

Hu Yang

**Head of Technology
Leadership, Nokia**



AI Practice to Unlock Industrial Essentials

Dr. Hu Yang
Head of Technology
Leadership, Nokia China

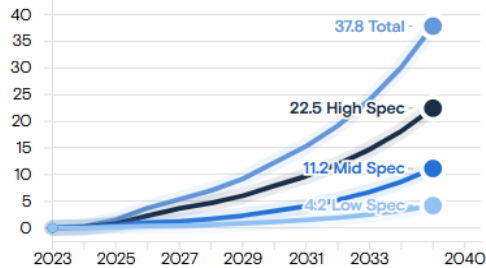
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Key Trend: Intelligent Agent in a scalable development accelerates Agent development enabled by AI technology

Humanoid robots are expected to become a \$38 billion market by 2035

Forecast global humanoid robot market size (\$ billion)

Replay



Source: Goldman Sachs Research
High, mid, and low spec refer to robot sophistication, from basic functionality to state of the art.

Goldman Sachs

The Ambitious Humanoid Robot Market

Nearly 1 billion humanoid robots will be deployed globally, with 90% serving commercial purposes by 2050, the total market size is expected to exceed \$5 trillion

Rapid Cost Reduction with Mass Production

Manufacturing costs for high-specification humanoid robots are declining much faster than expected around a decrease of 40% YoY

High-value Market Segments

Initial large-scale deployments are concentrated in structured environments, such as the automotive industry, logistics, and warehousing.

General-purpose Humanoid Robots



Embodied AI: Deeply Empowers Industry – Scenario-based Task Requirements

- *The complexity challenges primarily stem from the intricacy and precision requirements*
- *Environmental challenges mainly arise from uncertainty and accessibility issues*

	Low-complexity Tasks <i>(simple decision-making, low precision)</i>	Low-complexity Tasks <i>(multiple decision-making, high precision)</i>
Certainty & Full Accessibility	<p>Scenario: Conveyor belt fixed-point stacking</p> <ul style="list-style-type: none"> - <u>Challenge:</u> Repeatability and velocity - <u>Capability:</u> Lower-level motion control 	<p>Scenario: High-precision engine assembly</p> <ul style="list-style-type: none"> - <u>Challenge:</u> Complex assembly, high precision (+force control) - <u>Capability:</u> Task planning and fine control/execution
Uncertainty & Full Accessibility	<p>Scenario: Dynamic assembly line picking</p> <ul style="list-style-type: none"> - <u>Challenge:</u> Variable speeds, random workpiece arrivals, real-time adjustments - <u>Capability:</u> Real-time perception-action closed loop 	<p>Scenario: Human-robot collaborative fine assembly</p> <ul style="list-style-type: none"> - <u>Challenge:</u> Uncertainty requiring synchronized coordination - <u>Capability:</u> Intention recognition and fine control/execution
Certainty & Partial Accessibility	<p>Scenario: Deep-shelf picking in warehouses</p> <ul style="list-style-type: none"> - <u>Challenge:</u> Hidden targets demanding path generation - <u>Capability:</u> Model-based reasoning and simple planning 	<p>Scenario: Cable harness inspection and maintenance</p> <ul style="list-style-type: none"> - <u>Challenge:</u> Complex structure, limited visibility (+ non-visual perception) - <u>Capability:</u> Multi-sensor fusion, fine force control
Uncertainty & Partial Accessibility	<p>Scenario: Cluttered scene tidying</p> <ul style="list-style-type: none"> - <u>Challenge:</u> Unknown and unstable environment with dynamic changes - <u>Capability:</u> risk assessment, path planning 	<p>Scenario: On-site repair of complex failures</p> <ul style="list-style-type: none"> - <u>Challenge:</u> Dynamically changing environment with partial inaccessibility - <u>Capability:</u> Expert-level knowledge reasoning, active perception, and long-term planning

Embodied AI: 5-level Intelligence Classification and Spatial & Scalable Architecture

- *The limitations of basic individual agents: interplay of embodiment, environment, and learning capabilities*
- *Based on task-environment complexity and continuous learning capabilities, etc, an L1-L5 embodied intelligence classification is formed, requiring networked embodied intelligent agent to address challenges*



