Autor

: Pintea Tudor

Summary

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This proposal introduces a dynamic scaling mechanism for prover workloads and an enhanced incentive structure to optimize network performance and reliability. By adjusting prover requirements based on network demand and introducing a tiered reward system, we aim to ensure high availability and efficiency while maintaining decentralization. Additionally, we propose a flexible emergency mode activation and a novel approach to proof batching that adapts to network conditions.

Dynamic Scaling of Prover Requirements

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To maintain network efficiency during varying levels of demand, we propose a dynamic scaling system for prover computational requirements. This system will adjust the minimum computing power and stake amount based on real-time network demand metrics.

- Low Demand: Reduce minimum requirements to encourage broader participation and reduce operational costs for provers.
- High Demand: Increase requirements to ensure that provers can handle the higher workload, thus maintaining network performance.

Enhanced Incentive Structure

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We propose a tiered incentive model that rewards provers based on their performance, stake, and participation in network stabilization during high demand periods.

- Base Reward: Computed as per the existing model, covering computation costs, L1 call data costs, and prover profit.
- Performance Bonus: Additional rewards for provers who consistently submit proofs faster than the average time window.
- Stabilization Bonus: Extra incentives for provers who contribute to network stability during high demand, measured by their participation in proof batching and emergency modes.

Flexible Emergency Mode Activation

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The activation of emergency mode should be more nuanced, taking into account not just the failure of a prover but also the overall network conditions.

- Prover Failure: Trigger emergency mode if a prover fails to submit a valid proof, considering the current network load and the number of available provers.
- Network Congestion: Activate a preemptive emergency mode if the network anticipates congestion, allowing for a smooth transition to proof racing and batched proofs.

Adaptive Proof Batching

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Instead of a fixed batching policy, we propose an adaptive approach that responds to network congestion levels.

- Normal Operation: Individual proofs are submitted to maintain low latency.
- High Congestion: Automatically switch to proof batching to manage the load, with the size of the batch dynamically adjusted based on the current transaction backlog.

Questions for Consideration:

- How should the dynamic scaling factors be calibrated to respond to network demand effectively?
- What metrics should be used to calculate the performance and stabilization bonuses to ensure fairness and encourage participation?

- What thresholds should be set for the flexible activation of emergency mode to prevent network congestion without causing unnecessary delays?
- How can we ensure that the adaptive proof batching system remains efficient and responsive to real-time network conditions?

Resources:

- Dynamic Scaling in Distributed Networks
- Incentive Models for Network Participation
- Real-time Network Congestion Management
- Adaptive Systems in Blockchain Technologies

This proposal aims to refine the prover mechanism within the Aztec Network, ensuring that it remains robust, efficient, and attractive for provers, which in turn will contribute to the overall health and scalability of the network.