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https://eloop.org

Modern Voucher Logistics

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Executive summary

We present an informal but structured exploration of voucher-based economies, with particular focus on replicating vouchers, lineage growth, and trust-based distribution networks. We analyze why such systems resist direct financial monetization, how social value emerges as the dominant utility, and how operational bottlenecks and trust assumptions shape real-world outcomes.

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1. Voucher Economics

1.1. Voucher Basics

Definition 1.1 (Voucher)**.** A **voucher** is an object that can spawn at most one associated **token** upon invocation.

Definition 1.2 (Token)**.** A **token** is a market good spawned by invoking a voucher, requiring payment of a **token fee**. Ownership of the token is declared by the invocator.

Definition 1.3 (Cutoff)**.** The **cutoff** is a global point in time after which ownership of multiple tokens is equivalent in value to ownership of a single token.

proposition 1.4 (Zero-Trust Ownership)**.** *Authenticity of changes in ownership of vouchers or tokens cannot be guaranteed.*

1.2. Birth of a Voucher Market

Definition 1.5 (Genesis Voucher)**.** A **genesis voucher** is a voucher with no predecessor.

Definition 1.6 (Initial Pool)**.** The **initial pool of vouchers** is the set of all genesis vouchers.

Genesis vouchers are initially controlled by a divine entity, which covertly delegates a subset of them to distributors.

1.3. Voucher Types

Definition 1.7 (End-Voucher)**.** An **end-voucher** is a voucher with no replication mechanism.

Definition 1.8 (Replicating Voucher)**.** A **replicating voucher** is a voucher capable of creating a successor voucher.

Definition 1.9 (Replication Delay)**.** The **replication delay** is the (known or unknown) time between invocation of a voucher and delivery of its successor.

Replicating Vouchers

Definition 1.10 (Angel Voucher)**.** An **angel voucher** is a replicating voucher that can create exactly one end-voucher.

Definition 1.11 (Standard Voucher)**.** A **standard voucher** is a replicating voucher that can create exactly one successor standard voucher.

1.4. Voucher Terminology

Definition 1.12 (Predecessor and Successor)**.** Let A and B be vouchers. If A created B, then $\mathrm{pred}(B) = A$, and B is a **successor** of A. If A is a standard voucher, its successor is unique and denoted $\mathrm{succ}(A)$.

Definition 1.13 (Voucher Graph)**.** The **voucher graph** is the directed graph on all vouchers with edges $A \to B$ iff $\mathrm{pred}(B) = A$.

Lemma 1.14 (Acyclicity)**.** *The voucher graph is a directed acyclic graph.*

Definition 1.15 (Lineage)**.** The **lineage** of a voucher A is the set of all tokens associated to A and to any voucher B with $B \prec A$, where $\prec$ is the transitive closure of the voucher graph.

1.5. Voucher Distribution and Replication

We restrict attention to standard vouchers.

Definition 1.16 (Distributor)**.** A **distributor** is an agent selected to receive vouchers from the initial pool.

Creation of a successor voucher is triggered by spawning the associated token, with both ownerships declared by the invocator.

2. The Voucher Economy

2.1. Voucher Utility

proposition 2.1 (Non-Accumulation of Financial Value)**.** *Under zero-trust assumptions and after the cutoff, ownership of multiple tokens provides no additional financial value beyond ownership of a single token.*

Definition 2.2 (Social Value)**. Social value** is utility derived from influence, prestige, or delegation power gained through token or voucher distribution.

2.2. Bottlenecks

Definition 2.3 (Human Delay)**. Human delay** is additional latency in token spawning caused by capital constraints or human factors.

proposition 2.4 (Lineage Sensitivity)**.** *Increased human delay negatively impacts achievable lineage length before the cutoff.*

This effect is illustrated schematically in fig. 1, where increased delay reduces the total number of vouchers and tokens created before the cutoff.

