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Get Smart on Smart Contract Platforms

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Introduction

In 2009, Satoshi Nakamoto created Bitcoin: a decentralized, digital store of value free from the control of central authorities. While Satoshi succeeded in creating the largest decentralized digital monetary network in existence with over $750B in market cap (as of March 18, 2022), many argue that the Bitcoin network lacks programmability and has limited use cases beyond serving as a store of value or facilitating simple peer-to-peer transfers of value. In 2015, the first notable smart contract platform, Ethereum, was launched, creating the foundation for an ecosystem of decentralized applications (dApps) to be developed and unleashing the potential use cases for the cryptocurrency ecosystem.

Decentralized networks fundamentally operate as ledgers that keep track of transactions and balances as users transfer tokens. Smart contracts are programs that operate on these networks and allow users to transact and build dApps.

While smart contracts are not a technology unique to decentralized networks, Ethereum was the first protocol to integrate smart contracts into a decentralized network with the introduction of the Ethereum Virtual Machine (EVM). The addition of EVM extended the capabilities of the network beyond simply transferring funds, by enabling programmable operations—smart contracts—that enable the creation of dApps.

The vast majority of on-chain user activity occurs on smart contract networks and as a result, every transaction or operation completed by individuals and dApps must be paid for with the native token of the smart contract platform, therefore capturing value from the activity of all users on the network.

Performance is Key

Functionality beyond simple peer-to-peer transfers of value enables countless types of operations on-chain. To reach their full potential, these smart contract platforms need to optimize transactions to be as efficient as centralized systems are today. Initially, it might seem surprising that something as revolutionary as the Ethereum network can only handle 7-15 transactions per second while a credit card network like Visa can handle over 65,000 transactions per second.

However, due to the nature of decentralized networks, there is an inherent tradeoff between speed and decentralization. As a centralized for-profit business, Visa invests in cutting edge hardware to support their software services and speed up transactions, but its centralization creates an inherent single point of failure. Decentralized networks remove the responsibility of maintaining the network from a central authority (and in so doing eliminate a single point of failure), as the network is hosted by many distinct, geographically dispersed, individuals rather than a single conglomerate.

Emerging smart contract platforms have taken unique approaches to solving performance issues from varying hardware specifications for nodes to different types of consensus mechanisms. For example, Solana validators require more expensive hardware than most other smart contract platforms, but are able to deliver significantly greater transactions per second (TPS).

FIGURE 1: **SMART CONTRACT PLATFORMS**[1]

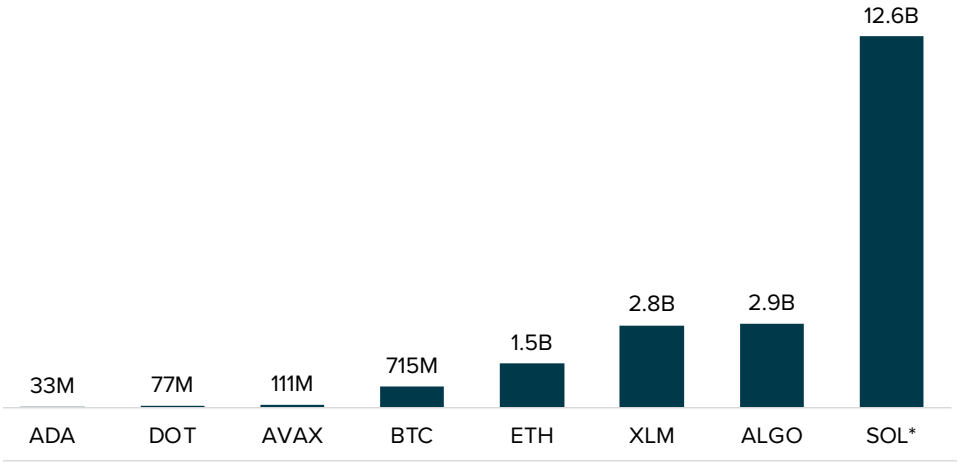
Network	Transactions Per Second (TPS)	Est. Hardware Cost (USD)
Solana (SOL)	65,000	$10,000
Avalanche (AVAX)	20,000	$1,000
Polygon (MATIC)	10,000	$1,500
Stellar (XLM)	3,000	$1,000
Algorand (ALGO)	1,300	$500
Polkadot (DOT)	1,000	$1,000
Cardano (ADA)	250	$5,000
Ethereum (ETH)	15	$2,500

As the only smart contract platform with a meaningful user base in 2017, Ethereum quickly reached capacity constraints when Cryptokitties launched and took the world by storm. Transactions involving these digital cats—which were among the first Non-Fungible Tokens (NFTs) to gain popularity—clogged the network, forcing users to pay excessive fees to have their transactions confirmed. In 2020, the fee dilemma began again for Ethereum as demand for Decentralized Finance (DeFi) services grew and users began using decentralized exchanges, lending brokers, asset management, and more—all on-chain.

