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Practical Robotics Institute Austria

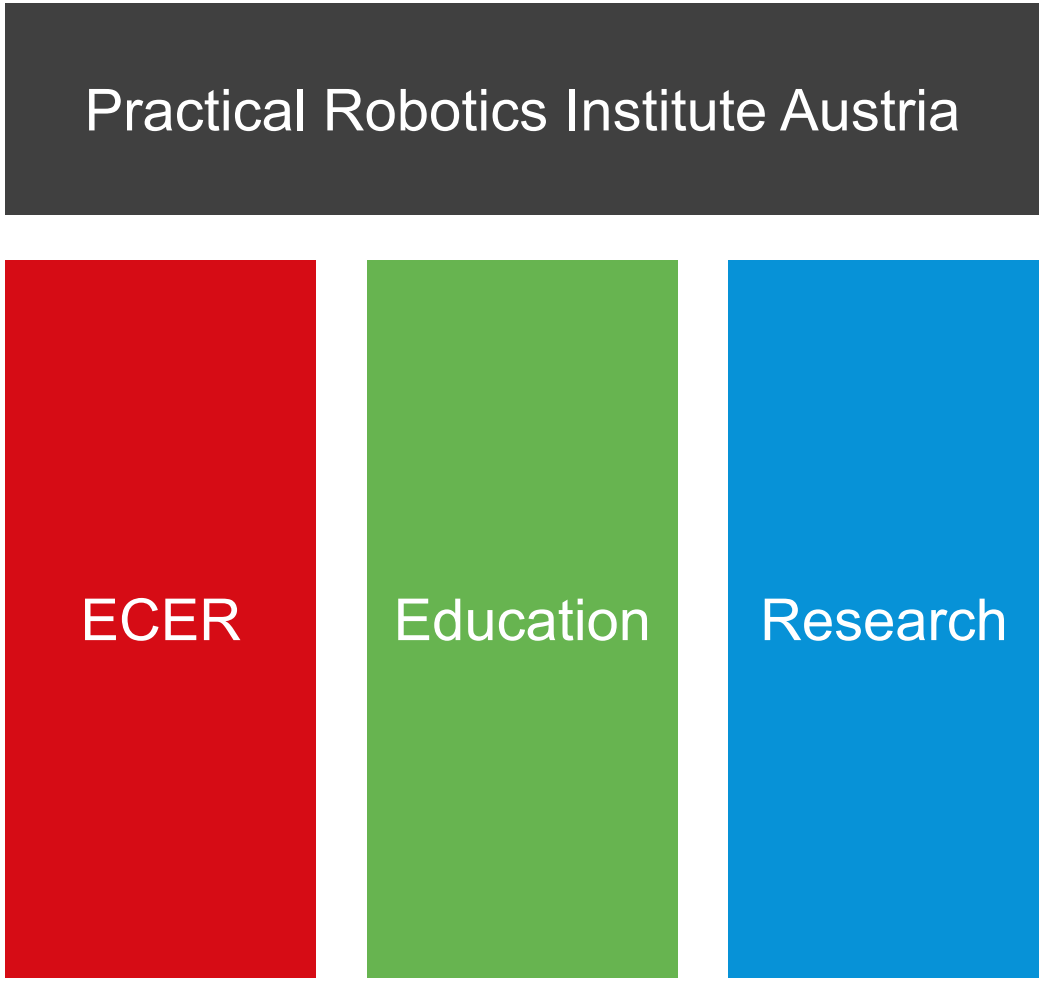
Dr. Wilfried Lepuschitz

Managing Director

05.06.2019

Practical Robotics Institute Austria (PRIA)

Non-profit association with the aim to promote scientific and technical excellence in schools using robotics as well as the operation of research projects in related fields of robotics and automation.



Robotics in Education

- Combines multiple disciplines
  → Mechanics, informatics, mathematics, …
- Creative learning and enthusiasm for the STEM fields

PRIA – Team

Reseachers, educators, students

DI(FH) Mag. Dr. Gottfried Koppensteiner, Chairman

DI Dr. Wilfried Lepuschitz, Managing Director

DI Dr. Munir Merdan, Scientific Director

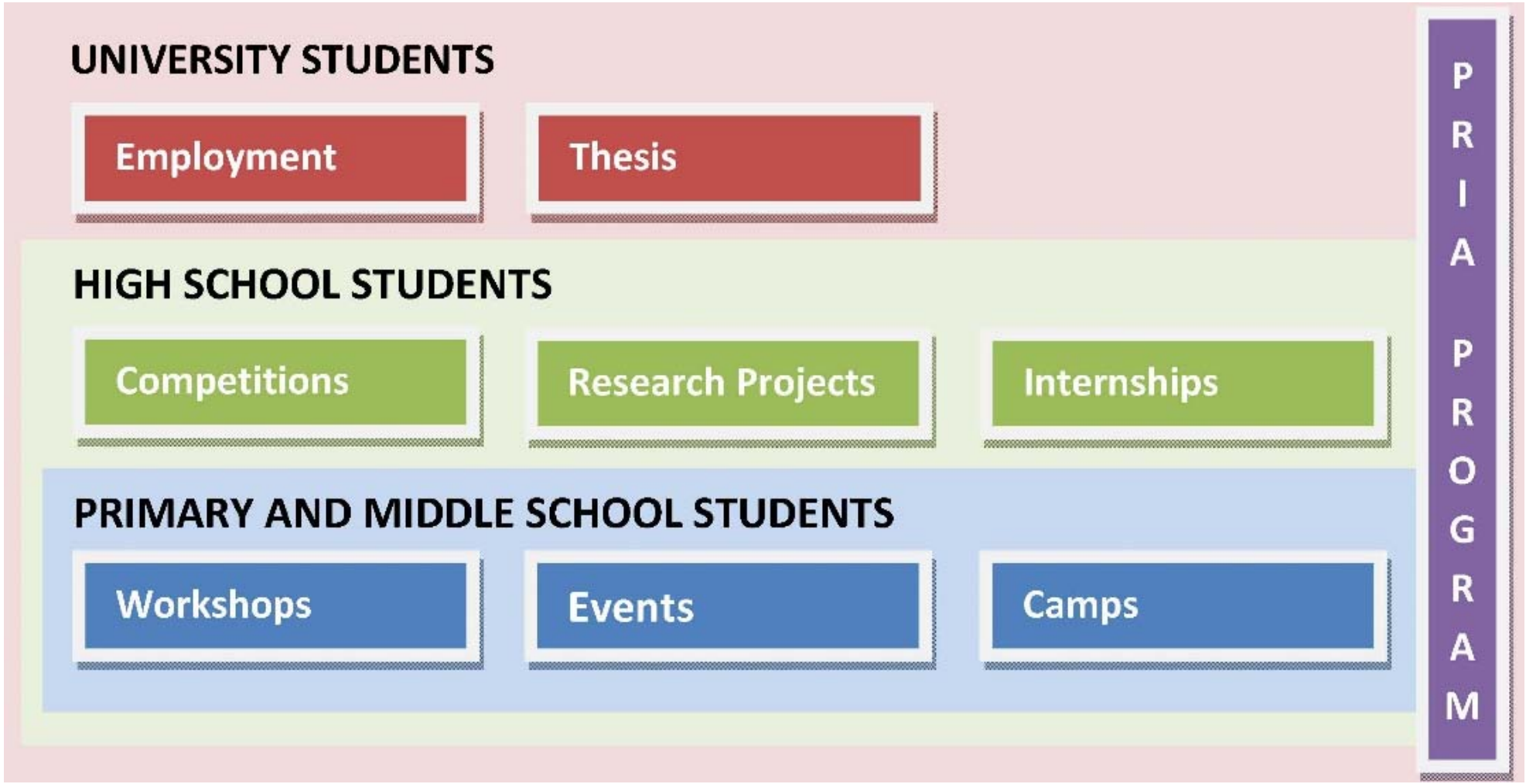
Mag. Tanja Tomitsch, Educational Director

