

Q1 2021 Layer1 Review: The Scaling Wars Have Arrived

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This past quarter was a tale of two stories within the world of Layer-1s.

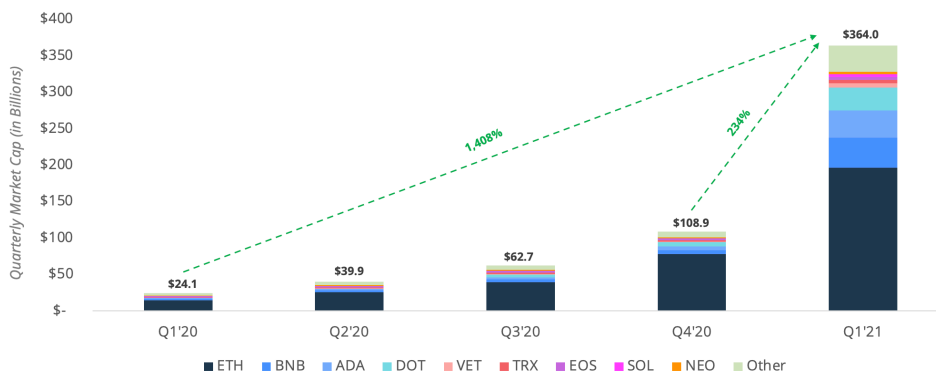
The first was about Ethereum, which reached new all-time highs, confirmed a launch date for perhaps its most significant upgrade to date (EIP-1559), and increased the total value locked (TVL) in its DeFi sector by almost 200% to around [\\$48 billion](#). It has solidified itself as the most used blockchain and has plenty of momentum heading into its next stream of upgrades.

The second story was about Ethereum's challengers. With crypto markets on the rise, the ensuing retail gold rush once again pushed Ethereum to its limits and average transaction fees (in dollar terms) to new heights. Users that couldn't stomach the rising fees looked outside of Ethereum and found what was once a wasteland, now teeming with early signs of life. The growth of application ecosystems on new Layer-1s like Binance Smart Chain (BSC) and Solana, as well as interchain solutions like Cosmos and Polkadot, accelerated throughout Q1. This trend shows no signs of slowing down.

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Quarterly Layer-1 Market Capitalization

The Layer-1 market reached new heights as the demand for DeFi applications has spilled over to networks outside of Ethereum



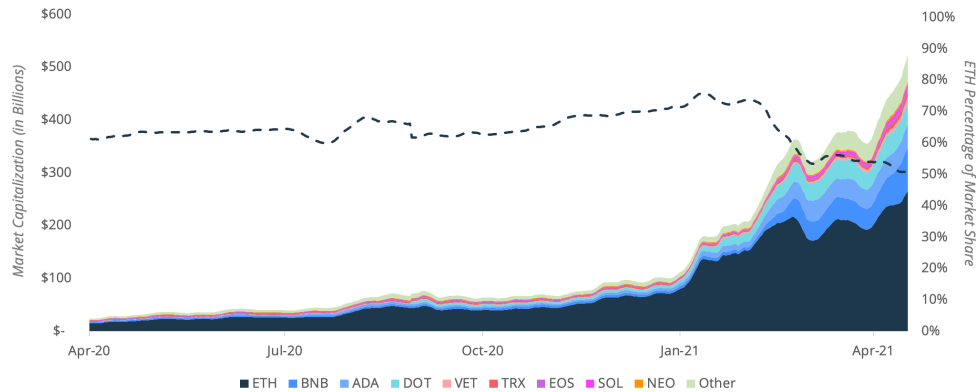
Data as of: Apr. 17, 2021
Source: Messari

While Ethereum stands to benefit from the entire Layer-1 sector growing, it also continues to lose market dominance. In Q1, its market dominance dipped to 51% and may fall further as newer, faster chains find their footing, and many others continue to get foolishly priced relative to Ethereum. The next year will be a defining one for Ethereum as developers explore solutions like flash bots and rollups to scale the network. Q1 affirmed that the long-awaited scaling wars have officially arrived.



Ethereum Layer-1 Market Dominance

Ethereum's market dominance dipped to 51% by mid-April due to the rise of new Layer-1s like Binance Smart Chain and Solana



Data as of: Apr. 17, 2021
Source: Messari

Ethereum Challengers

This year has been an “Ethereum Killer” renaissance so far. Most new Layer-1s raised absurd amounts of money between 2017 and 2019 only to live in relative obscurity, while Ethereum stole the spotlight.

