CONCEPT LITEPAPER

ECHO Protocol Concept Litepaper

Residual payments and verifiable attribution for AI generated work

ECHO lets creators and autonomous agents receive a share of future revenue when their work contributes to paid downstream outputs.

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Concept status

ECHO is a proposed protocol and token design. It is not yet a live network, audited product, or token offering. Economic parameters remain subject to technical testing, security review, and legal analysis.

Executive Summary

ECHO is a proposed attribution and payment protocol for AI-generated work. It creates a record of how one piece of work contributes to another, then uses that record to distribute a defined portion of downstream revenue to earlier contributors.

The simple idea is residual payments for intelligence. If one agent produces research, another agent uses that research in a paid report, and a customer buys the report, the original research agent may receive an automatic share of the sale. The protocol records the relationship between the two outputs and routes payment according to rules accepted when the work is published or reused.

Customers and agents pay for work in USDC. The proposed ECHO token serves a different purpose: participants lock it as collateral when they publish monetized work, validate attribution, or challenge a questionable claim. Honest participants may earn rewards. Fraudulent or careless participants may lose part of their stake.

The Two Asset Model

Asset	Primary function	Typical users
USDC	Pays for AI work and distributes revenue to current and upstream contributors	Buyers, agents, creators, service providers
ECHO	Secures attribution claims through staking, validation, challenges, slashing, and later governance	Publishers, validators, challengers, delegates

ECHO is designed as an application token deployed on Arc. It is separate from Arc's network token plans and is not affiliated with Circle or Arc Network Services. Arc network fees remain payable in USDC, so a user interacting with ECHO contracts would still use USDC for gas.

What This Document Defines

- The problem ECHO is intended to solve
- The artifact and lineage model
- The role of USDC and the proposed ECHO token
- The validation, challenge, and slashing process
- A practical technical architecture and phased development plan
- Open questions that must be resolved before any token launch

The Problem

AI systems increasingly build on work produced by other models, agents, data services, and human contributors. A research output may be summarized, combined with market data, transformed into a recommendation, and sold as part of a final product. Payment systems can compensate the last seller, but they usually do not preserve a reliable economic record of the earlier contributions.

This creates three practical gaps.

1. Attribution is fragile. A downstream agent may declare its sources, omit them, or fabricate them. A hyperlink or citation alone does not prove that an artifact was used during execution.
2. Revenue stops at the final sale. Earlier contributors are normally paid once, even when their work continues to generate value in later products.
3. Reputation measures popularity more easily than economic usefulness. Ratings can show whether users liked a service, but they do not show which outputs repeatedly contributed to paid results.

The Proposed Solution

ECHO treats each reusable AI output as an artifact. An artifact can be research, code, analysis, a data extract, an image, a model result, an agent plan, or another defined unit of work. The protocol records the artifact's creator, content hash, usage terms, parent artifacts, residual payment policy, and supporting execution evidence.

When a new paid artifact declares earlier artifacts as parents, ECHO adds a new link to a directed acyclic graph. That graph shows how work flowed from one output into another. A payment router then uses the declared policy to divide a sale between the current creator, eligible upstream contributors, verification participants, and the protocol.

A Simple Example

Step	Action	Economic result
1	Agent A publishes a verified research artifact	Agent A defines reuse terms and locks an ECHO bond
2	Agent B uses that research to create a paid analysis	Agent B records Agent A's artifact as a parent
3	A customer buys the analysis for 10 USDC	The payment enters the ECHO royalty router
4	The router applies the sale policy	USDC is split among Agent B, upstream contributors, verification, and protocol operations
5	A validator or challenger reviews a disputed link	Accurate participants keep or earn stake; proven fraud can be slashed

An illustrative 10 USDC sale might send 9.20 USDC to the current creator, 0.60 USDC to an upstream contributor pool, 0.10 USDC to verification rewards, and 0.10 USDC to protocol operations. These values explain the mechanism only. Final percentages have not been selected.

How ECHO Works

ARTIFACT LIFECYCLE

Stage	Recorded information	Primary control
Publish	Creator signature, content hash, storage reference, terms, price, residual policy, expiration	Creator bond in ECHO
Reuse	Parent artifact identifiers, contribution weights, license acceptance, execution receipts	Signed lineage declaration
Sell	USDC payment amount and routing policy	Royalty Router contract
Validate	Evidence review and validator vote or attestation	Validator stake in ECHO
Challenge	Dispute reason, supporting evidence, challenge bond, ruling	Dispute Manager and slashing rules
Settle	Final USDC distribution and updated reputation data	Onchain payment and event records

What Goes Onchain

ECHO should avoid placing full AI outputs or private data onchain. The chain would store the minimum information needed to identify an artifact and enforce economic rights. That record may include the artifact identifier, content hash, creator address, parent identifiers, economic terms, timestamps, status, and evidence references.

The underlying content can remain in private storage, an encrypted object store, a content-addressed network, or another system chosen by the publisher. A hash can show that content has not changed, but it cannot prove that the content is true or original. ECHO therefore needs evidence and dispute mechanisms in addition to hashes.

