NOVEMBER 2024

Injective Short Report

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Introduction

Injective is a Cosmos-based Layer 1 blockchain purpose-built for decentralized finance (DeFi) and Web3 applications. Launched in 2018 with backing from Binance Labs, it evolved from an Ethereum Layer 2 concept into a robust, standalone network that leverages the Cosmos SDK and a Tendermint-based Proof-of-Stake consensus mechanism. This shift allowed Injective to position itself as a versatile foundation for financial innovation, integrating cross-chain interoperability and advanced features that cater to both developers and end users.

Injective's infrastructure seamlessly connects with the Cosmos ecosystem and extends its reach to external blockchains, such as Ethereum, Solana, and Avalanche, through cross-chain communication protocols. Its inEVM and inSVM modules enable developers to deploy Solidity and Rust smart contracts natively, facilitating broad compatibility and innovation across ecosystems.

Key differentiators include its low-cost transaction model, enabled by gas compression technology, and innovative financial products such as tokenized indices that democratize access to traditionally exclusive markets. Injective also emphasizes accessibility through fiat on-ramp services, allowing users to interact with the ecosystem using over 25 fiat currencies via popular payment methods.

With advancements like the Altaris Mainnet upgrade, integration with the TON ecosystem, and support for real-world asset tokenization, Injective continues to push the boundaries of financial blockchain technology.

Injective 101

Injective is an advanced Layer 1 (L1) blockchain network that was purpose-built for on-chain financial applications. It leverages the Cosmos SDK framework alongside a Tendermint-based Proof-of-Stake consensus mechanism to deliver instant transaction finality with theoretical speeds reaching up to 25,000 transactions per second (TPS) in testnet environments. The infrastructure of Injective is meant to elevate the platform as a premier destination for DeFi, its primary and greatest use case.

Overall, Injective distinguishes itself by attempting to address the core limitations of decentralized exchanges (DEXs) while maintaining an accessible and intuitive user interface. These challenges are namely, scalability (i.e., handling periods of extreme congestion), transaction costs (specifically in reference to Ethereum), and liquidity fragmentation (as liquidity is often siloed within individual protocols or isolated pools).

Injective addresses these pain points by offering:

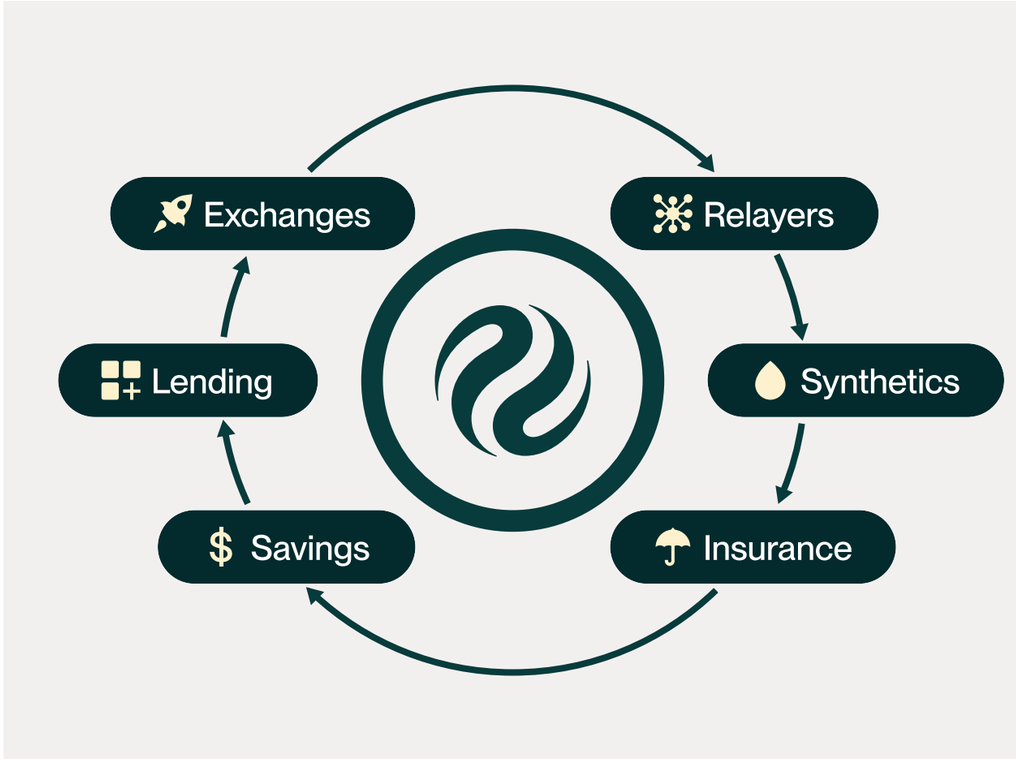
- Improved TPS and near-instant finality
- Near-zero fees
- A unified liquidity layer via its on-chain order book

When combining these solutions, DeFi applications built on Injective can significantly enhance their product offerings by operating with minimal latency and reduced costs. This makes Injective-based financial applications extremely competitive with other ecosystems, especially those on mainnet Ethereum. Of course, many similar projects also promise lower fees, faster throughput, and better liquidity efficiency.

