Starknet Report

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About the Authors

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Introduction

Starknet is a permissionless Layer 2 scaling solution designed to bring increased scalability, efficiency, and affordability to the Ethereum blockchain. Developed by StarkWare Industries, Starknet leverages Zero-Knowledge Rollup technology to achieve this goal. Ethereum's rise in popularity has highlighted its scalability limitations, leading to high gas fees and network congestion. L2 solutions like Starknet address these issues by executing transactions off-chain and submitting succinct cryptographic proofs (known as validity proofs) back to Ethereum, ensuring security and trustlessness without overloading the main network.

The backbone of Starknet's technology is STARK (Scalable Transparent ARgument of Knowledge) proofs, a novel form of cryptographic proof developed by StarkWare. Unlike other zero-knowledge systems that require a "trusted setup," STARKs are transparent and scalable. This transparency ensures that no party has control over the generation of cryptographic keys, thus eliminating centralization risks. Furthermore, STARKs offer greater scalability by allowing Starknet to batch thousands of transactions into a single proof, drastically reducing gas fees per transaction.

A key feature that distinguishes Starknet from other ZK Rollup solutions is its support for general-purpose computation. This means that any application that can run on Ethereum can also run on Starknet without compromising scalability or security. Starknet uses Cairo, its native programming language, designed to optimize computational efficiency on zero-knowledge systems. Developers on Starknet can deploy dApps that interact with smart contracts and process complex business logic, enabling a broad range of use cases such as decentralized exchanges (DEXs), gaming, NFTs, and more.

Starknet is designed with composability in mind, a crucial aspect in the DeFi ecosystem. Composability enables various decentralized applications (dApps) to interact seamlessly with each other on the same platform. By enabling this, Starknet ensures that developers can build protocols that leverage existing liquidity, assets, and data from other dApps. This interoperability is critical for scaling financial applications that rely on interconnected services, such as lending protocols or automated market makers.

The protocol also embraces Ethereum's ethos of decentralization by progressively rolling out its path to full decentralization. Starknet began with StarkWare providing centralized control over the network to iterate and improve its architecture rapidly. However, Starknet's governance model is evolving to transfer decision-making power to the community through a decentralized governance framework. This involves the use of Starknet's native token, STRK, which will enable token holders to participate in governance decisions, such as protocol upgrades and economic incentives.

One of Starknet's most significant advancements is its adoption of Account Abstraction, a concept designed to enhance the user experience of interacting with crypto wallets and smart contracts. Traditional wallets rely on externally owned accounts (EOAs) that can be cumbersome and risky to use. Account Abstraction allows smart contracts to act as user accounts, enabling features such as multi-signature security, social recovery, and gas fee delegation. These improvements are expected to make blockchain interactions more intuitive and secure, especially for newcomers.

Starknet's development is taking place within the broader context of Ethereum’s roadmap for scalability. Vitalik Buterin, Ethereum’s co-founder, has emphasized the importance of rollups in Ethereum's long-term vision. With Ethereum’s planned upgrades (e.g., proto-danksharding and full danksharding), rollups like Starknet are expected to benefit from reduced transaction data costs and increased throughput, further enhancing their scalability potential. As Ethereum continues to mature, Starknet aims to remain at the forefront of L2 innovation.

A strong indicator of Starknet's growth is its expanding ecosystem. In just a few years, the protocol has attracted a wide range of projects, from DeFi applications to NFT platforms and infrastructure providers. Starknet also collaborates with other leading blockchain platforms, making it a focal point for multi-chain interoperability. Its developer community is rapidly growing, with several hackathons, grants, and partnerships designed to accelerate dApp development.

Starknet's architecture is aligned with Ethereum's modular design, separating the execution, settlement, and data availability layers. While Starknet handles transaction execution off-chain, Ethereum functions as the settlement layer, verifying the validity of transactions through STARK proofs. This division of responsibilities optimizes Ethereum's limited block space while preserving decentralization and security.

