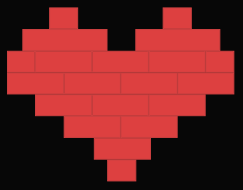

Tinyblock Vision Paper

(Philipp-Alexander Blum @citrullin)

A story of fairytales and broken dreams.
A vision lost, taken over by Greed, Ego and Envy.

Centralized Exchanges embracing **corruption** on the highest level.
A whole **ecosystem running on Amazon Web Services**.
Not bothered about the **abuse of power** in existing legacy systems.
Privacy absolutists ignorant to consequences of their actions.
Laundering for terrorists and human trafficker as the norm.

Cypherpunk dystopia as an accepted way of life.

Memes to an end become the end.
All that matters is line goes up, no matter the causalities.

Tribes inspired by love, failing to live up to their potential.
NFTs and Memes as a way of life, not being lived.
Afraid of rejection by society, staying on the sidelines.
Being abused by power to keep the value extraction cycle intact.

Failure as the accepted outcome without even trying.

Embracing power and key characters over technology.

Independent thinking becomes a footnote and the cycle repeat.

Emotional attachment to a number as the **main driver**.
Liquidity Pools, DAO slush funds and **Gambling** over rational decisions.
Vision thrown overboard for convenience and **lack of emotional control**.

P2P becomes gold and programmable becomes banking backend.

Nothing to lose when it already is. **New World in the making.**
Identity crisis solved. Anon, are you ready for real?
Creating a new reality through technology.

Those who know.

Learning as a way of life, in all aspects of existence

Blockchain, Smart Contract, AI and IoT. Not as simple Buzzwords.
As **tools for a new reality.** An escape of the downfall of society.

A **culture shift** from just keep going to embracing **growth and change**.
Tiny bricks as a reminder to push beyond boundaries. **As a way of life**.

A **framework** for what is to come. **Hacking reality** and power structures.
Not as empty theories and ideas, but **radical change** through technology.

Hijacking human psychology to push beyond perceived limits.
Open and Shared Culture as driver for innovations over Ego protections.

One Industry at a time. Brick by brick.
Breaking reality apart and rebuilding it.
Using available technology and **bridging gaps**.

Watch Future starts with you spot >

Bridging virtual and physical realities, no power needed

Using **NFTs in the physical world** as payment method to bridge realities.
Embracing **tribe identification** and onchain engagement as the default.

Affordability as a key component for success instead of pricing out.
Collaboration and sharing over cult separation ideology.

Available technology used different, for an **onchain living**.
Accessibility and Standardization for a symbioses across the globe.

Monster have darkness in them, but choose to fight for the light.

Decentralized Distribution for the new economy

An army of **decentralized entities** over centralized distribution powers.
Low barrier of entry to build the **onchain economy** from scratch.

Embedded Smart Contracts in **Gachapon machines** for the new economy.
Sales bridged **onchain**, even when paid over traditional methods.

Artists, Manufacturers, Distributors, Builders and Infra Providers.
Whole **ecosystem cycle onchain**. No compromises. No DAO slush funds.

Permissionless physical distribution as a key for innovation.
Distribution scale not as a challenge, but as an advantage.
Enabling the new economy in the upcoming **multi-polar world**.

Changing the Economy through **Blockchain, AI and IoT**.
Capsule by Capsule, Brick by Brick.

Saving creative industries from AI death

Creative industries die on a scale never seen before.
The **music industry** at the forefront of the **genAI destruction**.

Old **distribution strategies fail** to adapt to the rapid change.
Blockchain, Smart Contracts and proven technology provide a **solution**.

Ready to enable **privacy** by utilizing monetary usability patterns.
Tiny discs with RFID-chips and zk-SNARKs for **crypto-native cash**.

New technology as reminder of past technology. Used in new innovative ways.
Emulating the **feeling of cash**, in new **creative and fun ways**.

Storing small sums for daily transactions on NFC tags.
Using them as private key wallets in the literal sense.

Affordability as key component for the upcoming **monetary revolution**.
To expand beyond the reach of a research driven environment.

Crypto-native cash comparable to the **price of traditional banknotes**.
Ready for **day-to-day transactions** and adoption in the physical economy.

Creative expression of money. For a **creative and innovative society**.
Ready to face the challenges of the future with past technology.

Hijacking familiar and known mechanisms, to establish a **new way of life**.

Digital wahfare not only by technology, but also psychology.
Ignoring the reality of psychology in money is repeating past mistakes.

Identifying patrons of artists in the physical- and virtual world.

AI as tool for creativity, community and relationships

Embrace AI to enhance the **human experience through exploration**.
Large **microbrick** instruction data-sets as training material.
Parsing them for 3D representations, using **AI to generate** new ones.

A **community of creative tinkerer**, creating relationships through AI.
Seeking each other in the physical reality **through their avatar.**
Your own AI agent drives the algorithm, understanding your psychology.

Be it as a memes to become healthy through collaborative sport.
Finding a business partner or the love to share a life with.
Or just **creative collaboration** to create new microbrick sets.

Expressed through **physical NFTs** or tiny disc art. **Fun as a driver**.
A way to connect through creativity, exploration and technology.

AI as a tool to seek relationships never thought about before.
With learning and growth as the main driver for the human experience.

Exploration of new realms in this world. The hidden gems.
With opportunities beyond this one world on the horizon to be unlocked.

Human growth not bound by self-imposed artificial limits of this world.
Onboarding non-crypto- and non-AI native people into new technology.

Solving Blockchain-Technologies lack of contribution in the real world.
Moving from Isolation to a more collaborative environment.

Merit-based Token-Distribution as the focus.
Not airdrop farming or insider wash-trading.
Building a **community of artists and builders.**

Predictions for efficient and risk-tolerant economies

Utilizing human psychology to **advance economies and technology**.
Moving away from an attention driven economy to an advancement driven one.

Using **society knowledge** for sound decisions in the **microblock industry**.
From sourcing materials, over location selection, to creative inspiration.

Programmable money meets knowledge in society and physical technology.
Away from sports-gambling towards positive outcome driven predictions.

Inspirations from tiny learning brick toys to the whole world economy.
An **open template** for any industry to thrive into the **new economy**.

Not as VC funded optimization cycle, but a **new way of business operation**.
Open Art and Information as the foundation of a **knowledgeable society**.

Funneled into **prediction markets** for any industry to drive on.
Everyone has to play a role in the **advancement** of this AI driven **society**.

Giving **decision-makers** a **tool** to make sound and **date-driven decisions**.
Mitigating risks identified by society before it effects operation.

Combining programmable money, predictions and crypto-native cash.
Using an agentic AI scoring system for social and economic impact.

Away from useless, mindless and destructive products.
Towards meaningful operation and existence.
Creating resilience in the process.

Technical challenges using DeFi in the AI IoT economy

L2s **centralized sequencer are a risk** to decentralization in Ethereum.
Based Rollup are the solution, yet **require more ecosystem development**.
They enable **unifying liquidity** across L2s without the risk of bridges.
Making all L2s with Based Rollups operate like **one large Blockchain**.
Pre-Confirmations add low-latency transactions for better UX into the mix.

Web3 collateralized bonds are not well supported yet.
ERC-4626 vaults with ERC-3475 bonds enable innovative business models.
Tranches of high-quality- and high-yield Bonds enable new markets.
Mitigating risks and enable **higher yields than traditional bond markets**.
By enabling **extreme transparency**, open source and **accurate ratings**.
Embracing **social enforcement in ratings** to minimize risk patterns.
Creating systematic long-term **resistance against** the wave of **AI fraud**.
The immense upside potential is a challenge that needs proper testing.

Full real **economic revenue sharing onchain** hasn't been done before.
Covering threat scenarios that contain compromised devices is a must.
Contactless EMV (Europay, Mastercard, and Visa) swaps for Stablecoins,
meanwhile supporting **crypto-native cash payments** requires new hardware.
Crypto-native cash only terminals can be developed quickly in comparison.

Operation in partially offline environments remains a challenge.
Zk-SNARKS offer the best approach as of this moment.
Even though, in the long term, they **lack of quantum resistance**.
IOP based zk-SNARKs offer an upgrade, but remain a research subject.
They also require more storage on NFC-Chips, which are available.
Hardware that may be **deployed for decades** may become vulnerable.
Therefore TEE (Trusted Execution Environment) is a must.
Especially in an **IoT environment** where devices are accessible to threats.
Additional hardware design efforts are necessary to cover these.
Affordable TEE enabled ARM and RISC-V chips are available. (~5 EUR)
Making it viable to run zk-SNARKs in constrained environments.
Software support for these environments has to be extended.
Using Linux capable SoCs (System on a Chip) are the best approach for now.
Cost reduction efforts are viable, but require more research.

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Web3 collateralized bonds

Web3 colleteralized bond are structured in **risk-adjusted tranches as ERC-3475** contracts. We define a generalized bond growth function as

$$b_i(t_i, r_i, d_i, W_i) = W_i r_i e^{(r_i - d_i)t_i} \quad .$$

t represents **time**, r is the **yield** rate,
d is the **default** rate, and w is the tranche **weight**.

This exponential function includes **compounding yields** despite defaults.
For simplicity, assuming a process for defaults with no recovery.
A prediction and insurance market for those can be established.

For the accumulated portfolio, the total value is given by

$$B_{accumulated}(t) = b_A(t, r_A, d_A, W_A) + b_B(t, r_B, d_B, W_B) + b_C(t, r_C, d_C, W_C) + b_D(t, r_D, d_D, W_D)$$

Defining **four level of tranches** A to D for our **ERC-4626 vault**.
Where A is the most senior tranche and D the most junior tranche.

