

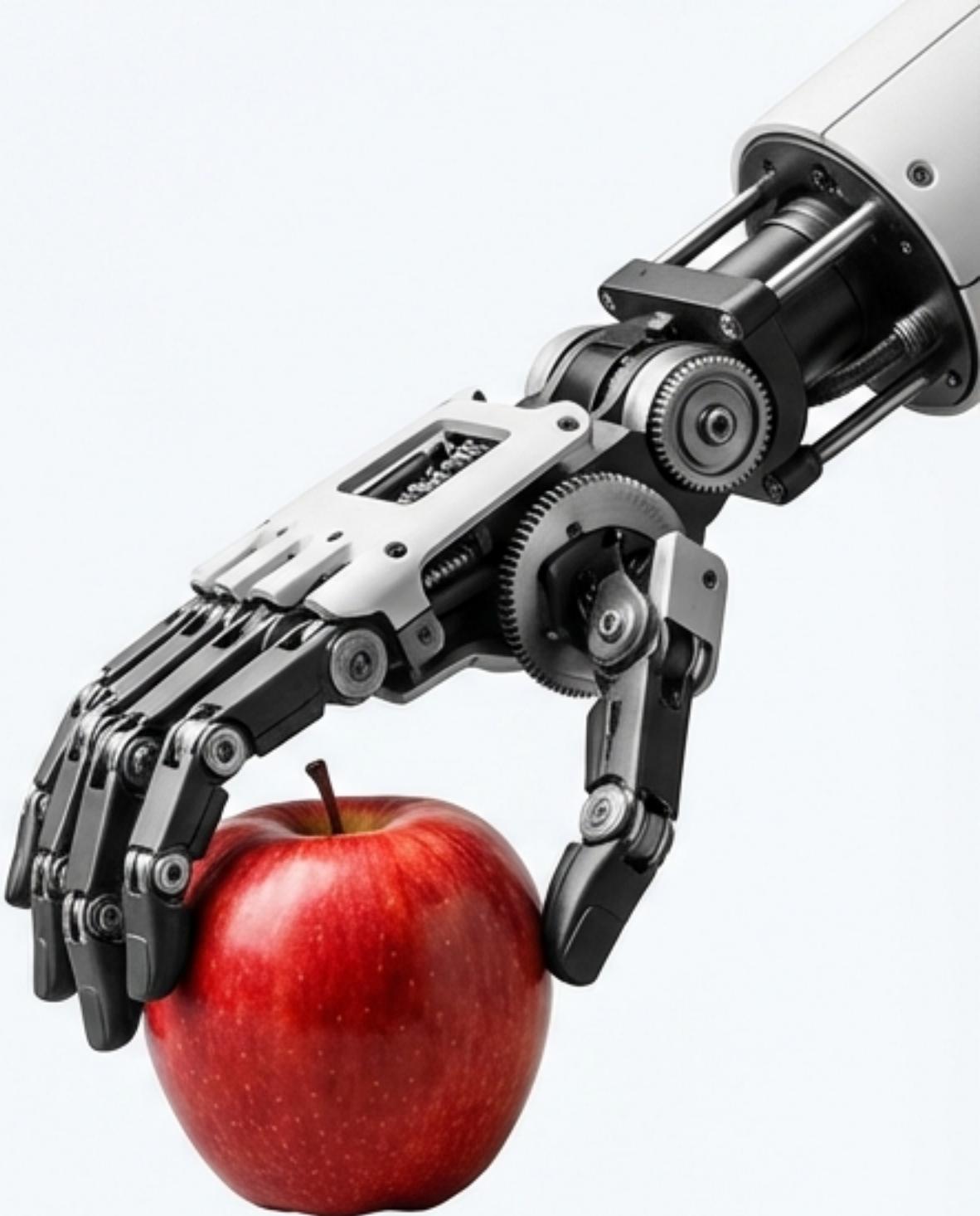


The Code

```
{  
  "robot_type": "humanoid_gr1",  
  "sensors": {  
    "wrist_cam": "realsense_d435",  
    "joint_limits": "config/upper_body.urdf"  
  },  
  "policy": "gr00t_n1_vla"  
}
```

# Orchestrating Physical AI

The Tooling Layer for the  
NVIDIA GROOT Ecosystem

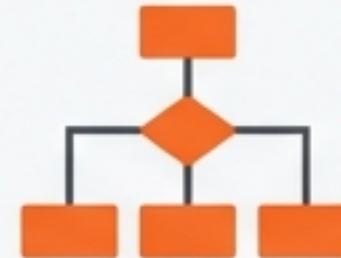


The hardware is ready. The brain is ready. The opportunity is the interface.

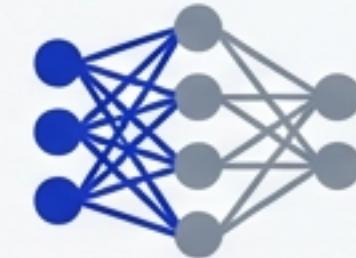
# The 'Brain' Exists, But the 'Nervous System' is Missing

Precision Engineering meets Modern Software Architecture

## The Shift



Scripted



VLA Model

Robotics is moving from task-specific scripting to Generalist VLA (Vision-Language-Action) models like GR00T N1.

