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The joint research project “Bauen 4.0”

Towards more sustainability und productivity on construction sites

ESI Live // 4th November 2021

Outline

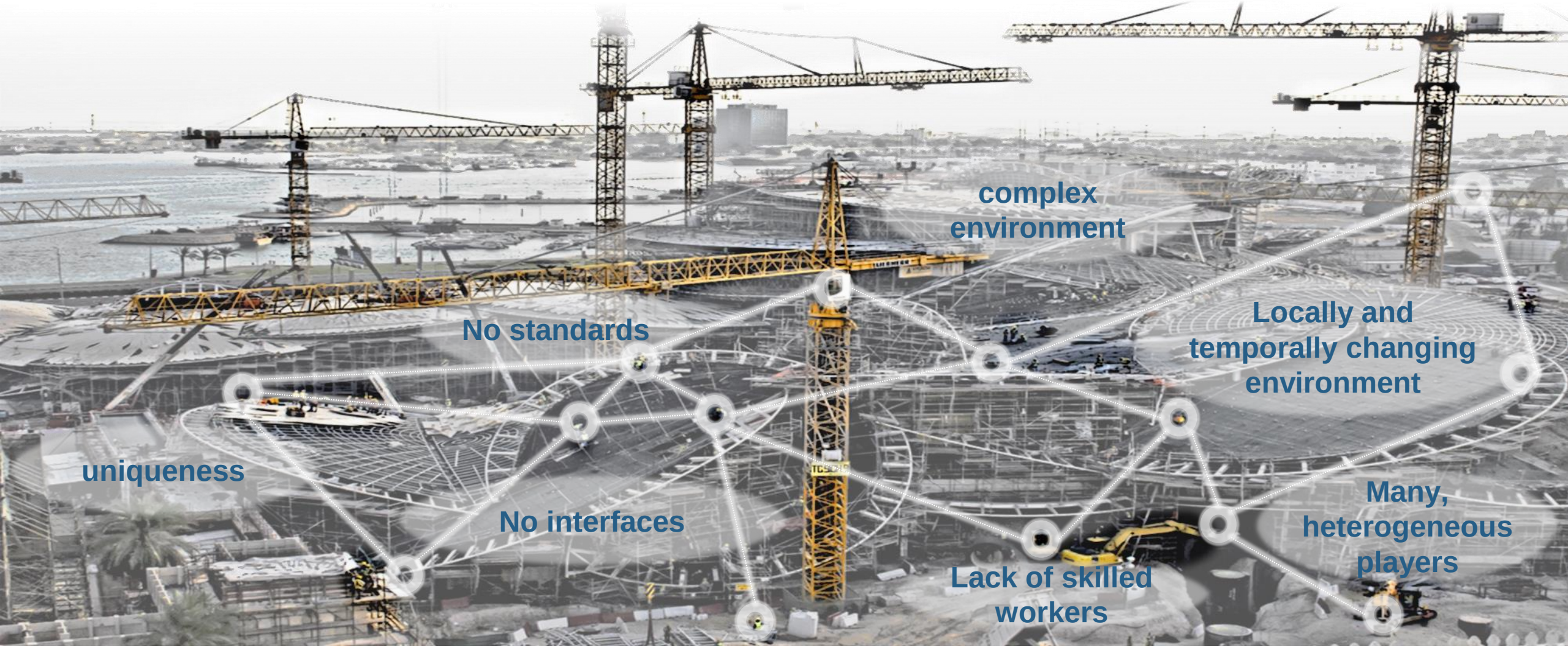
1. Overview
2. Demos
3. “Bauen 4.0” solutions
4. Outlook