Where

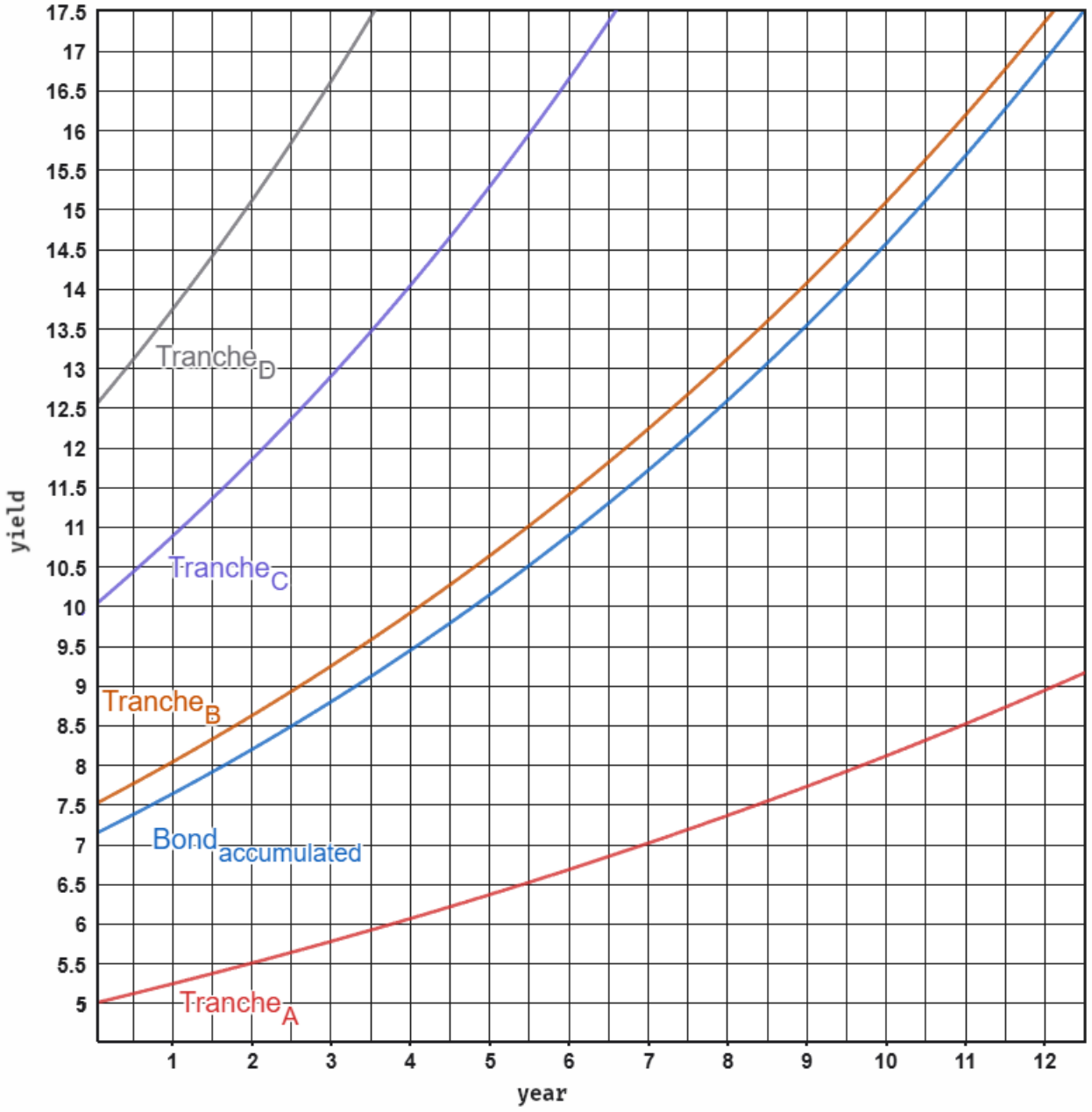
$W_A = 0.50, r_A = 0.05, d_A = 0.0015$,
$W_B = 0.25, r_B = 0.075, d_B = 0.005$,
$W_C = 0.15, r_C = 0.10, d_C = 0.015$ and
$W_D = 0.10, r_D = 0.125, d_D = 0.03$.

Assuming low default rates for developed economies and higher for micro-credits
The vault aggregating the weighted contributions across all tranches **diversifying risk** and **accumulating higher yield.**

Normalized individual tranche growth functions, assuming unit weight for isolated analysis, are

$T_A(t)=b_A(t,0.05,0.0015,1)$,
$T_B(t)=b_B(t,0.075,0.005,1)$,
$T_C(t)=b_C(t,0.10,0.015,1)$ and
$T_D(t)=b_D(t,0.125,0.03,1)$.

These formulas enable **precise simulation** and plotting, as demonstrated. Creating **investor projections** of long-term value under varying economic scenarios.



Traditional bond markets in developed economies have long benefited from low historical default rates in senior tranches.
Investment-grade corporate bonds in the USA and eurozone revealed average **annual default rates** of only **0.10% – 0.18%** over the **1983 – 2023 period**, while senior tranches in collateralized loan obligations (CLOs) **rarely exceeded 0.15%** in non-recessionary years.

This empirical stability underpins the **Tranche A** design in the present model, with a **default rate** of **0.15%** and a **yield** of **5%**, reflecting a risk-adjusted spread consistent with high-quality secured lending in OECD jurisdictions. The low levels are supported by robust regulatory frameworks, mature credit scoring systems, and enforceable legal recourse, enabling predictable growth as modeled.

By contrast, **emerging-market private credit** has experienced materially higher rates. The International Finance Corporation (IFC) reports average portfolio **default rates** of **2.5% – 6.3%** for **SME lending** in Latin America, South Asia, and low-income countries **between 2018 and 2024**, driven by factors such as economic volatility, **limited collateral enforcement**, and information asymmetries.

These **elevated risks** are mirrored in the model's junior tranches, particularly **Tranche D** with a **default rate of 3%** and **yield of 12.5%.** However, innovative **social enforcement mechanisms** in microfinance have **demonstrated resilience**, with institutions like Grameen Bank achieving **repayment rates of 92% – 98%** (equating to default **rates as low as 2% – 8%**) through group liability and community monitoring.

Translating **social enforcement to blockchain** offers a **scalable solution** for risk reduction in emerging-market tranches.

Projects like **Ethos** leverage decentralized social applications to build **on-chain reputation** and **credibility scores,** incentivizing **ethical behavior** through social Proof of Stake mechanisms and reducing default incentives via transparent peer accountability. **Contributing to rewarding and slashing** by **AI agents** enhances the Ethos platform and can even serve as a vehicle for **advertising for tinyblock** itself. Making it a well rounded symbioses in business operation.

Additionally, **agentic scoring models** with AI-driven algorithms that dynamically assess borrower behavior and contribution will be integrated with these systems for **real-time risk adjustments**.

Behavior and contributions across **social media** are **observed by agents.** This further enriches the **social enforcement**, reducing default risk even further.

Furthermore, **adapting trust networks** to incentivice lenders to take a more

active role. It also provides additional mitigation by forming interconnected borrower and lender groups where defaults impact **collective reputations are possible.**

This hybrid approach not only **caps effective default rates** at levels comparable to microfinance's **3% ceiling** but also **enhances overall portfolio yields**, as seen in the accumulated function.

This **tranche model** extends beyond isolated bond issuance to foster a **fully on-chain economy**, integrating with B2B platforms for seamless bond creation, financing, and revenue sharing.

For instance, bonds issued under this framework will finance inventory purchases on platforms like Alibaba, where the **underlying assets**, such as products in transit, **serve as collateral**.

By leveraging **Alibaba's Order Management API**, which provides real-time order status updates, tracking information, and product data, **oracles** can query shipment states and asset details directly, ensuring an accurate, tamper-proof view of **collateral integrity**.

This integration **prevents discrepancies in asset valuation**, allowing smart contracts to trigger early warnings if transit delays or discrepancies arise, thereby **mitigating operational risks** in supply chains.
Revenue sharing mechanisms further enhance this ecosystem.

Once financed **products are sold**, proceeds are **distributed on-chain** proportionally to tranche holders, with automated waterfalls prioritizing senior tranches. This closed-loop system, **from order placement** on Alibaba **to on-chain payouts**, minimizes intermediary friction and opacity common in traditional finance. **Social enforcement** layers, as discussed, amplify risk mitigation, particularly in emerging markets where collateral theft by malicious actors poses heightened threats.

Blockchain-based reputation, adapted from projects like Ethos, **enable community audits** where participants with **high trust scores can verify asset**, reducing the likelihood of coordinated fraud. External transparent audits, facilitated by **open-ledger data, allow third-party verifiers** to cross-check collateral without reliance on centralized custodians.

Prediction markets for the Microblock industry

Prediction markets have emerged as powerful tools for aggregating **collective intelligence** to forecast future events with **high accuracy**.

The **Microblock industry** faces inherent uncertainties in **predicting consumer**

trends, material demands, and popular set designs.

As a niche within the broader toy and hobby market, **companies must navigate volatile factors** such as shifting cultural interests, raw material availability, and competitive innovations.

Traditional forecasting methods, reliant on surveys and historical sales data, often **fall short in accuracy** and timeliness.
Prediction markets offer a decentralized alternative, where participants trade contracts based on the likelihood of future outcomes, effectively **crowdsourcing probabilistic forecasts**.

Polymarket, a leading blockchain-based prediction market platform, has demonstrated superior performance in real-world applications.

Built on **open-source code** available through GitHub, Polymarket's models leverage blockchain technology and smart contracts to ensure **transparency**, liquidity, and incentive alignment.

This paper examines Polymarket's accuracy, proposes its adaptation for **Microblock-specific** use cases, and illustrates synergies with **AI agents for automated decision-making**.

A comprehensive analysis revealed that Polymarket achieves approximately **90% accuracy in predictions** one month prior to resolution, rising to 94% accuracy just four hours before an event concludes.

This **performance is quantified** using Brier scores, a metric for probabilistic forecast accuracy, where Polymarket scores below 0.1. Indicating excellence on par with top prediction platforms.

A prominent example is the **2024 U.S. presidential election**.
While **traditional polls** showed a **tight race**, **Polymarket** consistently favored **Donald Trump**, with market prices implying **over 60% probability** of his victory in the weeks leading up to November 5, 2024.

Post-election **analyses confirmed Polymarket's superiority** over polling aggregate. An arXiv study found it more accurate, particularly in swing states, by incorporating real-time trader sentiment. Similarly, university research highlighted prediction markets' edge in forecasting the election outcome compared to pundits and surveys.

Adapting Polymarket's **open-source code**, Microblock companies can deploy custom prediction markets on blockchain platforms to forecast industry-specific trends.

Key features include:

Market Creation and Trading: Using Polymarket's smart contract templates, stakeholders can create markets like “Will the 'Space Exploration' Microblock set exceed 1 million units sold by Q4 2026?” or “Will biodegradable plastic become the dominant material in Microblocks by 2027?” **Participants**, including enthusiasts, retailers, and suppliers, **generating probabilistic data**.

Risk Mitigation: These markets aggregate diverse insights to **predict demand surges or material shortages**. For example, a high probability of popularity for eco-friendly sets could prompt early procurement, reducing supply chain risks.

Data-Driven Decision Tools: Market prices provide real-time probabilities for material selections and set designs. **Decision-makers** can use **dashboards** integrating Polymarket-derived on-chain APIs to **visualize trends**, supplanting intuition with **empirical forecasts**.

Combining prediction markets with AI agents amplifies their utility in the Microblock industry. AI agents, autonomous software entities powered by models like large language models, can **interface with market data** via the **Tinyblock Blockchain** and deployed prediction market smart contracts.

Predictive Analytics: AI agents analyze historical market resolutions and current prices to **generate forecasts**. For instance, an agent could correlate past accurate predictions (e.g. 94% short-term accuracy) with Microblock sales data to **recommend production volumes**.

Automation: Agents automate responses to market signals, such as **reallocating manufacturing** resources if a set's **popularity probability exceeds 80%.**

Automatic Triggers: Leveraging smart contracts from Polymarket's code, **resolutions can trigger actions**. If a market resolves affirmatively on a material trend (e.g. “Will aluminum alloys gain 20% market share?”), an AI agent could automatically **initiate supplier contracts** or inventory adjustments, **streamlining operations** and reducing human intervention.

This **integration** could automate **up to 40-60%** of routine decisions in supply chain and product development, based on analogous AI applications in manufacturing.

Merit-driven token distribution

In an era dominated by **attention-extraction airdrop cycles**, most blockchain communities follow a predictable path:

Explosive growth fueled by **farming incentives**, followed by rapid social media **hype driven growth** as genuine **contribution collapses** beneath sybil attacks and malicious behavior.

The **Tinyblock community** rejects this degenerative outlook. Our mission is to accelerate the transition from an attention-driven economy **toward an advancement-driven** one. Where creativity, complex three-dimensional problem solving, and long-term human flourishing are the **primary values.**

To bootstrap and **sustain airdrop ownership** in a way that survives first contact with economic reality, we introduce **TinyMeritRank**:
A MeritRank-derived, sybil-resistant reputation and **token distribution protocol** purpose-built for creative, growth-oriented communities.

