UNIVERSITY OF WYOMING

Center for Blockchain and Digital Innovation

Blockchain Analysis Report

Prepared for the
Wyoming Stable Token Commission

For Presentation on December 21, 2023

1000 University Avenue · Dept. 3275 · Laramie, WY 82071-2000

Table of Contents

I. Background

This Blockchain Analysis Report (“Report”) has been performed by the University of Wyoming’s Center for Blockchain and Digital Innovation (“UW CBDI”), for presentation to the Wyoming Stable Token Commission (“STC” or “Commission”).

The Report was prepared and completed under the direction and supervision of the Executive Director (“Director”) of the STC.

The report is intended to provide the Commission with information regarding the capabilities, limitations, and adoption of various blockchains suitable for launching a Wyoming Stable Token ("WST").

II. Letter from the UW CBDI

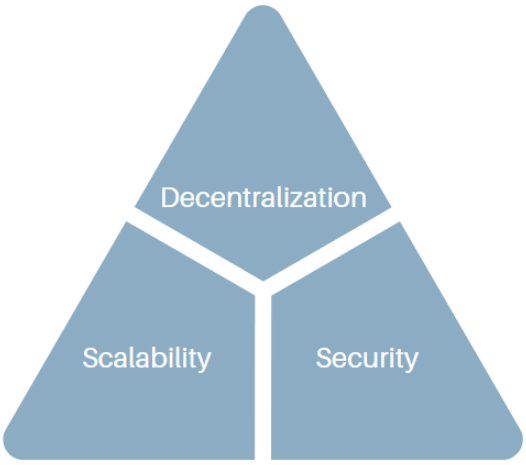
Dear Commissioners,

Thank you for the opportunity to share our research with you. Ahead of our presentation, we would like to appropriately frame our findings within the context of this emerging technology.

There are several considerations and clarifications to be made regarding this report in contemplation of reporting standards within the blockchain industry, the use of certain terminology, and trade-offs between speed, security, and decentralization.

The blockchain industry currently lacks any standardized disclosure and reporting guidelines which has led to challenges in information gathering and consistency, as evidenced by the varied data sets presented in this document. The University of Wyoming's Center for Blockchain and Digital Innovation advocates for the creation of standardized industry disclosures. These standards are crucial for transparency, as well as for providing clear and comparable information to investors, regulators, and users. Standardized disclosure guidelines also promote market integrity and growth by highlighting best practices, fostering innovation, and attracting investment. The center endorses the establishment of an industry standard-setting body for disclosures, akin to the Smart Contracts Institute suggested by Charles Hoskinson in 2021.

In this report, the term “stable token” is utilized in place of the term “stable coin.” The term “stable token” is the standard term set by Act No. 85 of the Wyoming state legislature which set forth the Wyoming stable token initiative. The term “stable coin” is generally the industry term used to describe the many projects referenced in this report such as USDT (Tether) and USDC (Circle). Although it is understood that there is a difference between the term “token” and “coin” in this context, “token” is used exclusively for the purpose of consistency with the standard terminology set in the original act.



The blockchain trilemma refers to the challenge in balancing the three key properties of blockchain technology: security, decentralization, and scalability, where improving one aspect often leads to compromises in the others.

In addressing the blockchain trilemma, the pivotal trade-offs among scalability, security, and decentralization become particularly evident when considering the divergent mechanisms of Proof of Work (PoW) and Proof of Stake (PoS). PoW, exemplified by its use in Bitcoin, offers robust security through computational work, deterring malicious actors with high energy and hardware costs. However, this security comes at the expense of speed and scalability, as the intensive process inherently limits transaction throughput. In contrast, PoS, as implemented in networks like Ethereum 2.0, proposes a more energy-efficient model where validators stake their own cryptocurrency to validate transactions. This shift can enhance speed and scalability but raises concerns about centralization, as those with more significant stakes have greater control.

It's crucial to recognize that not all blockchains are created equal, and these trade-offs manifest differently across various implementations and designs, each tailored to specific use cases and priorities. It is imperative that the commission keep these trade-offs in mind when determining a blockchain to utilize in the initial launch of WST and any subsequent launches on other blockchains.

The center would like to extend our sincere gratitude to the Commissioners of the Wyoming Stable Token Commission and the Executive Director, Anthony Apollo, for their dedication, leadership, and insightful contributions to this endeavor.

Regards,

Director Steven Lupien and the Research Team
University of Wyoming Center for Blockchain and Digital Innovation

III. Letter from the Executive Director

Dear Commissioners,

In its initiative to launch the first publicly-issued, fiat-backed stable token in the United States, the Stable Token Commission has many critical decisions at hand. One such determination is which blockchains or distributed ledgers a Wyoming Stable Token should launch on, and in which order.

In its November 8, 2023 letter to the Commission, the Select Committee on Blockchain, Financial Technology, and Digital Innovation Technology "encourage[d] a multi-chain, technology-neutral approach." I believe this Report well-represents the extent of consideration that has been given to many existing and in-development platforms.

That said, the Commission has a limited pool of budget and resources. There must inevitably be an assessment of where the WST will have the smoothest development (technical), strongest compliance (legal), and highest adoption (financial). There is no one metric to provide an objective answer.

The research team at the University of Wyoming's Center for Blockchain and Digital Innovation has gathered data on both qualitative and quantitative metrics for over a dozen blockchains. Certain blockchains may have been excluded for legal or technical reasons. For example, despite having nearly US$50B of stable tokens on its platform,[1] Tron has been excluded due to domestic regulatory concerns. Others have been excluded simply due to time constraints; and we look forward to exploring additional blockchains in the future.

Given the large response received during the Commission's initial "Request for Information" process, it may behoove the Commission to take more time in its consideration of design choices for a proposed WST. This Report should serve as a guide through future decisions.

Finally, adaptability in this ever-changing technological landscape is key. Keeping abreast of technological advancements, regulatory changes, and evolving user needs is essential for both the long-term success of the WST, and mitigating risks for the state of Wyoming.

I would like to thank the research team at the University of Wyoming's Center for Blockchain and Digital Innovation for assembling this report and helping inform the STC of the breadth of choices available.

Regards,

Anthony J. Apollo
Executive Director, Wyoming Stable Token Commission

[1] https://messari.io/report/stablecoin-brief-december-13th-2023

IV. Definitions

To achieve a comprehensive understanding of the various aspects outlined in this report, it is imperative to establish clear definitions for several key terms. These terms are listed below:

Account-Based System

Blockchain that maintains balances associated with user accounts. Each user account has an associated balance, and transactions involve the transfer of value between these accounts. Unlike UTXO-based systems, which track individual coin outputs, account-based systems (like Ethereum) manage balances tied to specific addresses. This model simplifies transaction verification and enables more complex smart contracts by allowing direct manipulation of account balances.