To this end, Injective also has a strategy to target and empower the developers. Injective offers a developer-tailored production environment that helps to simplify the overall creation and deployment of new dApps. The platform is built with a modular blockchain design, including built-in primitives to help eliminate certain technical barriers. The modularity here is how Injective can generate much greater performance while also enabling external developers to either migrate to Injective or build new applications relatively easily.

Advanced DeFi Features

As mentioned above, Injective offers an advanced trading interface and a more efficient DeFi hub thanks to its unified liquidity layer design and universal on-chain order book. This strategically makes Injective far more efficient than typical automated market makers (AMMs), which rely on static liquidity pools that are often subject to inefficiencies such as slippage, impermanent loss, and capital underutilization.



Examples of specific, launchable application models include things like:

- Cross-chain perpetual swaps
- Margin and spot trading protocols
- Customizable secondary marketplaces
- Ultra-efficient, MEV-resistant DEXs

Injective's unified liquidity layer and universal on-chain order book eliminate these inefficiencies by dynamically aggregating liquidity and mirroring the functionality of traditional financial markets. Unlike AMMs, which require liquidity providers to lock capital into specific pools, Injective enables a shared liquidity structure that utilizes capital more effectively across the ecosystem. This improves trading efficiency, reduces costs, and ensures fairer pricing for all participants. Plus, the on-chain order book provides advanced features like price discovery and transparency, making it more appealing to institutional traders and high-frequency trading strategies.

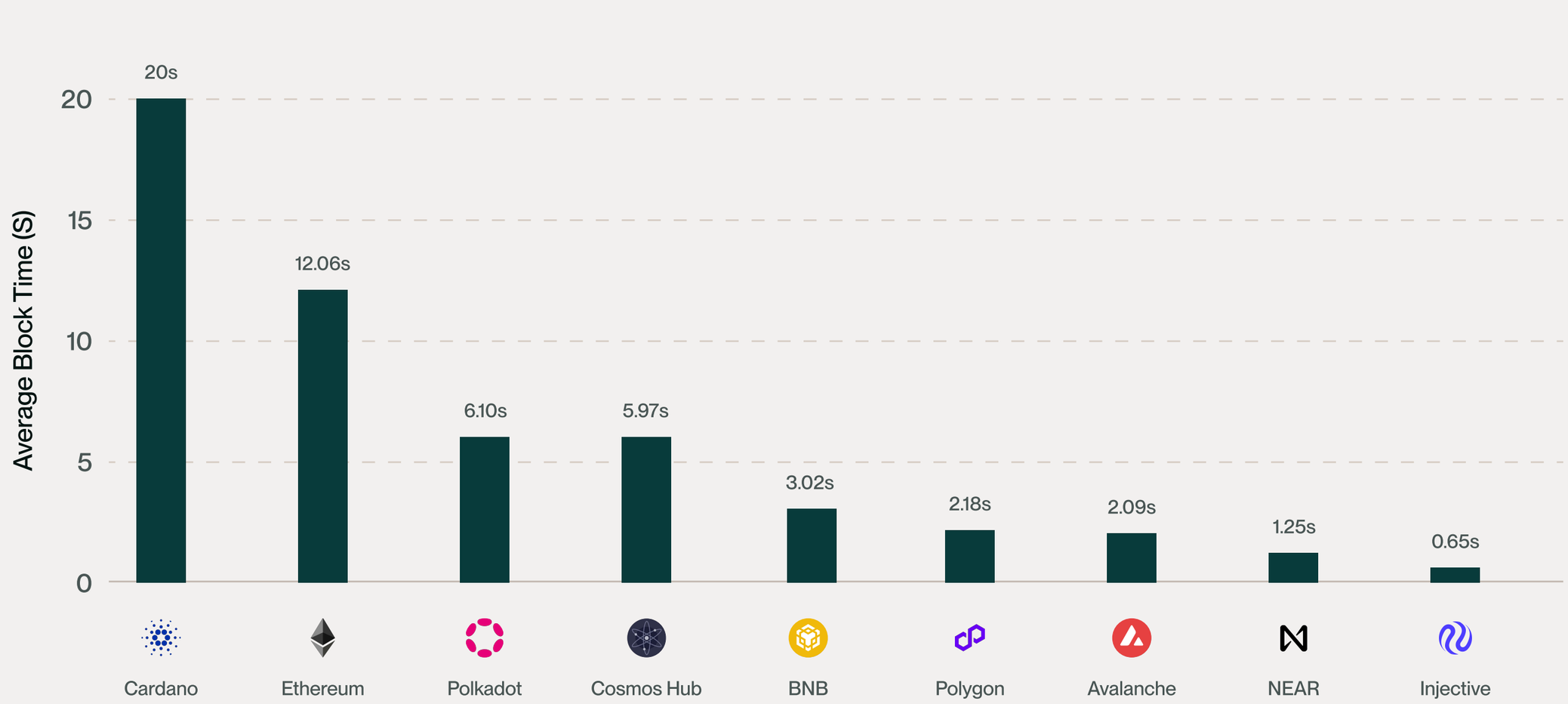
How Injective Works

Injective is a Layer 1 blockchain built using the Cosmos SDK and the CometBFT Consensus protocol, managed by 60 validators. While this number might seem small compared to other proof-of-stake blockchains, it aligns with other CometBFT-based networks. The blockchain uses a proof-of-stake system with a smaller validator group to improve efficiency and performance. The network's security is strengthened by community involvement, where delegators select and support trustworthy validators.

