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2024: A Consequential Year for Crypto

GALAXY RESEARCH • JANUARY 2024

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2024 Will Be a Consequential Year for Crypto

At the start of 2023, one bitcoin was trading for $16,500. FTX's collapse rippled across the industry and left a trail of destruction in its wake. Crypto-friendly banks went out of business, while others were pressured to avoid the industry. A variety of new regulations have been proposed, some of which are stifling to American crypto innovation. Venture dollars invested in crypto have declined to their lowest levels in years.

But bitcoin didn't die. Instead, in 2023 bitcoin has been one of the world's best performing assets, both on absolute return (+130%) and on a risk-adjusted basis. Across the crypto technology landscape, new innovations have emerged that improve scalability. The marriage of A.I. and crypto is early but is already showing promise. And Bitcoin (and possibly Ethereum) will find a home inside the world's most efficient market access vehicle: exchange-traded funds.

2024 will feature a Bitcoin halving, a U.S. presidential election in which multiple candidates have spoken favorably about crypto, the launch of new market access vehicles for BTC (and maybe ETH), the expansion and maturation of layer 2 and modularity technologies, and much more. Competition between both layer 1s and layer 2s will be a prominent feature. Venture dollars will return and many new projects will be funded and launch. For cyclical, secular, and macro reasons, we expect 2024 to be big.

But challenges and headwinds still exist. In the U.S. particularly, crypto technologies remain under attack. Certain political figures have aligned with banks not to protect consumers or regulate centralized intermediaries, but to neuter the underlying technologies that power decentralized networks themselves. Decentralized Finance (DeFi) remains in a precarious position domestically, with a slew of rules either proposed or coming into force set to make it unworkable to operate in the U.S.

Abroad, the picture is brighter. Europe and other jurisdictions have enacted regulatory frameworks that provide pathways for operating cryptocurrency businesses legally. In many cases, these regulations are restrictive and burdensome, but they are not strangulating. Europe's MiCA, for example, sets tight and serious rules, but the rules are not insurmountable, unlike many proposals in the United States.

2024 will be a year of growth, but also a year of evolution. While Bitcoin in particular is poised for a big year, there are also threats to the broader industry that could hamper adoption. While we have returned (yet again) from the depths of a grueling bear market, we have not yet reached the mountaintop. There's still much to build. In this report, we give our predictions for the year ahead.

Alex Thorn
Head of Firmwide Research @ Galaxy

Top-Line Predictions for 2024

- The Bitcoin ETFs will see significant inflows, but they will also reshape how bitcoin markets work in the United States. Bitcoin will land against traditional finance like a wave, and the fallout will impact asset managers, brokers, and exchanges in both crypto and tradfi.
- The Bitcoin halving will challenge miners, leading to some consolidation, but will also coincide with monetary easing from global central banks, serving as a powerful marketing narrative for BTC. Miner revenue will face new challenges and opportunities.
- Ethereum will continue down its modular path, enacting upgrades that further support L2s and working to incorporate new technologies like restaking.
- As Ethereum moves further down the path to modularity, it will face unprecedented challenges from alternative layer one blockchains like Solana, and perhaps even from Bitcoin itself, which will see a resurgence of use as a "platform."
- Decentralized finance will not be a challenger to traditional finance in 2024. But new innovations in DeFi will help evolve the on-chain landscape. The recent growth in real world assets (primary Treasury bills) onchain will stall as global tradfi rates recede and onchain crypto yields expand in a new bull market. Nonetheless, tokenization will continue to be an ascendant theme in 2024.
- While cryptocurrencies are unlikely to be a key ballot issue in the upcoming 2024 elections, it is noteworthy that the technology has sparked comments and debate from more presidential candidates this election that ones prior. Because of elections, draft legislation and bills will likely be more difficult to progress through Congress, especially past the spring of 2024.
- Stablecoin supplies will begin to grow again as a resurgent crypto market drives demand for on and off ramps. US-based stablecoins will remain stagnant in the face of regulatory uncertainty, while offshore stablecoins like Tether and newer entrants like Mountain that pass collateral yield to token holders will grow in supply and usage.
- The combination of crypto and AI will be a notable source of activity in the crypto ecosystem, both in terms of protocol adoption and venture investment. Decentralized compute providers will benefit from growing demand for GPUs needed to train and run inference requests on AI models. Even the most established providers have only just begun rolling out dedicated servers for AI-related tools.

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The Bitcoin ETF Market Opportunity

Bringing Bitcoin to the Investing Masses

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Illustrative Bitcoin Spot ETF Market Sizing and Inflows by Year

Market Size by Wealth Platform ($T)	Year 1	Year 2	Year 3
Broker-Dealer % access	$6.8 25%	$13.6 50%	$20.3 75%
Bank % access	$3.0 25%	$6.0 50%	$8.9 75%
RIA % access	$4.7 50%	$7.0 75%	$9.3 100%
ETF Addressable Market via Wealth Channels % access (avg)	**$14.4T** 30%	**$26.5T** 55%	**$38.6T** 80%

BTC ETF Inflows	Year 1	Year 2	Year 3
Avg % of assets adding BTC exposure	10%	10%	10%
Avg % allocation to BTC	1%	1%	1%
Est. Inflows into Bitcoin ETF by Year ($Bn)	**$14.4**	**$26.5**	**$38.6**

Data: Dakota, Galaxy Research estimates

Ten years since the first Bitcoin spot ETF application, the U.S. Securities & Exchange Commission has approved the launch of spot-based Bitcoin ETFs in the U.S. The two primary factors for a why a bitcoin spot ETF will be particularly impactful for the market adoption of bitcoin:

- **Expanded accessibility across wealth segments**. The ETFs increase the reach of BTC investment products for both retail & institutions and expand distribution through more investment channels – namely financial advisors / fiduciaries. In our view, the US wealth management industry has the most net new accessibility from the approved Bitcoin ETF. As of October 2023, assets managed by broker-dealers, banks and RIAs collectively totaled $48.3 trillion.
- **Greater acceptance from formal recognition by regulators & trusted brands**. Formal recognition / validation by regulators and established financial brand names will improve perceptions around bitcoin/crypto's legitimacy as an asset class by addressing regulatory and compliance concerns and highlighting portfolio benefits.

Impact of BTC ETFs on Bitcoin

These new market access vehicles will dramatically impact the Bitcoin and traditional finance worlds.

- **Bitcoin culture will expand and fracture.** The easy access these vehicles offer will likely expand the number of Bitcoin holders significantly. Importantly, though, these vehicles offer exposure to Bitcoin price, but do not deliver actual BTC to shareholders, creating a fracture between owners of ETF shares and *actual* bitcoin. This will impact Bitcoin culture and could impact Bitcoin governance and design decisions.
- **Bitcoin brokerage and trading will be challenged.** The low ETF fees will not just create an incredibly competitive environment among issuers, but will also challenge the fees charged by spot-BTC exchanges and brokerages. Beyond spot, ETF shareholders will have access to securities lending (margin) and options trading through traditional prime brokers.
- **BTC volatility and crypto cyclicality is likely to dampen.** If wealth managers are a major portion of ETF users, capital allocated to these vehicles is likely to be much stickier than bitcoin allocations in prior eras. Bitcoin investment will be held in brokerage accounts adjacent to traditional and macro investments, rather than on crypto exchanges where they sit adjacent to alternative cryptoassets.
- **Bitcoin's geopolitical and macro relevance will rise.** Increased ownership, along with the ease in moving between bitcoin exposure and other traditional assets, will make BTC an even more relevant asset on the global stage.

The ETFs will spur growth and expansion, but headwinds exist in the near-term.

- **Grayscale's high fees (150 bps) will lead to continued redemptions.** Billions will be redeemed from GBTC, and while some of its AUM was delta hedged, the outflows will nonetheless cause selling pressure for weeks or months.
- **Wealth Management firms will take time before adding the ETFs to their platforms.** The primary net-new market for these ETFs are wealth managers and financial advisors, and their platforms will be slow to add the vehicles, dampening net-new inflows through H1 2024.

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BTC Price Cycles and Mining

Navigating the Halving and Mining's Future Landscape

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Bitcoin's 4th Halving

Every 210,000 blocks (~4 years), the Bitcoin network automatically reduces the rate of supply growth by half, resulting in a predictable monetary policy that will eventually culminate with a total of 21m coins. This monetary policy is etched into the Bitcoin software's source code and enforced by the consensus of thousands of Bitcoin software operators around the world. The policy is immutable, never to be changed as long as Bitcoin exists.

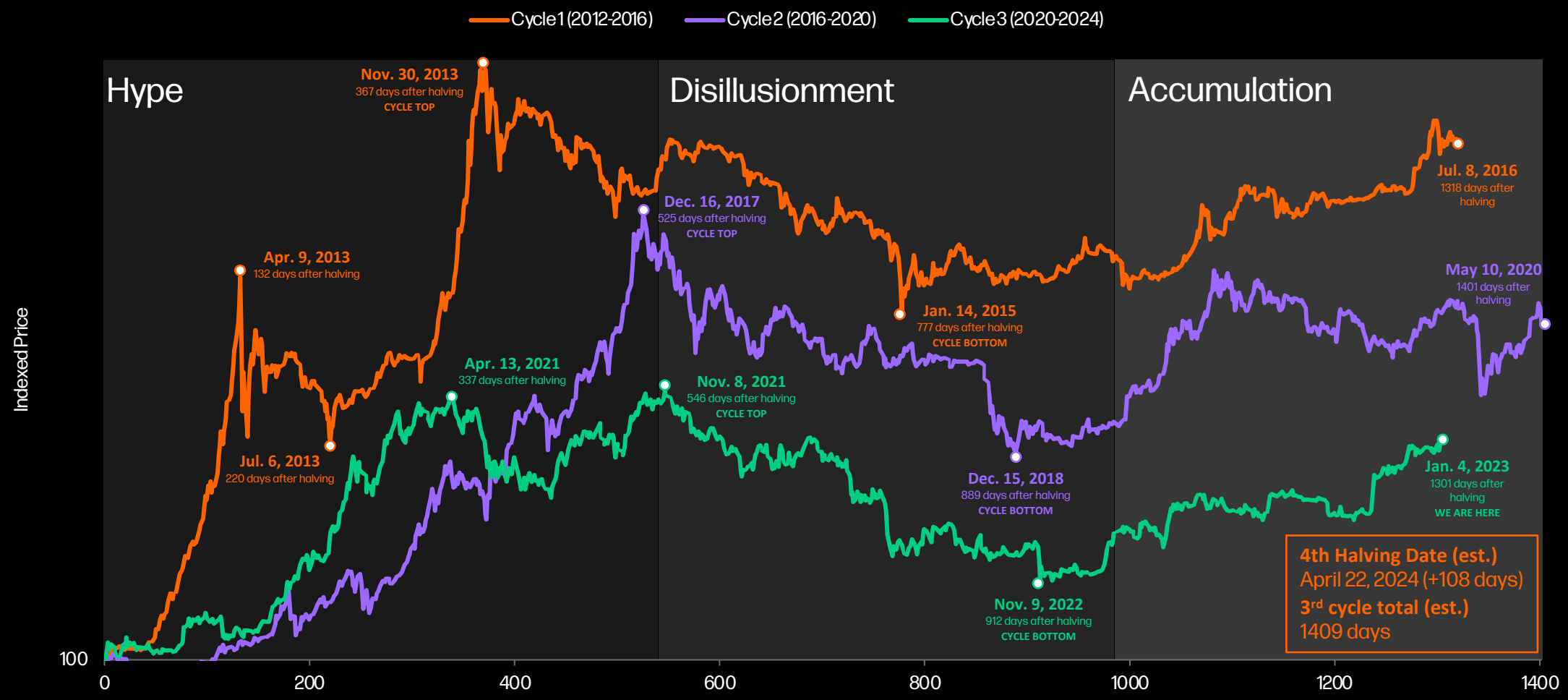
Halvings have historically framed bitcoin's four-year price cycles, with halving dates marking the beginning of a fresh cycle. Price has followed similar intra-halving cycle patterns classified by periods of hype, disillusionment, and accumulation.

Bitcoin's fourth halving will reduce the block reward (the amount of BTC allocated to miners for finding new blocks) from 6.25 BTC/block to 3.125 BTC/block. This halving period will see bitcoin's inflation rate drop below 1% and its supply increase by 656,250 BTC to 20,343,750 BTC (96.88% of sovereign supply).

Bitcoin Halving Supply and Model

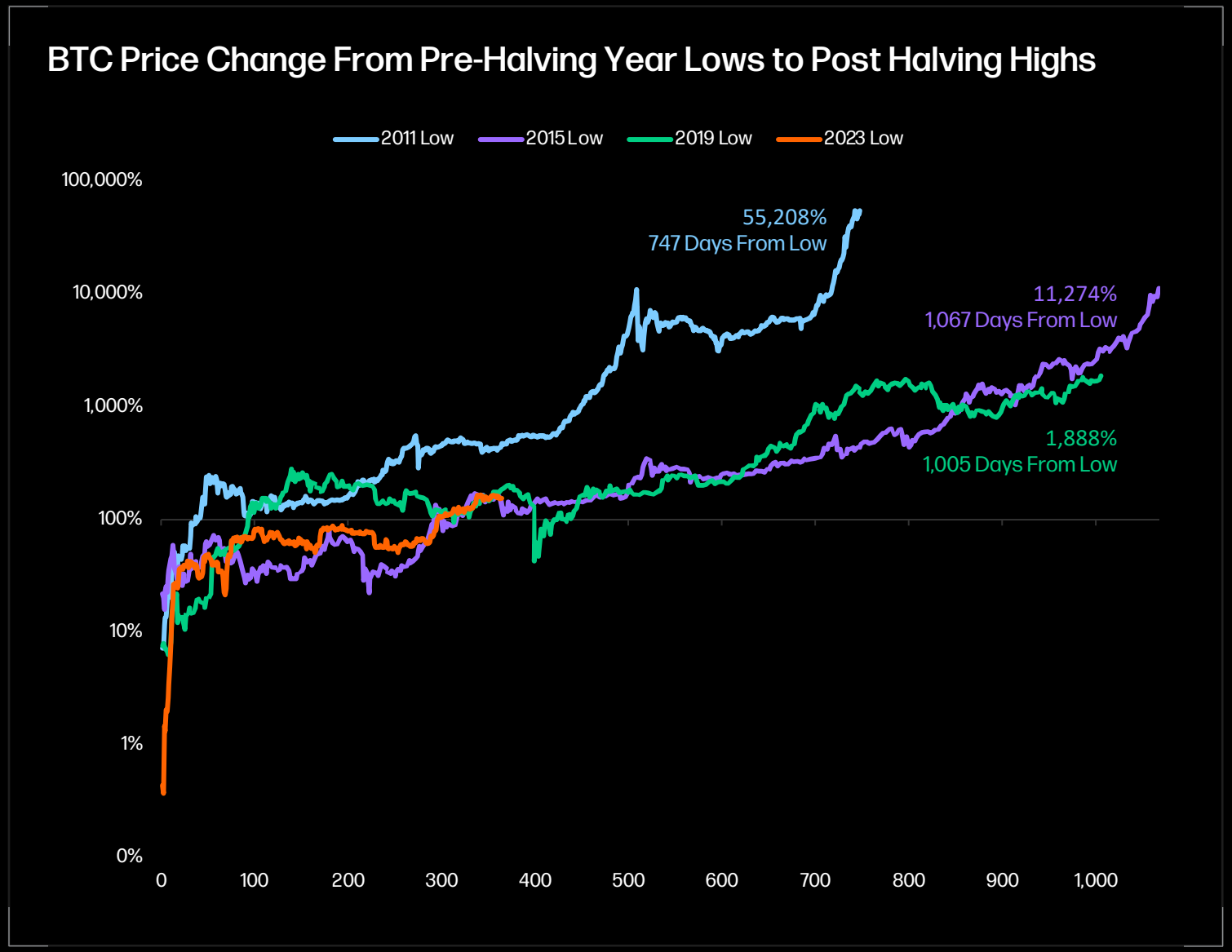
Block	Reward Era	BTC/block	Start BTC	BTC Added	Supply	End BTC	BTC Increase	End BTC % of Limit
0	1	50	0	10500000	0	10500000	infinite	50.00%
210000	2	25	10500000	5250000	15750000	15750000	50.00%	75.00%
420000	3	12.5	15750000	2625000	18375000	18375000	16.67%	87.50%
630000	4	6.25	18375000	1312500	19687500	19687500	7.14%	93.75%
840000	5	3.125	19687500	656250	20343750	20343750	3.33%	96.88%
1050000	6	1.5625	20343750	328125	20671875	20671875	1.61%	98.44%
1260000	7	0.78125	20671875	164062.5	20835938	20835937.5	0.79%	99.22%
1470000	8	0.390625	20835937.5	82031.25	20917969	20917968.8	0.39%	99.61%
1680000	9	0.1953125	20917968.8	41015.625	20958984	20958984.4	0.20%	99.80%
1890000	10	0.0976563	20958984.4	20507.813	20979492	20979492.2	0.10%	99.90%
2100000	11	0.0488281	20979492.2	10253.905	20989746	20989746.1	0.05%	99.95%
2310000	12	0.0244141	20989746.1	5126.9526	20994873	20994873	0.02%	99.98%
2520000	13	0.012207	20994873	2563.4763	20997437	20997436.5	0.01%	99.99%
2730000	14	0.0061035	20997436.5	1281.7371	20998718	20998718.3	0.01%	99.99%
2940000	15	0.0030518	20998718.3	640.8675	20999359	20999359.1	0.00%	100.00%
3150000	16	0.0015259	20999359.1	320.4327	20999680	20999679.6	0.00%	100.00%
3360000	17	0.0007629	20999679.6	160.2153	20999840	20999839.8	0.00%	100.00%
3570000	18	0.0003815	20999839.8	80.1066	20999920	20999919.9	0.00%	100.00%
3780000	19	0.0001907	20999919.9	40.0533	20999960	20999959.9	0.00%	100.00%
3990000	20	9.536E-05	20999959.9	20.0256	20999980	20999980	0.00%	100.00%
4200000	21	4.768E-05	20999980	10.0128	20999990	20999990	0.00%	100.00%
4410000	22	2.384E-05	20999990	5.0064	20999995	20999995	0.00%	100.00%
4620000	23	1.192E-05	20999995	2.5032	20999997	20999997.5	0.00%	100.00%
4830000	24	5.96E-06	20999997.5	1.2516	20999999	20999998.7	0.00%	100.00%
5040000	25	2.98E-06	20999998.7	0.6258	20999999	20999999.4	0.00%	100.00%
5250000	26	1.49E-06	20999999.4	0.3129	21000000	20999999.7	0.00%	100.00%
5460000	27	7.4E-07	20999999.7	0.1554	21000000	20999999.8	0.00%	100.00%
5670000	28	3.7E-07	20999999.8	0.0777	21000000	20999999.9	0.00%	100.00%
5880000	29	1.8E-07	20999999.9	0.0378	21000000	20999999.9	0.00%	100.00%
6090000	30	9E-08	20999999.9	0.0189	21000000	21000000	0.00%	100.00%
6300000	31	4E-08	21000000	0.0084	21000000	21000000	0.00%	100.00%
6510000	32	2E-08	21000000	0.0042	21000000	21000000	0.00%	100.00%
6720000	33	1E-08	21000000	0.0021	21000000	21000000	0.00%	100.00%
6930000	34	0	21000000	0	21000000	21000000	0.00%	100.00%

Bitcoin Bull Runs Following Halving Cycles



Data: Coin Metrics, Galaxy Research

As of Jan 4, 2024



Data: Glassnode

The current halving cycle is ending, with the fourth halving anticipated to happen in mid to late April 2024. BTC performance is behaving like that of the past 2 cycles.

