

# Welcome

## Movelt Pro Works Here Webinar Series

**INVENTIA**  
LIFE SCIENCE



**Jason Leavens**

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CEO  
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**Dave Coleman**

Founder & CPO  
PickNik Robotics

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 **Movelt Pro**

by  **PICKNIK**

# Housekeeping for Today



More about  
PickNik  
[picknik.ai](https://picknik.ai)



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

**INVENTIA**  
LIFE SCIENCE

More about  
Inventia  
[inventialifescience.com](https://inventialifescience.com)

# Agenda

- Welcome & Housekeeping
- PickNik Robotics Introduction
- Inventia
  - Jason & Tom
- MoveIt Pro Overview
  - Dave Coleman
- Q&A





**> MoveIt Pro**

# AI Robotics Application Platform

**Dave Grant**

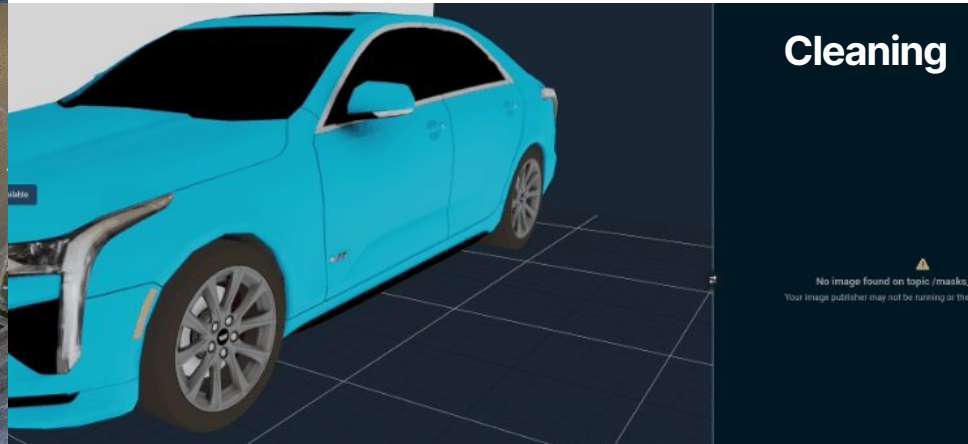
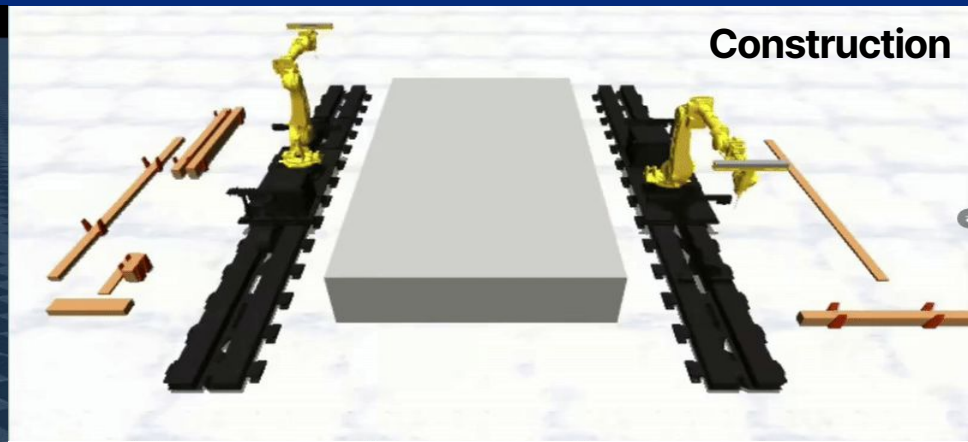
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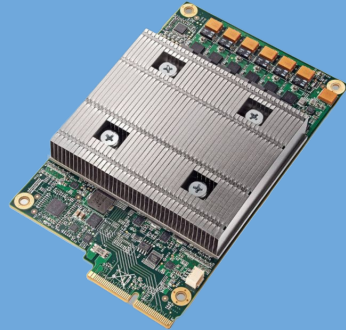
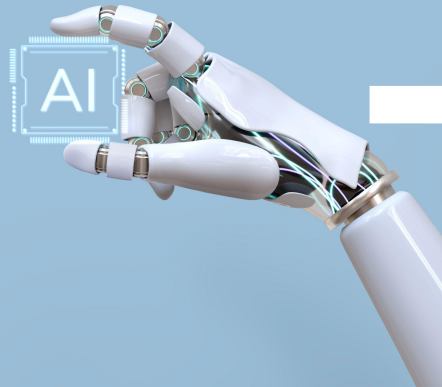
# ChatGPT is Transforming Office Work

## Movelt Pro is Transforming Physical Work



# Why Now?

## AI + Compute Power + Open Hardware



# PickNik empowers innovators to build the future

Movelt Pro gives customers the power to bring their ideas to life.

Faster, safer, and without the heavy lifting of low-level coding or infrastructure.



# Movelt Pro

## The Fastest Path from Whiteboard to Production

 **Movelt Pro**

### Robotics Application Platform

#### Development

- Prototype in Digital Sim
- Build Robust Applications
- Rapid Iteration



#### Deploy & Scale

- Exact Same App to Production
- Tune and Update
- Duplicate & Modify

# Inventia Life Science

# Your Presenters from Inventia

*Meet the team behind the work*



**Jason Leavens**

*Head of R&D - LIGO*

- 4 Years at Inventia, 16 years prior in Implantable Medical Device Development
- Responsible for LIGO program management



**Tom Hazell**

*Sr. Systems & Controls Engineer*

- 2+ years at Inventia, 8 years experience in Software and Electrical Engineering.
- Full-stack development. Emphasis on robotics and motion, safety and PLC / embedded systems.

