
LitVM
Litecoin's Virtual Machine
LitVM Litepaper V3
www.litvm.com

Contents

1. **Introduction**
   - 1.1. Background: The Evolution of Litecoin
   - 1.2. The Need for a Litecoin Rollup
   - 1.3. LitVM's Vision
   - 1.4. Market Context and Opportunity
2. **LitVM Overview**
   - 2.1. Core Purposes
   - 2.2. Target Audience
   - 2.3. Interoperability Goals
3. **Technical Architecture**
   - 3.1. Hybrid Rollup Architecture
   - 3.2. Charms Protocol Integration
   - 3.3. Arbitrum Orbit and Nitro
   - 3.4. Succinct zkVM
   - 3.5. Espresso Shared Sequencer
   - 3.6. Dual Bridge Architecture
   - 3.7. EVM Compatibility
   - 3.8. Asset Support
   - 3.9. Scalability and Performance
   - 3.10. Security Guarantees
4. **Tokenomics**
   - 4.1. Dual-Token Model
   - 4.2. zkLTC: The Gas Token
   - 4.3. LITVM: Governance and Utility Token
   - 4.4. Revenue Model
   - 4.5. Community Allocation
5. **Governance**
   - 5.1. The Litecoin DAO
   - 5.2. Treasury Board
   - 5.3. Proposal Process
6. **Use Cases**
   - 6.1. Yield Markets (DeFi & Institutional)
   - 6.2. Real-World Assets
   - 6.3. AI Ecosystem
   - 6.4. Advanced Payments Infrastructure

6.5. NFTs and Litecoin Ordinals
6.6. Gaming and Metaverse
6.7. Decentralized Identity and Governance

7. Ecosystem Benefits

7.1. For the Litecoin Community
7.2. For EVM Developers
7.3. For Bitcoin and the Broader Crypto Ecosystem

8. Strategic Partners

9. Conclusion

Abstract

LitVM is Litecoin's first trustless EVM rollup, designed to unlock the full spectrum of Web3 functionality for the Litecoin community. Officially endorsed by the Litecoin Foundation, LitVM transforms Litecoin from a payment-focused network into a fully programmable Web3 ecosystem.

Built on Arbitrum Orbit using the Nitro stack and integrated with the Charms protocol, LitVM delivers an EVM-compatible smart contract environment for Litecoin—enabling Web3 functionality such as yield markets, DeFi, real-world asset (RWA) tokenization, and AI-driven applications while connecting native LTC to the Ethereum and LitVM ecosystems through trustless bridging infrastructure.

LitVM follows the mantra of "Hard Money Web3"— bringing the principles of hard money (scarcity, security, and decentralization) to programmable blockchain applications. Through the Charms protocol, LitVM enables trustless bridging of native LTC into the EVM ecosystem as zkLTC using client-side validation and zero-knowledge proofs, bringing Litecoin-native value into a high-performance EVM environment without relying on a traditional custodial bridge.

By combining Ethereum settlement with trustless LTC bridging, LitVM aims to redefine Litecoin's role in the modern Web3 landscape.

1. Introduction

1.1 Background: The Evolution of Litecoin

Litecoin (LTC), launched in 2011 by Charlie Lee, was created as a faster, more efficient complement to Bitcoin, often described as the "silver to Bitcoin's gold." Built on a Scrypt-based proof-of-work (PoW) consensus mechanism, Litecoin offers a 2.5-minute block time—four times faster than Bitcoin's—enabling rapid transaction confirmations and low fees, typically under $0.01. These attributes have made Litecoin a preferred choice for everyday payments, microtransactions, and merchant adoption, with integrations in payment processors like Travala and BitPay (where it tops the rankings as the most used

cryptocurrency by transaction volume). Over its 15-year history, Litecoin has maintained a prominent position in the cryptocurrency rankings, with a market cap exceeding $20 billion at its peak, hundreds of millions of lifetime transactions processed, and hundreds of thousands of daily active addresses.

Litecoin's development has prioritized simplicity, security, and decentralization, aligning with Bitcoin's core principles. Key milestones include its early adoption of Segregated Witness (SegWit) in 2017, which improved transaction malleability and enabled future scaling solutions, and the introduction of MimbleWimble Extension Blocks (MWEB) in 2022, which added optional privacy for shielded transactions. This has solidified Litecoin's reputation as an innovator when it comes to features later adopted by Bitcoin, reinforcing its role as a complementary network.

However, the rise of smart contract platforms like Ethereum, which supports DeFi, NFT infrastructure, and a wide array of decentralized applications (dApps), has exposed limitations in Litecoin's Layer-1 (L1) design. Lacking native smart contract functionality, Litecoin has been unable to support complex Web3 use cases, restricting its participation in high-growth sectors. While Litecoin's focus on payment efficiency remains a strength, the absence of a scalable Layer-2 (L2) rollup has hindered its ability to compete in the rapidly evolving Web3 ecosystem, where programmability and interoperability are paramount.

Furthermore, while the Bitcoin ecosystem has witnessed the birth of numerous L2s to provide extended functionality to the Bitcoin mainchain, Litecoin has significantly lagged behind. This undermines the previous work Litecoin has done to forge its position as Bitcoin's innovative counterpart for new upgrades and functionality, and threatens its continued relevance in the modern blockchain landscape.

