SOLANA 101:

Its History, Future, and Features

Famously known as Ethereum's rival, Solana is one of the world's most popular peer-to-peer public blockchain platforms.

Its high speed, low fees, and strong venture capitalist backing helped it rise meteorically into the top ten cryptocurrencies in the world between 2020-21. The blockchain is popular for minting and trading non-fungible tokens (NFTs) and developing decentralized finance (DeFi) platforms.

1.0 INTRODUCTION

Currently the world's fastest blockchain, Solana processes nearly 5,000 transactions per second. In comparison, Ethereum only processes 3 transactions per second.[1] Solana's speed is achieved by its use of proof-of-stake and proof-of-history mechanisms to reach consensus. This unique hybrid approach helps Solana avoid double spending and speeds up processing time.

The native token on the Solana network is SOL; the tokens are created through operations on the Solana network and used to pay its transaction fees. Put simply, SOL to Solana is what Ether is to Ethereum.

Solana is designed for creating smart contracts called Solana programs. Smart contracts can help you exchange money, property, shares, or anything of value in a transparent, conflict-free way while removing the services of a middleman. A smart contract is a collection of code (i.e., functions) and data (i.e., state) that reside at

a specific address on the Solana blockchain. This means a smart contract can have a balance and can send transactions over the network. However, a smart contract can be deployed where they are not controlled by any user; instead they are deployed and run as programmed autonomously by the blockchain. User accounts can then interact with a smart contract by submitting transactions that execute a function defined on the smart contract. Smart contracts can define rules, like a regular contract, and automatically enforce them via the code.

Asset	SOL
Inception	March 2020
Price (USD)	$231.51
Market Cap (USD)	$116 billion
Circulating Supply	448.17 million
Consensus Mechanism	Proof-of-Stake/Proof-of-History
Market Segment	Digital Currency, Store-of-Value, Network Based

Source: Coingecko.com

The Solana protocol was first conceived by Anatoly Yakovenko in a 2017 whitepaper draft detailing a new time-keeping technique for distributed systems called proof-of-history.[2]

One of the issues in popular blockchain networks such as Bitcoin and Ethereum is scalability. Anatoly believed that the new proof-of-history consensus, which automates the transaction ordering process, would be a key piece to scaling blockchain networks.

Anatoly teamed up with Greg Fitzgerald to build a blockchain network in Rust: a multi-paradigm, general-purpose programming language designed for performance and safety, especially safe concurrency[3] and the two released a whitepaper along with an internal testnet in February 2018. After the release of the whitepaper, they were joined by Stephen Akridge, an ex-colleague

who suggested that offloading signature verification to graphics processor could further increase scalability. Anatoly, Greg, and Stephen then launched Solana Labs and in March 2020 the Solana mainnet launched with over $1.76 million public token auction

hosted on CoinList. Development of the Solana network is overseen by the Solana Foundation, a Swiss non-profit organization, and Solana Labs, Inc., a Delaware corporation, which administered the original network launch and token distribution.

Market Cap
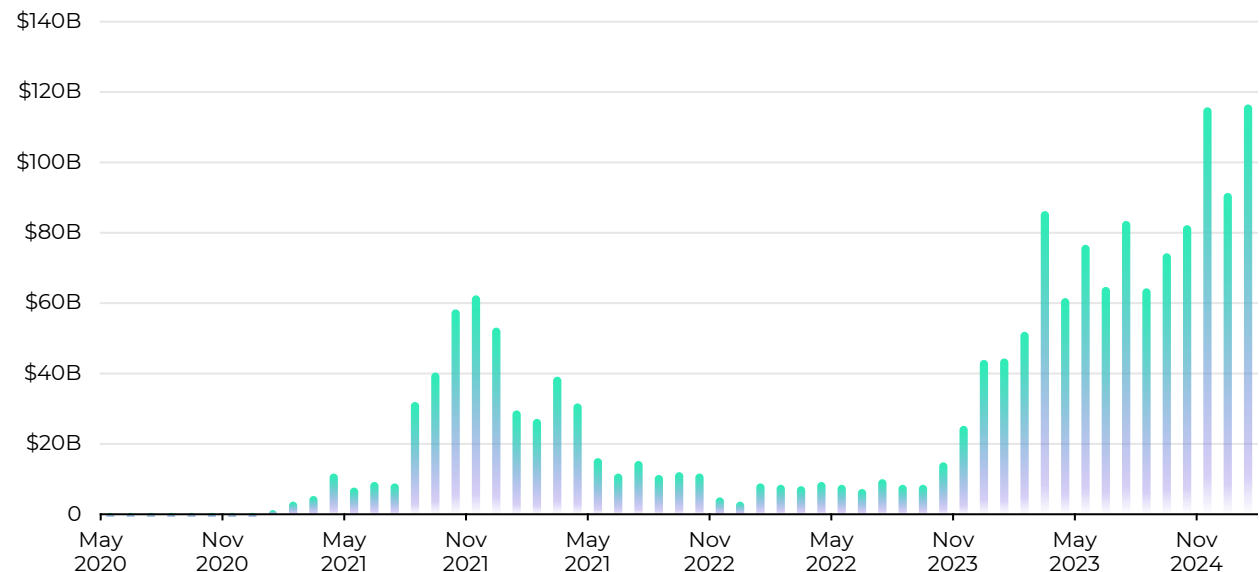
Source: https://coinmarketcap.com/