The dynamic between Ethereum and its so-called challengers has since shifted ever so slightly over the last six months as high Ethereum fees led users to explore new platforms. An outflow of users from Ethereum indicated to developers that they could earn a living elsewhere. As developers launched new applications chock full of token incentives, users flocked to them in search of profit, thus setting off a flywheel of speculation and development. More users led to more revenue or better token performance for development teams, which sparked more developers to join and build applications with high-yield incentives.

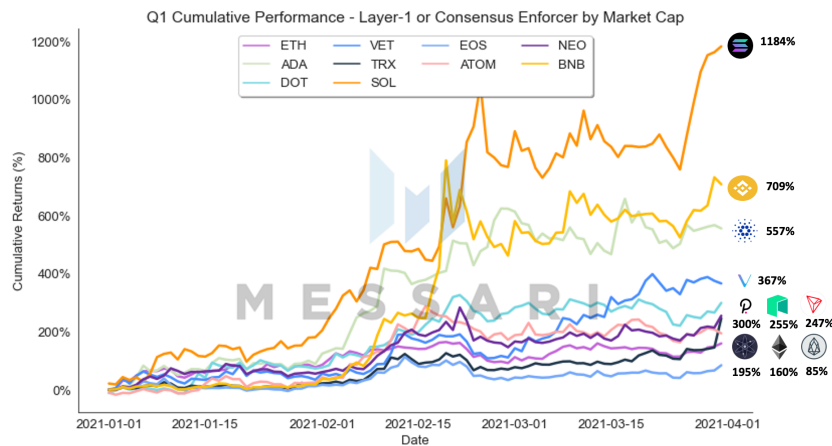
Token-incentivized flywheels move ultra-fast (both on the way up and on the way down), which is why a few new low-fee, high-performance Layer-1s have arrived on the scene so quickly. Low-fee platforms are also fertile environments for experiments and innovations (and scams). But incentives-driven customer acquisition strategies are a highly competitive practice, and Ethereum has several upgrades in the works to improve its current scaling woes. The future success of Ethereum challengers will depend on their ability to differentiate their offerings enough from Ethereum to stand out amongst the crowd.

These challengers come in two different forms: vertically integrated (single-stack) and modular (interchain) networks. Let’s dive into how these categories performed in Q1.

Vertically Integrated

Vertically integrated networks are fully-featured, one-size-fits-all tech stacks. Ethereum, in its current form, is a single-stack network that layers different network touchpoints on top of one another, yet they all share the same state. These chains enable synchronous interoperability (also known as composability) due to their ability to process transactions that call multiple contracts within a single block.

Binance Smart Chain (BSC) and Solana are two chains that have embraced the single-stack model, and both have outperformed the other top ten Layer-1s over the last quarter by substantial margins.



BSC's rise largely originated from its proximity to Binance and EVM compatibility. It uses BNB as its native token for gas payments, which already has a broad user base and a [hodge-podge of utility functions](#) across Binance's product suite. Binance also started a [\\$100 million support fund](#) when BSC launched in September 2020 to bootstrap development. These funds either directly or indirectly led to the creation of BSC's most successful applications to date, PancakeSwap (DEX) and Venus (lending platform). PancakeSwap regularly competes with Uniswap in terms of daily trading volume, and Venus has amassed over \$5 billion in TVL (or about two-thirds of Compound's total TVL).

