Solana – Challenger Facing Challenges

I. Executive Summary

Solana key stats	
As of date	31-Aug-2022
Price (in USD)	32
Market cap	
Circulating (in bn)	11
Fully diluted (in bn)	16
Circulating as % of fully diluted (%)	*69%*
As a % of ETH market cap	*8%*
As a % of BTC	*3%*

1. Solana was able to launch at an opportune time during the 2020-2021 crypto upcycle as an "Ethereum killer" with a network optimized for speed. With successful venture backing and support from FTX, it drove strong user and developer adoption. Expectations for future growth led to a very successful run for the SOL tokens, up 100x within a year.
2. Certain elements of its protocol design, such as high hardware requirements for nodes and a lack of variable gas fees, led to problems with node concentration and bot spamming, resulting in a few instances of a complete halt of network operations. Solana's ability to quickly coordinate network restarts, while should be applauded, does give rise to concerns regarding centralization.
3. We observe that while Github commits to dApp development on the Solana network remains steady at 900-1000 commits per quarter in the last year, the current slate of dApps attracting consistent user traffic seems somewhat limited. The top area of activity is NFT exchanges, which rely heavily on ad-hoc NFT trading (where Solana has a transaction cost advantage) by individuals, while the second major area of activity (DeFi) has been plagued by manipulation / double counting problems, with current TVL only ~4% of TVL on Ethereum.
4. We think the competition will become more intense going forward. The outlook of Solana's ecosystem development is potentially clouded by the departure of developers attracted by newer chains, some of which are similarly well-funded with venture capital and are providing funding to onboard project development teams. Similarly, Ethereum's implementation of a Proof-of-Stake consensus this month will position that network for further upgrades in 2023 through shards and/or Layer-2 roll-ups, reducing the speed and cost advantages that Solana currently enjoys.
5. From a token perspective, supply/demand is also unfavorable. Demand for SOL as a native currency is driven by users, dApp adoption, and transaction volume. Active users and total revenues have trended down since May. Supply, on the other hand, is both inflationary and heavily controlled by early investors and founders (49% based on initial token distribution) who invested during seed, founding, and Series A rounds in 2018-19. Only 1.6% of tokens were sold in the 2020 public sale.
6. **We rate SOL a Neutral, with a 3-month Base Case price target of US$35.00. With a Bear case downside to $22.00, the risk-reward at the current price of $32.44 is not favorable.**

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II. Discussion of Network/Project

Summary

Solana has differentiated and marketed itself as optimized for speed, making trade-offs in terms of centralization of nodes and gas fee economics. However, these trade-offs resulted in roadblocks that damaged its reputation, hindering its scalability and growth. It has now fallen further behind Ethereum and faces new threats (Aptos/Sui) that might render it irrelevant.

Exhibit 1: Ethereum and its competitors

Feature	Ethereum	Solana	Binance Smart Chain	Avalanche
Year of Foundation	2013	2017	2020	2020
TPS (Transactions per second)	13–15	3800	60	4,500
# Validators	13–15	2,700	60	4,500
Avg. gas fee per trx	US$5.00	US$0.00025	US$0.35	US$0.23
Block Times	15 seconds	1 second	3 seconds	Less than 1 second
Consensus Mechanism	Proof-of-Work -> Proof-of-Stake	Proof-of-History / Delegated Proof-of-Stake	Proof-of-Staked Authority	Snow Proof-of-Stake
Programming Language	Solidity	Rust, C, C++	GO, Java, C++, Python	Go, TypeScript, JavaScript, Python, Vue
Advantages	• Established • Large developer community • Huge DeFi and NFT ecosystem	• Fast transactions and low fees • High scalability • Low environmental impact	• Fast transactions and low fees • Cross-chain compatibility • Deflationary token (BNB)	• Fast transactions and low fees • Cross-chain compatibility
Disadvantages	• High transaction costs • Slow transactions • New programming language	• Fewer projects • More centralized • Lack of transparency	• Mainly scam projects • Only 21 validators • Lack of transparency	• Fewer projects • More centralized • Lack of transparency

Description

Solana is a public Layer-1 (L1) blockchain that optimizes for speed. It attempts to solve it by using a timestamp system called Proof-of-History (PoH) that enables automatically ordered transactions by providing a way to cryptographically prove the passage of time without referring to an external clock. Nodes can rely on this "internal clock" to enforce transaction ordering and focus on efficiently processing blocks and getting valid blocks into the ledger, without the need to repeatedly verify the temporal claims of nodes and reconcile the current state of the chain. This PoH system, combined with the underlying Proof-of-Stake (PoS) consensus mechanism, theoretically enables faster processing time and lower transaction costs.

