

The Governance Paper

Temporal Governance: Mitigating Plutocracy via Time-Decayed Stake-Weighted (TDSW) Voting

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Abstract

First-generation Decentralized Autonomous Organizations (DAOs) rely predominantly on "Coin-Voting" schemes (1 Token = 1 Vote). While permissionless, this model inevitably degrades into plutocracy, where capital centralization allows a minority of "Whales" to capture protocol utility. Furthermore, the liquidity of voting tokens exposes governance to "Flash Loan Attacks" and short-term rent-seeking. This paper introduces a novel governance primitive: Time-Decayed Stake-Weighted (TDSW) Voting. We propose a dual-class structure that weighs voting power not merely by capital magnitude, but by Capital Lock-Duration (Time) and Epistemic History (Merit). By introducing "Reputation Entropy"—where governance power decays automatically if not exercised—we solve the "Zombie Stake" problem and ensure that control remains with active, long-term contributors rather than passive capital aggregators.

1. Introduction: The Failure of Coin-Voting

The foundational promise of Web3 governance is the democratization of control. However, empirical analysis of major DeFi protocols reveals a regression to oligarchy. The "Coin-Voting" standard suffers from three critical failure modes:

1. **The Plutocracy Trap:** Since tokens are liquid assets, power is strictly correlated with wealth. A malicious actor can acquire 51% of voting power simply by buying it, without any history of contribution or alignment with the protocol's mission.
2. **The Decoupling of Risk:** In a liquid voting market, a voter can cast a destructive vote and immediately sell their position before the market prices in the event of failure. This creates a "Moral Hazard" where voters are not exposed to the long-term consequences of their decisions.
3. **Flash Governance Attacks:** Utilizing Flash Loans, an attacker can borrow millions of dollars worth of tokens for a single block, pass a malicious proposal, and repay the loan within the same transaction, effectively hijacking the protocol with zero capital risk.

To create a sustainable "Market for Truth," the governance of the Klyrox Protocol must be resistant to purely capitalistic capture. We assert that **Time** and **Work** are more reliable signals of alignment than **Capital**.

2. System Architecture: The Dual-Vector Governance Model

Klyrox implements a governance surface that requires the convergence of two distinct vectors to authorize a state change: **Financial Capital (\$KLY Utility Token)** and **Epistemic Capital (Identity Token)**.

2.1 The Voting Power Function (Vp)

In standard systems, Voting Power (Vp) = Token Quantity (Q).

In Klyrox, Vp is a function of three variables:

- **Q (Quantity):** The amount of tokens staked.
- **T (Time):** The duration for which the tokens are locked.
- **M (Merit):** The Epistemic Score of the voter's Identity.

The TDSW Fundamental Equation:

$$Vp = [\text{Log}(Q) \times (T_lock / T_max)] \times (1 + \text{Merit_Multiplier})$$

This formula introduces two critical dampeners:

1. **The Billionaire's Ceiling (Logarithmic Q):** By applying a logarithmic function to the token quantity, we achieve "Quadratic Voting" properties. The marginal gain in voting power decreases as the stake increases. Buying 10x more tokens does not give you 10x more power; it might only give you 2x. This prevents a single whale from overpowering a consensus of smaller, active users.
2. **The Time-Lock Multiplier (Linear T):** Voting power is linearly proportional to lock-up duration. A user locking 1,000 tokens for 4 years has the same voting power as a user locking 4,000 tokens for 1 year. This shifts power from "Mercenary Capital" to "Missionary Capital."

3. The Mechanics of Time-Decay (Entropy)

A major flaw in reputation-based systems is the "Zombie Whale" problem: early contributors accumulate massive reputation scores and then become inactive, yet they retain permanent veto power over new contributors. To solve this, Klyrox introduces **Governance Entropy**.

3.1 The Half-Life of Reputation

Reputation in Klyrox is not a static integer; it is a decaying asset.

The Epistemic Score (Es) of every Identity Token is subjected to a decay function δ at every block height.