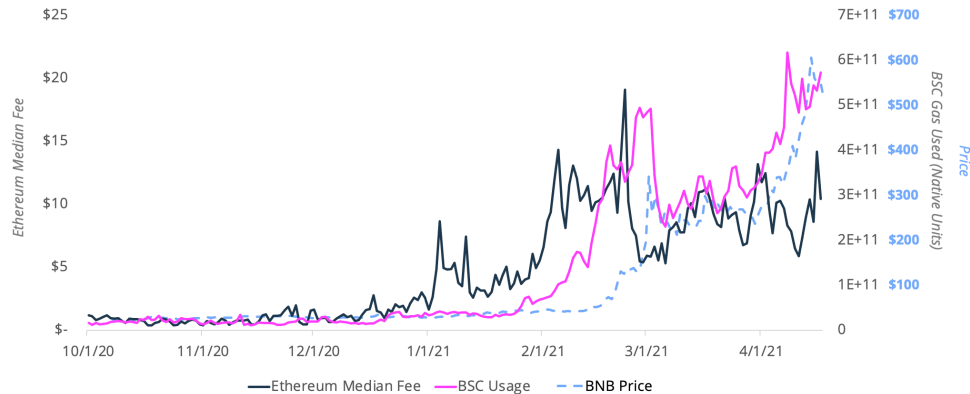
BSC is also compatible with Ethereum tooling. This strategy lowered the learning curve for most smart contract developers to help accelerate application development. But BSC's key feature was adding support for MetaMask. Users familiar with Ethereum's premier browser-based wallet can near-seamlessly switch between Ethereum and BSC, almost negating any switching costs.

These building blocks were already in place when Ethereum's on-chain activity breached its max capacity in early January 2021. While the user experience deteriorated on Ethereum, BSC was able to offer a smaller but serviceable DeFi ecosystem at 4% of the cost and with three-second block times. The result is readily apparent: users flocked to BSC, and its on-chain activity grew exponentially in February. Since BNB is an integral part of the platform and DeFi liquidity pools, BSC's newfound popularity led users to acquire, deploy, and hold more BNB.



Ethereum Median Gas Fee vs. Binance Smart Chain Usage

BSC became a popular outlet for DeFi users and profit seekers when Ethereum's on-chain fees rose and remained elevated in Q1'20



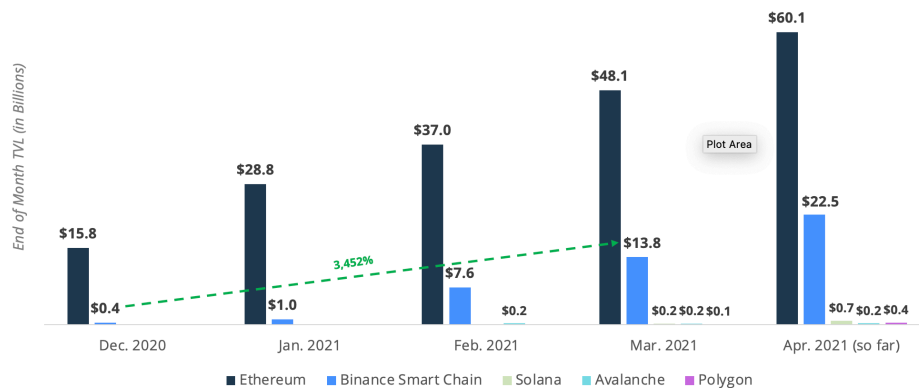
Data as of: Apr. 17, 2021
Source: Messari, Coin Metrics, BscScan

BSC now has over \$22 billion worth of tokens locked in over 50 DeFi applications. Its TVL is second only to Ethereum (\$60.1 billion).



Total Value Locked (TVL) in DeFi Sector Comparison

Binance Smart Chain's TVL increased by 3,452% in Q1'21 and has continued its ascent into Q2



Data as of: Apr. 17, 2021
Source: DeFi Llama, DeFi Station, DeFiPulse, DeBank

Note: Data for Avalanche, Solana, and Polygon only begins in February 2021

Solana's story is fairly similar. Its turning point was the arrival of Sam Bankman-Fried and the launch of Serum in August 2020. Unlike the AMM model popularized by necessity on Ethereum, Serum uses an order book model that features an on-chain matching engine. This on-chain order book, arguably a more capital efficient model, was only possible due to Solana's fast processing times (upwards of 50,000 transactions per second) and low fees (\$0.001 per 100 transactions). In contrast, Ethereum's 15 second block times and volatile fees made the user experience for order book DEXs feel clunky and inefficient.

At the base of almost every Solana application lies Serum. Its order books became a critical building block for AMMs like Bonfida and Raydium or lending protocols like Oxygen. Non-financial applications such as Audius and Solible also plan to use Serum's matching engine on the backend to facilitate the exchange and distribution of NFTs or social tokens.

Development on Solana didn't ramp up until Ethereum fees spiked in January. Since then, Solana's DeFi sector has expanded from a small handful of projects plus Serum to include almost [40 applications](#). These applications now contain over [\\$750 million](#) in TVL, a far cry from Ethereum but up over 4,000% since the beginning of February.