Address

Refers to a unique cryptographic identifier associated with participants or entities within the network. Public addresses, generated from public keys, serve as destinations for receiving cryptocurrencies or tokens, enabling transparent transactions. These public addresses are openly shared for fund transfers. In contrast, private addresses, linked to private keys, are kept confidential and provide access to the assets associated with the corresponding public address. The pairing of public and private addresses ensures secure and verifiable transactions, as the public address is used for receiving funds, while the private key is utilized to authorize and manage asset transfers, preserving the privacy and control of individual users over their blockchain assets.

Collateralized Debt Protocol

Financial system used in the world of decentralized finance (DeFi). “CDP” allows users to borrow assets, typically a cryptocurrency, by locking up on-chain collateral in a smart contract. The key feature of a CDP is that the loan is overcollateralized. This is done to mitigate the risk of price volatility in the cryptocurrency market.

Consensus Mechanism

The agreed-upon process that ensures all participants in the network reach a common decision about the state of the blockchain. Consensus is the method by which nodes (computers in the network) agree on the validity of transactions and the order in which they are added to the blockchain.

Different consensus mechanisms, such as Proof of Work (used by Bitcoin) or Proof of Stake (used by Ethereum 2.0), provide the network with security and prevent malicious activities by establishing a shared truth among decentralized participants. The choice of a consensus mechanism significantly influences the blockchain's security, scalability, and energy efficiency.

Daily Active Addresses

Pertains to the count of unique cryptographic addresses that actively participate in a blockchain's activities within a 24-hour period. This metric serves as a pivotal gauge for evaluating the daily user engagement and adoption of a blockchain network. DAA offers valuable insights into the number of distinct addresses involved in transactions, transfers, or other interactions during the specified timeframe. Monitoring daily active addresses is essential for gauging the vitality and functionality of a blockchain ecosystem in real-time, providing a snapshot of user involvement and the practical utility of the associated cryptocurrency within the network.

Decentralized Applications (dApps)

Software application that operates on a decentralized blockchain. Unlike traditional applications, dApps leverage the distributed and secure nature of blockchain technology. dApps use smart contracts to execute predefined rules and logic, ensuring transparency, security, and user control over data. dApps cover a range of purposes, including decentralized finance (DeFi), gaming, and peer-to-peer transactions.

Decentralized Finance (DeFi)

Category of financial services and applications built on blockchain technology. “DeFi” aims to recreate and innovate traditional financial systems in a decentralized and open manner.

DeFi platforms use smart contracts to enable activities such as lending, borrowing, trading, and earning interest without the need for traditional intermediaries like banks. DeFi promotes financial inclusion, transparency, and accessibility by allowing users to interact with financial services directly through decentralized applications (dApps).

Digital Wallet

A secure software application or device that allows individuals to store, manage, and interact with their digital assets through a user interface. It functions as a virtual container for cryptocurrencies and other tokens, enabling users to view their balances, initiate transactions, and monitor their transaction history.

Digital wallets can be either software-based (i.e., applications or online services) or hardware-based (i.e., physical devices), and employ cryptographic techniques to ensure the security of private keys, which are essential for authorizing transactions on the blockchain.

EVM Compatibility

The ability of a blockchain or smart contract platform to execute programs written for the Ethereum Virtual Machine (EVM). The EVM is a runtime environment for smart contracts on the

Ethereum blockchain, and compatibility with it allows developers to port and run their existing Ethereum-based smart contracts on another blockchain that supports EVM.

In practical terms, EVM compatibility simplifies the migration of decentralized applications (dApps) and smart contracts from the Ethereum network to alternative blockchain platforms, fostering interoperability and giving developers flexibility in choosing the most suitable blockchain for their projects without significant code modifications.

Liquid Staking

Liquid staking transforms staked tokens into tradable assets, providing liquidity to token holders. It allows users to trade or transfer their staked assets while still participating in the staking process, offering flexibility and maintaining active engagement in the cryptocurrency ecosystem.

Market Capitalization

Financial metric that represents the total value of a cryptocurrency in circulation, calculated by multiplying the current market price of a single unit of the cryptocurrency by the total number of units (coins or tokens) in circulation. “Market cap” provides a quick assessment of the overall value and relative size of a particular cryptocurrency in the market.

Nakamoto Coefficient

Nakamoto Coefficient is a measure of the smallest number of independent entities that can act collectively to shut down a blockchain. On a typical Proof-of-Stake network the Nakamoto Coefficient is defined by the number of node operators that, together, control more than one third (33.33%) of all stake on the network.

Private / Permissioned Blockchains

Type of blockchain that limits access, functionality, and validation to specific participants with explicit permissions.

Permissioned blockchains are often utilized by businesses or organizations where privacy, control, and regulatory compliance are critical. These chains may restrict visibility of the ledger to specific parties.

Programming Language

Set of instructions used to develop blockchain protocols, as well as the smart contracts and decentralized applications (dApps) thereon. Each blockchain typically supports specific languages for coding. For instance, Ethereum uses Solidity. The choice of language influences how developers express logic and create functionalities in their dApps, and materially impacts the size of the developer base.

Proof of Stake (PoS)

Blockchain consensus mechanism where validators, chosen based on the amount of cryptocurrency they stake, create new blocks and validate transactions. It provides security, encourages network participation through staking, and is more energy-efficient than traditional Proof of Work. Examples include Ethereum 2.0, Cardano, and Algorand.

Proof of Work (PoW)

Blockchain consensus mechanism where miners (i.e., computers) compete to solve mathematical puzzles, to “win” the privilege of mining a block. The first miner to solve the puzzle adds a new block to the blockchain, ensuring security through computational effort. Notable examples include Bitcoin, Monero, and the original iteration of Ethereum. “PoW” can be energy-intensive in some implementations.

Public / Permissionless Blockchains

Type of blockchain that is “open to anyone.” Participants can join or leave the network without requiring explicit permission, and also have the ability to read, write, and validate transactions.

Permissionless blockchains are characterized by decentralization, meaning no central authority controls the network and transactions are validated by a distributed network of nodes. These chains offer transparency, security, and inclusivity.

Stable Token Market Capitalization

Total value of a stable token (or “stablecoin”) in circulation. Calculated by multiplying the current market price of one unit of the stable token by the total number of units in circulation, it reflects the overall perceived value and stability of the stable token in the market. Stable tokens are designed to maintain a stable value by pegging to a reserve asset, such as a fiat currency like the US Dollar. Monitoring the market capitalization of stable tokens is essential for assessing their adoption, utility, and overall impact within the cryptocurrency ecosystem.