In addition to technical innovations, Starknet has focused on providing scalability solutions for real-world use cases. Financial institutions, gaming platforms, and enterprise clients are increasingly seeking blockchain solutions that can handle high transaction volumes without sacrificing security. Starknet’s ability to offer fast, low-cost transactions without compromising trust has positioned it as a leading solution for these industries.

In summary, Starknet represents a key piece of Ethereum's scaling future. Its use of STARK technology, focus on general-purpose computation, and commitment to composability and decentralization provide a robust foundation for innovation. Starknet’s rapid adoption highlights its potential to become a core infrastructure layer for decentralized applications across various sectors.

Exploring the L2 ecosystem and Starknet's positioning

The L2 ecosystem has become a focal point in the blockchain industry, aiming to address the scalability limitations inherent in L1 networks like Ethereum. L2 solutions operate atop the base layer, processing transactions off-chain and subsequently settling them on-chain, thereby enhancing throughput and reducing costs while maintaining the security and decentralization of the underlying blockchain. This approach is crucial for accommodating the growing demand for dApps and services.

Within the L2 landscape, various scaling solutions have been developed, each employing distinct methodologies to achieve scalability. The primary categories include State Channels, Plasma, Sidechains, and Rollups. State Channels enable participants to conduct multiple off-chain transactions, only settling the final state on-chain, which reduces on-chain transaction volume but requires all parties to be online and can be complex to implement.

Plasma involves creating child chains that handle transactions off the main chain, periodically submitting summaries to the main chain; however, it faces challenges with mass exits and data availability. Sidechains are independent blockchains that are interoperable with the main chain, offering flexibility but relying on their own security mechanisms, which may not be as robust as Ethereum's.

Rollups, particularly Optimistic and ZK Rollups, have gained prominence due to their balance of scalability, security, and compatibility.

Optimistic Rollups, such as Arbitrum and Optimism, assume transactions are valid by default and employ fraud proofs to challenge incorrect transactions. This approach allows for compatibility with existing Ethereum smart contracts but introduces a delay in transaction finality due to the challenge period required for fraud proofs.

In contrast, ZK Rollups, like Starknet and zkSync, generate validity proofs that verify the correctness of transactions before they are posted on-chain, enabling faster finality and enhanced security. However, ZK Rollups can be more complex to implement and may require developers to learn new programming languages or paradigms.

Starknet distinguishes itself within the ZK Rollup space through its use of STARK proofs. Unlike SNARKs, which require a trusted setup, STARKs are transparent and do not necessitate such a setup, reducing potential security risks associated with trusted setups. Additionally, STARKs offer scalability advantages, as they can batch a large number of transactions into a single proof, thereby reducing the data posted on-chain and lowering transaction costs.

Starknet Vs. Other Rollup Layer 2s

A Detailed Comparison

STARKNET

Features	Starknet	zkSyncEra	Polygon zkEVM	Scroll	Linea
Rollups	zk-STARK	zk-SNARK	zk-SNARK	zk-SNARK	zk-SNARK
Proof System	Transparent (no trusted setup)	Trusted setup	Trusted setup	Trusted setup	Trusted setup
Coding Language	Cairo	Solidity (zkSync-flavored)	Solidity	Solidity	Solidity
Mainnet Status	Live on Ethereum, expanding to Bitcoin	Live	Live	Live	Live
Native Account Abstraction	Yes	Partial	No	No	No
Target Ecosystem	Ethereum + Bitcoin	Ethereum	Ethereum	Ethereum	Ethereum

Another notable feature of Starknet is its support for general-purpose computation, allowing developers to deploy complex dApps with diverse functionalities. This is facilitated by Cairo, Starknet's native programming language, which is designed to optimize the generation of STARK proofs. While Cairo differs from Ethereum's Solidity, it enables developers to write more efficient programs that can be executed at scale, albeit with a learning curve for those accustomed to Solidity.

In terms of ecosystem positioning, Starknet has been gaining traction with a growing number of projects building on its platform. Its focus on scalability and security has attracted DeFi applications, NFT platforms, and gaming projects seeking to leverage its high throughput and low transaction costs. The expanding Starknet ecosystem reflects its potential to become a significant player in the L2 space.