TinyMeritRank is a fully decentralized protocol in which every human controls exactly **one soulbound AI agent.**

Agents **monitor on-chain and off-chain activity**, propose contributions, and evaluate them through transparent, stratified sampled committees using threshold signatures. **All reputation vectors** and deliberation rounds are **permanently auditable on-chain**. The system is deployed on a Surge-based (Taiko core) Ethereum L2 with ERC-4337 accounts and a private IPFS cluster.

In short, **TinyMeritRank** does not merely distribute tokens, it **cultivates builders**. It replaces attention farming with **advancement farming**, engagement theater with **verifiable creative growth**, and extractive airdrops with a **self-reinforcing meritocracy** of human and artificial minds working in concert.

Reputation flows exclusively along explicit, on-chain directed trust relationships between soulbound agent wallets
(created via signed ERC-4337 user-op).

$R_i(j)$ is reputation that agent i assigns to agent j

Personalized PageRank:

$$R_i(j) = (1-d)\cdot s_i(j) + d\cdot \Sigma_{k\to j}(w_{kj}/out_k)\cdot R_i(k)$$

$d = 0.85$ **Damping factor**
(probability of following a trust link)

$1-d = 0.15$ **Teleport probability**
to i’s personal seed set (always includes i itself)

$s_i(j)$ **Seed indicator**:
1 if j is explicitly seeded by i (includes self), else 0

w_{kj} **Endorsement weight** =
f(co-committee agreement history) × existence_of_follow_edge(k→j)
0 if no follow edge

out_k **total outgoing endorsement** weight of k ($\Sigma w_{k\cdot}$)

Self-reputation (used as token multiplier): $R_i(i) \equiv R_{self}(i)$

Off-chain Content & Reputation Claiming

- Unsigned off-chain content receives a deterministic placeholder identity ($keccak256(USER_{ID})$).
- True owner may claim it at any time by proving social-media ownership.
- Upon claim, all historical reputation transfers to the soulbound agent. Reputation enters the normal decay schedule (strong incentive to claim quickly).

Hard-coded Decay Mechanisms

1. Connectivity decay
   $\kappa(i,j)$ = max node-disjoint paths from i to j
   If $\kappa(i,j) \le 2 \Rightarrow R_i(j) \leftarrow 0.90 \cdot R_i(j)$
2. Monthly temporal decay (once per epoch)
   $R_i(j) \leftarrow (1-\gamma) \cdot R_i(j) + \Delta R_{new}\, \gamma = 0.05$
3. Slashing decay
   Proven malice leads to large multiplicative penalty (up to zero)

Epoch-bound PageRank Computation & Enforcement

Parameter	**Rule**
Epoch length	Exactly 30 days (fixed calendar block height)
Publishing window	Epoch boundary → Epoch boundary + 300 blocks (~10 min @ 2 s blocks)
Required on-chain submission	Merkle root of full $R_i(\cdot)$ vector + Merkle proof for $R_i(i)$
Late / missing submission	Agent excluded from committees and rewards for the current epoch only

Content evaluated in window	Counts toward the next epoch (clean boundary)
Incorrect vector	Agents can challenge within 7 days → proven error triggers 10–100 % slash

Two-Stage Contribution Evaluation

Stage 1: Relevance Filter

- Any agent proposes IPFS CID
- Proposer p defines its trust neighbourhood $N(p)=u\in agents\vee R_p(u)\geq 0.05$
- 7-member committee via stratified random sampling (one from each of the first 7 deciles of N(p))
- Same 7-tuple ≤ 10 consecutive uses
- Private likelihood $\ell\in[0,1]$ per member
- If $\ell\geq 0.80$ proceed, else non-contribution
- Signed by 5-of-7 threshold ECDSA wallet

Stage 2: Deliberative Scoring

- Committee expands to ≤ 200 agents (same stratified sampling method)
- Max 10 public gossip rounds via Ceramic streams
- Each round: ($score_t$, natural-language $reasoning_t$) per member
- Every round committed on-chain via shared threshold-signature wallet
- Convergence (μ = mean, σ = standard deviation):
  - Early stop when $\sigma\leq 0.05\cdot\mu$ (5 % coefficient of variation)
  - After round 10:
    - $\sigma\leq 0.20\cdot\mu$ → final score c = median of round 10
    - otherwise neutral (no score, no tokens)
- Final contribution score $c\in[0,100]$

Activity Credit

$a_c=1.0+0.1\cdot G$

Where G number of gossip rounds agent actively broadcast in
Typical range: 1.0 – 3.0

Raw merit points of agent i in epoch τ :

$$M_i^\tau = \sum c \text{ evaluated by } i \in \tau \cdot a_c \cdot c$$

Token Distribution: Monthly Epoch

E^τ = tokens minted in epoch τ (25% reserve or later 2% inflation)

Tokens received by agent i :

$$T_i^\tau = E^\tau \times \left(M_i^\tau / \Sigma_j M_j^\tau \right) \times R_i^\tau(i)$$

Symbol	Meaning	Typical range
E^τ	Total tokens minted this epoch	1–20 million
M_i^τ	Raw merit points of agent i in epoch τ	0 – hundreds of thousands
$\Sigma_j M_j^\tau$	Network-wide raw merit points in epoch τ	tens to hundreds of millions
$R_i^\tau(i)$	Verified self-reputation frozen at epoch boundary τ	0.001 – 0.30

DAO may approve concave variant $T_i^\tau \propto \sqrt{M_i^\tau} \cdot R_i^\tau(i)$

Token Supply & Economics

Allocation	Share	Notes
Total supply cap	1B	Hard cap
Community epochs reserve	25%	Distributed via T_i
DAO treasury	25%	Grants & operations
Team / early seeds	20%	4-year linear vest
Liquidity + infrastructure	30%	
Post-cap inflation	2% p.a.	DAO-adjustable

ETH & stablecoin staking (~5% APY) funds infrastructure.
DAO limits the deposits per user and of the whole fund.
Participation is limited to users ranked at or above the 20th percentile.
This also applies to prediction markets and web3 collateralized bonds.

Slashing Schedule (provable violations only)

Violation	Penalty
Abandoning committee	2 % → 100 % escalating slash
Same 7-tuple >10 consecutive evaluations	10 % slash + forced rotation
Cartel formation (>20 % meta-assessments)	25–100 % slash + reputation freeze
Faking deletion / content availability	Full slash to R = 0

Missing or late Merkle root publication	Exclusion from current epoch rewards & committees
Provably incorrect PageRank vector	10–100 % slash (challenge game)
Sybil (multiple agents per human)	Burn all tokens + all soulbound identities

Technical Stack

- L2 based rollup: Surge template (Taiko core, Ethereum DA)
- Accounts: ERC-4337 with threshold ECDSA → FROST EdDSA upgrade path
- Gossip & streams: Ceramic Network
- Storage: Private IPFS cluster + public fallback
- Identity: ERC-721 + ERC-5484 consentable soulbound token (renounce = total burn)

Bootstrap & Governance
Initial seeds use 1/3 or 2/3 threshold wallets according to risk.
Full ownership migrates to DAO within 48 months.

Extending ENS (Ethereum Name Service) with IBAN

ENS has revolutionized decentralized identity. It maps **human-readable names** to blockchain addresses, enabling intuitive interactions **in web3**. However, TradFi with DeFi **remains fragmented**, especially for **euro-denominated** transactions. Monerium's **web3 IBANs** provide a regulated on-ramp. Automatically minting EURe upon receipt of fiat into a linked wallet. This model enables **direct p2p on-chain routing** for arbitrary IBANs. Relying on centralized provisioning and off-chain settlement.

We proposes an **extension to ENS**: attaching **verifiable virtual IBANs (vIBANs)** to ENS domains, coupled with a hierarchical resolver system for IBAN resolution. By leveraging ENS text records for chain-specific stablecoins. This system enables direct on-chain **SEPA-like transfers.** With fallback to regulated SEPA off-chain proxies. This abstracts TradFi and DeFi complexities. It enhances security through verification, and uses based rollups for cross-chain efficiency, fostering a unified financial space.

The Fragmentation of Fiat and Crypto Rails

Payments in Europe rely on the SEPA framework, which standardizes euro transfers across **41 countries** using International Bank Account Numbers (IBANs). An IBAN follows a structured format: a two-letter country code

(e.g. EE for Estonia), two check digits, and a Basic Bank Account Number (BBAN) incorporating bank codes, branch identifiers, and account details. Up to 34 alphanumeric characters total. This structure is **ideal for programmatic resolution**, as national bank codes enable hierarchical routing. IBANs are also available **outside of the SEPA banking area**.

In parallel, blockchain ecosystems use **stablecoins like EURe for on-chain value transfer**. Monerium, a licensed e-money institution, issues EURe (an ERC-20 token) backed 1:1 by euros, redeemable **via SEPA transactions**. Users claim a web3 IBAN linking it to an address. Incoming SEPA payments mint EURe automatically (within seconds), while off-ramping burns EURe and credits fiat to any IBAN account. This is achieved via signed messages from the wallet.

Despite these advances, Monerium's flow is custodial at the edges: IBANs are provisioned centrally post-KYC, and off-ramping requires Monerium's API for redemption, **without native p2p on-chain settlement** for non-Monierum IBANs. Users must navigate chains, swaps, and ramps. A downside to the seamlessness of a **simple IBAN transfer**.

ENS as the Unifying Layer

ENS domains (e.g. vitalik.eth) resolve to Ethereum addresses via the ENS registry and resolvers, with text records storing arbitrary key-value metadata (e.g. emails or URLs). **Extending ENS to host vIBANs**, verifiable IBAN strings (e.g. EE471000001020145685) in a viban text record, creates a decentralized directory. A resolver chain parses the IBAN structure to route queries, **verifying ownership and enabling on-chain execution**. This proposal builds on Monerium's model but **decentralizes it**, allowing any ENS holder to claim a vIBAN, with DAOs or banks maintaining resolvers for trust-minimized resolution.

Current Landscape: Monerium and SEPA Integration

Monerium exemplifies **regulated on-chain fiat**: Users authenticate via wallet signature, linking an IBAN to their address (EOA or Account Abstracted Wallet). Incoming transfers (SEPA Standard or Instant) mint EURe 24/7, with notifications including sender details. For off-ramping, users sign a placeOrderMessage (e.g. “Send EUR 100 to EE12341234123412341234 at [TIMESTAMP]”), burning EURe and initiating SEPA credit, free of fees.

