



PLENUM

PLENary multi-User developMent arena for
industrial workspaces



SCANIA



ZEEKR
Technology Europe

**RI
SE**

Research
Institutes
of Sweden

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CHALMERS
UNIVERSITY OF T



FRAUNHOFER CHALMERS
RESEARCH CENTRE FOR INDUSTRIAL MATHEMATICS



**UNIVERSITY
OF SKÖVDE**



**Rockwell
Automation**

PLENUM purpose

Improved productivity: PLENUM contributed to improved production development in the manufacturing industry for more efficient factories and workplace design through new methods and 3D design tools to create sustainable production development.

Interactive and low-cost solutions: PLENUM Provides the manufacturing industry with easy-to-use and cost-effective interactive 3D environments for multi-user XR with respect to production development, workplace design, upskilling and ergonomics analysis.

Industrial benefits: PLENUM included software developers and commercial actors for future scale-up/commercialization, in order to achieve industry benefits early.

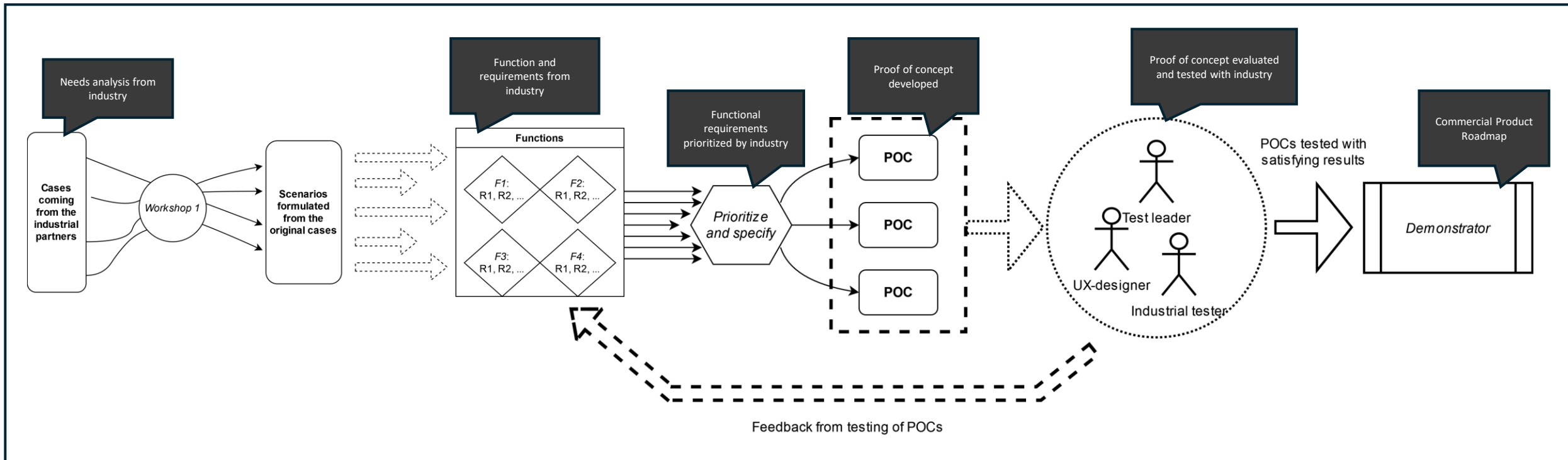
Use case examples:

- Digital Twins, Rockwell
- AR Training, VCC
- Factory Layout planning, GKN

Deliverables:

- Req specification on XR for industrial applications
- Functionality for industrial XR-environments
- Domain specific implementation and evaluation
- Commercially viable demonstrators

