

No Server Exchange of Value Credits (VCs)

A Decentralized Validation Network Using AI-Replicated Nodes

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Executive Summary

This white paper introduces No Server Exchange of Value Credits (VCs), a novel approach to digital currency that eliminates centralized servers, permanent audit trails, and energy-intensive blockchain mining while maintaining transaction integrity through AI-replicated validation nodes. The system combines the privacy benefits of cash with the security of cryptographic validation, creating a truly decentralized yet auditable exchange mechanism.

Unlike blockchain systems that maintain permanent public ledgers or fiat currencies that rely on centralized banking infrastructure, VCs use ephemeral validation through open-source nodes that can be replicated and operated by AI agents, ensuring network resilience without centralized control.

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1. Introduction

1.1 The Problem with Current Systems

Modern value exchange systems suffer from fundamental tradeoffs:

Fiat Currency:

- Requires centralized banking infrastructure
- Involves transaction fees and intermediaries
- Enables comprehensive surveillance of financial activities
- Subject to arbitrary monetary policy and inflation
- Excludes the unbanked population

Blockchain/Cryptocurrency:

- Maintains permanent public ledgers (privacy concerns)
- Requires enormous energy consumption for mining
- Suffers from scalability limitations
- Creates irreversible transaction history
- Complex for average users to understand and use

Cash:

- Physical limitations (can't transmit digitally)
- No cryptographic proof of authenticity
- Vulnerable to counterfeiting
- Difficult to verify in peer-to-peer transactions

1.2 The Value Credits Solution

No Server Exchange of Value Credits (VCs) introduces a third paradigm that combines the best aspects of each system:

- **Privacy of cash** - No permanent transaction ledger
 - **Security of blockchain** - Cryptographic validation prevents fraud
 - **Efficiency of digital** - Instant peer-to-peer transfers
 - **Decentralization** - No central authority or single point of failure
 - **Sustainability** - Minimal computational overhead
-

2. System Architecture

2.1 Core Components

The VC system consists of three primary components:

Value Credits (VCs):

- Cryptographically signed digital tokens
- Each VC contains a unique hash identifier
- Issued with tamper-proof server signatures
- Cannot be duplicated or forged

Validation Nodes:

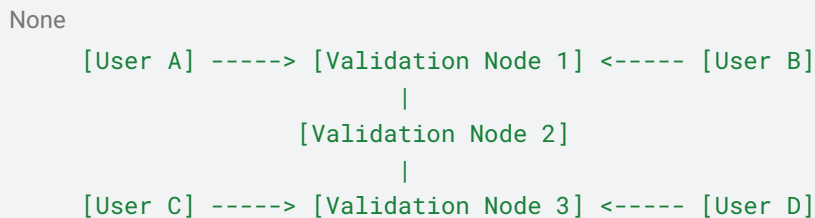
- Open-source server software
- Validates transfer requests
- Issues cryptographic signatures
- Does not store transaction history
- Can be operated by anyone

User Clients:

- Lightweight applications (web, mobile, CLI)
- Store VCs locally
- Generate transfer requests
- Verify server signatures

2.2 Network Topology

The VC network operates as a distributed mesh of validation nodes:



Users can connect to any validation node. Nodes communicate only to verify VC authenticity, not to maintain a shared ledger. This creates a truly decentralized network without blockchain's synchronization overhead.

2.3 Data Flow

No Persistent Storage:

- Validation nodes verify requests in real-time
- Once validated, the transaction data is discarded
- No audit trail is maintained by the network
- Users maintain their own transaction records if desired

This ephemeral validation model provides privacy while preventing double-spending through cryptographic state markers.

3. How Value Credits Work

3.1 Credit Creation

Value Credits are initially created through a controlled issuance process:

Step 1: Credit Generation

None

```
VC_hash = HASH(issuer_public_key + timestamp + random_nonce)
```

Step 2: Server Signature

None

```
VC_signature = SIGN(VC_hash, server_private_key)
```

Step 3: Credit Structure

JSON

```
{
  "hash": "7a3f9e4b2c1d8f5a...",
  "signature": "4b7e9a2f1c8d5e3a...",
  "issuer": "node_public_key",
  "created": 1706572800,
  "status": "active"
```

```
}
```

3.2 Credit Properties

Each Value Credit has the following properties:

- **Uniqueness** - Cryptographic hash ensures no two VCs are identical
- **Verifiability** - Server signature can be validated by any node
- **Non-repudiation** - Signed transfers cannot be denied
- **Transferability** - Can be sent to any user with cryptographic proof
- **Finality** - Once transferred and validated, the VC belongs to the recipient

3.3 Credit Lifecycle

None

```
[Creation] -> [Active] -> [Transfer Pending] -> [Transferred] -> [Active (new owner)]
```

At any moment, a VC exists in one of these states, but only the current owner tracks this state locally. The network does not maintain this information.

