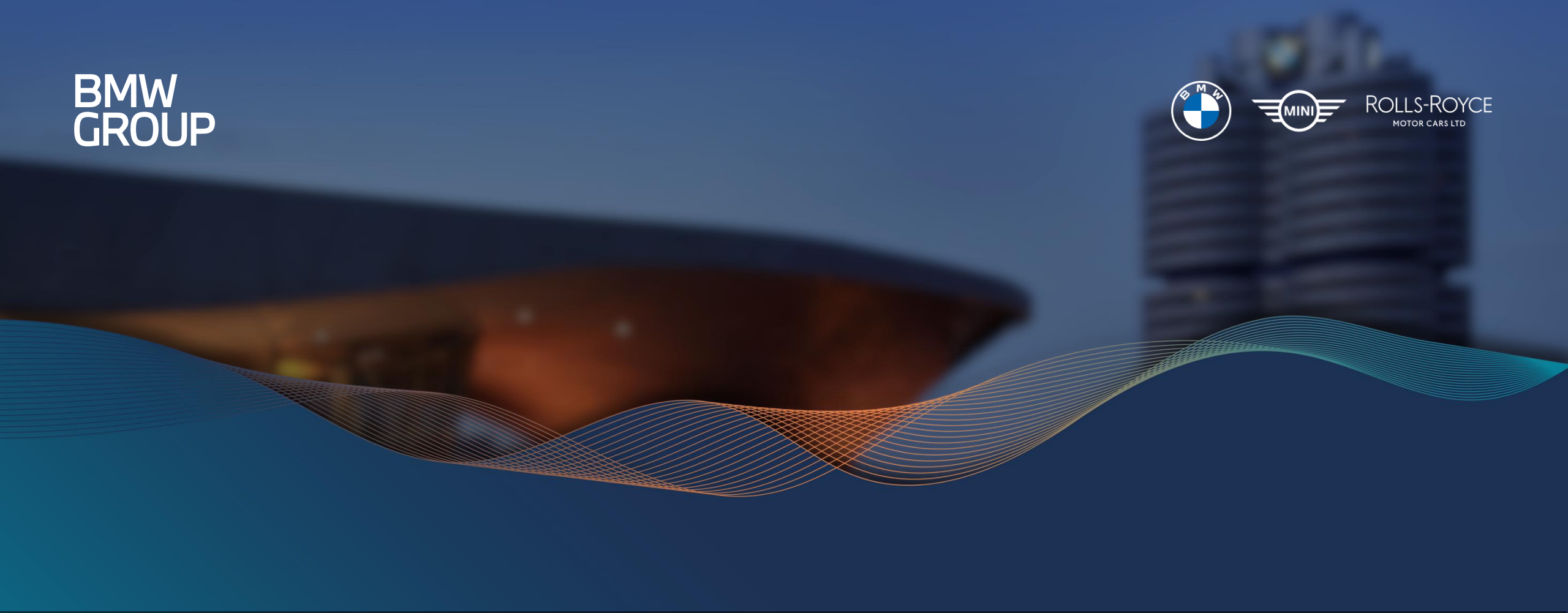


ROS IN MANUFACTURING

FROM INTEROPERABILITY TO PHYSICAL AI

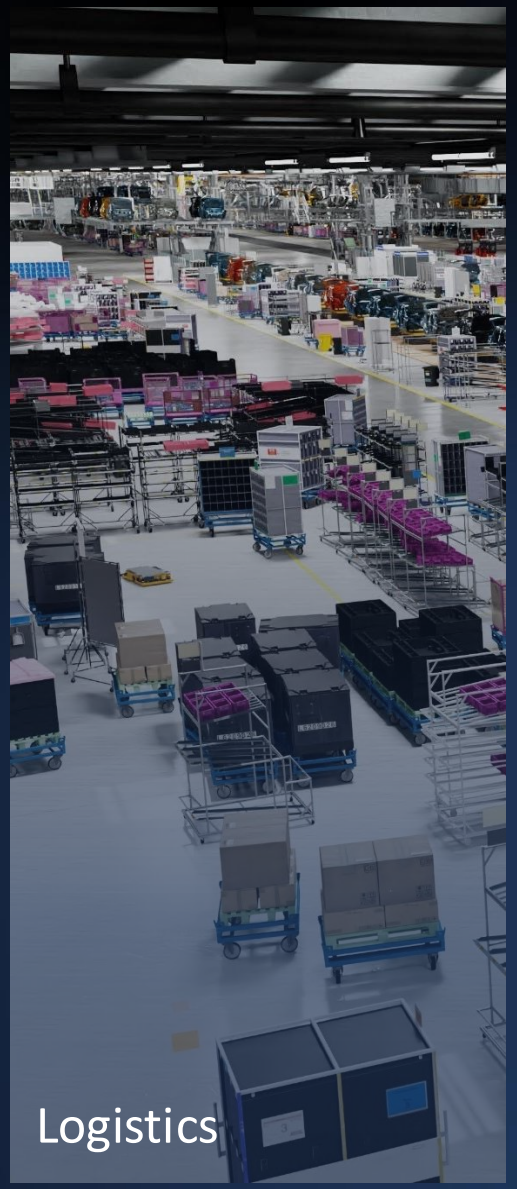
/ POTENTIAL FOR SMART AUTOMATION

/ POTENTIAL FOR SMART AUTOMATION


Inspection

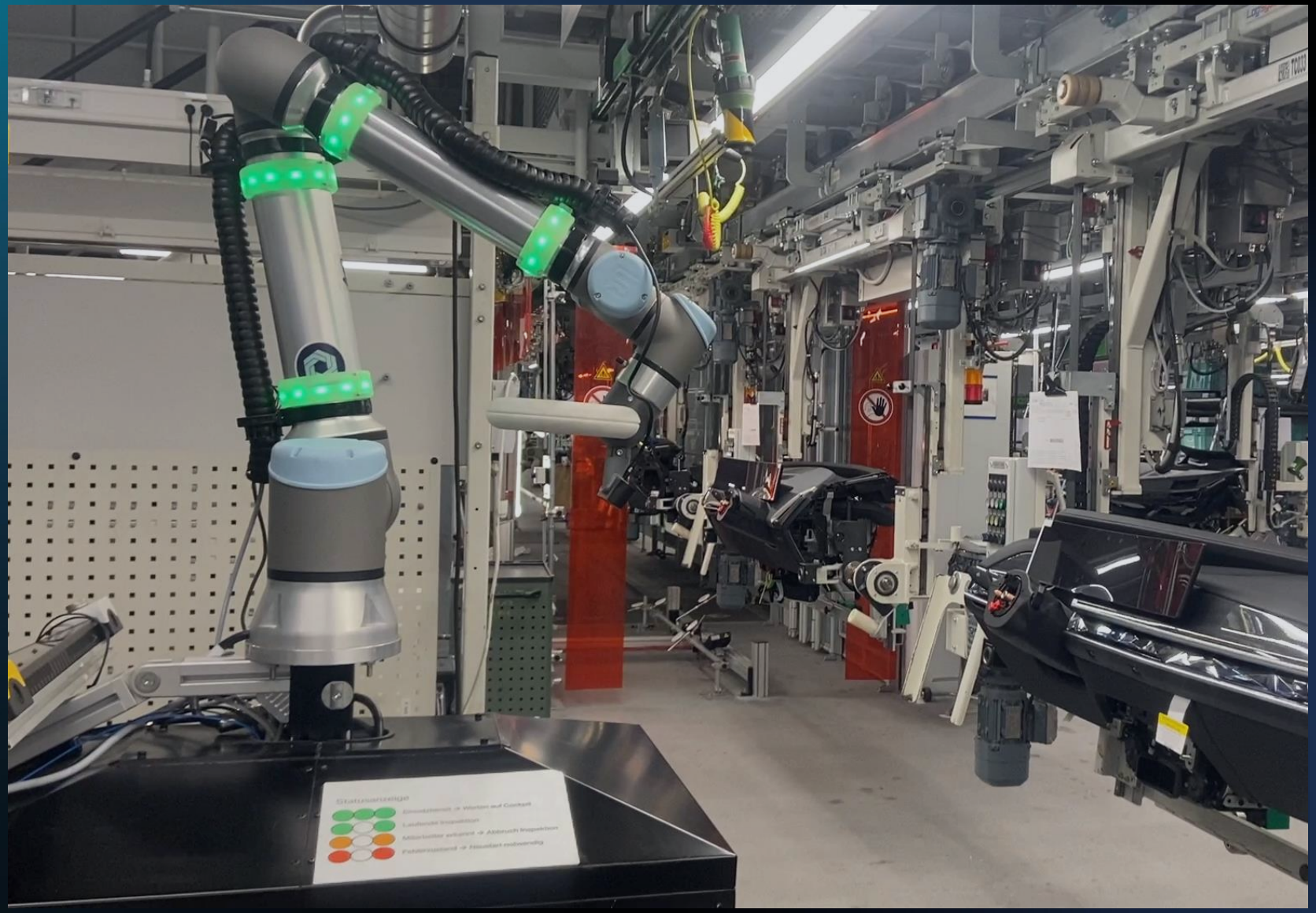
Machine Loading

Assembly


Logistics


Body Shop

/ AI-BASED IN-LINE QUALITY INSPECTION



Collision Avoidance

Web-based UI

Cycle Time Optimization

Kinesthetic Teaching

Enabling anyone to teach a robot to inspect in-line.