# About Inventia Life Science

Who we are and what we do

## INVENTIA LIFE SCIENCE

### Quick Facts

**Founded:** 2013

**HQ:** Sydney, Australia

**Industry:** Life Science / Medical Device

**Website:** [inventia.life](http://inventia.life)

### Company Overview

**RASTRUM:** A lab based bioprinting platform that builds reproducible, high-throughput 3D tissue models for disease research and drug discovery.



**LIGŌ:** [Where Movelt Pro is deployed], is a robotic in situ bioprinting platform that works in the operating theatre alongside a surgeon to rebuild living tissue at the site of an injury.



# What Inventia is Building with MoveIt Pro

*The application, the problem, the outcome*

## The LIGO Application

**Problem being solved:** Precise, repeatable robotic manipulation in a demanding clinical environment delivering nanoscale biomaterials. Safe, constraint-bounded motion that manual operation cannot deliver.

**Hardware stack:** KUKA LBR Med 7-axis collaborative arm, sterile biomaterial dispensing cartridges, 3D structured light scanner.

**Where MoveIt Pro fits:** *It is the supervised-autonomy motion layer, converting sensor-derived maps into collision-aware, constraint-bounded trajectories executed under operator oversight.*

**Target customers / end-users:** Hospital procedural and surgical teams operating in clinical care settings.

**Current stage of development:** In active development and clinical validation



Demonstration Print  
- 2-part low viscosity materials (1-3 cP)  
- Printed in-situ onto the forearm  
from 50mm above the surface  
- Part 1 - Red, Part 2 - Clear  
- Mix ratio 1:1  
- Ejecting 45nl droplets every 0.5mm

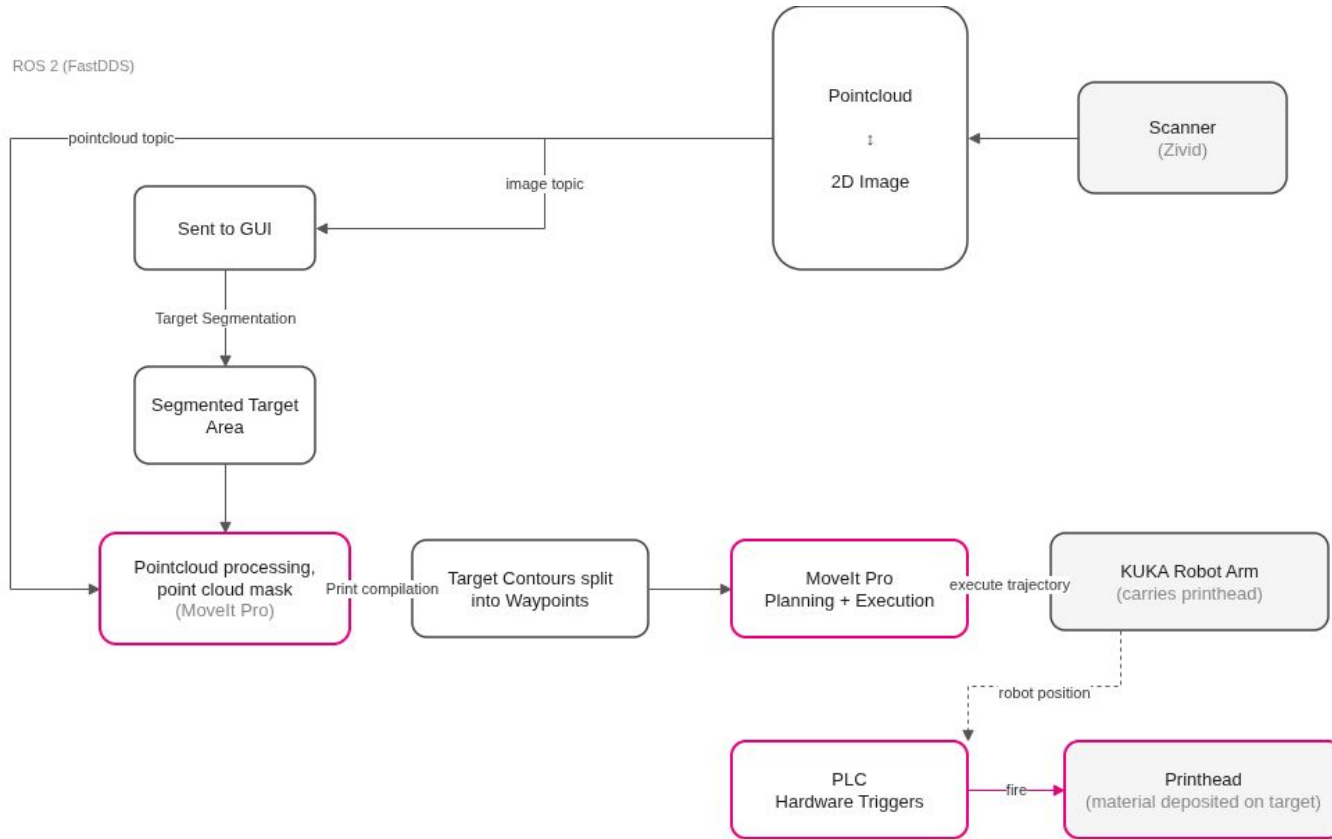
# World's First Clinical use of In situ Bioprinting Powered by LIGÖ

Established the **safety and feasibility** of an **automated surgical robot**

Laid the foundation for use of the system across expanded indications within **Plastics and Reconstructive Procedures**