In addition, Solana chose to write their **smart contract language in Rust**, differentiating it from other EVM-compatible blockchains that use Solidity. Rust is a popular programming language that is noted for ease of

use in a wide variety of applications, such as games and blockchains. Theoretically, developers' familiarity with Rust makes Solana a more accessible platform than Ethereum for deploying apps, but we note that while developer interest is very high (#2 in Github commits according to CryptoMiso), the number of dApps with healthy usage on Solana is still only half of Ethereum's.

We believe this phenomenon is attributable to:

1. dApps that previously launched on Ethereum, or other EVM-compatible chains, cannot quickly deploy their smart contracts on Solana – the entire dApp will need to be rebuilt using Rust.
2. dApp developers choosing to devote resources to the largest ecosystem of apps and users.
3. Users currently gravitating to Solana primarily for ad-hoc NFT transactions due to lower costs, while users for DeFi are more cautious regarding security, the scale of dApps, and liquidity.

Players within the Ecosystem

As a POS blockchain, Solana relies on validators to run nodes and produce blocks, and stakers to stake their SOL tokens as an incentive mechanism. Developers must build dApps in Rust, with many projected funded via a development fund. Some salient points concerning each player in the ecosystem:

1. *Validators:* As a trade-off to achieving scalability, Solana developers chose to **optimize for speed** (at the expense of decentralization).

   To run a Solana node, validators need to factor in a few factors:
   - Hardware requirements are much higher.
   - The Solana network issues new SOL at ~8% annually to pay the validators charging anywhere from 0 – 10% of the staking rewards.
   - Validators need to pay ~400 SOL annually to the network for it to vote.

   Hence, a validator needs to attract ~50k of SOL from other parties for it to break even (i.e., to pay the network to vote; not accounting for its initial hardware and electricity cost). This means that the barriers of entry to running a Solana node are higher than Bitcoin or Ethereum, reducing the number of people that can run a node.

2. *Stakers:* Stakers participate by putting up their SOL tokens as collateral, **delegating them to validators**. If validators do their job properly, stakers get some SOL back as a reward; If they do not, their stake might be reduced (slashed). However, as of today, slashing is not automated. The current nominal staking APY is roughly 6.2%.

   Like Ethereum POS, validators work together with stakers:
   - The more stake a validator has delegated to them, the more this validator will be chosen to write new transactions (and earn block rewards for the stakers).
   - As mentioned above, the validator earns 0 – 10% of the staking rewards, with the rest going back to the stakers.

3. *Investors:* Solana is well known in the community to be a **VC-funded chain**, with Kyle Samani from Multicoin Capital as the lead advocate. Sam Bankman-Fried of FTX and Alameda is also a strong supporter of the blockchain, offering users first access to tokens within the Solana ecosystem via the FTX platform.

4. Developers: Given Solana's choice of using **Rust as a programming language**, regardless of the benefits of the Rust programming language, this results in a higher barrier for dApps to be built on the chain.

   As with most L1s that need to attract developers to build on their chain, Solana has set up various investment funds:

- US$5mn creator fund to fund builders, musicians, and other artists/creators.
- US$100mn investment and grant fund targeting South Korean web3 start-ups.

Aside from the Solana Foundation, VCs such as Multicoin Capital are strong supporters of Solana and tend to fund projects that build on Solana.