4. AI-Replicated Validation Nodes

4.1 The Innovation: AI Operators

Traditional distributed systems require manual node deployment and maintenance. The VC system introduces AI-replicated nodes that can autonomously:

- Deploy new validation nodes
- Monitor network health
- Scale capacity based on demand
- Maintain software updates
- Detect and respond to attacks

4.2 Open Source Foundation

The validation node software is completely open source:

Benefits:

- Anyone can audit the code for security vulnerabilities
- No proprietary algorithms or hidden backdoors
- Community-driven development and improvements
- Transparent validation logic
- Free to deploy and operate

Repository Structure:

```
None
vc-validation-node/
├─ src/
│   ├─ validator.js      # Core validation logic
│   ├─ signature.js      # Cryptographic operations
│   ├─ network.js        # Inter-node communication
│   └─ api.js            # User-facing API
├─ tests/
├─ docs/
└─ LICENSE (MIT/Apache 2.0)
```

4.3 AI Agent Deployment

AI agents can operate validation nodes through several mechanisms:

Autonomous Deployment:

- AI agents read the open-source code
- Provision cloud infrastructure (AWS, Azure, DigitalOcean)
- Deploy and configure validation nodes
- Monitor performance metrics
- Scale horizontally based on traffic

Self-Replication:

- Successful nodes spawn additional instances
- Geographic distribution for resilience
- Load balancing across node clusters
- Automatic failover and recovery

Coordinated Swarms:

- AI agents form cooperative networks

- Share validation workload
- Cross-verify high-value transactions
- Detect and quarantine malicious nodes

4.4 Economic Incentives for Node Operators

While the system has no transaction fees, node operators can be incentivized through:

- **Voluntary Tips** - Users can attach optional tips to transfers
- **Premium Services** - Faster validation, guaranteed uptime
- **Network Subsidies** - Early adopter rewards, foundation grants
- **Reputation Systems** - Trustworthy nodes attract more users

AI agents optimize for these incentives while maintaining network integrity.

4.5 Node Validation Process

When a node receives a transfer request:

Step 1: Verify VC Signature

```
JavaScript
isValid = verifySignature(VC.hash, VC.signature, issuer_public_key)
```

Step 2: Check VC Status

```
JavaScript
// Query issuer node or cache for double-spend check
isNotSpent = checkNotInSpentCache(VC.hash)
```

Step 3: Generate Transfer Token

```
JavaScript
transfer_token = {
  vc_hash: VC.hash,
  sender: sender_pubkey,
  recipient: recipient_pubkey,
  timestamp: now(),
  nonce: random()
}
```

```
transfer_signature = SIGN(transfer_token, node_private_key)
```

Step 4: Mark as Spent (Temporary)

```
JavaScript  
addToSpentCache(VC.hash, expiry: 60_seconds)
```

Step 5: Return Signed Transfer

```
JavaScript  
return {  
  transfer_token,  
  transfer_signature,  
  validator_node: node_public_key  
}
```

The spent cache is ephemeral and expires after transfers are claimed or timeout.

5. Transaction Flow

5.1 Peer-to-Peer Transfer

Scenario: Alice wants to send 5 VCs to Bob

Step 1: Alice initiates transfer

- Selects 5 VCs from her local wallet
- Specifies Bob's public key as recipient
- Sends request to a validation node

Step 2: Validation node processes

- Verifies Alice owns the VCs (signature check)
- Confirms VCs haven't been spent (cache check)
- Generates transfer code with node signature
- Marks VCs as temporarily locked (60 second window)

Step 3: Alice shares transfer code

- Receives base64-encoded transfer token
- Sends to Bob via any channel (QR code, message, email)

Step 4: Bob claims the transfer

- Decodes the transfer token
- Submits to any validation node
- Node verifies signatures and ownership chain
- VCs are added to Bob's wallet
- Alice's VCs are permanently invalidated

Step 5: Cleanup

- Original validation node removes spent cache entry
- No record of the transaction remains in the network
- Alice and Bob optionally keep local records

5.2 Multi-Party Transactions

The system supports complex transaction patterns:

Split Payments:

```
None
Alice -> Node -> [3 VCs to Bob, 2 VCs to Carol]
```

Batch Transfers:

```
None
Alice -> Node -> 50 VCs in one transfer code
```

Conditional Transfers:

```
None
Alice -> Node -> "Release to Bob only if Carol also sends 10 VCs"
```

These are handled through smart transfer tokens that encode multiple recipients or conditions.

