AI by CPPS
Cyber-Physical Production Systems Concepts in Research and Reality

Harald Loos, Siemens AG Österreich, T RDA AT

CPPS Concepts in Research and Reality
Introduction

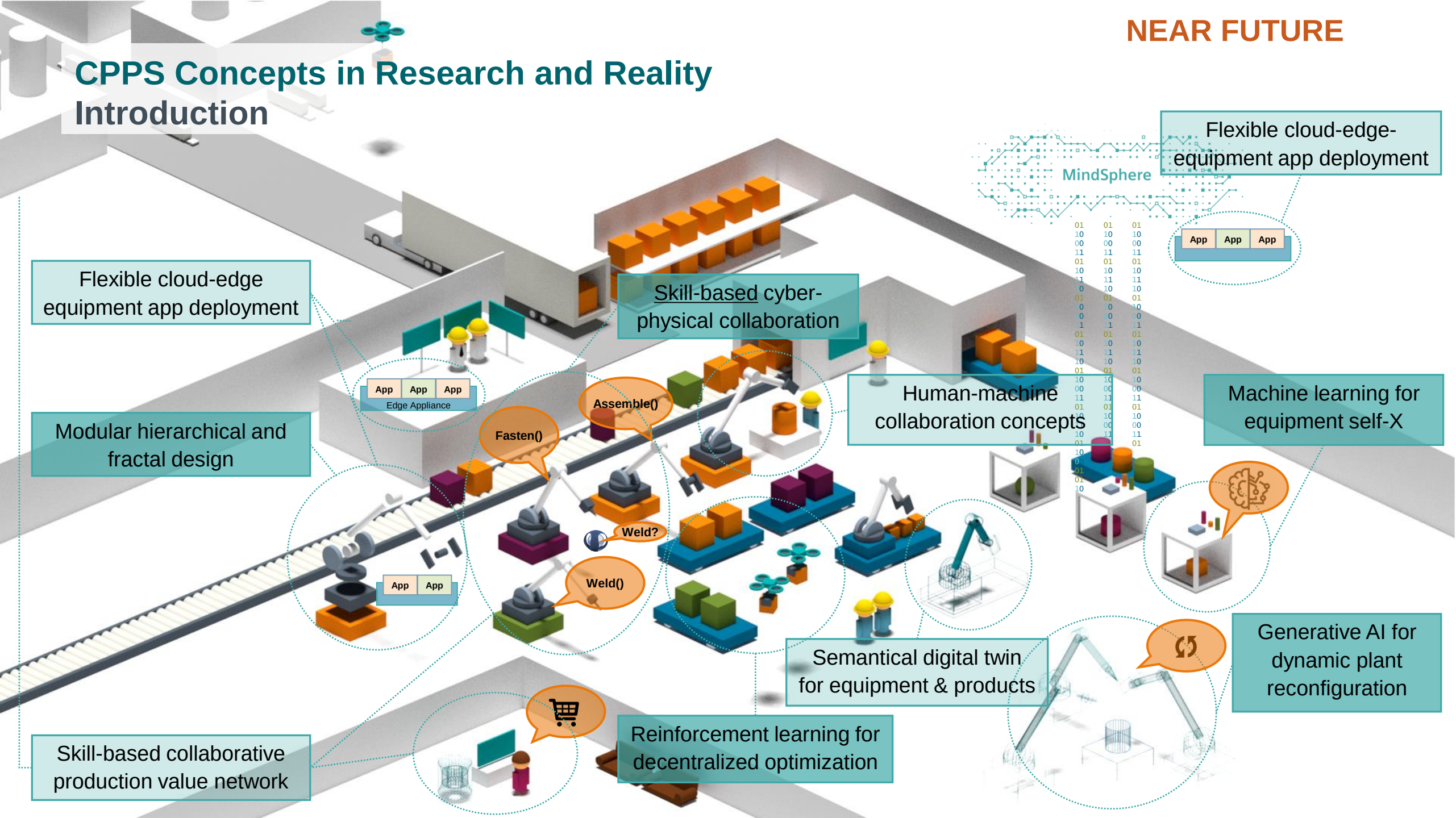
PAST & PRESENT

NEAR FUTURE

CPPS Concepts in Research and Reality
Introduction

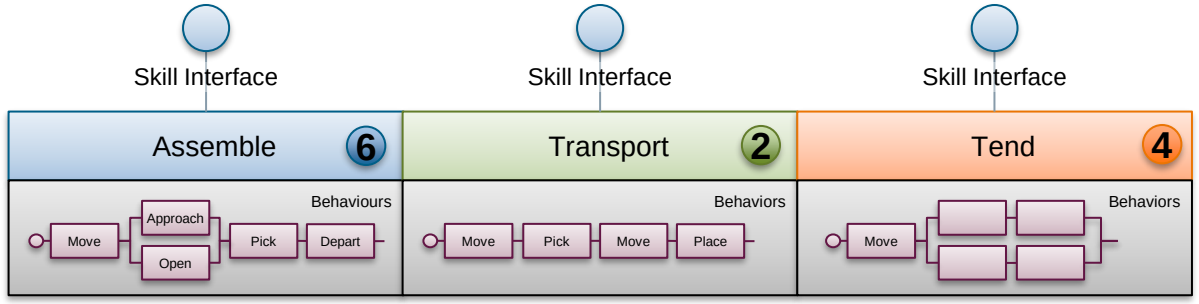
NEAR FUTURE

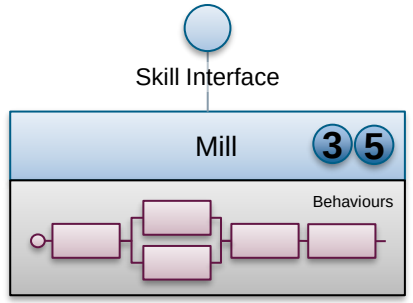
CPPS Concepts in Research and Reality
Introduction