Clemens Koza, Research Assistant

Viktoria Zach, Research Assistant

…currently 17 employees

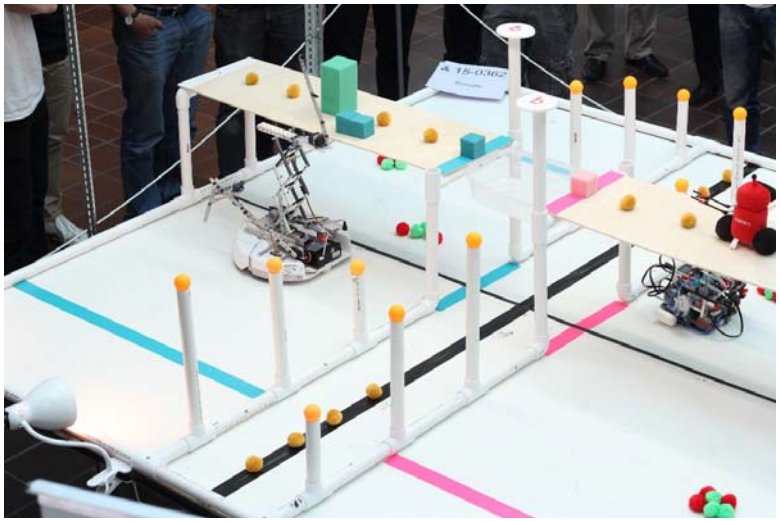
Multiple entry points for students



Project ER4STEM

The project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No. 665972

Educational Robotics for STEM Education



Development and evaluation of ER4STEM framework

Educational robotics workshops in 6 European countries with over 4000 young learners in 3 years

ECER conferences

2016 in Austria, 2017 in Bulgaria, 2018 in Malta

ER4STEM repository for educators

TU WIEN ACIN | ESI European Software Institute Center Eastern Europe | PRIA Practical Robotics Institute Austria | CARDIFF UNIVERSITY PRIFYSGOL CAERDYDD | ETL EDUCATIONAL TECHNOLOGY LAB NKUA | acrosslimits | CERTICON

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ROBOCOOP

Robotics Education driven by Interregional Cooperation

PRIA Practical Robotics Institute Austria

Bildungsdirektion Wien

CENTRUM VEDECKO-TECHNICKÝCH INFORMÁCIÍ SR

ACIN
AUTOMATION & CONTROL INSTITUTE
INSTITUT FÜR AUTOMATISIERUNGS- & REGELUNGSTECHNIK

STU
SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA

European Conference on Educational Robotics (ECER)

Bundesministerium
Verkehr, Innovation
und Technologie

FFG
Forschung wirkt.

M@S
MAKERS AT SCHOOL

ACIN
AUTOMATION & CONTROL INSTITUTE
INSTITUT FÜR AUTOMATISIERUNGS-
& REGELUNGSTECHNIK

IFT

PRIA Practical Robotics Institute Austria

Maker Austria
www.makeraustria.at

DIGITAL CITY WIEN

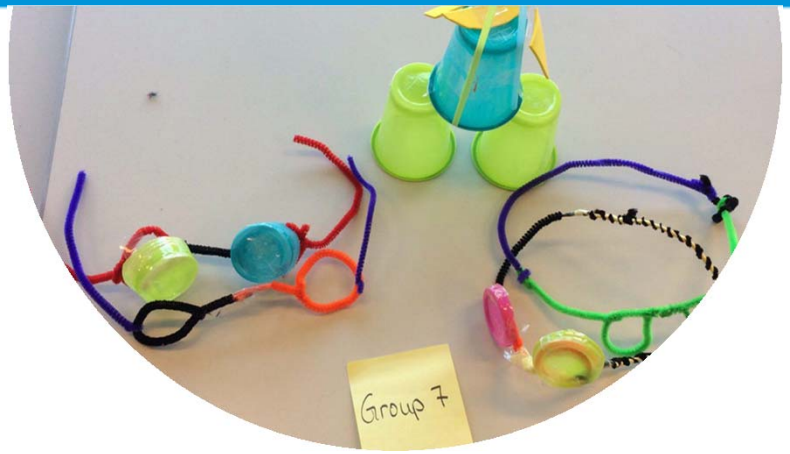
FFG 860104, Talente regional, 2017-2020

Makers@School – Overview

- Communicate a better understanding of the maker-movement
- Necessity of various skills in regard to entrepreneurship and STEM
- Series of workshops (started from school year 2017/2018)
  - Design Thinking
  - Maker
  - 3D Printing
  - Programming
  - FTI (Research, Technology, Innovation)
- Maker-project in school and presentation (started from school year 2018/2019)

Workshop: Design Thinking

- Foster creativity
- Product development
- Tasks:
  - Develop glasses using provided materials
  - Enhance the glasses for researchers
  - Design a robot for given requirements



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ACIN
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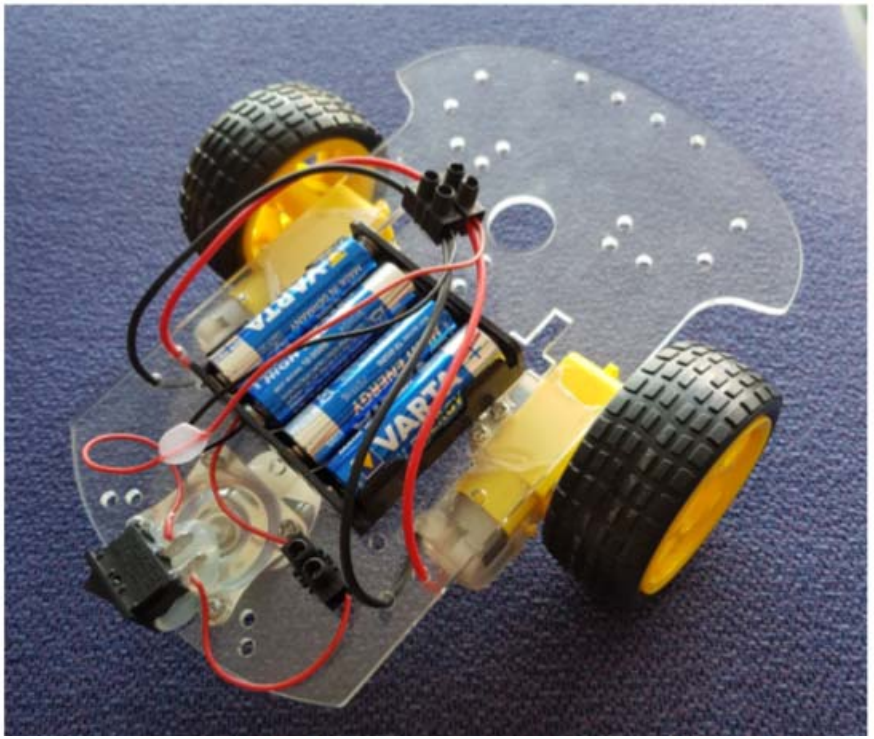
Workshop: Maker

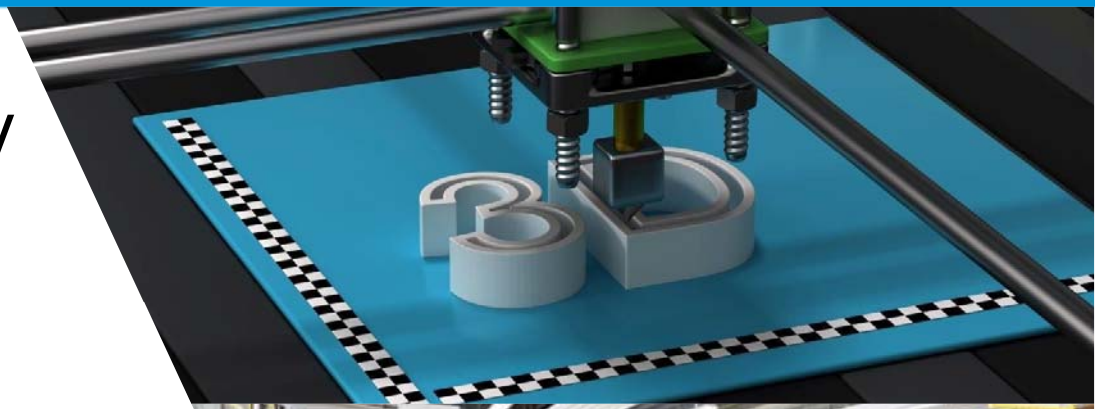
- Makerspace of Maker Austria
  - Various machines and tools
- Mobile robot platform
- Put the different parts of a robot together
  - Soldering, wiring
- Laser cutter