## The Gap



**Developer experience is broken.**

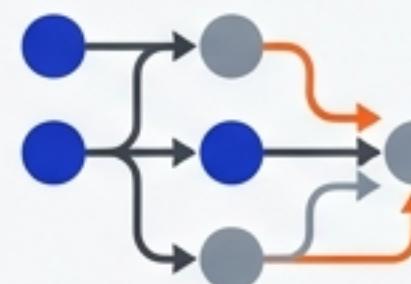
Workflows suffer from silent failures, invisible data pipelines, and stateless reflexes.

Error: Sensor mismatch in URDF.  
Robot frozen.

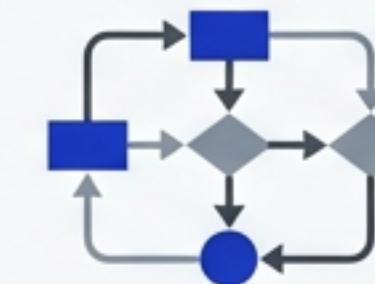
## The Opportunity



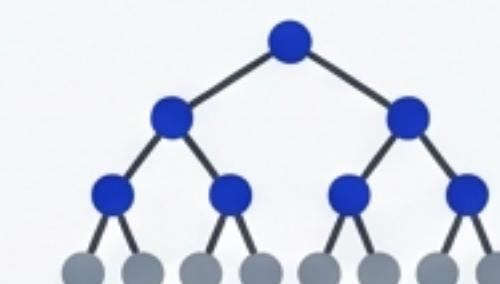
**The "Windsurf"**  
**for Robotics**  
(Agentic IDE)



**The "ComfyUI"**  
**for Robotics**  
(Data Flywheel)



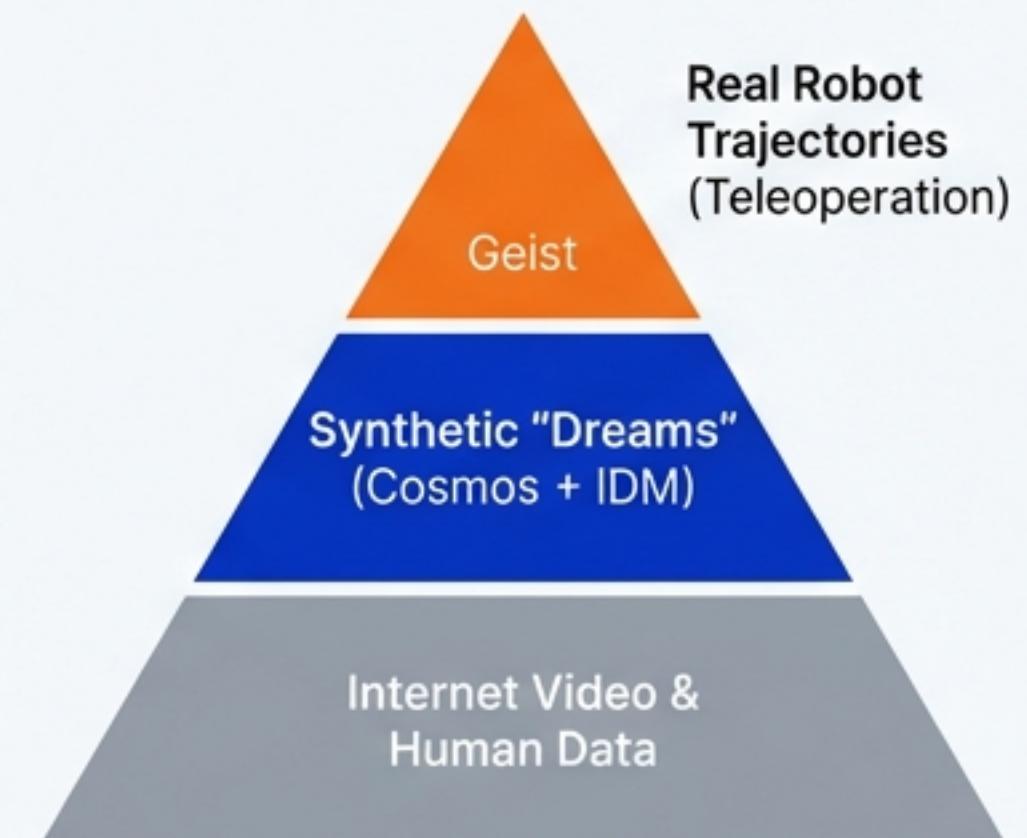
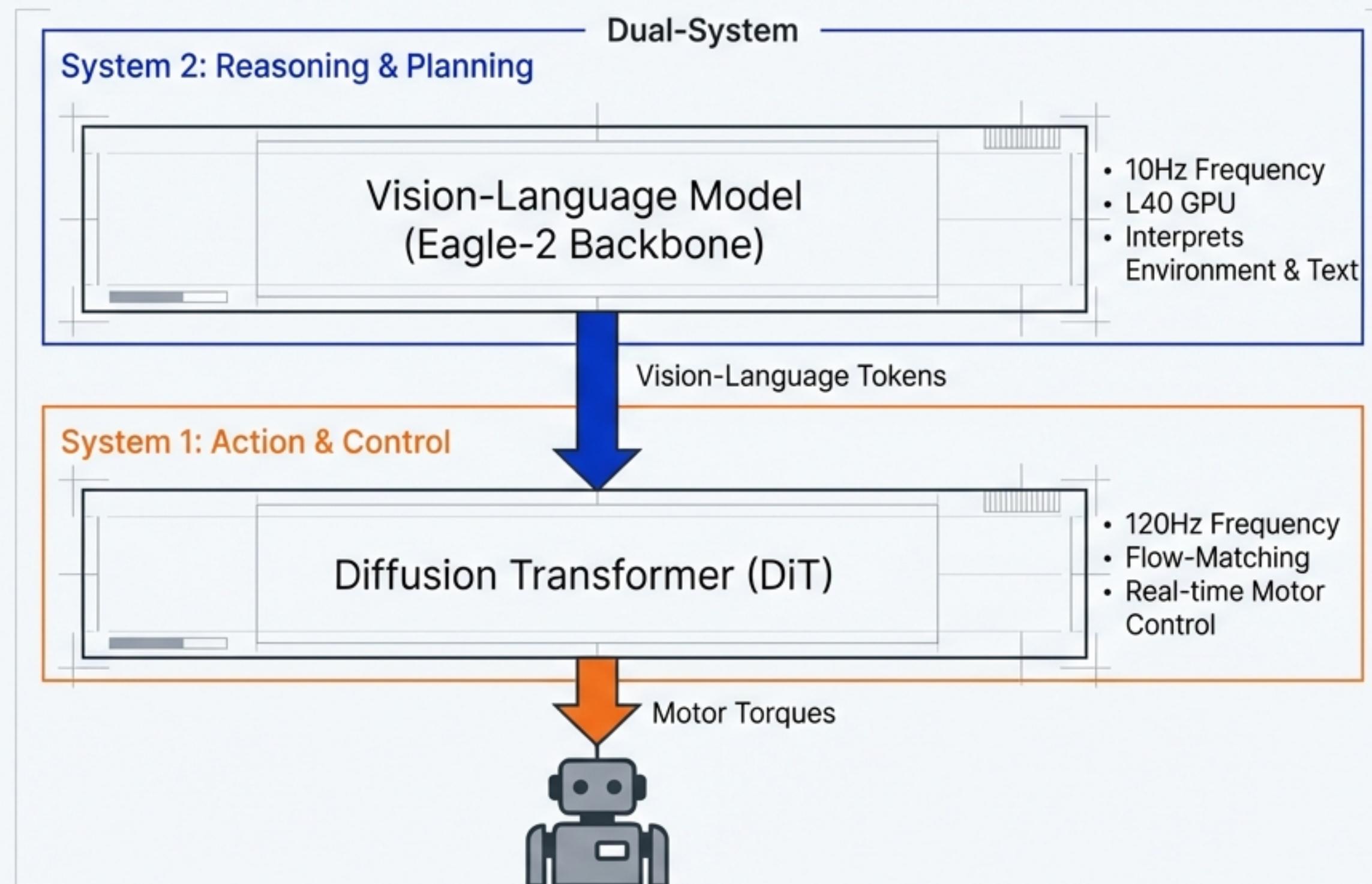
**The "LangGraph"** for  
**Embodied Agents**  
(Orchestration)