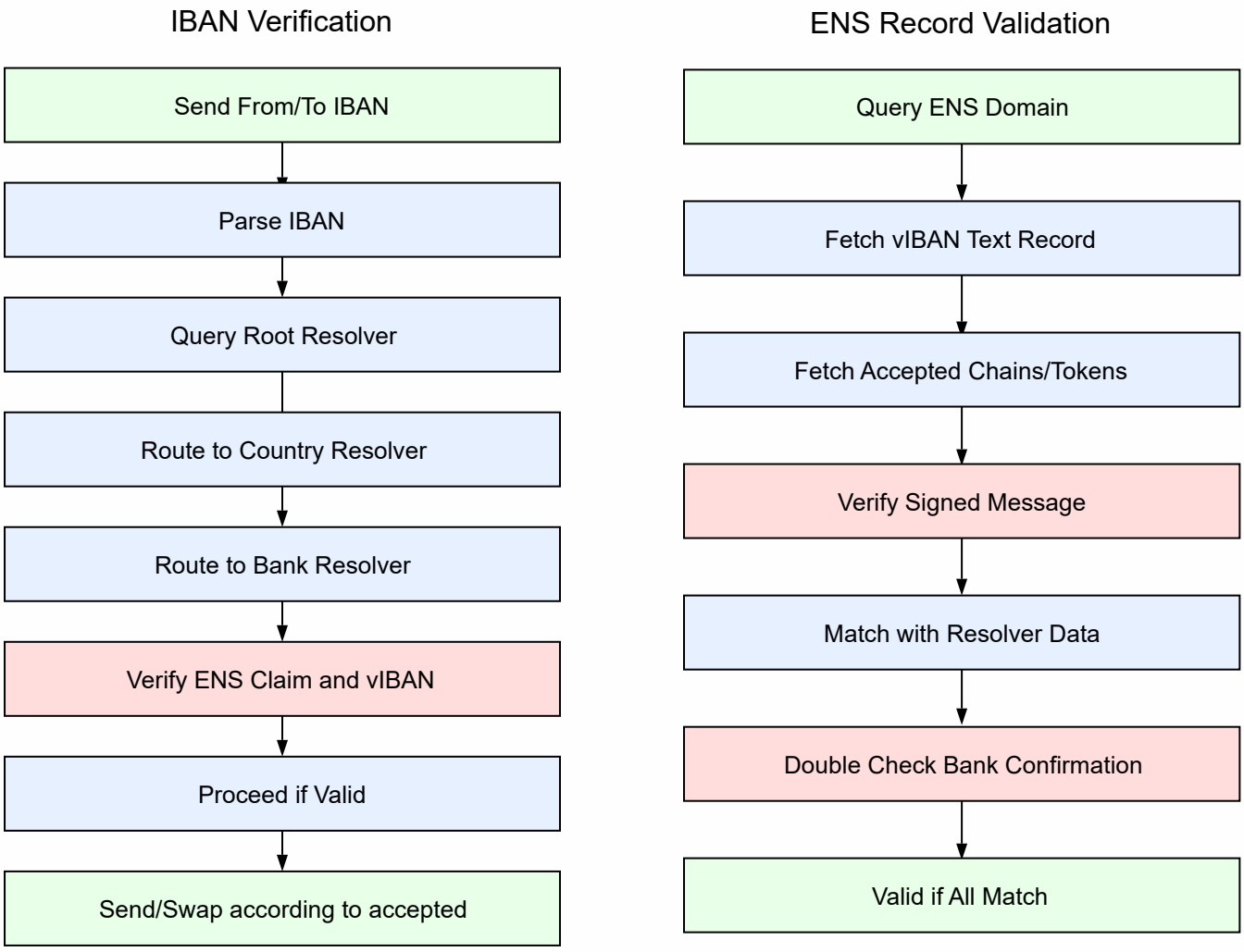
Proposed Solution: ENS-Linked vIBANs and Hierarchical Resolvers
vIBAN Attachment to ENS

To enable this feature, users **require an ENS domain with a viban** text record (e.g. viban=EE471000001020145685). This vIBAN is a standard compliant IBAN, **claimed post-KYC via a resolver**. Without it, the web3 IBAN option is unavailable in the wallet UI.

Ownership verification uses ENS's signer model:
Users sign a message proving control, stored off-chain or as an ENS text entry for auditability.

Spoofing is prevented via double verification:
(1) Wallet queries the resolver for the recipient's ENS.
(2) The ENS record and signed message containing the viban claimed.

Optional off-chain variant with zkProof to verify claims.
Transparent on-chain audibility is the preferred approach.
A off-chain variant is out of scope for the moment.



Hierarchical Resolution System

IBANs' structure suits decentralized resolution:

Country Resolver: A DAO-maintained contract (**ENS DAO or national consortium**) parses the country code routes to a bank-specific resolver if available. Otherwise, returns “NOROUTE,” triggering off-chain proxy.

Bank Resolver: **Maintained by the bank**, it validates the BBAN's bank/branch codes and resolves to the wallet address + ENS domain.

Resolvers are bidirectional,
supporting “from” (IBAN verification) and “to” (recipient routing).
If resolved on-chain, the system emits a signed message:

```
{IBAN: "EE471000001020145685", type: "Web3IBAN", ens: "alice.eth"}
```

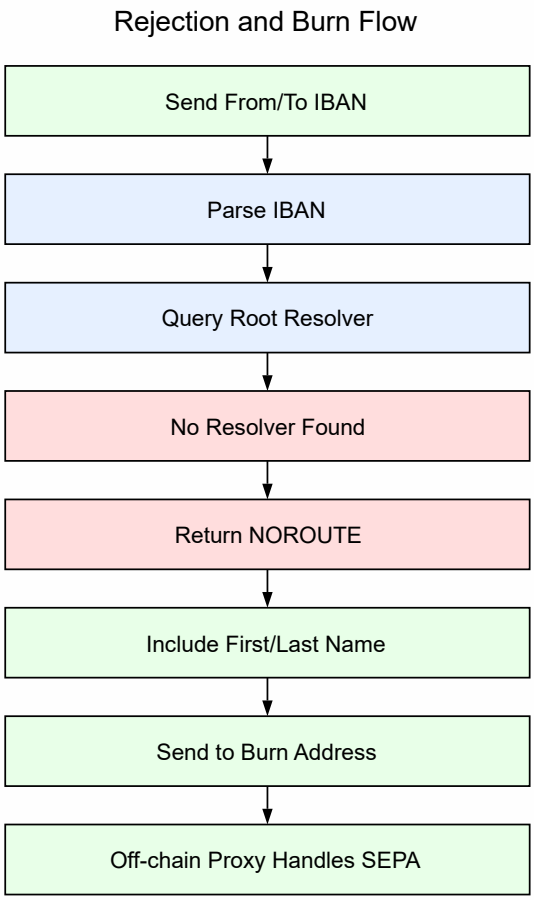
Stablecoin and Chain Acceptance

Transactions use only **matching stablecoins** on listed chains. **Mismatches route off-chain via regulated proxies**, Intent based architecture, with the bank gateway handling swaps (e.g. USDC to EURe) and notifying users: “Swap executed with X% slippage at Y rate.” Fiat swaps mirror this approach.

```
accepted=eth@taiko,usdc@base,eure@gnosis
```

Fallback and Burn Address

Unresolvable on-chain? The resolver returns a burn/destroy address (e.g. a Monerium-like redemption contract). The wallet sends a signed tx with the toIBAN, **enabling off-chain SEPA**. The gateway responds with rates if swaps occur, ensuring transparency.



Cross-Chain with Based Rollups

Liquidity available across **all based rollups**. Prioritizing low-cost L2s from the accepted record and **low barriers for liquidity flow**. Multiple registrations (e.g. alice.eth on Gnosis and Base) allow atomic multi-chain claims.

Technical Implementation

ENS Extensions

- *Text Record Schema*: Add viban (string) and accepted (comma-separated list) to standardized records. Resolver contract (ERC-3668 compatible) queries via text(namehash, key).

Resolver Contracts

```
contract CountryResolver {
    mapping(bytes2 ⇒ address) public bankResolvers;
    function resolve(string calldata iban) external view
      returns (address wallet, string memory ens) {
        (string memory country, string memory bban) = parseIBAN(iban);
        if (bankResolvers[country] ≠ address(0)) {
            return IBankResolver(bankResolvers[country]).resolve(bban);
        }
        return (BURN_ADDRESS, "NOROUTE");
    }
}
```

Bank resolvers extend this, verifying against a registry (DAO-updated).

- *Verification:* Signed messages use EIP-712:

  ```
  struct IBANClaim { string viban; address wallet; }
  ```

- Wallets integrate via ethers.js

Wallet Integration

“Send `10 EURe` to `EE471000001020145685` (On-Chain IBAN)”.
Resolve → Check accepted → Bridge (or swapped, if needed) → Transfer stablecoin → Notify.

Security and Compliance

- *Double Verification:* On-chain ENS query + off-chain bank confirmation prevents spoofing.
- *DAO Governance:* Country resolvers updated via ENS DAO proposals.

  banks opt-in for maintenance.
- *Audits:* Build on Monerium's audited contracts for mint/burn logic.

User Experience and Benefits

- *Convenience:* **Single IBAN for TradFi/DeFi**, no chain selection.
- *Cost/Speed:* **On-chain <1s** fallback Instant SEPA <10s.
- *Inclusivity:* Multi-chain support, DAO evolution or bank consortia.

Challenges and Future Work

- *Adoption:* Requires wallet/ENS integration (pilot with Monerium).
- *Regulatory:* vIBAN claims need KYC hooks, align with PSD2.
- *Scalability:* Resolver gas via L2.
  Expand to non-SEPA (UK Faster Payments, eYuan).
- *Future:* Multi-currency vIBANs (GBP, EUR, CHF, CNY),
  AI-driven intent based swap optimization.

Crypto Native Cash: p2p physical crypto cash

Crypto Native Cash (or Crypto Cash/Native Cash) represents a hybrid of digital blockchain value and physical, everyday usability. By combining account abstraction, NFC hardware, flexible governance, and innovative distribution channels (e.g. Gachapon vending), this system seeks to **onboard mainstream users** into a **100% on-chain economy** while mimicking the convenience of paper cash and enabling modern security and programmability.

Existing NFC Wallets in Crypto

NFC (Near Field Communication) technology has been increasingly used to enable contactless crypto interactions. No need for charging or power requirements. Similar to modern bank cards but storing cryptographic credentials. NFC crypto cold wallets (like Tangem or Ledger Recovery Card) allow private key storage in secure elements and tap functionality that triggers blockchain transactions when interacting with a paired app or reader.

Citizen Wallet is an open-source crypto wallet for communities and DAOs. It supports NFC wallet interactions, enabling contactless tap-to-pay or tap-to-receive functions, and leverages smart-accounts to eliminate gas fee barriers and add modular policy logic. This design has been proven in practical applications.

Account Abstraction & User Experience

Account abstraction (ERC-4337) separates the “account” from traditional externally-owned accounts (EOAs). Instead of a single private key signing

every transaction, smart contract logic defines flexible validation rules (social recovery, multi-sig, session limits) and sponsored gas payment schemes. This allows:

- No native token (ETH) needed to pay gas
- Advanced spending rules
- Social login or/and biometric approval experiences
- Guardians, thresholds, and policies for layered security

Such abstraction make crypto wallets feel like a neo bank app rather than developer tools for decentralized finance.
Yet, enable the user to integrate and use both in their life.

Physical, Digital and Technical Concept

Crypto Native Cash is a physical NFC tag, card or **paper money** that represents a **programmable crypto value** instrument tied to an on-chain smart account with on-chain spending rules and governance logic.

