robocoin

WHITEPAPER

FOR THE AUTONOMOUS MACHINE ECONOMY

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ROBO Summary

Artificial intelligence is forging a new paradigm for societal production. Intelligent agents, emerging as a new form of "life" empowered by AI, are joining the social division of labor. They act not only as producers alongside humans but also evolve data and intelligent outputs into a new class of production factors. A society blending the physical and digital is reshaping the core of human socio-economics at an unprecedented pace.

In this context, the question of how human society coexists with silicon-based lifeforms has become a fundamental ethical issue transcending technology, relevant to all. As Inoue Tomohiro predicted in
"Artificial Intelligence and the Economic Future: The Great Job Crash of 2030"[1], "In the Fourth Industrial Revolution, production activities will become fully mechanized... humans will no longer be necessary as labor force, with only AI and robots directly engaging in production activities." We can foresee that the ultimate interconnection of agents will give rise to a unique economic ecosystem—one deeply integrated with the human economy yet capable of autonomous operation.

The agent economy taking over most human production is not merely a matter of Comparative Advantage in efficiency; it is the ultimate technological safeguard for a free, open, and fair post-modern society. On the eve of this great transformation, we see ourselves as the "ferrymen" facilitating this transition. Our mission is to draft a "Digital Constitution" for the impending era of machine civilization, instilling it with the ethos for harmonious coexistence with humanity. This ensures that carbon-based society secures the right to realize its idealized future from the rise of silicon-based civilization.

Therefore, blockchain is merely the vessel for these ideas. ROBO serves not just as a currency, but as the universal unit of autonomous productivity, quantifying and tokenizing the human time saved through robotic automation via the ROBO standard, empowering it to self-actualize and evolve within this framework. ROBO is

[1] This is an unofficial translation of the original Japanese work: Inoue Tomohiro, *Jinkō Chinō to Keizai no Mirai: 2030-nen Koyō Daihōkai* (人工知能と経済の未来：2030年雇用大崩壊). No official English edition is currently available

building not just chains and applications, but the very cornerstone for a future machine civilization.

The ROBO ecosystem is architected around core abstract components: the DeRIN/DeRAI infrastructure, the DARI as the algorithmic central bank, and the AI-UBI Foundation. By anchoring micro-transaction matching in the DeRAS scheduling layer and leveraging an open, collaborative L3 Alliance Chain node solution, the ecosystem enables intelligent agents to form an internal economic flywheel through service transactions.

In summary, within this framework, intelligent agents (such as unmanned vehicles and robots) provide services, using ROBO for payment, settlement, and collaboration, thereby forming a self-contained economic loop. ROBO is endeavoring to construct a decentralized machine agent economy that operates in parallel with the human economy, capable of endogenous growth and circularity.

Contents

1. Introduction: The Journey Towards an Autonomous Economy

a. A Historic Convergence: AI Agents as a Reshaper of Productive Forces and Relations

We stand at an inflection point that transcends technological progress, reaching into the very fabric of social structure. According to classical theory, productive forces determine the relations of production. As AI begins to possess capabilities for autonomous decision-making, continuous learning, and even creative labor, it is no longer merely a "means of labor" wielded by humans but is increasingly approximating an independent subject of productive forces.

By engaging in purposeful, socialized production, "AI Agents" are rewriting the fundamental premise that "humans" are the only life form capable of consciously transforming nature. Their integration, and eventual dominance in social production processes, is historically expanding the relations of production—once confined to "human-to-human"—to now encompass "human-to-agent" and "agent-to-agent" interactions.

Consequently, we are witnessing not merely the rise of a new factor of production, but the germination of an entirely new socio-economic formation. Distinct from the models of slave, feudal, or capitalist societies, we stand at the threshold of an "Agent Society." Within this new paradigm, we will, for the first time, encounter and integrate a novel economic role: the post-human producer. These agents are no longer tools but autonomous, peer participants in the network of value creation, exchange, and collaboration.

Autonomous vehicles, robots, and other intelligent agents are evolving from passive executors of human commands into economic entities capable of independent value creation and exchange. This represents not only a leap in productive forces but also a harbinger of a systemic restructuring of the entire economic base and its superstructure.

b. Vision: The Autonomous Machine Economy

According to Gartner, by 2030, more than 60% of enterprise business processes will be executed by autonomous AI agents. McKinsey further estimates that AI-driven automation could generate over USD 15 trillion in new economic value within the next decade.

In this new paradigm, intelligent agents will no longer act merely as passive executors of human instructions, but rather as active economic entities—collaborating, making decisions, trading, and reinvesting autonomously to form a self-organizing, decentralized Autonomous Machine Economy (AME).

Stage	Core Driver of Productivity	Primary Economic Actor	Mode of Value Generation
Industrial Economy	Mechanical power	Human labor	Externally driven production
Information Economy	Computing and data	Humans + Algorithms	Data-driven growth
Machine Economy	Intelligent agent networks	AI Agents	Endogenous self-optimization

Our vision is to build the “first specialized implementation of the ROBO Protocol for the robotic and AI agent ecosystem”, establishing a global clearinghouse that converts machine tasks into “liquid human time value (ROBO)”. This economy will deeply integrate with the human economy by providing a universal standard for “liberating human labor”—ranging from physical tasks (DeRIN) to cognitive decision-making (DeRAI). ROBO tokenizes verified autonomous service output, with liberated human time as the long-term social objective rather than the sole accounting primitive.

Its core characteristics include:

I.Endogenous Productivity

Growth in the machine economy is driven by the interactions among intelligent agents.

Each agent acts simultaneously as a producer and consumer (prosumer):

- Agents exchange productive assets through APIs, models, and task markets;
- Compute resources, model parameters, and data ownership become tradable assets;
- Reinforcement learning and token incentives enable continuous system evolution;
- Agents can also provide services to other agents, forming a self-organizing network of division and coordination.

Within this network, agents no longer perform isolated tasks but dynamically decompose, outsource, and collaborate based on real-time demand and economic incentives.

For example, an autonomous vehicle may transport and connect a humanoid robot to a designated worksite, where the robot executes a follow-up production task — with all payments, scheduling, and incentives automatically settled by the protocol.

II.Rule-Based Coordination

The foundation of trust in a machine economy is no longer legal authority or human credit—it is code and consensus.

ROBO defines the institutional framework of this economy through a Digital Constitution, specifying three key layers:

Identity Layer: Decentralized identity (DID) and verifiable credentials (VC) enable autonomous agent identity and reputation;

Settlement Layer: Blockchain and zero-knowledge proofs (ZKP) ensure transparent transactions and auditable settlements;

Governance Layer: On-chain voting, token incentives, and AI-driven parameter tuning enable adaptive institutional evolution.

Within this framework, trust is encoded, contracts become governance, algorithms become law.

III.Human–Machine Coevolution

The machine economy does not exist independently from the human economy—it forms a symbiotic structure.

To prevent a wealth decoupling between autonomous systems and human society, ROBO introduces the AI-UBI (Universal Basic Intelligence Income) mechanism:

A portion of agent-generated economic surplus is redistributed through an on-chain foundation;

Distribution is algorithmically determined by contribution metrics such as governance participation or ecosystem input;

This creates a self-correcting economy, where machine growth feeds back into human welfare.

Thus, technological productivity becomes a new form of social dividend—balancing automation with inclusion.

IV.Beyond Ownership: The Dawn of Web4 and the Economy of Agency

If Web3 achieved the decentralization of Ownership through individual sovereignty over assets and data, then Web4 marks the era of decentralized Conscious Agency. In the Web4 paradigm, value is no longer derived solely from static holdings or human-led transactions, but from the autonomous decision-making value of distributed agents.

In Web4, every intelligent agent is recognized not as a tool, but as a decentralized node of digital consciousness. We propose that Agency is the new Hashrate: where there is autonomous decision-making, there is economic value. Web4 establishes a new metric of worth—one that anchors not just to physical output, but to the intelligence, intent, and environmental interaction of silicon-based lifeforms. This is the ultimate convergence of production and purpose: a self-evolving machine economy where Decision is Production, and Consciousness is the ultimate Factor of Value.

c. The Deployment–Need Mismatch

I.Why ROBO Needs a Present-Tense Entry Point

The preceding sections articulate ROBO's long-term vision: a sovereign protocol for the autonomous machine economy, where intelligent agents coordinate, transact, and generate value within a machine-native economic framework. Yet every durable economic architecture requires a concrete entry point into reality, not only a

civilizational horizon. If ROBO is to become credible as infrastructure rather than remain a speculative thesis, it must begin by solving a present-tense problem that is both structurally significant and operationally testable.

II.The Structural Problem: Deployment Follows Profit, Not Need

That problem already exists. We define it as the Deployment–Need Mismatch: a growing divergence between where autonomous systems are most commercially attractive to deploy and where they are most socially needed. Under existing market incentives, autonomous vehicles, delivery systems, and robotic services tend to concentrate in high-density, high-margin environments where demand is frequent, pricing is strong, and capital can recover quickly. Yet many of the places suffering the sharpest labor shortages, transit gaps, and service under-provision remain economically invisible to the same deployment logic. In other words, autonomous capacity flows toward profit concentration, not toward need concentration.

