

Welcome

Movelt Pro Works Here Webinar Series



Dave Grant
CEO
PickNik Robotics
dave.grant@picknik.ai



Michael Gentner
Robotics Research Engineer
BMW Group
michael.gentner@bmw.de



Nathan Brooks
CTO
PickNik Robotics
nathanbrooks@picknik.ai





[Case Study](#)



We want to hear from you!
Please drop your questions
in the Q&A tab!

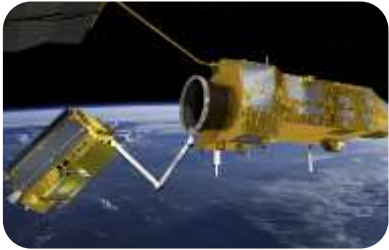


picknik.ai



PickNik Mission:

Enable organizations to rapidly deploy **intelligent robots for advanced applications** across multiple form factors



Aerospace



Construction



Mobile Cleaning



Multi-arm



Develop, test, and validate advanced robotic manipulation systems faster and more safely.

BMW NEXT GEN ROBOTICS OVERVIEW

Michael Intro – Personal Story

How I got interested in Robotics

How / when I joined BMW

Team Background

Mission

Location

Purpose



THE AI-RACE IS DRIVING ADVANCES IN ROBOTICS LEADING TO A NEW WAVE OF INDUSTRIAL AUTOMATION.

2024

<Advances in AI>

The foundation for the next generation of industrial robots.



<Autonomy>

Robots can react and adjust to unforeseen changes in the environment on their own.



<New forms of interaction>

It will be possible to interact with robots via text, speech and gestures.



<Interoperable hardware>

Hardware and software can be combined flexibly for different use cases.



<Multi-purpose usage>

Systems can be used for different tasks, not just hardware but mainly software.



<Goal-based programming>

Programming is done on a higher abstraction level or by only specifying goals to achieve.

<Autonomous Transport Robots>

700 Intelligent logistics robots, managed through a central cloud hosted system, complete 41.000 missions a day in 11 BMW plants worldwide.

<Smart Industrial Robots>

Automation of manual roles, starting at the interface of logistics and body shop, with reduced time to market and lower invest than classical robotics. AI driven Software allows bin picking and placing in unstructured, changeable environments.

<Humanoid Form Factor>

Industrialization of humanoid robots to serve in roles awkward and tiring for humans.

202X

// POTENTIALS FOR SMART AUTOMATION



Body Shop
Part Handling



Logistics
Part Handling



Assembly



Battery Cell
Manufacturing



Body Shop
Special Cases

VISION SMART ROBOTICS PLATFORM:

LEVERAGE NEW OPPORTUNITIES FOR COST EFFECTIVE AUTOMATION AT SCALE IN BMW PRODUCTION SYSTEM.

OT



<User Focused>

The interaction and maintenance of our systems does not require any specialized knowledge.



<Hardware & Software Baukasten>

Software configurable for different use cases and executed on a variety of robotic hardware, safety by design.



<Simulation First>

Robots are programmed, trained and tested in simulation.



<AI Enabled>

AI models control robots and automate highly complex processes.



<Open Standards>

Ensure long-term flexibility and independence.



<Always Up-to-Date>

Software and configuration is managed centrally and rolled out automatically, with built in security.

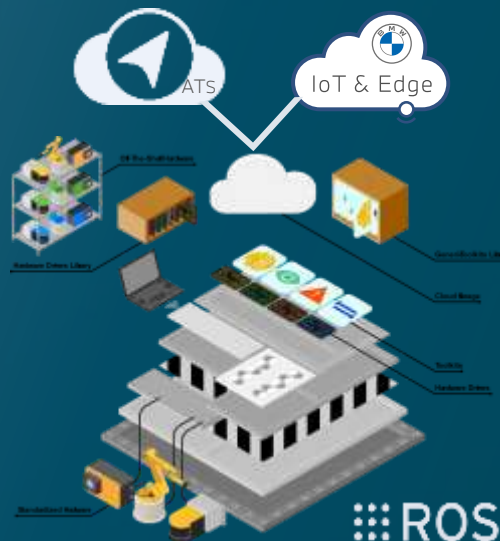


<Orchestrated>

We intelligently control a fleet of robots that interact with each other.