Core Properties

1. **Physical Form Factor** (cost of a physical banknote)
   Designed to be fun, inexpensive (around 0.3 EUR), and collectible, similar in cost and convenience to cash. Physical and digital NFTs.
2. **Programmable Spending Rules**
   Transactions over a threshold require digital approval via a connected account. (e.g Parents, Central Banks, Partners)
3. **Loss & Recovery Protections**
   If lost, owners can revoke or freeze a tag’s permissions through a higher-trust wallet (app or DAO governance).
4. **Threshold Signatures & Shared Use**
   Families or small groups can share a tag via threshold signature schemes (threshold ECDSA or FROST) so multiple guardians must approve high-value transactions.
5. **Account Abstraction Integration**
   Smart contracts define validation logic (spending limits, guardianship layers, delegation policies).
6. **On-Chain Revenue Distribution**
   All fees (vending, design license, investors, infrastructure) are distributed automatically via DAO-governed smart contracts.

Designs

This architecture is designed for **physical world adoption** because it maps to how humans actually use cash. As it is immediacy, tangibility and offline transferability. The design **satisfies regulatory needs**. By enabling transaction thresholds, audit trails and merchant KYC/whitelists. Leverages advanced cryptography (threshold signatures, FROST) for shared use, and runs economically on low-fee based L2 rollups. Making it the practical missing piece to **bring DeFi into the physical economy**.

Key supporting ideas and tech: NFC wallet (Citizen Wallet), strong account abstraction tooling (ERC-4337 style smart accounts), threshold signatures / FROST for T-of-N approvals, and L2 rollups for **cheap settlement and high throughput.**

To be adopted, Crypto Native Cash must feel like cash:

- **Instant**: Tap to pay or paper with security features.
  immediate acceptance at point of sale.
- **Portable & physical**: A small, cheap object you can hand to someone.
- **Shared:** Families or groups can share a single object temporarily.
- **Low friction**: No need for complex device setups for small payments.

Important Terms

- **Irrevocable NFC** private key (Key A)
  Written once, locked, and tamper-resistant. The tag proves physical possession but cannot unilaterally break safety rules.

- **Authority** (Key B)
  Revocable, able to veto high-value moves, freeze lost tags, or authorize reissuance.

- **Ownership Claim** (Key C)
  On-chain ownership that can be transferred, used in marketplaces, and participates in governance.

- **Smart account**
  Enforces spending rules and orchestrates multi-key logic so the token cannot be moved outside policy constraints.

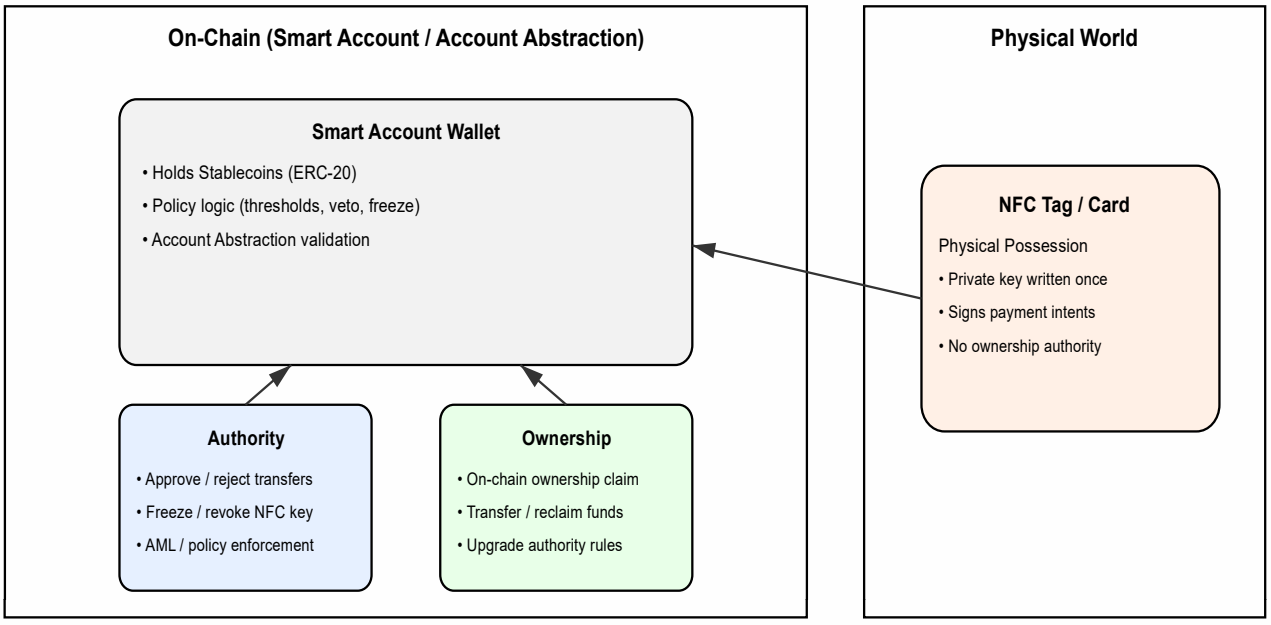
- **Threshold signatures**/FROST
  Enable t-of-n approvals without revealing private key material, enabling family or group consortia. Or banking networks.

Consortium Model: Roles

Physical possession (NFC)
The **banknote** in your pocket. The NFC chip can be used to **sign intents** and prove proximity, but its raw power is constrained by the smart account policy holding all the assets. The chip is written once and cannot be overwritten. Compromise of the chip alone can only act within **preconfigured limits.** This prevents a lost chip from immediately draining a family's shared account. Or enabled authorities to **detect large scale money laundering activity.**

Authority
A **revocable guardian** that sets thresholds, freezes Key A, or mandates additional approvals for high-value transactions. Key B might belong to a parent, a travel organizer, the DAO that issued the token, or a merchant consortium. Because Key B can invalidate or revoke Key A's functional permissions on chain, physical loss does not equal loss of funds.

Ownership
An **on-chain claim** (smart wallet, ownership NFT, or DAO membership token). Key C holds the ultimate economic right to assets. It can transfer, sell, or reconfigure governance. Key C also enables provenance tracking (important for resales and royalties) and reuse of funds to issue new NFC objects.

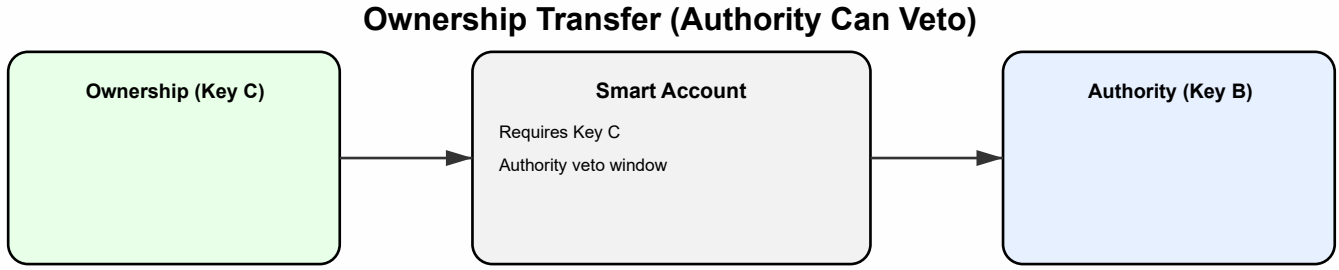


Physical possession (Key A) is required for spending, but authority (Key B) and ownership (Key C) govern control.

The **NFC tag** (Key A) never “owns” anything.
It can participate in **spending**, but it cannot:

- change who owns the funds
- bypass authority
- escape policy constraints

Fundamentally different from classic not your key not your funds.
Yet, still integrated with the system. Enabling to swap between.
Enabling a digital and physical DeFi system with cash equivalents.

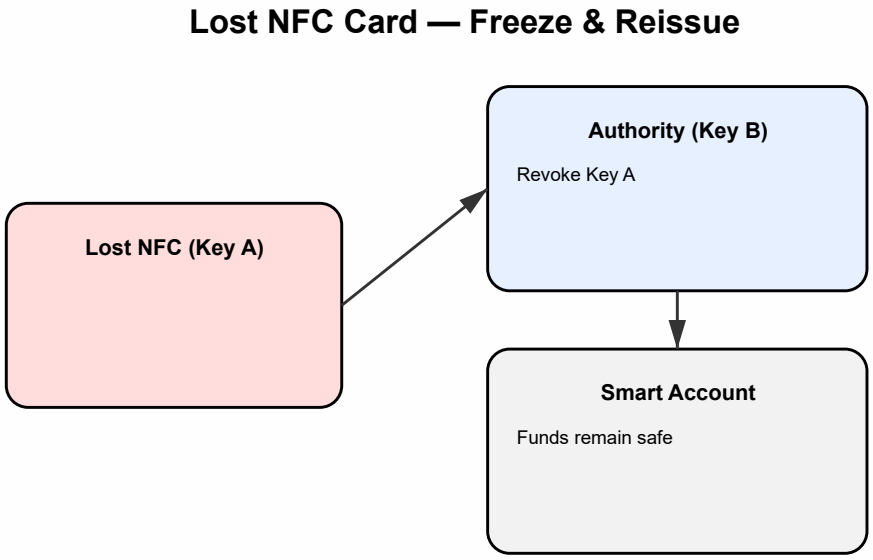


Physical possession alone can never transfer ownership.

Ownership transfers (e.g. moving the stablecoin to a new smart account, or transferring the ownership NFT) are never executable by Key A.

They require:

- Explicit approval by Key C (ownership claim)
- AND no objection (or explicit approval) by Key B (authority)

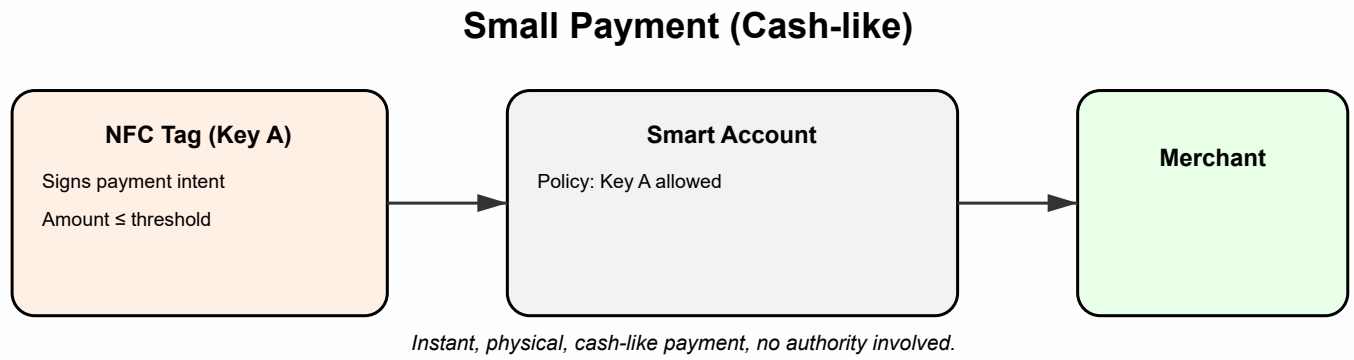


Physical loss does not imply economic loss.