Hyper-capable Agent



Hyper Scale



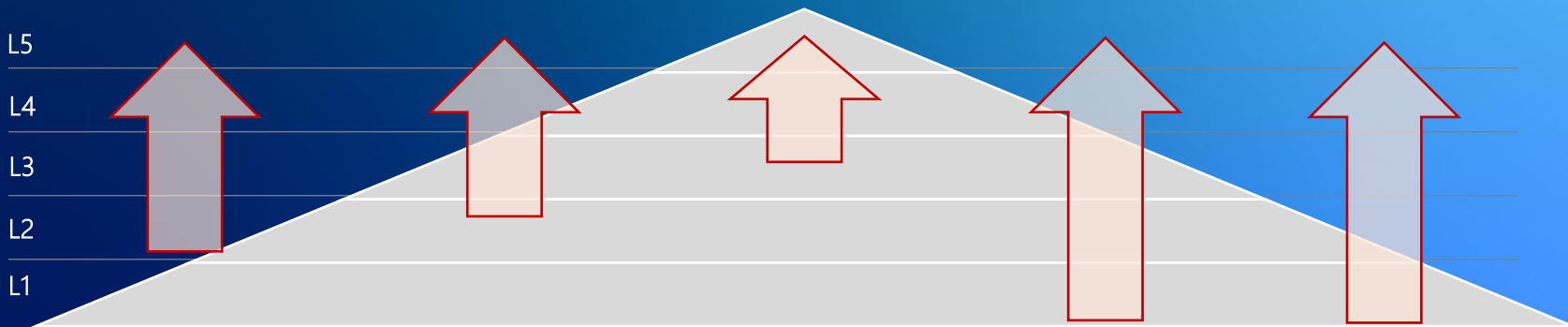
Hyper Coordination



Hyper Learning

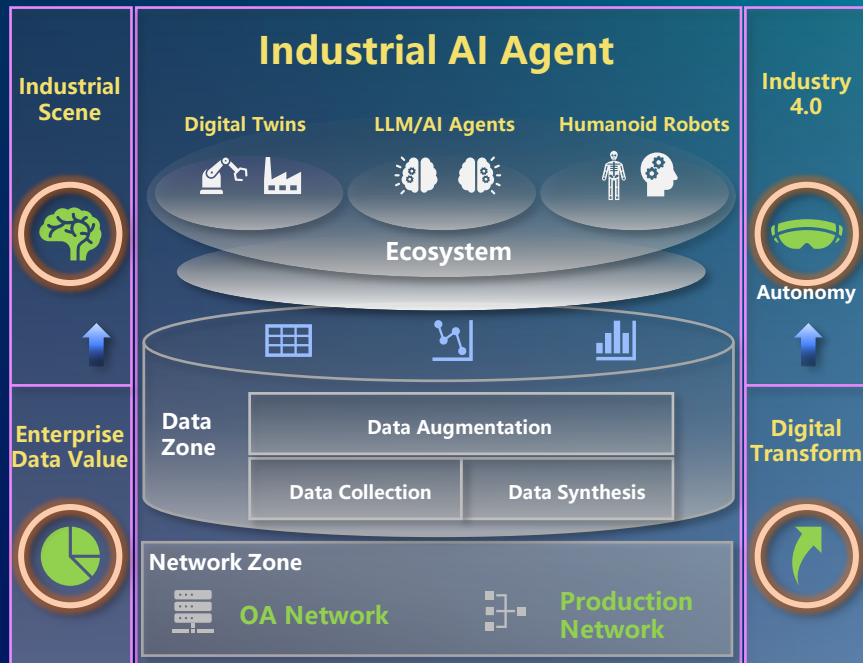


Hyper Base



NGAST (Nokia Generative AI Simulation Training Platform): Nokia "Industrial AI Agent" program: *Unlocking Automobile Autonomy*

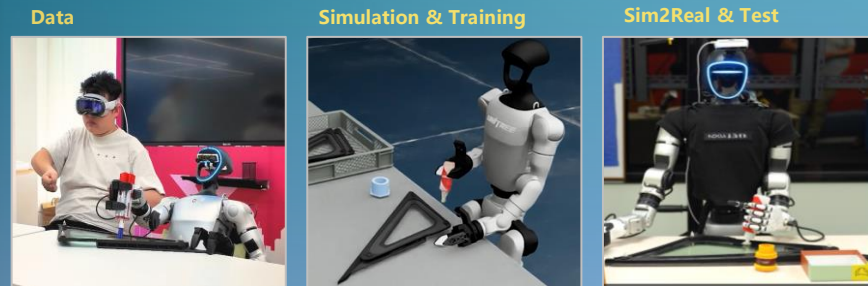
2025 Awards: GTI and WIC



PoC with SAIC-GM Cadillac



Automobile Use Case: Car Glass Primer Coating in Cadillac Final Assembly Production Line