Using the pre-halving year low as a basis, the current price action observed in BTC is on pace with 2015 moving into the 2016 halving and 2019 moving into the 2020 halving.

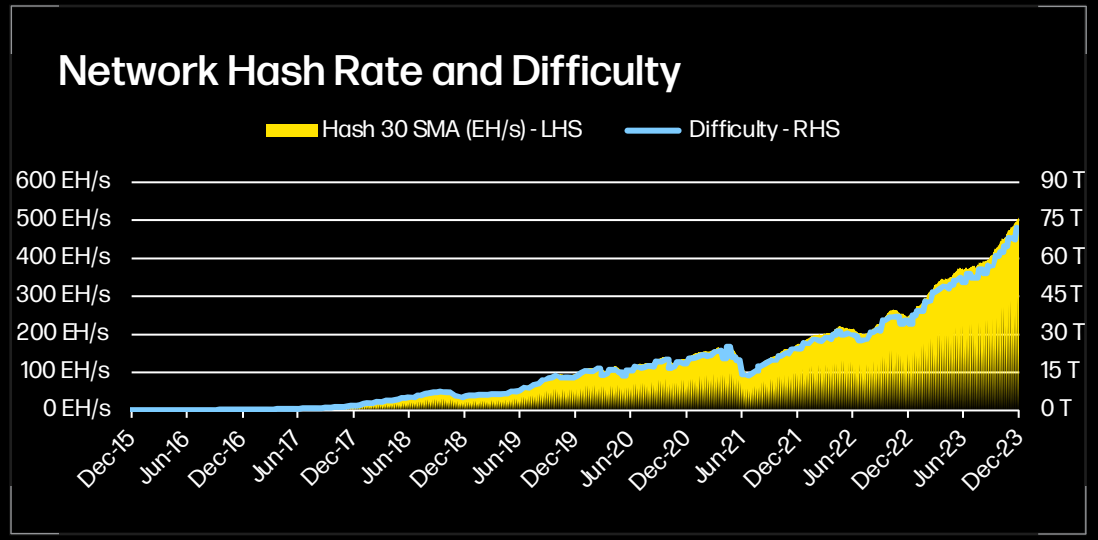
At 364 days since the 2023 low, BTC price has rebounded 154%. This compares to 151% from the 2015 low and 186% from the 2019 low at the same time.

The previous 3 halving dates have come between 376 and 542 days after the low was notched.

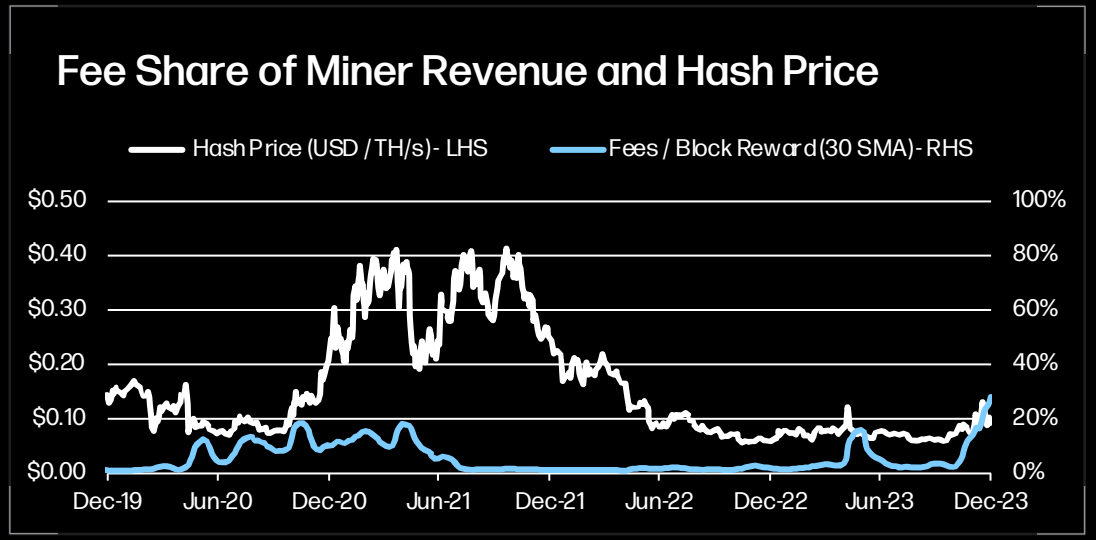
2012 Halving: 376 days after the 2011 low
2016 Halving: 542 days after the 2015 low,
2020 Halving: 459 days after the 2019 low.

The 2024 halving is anticipated to take place 467 days after the 2023 low, putting it within 75 days of the 2016 halving date from the low and within 8 days of the 2020 halving from the low.

Network Hash Rate and Difficulty



Fee Share of Miner Revenue and Hash Price



At the end of 2023 hash rate was trending around all-time highs of 505 Exahashes (EH/s). This is a signal that miners are pushing to get as much hash online before their rewards are reduced after the mid-April 2024 halving. Hash rate increased 103% from 248.5 EH/s to 505.3 EH/s in 2023. Adding 286 EH/s of raw hash power, the network added more hash rate in 2023 than the previous six years combined.

The network's elevated hash rate coincides with all-time highs in mining difficulty, or the number of hashes required to find a Bitcoin block. The greater the difficulty the more resources are required to mine BTC and the fiercer the competition between miners is. At the conclusion of 2023, the network required 72 trillion hashes of power to find a single block. This compares to 35.4 trillion hashes at the start of 2023.

Data: Glassnode, Dune, Luxor Technology

Rising difficulty and hash rate that make mining more resource intensive and competitive present challenges for miners in the year ahead. This is expressed through hash price, which is a measure of miner revenue per unit of hash rate they have online per day, and the fees paid to miners.

Despite block reward remaining the same and fees paid by users clearing the 2021 peak (noted by heightened fee to block reward ratio), miners are earning 76% less revenue today than they were in October 2021 per unit of hash power they have online. This can be partially attributed to 36% decline in BTC price since then but is magnified by the growing competition between miners as new hash has come online.

The halving will further reduce possible miner income by 3.125 BTC per block, or 450 BTC per day. This can exacerbate the economic challenges faced by miners which can lead to some miners closing their doors. The consolidation, however, can bring mining difficulty to a more sustainable level that economically benefits the miners who stay online.

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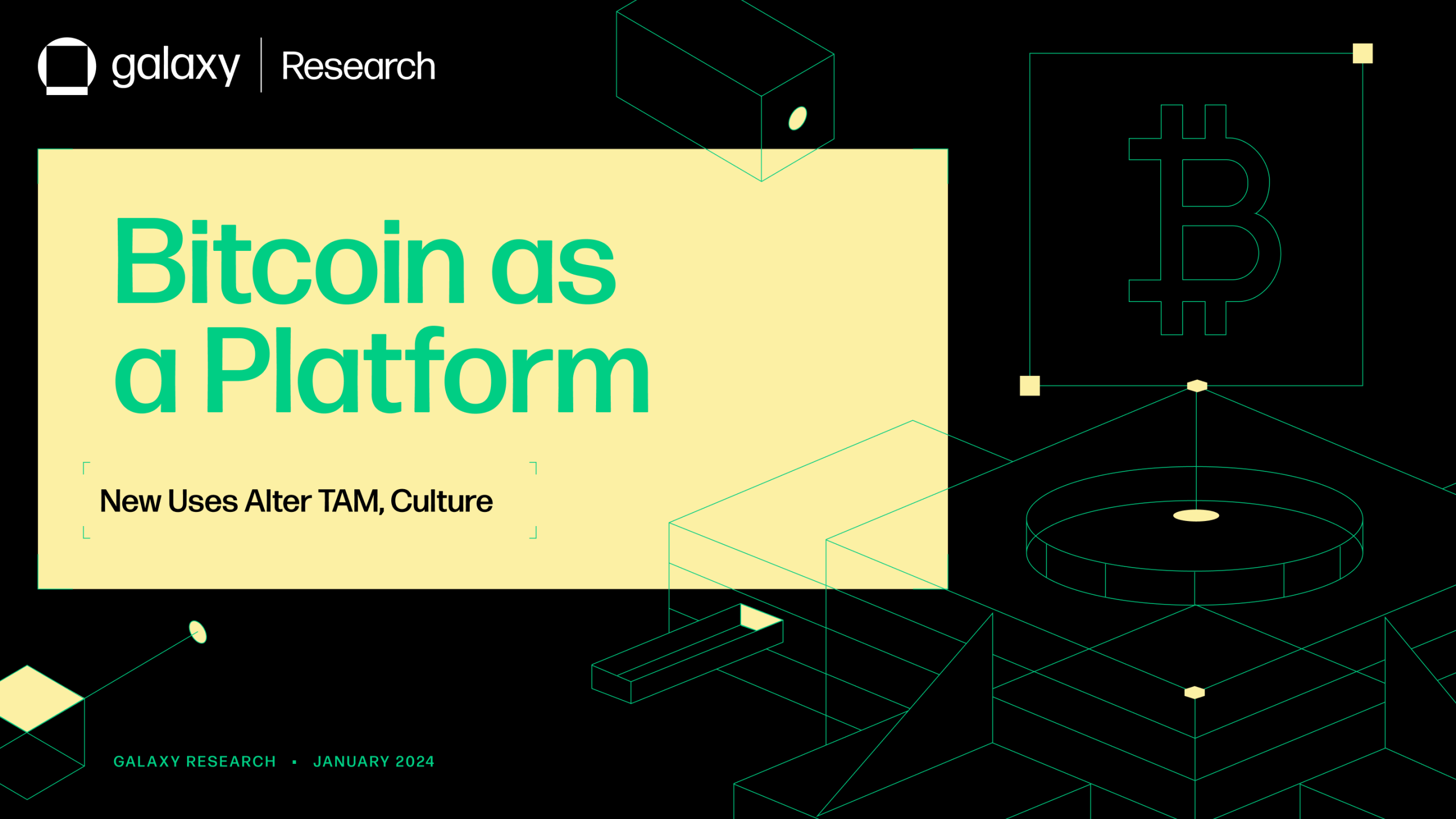
Bitcoin as a Platform

New Uses Alter TAM, Culture



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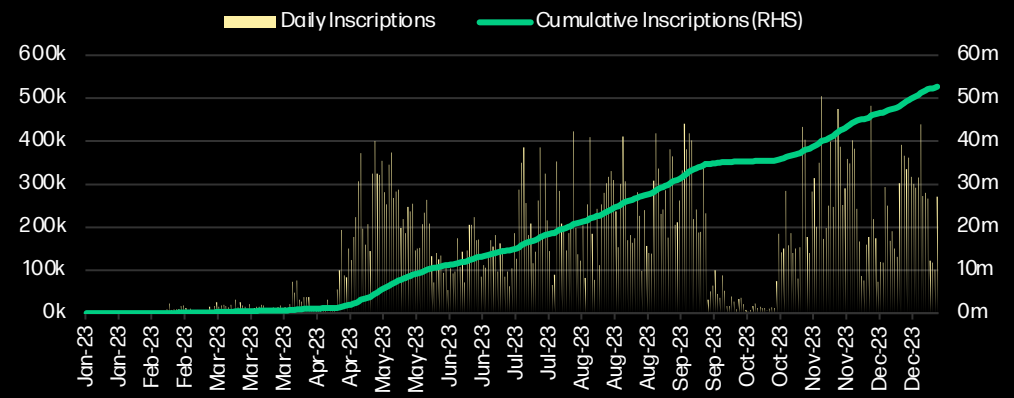
History of “Bitcoin as a Platform”

Project	Focus	Year Released
Namecoin	Domain Name Service	2011
Colored Coins	Tokenization	2012
Counterparty	Digital Art	2014
Omni Layer	Tokenization	2014
Lightning Network	Payments	2016
RGB	Smart-contracts	2017
Discreet Log Contracts (DLCs)	Smart-contracts	2020
Ordinals	Digital Art	2022
BRC-20s	Tokenization	2023
BitVM	Smart-contracts	2023
Taproot Assets	Tokenization	2023

Adoption of Inscriptions



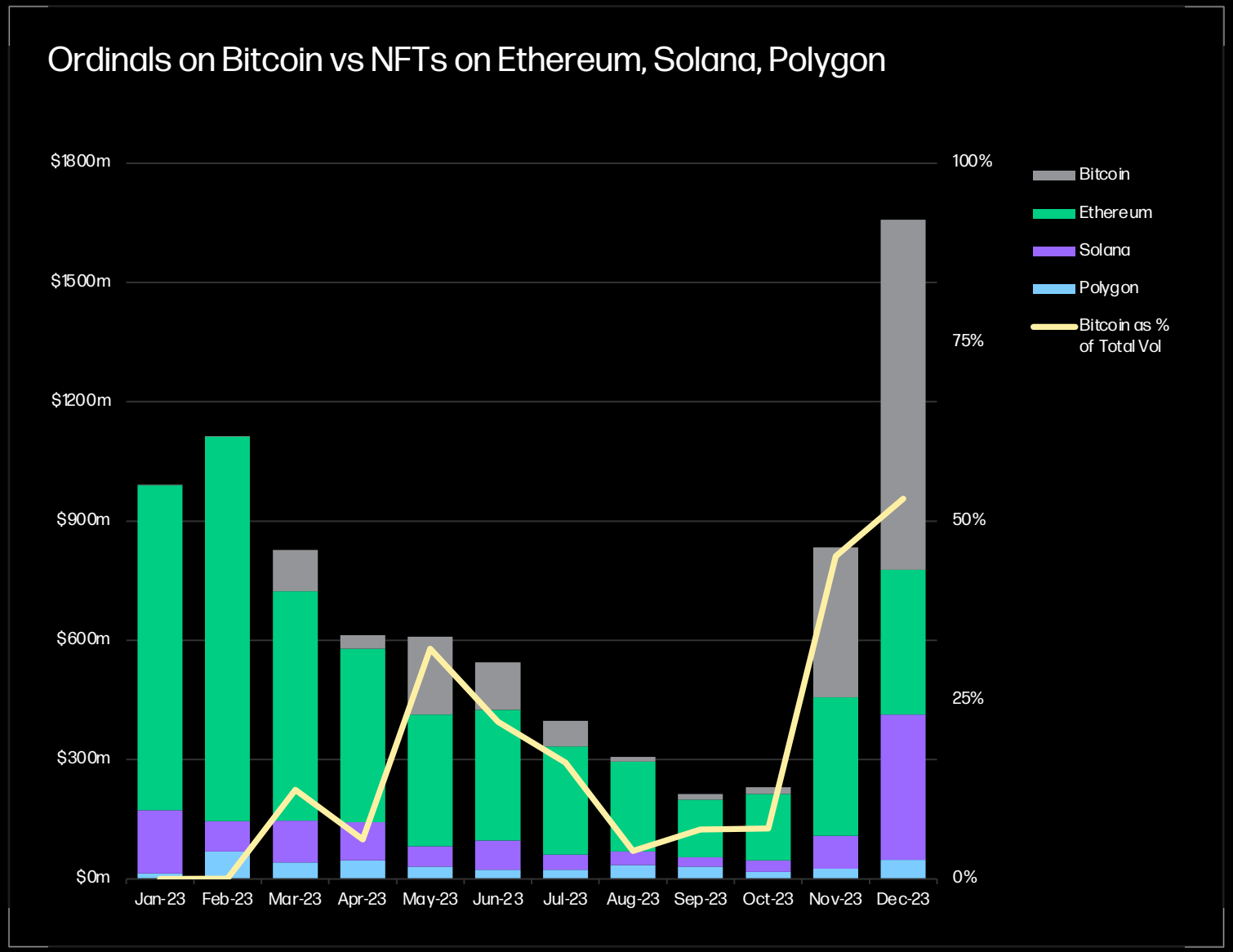
For years, Bitcoin has established itself as the most stable and conservative blockchain, prioritizing network security and decentralization above scalability. Bitcoin has often faced criticism for its lack of innovation and capacity to directly compete with other general-purpose Layer 1 blockchains such as Ethereum and Solana.

In October 2008, Satoshi Nakamoto introduced the Bitcoin whitepaper with the vision of creating a "peer-to-peer electronic cash system," emphasizing its role as a medium of exchange. However, over time, Bitcoin has become predominantly acknowledged as "digital gold" and a store of value. Despite this mainstream perspective of Bitcoin’s value, developers have attempted to expand Bitcoin’s functionality since 2011.

The most recent paradigm shift within the Bitcoin community occurred in H1 2023 with the emergence of inscription technology, which enabled users to attach any type of arbitrary data to a sat (the smallest unit of a bitcoin). As a result, on-chain art on Bitcoin flourished and gained meaningful adoption. Soon after the emergence of digital art , a new fungible token standard using inscription technology gained significant adoption.

Digital art and fungible tokens not only introduced new use cases for Bitcoin, but more importantly sparked a progressive development movement within the Bitcoin ecosystem.

Data: Dune (Galaxy)



Data: CryptoSlam. Known wash trading activity has been excluded from the data.