Convergence

IT



Up front Cost /Invest

Time to Market

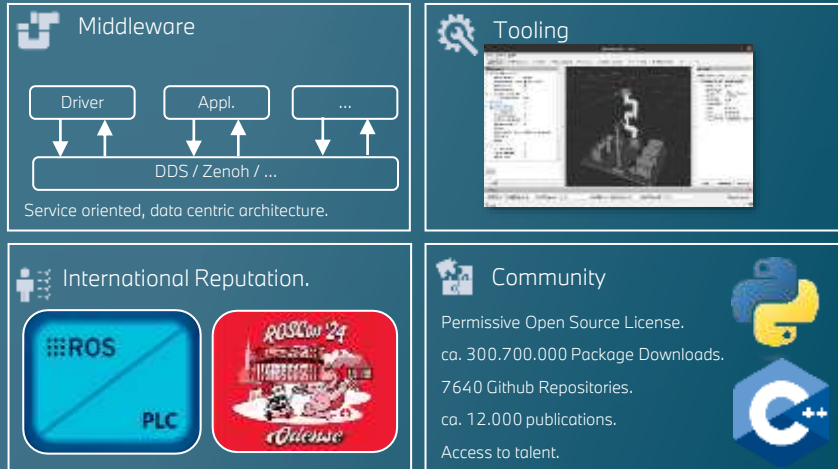
New Opportunities for Automation

ROBOT OPERATING SYSTEM (ROS) AS BASE OF THE SMART ROBOTICS PLATFORM.

„BAUKASTEN“ TO CREATE ROBOTICS SOFTWARE, SUPPORTED BY NUMEROUS OEMS.

What is ROS?

ROS [...] provides the building blocks you need to build your robot applications.
- ros.org



Industry uptake:

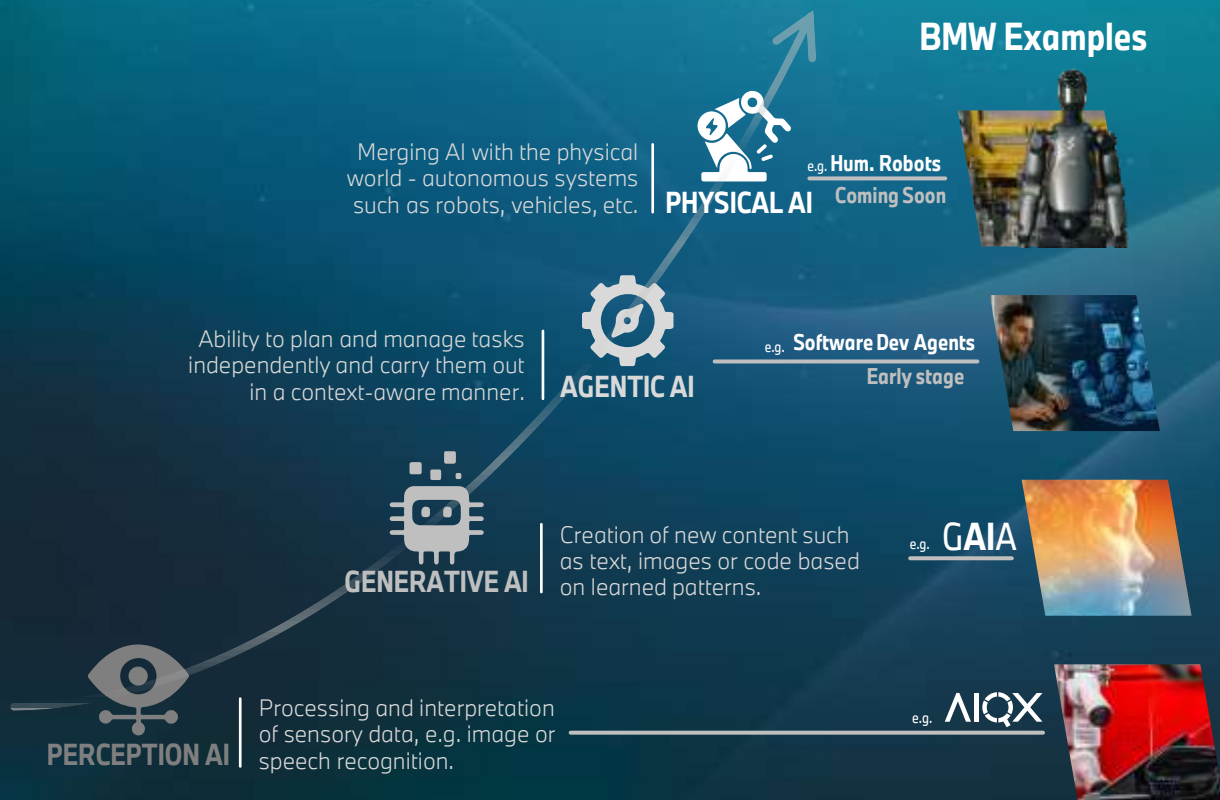
Technical governance financed through industry and governments