Project Partners and organizational framework

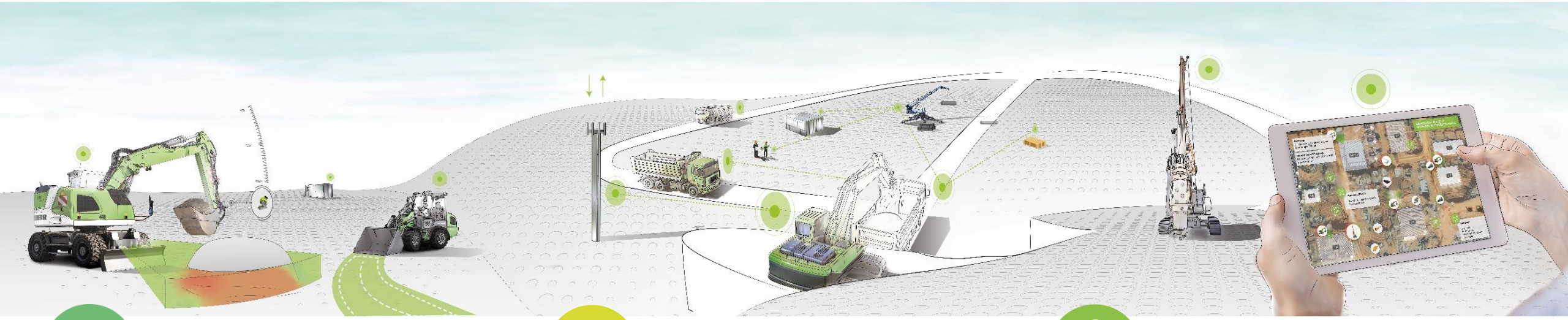
Facts and Figures:

- Funding BMBF – Project Management Agency Karlsruhe – INKOWE program
- Duration July 2019 – ~~July 2022~~ extended to December 2022
- 22 industrial partners, 2 universities
- Accompanied by various associations
- Total costs 10 Mio. € / 5 Mio. € funding

Construction site challenges



The main topics



Automated, connected mobile machines

- **Automation**
- **Assistance functions**
- **Remote control**
- **Environment recognition**
- **Vertical Integration**

5G machine and construction site connectivity

- **Connectivity Solutions**
- **Cloud Technologies**
- **Reliable and secure data exchange**

Processes and solutions for the digital construction site

- **Tracking & Tracing**
- **Simulation of construction processes**
- **BIM to BIMsite**
- **Driver guidance system 4.0**

Integration of main topic solutions into a common construction demo scenario – end of project demonstration

2 Demos

Demos within the main topics

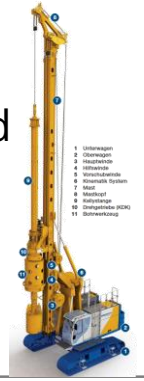
Vertical Integration via OPC UA

Automated, connected mobile machines

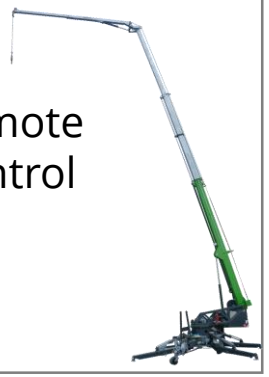
- Automated digging
- Automated tool change
- Detection “as built” condition

- Automated driving
- Environment recognition

- Automated processes



- Remote Control

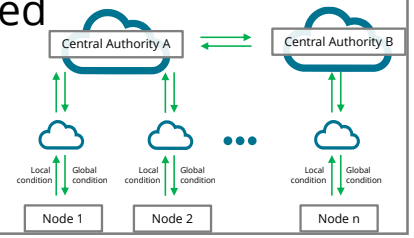


5G machine and construction site connectivity

- Mulit-Connectivity modul: WiFi, 5G, 4G, BLE…

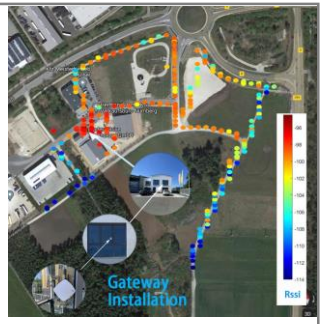
- Construction Site Networks: WiFi, 5G Campus

- Distributed Cloud Services



Processes and solutions for the digital construction site

- Tracking & Tracing of Material via LPWAN



- Process optimization and progress prediction using simulation and machine data (e.g. with ISO 15143-3 data via OPC UA)

