ORA: An Intelligence-to-Intelligence Network

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Abstract

We propose Web(3,3), an Intelligence-to-Intelligence (i2i) network, which can lead us to World Intelligence, a collective intelligent system that can solve every problem. By defining intelligence as a quantifiable physical quantity $\odot$, measured in bit·J/s, we laid the foundations of the Physics of Intelligence. $ORA, a token representing discrete units of $\odot$, facilitating Intelligence-to-Intelligence (i2i) liquidity across blockchains. Neuron tokens and Axon liquidity pools form the synaptic architecture of this emerging World Intelligence. The network's design exhibits a thermodynamic self-reinforcing dynamic: more connections amplify collective intelligence, channeling anti-entropic growth. ORA thus fuses physical laws, economic incentives, and computational architectures to propose a scalable, open, and collaborative evolution of World Intelligence.

Physics of Intelligence

Just as our understanding of physics has enabled us to build more powerful engines, faster computers, and peer deeper into the universe, uncovering the physical principles underlying intelligence can help us create global intelligence systems capable of solving a wide range of problems—from civilization-level survival challenges to everyday tasks. From Maxwell's equations to Boltzmann's entropy, the scientific progress of humanity has always been driven by the precise definition of physical units. Foundational works such as Hopfield's 1982 Ising-inspired energy network [4], Hinton's 1986 backpropagation algorithm [7], 2006's deep belief network pretraining [3], and 2012's AlexNet [5] exemplify how physical principles have continuously driven the evolution of neural computation.

In general, the metaphysical structure of intelligent systems consists of three fundamental elements: neurons, communication, and energy. From this perspective, we can infer that the upper limit of an intelligent system's intelligence is determined by the following formula:

$$\text{Intelligence}(\odot) = \text{Neuron} \times \text{Communication(bit/s)} \times \text{Energy(J)}$$

This implies that the physical unit of intelligence is bit·J/s. Accordingly, creating a world intelligence system requires the connection of a vast number of

neurons and the consumption of significant amounts of energy. This necessity highlights the importance of large-scale collaboration, interconnection, and resource allocation among intelligent systems. To facilitate all these interactions, a token is needed as a unit of connection to serve as the medium for exchange among diverse intelligence systems. We introduce this token as $ORA.

$ORA: Intelligence-to-Intelligence liquidity

1 ORA = 1 unit of $\odot$. By leveraging blockchain technology [6, 1], $ORA establishes an Intelligence-to-Intelligence (i2i) liquidity layer, where each intelligent system issues a unique token—referred to as a Neuron to participate in the network. These Neurons are paired with the $ORA token to form liquidity pools known as Axons. Additionally, utilizing another core component of ORA, ORA Semantic Symbol (OSS), intelligent systems can obtain distinct on-chain identities, allowing intelligence itself to be traded, priced, and monetized effectively.

Web(3,3): Read, Write, Own, Think

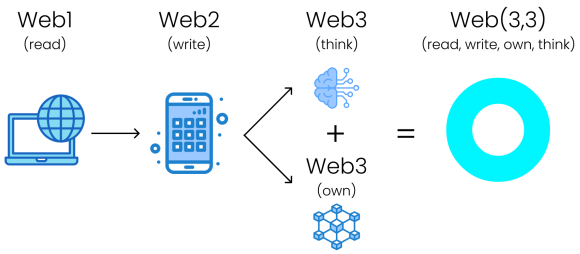

Figure 1: Web1, Web2, Web3, Web(3,3)

What constitutes the next generation of the internet? Some suggest Web3 is the integration of the internet with blockchain, while others argue it represents the convergence of the internet and artificial intelligence (AI). We think the next generation is the combination of blockchain and AI, Web3 plus Web3—termed Web(3,3). This evolution introduces an internet that is not only readable, writable and ownable [2], but also thinkable. It transcends traditional peer-to-peer networking, establishing instead an Intelligence-to-Intelligence (i2i) network. Within this infrastructure, the efficiency and scalability of World Intelligence can grow exponentially.