/ LESSONS LEARNED

System Building

Deployment

Operation

/ LESSONS LEARNED

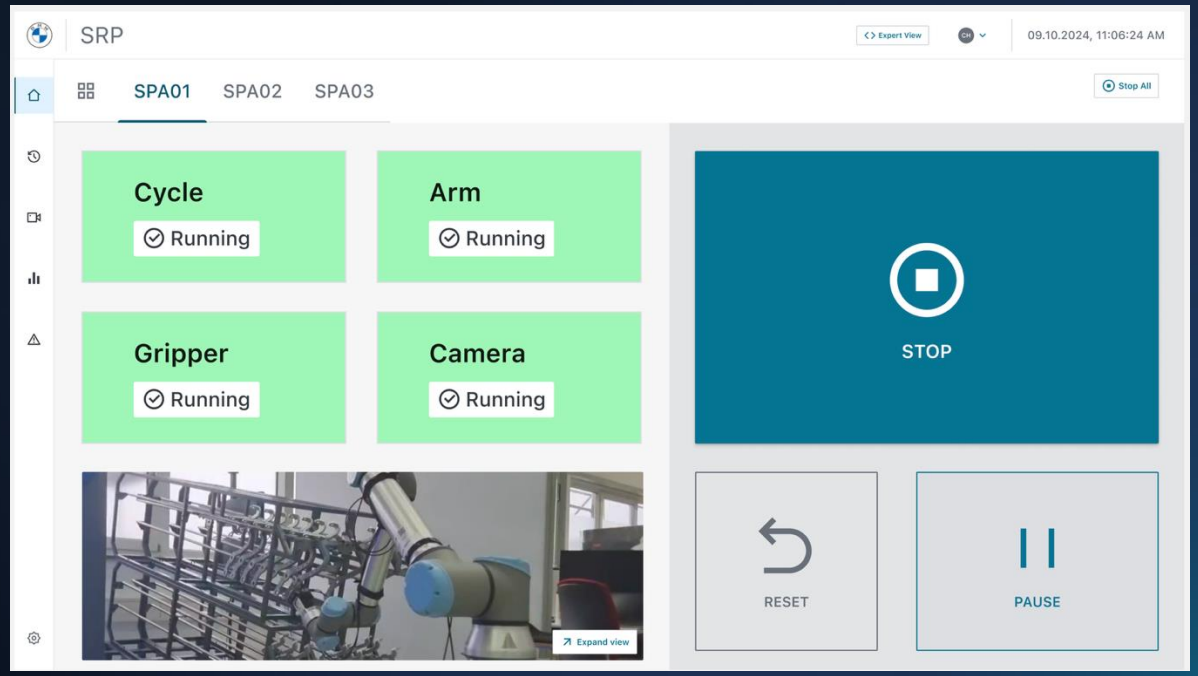
System Building

Deployment

Operation

Enabling maintenance personnel

Allow for easy interaction



/ MACHINE LOADING

2D Pose Estimation

BTs with Basic Recoveries

Advanced Safety

Showing that our robots can operate in production critical use cases.