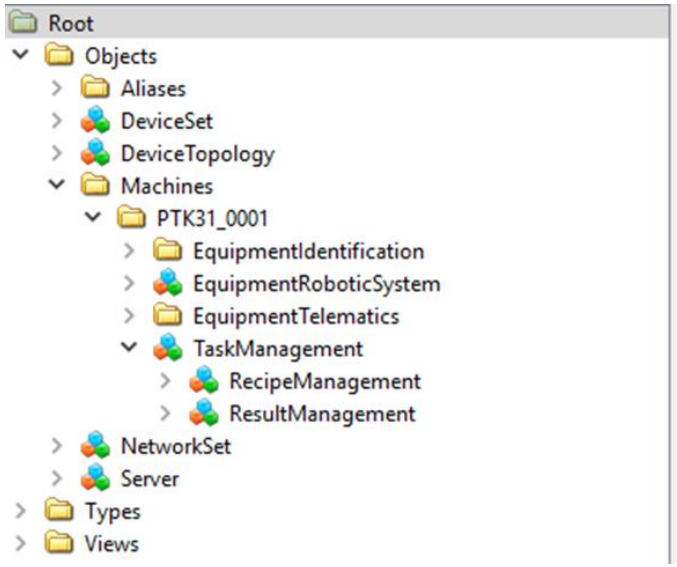
- AR-based driver assistance: Visualization via HoloLens

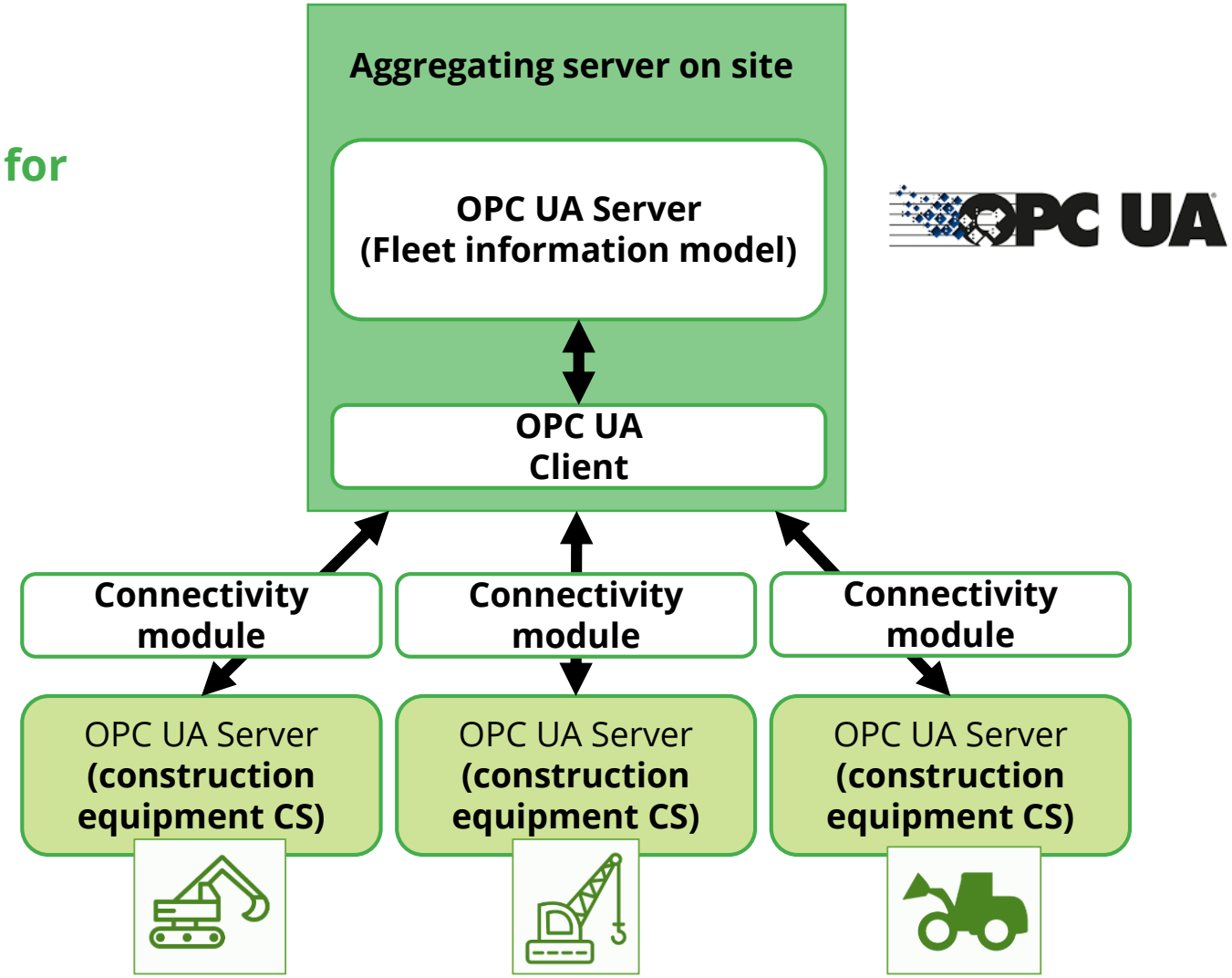
Demo Scenario at project end – 28th September 2022