1.2 The Need for a Litecoin Rollup

Layer-2 solutions have become a cornerstone of blockchain scalability, enabling blockchains to process transactions off-chain while preserving the security and decentralization of the mainnet (Layer-1). Technologies like zero-knowledge rollups (zkRollups) and optimistic rollups batch thousands of transactions into compact proofs, reducing congestion, lowering fees, and supporting complex computations. For Litecoin, an L2 solution is critical to address its current limitations and unlock new opportunities:

Enhance Scalability: Litecoin's L1 processes approximately 50 transactions per second (TPS), insufficient for Web3 applications requiring high throughput. A rollup can scale to

thousands of TPS, supporting and unlocking new use cases for LTC and Litecoin-native assets like LTC-20 tokens, Ordinals, and Runes.

Enable Smart Contracts: By introducing Ethereum Virtual Machine (EVM) compatibility, a rollup allows developers to deploy smart contracts for yield markets, DeFi protocols, RWA platforms, AI applications, NFT marketplaces, gaming dApps, and more, expanding Litecoin's utility far beyond payments.

Foster Innovation: A rollup attracts developers to build tailored applications, leveraging Litecoin's low-cost transactions and privacy focus to create novel use cases, such as tokenized real-world assets (RWAs), institutional-grade yield strategies, and AI-integrated consumer applications.

Strengthen Interoperability: A trustless rollup can bridge Litecoin with Ethereum's ecosystem while aligning with Bitcoin's decentralized ethos, enabling cross-chain asset transfers and collaborative dApps.

Without a robust rollup, Litecoin risks being sidelined in the Web3 era, where scalability and programmability drive adoption. LitVM addresses these needs by providing a trustless EVM rollup that preserves Litecoin's core strengths while integrating advanced Web3 capabilities.

1.3 LitVM's Vision

LitVM is Litecoin's first trustless EVM rollup, designed to propel Litecoin into the forefront of the Web3 era. By combining Litecoin's fast, low-cost transactions with Ethereum's programmability and Bitcoin's philosophical alignment, LitVM unlocks a wide range of use cases, including yield markets, RWAs, AI applications, DeFi, and more.

LitVM leverages a hybrid rollup architecture—combining the speed of optimistic rollups with the cryptographic security of zero-knowledge proofs—to deliver high-performance EVM execution while settling to Ethereum. Through its integration with Charms, LitVM provides trustless bridging between Litecoin and the EVM ecosystem, enabling native LTC to participate in programmable applications without requiring Litecoin itself to become a smart contract platform.

The vision of LitVM is to create a vibrant, community-driven ecosystem where:

- **Litecoin Users** can access advanced Web3 services, such as earning yield on LTC through DeFi protocols, participating in tokenized real-world assets, or engaging with AI-powered applications, all with sub-cent fees.

- **Developers** can build scalable dApps using familiar Ethereum tools (e.g., Solidity, Hardhat, Foundry, MetaMask), integrating Litecoin-native assets and cross-chain data.
- **The Broader Crypto Ecosystem** benefits from trustless cross-chain connectivity through Charms, creating pathways between Litecoin, Ethereum, Bitcoin, Cardano, and other ecosystems integrated with the protocol. This opens the door for LTC, Bitcoin-native assets, Cardano assets, and other supported assets to participate in LitVM's programmable ecosystem.
- **Bitcoin's Principles** are upheld through a decentralized, trust-minimized design, supporting programmable BTC and fostering collaboration between Litecoin and Bitcoin communities.

LitVM aims to redefine Litecoin's role as a Hard Money Web3 hub, cementing its position as the "silver" that complements Bitcoin's "gold" in the modern Web3 era, while tapping into Ethereum's programmable infrastructure. By empowering the Litecoin community with tools for innovation and interoperability, LitVM seeks to drive long-term adoption and growth of the broader Litecoin ecosystem.

1.4 Market Context and Opportunity

The Web3 market, valued at $4.62 billion in 2025 (in terms of revenue generated by Web3-related services, applications, and infrastructure), is projected to reach $99.75 billion by 2034, driven by a compound annual growth rate (CAGR) of 41.18%. Layer-2 solutions are pivotal to this growth, addressing the scalability and cost challenges of Layer-1 blockchains. Rollup technologies have emerged as the most robust L2 approach, offering high throughput (up to thousands of TPS), low fees (sub-cent), and robust security through cryptographic proofs. These platforms have fueled the expansion of DeFi, with a total value locked (TVL) exceeding $100 billion, and NFTs, with over $20 billion in trading volume in 2024, alongside emerging sectors like RWAs, AI, and gaming.

Litecoin, with its $5+ billion market cap, hundreds of thousands of daily active addresses, and hundreds of millions of lifetime transactions, holds a unique position in the cryptocurrency landscape. Its 2.5-minute block times and sub-$0.01 fees make it ideal for payments, processing over 1 million daily transactions at peak. However, its lack of smart contract functionality has excluded it from DeFi and other burgeoning Web3 sectors, limiting its growth potential. In contrast, Ethereum's ecosystem, hosting $300+ billion in assets and 10,000+ monthly active developers, dominates Web3, while Bitcoin's $2 trillion+ market cap underscores its role as a secure store-of-value layer.

LitVM seizes this opportunity by providing an EVM-compatible rollup that focuses on the Litecoin ecosystem, integrating Litecoin-native assets (LTC, LTC-20, Runes, Ordinals) with Ethereum's developer ecosystem. By catering to Litecoin's loyal community and Ethereum's vast developer base, LitVM can capture market share in high-growth sectors.