Nokia AI Robots Industrial Dojo

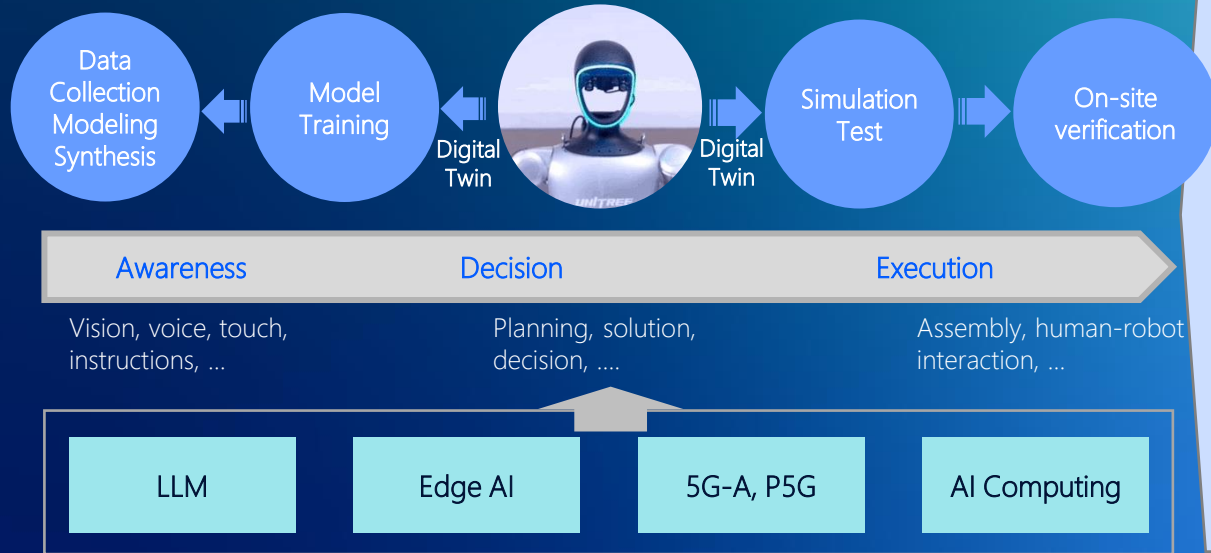


A Leading AI Partner Ecosystem



NGAST: Industrial Agent driving humanoid robots into industrial applications, realizing the essentials of large model agents + embodied AI + networking + computing

Industrial agents encompass key technologies enabling humanoid robots to achieve autonomous perception, decision-making, and action



Multimodal data collection

10X efficiency improvement

Data synthesis enhances generalization capability

Efficiency improvement through small amounts of real data and large-scale synthetic data

Massively parallel training

Improving training efficiency by 100x

High-reliability, low-latency networks supporting Edge+Cloud AI inference deployment

Addressing performance limitations, energy consumption issues, and cost challenges

NGAST: Insights from PoC – Industrial Intelligence is the bridge to industry autonomy, but facing three bottlenecks



Unproven Performance

Humanoid robots depend on AI inference for task completion, but missing low latency solution for real-time planning and inference



Unverified Robustness

Humanoid robots are designed for generalized, adaptable movement and interaction, verifying their consistent performance remains a challenge



Unreliable Safety

Unlike stationary industrial arms, humanoid robots are designed for mobility and interaction. Their complex, multi-jointed movements introduce new safety risks

Our initiative uncovered the market's critical missing solution that we are uniquely positioned to deliver

Any AI Models (VLA, VLM, etc.) and Industry AI Applications
(Industrial scene, use cases)