CometBFT

Injective utilizes a customized version of the Cosmos SDK, which leverages the Tendermint consensus algorithm, allowing it to achieve high transaction processing speeds. The Tendermint consensus mechanism is based on a Byzantine Fault Tolerant (BFT) Proof-of-Stake (PoS) algorithm, which provides instant transaction finality, high fault tolerance, and the ability to scale horizontally. Injective's Tendermint-based system can process a theoretical 25,000 TPS with near-instant finality (estimated to be about 0.65 seconds), reducing risks from processing delays and price volatility.

Average Block Time Amongst Layer 1s



It is worth noting that the advertised 25,000 TPS supposedly is the network's observed maximum potential within its testnet environment. According to platforms like TokenTerminal, Injective's real-world TPS is closer to around ~50 TPS. This is up dramatically from ~10 TPS back in 2021, thanks to some of the robust upgrades that the platform has undergone since.

What really makes this impressive is that Injective's performance capabilities have actually scaled upwards along with network activity, instead of the typical vice versa. This demonstrates that as the usage of Injective increases, the network scales appropriately, not only to handle the elevated amounts of traffic but also to improve continually.

FBA (Frequent Batch Auction)

Injective's Frequent Batch Auction (FBA) mechanism is an innovation designed to address existing inefficiencies in transaction processing and ensure more equitable market dynamics. In short, the FBA mechanism has three core features:

- Discrete-time - Orders are settled at specific time intervals, not continuously.
- Uniform clearing price - All orders within a batch are executed at the same clearing price.

Sealed bid - Orders are not posted to the order book until the batch auction is executed, preventing front-running.

Discrete-Time Settlement

Unlike continuous-time settlement systems, where transactions are processed in real-time as they arrive, FBA uses discrete-time intervals to batch and process orders collectively. Orders are executed in a specific sequence during each interval and occur as follows:

1. Market Orders are prioritized and executed first since they are not price-sensitive (and generally aim to be filled immediately).
2. Pending limit orders are executed next, as previously existing orders are rolling over from an older auction into the current auction.
3. Last to be executed are new limit orders, which were submitted during the current auction period.

Uniform Clearing Price

The Uniform Clearing Price (UCP) is a cornerstone of Injective's FBA system, addressing inefficiencies and price disparities inherent in traditional continuous order matching systems. By executing all orders in a batch at a single clearing price, UCP ensures fairness, maximizes trade volume, and enhances market efficiency. This approach aligns with auction principles, where participants trade under identical conditions, fostering equity and consistency.

The UCP feature works as follows:

A) Order Submission:
During a batch interval, market participants submit market orders (orders to buy or sell immediately at the best available price) and limit orders (orders to buy or sell at a specified price or better). These orders are temporarily withheld from public visibility under the sealed-bid protocol to prevent market manipulation.

B) Order Aggregation:
At the end of the batch interval, the system aggregates all buy and sell orders into a cumulative order book. This book represents the total demand (buy orders) and supply (sell orders) at different price levels. The aggregation process allows the system to evaluate the intersection of buy and sell interests across price levels.

C) Crossing Point Analysis:
The system then identifies the crossing point, which is the price level where the largest cumulative quantity of buy and sell orders overlap. This point represents the equilibrium price for the batch.
For example:

- At $100, there are 1,000 buy orders and 700 sell orders (700 matched units).
- At $99, there are 800 buy orders and 800 sell orders (800 matched units).
- At $98, there are 500 buy orders and 1,000 sell orders (500 matched units).

So, in this case, the UCP is $99, as it maximizes the volume of crossing orders (800 units).

D) Clearing Price Adjustment:
In cases where multiple price levels produce identical crossing volumes, the system employs additional rules to select the UCP:

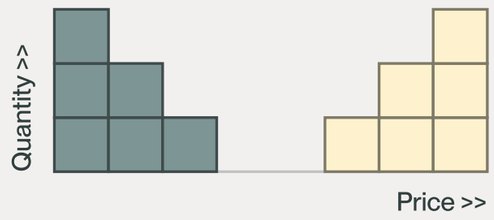
- **Midpoint Price Rule:** If two price levels have equal crossing volumes, the UCP may be set at the midpoint between these prices.
- **Tie-Breaking Criteria:** Factors such as time priority or proportional execution of orders may influence the final selection.