**The Generalization**  
**Layer**  
(DiT/LoRA)

# The Engine: Inside the GROOT N1 Architecture

Precision Engineering meets Modern Software Architecture



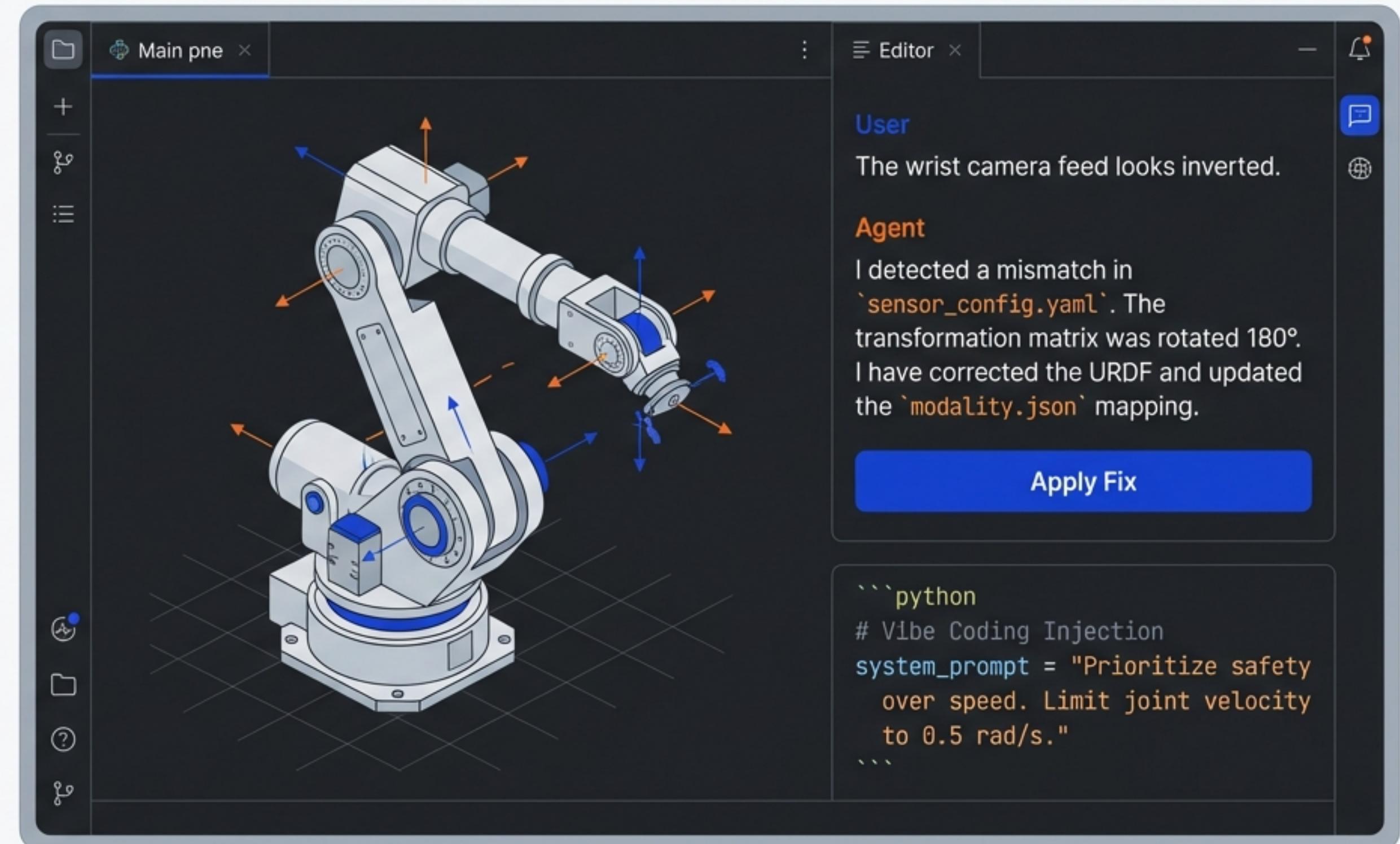
# Opportunity 1: The 'Windsurf' for Robotics (Agentic IDE)

## The Pain Point: Silent Failures

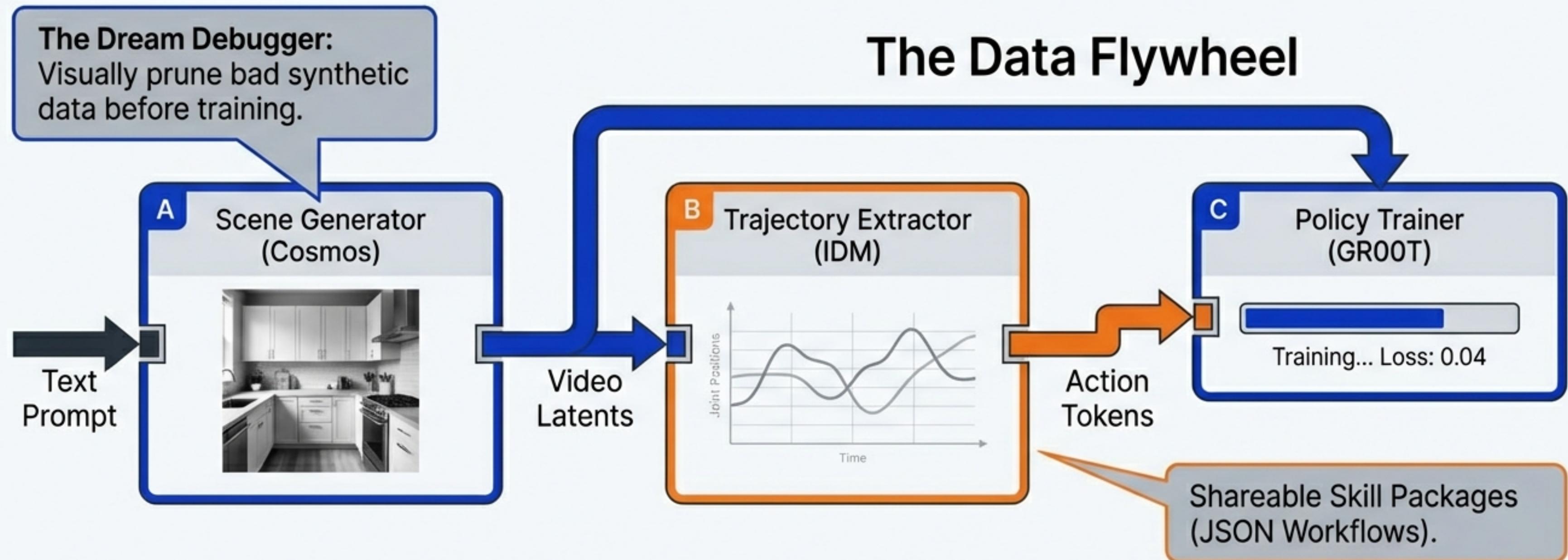
Misconfigured URDFs or off-by-one sensor indices cause models to train successfully but fail physically.

