

Resilient, Sustainable, Future-oriented Production Level 4 stands for the production of tomorrow

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smartFactory^{KL}

IFS Innovative
Fabriksysteme

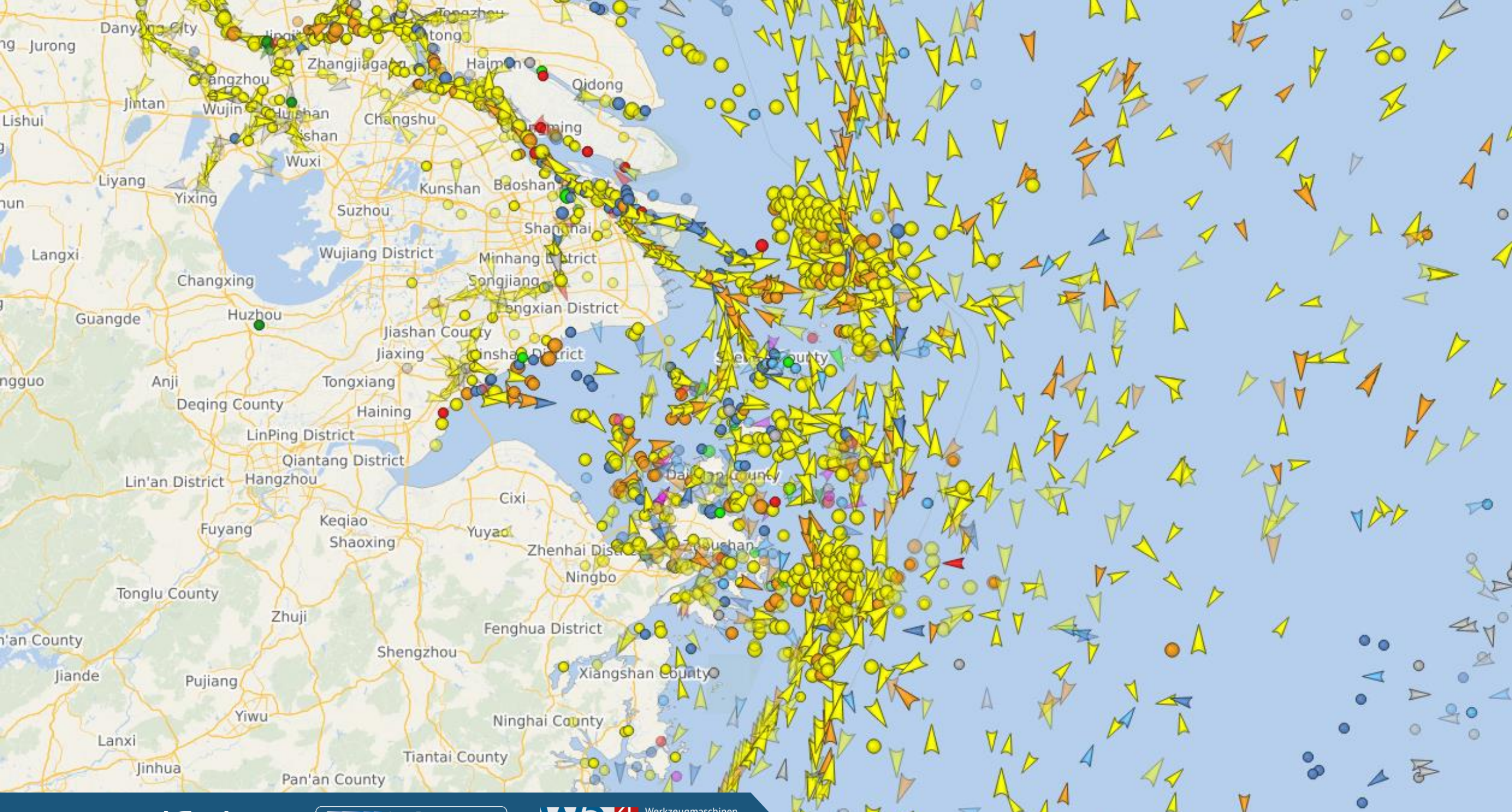
WS KL Werkzeugmaschinen
und Steuerungen
TU KAISERSLAUTERN