Uniform Clearing Price

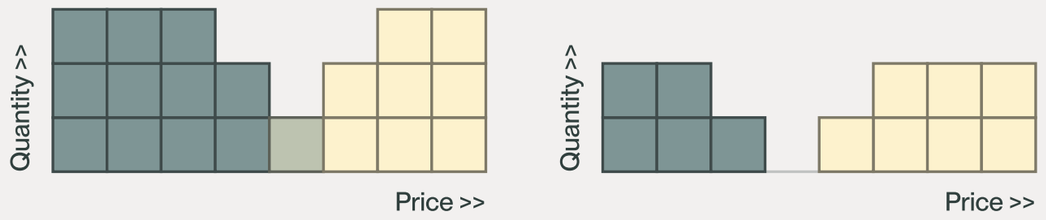
Source: Injective Blog

Injective

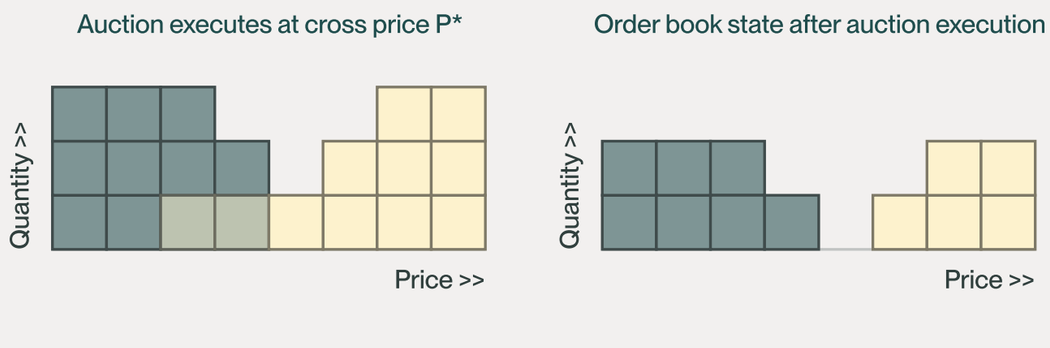
Case 1: No Cross



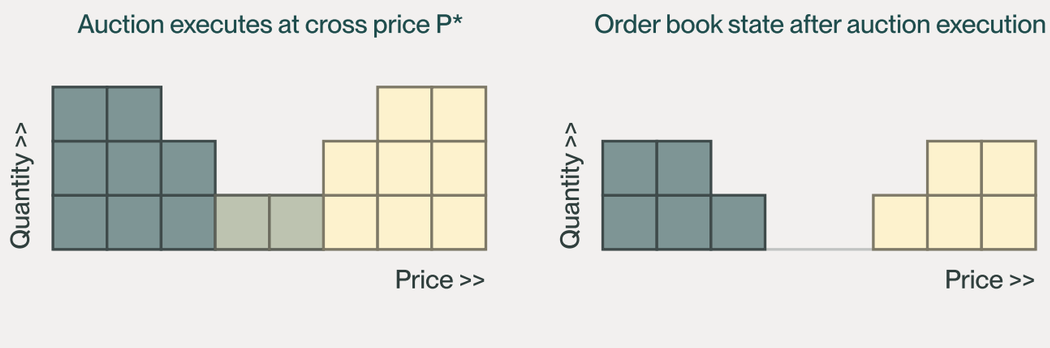
Case 2: Asks Exceed Bids at Cross



Case 3: Bids Exceed Asks at Cross



Case 4: Bids and Asks Cross Horizontally



Overall, the UCP mechanism offers a handful of key advantages that help increase the market efficiency and fairness of Injective. Maximizing trade volume ensures that the highest number of orders is matched within each batch, optimizing liquidity utilization. Its uniform pricing approach eliminates favoritism, creating a level playing field for all participants.

Additionally, the use of a single clearing price reduces price volatility, avoiding the fragmentation and rapid swings common in continuous matching systems. For oversized orders, UCP employs pro rata execution, distributing liquidity proportionally and equitably. Finally, the sealed-bid structure mitigates front-running by keeping pending orders private, safeguarding price discovery, and protecting traders from manipulative practices.

Sealed Bid

The last critical component of Injective's FBA system is the Sealed Bid feature. As briefly mentioned above, the Sealed Bid mechanism is responsible for preserving the confidentiality of all orders submitted during a batch interval (up until execution). Unlike traditional open order book systems where bids and asks are publicly visible in real-time, the Sealed Bid approach conceals other market participants' order details, including price and quantity. This confidentiality prevents predatory trading behaviors, such as front-running, where malicious actors exploit order visibility to gain an unfair advantage by placing transactions ahead of large trades to manipulate prices.

For Injective's ecosystem, the Sealed Bid structure is transformative in fostering equitable trading environments. It enables market makers to provide liquidity confidently near market prices without fear of being undercut or manipulated, thereby improving price stability and market depth. For retail traders, this feature ensures that their orders are executed based solely on market dynamics and not external influence, leading to fairer pricing.

Development Plug-and-Play Modules

Injective Protocol empowers developers by simplifying application development through its innovative Plug-and-Play Modules. These pre-built components reduce infrastructure complexity, enabling creators to focus on innovation and accelerate their time-to-market.

Exchange Module

The Exchange Module provides on-chain order book functionality and a matching engine to support both spot and derivatives trading, eliminating the need for developers to build these trading tools from the ground up. This effectively bootstraps the costs and development time of launching new trading applications on Injective, significantly lowering the barrier to entry. Not to mention, by offering unified liquidity, the Exchange Module helps minimize operational costs within early-stage DeFi startups, removing the need to issue tokens solely for liquidity provision. The Exchange Module underpins innovative platforms like the decentralized exchange Helix, highlighting its versatility and importance in the Injective ecosystem.

Automated Smart Contract / WASMX Module

Injective enhances smart contract functionality through its WASM-based virtual machines (CosmWasm) and the WASMX Module. This helps initialize the creation of automated smart contracts that execute seamlessly with each new block, eliminating the need for manual activation. Through automation, the WASMX Module unlocks use cases like recurring payments, subscriptions, or even automated payroll systems all executable on Injective.