This influx of user activity quickly sent fees skyrocketing, making it too expensive for most users to transact on-chain creating an opportunity for emerging smart contract platforms like Solana and Avalanche to capture large portions of the market. As Ethereum fees began to eclipse $10 per transaction, smart contract platforms like Stellar, Algorand, Solana, and Avalanche experienced strong growth in daily on-chain transaction counts. As of March 15 2022, Solana had processed over 12 billion transactions (adjusting for voting transactions) since March 2020, compared to Ethereum's ~1.5 billion total transactions since 2015—over eight times more transactions in approximately one quarter of the time.

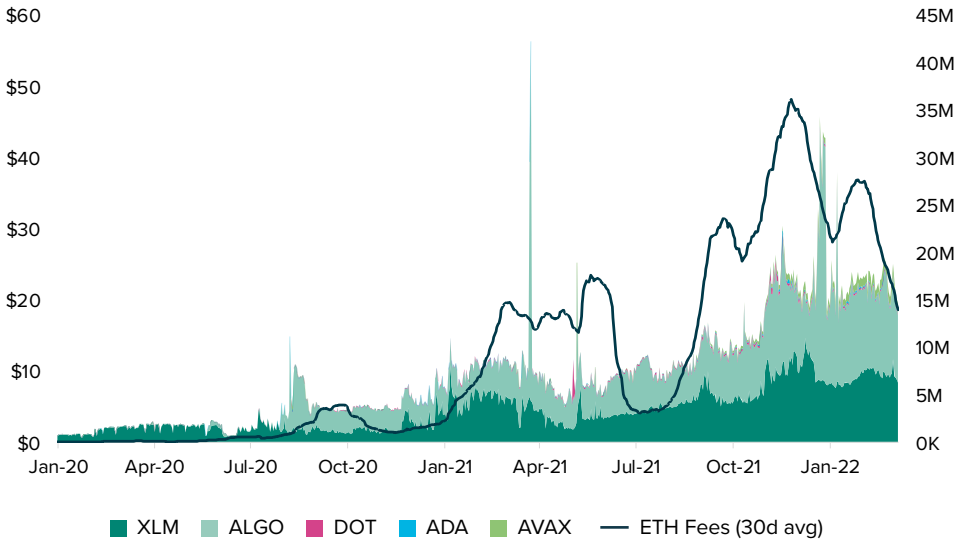
1. Source: Various blogs (TPS listed is a theoretical estimate), Grayscale Research
Solana: https://cryptoslate.com/solana-how-a-unique-consensus-design-powers-the-65000-tps-developer-friendly-blockchain/
Avalanche: https://support.avax.network/en/articles/4136568-how-many-transactions-per-second-does-avalanche-support
Matic: https://stackedcrypto.medium.com/matic-network-matic-fundamental-analysis-54593398a41d
Stellar: https://www.lumenauts.com/blog/how-many-transactions-per-second-can-stellar-process
Algorand: https://medium.com/coinmonks/crypto-analysis-algorand-290dcd59e5a8
Polkadot: https://www.crowdsense.ai/post/polkadot-dot-an-introduction-to-an-ecosystem-to-look-out-for
Cardano: https://www.nasdaq.com/articles/is-cardano-the-next-visa-of-crypto
Ethereum: https://ethtps.info/

FIGURE 2: **TOTAL LIFETIME NETWORK TRANSACTIONS**[2]



Increasing transaction counts are a good indicator of a strong and growing network. The number of transactions on a smart contract platform is directly correlated to the revenue earned by the network. Revenue from transaction fees are critical to the long term health of all decentralized networks as they are needed to pay users hosting the network. Insufficient revenue may lead to the network no longer being profitable enough for users to host.

FIGURE 3: **ETH FEES VS SMART CONTRACT PLATFORM TRANSACTION COUNTS**[3]



2. Source: 3/10/22. Coin Metrics, Snowtrace, SolanaBeach. *Estimated for non-voting transactions
3. Source: 3/10/22. CoinMetrics, Snowtrace

As the world becomes increasingly digital, more user activity is moving online. In the 1970s, it would have been unimaginable to trade stocks on your phone for free. According to data from Bloomberg, there are over 30 billion shares being traded daily on markets around the world and trillions of dollars being transferred daily. Beyond financial services, applications for gaming or Internet of Things (IoT) devices present huge opportunities for on-chain activity. For example, the Algorand blockchain has processed over 200 million transactions from IT devices tracking air quality since inception. Solana, having gained traction particularly in DeFi and NFTs, did roughly 350k and 200k transactions per day respectively in February and March 2022.