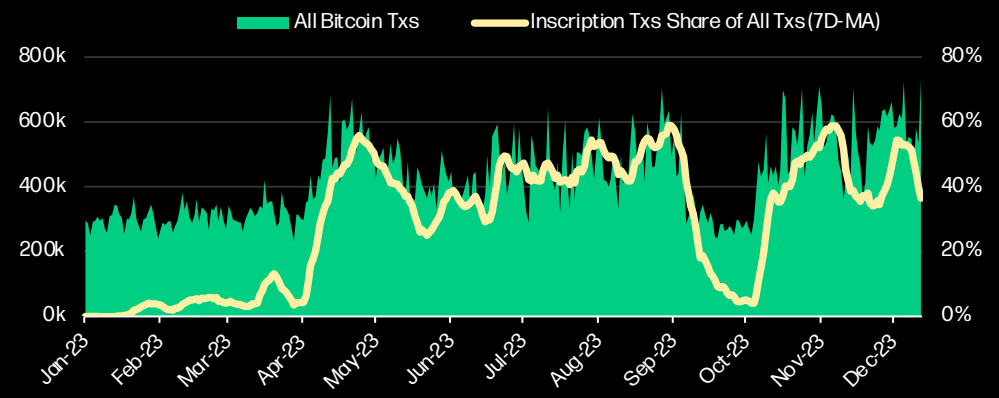
The explosive growth of Ordinals throughout the bear market took the broader NFT ecosystem by surprise. In December 2023, Ordinals and BRC-20s generated over $881m in trading volume, roughly 53% of all NFT volume that month.

In December, Ordinals and BRC-20 monthly volumes surpassed NFT volumes on Ethereum, Solana, and Polygon combined.

Since January 2023, the total cumulative trading volume for Ordinals and BRC-20s on Bitcoin stands at $1.8bn, making Bitcoin the second most popular network for digital collectables by trading volume in 2023 after Ethereum.

Bitcoin is clearly positioned to become a major player in the digital collectable ecosystem. A key differentiator for digital collectibles on Bitcoin continues to be that the metadata is stored on-chain by default, unlike Ethereum, Solana, and Polygon.

Inscriptions Are Here To Stay



Ordinals and BRC-20 related transactions represent a significant portion of total Bitcoin transactions. At its peak in November 2023, Ordinals and BRC-20 related transactions accounted for 50% of all Bitcoin transactions. The pronounced prevalence of Ordinal and BRC-20 transactions suggests a substantial appetite for fungible tokens and digital collectibles within the Bitcoin ecosystem.

Outlook on Ordinals & BRC-20s

- Digital art on Bitcoin will be a $5bn+ market by 2025
- All major NFT marketplaces will support Ordinals trading
- BRC-20s will flourish until a new fungible token protocol is battle tested

Data: Dune (@glxyresearch)

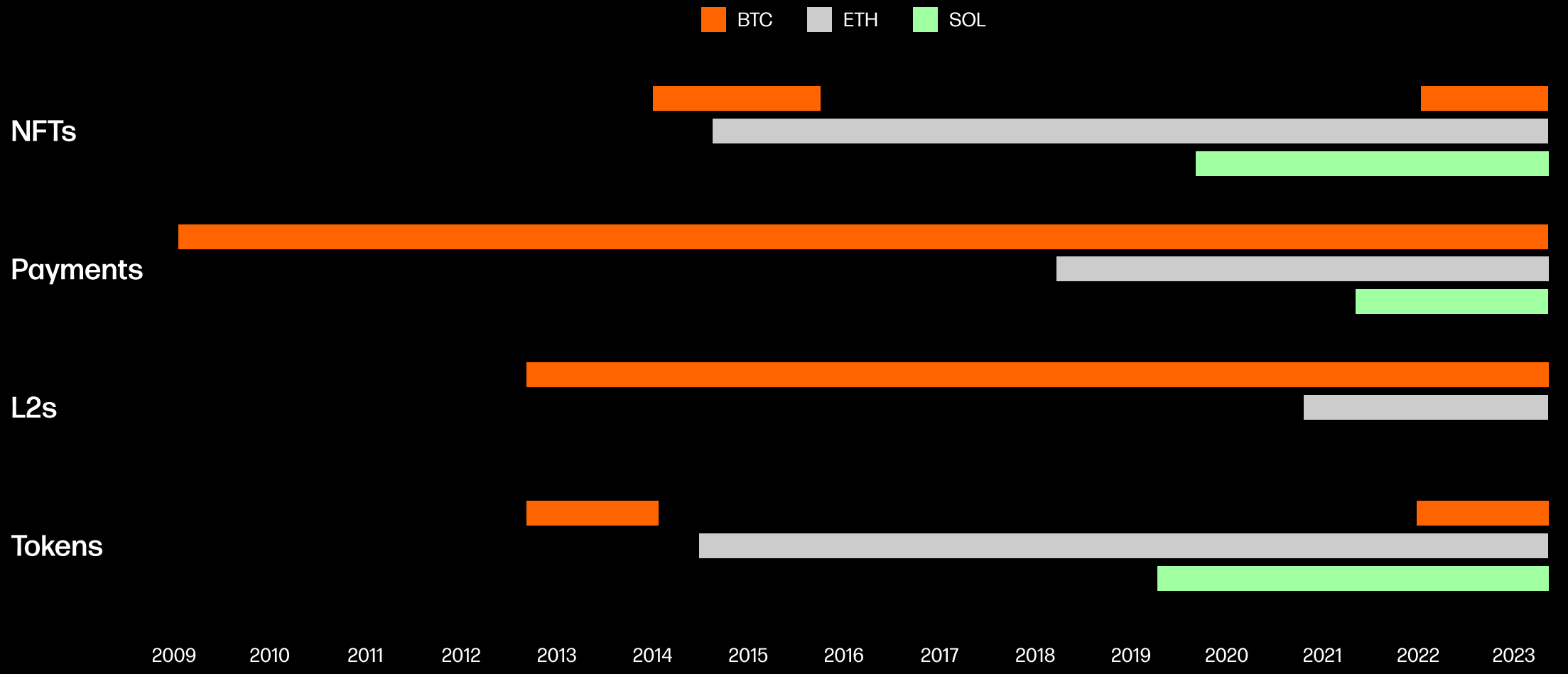
Other Technical Developments supporting “Bitcoin as a platform”

- BitVM: Off-chain virtual machine enabling Bitcoin to support turing-complete smart-contracts. With BitVM, the smart contracts are pre-signed transactions between two parties. The logic of the contract is executed off-chain while the results are posted on-chain.
- ZK-Rollups: Projects are exploring using Bitcoin as a data availability layer for off-chain Zero Knowledge Rollups. The ZK-Rollups in development are contingent on future upgrades to Bitcoin.

In 2023, the "Bitcoin as a platform" movement gained substantial traction, leading to a clash of narratives within the Bitcoin community. One faction views Bitcoin as global non-sovereign money, while the other perceives it as a robust platform. The increased focus on Ordinals and tokens on Bitcoin in 2023 underscores a clear cultural shift, emphasizing that Bitcoin is more than just money and digital gold.

A rising wave of progressive Bitcoin advocates is driving the development of infrastructure for digital collectibles, fungible tokens, rollups, smart contracts, and DeFi. Bitcoin is now challenging established narratives for Ethereum and other Layer 1 platforms concurrently, marking a historic shift.

Bitcoin Challenging Narratives on Other Blockchains



Blank spaces represent time periods when the respective narrative faded

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Ethereum Proof-of-Stake Put to the Test

Challenges to Staking and Modularity

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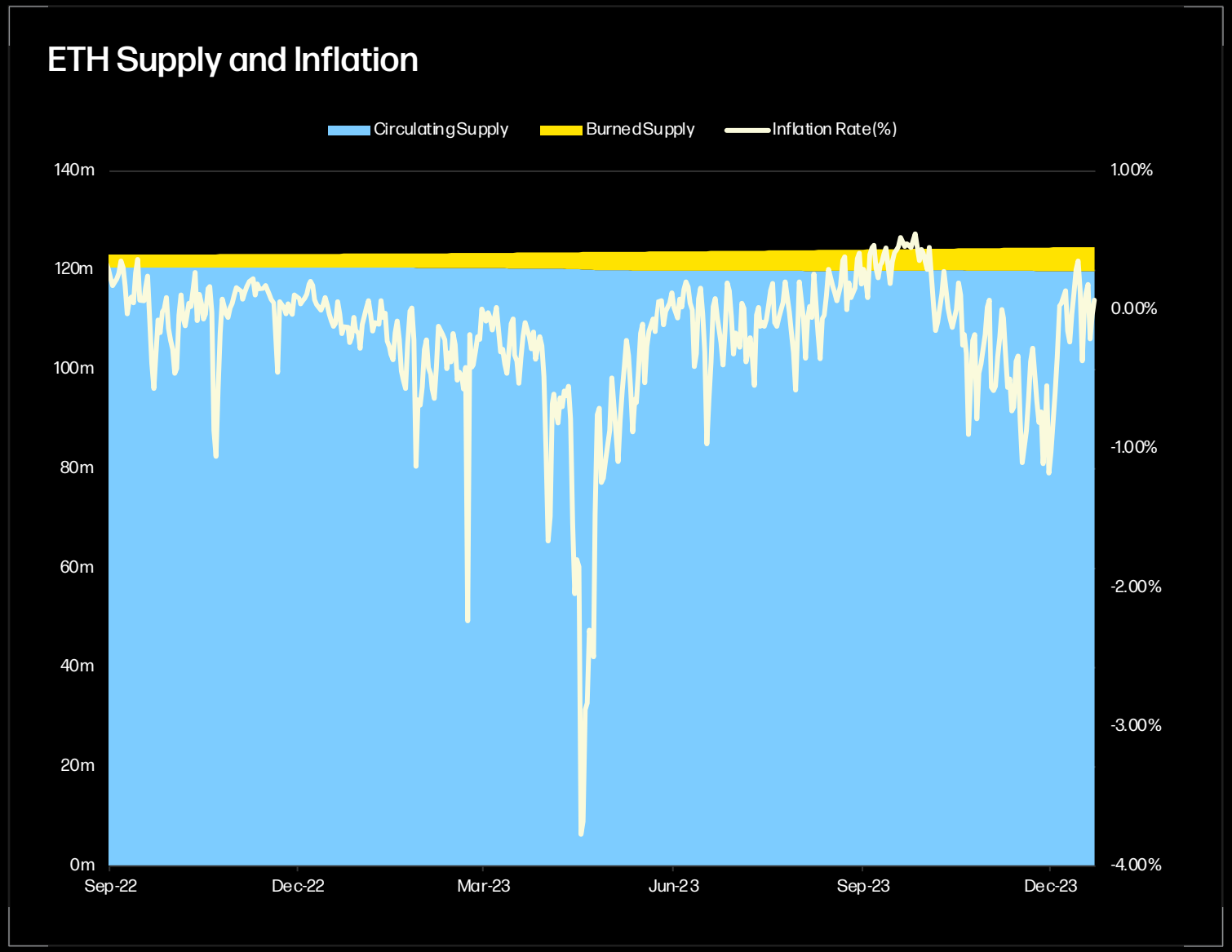
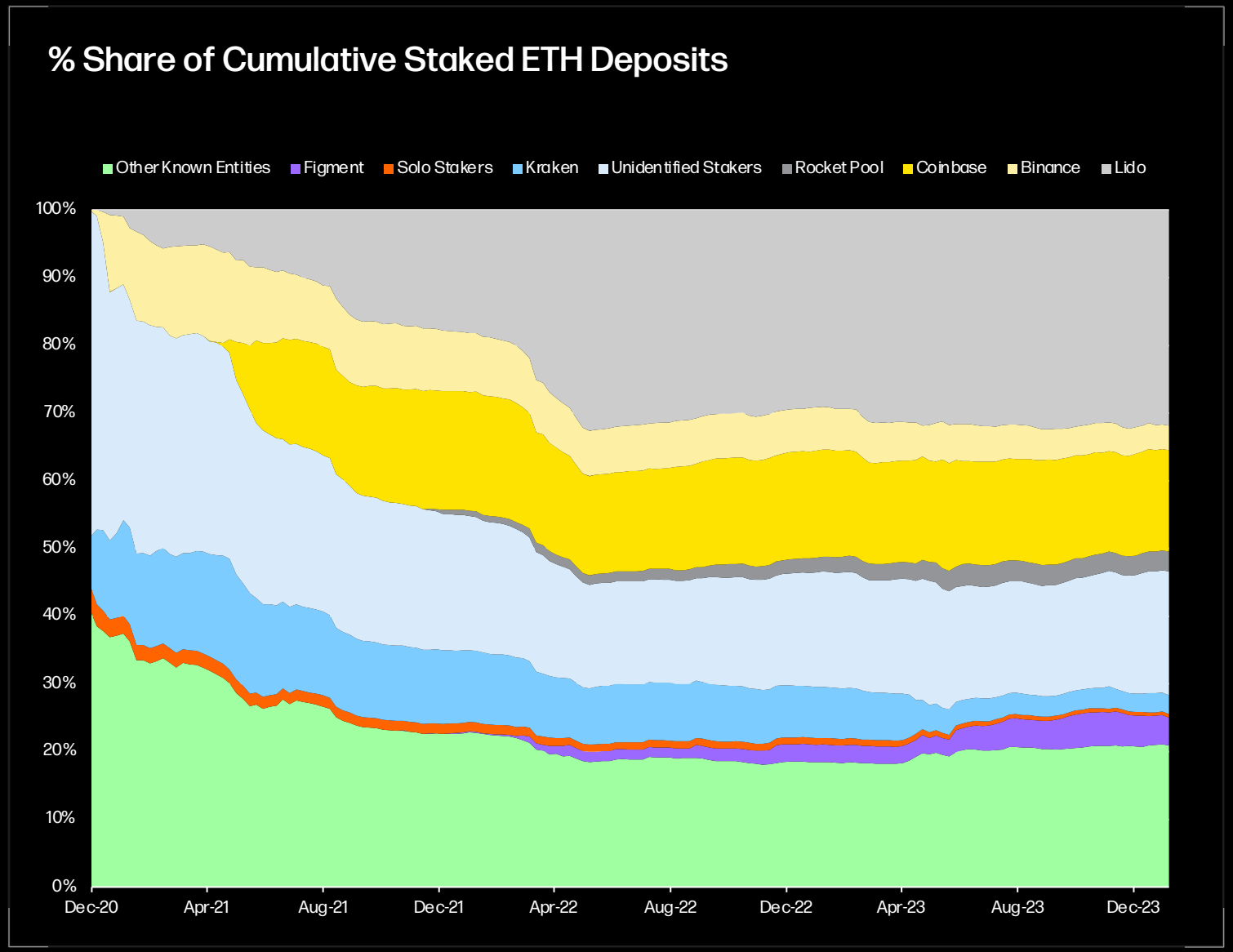


Data: Glassnode

Ethereum is the world's first and most valuable general purpose blockchain. Since the network's momentous upgrade to a proof-of-stake consensus protocol in the fall of 2022, the circulating supply of ether (ETH) has remained relatively unchanged at slightly under 120mn ETH.

This is due to reduced issuance since the transition to proof-of-stake, which has significantly slowed the rate of inflation on Ethereum to consistently below 1%. It is also in part due to Ethereum's burn mechanism, which developers activated back in August 2021 through an upgrade dubbed the "London" upgrade. For the majority of 2023, the daily annualized inflation rate of ETH was negative meaning more ETH has been burned through transaction fees than newly issued through validator rewards.

Because of Ethereum's burn mechanism and proof-of-stake consensus protocol, ETH supply is no longer consistently inflationary, which has strengthened the narrative of ETH as "ultrasound money" in 2023. This narrative is likely to continue to compel investors in 2024.



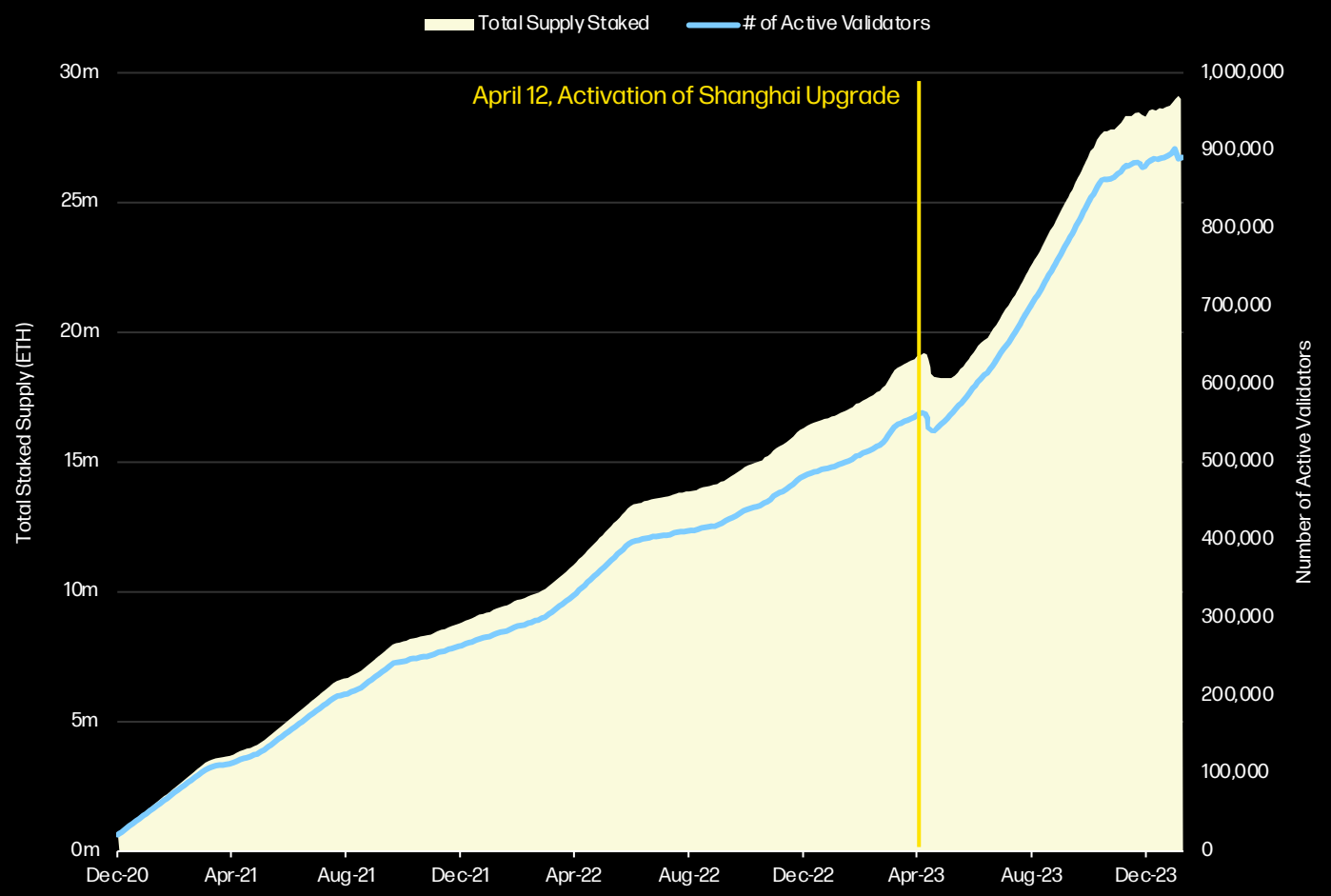
Data: Dune (@hildobby)

Unlike other proof-of-stake blockchains, Ethereum is not designed to support native stake delegation. Because of this, the percentage of total ETH staked through third-party staking pools has increased since Ethereum transitioned to a PoS consensus model while the share of staked ETH from independent, unidentified stakers has declined.