Subnets

Refers to a segmented and isolated network within the broader blockchain infrastructure. It involves the partitioning of the blockchain into distinct subsets, each operating independently while still being connected to the overarching network. Subnets are designed to enhance scalability, efficiency, and resource allocation by allowing specific operations or applications to function within their dedicated space without affecting the performance of the entire blockchain. Each subnet can have its consensus mechanism, governance rules, and smart contracts tailored to its specific use case, fostering versatility within the blockchain ecosystem. This partitioning facilitates parallel processing, enabling multiple operations to occur simultaneously, ultimately contributing to improved overall performance and responsiveness of the blockchain network.

Time to Finality

Duration it takes for a block of transactions to be confirmed and considered irrevocable on the blockchain. It measures the time elapsed from the initiation of a block to the point where the consensus mechanism ensures the permanence of the recorded transactions. A shorter time to finality is desirable, as it enhances the speed and security of transaction confirmations, contributing to the efficiency and reliability of the blockchain network.

Trade Volume

Total quantity of a particular cryptocurrency traded on various exchanges within a specific period, usually measured in terms of a 24-hour timeframe. It represents the total amount of a cryptocurrency that has been bought or sold across all trading pairs during that period.

Transaction Fee / Gas Fee

A small amount of cryptocurrency paid by users to miners or validators as compensation for processing and verifying transactions on a blockchain. It serves as an incentive for network participants to include transactions in the blocks they mine or validate.

Transactions per Second (TPS)

Measure of the processing capacity of a blockchain, indicating the number of transactions it can handle in one second. “TPS” serves as a crucial performance metric, reflecting the speed and scalability of the blockchain infrastructure. Higher TPS values suggest that the network can efficiently process a greater volume of transactions within a given time frame.

Achieving high TPS is essential for blockchain platforms to accommodate a large user base and support various decentralized applications. However, it's important to balance TPS with factors like decentralization and security to ensure the overall health and effectiveness of the blockchain network.

UTXO-Based System (Unspent Transaction Output-based)

Blockchain architecture where transactions are treated as a series of individual, unspent outputs. Each output represents a specific amount of cryptocurrency and is used as an input for future transactions. UTXO-based systems, like Bitcoin, track the ownership and status of each coin by recording when it is spent or remains unspent. This model enhances security and allows for straightforward verification of transaction authenticity.

Zero-Knowledge

Class of cryptographic proofs that allow one party (the “prover”) to demonstrate knowledge of certain information to another party (the “verifier”) without revealing the actual information itself.

This concept enhances privacy and security by enabling parties to authenticate data without exposing the underlying details.

“ZKs” come in various forms, such as zero-knowledge proofs of knowledge, where a prover can convince a verifier that they possess certain information without disclosing the information itself. This cryptographic technique is particularly relevant in blockchain applications, where it can be employed to validate transactions or statements without revealing sensitive details, contributing to enhanced privacy and confidentiality on the blockchain.

V. Summary Table

	Active Addresses	Transactions per Second (TPS)	Stable Token Market Cap	Dominance of Leading Token	Transaction / Gas Fee
Arbitrum (L2, EVM)	141,520	7.14	$1.927 B	USDT - 63.70%	$0.004
Avalanche (L1, EVM)	104,460	N/A	$1.047 B	USDT - 65.14%	$0.85
Cardano (L1)	58,321	3.59	$21.04 M	IUSD - 77.75%	$0.13
Ethereum (L1, EVM)	436,000	9.43	$66.599 B	USDT- 55.8%	$0.98
NEAR (L1)	95,140	N/A	$68.95 M	USN - 54.87%	$0.0002
Optimism (L2, EVM)	53,100	3.87	$581.16 M	USDT - 63.70%	$0.272
Polygon (L2, EVM)	336,680	56.54	$1.192 B	USDT - 46.27%	$0.014
Solana (L1)	122,690	N/A	$1.607 B	USDT - 56.41%	$0.00019
Stellar (L1)	108,731	42	$86.95 M	USDC - 99.54%	$0.01

The summary table was compiled using several criteria to identify suitable blockchain networks for deployment of the WST. These include:

- Public / Permissionless chains with decentralized governance, which have “open access” to users and developers.
- Energy-efficient Proof-of-Stake (PoS) networks.
- Averaging over 50,000 daily active addresses across the last 5 quarters, indicating an engaged user base.
- A stable token market capitalization exceeding US$10 million, signaling an established ecosystem and adoption.
- At least 18 months of proven mainnet operations, demonstrating stable infrastructure.

By concentrating on mature PoS networks with thriving stable token ecosystems, the goal was to prioritize scalability, stability, and features that are essential for the successful launch of the token. Factors such as centralization risks and data transparency were also weighed. This list is presented alphabetically, and not as a formal ranking.

VI. Blockchain Analysis

UTXO Model

1. Bitcoin - Liquid Network

Background

- Launched: October 10th, 2018
- Summary: The Liquid Network is a federated sidechain built on top of the Bitcoin blockchain. It enables faster and more confidential transactions compared to the main Bitcoin network. Developed by Blockstream, the Liquid Network is designed to provide quick settlement times, support confidential transactions, and offer the issuance of various tokenized assets.
- Consensus Mechanism: The Liquid Network uses a federated consensus model. A group of functionaries, consisting of trusted entities such as exchanges and financial institutions, is responsible for validating and signing blocks. This consensus mechanism is designed to provide efficiency and faster confirmation times compared to the Proof-of-Work mechanism used in the Bitcoin network.
- Chain Access: Hybrid. The Liquid Network is not entirely permissionless in the same way as the Bitcoin network. It operates on a federated model, and participants in the network, known as "functionaries," are chosen by consensus among the network's stakeholders. Functionaries are typically exchanges and financial institutions.
- Code Access: Open-source
- Programming Language: Multiple languages including, C++, Go, Ruby, Java, Python
- Platform Token: L-BTC is the native token of the Liquid Network and is pegged one-to-one with Bitcoin, ensuring value parity and providing a seamless bridge between the Liquid sidechain and the main Bitcoin blockchain.
- Does the SEC consider the Platform Token a security? No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: Insufficient data was available to determine daily active addresses.
- Market Capitalization: $134.169 M[2]
- 24Hr Trade Volumes: Insufficient data was available to determine 24Hr trade volumes.

[2] https://sideswap.io/network-stats/

- Transactions per Second: 7-10[3]
- Block Size: 4vMB
- Transaction / Gas Fees: 0.1 satoshi/vbyte[4]
- Time to Finality: 2 min
- Developer Base: Insufficient data was available to determine a core developer base.

