To be defined
Industrypartner:	STIWA
Contact:	Lukas Kathrein (lukas.kathrein@tuwien.ac.at)
	Kristof Meixner (kristof.meixner@tuwien.ac.at)

Background:

In multi-disciplinary production systems engineering (PSE), projects, similar to a software projects, undergo different subsequent phases employing several domain-specific roles. For example, basic engineers in early stages design matching production processes from product characteristics and select production resources (machines like welders or presses). The dependencies among these concepts were coined as product-process-resource (PPR) [1]. As many domain experts lack sophisticated domain-specific tools and often rely on custom built Excel sheets, a graphical modeling language based on the formal process description, capable of expressing PPR knowledge, was proposed in [2]. Figure 1 illustrates a simple cake-baking example in this language.
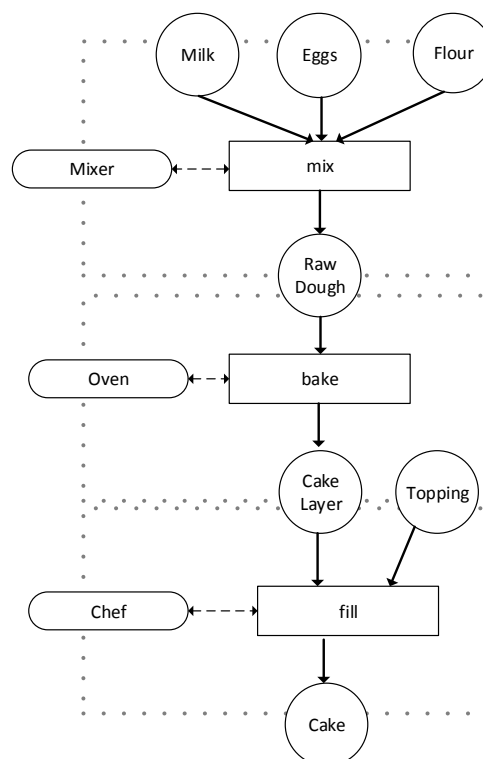

Figure 1: Product (circles), Process (squares), Resource (rounded squares) model for a simple cake.

In the context of multi-disciplinary engineering, this topic aims at extending the visual approach with a textual and more formal domain-specific language description using the MPS tool from JetBrains [3]. The developed extension should define necessary

Institut of Information Systems Engineering
Devision Information & Software Engineering
http://qse.ifs.tuwien.ac.at

Seminar, Project
Bac Thesis
Master Thesis

elements based on the existing approach, provide capabilities like expressing consistency expressions such as "the sum of part A + part B must not exceed 500 kg", as well as a graphical rendering of the DSL with a custom MPS view.

The complexity of this topic requires an iterative and incremental approach, which, depending on the course type and effort, offers several sub-topics to be investigated and worked on.

This topic is provided and supervised in cooperation with our industry partner STIWA Group (www.stiwa.com)

Tasks:

- DSL definition based on [2]
- Extension of the existing approach

Expertise:

For this topic a set of skills is recommended (at least two are mandatory).

- Java programming skills
- Data modeling
- Empirical evaluation, e.g. case study, pre/post comparison
- Jetbrains MPS (is an advantage)

[1] Schleipen, M., Lüder, A., Sauer, O., Flatt, H., & Jasperneite, J. (2015). Requirements and concept for Plug-and-Work. at-Automatisierungstechnik, 63(10), 801-820.

[2] Kathrein, L. (2019). Modeling Language Selection and Application for Multi-Disciplinary Production Systems Engineering
http://katalog.ub.tuwien.ac.at/AC15289699

[3] https://www.jetbrains.com/mps/