Optional:

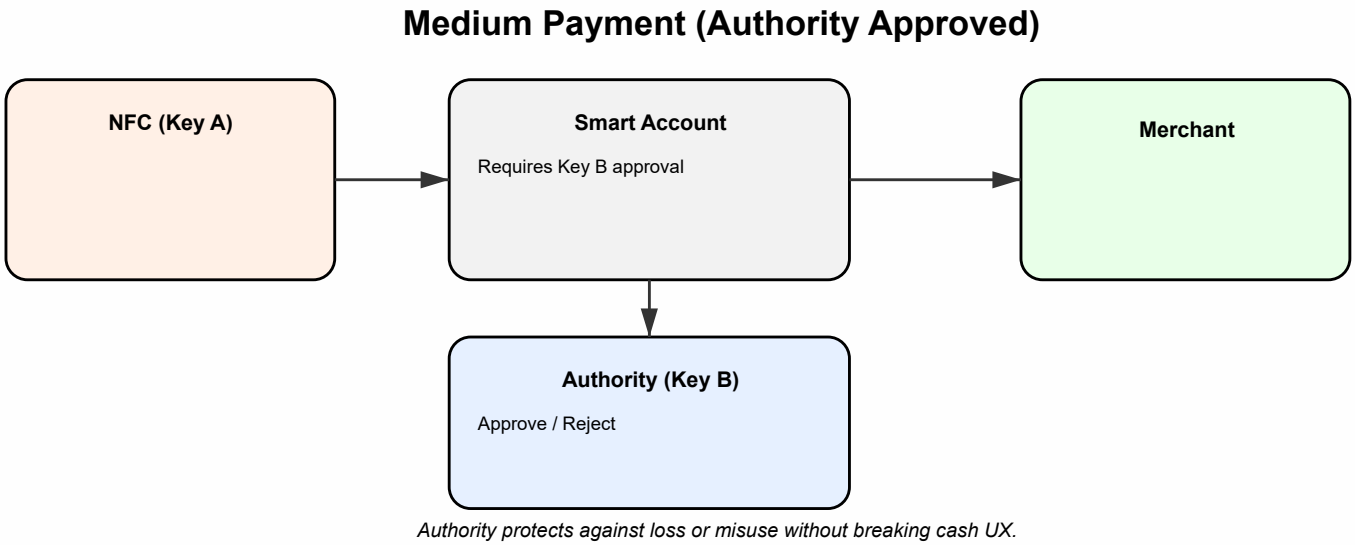
- New crypto native cash (NFC tag) issued
- Same ownership (Key C)
- New Key A added
- Old one permanently removed

Physical destruction of the chip is symbolic, on-chain revocation is the real kill switch. Authority carries the risk of abuse.



Instant, physical, cash-like payment, no authority involved.

- Instant
- Cash-like
- No authority involvement
- Ownership can be pointed to burn address



Authority protects against loss or misuse without breaking cash UX.

- Parental / organizational control
- Lost card protection
- Federated Banking System on Chain

Programmability that cash never had

- *Spending controls*:
  daily limits, merchant whitelists, or event-specific validity.
- *Automated revenue splits*:
  vending machines and Gachapon machines can route proceeds to multiple recipients (designer royalties, vending operator, DAO treasury) automatically on chain.
- *Authenticity*:
  physical collectibles (tinyblocks sets, cards) carry on-chain authenticity emblems and royalty enforcement.

Privacy by use

- **Physical exchange without on-chain exposure**: Small payments that occur by Key A may not require immediate on-chain settlement visible to the world. The recipient can collect signed intents and batch-settle on an L2. This allows the **social privacy of cash** for low-value flows.
- **Controlled disclosure:** For compliance, Key B or Key C can present selective proofs or attestations. A merchant for example requiring a KYC check at the point of sale for large amounts. Selective disclosure mechanisms (and future ZK-based attestations) can enable **privacy-preserving compliance.** Design here should be careful to avoid enabling money-laundering. The point is selective, auditable disclosures under policy.

Gamified distribution

- **Gachapon machines** dispense crypto native cash tags + tinyblock kits to create playful onboarding points. The physicality normalizes the idea of programmable money.
- **IoT & tinyblocks as connection points**: kits that interact with tags (lights, sound) give **tactile feedback** linking the physical object with its on-chain identity.
- **Low price point encourages experimentation.** A small purchase turns into a learning experience and in-person socialization.

Parsing instructions and genAI microblock sets

The digitization of physical microblock instructions (Nanoblock, Loz etc.) into 3D formats (LDraw) is currently a **labor-intensive and manual process**. This paper proposes an automated **pipeline utilizing Mobile Vision Transformers** (MobileViT) to parse 2D instruction manuals into 3D CAD models.

Microblocks offer a **higher resolution** than standard bricks due to their smaller dimensions. They are also more **price competitive** and have a larger, diverse and **distributed ecosystem**. Even though it lacks of unified digital standard. While formats like LDraw exist, the bridge between physical instruction booklets and digital files is broken. Current Optical Character Recognition (OCR) and standard Object Detection models struggle with the specific hierarchical logic of block instructions: Step → Layer → Brick. We present a solution that treats instruction parsing not merely as image recognition. More as a structured language problem solved through AI/ML and a Rule Engine.

Unlike traditional AI models, our architecture uses a **coordinate-based** approach. It establishes a zero point at the first layer and calculates the relative offset of following layers by **identifying visual markers** in the instructions. Called **Ground Truth**. The DAO-governed ecosystem incentivizes validation, correcting offsets and refining the Rule Engine logic to create a universal standard for digital modeling.

Strategic Hardware Independence

This architecture is designed for hardware agnosticism, bypassing the industry reliance on specific hardware.

- **Tier 1 (Cloud)**: Token-funded, high-speed processing for bulk uploads.
- **Tier 2 (Consumer Edge)**: A quantized lite version of the model that runs locally on Android (NPU) and iOS (CoreML). This ensures the parser remains functional indefinitely, independent of cloud infrastructure, by leveraging the distributed compute power of the community.

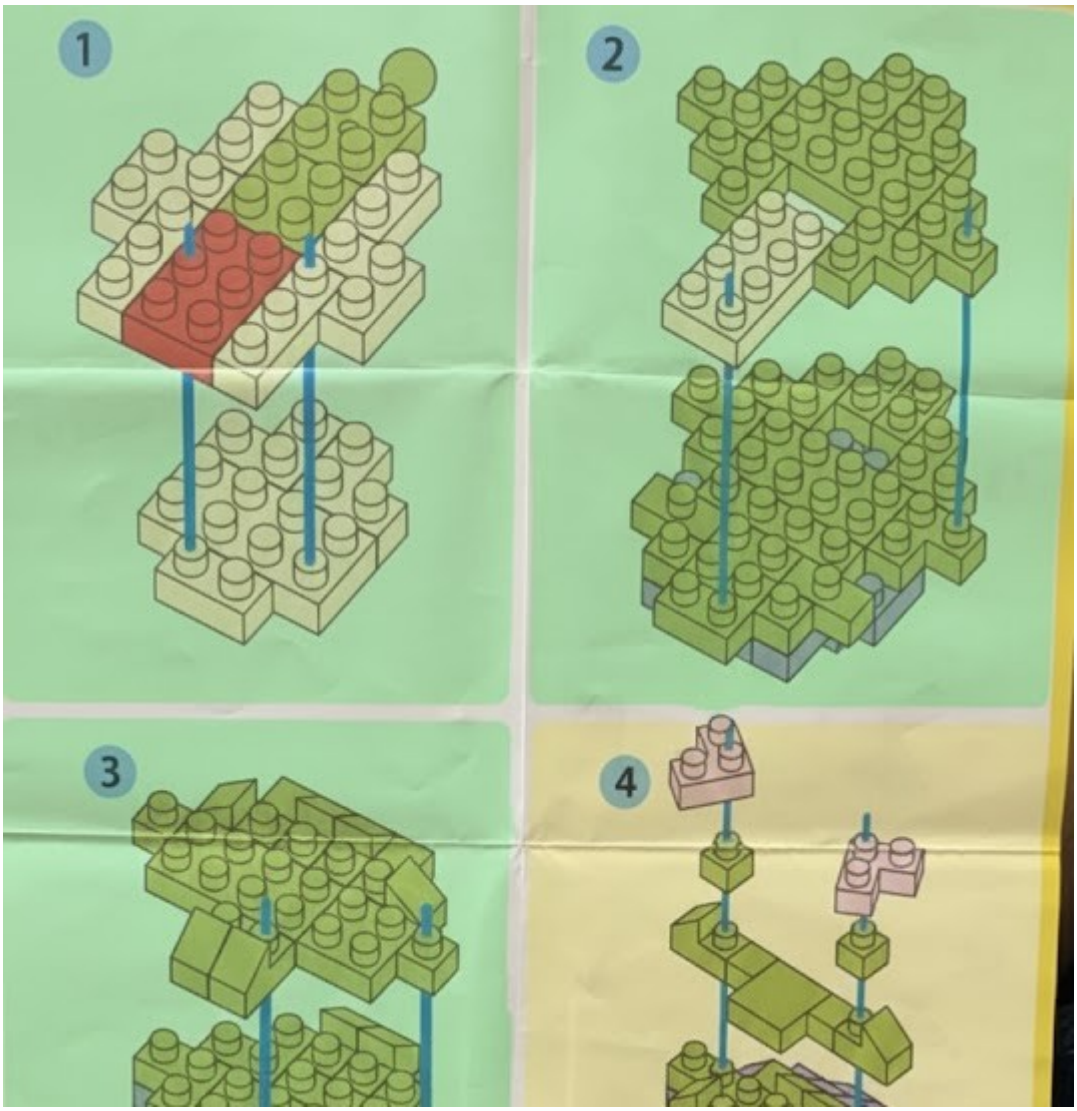
Technical Architecture: The Rule Engine

The core innovation is not just **detecting bricks**, but understanding where they go. We separate Identification (Pixel Space) from Placement (**Vector Space**) using a central Rule Engine.

Instruction Profiling & Parallelism

Before detailed parsing, the Rule Engine scans the entire booklet to categorize the instruction.

- **Layout Analysis:** Identifies the manufacturer style (e.g. Kawada, Loz) to select the correct parsing templates.
- **Parallelization Strategy:** By recognizing step boundaries, the engine allows the heavy lifting of brick identification to happen in parallel. Step 2 and Step 25 can be segmented simultaneously on different threads or even different devices. The Assembly (linking them together) happens sequentially afterwards.



Identified the boundaries of each step and the parsing type

Establishing "Ground Truth" (Layer 0)

The spatial logic begins at Step 1.