3.0 IMPORTANT FEATURES OF SOLANA

SOL

SOL is the native currency that is required to use the Solana network. While SOL can be thought of as the cryptocurrency of the Solana network, metaphorically speaking, it is more accurate to refer to it as the "fuel" of the network. SOL's main purposes serve to (1) to store value in SOL, (2) settle transactions by allowing users to send or receive payments in SOL, and (3) facilitate network operations via transaction fees paid in SOL, which are based on the computational costs of executing the code.

Unlike other digital assets such as Bitcoin, which are exclusively created through mining, the Solana network introduced 500 million SOL that were created in connection with the Solana Foundation based in Zurich, Switzerland.

The rate of SOL supply varies over time. The Solana protocol reduces SOL by burning 50% of transaction fees as part of its deflationary mechanism as there is no hard cap on the supply of SOL (compared with Bitcoin that is capped to 21 million BTC). SOL is a fungible token based on the Solana Program Library (SPL) protocol (similar to Ethereum ERC-20 tokens). Fungible tokens all have identical properties (i.e., every dollar bill is worth the same).

Solana Programs

Solana programs, also known as smart contracts, are software programs that are written and then uploaded to the Solana blockchain. Solana programs can help you exchange money, property, shares, or anything of value in a transparent, conflict-free way while removing the services of a middleman.

A Solana program is a collection of code (i.e., functions) and data (i.e., state) that resides at a specific address on the Solana blockchain. This means a Solana program can have a balance and can send transactions over the network. However, they can be deployed where they are not controlled by any user; instead they are deployed and run as programmed autonomously by the blockchain. User accounts can then interact with Solana programs by submitting transactions that execute a function defined on the Solana program. Solana programs can define rules, like a regular contract, and automatically enforce them via the code.

Decentralized Applications (DApps)

Development on the Solana network involves building more complex tools on top of smart contracts. A decentralized application (DApp) is an application built on the Solana network that combines a smart contract (back-end) and a front-end user interface. A DApp has its backend code running on a decentralized peer-to-peer network like Solana—contrast this with an app where the backend code is running on centralized servers like those owned by Google or Amazon.

DApps have three main features. They're:

- **Decentralized**, meaning, they are independent, and no one can control them as a group.

- **Deterministic**, meaning, they perform the same function irrespective of the environment in which they are executed.

- **Turing complete**, meaning, given the required resources, the DApp can perform any action.

The Solana network contains DApps in finance, arts and collectibles, gaming and technology. Some of the most popular DApps created on the Solana network are Serum, Apricot Finance, Metaplex, and Audius etc.[4]

Decentralized Finance

Additionally, the Solana network is used for DeFi. DeFi is a collective term for financial products and services that are accessible to anyone who can use Solana – that is, anyone with an internet connection. DeFi markets are always open and there are no centralized gate keepers who can block payments or deny access. Services that were previously slow, arbitrary, or regional are automatic and safer now that they are handled by code that anyone can inspect and scrutinize. These are financial products that focus on building out financial services using cryptocurrencies. They offer the likes of lending, borrowing, earning interest, and private payments to anyone in the world at any time.

Solana's total value locked (TVL) is around $8.4 billion[5] at the time of this writing. TVL represents the number of assets that are currently being staked in Solana. This value is not meant to represent the number of outstanding loans, but rather, the total amount of underlying collateral that is secured by Solana's DeFi protocols.

Solana's Total Value Locked

Source: https://defillama.com/chain/Solana?currency=USD

4.0 CONSENSUS MECHANISMS

Consensus mechanisms are a fault-tolerant mechanisms used in blockchain technology[6] to reach a distributed consensus and agree on a single truth in the network.