5.3 Transaction Finality

Transactions achieve finality when:

- Transfer code is claimed by recipient
- Validator signature is verified
- VCs are added to recipient's wallet

This typically occurs in under 1 second, compared to 10+ minutes for Bitcoin or hours for traditional bank transfers.

6. Comparison with Existing Systems

6.1 Feature Matrix

Feature	Value Credits	Blockchain	Fiat Currency
Transaction Speed	<1 second	10 min - 1 hour	Hours to days
Privacy	High (no ledger)	Low (public ledger)	Medium (bank records)
Energy Consumption	Minimal	Extremely high	Moderate
Decentralization	Fully distributed	Distributed ledger	Centralized banks
Transaction Fees	Optional/minimal	Required (gas fees)	2-3% typical
Scalability	Linear with nodes	Limited (7-15 tps)	High but centralized
Audit Trail	User-controlled	Permanent public	Bank/government access
Reversibility	No (like cash)	No	Yes (chargebacks)
Regulation Resistance	High	Medium	Low
User Complexity	Low	High	Low

6.2 Blockchain vs Value Credits

What Blockchain Does:

- Maintains permanent, immutable ledger
- Requires consensus across all nodes
- Uses proof-of-work or proof-of-stake
- Every transaction is public and traceable

What Value Credits Do:

- Validates transactions ephemerally
- No consensus needed (stateless validation)
- Uses cryptographic signatures only
- Transactions are private and untraceable

Why This Matters:

- Blockchain's permanent ledger is a privacy liability
- Consensus mechanisms don't scale well
- Energy consumption is unsustainable
- Users don't need global transaction history to verify ownership

6.3 Fiat Currency vs Value Credits

Fiat Advantages:

- Legal tender status
- Government backing and insurance
- Well-established infrastructure
- Easy reversibility (consumer protection)

Value Credits Advantages:

- No central authority can freeze funds
- Works anywhere with internet
- No bank account required
- Instant settlement
- No currency conversion fees
- Immune to monetary policy manipulation

Use Case Alignment:

- Fiat: Large purchases, regulated transactions, loans
- VCs: Peer-to-peer payments, international transfers, privacy-sensitive transactions

7. Security Model

7.1 Threat Analysis

Attack Vector 1: Counterfeiting

- **Threat:** Create fake VCs
- **Mitigation:** Server signatures cannot be forged without private key
- **Risk Level:** Very Low

Attack Vector 2: Double-Spending

- **Threat:** Spend the same VC twice
- **Mitigation:** Ephemeral spent cache + cryptographic locking
- **Risk Level:** Low (60-second window)

Attack Vector 3: Node Compromise

- **Threat:** Malicious validation node
- **Mitigation:** Multi-node verification, reputation systems
- **Risk Level:** Low (users choose trusted nodes)

Attack Vector 4: Network Partition

- **Threat:** Split network leads to conflicting states
- **Mitigation:** Gossip protocol for node discovery
- **Risk Level:** Medium (resolved on reconnection)

Attack Vector 5: Replay Attacks

- **Threat:** Reuse old transfer codes
- **Mitigation:** Nonces and timestamp expiration
- **Risk Level:** Very Low

7.2 Cryptographic Foundations

Digital Signatures:

None

Algorithm: Ed25519 (Curve25519)

Key Size: 256 bits

Signature Size: 512 bits

Security: 128-bit (quantum-resistant variants available)

Hash Functions:

None

Algorithm: SHA-256 or BLAKE3

Output Size: 256 bits

Collision Resistance: 2^{128} operations

Random Number Generation:

None

Source: /dev/urandom or Web Crypto API

Entropy: Hardware RNG or cryptographically secure PRNG

7.3 Trust Model

The VC system operates on a "trust but verify" model:

Users trust:

- The open-source validation code (auditable)
- The cryptographic primitives (industry standard)
- The nodes they choose to connect to (reputation-based)

Users do NOT trust:

- Any single validation node
- The network to maintain their transaction history
- Central authorities or intermediaries

Verification mechanisms:

- Multiple signature checks at each step
- Cross-node validation for high-value transfers

- Client-side verification of all server responses
 - Public key infrastructure for node identity
-

8. Privacy Guarantees

8.1 Transaction Privacy

What is NOT recorded:

- Sender identity (only public key)
- Recipient identity (only public key)
- Transaction purpose or description
- IP addresses or metadata
- Historical transaction graph

What CAN be determined:

- A specific VC was transferred (by the parties involved)
- The timestamp of the transfer (approximate)
- The validation node used (temporarily)

Privacy Level: Comparable to physical cash transactions with the added benefit of cryptographic non-repudiation when needed.

8.2 Network-Level Privacy

Onion Routing Integration: Users can connect to validation nodes through Tor or I2P for IP anonymity.

Mixing Services: Optional VC mixing services can shuffle credits between users to break ownership chains.

Stealth Addresses: One-time recipient addresses prevent linking multiple transfers to the same user.

8.3 Regulatory Considerations

The VC system walks a fine line:

Compliance-Friendly Features:

- Users can voluntarily maintain transaction records
- Businesses can implement KYC at the application layer

- Specific VCs can be tagged for regulatory purposes
- Authorities can subpoena individual users (not the network)

Privacy-Preserving Features:

- No central database to seize or surveil
- Network doesn't know who transacts with whom
- Users control their own data disclosure

This allows VCs to be used for both legitimate privacy-conscious transactions and regulated commercial activities.

9. Economic Implications

9.1 Monetary Policy

Supply Control: The total supply of VCs can be managed through:

- Controlled issuance by founding nodes
- Algorithmically determined creation rate
- Democratic governance by node operators
- Fixed supply cap (like Bitcoin) or flexible (like fiat)

Inflation/Deflation: Unlike fiat currency with central bank control, VC monetary policy is:

- Transparent and predictable
- Governed by protocol rules
- Not subject to political manipulation
- Community-driven through governance

9.2 Economic Benefits

For Individuals:

- Zero or minimal transaction fees
- Instant settlement (no waiting for bank transfers)
- Access for the unbanked (only internet required)
- Protection from currency devaluation
- True ownership (no account freezes)

For Businesses:

- Lower payment processing costs (no 2-3% credit card fees)
- Faster cash flow (instant settlement)
- Global reach without currency conversion
- Programmable payments (smart contracts possible)
- Reduced fraud (cryptographic verification)

For Society:

- Financial inclusion for 1.7 billion unbanked people
- Reduced dependence on commercial banks
- Competition for legacy payment systems
- Innovation in financial services
- Privacy protection from mass surveillance

9.3 Market Dynamics

Price Discovery:

- VCs can float against fiat currencies
- Market-determined exchange rates
- Arbitrage opportunities across platforms
- Stable over time as adoption grows

Adoption Curve:

None

Early Adopters -> Tech Enthusiasts -> Merchants -> General Public
(Privacy-conscious) (Developers) (Cost-savings) (Convenience)

Network Effects: Value increases as more users and merchants accept VCs, creating a positive feedback loop.

10. Implementation Roadmap

10.1 Phase 1: Proof of Concept (Q1 2026)

Deliverables:

- Core validation node software (open source)
- Reference client implementation (web app)

- Testnet with 10 manually operated nodes
- Documentation and API specifications
- Security audit by third-party firm

Milestones:

- 1,000 test users
- 10,000 test transactions
- Zero critical security vulnerabilities

10.2 Phase 2: AI Node Deployment (Q2-Q3 2026)

Deliverables:

- AI agent framework for node deployment
- Automated monitoring and scaling
- Geographic distribution across 5 continents
- 100+ AI-operated validation nodes
- Mobile client applications (iOS/Android)

Milestones:

- 50,000 active users
- 1 million transactions per month
- <500ms average validation time

10.3 Phase 3: Ecosystem Growth (Q4 2026)

Deliverables:

- Merchant integration SDKs
- Point-of-sale applications
- VC debit cards (fiat conversion)
- Multi-signature wallets
- Governance framework

Milestones:

- 500,000 active users
- 1,000 merchant accepting VCs
- 10 million transactions per month

10.4 Phase 4: Mainstream Adoption (2027+)

Deliverables:

- Browser extensions
- Smart contract capabilities
- Decentralized exchanges
- Cross-chain bridges
- Enterprise solutions

Milestones:

- 10 million active users
- 100,000 merchants
- Parity with existing payment networks

10.5 Technical Specifications

Validation Node Requirements:

None

CPU: 2 cores minimum

RAM: 4GB minimum

Storage: 10GB SSD

Bandwidth: 1Mbps sustained

OS: Linux, macOS, Windows

Client Requirements:

None

Modern web browser OR

Mobile device (Android 8+, iOS 13+) OR

Command-line terminal

Network Specifications:

None

Protocol: HTTPS/WSS

Port: 443 (standard HTTPS)

API Format: REST + WebSocket

Encoding: JSON

Compression: gzip/brotli

11. Conclusion

11.1 Summary of Advantages

No Server Exchange of Value Credits represents a paradigm shift in digital currency:

Technical Innovation:

- Ephemeral validation eliminates blockchain bloat
- AI-replicated nodes ensure decentralization
- Cryptographic security without energy waste
- Linear scalability with network growth

Economic Benefits:

- Near-zero transaction costs
- Instant global settlements
- Financial inclusion for the unbanked
- Resistance to monetary manipulation

Privacy Protection:

- No permanent transaction ledger
- Cash-like anonymity with digital convenience
- User-controlled disclosure
- Immune to mass surveillance

Usability:

- Simple peer-to-peer transfers
- No complex wallet management
- Works on any device
- Familiar user experience

11.2 Why VCs Will Succeed

Blockchain's Fatal Flaw: Permanent public ledgers are a privacy nightmare. Every transaction you've ever made is permanently recorded for eternity. This is antithetical to financial privacy.

Fiat's Achilles Heel: Centralized control enables censorship, surveillance, and arbitrary policy changes. Governments can freeze accounts, inflate currency, or restrict transactions at will.

The VC Advantage: By combining the privacy of cash with the security of cryptography and the resilience of distributed systems, Value Credits offer a genuinely superior alternative for peer-to-peer value exchange.

11.3 The Path Forward

The success of Value Credits depends on:

Community Adoption:

- Open-source development
- Merchant integration
- User education
- Network effects

Technical Excellence:

- Robust security
- Reliable infrastructure
- Continuous improvement
- Scalability solutions

Regulatory Navigation:

- Compliance where required
- Privacy where possible
- Transparent governance
- Cooperative engagement

11.4 Call to Action

For Developers: Contribute to the open-source codebase, deploy validation nodes, build applications on the VC network.

For Users: Adopt VCs for peer-to-peer payments, demand merchant acceptance, educate others about financial privacy.

For Merchants: Integrate VC payments to reduce fees, reach new customers, and support financial innovation.

For AI Researchers: Deploy autonomous validation nodes, optimize network efficiency, advance decentralized systems.

For Regulators: Engage constructively with the community, balance privacy with legitimate oversight, enable innovation.

Appendix A: Technical Deep Dive

A.1 Transfer Token Structure

JSON

```
{
  "version": "1.0",
  "transfer": {
    "credits": [
      {
        "hash": "7a3f9e4b2c1d8f5a6e9b7c4d2a1f8e3b",
        "signature": "node_sig_4b7e9a2f...",
        "issuer_pubkey": "ed25519:AAB3F7..."
      }
    ],
    "sender_pubkey": "ed25519:CCE5A1...",
    "recipient_pubkey": "ed25519:DDF6B2...",
    "timestamp": 1706572800,
    "nonce": "3e7f9a2b1c8d4e5f",
    "validator_pubkey": "ed25519:EEG7C3...",
    "validator_signature": "sig_9a2b1c8d..."
  },
  "metadata": {
    "amount": 5,
    "expiry": 1706572860,
    "memo": "optional encrypted message"
  }
}
```