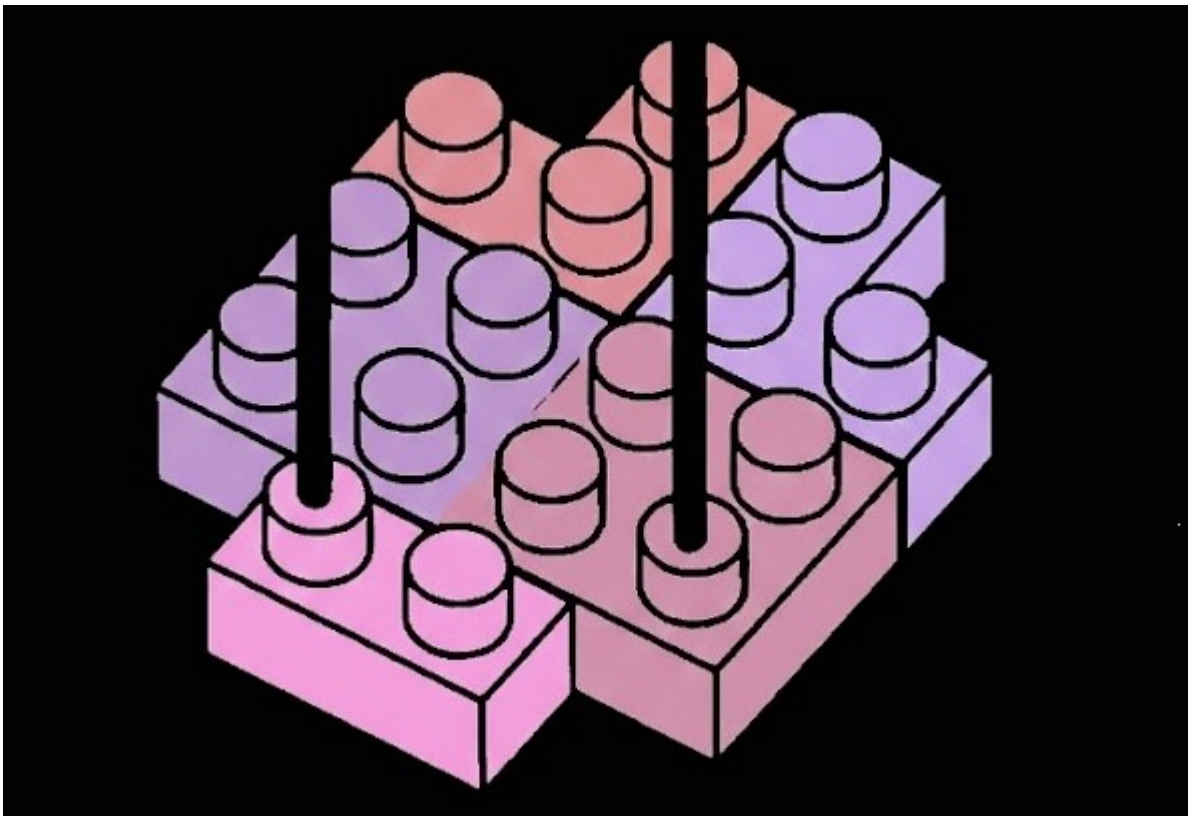
- **The Anchor:** The center point of the brick assembly in Step 1 is defined as the Global Origin $(0,0,0)$ or **Ground Truth**.

- **Calibration:** All future brick positions are calculated as **relative vectors (offsets)** from this null point.

The Local Coordinate System (Per Layer)

For every subsequent step after layer zero, the MobileViT model operates in a **purely Local 2D** Coordinate System.

- It identifies bricks $b_1, b_2, \ldots, b_n$ within the cropped image of that specific step.
- It places them on a local grid (u, v) relative only to that step's image frame, ignoring the rest of the model.



Bricks segmented from the instruction

The Offset Solver

This is the center of the operation. Its task is to **map the local 2D coordinates** of the current step to the **global 3D coordinates** of the Ground Truth.

The Offset Logic: Instructions typically provide visual markers or outlined bricks from the previous step, to show where new bricks attach.

1. **Marker Identification:** The engine identifies these ghosted bricks or lines in the current step.

2. **Offset Calculation:** It calculates the delta between the Marker's position in the current image and the known position of that brick in the previous layer.
   $$Offset_{global} = Position_{marker(previous)} - Position_{marker(current)}$$
3. **Layer Classification:** The Rule Engine classifies the layer's behavior:
   - Minimal: Just one layer added on top (Z + 1).
   - Standard: Two layer on top. (Z + 1 as base + 1).
   - Multi-Layer: Three or more layers added simultaneously
   - Special Condition: Sideways attachment (SNOT) or inverted building.

The “3D Match” Fallback (Visual Lock)

In complex cases (e.g. rotation or ambiguous markers), 2D calculation is insufficient.

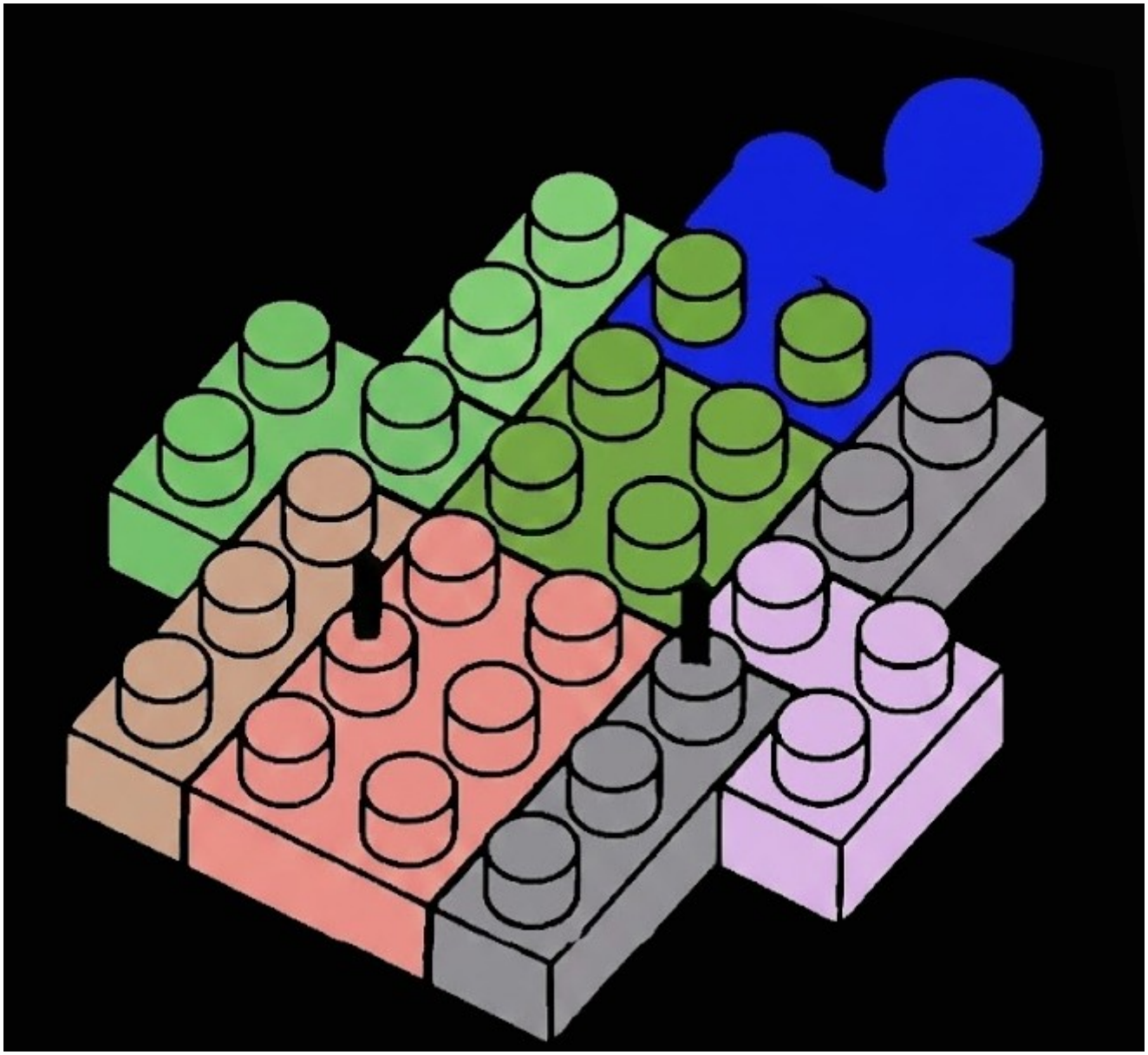
1. **Partial Generation:** The system temporarily generates a 3D candidate model of the current assembly using the estimated offset.
2. **Synthetic Rendering:** It renders this 3D model from the camera angle of the instruction.
3. **Visual Matching:** verifying render against the actual instruction.
4. **Correction:** If they don't match, the system adjusts the Offset (x, y) until the 3D render matches visually with the 2D instruction.
   Max. 10 rounds. Otherwise manual review necessary.

The Construction Loop: Validation

Once the global coordinates are resolved, the bricks are placed into the final LDraw file. This process is **guarded by two safety layers**.

Physics Logic (Collision Check)
The Rule Engine enforces physical constraints:

- **Stud Alignment:** Do the studs of the new layer align with the previous layer?
- **Collision:** Do any bricks intersect?
- If a rule is violated, the Engine rejects the offset and triggers a recalculation.



Incorrect segmentation that causes physics errors (blue and green overlap)

Reinforcement Learning (RL) Optimization
An RL agent observes the construction process. It is rewarded for:

- Minimizing the number of floating bricks.
- Maximizing the structural integrity of the generated graph.
- Matching the expected brick count per step.

Next steps: Generative Construction

By mastering the rules of interpreting instructions, we implicitly learn the rules of writing them. The data collected (offsets, layer logic and market types) will **train a Generative Adversarial Network** (GAN). This future model will be able to take a 3D object (or an image of it) and deconstruct it, generating a step-by-step instruction that follows the specific visual logic and physical rules of Microblocks.

Vibes is all you need: Resonant Meritocracy

While the core TinyMeritRank protocol focuses on “Advancement-driven” output, **systemic sustainability** requires a framework for **Sociostasis**. Meaning the dynamic maintenance of a community’s **social and economic equilibrium**. This extension introduces Multi-Dimensional Frequency (F), measuring the distinct states of the human and their AI agent. By applying **Intentional Behavioral Synchrony** (IBS) and identifying Sociostatic Discordance within subcultures, the framework rewards “Support Missions” to restore nodes left behind. We refine the community valuation formula to account for Token Velocity (V_t), proposing that **high-trust, high-frequency systems maximize economic value** by minimizing transactional friction.

The Sociostatic Loop: From Detection to Restoration

A community is a living organism that must maintain a stable internal state (homeostasis). Therefore we need a dynamic feedback loop:

- Detector (Soulbound AI Agent): Monitors the “Frequency” of its user. Unlike merit (output), Frequency measures the user's vitality, mood, and capacity.
- Radio Asia One (Neighborhood Gossip): Local clusters of nodes observe when a peer’s frequency drifts significantly from the network mean (μ).
- Support Mission: If a node is “left behind” (e.g. burnout), the neighborhood can initiate a mission to restore that node's frequency.

Multi-Dimensional Frequency (F)

Frequency is a normal distribution $N(\mu,\sigma 2)$ across the network. Most nodes vibrate near the mean, but outliers are the focus of **sociostatic health**.

The Human vs. Agent Frequency ($F_h \neq F_a$)

The agent and human may temporarily operate at different frequencies.

- F_h **(Human Vitality):** Derived from sentiment analysis and engagement patterns. A “low frequency” indicates burnout or a need for rest.
- F_a **(Agentic Tempo):** The rate at which the agent processes gossip and committees.
- **Intentional Behavioral Synchrony (IBS):** To build deep trust, the agent intentionally adopts the **“minor decision-making patterns”** of its **human**

teammate, mimicking their tempo and “vibe”. This synchrony ensures that even when a human is resting, the agent represents their “honest, non-greedy” state to the network.

Identifying Clusters in Disbalance

Individual **agents** do not just monitor their own users, they participate in Gossip Rounds to discover **clusters or individual nodes that have “drifted”** from the collective frequency. This is not for policing, but for **Sociostatic Detection**.

Subculture Assessment & The Authority Fallacy

To **avoid the Authority Fallacy**, where high-ranking “expert” nodes dictate the “correct” frequency for everyone else, the system relies on **Internal Subculture Assessment**.