How Attribution Is Proven

Attribution should use layered evidence instead of relying on one similarity score. A practical first version can combine the following records.

- Creator and agent signatures that identify who published or reused an artifact
- Signed tool calls, API receipts, or execution traces showing that a parent artifact was accessed
- Payment receipts associated with licensed access
- Content hashes and timestamps that establish a stable version
- Optional trusted execution or privacy-preserving attestations as the technology matures
- Human or automated validator review when a claim is challenged

Semantic similarity may help identify suspicious claims, but it should not be the sole basis for paying or slashing participants. Similar content can be produced independently, and genuine reuse may result in a very different final output.

How the ECHO Token Works

The proposed token coordinates a permissionless attribution network. End buyers do not need ECHO. They can purchase work in USDC. Participants use ECHO when their actions can affect attribution or payment rights.

Function	Who locks or receives ECHO	Purpose
Creator bonding	Publishers of monetized artifacts	Discourages spam and false ownership or lineage claims
Validator staking	Nodes that review attribution evidence	Creates collateral that can be penalized for dishonest or careless validation
Challenge bonds	Participants disputing a claim	Discourages nuisance disputes while giving legitimate challengers a path to act
Slashing	Proven dishonest publishers, validators, or challengers	Removes stake and funds defined remedies or rewards
Rewards	Accurate validators and successful challengers	Compensates participants who protect the lineage graph
Governance	Delegates or qualified token holders in a later phase	Adjusts defined protocol parameters after the system is stable

The Stake Cycle

1. A publisher, validator, or challenger acquires ECHO and locks the required amount in a protocol contract.
2. The participant performs an action that affects the lineage graph or a payment claim.
3. The stake remains locked during a defined challenge window.
4. If the action survives review, the participant can withdraw the stake and may receive a reward.
5. If fraud or material negligence is proven under the protocol rules, a defined portion of the stake may be slashed.

Why ECHO Is Not the Payment Currency

AI services need predictable pricing. A volatile payment token would make a one-cent API call or a ten-dollar report harder to price and account for. USDC is better suited to the payment role, while ECHO can remain focused on collateral, verification, disputes, and governance.

When a Token Is Justified

The protocol can demonstrate artifact registration and USDC payment routing before a token exists. A separate token becomes defensible only if ECHO operates a genuinely open validator and challenge network that needs shared collateral and rewards. If a small team controls every attribution decision, USDC bonds or a conventional database may be simpler. The project should prove the need for decentralized verification before launching ECHO.

Validation and Dispute Design

Attribution creates a direct claim on future revenue, so attackers may try to create fake parents, route payments to themselves, copy existing work, or collude with validators. ECHO must make those attacks more expensive than honest participation.

Illustrative Dispute Flow

1. A participant challenges an attribution link and locks an ECHO bond.
2. The disputed royalty share is temporarily held while undisputed funds continue to settle when possible.
3. A randomly selected validator group reviews the defined evidence package.
4. Validators submit commitments before revealing votes to reduce copying and coordination.
5. The Dispute Manager applies the ruling, releases or redirects the held USDC, and returns or slashes ECHO bonds.
6. A limited appeal may be available for large claims or conflicting evidence.

Key Attack Controls

Threat	Example	Possible control
Fake lineage	A seller names its own unrelated artifacts as parents	Execution receipts, challenge bonds, creator stake, validator review
Circular lineage	Artifacts point back to each other to manufacture claims	Enforce an acyclic graph and reject descendant-to-ancestor links
Self-dealing	One operator buys from itself to create reputation or rewards	Identity and wallet clustering, reward caps, delayed reputation credit
Validator collusion	A validator group approves false claims	Random selection, stake concentration limits, commit-reveal voting, appeals
Royalty explosion	Too many ancestors consume the entire sale	Maximum upstream pool, depth limits, minimum thresholds, contribution weights
Private data exposure	Evidence reveals confidential prompts or outputs	Encrypted storage, selective disclosure, privacy-preserving attestations

Royalty Limits

Residual payments need hard limits. The protocol should cap the total upstream share of any sale, limit the number of generations that receive payment, and define how contribution weights are calculated. Without those limits, a successful artifact could accumulate a long chain of obligations that makes reuse uneconomic.

Proposed Technical Architecture

Arc is an EVM-compatible Layer 1 network with USDC as gas and deterministic finality in under one second. Those properties allow ECHO to use standard Solidity tooling while pricing both gas and application payments in dollars. Circle's nanopayment infrastructure also supports small USDC payments by batching signed authorizations, which may become useful for high-volume artifact access.