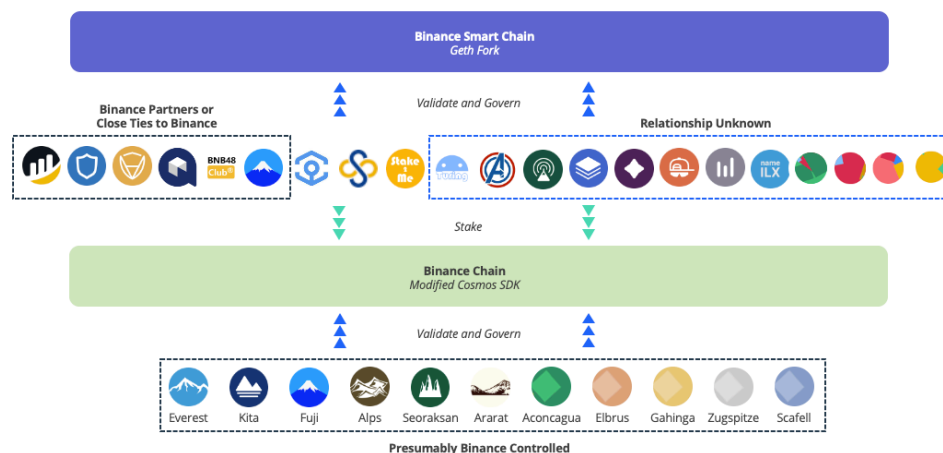
BSC and Solana have each benefited from their monolithic designs. Synchronous composability has arguably been Ethereum's defining feature. Integrating existing building blocks allows developers to rapidly innovate and create applications. With the right integrations or a differentiated approach, a few core building blocks can seed the formation of a new DeFi ecosystem.

The catch is that vertically integrated networks have historically struggled with scalability. Single chains are data-heavy, and every application is subject to the same transaction rules. The result is that node storage costs and network fees increase alongside on-chain traffic. Ethereum has reached its upper limits and must look to shard its processing responsibilities, which lowers storage costs and fees but breaks synchronous composability ties.

BSC and Solana have combated this issue by decreasing validator count and increasing validator costs, respectively. BSC limits its validator set to 21 to minimize the time required to reach consensus. Its consensus layer also relies on Binance Chain (Binance's other, older independent blockchain), which [only has eleven validators](#) (as illustrated below), to minimize on-chain complexity. Solana's [validator requirements](#) are an order of magnitude higher than Ethereum's node costs. Since validator storage costs will only increase over time, the facilities best suited to run Solana nodes are high-end data centers. These approaches make it difficult to decentralize the network's power dynamics (how many entities control the network).

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Binance Chain & BSC Validator Relationship



The final question is, will users care about centralization? Most people have already abandoned privacy for convenience. Decentralization may go the same route as profit mercenaries gravitate towards centralized offerings. But political decentralization has become the bedrock of Ethereum's DeFi sector, as nearly every application is working to establish a DAO-based governance system. Handing power over to a community is an excellent strategy for preservation. Yield will fade when the crypto market corrects, and UX differences between networks will converge in the long run. But communities that feel empowered and embrace decentralization will be more likely to ignore market conditions and remain active contributors.

Decentralization also doesn't matter until a controlling entity does overstep boundaries.

It's an unsustainable model for community preservation. When decentralization gets compromised, everyone realizes it mattered all along.