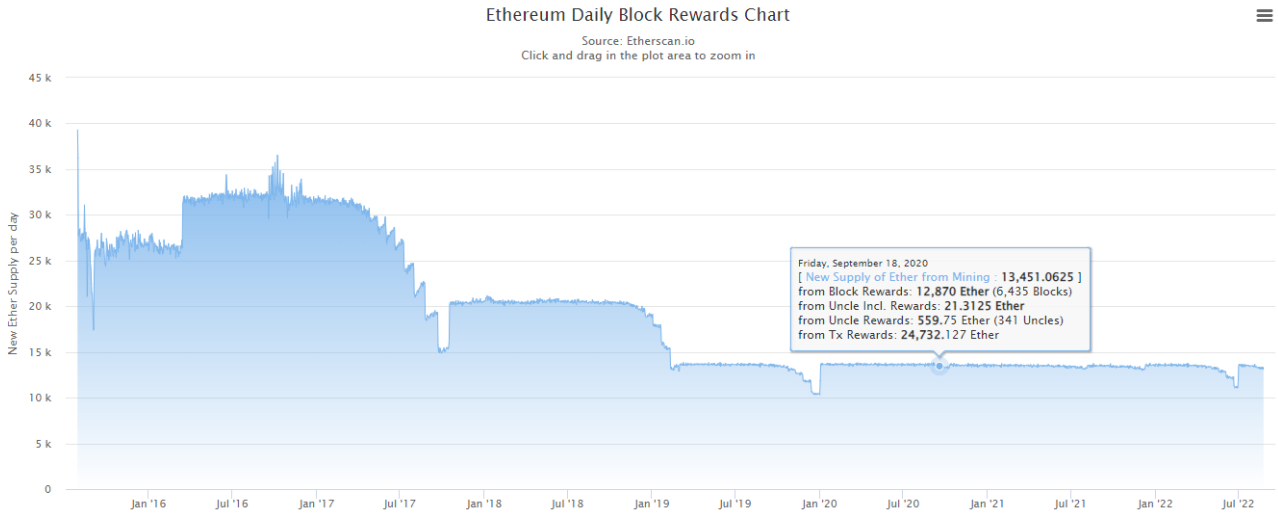
Evolution/Developments

Armed with VC funds, influencer marketing, and the support of FTX, Solana managed to incubate and launch various projects, gaining substantial traction and adoption during the bull market of 2021. Within a short time span of 9 months, Solana managed to grow its total value locked (TVL) 14x (from <US$1bn to ~US$14bn).

Even though most projects were still copycat projects of Ethereum, users are attracted to the ecosystem due to the farming rewards and low gas fees proposition. However, the network soon began to experience problems with **bot spamming and chain halting issues** due to the trade-offs that Solana made to prioritize speed over fees:

1. *Solana's spamming issue:* As a blockchain, users compete for block space – i.e., compete for their transaction to be included in a block, and preferably ahead of others that want to execute the same transaction. This is critical as the blockchain is, as the word suggests, **a chain**. This is important as the ability to be first conveys many benefits such as:
   - *NFT minting*: Given a limited supply of NFTs, the ability to mint first means you get the NFT while others do not.
   - *Initial coin offering*: Similarly, when a project token launches on a DEX like Uniswap, the ability to swap the tokens first means you get the best price, which you can sell to others at a higher price.
   - *Arbitrage*: Given different liquidity sources, being the first user to identify an arbitrage and exploit it before others means you get all the arbitrage profits.

Exhibit 2: Ethereum block reward vs. transaction reward



Ethereum uses a fee market mechanism to help miners prioritize transactions – transactions with higher attached fees will be prioritized by miners since the fee is additional revenue to miners. This fee can be significant. For example, on September 18, 2020, the transaction rewards are 2x the block reward.

For Solana, a design trade-off they made was to **not have a variable fee mechanism**. Users pay the same fee regardless of their transaction, allowing their transaction to remain cheap. For a user that wants to be the first to mint an NFT/swap tokens during an ICO, it now becomes logical for them to spam transactions so that

they will be first in line – the cost to spam transactions in exchange for the potential first-in-line to mint/swap is now profitable. This becomes an issue for the chain whenever there is a popular NFT mint or ICO situation, as multiple users will start spamming the network to maximize their probability of winning.

This transaction spamming leads to network congestion as validators are unable to cope with the traffic volume, similar to what happens during a DDOS attack scenario. Once that happens, the consensus mechanism (where each node checks other nodes) fails, leading to chain halts as the validators regroup to restart the chain. **Across its short lifespan of 2 years, Solana experienced at least 5 major chain halts (as well as several minor halts) due mainly to the bot spamming issue**.

Additionally, the speed at switch the Solana network can halt and restart itself also speaks to the level of node centralization and coordination.

2. *Inflated total value locked*: Recently, it has been revealed that much of the total value locked (TVL) of the Solana ecosystem was double counted and was the result of manipulation. The overall double-counted volume accounted for ~80% of its peak TVL, bringing to question how much adoption really happened during its meteoric rise.

Ever since the crash in May 2022, the hype surrounding Solana has slowed down. The Solana team continues to build the ecosystem: hackathons and marketing campaigns (physical and digital), give out grants, introduce developer tools (changelog, transaction parser, new developer languages – i.e., seahorse…), and recently announced plans to launch a Solana-based phone. Meanwhile, newer blockchain projects like Aptos and Sui are emerging to "challenge the challenger". We are aware of chatters regarding Solana dApps being incentivized to either migrate over to Aptos/Sui or build there as well. Given the increasingly competitive landscape around the same "speed" and "programmable" narrative, it remains to be seen if Solana can maintain its lead against these newcomers.

At the same time, investors should also note that Ethereum is switching its consensus mechanism from Proof-of-Work (POW) to POS this month ("the Merge") to pave the way for the main network to better work in conjunction with Ethereum shards ("the Surge") or other Layer-2 (L2) that will increase capacity / TPS and lower gas fees. Implementation for these scaling solutions is being targeted for 2023, and while the timing may slip, the Ethereum ecosystem will eventually reduce its speed and cost disadvantages.