These mechanisms allow all nodes in the network to be synchronized with each other and agree on transactions that are then added to the blockchain. One of the unique attributes of Solana is how the blockchain uses a combination of proof-of-stake and proof-of-history consensus mechanisms.
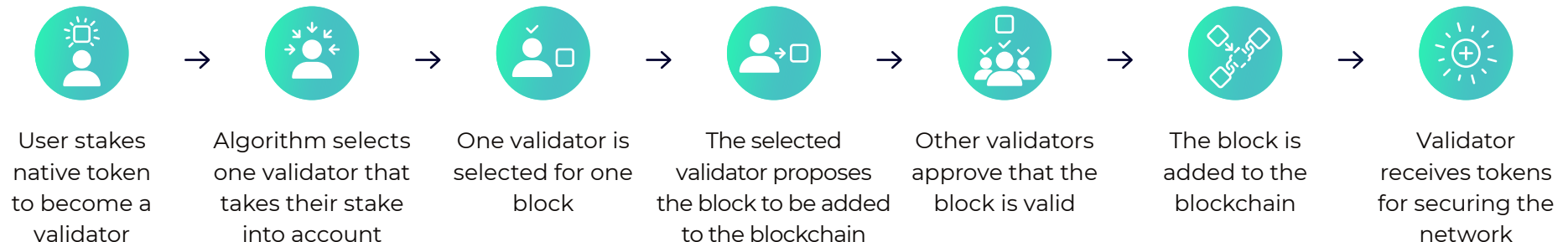
Proof of Stake

Proof of stake is still an unfamiliar concept to many, even within the blockchain space, and yet we see many of the next generation protocols adopting proof of stake and forming a large ecosystem of cryptos built around the alternative to proof of work.

So, what is proof of stake? Proof of stake is a type of consensus mechanism used by blockchain, such as the Solana network, to achieve distributed consensus that states that a user can validate block transactions according to how many coins they stake.

Proof of stake requires users to stake their SOL tokens to become a validator in the network. Instead of having many validators competing in an energy-intensive fashion (like Bitcoin's proof-of-work protocol) to solve the puzzle and create the same block, validators are chosen based on a selection algorithm that takes their stake into account. Once a validator is selected, they have the exclusive right to create a block. In this context, proof of stake requires virtually no energy relative to proof of work.

Proof of Stake Process

| User stakes native token to become a validator | → | Algorithm selects one validator that takes their stake into account | → | One validator is selected for one block | → | The selected validator proposes the block to be added to the blockchain | → | Other validators approve that the block is valid | → | The block is added to the blockchain | → | Validator receives tokens for securing the network |

How Does Proof-of-Stake Work?

There are three important concepts key to understanding what proof of stake is and how it works: consensus mechanisms, validation, and delegation.

1. Consensus Mechanisms

Proof of stake, like its proof-of-work predecessor, is a consensus mechanism. At its core, a consensus mechanism is a way for a distributed system (i.e., a network of nodes) to agree on a single source of truth in order to stay secure.

In centralized systems, it is not hard to prevent double spending when there is one entity managing a ledger of all transactions. For example, when Vanessa sends Bob $1, the centralized authority (i.e., the bank) simply takes $1 from Vanessa and gives $1 to Bob.

Cryptocurrencies are different because there is not a single authority that keeps track of balances—instead, there are many different nodes that must cooperate and agree on a single truth to prevent double spending in order to maintain the network.

The original consensus on which Bitcoin was created (i.e., proof of work) solved the decades' long problem of double spending, but proof of work still faces its own set of problems, such as its large energy consumption and need for specialized equipment. As a result, proof of stake, another consensus mechanism, is quickly gaining popularity.