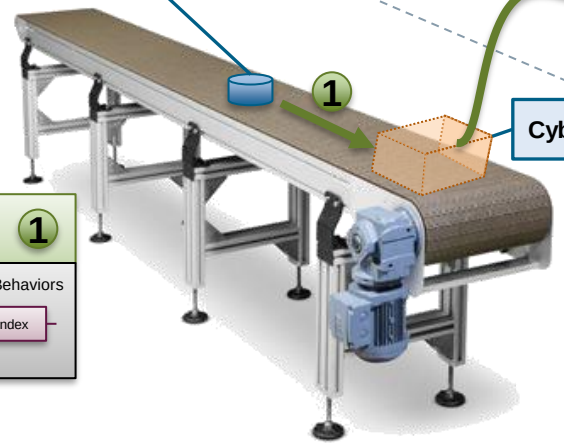
CPPS Concepts in Research and Reality
Cyber-physical Production Units

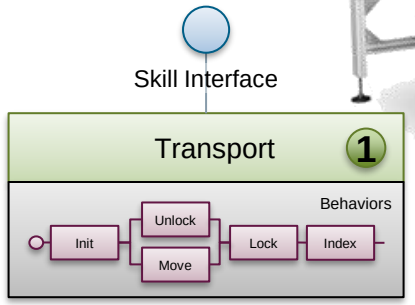
SIEMENS
Ingenuity for life





Product Bill of Process (BOP):
1. **Mill** type(hole) diameter(0.8) length(2.2) position(…) 3
2. **Mill** type(hole) diameter(0.3) length(6) position(…) 5
3. **Assemble** part("Lid23") product(this) position(…) 6
4. …



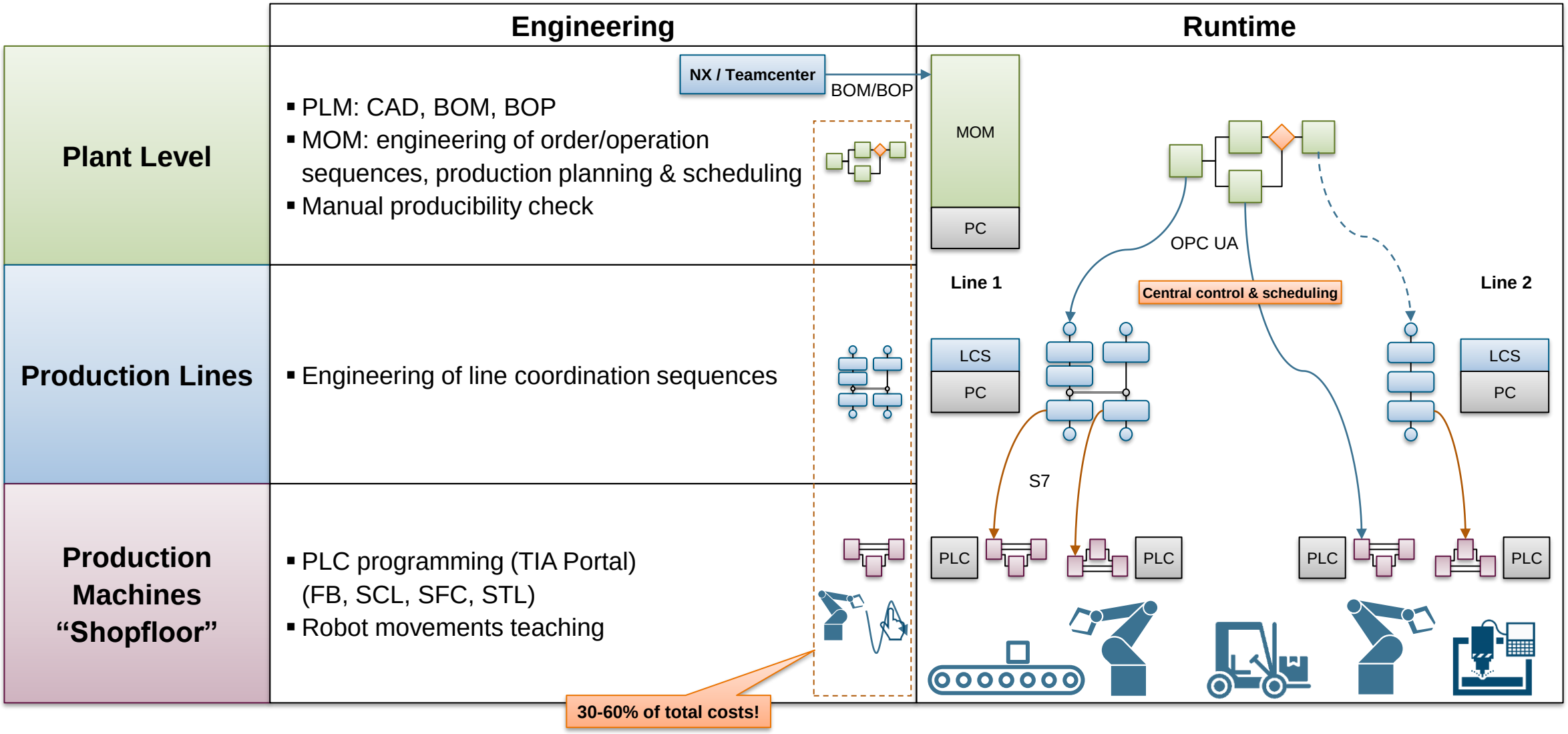


- Self-organizing autonomous production units
- Product steers its own production
- Plug & Produce with Zero Engineering