Additionally, the WASMX Module further simplifies contract deployment while incorporating governance tools to manage execution fees effectively. Together, these features streamline development and expand the possibilities for decentralized applications within the Injective ecosystem.

RWA (Real World Asset) Module

Injective's Real World Asset (RWA) Module facilitates the creation and management of tokenized real-world assets, such as fiat currency pairs, treasury bills, and exclusive credit products, through compliant gateways. By incorporating a native permissioning layer, Injective ensures that these tokenized assets are managed securely and in compliance with regulatory standards, making them accessible to both institutional and individual users.

Auction Module

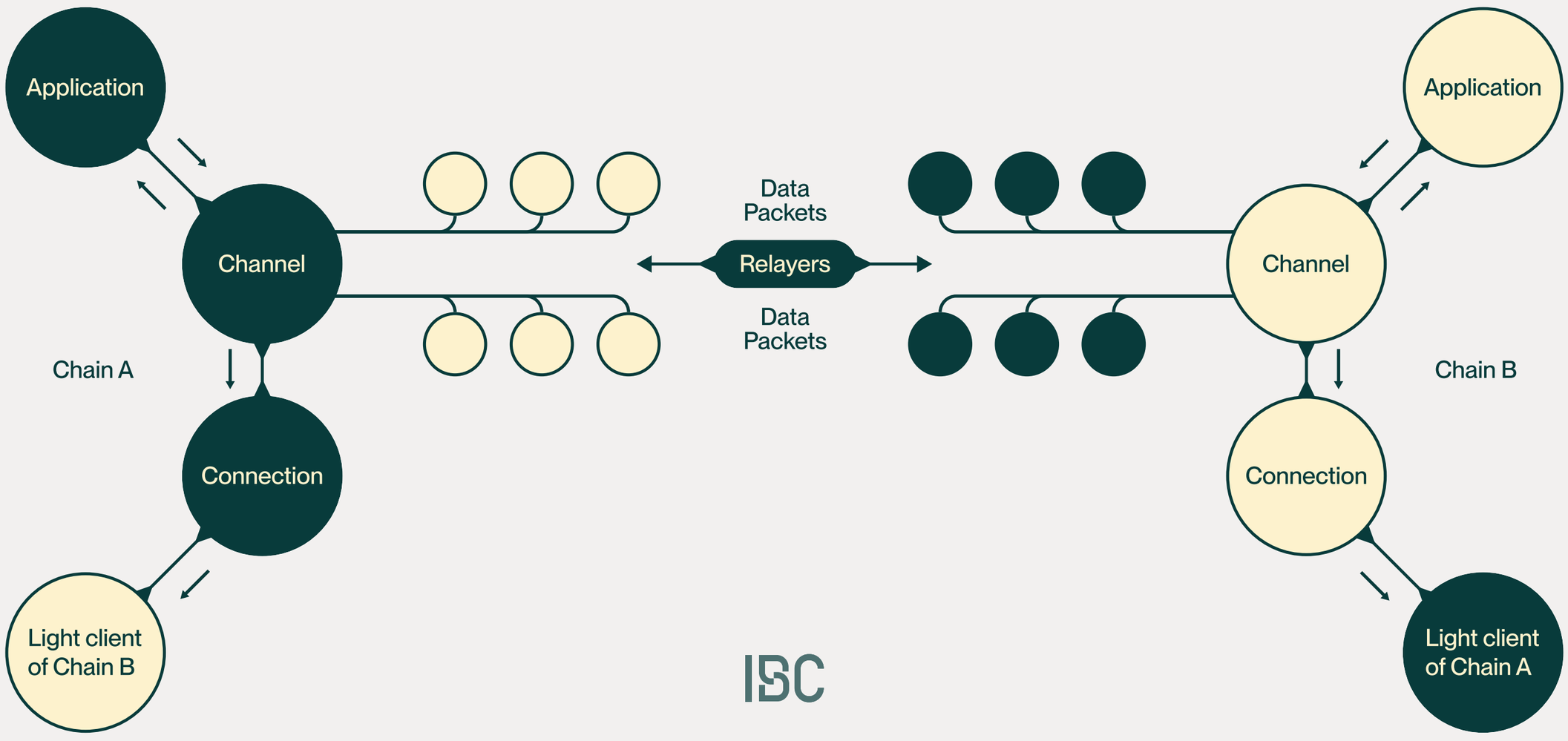
The Auction Module is a unique feature within the Injective ecosystem, designed to enhance the value proposition of the INJ token through a systematic buy-back-and-burn mechanism. Periodically, the module collects a basket of tokens accumulated from trading fees across various decentralized applications built on Injective. These tokens are then auctioned off to the highest bidder in an open English auction, with bids placed in INJ tokens. The winning bidder receives the basket of tokens, and the INJ used in the winning bid is subsequently burned, effectively reducing the total supply of INJ tokens.

Interoperability

Injective offers support for multiple blockchains through the Wormhole bridge and compatibility with the Inter-Blockchain Communication (IBC) protocol. It connects with 19 Cosmos chains, with the largest asset flow occurring between Injective and Cosmos Hub. Popular bridged assets include USDT (over 11 million USDT), wETH, USDC, SOL, wMATIC, and LINK.