Among the staking pools operating on Ethereum, the most popular is liquid staking protocol Lido, which has almost consistently controlled over 30% of total ETH staked since May 2022. Lido is trending close to the threshold of controlling over 1/3 of total ETH staked, which prominent Ethereum core developers have pointed out presents a major "systemic threat" to Ethereum's security, neutrality, decentralization, and legitimacy.

Ethereum developers and prominent members of the Ethereum ecosystem have called on Lido to "self-limit" and reduce the stake under their control. Lido developers are exploring solutions like distributed validator technologies (DVT) to increase the resiliency and decentralization of the protocol.

Ethereum Total Staked Supply and Number of Active Validators, All-Time

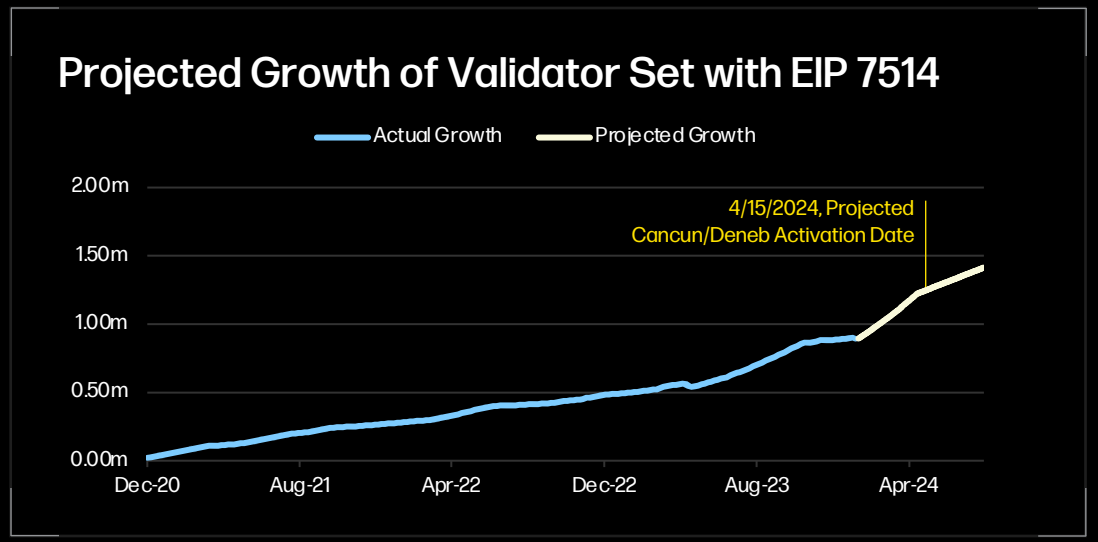


Data: Coin Metrics

Since the activation of staked ETH withdrawals on April 12, the total amount of ETH staked on Ethereum has nearly doubled. This has also caused the number of validators on Ethereum to soar given that validators on Ethereum cannot earn yield on staked ETH deposits greater than 32 ETH.

The lack of auto-compounding for staking rewards has become a growing concern as every new validator adds strain to the peer-to-peer networking layer of Ethereum. Every additional validator represents another cryptographic signature that must be aggregated by the network every 6.4 minutes, or epoch, to progress the chain.

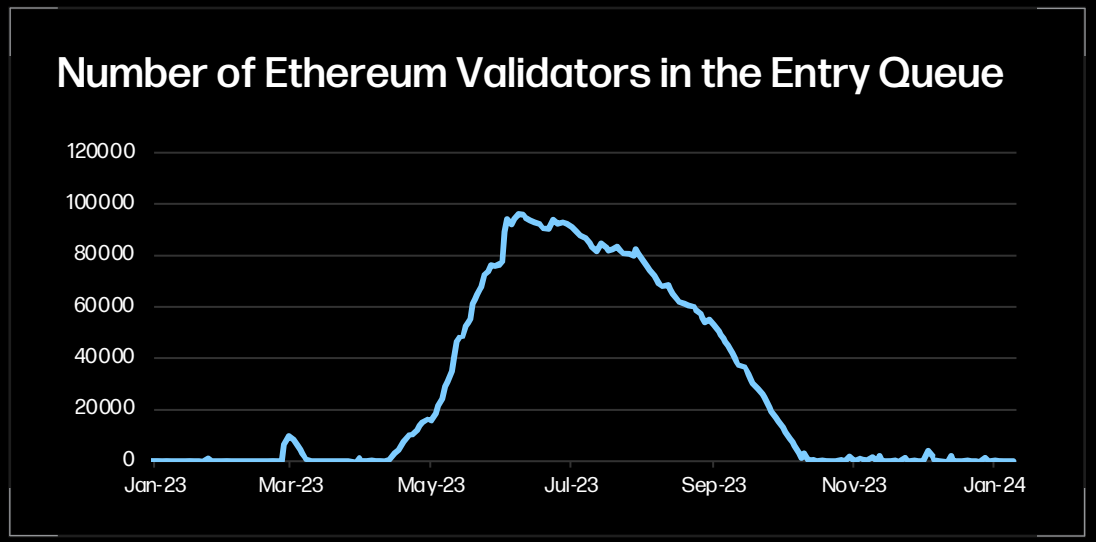
Based on tests that have been run by the Ethereum Foundation, major networking issues start to arise when the active validator set size reaches 2.1 million. The largest validator set size that developers are confident Ethereum can support without disruption and issue is 1.4 million, which is the size of Ethereum's newest test network, Holesky.



Validator entries and exits on Ethereum are limited per epoch by a churn rate that increases in a step wise fashion with the total validator set size. As the validator set size has grown, the churn rate for validator entries and exits has increased from a maximum of 8 to 13 validator entries and exits per epoch.

To curb the growth of the active validator set, Ethereum developers have implemented a stopgap solution in the forthcoming Cancun/Deneb upgrade that will limit validator entries by a constant churn rate of 8. If the upgrade is activated on Ethereum mainnet in mid-February and the number of validator entries consistently max out the churn rate between now and June, Ethereum will exceed the key threshold of 1.4 million validators by the beginning of June 2024.

Data: Coin Metrics

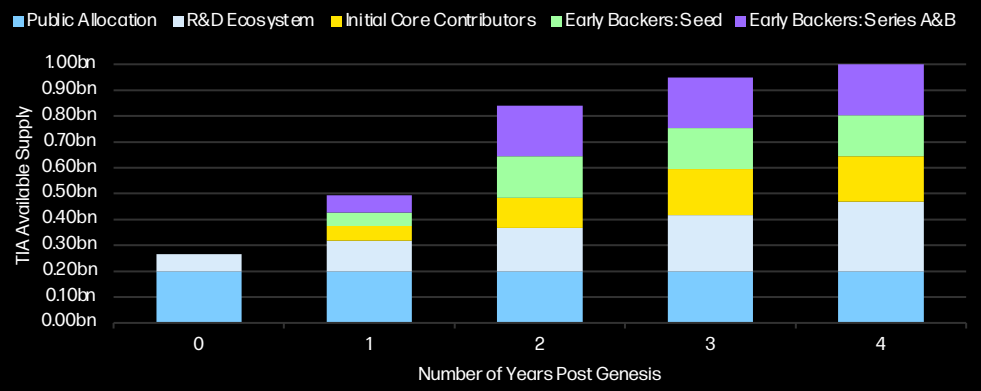


Developers will likely have a few more months of leeway before the threshold of 1.4 million active validators is reached because the validator entry queue on Ethereum has started to decline and the number of new validators activated on Ethereum is no longer consistently maxing out the churn rate like it was between April and October 2023.

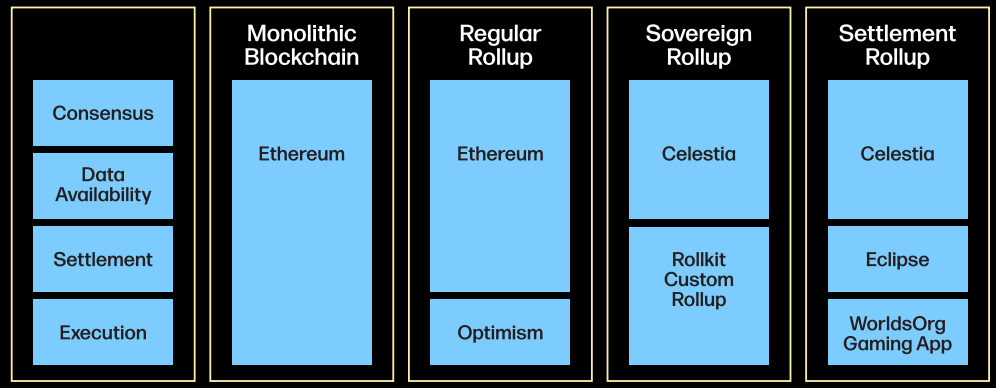
However, the issue of validator set size growth is not one that can be avoided for long, especially if transaction activity picks up again on Ethereum, increasing fees, and therefore demand for staking. Ethereum developers will need to weigh drastic changes to staking dynamics and monetary policy in 2024 to address this issue of validator set size growth.

Data: GitHub, Dapplion

TIA Supply Growth (Excluding Inflation)



Modular Architecture of Different Rollup Types



A growing share of Ethereum's revenue from transaction fees is coming from Layer-2 rollups (L2s). The resurgence of layered scaling solutions on Ethereum is in large part motivated by a broader thesis on how to solve the blockchain scalability trilemma called the "blockchain modularity thesis." This thesis has mainly been popularized by the developers of a new Layer-1 blockchain, called Celestia.

Celestia is a Layer-1 blockchain designed to validate batched transaction data from L2s. Celestia has no native smart contract functionality of its own. It is highly optimized to function as a data availability (DA) layer, meaning a network that allows L2 block producers, also called sequencers, to temporarily store proofs of user transactions on-chain. To learn more about Celestia, read this Galaxy Research report.

The growth of the Celestia ecosystem and the forthcoming activation of the Cancun/Deneb upgrade on Ethereum in 2024 will advance innovation in L2 technologies and rollup architecture. Because of L2s on Ethereum and Celestia, there will be an unprecedented amount of flexibility in the way decentralized application (dapp) developers can launch their products according to different user needs such as privacy, cost, security, and compliance.

However, the modular architecture of different rollup types will introduce new challenges and technological risks due to their nascency. The most differentiated general purpose blockchain that is pursuing a monolithic architecture is Solana. It will be important to watch heightened competition and differentiation between Solana and other modular blockchains like Ethereum and Celestia in 2024.

Data: Celestia Foundation

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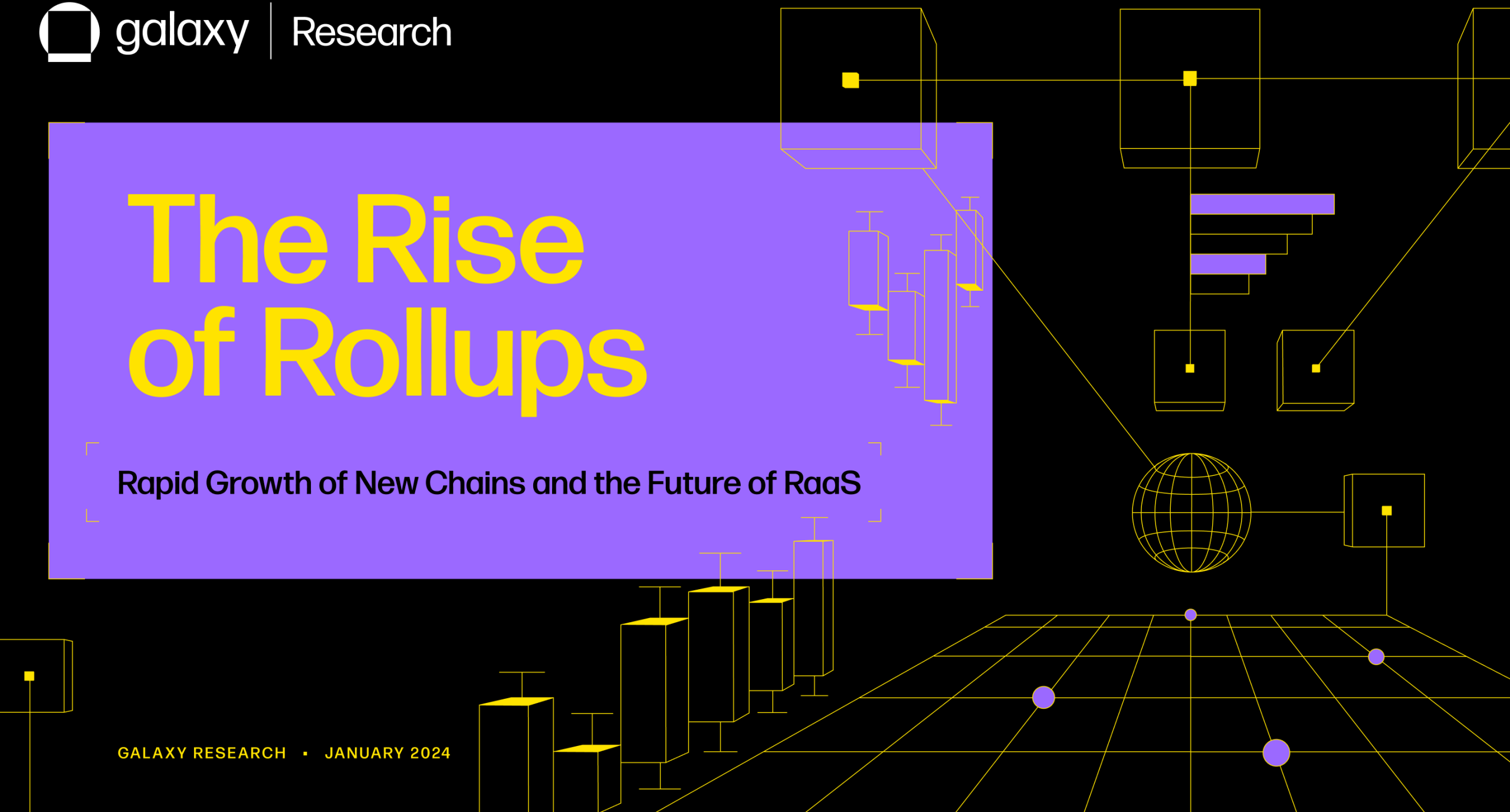
The Rise of Rollups

Rapid Growth of New Chains and the Future of RaaS



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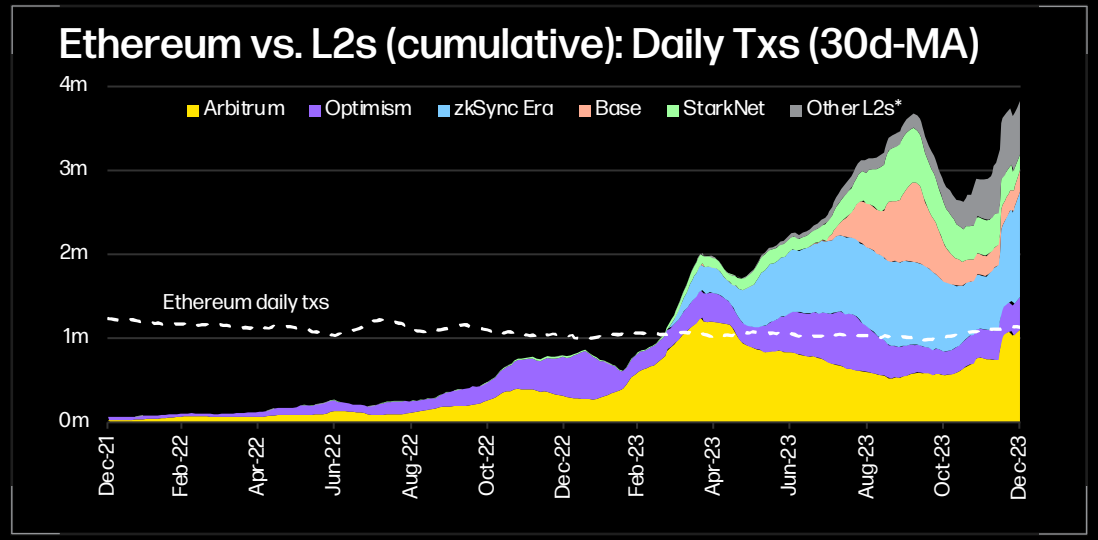
Rollups are core to Ethereum's roadmap, serving as Ethereum's premiere L2 scaling solution and the primary onboarding channel for new users.

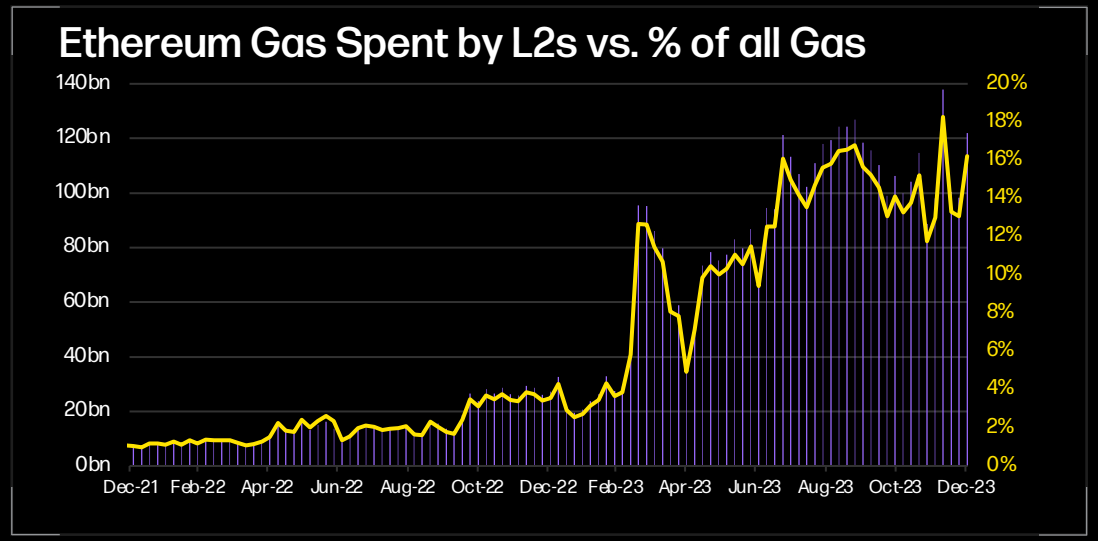
Led by Arbitrum and Optimism, L2s first surpassed Ethereum in transactions in March this year, but in 4Q23, L2 transactions across all rollups have collectively averaged over 3m daily txs or nearly 3x more than daily txs on base layer. Settlement and proofs of rollups currently account for ~15% of all gas paid on Ethereum, up from 3% at the start of the year.