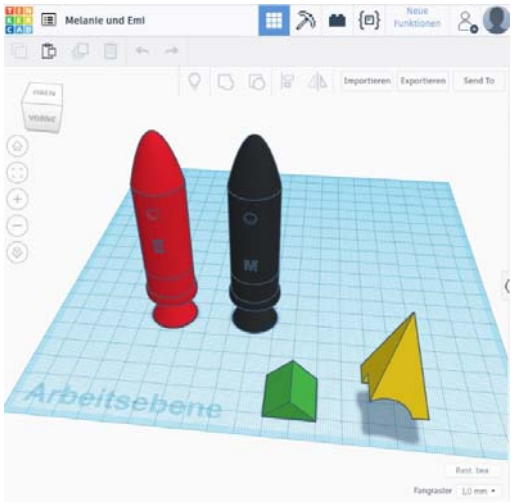


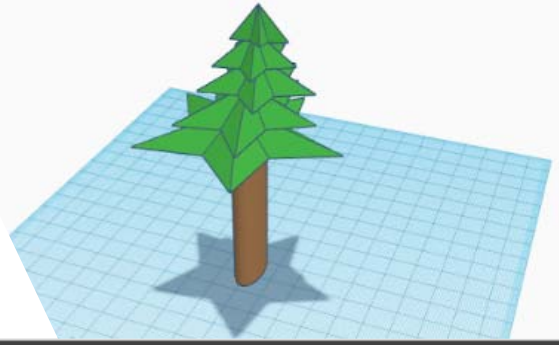
Maker Austria
www.makeraustria.at

Workshop: 3D Printing

- Industry 4.0 Pilot Factory of Vienna University of Technology
  - Industrial robots
  - CNC-Machines
- 3D printing
- Tinkercad

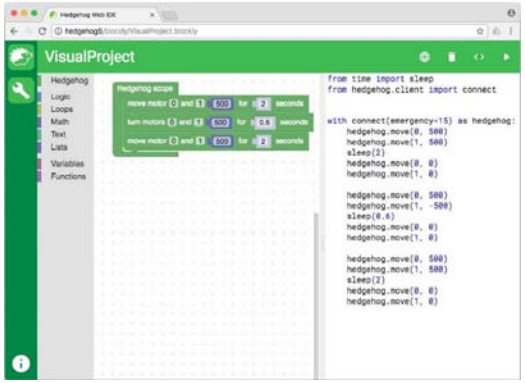






Workshop: Programming

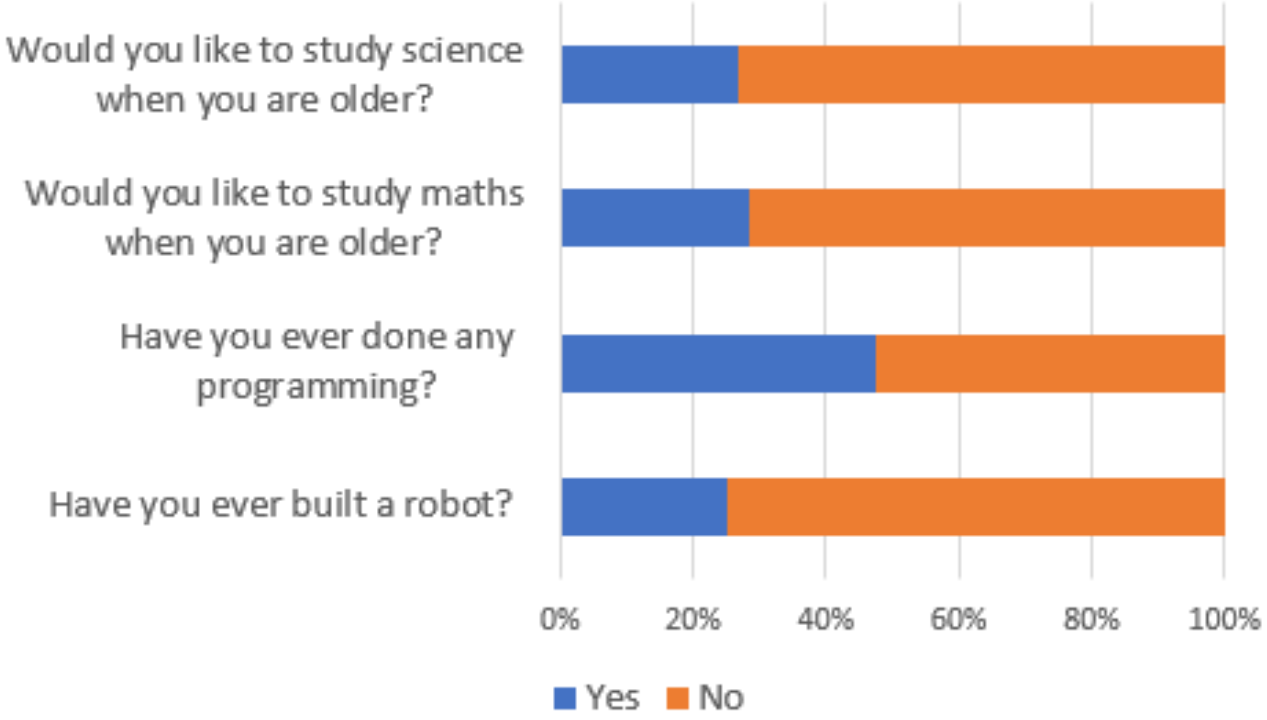
- Hedgehog controller
- Basic concepts about programming
  - Graphical programming for primary school pupils
  - Textual programming for secondary school pupils