Digital Cities

Smart contract platforms can be divided into two layers: Layer 1 (L1) and Layer 2 (L2). L1 refers to decentralized blockchains like Ethereum, Avalanche, and Solana. L2 protocols, like Polygon, are scaling solutions built on top of L1 networks specifically addressing the scalability issues impacting Ethereum.

Dragonfly Research pioneered a useful framework for understanding blockchains by comparing blockchains to cities, the thesis being that blockchains are similar to cities in that each chain is a physically constrained network that prioritizes different features. One city might prioritize infrastructure and focus on high-speed transportation systems through meticulous centralized zoning efforts. Another city might forgo efficiency in favor of more organic, albeit slower growth. Each chain's native token typically represents multiple things:

- Governance rights
- Proof of Stake security
- Burned for transactions

Ethereum is like New York City: it is vast, expensive, and congested in certain areas. However, it also features the richest application ecosystem, with over 500 apps that command a total value of over $100 billion—more than 10x larger than any other competing network. While using the network is expensive, users and developers take comfort that Ethereum will likely continue to be the center of gravity for application innovation and liquidity due to the size of its community and the amount of capital locked into the network's smart contracts. An L2 solution like Polygon is comparable to a skyscraper in NYC: it scales by building upwards. Polygon combines and settles many transactions internally first before settling back on Ethereum's base chain, giving users both the security of Ethereum's base layer and the low fees of a centralized chain.

The Avalanche network is like Chicago: its economy is similar to NYC, but the network is smaller, transactions are cheaper and less congested, and development is more centralized. Since Avalanche is compatible with the Ethereum Virtual Machine, it's easy for Ethereum developers to port

their apps onto Avalanche. While Avalanche's ecosystem feels like a smaller subset of Ethereum's ecosystem, a combination of a growing number of apps built natively on Avalanche (Platypus Finance and Trader Joe), game-specific subnets like Crabada, and partnerships with firms like Deloitte should offer more differentiation compared to apps on other chains, helping Avalanche craft a distinct identity moving forward.

Solana is like Los Angeles: a structurally distinct network that is speedier and focuses on different use cases. Solana's architecture relies on a different consensus mechanism that prioritizes speed and lower fees though at the cost of more centralization - rather than scaling through L2 chains Solana runs transactions through a speedy L1 chain. Running roughly 2300 transactions per second as of March 15 2022, Solana's ecosystem can support apps like Mango Markets, an on-chain order book for trading (which is difficult to build on Ethereum's network due to higher fees and lower speeds). In addition, the network has seen a lot of institutional development from quantitative trading firms looking to leverage the high transaction speed, including Jump Trading and FTX.

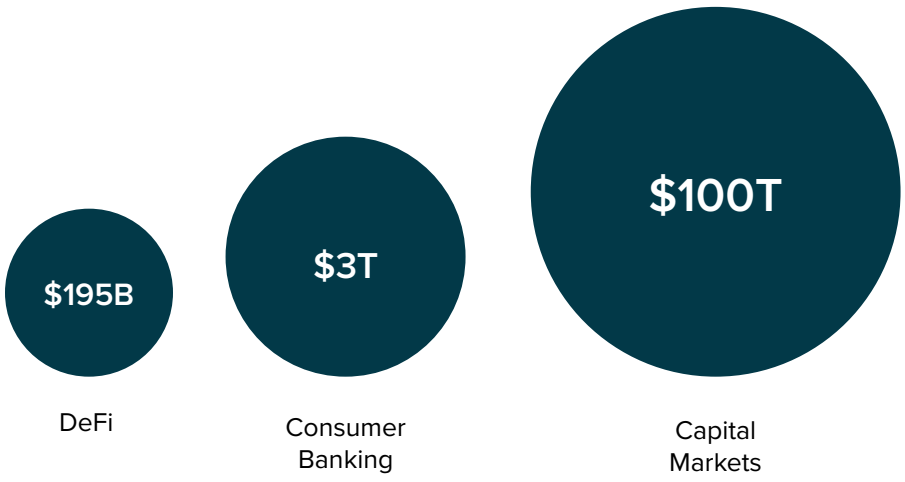
Ecosystem

Apps & Services

The ability to build programs on top of decentralized networks has created a vibrant ecosystem of dApps available to users. The most popular are DeFi apps that allow users to exchange tokens, take loans, or employ asset management strategies that are permissionless and on-chain. Without paperwork or underwriting, these protocols enforce positions and automatically settle using smart contracts.