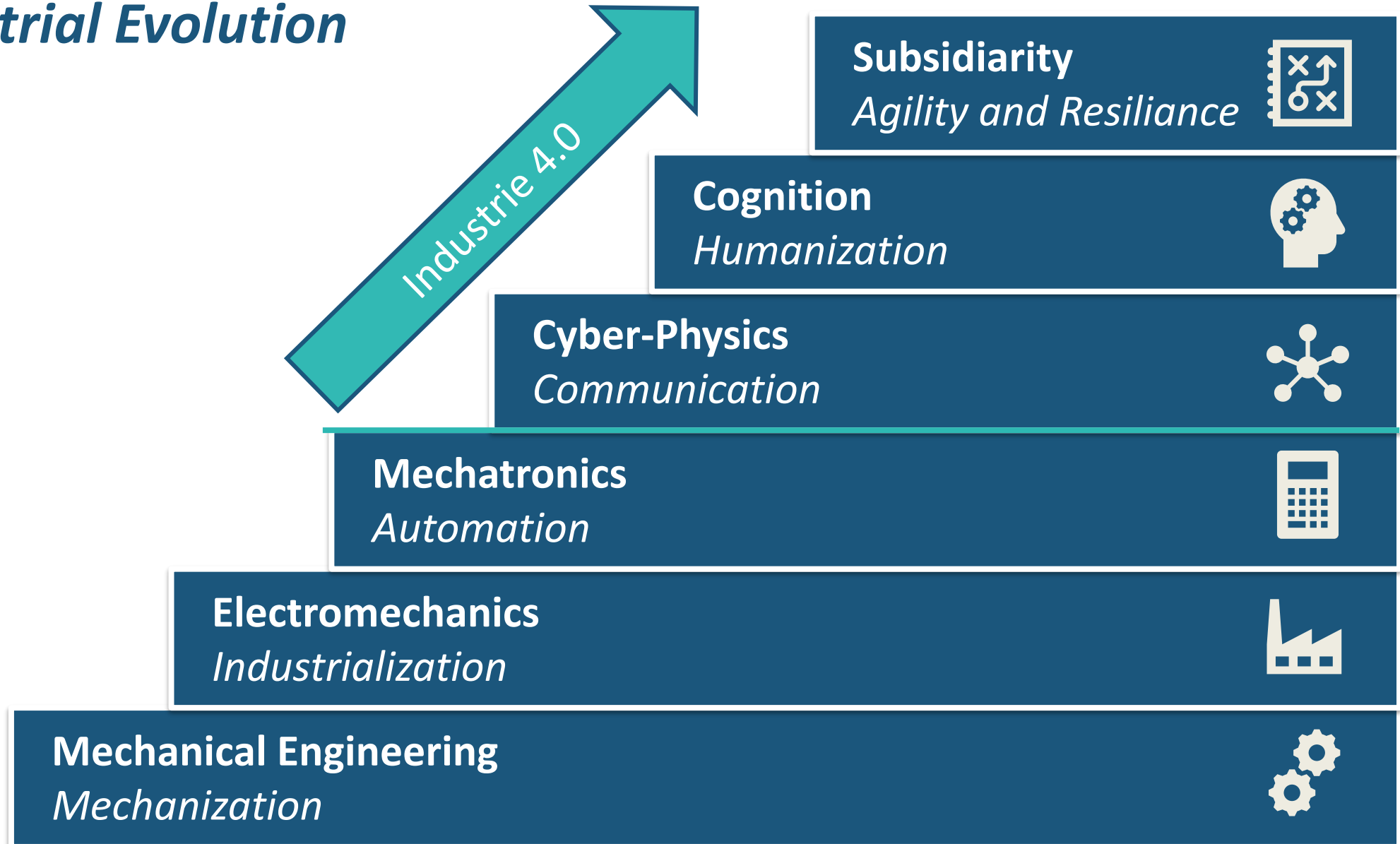
**Production
Level 4**







Industrial Evolution



Industrial Evolution

Production Level 4

Electromechanics
Industrialization

Mechanical Engineering
Mechanization