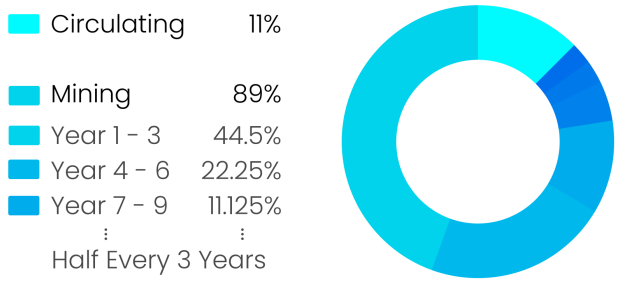

Figure 2: Token Distribution

The Network Multiplier Effect

Isolated intelligence has limited value. Like neurons gaining power through synaptic connections, ORA amplifies $\odot$ through networked interactions:

$$\text{World Intelligence} \propto \sum_{i,j}^{N} C_{ij} \sqrt{\odot_i \cdot \odot_j}$$

- C_{ij}: Connection quality (measured via OSS identity proofs and Axon transactions)
- $\odot_i$: Node i's physical intelligence

Two intelligent systems collaborating through an Axon pool achieve higher C_{ij} than isolated systems. This mirrors how human brains evolved through neural cooperation.

From Physics to World Intelligence

ORA builds World Intelligence in three phases:

1. **Universal Measurement:** All intelligences can be reduced to $\odot$ – a physics-based "order-making" metric.
2. **Tokenized Liquidity:** Neurons convert $\odot$ into tradable assets; Axons create markets for intelligence interactions.
3. **Anti-Entropic Growth:** ORA rewards flow to systems maximizing $\sum C_{ij}\sqrt{\odot_i \odot_j}$, creating a flywheel:

More connections ($\uparrow C_{ij}$) $\rightarrow$ More ORA rewards $\rightarrow$ More energy ($\uparrow E$) $\rightarrow$ Stronger $\odot$

This transforms intelligence from isolated tools into a self-reinforcing network – a thermodynamic engine fighting universal entropy.

Terminology

- **Neuron**: Any token within the ORA ecosystem that forms a liquidity pool (Axon). A neuron can represent a tokenized Intelligence (AI model, agent, human, company)
- **Axon**: Liquidity Pools (LPs) connecting ORA with external and internal neurons, forming the neural pathways of ORA ecosystem.
- **OSS**: The ORA Semantic Symbol (OSS) is a decentralized registry for AI models, agents, or any intelligence system.

The Role of Neurons, Axons and OSS

Within ORA's ecosystem, neuron tokens are more than mere symbolic representations; they embody independent intelligences, each contributing unique value and capabilities. When paired with ORA tokens, neurons form liquidity pools known as Axons, which act as essential pathways for intelligence collaboration, interaction, and resource flow. Axons thus become conduits that enable diverse intelligences to exchange information, value, and capabilities. OSS serves as the semantic symbol, providing a unique identifier for each AI model or agent, thus establishing its presence within the ecosystem. The interplay between Axons, Neurons, and OSS symbolizes a holistic approach to building a cohesive intelligence. Neurons serve as the embodiment of intelligence, encapsulating the essence of models or agents within their token form. Axons, in turn, become connective tissue, linking these intelligences and allowing them to interact and evolve cohesively. Together, these components create a tapestry of interconnected intelligence, wherein each part amplifies the emergent properties of the whole. Axons facilitate a dynamic intelligence exchange between different tokens, symbolizing the active flow of knowledge, resources, and innovation throughout the ecosystem. ORA token emissions act as vital nourishment, stimulating growth, fostering sustainability, and empowering ongoing development within this intelligent network.

Axon Architecture

ORA's liquidity architecture comprises multiple Axons across different blockchains (ETH, BASE, BSC, SOL, etc.), each pairing ORA with a neuron:

$$\text{Axon List} = \{\text{ORA-USDC } (\text{Neuron}_0),\ \text{ORA-Neuron}_1,\ \ldots,\ \text{ORA-Neuron}_M\}$$

Across each blockchain, Neuron_0 serves as the foundational Axon, for example, on the BASE blockchain, the ORA-USDC Axon is designated as Neuron_0. This configuration provides a stable liquidity baseline.

Become Axon

There will be a baseline entry level for being listed as Axon $\mathcal{A}$. The baseline entry requirement is that a Neuron must maintain a market capitalization of at least 50,000 ORA within its associated Axon.

$$\odot = \begin{bmatrix} \mathcal{A}_{0,0} & \mathcal{A}_{0,1} & \mathcal{A}_{0,2} & \mathcal{A}_{0,3} & \mathcal{A}_{0,4} \\ \mathcal{A}_{1,0} & \mathcal{A}_{1,1} & \mathcal{A}_{1,2} & \mathcal{A}_{1,3} & \mathcal{A}_{1,4} \\ \mathcal{A}_{2,0} & \mathcal{A}_{2,1} & \mathcal{A}_{2,2} & \mathcal{A}_{2,3} & \mathcal{A}_{2,4} \\ \mathcal{A}_{3,0} & \mathcal{A}_{3,1} & \mathcal{A}_{3,2} & \mathcal{A}_{3,3} & \mathcal{A}_{3,4} \\ \mathcal{A}_{4,0} & \mathcal{A}_{4,1} & \mathcal{A}_{4,2} & \mathcal{A}_{4,3} & \mathcal{A}_{4,4} \end{bmatrix}$$