We believe DeFi is just beginning to scratch the surface of how this technology can revolutionize traditional finance. Services typically provided by expensive intermediaries such as banks, brokers, and custodians can now be provided for a small fee on a blockchain in a fraction of the time. Services like foreign exchange (forex), stocks, derivatives, lending, and yield aggregating are finding more efficient homes on smart contract platforms as dApps. Capital markets alone are valued at 500x more than the current DeFi market as shown below, while still operating on antiquated technology to provide multi-day settlement times for trades and fund transfers.

FIGURE 4: **MARKET CAPITALIZATION OF FINANCIAL SECTORS**[4]



4. Source: 3/10/22. BondAppetit.io, Statista, Defillama

Forex markets transact on average $6.6 trillion of volume per day. In contrast to public equities markets (which trade roughly $200 billion of volume per day), forex market participants range from retail investors to hedge funds to central banks, and markets are open 24 hours a day. Smart contract platforms focused on fast transactions and low fees like Solana and Avalanche may be poised to capture significant market share from this forex market; especially considering both platforms already have on-chain order books and highly liquid stablecoin swap applications. Crypto capturing even 1% of the current forex market activity would result in over $660 billion of daily volume, or nearly $20 trillion in monthly volume. By comparison, the highest monthly volume for Decentralized exchanges peaked in May 2021 at just over $168 billion.

Gaming-related NFTs had over $4.5 billion of trading volume in 2021 and compared to the global game revenue of $180.3 billion in 2021, Web 3.0 gaming represents ~2% penetration rate of the existing gaming market. As games achieve higher levels of activity, developers are becoming more selective on which networks they develop on, and looking for cheap and fast transactions on those networks. For example, Axie Infinity (~$1.3 billion in cumulative revenue) migrated from Ethereum's main chain to a sidechain and DeFi Kingdoms ($1.84 billion in transaction volume in January 2022) is in the process of expanding to its own Avalanche subnet. Smart contract platform foundations have recognized this shift and have begun incentivizing development through funding programs. For example, the Avalanche Foundation announced on March 8th, 2022, a $290M (4M AVAX) fund to attract game developers to grow their "Multiverse" ecosystem. As Web 3.0 adoption from the broader gaming community increases, as smart contract foundations add more incentives, and as gaming as a whole becomes more popular, we believe that Web 3.0 gaming may penetrate a larger amount of the total addressable market (TAM), specifically accruing value into these alternative Layer 1 and 2 networks.

The market opportunity for DeFi and Metaverse applications combined, in our opinion, is likely larger than the $2 trillion market cap of the entire digital assets market today. Smart contract platforms are the operating layer that DeFi and Metaverse applications build on and leverage for transactions, ultimately driving value to the base chain as users accumulate native tokens for fees.

Decentralized Future

In a 2016 essay titled “Fat Protocols”, Joel Monegro of Union Square Ventures explains that one major difference between Web 2.0 (think Facebook, Google, etc.) and Web 3.0 (crypto) is that most of the value in Web 2.0 accumulates to the application layer, while most of the value in Web 3.0 accumulates to the protocol layer (ETH, AVAX, SOL) on which dApps are built. Six years later, this thesis seems to have played out: while most of the SaaS market cap has been driven by applications like Google and Facebook built on centralized servers, most of the crypto market cap has been driven by the underlying tokens that secure the smart contract platforms.