Qualitative

- Node Structure: Liquid employs a curated system of functionaries within its federated model. All functionary node operators are financially incentivized to preserve the integrity of the side chain.
- Leading Wallet: Blockstream green[5]
- Block Explorer: https://liquid.network/
- Leading Application: SideSwap, a peer-to-peer trading and self custody platform.
- Stable Token Applications: SideSwap, a peer-to-peer trading and self custody platform.[6]
- Privacy Mechanisms: The federated pegging mechanism is maintained through a federated consensus model, which significantly enhances transaction confidentiality through Confidential Transactions. This feature masks transaction amounts and asset types, offering a higher degree of privacy.

[3] https://help.blockstream.com/hc/en-us/articles/900001390903-What-is-the-transaction-capacity-of-Liquid- for Liquid Network TPS, Block Size, and TTF data.
[4] https://help.blockstream.com/hc/en-us/articles/900001386846-How-do-transaction-fees-on-Liquid-work-
[5] https://blockstream.com/green/
[6] https://sideswap.io/network-stats/

2. Cardano

Background

- Launched: September 29th, 2017
- Summary: Cardano is a blockchain platform designed for the development of decentralized applications (dApps) and the execution of smart contracts. It emphasizes scalability, sustainability, and interoperability, aiming to provide a secure and scalable infrastructure for the development of the decentralized economy.
- Consensus Mechanism: PoS (specifically an algorithm known as Ouroboros)
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Multiple programming languages, and its smart contracts are developed using Plutus, a language based on Haskell, and Marlowe, a domain-specific language for financial contracts.
- Platform Token: ADA
- Does the SEC consider the Platform Token a security? The SEC does consider ADA to be a security, however, the SEC has not taken any action at this time.[7]

Quantitative

- Daily Active Addresses: 58,321
- Market Capitalization: $15.74 B
- 24Hr Trade Volumes: $810 M
- Transactions per Second: 3.59[8]
- Block Size: 90kb[9]
- Transaction / Gas Fees: $0.13[10]
- Time to Finality: 1 day[11]
- Developer Base: 159

[7] https://www.sec.gov/files/litigation/complaints/2023/comp-pr2023-102_0.pdf
[8] https://cexplorer.io/tps
[9] https://www.lidonation.com/en/posts/max-block-size
[10] https://resources.messari.io/state_of_market_Q3_2023.pdf for all Transaction / Gas Fee data unless specifically noted otherwise.
[11] https://docs.cardano.org/explore-cardano/time/#:~:text=Transaction%20finality%20can%20be%20achieved,according%20to%20Ouroboros%20consensus%20design

- Total Stable Token Market Capitalization: $21.04 M
- Dominance of Leading Stable Token: IUSD 77.75%

Qualitative

- Node Structure: The Cardano blockchain has over 3000 unique stake pools currently operating. The Cardano network employs the ouroboros protocol to facilitate and encourage decentralized consensus.[12]
- Leading Wallet: Daedalus wallet
- Block Explorer: https://explorer.cardano.org/en
- Leading Application: Indigo (Collateralized debt protocol)
- Stable Token Applications: Stable tokens on Cardano are mainly utilized in decentralized finance applications and for simplifying the on and off ramp process for new network users.[13]
- Privacy Mechanisms: IOG will be looking to deploy the midnight network with heavy integration of ZK proofs.[14] The new Cardano ENCOINS feature will enable private financial transactions.[15]

[12] https://www.emurgo.io/press-news/decentralization-in-cardano/
[13] https://www.emurgo.io/press-news/the-role-of-stablecoins-in-cardanos-defi-ecosystem/
[14] https://www.coindesk.com/business/2022/11/18/cardano-is-launching-new-privacy-blockchain-and-token/
[15] https://cardanospot.io/news/encoins-revolutionizing-privacy-on-cardano

3. Monero

Background

- Launched: 2014
- Summary: Monero (XMR) is a privacy-focused cryptocurrency. It employs an opaque blockchain that conceals transaction details, including the identities of senders and recipients, to ensure anonymity. Monero's egalitarian mining process emphasizes equal opportunities without any stake reserved for its developers, relying instead on community contributions for development.[16]
- Consensus Mechanism: PoW, specifically RandomX
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Java, Python, C++, Golang, Rust, C#[17]
- Platform Token: XMR
- Does the SEC consider the Platform Token a security: No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: Insufficient data was available to determine daily active addresses.
- Market Capitalization: 3.24 B[18]
- 24Hr Trade Volumes: $108 M
- Transactions per Second: 0.29
- Block Size: 90.46kb
- Transaction / Gas Fees: $0.056[19]
- Time to Finality: 26 min[20]
- Developer Base: Insufficient data was available to determine a core developer base.

[16] https://www.gemini.com/cryptopedia/monero-coin-xmr-crypto-privacy#section-moneros-privacy-features
[17] https://www.getmonero.org/resources/developer-guides/
[18] https://coinmarketcap.com/ for all Market Capitalization and 24 Hr trade volume data.
[19] https://bitinfocharts.com/monero/ for all Monero quantitative data unless specifically noted otherwise.
[20] https://www.monero.how/how-long-do-monero-transactions-take

Qualitative

- Node Structure: The Monero blockchain has 3595 active nodes across 73 nations.[21]
- Leading Wallet: Monero GUI Wallet
- Block Explorer: https://localmonero.co/blocks/
- Leading Application: The Monero blockchain is primarily used for private peer-to-peer payment transactions.[22]
- Stable Token Applications: The Monero developer community has begun the process of launching XMRD which will be the first stable token operating in the Monero ecosystem.[23]
- Privacy Mechanisms: The Monero blockchain employs several key privacy-enhancing technologies including Ring Confidential Transactions, Stealth Addresses, Bulletproofs, and Dandelion ++.[24]

[21] https://monerohash.com/nodes-distribution.html
[22] https://cointelegraph.com/learn/what-is-monero-xmr
[23] https://monerodollar.org/
[24] https://www.scip.ch/en/?labs.20220120

4. NEAR

Background

- Launched: April 22nd, 2020
- Summary: NEAR Protocol is a decentralized blockchain platform designed to make it easy for developers to build and deploy decentralized applications (dApps). It aims to provide scalability and usability while maintaining security and decentralization. NEAR facilitates the creation of open and accessible applications that can disrupt traditional centralized systems.
- Consensus Mechanism: PoS
- Chain Access: Permissionless
- Code Access: Open-source
- Programming Language: Rust
- Platform Token: NEAR
- Does the SEC consider the Platform Token a security? The SEC does consider NEAR to be a security, however, the SEC has not taken any action at this time.[25]

Quantitative

- Daily Active Addresses: 95,140 trailing average 5 quarters
- Market Capitalization: $2.36 B
- 24Hr Trade Volumes: $242.058 M
- Transactions per Second: Insufficient data was available to determine transactions per second.
- Block Size: Insufficient data was available to determine the block size.
- Transaction / Gas Fees: $0.0002
- Time to Finality: 2 seconds[26]
- Developer Base: 95
- Total Stable Token Market Capitalization: $68.95 M
- Dominance of Leading Stable Token: USN 54.87%

