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SUMMIT 2021 BRUSSELS

CONSTRUCTING THE EUROPE OF TOMORROW

21 OCT LIVE STREAMING

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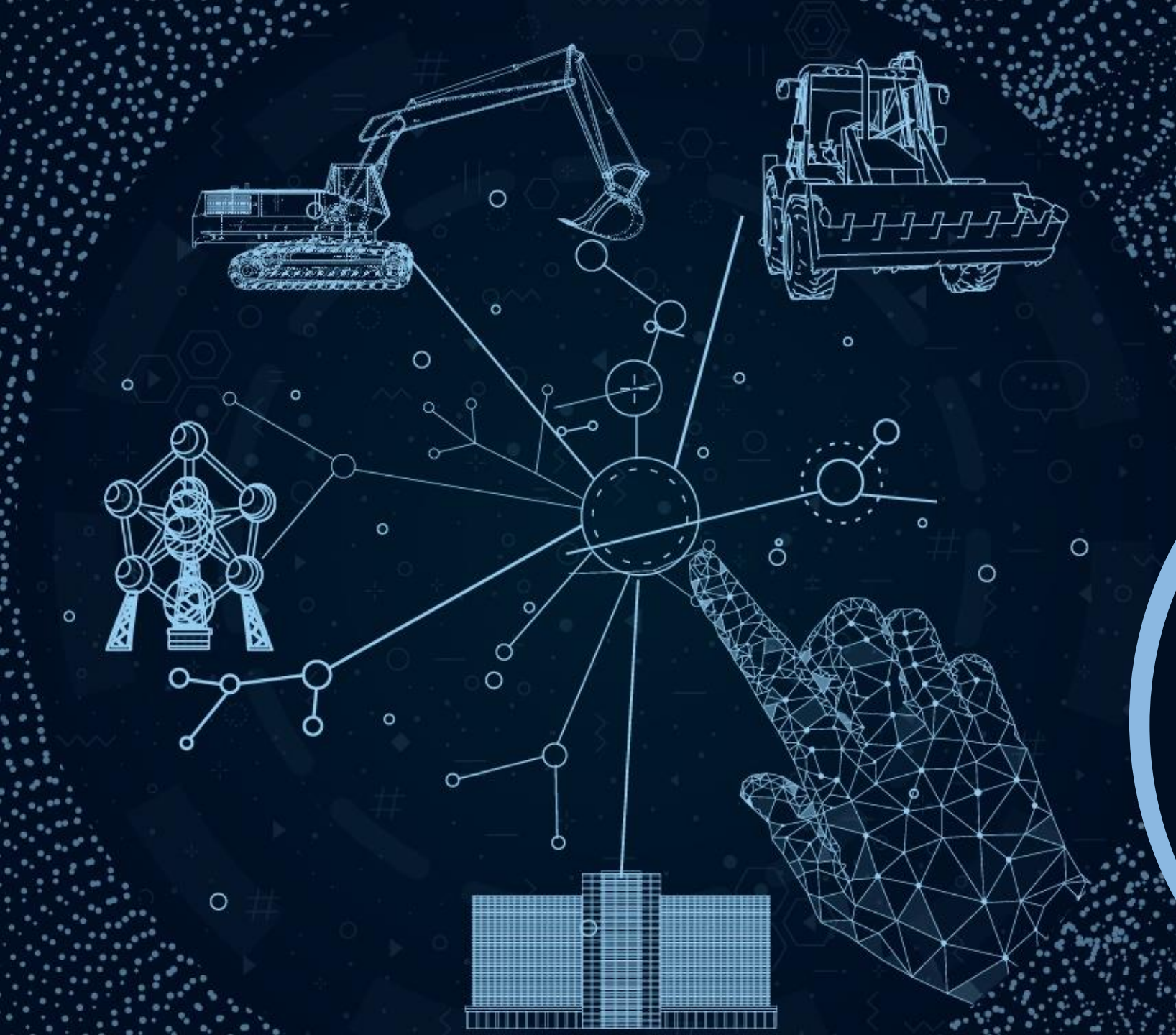

Joint research project „Bauen 4.0“

Overview, development status, demos and outlook

Prof. Dr.-Ing. Jürgen Weber
Chair of Fluid-Mechatronic Systems
TU Dresden

Outline

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

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Project partners and organizational framework

- 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

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Construction site challenges