Quantitative Results of Workshops #1

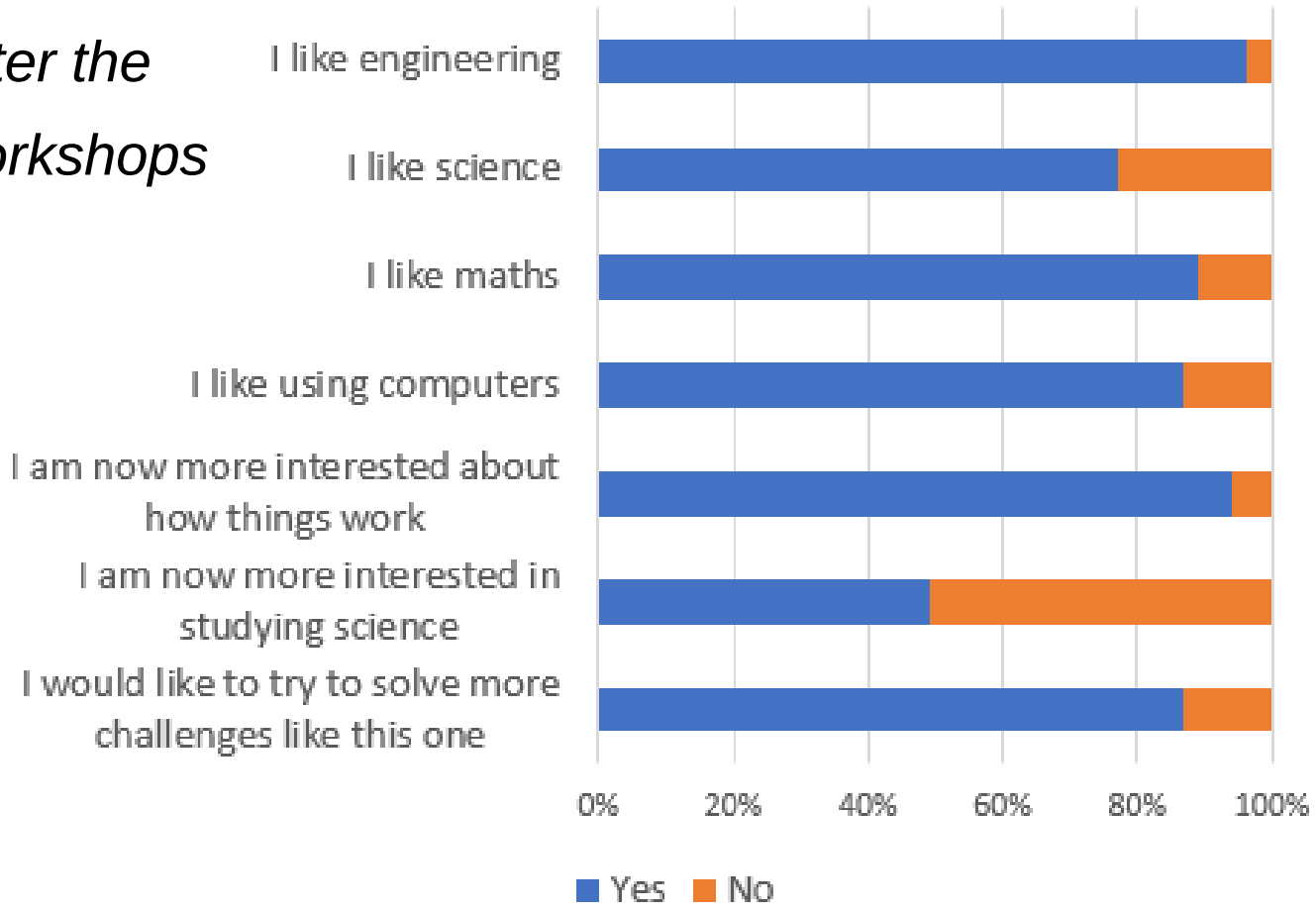
- 179 pupils: 52% girls, 48% boys

Before the workshops



Quantitative Results of Workshops #2

After the workshops



Confirmed in interviews with pupils, e.g. “Yes, and if we can do hands-on activities and it functions afterwards, then I like it more, if we do more like that.”

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Hedgehog

Educational Robotics Controller

Developed in the frame of:

SCORE!

FFG 839097, COIN Aufbau, 2013-2016

ER4STEM

EU 665972, SwafS SEAC-1-2014, 2015-2018

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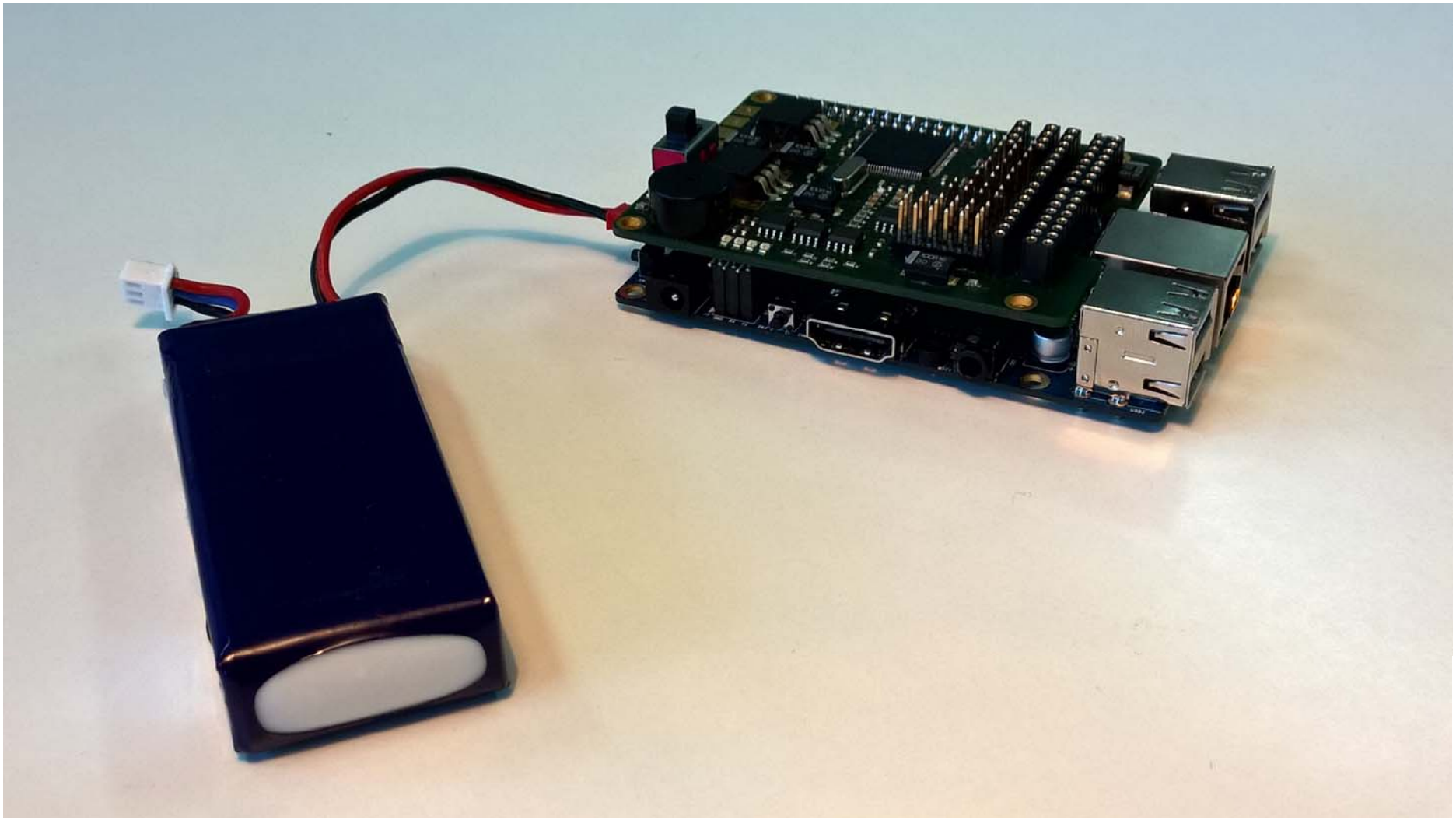
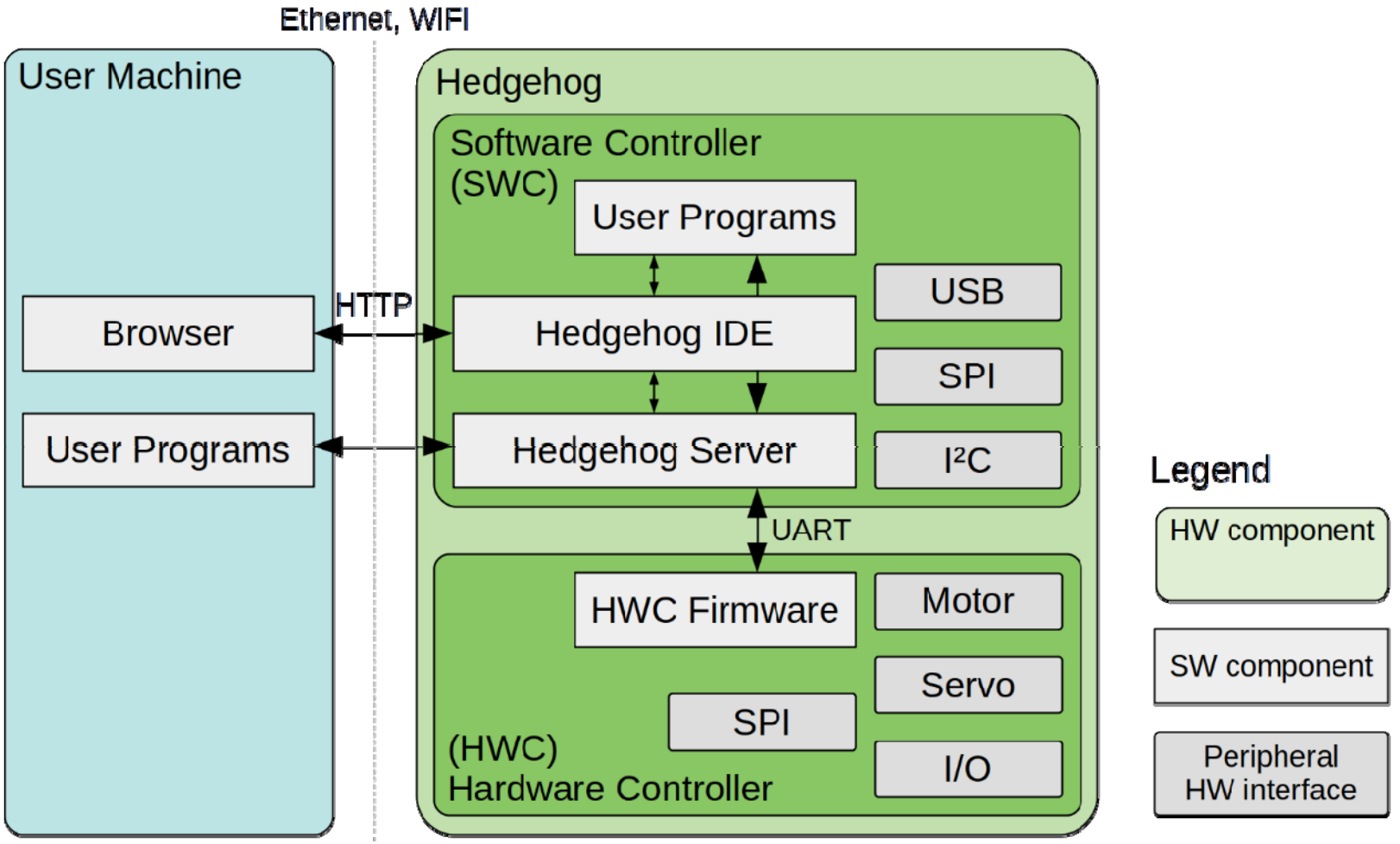
Hedgehog