[25] https://www.sec.gov/files/litigation/complaints/2023/comp-pr2023-102_0.pdf
[26] https://docs.near.org/integrator/exchange-integration

Qualitative

- Node Structure: NEAR currently has 209 nodes. They have three different kinds of nodes, validators RPC and Archival, each one playing a different role in the validation process. NEAR has a Nakamoto coefficient of 9.[27]
- Leading Wallet: NEAR Wallet[28]
- Block Explorer: https://nearblocks.io/
- Leading Application: Meta Pool Near (Liquid Staking)
- Stable Token Applications: Stable tokens on NEAR are primarily utilized for payments and decentralized finance trading and lending. [29]
- Privacy Mechanisms: NEAR Protocol's privacy mechanisms, developed with ZeroPool, enable private transactions by using a method called UTXO (unspent transaction output) and advanced cryptographic techniques. Instead of revealing transaction details like sender, receiver, and amount, a merkle tree stores encrypted information, ensuring privacy. To prevent fraud, a unique identifier called a nullifier is used.

[27] https://nearblocks.io/
[28] https://wallet.near.org/
[29] https://pages.near.org/blog/usdc-launches-natively-on-the-near-protocol/

5. ZCash

Background

- Launched: 2016[30]
- Summary: Zcash is a privacy focused protocol that's integrated with zk-SNARKS to hide addresses of both participants and the transaction amount.
- Consensus Mechanism: PoW
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Rust, C, C++
- Platform Token: Zec
- Does the SEC consider the Platform Token a security? No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: Insufficient data was available to determine daily active addresses.
- Market Capitalization: $484.51 M
- 24Hr Trade Volumes: 70.43 M
- Transactions per Second: 0.04[31]
- Block Size: 2mb[32]
- Transaction / Gas Fees: Insufficient data was available to determine transaction fee.
- Time to Finality: Insufficient data was available to determine time to finality.
- Developer Base: 10[33]

Qualitative

- Node Structure: The Zcash network has over 4220 active nodes. The ViaBTC mining pool currently controls over 51% of the network's computational power.[34]

---

[30] https://corporatefinanceinstitute.com/resources/cryptocurrency/zcash/ for all Zcash background information.
[31] https://tokenterminal.com/terminal/projects/zcash
[32] https://medium.com/@alephium/block-time-and-block-size
[33] https://blockchair.com/zcash
[34] https://blockchain.news/news/coinbase-addresses-zcash-mining-centralization-concerns

- Leading Wallet: Zingo![35]
- Block Explorer: https://zcashblockexplorer.com/
- Leading Application: Zcash is primarily used for private peer-to-peer payment transactions.[36]
- Stable Token Applications: The Zcash network does not currently have any stable tokens in operation.
- Privacy Mechanisms: The Zcash blockchain has implemented extensive zk-snarks architecture along with transparent and shielded address capabilities. [37]

[35] https://z.cash/ecosystem/zingo/
[36] https://cryptowallet.com/academy/zcash-use-case/#cw-content-section-620d439144115
[37] https://www.coindesk.com/layer2/2022/01/26/what-is-zcash-the-privacy-coin-explained/

Account Model – “Layer 1”

6. Avalanche

Background

- Launched: September 21st, 2020
- Summary: Avalanche is a decentralized platform designed to support custom blockchain networks and decentralized applications (dApps). It aims to provide a highly scalable and interoperable ecosystem, allowing developers to create their own blockchain networks with specific rules and consensus mechanisms.
- Consensus Mechanism: Avalanche consensus
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Multiple programming languages including, Solidity, Java, C/C++, Go, and Python.
- Platform Token: AVAX
- Does the SEC consider the Platform Token a security? No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: 104,460 Average trailing 5 quarters[38]
- Market Capitalization: $10.03 B[39]
- 24Hr Trade Volumes: $1.51 B
- Transactions per Second: 12.2 Current on 12/07/2023.[40]
- Block Size: 1mb[41]
- Transaction / Gas Fees: $0.85[42]
- Time to Finality: 1 second[43]

[38] https://resources.messari.io/state_of_market_Q3_2023.pdf for all Daily Active Addresses data unless specifically noted otherwise.
[39] https://coinmarketcap.com/ for all Market Capitalization and 24Hr Trade Volume data.
[40] https://coinkickoff.com/ethereum-vs-avalanche/ All TPS data is the 24Hr average TPS calculated on 12/07/2023 unless specifically noted otherwise.
[41] https://coinkickoff.com/ethereum-vs-avalanche/
[42] https://cointool.app/gasPrice/avax
[43] https://www.avax.network/blog/time-to-finality-ttf-the-ultimate-metric-for-blockchain-speed

- Developer Base: 46[44]
- Total Stable Token Market Capitalization: $1.047 B[45]
- Dominance of Leading Stable Token: USDT 65.14%

Qualitative

- Node Structure: The Avalanche blockchain has over 1600 active validator nodes.[46] Avalanche has most recently received a Nakamoto Coefficient of 24.[47] Avalanche's decentralization is further enhanced by its subnet architecture, allowing for the creation of custom blockchains (subnets) by users.
- Leading Wallet: MetaMask
- Block Explorer: https://subnets.avax.network/
- Leading Application: Benqi (Lending/liquid staking)
- Stable Token Applications: USDT is the leading stable token on Avalanche. USDT is primarily utilized in decentralized finance trading.
- Privacy Mechanisms: The Avalanche blockchain prioritizes speed and scalability with only standard privacy protection measures.

[44] https://tokenterminal.com/terminal/crypto-screener?preset=325356a8-9f04-42e1-b05c-7fa587fbf9fd for all Developer Base data unless specifically noted otherwise.
[45] https://defillama.com/stablecoins/chains for all Stable Token Market Capitalization and Leading Stable Token Dominance data.
[46] https://avascan.info/stats/network-activity
[47] https://nakaflow.io/

7. Ethereum

Background

- Launched: July 30th, 2015
- Summary: Ethereum is a decentralized blockchain platform that enables the creation and execution of smart contracts and decentralized applications (dApps). It introduced the concept of a Turing-complete scripting language, allowing developers to build a wide range of applications on its blockchain.
- Consensus Mechanism: PoS
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Primarily Solidity
- Platform Token: ETH (ether)
- Does the SEC consider the Platform Token a security? No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: 436,000
- Market Capitalization: $272.71 B
- 24Hr Trade Volumes: $13.65 B
- Transactions per Second: 9.43[48]
- Block Size: 1mb[49]
- Transaction / Gas Fees: $0.98
- Time to Finality: 15 minutes[50]
- Developer Base: 167
- Total Stable Token Market Capitalization: $66.599 B
- Dominance of Leading Stable Token: USDT 55.8%