Subsidiarity
Agility and Resilience

Cognition
Humanization

Cybernetics
Communication





Layered Automation Structure

Field bus

State machine

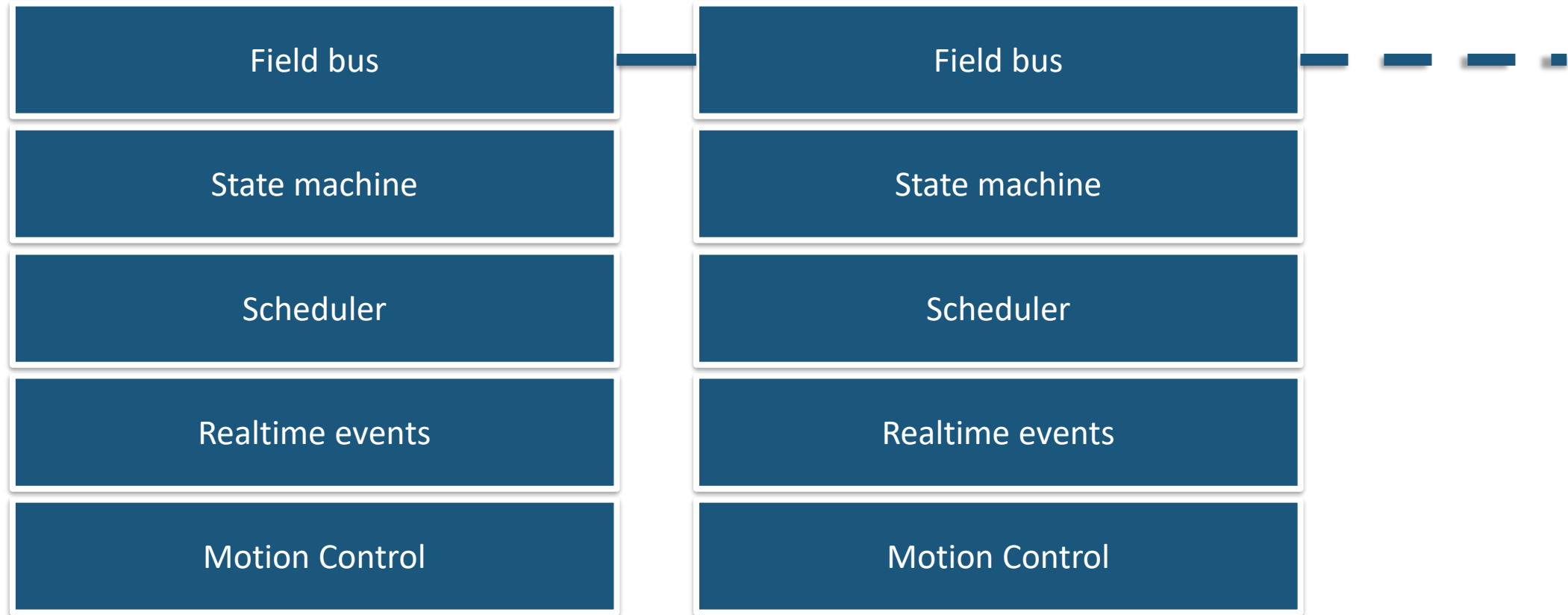
Scheduler

Realtime events