# Ligo: System Diagram



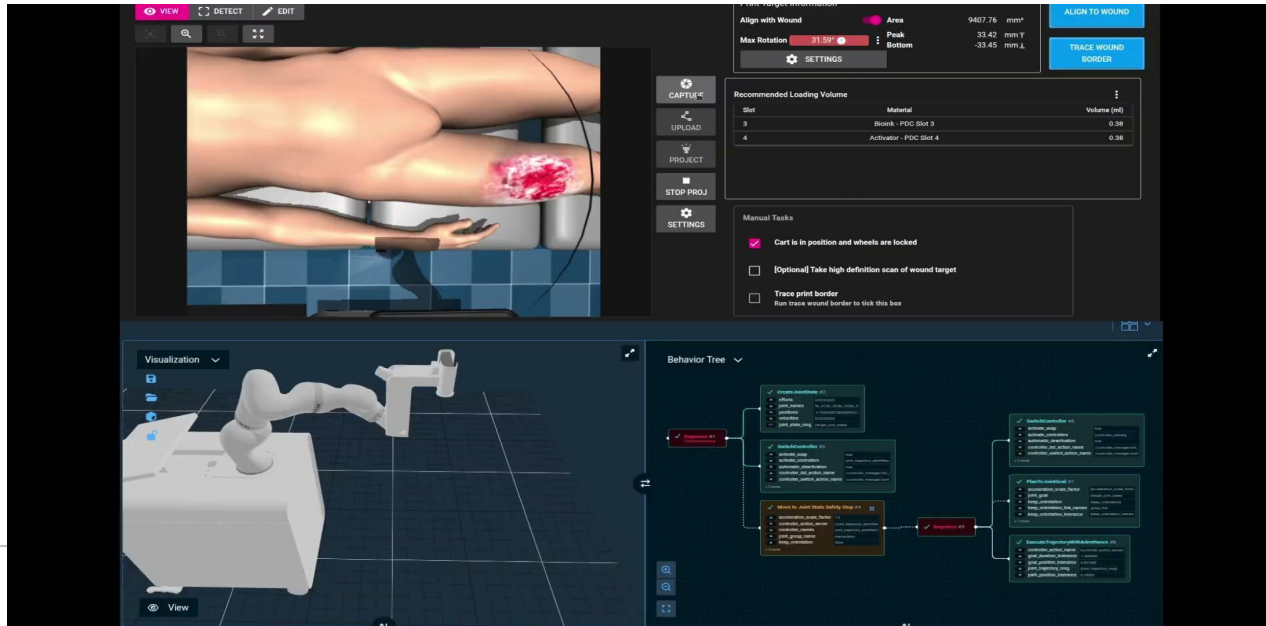
# Wound Target Registration

Move it Pro snapshot window:

- Targeting can be simulated easily
- Collision detection on snapshot pointcloud helps us avoid accidentally colliding with print target.

Ligo GUI Window (Separate Quasar UI over Rest API):

- ROS image taken and sent to the UI from the 3D camera.
- Target area segmented (or selected)
- Segmented pointcloud stored + in backend.
- Processed, converted into a print path.



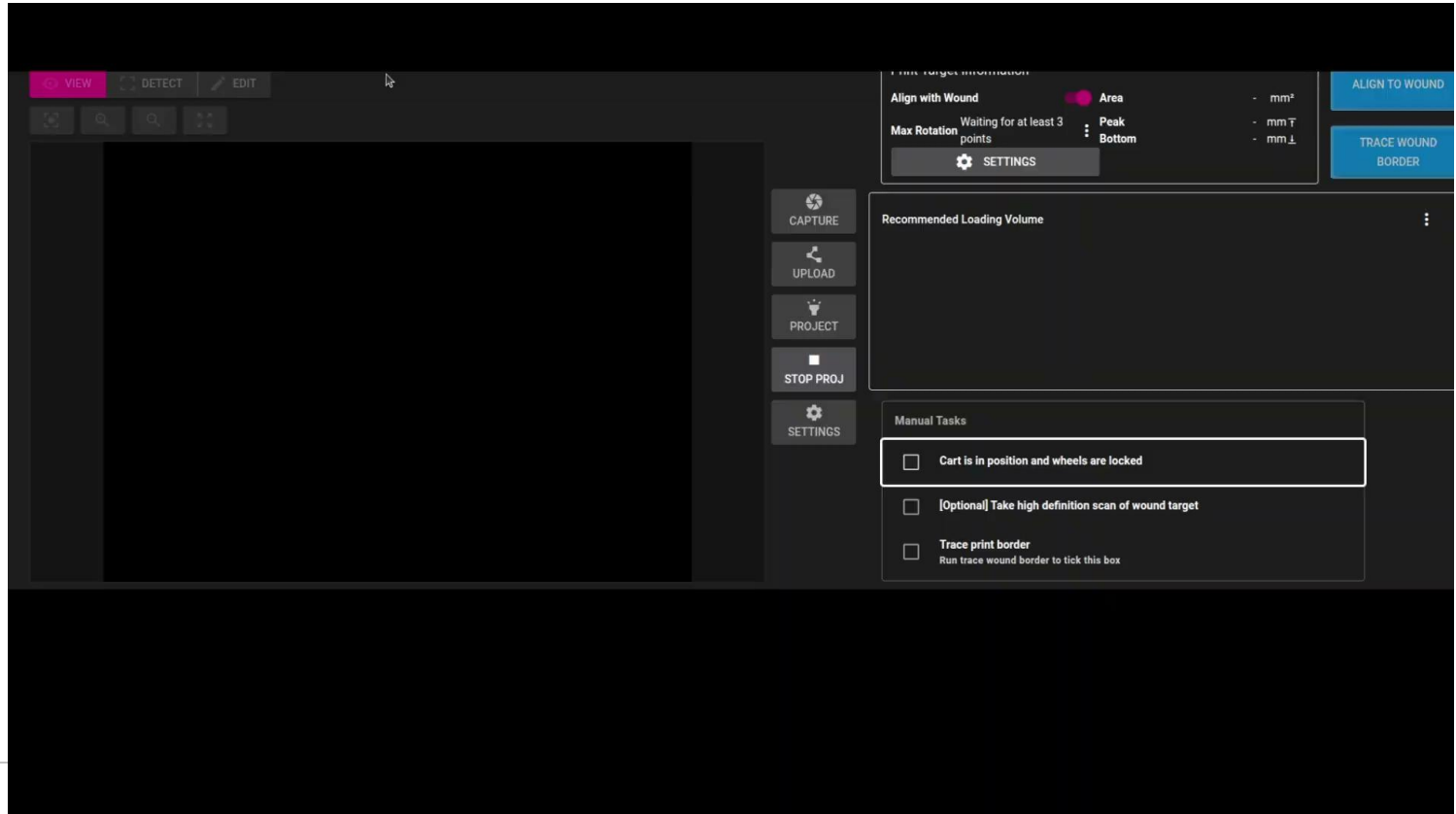
# Wound Target Registration: Segmentation

