



Summer School 2022

IoT Platforms for Industry 4.0



Information Guide

July 25 – August 5, 2022

Technical University of Munich

Campus Garching

Introduction

We are pleased that you have chosen to participate in the EIT Digital Summer School on IoT Platforms for Industry 4.0 at the Technical University of Munich (TUM). The focus will be on developing ideas and scenarios for the future of industry. Our goal is to sharpen the understanding of trends like Internet-of-Things (IoT), IoT platforms, and digitally enabled Business Model Innovation to identify and evaluate potentials for Industry 4.0. This information guide provides necessary information about summer school.

The Summer School, "IoT Platforms for Industry 4.0", will be held from Monday, July 25, 2022, to Friday, August 5, 2022. It takes place at the Garching campus of the Technical University of Munich.

During our two-week Summer School, you will work in teams on business cases. The cases, which are provided by industry partners from TUM and EIT Digital, will cover applications in the domains of IoT platforms, artificial intelligence (AI), and Industry 4.0. The emphasis is on developing a minimal viable product and a business plan.

The Summer School will start with a kick-off presentation, team building, and the presentation of the cases. We will follow an approach to develop solution ideas, prototypes, market analyses, and your pitch presentation. In the first week, we set the theoretical foundations to enable you to develop a solution for your case challenge. You will learn about concepts and use cases of Industry 4.0.

Besides these, you will start to analyze your case challenge and develop first solution ideas. The second week focuses on implementing your idea, market analysis, business plan development, and preparations for the pitch presentation.

On Saturday July 30th we invite you to a team event at the Jochen Schweizer

Arena here in Munich. Please bring some casual/sporty clothes for this event.

We are looking forward to welcoming you to our EIT Digital Summer School in Munich.

Stay healthy!

Corona regulations

We continue to face a multitude of challenges due to the coronavirus pandemic. Together, we can turn this situation to our advantage and make a meaningful contribution to the success of the current generation of students and our university as a whole – and, above all, get ourselves safely through these challenging times.

The current **entry and quarantine regulations in Germany** can be found on the website of the Federal Foreign Office:

<https://www.auswaertiges-amt.de/en/coronavirus/2317268>

In addition, you can find all current information about the **corona regulations at the Technical University of Munich (TUM)** on the website of the TUM:

<https://www.tum.de/en/about-tum/news/coronavirus>

During lectures and exercises at our chair it is mandatory to wear FFP2 masks!

Organizing team:

Prof. Dr.-Ing. Birgit Vogel-Heuser

Dr.-Ing. Dorothea Pantförder



About HAWE Hydraulik SE

HAWE Hydraulik is a mid-sized, internationally active family business headquartered in Munich/Germany. Subsidiary companies in Europe, North America and Asia offer a global sales, service and engineering network. The production plants in Germany supply customers all around the world. Great value-added depth, efficient processes and rigorous attention to quality ensure the reliability, ruggedness, and long service life of HAWE products. HAWE Hydraulik aspires to combine over 70 years of experience in hydraulics with the integration of new technologies to provide innovative solutions - "Solutions for a World under Pressure"!

Hydraulics is a classic interdisciplinary technology that is used in a multitude of applications and machines. Machine and system manufacturers offer a wide and varied range of technically advanced products, for which HAWE Hydraulik offers solutions to match. Components of rigorously structured modular design create an amazing number of different variants for tailored solutions

BUSINESS CASE E:

Feature-Based Assembly Process Configuration

Due to the high product diversity, the assembly of each individual products is very complex. To reduce the complexity, the assembly is partly highly automated, which, however, requires a precise product definition and exact definitions of product-specific assembly actions / steps. Products at HAWE Hydraulik are configured on the sales side using a type code.

The type code specifies exactly the single product, i.e. a specific product variant from the entire product variety. The product variety must be modelled in a feature model or variability model, which must be created by HAWE and, if necessary, enriched with further necessary information by the developer team of the Summer School. The feature model should also include which elements or groups are included or excluded based on an activated feature. In addition, there should be a pool of assembly actions that includes assembly steps. It must be checked how granular / atomic assembly actions / steps can be defined by the features. When selecting features (via the given type code), corresponding assembly actions should be automatically selected and combined in the background. However, it should also be considered that features can have a reciprocal influence on other features and thus the assembly steps can also vary. At the same time, assembly actions must be defined in such a way that they are also linked to other assembly steps as pre- or post-conditions, since, for example, a screw is first tightened and then screwed with a fixed torque. Modelling notation might be finite automata or state machines of the (UML/SysML). Based this method it is possible to define the complete assembly process automatically.

Expected Targets

The general aim of the business case is that the product "knows" the information how to be assembled by itself, only by given features chosen by the end customer. The vision is, that sales staff defines the product in cooperation with the end customer and as soon as the order is placed, the product (digital twin) "knows" how is has to be processed. Referring to the image above:

1. Basic **feature model** is given by HAWE Hydraulik SE (but can be enriched with necessary information withing this project)
2. **Product specification** is given by an end user (in this case HAWE Hydraulik SE). Product specification is in general the definition of an individual product.
3. Based on the feature model and the product specification an automatic **decision-making** process must be developed within the scope of this project. The atomic assembly states are given by HAWE-Hydraulik SE. The decision-making process defines the orchestration of atomic assembly states to the holistic and individual process for the specified product.
4. The **formal/graphical representation of the assembly process** has to be a standardizes notation, i.e. UML/SysML, timed automata or finite automata. The representation depends on the information representation.

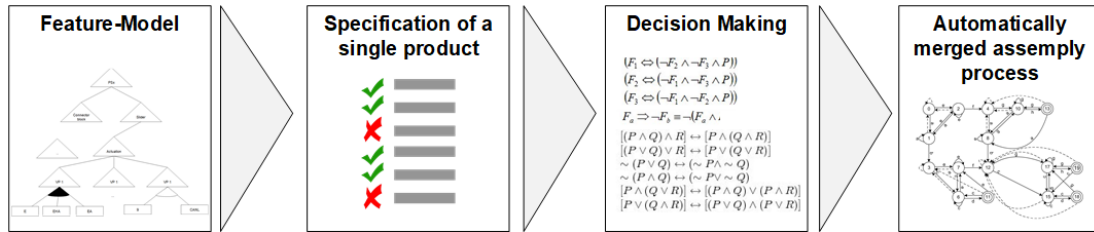


Figure 4 : Procedure for Feature-Based Assembly Process Configuration