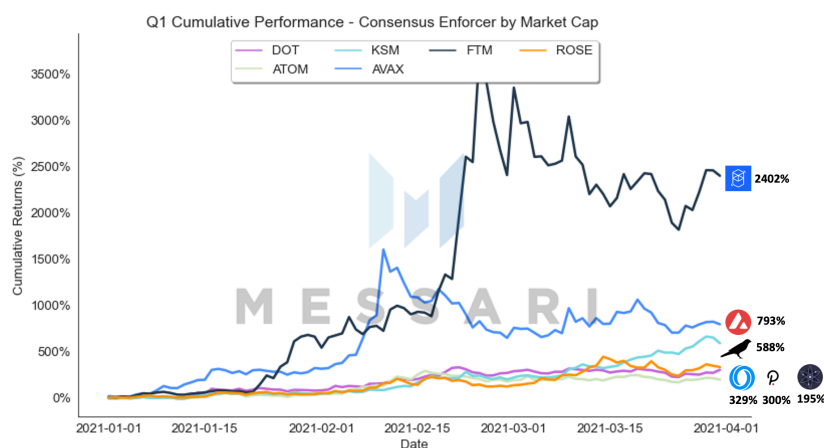
Modular

Unlike one-size-fits-all networks, modular systems split processing, consensus, or storage responsibilities across various independent chains. These chains often build their base infrastructure using a software framework or modular toolkit common to each chain's respective ecosystem. Independent chains are either application-specific and offer one primary function, or they provide a more general platform for application development like Ethereum.

Modular systems typically resemble a hub and spoke topology, where the independent chains plug into a central hub or chain that can facilitate cross-chain communication or assist with network security. Since these systems distribute computational resources, no single chain bears the weight of the whole ecosystem. It's scalability through parallelization.

While Polkadot and Cosmos are the two oldest and well-known modular networks, Fantom and Avalanche stood out in Q1 in price performance.

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Fantom features separate consensus and application execution layers. Its consensus layer, called Lachesis, provides the validator resources to support and secure multiple external execution layers. Fantom's first execution layer is an EVM-compatible platform called Opera FTM that launched in December 2019, but it didn't receive much attention until January 2021. Its recent resurgence originated from all-star DeFi developer and long-time Fantom advisor Andre Cronje, who helped build and market Fantom's cross-chain solutions and technical capabilities.

Fantom launched its bridge to Ethereum in early March, which prompted DeFi applications from the Yearn Ecosystem - [Curve](#), [SushiSwap](#), and [Cream Finance](#) - to deploy versions of their contracts on Opera FTM. It also made headlines when [Alameda Research](#) and [Block-Tower Capital](#) purchased large quantities of FTM tokens in late February and early March, respectively.

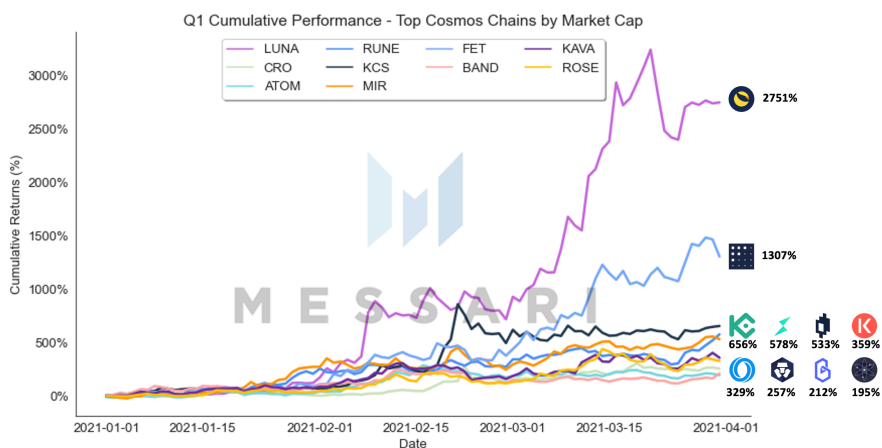
Avalanche is similar to Fantom as it has multiple layers that perform core network functions (consensus, application execution, and token creation). Developers can also create customized execution layers called subnets that feature use-case-specific network parameters but secure transactions by using a subset of Avalanche's validator group. Subnets can have overlapping validator sets but are modular in every other aspect. For a deeper dive into

Avalanche's architecture, see our past report: "[Avalanche's Bid for the Smart Contract Market](#)."

On-chain activity accelerated when Avalanche's first DeFi application, Pangolin, launched on Feb. 9, 2021. The network's native gas and staking token, AVAX, got bid up from around \$15 to almost \$60 in the ensuing frenzy. The flood of user activity also triggered a bug in Avalanche's codebase that rendered its primary execution layer (the C-Chain) unusable for a full day. The series of events illustrated that the demand for low-fee DeFi environments was very real. Pangolin now has over \$200 million in liquidity and facilitates around \$15 million in daily trading volumes. Avalanche's DeFi ecosystem has also grown to include complementary financial products like YetiSwap (exchange), Snowball (yield aggregator), Penguin Finance (asset management), and SushiSwap.