PLENUM journey and partners



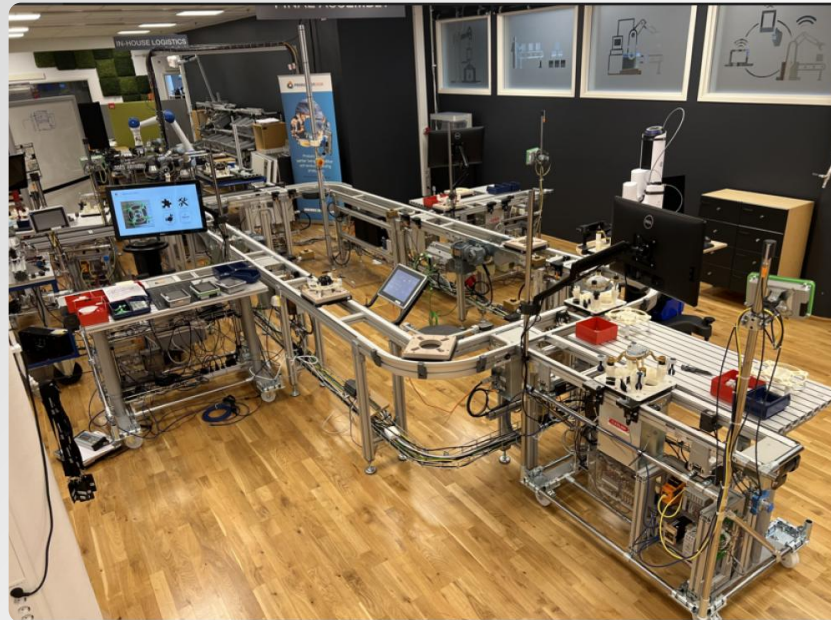
RA | SII-Lab Drone Factory Digital Twin

PLENUM | Swedish Manufacturing Conference 2026



- Demonstration
- Simulation
- Virtual Commissioning
- Operator Training

- Robotic kitting & assembly
- Manual assembly & inspection
- Conveyor systems & AMR
- Automation systems
- Camera based motion-capture



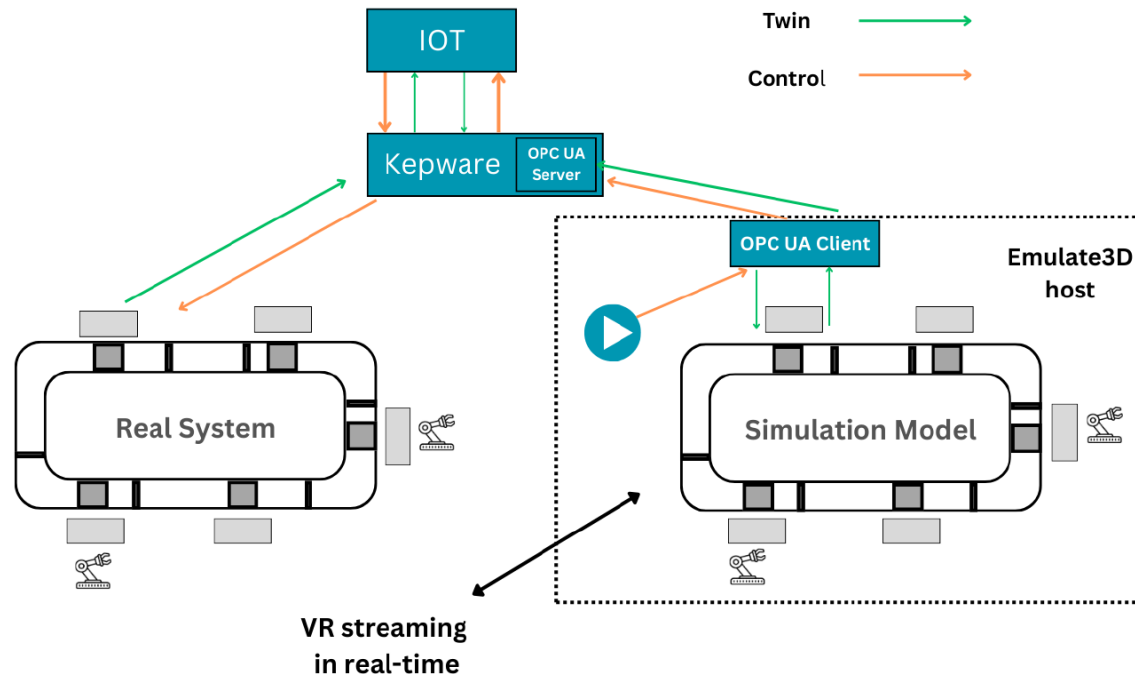
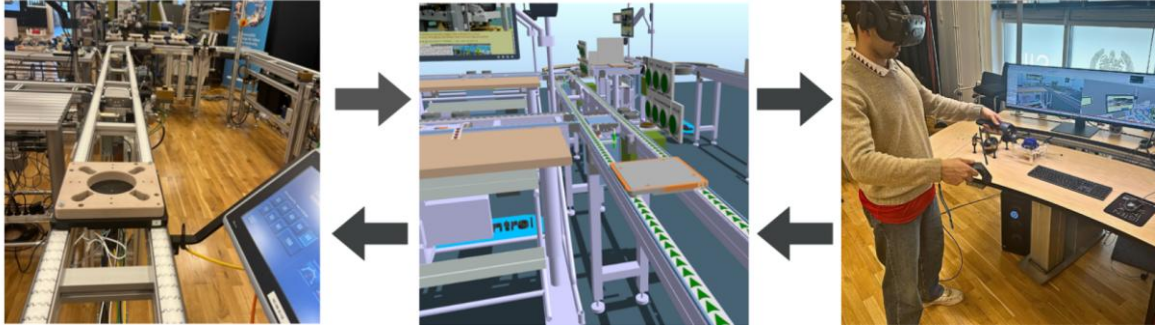
- Environment: Hybrid simulation & emulation
- Modes: Independent & shadow
- Configurations: Human-, Hardware-, Software- in the loop