Key market opportunities include:

- **Yield Markets:** Enabling Litecoin users to participate in DeFi protocols, institutional-grade yield strategies, and other yield-generating opportunities, with potential TVL growth to billions.
- **Real-World Assets (RWAs):** Facilitating tokenized assets (e.g., commodities like silver and gold, real estate, and physical collectibles) with scalable EVM infrastructure and programmable smart contracts.
- **AI Ecosystem:** Supporting Litecoin-powered AI agents, AI-enhanced Web3 applications, and future-proofing in the age of artificial intelligence.
- **Advanced Payments:** Building on Litecoin's payment infrastructure with programmable payment rails and stablecoin support.
- **NFTs and Ordinals:** Supporting Litecoin-native NFT/Ordinals marketplaces and infrastructure, leveraging Litecoin's cultural relevance and low fees.
- **Gaming and SocialFi:** Offering scalable infrastructure for on-chain games and decentralized social platforms.

LitVM's competitive advantages include:

- **Hybrid Rollup Architecture:** Combining Arbitrum Nitro's battle-tested optimistic rollup with Succinct's zkVM validity proofs delivers the best of both worlds—fast execution with cryptographic security guarantees.
- **Trustless Bridging:** Charms powers LitVM's LTC bridging infrastructure using client-side validation and zero-knowledge proofs, enabling native LTC to be represented on EVM as zkLTC without relying on a traditional custodial bridge operator or multisig.
- **Decentralized Sequencing:** Espresso's shared sequencer distributes block ordering across a permissionless node network, eliminating single points of failure and censorship risks.
- **Community Focus:** Allocating 51% of $LITVM tokens to community governance, ecosystem funds, and grants fosters adoption and incentivizes development.
- **Litecoin-Native Assets:** Support for LTC-20 tokens, Runes, and Ordinals (in addition to LTC) enables unique use cases, such as Litecoin-based collectibles and tokenized assets.

- **Official Endorsement:** LitVM is officially endorsed by the Litecoin Foundation, with advisors including Charlie Lee and David Schwartz.

By positioning Litecoin as a scalable, programmable Web3 hub, LitVM aims to increase LTC's utility, attract global developers, and drive adoption across retail and institutional markets.

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2. LitVM Overview

2.1 Core Purpose

LitVM is Litecoin's first trustless EVM rollup, designed to unlock the full potential of the Litecoin ecosystem by enabling secure, scalable, and cost-efficient Web3 applications. By leveraging a hybrid rollup architecture that combines optimistic execution with zero-knowledge validity proofs, LitVM provides scalable EVM execution while settling to Ethereum and enabling trustless LTC bridging through Charms.

The platform's primary objectives are:

1. **Create More Demand for LTC:** Drive adoption and utility for Litecoin as a base layer asset through yield opportunities, DeFi participation, and expanded use cases.
2. **Unlock Hard Money Web3:** Solve the trustless hard money issue in Web3 for retail, funds, institutions, treasuries, and governments by bringing the principles of hard money to programmable blockchain applications.
3. **Foster a Utility-Driven Future:** Connect Litecoin to the broader Web3 ecosystem, enabling cross-chain interoperability and new application categories.
4. **Enable Yield Generation:** Provide sustainable earning mechanisms for the Litecoin community through DeFi protocols and institutional-grade yield strategies.
5. **Create a Vibrant Ecosystem:** Build a vibrant Litecoin-powered ecosystem with primary focus on yield markets, RWAs, and AI applications.

LitVM addresses Litecoin's historical limitations—such as the lack of native smart contract support—while preserving its strengths as a fast, low-cost, and widely adopted payment network. By creating a scalable environment for decentralized applications and infrastructure, LitVM positions Litecoin as a central hub in the Web3 ecosystem, complementing Bitcoin's role as a secure settlement layer and Ethereum's programmable infrastructure.

2.2 Target Audience

LitVM is engineered to serve a diverse set of stakeholders, each with unique needs and opportunities within the Litecoin and broader crypto ecosystems.

For Litecoin Holders:

- Access yield opportunities without giving up custody of LTC
- Participate in DeFi protocols using trustlessly bridged Litecoin
- Engage with Litecoin-native assets (LTC, Ordinals, Runes, LTC-20s) in a programmable environment

For Developers:

- Unlock a large and active target market of Litecoin holders
- Deploy EVM-compatible smart contracts using familiar tools (Solidity, Hardhat, Foundry)
- Build applications around an asset secured by Litecoin's long-running proof-of-work network
- Leverage ZK technology for scalable, low-cost applications

For Enterprises:

- Tokenize real-world assets using scalable, EVM-compatible infrastructure
- Access institutional-grade yield strategies
- Build compliant, scalable blockchain solutions

For the Broader Crypto Ecosystem:

- Ethereum developers and users benefit from LitVM's new market and ability to integrate Ethereum-based assets with LitVM's low-cost environment
- Bitcoin maximalists and developers align with LitVM's trustless, decentralized design, which respects Bitcoin's principles while extending functionality via Litecoin

2.3 Interoperability Goals

LitVM is architected to bridge Litecoin with Ethereum while aligning philosophically with Bitcoin's principles, creating a unified and decentralized Web3 ecosystem. Its interoperability goals are underpinned by advanced bridging mechanisms, modular infrastructure, and strategic ecosystem partnerships.