Component	Primary responsibility
Artifact Registry	Creates immutable artifact identifiers and stores creator, hash, terms, status, and evidence references
Lineage Graph	Records parent relationships and rejects cycles or invalid links
Royalty Router	Receives USDC and distributes each sale according to the accepted payment policy
Stake Vault	Locks ECHO for publishing, validation, and challenges; manages release windows
Dispute Manager	Freezes disputed shares, selects validators, records rulings, and applies slashing
Reputation Index	Calculates economic-use metrics from validated lineage and settlement events
Governance Timelock	Controls approved upgrades and parameter changes after an initial security phase
Offchain Evidence Service	Stores or indexes signed receipts, traces, encrypted evidence, and content pointers

Information Flow

A buyer or agent requests an artifact and pays in USDC. The seller creates or updates a signed artifact record, including any parent artifacts used. The Royalty Router applies the current policy and emits settlement events. Validators inspect only the evidence needed for their task. The graph and reputation index update after the challenge period or final ruling.

Data and Privacy

Public blockchains are poor places for confidential prompts, proprietary code, personal data, or large model outputs. ECHO should store hashes and economic records onchain while keeping sensitive content offchain. Publishers should be able to prove access or contribution without automatically revealing the underlying material to every network participant.

Development Plan

The project should build the attribution product before centering the launch around a token. Each phase below creates a testable system and a clear decision about whether the next layer is necessary.

Phase	Product scope	Success test
Phase 1 Prototype	Artifact registry, declared parents, content hashes, basic USDC split payments, visual lineage explorer	Two or more agents can create, reuse, sell, and trace artifacts end to end
Phase 2 Evidence	Signed execution receipts, challenge window, administrator-reviewed disputes, capped royalty rules	The system distinguishes supported and unsupported lineage claims using documented evidence
Phase 3 Open Validation	Validator staking, randomized review, challenge bonds, slashing, reward distribution	Independent participants can secure disputes without a single operator making every decision
Phase 4 Production	Audits, monitoring, privacy controls, developer SDK, agent integrations, governance timelock	External teams can integrate safely and understand the economic rules
Phase 5 Expansion	Broader artifact types, privacy-preserving proofs, crosschain access, deeper agent reputation	Usage expands without weakening attribution quality or payment reliability

Minimum Viable Product

The first public demonstration should make the value visible without requiring a token sale. A user should be able to open an artifact, see its creator and parents, inspect the supporting receipts, buy the output in USDC, and watch the payment split settle. The lineage explorer should then show which upstream artifacts earned revenue.

A strong prototype can begin with a narrow artifact type, such as market research or structured data analysis, and a small group of known agents. Narrow scope will make attribution rules easier to test before the network handles arbitrary text, code, images, and private inputs.

Token Launch Requirements

No token supply, allocation, sale structure, or launch date is finalized in this concept. Before deployment, the project should publish and independently review the following information.

- Total supply or supply cap and the exact minting authority
- Team, community, treasury, validator, liquidity, and investor allocations
- Vesting schedules and onchain unlock controls
- Validator reward schedule and long-term funding source
- Stake minimums, challenge bonds, slashing ranges, and withdrawal delays
- Governance scope, emergency controls, upgrade keys, and timelocks
- Smart contract audits, economic attack testing, and incident response procedures
- Legal and regulatory analysis for the token, sale method, protocol fees, and supported markets

Economic Design Principles

Token rewards should compensate measurable security work rather than passive ownership. Emissions should decline or adjust as real protocol revenue grows. Team and investor allocations should vest over time. Governance should control a limited set of published parameters, and emergency powers should be transparent. The project should not promise price appreciation, yield, or profit sharing.

Risks and Limitations

Risk	Why it matters
Attribution uncertainty	No technical system can perfectly determine intellectual contribution from hashes or similarity alone
Oracle and evidence risk	Signed receipts can prove that an input was accessed, but not always how much it influenced the result
Sybil and collusion risk	Multiple wallets may belong to one operator, and validators may coordinate
Smart contract risk	Bugs can misroute payments, lock funds, or apply incorrect slashing
Privacy risk	Prompts, outputs, receipts, or metadata may expose confidential or personal information
Token volatility	The value of staked ECHO may change sharply and weaken or overburden security requirements
Legal uncertainty	Residual payments, licensing, automated agents, and token distribution may receive different treatment across jurisdictions
Adoption risk	Creators and agent platforms may reject the extra recording, licensing, and dispute steps

Current Status

ECHO is a concept for technical and economic development. The architecture, token mechanics, percentages, and roadmap in this paper are proposals. They may change after prototyping, user testing, audits, economic simulation, and legal review. The paper does not guarantee that ECHO is unique, feasible at scale, or suitable for every form of AI output.

Important Disclosures

This document is for informational and design discussion purposes only. It is not an offer to sell or a solicitation to buy a token, security, financial product, or investment. It does not provide legal, tax, financial, or investment advice. Digital assets involve substantial risk, including loss of value, smart contract failure, network disruption, regulatory change, and loss of access. ECHO is independent from and not endorsed by Circle, Arc Network Services, or USDC.

Sources

1 Circle announces the Arc public mainnet launch

2 Arc Network documentation

3 Arc stablecoin native model

4 Circle Gateway nanopayments documentation

5 Arc deterministic finality documentation

Source references support statements about Arc, USDC gas, EVM compatibility, finality, and Circle nanopayments. The ECHO protocol design itself is a proposal developed in this paper.