VR – Enabled Digital Twin of Drone Factory

Real time connection between Physical & Virtual systems



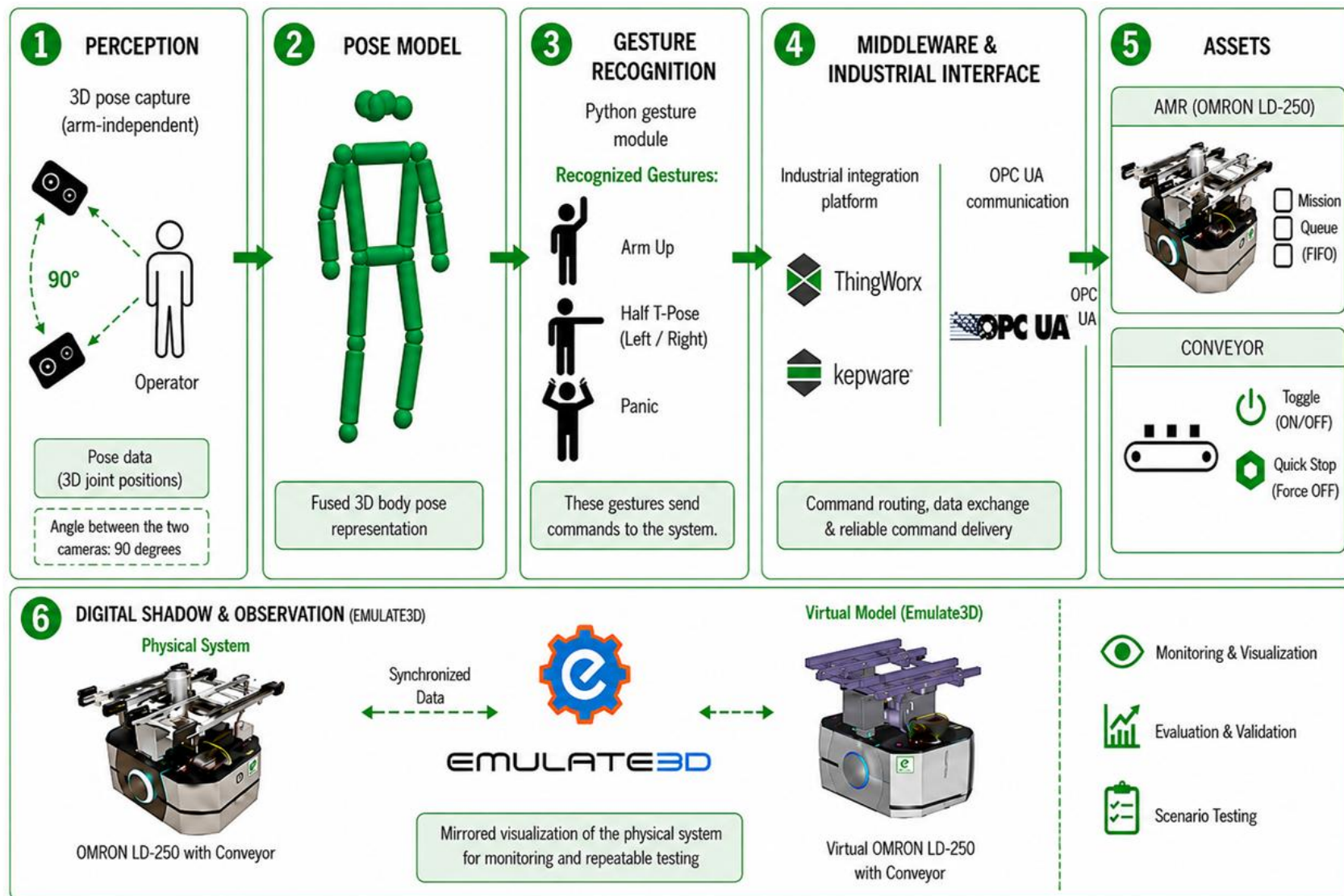
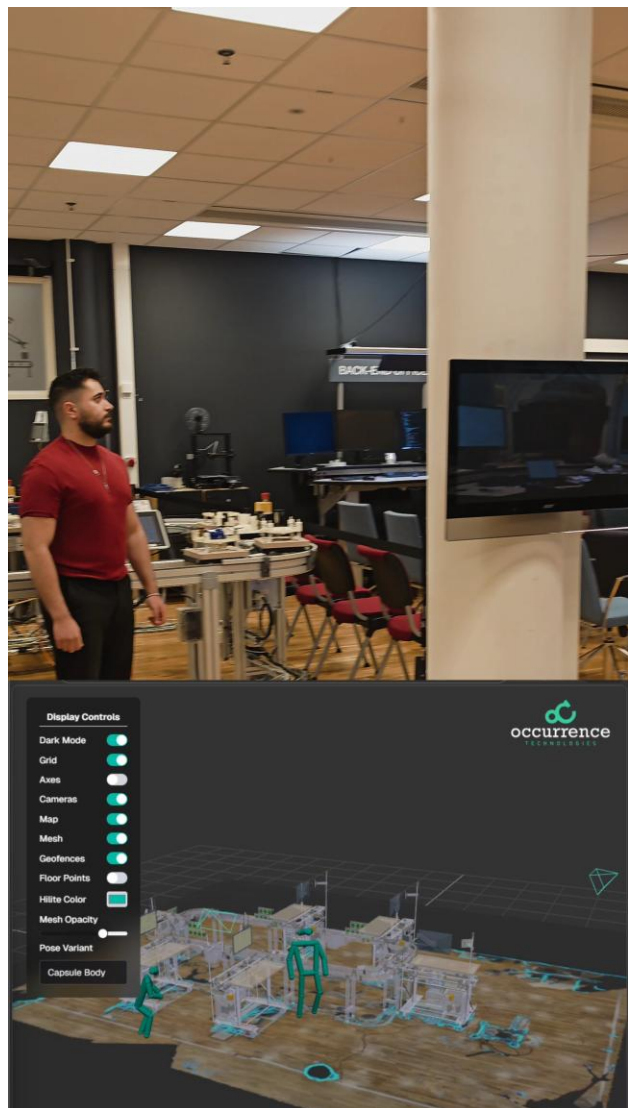
Key Outcomes