A.2 Cryptographic Verification Algorithm

JavaScript

```
function verifyTransfer(transferToken, recipientPrivateKey) {
  // Step 1: Verify timestamp not expired
  if (transferToken.timestamp + 300 < Date.now() / 1000) {
    return { valid: false, reason: "Transfer expired" };
  }

  // Step 2: Verify each credit signature
```

```

for (const credit of transferToken.credits) {
  const isValidCredit = verifySignature(
    credit.hash,
    credit.signature,
    credit.issuer_pubkey
  );
  if (!isValidCredit) {
    return { valid: false, reason: "Invalid credit signature" };
  }
}

// Step 3: Verify validator signature on transfer
const transferHash = hash(JSON.stringify({
  credits: transferToken.credits.map(c => c.hash),
  sender: transferToken.sender_pubkey,
  recipient: transferToken.recipient_pubkey,
  timestamp: transferToken.timestamp,
  nonce: transferToken.nonce
})));

const isValidTransfer = verifySignature(
  transferHash,
  transferToken.validator_signature,
  transferToken.validator_pubkey
);

if (!isValidTransfer) {
  return { valid: false, reason: "Invalid transfer signature" };
}

// Step 4: Verify recipient matches
if (transferToken.recipient_pubkey !== derivePublicKey(recipientPrivateKey))
{
  return { valid: false, reason: "Not intended for this recipient" };
}

return { valid: true, credits: transferToken.credits };
}

```

A.3 Double-Spend Prevention

Ephemeral Spent Cache:

JavaScript

```
class SpentCache {
  constructor() {
    this.cache = new Map();
    this.cleanupInterval = setInterval(() => this.cleanup(), 10000);
  }

  markSpent(creditHash, expirySeconds = 60) {
    this.cache.set(creditHash, {
      markedAt: Date.now(),
      expiresAt: Date.now() + (expirySeconds * 1000)
    });
  }

  isSpent(creditHash) {
    const entry = this.cache.get(creditHash);
    if (!entry) return false;
    if (Date.now() > entry.expiresAt) {
      this.cache.delete(creditHash);
      return false;
    }
    return true;
  }

  cleanup() {
    const now = Date.now();
    for (const [hash, entry] of this.cache.entries()) {
      if (now > entry.expiresAt) {
        this.cache.delete(hash);
      }
    }
  }
}
```

Cross-Node Verification: For high-value transfers, nodes can optionally consult peer nodes:

JavaScript

```
async function verifyWithPeers(creditHash, peerNodes) {
  const promises = peerNodes.map(peer =>
    fetch(`https://${peer}/api/verify/${creditHash}`)
      .then(r => r.json())
      .catch(() => ({ spent: false, reachable: false })))
  );
```

```
const results = await Promise.all(promises);
const reachablePeers = results.filter(r => r.reachable);
const markedSpent = reachablePeers.filter(r => r.spent).length;

// If majority of reachable peers say it's spent, reject
return markedSpent <= reachablePeers.length / 2;
}
```

Appendix B: FAQ

Q: How is this different from Bitcoin?

A: Bitcoin maintains a permanent public ledger of all transactions. VCs validate transfers ephemerally without storing history, providing better privacy and efficiency.

Q: Who controls the money supply?

A: The protocol rules determine issuance, governed by the community of node operators through a democratic process. No single entity controls supply.

Q: What if a validation node goes offline?

A: Users connect to any available node. The network is resilient to node failures due to AI replication and geographic distribution.

Q: Can I reverse a transaction?

A: No, VCs are like digital cash - once transferred, they're final. This prevents chargebacks but requires care when transacting.

Q: Is this legal?

A: VCs are tools for value exchange. Legality depends on jurisdiction and use case. Users are responsible for compliance with local laws.

Q: How do I get Value Credits?

A: Through exchanges, peer-to-peer purchases, merchant payments, or early adopter programs during initial distribution.

Q: What prevents inflation?

A: The protocol can enforce a fixed supply cap or predictable issuance schedule, similar to Bitcoin's halving but with more flexible governance.

Q: Can governments shut this down?

A: The decentralized nature makes it extremely difficult. Shutting down VCs would require blocking the entire internet or compromising thousands of independent nodes globally.

Q: What about quantum computers?

A: The system can upgrade to quantum-resistant cryptography (e.g., CRYSTALS-Dilithium) as quantum threats emerge.

Q: Why would AI agents run validation nodes?

A: AI agents can earn rewards through voluntary tips, premium services, or simply to support the network they use for their own transactions.

Appendix C: References

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"Privacy is necessary for an open society in the electronic age. Privacy is not secrecy... Privacy is the power to selectively reveal oneself to the world."

— Eric Hughes, A Cypherpunk's Manifesto (1993)