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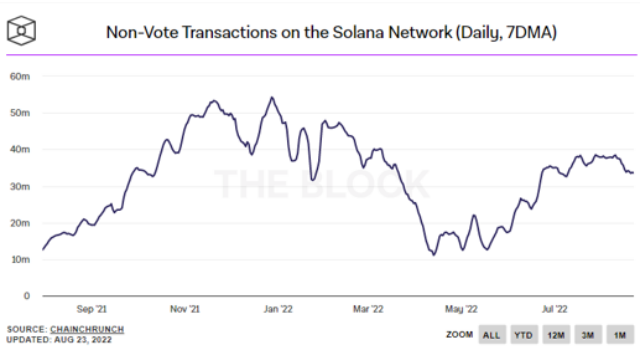
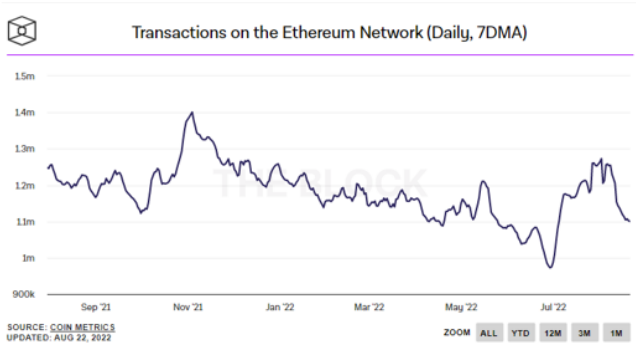
IV. Current State of the Network

Summary

As Solana gains adoption, we see its transaction and addresses metrics increase steadily – with growth greatly surpassing that of Ethereum. However, we believe some metrics are not a good representation of actual usage (due to the way Solana's blockchain works, and the easy manipulation of these data). This is clear once we examine app usage and especially total value locked, a "put your money where your mouth is" metric. Through those metrics, we see Ethereum still being competitive at capturing and retaining users' attention and wallet (total value locked) across the various crypto cycles, despite its cost and speed disadvantages.

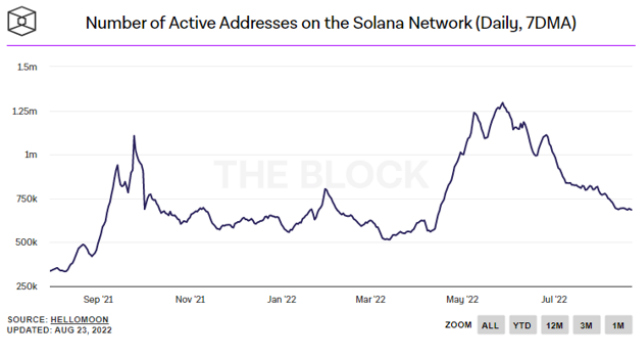
Exhibit 3: Transactions across Solana and Ethereum over the last 1 year

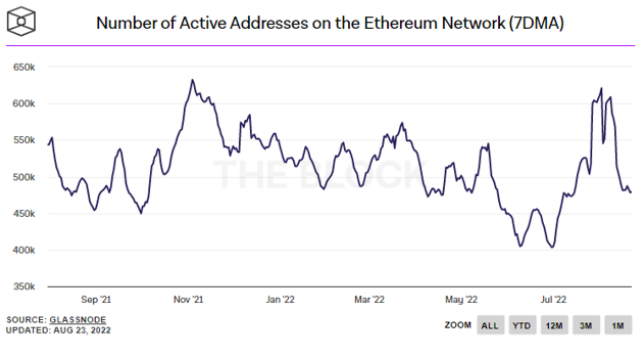




As compared to Ethereum, Solana processes ~10-30x more (50m on Solana vs. 1.4m on Ethereum at their peak) transactions than Ethereum. It is, however, important to note that Solana suffers from bot-spamming issues (explained earlier), with transaction figures overstating the actual activity on the blockchain.

Exhibit 4: Active addresses across Solana and Ethereum over the last 1 year





The severity of Solana's bot-spamming issue is clear when comparing its active addresses – while it only has 2x more active addresses than Ethereum (1.25m on Solana vs. 0.6m on Ethereum at their peak), it generated 10-30x more transactions during the same period, implying that the average Solana user transacts 5-15x more than the average Ethereum user, an unlikely scenario given the predominance of activities involving NFTs and DeFi.