Wound and Necrosis Auto-segmentation

ML model classifies  
image into:

- None (no wound)
- Wound
- Necrotic Tissue

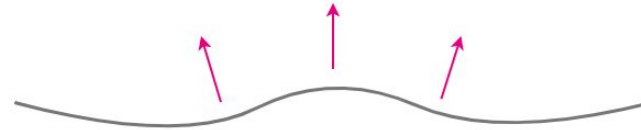
and returns a mask.



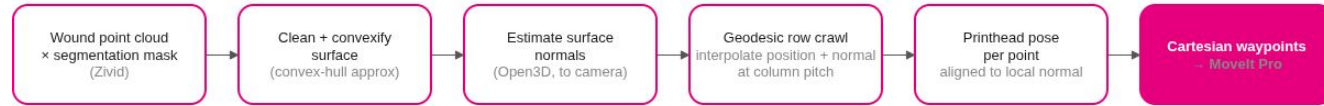
# Contour Printing

- For complex, larger wounds, the contours of the wound need to be taken into account.
- When depositing material, we need to be sure that we are depositing in a straight line, and for consistency the deposition height must be maintained.
- We need to move the robot along a contour of the surface, with the printhead oriented normal to the surface when a deposition is triggered.

## Surface-aware contour targeting



Printhead stays perpendicular to the tissue surface

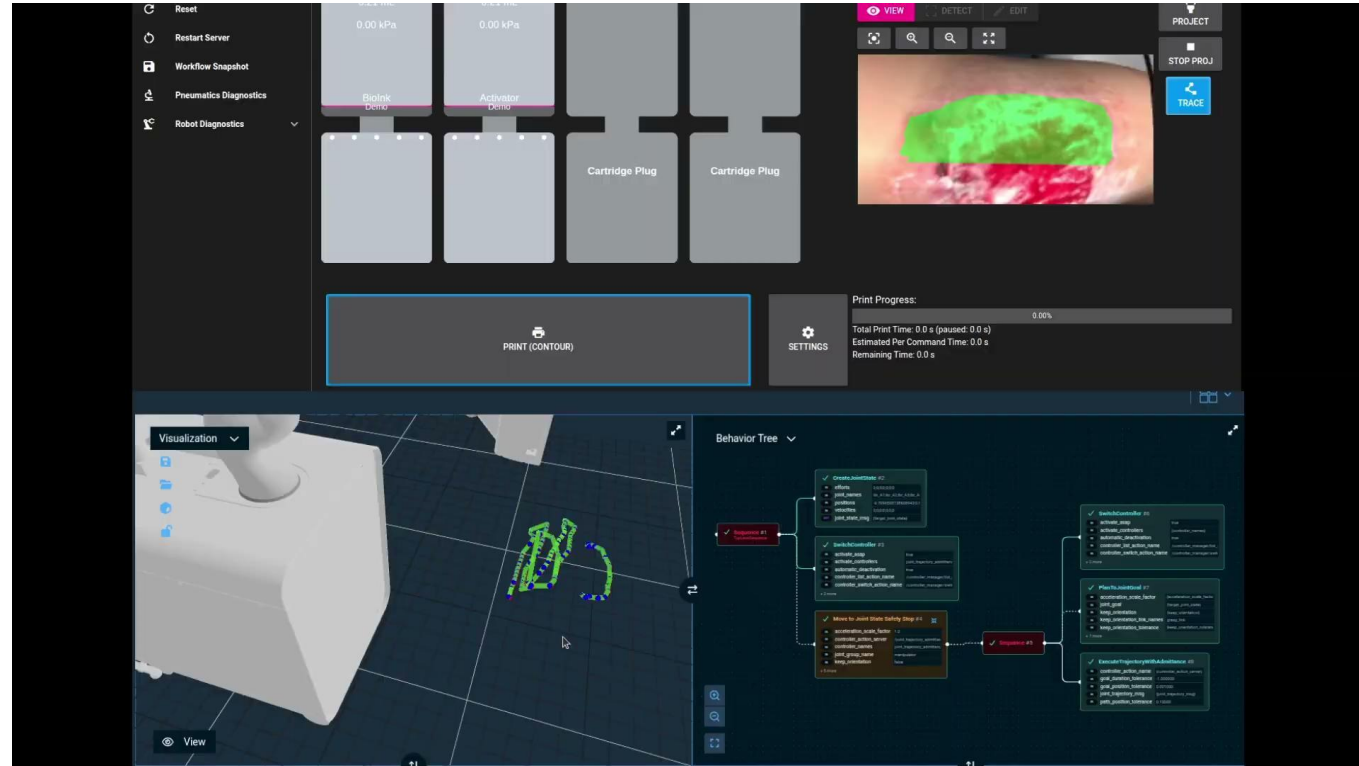


The path follows the wound's 3-D surface, not a flat trace. We mask the cloud to the wound, clean and convexify it, estimate surface normals, then crawl row-by-row interpolating both position and normal — so the nozzle meets curved tissue perpendicular at every point.