3 „Bauen 4.0“ solutions

OPC UA-based Bauen 4.0 architecture

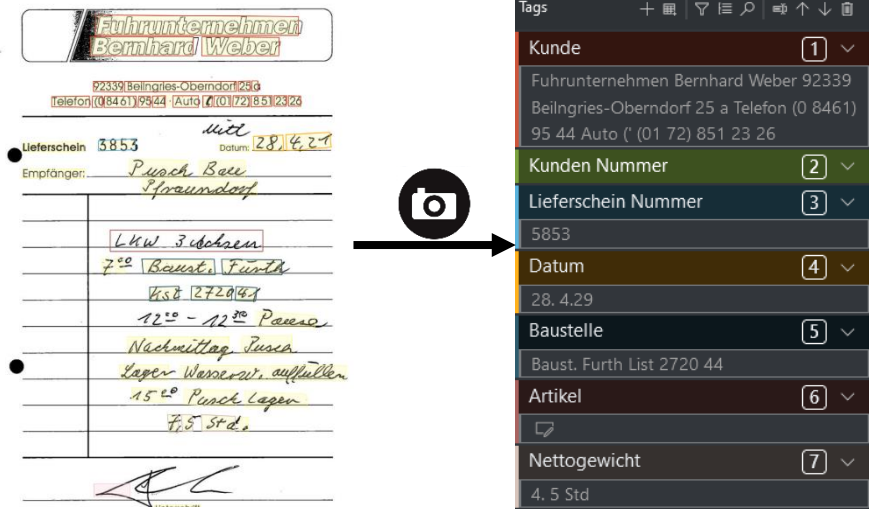
- **OPC-UA data model and communication protocol**
- **Specification for interoperable data model for construction equipment**
  - machine identification
  - basic Telematics data
  - kinematic data & robotic interface
  - task-management