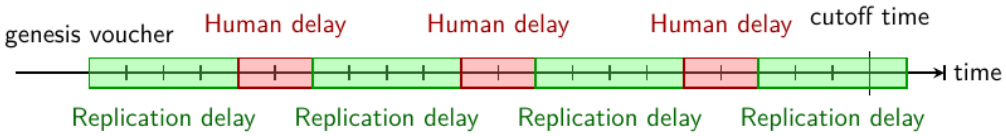

Figure 1: Timeline of voucher creation. Larger human delay times can lead to fewer total vouchers and tokens due to the cutoff time.

2.3. Visualization

3. Trust Networks

3.1. Maximizing Lineage

Definition 3.1 (Trust Network)**.** A **trust network** is a recursive structure in which vouchers or tokens are distributed along social trust relationships.

proposition 3.2 (Lineage Maximization Strategy)**.** *A voucher owner maximizes lineage by minimizing human delay and controlling successive ownership declarations.*

Trust networks enable recursive delegation of vouchers and tokens, as depicted in fig. 2.

3.2. Diagram

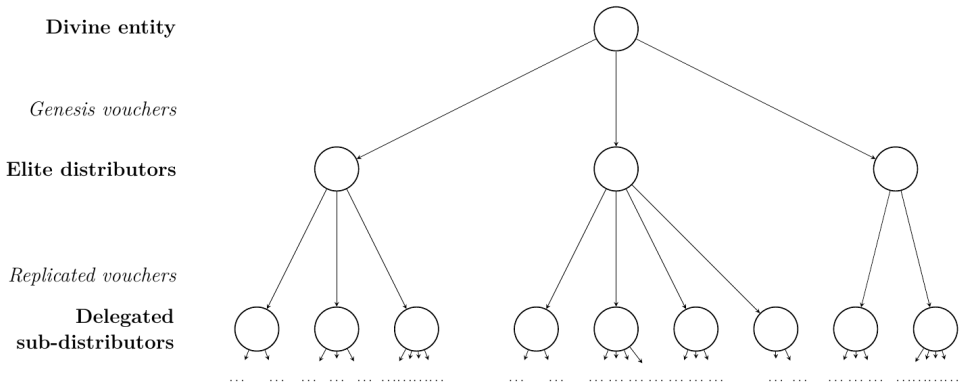

Figure 2: Voucher propagation in a trust network.

3.3. Pyramid Scheme?

Definition 3.3 (Pyramid Scheme)**.** A **pyramid scheme** is a distribution system exhibiting exponential growth in participant obligations or rewards.

proposition 3.4 (Trust Networks Are Not Pyramid Schemes)**.** *Trust networks formed from standard vouchers are not pyramid schemes.*

The intuition behind this claim follows from the bounded branching structure visible in fig. 2; a formal argument is given in section A.

4. Problems

4.1. Exploits

Definition 4.1 (Double-Sale Exploit)**.** A **double-sale exploit** occurs when a single token ownership declaration is sold to multiple parties.

4.2. Operational Expenses

Voucher economies incur costs from distribution management, debt accumulation, and high upfront investment.

5. Future Work

Definition 5.1 (Infinity Voucher)**.** An **infinity voucher** is a proposed voucher type capable of spawning arbitrarily many non-replicating end-vouchers subject to per-timeframe limits.

6. Conclusion

Voucher economies prioritize social value over direct financial gain. By constraining replication and modeling distribution as a directed acyclic graph, such systems avoid exponential growth while remaining sensitive to trust and human delay. The qualitative behavior illustrated in figs. 1 and 2 aligns with the formal results presented in the main text and appendix.

A. Formal Properties of Trust Networks

Lemma A.1 (Tree Structure)**.** *The subgraph induced by standard vouchers is a forest of rooted trees.*

Lemma A.2 (Linear Growth)**.** *The number of vouchers and tokens created before the cutoff grows linearly in time.*

proposition A.3 (Anti-Exponential Propagation)**.** *Trust networks formed from standard vouchers do not exhibit exponential layer growth.*