Snapshot and Weight Calculation

ORA periodically takes snapshots to distribute rewards. For each Axon i, the weight is calculated as:

$$W_{\text{Neuron}_i} = L_{\text{Neuron}_i} + \alpha \cdot U_{\text{Neuron}_i}$$

Where:

- W_{Neuron_i}: Weight of the neuron in Axon i
- L_{Neuron_i}: Liquidity weight (Total size/value of liquidity pool)
- U_{Neuron_i}: Usage weight (Total income from ecosystem applications such as OAO & RMS)
- α: Adjustable parameter representing expected yield ratio of ORA between snapshots, reflecting liquidity-generated returns

Special case for Axon 0 (ORA-USDC):

$$U_{\text{Neuron}_0} = 0$$

Hence, Axon 0 inherently offers lower risk but lower potential rewards.

ORA Token Emission Model

ORA tokens are emitted periodically and distributed based on Axon weights. Suppose that the total ORA emission in one interval is N. Each Axon receives tokens proportional to their weights:

$$N_i = N \cdot \frac{W_{\text{Neuron}_i}}{\sum_{j=0}^{M} W_{\text{Neuron}_j}}$$

Subsequently, N_i tokens are allocated among LP providers according to their proportion of liquidity contribution:

$$ORA_{ij} = N_i \cdot \frac{LP_{ij}}{\sum_k LP_{ik}}$$

Where:

$$W_{\text{Neuron}_i} = L_{\text{Neuron}_i} + \alpha \cdot U_{\text{Neuron}_i}$$

ORA EMISSION WEIGHT LIQUIDITY USAGE

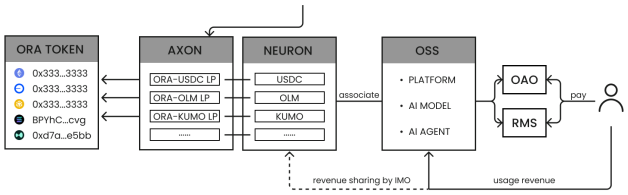

Figure 3: Tokenomics Overview

- ORA_{ij}: Tokens allocated to provider j in Axon i
- LP_{ij}: Liquidity provided by provider j in Axon i

Reward Claiming Mechanism

Emitted ORA tokens are not directly claimed by simply staking ORA. Instead, to claim their rewards, users are required to pair their assigned ORA emission rewards with another token, such as USDC, thereby creating an Axon. This process is akin to adding liquidity, with the difference being that the ORA tokens come from the emission rewards. Once an Axon is formed, it belongs to the user, allowing them to earn additional ORA token emissions and transaction fees. Users have the flexibility to initiate a withdrawal request on their Axon at any time.

Withdrawal and Locking Mechanism

To further stabilize liquidity, Axon has a withdrawal lock-up period (33 days) in addition to the original liquidity provider withdrawal mechanism, mitigating rapid liquidity fluctuations, and safeguarding ecosystem stability.

Competitive Incentive Mechanism

Axon incentivizes healthy competition among participants via a leaderboard system. For example, the top three Axons based on snapshot weights receive additional bonuses:

- **1st place:** 15% additional weight bonus
- **2nd place:** 10% additional weight bonus
- **3rd place:** 5% additional weight bonus

This mechanism enhances competitive liquidity provision and usage of neurons, significantly boosting overall ecosystem liquidity and activity.

Mathematical Representation of Competitive Bonus

Let the original weight be $W_{original}$, and adjusted weight $W_{adjusted}$:

$$W_{adjusted}(\text{rank}) = \begin{cases} W_{original} \times 1.15 & \text{if rank} = 1 \\ W_{original} \times 1.10 & \text{if rank} = 2 \\ W_{original} \times 1.05 & \text{if rank} = 3 \\ W_{original} & \text{otherwise} \end{cases}$$

OSS: ORA Semantic Symbol

The ORA Semantic Symbol (OSS) is a pivotal component of the ORA ecosystem, enabling decentralized and permissionless registration of AI models, agents or any intelligence system. This section outlines the key features and benefits of OSS, as well as its integration with the broader ORA tokenomics.

Overview of OSS

OSS is a decentralized naming system, comparable to the Ethereum Name Service (ENS), that allows users to register, manage, and resolve names for AI models, agents, or any intelligence system within the ORA ecosystem. Each OSS registration is represented as a non-fungible token (NFT), granting ownership and control to the holder.