- ✓ Real- time bi-directional connectivity
- ✓ Verified synchronisation of physical & virtual Systems
- ✓ VR enabled monitoring & control of production system

Potential Use cases

- Human-In-Loop Virtual commissioning
- Operator training in VR
- Remote monitoring & control
- What-if simulations & process optimization

RA | Gesture-based Control Layer for I5.0





Sealant XR operator training

Sealant application



Mostly automated



Repetitive work



Difficult to learn

Business value



Earlier training



Shorter training period



More training



Reduce scrap and material waste



Improve cleanliness

Training scope



Early phase onboarding



Learning a new skill



Focus on familiarization

A close-up look at the solution



Training scenario with Sealant XR

Assessment on



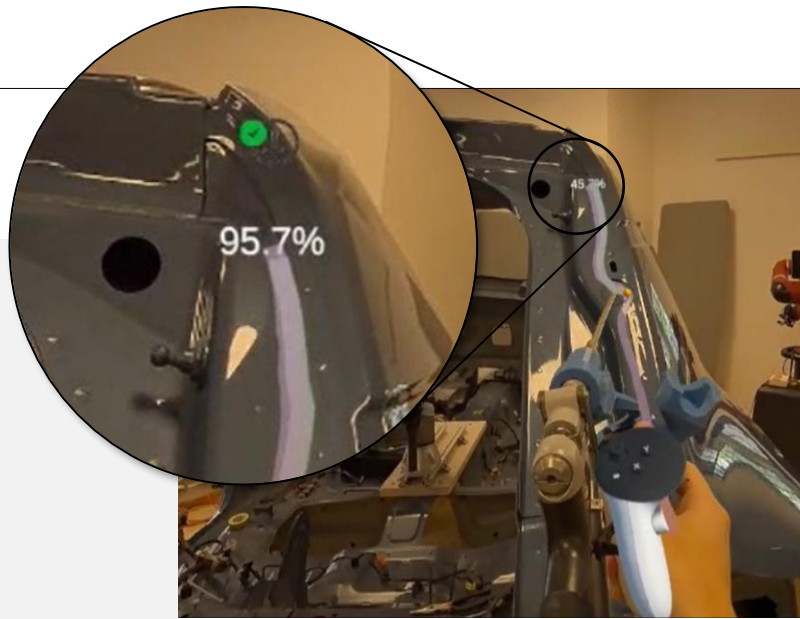
Time



Position accuracy



Angles accuracy



The training session

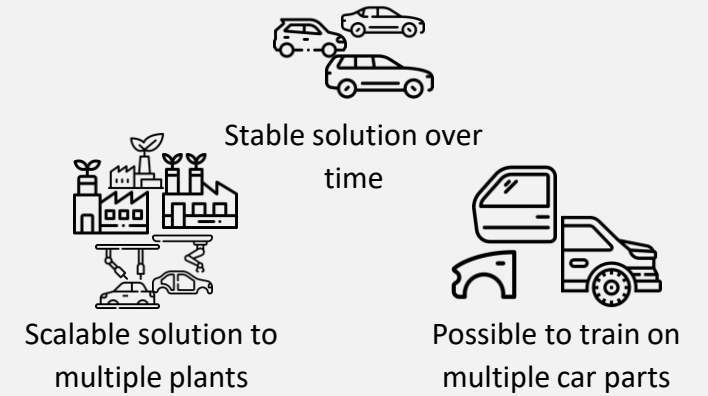
- Instructor starts with the XR headset and records a *target* sealing
- Trainee gets the XR headset
- Trainee trains, by following the set *target*
- Trainee is instantly assessed by how close they get to the set *target*
- Trainee deletes their sealing to reset and repeat