Seamless Asset Transfers:

- LitVM employs trustless LTC bridging through the Charms protocol, enabling users to move LTC from Litecoin into the EVM ecosystem as zkLTC using client-side validation and zero-knowledge proofs without relying on a traditional custodial bridge.
- The Arbitrum Bridge enables seamless transfers of ETH and ERC-20 tokens from Ethereum
- LTC and other Litecoin-native assets can be used in EVM protocols and dApps, while Ethereum-based assets can operate within LitVM's low-cost environment

Support for Cross-Chain dApps:

- LitVM's EVM compatibility allows developers to build dApps that interact with assets and data from both Litecoin and Ethereum ecosystems
- Oracles and SDKs provide access to multi-chain data, enabling dApps like cross-chain DeFi platforms, RWA marketplaces, or AI-integrated applications

Alignment with Bitcoin's Principles:

- LitVM respects Bitcoin's focus on decentralization and immutability, avoiding reliance on centralized bridges or custodians
- Its ZK-based architecture ensures trust-minimized interactions, appealing to Bitcoin's security-conscious community
- Through Charms, LitVM's cross-chain capabilities can extend beyond Litecoin to BTC, Bitcoin-native assets, Cardano assets, and assets from other ecosystems integrated with the Charms protocol. As the Litecoin and Ethereum integrations are completed, these rails create a pathway for assets from the wider Charms ecosystem to participate in LitVM-based DeFi and applications.

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3. Technical Architecture

LitVM's technical architecture is designed to deliver a scalable, secure, and interoperable Layer-2 solution for Litecoin, leveraging a hybrid rollup architecture that combines the best of optimistic and zero-knowledge rollup technologies. By integrating Charms for trustless LTC bridging and cross-chain asset connectivity, Arbitrum Nitro for EVM-compatible execution, Succinct's zkVM for validity proofs, and Espresso for decentralized sequencing,

LitVM creates a robust platform for Litecoin-powered applications and cross-chain functionality.

3.1 Hybrid Rollup Architecture

LitVM is built as a hybrid rollup that combines the advantages of both optimistic and zero-knowledge rollup architectures:

Optimistic Execution (Arbitrum Nitro):

- Transactions are executed optimistically for fast processing
- Arbitrum's fraud proof mechanism provides security guarantees
- Users experience immediate transaction confirmations

Zero-Knowledge Validity Proofs (Succinct SP1 zkVM):

- Validity proofs are generated for all chain execution
- Proofs provide cryptographic guarantees of execution correctness
- Fast finality in minutes rather than the 7-day challenge period of pure optimistic rollups

This hybrid approach delivers:

- **Scalability:** Thousands of transactions per second with sub-cent fees
- **Security:** Mathematical guarantees through ZK proofs plus fraud-proof fallback
- **Speed:** Immediate optimistic confirmations with rapid ZK-verified finality
- **Cost Efficiency:** Proof costs as low as $0.01-0.02 per transaction

3.2 Charms Protocol Integration

Charms is an open-source protocol for programmable assets across UTXO-based blockchains. It uses client-side validation and zero-knowledge proofs to enable programmable asset state without requiring the underlying blockchain to execute application logic itself.

Rather than relying on a traditional bridge operator, custodian, or multisig to determine whether asset state is valid, Charms enables participants to verify validity cryptographically. The underlying blockchain provides ownership and settlement security, while Charms' proof system validates the programmable asset layer.

Charms already supports Bitcoin and Cardano, including cross-chain movement between the two ecosystems. LitVM is working directly with Charms creator Ivan Minushkin to co-develop Litecoin and Ethereum support, establishing the infrastructure required to bridge native LTC into the EVM ecosystem as zkLTC and creating a pathway between LitVM and the wider Charms ecosystem.

Core Charms Components:

Client-Side Validation: Charms-related state is interpreted and validated by Charms-aware clients rather than by the underlying blockchain itself. This allows programmable assets to operate without requiring changes to the base chain's consensus rules.

Zero-Knowledge Proofs: Charms uses ZK proofs to demonstrate that asset state transitions comply with the rules of the relevant application. This allows participants to verify validity cryptographically rather than trusting a centralized intermediary.

Beaming: Charms refers to its cross-chain asset movement mechanism as “beaming.” Beaming allows supported assets to move between integrated blockchain environments while preserving cryptographic proof of their validity. In the context of LitVM, this technology forms the foundation of the LTC Bridge and, over time, creates pathways for assets from other Charms-integrated ecosystems.

zkLTC Bridge Architecture:

The LitVM integration extends the Charms architecture to Litecoin and Ethereum, enabling native LTC to be bridged into the EVM ecosystem as zkLTC.

Deposit Flow:

1. A user initiates an LTC bridge transaction from Litecoin through the LitVM Bridge.
2. Charms verifies the relevant LTC state and enables the corresponding LTC to be represented on Ethereum as zkLTC.
3. zkLTC is routed from Ethereum into LitVM through Arbitrum's native bridge infrastructure.

Withdrawal Flow:

1. A user initiates a withdrawal of zkLTC from LitVM.

2. zkLTC returns through Ethereum, with Charms verifying the corresponding state transition.
3. The user receives native LTC back on Litecoin.

Security Properties

- **Non-Custodial Architecture:** The LTC Bridge does not rely on a traditional bridge custodian controlling user funds.
- **ZK Verification:** Asset validity and state transitions are cryptographically verifiable.
- **Client-Side Validation:** Participants can independently verify Charms asset state.
- **Litecoin Backing:** zkLTC represents LTC originating from and ultimately redeemable to the Litecoin network.
- **Cross-Chain Extensibility:** The same Charms infrastructure provides connectivity to other supported ecosystems, including Bitcoin and Cardano, with additional pathways possible as the protocol expands.