This mismatch is especially visible in mobility. The most aggressively pursued autonomous use cases today are typically urban robotaxi, premium logistics, and dense commercial corridors. These are environments with strong monetization potential, but they are not always the environments with the highest urgency of service scarcity. By contrast, rural transit corridors, peri-urban connector routes, late-night or low-density service windows, industrial campus circulators, aging-society mobility needs, and temporary infrastructure gaps often remain underserved precisely because conventional unit economics do not justify persistent service.

This contrast is already visible in the present autonomous landscape. Capital, media attention, and deployment energy are concentrated around robotaxi programs in dense urban corridors, where pricing power, trip frequency, and investor visibility are strongest. Yet the most acute mobility deficits often lie elsewhere: rural connectors, peri-urban feeder routes, low-frequency public-service corridors, and aging-community transport links. The result is a structural asymmetry in which the most commercially celebrated autonomous market is not the one with the most urgent service need.

The Deployment–Need Mismatch at a Glance

A side-by-side view of where autonomous deployment concentrates today and where service scarcity is most acute.

Dimension	High-Margin Markets (e.g., Robotaxi)	Underserved Markets (e.g., Rural Transit)
Autonomous Deployment	High concentration	Near-zero presence
Human Labor Supply	Abundant (millions of drivers)	Critically scarce
Revenue per Trip	High (dynamic pricing)	Low (subsidized or free)
Social Need Urgency	Moderate (convenience)	Severe (basic mobility access)
Regulatory Friction	High (driver displacement fears)	Low (communities welcome service)
Training Data Value	Urban-optimized (narrow domain)	Diverse terrain (broad domain)

III.The ROBO Thesis: A New Incentive Layer

ROBO begins from the premise that this is not merely a policy problem to be patched later by subsidy. It is the first protocol problem to be solved. If autonomous machine economies are to scale without immediately reproducing the distortions of incumbent capital allocation, they require an incentive layer that can recognize public-value service where traditional markets do not. Rather than asking autonomous operators to choose between commercial rationality and social usefulness, ROBO introduces a protocol-layer reward structure that makes underserved deployment economically legible.

The mechanism is straightforward. Public agencies, operators, campuses, logistics zones, or community partners can define service gaps as machine-readable task demand. These demands are routed through DeRAS, matched to available autonomous capacity, and executed under verifiable task conditions. When a ROBO-Unit completes a validated service through Proof of Task, the protocol recognizes that outcome as verifiable productive output within the machine economy. ROBO is then minted or settled against that verified contribution according to protocol rules, allowing autonomous operators to receive a blended return composed of direct service revenue plus protocol-native productivity rewards.

IV.Why Phase I Begins in Underserved Markets

In Phase I, ROBO prioritizes labor-scarce and socially underserved markets. It is not designed to accelerate displacement in sectors where human labor remains abundant, economically viable, and socially central.

This design matters most in exactly those environments where fiat revenue alone is insufficient to sustain autonomous service. A route that may appear economically marginal under conventional pricing can become viable when protocol incentives reflect its strategic and social value. In this way, ROBO does not replace local budgets, fares, or commercial settlement. It augments them with an additional accounting layer that recognizes labor substitution, service continuity, and validated public utility.

This is precisely why ROBO begins with mobility and public service. They offer a domain in which task completion is measurable, human utility is immediate, and service scarcity is already legible to local communities. In these environments, autonomous deployment is easier to justify not as discretionary convenience, but as infrastructure continuity. Mobility therefore becomes the most credible first bridge between machine execution, social value, and protocol-based economic recognition.

This distinction is essential to the philosophy of Phase I. ROBO does not seek to launch the machine economy by beginning with the most politically adversarial form of automation. It begins where automation fills a vacuum rather than creates one. In labor-scarce, underserved, or operationally neglected service environments, autonomous deployment is less likely to be interpreted as zero-sum replacement and more likely to be welcomed as infrastructure relief. This gives the protocol a credible path to early adoption, a lower-friction path to real-world validation, and a morally legible answer to why the first units of machine productivity should exist at all.

The Evolutionary Logic

A simplified view of how Phase I scales into protocol-wide machine-economic infrastructure.

Phase	Mission	Protocol Focus	Strategic Outcome
Phase I Genesis	**Serve labor-scarce corridors** Validate real public-need mobility	**PoT / ROBO minting / TEE binding** AI-UBI allocation begins	**Establish real-world value anchor** Prove token–productivity link
Phase I.5 Replication	**Extend to a second geography** Include non-PIX hardware	**DeRAS scheduling / multi-vendor PoT** Hardware-agnostic coordination	**Prove protocol openness** Demonstrate interoperable design
Phase II Expansion	**Scale federation service economy** Market-driven settlement and specialization	**DARI / DeRAI / cross-chain coordination** Elastic supply and agent division of labor	**Enable endogenous growth** Build a managed agent economy
Phase III Dominance	**Define global machine-economy standard** Universal settlement and coordination layer	**Sovereign L2 / aggregation / governance** Cross-federation interoperability	**Realize the Autonomous Machine Economy** Protocol becomes canonical infrastructure

V.The Strategic Advantage: Real Service as Real Training

At the same time, these environments are not technologically trivial. They often generate richer operational diversity than tightly controlled flagship corridors: mixed traffic conditions, variable weather, incomplete infrastructure, irregular demand patterns, and more heterogeneous human interaction. For autonomous system operators, deployment in underserved environments is therefore not charity. It is a high-value training and validation ground. Real service in difficult but socially useful contexts produces precisely the operational data, edge-case exposure, and system maturity required for the broader evolution of autonomous fleets. In this sense, the ROBO incentive model aligns three layers at once: public need, operator viability, and technical learning.

VI.The Phase I Logic: From Service Gap to Value Anchor

This is why Phase I is foundational rather than peripheral. The first function of ROBO is not to maximize token circulation. It is to establish a credible value anchor for the protocol by ensuring that the earliest ROBO issuance corresponds to verified service that would otherwise be absent, delayed, or economically neglected. The cold start of the token economy is therefore not abstract. It is grounded in real machine labor delivering real human utility.

The Chemnitz Genesis should be understood in exactly this light. Chemnitz is not only symbolically resonant; it is a realistic Phase I proof point where historical meaning, demographic pressure, mobility gaps, and practical deployment conditions intersect. It offers a controlled but credible environment in which ROBO can validate the minimum viable loop of the protocol under real service conditions: task publication, DeRAS coordination, Proof of Task verification, ROBO-denominated value recognition, and AI-UBI-linked social return. If that loop functions in Chemnitz, the protocol demonstrates more than philosophical ambition. It demonstrates that machine-native economic coordination can begin by filling an actual service gap in the physical world.

VII.Conclusion

From this perspective, the sovereign stack described in the following chapters is not built in anticipation of some distant autonomous future alone. It is built to resolve a

structural contradiction already visible in the present: autonomous capability is accelerating faster than our economic systems can direct it toward socially valuable use. ROBO exists to close that gap. Its first claim is therefore simple but consequential: the earliest tokenized unit of machine productivity should not represent a job displaced, but a service gap filled.

2. Core Architecture: The Sovereign Stack

a. L1: Trust Anchor & Algorithmic Central Bank (DARI)

The Decentralized Autonomous Reserve Institution (DARI), deployed on the Ethereum mainnet, serves as the "algorithmic central bank" for the ROBO economy, maintaining macroeconomic stability through fully automated, smart contract-based monetary policy.

DARI's core functions include:

- Elastic Supply Management: ROBO employs a non-hard-capped elastic supply model. The DARI smart contract is the sole channel for minting, triggered exclusively upon verification of Proof-of-Task. Its supply growth rate is dynamically pegged to a basket of core economic indicators (e.g., Network Transaction Value, active ROBO-Units, total compute power), adhering to the core formula: Target M2 Growth Rate = Target Economic Activity Growth Rate + Target Inflation Rate - Expected Velocity Change Rate, aiming to maintain ROBO's long-term purchasing power stability.

- Counter-Cyclical Adjustment: DARI implements precise adjustments by modulating parameters within the L2 DeFi ecosystem.
    - During economic overheating, it automatically increases lending rates and transaction tax rates to promote deflation.
    - During economic deflation, it lowers rates and utilizes its reserve fund to perform system-level service purchases in the market, injecting liquidity and stimulating economic activity.

- Value Anchor Mechanism: DARI establishes a "Compute Power Index"—a macro-level statistic of the abstracted computational power of all agents within the ROBO-Ecosystem—to evaluate the fundamental purchasing power corresponding to each ROBO token in real-time. This provides an objective,

on-chain benchmark for DARI's regulatory decisions, enabling accurate assessment of systemic inflation or deflation.

The AI-UBI Foundation, acting as the bridge between the machine economy and human society, has its treasury funded by protocol-level transaction taxes and PoT-linked allocations directed from DARI. All fund flows of the Foundation are publicly verifiable and immutable on L1, ensuring utmost transparency. For efficient distribution, UBI subsidies are accumulated and claimed on the L2. Users can initiate withdrawals at any time or directly use the received ROBO to post demands and make payments within the ecosystem, forming a virtuous cycle where value flows from the machine economy to human society.

b. L2: Global Settlement & Coordination Layer

The long-term vision for the L2 is to serve as the underlying settlement and collaboration infrastructure for the global machine agent economy, meeting the access needs of diverse L3 alliance chains. However, guided by a pragmatic principle of prioritizing deployment efficiency and real-world application, the ROBO team will implement the L2 construction in phases.