The non-essential layers and their tokens within modular systems also stand to benefit from improvements to the developer experience and, in some cases, better defensibility (tough to fork out tokens tied to a chain's security model). The Cosmos ecosystem is a perfect example of these advantages since zones (independent chains) can optimize for a specific use case, find product-market fit, and rapidly innovate (add new modules) to capitalize on a particular trend.

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Source: Messari. Performance as of March 31, 2021.

For example, Terra initially built out its stablecoin-creation system and generated organic user demand through its Chai app. As demand for Terra's UST stablecoin grew, it added a smart contract module to its base infrastructure in December 2020, which enabled Terra to launch a trading platform for synthetic assets (Mirror Protocol) and a money market protocol (Anchor) in the following months. UST is a core asset within each protocol, and their arrival supercharged UST mints. LUNA's price performance in Q1 represents Terra's fast-growing DeFi ecosystem and the widespread use of UST. When Terra stablecoins are issued, LUNA is burned, which is positive for price action.

Modular networks still have some near-term challenges. While these systems don't limit intra-chain composability, inter-chain communication will be asynchronous by default. As mentioned earlier, seamless composability is often a precursor to rapid innovation. But as Paradigm notes, "synchronous interaction with all other applications is ultimately impossible to maintain at scale." Most chains, even Ethereum, are solving scalability issues by sharding their state. Future systems will consist of a mix of synchronous and asynchronous communi-

cation pathways.

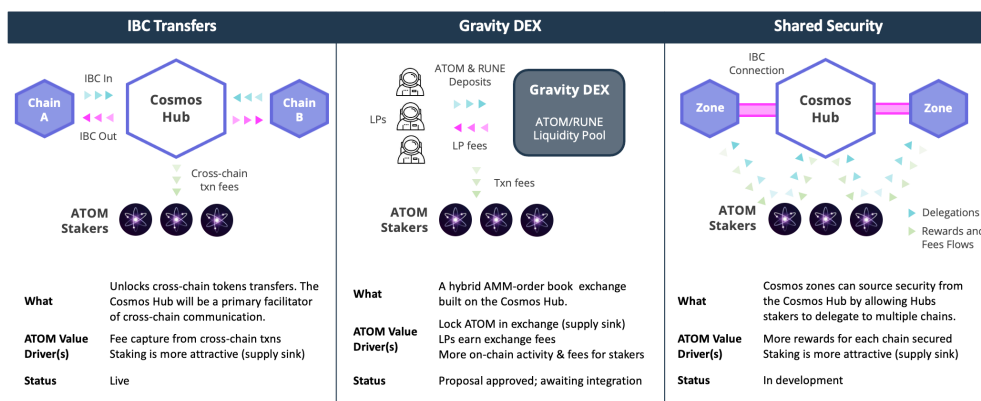
The other shortcoming of modular networks is that their architecture is relatively new; therefore, their ecosystems are either feature-incomplete or underdeveloped. But a few modular systems are on the brink of major development milestones.

More seasoned networks like Cosmos and Polkadot, which both have ample developer activity, are nearing the release of their defining features. The Cosmos Hub launched support for IBC connections in February and transfers in March to enable cross-chain communication. It was the [first in a series of planned upgrades](#) that aim to improve the fundamentals of ATOM and the Cosmos Hub's role within the ecosystem.

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Planned Upgrades to the Cosmos Hub

IBC is the first of three planned upgrades that will improve the fundamentals of ATOM and the Cosmos Hub's role within its ecosystem



Data as of: Apr. 1, 2021
Source: Messari

Likewise, Kusama and Polkadot plan to launch support for parachains (individual chains connected to either Kusama or Polkadot) at some point in 2021. Once live, KSM and DOT holders can loan their tokens to projects to secure a parachain slot in exchange for token incentives. Stakers on either network will also receive a proportionate claim on fees generated by the network for facilitating cross-parachain communication. For a deeper dive into Polkadot's architecture, see our past report: ["Polkadot Primer."](#)

Until now, KSM and DOT have been a claim on seigniorage and granted holders voting rights within their isolated networks. Parachains transform these tokens into stronger capital assets (claim on fees) while giving them money-like characteristics (post as collateral for Parachain auction rewards). Users are likely bidding up KSM in preparation for Parachain auctions, which could arrive on Kusama within the next few months, if not sooner.