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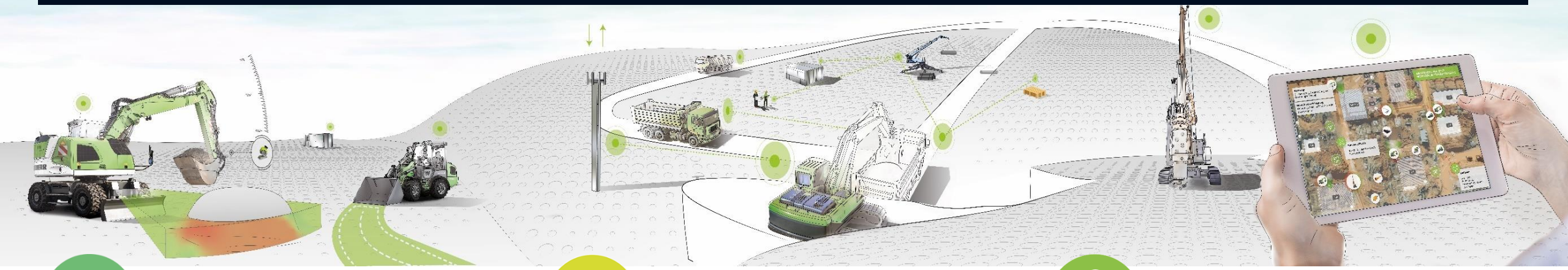
The main topics



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

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2 Demos

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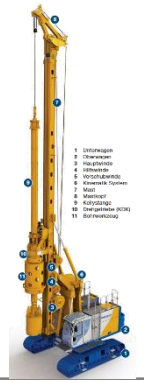
Demos within the main topics

Vertical Integration via OPC UA

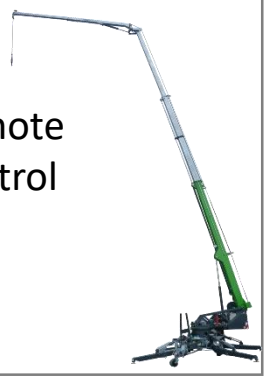
- Automated digging
- Automated tool change
- Detection "as built" condition

- Automated driving
- Environment recognition

- Automated processes



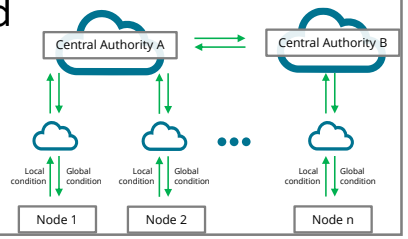
- Remote Control



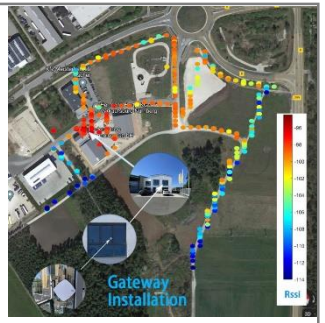
- Mulit-Connectivity modul: WiFi, 5G, 4G, BLE…

