GTI

The 44th GTI Workshop

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Qualcomm

Scaling Physical AI through Reasoning: From Silicon to Skills

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Mission

Build a Scalable Physical AI Platform that Turns a Mechatronic Chassis into a continuously learning General Purpose Connected Robot

Moving from rule-based autonomy to adaptive reasoning

Bringing a core set of capabilities for deployment-ready robotics

To solve today's challenges in robotics

Compound AI System
Mixed criticality AI, Reasoning models, VLA, Perception, grasping, motion control, HRI, agentic AI framework

Physical AI MLOps
Training framework, behavior cloning, reinforcement learning, world model based digital twin

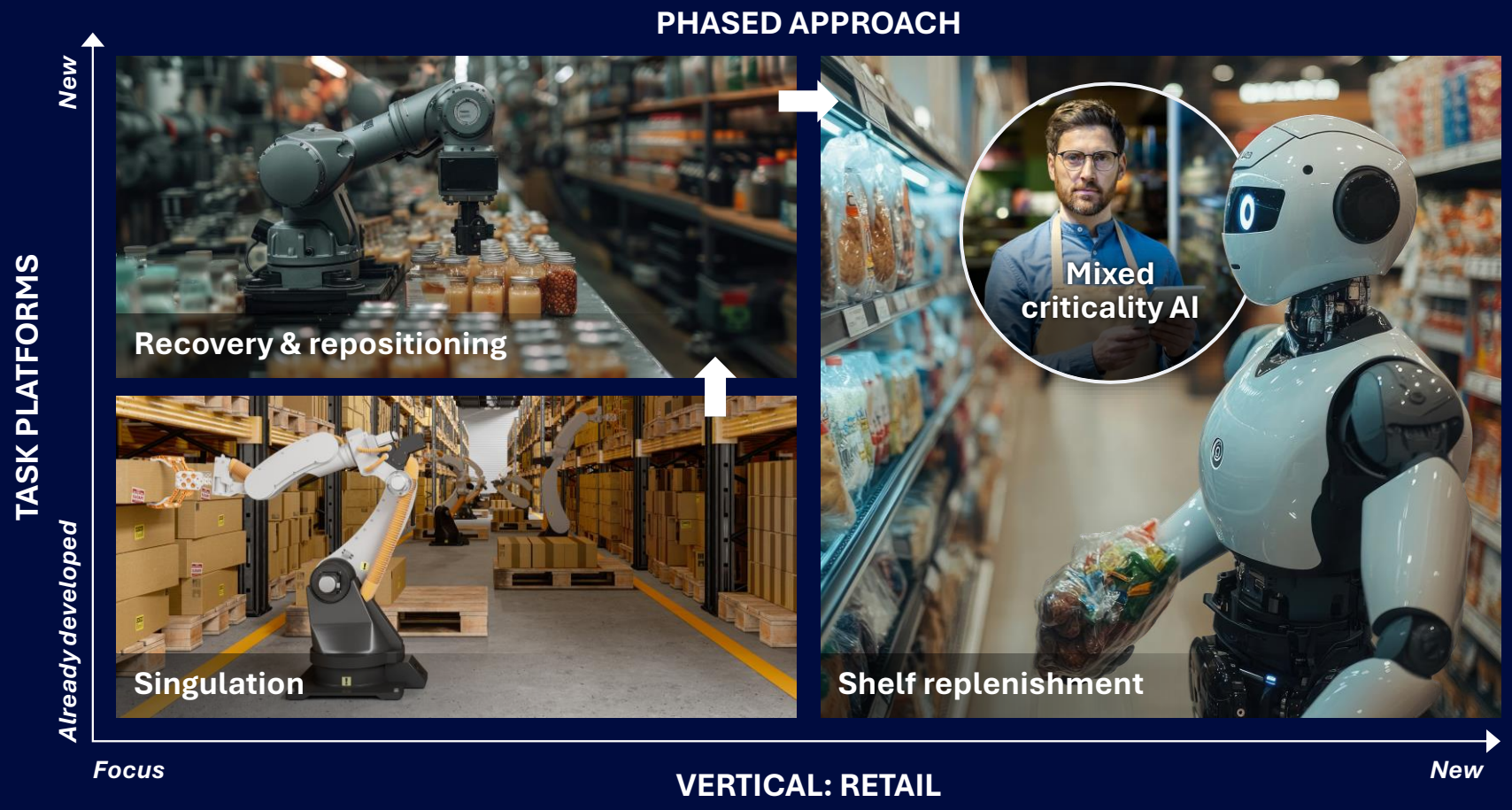
Heterogeneous edge compute
SW-HW co-design with innovative memory architecture, real-time safeguarding, fleet management

AI Fly Wheel
AI based data collection, curation, cataloguing and annotations

Deployment Ready Dev Platform
Model Zoo, foundation models, Robotics SDKs, example applications, Text-to-skill generation

HRI is human robot interaction;
Compound AI is an agentic framework that integrates spatial understanding, long-horizon reasoning, multimodal precision, and seamless collaboration with humans and physical AI agents to achieve end-to-end goals.