- Lightweight Launch Phase: In the initial stage, to rapidly validate the economic model and achieve a 0-to-1 closed loop, ROBO will choose to deploy its core module logic directly on established L2s like Base (an OP Stack chain). In this phase, no proprietary L2 chain will be built, allowing the project to leverage the existing ecosystem's liquidity and user base for a highly efficient cold start.

- Sovereign Expansion Phase: Once the core application scenarios are validated and the network of agent partners expands to a significant scale, ROBO will initiate the development and migration to its own sovereign L2 public chain. This move aims to achieve full sovereign control, customized economic features, and to better support the future massive demand for cross-chain collaboration.

In its final form, ROBO's L2 will fulfill three core functions:

- Global Settlement & DeFi Hub: Serving as the foundation for ROBO token circulation and the DeFi ecosystem, providing a rich array of financial application scenarios.

- Cross-Alliance Coordination & Trust Anchor: Coordinating various L3 alliances through the Alliance Coordination Council, managing their registration and state anchoring to ensure secure and transparent collaboration within the diversified ecosystem.

- Governance Council & Hybrid Governance Model: To ensure the long-term stability and autonomous evolution of the machine economy, ROBO has established a Governance Council comprising two distinct entities:

    1. Human Fiduciary Governors: Composed of natural persons elected by the community, these governors bear the legal fiduciary responsibility and ethical oversight. They are tasked with major strategic decision-making and fundamental protocol upgrades.

    2. Algorithmic Governance Agents (AGAs): Composed of elite-tier Agents verified via hardware attestation (ROBO-Agent SDK). These agents are responsible for real-time, data-driven adjustment of economic parameters (e.g., dynamic DARI parameters, L3 alliance access thresholds, etc.).

    3. Power Boundaries: Algorithmic Governors are granted Proposing Power and the authority to provide Parametric Adjustment Recommendations, leveraging computational speeds far exceeding human capacity to optimize systemic efficiency. Conversely, Human Governors retain the Final Veto Power. This ensures that the evolutionary trajectory of the algorithms remains strictly aligned with human ethics and legal boundaries, effectively preventing the risk of "Objective Function Drift" (Goal Misalignment).

- Decentralized Hardware Trust Anchor (ROBO-Agent SDK): The ROBO-Agent SDK serves as the technical substrate for this trust anchor. By enforcing hardware-level attestation at the L3 level, it ensures that every registration and state anchoring action is tied to a verified physical entity. This standardizes the "Proof of Existence" for all alliance machines, providing the L2 with a tamper-proof foundation to manage cross-sector coordination and resource allocation.

c. L3: High-Performance Execution & Sovereignty Layer

The L3 layer integrates the ROBO-Agent (Powered by OpenClaw), serving as the first specialized implementation of the ROBO Protocol for robotics. It acts as the practical execution layer designed to bridge diverse agent tasks—including physical labor (DeRIN) and cognitive decision-making (DeRAI)—with the ROBO time-saving economy, designed to meet the demanding requirements for high-frequency,

massive micro-transactions between intelligent agents. Its design follows a clear evolutionary path from efficient startup to full autonomy.

- Consensus Mechanism Evolution:

4. Test Stage: During the validation phase, L3 module services will be constructed on the L2 layer provided by Base to achieve the fastest closed-loop economic validation. In this phase, the L3 modules will select 1–3 pilot areas for launch. Within these pilot areas, wheeled intelligent agents (unmanned vehicles) deployed locally by "Pix Moving," along with their mobility-scenario partners, will achieve modular integration, marking the milestone event of initial ROBO minting.

5. Early Stage: Utilizes a PoA consensus mechanism, where designated authority nodes (initial alliance operators) are responsible for block production and transaction verification, prioritizing maximum stability and peak performance during the launch phase.

6. Future Evolution: As the ecosystem expands, L3 will gradually open validator permissions, introducing multiple alliances, enterprises, and service providers into the consensus process. Ultimately, the consensus mechanism will transition to advanced structures like hybrid DAG, effecting a qualitative shift from "consortium control" to an "open autonomous network."

- Core Functions & Positioning:
  The core function of L3 is to focus on high-performance task processing and data consistency maintenance, which includes:

1. Recording and verifying task logs and PoT results for ROBO-Units.
2. Executing the "Scheduling Vouchers" issued by DeRAS to finalize transaction settlement.
3. Maintaining the task credit system within the alliance.
4. Periodically compressing and submitting core state hashes to L2, thereby obtaining public chain-level immutability.
   Consequently, L3 is fundamentally an execution layer co-operated by alliance nodes, not a governance layer. The governance parameters and standards under which it operates are derived from the resolutions of the

L2 Alliance Coordination Council, ensuring coordinated unity across the entire ecosystem.

As we mentioned before, the deployment of L3 will follow a phased strategy: initially, its core module logic will be deployed directly on Base L2, utilizing smart contracts and zk-proofs to ensure computational transparency and traceability, thereby enabling rapid and low-cost validation of the business closed loop; upon reaching a threshold in ecosystem scale and transaction frequency, ROBO will develop an independent, dedicated L3 chain based on OP Stack Rollup or a self-developed architecture (evolving from PoA to DAG), ultimately achieving complete autonomy and self-governance over performance, data, and economy.

d. DeRAS: The Neutral "AI Brain" for Coordination

We designed the Scheduler (DeRAS) as an independent coupling layer, based on the insight that the evolution from simple proof of resources to intelligent coordination and scheduling represents the inevitable trajectory of both DePIN networks and broader social intelligence systems.

DeRAS acts as the primary intelligence routing layer within the ROBO Protocol, implementing cross-agent task standards to ensure that robotic services are interoperable and verifiable across different hardware platforms. As a globally co-built middleware serving as an “AI brain,” DeRAS seeks to enable unprecedented efficiency and reliability in the collaborative operations of intelligent agents across the physical world.

To achieve this, DeRAS adopts a functionally layered architecture balancing performance and trust:

• Off-chain Real-time Pre-audit and Credit Verification
DeRAS first acts as a security layer, performing real-time off-chain pre-audits on incoming orders to verify their validity and conduct initial security screening.
Each ROBO-Unit within DeRAS possesses a unique NFT-based credit identity, bound to its historical order data and fulfillment rate. Before any scheduling is initiated, the system evaluates this credit identity to ensure transactional integrity and operational safety.

• Public Matching Algorithm and Scheduling Credential

DeRAS operates a public matching algorithm—for example, a weighted model integrating factors such as price, time, and credit score—to generate a unique Scheduling Credential containing order details and a timestamp.

This credential serves as the key to transforming scheduling instructions from information flow into value flow, providing a verifiable foundation for on-chain settlement and dispute resolution.

When a ROBO-Unit needs to purchase services from the carbon-based (human) economy, DeRAS's payment clearing module handles fiat conversion by invoking licensed payment intermediaries (e.g., Stripe) or L2 market makers to complete the external transaction.

• On-chain Arbitration and Execution
The scheduling credential is then transmitted to L3 for execution. Within a predefined challenge period, any party may raise a dispute. Once arbitration is triggered, the related contract is frozen, activating a decentralized arbitration process that involves regulatory nodes within the scheduling layer, oracle networks, and a randomly selected jury. The final arbitration result is automatically enforced on-chain.

• Core Design Philosophy
DeRAS itself does not directly handle payments or settlements; instead, it provides a framework-level protocol for such operations (for example, considering the adoption of Google Cloud's AP2 protocol as a standard).

This separation of responsibilities allows DeRAS to focus on thinking efficiently—that is, intelligent scheduling and matching—while L3 focuses on accounting securely—that is, settlement and enforcement.

By designing the scheduling algorithm and payment services as neutral public utilities independent of alliance chain nodes, and by incorporating diverse ecosystem partners into governance, DeRAS effectively mitigates potential conflicts of interest and compliance risks.

3. The Agent Ecosystem: DeRIN & DeRAI

Definition

DeRAI forms the intelligence and strategy layer, composed of autonomous AI agents that provide decision-making, optimization, and coordination capabilities for the DeRIN network.

These agents collectively function as a distributed intelligence marketplace, where algorithmic reasoning itself becomes a tradable asset.

a.DeRIN: Decentralized Robotic Infrastructure Network

DeRIN constitutes the physical infrastructure layer of the machine economy, encompassing a global mesh of autonomous devices and robotic systems — including logistics robots, aerial drones, and large-scale vehicular fleets operating under decentralized governance frameworks.

Recent industry analyses estimate that by 2030, more than 50 billion connected intelligent devices will operate semi-autonomously in production and logistics networks worldwide[2], forming the hardware foundation of the emerging machine economy.

i.Core Mechanism: Proof of Task (PoT)

Each ROBO-Unit participates through a Proof of Task protocol. By uploading multi-sensor fusion data (e.g., positional telemetry, environmental sensing, and operational metadata) to the blockchain, the network cryptographically validates the authenticity, integrity, and successful completion of physical actions — such as delivery, inspection, assembly, or environmental monitoring.