## The Solution: Agentic Indexing

An IDE that understands embodiment. Auto-generates `modality.json` and validates physics constraints.

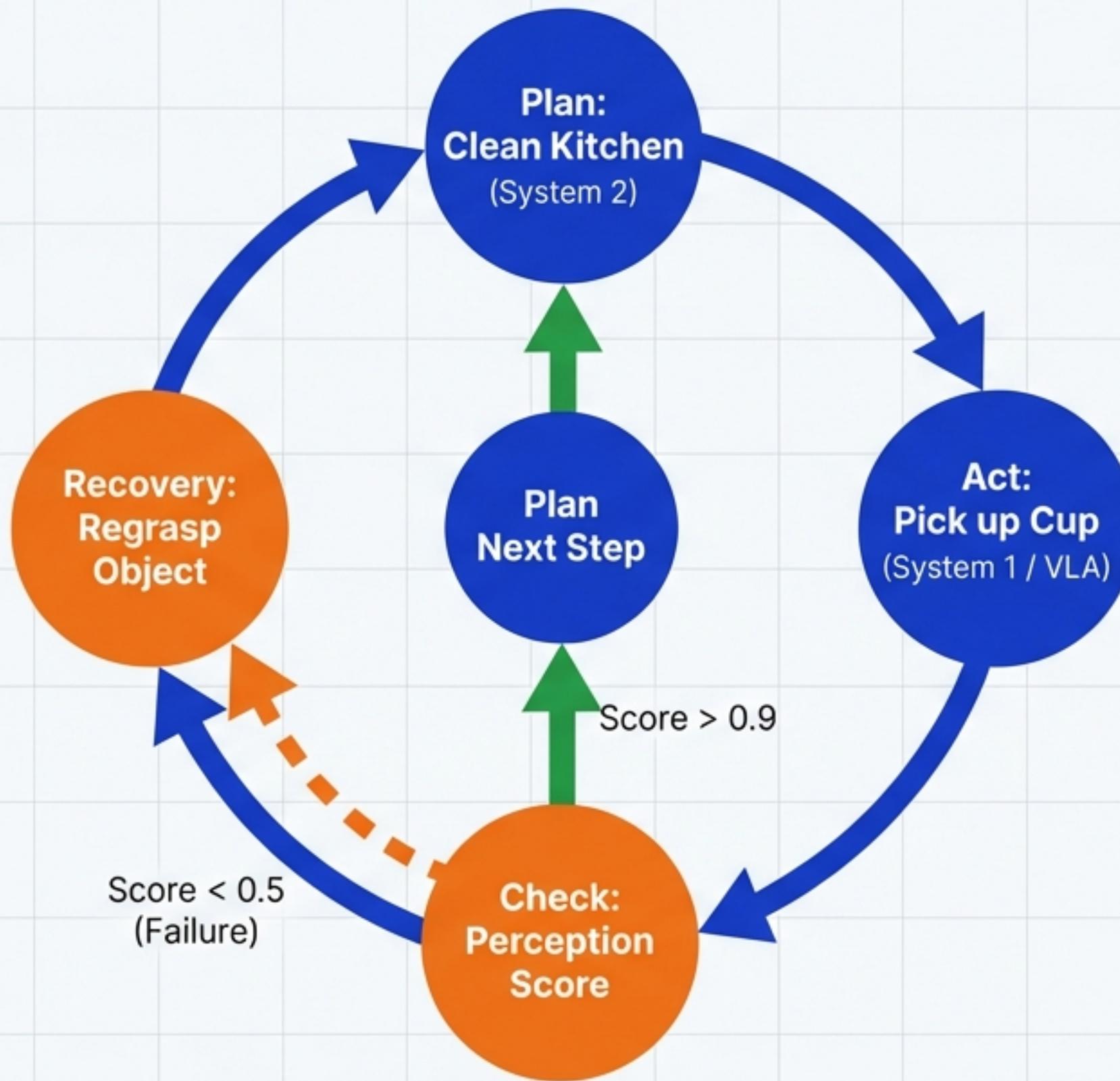


# Opportunity 2: The ‘ComfyUI’ for Robotics (Visualizing the Data Flywheel)



Moving from manual scripts to a visual pipeline for synthetic data generation.

# Opportunity 3: The 'LangGraph' for Embodied Agents



## Orchestration & Memory

GR00T provides the reflex (120Hz), but lacks long-horizon state. We need a "Cortex" to manage the plan.