3.3 Arbitrum Orbit and Nitro

LitVM is built as an Arbitrum Orbit chain using the Nitro tech stack. Arbitrum Orbit enables permissionless deployment of customizable chains with:

- **EVM Equivalence:** Full compatibility with Ethereum smart contracts, tooling, and developer experience
- **Fraud Proofs:** Interactive fraud proof mechanism for transaction validity
- **Advanced Compression:** Efficient data batching for lower costs
- **Custom Gas Token:** zkLTC as the native gas token instead of ETH

Why Arbitrum Orbit:

- Battle-tested technology powering billions in TVL
- Active ecosystem of developers and tooling
- Continuous upgrades from Offchain Labs
- Flexibility to customize gas tokens, governance, and more

Nitro Architecture: Arbitrum Nitro provides the core execution environment:

- High-performance EVM-compatible execution
- Efficient state management
- Optimized transaction batching
- Seamless integration with Ethereum tooling

3.4 Succinct zkVM

LitVM enhances the Arbitrum Nitro rollup with Succinct's SP1 zkVM to generate validity proofs for all chain execution, creating a hybrid rollup architecture:

- **SP1 zkVM:** General-purpose zero-knowledge virtual machine that can prove execution of any Rust program
- **Validity Proofs:** Cryptographic proofs that verify correct state transitions
- **Fast Finality:** Proofs can be verified in minutes rather than the 7-day challenge period of pure optimistic rollups
- **Cost Efficiency:** Proof costs as low as $0.01-0.02 per transaction

This hybrid approach combines:

- The immediate execution speed of optimistic rollups
- The cryptographic security guarantees of ZK rollups

3.5 Espresso Shared Sequencer

LitVM utilizes Espresso's shared sequencer for decentralized block ordering:

- **Decentralized Sequencing:** Block proposals distributed across a permissionless node network
- **Censorship Resistance:** No single entity controls transaction ordering
- **Cross-Chain Composability:** Shared sequencing enables atomic operations across chains
- **Network Security:** Multiple independent sequencers provide redundancy

Unlike most rollups that rely on centrally operated sequencers, Espresso distributes sequencing across a geographically diverse set of professional and community-run nodes, eliminating single points of failure and censorship risks.

3.6 Dual Bridge Architecture

LitVM uses two complementary bridge layers to connect Litecoin with LitVM through Ethereum:

Charms LTC Bridge (Litecoin ↔ LitVM):

Feature	Description
Source Chain	Litecoin
Asset Type	LTC → zkLTC
Trust Model	Client-side validation + ZK proofs
Custodian	No traditional bridge custodian
Primary Use	Bridge native LTC into the EVM ecosystem

Arbitrum Bridge (Ethereum ↔ LitVM):

Feature	Description
Source Chain	Ethereum / EVM
Asset Type	ETH, ERC-20s
Trust Model	Optimistic + ZK hybrid
Custodian	Bridge contracts

Primary Use	Onboard Ethereum users

The Arbitrum Bridge supports:

- ETH
- USDC, USDT, and other stablecoins
- ERC-20 tokens
- Other Ethereum-native assets

Together, these bridge layers connect native Litecoin to LitVM through Ethereum while providing access to Ethereum's deep liquidity and, through Charms, establishing pathways to the broader ecosystem of supported chains and assets.

3.7 EVM Compatibility

LitVM's full compatibility with the Ethereum Virtual Machine (EVM) ensures a seamless development experience:

Familiar Development Environment:

- Write smart contracts in Solidity, Vyper, or other EVM-compatible languages
- Use established tools: Hardhat, Foundry, Remix, Truffle
- Interact via Ethers.js, Web3.js, and standard libraries
- Connect with MetaMask, Rabby, and other EVM wallets

Portability:

- Existing EVM-native dApps can be deployed on LitVM with minimal modifications
- Standard token standards supported: ERC-20, ERC-721, ERC-1155

Ecosystem Integration:

- Full interoperability with Ethereum-based protocols, oracles, and DeFi platforms
- Access to Ethereum's vast developer ecosystem and tooling

3.8 Asset Support

LitVM supports a diverse array of assets, catering to both the Litecoin and Ethereum ecosystems:

Litecoin-Native Assets:

Asset Type	Description	Status
LTC	Native Litecoin (as zkLTC)	✅ Supported
Ordinals	NFT-like inscriptions	🔜 Planned
Runes	Fungible token protocol	🔜 Planned
LTC-20	Token standard	🔜 Planned

Ethereum-Native Assets:

- ETH
- USDC, USDT, and other stablecoins
- ERC-20 tokens
- ERC-721 NFTs
- ERC-1155 multi-tokens

Broader Charms Asset Support (Planned): Beyond LTC, the Charms integration creates a pathway for LitVM to support assets from other Charms-connected ecosystems. Bitcoin and Cardano are already integrated with the Charms protocol, opening future pathways for BTC, Bitcoin-native assets, Cardano assets, and additional assets from ecosystems integrated with Charms over time to participate in LitVM-based DeFi and applications.