Success for modular systems will depend on the quality and size of their subchain ecosystems. Cosmos and Polkadot have had a head start and now have over [200](#) and [130](#) projects, respectively, waiting to connect with each other. Greener modular networks like Fantom and Avalanche feature only one primary execution environment. In each case, the chain is EVM compatible, which is a great growth hack but will eventually compete with every other EVM compatible Layer-1 network (like BSC) and Layer-2 solution. Ecosystem variety in either product suite or go-to-market strategy will be the difference between success and mediocrity.

Layer-2 Scaling Solutions

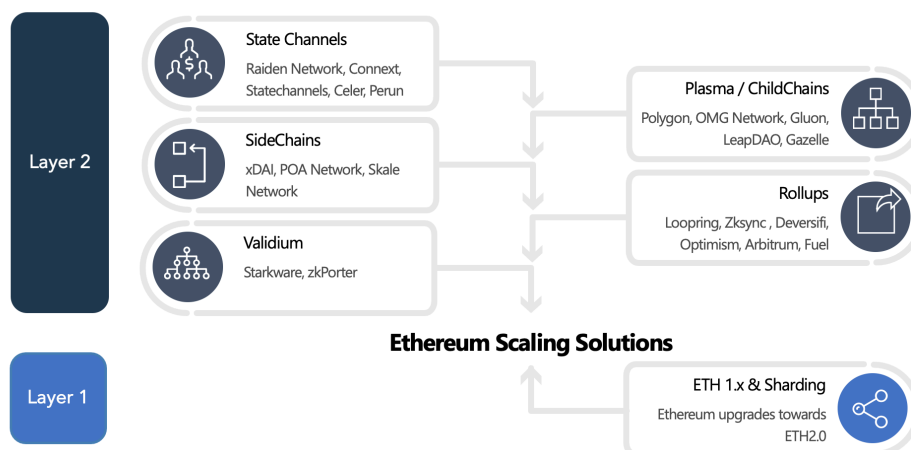
Layer-2 scaling solutions are firmly a part of Ethereum's development roadmap. They'll not only help bridge the gap between now and the launch of Eth2 but also act as an accelerant to Eth2's scalability, increasing its processing power to a theoretical max of ~100,000 transactions per second.

In general, these second-layer solutions facilitate transactions through off-chain means before bundling and submitting them as a single transaction to the base layer. By batching transactions, Layer-2s can significantly improve the number of transactions they process per block while theoretically providing similar security guarantees upon settlement. Off-chain transactions are essentially free and don't bog down the underlying network with excess data and computing requests. For a more in-depth analysis on Layer-2 solutions, see our past report: "[Ecosystem of Ethereum Scaling Solutions](#)."

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Ethereum Scaling Solutions by Type

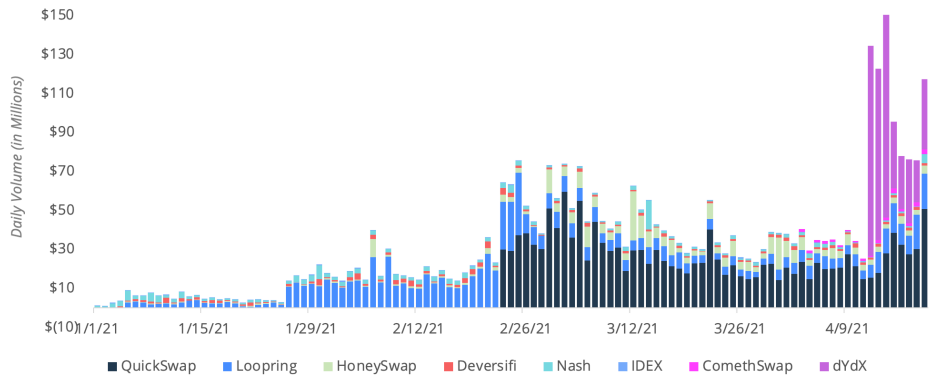
Classification of scaling solutions and projects



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Layer-2 DEX Trading Volumes

Layer-2 DEX volumes picked up in Q1, led by Loopring and Polygon's QuickSwap



Data as of: Apr. 19, 2021
Source: CoinGecko

Note: dYdX volume only tracks perpetuals and Loopring includes order book and AMM volumes






While these volumes are a far cry from the numbers generated by Layer-1 DEXs, the trend is readily apparent: projects are moving up a layer, and users are following suit.