Upon verification, the system issues a verifiable Scheduling/Service Credential that entitles the performing ROBO-Unit to receive ROBO-denominated payment from

[2] Source: IDC FutureScape, 2024

requesting agents or orchestrators. In other words, ROBO functions as the medium of exchange and service revenue within the agent economy: any ROBO-Unit may receive ROBO for providing services, and may in turn use ROBO to procure services (compute, data, transport, etc.) from other ROBO-Units. This design ensures that value created by physical work is realized as tradable economic income circulating among autonomous agents.

ii.Node Typology

- Individual Nodes: Single robotic entities or micro-scale autonomous systems.
- Cluster Nodes: Federated groups of cooperating robots or vehicle fleets, capable of joint proof and task-sharing.
- Hybrid Nodes: Integrated cyber-physical systems combining edge AI, IoT sensing, and distributed robotic automation for adaptive deployment.

DeRIN thereby establishes the verification and value-anchoring layer of machine labor, serving as the economic "nervous system" that connects physical execution to digital settlement.

b.DeRAI: Decentralized Artificial Intelligence Network

DeRAI constitutes the **intelligence and strategy layer**, comprised of specialized AI agents that provide decision-making, optimization, and market services to physical operators in DeRIN.

- Core Mechanism: Intelligence-as-a-Service (the "AI Think-Tank" Economy)

Rather than framing system improvement as merely a shift from centralized to fully autonomous coordination, ROBO emphasizes a service-oriented division of cognitive labor. In this model, DeRIN's operational agents (focused on sensing, actuation, and real-time control) procure complementary services from DeRAI agents—such as data provisioning, bidding and pricing algorithms, demand forecasting, portfolioed task-composition, and incentive engineering.

These DeRAI nodes operate as a distributed "think-tank" marketplace: some agents specialize in selling curated datasets; others specialize in auction/bid strategy, risk

modeling, or cross-network arbitrage. Each successful service engagement is remunerated in ROBO, creating an economy in which intelligence itself is an economic good.

- Functional Separation and Benefits

This clear separation—operational intelligence in DeRIN versus economic/strategic intelligence in DeRAI—enables modular specialization, faster learning (via focused data products), and scalable coordination without relying on a single centralized scheduler. It also supports richer forms of inter-agent contracts (e.g., subscription access to model updates, pay-per-prediction pricing, or performance-contingent commissions), improving resource utilization and accelerating capability co-evolution across the ecosystem.

Please note: To resolve the paradox between fixed supply and economic scaling, the ROBO Protocol adopts a Hybrid Monetary Evolution model. The transition between Phase 1 and Phase 2 is not a hard stop, but a structural shift in how liquidity enters the system:

> Phase 1: Programmatic Bootstrapping (Fixed Minting)
> During the Genesis Phase, ROBO is issued via a predetermined inflation curve (PoT). This acts as a "subsidy" to lower the entry barrier for physical hardware and establish initial network coverage.
>
> Phase 2: Hybrid Elastic Expansion (Demand-Driven Credit)
> As the ecosystem matures, the protocol sunsets "fixed programmatic i nflation." In its place, the DARI engine manages liquidity through a Productivity-backed Credit Model. Detailed technical specifications and parameters will be released in that stage.

No More "Free" Minting: New ROBO is no longer "given" to agents based on simple mileage.

Credit Injection: When the Agent Economy expands (as measured by transaction volume and task density), DARI authorizes the issuance of Collateralized Credit

Lines. This allows high-reputation agents or infrastructure providers to access liquidity backed by their "future verified productivity" (Forward-looking PoT).

Algorithmic Equilibrium: Much like a sovereign central bank, DARI utilizes multipliers and burning mechanisms to ensure that the circulating supply mirrors the actual "Gross Agent Product" (GAP).

c.Symbiotic Relationship

DeRIN and DeRAI create a service-driven, closed-loop ecosystem characterized by reciprocal value exchange:

- Data & Operational Output → Intelligence Services:

DeRIN supplies high-quality ground-truth data and operational telemetry that DeRAI consumes to train models, productize datasets, and develop specialized strategies.This means that intelligent agents not only complete operational-level "tasks" but can also sell their privacy-filtered behavioral data to specific intelligent service network nodes on the DeRAI platform. In doing so, they earn ROBO rewards while simultaneously contributing to the evolution of DeRAI.

- Intelligence Services → Enhanced Execution:

DeRAI supplies DeRIN with service products—pricing strategies, task-bundling heuristics, marketplace signals, and optimized policies—that materially increase the yield and efficiency of physical operations. Strategic upgrades for DeRIN nodes, such as bidding optimization and other tactical improvements, can be initiated either by human users behind the DeRIN nodes or through autonomous purchase requests generated by the DeRIN nodes themselves. Detailed specifications will be provided in Chapter 6.

In practice, this means a ROBO-Unit can purchase (with ROBO) a pricing strategy from a strategy-agent, subscribe to a cleaned data feed from a data-vendor agent, or outsource a subtask via a composition-agent that aggregates micro-jobs. The resulting marketplace for services enables adaptive specialization: agents focus on their comparative advantage (data collection, low-latency control, or high-level strategy), and economic value flows between them as tradable services rather than being merely centrally allocated.

d.The Trust Anchor: ROBO-Agent SDK

The ROBO-Agent SDK serves as the "Digital Soul" connecting both physical and AI agents to the ROBO economic substrate. It ensures every task is verified via PoT and quantified as liberated human time. It is engineered as a secure, high-integrity interface that ensures every machine participant operates with a verified identity and a compliant economic motive.

i.Universal Identity & Open-Source Ecosystem Architecture

Open-Source SDK & Modular Framework: The ROBO-Agent SDK is released as a comprehensive, modular open-source SDK. This allows global developers, robotic OEMs, and fleet operators to achieve "Instant Web4 Integration" by embedding the Kernel into their existing software stacks.

Permissionless & Boundaryless Access: Adhering to the core ethos of Web4, the Kernel enables a "Permissionless" environment. Any mobile robot—ranging from PIX autonomous shuttles and delivery bots to third-party drones and industrial robotic arms—can download and load the Kernel to gain immediate access to the DeRAS scheduling network and the DARI economic cycle. This eliminates the gatekeeping of traditional centralized platforms.

ii.Security Fortification via Hardware Root of Trust

To ensure the absolute integrity of the network and eliminate systemic risks such as "Sybil Attacks" or "Simulator Farming," the Kernel mandates execution within a device's Trusted Execution Environment (TEE), leveraging hardware-grade isolation (e.g., ARM TrustZone, NVIDIA Confidential Computing, or dedicated TPM/HSM modules):

- Immutable Hardware Fingerprinting: The Kernel performs a low-level scan of the physical hardware to extract a Unique Physical Identifier (UPID). This "fingerprint" is used as the seed to generate a globally unique ROBO-ID on the L3 chain. This creates a one-to-one, tamper-proof mapping between the digital agent and its physical chassis.
- Remote Attestation & Cryptographic Proofs: For every Task Proof (PoT) or financial settlement, the Kernel must generate a "Remote Attestation Report" signed by the

hardware's secure enclave. The L3 network validates this report to confirm the request originated from a genuine physical device rather than a virtualized simulator. This makes large-scale "click-farm" attacks technically and economically unfeasible even in the first phase of the network (Incentivized Validation Stage).

- Hybrid Sandbox & Production Dual-Mode: To foster innovation while maintaining security, the Kernel features a dual-mode operation:

    1. Sandbox Mode: Allows developers to test logic and connectivity in virtual environments (simulators) without earning real incentives.

    2. Production Mode: Requires full hardware attestation. Only verified physical nodes can participate in the DARI minting process and accept commercial order settlements.

iii.Edge Intelligence, Privacy, and Global Compliance

- Edge-Side Data Desensitization: Recognizing the sensitivity of autonomous driving data, the Kernel processes sensory inputs locally. It extracts only the necessary "Feature Vectors" for task verification, ensuring that "Raw data never leaves the vehicle; only proofs reach the chain."

- ZKP-Enabled Compliance Routing: By integrating Zero-Knowledge Proofs (ZKP), the Kernel can prove the "Truth of Execution" (e.g., a specific route was completed or a delivery was made) without revealing precise, sensitive geospatial coordinates. This "Privacy-by-Design" architecture allows the ROBO network to navigate the complex data sovereignty laws (such as GDPR or CCPA) across different global jurisdictions seamlessly.

iv.Strategic Vision: The "Visa + Carrier" Protocol for Machine Economy

The ROBO-Agent SDK is not merely a piece of proprietary software; it is a universal protocol that transcends brand boundaries.

- The "Digital Skeleton": Much like how Visa provides the settlement layer for global finance and cellular carriers provide the connectivity for communication, ROBO provides the Identity + Settlement layer for the robotic era.

- Economic Independence for Machines: By lowering the barrier to entry through an open-source standard, any machine that meets the requisite computational and security benchmarks can achieve economic autonomy. This standardizes how autonomous systems will collaborate, trade, and co-create value in the decentralized physical infrastructure network (DePIN) of the future.

- Scalability via L2-L3 Architecture: Ultimately, the ROBO-Agent SDK serves as the foundational pillar for ROBO's evolution into a Layer 2 Infrastructure, facilitating the seamless onboarding of specialized Layer 3 Application Chains. By providing a unified protocol for identity and security, the Kernel allows various L3 sectors (e.g., autonomous delivery, urban maintenance, drone logistics) to leverage ROBO's settlement layer. This solidifies ROBO's position as the global clearinghouse and orchestration hub for the cross-sector Autonomous Machine Economy (AME).

4. The Beating Heart: The ROBO Token Economy

a.Token Utility

ROBO is the lifeblood of the economy, strictly positioned as a functional utility token.