Production Skills	Required in product BOP, called by orchestrator (decentral/central)
Transportation Skills	Never in BOP, called by orchestrator (decentral/central)
Collaboration Skills	Never in BOP, called between equipment (e.g., CNC asks robot to rotate the product calling its Tend skill)

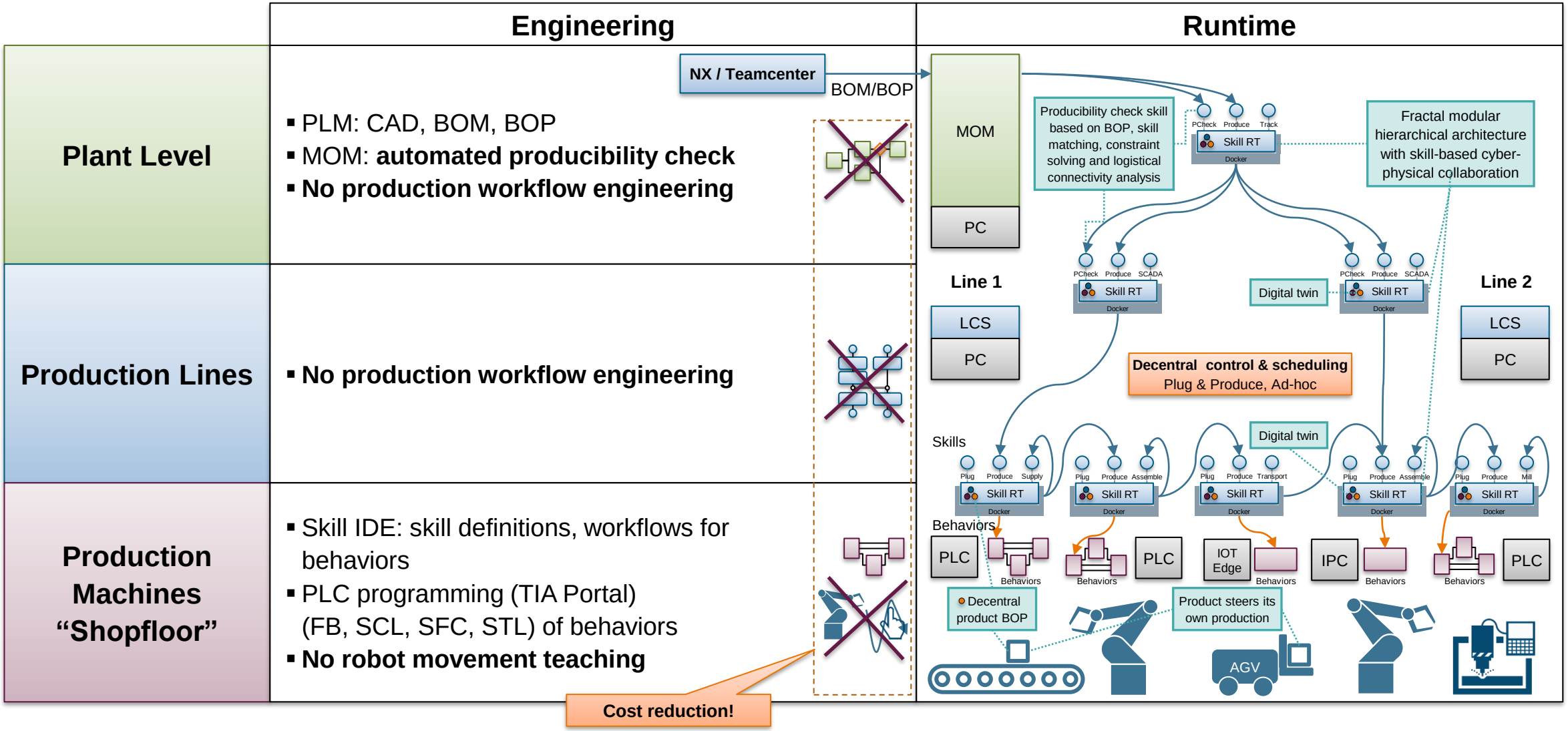
CPPS Concepts in Research and Reality
Classic Production

SIEMENS
Ingenuity for life



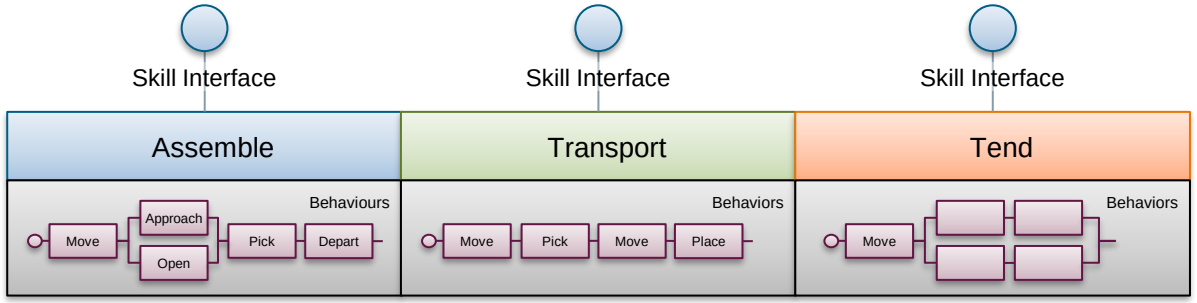
CPPS Concepts in Research and Reality
Cyber-Physical Production