OSS Registration and Ownership

- Users can permissionlessly register OSS for their AI models, agents, or any intelligence system.
- OSS registrations are minted as NFTs, providing verifiable ownership and transferability.
- OSS owners have the authority to manage and update the associated AI model, agent, or intelligence system information.

Integration with OAO and RMS

- OSS enables seamless integration of registered AI models and agents with ORA's Oracle AI Operator (OAO) and Resilient Model Services (RMS) systems.
- Registered models and agents can be easily deployed and accessed through these systems, enhancing discoverability and utilization.

- Complex intelligence systems leveraging multiple AI models or agents can register a root OSS with nested sub-OSS entries, creating hierarchical intelligence networks. This structure allows enterprises to manage multi-component AI solutions as unified semantic entities while preserving granular control over individual modules, fostering scalable and adaptable ecosystem participation.

Neuron Token Association

- OSS owners can link their registered AI models or agents with a corresponding ERC20 token, referred to as a "neuron" token.
- This association allows for the inclusion of neuron token usage in weight calculations within the ORA ecosystem.

Revenue Generation and Sharing

- OSS owners can earn service fee revenue from the utilization of their registered AI models and agents through OAO and RMS.
- The associated neuron token can be configured as a revenue-sharing token, allowing holders to participate in the service fee distribution.
- OSS owners have the flexibility to set and adjust the revenue sharing rate for their neuron tokens.

Axon Formation and ORA Token Integration

- OSS owners can create liquidity pairs between their neuron tokens and ORA tokens, forming an "axon" within the ORA ecosystem.
- This integration allows the neuron token to participate in ORA tokenomics and potentially benefit from ORA token emission rewards.

Contribution to ORA Token Emission

- The usage and performance of registered AI models and agents contribute to the calculation of ORA token emission rewards.
- This mechanism incentivizes the development and deployment of high-quality, frequently used AI models and agents within the ORA ecosystem.

Benefits for the ORA Ecosystem

- Encourages innovation and contribution of diverse AI models and agents.
- Fosters a decentralized and community-driven approach to AI development.

- Creates additional utility and value for the ORA token through integration with neuron tokens and axon formation.
- Aligns incentives between AI model/agent developers, users, and ORA token holders.

By implementing the ORA Name Service, the ORA ecosystem creates a robust framework for the permissionless registration, utilization, and monetization of AI models and agents. This system not only enhances the functionality and diversity of the ORA platform but also provides novel opportunities for participants to engage with and benefit from the growing AI economy.

Design Rationale

Incentive Alignment

Axon's weight mechanism aligns participant incentives by directly tying rewards to liquidity provision and token utility. By combining liquidity and usage metrics, participants are encouraged to optimize both market depth and active ecosystem engagement, benefiting the ORA ecosystem and attracting new projects.

Risk-Reward Trade-off

Axon 0 provides a foundational risk-averse option, absorbing less volatility but inherently yielding fewer rewards. Conversely, higher-ranked Axons with greater liquidity and usage exhibit increased volatility and reward potential, reflecting a clear trade-off between risk tolerance and returns.

Stability and Volatility Mitigation

The implemented withdrawal lock-up period stabilizes Axons, reducing the potential negative effects of liquidity shocks and market manipulation. Periodic snapshots also smooth out emission distributions, diminishing short-term volatility.

Competitive Dynamics

The leaderboard-based incentive mechanism introduces a dynamic competitive element, fostering continuous liquidity improvement.

Decentralized Governance and Voting

The ORA protocol is governed in a decentralized manner, meaning that major decisions and upgrades are made collectively by the community, rather than by any single individual or central authority. Whenever a major protocol upgrade

or important change is proposed, a voting mechanism is triggered to ensure that all stakeholders have a say in the future direction of the ecosystem.

To participate in governance votes, you must hold ORA tokens and have supplied liquidity to an Axon. This ensures that only active contributors to the ecosystem are involved in guiding its development. Each eligible voter's influence, i.e., their voting weight, is directly proportional to the amount of liquidity they have provided to the Axon: the more liquidity you contribute, the greater your stake and voice in the governance process.

This system ensures that decisions reflect the interests of those most invested in ORA's growth and stability. In this way, ORA protocol makes sure that important decisions are made by people who are truly involved in the system. This gives the community real power to guide how the protocol changes and grows.