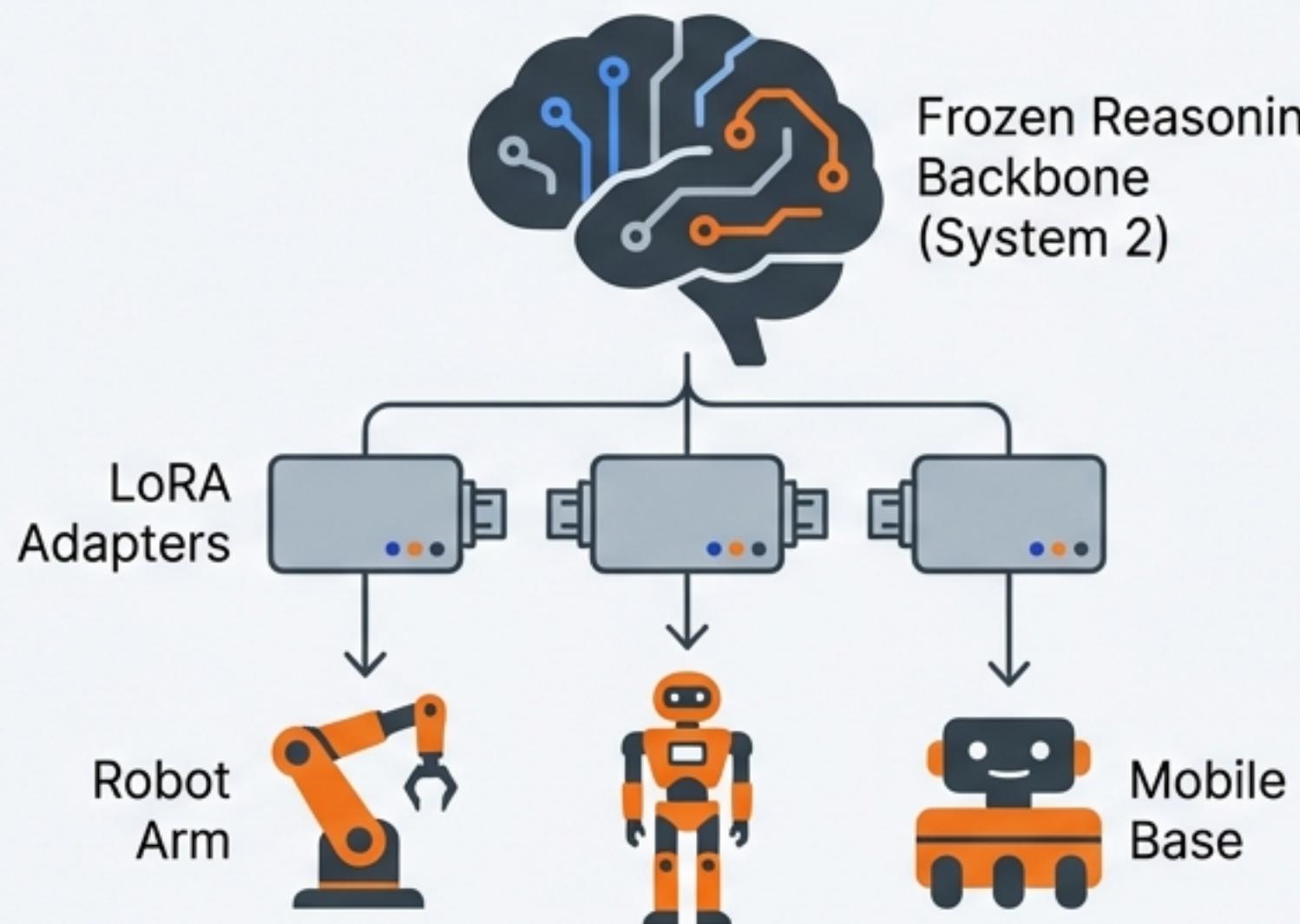
## MCP for Robots

Implementing Model Context Protocol to query hardware state dynamically.

```
def check_state(agent):  
    battery = client.call_tool("get_battery_level")  
    if battery < 20:  
        return "navigate_to_charger"
```