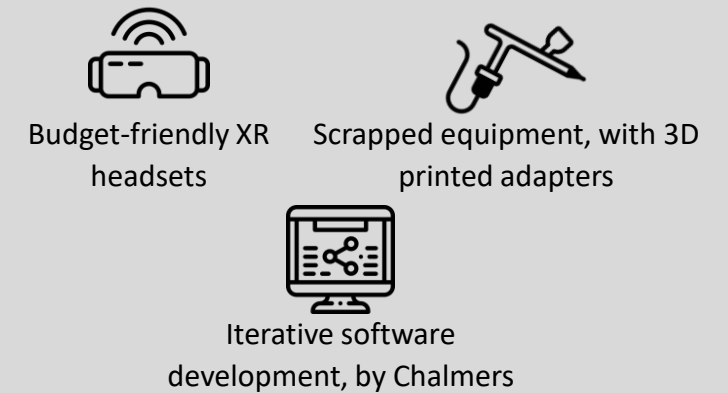


Development

Requirements

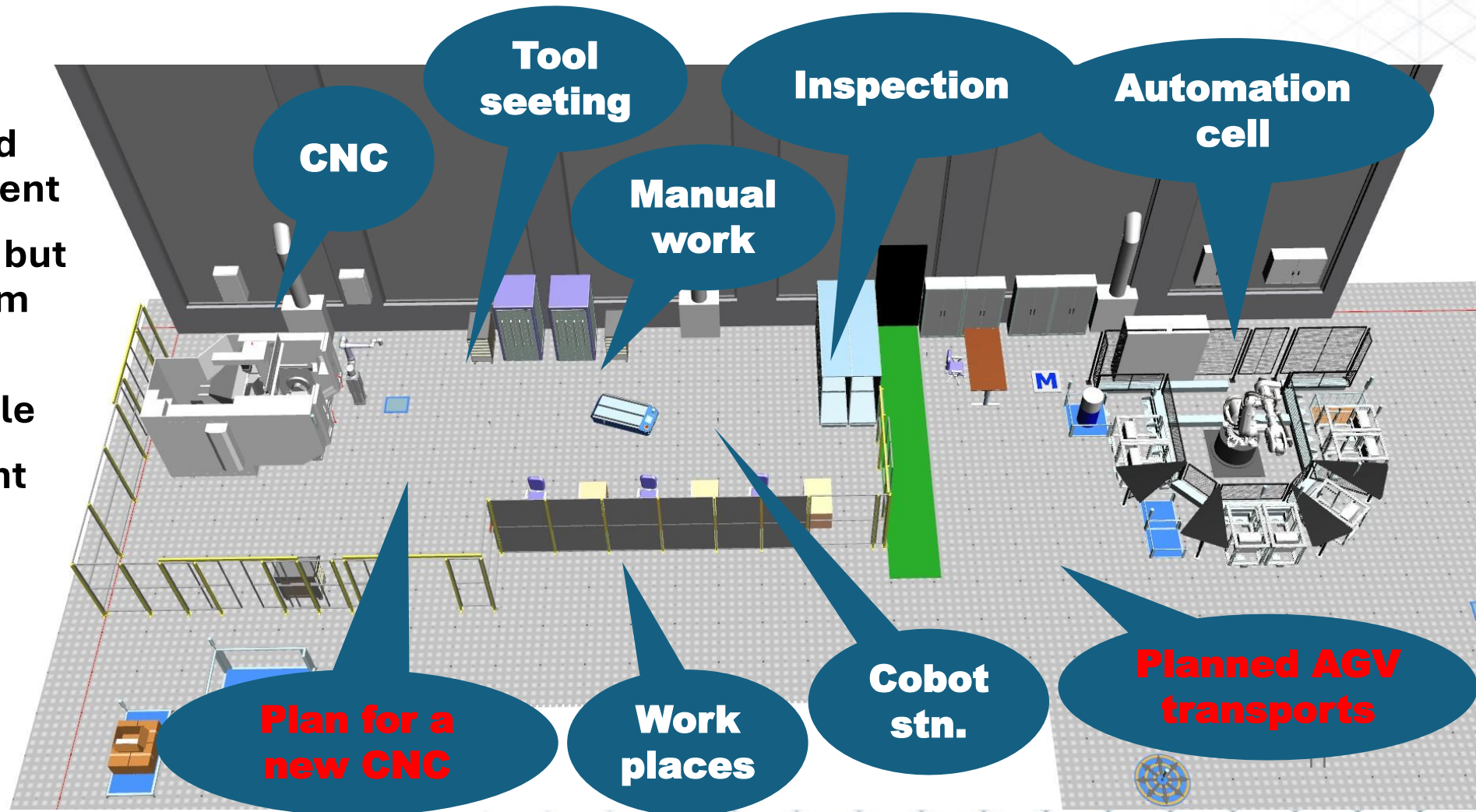


Industry-academia collaboration



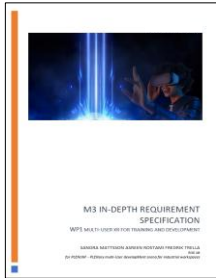
“Factory-of-the-Future” project @ PTC/GTC

- **Area for machining and automation development**
- **Partly commissioned, but is also a flexible system**
- **Some stations are supposed to be movable**
- **How to optimize current layout**
- **Scenario for new installations**



Use case on layout planning

Results



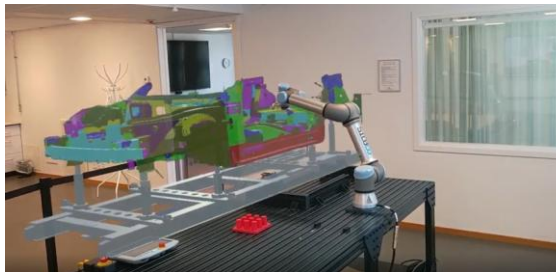