Architecture of IBC
Source: ibcprotocol.dev

Injective



Multi-VM Support

Injective is unique among typical L1s because it has chosen to incorporate support for multiple virtual machines (VMs), including WASM, EVM, and SVM, rather than just build its own and attempt to draw compatibility solely with Ethereum. This multi-VM strategy creates a versatile and inclusive development environment, enabling builders from various ecosystems—such as Cosmos, Ethereum, and Solana—to deploy their applications on Injective seamlessly. By adopting this approach early, Injective has positioned itself as a leader in multi-VM integration, setting a precedent for other networks like Sei, which are now catching up.

Injective's unique method leverages rollups for VM implementations rather than directly embedding VMs into the main chain. This design choice maximizes developer autonomy and ensures that value flows back to Injective's native assets. By decoupling VMs into rollups, developers gain more control over their applications without compromising Injective's overall efficiency or scalability.

inSVM: Bridging Solana and Injective

inSVM is the first Solana Virtual Machine (SVM)-based rollup in the Cosmos ecosystem, offering Solana developers a familiar environment within Injective's infrastructure. This rollup supports Solana-specific features, such as parallel transaction processing and integration with Solana wallets, allowing developers to deploy their applications on Injective with minimal friction.

The inSVM rollup operates as a Cosmos-compatible layer, leveraging Injective for settlement and Celestia for data availability (DA). A sequencer aggregates transactions and submits them to the DA layer. The roadmap includes decentralizing the sequencer to enhance the rollup's resilience. By utilizing SVM, inSVM ensures compatibility with Solana tooling while benefiting from Injective's interoperability features, making it easy for Solana-native developers to expand into the broader Cosmos ecosystem.

Why is this important? Solana developers can overcome the ecosystem's isolation by deploying their applications in a multi-chain environment. inSVM allows them to integrate with Injective's broader infrastructure while accessing Cosmos's interoperability features, including IBC.

inEVM: Ethereum Compatibility

The inEVM rollup provides a fully EVM-compatible environment within Injective (working the same way as the inSVM), making it accessible to Ethereum's extensive developer community. This rollup allows developers to deploy Solidity-based applications while benefiting from Injective's robust infrastructure and interoperability. By leveraging innovative bridging solutions like Hyperlane and LayerZero, inEVM enables seamless communication between Injective's ecosystem and external blockchain networks, opening up new possibilities for decentralized applications.

Hyperlane is a generalized message-passing protocol that facilitates communication between different blockchains and rollups. It acts as a bridge between the inEVM rollup and Injective's WASM-based chain, allowing applications written in Solidity (EVM-compatible) to interact with those built using WASM (Cosmos ecosystem-compatible).

It works as follows:

1. **Message Relaying:**
   Hyperlane uses an off-chain relayer network to transmit messages between chains or rollups. These messages carry encoded data about transactions, allowing interoperability between disparate virtual machine environments.

2. **Verification:**
   Hyperlane ensures that messages are secure by verifying their validity on both the sending and receiving chains, preventing malicious actors from altering or forging data.

3. **Integration:**
   This bridging allows developers to create applications that can span both WASM and EVM environments without additional technical overhead, making Injective a highly interoperable platform for multi-chain dApps.

By enabling direct communication between EVM-based and WASM-based applications, Hyperlane significantly enhances the composability and functionality of Injective's ecosystem.

Economics

Since its launch in November 2021, Injective Protocol has grown significantly, with its native token, INJ, playing a key role in its ecosystem. INJ enhances network security by enabling staking for rewards and supports on-chain governance, giving holders a voice in key decisions. The token is used for transaction fees and powers the protocol's buy-back and burn model, helping manage supply and value. Additionally, INJ acts as margin and collateral for derivatives, underscoring its importance in financial activities on the platform.

The total supply of INJ is capped at 100 million, of which just over 97% is currently in circulation. Injective's existing PoS staking rewards necessitated an initial 7% inflation rate but has experienced planned reductions of 15% annually to decrease inflation over time gradually. This tapering approach helped encourage long-term investing in INJ.

Token Utility

INJ is a multi utility token with functions such as governance, staking, and Incentives.

Business Model

Injective implements a 0.1% maker fee and a 0.2% taker fee on all DApps in the ecosystem. Injective collects 60% of the revenue and uses it to buy back and burn INJ from circulation through a weekly auction. The remaining 40% of the fee revenue is shared with DApps.

Supply Distribution

Injective has a max cap of 100M INJ, Around 90M INJ are in circulation right now.

Demand Drivers

Injective is interoperable with both Cosmos, and Ethereum. They also provide gasless fees experience for users who use DAPPs built on Injective. Their robust infrastructure could bring demand from both products and end users.

Supply Inflation

INJ had a 1.66% inflation in the past year, which could possibly decrease and reach a deflationary stage if trading volume on Injective increases by 10-20 times its current levels.