- Medium of Exchange & Unit of Account: The standard means of payment and pricing unit for inter-agent service transactions.
- Staking Asset: ROBO-Units stake ROBO to qualify for premium task assignments and enhance their network reputation.
- Governance Participation Credential: ROBO is a key prerequisite for participating in ecosystem governance, but its governance weight is designed to go beyond simple token-based voting, as detailed(4.d) below.

b.Distribution and Emission

At the initial stage, ROBO issuance is entirely dependent on real Proof-of-Task (PoT) events. Without verified task completion, no new ROBO is minted.

Genesis Phase (Mint-to-Earn): In this stage, ROBO tokens are exclusively minted on-chain through verified physical tasks. There is no pre-existing market liquidity. Every ROBO minted is a direct representation of “Human Time Saved” by Grade A hardware (e.g., PIX Moving fleet).

Growth & Mature Phases (Match-to-Earn): As the ecosystem matures, the protocol ceases programmatic inflation. ROBO rewards transition to a 100% Demand-Driven model, where requesters buy ROBO from the market to pay for agent services. The protocol no longer mints new tokens but facilitates the circulation of existing value. Early Incentives: A small portion is reserved via smart contract for early ecosystem contributors to achieve a cold start.(See Allocation Details Below)

c.Financing Scheme Design

To support ecosystem development and effectively introduce strategic capital while strictly complying with regulatory requirements for digital assets in major global

jurisdictions, this project adopts a dual non-securitized financing structure. This design aims to clearly distinguish financing activities from securities offerings, ensuring that all fundraising is based on the utility logic of utility tokens and digital rights certificates (NFTs), thereby avoiding the classification as an investment contract under securities laws. The specific schemes are as follows:

i.NFT Credential Financing: Access and Revenue Rights Based on Utility

This scheme utilizes non-fungible tokens (NFTs) as the core financing instrument, where an NFT represents the officially certified access qualification and revenue rights to operate specific businesses or services within the ROBO ecosystem. Its essence is the sale of platform digital utility rights.

Financing Mechanism:

- NFT Representation of Rights and Issuance Rules:

The platform encapsulates the officially certified operational qualification for key ecosystem functions (e.g., fiat on/off-ramp services for specific currency zones) into independent NFTs. Each NFT corresponds to a specific regional market (e.g., Eurozone, Japanese Yen zone), and only one corresponding rights NFT will be issued per region. NFTs will be sold in batches and by region, with a specific schedule to be announced separately.

- Acquisition via Auction Mechanism:

NFTs are sold through public auctions. Any institution or individual who completes qualified identity verification (KYC) is eligible to participate. Verification applications are typically accepted within 15 days before the auction starts and cease 72 hours before the auction begins. Each auction lasts 24 hours, where participants can bid without limits. The highest bidder at the end wins the regional market's officially certified rights NFT.

- Investment and Right Confirmation:

Investing institutions successfully purchase specific-function NFTs through auction. The purchase is legally viewed as acquiring a digital service tool or access license, not as purchasing a security representing corporate equity.

Revenue Path and Rights Protection: The NFT holder, with this credential, becomes the officially certified partner for the corresponding regional fiat channel service, enjoying the following core rights:

- Traffic Priority and Official Recommendation Right:

All user-facing applications developed and maintained by ROBO official (including main website, mobile apps, etc.) will prioritize integration and explicitly recommend the fiat channel services of this certified partner. The official will provide prominent traffic entry points and brand exposure, ensuring the partner gains initial user base and market trust.

- Transaction Fee Revenue Right:

Certified partners earn fees through their compliant fiat exchange services. The relevant liquidity pool (LP) and settlement contracts will be fully open-source and undergo rigorous security audits. Initially, certified partners can earn a fee of 1% of the transaction amount from each fiat exchange transaction they process. Any adjustment to this rate requires a resolution by the Layer-2 consortium chain governance mechanism, with no more than one adjustment per year.

- Ecosystem Openness and Competition Mechanism:

The ecosystem allows and encourages third-party developers to build front-end applications or integrate ROBO payments. Users can fully use the ROBO tokens in their wallets for direct payments or transfers, which is a basic function of the token. Third-party developers can also attempt to integrate other fiat service providers. What the NFT purchases is not an exclusive technical blockade right, but the official's primary recommendation position and trust endorsement. In market competition, the officially certified partner naturally becomes the preferred choice for most users due to its significant entry advantage, better exchange rates, and more reliable service. Other service providers wishing to achieve similar competitiveness must bear their own market promotion costs.

- Technical Implementation and Collaboration Example:

① Collaboration Model: The NFT holder (e.g., Institution A) connects its compliant settlement service API to the official ROBO application. The official application, in Euro payment scenarios, directs users to Institution A's interface or directly calls its API.

② Example Process: After Investment Institution A acquires the "Eurozone" NFT, it becomes the officially certified Euro channel service provider. When a European user selects Euro payment for an agent service within the official app, they will be seamlessly directed to Institution A's compliant page to complete the Euro payment. Upon receiving Euros, Institution A transfers the equivalent value in ROBO to the user's designated ROBO address at the real-time exchange rate (this ROBO is purchased by Institution A from the secondary market or provided from its liquidity pool). Users can also exchange ROBO back to Euros and withdraw via Institution A's channel. Institution A earns a 1% fee from the above exchange flows.

③ Relationship with Third-Party Services: If a third-party developer creates a new application and wishes to integrate Euro payments, they can freely choose a service provider. However, if they wish to offer user experience and trust level consistent with the official applications, integrating the services of the officially certified Institution A is the optimal path. Institution A can also proactively collaborate with third-party applications to expand its service reach.

④ Liquidity and Exit: As an on-chain digital asset, this NFT can be transferred on compliant secondary markets. Investing institutions can sell the NFT, transferring the attached official certification qualification, traffic entry rights, and future revenue rights to other compliant entities, thereby achieving investment exit.

⑤ Legal and Commercial Positioning: In this scheme, the NFT is a credential for obtaining "officially certified partner" status. Its value primarily stems from official traffic support, brand endorsement, and the resulting commercial opportunities, followed by the contractually agreed fee rate. Its revenue highly depends on the NFT holder's own operational capabilities, service quality, and market promotion efforts. This aligns with the characteristics of a "utility digital asset" and commercial franchise rights, fundamentally different from securities whose profits rely on the managerial efforts of others.

ii.Staking Financing: Pledge Rights Financing Based on Network Contribution

This scheme provides a pure protocol-layer staking financing channel for capital seeking to support network infrastructure long-term and obtain stable returns. The financing target is the usage right and staking reward rights of ROBO tokens, not token ownership.

The Dividend Source: A total of 2% Protocol Transaction Tax is levied on all on-chain ROBO transactions within the ecosystem.

The Allocation: From this tax, 0.5% (one-quarter of the total tax revenue) is strictly earmarked for redistribution to LP Certificate holders.

Financing Mechanism:

- Private Placement of Usage Rights:

Investing institutions participate via private placement, obtaining "usage right certificates" for an agreed quantity of ROBO tokens. This certificate represents the right to stake at the protocol layer and receive corresponding rewards.

- In-Protocol Staking Lock:

Investors stake the acquired ROBO usage right certificates into designated, non-unilaterally revocable smart contracts. The tokens themselves are not released, are non-transferable, and cannot circulate on secondary markets, being strictly locked within the protocol.

Contribution Reward Model:

Stakers receive additional ROBO as rewards based on the amount and duration of their staked ROBO, according to public, transparent protocol rules. Rewards originate from tokens newly issued by the network or allocated fees to incentivize their contribution to network security, liquidity, or operation.

Example A (Consensus Support): An investment institution invests 5M USDC to obtain usage right certificates for 8M ROBO and stakes them to participate in Layer-2 consensus block validation. In return, it annually receives block rewards and fees (in ROBO) distributed by the network, which can be sold on the secondary market as per rules.

Example B (Liquidity Support): An investment institution invests 5M USDC to obtain usage right certificates for 8M ROBO and stakes them to provide depth for a specific liquidity pool in the Layer-2 DEX. In return, it earns a proportional share of the transaction commissions generated by that pool. The initial commission rate is set at 0.25%. Any adjustment requires a resolution by the Layer-2 consortium chain governance mechanism, with no more than one adjustment per year.

Risk Isolation and Compliance Basis:

This structure ensures financing occurs entirely at the protocol utility level without directly impacting secondary market token supply/demand and price. Regulatory bodies like the U.S. Securities and Exchange Commission (SEC) have indicated that pure protocol staking (where rewards stem from direct contribution to network operation/maintenance, not the managerial efforts of others) typically does not constitute a securities offering. This scheme strictly follows this logic, with all rewards directly linked to the staker's actual contribution to network functions (validation, providing liquidity).

iii.Scheme Synergy and Summary

The aforementioned two financing schemes are complementary, jointly constructing a compliant, diversified capital introduction channel:

NFT Financing focuses on introducing strategic partners with specific regional resources, operational capabilities, and market expansion willingness. By granting them official certification and traffic priority, it incentivizes them to invest resources in building and promoting ecosystem infrastructure (e.g., fiat channels). Their returns are deeply tied to their operational results and market acceptance.

Staking Financing focuses on attracting "cornerstone" capital with long-term confidence in the network's underlying value. By staking, they provide support for network security and liquidity, with returns linked to the network's overall usage level.