[48] https://ethtps.info
[49] https://coinkickoff.com/ethereum-vs-avalanche/
[50] https://www.coindesk.com/tech/2023/05/17/ethereums-loss-of-finality-what-happened/

Qualitative

- Node Structure: Ethereum has a total node count of 8,704,940 nodes. Ethereum most recently received a Nakamoto Coefficient of 2. This score is an indication of centralization within the ecosystem. It is likely due to the high concentration of power in a limited number of staking pools following the transition to proof of stake.[51]
- Leading Wallet: MetaMask
- Block Explorer: https://etherscan.io/
- Leading Application: Lido (Liquid Staking)
- Stable Token Applications: Stable tokens on Ethereum are primarily used for payments and decentralized finance trading.
- Privacy Mechanisms: The Ethereum blockchain has improved privacy features in recent years. Zero knowledge proofs, privacy pools, sharding, and privacy centric layer 2's all contribute to the level of privacy available to network participants.[52]

[51] https://nakaflow.io/

[52] https://www.ey.com/en_gl/news/2023/01/the-ey-and-polygon-organizations-update-source-code-for-blockchain-privacy-based-protocol-nightfall, https://www.privacypools.com/, https://blog.netcoins.com/privacy-features-on-the-ethereum-network/

8. Stellar

Background

- Launched: July, 2014
- Summary: Stellar is a blockchain-based platform designed to facilitate fast, low-cost cross-border payments and remittances. It aims to connect financial institutions and enable the efficient transfer of value globally.
- Consensus Mechanism: Stellar Consensus Protocol (SCP)
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Multiple programming languages, including JavaScript, Python, and Go.
- Platform Token: XLM (Stellar Lumens)
- Does the SEC consider the Platform Token a security? No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: 108,731 average 365 days[53]
- Market Capitalization: $3.49 B
- 24Hr Trade Volumes: $107 M
- Transactions per Second: 42[54]
- Block Size: 100 tx / block
- Transaction / Gas Fees: $.01 = 10k transactions[55]
- Time to Finality: 5 seconds[56]
- Developer Base: 59
- Total Stable Token Market Capitalization: $86.95 M
- Dominance of Leading Stable Token: USDC 99.54%

[53] https://charts.coinmetrics.io/crypto Data was not available to determine a trailing 5 quarter average.
[54] https://stellarchain.io
[55] https://resources.stellar.org/hubfs/Proof%20of%20Agreement%20explainer.pdf
[56] https://resources.stellar.org/hubfs/Proof%20of%20Agreement%20explainer.pdf

Qualitative

- Node Structure: The SCP relies on federated Byzantine Agreement, where individual nodes independently choose which other nodes they trust to reach consensus. The Stellar network has 43 validator nodes located in 9 different countries. [57]
- Leading Wallet: Lobstr[58]
- Block Explorer: https://stellarchain.io/
- Leading Application: StellarX (Decentralized Exchange)
- Stable Token Applications: Stellar USDC is primarily used for cross-border payments, fiat on/off ramping, and bulk payment disbursements.[59]
- Privacy Mechanisms: The Stellar network features industry standard cryptographic pseudo anonymity.

[57] https://stellarbeat.io/?view=map&no-scroll=1
[58] https://stellar.org/learn/store-and-send-lumens
[59] https://www.circle.com/en/usdc-multichain/stellar#:~:text=Stellar%20USDC%20enables%20seamless%2C%20near,ramping%2C%20and%20bulk%20payment%20disbursements

9. Solana

Background

- Launched: March, 2020
- Summary: Solana is a high-performance blockchain platform designed for decentralized applications (dApps) and crypto projects. It focuses on scalability and throughput, aiming to provide fast and cost-effective transactions without sacrificing decentralization.
- Consensus Mechanism: Solana uses a unique consensus mechanism known as Proof of History (PoH) combined with Proof of Stake (PoS). Proof of History helps secure the order and time of transactions before they are added to the blockchain, contributing to the overall efficiency of the network.
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Rust
- Platform Token: SOL
- Does the SEC consider the Platform Token a security? The SEC does consider SOL to be a security, however, the SEC has not taken any action at this time.[60]

Quantitative

- Daily Active Addresses: 122,690
- Market Capitalization: $27.31 B
- 24Hr Trade Volumes: $2.95 B
- Transactions per Second: ~2600[61]
- Block Size: 128mb[62]
- Transaction / Gas Fees: $0.000194
- Time to Finality: 2.5 seconds[63]
- Developer Base: 69
- Total Stable Token Market Capitalization: $1.607 B

[60] https://www.sec.gov/files/litigation/complaints/2023/comp-pr2023-102_0.pdf
[61] https://explorer.solana.com/ Current approximate TPS. Data was not available for a 24Hr average TPS.
[62] https://finance.yahoo.com/news/solana-vs-polygon-developer-perspective.
[63] https://dailyhodl.com/2023/11/25/solana-competitor-explodes-over-110-in-two-weeks-amid-new-investment-from-usdc-issuer-circle

- Dominance of Leading Stable Token: USDT 56.41%

Qualitative

- Node Structure: As of recent data, Solana has a global network comprising over 2,919 nodes distributed across 31 countries. A key metric for assessing Solana's decentralization is the Nakamoto Coefficient, which currently stands at 22.[64]
- Leading Wallet: OKX
- Block Explorer: https://explorer.solana.com/
- Leading Application: Marinade Liquid Staking
- Stable Token Applications: Many stable tokens operate on Solana due to the network's high throughput and low transaction costs. Stable tokens on Solana are primarily used for payment. One interesting development is Visa's plans to launch their stable token pilot on Solana. [65]
- Privacy Mechanisms: The Solana blockchain has recently made significant advancements in enhancing user privacy through its v1.16 update, which introduced Confidential Transfers for Solana's token standard. Additionally, members of the Solana community intend to further integrate zero knowledge tools.