Using a “task-based” approach to solve the hardest problems in industries with high demand for automation



10 PRIORITY REAL-WORLD TASKS FOR POC EXPANSION

TARGET CAPABILITY TO DEVELOP
Dexterity · Perception/reasoning

LOGISTICS

- Item picking
- Bin/tote picking
- Case stacking

MANUFACTURING

- Wiring and non-tool assembly
- Line sequencing[1]
- Kitting for components and tools[2]

RETAIL

- Shelf replenishment
- Singulation[3]
- Recovery and re-positioning of items[4]
- Inventory and breakage scanning

1. Identifying, collecting, and sequencing in right order different parts for assembly
2. Preparing required material for specific assembly (e.g., screws, bolts, fasteners, screwdrivers)
3. Separating bulk items (e.g., from pallet or large box) into single units
4. Fixing orientation and positioning of misplaced items

A unified, silicon-to-skills architecture for robotics

SOLUTION STACK

Applications

Compound AI Robotics SDK

Platform services

Qualcomm Linux | Ubuntu

SoCs, Modules

Skills

Pick & Place | Tool Manipulation | Object Det & tracking | Task Planning | ....

MLLM, VLA, Reasoning Models

SLAM & Navigation

HRI

Safety Guard Rail (CoT, CBF)

Perception Stack: OD, SemSeg, DFS, 3D reconstruction, Occupancy Flow, Lidar perception Models

Active Learning

Motion Planning

Functional Safety

MiddleWare

Qualcomm® Neural Processing SDK

Math Lib

6G/5G, SideLink, Wi-Fi, UWB

BACKEND INFRASTRUCTURE AND SERVICES

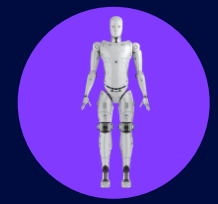
Physical AI MLOPs
BC, RL,
Data augmentation,
Benchmarks

Virtual Platform

AI Data Fly Wheel : XR

Simulation

REFERENCE DESIGNS



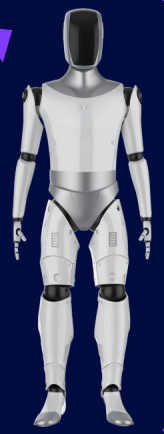
Humanoid reference design

Qualcomm Dragonwing™ IQ9 - based reference design for GPR

Best-in-class power efficient compute and adaptive reasoning skills

HIGHER COMPLEXITY

LOWER COMPLEXITY



- Dexterous manipulation
- Task and motion planning
- Tactile sensing
- Human-robot interaction
- Cognitive architectures
- Reinforcement learning

Structured Environment → Unstructured Environment

2D Navigation → 3D Dexterous Manipulation

Reactive Control → Cognitive Reasoning

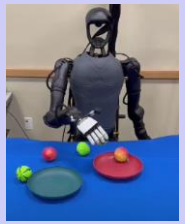
Rule-based Decisions → Reasoning-based Autonomy

Limited Degrees of Freedom → High DOF Articulated Motion

Shared foundational technologies

- Sensor fusion & Multimodal Perception
- AI Planner & Data Harvesting
- Deep Neural Networks (Object Detection, Semantic Segmentation)
- Localization & Mapping
- Hybrid Planner
- Control Systems
- ...

Robotics demos for CES 2026

Demo			Chipset	Partner	Description
#1	VLA demo on IQ-10 based humanoid robot		IQ-10	Off-the-shelf Unitree H1-2 robot	Robot #1: VLA running on IQ-10 for humanoid robot manipulation task including: Sorting and placing fruits into various colored plates Robot #2: Tele-operation demo
#2	VinMotion humanoid robot		IQ-9075	VinMotion	1> Dancing: RL based + MPC models 2> Receptionist: Remote control the robot to give freebies (TBD) to visitors
#3	Booster humanoid robot		QCS8550	Booster & Aplux	Dancing : RL based+MPC models
#4	Aplux Tele-operation& Data Collection Solution		IQ-10	Aplux	Teleop running w IQ10 + Initial AI Fly Wheel
#5	Advantech AMR reference design		IQ-9075	Advantech & AutoCore	Advantech IQ-9 based reference design for AMRs; AutoCore.OS running on Advantech compute box (sensor data are from Gazebo simulator)
#6	Robotics Simulation		IQ-9075	Robotec	Pre-recorded video only, no live demo; Robotics simulation: IQ-9 based Unitree G1-Q robots working in a warehouse environment