- Construction Site Networks: WiFi, 5G Campus

- Distributed Cloud Services



- 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

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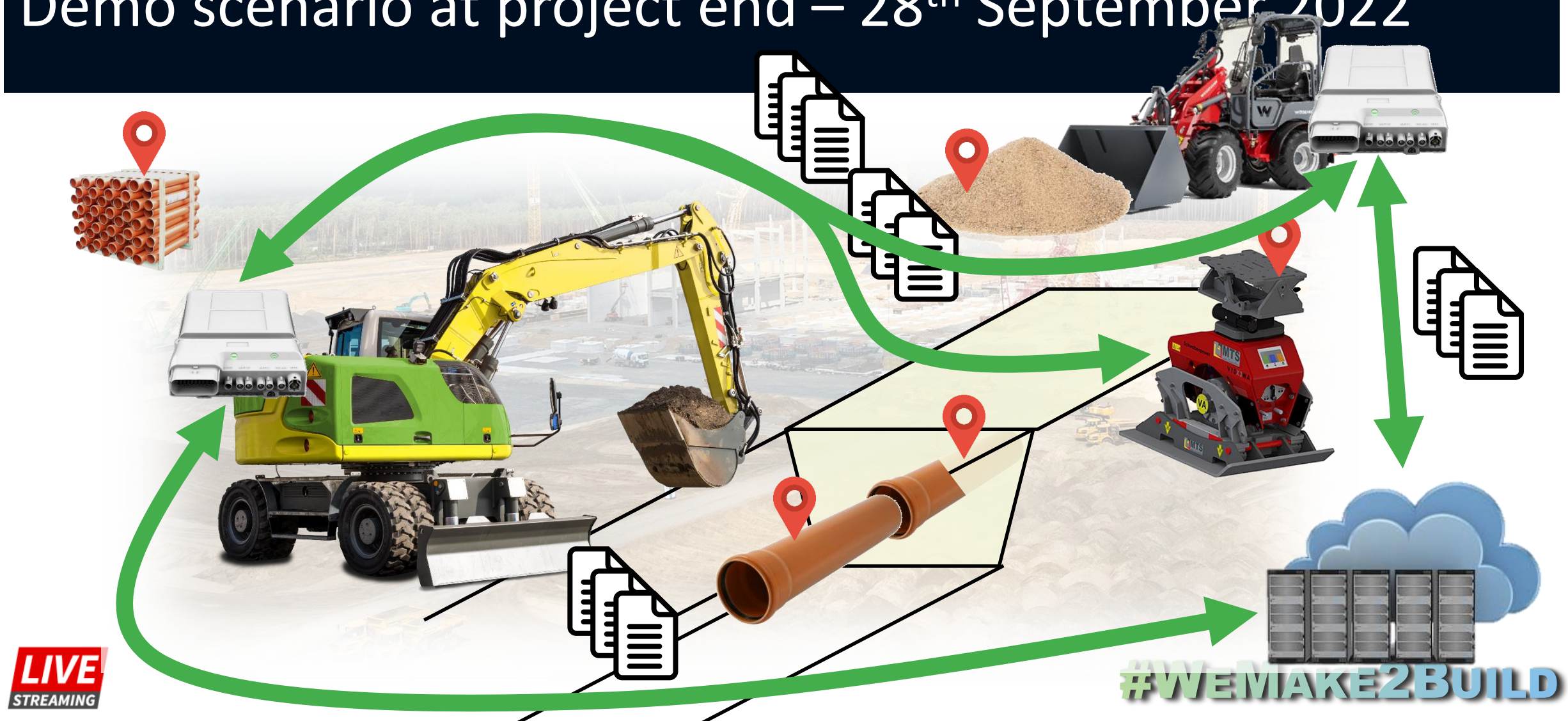
Demo scenario at project end – 28th September 2022