3.9 Scalability and Performance

LitVM is engineered for high scalability and performance:

Metric	LitVM	Litecoin L1	Ethereum L1
Throughput	Thousands TPS	~56 TPS	~15 TPS
Transaction Fees	Sub-cent	Sub-cent	$1-$100

Key Optimizations:

- **Recursive zkSNARKs:** Enable proof aggregation across multiple batches
- **Efficient Batching:** Up to 10,000 transactions per rollup block
- **Parallel Proof Generation:** Minimizes bottlenecks for high-throughput dApps
- **Data Compression:** Optimized for L1 data requirements

3.10 Security Guarantees

LitVM inherits security from multiple layers:

1. **Litecoin Asset Security:** Native LTC is secured by Litecoin's long-running proof-of-work network before being bridged into the EVM ecosystem as zkLTC.
2. **Ethereum Settlement:** World's most decentralized smart contract platform
3. **ZK Proofs:** Mathematical guarantees of execution correctness via Succinct SP1
4. **Espresso Sequencing:** Decentralized block production prevents censorship
5. **Charms LTC Bridge:** Trustless LTC bridging using client-side validation and zero-knowledge proofs.
6. **Arbitrum Bridge:** Battle-tested rollup bridge infrastructure

Additional Safeguards:

- **Audited Contracts:** Smart contracts, bridges, and ZK circuits undergo rigorous third-party audits
- **Bug Bounties:** Incentive programs for white-hat security researchers
- **Fail-Safe Mechanisms:** Forced inclusion via L1 ensures liveness; emergency withdrawal protocols protect user funds

4. Tokenomics

LitVM operates with a dual-token model designed to align incentives across the ecosystem while maintaining the principles of hard money.

4.1 Dual-Token Model

Token	Primary Function	Backing	Supply
zkLTC	Gas & Base Asset	1:1 with LTC	Elastic (based on bridged LTC)
$LITVM	Governance & Utility	Protocol value	Fixed

Benefits of Separation:

1. **Hard Money Preservation:** Gas fees paid in LTC-backed asset maintains Litecoin's monetary properties
2. **Clear Incentives:** Governance token aligns long-term stakeholders
3. **Sustainable Economics:** Revenue sharing creates value beyond speculation
4. **Flexible Tokenomics:** Each token optimized for its specific role

4.2 zkLTC: The Gas Token

zkLTC is a fully-collateralized representation of Litecoin (LTC) on LitVM, serving as the native gas token for all transactions and the primary base asset for DeFi protocols.

Key Properties:

Property	Description
1:1 Backing	Every zkLTC backed by LTC locked on Litecoin mainchain
Trustless	Bridging uses ZK proofs—no custodians or multisig

Gas Token	Used to pay transaction fees on LitVM
Base Asset	Primary liquidity pair for DeFi protocols
Redeemable	Can always be bridged back to native LTC

zkLTC Use Cases:

- Transaction fees (gas)
- DeFi collateral
- Trading pair base asset
- Yield strategies
- Cross-chain transfers

Why zkLTC Instead of Wrapped LTC?

Aspect	Wrapped LTC (Traditional)	zkLTC (Charms)
Custody	Third-party custodian	No traditional bridge custodian
Trust	Trust the custodian	Cryptographic verification via ZK proofs
Verification	Off-chain attestation	Client-side + ZK proof verification
Counterparty Risk	High	Minimized through protocol design
Redemption	Depends on custodian	Protocol-based return to native LTC

4.3 LITVM: Governance and Utility Token

LITVM is the native governance and utility token of the LitVM ecosystem, designed to coordinate activity between the economic, governance, and strategic layers of the network.

Token Utility:

1. Governance LITVM powers the Litecoin DAO, giving token holders rights to:

- Vote on protocol parameters and upgrades
- Propose and approve ecosystem grants
- Participate in strategic funding decisions
- Shape the future direction of LitVM

2. Revenue Sharing LitVM is one of the few Layer-2 platforms explicitly designed to share protocol revenue with its community:

- Sequencers order and batch transactions on LitVM
- A percentage of sequencer fees flows to LITVM holders and/or stakers
- Unlike chains where fees go entirely to operators, LitVM distributes value back

3. Ecosystem Participation

- Participation in Litecoin DAO initiatives
- Eligibility for ecosystem incentive programs

4.4 Revenue Model

LitVM's revenue model is designed around network and ecosystem activity. Potential revenue sources include sequencer fees and protocol-level fees generated by applications and infrastructure deployed across the network.

This model transforms core infrastructure usage into tangible, recurring revenue that flows directly to community members—not relying on inflationary rewards or speculation.

4.5 Community Allocation

51% Community Allocation: Over half of all tokens are reserved for community governance, prioritizing current Litecoin holders and welcoming new ecosystem participants.

Community allocation includes:

- Grants fund for innovative projects
- Usage incentives for Litecoin users
- Staking and liquidity incentives
- Governance rewards for active participation

- Dedicated Ordinals/Runes fund

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5. Governance

5.1 The Litecoin DAO

LitVM's governance model has been designed to ensure decentralized, democratic decision-making processes tailored to the Litecoin community's founding principles. The $LITVM token serves as the vehicle for participation, incentive modeling, and stewardship.

Governance Rights:

- Vote on protocol parameters and upgrades
- Propose ecosystem initiatives
- Approve grant allocations
- Participate in strategic decisions

Governance Incentives: Active participants who vote, propose, and engage in community dialogue are eligible for rewards, encouraging ongoing engagement.

5.2 Treasury Board

LitVM's governance is anchored by the LitVM Treasury Board, a body tasked with overseeing the allocation of the 51% community token supply reserved for ecosystem development.

Treasury Board Composition (5 Seats):

1. Aztec Amaya (LitVM Co-founder)
2. Roc Zacharias (LitVM Co-founder)
3. David Schwartz (Litecoin Foundation, Director of Partnerships)
4. Community Majority Opinion Seat
5. Additional Member (TBA)

5.3 Proposal Process

LitVM employs an iterative, multi-step approach to ensure thorough vetting and genuine community input:

1. **Initial Proposal:** Community members submit proposals for consideration
2. **Temperature Check:** Token holders vote on whether the proposal merits further development
3. **Detailed Proposal:** Approved proposals return with comprehensive implementation details
4. **Treasury Board Vote:** Final determination on implementation

This governance model is intended to be a living, breathing framework that adapts based on feedback, performance, and emerging opportunities as Web3 technologies advance.