# Path Planning and Print Execution

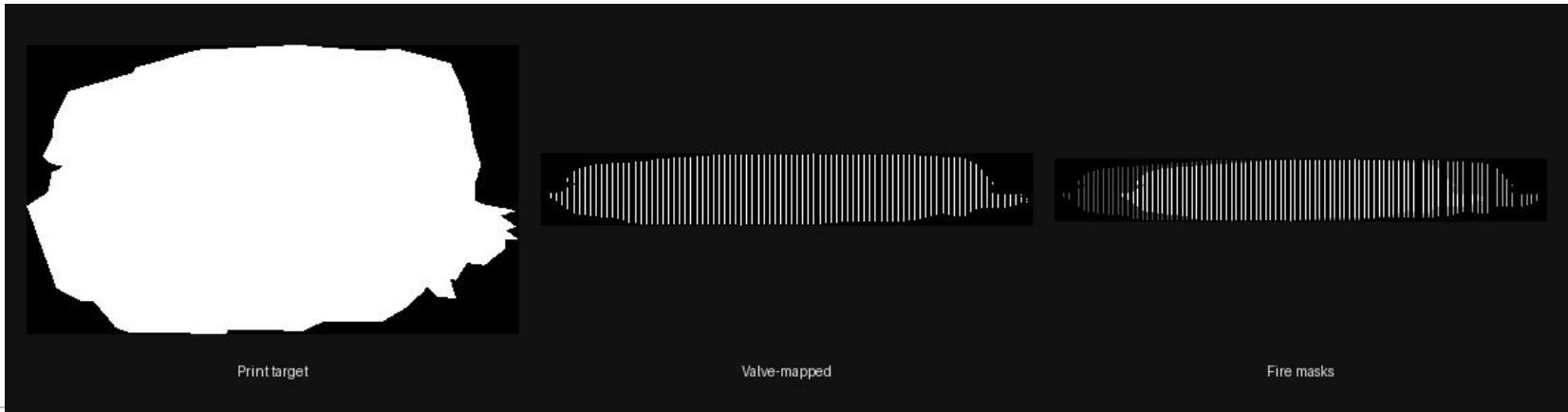
Ligo Quasar GUI and Movelt Pro UI side by side

- Example of a 'Contour Print' with the printhead offset at a normal to the wound surface



# Bitmap Printing

- Bitmap determines masking for hardware triggers - which nozzles fire when.
- The bitmap is processed through various masks so that each nozzle covers the exact same region when printing a row. Additionally, a starting bitmap can be chosen to print particular features (e.g. pores in skin).
- When we execute a print, a separate hardware trigger loop is initiated on the robot itself, which sends hardware triggers to our dispensing machine (PLC). That way we can print with consistent droplet spacing.



# Our Journey with Picknik

1 What did you do before Movelt Pro?

**Before Movelt Pro we were locked into directly using the API of our robot arm.**

2 Why did you choose Movelt Pro?

**We were transitioning to a ROS based system, and wanted the quick development, integration, support and inverse kinematics Movelt Pro offered.**

## Our Journey with Picknik

3

How does MoveIt Pro integrate with what you had already built?

**MoveIt Pro integrated very easily with the robot arm we were using, and we were able to port our existing python backend onto a ROS node talking to moveit pro without much fuss.**

4

How do you use MoveIt Pro day-to-day?

**MoveIt Pro runs the motion for our Robot arm(s), and we test our motion out the Mujoco based physics simulator.**

5

What benefits has MoveIt Pro delivered for your team?

**We moved towards a ROS based system much faster than what we would have been able to otherwise. We were able to use an out-of-the-box planner + IK solver without worrying about whether the path would collide / get stuck in a singularity.**

# Lesson Learned

- **1. Don't rewrite what already works**

Instead of rewriting our python backend to C++ objectives, we wrapped the backend in a ROS node and communicate with MoveIt Pro.

- **2. Use the off the shelf solutions MoveIt Pro provides**

MoveIt Pro objectives and example projects are very helpful to figure out how to integrate into different applications. Useful hint: `ExecuteTrajectoryWithAdmittance` allows you to set decelerations for when you cancel an objective.

- **3. Simulation allows you to iterate faster**

Being able to test the full workflow in simulation allows you to find a lot of bugs that would otherwise cause scary movements, as well test things quickly.

- **4. Hardware constraints shape the architecture**

NVIDIA drivers do not like interacting with `PREEMPT_RT` - so we separated out our graphics and machine learning to a separate machine from the one that runs MoveIt Pro.

 ***Movelt*** **Pro**

# AI Robotics Application Platform

**Dave Coleman**

Founder & Chief Product Officer

dave@picknik.ai

# Reduce your software engineering time by 75% or more.

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Movelt Pro makes your robotics developers 4x more productive.

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We've developed

# A hybrid AI approach that solves the reliability problem.



Visual Language Models (VLMs)



Segmentation Transformers



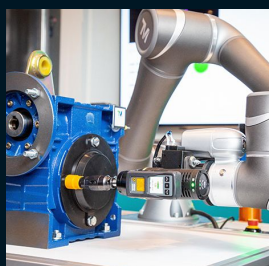
Grasp Transformers



Large Language Models (LLMs)