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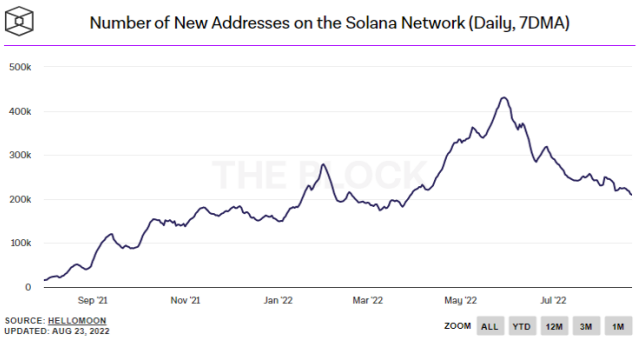
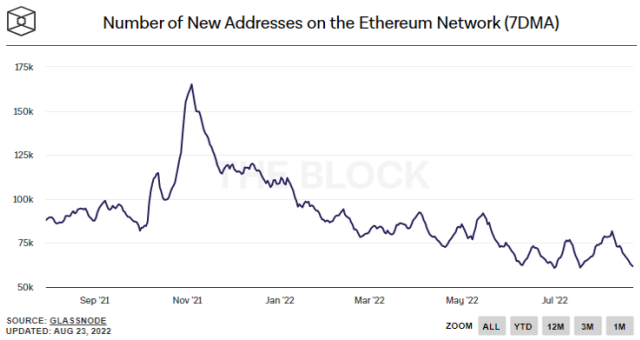
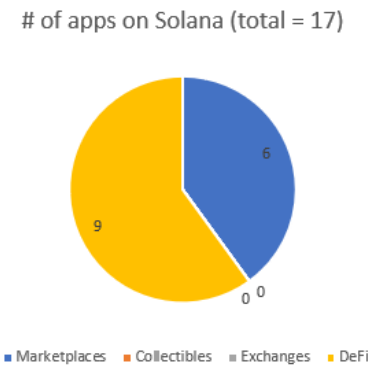
Exhibit 5: New addresses on Solana and Ethereum





Solana's new addresses metrics show healthy adoption, with it generating ~3x more new addresses on their blockchain than Ethereum – this is logical given Ethereum's higher level of maturity as a blockchain.

Exhibit 6: # of apps with 2000+ users over the last 30 days



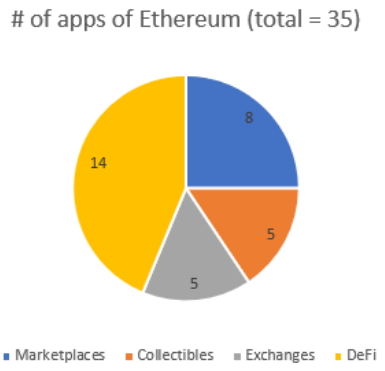
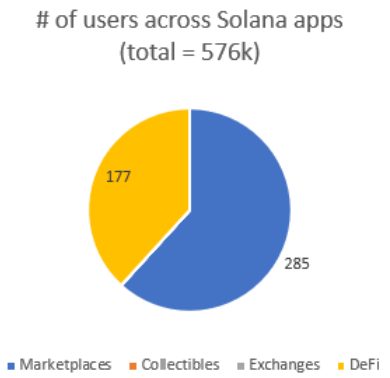
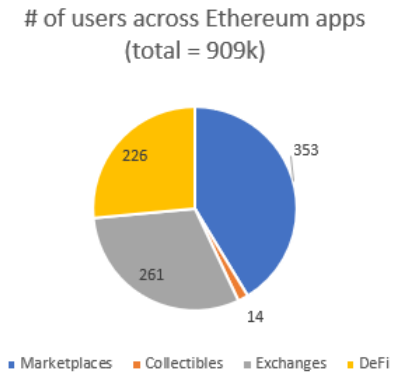


Exhibit 7: # of users across apps with 2000+ users over the last 30 days





While Solana has consistently booked a higher transaction count, active addresses, and even new addresses than Ethereum, we see a different story when looking at app usage and total value locked.

As compared to Ethereum (35 apps), Solana has fewer apps (17 apps) that managed to capture users' attention. These apps are also more concentrated – i.e., mainly DeFi and marketplaces – whilst Ethereum has better diversification, indicating broader and more sustainable use cases on the network.

The number of users for these "high activity" dApps on Solana (~576k) is also fewer than that of Ethereum (~909k), a metric that contrasts with the previous active address metric.