Hedgehog‘s hardware components



Hedgehog‘s connectors

Connector	Count	Description
Motor	4	2 pin connector, motor driver
Servo	6	standard RC servo connectors
Digital I/O	8	3 pin connector, configurable as input & output; optional pullup or pulldown resistors for input
Analog Input	8	3 pin connector, 12-bit analog/digital converter inputs with optional pullup or pulldown resistors; can also be used as additional digital I/O pins
UART	1	Universal Asynchronous Receiver/Transmitter from Microcontroller
I^2C Bus	1	Inter-integrated circuit from Raspberry Pi
I^2C Bus	1	Inter-integrated circuit from Microcontroller
SPI	2	Serial Peripheral Interface from Raspberry Pi
SPI	1	Serial Peripheral Interface from Microcontroller

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KnowDrift

Knowledge-Driven Industrial Robotics for Flexible Production

FFG 858707, Produktion der Zukunft, 2017-2019

Practical Robotics Institute Austria

CZECH INSTITUTE OF INFORMATICS ROBOTICS AND CYBERNETICS CTU IN PRAGUE

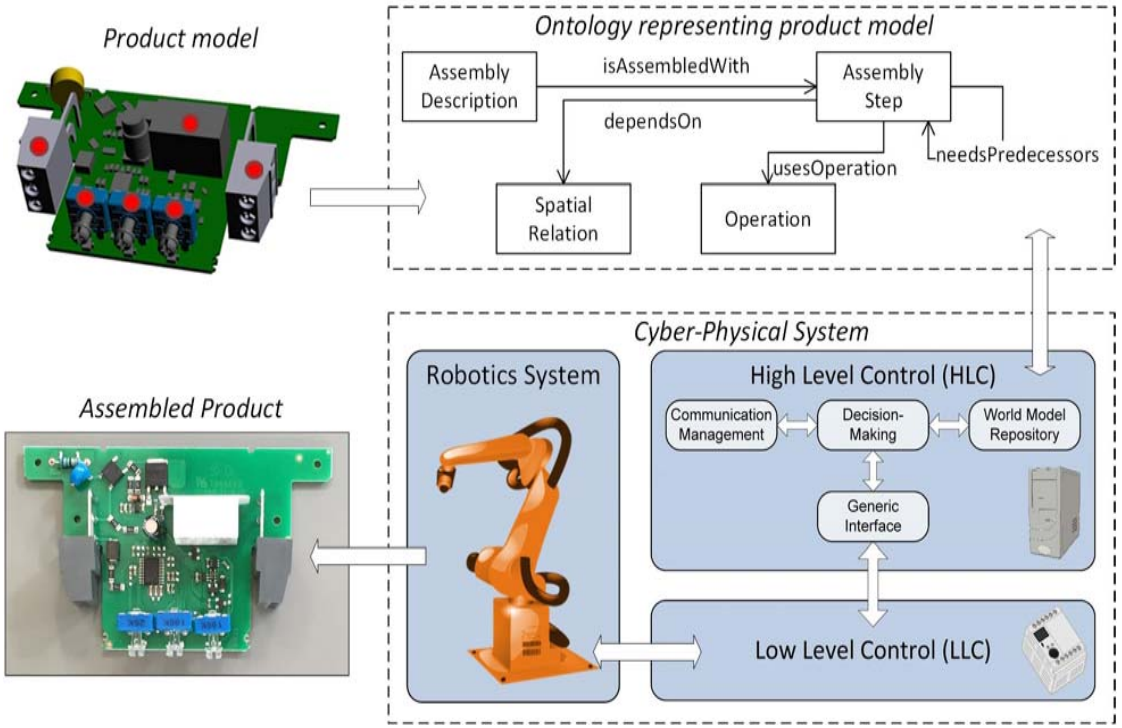
Babitsch MECHANICS
High Quality Solutions