Historical Annualized Bitcoin Electricity Consumption
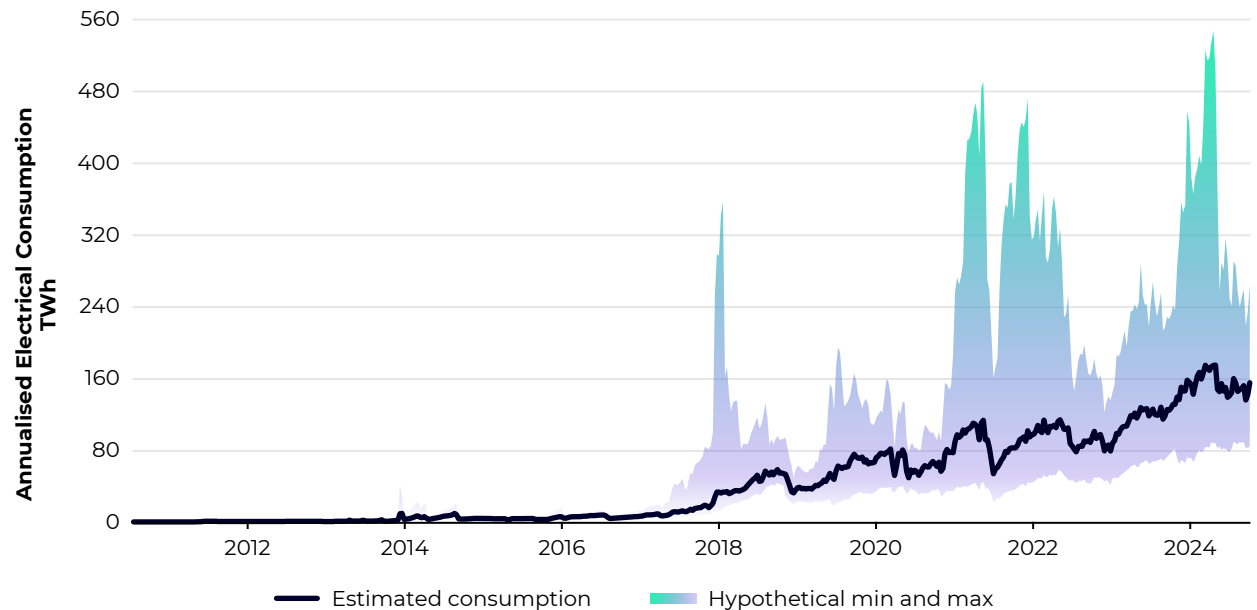
Source: Cambridge Bitcoin Electricity Consumption Index

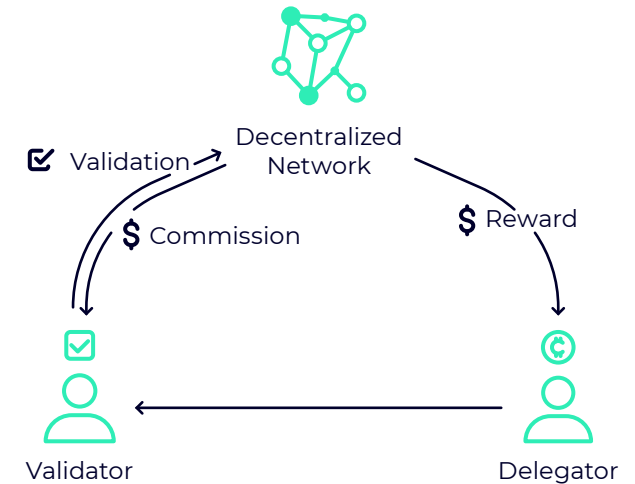# 4.0 CONSENSUS MECHANISMS

2. Validation

The second key to understanding how proof of stake works is understanding how validation takes place. In a proof-of-stake environment, members basically stake their native cryptocurrency on block of transactions that they deem to be valid. Then, if the majority of the network agrees, they receive a reward for their stake. However, if they try to cheat (i.e., stake on two different blocks of transactions at the same time), they risk losing their staked cryptocurrency, thus incentivising validators to not cheat, making the network more secure.

Once a member of the network stakes their cryptocurrency, it is registered in the network and the members are required to run node infrastructure that will participate in the consensus by receiving, signing, and sending messages (about blocks of transactions) to other members in the network. The combination of stake and node infrastructure is called a validator.

3. Delegation

The last key to understanding proof of stake is understanding how the proof-of-stake delegation process works. For example, what if members of a network want to stake their tokens but cannot run a node infrastructure? This is where delegation comes in.

Delegating tokens means staking tokens towards a validator and in return receiving a shared split reward with the validator. Delegated tokens can never be custodied or reproduced by the validator on a different smart contract.