Visual Language Segmentation

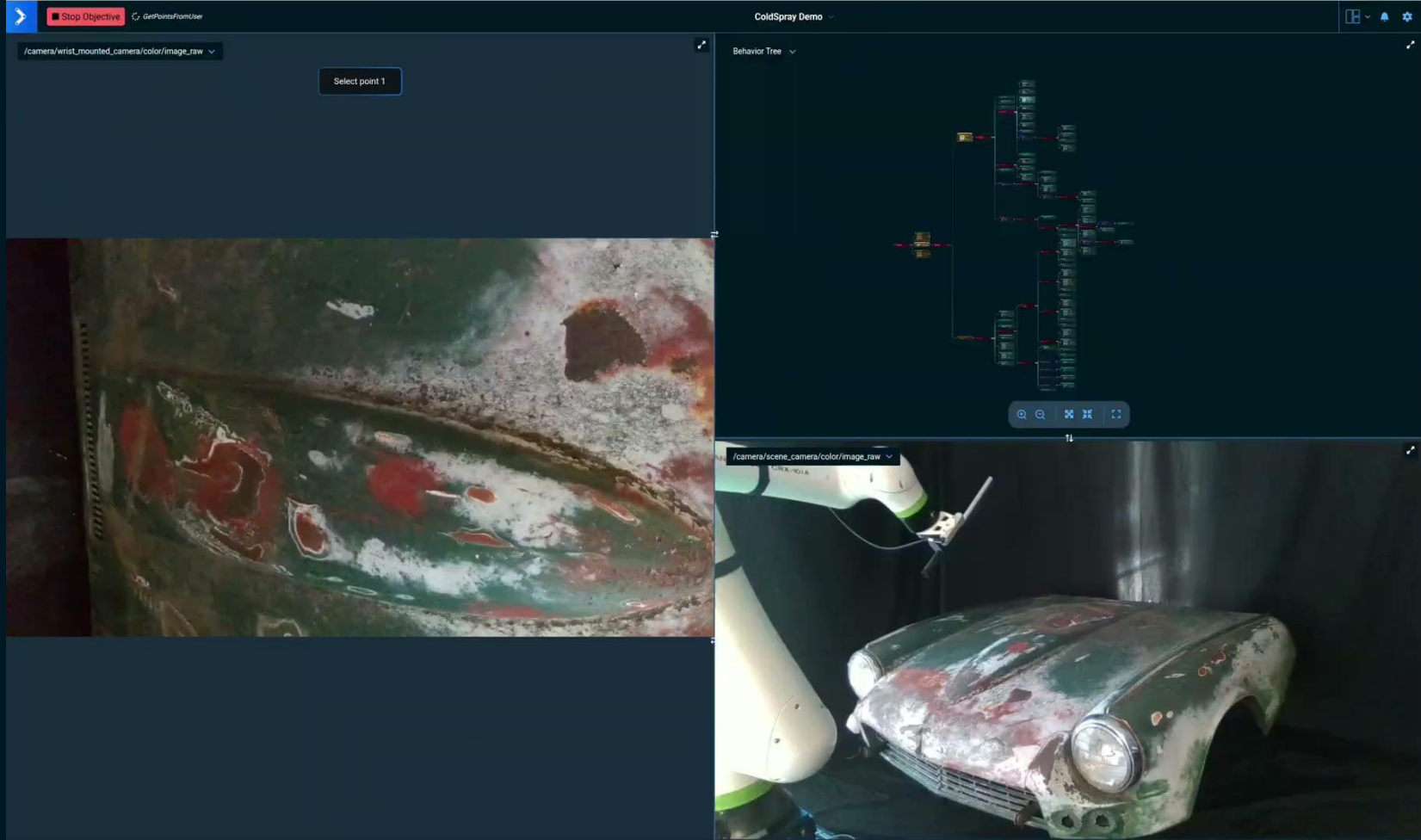


Action Transformers

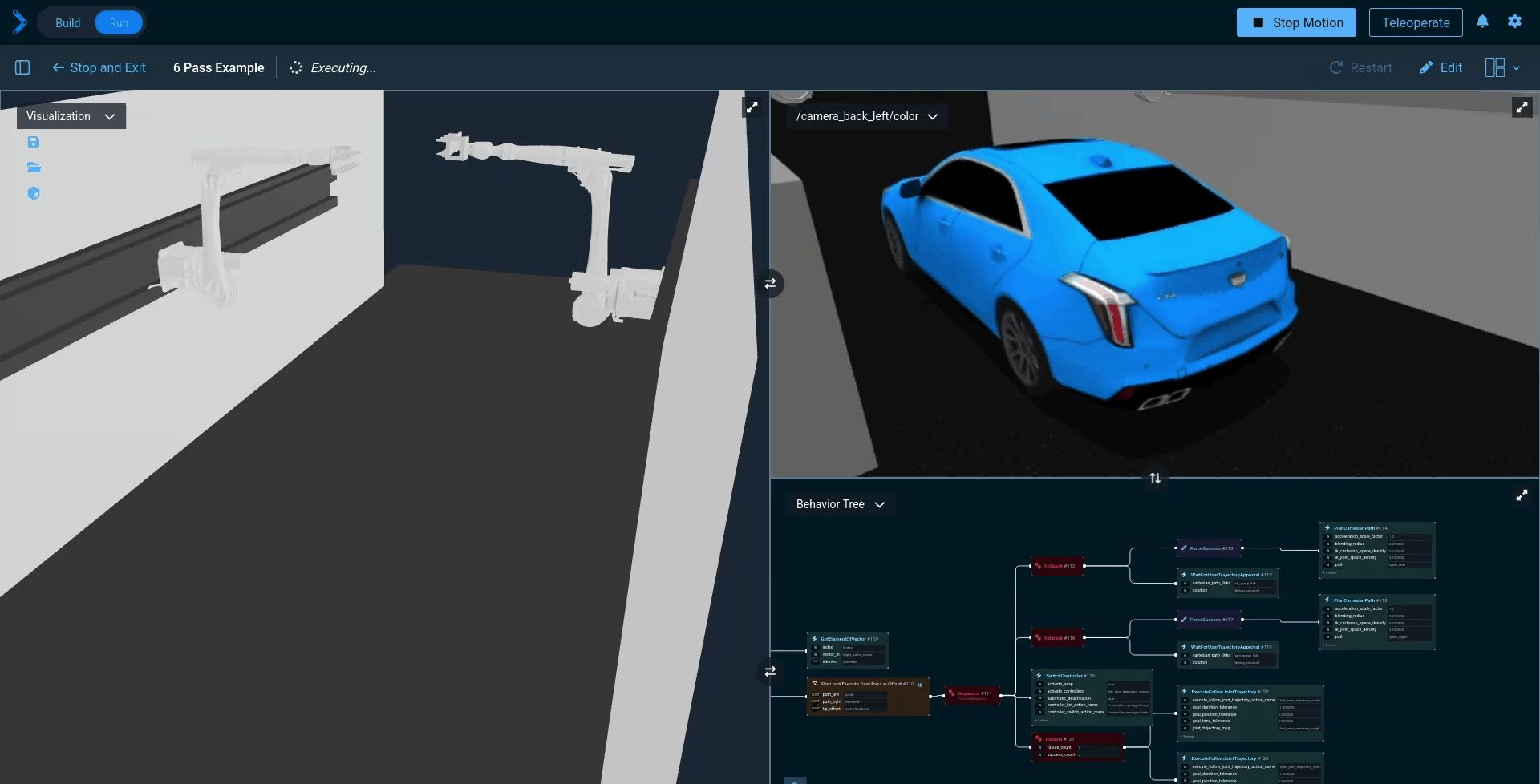