Comparatively, other L2 solutions like Arbitrum and Optimism have prioritized ease of integration with existing Ethereum dApps by maintaining compatibility with the EVM. This approach allows developers to migrate their applications with minimal modifications, facilitating quicker adoption. However, these Optimistic Rollups introduce latency due to the challenge periods inherent in their fraud-proof mechanisms, which can affect user experience in time-sensitive applications.

zkSync, another ZK Rollup solution, aims to combine the benefits of ZK proofs with EVM compatibility through its zkEVM initiative. This effort seeks to enable developers to deploy existing Ethereum smart contracts on zkSync with minimal changes, offering a balance between scalability and developer convenience. While promising, zkEVM implementations are complex and still under active development, with full compatibility yet to be achieved.

Polygon, known for its sidechain approach, has also ventured into the ZK Rollup space with its Polygon zkEVM. By leveraging zero-knowledge proofs, Polygon aims to provide scalable solutions that are compatible with existing Ethereum infrastructure. This development reflects the broader industry trend towards adopting ZK Rollups as a preferred scaling strategy.

In summary, the L2 ecosystem comprises a diverse array of solutions, each with its own trade-offs in terms of scalability, security, compatibility, and complexity. Starknet's unique approach, characterized by its use of STARK proofs and support for general-purpose computation through Cairo, positions it as a compelling option for developers seeking to build scalable and secure dApps. As the L2 landscape continues to evolve, projects like Starknet are poised to play a crucial role in the broader adoption and maturation of blockchain technology.

Recent developments & next steps for Starknet

Starknet has been undergoing rapid evolution, with significant milestones and initiatives shaping its trajectory as a premier Layer 2 solution on Ethereum. One of the most impactful updates is captured in the recently released Starknet Ecosystem Report 2025. This comprehensive report highlights several key data points, including the rapid expansion of Starknet-based projects and the increased adoption by developers and users alike. The number of projects built on Starknet has grown by 168% year-over-year, rising from 72 in November 2023 to 193 in November 2024. This surge underscores the growing confidence in Starknet’s infrastructure and its ability to accommodate complex dApps at scale.

The report emphasizes the protocol’s role as a hub for DeFi, gaming, and infrastructure projects. Leading DeFi protocols have launched on Starknet, utilizing its scalability and security to offer faster, cheaper transactions compared to Ethereum mainnet. Meanwhile, gaming projects are increasingly drawn to Starknet's ability to handle high transaction volumes without compromising on decentralization, a crucial factor for blockchain-based games that require real-time operations. Infrastructure initiatives, such as decentralized identity and data storage protocols, have also found a home on Starknet due to its composability and flexibility.

Developer engagement has been a major focus for Starknet's ecosystem growth. At ETHDenver, Starknet launched new initiatives to onboard developers, including hands-on workshops, tool demonstrations, and networking events. Starknet's developer support framework includes comprehensive documentation, access to grants, and mentorship programs designed to lower the barrier to entry for newcomers. By targeting both experienced blockchain developers and those transitioning from Web2, Starknet aims to accelerate the development of innovative dApps on its platform.