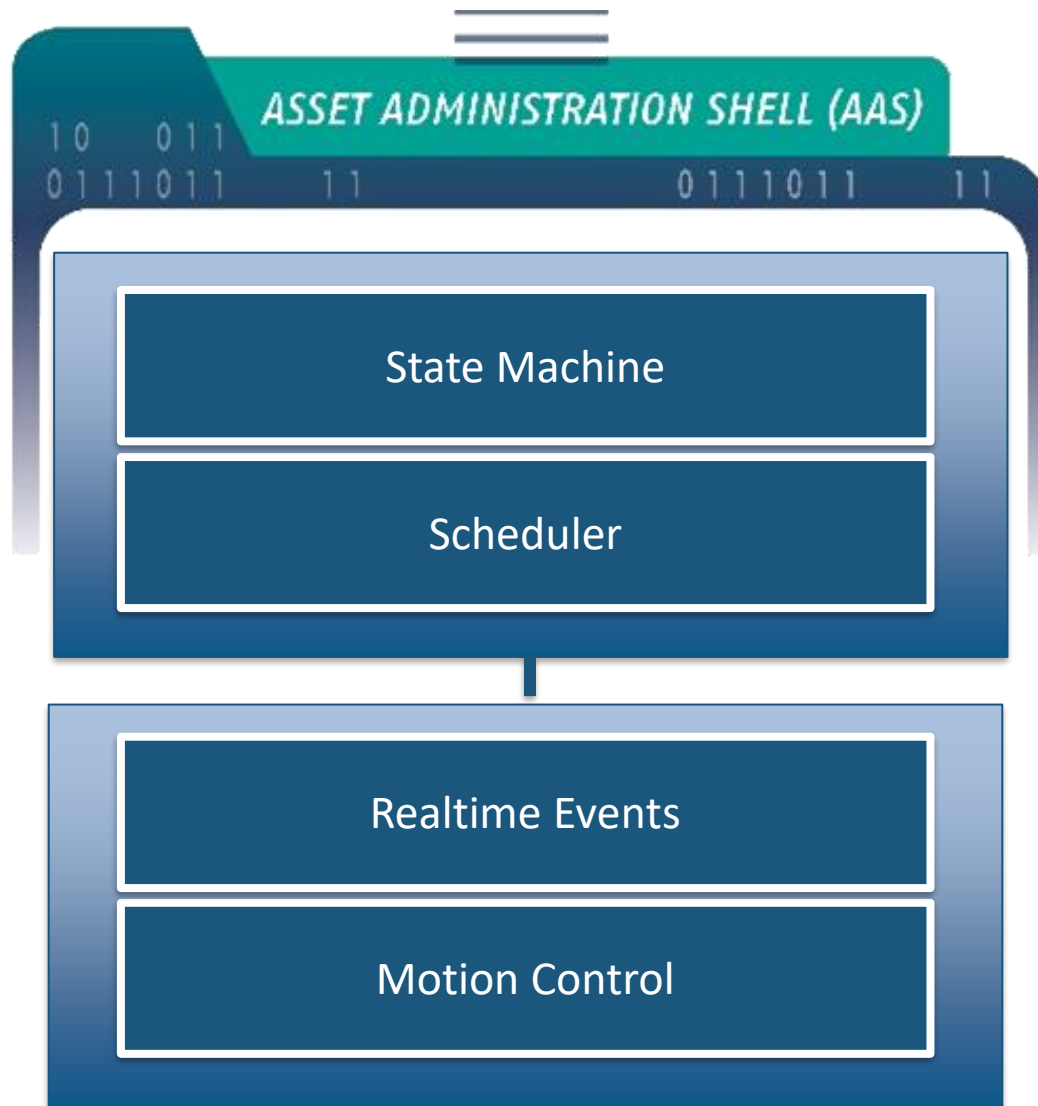
Motion Control



Layered Automation Structure

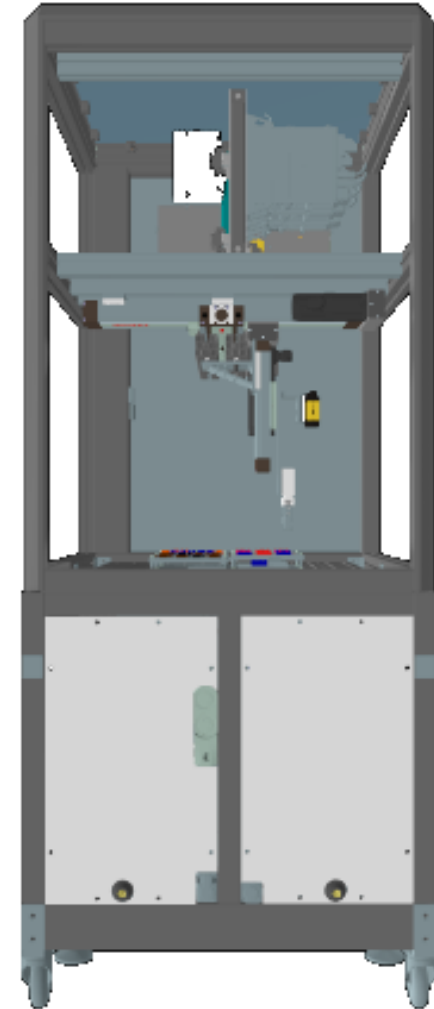


Production Level 4 Structure

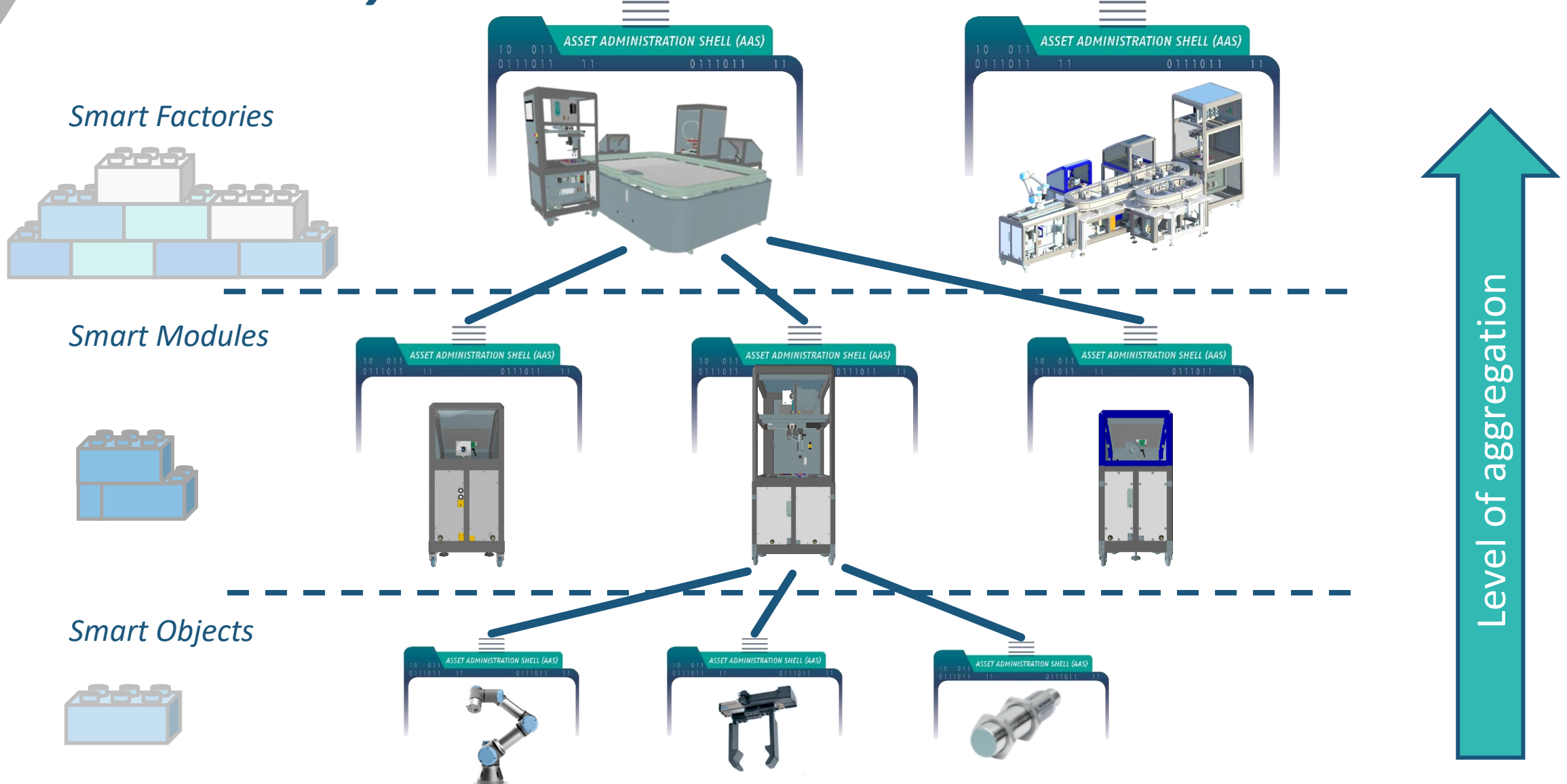