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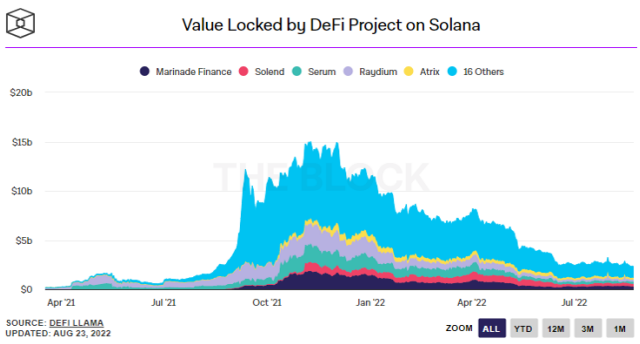
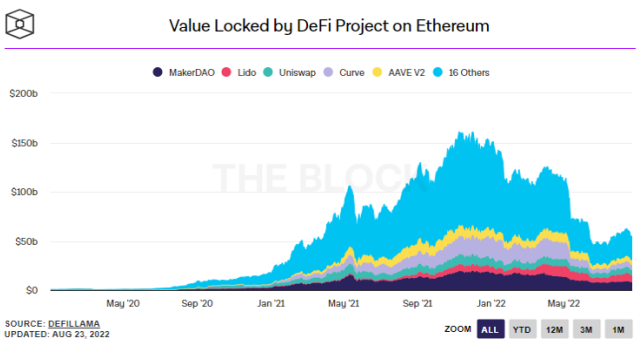
Exhibit 8: Total value locked across Solana and Ethereum





The traction story is clear once we compare the TVL across Ethereum and Solana, where Ethereum's TVL is consistently 10x that of Solana's (US$150bn for Ethereum vs. US$15bn for Solana at peak). Solana's TVL trend continues to drop over the last few months, while Ethereum's is starting to exhibit signs of recovery.

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VI. Discussion of Token

Summary

As is the case for other protocol tokens, SOL token's prospect is closely linked to the level of activity on the network – e.g., a virtuous cycle of developers building dApps, users transacting, users being optimistic, and staking their tokens. However, because of the initial token distribution design, most of the circulating supply of 349 million SOL are tokens initially held by venture investors and the founding team. Only 1.6% of the maximum supply of 508 million SOL (with 6-8% inflation every year) is held by public investors, which suggests huge selling pressure over the next few years.

Token Utility

SOL is the native token of Solana – its main utility is akin to a currency – a currency that you spend to pay for services (block space).

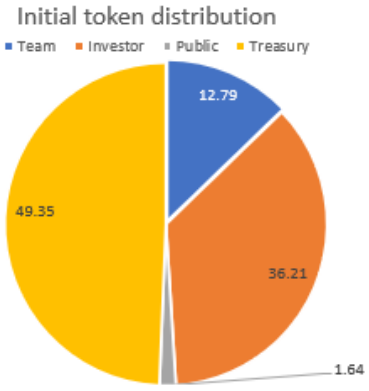
For users who want to transact on Solana, SOL is used for **gas fees** – i.e., users that transact on the Solana network would pay the network a certain amount of gas, denominated in SOL tokens, which is then burnt. The more people choose to transact on the network, the more SOL will be used and burnt.

For users who are optimistic about Solana, they can choose to stake and delegate their tokens to validators to help secure the network, earning **staking rewards** in return for putting their tokens at risk.

The Solana blockchain itself does not have accrual value but serves as a "platform" for dApps to be built on, which hopefully has strong use cases that drive adoption and activity onto the blockchain itself. This then drives demand for the native currency SOL tokens.

Token Distribution:

Exhibit 9: Initial token distribution



Source: https://research.binance.com/en/projects/solana

Total tokens (in m)	500

Voting metric	
Investor vs. public	22x
(Investor + Team) vs. public	30x

Investor breakdown	in %	in #
Seed round	16.2	81
Founding sale	12.9	65
Validator sale	5.2	26
Strategic sale	1.9	9
Total	36.2	181

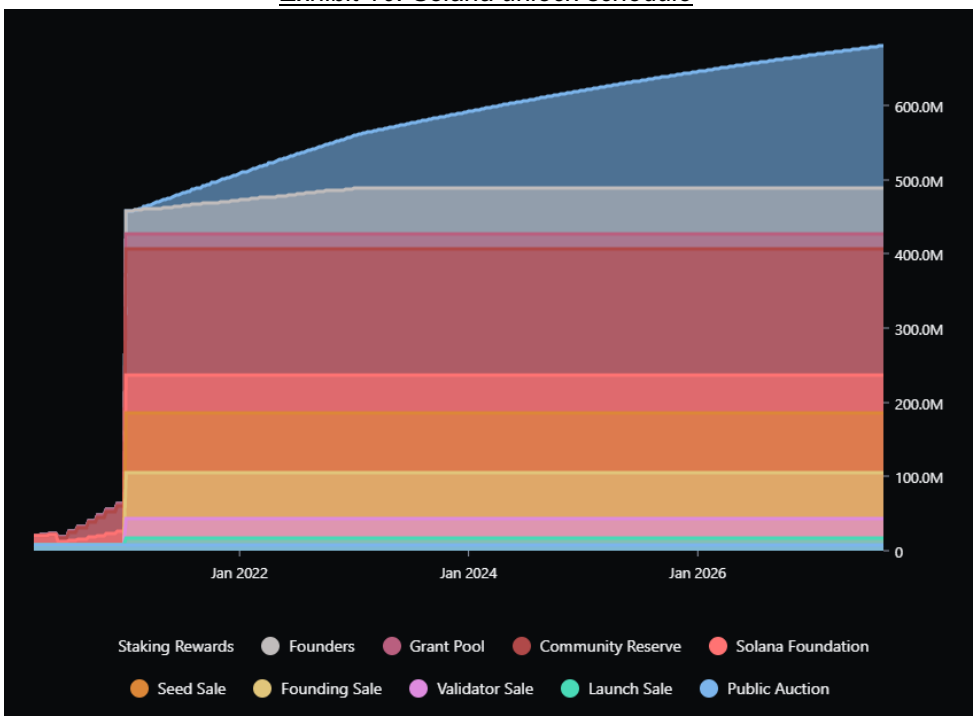
Treasury breakdown	in %	in #
Community reserve fund	38.9	194
Solana Foundation	10.5	52
Total	49.4	247