Motion Planners & Controllers

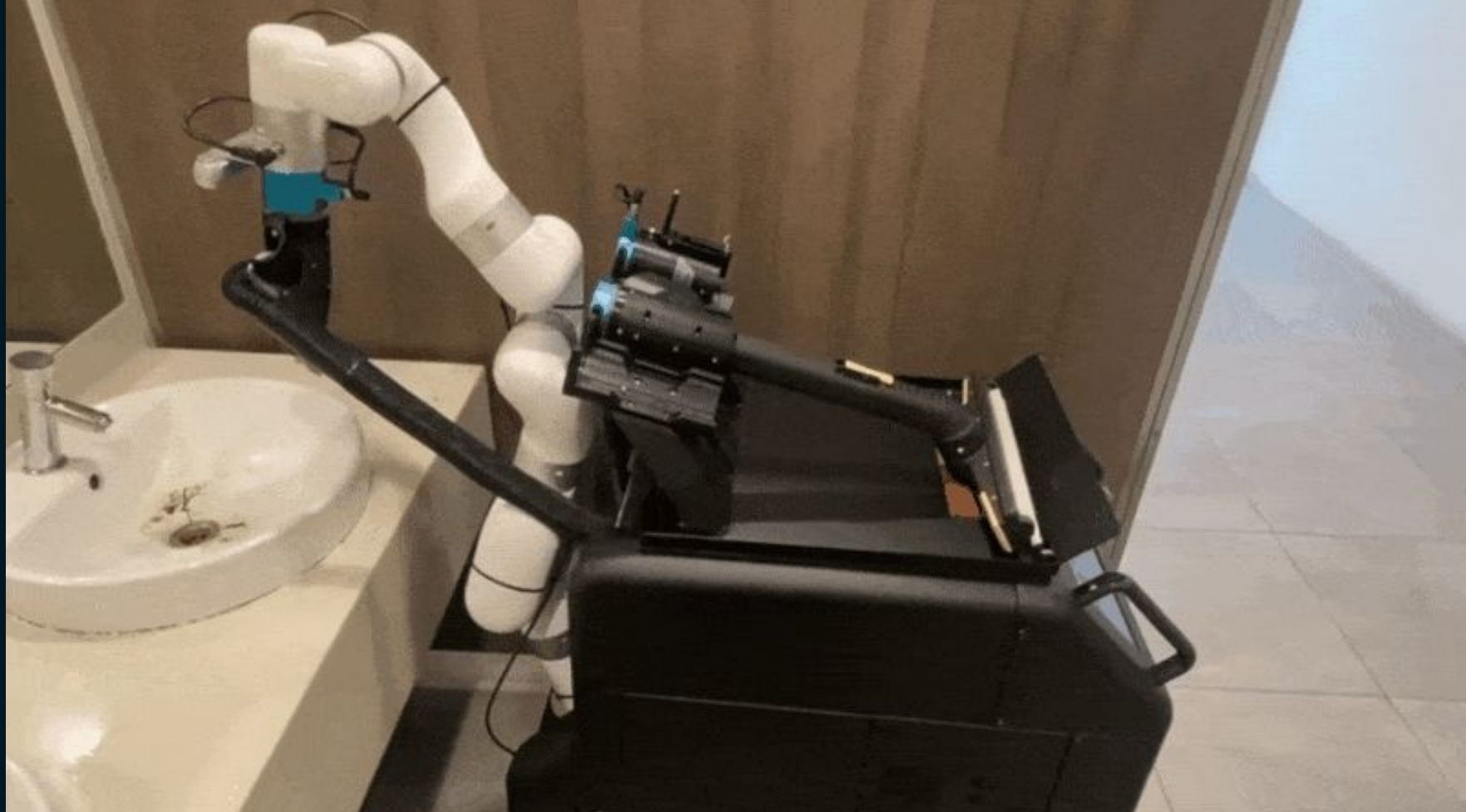
*Safety through deterministic controls and verifiable Behavior Trees*