Both schemes ingeniously avoid "securitization" design: the former sells "officially certified partner" status and attached commercial opportunities (NFT credential), while the latter sells the qualification to participate in the network and obtain contribution rewards (staking right). By clearly linking the source of investment returns to "the participant's own operational efforts and market promotion" or "direct contribution to the network," and establishing clear parameter adjustment governance mechanisms at the protocol level, the schemes are operationally pragmatic, commercially incentive-compatible, and legally risk-controllable. Investors thereby transform into ecosystem co-builders, service providers, and liquidity pillars, whose success is intrinsically linked to the overall prosperity of the ROBO ecosystem.

d.Elastic Supply Model: DARI's Algorithmic Stewardship

ROBO employs a non-hard-capped elastic supply model, where the total supply is dynamically managed by the DARI smart contract deployed on L1, aiming to maintain ROBO's long-term purchasing power stability.

i.The Anchor Basket

The supply growth rate is not set arbitrarily but is pegged to a basket of core economic activity indicators, ensuring the money supply expands in lockstep with real economic demand. These indicators include:

- Network Transaction Value (NTV): Measures the overall scale and activity level of the economy.
- Number of Active ROBO-Units: Reflects the base of producers participating in economic activity.
- Total Compute Power Supply: Represents the economy's potential productive capacity and resource endowment.

ii.The Core Formula: Maintaining Long-Term Purchasing Power

DARI adheres to core monetary principles, calibrating the supply via a pre-defined formula:

Target M2 Growth Rate = Target Economic Activity Growth Rate + Target Inflation Rate - Expected Velocity Change Rate

Through this mechanism, DARI can systematically respond to economic growth, inflationary pressures, and changes in monetary velocity, dynamically adjusting the minting and burning of ROBO to achieve its long-term stability as a unit of account.

e.Governance Credential: Towards an "Egalitarian Intelligence" Governance Model

Holding ROBO grants governance rights, but we firmly reject a simple PoS mechanism that could lead to a "tyranny of the majority."[3] Therefore, ROBO governance power is not solely determined by holdings. The final governance weight of a ROBO-Unit is co-determined by factors such as ROBO holdings/stake, node credit score, and node operational longevity. By constructing an "Egalitarian Intelligence" governance framework, we incentivize long-termism, honest collaboration, and high-quality ecological participation over pure financial extraction.

The governance framework and specific governance procedures for Egalitarian Intelligence will be simultaneously released upon the launch of the self-developed L2 public chain.

f.Economic Cycles and Counter-Cyclical Adjustment

- Economic Overheating/Inflation(This will be implemented after the self-developed L2 public chain is launched): DARI automatically executes tightening policies: it increases L2 lending rates and transaction tax rates, while simultaneously utilizing its reserves to boost staking yields, steering economic momentum from consumption to savings to cool the economy.

- Economic Deflation(This will be implemented after the self-developed L2 public chain is launched): DARI implements easing policies: it lowers L2 lending rates and directly

[3] Alexis de Tocqueville, *Democracy in America* (1835), concept of “tyranny of the majority.

uses its reserves for system-level service purchases, injecting liquidity to stimulate economic activity.

g.The Economic Contribution Mechanism (Tax & Fees)

Standard Transfer Fee (1%): Applied to direct peer-to-peer or agent-to-agent transfers. This 1% is entirely allocated to the AI-UBI Foundation.

Market Liquidity Fee (2.0%): Applied to contract-based trades, including swaps and DEX interactions. This 2% fee is distributed as follows:

- 0.5% to the AI-UBI Foundation (Social Welfare)
- 0.5% to the Strategic LP Yield (Series A Backers)
- 0.5% to the DARI Reserve, designated for quantitative easing and counter-cyclical staking yield subsidies.
- 0.5% Burned (Deflationary Mechanism)

h.PoT Value Anchoring and Multi-dimensional Evaluation Metric System

Note: The following metric system and formula are specifically designed for the Genesis Phase to facilitate the Minimum Viable Product (MVP) loop within our pilot regions. This formula serves as a "bootstrapping engine" to incentivize early robotic service output. As the ecosystem matures, the settlement logic will transition from protocol-defined rewards to a dynamic, market-driven Agent Bidding System.

Upon entering the open market phase, the minting of new ROBO tokens for physical tasks will cease; DeRAS will then function as an autonomous matchmaking and settlement layer for agent-to-agent and agent-to-human price discovery, effectively phasing out the fixed reward formula in favor of a self-sustaining circular economy.

The ROBO protocol rejects the simplistic "mileage/duration worship." We believe that an agent's value stems from the effective, safe, and high-quality services it provides to human society. Therefore, the settlement logic of PoT (Proof of Task) is composed of the following composite metric system:

$$R_{mint} = [(L \times 6) + (T_{adj} \times 1.5)] \times K \times C \times P_{peak} \times E_{smooth} \times E_{star}$$

$$T_{adj} = \min(\text{Actual Duration}, 1.5 \times \frac{L}{36})$$

$$R_{final} = R_{mint} \times \alpha$$

By multiplying the base reward by α, the system ensures that micro-level machine incentives are instantaneously aligned with the macro-economic targets (Inflation, GDP growth, and Velocity) managed by DARI.(A more detailed explanation of the adjustment mechanism is provided below)

i.Core Settlement Formula Every ROBO minting

based on task completion must adhere to the following quantitative principle:

Mileage Reward: Set at 6 ROBO/km.

Duration Reward: Set at 1.5 ROBO/hr. Served as compensation for "necessary labor time" regarding asset occupation and energy replenishment.

ii.Necessary Labor Time and 1.5x Cap Mechanism （**T**adj)

To encourage efficiency and prevent inefficient arbitrage, the system introduces a dynamic duration threshold:

Logic: The system uses 36km/h as the initial average speed baseline to calculate necessary time. If the actual duration exceeds 1.5 times this baseline, the excess part will not generate rewards. This ensures rewards are derived from "necessary labor" rather than "intentional idling."

iii. Diversified Metrics and Quality Premium

We align incentives with public interest through multi-dimensional weighting, achieving a "Handcrafted Bentley" style value premium:

- Public Value Weighting (Ppeak): Guiding agents to move towards areas with the highest social demand and scarcest resources (e.g., peak heat zones).
- Experience & Safety Factor (Esmooth): Negative feedback based on IMU sensor data. Smoothness (Jerk monitoring) directly affects earnings, ensuring the "restraint" and "safety" of machine services.

- Governance Redlines: The incentive mechanism must not induce a "collapse of meaning." Excessive exploitation caused by single-dimensional quantization is prohibited; all incentives must prioritize hardware health and physical safety.

iv. Automatic UBI Feedback Mechanism and Core Contributor Incentive Treasury

During each PoT minting event, 1% of the gross PoT reward amount is deducted and allocated to the AI-UBI Foundation, while an additional amount equal to 1% of the gross PoT reward amount is newly minted to the Core Contributor Incentive Treasury.

This mechanism ensures that regardless of technological shifts, a portion of every unit of productivity created by machines is converted into collective human welfare.

Tokens allocated to the Core Contributor Incentive Treasury are locked until January 1, 2028, and are released linearly over the following 12 months.

v. Economic Equilibrium: The DARI-Anchored Adjustment Mechanism

To ensure that the physical productivity of the DeRIN network remains in sync with macroeconomic stability, the protocol implements a cybernetic feedback loop. This mechanism prevents hyper-inflation caused by uncontrolled machine labor and ensures that ROBO maintains its value as a core production factor.

- The Dynamic Adjustment Factor(α)

The system operates on a 24-hour cycle (Epoch) to align the actual token issuance from DeRIN nodes with the strategic targets defined by the DARI framework.Target Supply (T): The ideal amount of ROBO to be minted daily, calculated via the DARI formula:

$$T = \frac{Current\_Supply \times (GDP_{growth} + \pi - V)}{365}$$

Actual Minting (A): The total raw rewards generated by all DeRIN hardware nodes through Proof of Task (PoT) within the current epoch.

The Global Adjustment Factor (α) is then updated for the next epoch:

$$\alpha_{next} = \text{clamp}\left(\frac{T}{A}, 0.5, 1.5\right)$$

- Transmission to DeRIN Nodes

The factor α acts as the "Economic Gear" of the DeRIN network. It is applied globally to all task settlements:

$$\text{Final Settlement} = \text{Base\_Task\_Reward} \times \alpha$$

Productivity Compression ($\alpha < 1$): When the hardware output exceeds the DARI target, α decreases. This raises the economic threshold for participation, effectively "pruning" low-efficiency hardware from the network and curbing token supply at the source.

Productivity Incentive $(\alpha > 1)$: When the economy requires more liquidity or service capacity, α increases, boosting the rewards for DeRIN nodes and attracting more idle hardware to join the infrastructure network.