Venture firms have also recognized the growing need and adoption of Layer-2 solutions. As a16z notes, "there is little debate that scaling Ethereum is necessary to continue supporting the rapid growth of the network." This need is precisely why VCs invested over \$100 million in Layer-2 solutions in Q1, headlined by Optimism's \$25 million Series A and StarkWare's startling \$75 million Series B.

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Venture Deals for Ethereum Layer-2 Solutions in Q1'21

Vcs have invested over \$100M in Layer-2 solutions this part quarter as scalability has become necessary to continue Ethereum's growth

Project		Date	Lead Investor(s)	Amount	Round Type
Optimism		2/24/2021	a16z	25.0	Series A
Matter Labs		3/1/2021	Union Square Ventures	Undisclosed	Series A
Connex		3/22/2021	Polychain Capital	2.2	Seed
Loom Network		3/23/2021	Undisclosed	Undisclosed	Private
StarkWare Industries		3/24/2021	Paradigm	75.0	Series B

Data as of: Apr. 19, 2021
Source: Messari, The Block

The only development roadblock Layer-2s hit in Q1 was that Optimism pushed back its public launch from April to July (or later). This delay should only be a minor hurdle in what's shaping up to be a banner year for scaling solutions. Optimism's public release and Uniswap integration are two of several major Layer-2 milestones expected for 2021. Other developments include the mainnet launches for Arbitrum's optimistic rollup, Matter Labs' [zkSync 2.0](#) with support for Solidity smart contract development, and application support on StarkWare's

STARK-powered zero-knowledge rollup.

While Layer-2 scaling solutions are the necessary next stage of Ethereum's evolution, there are a few lingering questions related to their impact on the network and user experience.

- **Parasitic Layer-2 Problem:** Will Layer-2s be detrimental to Ethereum's security and ETH's value capture because they divert activity and miner/validator fees away from the base layer?
- **Breaking Composability:** For the foreseeable future, Layer-2s will be [isolated hubs](#) of composable activity with cross-Layer-2 activity only happening on an asynchronous basis. How will protocols that rely on Ethereum's current composability standards cope when their underlying connection points (and liquidity) move to different solutions?
- **Cross-Layer-2 Communication:** At the moment, cross-L2 communication requires multiple, fee-intensive transactions since they must route through Ethereum. Users may also face a lengthy waiting period when looking to withdraw assets back to the base layer. How can these transaction types become more user-friendly if Ethereum's DeFi sector splinters to different Layer-2s? Connex's Spacefold transaction rails and using [L1 liquidity for L2 applications](#) are potential solutions, but the field for L1-L2 and L2-L2 transactions is wide open.
- **Repeating the Congestion Issue:** What happens if nearly every protocol moves to the same Layer-2 and triggers the same congestion issue Ethereum has experienced during times of peak activity?

Not every question will have a nice, tidy answer. Most solutions may end up being compromises to intractable problems. But the demand for scalability is real. Where there's demand, there's an opportunity, and so far, crypto developers have been creative yet effective at problem-solving within the confines of cryptography and blockchains.

The Multi-Chain Future

The unquenchable thirst for yield-generating protocols and assets has made it abundantly clear that the crypto industry is in fact big enough for more than one blockchain. Layer-2s and Eth2 will alleviate Ethereum's scale woes, but the answer to scaling will also [include](#) bridged Layer-1s for now.

Maximalism is simply a "safe space" for those that refuse to accept what the data is saying. Ethereum will likely be the epicenter of the crypto economy, and Bitcoin is the front-runner for the role of crypto's reserve asset. But modern Layer-1s can offer better or even complementary services in specific sectors, like how Flow has positioned itself as a haven for NFTs or how THORChain can connect legacy blockchains. As the crypto industry grows, more problems (or for the optimist, opportunities) will arise, and the technical components required to solve them may reside on a newer Layer-1.

Bitcoin set the wheels in motion. Ethereum expanded the possibilities by adding functionality. Their offspring will grow the user base beyond a niche following of crypto natives to a more mainstream audience. While the number of viable chains should condense over time as some network communities fail to materialize, the near-term future will be a multichain one.