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6. Use Cases

LitVM combines Litecoin's fast, low-cost transactions with Ethereum's smart contract capabilities, enabling diverse Web3 applications. Its trustless bridges and hybrid rollup architecture create a versatile platform for developers and users, with primary focus on yield markets, real-world assets, and AI applications.

6.1 Yield Markets (Primary)

LitVM is unlocking a spectrum of on-chain, off-chain, and cross-chain yield opportunities for the Litecoin community.

DeFi Ecosystem:

- High-performance DEXs for decentralized trading
- LTC serving as primary base asset for DEX pairings
- Standard LP and farming incentives

Lending Markets:

- Decentralized lending platforms seeking LTC deposits
- LTC-backed loans with algorithmic rates
- Borrowing against LTC holdings without selling

Staking and Governance Rewards:

- Potential $LITVM staking for governance participation
- Additional rewards for active involvement

- Protocol airdrops to LTC and $LITVM stakers/holders

6.2 Real-World Assets (Primary)

LitVM's technical architecture uniquely positions it as a prime hub for tokenized RWAs:

Programmable RWA Infrastructure:

- EVM smart contracts enable programmable ownership, settlement, and asset management.
- Trustless bridging can connect Litecoin and other Charms-supported assets with RWA applications on LitVM.
- Smart contracts can support fractional ownership and asset-specific logic.

Supported Asset Types:

- **Commodities:** Silver, gold, and other precious metals with audited reserves
- **Real Estate:** Tokenized property with fractional shares
- **Financial Instruments:** Programmable bonds and structured products
- **Consumer-Driven:** Physical collectibles, royalties etc.

Key Benefits:

- Democratized investment access
- DeFi-ready infrastructure
- Cross-chain market access
- Institutional and retail appeal

6.3 AI Ecosystem (Primary)

LitVM positions Litecoin at the intersection of hard money and artificial intelligence:

Litecoin-Powered AI Agents:

- Autonomous agents operating with LTC and other assets
- AI-driven trading and portfolio management
- Automated DeFi strategies

AI-Enhanced Web3 Applications:

- User-friendly interfaces powered by AI

- Intelligent dApp interactions
- Simplified Web3 onboarding

Future-Proofing:

- Infrastructure ready for AI evolution
- DeFi AI agents for automated strategies
- Integration with emerging AI technologies

6.4 Advanced Payments Infrastructure

Building on Litecoin's payment heritage:

- **Programmable Payments:** Smart contract-enabled payment rails
- **Stablecoin Support:** Integration with major stablecoins (USDC, USDT)
- **Cross-Border Payments:** Low-cost international transfers
- **Merchant Solutions:** Enterprise-grade payment infrastructure

6.5 NFTs and Litecoin Ordinals

LitVM integrates Litecoin's Ordinals with EVM smart contracts:

NFT Infrastructure:

- Marketplaces for trading Litecoin Ordinals
- EVM contracts managing ownership and royalties
- Cross-chain NFT listings

Digital Collectibles:

- Art and collectibles minted as Ordinals on Litecoin mainchain
- Ported to LitVM for programmable features
- Fractional ownership capabilities

Creator Economy:

- Royalty management via smart contracts
- Creator tools and platforms
- Community-driven collections

6.6 Gaming and Metaverse

LitVM's high throughput and low fees support blockchain gaming:

Play-to-Earn:

- Rewards in LTC or LTC-20 tokens
- Low-latency transactions
- Transparent game mechanics

Metaverse Economies:

- Digital assets (land, items) as Ordinals or NFTs
- Smart contract ownership management
- 3D integration capabilities

Gaming Infrastructure:

- On-chain randomness for fair mechanics
- Scalable infrastructure for high-frequency interactions
- Cross-chain gaming assets

6.7 Decentralized Identity and Governance

Decentralized Identity (DID):

- Verifiable credentials stored on-chain
- Zero-knowledge proofs for privacy
- Interoperability with Ethereum DIDs

On-Chain Governance:

- LTC-20 or $LITVM tokens for voting
- Low fees encouraging participation
- Transparent, community-driven decision-making

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7. Ecosystem Benefits

7.1 For the Litecoin Community

Access to Web3: LitVM bridges the gap between Litecoin's payment focus and modern Web3 capabilities:

- Trade LTC on DEXs and participate in DeFi
- Access yield opportunities without giving up custody
- Engage with Litecoin Ordinals in programmable environments
- Participate in RWA markets and AI applications

Cost Efficiency:

- Sub-cent transaction fees
- Accessible DeFi for retail users
- Economical NFT trading and gaming

Community Growth:

- Attracts developers building on LitVM
- New users from DeFi, NFT, and gaming sectors
- Community-driven governance empowers participation

7.2 For EVM Developers

New Market Access:

- Millions of Litecoin users as potential dApp users
- Deploy existing contracts with minimal modification
- Fresh market beyond competitive Ethereum L2 landscape

Cross-Chain Opportunities:

- Build dApps spanning Litecoin and Ethereum
- Access Litecoin's payment capabilities
- Create novel cross-chain applications

Scalability:

- Thousands of TPS at sub-cent costs
- Fast finality for time-sensitive applications
- Familiar tools and development experience

7.3 For Bitcoin and the Broader Crypto Ecosystem

Philosophical Alignment:

- Trust-minimized, decentralized design
- No centralized sequencers or custodial bridges
- Respects Bitcoin's core principles

Interoperability:

- Bridges Litecoin with Ethereum ecosystem
- Cross-chain asset connectivity through Charms, including future pathways for BTC, Bitcoin-native assets, Cardano assets, and assets from other Charms-integrated ecosystems
- Reduces ecosystem fragmentation

Innovation Hub:

- Testing ground for cross-chain collaboration
- Novel applications spanning multiple ecosystems
- Potential inspiration for Bitcoin L2 solutions

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8. Strategic Partners

LitVM is built through collaboration with leading blockchain infrastructure providers:

Litecoin Foundation

The non-profit organization dedicated to advancing Litecoin adoption and development. LitVM is officially endorsed by the Litecoin Foundation.