Source: Proof-of-Stake Ecosystem 101, Medium – October 19th, 2018
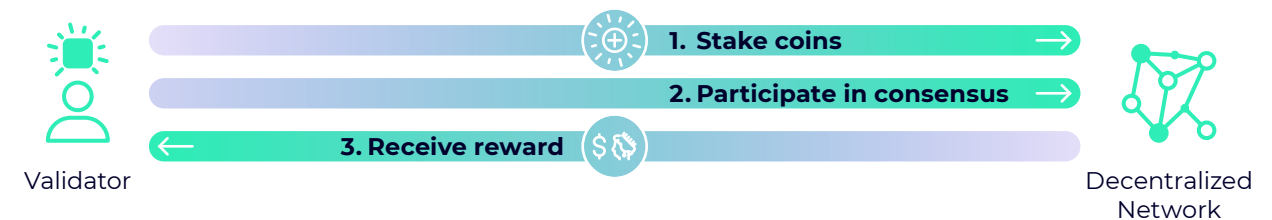
Source: Proof-of-Stake Ecosystem 101, Medium – October 19th, 2018

4.0 CONSENSUS MECHANISMS

Proof of History

One of the most difficult problems in distributed systems is agreement on time. Decentralized networks have solved this problem with centralized timing solutions, such as Google's Spanner, which uses synchronized atomic clocks between its data centers. But in more complex systems, like blockchain, this problem becomes even more difficult. Anatoly Yakovenko solved this problem and created a new time consensus mechanism called proof of history (PoH). PoH is a sequence of computation that can provide a way to cryptographically verify passage of time between two events[7] and creates a historical record that proves that an event has occurred at a specific moment in time.

How Does Proof of History Work?

In order to create a historical record that proves that an event has occurred at a specific moment in time, all of Solana's events and transactions are hashed with the SHA256 hash function. Using the SHA256 function, Solana takes the input and produces a unique output that is difficult to predict, then it takes the output of a transaction and uses it as input for the next hash. This sequence of transactions is now built into the hashed output creating a log, uninterrupted chain of hashed transactions.

For example:

Let's say there are three transactions: X, Y, and Z. The network executes these transactions in order through proof of history. PoH takes the transaction and the internal clock as an input that measure the order of transactions. It goes as follows:

- PoH (X, time stamp 0) -> hash: encrypted version of X on time stamp 0

- PoH (Y, time stamp 1) -> hash: encrypted version of Y on time stamp 1

- PoH (Z, time stamp 2) -> hash: encrypted version of Z on time stamp 2... and so on.[8]

This process provides an objective measure, including when each transaction took place, and the order in which each transaction took place. PoH creates another layer of security, and does not need humans to validate, making validations much faster than proof of work or proof of stake.

7 https://solana.com/solana-whitepaper.pdf
8 https://anycoindirect.eu/en/blog/what-is-proof-of-history#Solana%E2%80%99s%20Proof-of-History

5.0 SOLANA'S EXPONENTIAL GROWTH

Solana has been one of the fastest growing cryptocurrencies. With its lightning-fast speed and low fees, Solana has catapulted into the top 10 cryptocurrencies by market cap in 2021 with returns of over 14,000%,[8] making it the most profitable. Often called the Ethereum killer due to its scalability and lighting-fast network, Solana is making big waves in the crypto space, especially in the NFT and DeFi sectors.

	SOLANA	ethereum	ripple	bitcoin
Inception	March 2020	July 2015	June 2012	January 2009
Store of Value	SOL	Ether	XRP	BTC
Market Cap (as of Janury 31, 2025)	$116 billion	$391 billion	$180 billion	$2,076 billion
Transactions per Second	4,893	15	1,500	3.5
Consensus Mechanism	Proof-of-Stake Proof-of-History	Proof-of-Stake	Proof-of-Stake	Proof-of-Work
Average Fee per Transaction	$0.00025	$0.65	$0.0002	$1.57
Supply	448.17 million	120.52 million	59,455.23 million	19.82 million

Source: Coingecko.com, ycharts.com

6.0 LOOKING FORWARD

Purpose
INVESTMENTS

Looking into the future, Solana has a lot of potential. It has become one of the fastest growing cryptocurrencies over the last few years.

While people are labelling Solana as an "Ethereum Killer," it should not be seen as a battle between these two blockchains as a zero-sum game. Ethereum has the first-mover advantage and is the undoubted leader in blockchains offering smart contract capabilities and DApp development. For the most part, it does what it is supposed to do, and it does it well. However, its popularity, decentralization, and relatively high level of security has resulted in backlogs and very high network fees.

This leaves room for upstarts like Solana to propose new solutions to well-acknowledged problems. Though the fundamentals of Solana have not been as tested as Ethereum or Bitcoin, it is innovating in interesting ways that could have far-reaching consequences. We believe there is room for both these platforms as the adoption of cryptocurrency continues to increase globally.

Let's talk!
1-888-557-5020 | sales@purposeinvest.com

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