Soft Real Time
Virtualized

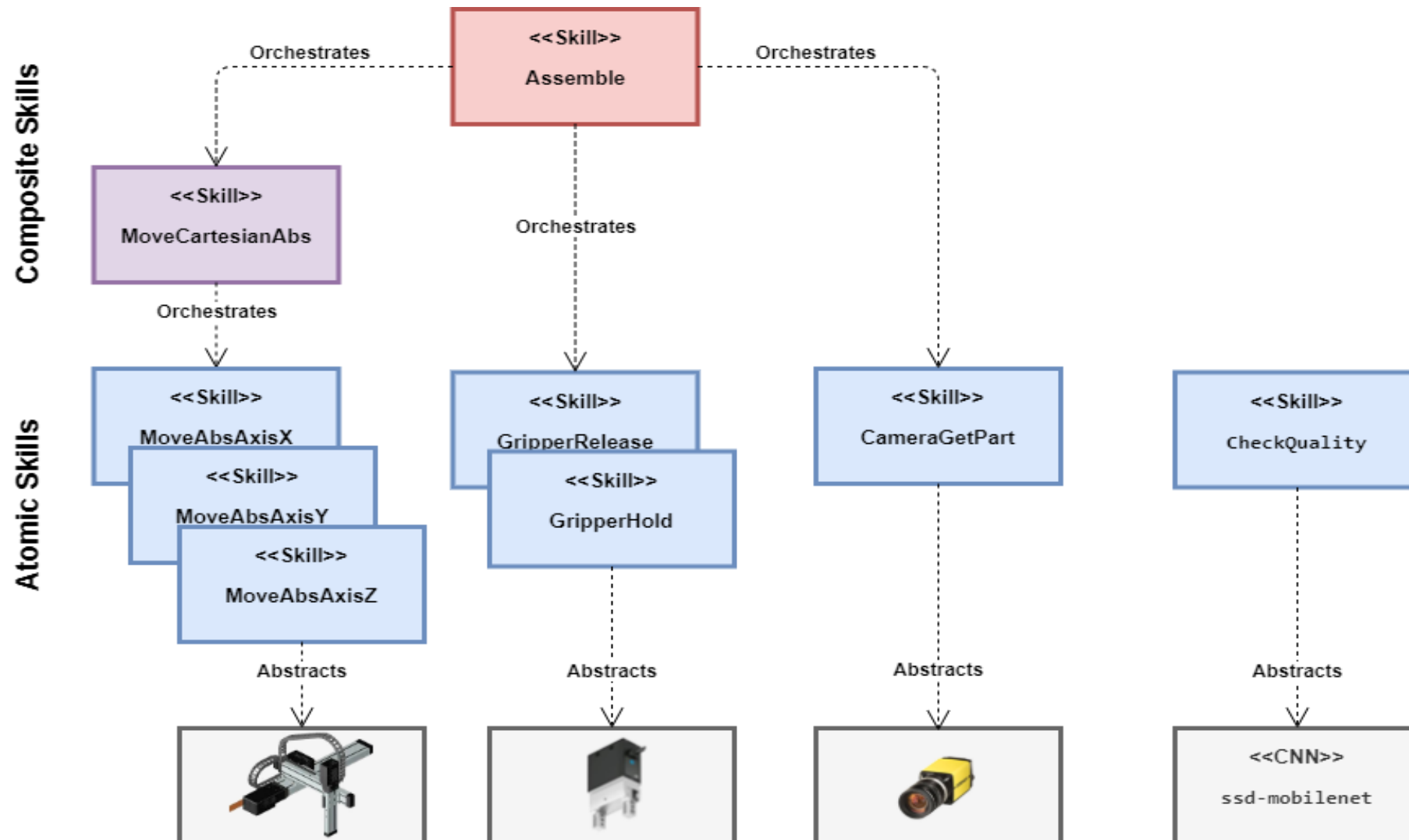
Hard Real Time
PLC/Drive



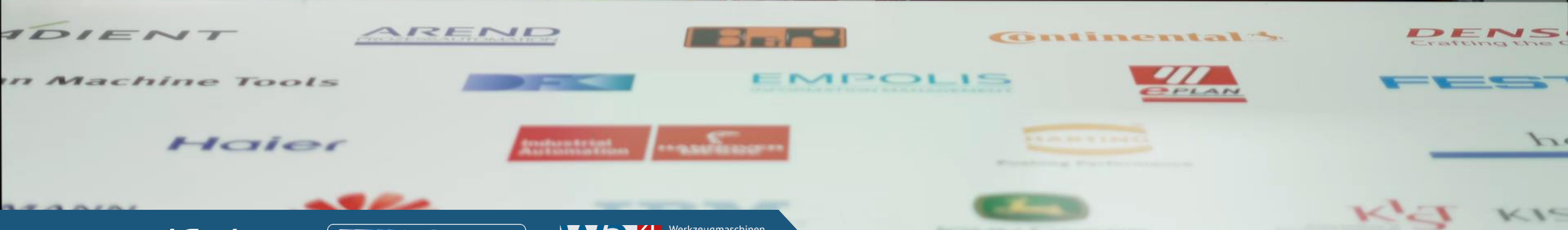
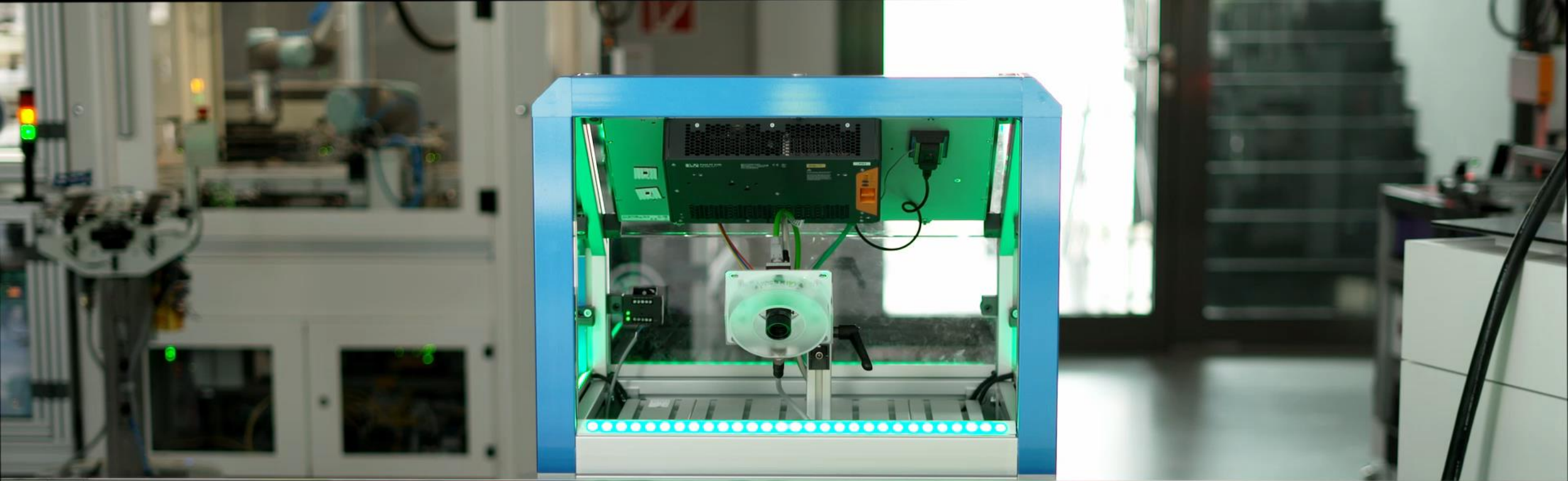
SmartFactory Architecture