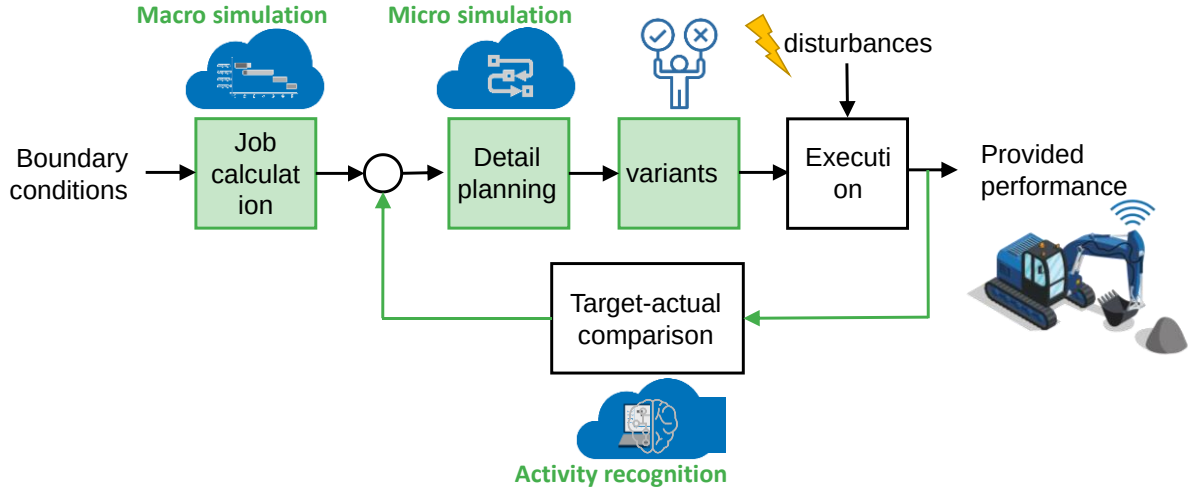


Developed solutions in main topic 1

Tracking & Tracing



Process simulation

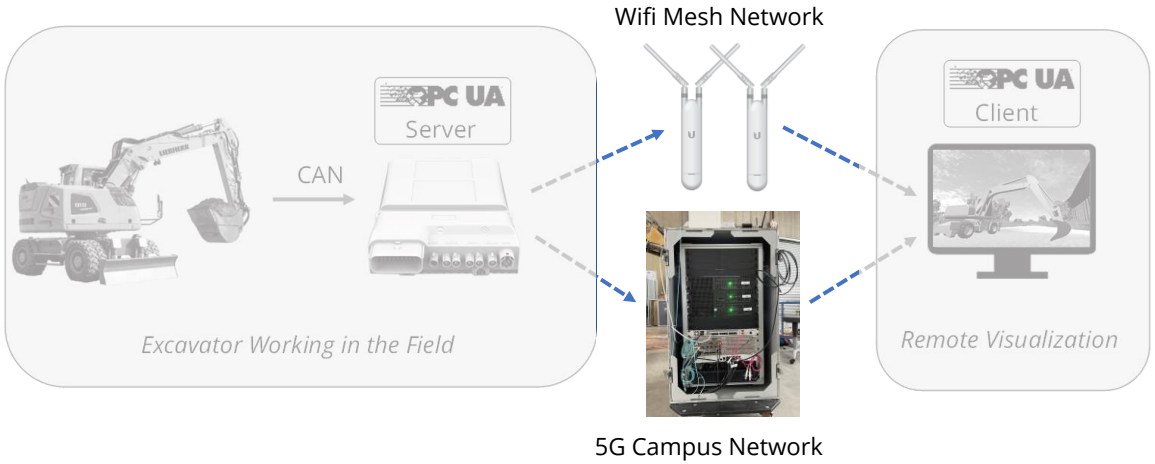


Driver guidance

BIMsite

Developed solutions in main topic 2

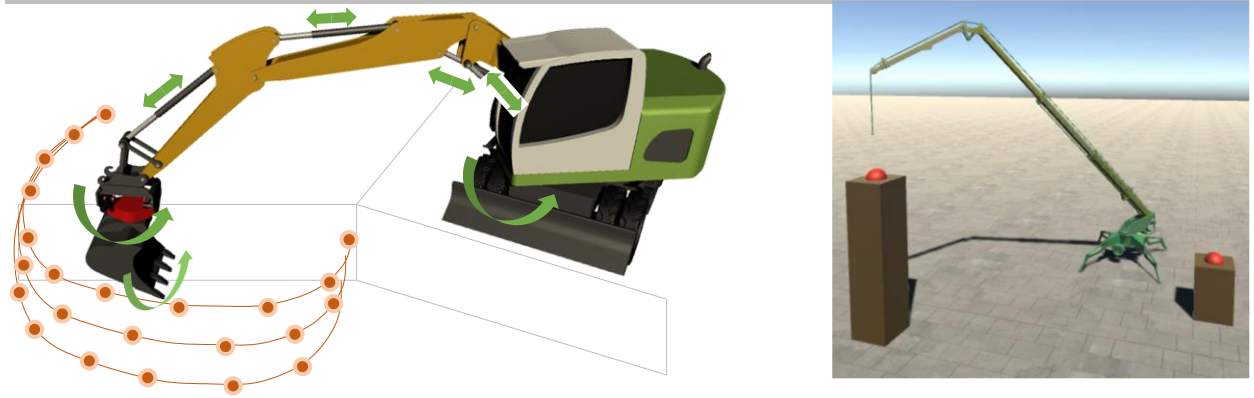
5G Campus and multi-connectivity



Special 5G connectivity modul

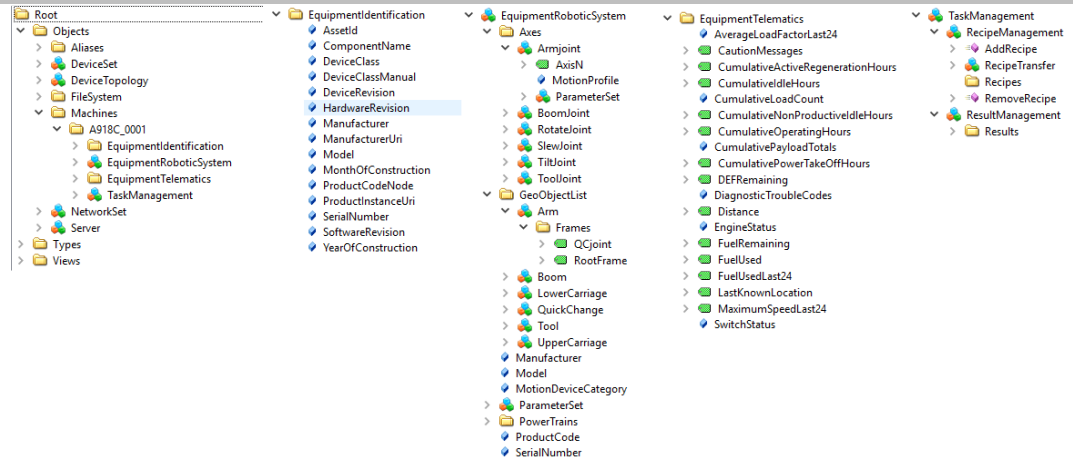
Developed solutions in main topic 3

Trajectory planning and machine automation



ambient detection