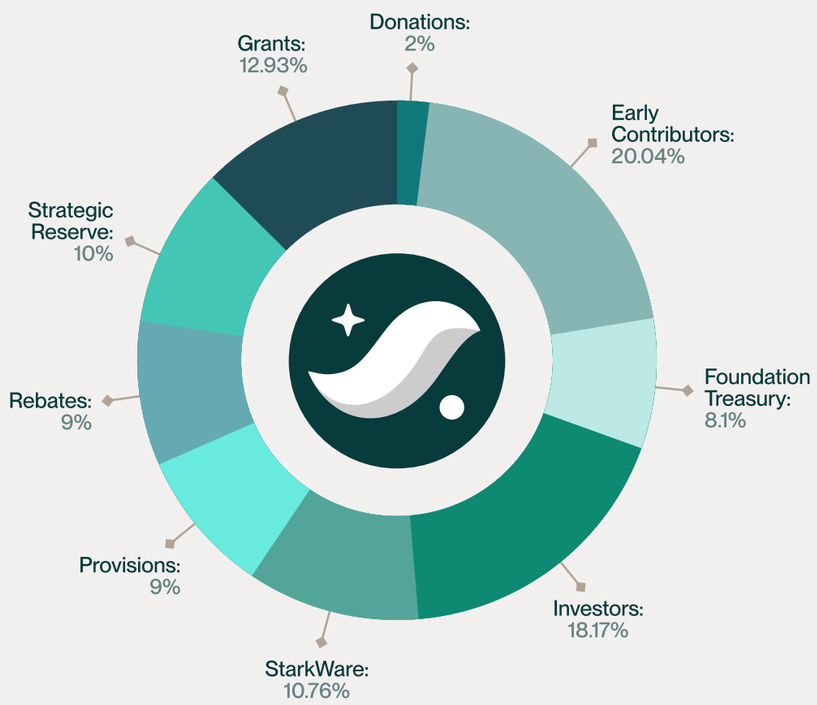
To further support this growth, Starknet introduced the SN Stack, a modular and customizable developer toolkit. The SN Stack enables teams to build "appchains," custom Starknet-based blockchains optimized for specific use cases. This architecture allows projects to scale independently while benefiting from Starknet's zero-knowledge infrastructure. By offering such flexibility, Starknet is positioning itself as a leader in blockchain scalability, empowering developers to tailor infrastructure to their needs without sacrificing interoperability with the broader Starknet and Ethereum ecosystems.

Decentralization remains a key strategic priority for Starknet. The protocol is currently in the early phases of its staking initiative, with over 150 million STRK tokens staked and more than 100 validators participating. This phased rollout will eventually distribute network governance and security responsibilities among a wider pool of participants. The introduction of staking is expected to increase community involvement in protocol decision-making, reinforcing Starknet's long-term vision of a fully decentralized network.

Planned distribution of STRK

Source: docs.starknet.io

STARKNET



Account Abstraction is another area where Starknet is making significant strides. By allowing smart contracts to act as user accounts, Account Abstraction enables features such as social recovery, gas fee delegation, and multi-signature security—all designed to improve the user experience. This initiative has the potential to revolutionize how users interact with blockchain applications, particularly by simplifying wallet management for mainstream users.