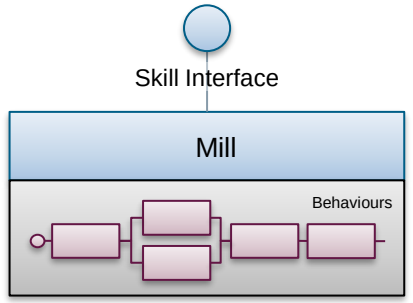
SIEMENS
Ingenuity for life

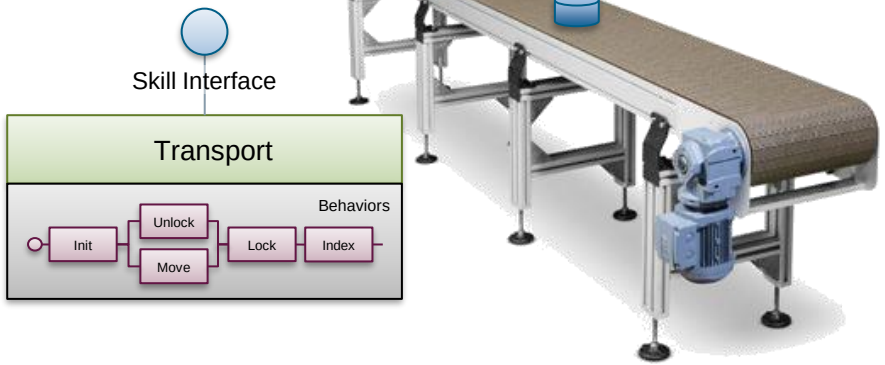


CPPS Concepts in Research and Reality

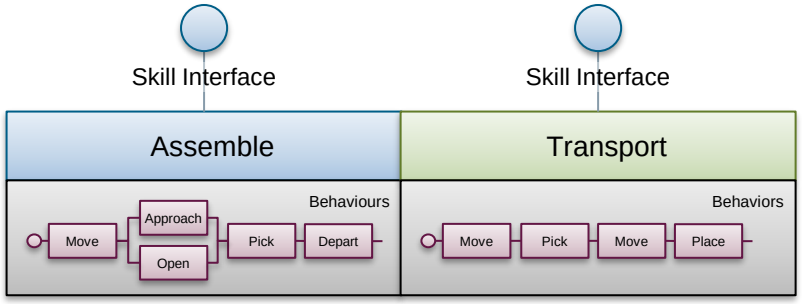
How to make cyber-physical production units intelligent?