Predictions for this year:

- Significant transaction cost efficiencies are coming to rollups. Ethereum's upcoming EIP-4844 Dencun upgrade will unlock a new fee market specifically for rollups for major cost efficiencies. This will benefit all rollups and their users, but will be even more beneficial for the adoption of zk-rollups. So far, transaction costs on validity proof rollups have been more expensive than on optimistic rollups, which may have slowed their adoption so far, but EIP-4844 will allow zk rollups to offer more competitive transaction costs to users.
- zkEVMs will see increased competition with new launches but will face difficulty challenging optimistic rollups. Following zkSync Era and Polygon zkEVM, new zkEVMs are expected to launch in early 2024 (incl. Consensys' Linea, Scroll, Taiko). zkEVMs deliver the benefits of zk-technology to rollups while still maintaining some level of bytecode compatibility with the EVM and all its tooling (e.g. libraries, wallets, marketplaces etc.). Competition will increase between zkEVMs, however, zkEVMs may struggle to challenge the leading optimistic rollups, Arbitrum and Optimism without introducing new primitives / apps for users.
- Exchanges launch L2s to meet their users on-chain. Seeing the success of Coinbase's Base and Binance's BNB Chain and opBNB, other exchanges will launch their own chains to meet their users on-chain – in November, OKX announced it was launching its own zkEVM L2 called X1 built with Polygon's technology while Kraken was also reportedly in conversations with rollup teams to partner with in building out their own L2. These exchanges will help on-ramp new populations of users and will play an important role in improving the on-chain UX.

Data: Artemis, Dune





Rollup frameworks enable developers to deploy customized app-chains around L2 networks.

	Optimism	Arbitrum	Polygon
Rollup Details			
Primary Chain	OP Mainnet	Arbitrum One	Polygon PoS, zkEVM
Technology	Optimistic Rollup	Optimistic Rollup	ZK Rollup
Proof Type	Fraud Proof (in progress)	Fraud Proof	Validity Proof
Rollup Maturity Stage	Stage 0	Stage 1	Stage 0
Rollup Tech Stack			
Tech Stack	OP Stack	Nitro Stack	Polygon CDK (zkEVM, Validium)
Other Core Contributors	Coinbase, Test in Prod	No other core contributors (yet)	NEAR, OKX
Rollup Framework	Superchain	Arbitrum Orbit	Polygon Supernets
Approach	Horizontal scaling via L2s	L2s / L3s that settle to Arbitrum Mainnet	Network of zk-based L2s
Notable Projects	Base (general purpose) Zora (NFTs) Celo (general purpose) [planned]	Nova (gaming, social) XAI (gaming) Kinto (KYC, permissioned)	Immutable (gaming) Gnosis Pay (payments) Canto (RWA-focused) [planned]

Teams behind the most popular rollups have presented differing frameworks to unify their ecosystems including Optimism's Superchain, Arbitrum Orbit, and Polygon's Chain Development Kit. Initial adoption of these rollup development kits has so far been promising with buy-in from major organizations including exchanges (e.g., Coinbase, Binance) and several 'Alt L1' protocol teams.

The rapid growth of new rollup chains as part of these rollup frameworks has been facilitated by rollup-as-a-service ("RaaS") providers (e.g., Conduit, Caldera, Eclipse, AltLayer) that offer builders with a solution for quick and easy deployment of their own blockchains. They help protocol teams service more projects, educate builders on implications of various design choices, and provide ongoing support with coordination efforts for any network upgrades or technical changes. Navigating the rollup landscape and keeping up with all the technical intricacies is a challenge for new crypto users, let alone crypto-natives, so RaaS providers can be a significant value-add for any rollup ecosystem and should continue to work closely with protocol teams.

Data: Official protocol docs, L2Beat, company announcements

Look Ahead for Rollups / Project Initiatives

- Rollup protocol teams will shift focus to compete for developers over users. Rollup protocol teams aim to differentiate offerings through specialized features such as added language support or increased customizability for builders to launapp-chains to best serve end users. However, interoperability aspirations to connect each rollup framework will be a longer-term goal requiring more R&D efforts.
- Greater app-rollup adoption and experimentation. Thanks to modularity improvements, rollup-as-a-service ("RaaS") providers will allow builders to choose different operational components, such as the rollup tech stack and execution engine used to power their app-chain, where the data is posted, the sequencer & validator setup, and the fee market structure. We will see greater experimentation on top of DA layers such as recently-launched Celestia and EigenDA, which provide a lower-cost option to Ethereum for app-rollups to publish data.
- Hundreds of new rollups will be deployed, though they will be built around only a handful of core rollup ecosystems. RaaS providers will enable a dramatic expansion of rollup-based application-specific blockchains ("appchains") – few currently exist today but hundreds of new appchains will be deployed in 2024, mostly in gaming and social verticals. Even though most of these appchains will be based around just a handful of rollup ecosystems, they will likely run into social coordination and fragmentation issues especially as blockchain interconnectivity remains a challenge yet to be solved.

Other areas of research/development:
Fraud proofs, shared sequencing setups, added programming environments with support for other languages, zk rollup validating / proving costs with decentralized setups, faster bridging for more seamless connectivity.

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Solana's Resurgence and Growth

Reigniting Interest and the Rise of the Third Chain

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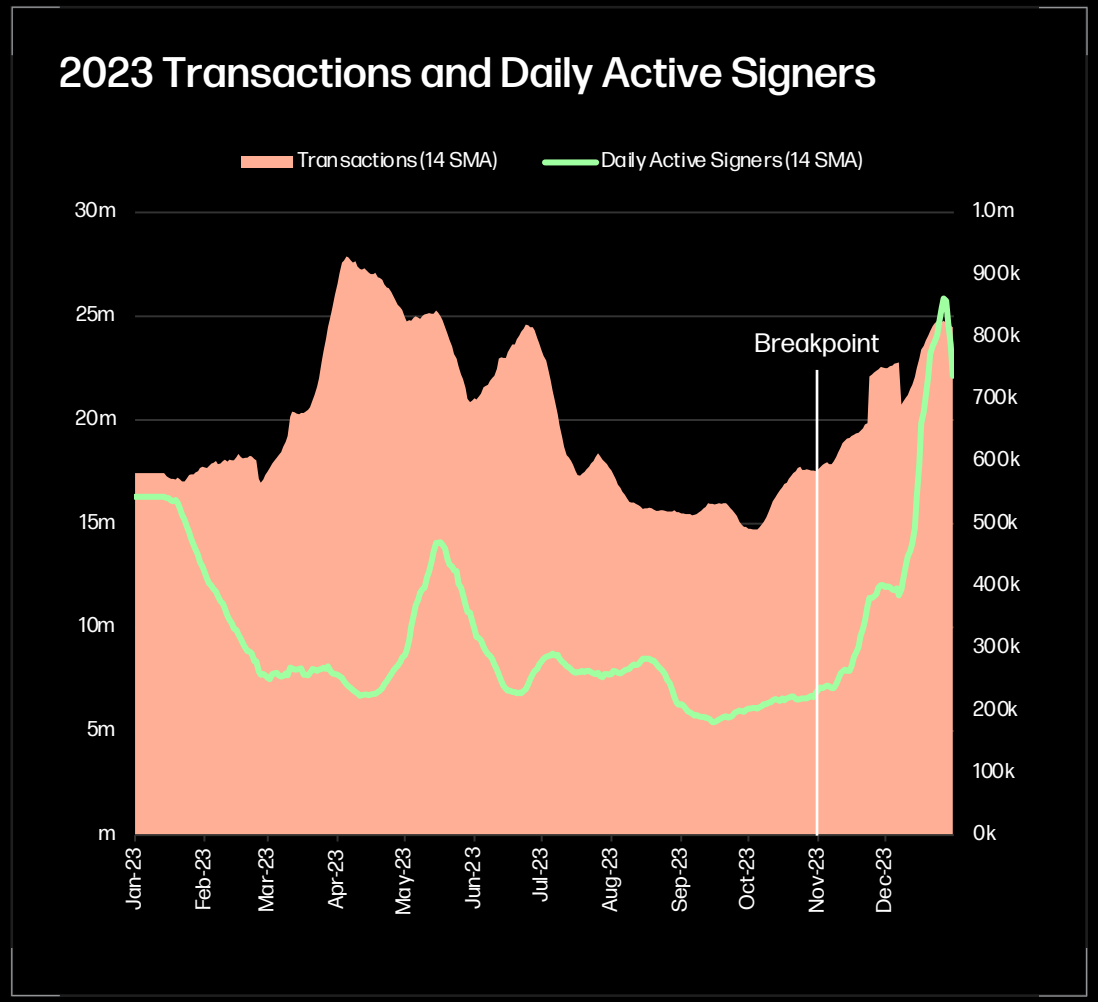
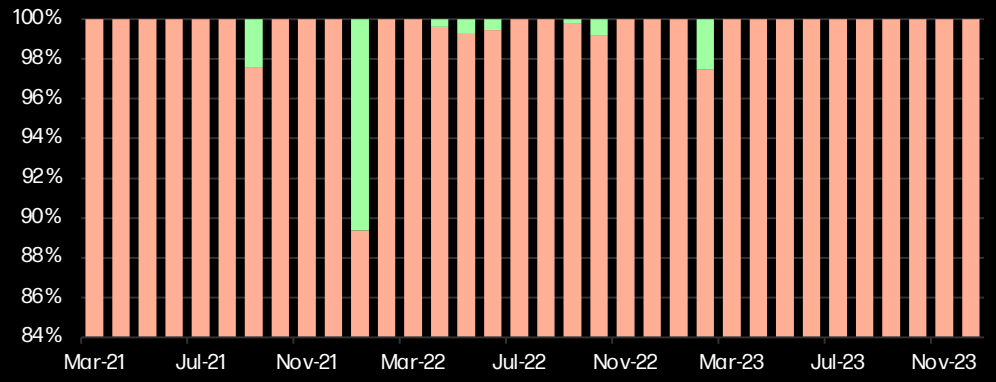
Solana Regains its Footing

- Solana was especially affected by the FTX collapse in early November 2022 due to the ecosystem's early ties with CEO Sam Bankman-Fried.
- Over the past year Solana has established itself as "the third chain" thanks to its differentiated approach to blockchain design, committed and growing developer community, and strong social layer (partially a legacy of its large NFT ecosystem.
- Solana focuses on execution and scalability above all, with a view that the blockchain should be as fast and cheap as possible to transact on. This is a distinctly different narrative from Bitcoin (store of value) and Ethereum (settlement) and one that opens the design space for developers to build products that are "Only Possible on Solana."
- Due to a drawdown in onchain activity during the bear market, outside observers overlooked critical upgrades to Solana's core protocol that improved performance and uptime, addressing the network's largest critique – that it constantly goes down.
- Solana's annual Breakpoint conference reignited broader interest in the ecosystem as it showcased the quality of teams and breadth of products on the network.

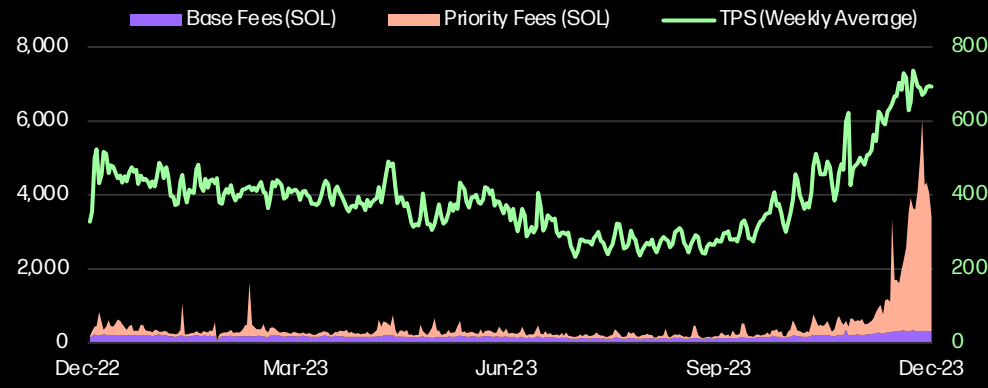


Data: Artemis

Solana Downtime/Degraded Performance



Solana TPS (Non-vote transactions)



Protocol improvements implemented over the past year have resolved downtime & degradation issues (QUIC, Stake Weighted Quality of Service, and Local Fee Markets).

- Solana has 100% uptime since February and three consecutive quarters without any network issues. The onboarding of new validator clients and core protocol upgrades planned over the coming year will be a further test of network's stability.
- Solana TPS, which normally ranges in the 400-500 range, has topped 700-1000+ multiple times throughout 2023. This is greater than the next 20 fastest chains combined and a test of the network's capacity.
- Solana has 1,958 block-producing validators, second only to Ethereum for PoS networks and a 233% increase since July 2021.

In the coming year, multiple new validator clients are expected to be released, enhancing the network's throughput and resilience while reducing validator costs.

- Firedancer, a validator client developed by Jump Crypto, is now live on testnet and expected to launch on mainnet in 2H2024. Two additional validator client in production include SIG (RPC focused) and TinyDancer (Solana's first light client). Solana remains the only other major L1 smart contract blockchain besides Ethereum with multiple validator clients.
- Validator costs, a major criticism of the network's decentralization, continue to drop as hardware gets cheaper. The economics of running a validator have also improved as Solana onchain activity ramps up and validators earn more from transactions and MEV.

Data: Solana Foundation, Dune

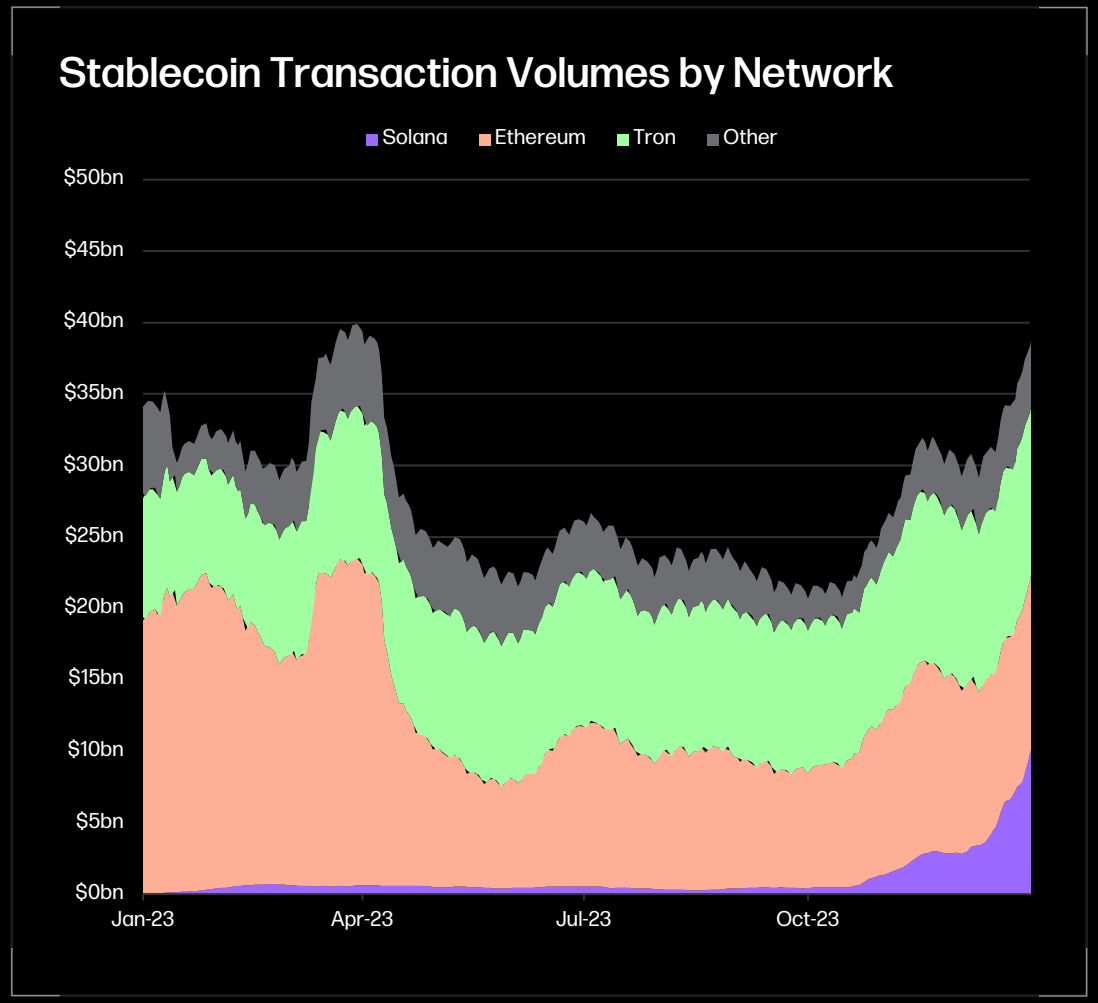
Onchain Activity and Growth

Technical improvements over the past year are being put to the test as onchain activity ramps up. In December, Solana surpassed Ethereum in monthly NFT volume, weekly stablecoin transfers, and weekly DEX volume for the first time.

Solana will continue to grow its onchain market share in the coming year, both from new crypto users entering the ecosystem and existing crypto users bridging over from other chains due to:

- DeFi 2.0 Airdrops: Leading Solana DeFi protocols have a series of airdrops planned over the coming year to incentivize onchain activity and improve liquidity. Already 10+ projects have confirmed they plan to release tokens and launched liquidity mining programs.
- Developer Growth: The most recent Solana Foundation Hyperdrive Hackathon (September '23) received an all-time high of 907 submissions from 7000+ participants and three-month developer retention increased from 31-50% over the course of 2023.
- Tooling and Product Diversification: New tooling like state compression, Token 2022, and xNFTs expand the design space for teams building on Solana. Notable verticals to watch include AI, DeFi, DePIN,, Gaming, Mobile, Payments, Privacy, and RWA.
- Liquid Staking Token (LST) Push: Only 4.5% of staked SOL is in LSTs. Major LST providers including Jito Labs, Marinade, and SolBlaze have launched incentives programs to increase LSTs in circulation.
- CEX Integrations: Solana will benefit from new integrations with established exchanges like Coinbase and Swissborg, as well as newly launched ones like Backpack and Cube.