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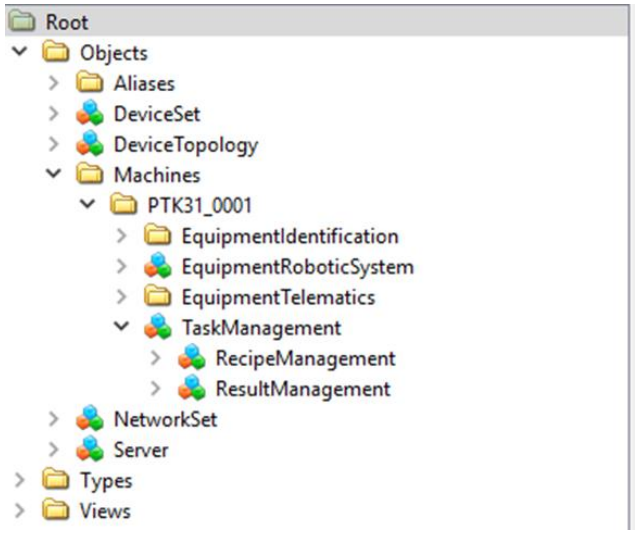
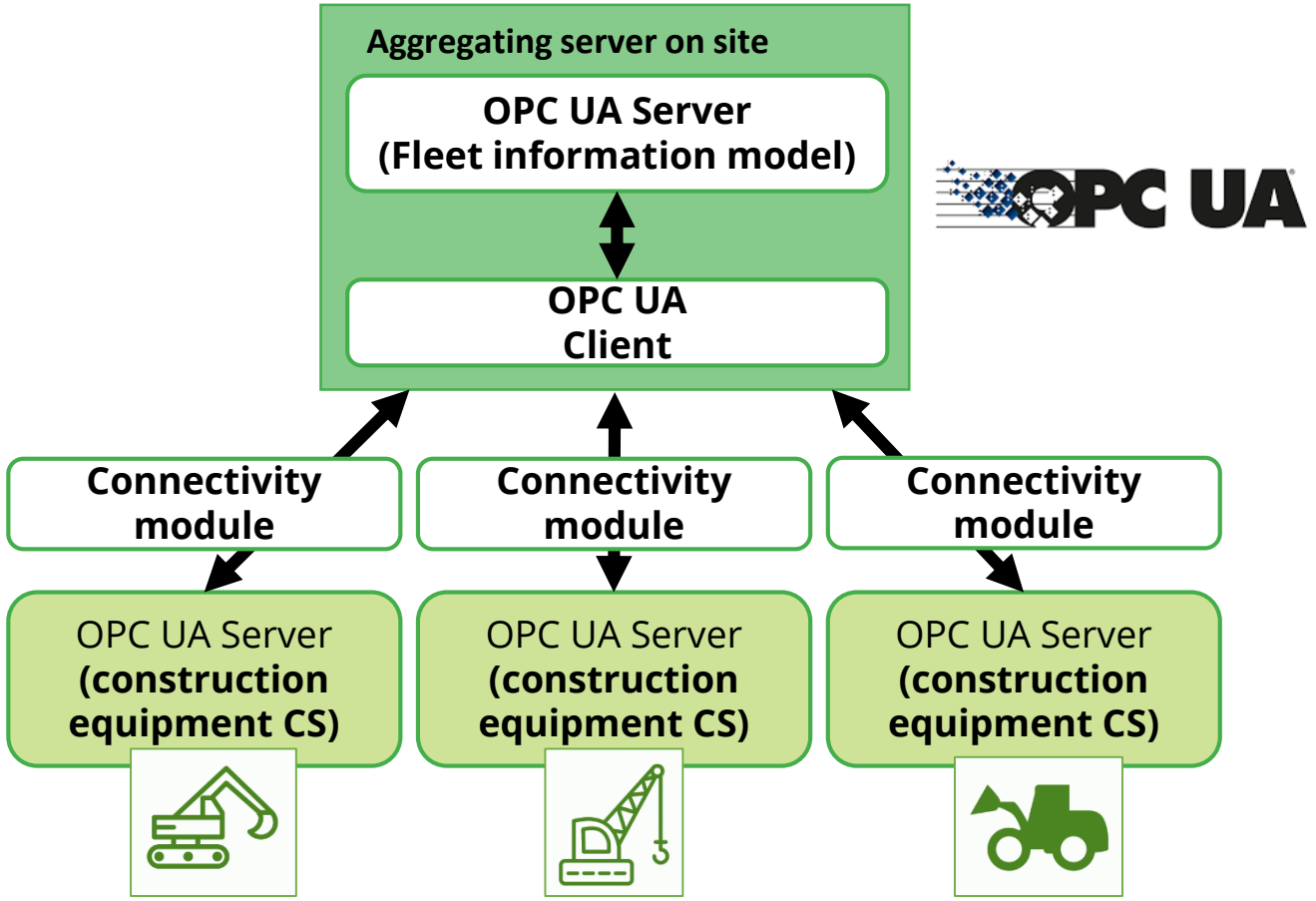
3 “Bauen 4.0” solutions

OPC-UA based Bauen4.0 architecture

- **OPC-UA** data model and communication protocol
- Bauen 4.0 Specification for **interoperable data model** for construction equipment





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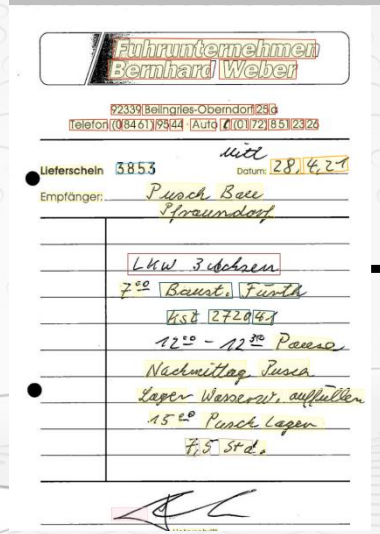
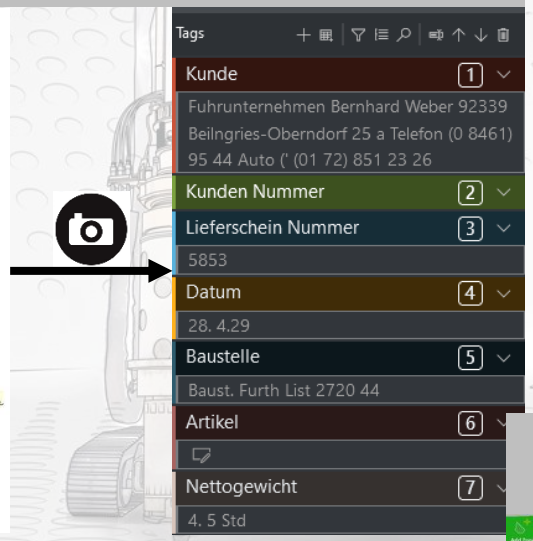
Developed solutions in main topic 1