[64] https://solanacompass.com/statistics/decentralization and https://cryptobriefing.com/how-decentralized-is-solana/
[65] https://usa.visa.com/solutions/crypto/deep-dive-on-solana.html

10. Tezos

Background

- Launched: June, 2018
- Summary: Tezos is a blockchain platform that features a self-amending blockchain. It allows for on-chain governance, enabling stakeholders to vote on proposed protocol upgrades without the need for hard forks. Tezos aims to be a secure and upgradeable blockchain for smart contracts and decentralized applications (dApps).
- Consensus Mechanism: Liquid Proof of Stake (LPoS)
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Multiple programming languages, including Michelson for smart contracts and SmartPy, a high-level smart contract language.
- Platform Token: XTZ (Tez)
- Does the SEC consider the Platform Token a security? The SEC does consider Tez to be a security, however, the SEC has not taken any action at this time.[66]

Quantitative

- Daily Active Addresses: 4,666 trailing 3 month average[67]
- Market Capitalization: $855.3 M
- 24Hr Trade Volumes: $32 M
- Transactions per Second: 170[68]
- Block Size: 500kb[69]
- Transaction / Gas Fees: $0.22[70]
- Time to Finality: 30 seconds
- Developer Base: 19[71]
- Total Stable Token Market Capitalization: $56.85 M

---

[66] https://www.sec.gov/files/litigation/complaints/2023/comp-pr2023-102_0.pdf
[67] https://tzkt.io/stats/active-users?type=line&period=day Data was not available to determine a trailing 5 quarter average.
[68] https://opentezos.com/tezos-basics Current TPS at an unknown date. Data was not available for a 24Hr average TPS. Time to finality data was also derived from this source.
[69] https://www.cryptoeq.io/corereports/tezos-abridged
[70] https://cryptowallet.com/academy/tezos-use-case/
[71] https://defillama.com/chain/Tezos?developers=true&tvl=false

- Dominance of Leading Stable Token: USDT 69.91%

Qualitative

- Node Structure: As of this report Tezos has 373 bakers (validators). Tezos' decentralization is evidenced by a large number of nodes, distributed across various geographic locations and hosting providers. [72]
- Leading Wallet: Kukai
- Block Explorer: https://tzstats.com/
- Leading Application: Youves (Synthetic Assets)
- Stable Token Applications: The main stable token currently operating on the Tezos network is USDT. USDT is primarily utilized for payments and the purchasing of assets on the network (defi trading).
- Privacy Mechanisms: Tezos uses the sapling library to support shielding transactions.[73]

[72] https://tzstats.com/bakers
[73] https://decrypt.co/49912/tezos-will-get-zcashs-privacy-features-in-next-upgrade

11. Algorand

Background

- Launched: June 19th, 2019
- Summary: Algorand is a blockchain platform designed to provide a scalable and decentralized environment for building decentralized applications (dApps). It aims to address scalability, security, and decentralization challenges commonly associated with blockchain technology.
- Consensus Mechanism: Pure Proof of Stake (PPoS)
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Java, JavaScript, and Python.
- Platform Token: ALGO
- Does the SEC consider the Platform Token a security? The SEC does consider ALGO to be a security, however, the SEC has not taken any action at this time.[74]

Quantitative

- Daily Active Addresses: 36,966 24h (12/05/23)[75]
- Market Capitalization: $1.25 B
- 24Hr Trade Volumes: $81 M
- Transactions per Second: 8.39[76]
- Block Size: 5mb[77]
- Transaction / Gas Fees: $0.013
- Time to Finality: 10 min[78]
- Developer Base: 16
- Total Stable Token Market Capitalization: $74.22 M
- Dominance of Leading Stable Token: USDC 69.91%

[74] https://www.sec.gov/files/litigation/complaints/2023/comp-pr2023-237.pdf
[75] https://defillama.com/chain/Algorand?addresses=true&tvl=false Data was not available to determine a trailing 5 quarter average.
[76] https://algoexplorer.io/top-statistics
[77] https://cexplorer.io/article/what-is-the-future-of-cardano-scalability
[78] https://www.cryptofrens.info/

Qualitative

- Node Structure: Algorand currently has 1,024 participating nodes in operation.[79]Algorand's decentralization has faced criticism due to the centralized nature of its Relay Nodes. Most Relay Nodes are managed by organizations and VC-backed projects, leading to concerns about potential conflicts of interest and the network's resilience against centralized control.[80]
- Leading Wallet: Pera Wallet[81]
- Block Explorer: https://algoexplorer.io/
- Leading Application: Folks Finance (Lending/Liquid Staking)
- Stable Token Applications: Stable tokens on Algorand are primarily used for cross-border payments.[82]
- Privacy Mechanisms: Algorand uses ZK-Proofs on top of selective disclosure techniques like Pedersen Commitments and confidential assets.[83]

[79] https://metrics.algorand.org/#/decentralization/
[80] https://algonaut.space/algorand-nodes/
[81] https://algorandwallet.com/
[82] https://www.algorand.foundation/news/
[83] https://virtualspotlights.com/privacy-on-algorand-understanding-how-private-transactions-work/

Account Model – “Layer 2”

12. Arbitrum

Background

- Launched: May, 2021
- Summary: Arbitrum is a layer-2 scaling solution for Ethereum that employs Optimistic Rollups. It aims to enhance the scalability and efficiency of the Ethereum blockchain by processing most transactions off-chain and submitting only a summary to the main Ethereum network.
- Consensus Mechanism: PoS
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Solidity
- Platform Token: ETH (ether)
- Does the SEC consider the Platform Token a security? No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: 141,520 average 365 days
- Market Capitalization: $1.37 B
- 24Hr Trade Volumes: $370 M
- Transactions per Second: 7.14[84]
- Block Size: 1.76kb
- Transaction / Gas Fees: $0.004[85]
- Time to Finality: 2 seconds[86]
- Developer Base: 35
- Total Stable Token Market Capitalization: $1.927 B
- Dominance of Leading Stable Token: USDT 63.7%

[84] https://docs.arbitrum.io/
[85] https://www.oklink.com/arbitrum
[86] https://www.curvegrid.com/blog/2023-06-28-all-you-need-to-know-about-layer-1-and-2-transaction-finality

Qualitative

- Node Structure: The Arbitrum blockchain is structured around sequencers and validators. Sequencers handle transaction ordering, while validators process these transactions and update the Layer 2 state. The governance structure includes the Security Council and an Arbitrum DAO for maintaining network security and efficiency. This governance model aims to ensure equitable stake pool concentration and a balanced network.[87]
- Leading Wallet: MetaMask
- Block Explorer: https://arbiscan.io/
- Leading Application: GMX (Derivatives)
- Stable Token Applications: Stable tokens in the Arbitrum ecosystem are primarily used in Decentralized finance and lending protocols.
- Privacy Mechanisms: Arbitrum does not currently offer native privacy features that obscure transaction data or participant identities. It inherits the public transparency of Ethereum since validity proofs are stored on the parent chain.[88] Other projects have used Trusted execution environments (TEEs) or ZK proofs to increase privacy.