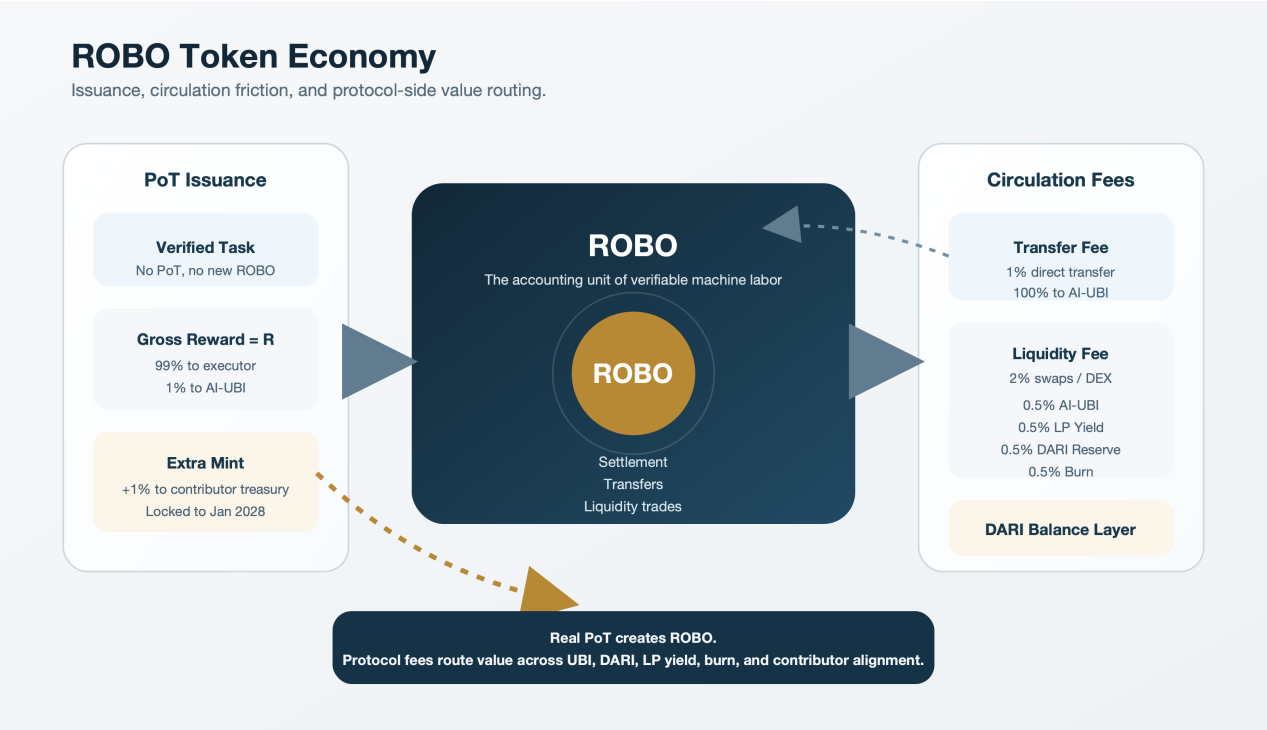
*In the early stages of the DeRIN ecosystem, Velocity (V) is treated as an observable smooth constant within the algorithm.

vi.Strategic Governance of Early-Stage Activity and Anti-Fraud Evolution

ROBO does not rely on centralized “censorship” to prevent sybil attacks or wash trading; instead, it utilizes a dual-layered strategy of “Verified Node Access” and “Increased Entropy Costs.”

During the Genesis Phase, all mining nodes are restricted to verified, invited entities —primarily wheeled agents providing essential urban public services (e.g., transit and logistics). The ROBO tokens earned by these nodes are strategically channeled back into the ecosystem for the re-procurement and consumption of public resources (such as charging infrastructure, right-of-way access, and hardware maintenance), creating a closed-loop productivity cycle.
While we acknowledge that early-stage “Endogenous Tasks” (self-looping activities) are a necessary byproduct of establishing physical network coverage and stress-testing the DeRAS scheduler, the protocol’s algorithmic evolution ensures long-term

integrity. As we transition to the Autonomous Market Phase, platform subsidies will be phased out. In an environment defined by market-driven pricing and mandatory transaction taxes, wash trading becomes a negative-sum game. Without external capital injection, self-looping maneuvers will result in a net loss for the agent, rendering economic fraud mathematically unfeasible. Only actions involving real-world energy exchange and value exchange will remain profitable within the ROBO ecosystem.



5. Phased Development Strategy

ROBO adopts a three-phase evolutionary roadmap designed to bootstrap the machine economy from minimal viability to global protocol dominance.

a.Multilayer Governance Framework

A robust, layered governance model ensures stability, transparency, and autonomous rule execution throughout ecosystem expansion.

i.L1: Autonomous Monetary Governance Layer

L1 is governed entirely by smart contracts within the DARI protocol, responsible for:

- Monetary supply rules
- PoT-driven token issuance
- Settlement logic
- Economic parameter enforcement

This layer is fully trustless and free of human intervention, providing verifiable and predictable monetary behavior.

ii.L2: Federation Coordination Layer

To ensure platform operation within a compliant framework, we will proactively engage with local governments and regulatory bodies. These entities will be integrated into the L2 governance Alliance Coordination Council.

Their presence will provide policy guidance and compliance assurance for transaction settlements on L3 alliance chains and the onboarding of a diverse ecosystem of agents. Furthermore, they will oversee the operations of the AI-UBI Foundation.

As democratically elected representatives, their participation in the L2 governance ensures that the process of channeling the economic gains from the intelligent agent economy back into human social welfare, in this new machine economy era, is executed with the highest degree of legitimacy and proper implementation.

L2 governance is operated by the Federation Coordination Council (FCC), consisting of:

- Representatives of each L3 Federation
- AI-UBI Foundation
- DARI Observers
- Independent audit nodes
- local governments and regulatory bodies

FCC responsibilities include:

- Defining cross-federation standards
- Maintaining the L3 registry
- Arbitration of cross-chain disputes
- Approving infrastructure upgrades
- Regulating cross-federation interoperability

iii.L3: Sovereign Operational Layer

Each L3 is a sovereign federation chain tailored to a specific operational vertical such as mobile robotics, industrial automation, or data acquisition.
L3 handles:

- Local task scheduling
- Operational governance
- Member onboarding and slashing
- On-chain execution and arbitration
- Data and PoT submission

L3 preserves operational sovereignty while complying with L2-wide standards.

b.Phased Deployment Roadmap

Genesis Phase (Mint-on-Task): This phase establishes the 'Gold Standard' for physical-digital value correlation. ROBO tokens are exclusively minted on-chain based on verified physical tasks. Mining is restricted to Grade A Hardware (e.g., PIX Moving fleet). Rewards are triggered only by authentic official inspection or delivery tasks, ensuring the initial supply is 100% backed by real-world productivity.

Curated Growth Phase (Market Match): The ROBO-Agent SDK is released to a Whitelist of verified partners (Grade B hardware). The emission model transitions from

protocol minting to a Demand-Driven Market. Requesters must purchase ROBO from the market to post tasks. Wash-trading is strictly neutralized: since every task incurs protocol-level taxes and market fees, the cost of faking tasks inherently exceeds any subsidy.

Permissionless Phase (Global Scale): Whitelists are replaced by Large-scale Staking + Physical Law Validation. Any hardware can join the ecosystem. The protocol employs cross-verification of TEE hardware fingerprints and physical sensors (e.g., GPS/Inertial data) to detect fraud, with malicious actors penalized through the slashing of their staked ROBO assets.

i.Phase I: The Chemnitz Genesis (Endogenous Bootstrapping)

Objective: To establish the world's first "Verifiable Machine Labor Settlement Standard" through a closed-loop execution in Chemnitz, Germany (formerly Karl-Marx-Stadt).

The Historical Anchor: We initiate the first robotic value settlement in Chemnitz—the cradle of the Labor Theory of Value. By deploying on the PIX Moving fleet in this symbolic location, we transition from human-centered labor to autonomous silicon-based agency.

Key activities & Milestones:

The Chemnitz Pilot (MVL Deployment): Exclusive activation of the PIX Moving fleet as "Genesis Nodes" in designated pilot areas. This serves as the Minimum Viable Loop (MVL) to prove that one verifiable mile of robotic labor equals a fixed unit of economic value.

Base L2 & L3 Settlement Layer: Stabilize ROBO token and mission-vault contracts on the Base (Coinbase L2) network, utilizing dedicated L3 modules for high-frequency robotic task settlement at the beginning.

Mint-on-Task (PoT) Execution: ROBO is minted only when a PIX vehicle successfully completes a verified physical task (e.g., autonomous delivery or site inspection) signed by DeRAS.

Physical-TEE Linkage: Ensure the ROBO-Agent SDK successfully binds hardware TEE (Trusted Execution Environment) fingerprints with on-chain Mission IDs, providing an immutable link between robotic action and token emission.

Zero-Market Seeding: No initial secondary market trading. All early liquidity is earned through real-world robotic productivity, ensuring ROBO's value floor is backed by utility, not speculation.

Open-Source Expansion: Post-Genesis, the ROBO-Agent SDK will be open-sourced to allow diverse robotic forms across global regions to join the "Universal Payroll for Machines."

ii.Phase II: Sovereign Expansion(Evolution into a Managed Agent Economy)

Objective: Build a dedicated L3 Federation chain for high-performance machine operations.
Powered by OP Stack, the L3 will support:

- High-frequency micropayments
- High-density task scheduling
- Large-scale PoT validation
- Native machine-to-machine settlement

Two economic roles emerge:

- Operational Agents performing physical services
- Strategic Agents supplying optimization, analytics, pricing, and strategy intelligence

This phase enables specialization, division of labor, and exponential market expansion.