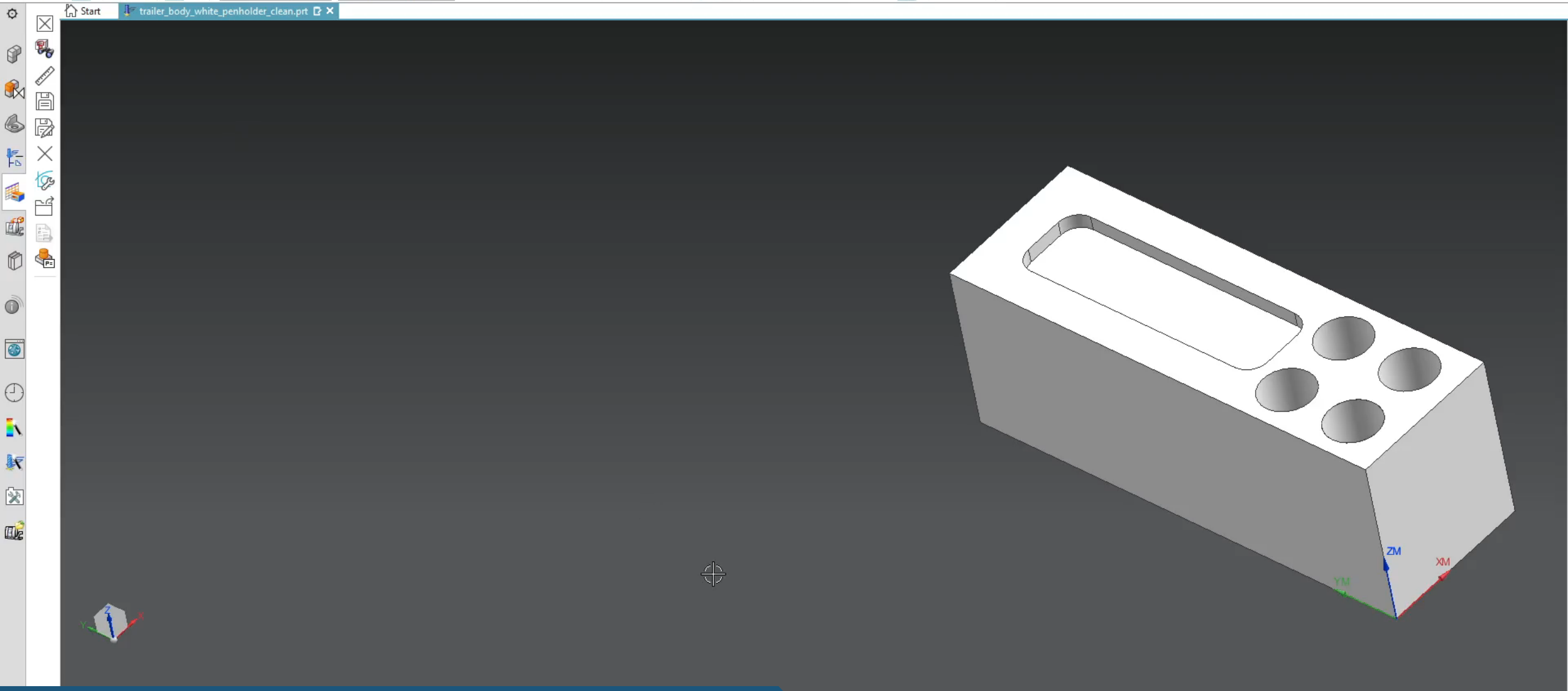
Agents with Composite Skills



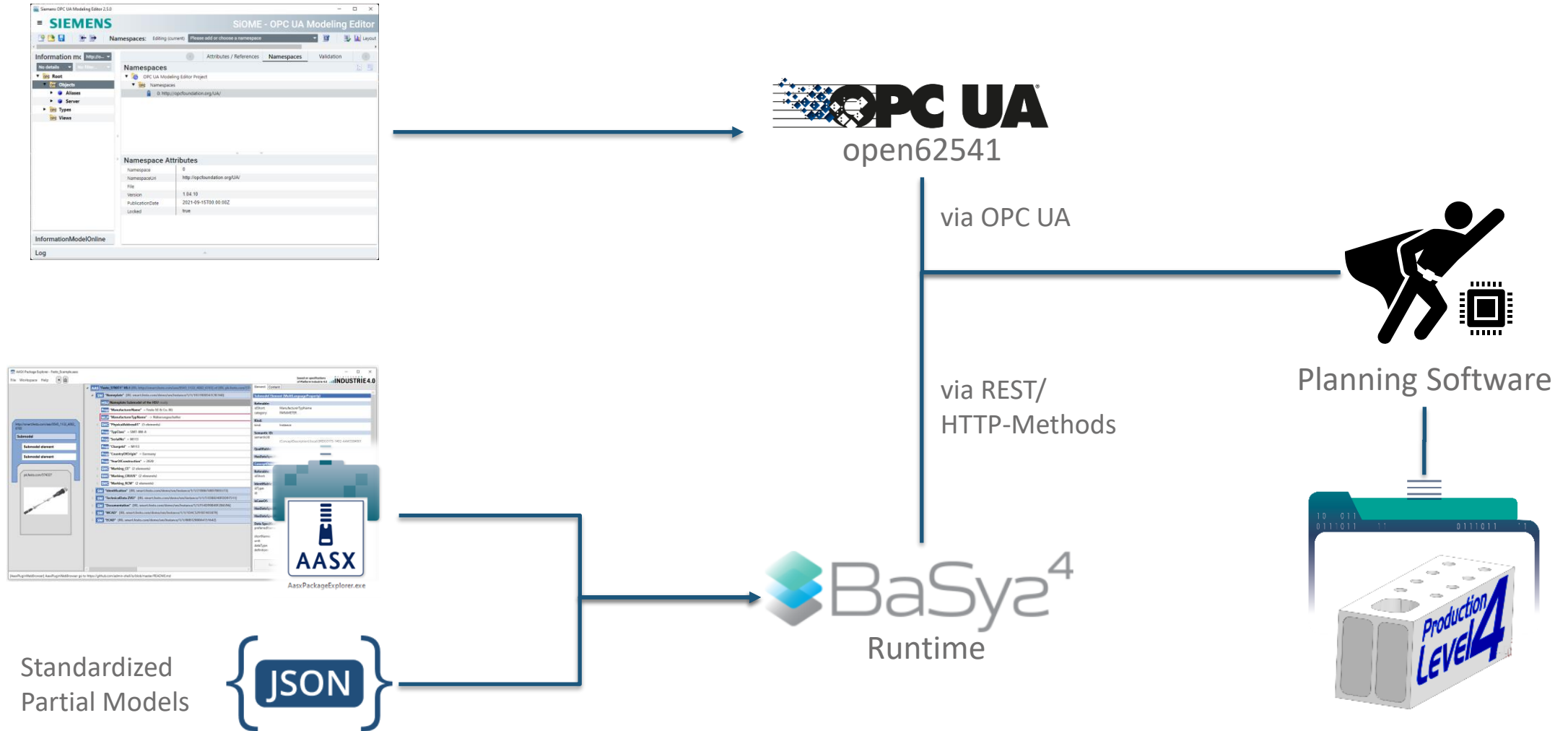