Increased onchain activity will also bring new challenges. Beyond network stability and scalability, a major focus will be on developing a more robust governance process that accounts for an increasingly diverse contributor community.

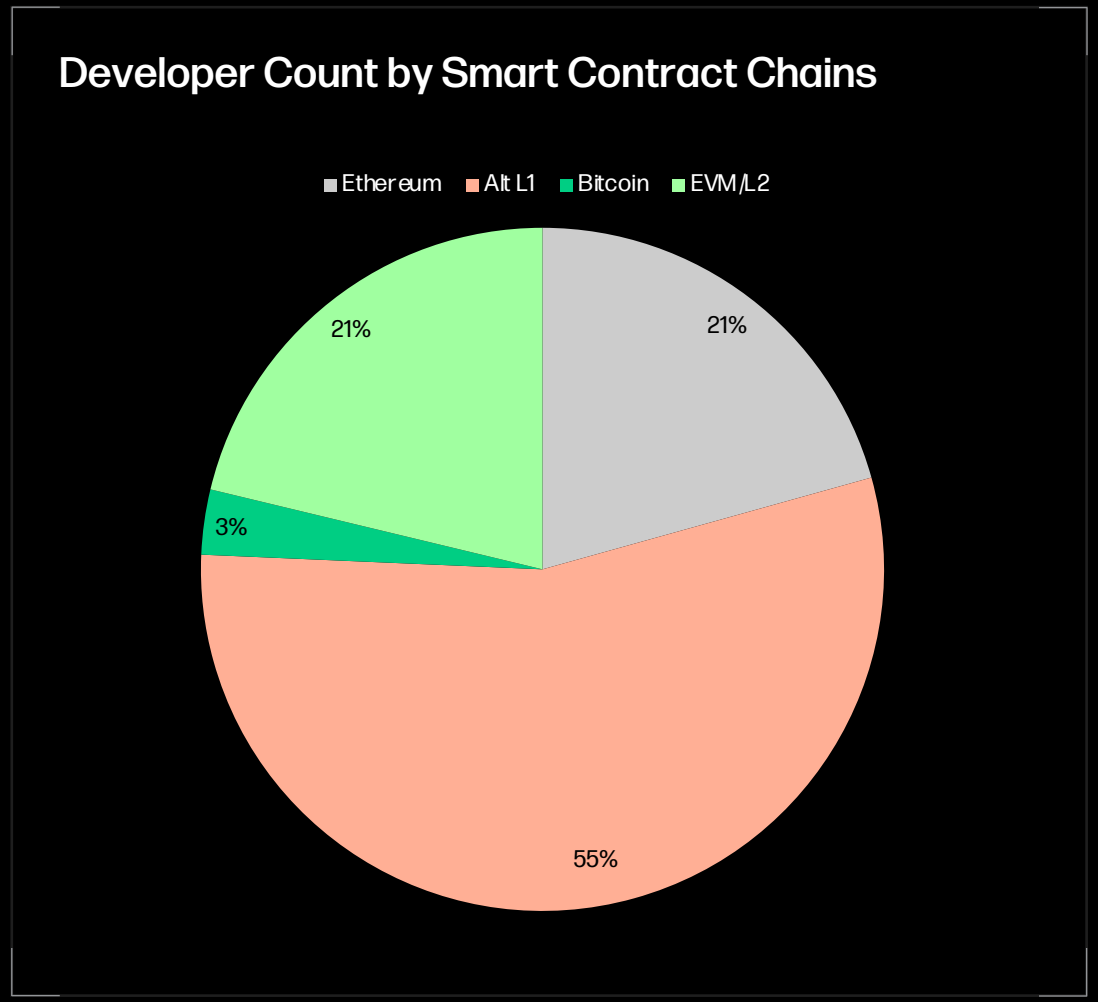


Data: Artemis

Alt L1 Interest Reignited

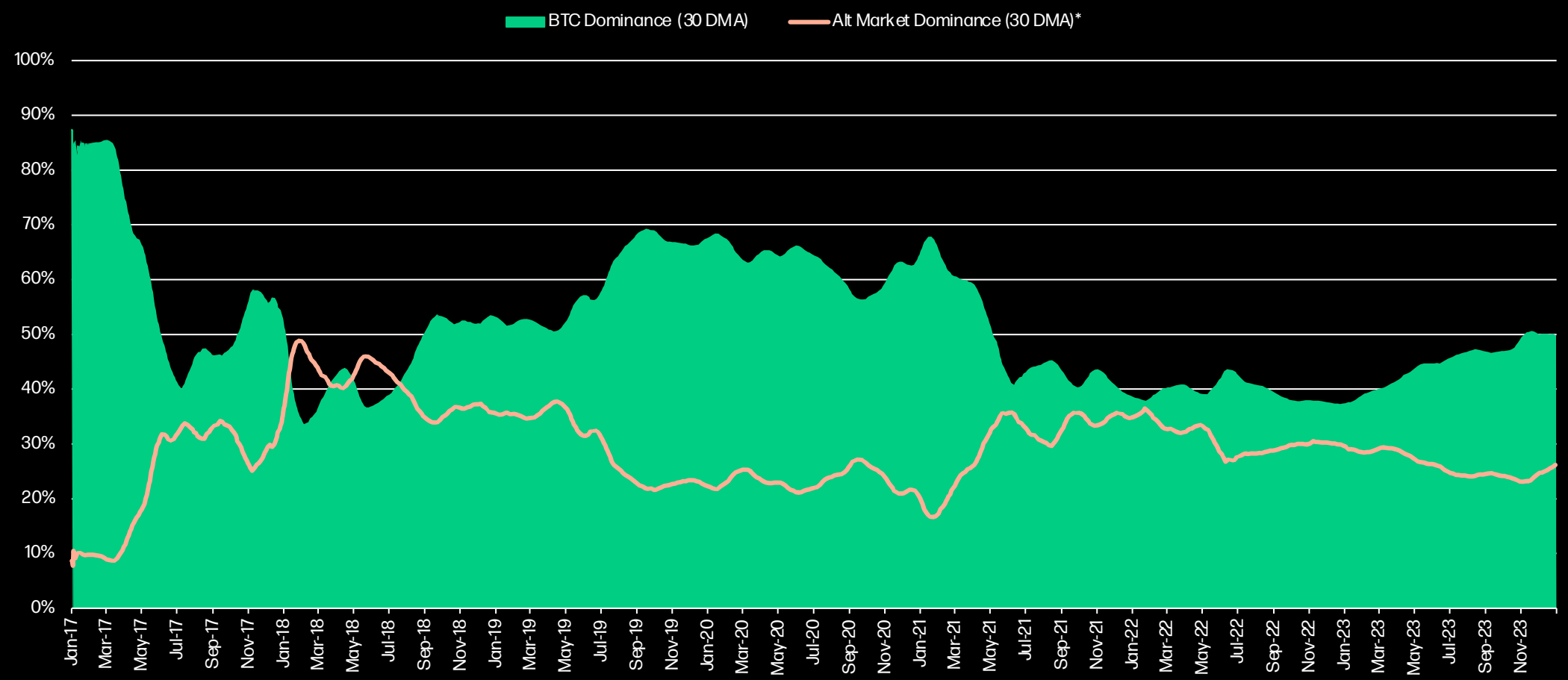
As onchain activity picks up across the space, demand for blockspace on dominant chains will outpace supply, once again pushing users to alternative L1s with different value propositions:

- Technical Advantages Over Ethereum: Alt L1s are designed to specifically address existing inefficiencies with Ethereum such as lack of scalability, inability to parallelize execution, and limited interoperability/composability. Until Ethereum and its L2 roadmap effectively address these shortcomings, Alt L1s will attract new investment and developers as they expand the design space for specific applications like gaming, social media, payments, DeFi, and institutional KYC/privacy solutions.
- Continuous Technical Innovation: Alt L1s have lower technical debt, enabling more rapid innovation. Constant iteration is crucial to maintain relevance in the evolving blockchain landscape. They also are working to improve developer experience by providing support for multiple coding languages and providing greater control/flexibility. Alt L1s will need to ensure these innovations unlock products that attract sticky user bases, or risk seeing them replicated and integrated by Ethereum.
- Community Building, Business Development, and Marketing: Despite technical superiority, Alt L1s face challenges in attracting developer mindshare, users, and liquidity. They are starting to pickup traction. As of October 2023, Alt L1s account for over 50% of developers outside of Bitcoin, Ethereum, and EVM/L2s. Further success will hinge on balancing technical prowess with effective marketing. Already, some Alt L1s are repositioning to better leverage the network effects of Ethereum's EVM and ecosystem, focusing more on complementing Ethereum rather than direct competition.



Data: Electric Capital Developer Report

Bitcoin vs. Altcoin Market Capitalization Dominance



*Alt excludes ETH and stablecoins

Data: CoinGecko and DeFiLlama

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Stablecoin Adoption and Growth

Increasing Competition and Establishing New Norms

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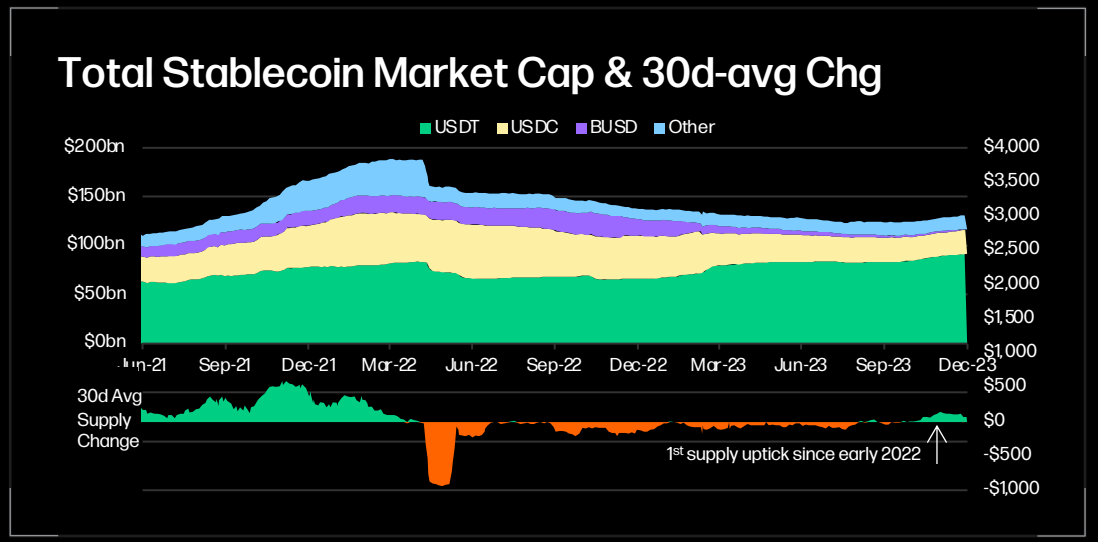
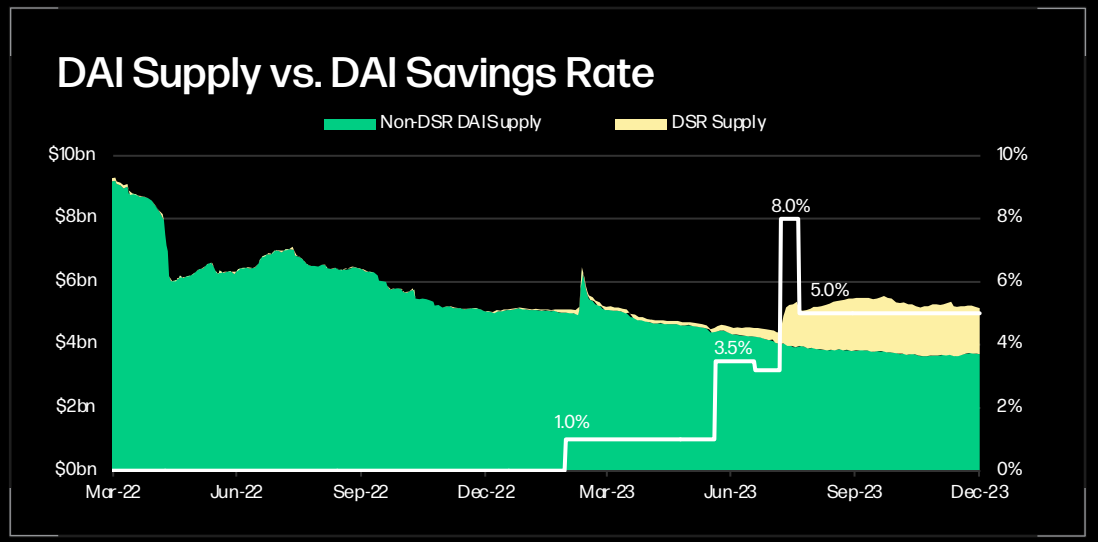


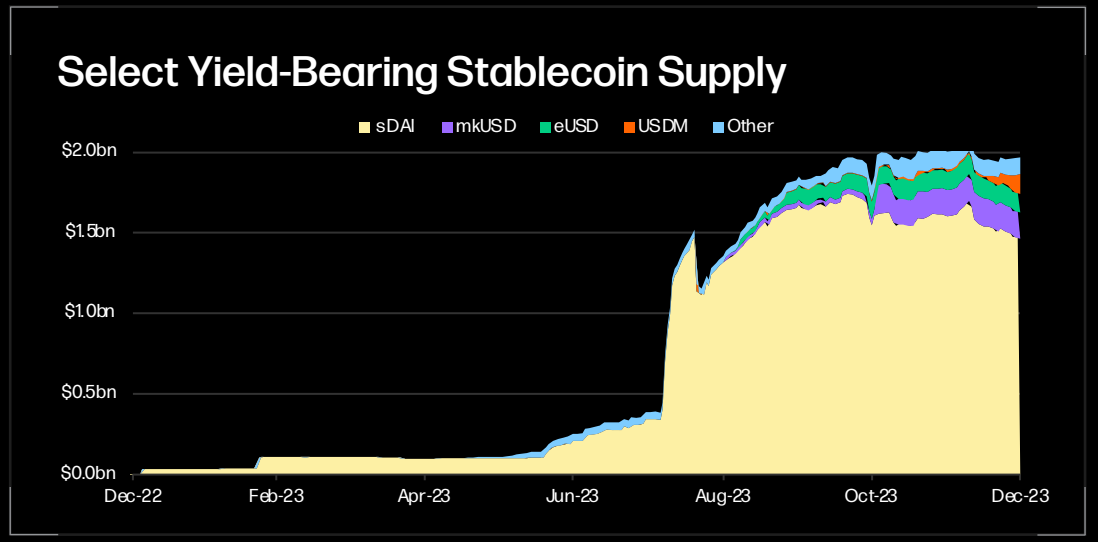
Data: DeFi Llama. 'Off-shore' includes USDT, TUSD, FDUSD; 'On-shore' includes USDC, BUSD, USDP, GUSD, PYUSD.

Stablecoin market cap ended 2023 at $130bn, down 5% since the start of the year and 30% off the previous ATH of $188bn set in March 2022. USDT is still the dominant leader in the stablecoin market – USDT started the year at $66bn and grew supply to new ATH of $87bn (+32%) with stablecoin market dominance up from 48% to now 69%.

Predictions for Fiat-backed Stablecoins

- **Stablecoin supply will reach new highs**. Towards the end of 2023, the stablecoin market saw its 1st supply uptick since early 2022 to end the year at $130bn. Stablecoin supply will likely increase in 2024 to challenge the previous ATH of $189bn as overall crypto adoption continues to grow and demand for leverage returns.
- **Further competition between on-shore vs. off-shore**. In early 2023, USDC experienced its first major de-peg following US banking turmoil and Paxos' BUSD entered wind-down only mode – this flight to off-shore stablecoins including Tether's USDT, TUSD (issued by Asia-based Techteryx Ltd) and FDUSD (issued by Hong Kong-based First Digital). Stablecoin legislation has the potential to reshape the market and change the on-shore and off-shore competitive dynamics - various bills have been proposed in the US, UK, EU and other markets but most have yet to pass.
- **Circle will reverse supply slide in USDC through with continued innovation and utility improvements**. Circle added native USDC support on new chains (e.g., Polygon, Arbitrum, Optimism, Cosmos), launched Cross-Chain Transfer Protocol (CCTP), and partnered with Visa to expand stablecoin settlement capabilities to merchant acquirers. These new integrations and capabilities have yet to find meaningful adoption but will be important differentiators for USDC to grow its supply and market share among stablecoins. In addition, new payment-focused use cases could drive a new wave of demand for USDC and PayPal's newly-launched PYUSD, issued by Paxos and one of the only new on-shore fiat-backed stablecoin products to launch in recent years.





Data: Dune

The rising interest rate environment coupled with risk-off sentiment and falling DeFi yields have increased the attractiveness of traditional credit instruments such as U.S. Treasuries and private credit. On-chain demand for this off-chain yield in DeFi settings has led to a resurgence in DeFi yields for stablecoin products.

In 2023, Maker's DAI saw a resurgence with its interest-bearing stablecoin product. DAI supply broke out of its 1.5-year downward trajectory after Maker re-introduced the DAI Savings Rate (DSR) this year, which briefly offered an 8% "enhanced" yield generated via Real-Word Asset (RWA) / tokenization initiatives.

Predictions for crypto-native stablecoins

- Yield-bearing offerings will become the new norm for stablecoins. MakerDAO led demand for yield-bearing stablecoins, which now represent over $2bn after starting the year at near-zero levels. Other offerings such as Prisma Finance's mkUSD and Lybra Finance's eUSD use a variety of strategies to pass yield to tokenholders.
- Other overcollateralized stablecoins may see resurgence as DeFi activity picks up and risk-on appetite returns. Launched in 2023, Curve's crvUSD and Aave's GHO stablecoins have seen relatively muted demand so far – however, these overcollateralized stablecoins will likely experience greater supply expansion as demand for leverage improves in 2024 (ideally to healthier, safer levels than the prior cycle).