Equation 2: The Decay Function

$$Es(t) = Es(t-1) \times (1 - Decay_Rate)$$

- **Active Maintenance:** To maintain their score, a user must perform "Work" (verifying data, voting, or bonding truth). Every successful action adds points $+ \Delta Es$.
- **Passive Decay:** If a user goes dormant, their score asymptotically approaches zero.

This ensures that the "Elders" of the protocol cannot rest on their laurels. Governance power is a stream that must be constantly replenished with fresh contribution.

3.2 The Reset on Transfer

The Identity Token (ERC-721M) is technically transferrable (to allow for wallet rotation), but transferring it triggers a Reputation Slash.

If Owner_A transfers Identity to Owner_B:
New_Score = Old_Score × 0.10

This prevents a secondary market for "High Reputation Accounts." You cannot buy a seat at the table; you must earn it.

4. The Proposal Lifecycle and Veto Rights

The governance process is divided into two chambers to prevent mob rule.

4.1 The High Court (The Meritocratic Chamber)

Composition: The top 100 active nodes by Epistemic Score.

Role: Veto Power and Proposal Vetting.

Before a proposal goes to a general token vote, it must pass a "Sanity Check" by the High Court. This chamber cannot unilaterally pass changes, but they can veto changes that violate the protocol's constitution (e.g., changing the hard cap of tokens). This acts as a Supreme Court.

4.2 The General Assembly (The Token Chamber)

Composition: All holders of veKLY (Vote-Escrowed Tokens).

Role: Ratification.

Once vetted, the proposal moves to a TDSW vote.

5. Security Analysis: Resistance to Attack Vectors

5.1 Flash Loan Resistance

Flash Loans allow an attacker to borrow capital for one block. Defense: Klyrox governance measures voting power based on the snapshot of the previous epoch (e.g., 7 days ago). Furthermore, the Time-Lock variable in the TDSW formula means that tokens bought instantly (Lock = 0) have effectively zero voting power. To vote, you must lock tokens for a minimum of T_min (e.g., 4 weeks). Flash loans cannot span 4 weeks; thus, flash governance is mathematically impossible.

5.2 The "Sybil Whale" Attack

Attack: A whale splits their 1,000,000 tokens into 1,000 wallets of 1,000 tokens each to bypass the "Logarithmic Ceiling" (Quadratic Voting defense).

Defense: The Merit Multiplier.

While splitting tokens bypasses the Logarithmic Q constraint, the split wallets will have Zero Reputation (M=0).

A single wallet with High Reputation and High Stake will still outvote 1,000 fresh wallets with High Stake but Zero Reputation.

To make the Sybil attack work, the attacker would have to build up the Epistemic History of 1,000 separate accounts over months of active work. The Time Cost and Work Cost of doing so makes the attack economically irrational compared to honest participation.

6. Economic Incentives: The Governance Dividend

To solve "Voter Apathy" (where participation is too low to be secure), Klyrox provides yield, but strictly links it to governance participation.

The Active Governance Yield:

Protocol revenue (from dispute fees and API calls) is not distributed to all token holders. It is distributed only to those who voted in the epoch.

- **Did not vote?** You receive 0% yield (inflationary dilution).
- **Did vote?** You receive a pro-rata share of the revenue.

This forces stakeholders to remain active observers of the protocol. Passive holding is penalized via dilution; active governance is rewarded with real yield.

7. Conclusion: Service-Based Sovereignty

The Klyrox Governance Paper outlines a transition from "Shareholder Supremacy" (Web2/Standard Web3) to "Stakeholder Meritocracy." By weighing votes by **Time (Commitment)** and **Merit (Competence)**, rather than just **Wealth (Capital)**, we align the long-term health of the protocol with the incentives of its governors. The introduction of "Reputation Entropy" ensures that Klyrox remains dynamic, preventing the stagnation that plagues gerontocratic institutions. This is not just a DAO; it is a digital nation-state where citizenship is earned.

Reference

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