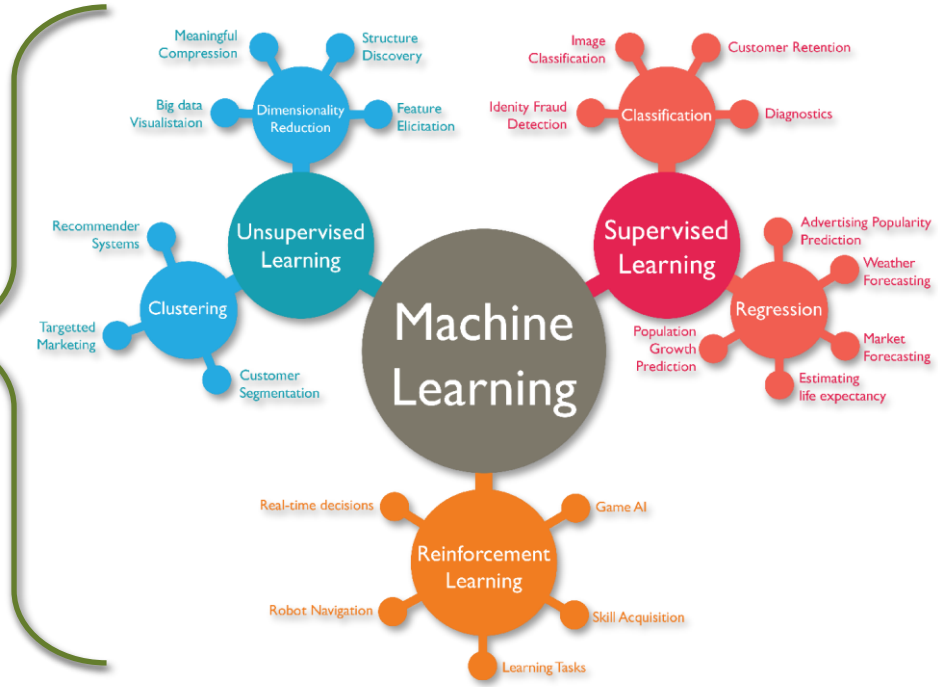




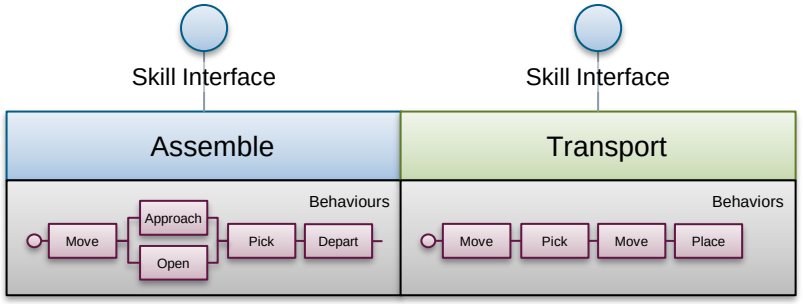


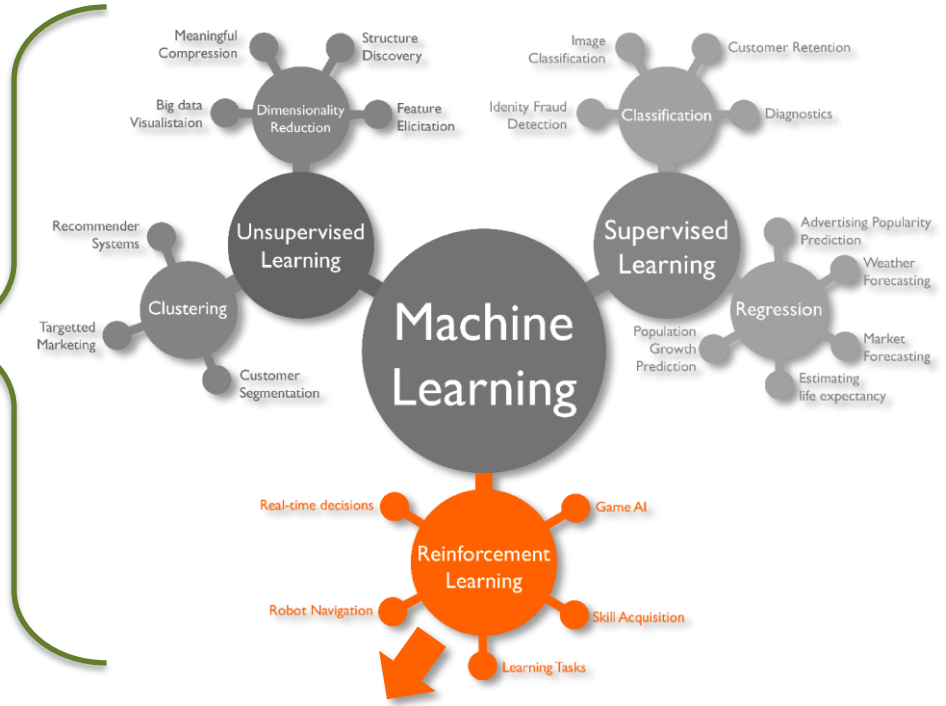
CPPS Concepts in Research and Reality
Intelligent Cyber-Physical Production Equipment

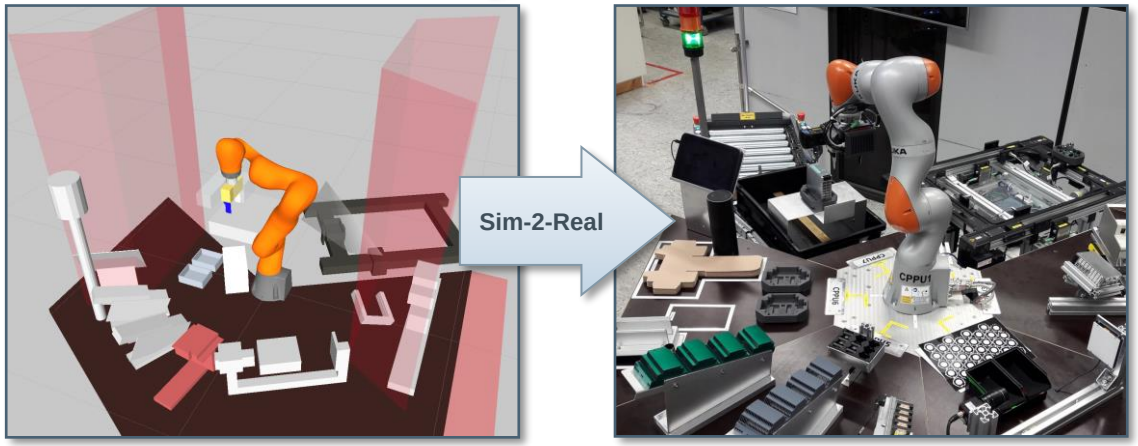




CPPS Concepts in Research and Reality
Intelligent Cyber-Physical Production Equipment