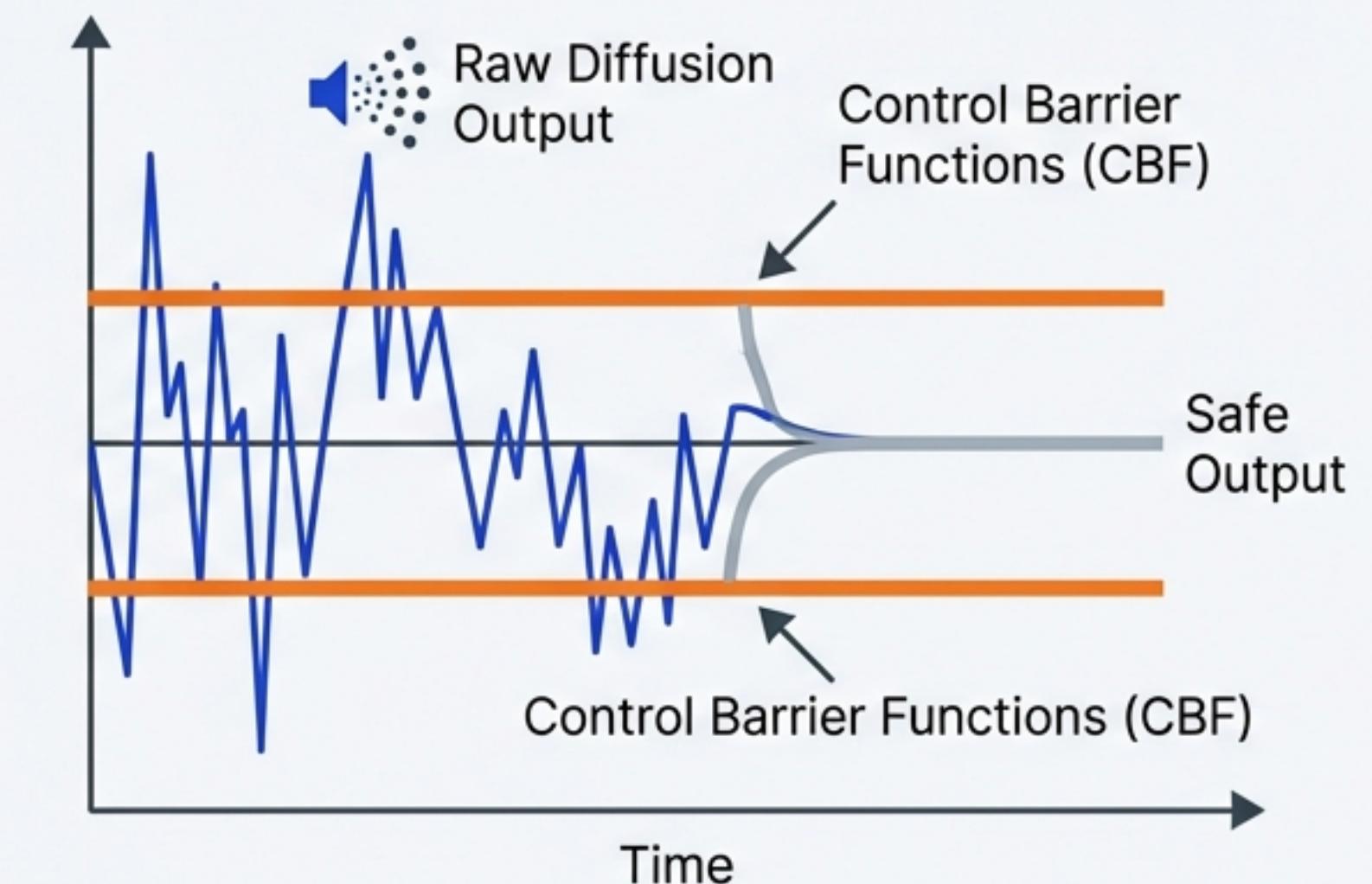
# Opportunity 4: Leveraging Diffusion Transformers

## Cross-Embodiment Fine-Tuning



Train the Action Head (System 1) on just 50 demos. Keep the Reasoning Brain frozen.

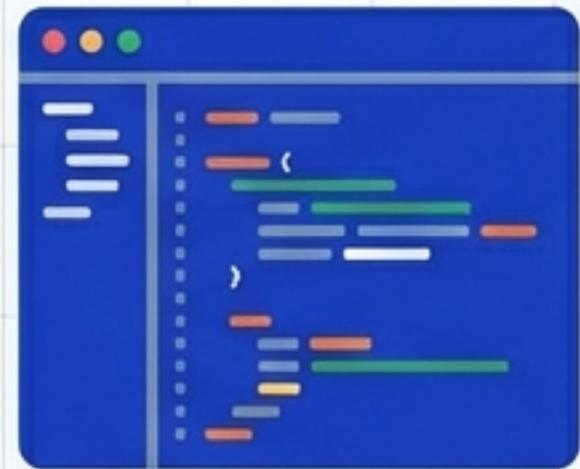
## The Safety Shield



Clamping probabilistic DiT outputs to safe physical limits (Torque/Velocity).