Tracking & Tracing

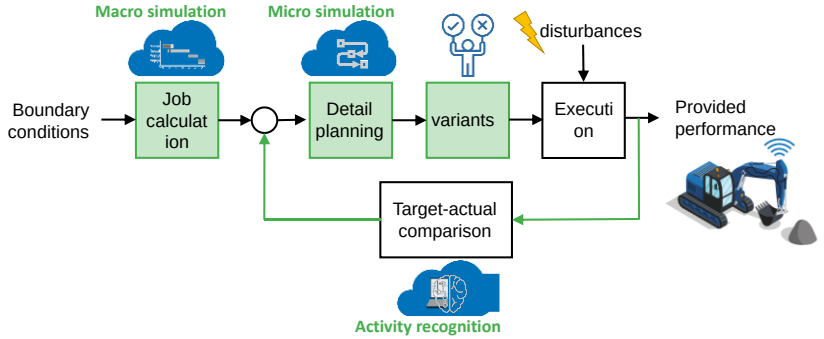




Driver guidance

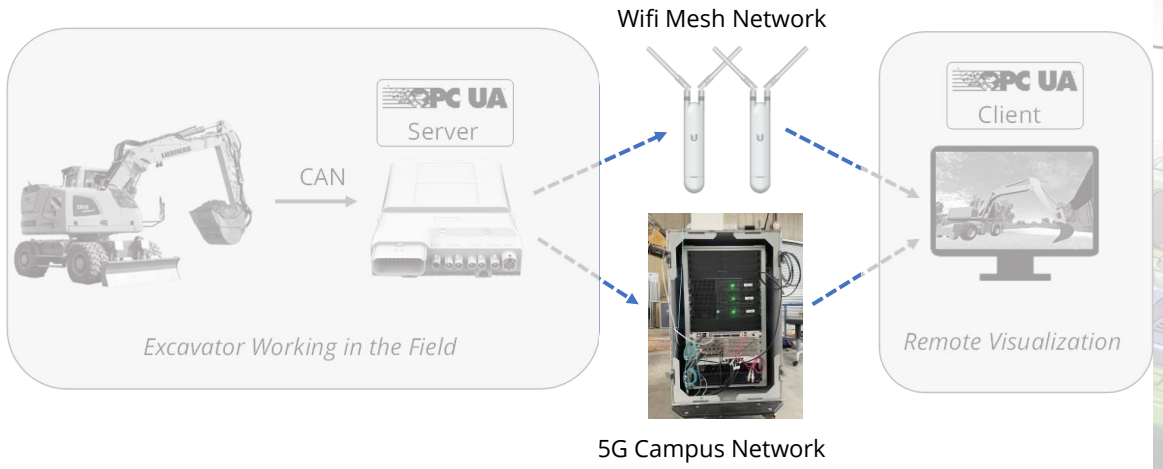
BIMsite

Process simulation



Developed solutions in main topic 2

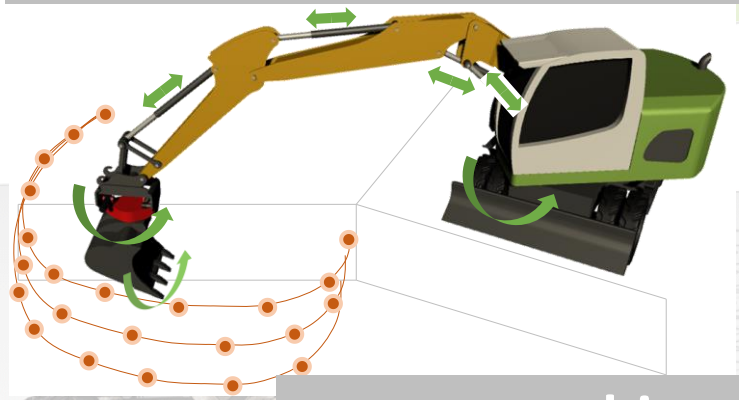
5G Campus and multi-connectivity