- Official endorsement and community alignment
- Ecosystem collaboration
- Advisory by Charlie Lee and David Schwartz
- Governance participation by David Schwartz

Charms Protocol

Charms is an open-source protocol for programmable assets across UTXO-based blockchains, using client-side validation and zero-knowledge proofs to enable trustless asset

creation and cross-chain movement. Charms currently supports Bitcoin and Cardano, and LitVM is working directly with Charms creator Ivan Minushkin to co-develop Litecoin and Ethereum support.

- Client-side validation and ZK-proof infrastructure
- Trustless cross-chain "beaming"
- Existing Bitcoin and Cardano integrations
- Litecoin and Ethereum integration co-development
- zkLTC and LitVM LTC Bridge architecture
- Future connectivity between LitVM and the broader Charms ecosystem

Arbitrum (Offchain Labs)

Provides the core rollup technology powering LitVM.

- Arbitrum Nitro execution layer
- EVM equivalence and smart contract support
- Interactive fraud proof mechanism
- Battle-tested security (billions in TVL)

Zeeve

Infrastructure provider supporting the deployment and operation of LitVM's Arbitrum Orbit infrastructure.

- Chain deployment and management
- RPC and node infrastructure
- Network monitoring and reliability

Succinct

Develops SP1, a general-purpose zero-knowledge virtual machine.

- SP1 zkVM integration
- Validity proof generation
- Fast finality capabilities
- Cost-efficient proving

Espresso Systems

Provides shared sequencer infrastructure for decentralized transaction ordering.

- Shared sequencer mechanism
- Decentralized block ordering
- Cross-chain composability
- Censorship resistance

Lunar Digital Assets

The venture studio incubating LitVM.

- Full-stack blockchain venture studio
- Marketing and community building
- Strategic partnerships
- Ecosystem development

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9. Conclusion

LitVM represents a pivotal evolution for Litecoin, redefining its role as a scalable, programmable, and interoperable hub in the modern Web3 era. By harnessing a hybrid rollup architecture that combines Arbitrum Nitro's battle-tested execution with Succinct's zkVM validity proofs, LitVM overcomes Litecoin's historical L1 limitations, enabling a vibrant ecosystem of yield markets, real-world assets, AI applications, and diverse Web3 use cases.

Its EVM compatibility empowers developers to build sophisticated dApps using familiar tools while seamlessly connecting Litecoin with the Ethereum ecosystem. LitVM uses Ethereum as its settlement layer, combining Ethereum's mature infrastructure with Litecoin-native value and Charms-powered LTC bridging. Advanced technologies—including the Charms-powered LTC Bridge, Espresso's decentralized sequencing, and Succinct's cost-efficient proving—underpin LitVM's high-throughput architecture, capable of supporting scalable applications at low transaction costs.

LitVM's vision extends beyond technical innovation to foster a cohesive and interconnected crypto ecosystem. By bridging Litecoin with Ethereum and connecting into the broader Charms ecosystem, LitVM creates pathways not only for LTC but, over time, for BTC, Bitcoin-native assets, Cardano assets, and assets from other Charms-integrated networks to participate in programmable Web3 applications. Its support for Litecoin-native assets

and cross-chain capabilities unlocks novel use cases—from institutional-grade yield strategies to tokenized real estate and AI-powered applications—driving demand for LTC and expanding its utility.

Central to LitVM's mission is its commitment to community-driven growth. By allocating 51% of its token supply to community governance, ecosystem funds, and developer grants, LitVM incentivizes adoption and innovation. The governance model, anchored by the Treasury Board and Litecoin DAO, ensures democratic participation in the platform's evolution. A comprehensive developer ecosystem—featuring familiar EVM tooling, open-source contracts, and robust documentation—empowers global developers to build on LitVM.

As the Web3 market surges toward a projected $99.75 billion by 2034, LitVM positions Litecoin to capture significant market share in high-growth sectors like yield markets, RWAs, and AI. By cementing Litecoin as "Hard Money Web3"—the silver that complements Bitcoin's gold in the modern Web3 landscape—LitVM not only extends Litecoin's utility but creates a unified platform bridging retail, institutional, and developer communities.

The success of LitVM will amplify Litecoin's relevance, drive LTC adoption, and inspire further innovation across the crypto landscape, paving the way for a decentralized, inclusive, and interconnected future built on the principles of hard money.

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LitVM is Litecoin's Virtual Machine, enabling smart contract capabilities and Web3 applications for Litecoin. Officially endorsed by the Litecoin Foundation, LitVM is committed to fostering a 'Hard Money Web3' ecosystem, including Litecoin yield opportunities, real-world assets, AI and more.

Official Channels:

- Website: https://litvm.com
- Twitter: @LitecoinVM
- Telegram: t.me/litecoinvm


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@LitecoinVM
www.litvm.com