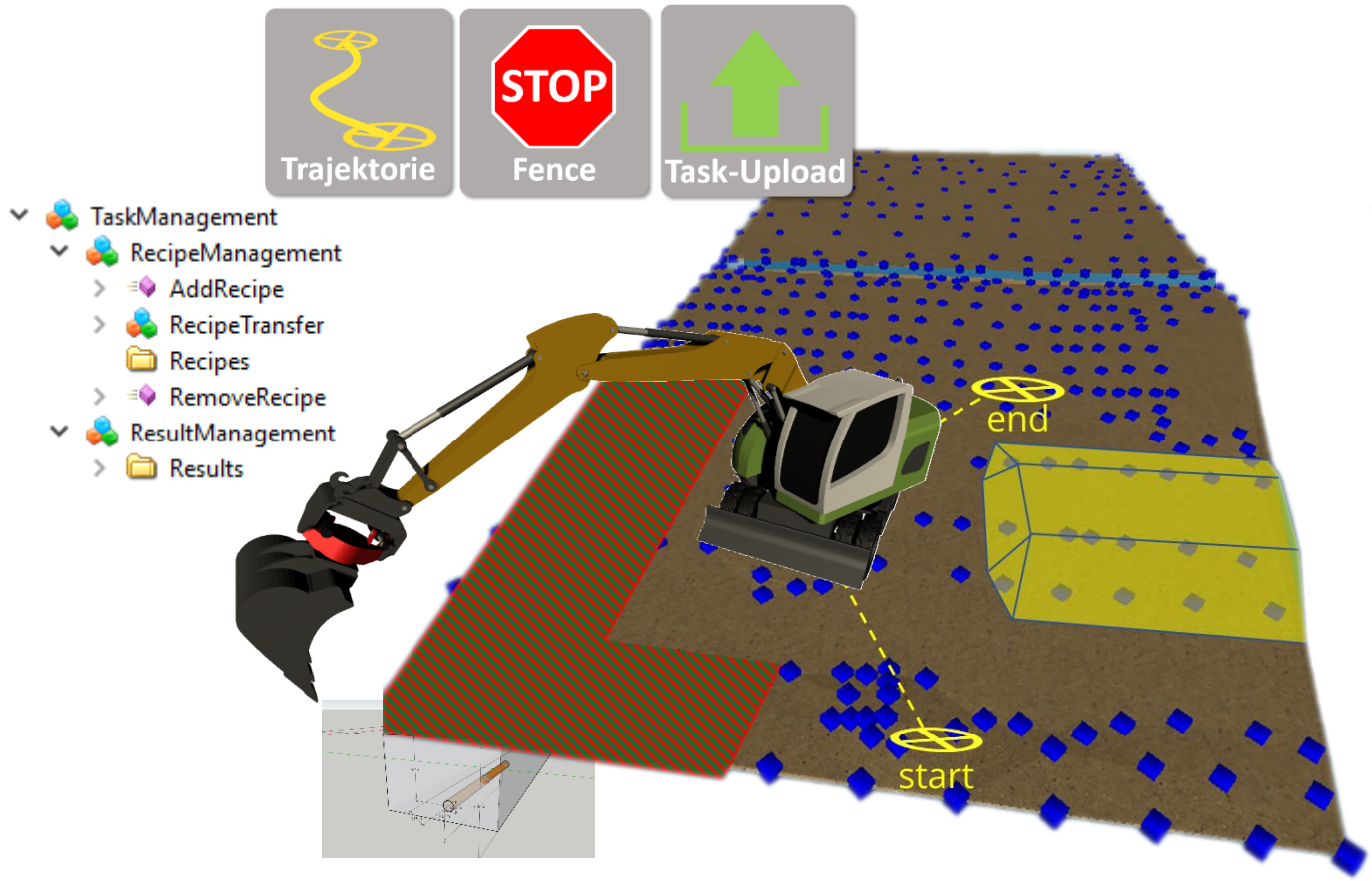
OPC UA data model for construction machines



All demonstrator machines are built up and the first automation functions have been tested

Developed solution: site management system

- **Mission data is submitted via OPC-UA interface**
- **Topografic mission data in annotated LandXML in accordance with ISO 15143-4**
- **Automation specific annotations**
  - geofences
  - trajectories
  - tracks
  - dump areas
  - target geometry



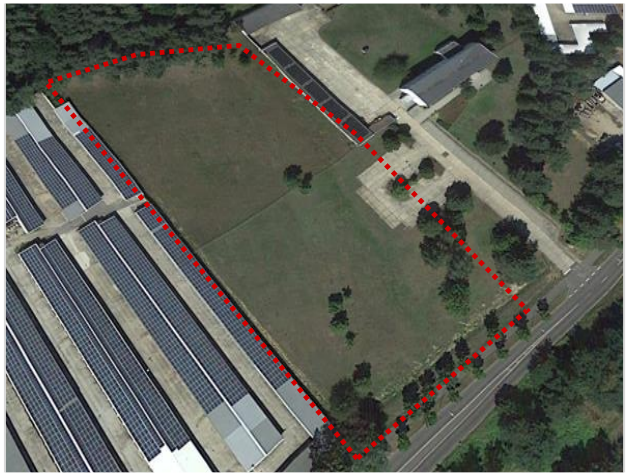
4 Outlook

Next Steps

Fabrikstraße 48, Dresden

- First 5G connectivity tests
- Test of excavator automation
- First tests with site information systems

Industrial area Zeißig, Hoyerswerda



- Setup of 5G Campus Network
- Automation of machine interaction
- Setup and test of the demo scenario

Industrial area Görlitz

- Establishment of infrastructure and corporate organizational forms for use after the end of the project

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