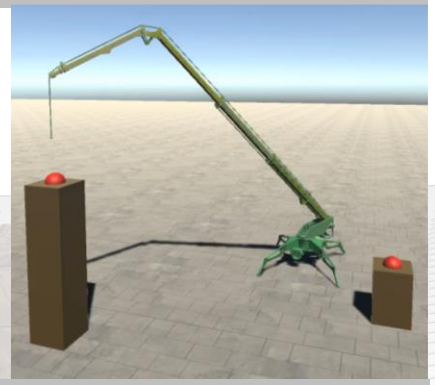


Special 5G connectivity modul

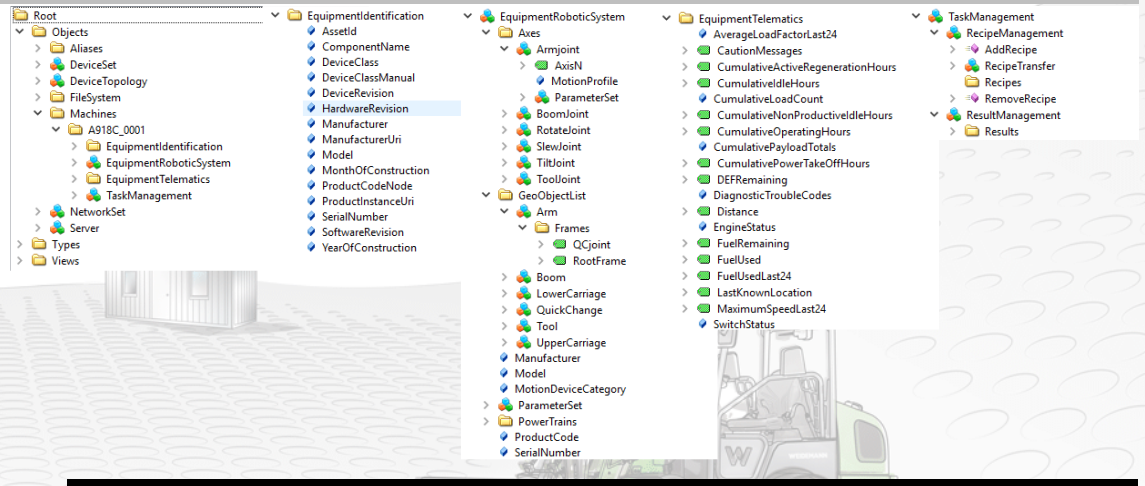
Developed solutions in main topic 3

Trajectory planning and machine automation

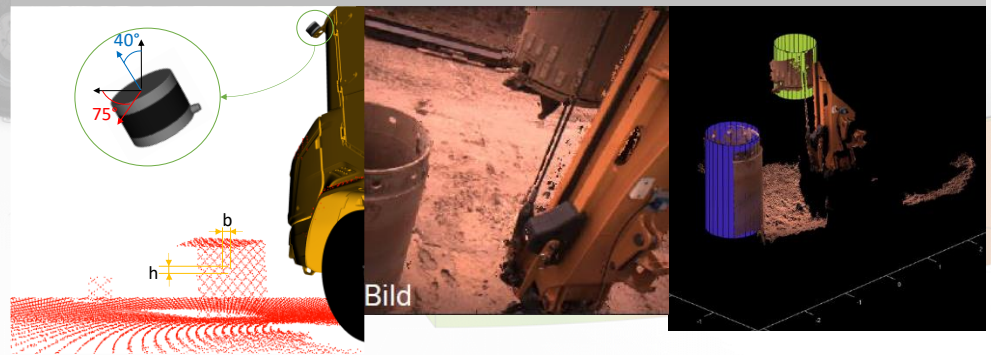