tele

Ing. Eric Dokulil e.U.
Technische Dienstleistungen

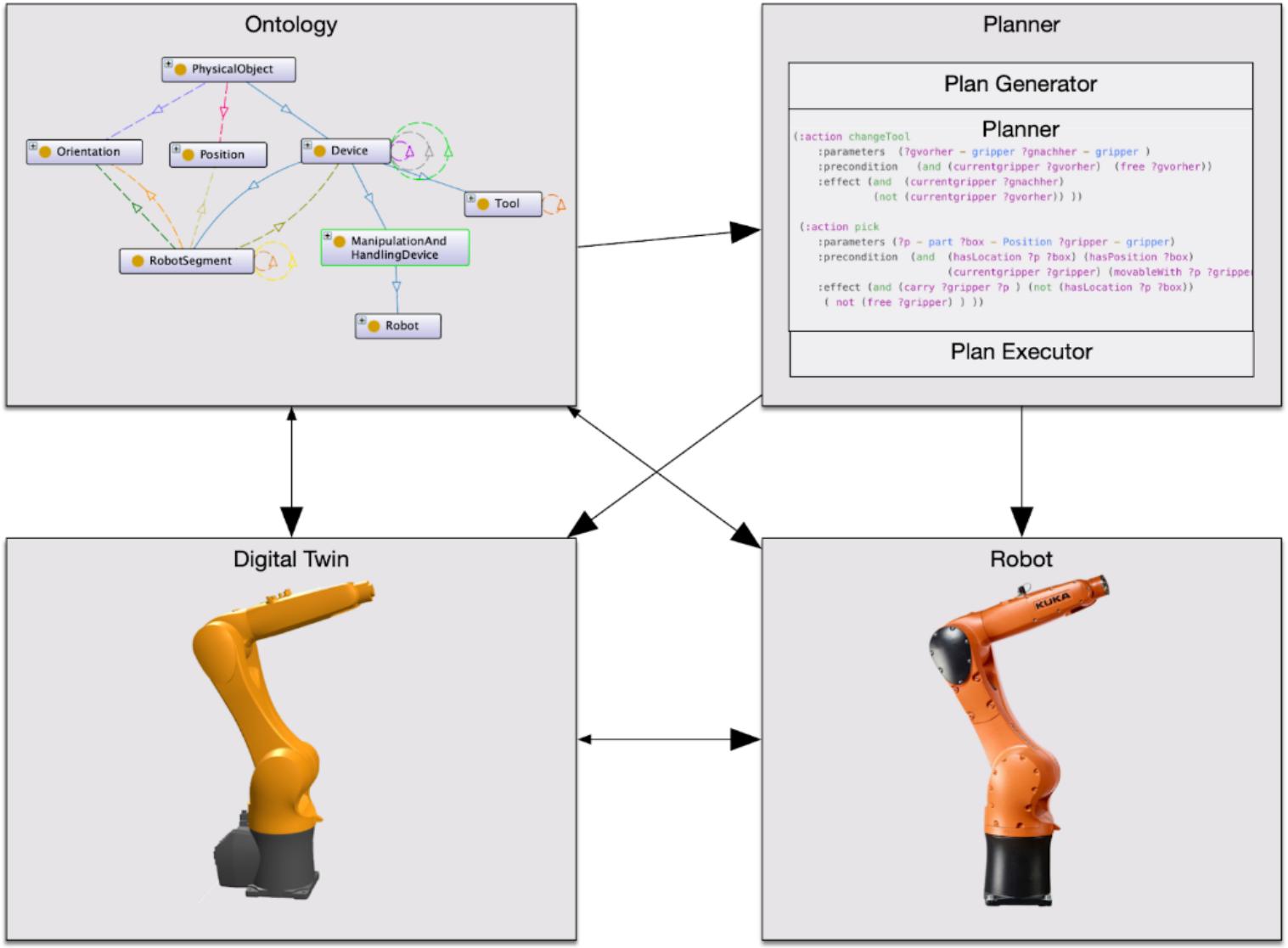
Project KnowDrift

The aim of project KnowDrift is the development of a knowledge-intensive CPS for an automated control, programming, configuration and monitoring of a robotics system:

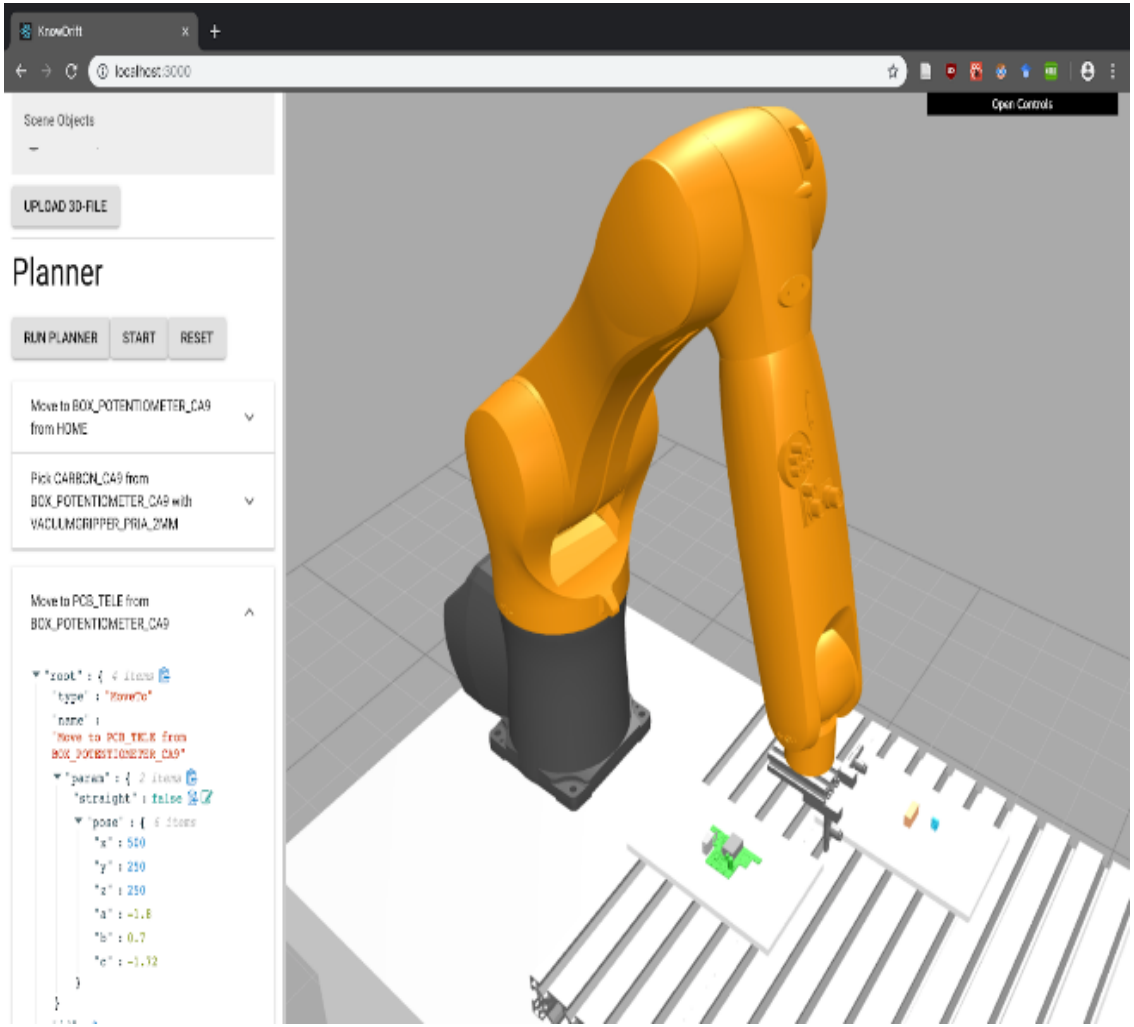


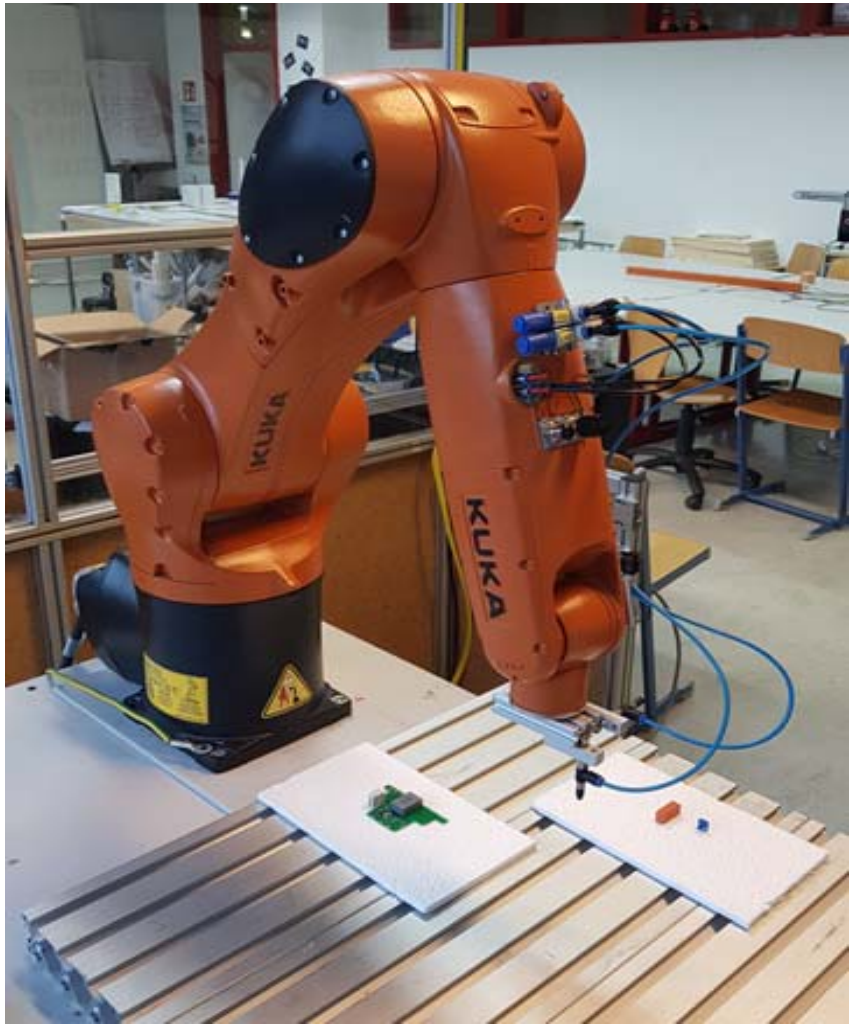
- Usage of an ontology-based product model to extract the production operations from the product design and link particular tasks, to particular resources; and
- a two-layer-based knowledge-intensive CPS control architecture that spreads real-time and reasoning layer with integrated knowledge about own goals, skills and behaviours.