/ LESSONS LEARNED

System Integration

Deployment

Operation

/ LESSONS LEARNED

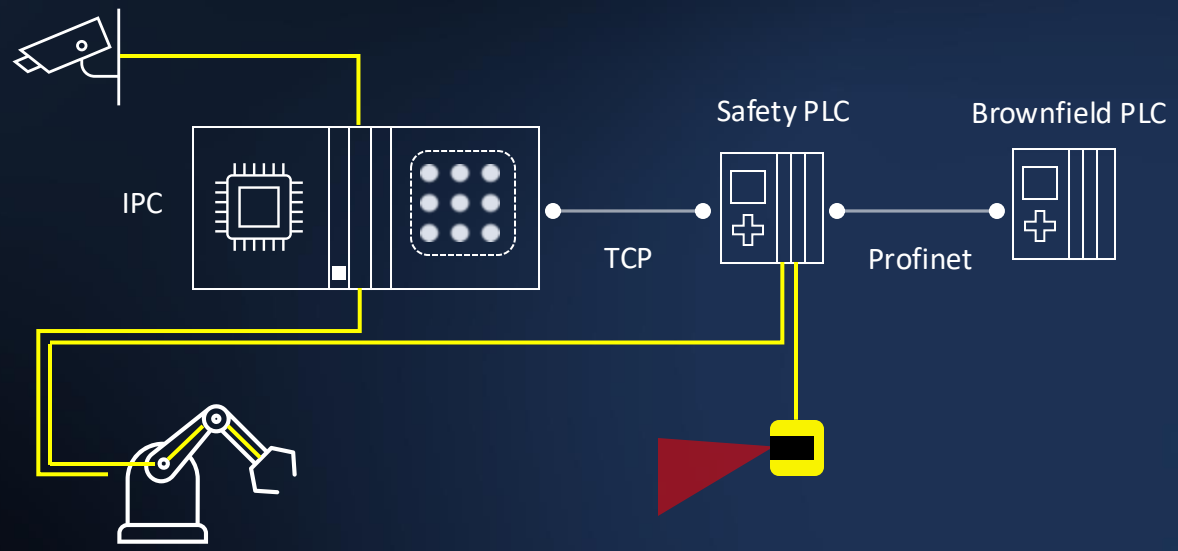
System Integration

Deployment

Operation

Network configurations

Abstracting I/Os



/ SCALABLE MACHINE LOADING ROBOT

/ LESSONS LEARNED

System Integration

Deployment

Operation

/ LESSONS LEARNED

System Integration