NGAST

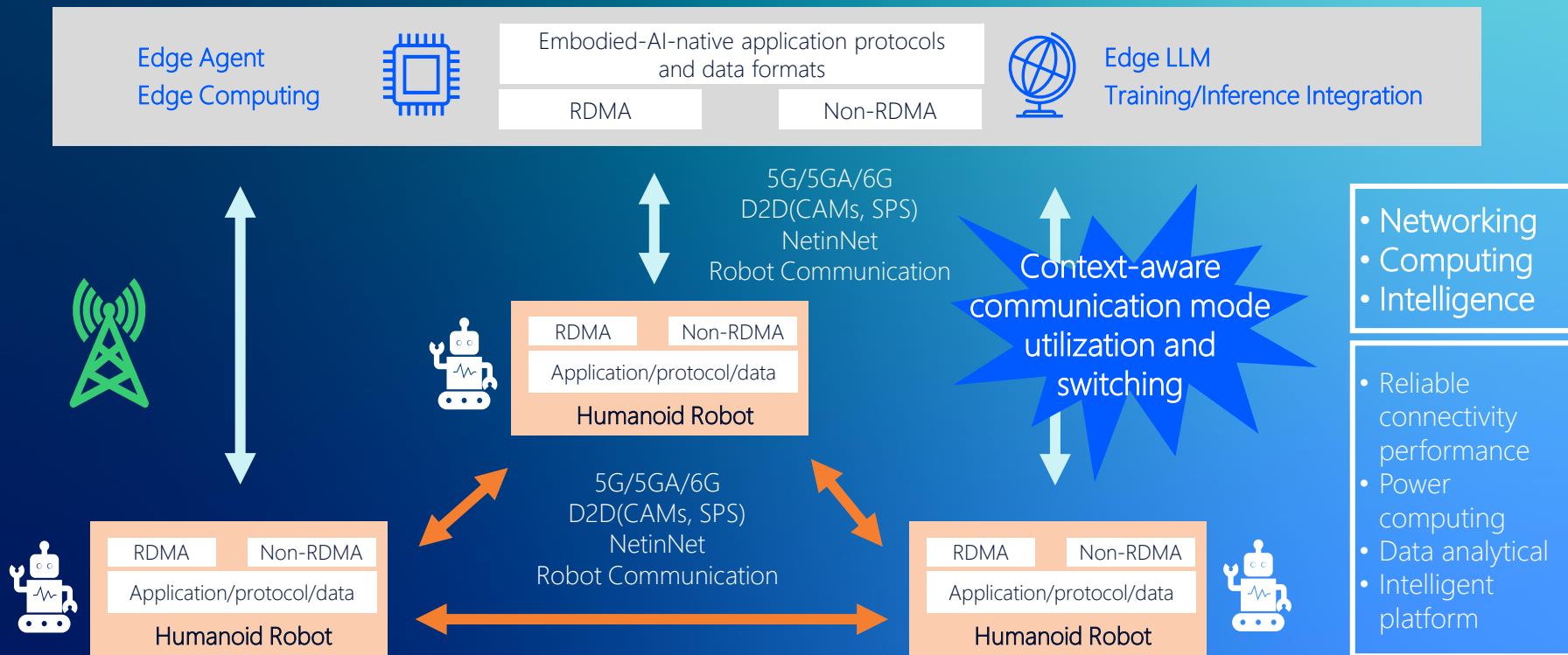
Agent Accelerating Network (AAN)

Manage, accelerating, optimize inference, minimize latency, ensure the performance and safety



Any Embodied AI (humanoid robots, AMR, AGV, etc.)

5G-A with Computing and Intelligence: Industrial Agent redefines networking architecture paradigm



5G-A for Enterprise: Converged & Private Network Deployment with Industrial Agent native



Achieving High-precision Performance:

- Ultra-low latency enables humanoid robot brains to achieve millisecond-level joint control, making high-precision tasks feasible
- The agents can switch between tasks in **real time**
- Dedicated networks deliver **sustained**, high-speed visual and sensor data flow



Achieving High-intelligent Operation:

- Upon detecting abnormal conditions, the agent is capable of near real-time **identification**, initiating **root cause** analysis, and even **self-correction**
- By leveraging **digital twin** simulations, the deployment time for new tasks is reduced (hours or days)



Achieving High-efficiency e2e System:

- By deploying AI with **local simulations**, the system's autonomy and performance are ensured
- Efficient utilization of industrial humanoid robots and edge server resources reduces **capital expenditure**
- Minimize overall system unplanned **downtime**

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