Interface to ROS supported by numerous OEMs



PHYSICAL AI: A NEW ERA OF ROBOTICS – DRIVEN BY THE RAPID DEVELOPMENT OF AI.



BMW Examples



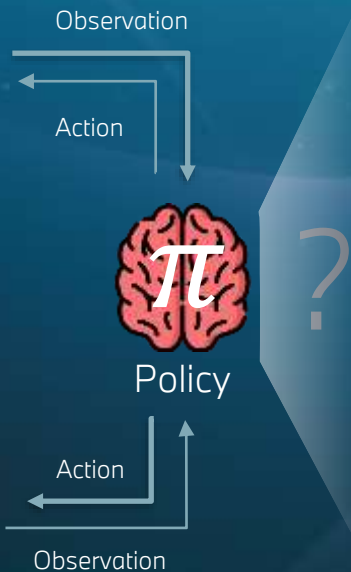
AS AN EARLY ADOPTER, WE ARE USING OUR KNOW HOW ADVANTAGE AND ARE ALREADY WORKING ON ROBOTICS FOUNDATION MODELS FOR ROBOTIC ARMS.



Bowl stacking



Laundry folding



Scaling robot learning to industrial use cases



BMW Pre Assembly Task

Automating complexity:
Data-driven approaches enable automation of challenging use cases.

Scalable solutions:
Policies can be transferred zero-shot or with little finetuning to new applications.

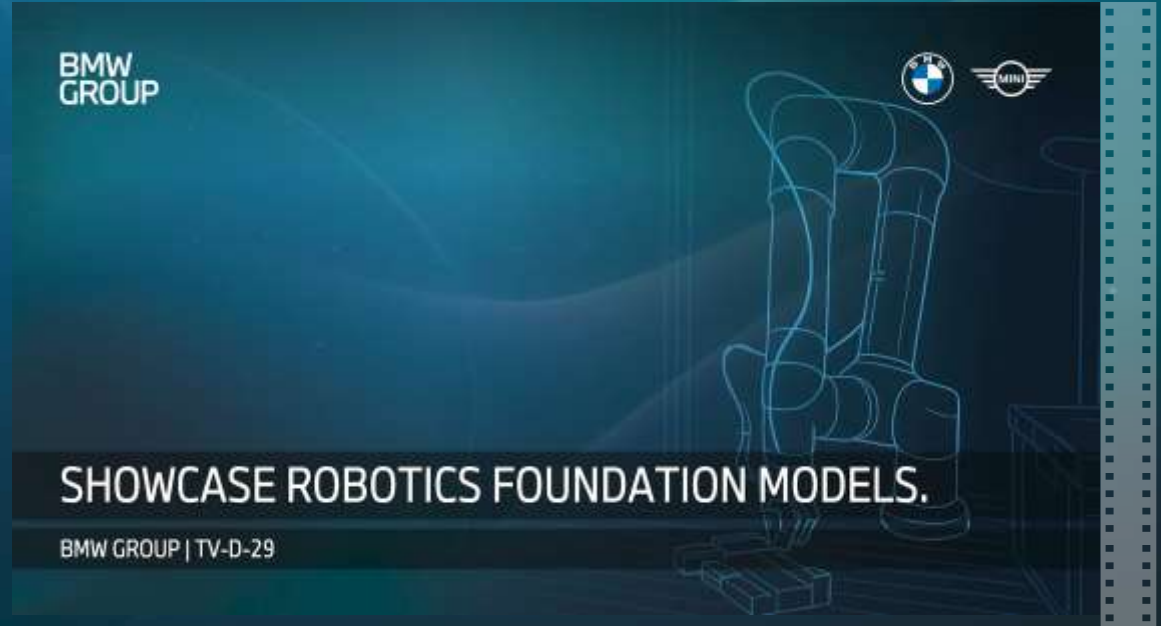
Data value:
Our data can be of high strategic value to a general market for training large models.