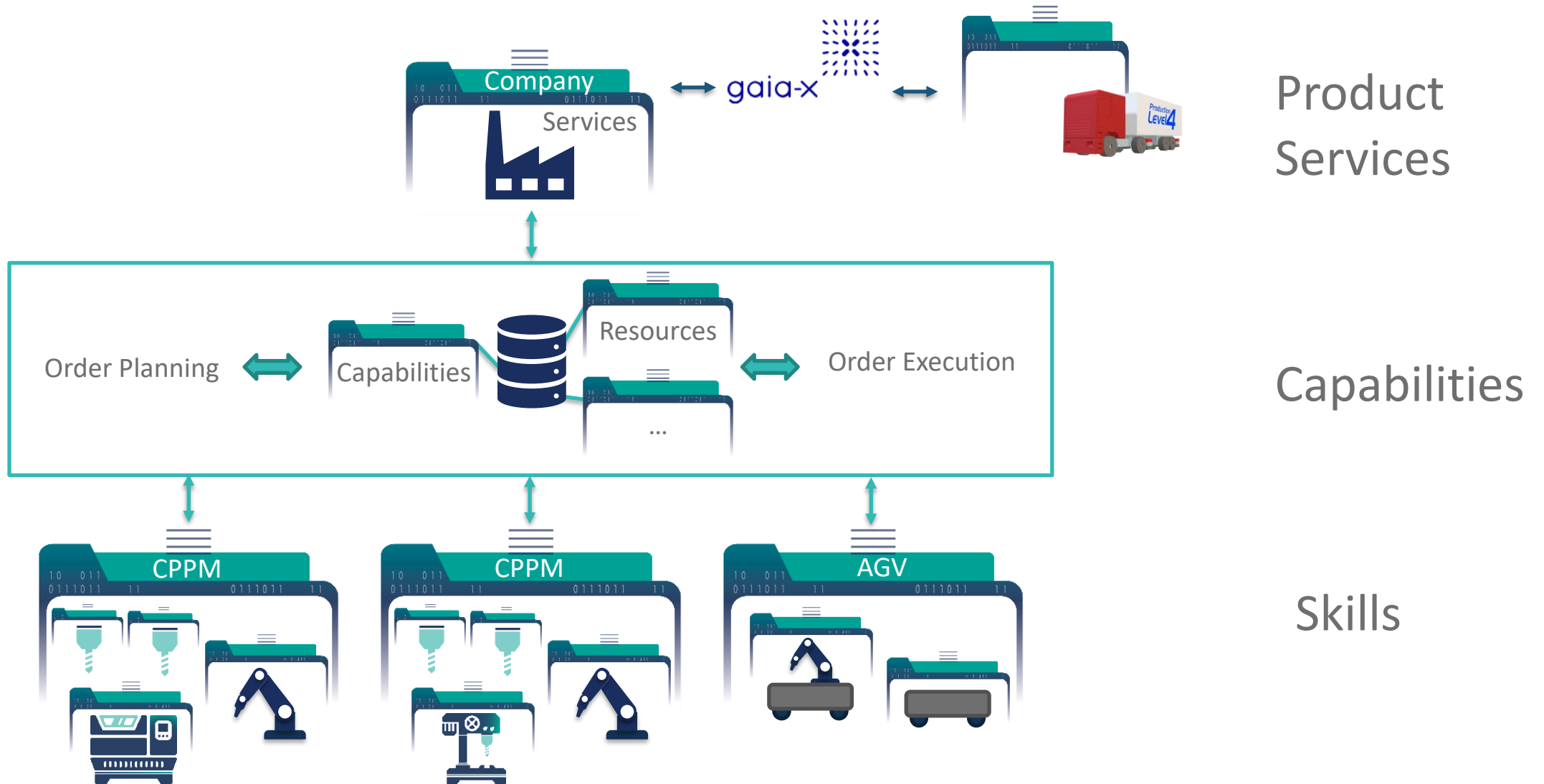




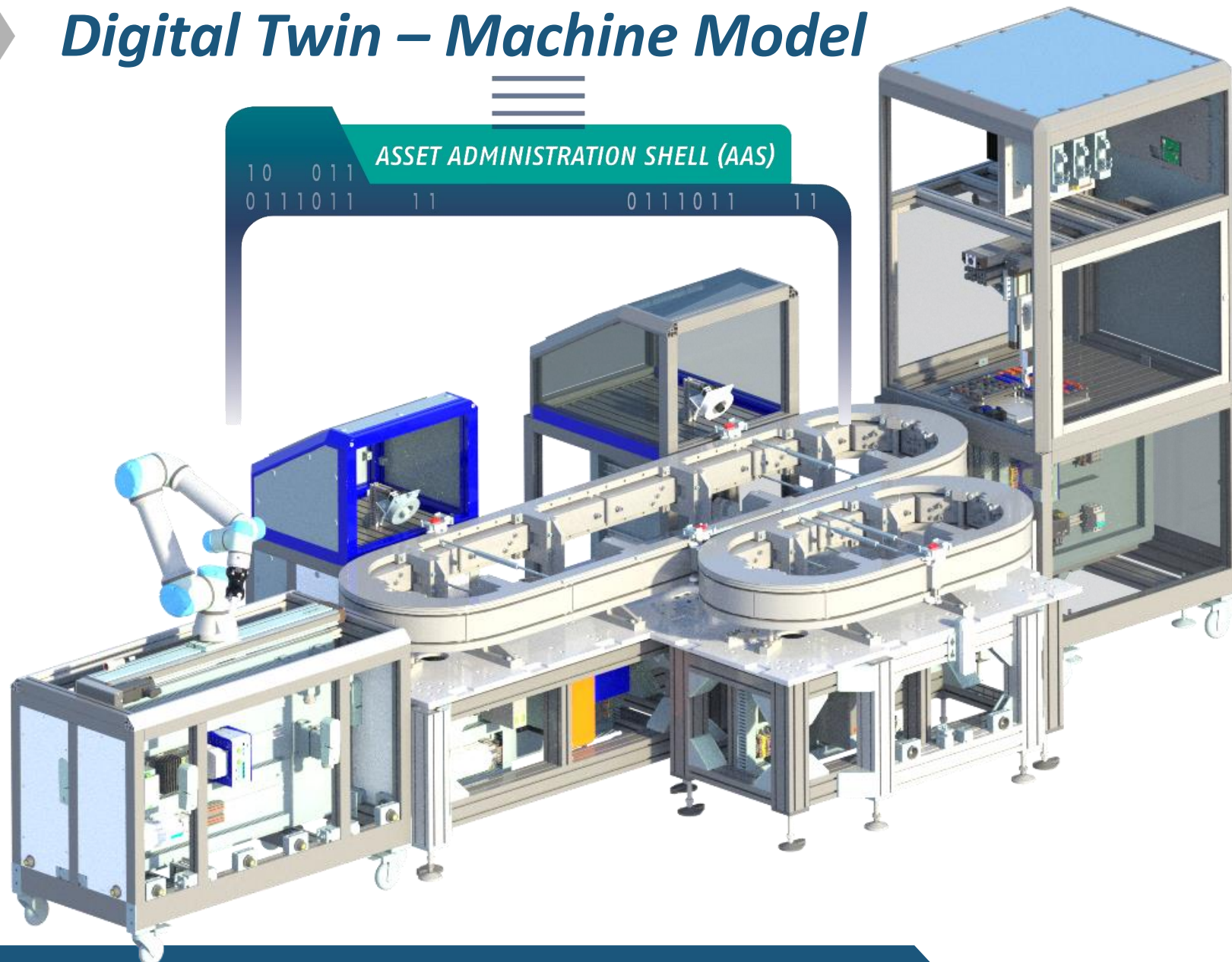
Interoperation of Asset Administration Shell and OPC UA