OPC UA data model for construction machines



ambient detection



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

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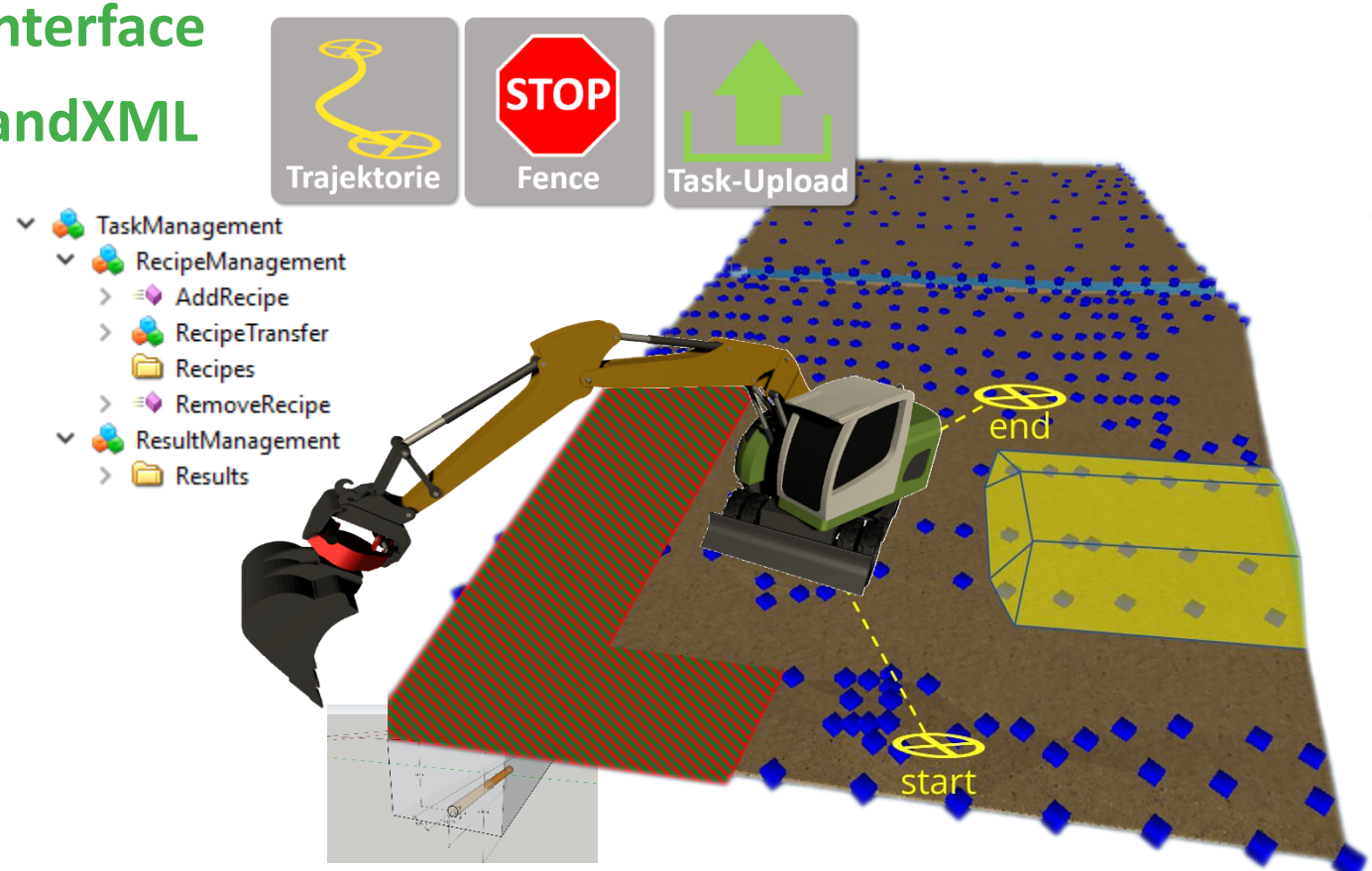
Developed solution: site information system