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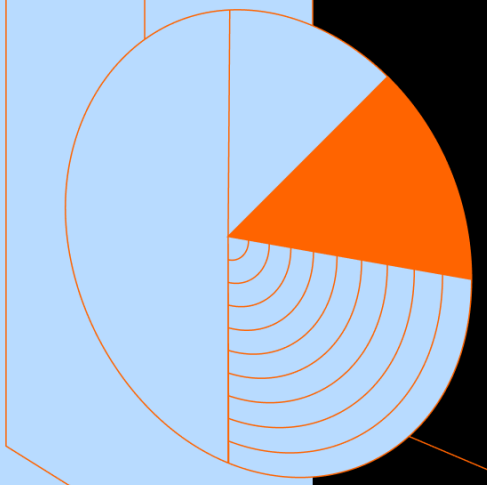
DeFi, RWAs, and Tokenization

DeFi's Surge and the Tokenization of Real-World Assets



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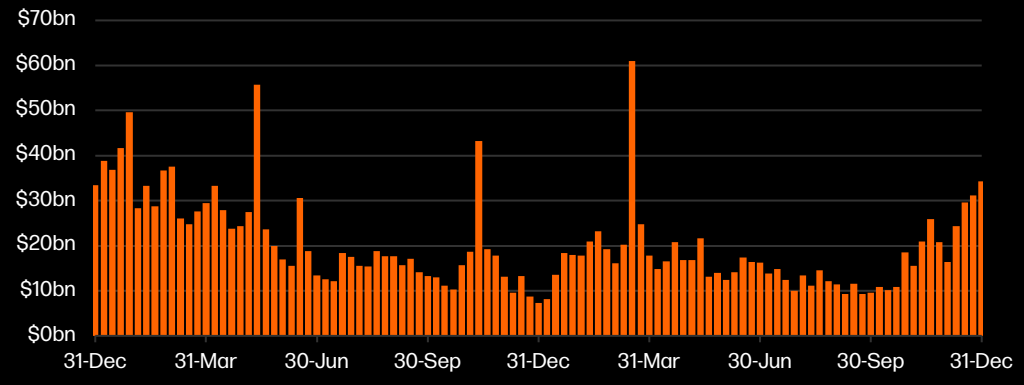
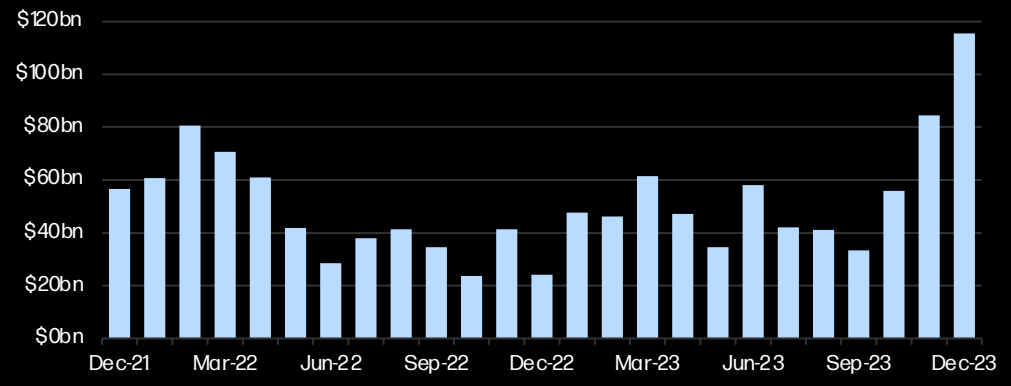
DeFi TVL

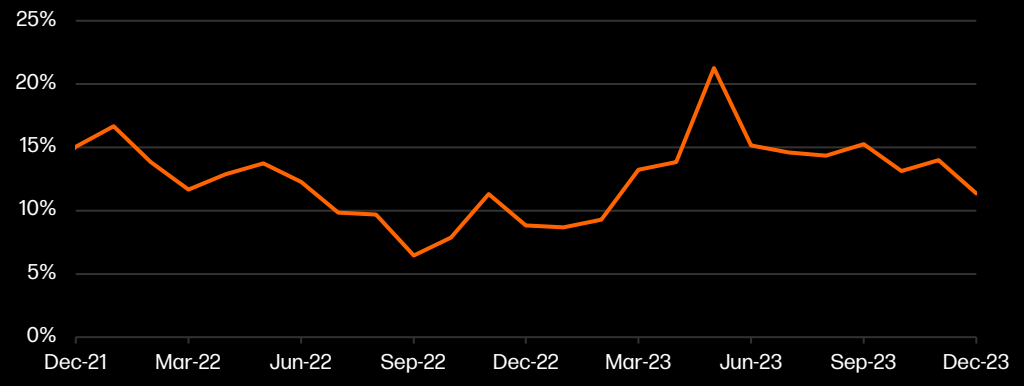
DEX Volume (weekly)



Monthly DeFi Derivatives Vol



DEX to CEX Spot Trade Volume (%)



Data: DeFi Llama, Dune, The Block

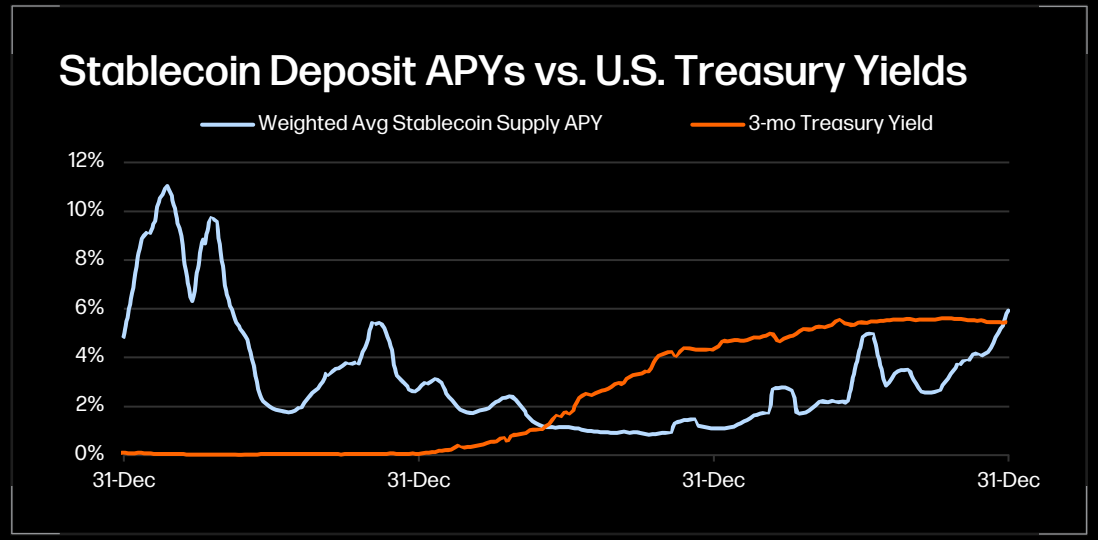
Real-world assets ("RWAs") have been one of the fastest growing verticals across crypto in 2023. The value of non-stablecoin RWAs on public blockchains grew to $2.7bn (+112% YoY) – $1.0bn (80%) of which has come from yield-bearing assets including Treasuries, real estate, and private credit. Market share of yield-bearing RWAs has grown this year from 31% to 55%.

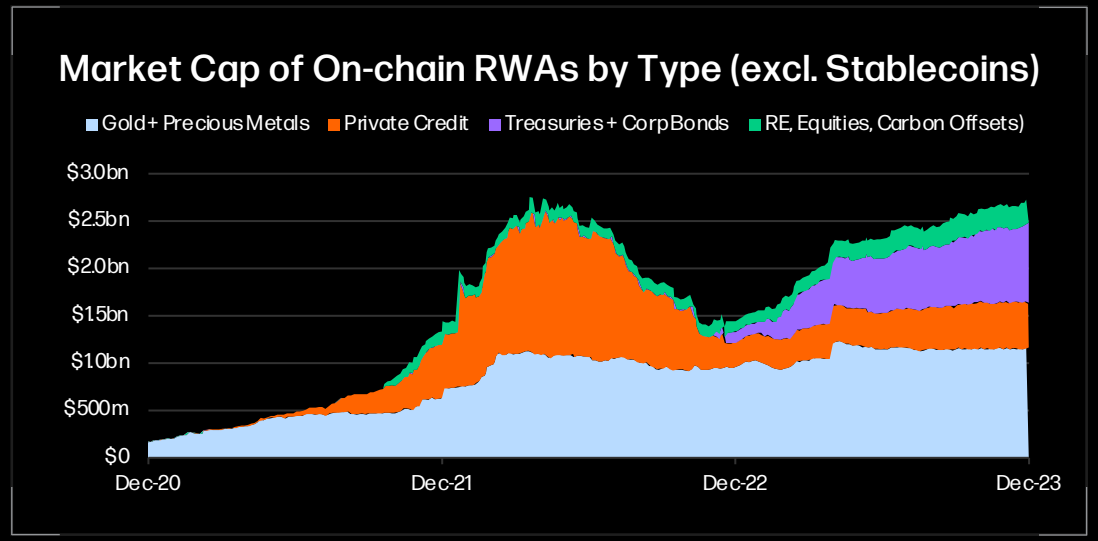
Traditional financial brands like Franklin Templeton and WisdomTree have started to experiment with RWAs by tokenizing equity-centric funds and money market funds to service their institutional customers' needs.

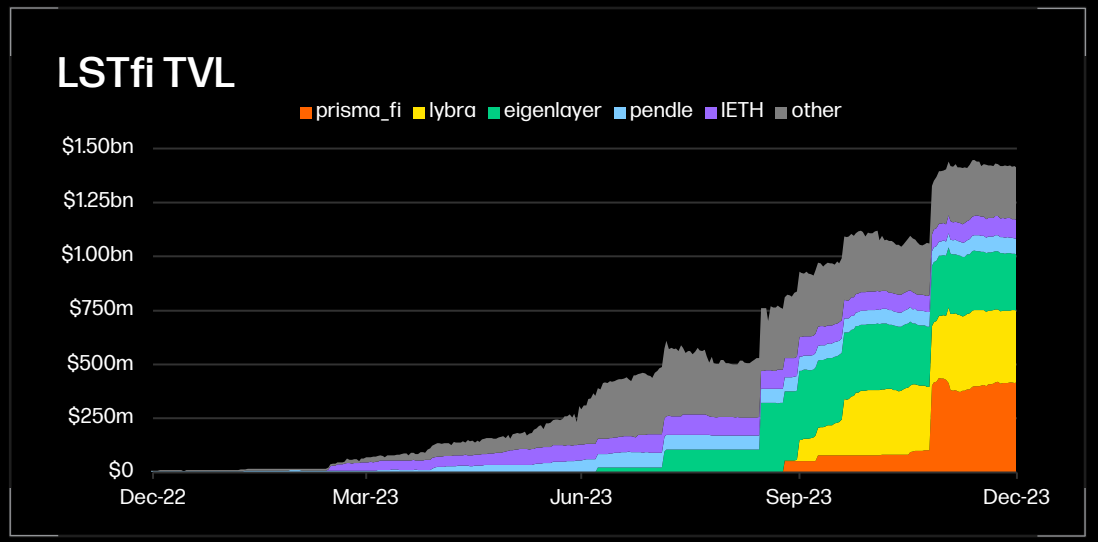
Looking ahead in tokenization:

- Though tokenization efforts are still nascent and in the early stages of development, the issuance of RWAs by established TradFi brands companies can catalyze onboarding of large swaths of new users to crypto.
- On-chain credit markets have a lot of room for development – more research is needed to understand some of the idiosyncratic or distinctive risks with DeFi / blockchains particularly as it relates to defaults and token composability. The monitoring, auditing, and communication of off-chain assets to on-chain end users also poses challenges for tokenization. Infrastructure will have to be developed to streamline this process and promote transparency, a key pillar of the blockchain economy.
- Out of a multi-trillion-dollar addressable market, so far only $1.5bn of financial assets has been tokenized on public blockchains, representing a significant market opportunity. Tokenization represents one of crypto's most compelling use cases and will continue to be an important trend going forward.

Data: FRED, DeFi Llama, rwa.xyz







LSTfi: While yield-bearing stablecoins and new tokenized RWA credit products aim to deliver off-chain yields through on-chain products, LSTfi (liquid staking token finance) aims to allow crypto-native yields to be used more productively in DeFi. The LSTfi market is now at $1.3bn, up from near zero since the start of this year, and it will have important implications for protocol design and incentive structures. LSTfi is more modular designs such as posting to alternative DA layers like Celestia and EigenDA.

DeFi continues to add improvements to UX. DeFi protocols have continued to make progress in optimizing and simplifying user operations, automating tasks, lowering costs, improving capital efficiencies, and revamping protocol incentives for more sustainable yield. Technical improvements enable more seamless on-chain experiences with features including Account Abstraction, gas-less transactions, and protocol subsidies/rebates.

Data: Dune

Predictions:

- DeFi protocols will continue horizontal expansion to build competitive moats. Many of the core DeFi protocols have expanded horizontally into new products to grow synergies with existing product offerings – for example, Curve Finance and Aave now have the crvUSD and GHO stablecoins, respectively, MakerDAO now offers yield on its stablecoin through sDAI and also launched its own lending protocol SparkLend (a fork of Aave), while Frax introduced its own competitor to sDAI with sFRAX and LST with frxETH. This trend will eventually lead to significant overlap in offerings among major DeFi protocols.
- Institutional adoption continues to accelerate. TradFi is warming up to crypto as the industry aims to modernize their financial infrastructure and product offerings. Familiar financial brands including Franklin Templeton, WisdomTree, JPMorgan's Onyx, and Apollo have recently announced various RWA/tokenization initiatives that utilize public blockchain infrastructure and permissioned solutions – a sign that institutional- and enterprise-grade blockchain solutions are nearing production-readiness. Regulatory clarity / compliance solutions can be a big unlock and determinant for how DeFi evolves and how institutions get involved.
- Trading & infrastructure developments will improve capital efficiency in DeFi and unlock new use cases. Trading activity improved with continued development of AMMs, aggregators, and derivatives platforms. Telegram trading bots drove significant trading volume in 2023 as they offer simplified trading interfaces and can automate execution of a wide range of trades quickly. Expected to launch in 2024, Uniswap v4 features 'hooks' or intent-centric uses that can help aggregate fragmented liquidity across different DEXes, CEXes, and across chains. Infrastructure improvements can unlock new interoperability use cases in DeFi, such as Chainlink's Cross-Chain Interoperability Protocol (CCIP) and Circle's Cross-Chain Transfer Protocol (CCTP).

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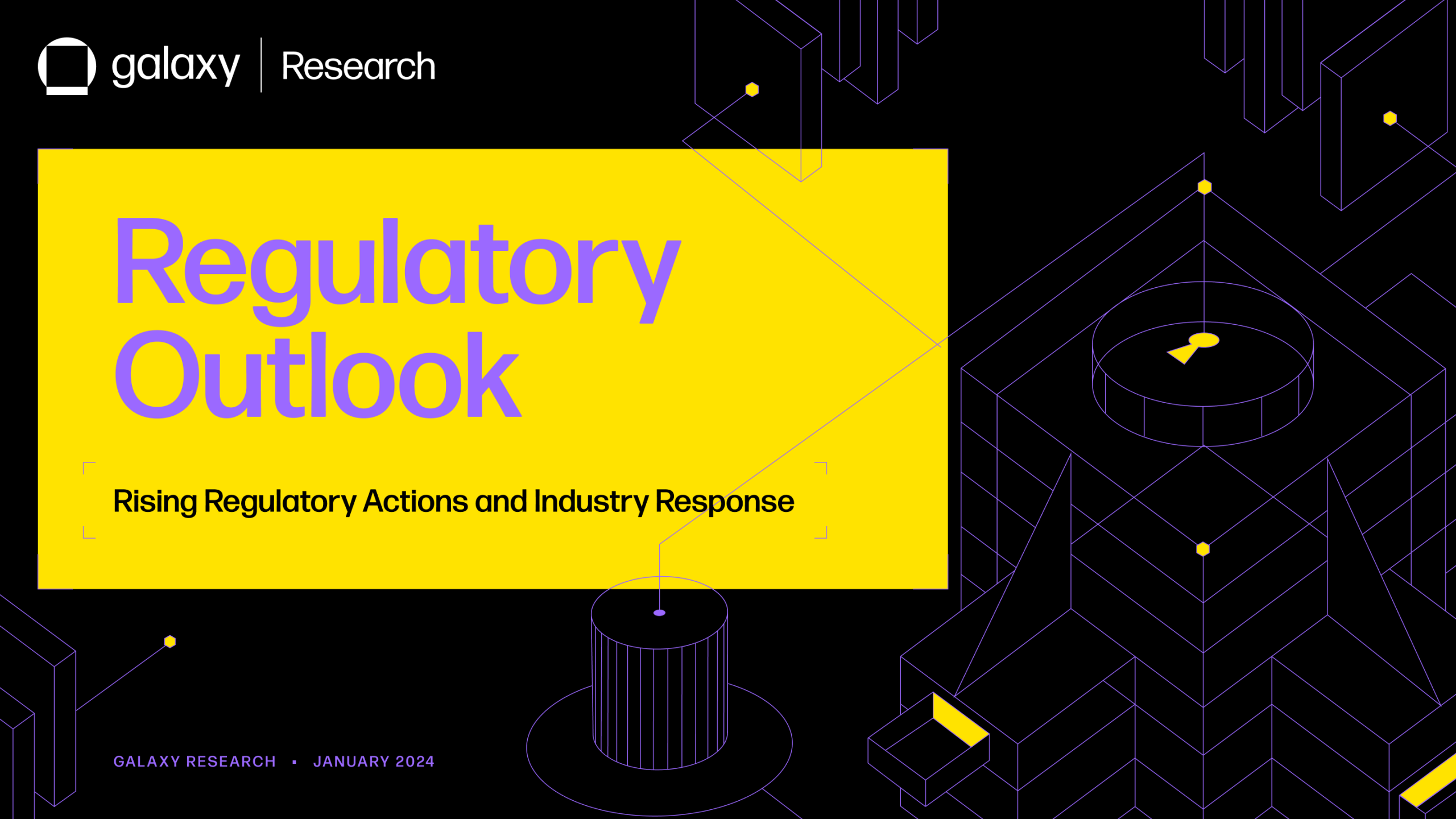
Regulatory Outlook

Rising Regulatory Actions and Industry Response



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SEC Cracks Down On Crypto

Decentralized exchange (DEX) trading volumes trended at multi-year lows in 2023, in large part due to increasing regulatory scrutiny of decentralized finance (DeFi) applications in the U.S.

In 2023, the U.S. Securities and Exchange Commission (SEC) cracked down on the crypto industry broadly and brought more than 25 enforcement actions against various cryptocurrency projects for selling unregistered securities. This is the highest number of enforcement actions brought by the SEC against crypto projects in any calendar year since the organization first started to bring enforcement actions against crypto-related activities in 2013.

The licensing of DeFi projects, specifically, were put under the spotlight when the SEC proposed new amendments to the definition of "exchange" earlier in 2023. These amendments effectively broaden the definition of an exchange to include "communications protocol systems" that support the trading of cryptocurrencies, such as DEXs and other types of DeFi protocols. If the SEC's amendments are finalized, in 2024, DeFi protocol developers will need to register with the SEC or be held liable for non-compliance in the U.S.