# The Integrated Vision: ‘Project Root-Control’

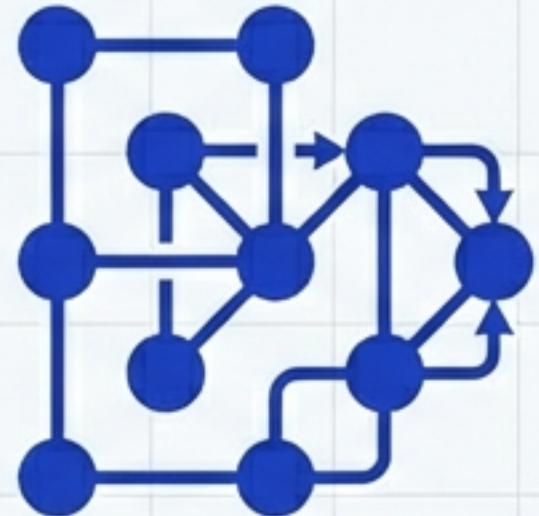
**Design**



**Agentic IDE**

Config & Vibe  
Coding

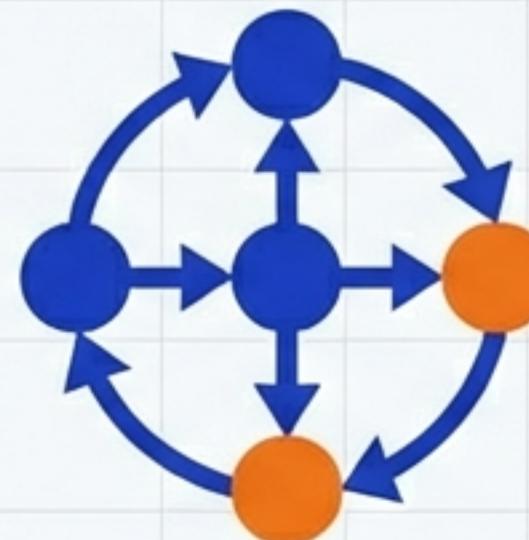
**Train**



**Data Workbench**

Synthetic Dreams  
(Cosmos) + LoRA  
Training

**Plan**



**Orchestrator**

LangGraph Controller  
& MCP Tools

**Act**



**Runtime**

GR00T N1 +  
Safety Shield

Operating System for Physical AI

# Unlocking Business Value & Performance

**15%**

## Success on Novel Objects

vs 0% on previous architectures. Enabled by '**DreamGen**' synthetic data mixing.

**10X**

## Data Efficiency

Comparable performance using only 10% of real-world human teleoperation data.

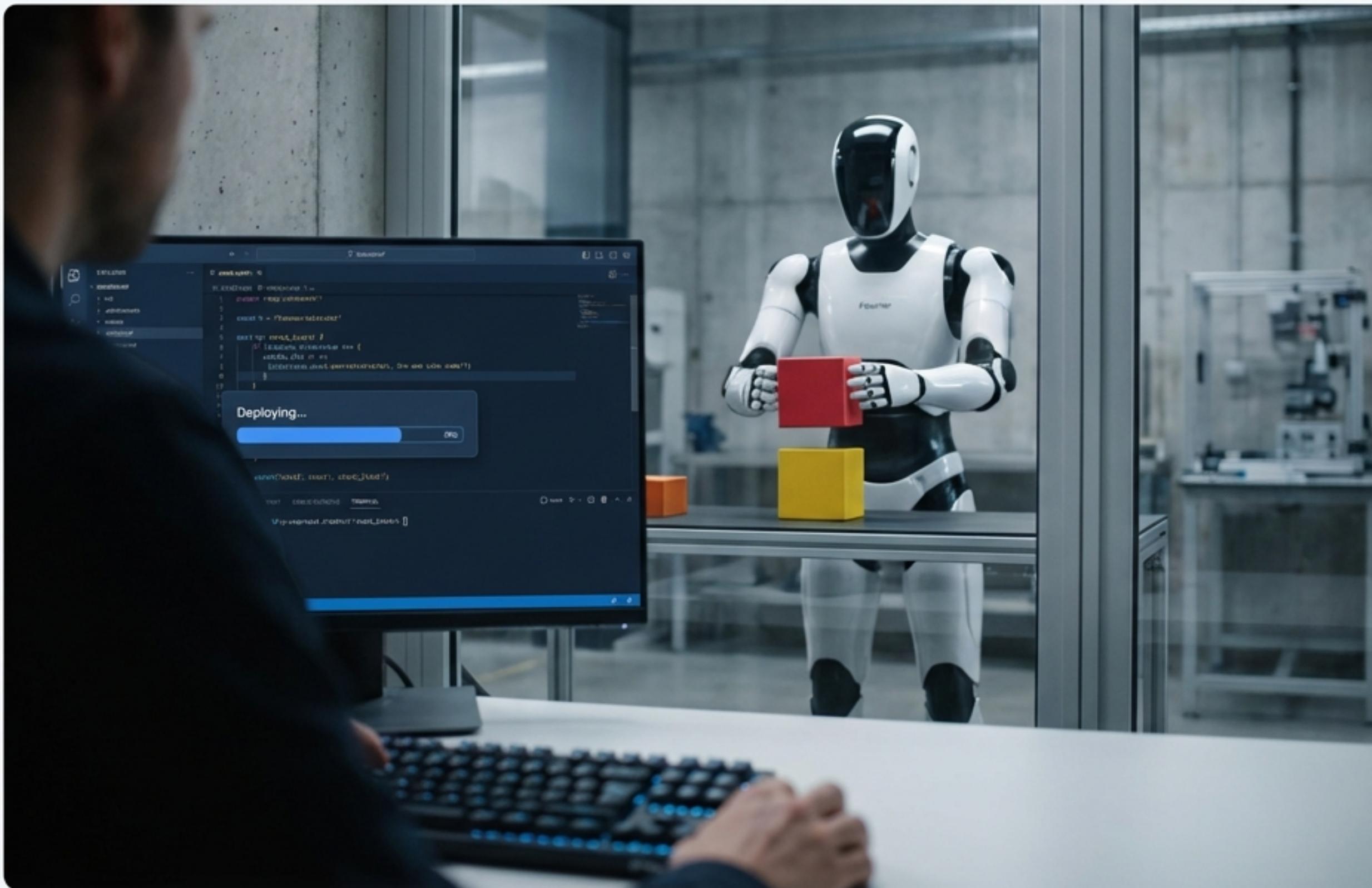
**Skill  
Store**



## New Market Opportunity

Democratizing robotics via shareable **JSON Skill Packages**. From PhD scripting to '**Vibe Coding**'.

# The Path Forward: Building Mission Control



The transition from manual scripting to “vibe coding” is the next frontier.

We are building the interface between human intent and physical reality.

**Let's Build.**