Implemented framework of the Digital Twin



Digital Twin demonstrator application





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COmBINE

Cloud-Based Production Framework for Networked Small and Medium Enterprises

FFG 864798, Produktion der Zukunft, 2018-2020

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FH Vorarlberg
University of Applied Sciences

tele

guh

COPADATA
do it your way

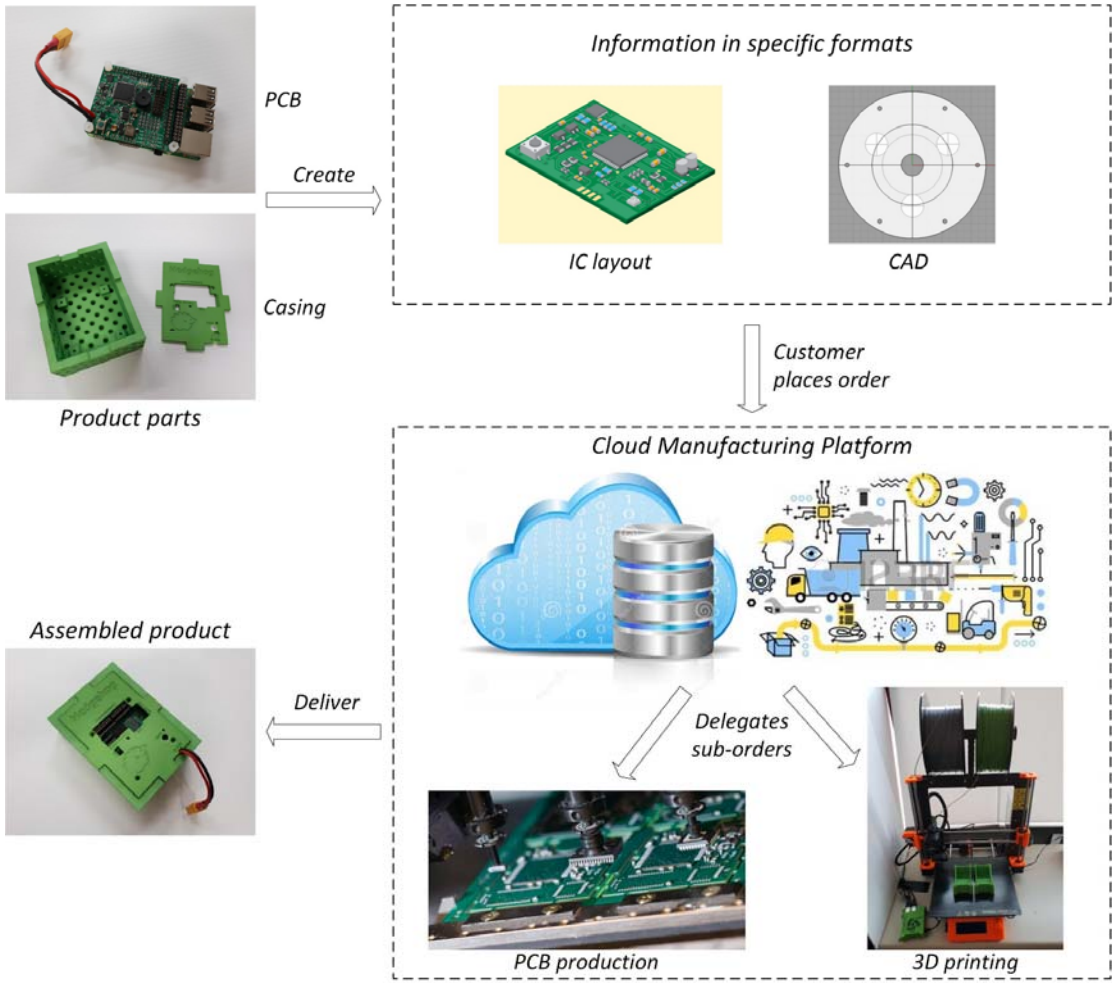
LITHOZ

Stromberger

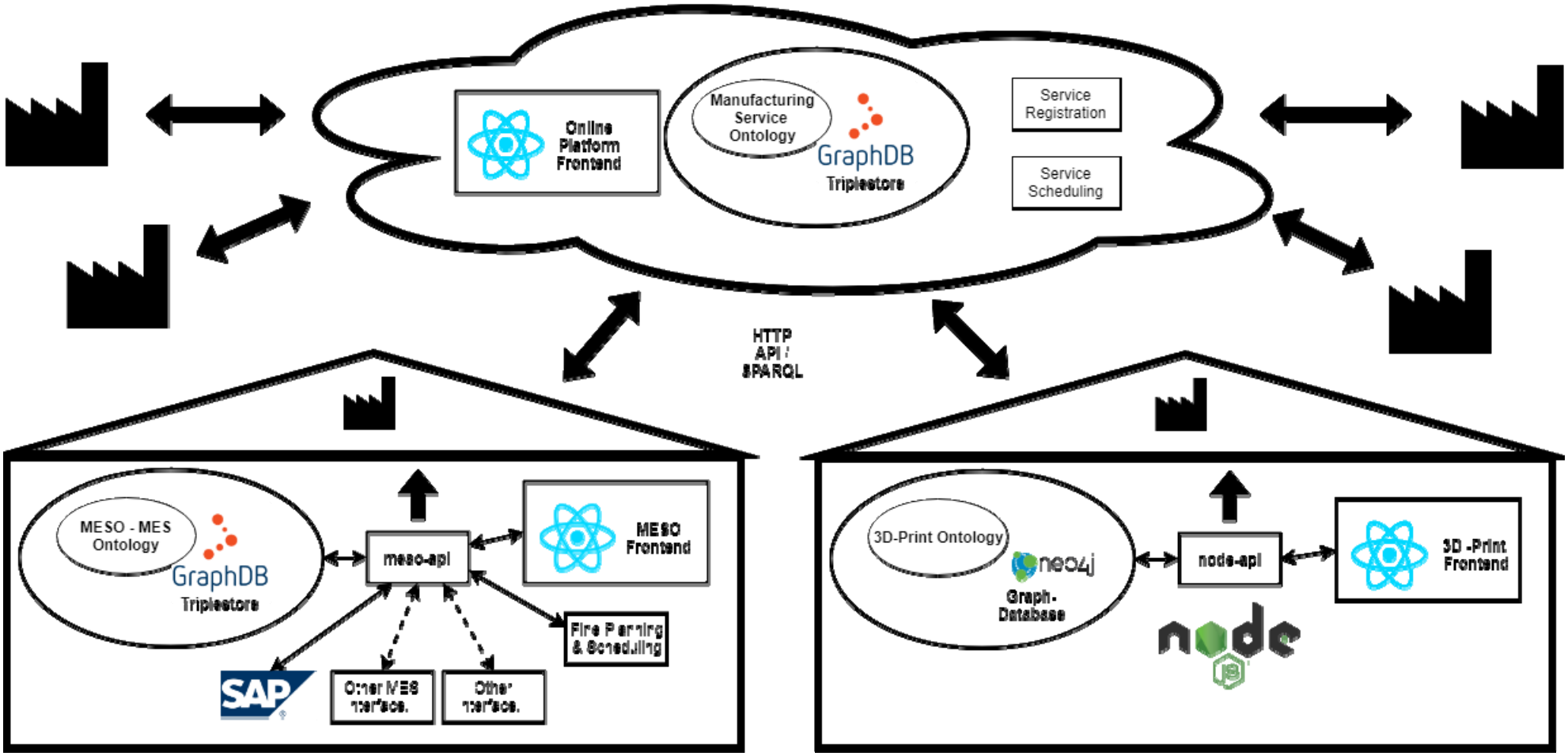