[87] https://docs.arbitrum.io/
[88] https://docs.arbitrum.io/inside-arbitrum-nitro#privacy-model

13. Optimism

Background

- Launched: July, 2021
- Summary: Optimism is an Ethereum layer-2 scaling solution that employs optimistic rollups to improve the scalability of the Ethereum blockchain. It aims to increase transaction throughput and reduce fees while maintaining compatibility with existing Ethereum smart contracts.
- Consensus Mechanism: PoS
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Solidity
- Platform Token: ETH (ether)
- Does the SEC consider the Platform Token a security? No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: 53,100
- Market Capitalization: $1.6 B
- 24Hr Trade Volumes: $201 M
- Transactions per Second: 3.87[89]
- Block Size: 5 million gas target size[90]
- Transaction / Gas Fees: $0.272
- Time to Finality: 10 min[91]
- Developer Base: 51
- Total Stable Token Market Capitalization: $581.16 M
- Dominance of Leading Stable Token: USDT 47.18%

[89] https://tokenterminal.com/terminal/crypto-screener?preset=325356a8-9f04-42e1-b05c-7fa587fbf9fd
[90] https://community.optimism.io/docs/developers/build/differences/#transaction-costs
[91] https://www.cryptofrens.info/p/

Qualitative

- Node Structure: The Optimism blockchain utilizes a node structure comprising sequencers and validators. Optimism's decentralization strategy involves economic incentives for accurate data processing and a seven-day challenge period for state validation. However, the operational roles within the network are predominantly managed by central teams, which is a key consideration in its decentralization and stake pool concentration. [92]
- Leading Wallet: MetaMask
- Block Explorer: https://optimistic.etherscan.io/
- Leading Application: Synthetix (Synthetic Assets)
- Stable Token Applications: Stable tokens in the Optimism ecosystem are primarily used in Decentralized finance and lending protocols.
- Privacy Mechanisms: Optimism features industry standard cryptographic pseudo anonymity.

[92] https://www.galaxy.com/insights/research/optimism-arbitrum-pt2-decentralization/

14. Polygon

Background

- Launched: May, 2020
- Summary: Polygon is a multi-chain scaling solution for Ethereum, providing a framework for building and connecting Ethereum-compatible blockchain networks. It aims to address the scalability issues of Ethereum, offering faster and cheaper transactions while maintaining compatibility with the Ethereum ecosystem.
- Consensus Mechanism: PoS, specifically BFT (Byzantine Fault Tolerance)
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Solidity
- Platform Token: MATIC
- Does the SEC consider the Platform Token a security? The SEC does consider MATIC to be a security, however, the SEC has not taken any action at this time.[93]

Quantitative

- Daily Active Addresses: 336,680
- Market Capitalization: $7.78 B
- 24Hr Trade Volumes: $637 M
- Transactions per Second: 65.54[94]
- Block Size: 50-120kb[95]
- Transaction / Gas Fees: $0.014[96]
- Time to Finality: 2 second[97]
- Developer Base: 27
- Total Stable Token Market Capitalization: $1.192 B
- Dominance of Leading Stable Token: USDT 46.27%

[93] https://www.sec.gov/files/litigation/complaints/2023/comp-pr2023-237.pdf
[94] https://tokenterminal.com/terminal/crypto-screener
[95] https://finance.yahoo.com/news/solana-vs-polygon-developer-perspective
[96] https://polygonscan.com/chart/avg-txfee-usd
[97] https://www.curvegrid.com/blog/2023-06-28-all-you-need-to-know-about-layer-1-and-2-transaction-finality

Qualitative

- Node Structure: Polygon has 120,352 nodes operating at this time with Nakamoto Coefficient of 4. The Bor layer serves as the block producer layer, aggregating transactions into blocks verified by Heimdall nodes.[98]
- Leading Wallet: MetaMask
- Block Explorer: https://polygonscan.com/
- Leading Application: AAVE (Lending)
- Stable Token Applications: Stable tokens in the Polygon ecosystem are primarily used in Decentralized finance and lending protocols.
- Privacy Mechanisms: The Polygon blockchain has enhanced its privacy features through the integration of Zero-Knowledge technology, notably in its Polygon ID product. Polygon core developers are also assisting in the development of the Nightfall blockchain.[99]

[98] https://polygonscan.com/nodetracker
[99] https://www.ey.com/en_gl/news/2023/01/

15. Immutable

Background

- Launched: April 8th, 2021
- Summary: Immutable is designed to provide a gas-free and scalable platform for trading and minting NFTs on the Ethereum blockchain. It aims to solve the high gas fees and environmental concerns associated with Ethereum while maintaining the security and decentralization features.
- Consensus Mechanism: PoS
- Chain Access: Permissionless
- Code Access: Open-Source
- Programming Language: Primarily Solidity
- Platform Token: ETH (ether)
- Does the SEC consider the Platform Token a security? No, the SEC has not taken any action at this time.

Quantitative

- Daily Active Addresses: 3,315 (Trailing 7 day average ending 12/11/2023)[100]
- Market Capitalization: $2.494 B
- 24Hr Trade Volumes: $728,915[101]
- Transactions per Second: 15[102]
- Block Size: Dependent on Ethereum
- Transaction / Gas Fees: 2% of the transaction[103]
- Time to Finality: N/A[104]
- Developer Base: 26[105]
- Total Stable Token Market Capitalization: N/A

[100] https://cryptoquant.com/asset/imx/chart/addresses/ data was not available to determine a trailing 5 quarter average.
[101] See block explorer for source.
[102] https://dappradar.com/blog/immutable-x-the-nft-specific-blockchain Current TPS on March 18th, 2021. Data was not available to determine a 24Hr average TPS.
[103] https://docs.immutable.com/docs/x/fees/
[104] Data was not available to determine a TTF.
[105] https://defillama.com/protocol/immutablex

- Dominance of Leading Stable Token: N/A[106]

Qualitative

- Node Structure: Immutable utilizes zk-rollup technology developed with StarkWare, enhancing transaction throughput while maintaining Ethereum's security features. It offers a unique Volition model, allowing users to choose between Validium and ZK-Rollup, ensuring data availability and decentralization.
- Leading Wallet: Metamask[107]
- Block Explorer: https://immutascan.io/
- Leading Application: Iluvium (NFT Gaming)[108]
- Stable Token Applications: There are no stable tokens currently operating on the Immutable X network.
- Privacy Mechanisms: Immutable X utilizes Zero-Knowledge Rollup (ZK-Rollup) to batch multiple transactions into one ZK-STARK.[109]

[106] Data was not available to determine stable token information.
[107] https://www.immutable.com/blog/immutablex-wallet-explained
[108] https://chainplay.gg/chain/immutable-x/
[109] https://academy.binance.com/en/articles/what-is-immutable-x-imx?hide=stickyBar

VII. Credits

Research Analysts

1. Joey Marchand
2. Teagan Pennock
3. Isaac Riley
4. Matthew Skrlac

Supervisors

5. Anthony Apollo, Executive Director Wyoming Stable Token Commission
6. Professor Steve Lupien, Director Center for Blockchain and Digital Innovation University of Wyoming