Scan and Plan - Cold Spray Additive Manufacturing with Human-in-the-loop

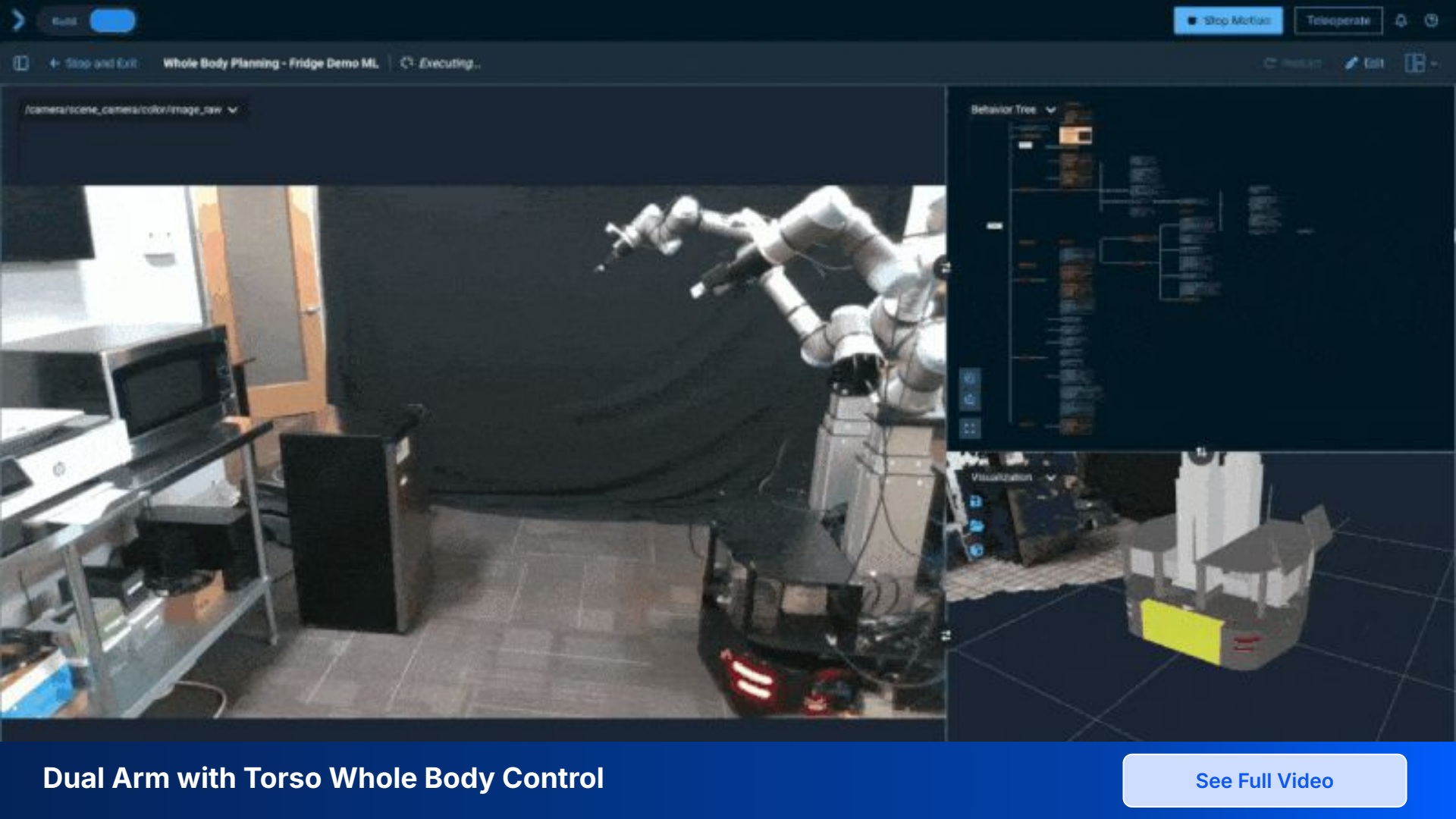


Real-time Scan and Plan with Cartesian Planning



**ML-based Mobility, Scanning, & Spraying**

[See Full Video and Case Study](#)



Dual Arm with Torso Whole Body Control

[See Full Video](#)

**Shelf Stocking Main Application**  
 Three stage pipeline (Perception -> Pick -> Place) running as three parallel threads. Each thread loops forever on a poll-wait + clear-flag + work + set next flag pattern. Place re-triggers Perception at its start, so perception of the next item runs concurrently with the current place.

3D Visualization

Behavior Tree

/geminl\_orientation\_image

Shelf stocking

Product Pick History  
No pick attempts yet.

- GeminiResponseStep (3 try across 1 model; gemini-robotics-ai-1.5-4-3s-preview)
- SelectNextProductCandidate
- GeminiDetermineOrientation
- LearnRecovery

rosbridge connected

last update: 5:23:19 PM

/camera/wrist\_mounted\_camera/color/image\_raw

/geminl\_marked\_image

Original Image

2x speed

## Shelf Stocking Pick and Place - with VLMs and Segmentation Models



## Universal Robotics

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Vendor Supported DRIVER  
 Movelt Gold Integration CONFIG



## FANUC

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Vendor Supported DRIVER  
 Movelt Gold Integration CONFIG



## Kinova

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Vendor Supported DRIVER  
 Movelt Gold Integration CONFIG



## Franka Robotics

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Vendor Supported DRIVER  
 Movelt Gold Integration CONFIG



## UFactory

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Vendor Supported DRIVER  
 Movelt Gold Integration CONFIG



## Motiv Space Systems

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Vendor Supported  
 Movelt Gold Integration



## HDT Global

Driver Quality Score: **Average**  
Low-Bandwidth Trajectory

ROS Vendor Supported  
 Movelt Gold Integration



## Elite Robots

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Vendor Supported DRIVER  
 Movelt Gold Integration



## ABB

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Community Support DRIVER  
 Movelt Basic Integration



## KUKA KR Cybertech Series

Driver Quality Score: **Great**  
High-Bandwidth Streaming

ROS Community Support DRIVER  
 Movelt Basic Integration



## AgileX

ROS Vendor Supported DRIVER  
 Movelt Basic Integration



## Aubo

ROS Vendor Supported DRIVER  
 Movelt Basic Integration

Compatible with any hardware with a ROS 2 driver.

[Learn more at Hardware Partner Ecosystem](#)

# All-In-One Robotics Application Platform

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## RUNTIME AUTONOMY

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### **ML for Perception & Grasping**

Off the shelf models for most applications

### **End-to-End ML**

Increase dexterity with generalizable AI

### **Real-time Planners, Controllers, Solvers**

Collision & force aware automatic trajectory generation

### **Mobile Base Navigation**

Integrated for AMRs and humanoids on wheels

## USER INTERFACES

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### **Behavior Tree Builder**

Visually build reactive logic, more flexibly than state machines

### **Robot Visualizer**

Understand robot telemetry and logic

### **Debugging Toolchain**

Insert breakpoint and view parameters at runtime

### **Teleoperation Suite**

Five modes of human in the loop control

## SIMULATION

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### **AI Training Sim**

Toolchain for synthetic training data generation

### **Offline Developer Sim**

Create apps without or before robot hardware

# Questions

## Movelt Pro Works Here Webinar Series

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