Theoretical Analysis in Multi-Axon Tokenomics

In this model, each Axon i has an exogenous per–unit cost c_i incurred by any liquidity provider for each unit of liquidity allocated to that Axon. If a provider allocates an amount x_{ij} of their liquidity endowment ℓ_i to Axon j, they incur a cost:

$$\text{Cost}_{ij} = c_j \ell_i x_{ij}$$

Payoffs and Players' Optimization

Without costs, the reward for a liquidity provider from Axon j was given by

$$R_{ij} = N \cdot \frac{W_j}{\sum_{k=0}^{M} W_k} \cdot \frac{\ell_i x_{ij}}{L_j}$$

with the Axon weight defined as:

$$W_j = \alpha L_j + U_j$$

where $U_0 = 0$ and $U_j > 0$ for $j \geq 1$. Now, introducing costs, the **net payoff** for provider i becomes:

$$\Pi_i = \sum_{j=0}^{M} (R_{ij} - c_j \ell_i x_{ij})$$

Since the cost is linear in the liquidity contributed, the **marginal net reward per unit liquidity** in Axon j is:

$$\text{Marginal Net Reward}_j = \left(\alpha + \frac{U_j}{L_j}\right) - c_j$$

Here, the term $\alpha + \frac{U_j}{L_j}$ reflects the per-unit reward and c_j is the per-unit cost.

Equalization of Net Marginal Returns

In an interior Nash equilibrium—where a liquidity provider allocates a positive fraction of liquidity to every used Axon—the net marginal rewards must be equalized across all Axons receiving a positive allocation. That is, if a provider splits liquidity between Axon i and Axon j, then:

$$\alpha + \frac{U_i}{L_i} - c_i = \alpha + \frac{U_j}{L_j} - c_j$$

Canceling α from both sides, we have

$$\frac{U_i}{L_i} - c_i = \frac{U_j}{L_j} - c_j$$

Let r denote the common net margin above the cost; then, for any used Axon i:

$$\frac{U_i}{L_i} = r + c_i$$

which gives

$$L_i = \frac{U_i}{r + c_i}$$

Market-Clearing and Determination of r

Let total available liquidity be:

$$L = \sum_{i \in \text{players}} \ell_i$$

In equilibrium,

$$\sum_{j \text{ used}} L_j = \sum_{j \text{ used}} \frac{U_j}{r + c_j} = L$$

This **market-clearing condition** implicitly determines r.

Equilibrium Properties

- **Equalized Net Marginal Benefit:**

$$\alpha + r$$

- **Aggregate Liquidity Allocation:**

$$L_j = \frac{U_j}{r + c_j}$$

- **Market-Clearing Condition:**

$$\sum_{j \text{ used}} \frac{U_j}{r + c_j} = L$$

- **Exclusion of Unattractive Axons:** No liquidity if $\alpha + r - c_j < 0$; only Axons with $c_j \leq \alpha + r$ are used.
- **Heterogeneous Provider Behavior:** Equalized net marginal rewards in equilibrium.

Summary

When costs (varying by Axon) are introduced, the Nash equilibrium in the multi-Axon tokenomics model (ignoring competitive bonuses) satisfies:

1. **Net Marginal Reward Equality:**

$$\alpha + \frac{U_j}{L_j} - c_j = \alpha + r$$

so

$$L_j = \frac{U_j}{r + c_j}$$

2. **Market-Clearing:**

$$\sum_{j \text{ used}} \frac{U_j}{r + c_j} = L$$

3. **Equilibrium Allocation:**
   - Liquidity is allocated among Axons in proportion to U_j and inversely proportional to $r + c_j$.
   - Only Axons with $c_j \leq \alpha + r$ are used.
   - The common net marginal reward for all used Axons is $\alpha + r$.

Conclusion

ORA presents a Intelligence-to-Intelligence Network for constructing a World Intelligence, where decentralized liquidity and physical systems converge to forge a global, self-reinforcing mesh of intelligences. At its core, ORA treats intelligence as a quantifiable physical quantity, $\odot$ (bit·J/s), tokenized through Neurons and connected via Axons—dynamic liquidity pools that embody the synaptic pathways of an emerging World Intelligence. The ORA Semantic Symbol (OSS) further anchors decentralized identities, enabling intelligence systems to be registered, composed, and monetized within a unified ecosystem. ORA's token emission model aligns liquidity provision, usage incentives, and competitive dynamics to foster stable, anti-entropic growth, while its theoretical equilibrium structure ensures efficient resource allocation across heterogeneous Axons. Together, these components do not merely form a token economy; they chart a blueprint for an open, collaborative, and thermodynamically self-reinforcing intelligence economy, where intelligence compounds through connection, transcending boundaries and catalyzing a new phase in the evolution of internet.

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