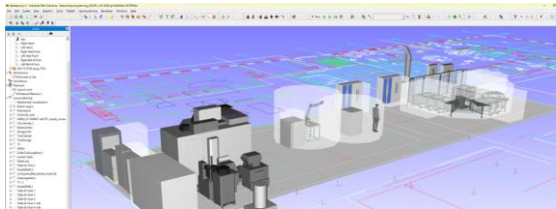
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*Requirements
Spec for Industrial
XR Environments*



24
*Scientific
publications*

13

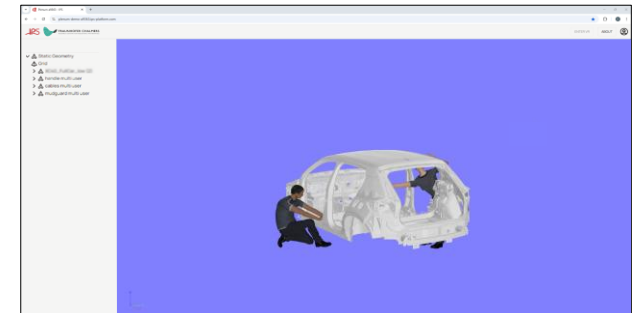
*Developed demonstrators of
industrial XR functionality*



2+

*XR multi-user platform
demonstrator*

- Multi-user collaboration
- Cloud-based solution
- Web interface
- Secure communication
- Cross-platform
- Browser view
- VR view





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