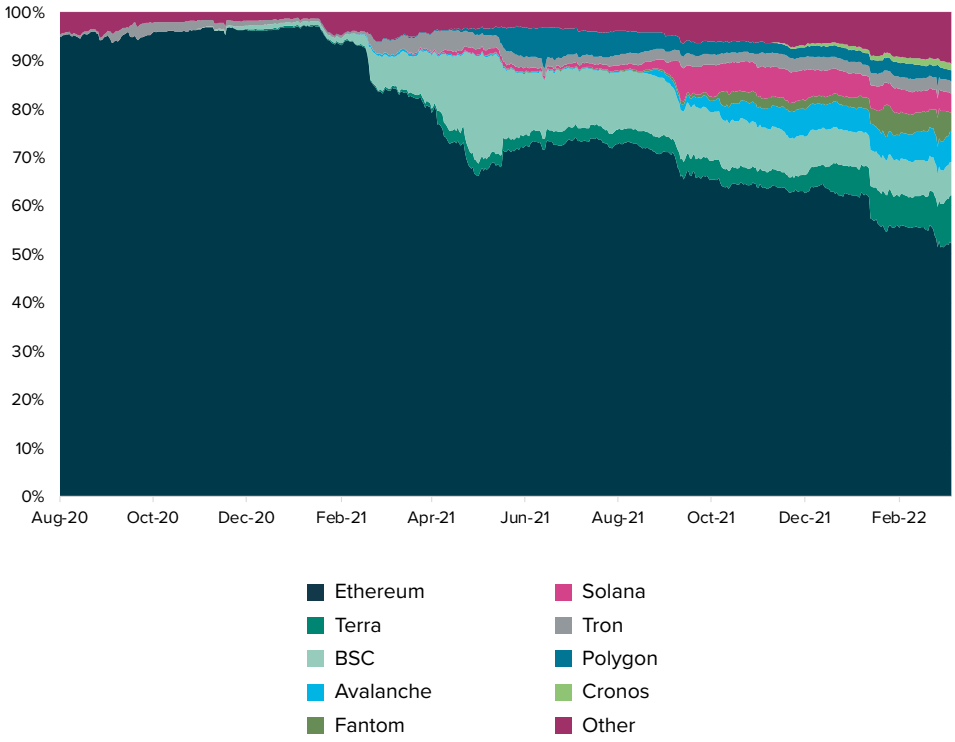
FIGURE 5: **MARKET CAP (BILLIONS)**[5]

Token	12/31/2020	02/28/2022	$ Change	% Change	Inception
BTC	539	715	176	33%	1/3/2009
ETH	84	340	256	305%	8/8/2015
Total	**623**	**1,055**	**432**	**69%**	**-**
SOL	0.1	31	31	4,4186%	3/16/2020
ADA	5	30	25	500%	9/29/2017
DOT	8	18	10	125%	5/27/2020
AVAX	0.2	19	19	7,817%	9/21/2020
MATIC	0.1	12	12	14,900%	5/19/2020
ALGO	0.4	5	5	1,156%	6/11/2019
XLM	2	5	3	150%	9/30/2015
Total	**15.8**	**120**	**104.2**	**660%**	**-**

5. Source: Grayscale Research

Despite the dramatic growth over the past 14 months, one should note that the operating history for most of these Layer 1 networks is brief. Many of these projects were founded between 2014-2018, with many of the larger DeFi protocols being built after 2018. Price action has therefore been concentrated in the last two years as dApps find market fit and bring traffic on-chain.

FIGURE 6: **DEFI TVL - ETHEREUM DOMINANCE DECREASING**[6]



Another consideration is the tokenomics of each network — how does a token like ETH accrue value as compared to SOL or AVAX? Tokenomics differ, but the underlying model shared by each of these networks has a burn mechanism to validate transactions. Through the lens of traditional finance, "burning" functions as a combination of transaction fee and buyback: with each transaction, a small amount of the supply of the token is removed from existence. Assuming a Layer 1 network achieves a certain level of transaction activity, the token burn rate could overtake the token inflation rate, resulting in a deflationary supply. As more valuable apps grow within these ecosystems, activity levels should increase leading to more tokens needed by users and increasing the likelihood of achieving a deflationary supply.

6. Source: Defillama

Conclusion

Despite handling millions of transactions per day, smart contract platforms in their current state would be incapable of handling even 10% of the worlds' internet traffic. The number of transactions processed on traditional exchanges and financial markets alone is enough to congest the current smart contract platform ecosystem, which would cause transactions to begin failing or confirming much slower. The total addressable market for digital on-chain transactions is far beyond the current capabilities of the smart contract platform ecosystem and may be enough for long term value accrual to the underlying smart contract platform's token. At its current size of $200 billion, DeFi may be undervalued given the potential impact it could have on traditional finance. Since 2020, emerging smart contract platforms have grown their share of the DeFi market from 5% to nearly 50% at the time of this writing. Other emerging trends like Metaverse and Gaming add the potential for increased growth in smart contract platforms by bringing an entirely new market of users, capital, and use cases into crypto.

We view smart contract platforms as an investment in a decentralized future, one with a vibrant ecosystem of decentralized applications offering services from finance to gaming and more. The ever growing ecosystem is building the foundation of a decentralized future capable of handling the immense traffic currently constrained to centralized systems, and giving users the ability to opt out of central authority. We believe investing in smart contract platforms may be one of the best ways to gain exposure to the growth of the entire digital asset ecosystem as the on-chain activity is likely to drive value to the native token of the network.

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