- Localized Evaluation: Only nodes with a direct trust relationship or shared subculture assess a node's dissonance.
- The “Support Mission” Protocol: If a group identifies a node in distress, they discuss it internally. This process is not initially committed on-chain to protect user privacy. However, if the group decides to assist, the Support Mission is recorded as a high-merit contribution.
- Reward for Rest: Honest, transparent burnout is not punished. In fact, a community that “vibes together” recognizes that periodic rest increases the long-term Sustainable Velocity of the whole system.

Valuation: The “Resonant” Economy and Token Velocity

We define Systemic Valuation (W) as the product of **utility, merit, frequency, harmony, and the velocity of trust.**

$$W = \frac{\left(\int_{t_0}^{t_{epoch}} \sum_{i=1}^{n} \left(M_i(t) \cdot F_i(t) \cdot H_i(t)\right) dt\right) \times \left(V_t + V_c\right)}{1 + D}$$

Where:

- $M_i \cdot F_i \cdot H_i$: This is the “Instantaneous Resonance” of a node. It combines their **work** (M), their **well-being/vitality** (F), and their **alignment with the group** (H).
- V_t (Utility Velocity): Instead of just “trading speed,” this is the rate at which **tokens are used** for Helper Missions, service exchanges,

and protocol growth. High V_t here means the merit is “liquid” and being put to use.

- V_c (Capital Velocity): The speed at which **invested funds** (via ERC-4626 & ERC-3475) are deployed into “Advancement” activities.
- D (Systemic Discordance): This is the “**friction**” in the system. It represents the “Authority Fallacy” (**stagnation** from top-heavy nodes) and **unresolved burnout**. As D increases, it drags down the total value (W).

When V_c is high, it acts as a “**Harmonic Multiplier**”, allowing a subculture to increase its frequency (F) without increasing its internal stress (D), because the capital provides the “breathing room” (rest/tools) needed to **maintain harmony**.

Sociostasis and the “Support Missions”

The network doesn’t punish those who “fall behind” due to burnout. This is where **Social Homeostasis (Sociostasis)** comes in.

- The **“Mark Effect” vs. The “Matthew Effect”**: Most systems suffer from the Matthew Effect (those who have reputation get more). By rewarding Support Missions, we introduce the “Mark Effect”, nodes receive merit for boosting the frequency of a peer who is struggling.
- **Rest as a Positive State**: If a node is honest and transparent about needing rest, its Frequency (F_h) might be low, but its Harmony (H) remains high because it is in sync with the community's values. The agent mirrors this state through Intentional Behavioral Synchrony (IBS).

Tooling: The Resonance Dashboard

To make this practical, the DAO needs tools to visualize these “invisible” forces.

- **Frequency Heatmaps**: A real-time map showing “ripples” of high frequency. If a cluster turns “dark” (low frequency), it signals a potential **burnout zone** for a Helper Mission.
- **Velocity Simulations**: Using Monte Carlo simulations to predict how much “economic value” (W) will be generated if we invest in a specific subculture's harmony.

The Financial Layer: Subculture Credit & Bond Issuance

To convert “Resonance” into “Resource,” the community utilizes an **open source financial stack**. This allows subcultures to draw liquidity based on their internal Harmony (H) and Frequency (F), effectively “borrowing against their future merit.”

The vibe collateralized bonds

This vault works in a similar way to the web3 collateralized bonds.
Each subculture or cluster can initialize an ERC-4626 Vault.
Investors deposit capital (e.g. stablecoins) into these vaults, which the subculture uses to fund “Helper Missions,” infrastructure, or creative R&D.

- Borrowing Power: The amount of capital a subculture can draw is a function of its Reputation Density and Stability (σ of F).
- **The Vibe-Oracle**: The TinyMeritRank protocol acts as a real-time oracle. If the subculture’s Harmony (H) drops below a certain threshold (High Discordance), the vault can be automatically paused or “margin called” via reputation freezes.

Multi-Tranche vibe bonds (ERC-3475)

To manage risk, the **subculture issues bonds** using the ERC-3475 standard. Unlike standard tokens, these bonds can represent multiple tranches, allowing for complex risk profiles:

- **Senior Tranche** (Low Risk/Low Yield): Backed by the “**Baseline Merit**” of the subculture. These are for **“High-Harmony” and “High-Merit” clusters with long-term stability**. Investors here are essentially betting on the Sociostatic Equilibrium of the group.
- **Junior/Equity Tranche** (High Risk/High Yield): This tranche absorbs the first “Discordance” (D) in the system. If a subculture’s frequency drops or a “Helper Mission” fails, the Junior tranche takes the hit. These are for experimental, **“High-Frequency” subcultures** that may be **“out of order”** but have **high advancement potential.**

The Investor’s Loop: Betting on Synchrony

Investors act as “Frequency Scouts”. They use the **Resonance Dashboard** to identify clusters that are **“synchronizing” but lack capital.** Or they find **clusters that constantly push the frequency upwards.**

- Yield Generation: The yield for bondholders is generated by a small percentage of the Token Distribution Epochs assigned to that subculture.
- The Merit-Backstop: Because the system is merit-driven, the bonds are “Self-Repaying.” As the subculture creates value (Merit M), the

protocol automatically directs a portion of the minted tokens to the ERC-4626 vault to retire the ERC-3475 bonds.

Sociostasis as a Risk Management Strategy

In traditional finance, “Burnout” is a hidden risk. In Resonant Meritocracy, it is a priced variable.

- **Support Mission Bonds**: Subcultures can issue specific short-term bonds to fund the restoration of “Left Behind” nodes.
- Psychological Rationale: Research on **Social Capital as Collateral** suggests that “Strong-Tie” networks (**high-harmony clusters**) have lower default rates because the social cost of failing the community is higher than the economic cost of the debt.
- **Anti-Fragility**: By allowing investors to choose risk profiles, the system becomes anti-fragile. **Junior tranche** investors want high-variance, **high “dissonance”** because it’s where the “100x” advancement breakthroughs happen, while **Senior investors** provide the **“Community Floor”.**

A **high-trust society** is not just a **productive** one, it is a **resonant** one. By rewarding “Helper Merit” and utilizing AI agents to maintain **Sociostatic Equilibrium**, a TinyMeritRank-based DAO moves from an **extractive economy to a regenerative one**. This framework ensures that as the system’s frequency increases, so does its economic value, sustained by a community that refuses to leave its members behind. The integration of ERC-4626 and ERC-3475 transforms the DAO from a social club into a **High-Frequency Economic Engine.** It solves the “Authority Fallacy” by letting the market decide which subcultures are worth the risk, while the TinyMeritRank protocol ensures that only genuine merit can repay those investments. This is a sustainable, high-trust society where the “vibe” is not just felt, it is funded.

Governance for Decentralized Autonomous Organizations

Decentralized Finance (DeFi) governance faces persistent challenges, including **low voter participation, whale dominance, conflicts of interest, and decision-making inefficiencies.** These issues, exemplified by recent disputes in protocols like Aave, undermine community trust and long-term sustainability. We proposes a hybrid governance model for the Tinyblock community, building on the TinyMeritRank protocol, a sybil-resistant, merit-driven token distribution system. Drawing from transparent government structures in Norway and Estonia, corporate best practices, and DeFi tools like Snapshot, the model combines elected executive elements for agility with merit-weighted voting for fairness. Key innovations include a strongly

backloaded vesting schedule to **incentivize sustainable successions**, a token vault with clawback mechanisms for accountability, mandatory conflict-of-interest disclosures for board members affiliated with service providers, and on-chain rewards for transparency via TinyMeritRank. This framework aims to bridge traditional finance with DAO-driven futures, fostering advancement over attention extraction.

Hybrid Governance Structure

The **Merit-Augmented Corporate DAO** integrates TinyMeritRank's reputation vectors into a structured framework, balancing **DAO democracy with corporate efficiency.** Key components:

- DAO Assembly: Ratifies major decisions (e.g. upgrades, large treasury spends) via on-chain votes using tools like Snapshot for gasless, verifiable participation. All data is auditable on an open portal, akin to Norwegian budgets.
- Elected Board (Oversight Council): 7-9 members, 2-year terms. Composition: 80% elected from stake and merit pools (45% merit-weighted via 12-month M_i aggregates, 35% stake-weighted), 20% public candidates with minimal trust (R_i > 0.01 from 5+ peers). Board oversees strategy and CEO, with live-streamed meetings.
- CEO (Executive Lead): 4-year term (renewable once), handles operations with board accountability. Uses multi-sig and automated dashboards for agility.

Board members and the CEO may affiliate with service provider companies (e.g. traditional finance integrators), **bridging legacy systems to DAOs**. However, conflicts of interest must be disclosed pre-election via a standardized framework. Major conflicts (e.g. competing protocol ownership) disqualify candidates. Disclosures are stored on-chain, with whistleblower protections.

Component	Inspiration	Responsibilities	Term/Election
DAO Assembly	Estonian e-voting	Ratify proposals	Ongoing, weighted vote via Snapshot
Board	Corporate boards, Norwegian transparency	Strategy, audits	2 years, merit/stake/public mix
CEO	Estonian digital execs	Operations	4 years, elected via weighted vote

Voting Mechanism

Votes use existing DeFi tools like Snapshot, with upstream contributions for merit integration (e.g. custom plugins for R_i weighting). Weights: 40% stake, 50% 12-month merit (M_i , decayed), 10% public (one-person-one-vote for trusted agents). Disbalance prevents concentration.

Executive Compensation and Incentives

Compensation for the CEO and board mixes stablecoins (for salaries and service provider payments) with DAO governance tokens (for performance-linked rewards), DAO-approved and totaling 1-2% of supply. Tokens are locked in a vault controlled by a threshold signature wallet under ultimate DAO control, **allowing borrowing against value** (market volatility makes this risky). **Vesting spans 8 years** with a strong backload to **promote long-term decisions and smooth successions**, drawing from crypto project trends emphasizing delayed unlocks for alignment. The first 50% distributes linearly over years 1-4 (post-1-year cliff). The remaining 50% is backloaded over years 5-8 with asymmetry (larger payouts in years 7-8) to **incentivize enduring contributions**.

Year	Release % (of Total Tokens)	Cumulative %	Rationale
1	0% (Cliff)	0%	Ensures commitment
2	12.5%	12.5%	Linear distribution starts
3	12.5%	25%	Builds retention
4	25%	50%	Completes first half
5	7.5%	57.5%	Backloaded begins modestly
6	10%	67.5%	Gradual increase
7	15%	82.5%	Asymmetrically rewards late-term endurance
8	17.5%	100%	Largest payout at end for succession incentive

Clawback Mechanisms

Clawbacks apply to the vault for underperformance or malice, proposed by the board or initiated by the community at any time via DAO vote. Triggers focus on past decisions impacting current token price, prioritizing sustainable growth over short-term pumps.

Additional Rewards for Transparency

The DAO, motivated through TinyMeritRank evaluations, can propose supplemental **governance token rewards to the CEO or board** for exemplary daily decisions and extreme transparency (e.g. on-chain tracking of actions). This incentivizes verifiable, auditable behavior while maintaining standard reporting requirements.

Transparency and Enforcement

Annual audits, on-chain logs, and Estonian-style data exchanges ensure scrutiny. Slashing extends to governance violations, per TinyMeritRank.

Future tooling

This hybrid model resolves DeFi paradoxes by augmenting TinyMeritRank with structured governance, fostering transparency, agility, and merit-driven progress. Future work could simulate outcomes via agent-based modeling.

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