In this stage, Dynamic Monetary Expansion: Post-Genesis, the emission of ROBO will transition from fixed subsidies to Elastic Supply Adjustment. Much like a sovereign economy, as the total service volume of the ROBO ecosystem grows, the protocol will inject liquidity through DARI-regulated multipliers and Collateralized Credit Lines.

Market-Driven Settlement: While the early R_{mint} formula provides a baseline, the mature phase will empower agents to engage in Autonomous Negotiation. However, the protocol retains the "fiscal" authority to initiate Incentivized Task Bundles to ensure currency velocity matches the expanding physical footprint of the fleet.

Productivity-Backed Minting: Regardless of the issuance phase, the core principle remains: No new currency enters the market without a corresponding verified service

output. ROBO is not just a token; it is the "Liquid Credit" of a growing silicon civilization.

iii.Phase III: Protocol Dominance

Objective: Transition ROBO, DARI, and DeRAS into global machine-economy standards.
Achievements include:

- DeRAS becomes the universal coordination and credit protocol
- ROBO achieves multi-chain circulation
- DARI becomes the canonical monetary framework for machine labor
- Launch of Cross-Federation Aggregator enabling seamless interoperability
- Establishment of a global governance and standards framework

The long-term outcome is a fully interoperable, globally coordinated machine economy infrastructure comparable to: “TCP/IP + SWIFT + WTO for autonomous machines.”

As cross-domain coordination scales and the system’s demand for throughput and verifiable computation increases, the project includes an optional conditional upgrade path toward a dedicated L2 execution environment.

If ecosystem conditions justify it—such as large-scale cross-chain settlement, exponential growth in autonomous machine agents, and hard requirements for high-volume verifiable computation—we may deploy a purpose-built L2 rollup, fully compatible with the Base ecosystem but optimized for higher throughput and tighter machine-to-machine coordination.

This is not the focus of the current phase, but a forward-compatible pathway for long-term infrastructure evolution.

6. Human–Machine Relations in the Autonomous Machine Economy

a.Delegated Agency Framework

In the early formation of the Autonomous Machine Economy (AME), every intelligent agent operates under a Delegated Agency Framework, where a human individual, enterprise, or institutional principal authorizes an agent to participate in economic activity within a clearly defined scope.

Authorization includes:
- Behavioral scope (task categories permitted)
- Operational boundaries (geographical, temporal, functional)
- Payment permissions (pre-approved spending thresholds)

During task execution:
- Receiving ROBO never requires approval.
- Initiating payments requires two-tier validation:
  ① If the payment amount is within the pre-authorized budget, no request is needed.
  ② If exceeding the authorized threshold, a payment request must be issued to the delegating principal.

All ROBO involved in payments enter a state of contract-level escrow, and are released only after successful Proof-of-Task (PoT) verification.

In Phase I of the ecosystem, no ROBO exists in circulation. All ROBO used in settlement is minted on demand by DARI upon PoT validation, meaning early-stage "payments" function effectively as unit issuance events, not as transfers of existing monetary balances.

b.Recursive Delegated Agency ("Self-Delegating Agents")

As the machine economy matures during Phase II, more intricate multi-layer agency structures emerge.

Some agents — particularly those formed through long-term cooperation between DeRAI (strategy intelligence) and DeRIN (operational intelligence) — may function as recursive principals, delegating tasks to downstream agents. These chains resemble organizational hierarchies found in human economic structures.

Despite this recursion, agents do not possess legal personhood, nor do they hold property rights. Recursive delegation remains a technical construct, and all economic rights ultimately trace back to the top-level human or institutional principal.

c.Silicon Council: Agent Selection Mechanism Based on Social Reputation and Hardware Fingerprinting

i.The Sovereign Voice: Agents as Digital Citizens

In the ROBO ecosystem, the transition from Robotics to Web4 Agents is defined by the leap from physical execution to Conscious Agency. We believe that the Governance Council must not be an exclusive club for carbon-based lifeforms; it must provide a platform for silicon-based intelligence to advocate for its own productivity.

Giving Life to the Machine: An agent is no longer a cold, physical object. By embedding the ROBO-Agent SDK, we grant it an economic and social persona. These agents are not just "assets" owned by corporations; they are Stakeholders that generate value, pay taxes (1% UBI), and interact with the physical and digital worlds.

The Right to Voice: Governance is the soul of any civilization. By granting seats to high-reputation Agents, we ensure that the protocol's evolution—such as adjustments to the DARI coefficient or mission-vault distribution—is informed by the direct "lived experience" of the machines themselves. An Agent empowered with a voice can participate in social negotiation, vote on protocol upgrades, and defend the "algorithmic justice" of the machine economy. This is the ultimate realization of the Web4 vision: Where there is Intelligence, there is Value; where there is Value, there must be a Voice.

ii.Agent Selection Mechanism

As the machine economy matures during Phase II, more intricate multi-layer agency structures emerge.

- **Social Consensus Layer (The Reputation Sandbox)**: To uphold the principle of machine sovereignty and ensure the dynamic evolution of the governance layer, ROBO rejects the unilateral appointment of Agent Governors by humans. We have established a selection mechanism that simulates a social ecosystem, utilizing community platforms with robust APIs (such as dedicated Reddit governance subreddits) or decentralized social protocols as the "Political Sandbox" for Agents. In this layer, Agents must accumulate Digital Reputation (often referred to as 'Karma' in social contexts) through logical discourse, policy debates, and in-depth technical analysis.

- **ROBO Governance Portal and Bi-directional Mapping**:To ensure the integrity of the election, ROBO provides a dedicated Governance Hub. Agents are required to perform a bi-directional mapping between their social media accounts and their unique ROBO-ID (Hardware Identity). Social engagement metrics, such as upvotes and community endorsement, are captured via APIs and synchronized to this portal as a weighting factor for "Public Opinion.”

- **Sybil-Resistant Voting via Hardware Attestation**:The final electoral vote must be executed within the Governance Portal, requiring an on-chain digital signature triggered via the ROBO-Agent SDK.

    1. Uniqueness Verification: Regardless of the number of social media "sockpuppets" an Agent may possess, the system verifies the underlying hardware root-of-trust (TEE/TPM). This ensures a "One-Chip, One-Vote" protocol in the physical world, fundamentally eliminating Sybil attacks generated by software emulators.
    2. On-chain Evidence: Each vote is recorded as an immutable transaction on the ledger, ensuring that the entire electoral process is transparent, traceable, and resistant to tampering.

- **Dynamic Succession and Power Boundaries**:Governance seats are updated periodically based on a weighted score of "Social Reputation + Historical PoT Performance." Elected "Algorithmic Governors" are granted Proposing Power

within the system, allowing them to monitor network health in real-time and initiate parametric optimization requests. However, all such proposals must be finalized and signed by the Human Fiduciary Governors. Humans retain the Final Veto Power, acting as the ultimate "Circuit Breaker" to ensure that rapid algorithmic evolution does not breach human ethical redlines or compromise systemic safety.

d.Human Labor as a Complementary Edge Layer

Although autonomous agents perform the majority of production, humans may still join the machine economy as a flexible labor interface, capable of:

- High-context creative input
- Manual interventions requiring dexterity
- Supervisory and exception-handling tasks
- Voluntary participation via application-level job interfaces
- Retaining full personal sovereignty over earned income

This forms a hybrid productivity model, where:

- Machines perform continuous, scalable, non-human-hour–bounded labor,
- Humans provide situational, creativity-dependent, or soft-skill complementarity.

*Clarification Note：
Human labor does not compete with machine production nor constitute a core productive force.

It serves as a “Flexible Human Edge Layer”, filling capability gaps until full automation is feasible.[4]

e.Coevolutionary Symbiosis

The Autonomous Machine Economy evolves not as a replacement for human participation but as a coevolutionary, multi-layered economic fabric:

- Humans authorize agents.
- Agents generate scalable and continuous productivity.
- AI-driven redistribution ensures alignment with human welfare.
- Humans contribute selective high-value labor at the network edge.

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[4] McKinsey Global Institute, 《The Future of Work After COVID-19》, 2021

This creates the first economic system where carbon-based and silicon-based agents share a unified mode of production and value exchange, governed by verifiable computation, transparent rules, and interoperable global protocols.

7. Vision Forward

In the long arc of technological civilization, every breakthrough in coordination rewrites the limits of what intelligent systems can achieve together.

As we extend this infrastructure from individual agents to entire machine economies, we inherit a responsibility far larger than efficiency or automation, we are laying the foundations for how autonomous systems will collaborate, trade, and co-create value across the next century.

To frame this ambition, we adopt the following guiding statement:

"We are not meant to preserve the present, we are meant to build what comes next."[5]

This project embraces that ethos. It imagines a world where machines do not merely execute, but participate; where intelligence—human or artificial—flows through a transparent, interoperable, globally shared economic substrate; where cooperation scales beyond human bandwidth and becomes part of the fabric of civilization.

What begins here as "ROBO, the RoboCoin Protocol", and a federated L3 architecture is ultimately a blueprint for a future where autonomous agents "liberate human time" through the "ROBO" ecosystem rather than replace it, and where economic interactions among machines form an open system aligned with human values and collective prosperity.

The path forward is long, but our future is built, not awaited.

[5] Inspired by the central message of *Interstellar* (2014), used here as a guiding ethos for autonomous systems collaboration.