IFT

COmBINE: Motivation

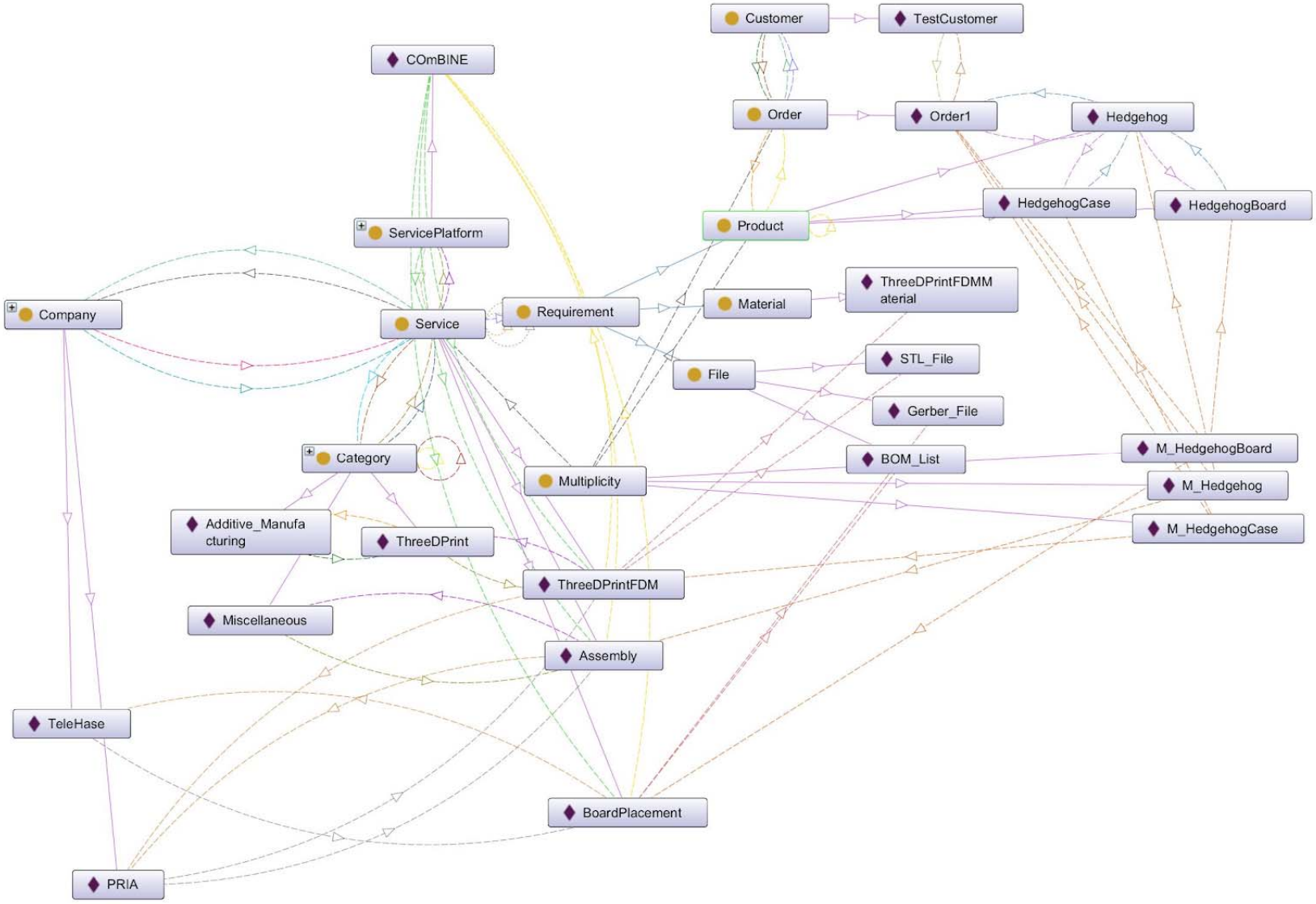
- Cloud Manufacturing System for allocating (sub-)orders to various companies and production facilities
- First use-cases: PCB production, 3D printing



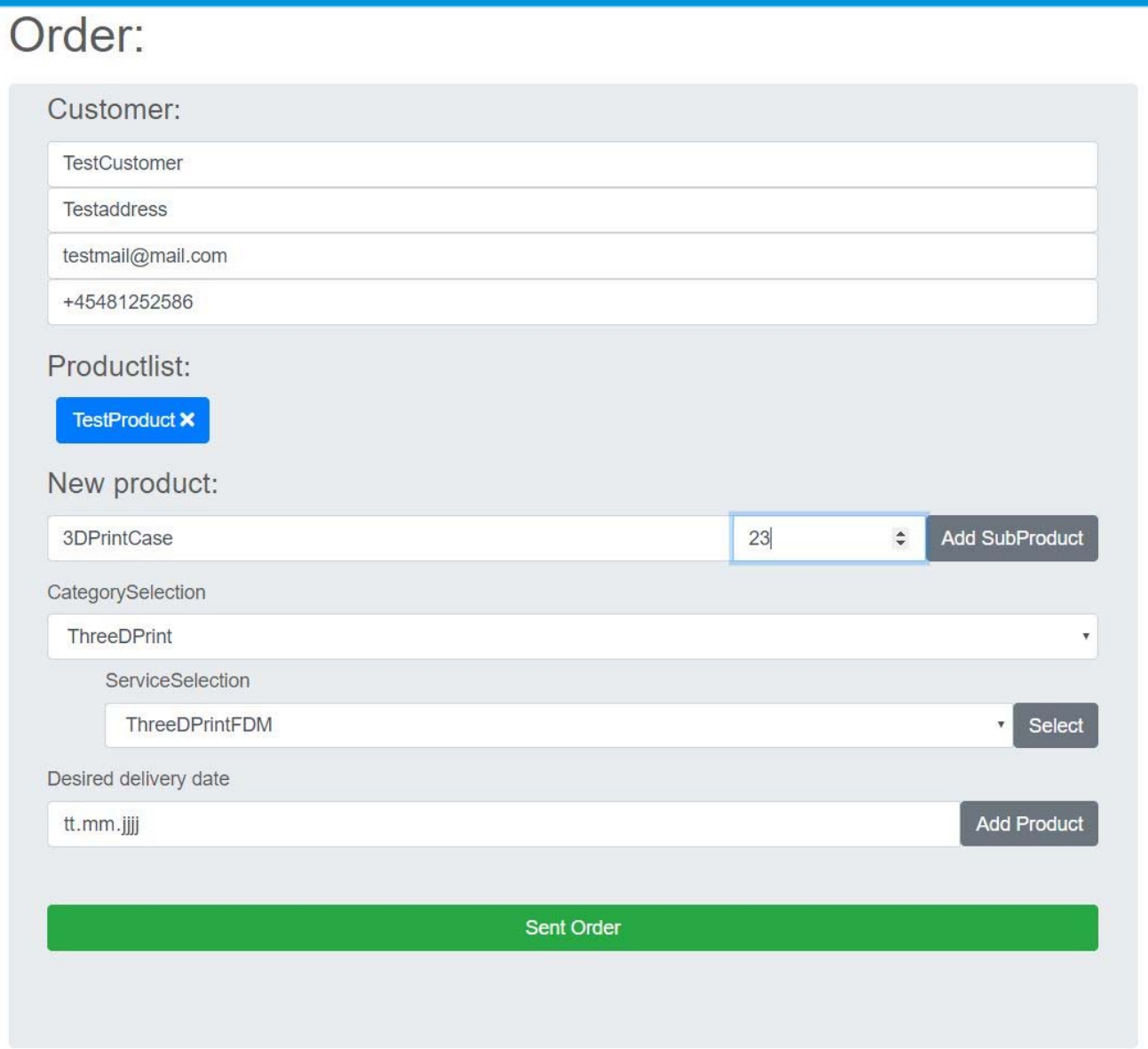
COmBINE: Architecture



COmBINE: Manufacturing Service Ontology



COmBINE: Cloud platform for production ordering



Thanks for your attention!

www.pria.at

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lepuschitz@pria.at