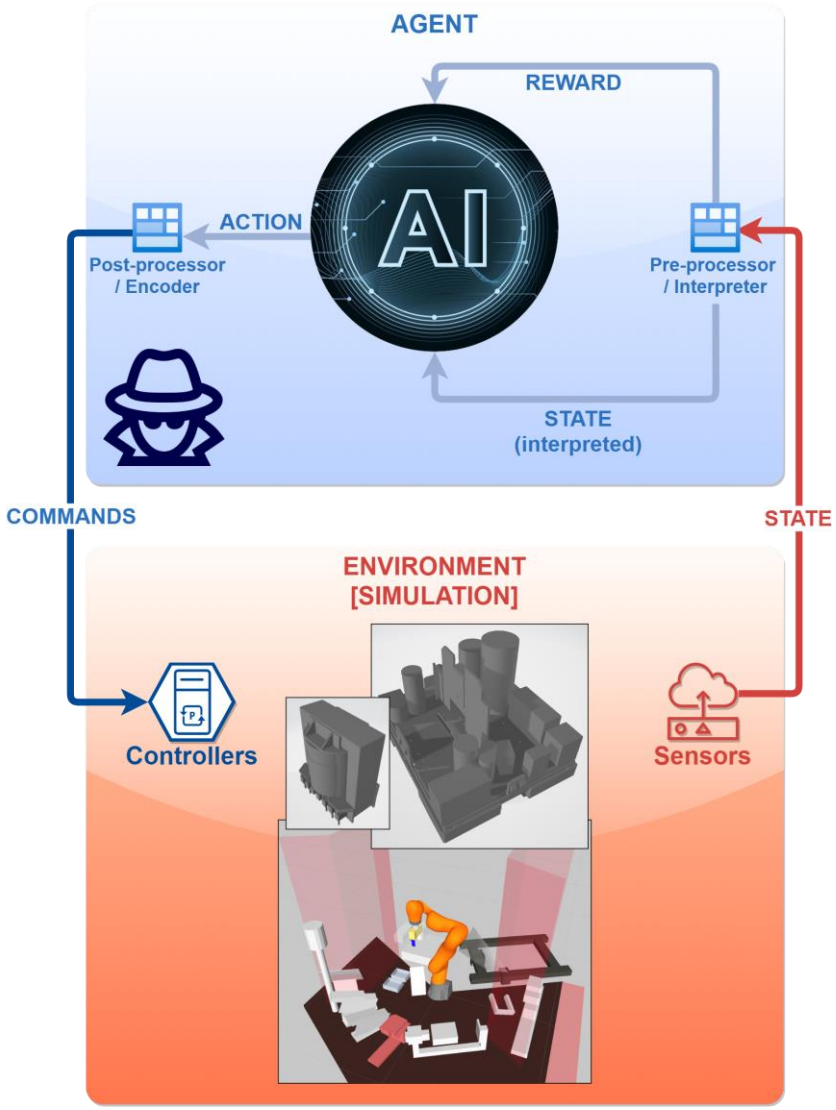




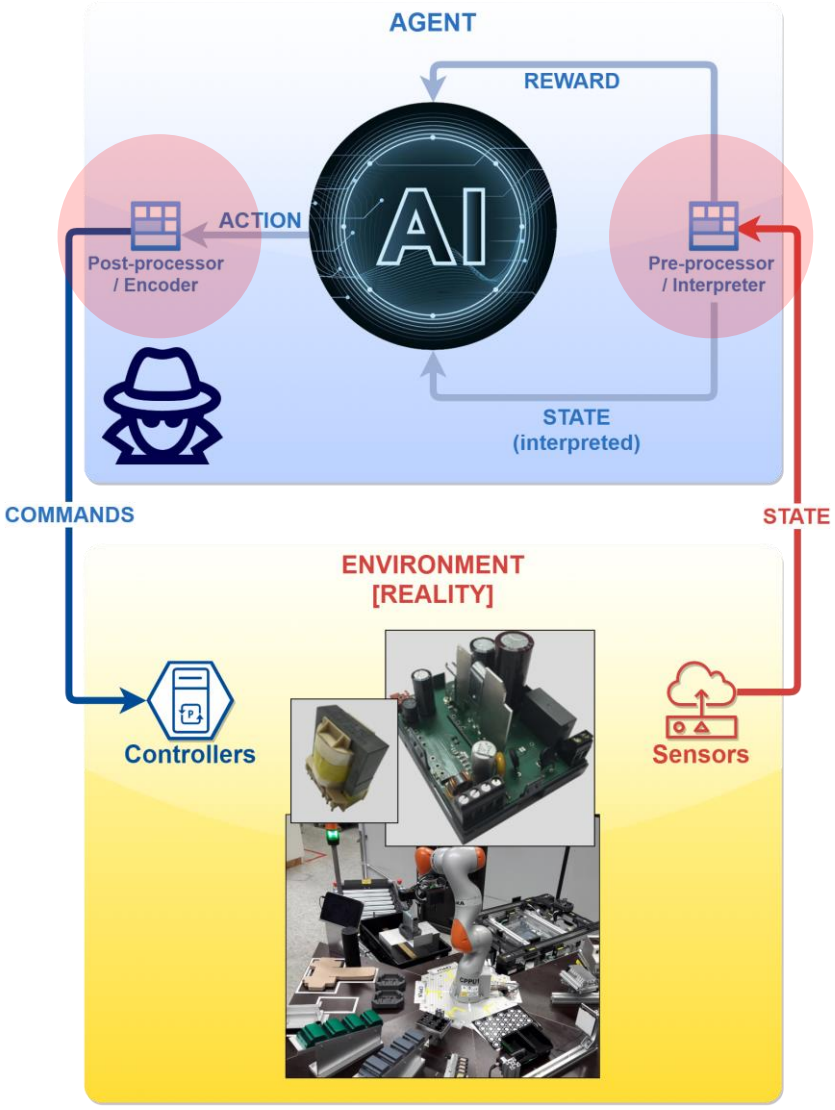


CPPS Concepts in Research and Reality
THT (Through-Hole Technology) Assembly Optimization with DRL