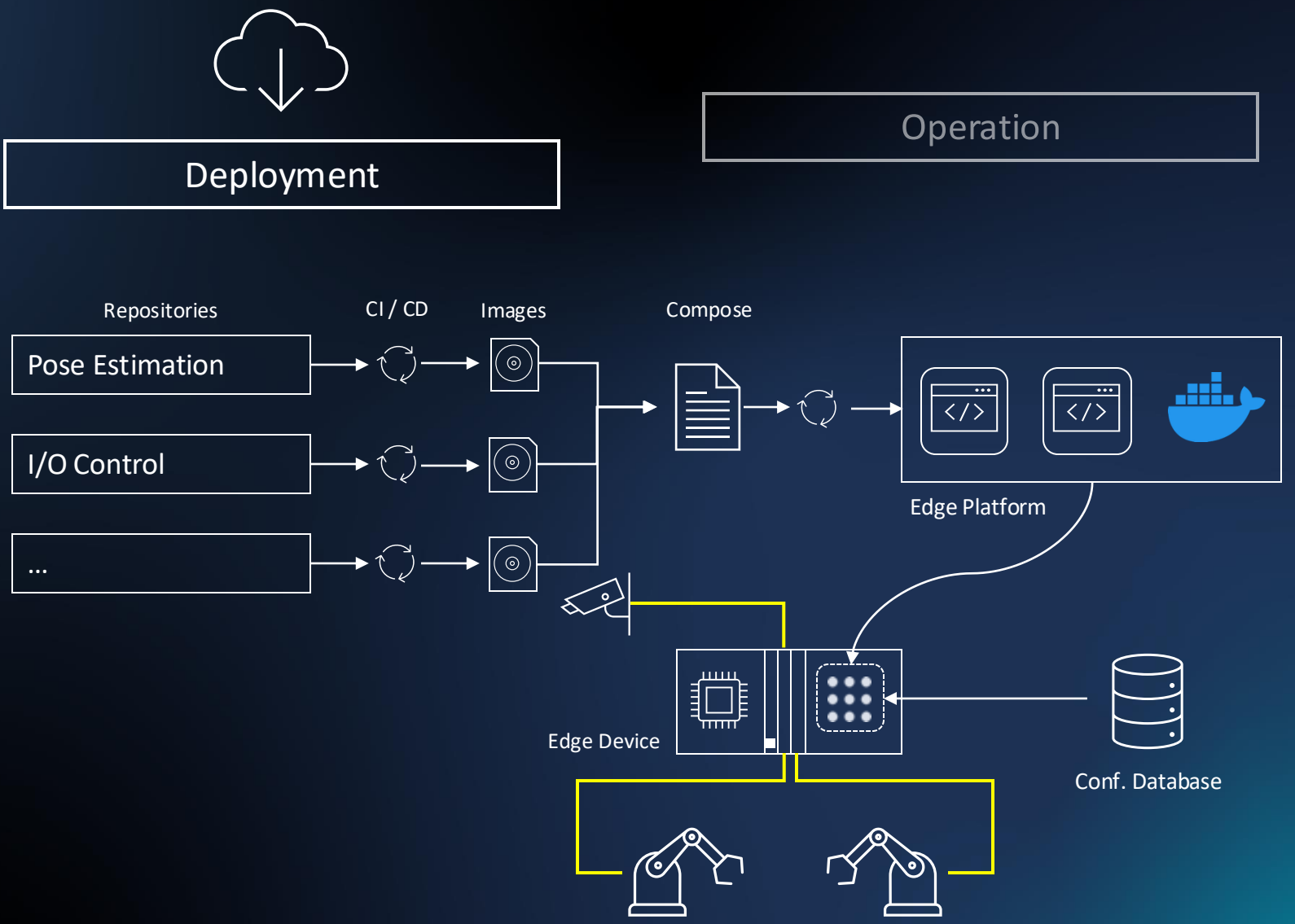
Deployment

Operation

Device Management

Packaging

Configuration Management

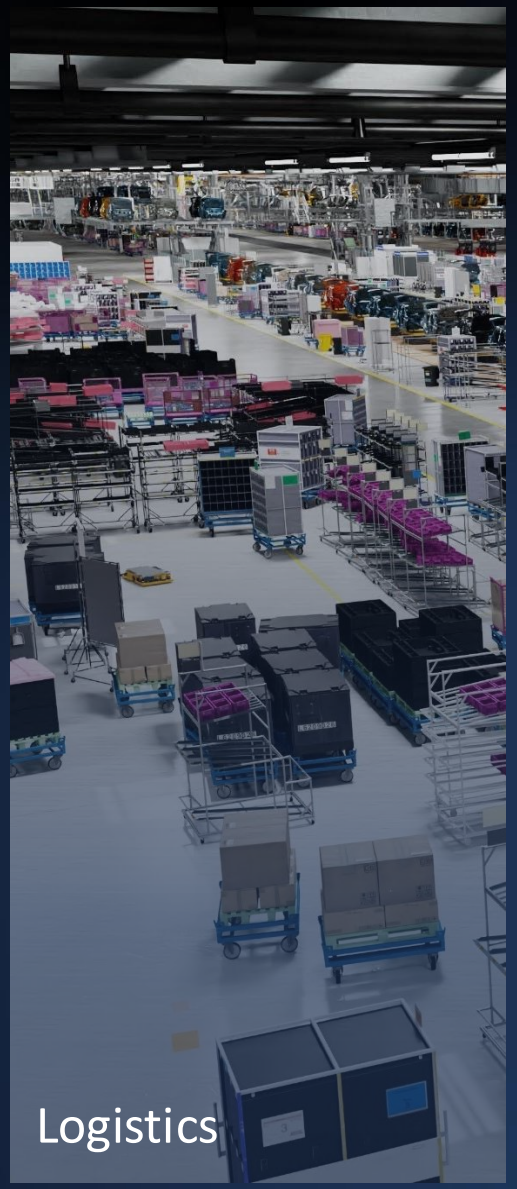


/ POTENTIAL FOR SMART AUTOMATION


Inspection

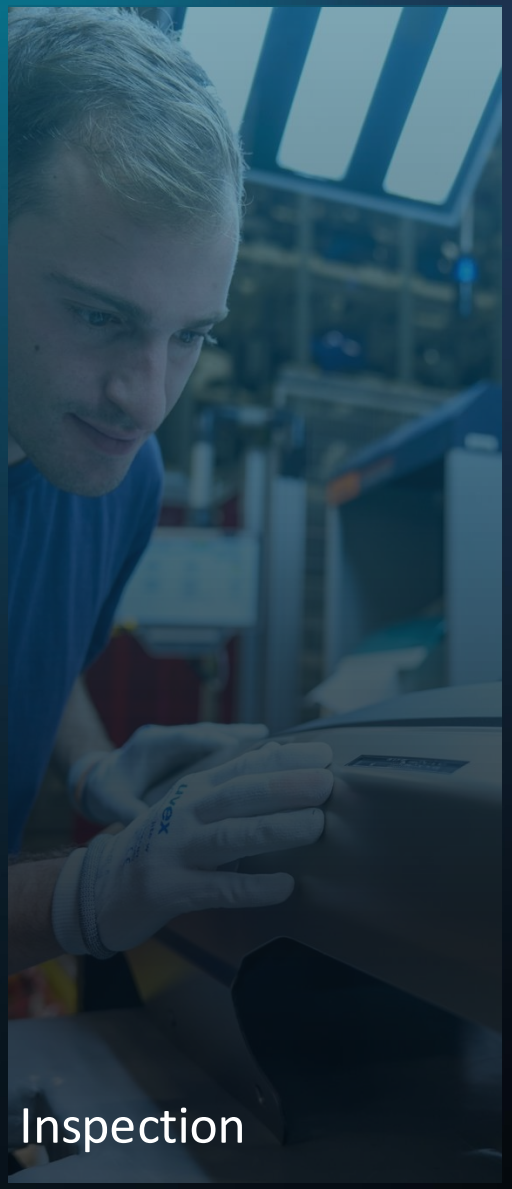
Machine Loading

Assembly


Logistics

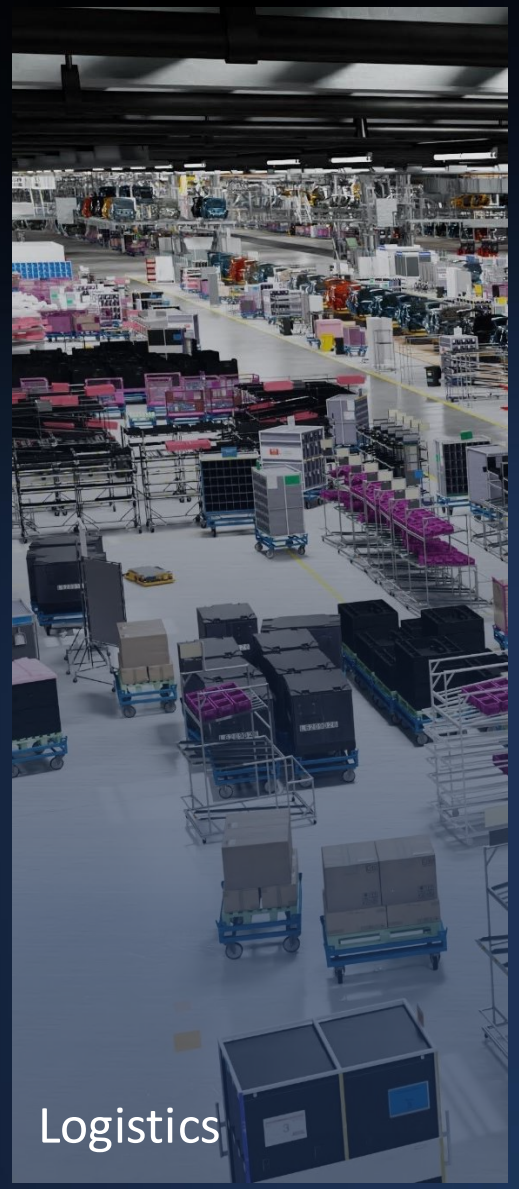

Body Shop

/ POTENTIAL FOR SMART AUTOMATION


Inspection

Machine Loading

Assembly


Logistics


Body Shop

/ THE RACE TOWARDS PHYSICAL AI

PERCEPTION AI

GENERATIVE AI

AGENTIC AI

PHYSICAL AI

BMW Examples

e.g. **Hum. Robots**
Coming Soon

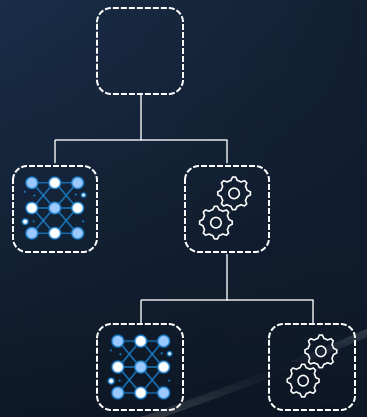
e.g. **Software Dev Agents**
Early stage