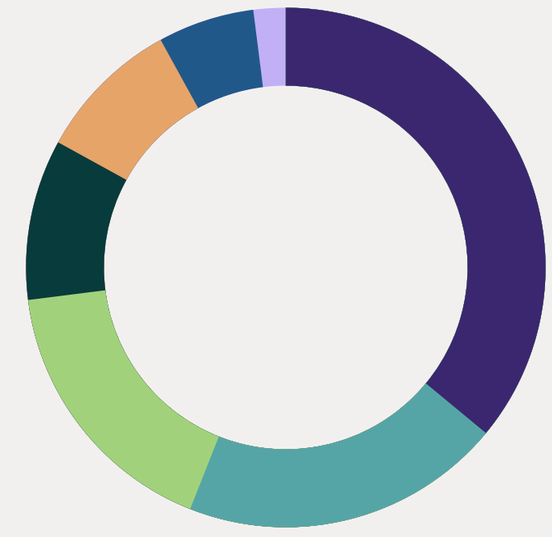
Value Capture

DApps capture value in the form of revenue shares from Injective, and holders can stake INJ to earn up to 15% in staking rewards.

Initial Distribution and Vesting Schedule

The initial allocation of INJ tokens follows a fairly standard model for similar token launches, with a focus on ecosystem development, contributor incentives, and plans for broader community participation. The distribution of INJ was initially as follows:

- Ecosystem Development: 36.33 million INJ (36.3%)
- Team: 20 million INJ (20%)
- Private Sale: 16.67 million INJ (16.7%)
- Community Growth: 10 million INJ (10%)
- Binance Launchpad Sale: 9 million INJ (9%)
- Seed Sale: 6 million INJ (6%)
- Advisors: 2 million INJ (2%)

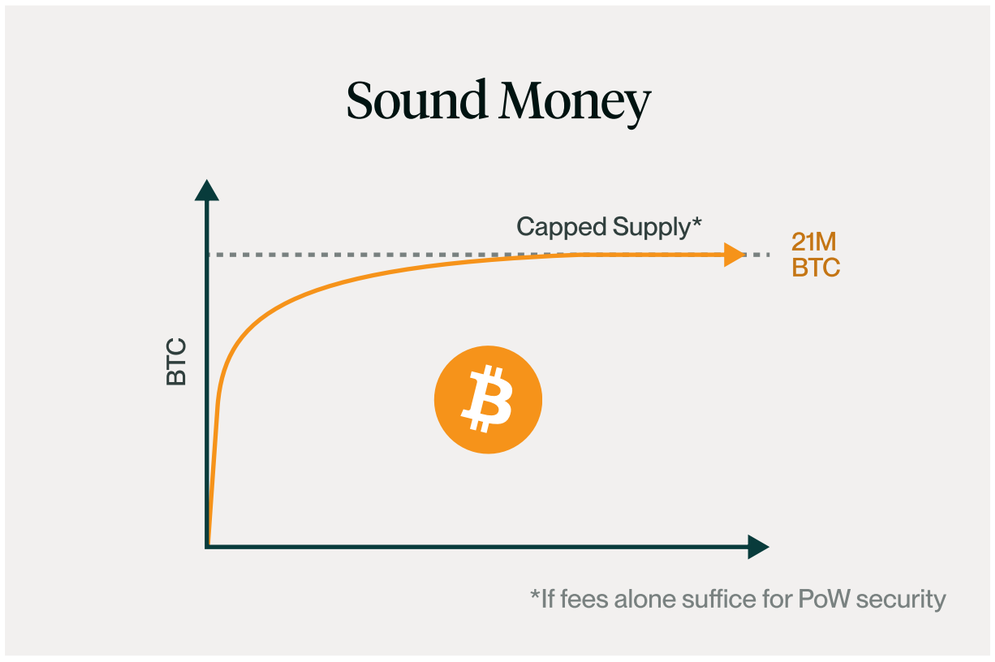


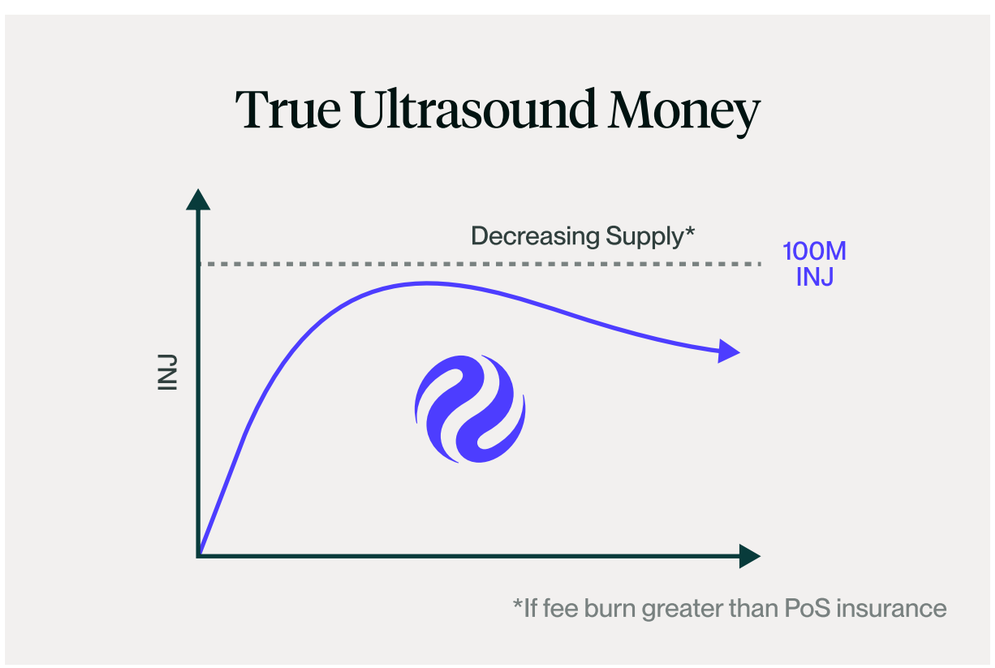
- Ecosystem Development: 36%
- Team: 20%
- Private Sale: 17%
- Community Growth: 10%
- Binance Launchpad: 9%
- Seed Sale: 6%
- Advisor: 2%