RoSi
Robotec Simulator

DIGITAL TWIN & SIMULATION PLATFORM

ROBOTEC AI

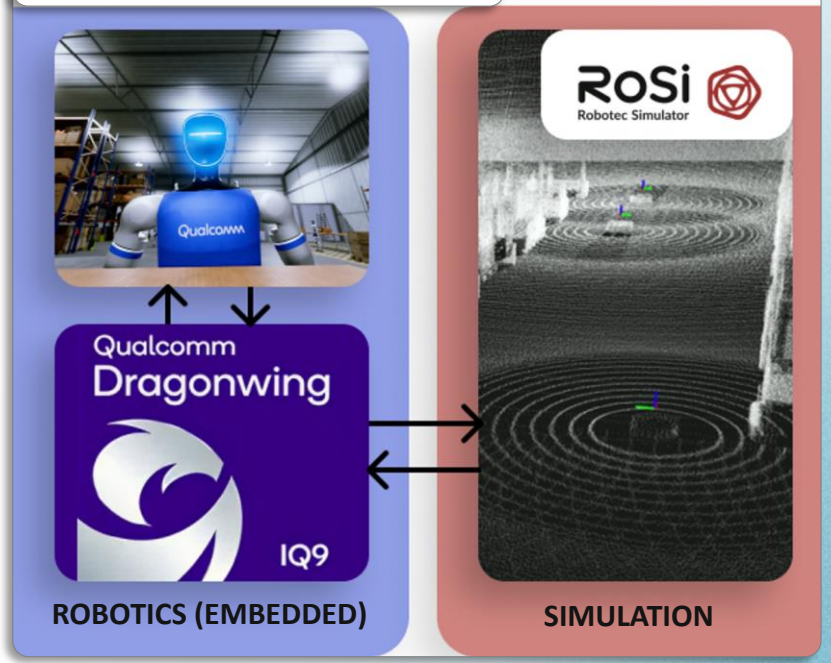
OVERVIEW

RoSi is a modular, AI-enabled simulation platform for virtual development and testing of robots and large-scale robotics fleets. It supports the entire robotics lifecycle - from early development through deployment and ongoing optimization via built-in modules: Software-in-the-Loop (SiL), Hardware-in-the-Loop (HiL), synthetic data generation, sensors library, virtual commissioning, and parallel cloud-based scenario execution.

KEY VALUE DRIVERS

- **High-performance simulations:** Open-core, AI-enabled platform leveraging advanced physics-based engines.
- **Data generation:** Produce large volumes of realistic data for AI models training.
- **Cost reduction:** Minimize project expenses through virtual testing before physical deployment.
- **Risk mitigation:** Identify and resolve issues safely within digital environments
- **Faster development**: Speed up design, programming, and testing cycles.
- **Maximized productivity:** Optimize robot performance and workflow efficiency.

SOLUTION BLOCKS

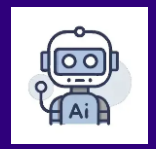


ROBOTEC & QUALCOMM COLLABORATION

- **Hardware-in-the-loop (HiL) simulations**: Accelerate development cycles
- Building strong communities around **Qualcomm Edge AI ecosystem**
- **Synthetic data generation:** High-quality datasets for AI training
- **AI scene and scenarios generation:** Pioneer prompt-based, generative simulation technologies accelerating digital testing

Qualcomm / ROBOTEC AI

Physical AI Standards



Safety Standards

Existing set of ISO standards address safety and risk management of robots in an industrial setting

Safety for robots acting in presence of humans and interacting with humans is of high importance

Cybersecurity and “collaborative workspace” recently added (2025)

Autonomous Systems and Perception

For AGVs and AMRs, an existing set of automotive safety related standards will apply

Interoperability

Interoperability between robots and a central unit in industrial settings have been standardized in various bodies (including ISO and national bodies)

Usually limited to command & control adequate for industrial settings

Interoperability between robots gaining importance for a variety of use cases

Intersection with Agentic AI Standards

Standards on various aspects of Agentic AI (communication, performance, security…) have recently started.

There will be an intercept with Physical AI Standards eventually

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Thank you

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