e.g. GAIA

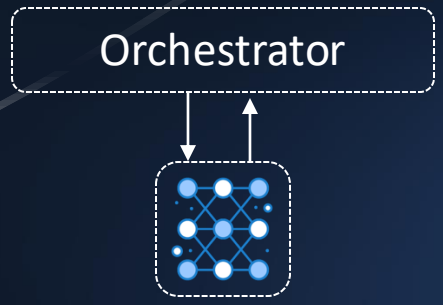
e.g. AIQX

/ NEXT LEAPS OF AI IN AUTOMATION

Perception



Mixed Architectures

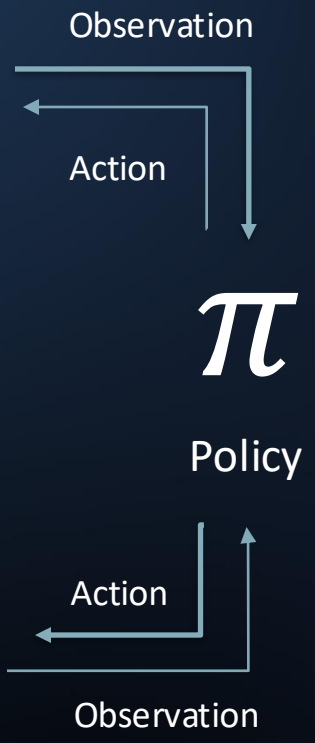


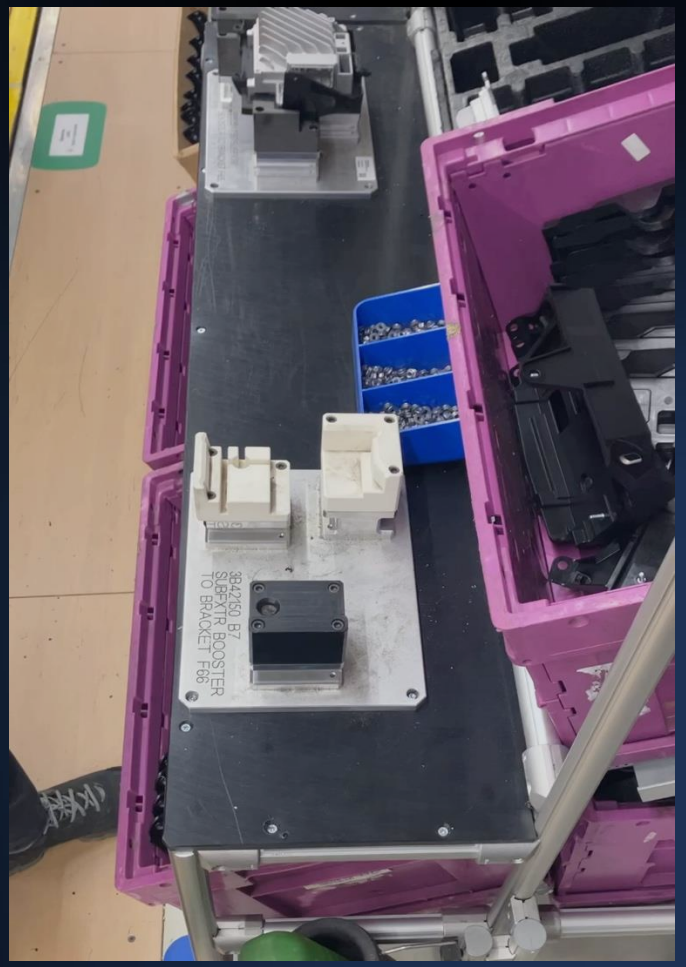
Specialized End-to-End Policies

/ FROM HOUSEHOLD TO INDUSTRIAL TASKS

Source: Physical Intelligence

Source: Physical Intelligence





/ IMITATION LEARNING BY TELEOPERATION

Data Collection

↓

Training