SIEMENS
Ingenuity for life



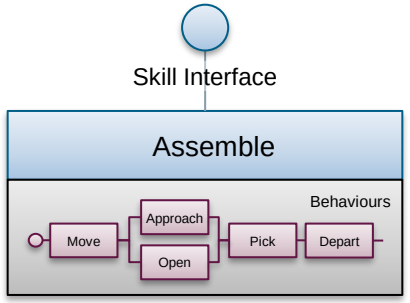
Sim-2-Real

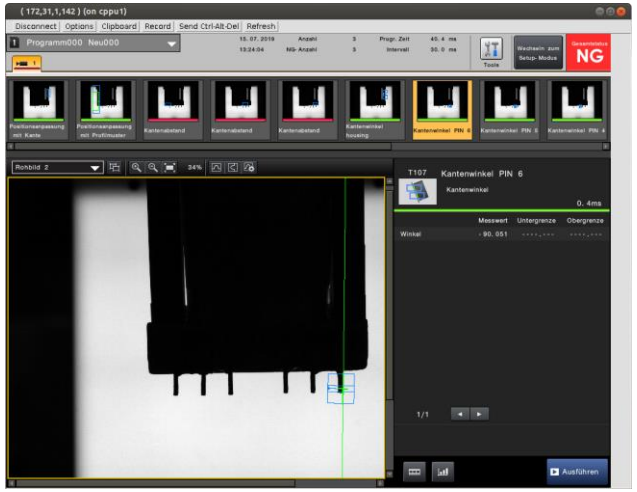


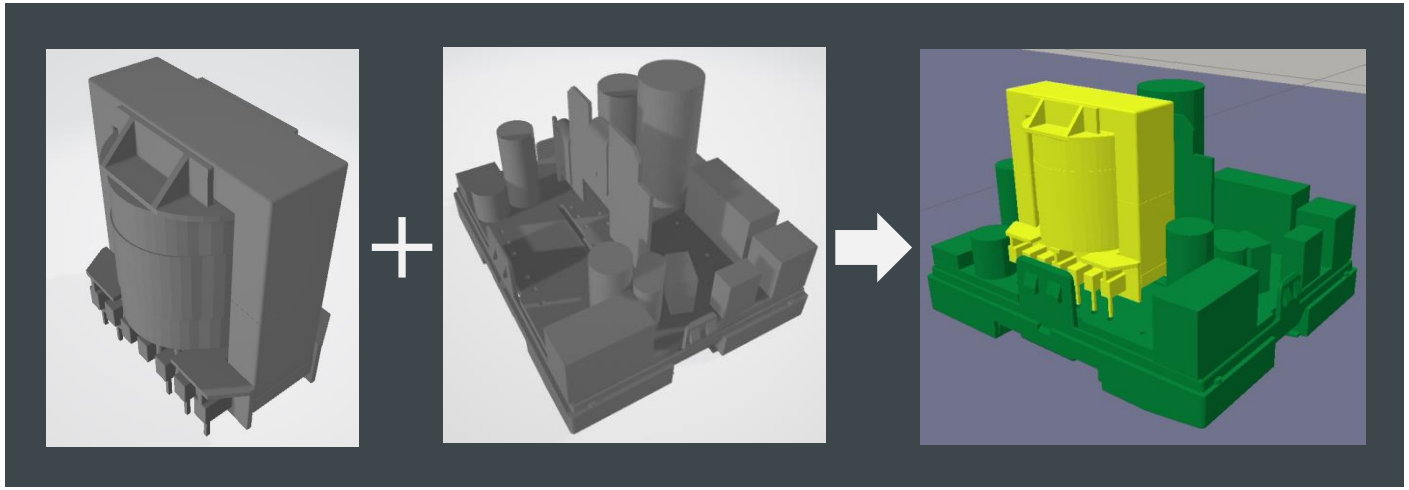
CPPS Concepts in Research and Reality
THT (Through-Hole Technology) Assembly Optimization with DRL

SIEMENS
Ingenuity for life

- Assemble electronic components to a PCB:
  - Currently a manual step on the SITOP production line
  - Challenges:
    - Tolerance of positioning of the PCB
    - Transformer part imperfections