AS AN **EARLY ADOPTER**, WE ARE USING OUR KNOW HOW ADVANTAGE AND ARE ALREADY WORKING ON **ROBOTICS FOUNDATION MODELS** FOR ROBOTIC ARMS.

| Sneak Peek at Industrial Use Cases for Pre-Assembly at the Dingolfing Plant

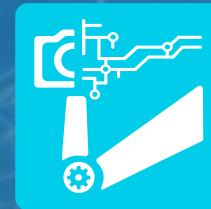


BMW Pre Assembly Task



CHECKBOT

SELF-SERVICE AUTOMATION OF VISUAL QUALITY INSPECTIONS



Motivation

- Inspection for dynamic needs is still manual
- Camera portals require setup time and are not flexible
- Intelligent automation solutions require experts for setup and operation



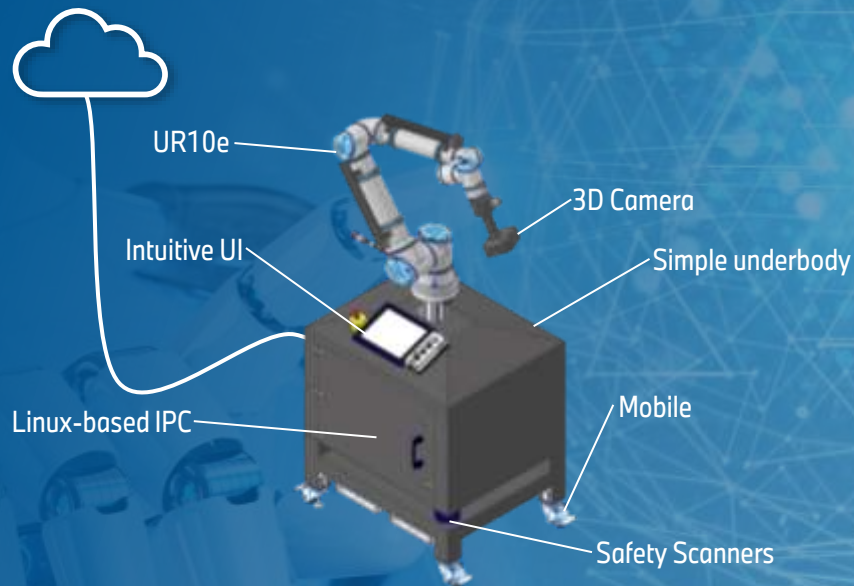
Easy to setup, configure and operate



Low-cost hardware <> Intelligent Software

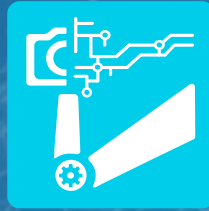


Connected and always up-to-date

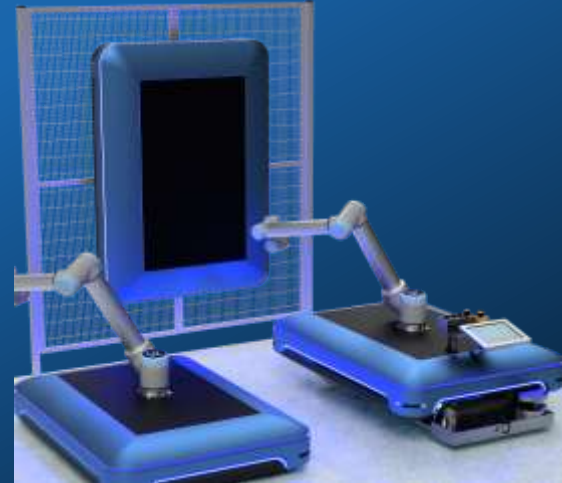


CHECKBOT

SELF-SERVICE AUTOMATION OF VISUAL QUALITY INSPECTIONS



KOKATBOT



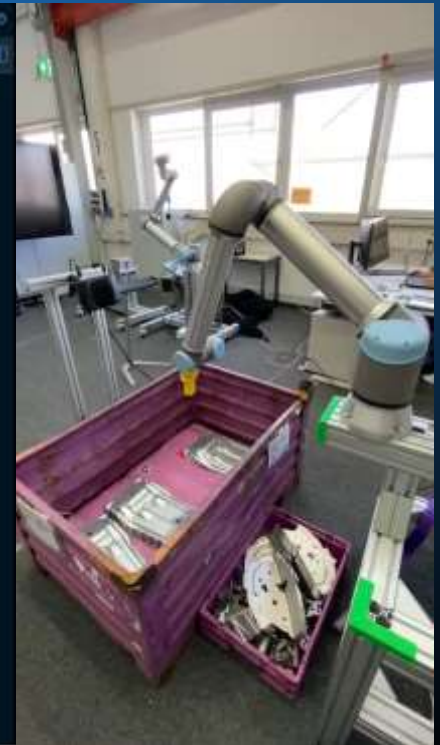
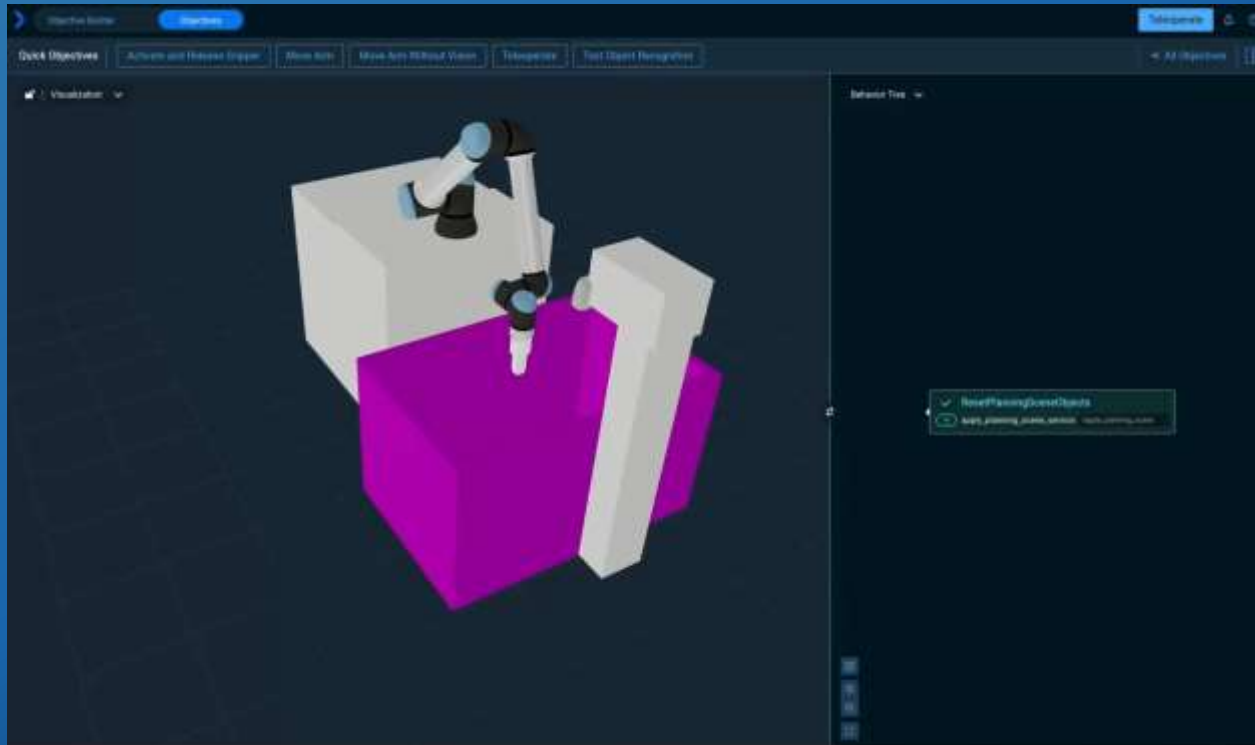
<KokatBot Concept>