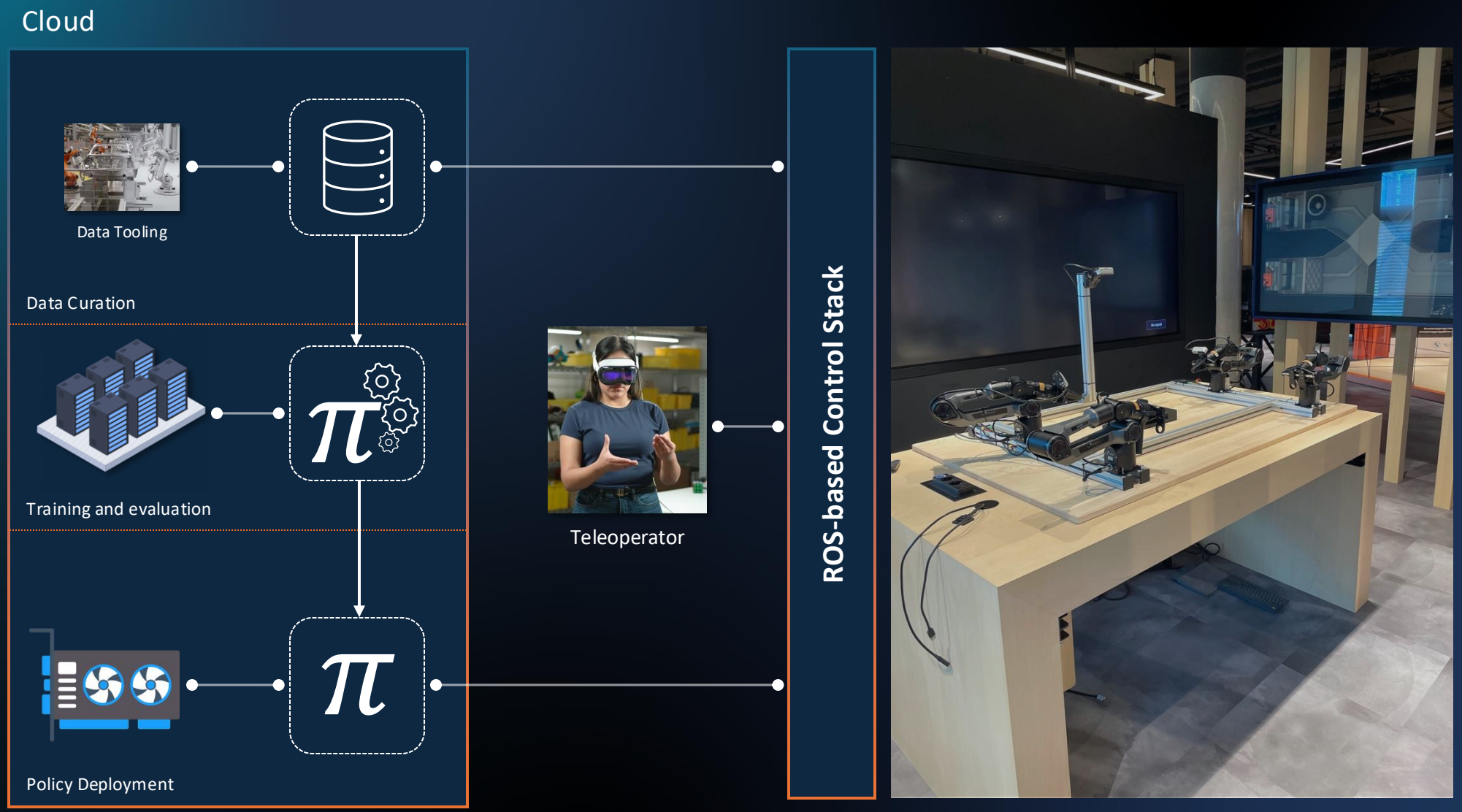
↓

Evaluation

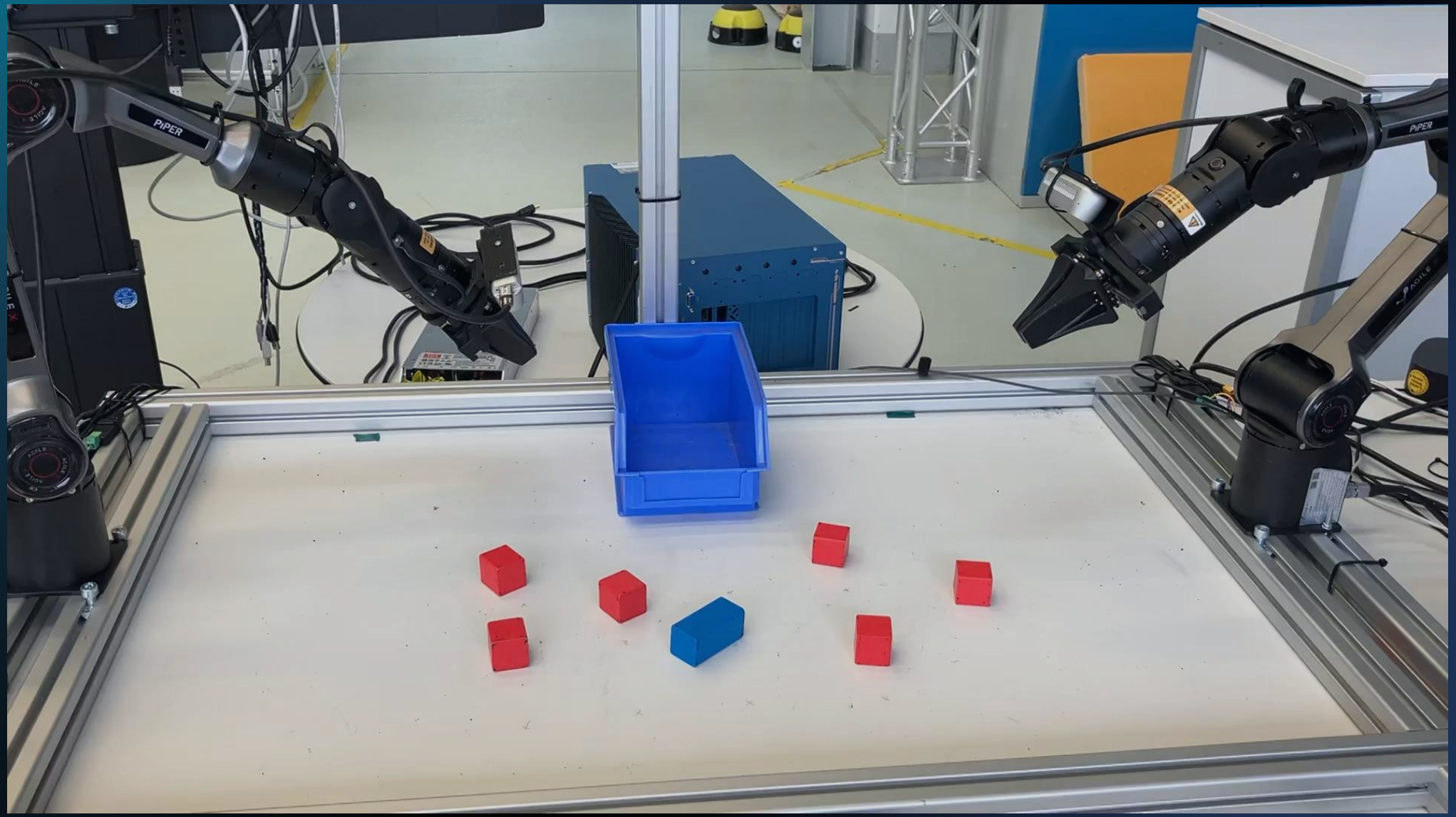
↑

~1 Week per Cycle

/ INFRASTRUCTURE AND ACCESSIBILITY ARE KEY



/ GRADUALLY INCREASING TASK COMPLEXITY



/ LESSONS LEARNED

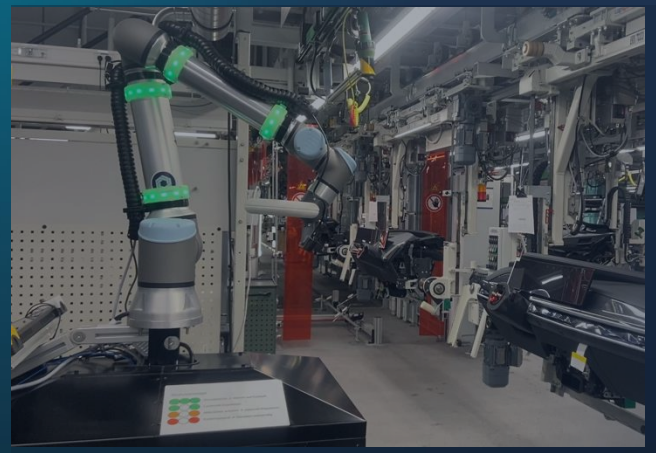
Start small

Skilled teleoperators

Evaluation is hard

/ FROM RESEARCH TO INDUSTRY ENABLING RESEARCH

/ BMW NEXT GEN ROBOTICS & COLLABORATORS



Thanks to an awesome team!