- **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



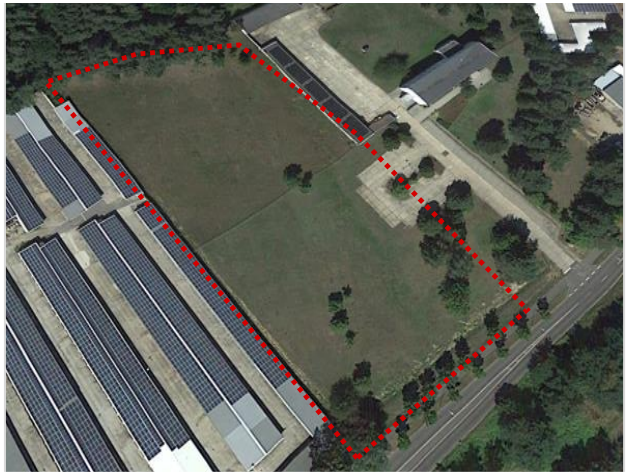
4 Outlook

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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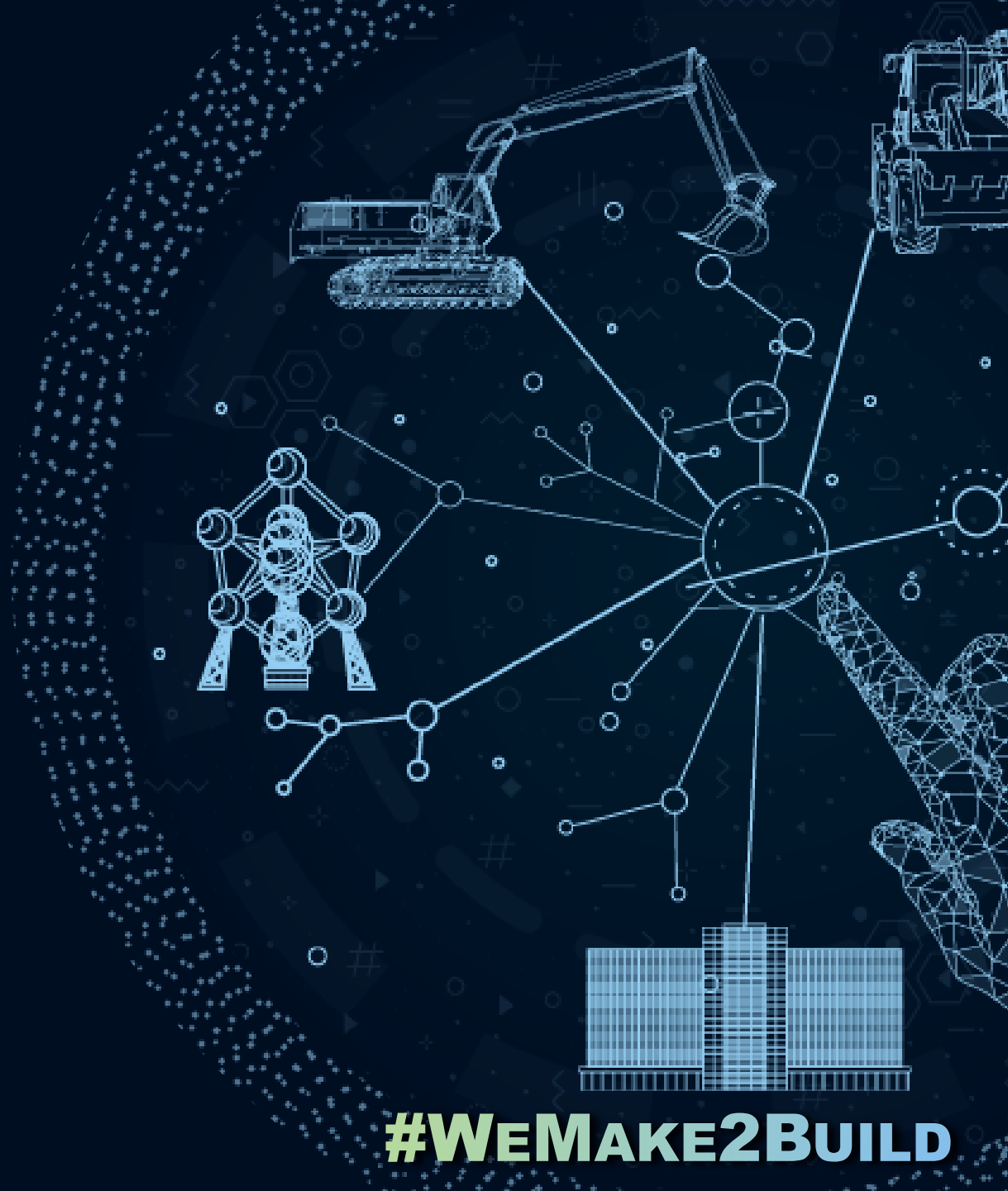

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