14.0 Reference Architecture

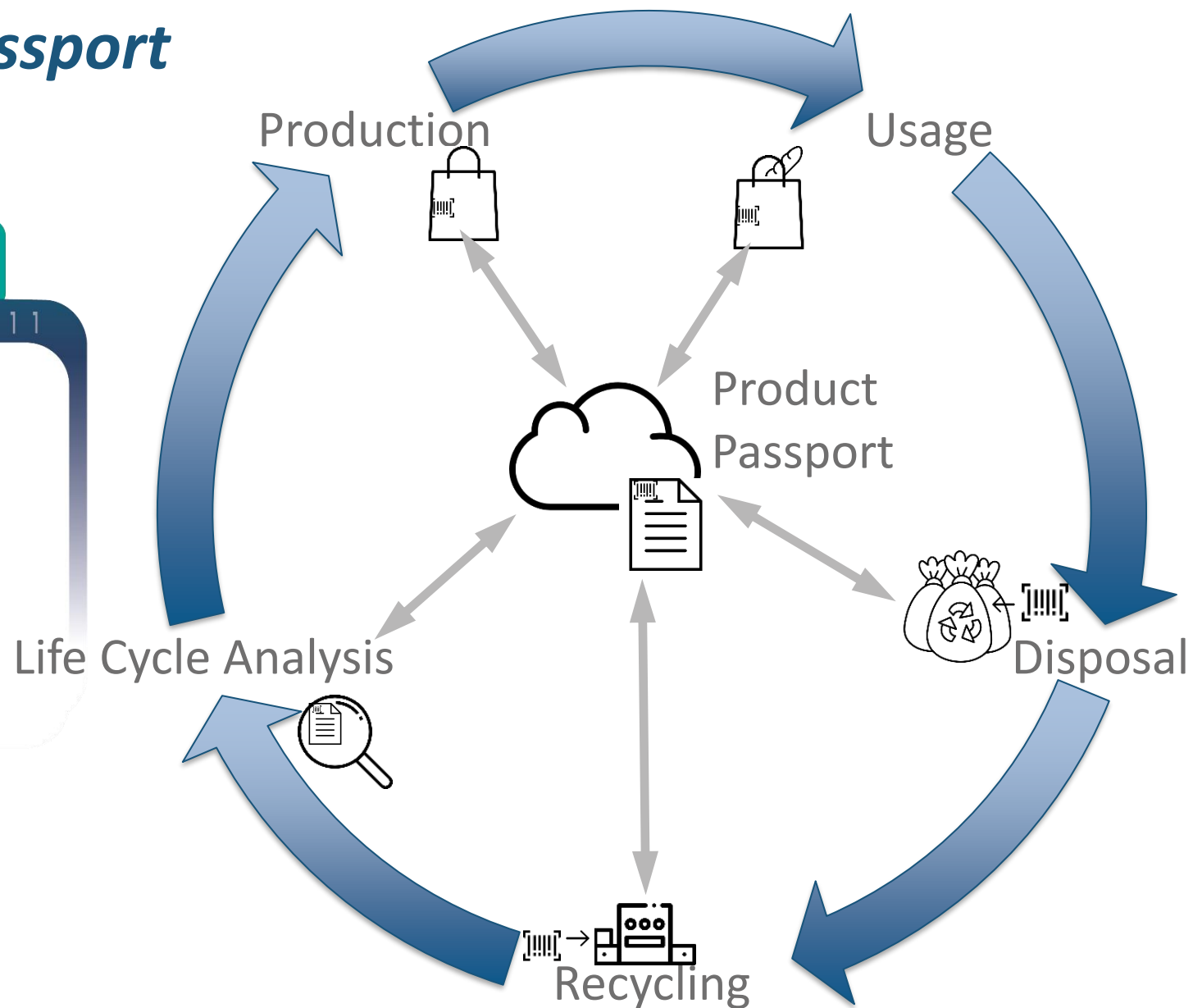


Digital Twin – Machine Model

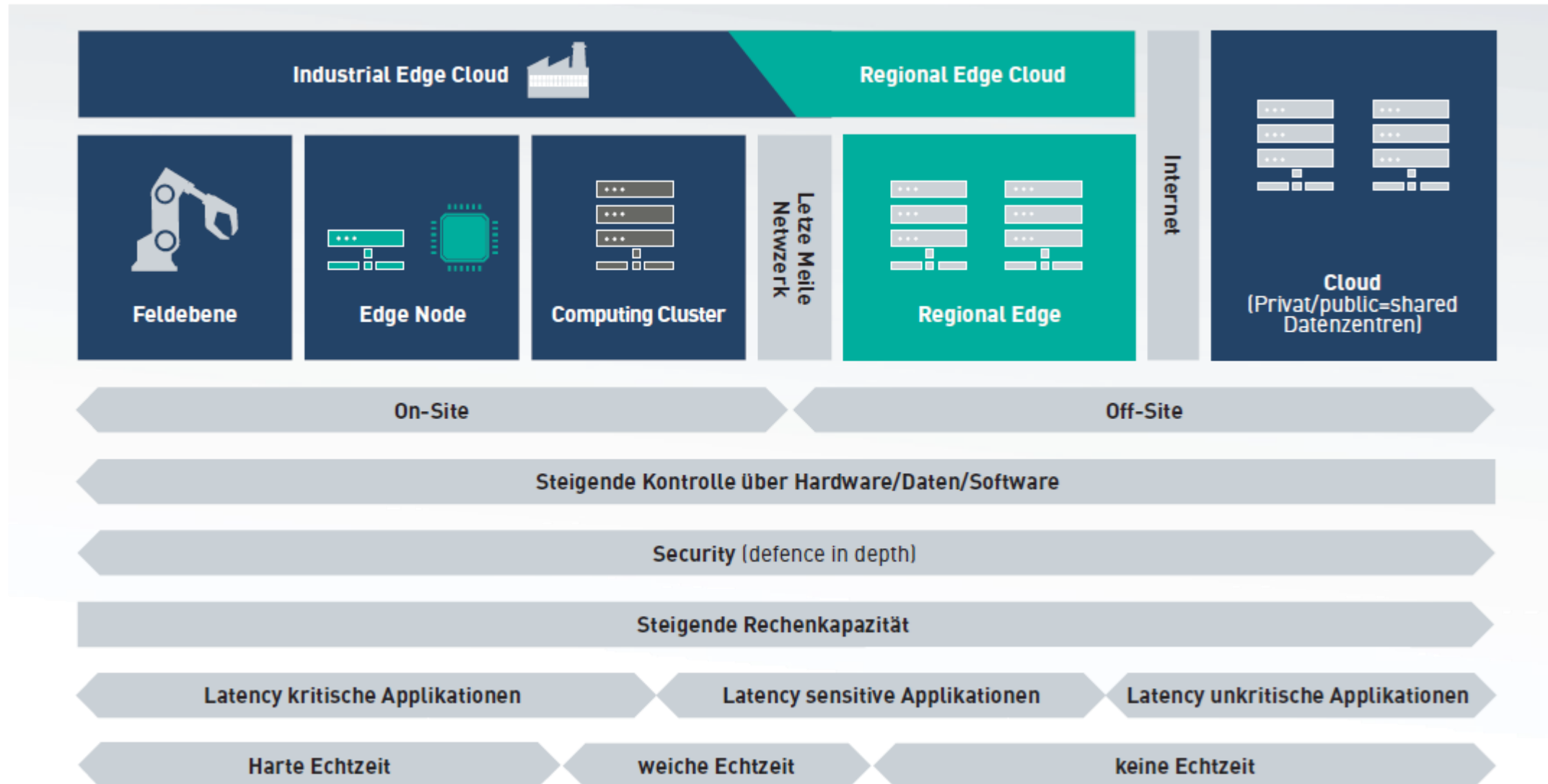


- Asset Administration
- Skill Interface
- Status Display
- Simulation
- Virtual Commissioning
- Material Tracking
- Efficiency
- ...

Digital Twin – Product Passport



Industrial Edge Cloud





The Development of SmartFactory^{KL}

TECHNISCHE UNIVERSITÄT
KAISERSLAUTERN



Founding
(7 Members)



I40 Demonstrator



Mittelstand 4.0
Kompetenzzentrum
Kaiserslautern



Mittelstand-Digital
Zentrum
Kaiserslautern



_JAVA



_KUBA



_MILOS

2005

2011

2014

2016

2019

2020

2021

2022



Cyber-
Physical
Systems



AI in
Production

Production
Level 4

Vision
2025

gaia-x

SHARED
PRODUCTION
Kaiserslautern

Members of SmartFactory^{KL}



DAIMLER TRUCK

Doosan Machine Tools



EMPOLIS



Pushing Performance

helbling



As of 1st August 2022

Knowledge and Technology Transfer

Research

TECHNISCHE UNIVERSITÄT
KAISERSLAUTERN



Real-world Problems



Future Key
Technologies

Working
groups

From Research to Application

smartFactory^{KL}