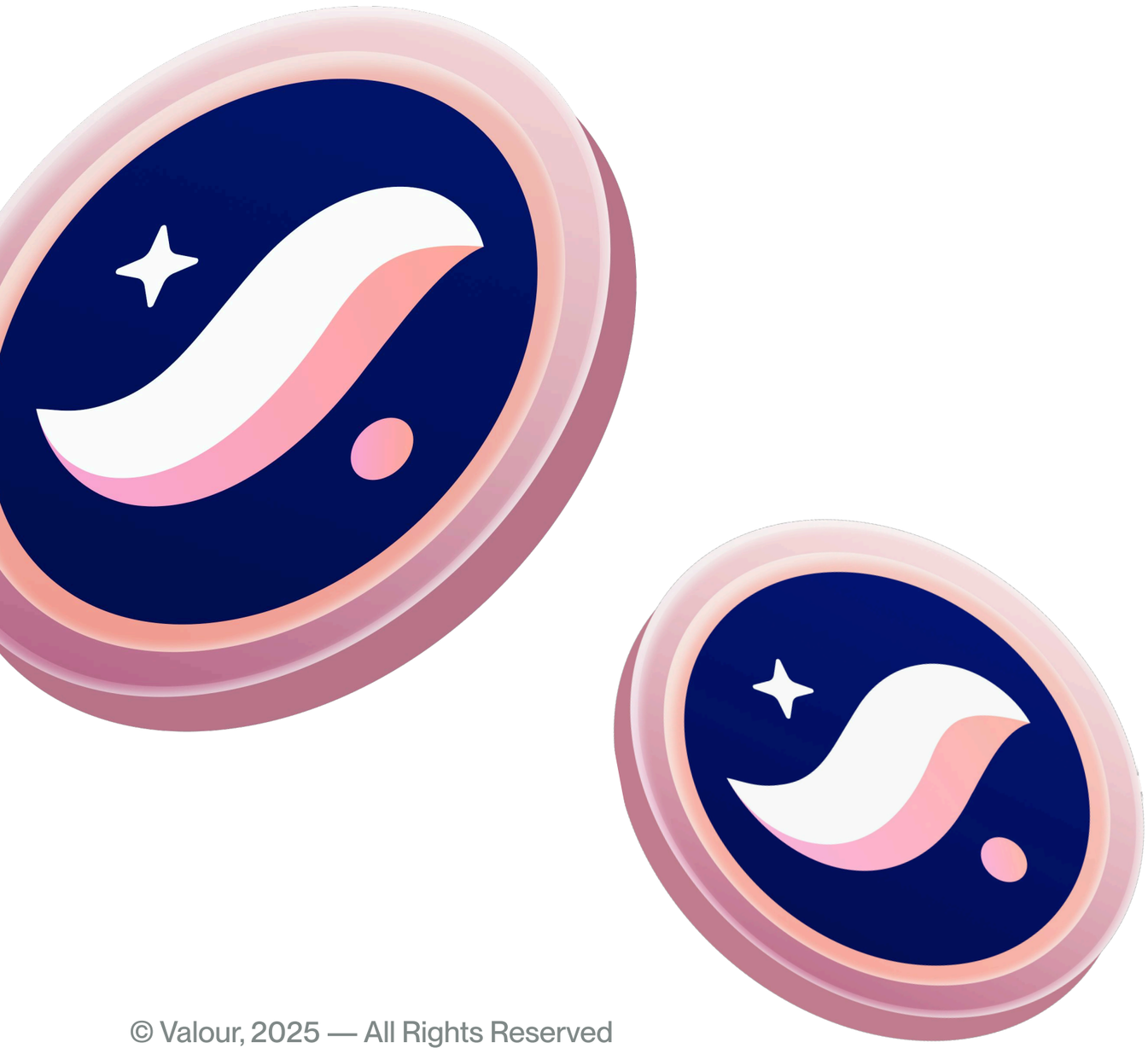
Looking ahead, Starknet is preparing for major protocol upgrades aimed at enhancing both performance and interoperability. These upgrades will optimize how Starknet handles transaction batching and proof generation, further reducing costs and improving transaction speeds. Additionally, Starknet is aligning its infrastructure with Ethereum's roadmap for scalability, including the eventual integration of Ethereum's proto-danksharding and full danksharding upgrades. These Ethereum enhancements are expected to lower data availability costs for rollups, benefiting Starknet and other L2 solutions by increasing throughput and reducing transaction fees.

One of Starknet's strategic goals for 2025 is to expand its multi-chain interoperability. While Starknet is deeply integrated with Ethereum, the protocol is exploring opportunities to interact with other blockchain ecosystems, especially Bitcoin. This cross-chain strategy aims to position Starknet as a scalable solution for applications that require data and asset transfers across multiple networks. By facilitating multi-chain operations, Starknet aims to attract developers from a broader range of blockchain ecosystems, thereby increasing its overall market share.

Looking ahead, Starknet's success will hinge on its ability to maintain a balance between technical innovation, decentralization, and ecosystem growth. By building on its current momentum and continuing to foster collaboration within the blockchain industry, Starknet is well-positioned to play a pivotal role in shaping the next generation of decentralized applications. With its focus on scalability, security, and user experience, Starknet has the potential to become a vital component of the blockchain ecosystem for years to come.

Valour ETP

Valour StarkNet (STRK) SEK is an exchange-traded product (ETP) tracking STRK, the native token of the StarkNet ecosystem. StarkNet is a decentralized Layer 2 scaling solution for Ethereum, leveraging zero-knowledge rollups (ZK-rollups) to enable fast, low-cost, and secure transactions. The STRK token is used for governance, staking, and paying transaction fees, empowering holders to influence protocol upgrades and ecosystem development. By enhancing Ethereum's scalability and efficiency, StarkNet supports a wide range of decentralized applications (dApps) and fosters innovation in the blockchain ecosystem.



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