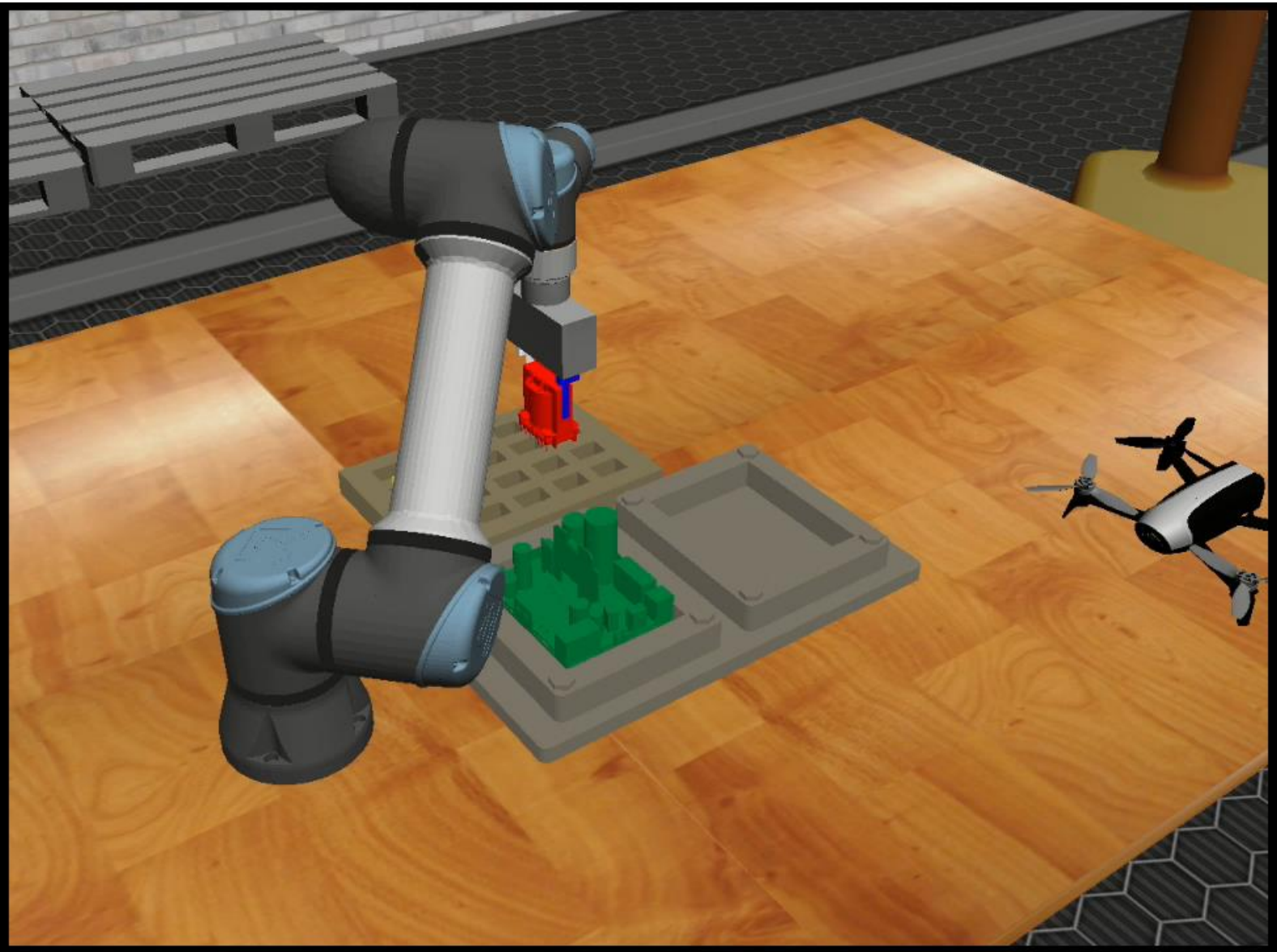


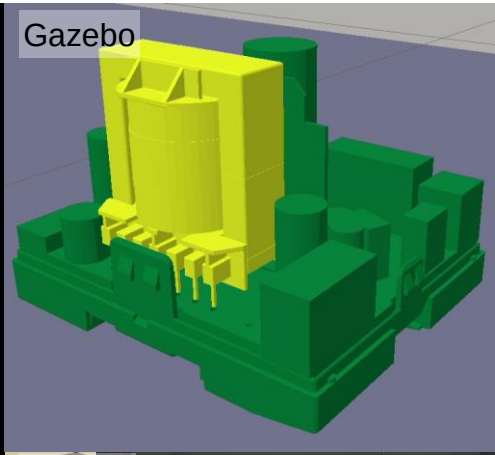


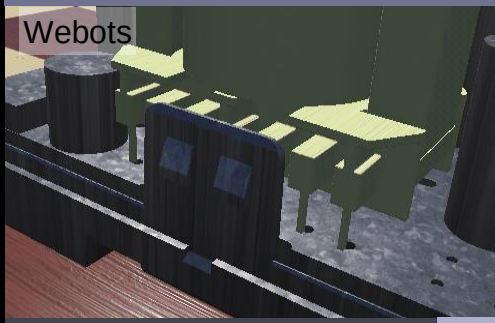


CPPS Concepts in Research and Reality
Through-Hole Technology (THT) Assembly Optimization with DRL

SIEMENS
Ingenuity for life



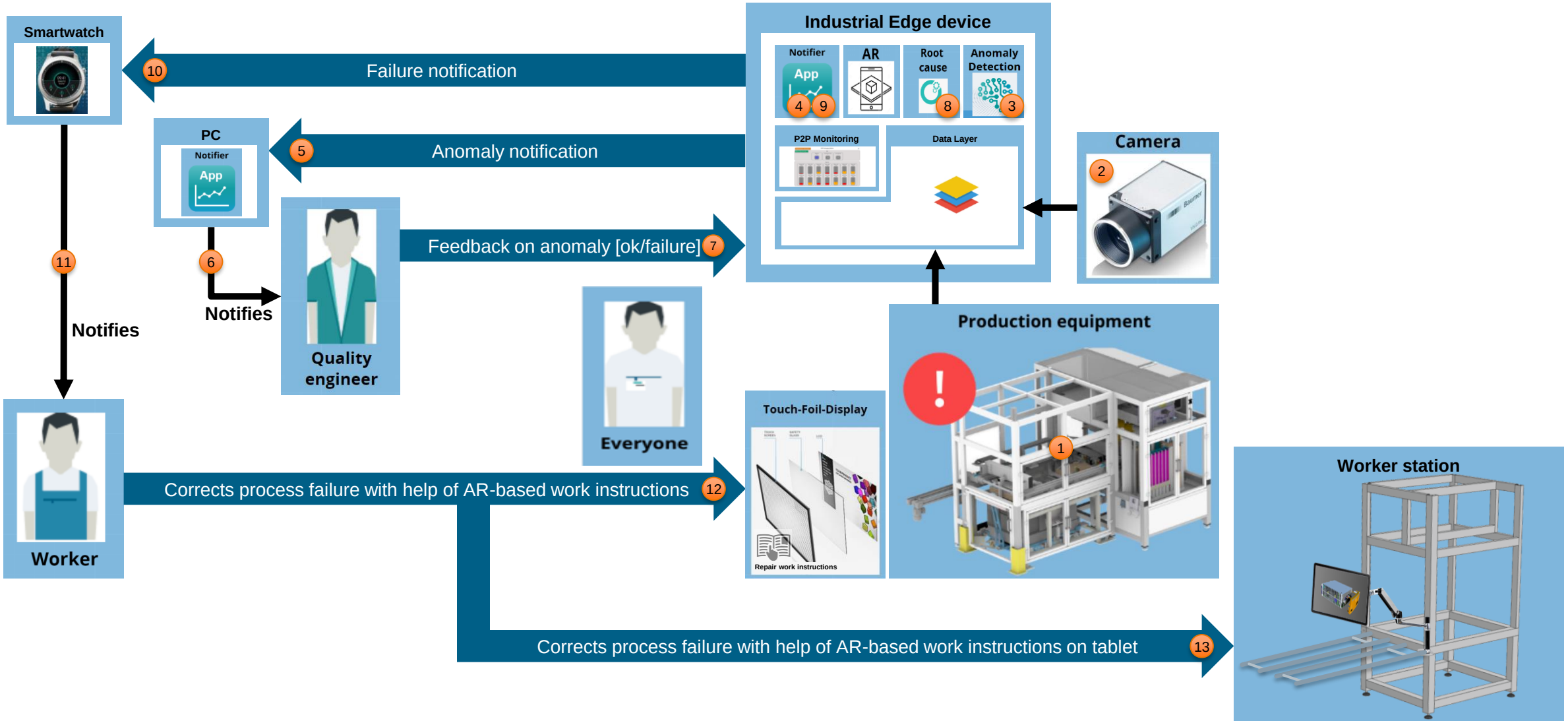




Simpler peg in hole use case

CPPS Concepts in Research and Reality
Anomaly Detection and New Human-Machine Interactions

SIEMENS
Ingenuity for life



CPPS Concepts in Research and Reality

Anomaly Detection on Edge & New Human-Machine Interactions (Video)


SIEMENS
Ingenuity for life
Peer2Peer – das cyberphysische Produktionssystem.
Flexibel. Intelligent. Automatisiert.
siemens.at
KNAPP

Thank You!

Harald Loos

Siemens AG Österreich
Head of T RDA AT

Siemensstrasse 90
1210 Vienna, Austria
E-mail: harald.loos@siemens.com