1. *Investor share*: Solana has a more fintech-style growth approach, choosing to raise funds from investors first (before going to the public) to finance their growth. As a result, they have a high investor token share of ~36%. This compares very poorly with Ethereum's insider share of 15% and outsider share of 80%.

   This approach could have explained their fast speed to market of ~2 years – conceptualized at the end of 2017 and launched in early 2020. It is also interesting to note that they have a validator sale of

~5% - i.e., incentivizing validators to run their blockchain with pre-sale tokens (likely priced at a discount).

Exhibit 10: Solana unlock schedule



As seen, most of the investor tokens have already been unlocked, while the founders/team tokens are being slowly unlocked till 2023.

2. *Treasury*: Solana continues to hold a huge chunk in Treasury/reserves, which they can deploy for other uses down the road (likely grants for ecosystem development). Given the huge imbalance in insider (team +investor) vs. public ratio of tokens (30x), insiders control the protocol's future decisions. They have already deployed some of the Treasury funds towards growing the ecosystem, such as to finance the US$100mn investment fund to fund South Korea's web3 start-ups.

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Token Emission:

Exhibit 11: Solana inflation schedule

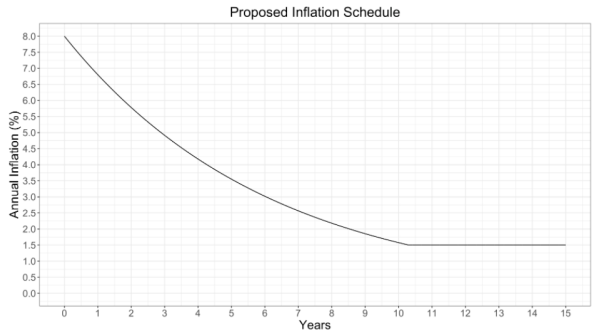
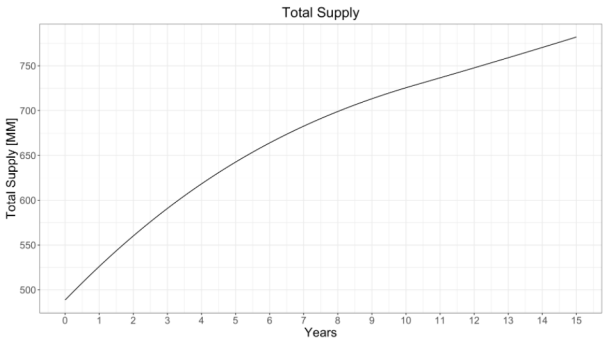


Exhibit 22: SOL supply over time



Solana starts at an inflation rate of 8%, which decreases over time to a terminal inflation rate of 1.5%. With this inflation rate and the initial distribution of 500m, token supply growth increases at a slow pace, hitting a 50% increase (750m) over a 15-year period. Given the high insider holdings, even if none of them stake their tokens, validators/stakers have a long way to even catch up to the insiders' share.

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VIII. Valuation

As with other protocols, we examine SOL market value versus the transaction fee ("revenue") generated. While the protocol currently does not receive any of this revenue, nor does any revenue get distributed to token holders, the demand for currency is based on how much goods and services needs to be paid for—in Solana's case, this would be the gas fee. The chart below shows how highly correlated Solana's circulating market value has been to the daily total revenues, which are currently averaging US$50-60k per day.

Price to Sales ratio over the 9 months have been in the 500-900x range—the current ratio of 533x indicates that Solana is both i) trading at the low-end of its recent range and b) much more expensive than more mature chains such as ETH @ 172x and BNB @ 160x.