Flexible and cost-effective automation of machine tending stations. Picking different parts from bins and placing them in the respective fixture.

KOKAT-BOT PLANT SPARTANBURG – JULI 2024



OUR JOURNEY WITH MOVEIT PRO - POC



FIRST MOVEIT PRO USE CASE - CHAOTIC BIN PICKING



SCALING WITH MOVEIT PRO

- Integrated development environment
- Configuration management with inheritance
- Dockerized application
- MoveIt Pro is ROS native and easy to extend
- Robust runtime for BT execution



SCALING WITH MOVEIT PRO

- Library of standard behaviors serves as basis
- Future Proof latest advances in Embodied AI
- Advanced skills like sampling-based motion planning and MTC
- Great user support from PickNik



WHAT ARE OUR NEXT STEPS WITH MOVEIT PRO?



CheckBot migration to MoveIt Pro

Meet target KPIs for KokatBot

LESSONS LEARNED ALONG THE WAY

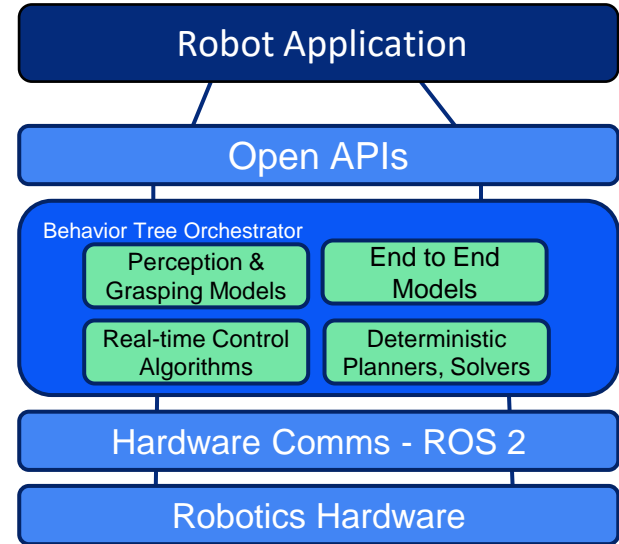
- Prototype first, generalize later, especially in BTs
- Start with use cases and not capabilities
- Start sequential and slow, optimize and parallelize later



Movelt Pro Integrated ML Architecture

AI Integrated with Controls

- Deterministic control for accuracy and efficiency
- ML for Perception & Grasping
- Train foundation models for robotics
- AI hallucinations are safeguarded by robot control



Integrated ML Architecture

Fast & Reliable



Motion Planners

Motion request

Joint trajectory

Move heavy objects or perform time optimal motions.

ML as Perception Subsystem



Segmentation Transformers

Vision (2D or 3D), Text Prompt

Mask specifying location

Find the next component for assembly task



Grasp Transformers

Vision (2D or 3D)

Grasp pose

Pick up a new tool from a messy workbench.

End to End ML



Action Transformers

Vision (2D or 3D)

Robot actions

Plan contact-rich, fine-grained motions for complex assembly.

Input

Output

Example

Safety through deterministic controls and verifiable Behavior Trees

 **Movelt Pro**

by  **PICKNIK**



Develop, test, and validate advanced robotic manipulation systems faster and more safely.

Questions?

**BMW
GROUP**



Also, Check Out More Success Stories <https://picknik.ai/case-studies/>



Hivebotics



Rapid Robotics



JAXA



Automotive
Assembly
Automate, '25

- [Webinar Series](#) Movelt Pro Works Here: Charles River Analytics
 - September 10th at 11am EST // 5p CEST