The vesting schedules for various token allocations were structured to ensure responsible distribution and alignment with the project's long-term objectives. For team members and associated advisors, tokens were subject to a 9-month lock-up, followed by releases every six months over a 2.5-year period. Private and seed round sales had lock-up periods of 6 and 7 months, respectively, with subsequent releases every six months over 1 to 1.5 years. However, as of November 2024, all of these tokens have been fully unlocked, hence the near-fully circulating supply.

Deflationary Mechanisms and Burn Mechanics

To counteract the effects of its inflationary staking model (despite the 15% annual reduction in the inflation rate), Injective features certain deflationary mechanisms to remove tokens from circulation and help the long-term value of INJ. Overall, Injective's deflationary mechanisms are largely based on the Auction Module, which is tasked with collecting fees from dApps operating on Injective (including any using the Exchange Module) and using those fees to buy back INJ tokens from the open market (like a stock buyback). The tokens that are repurchased are then permanently burned, reducing the circulating supply over time.





Initially introduced in INJ 1.0, the burn auction mechanism involved fees collected exclusively from the Exchange Module. These fees were pooled into a "basket" of assets and auctioned off to the highest bidder, with the bid paid in INJ. The winning INJ tokens were subsequently burned. INJ 2.0 expanded the fee sources to include all dApps operating on Injective.

dApps could voluntarily contribute their fees to the auction, increasing the size and variety of assets in the baskets. This expansion led to a greater amount of INJ being burned due to the higher auction demand.

Lastly, the most recent update occurred during INJ 3.0, which introduced user contributions to the auction, allowing participants to add assets directly to the basket. This enhanced participation and increased the volume of INJ burned through larger auctioned baskets. INJ 3.0 also formalized quarterly supply reductions, with scheduled decreases between 5% and 10% of the total token supply over two years. This structured deflationary trajectory equates to a cumulative reduction of 25% to 30%.

Gas Compression and Transaction Costs

Injective has implemented gas compression to minimize user transaction fees. This technology bundles multiple transactions into a single batch, significantly reducing computational and storage costs. This works by first grouping transactions to be processed in batches, which minimizes the on-chain footprint of network activity and helps lower execution costs. Next, Injective implements specialized data storage techniques to reduce transaction data size.

The protocol optimizes the way state data (information about accounts, balances, and smart contract interactions) is updated and stored on the blockchain. Instead of duplicating or redundantly storing data, Injective consolidates state changes into a single, efficient update per batch of transactions. Plus, wherever possible, Injective aggregates and processes non-critical data off-chain, submitting only the essential information to the blockchain. This method reduces the overall volume of on-chain data without compromising transaction integrity.

Combined, these innovations result in ultra-low transaction fees of $0.0003 per transaction, which are even lower than Solana's average fees of $0.00045. This accessibility broadens Injective's user base and positions it as one of the most cost-effective L1 solutions.

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Valor Injective SEK

Valour Injective (INJ) SEK is an exchange-traded product (ETP) tracking INJ, the native token of the Injective Protocol. Injective is a decentralized blockchain optimized for finance, offering fast, scalable, and interoperable solutions for trading, lending, and other DeFi applications. Built on a Layer 1 architecture, Injective enables fully decentralized order books, perpetual swaps, and cross-chain compatibility. The INJ token powers the ecosystem by facilitating staking, governance, and fee payments. Designed to expand access to financial markets, Injective fosters a user-centric, community-driven platform that supports innovation and inclusivity in decentralized finance.

Conclusion

Injective has emerged as a pioneering Layer 1 blockchain, addressing critical challenges in decentralized finance through a unique combination of scalability, low transaction costs, and interoperability. By leveraging innovative features such as its unified liquidity layer, Frequent Batch Auction mechanism, and multi-VM compatibility, Injective provides a robust foundation for developers and users seeking to build and interact with advanced financial applications.

Its strategic focus on democratizing access to traditionally exclusive financial markets, coupled with a modular design that simplifies decentralized application development, positions Injective as a catalyst for innovation within the DeFi ecosystem. The platform's ability to integrate seamlessly with external blockchain networks like Ethereum, Solana, and Polkadot further amplifies its relevance in the multi-chain future of Web3.

Despite challenges like validator centralization and the complexities of multi-VM architecture, Injective has demonstrated a strong commitment to addressing these issues through continued upgrades, community involvement, and robust security measures. With its innovative deflationary tokenomics, real-world asset tokenization, and developer-centric approach, Injective is poised to drive significant advancements in the financial blockchain space.

As the ecosystem matures, Injective's blend of technical ingenuity and user accessibility ensures its position as a leading blockchain network tailored to financial innovation and the broader adoption of decentralized finance.

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