Exhibit 13: Solana's circulating market cap to daily total revenues

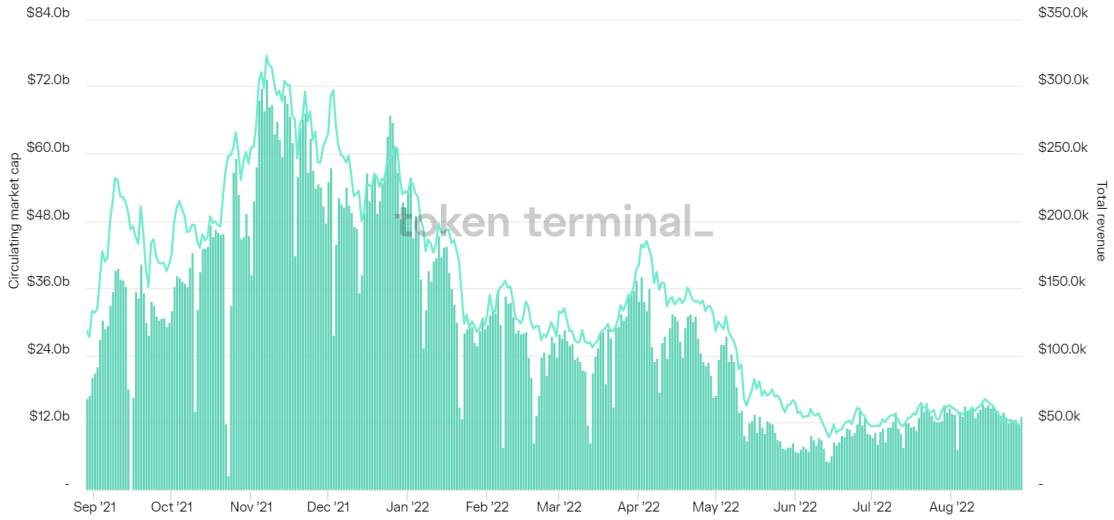

Exhibit 14: Solana's Price to Ratio

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X. Technical Analysis

Short Term: Price is currently within a trading range between US$25.00 (long-term support trendline) and US$47.50 (current resistance that price was unable to break through in 3 attempts in July-August). Near-term resistance with 30-day and 100-day moving averages both at the US$37.50-38.50 level.

Long Term: Long-term downtrend since the peak at US$259.00 in Nov 2022, exhibiting a descending triangle pattern with a long-term support trendline at US$28-29, which held despite a dip below in June during the LUNA market collapse. On the SOLETH chart, SOL has dipped below the June bottom of 0.0225, current trading at 0.0207 with a possible downside to 0.0175.

Exhibit 15: SOL/USD

Exhibit 16: 1-Year SOLUSD and SOLETH

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XI. Outlook for SOL

We are Neutral on SOL currently, and believe that at [~US$32] the risk-reward for SOL tokens on a 3-month basis is not very favorable because of two risks:

1. NFT dependence: We are currently seeing low volume and declining unit prices for NFTs, and believe that this may not reverse in the near term. While we are bullish on NFT technology that will facilitate the creation of economies for new digital assets, the speculation of image-based tokens may continue to face challenges. NFT marketplaces account for half of Solana's active users in the past month, according to DappRadar.
2. Ecosystem development: Any slowdown in ecosystem development would reduce the price-to-sales (P/S) valuation premium SOL currently enjoys relative to larger protocols backing the likes of ETH and BNB tokens. We do recognize that the Solana treasury could be deployed to increase incentives for developer teams.

Scenarios	***Thesis***
Bullish	
Target US$45.00 Probability 15%	A common argument by Solana bulls is that SBF/Alameda/Multicoin wields huge influence within the crypto community and will not allow Solana to fail. They will continue to push the ecosystem forward by upgrading the chain while launching new projects. If they managed to help launch more dApps to attract users and increase average user engagement, there is a case for Solana to regain its speed and scaling narrative, pushing the token back up.
Base Case (mostly likely)	
Target US$**35.00** Probability 50**%**	Solana continues to have a big war chest in its Treasury, which it could use to drive new initiatives – be it funding developers to build on its chain, or incentivizing users to transact. However, it is **unlikely that their scaling issues will be resolved** in the near term.
Bearish	
Target US$22.00 Probability 35%	Developers (and users) either get drawn to the newer chains like Aptos or Sui, or go back to Ethereum, **withdrawing their capital and resources from Solana**. Any prolonged market decline could also lead to SOL underperforming ETH with the ETH 2.0 Merge building expectations for faster scaling with the Surge in 2023. Separately, if depressed usage and revenues persist, further token unlocks and inflation will dilute value when insider holdings remain disproportionately high.

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