Data: Dune (@glxyresearch), sec.gov

Regulation to Watch in 2024

In 2023, the SEC's 2023 crackdown on crypto has galvanized many in the crypto industry to push back. Some of these efforts have been successful. Both Ripple and Grayscale won lawsuits against the SEC. Two high-profile cases that are ongoing and will be important to watch in 2024 are the SEC's suit against Binance and the SEC's suit against Coinbase.

Aside from the SEC, the crypto industry also faces scrutiny from other U.S. regulatory bodies including the Treasury. In August 2023, the Treasury proposed new rules requiring a large swath of digital asset entities and individual enthusiasts to provide tax reporting as "brokers." The language, which is quite expansive, would require IRS tax reporting from non-custodial crypto services including DeFi protocols, software developers, and even network participants such as nodes, validators, or miners.

Since the IRS broker rule was proposed, there has been strong pushback from the crypto industry and general public. During the public comment period for the IRS broker rule, over 124,000 comments were submitted for consideration by the Treasury from individuals and companies, anonymous and public. By contrast, only 180 comments were submitted during the public comment period for the SEC's amendments to the exchange definition. If finalized in 2024, the IRS broker rule will take effect in the 2025 tax year.

Aside from crypto regulation in the U.S., there were two important pieces of legislation passed in the European Union (EU) and the United Kingdom (UK) this year that will start to take effect in 2024.

The Markets in Crypto Assets (MiCA) bill is the most comprehensive piece of crypto legislation approved by EU lawmakers that starting in 2024 will place stricter requirements on stablecoin issuers, among other cryptocurrency businesses. Stablecoin issuers will be banned in EU countries from offering algorithmic stablecoins and issuers offering fiat-backed stablecoins will be required to establish safeguards against market abuse and insider trading. Alongside MiCA, the EU has adopted several new pieces of legislation focused on addressing anti-money laundering concerns related to crypto and self-hosted wallets.

In October 2023, the UK government published its final rules for overseeing cryptocurrency activities. The first part of the rules, also focused on regulation for fiat-backed stablecoins, is expected to take effect in early 2024. The rest of the legislation will be rolled out in phases throughout 2024 and focus on rules for cryptocurrency exchanges, custodians, and lending services.

2024 United States Presidential Election

The 60th presidential election in the U.S. is scheduled for Tuesday, November 5, 2024. Starting in January of this year, states and parties will hold primaries and caucuses. By early September, the Democratic and Republican parties will hold nominating conventions to choose their presidential candidates. So far, there are four candidates in the running for the Democratic party, the forerunner being current U.S. President, Joseph R. Biden Jr. For the Republican party, there are eight candidates in the running with the forerunner being former U.S. President, Donald J. Trump. Nearly half of all presidential election candidates have issued statements regarding their stance on crypto, many of which are positive. However, the two leading candidates from both Democratic and Republican parties have expressed skepticism on the value of cryptocurrencies in the past.

While cryptocurrencies are unlikely to be a key ballot issue in the upcoming 2024 elections, it is noteworthy that the technology has sparked comments and debate from more presidential candidates this election that ones prior. Because of elections, it will be more difficult for legislation to progress through Congress, especially past the spring of 2024. Legislation such as the proposed Digital Asset Market Structure Bill (FIT21 Act) and stablecoin legislation, among others, are likely to be put on hold next year until the next U.S. President is elected.

2024 Presidential Election Candidates

Name	Background	Party	Age	Stance on Crypto
Joseph R. Biden Jr.	Current President	Democratic	82	Argued many crypto assets "have no fundamental value"
Marianne Williamson	Self-Help Author	Democratic	72	Unclear
Cenk Uygur	Progressive Talk Show Host	Democratic	54	Unclear
Dean Phillips	Representative from Minnesota	Democratic	56	Unclear
Donald J Trump	Former President and Businessman	Republican	78	Tweeted that he was "not a fan of Bitcoin and other cryptocurrencies", also launched an NFT trading card collection
Nikki Haley	Former Governor of South Carolina	Republican	53	Unclear
~~Vivek Ramaswamy~~	Entrepreneur	Republican	39	Tweeted that "Bitcoin should not be regulated as a security"
~~Asa Hutchinson~~	Former Governor of Arkansas	Republican	74	Unclear
Ryan Binkley	Businessman and Pastor	Republican	57	Unclear
~~Ron DeSantis~~	Governor of Florida	Republican	46	Has championed bitcoin and other cryptocurrencies as investable assets
Chris Christie	Former Governor of New Jersey	Republican	62	Unclear
Doug Burgum	Governor of North Dakota	Republican	68	Has made positive statements in support of the cryptocurrency mining industry
Robert F. Kennedy Jr.	Lawyer and Nephew of Former President John F. Kennedy	Independent	71	Views cryptocurrencies as "a major innovation engine" and Bitcoin as "a symbol of democracy and freedom"
Cornel West	Professor	Green Party	72	Unclear
Jill Stein	Doctor	Green Party	74	Has stated that Bitcoin should be classified as a commodity

*Presidential candidate names that have been crossed out in this table represent candidates that have dropped out of the running as of 1/22/2024. 15, 2023.

Data as of November 15, 2023.

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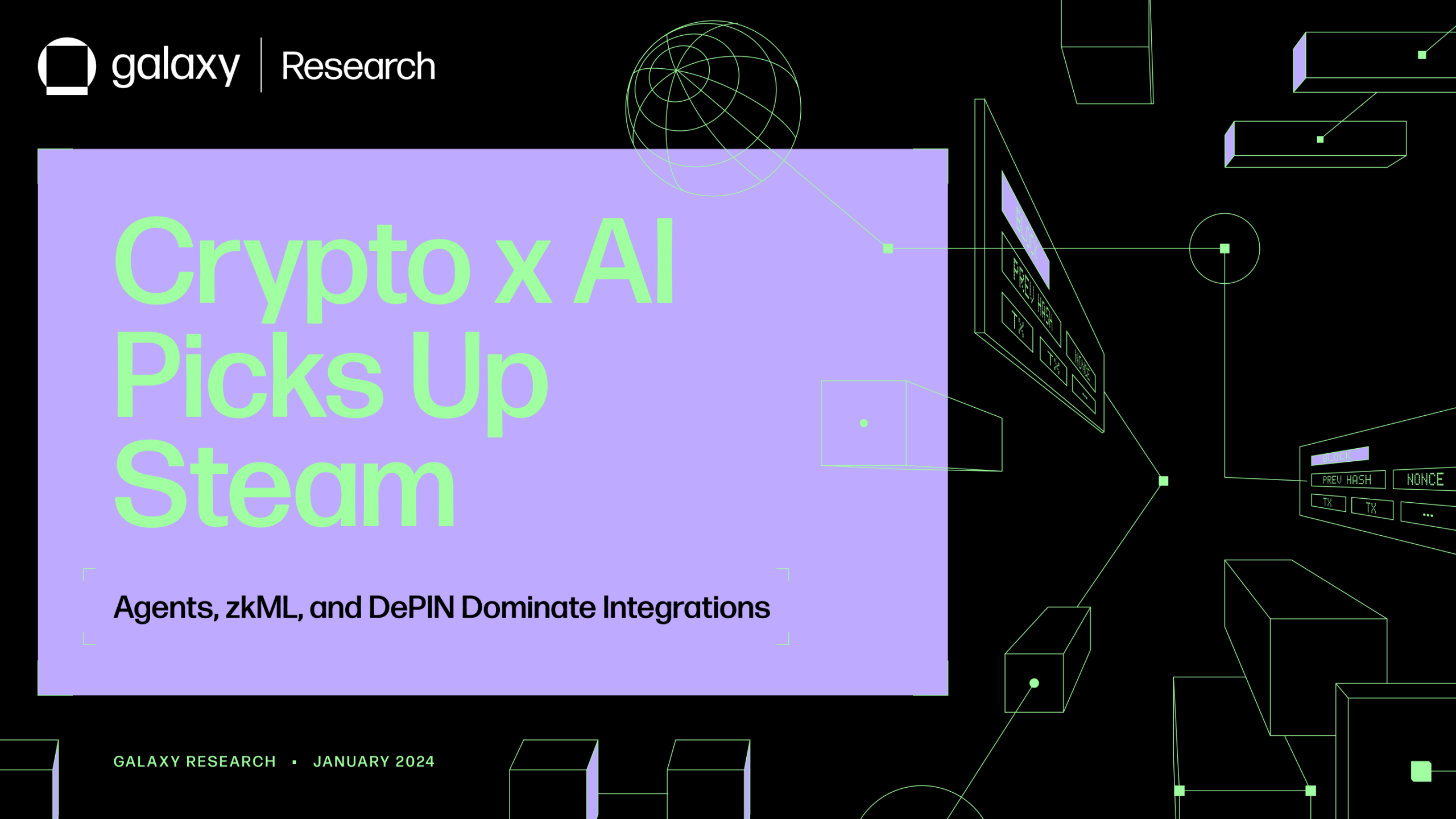
Crypto x AI Picks Up Steam

Agents, zkML, and DePIN Dominate Integrations



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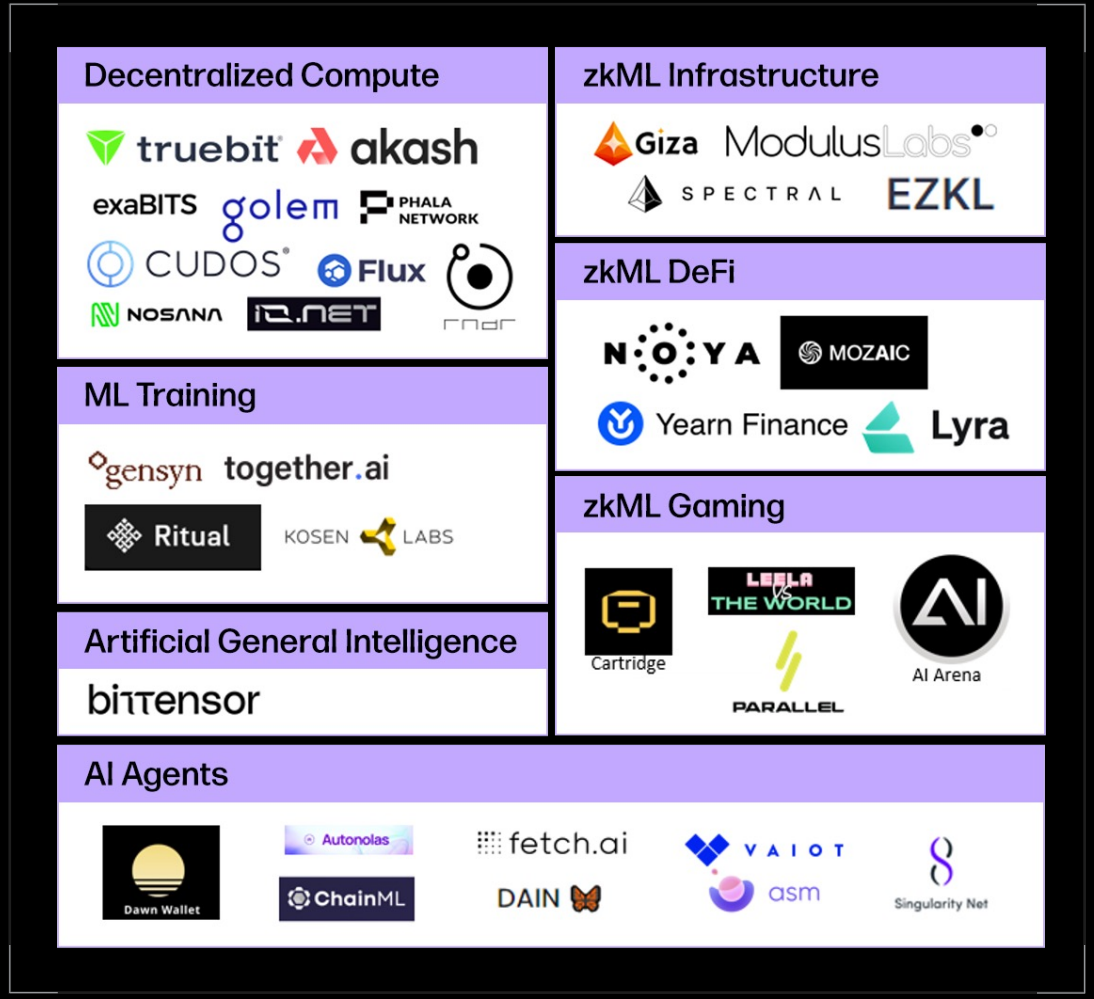
Real AI and Crypto Integrations Occurring Today

- Crypto provides AI with a permissionless, trustless, and composable financial layer. This unlocks use cases such as making hardware more accessible through decentralized compute systems, building AI agents that can automate complex tasks requiring the exchange of value, and developing identity and provenance solutions to combat Sybil attacks and deep fakes.

- AI brings to crypto many of the same benefits we see in Web 2. This includes enhanced user/developer experience thanks to large-language model chatbots as well as the potential to significantly improve smart contract functionality and automation.

- Crypto and AI integration in the near term will be dominated by AI applications that enhance developer efficiency, smart contract auditability and security, and user accessibility/experience. These integrations are not specific to crypto, but crypto stands to benefit immensely from them given notorious issues with UX and developer tooling.

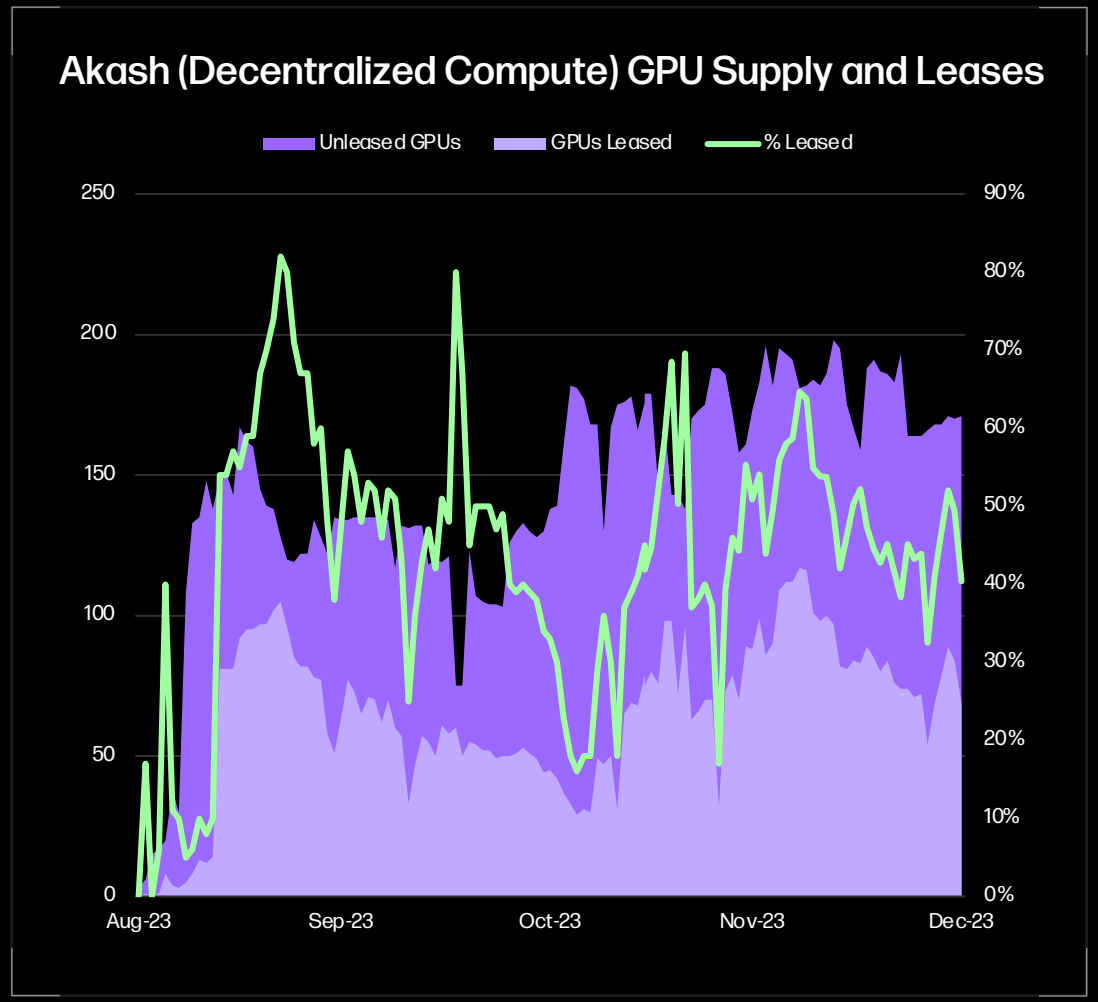
- Zero Knowledge Machine Learning (zkML) and AI Agents are still early in their development. Development in both verticals will remain focused on building out the infrastructure and tooling needed for teams to build products while teams continue to roll out proof of concept applications in defi, gaming, and identity. Talent acquisition remains a major obstacle due to a lack of developers with cross-domain experience in crypto and AI.



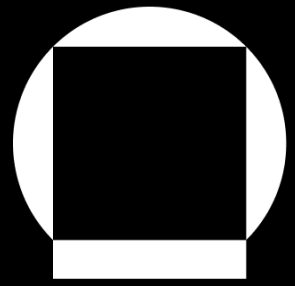
DePIN Finds PMF with Decentralized Compute?

DePIN experienced significant growth over the course of 2023 as both established and new projects gained adoption. AI use cases, especially, led to a dramatic increase in decentralized compute networks that connect buyers and sellers to rent GPUs and other hardware needed in machine learning training and inferencing. This trend will accelerate in the year ahead as AI x Crypto integrations grow and AI crypto solutions demonstrate practical advantages over their centralized alternatives. Specifically, decentralized compute providers will benefit from:

- GPU Supply: Wait times for the best-in-class hardware can be at least six months, and in many cases longer. Decentralized compute providers address both the demand and supply side, providing a permissionless, two-sided marketplace, for leasing and renting compute.
- Regulation/Censorship: Recent regulatory and geopolitical developments, including the AI Executive Order released by the White House, ongoing U.S.-China tensions, and the OpenAI controversy highlight the potential for regulation that limits access to AI technologies. This will drive demand for permissionless networks that offer anyone anywhere access to hardware needed for AI training and inferences.
- Product Maturity/Hardware Requirements: As AI models mature, hardware requirements will also drop increasing both supply and demand for consumer-grade hardware prevalent in households. Demand today is mostly driven by the highest-end hardware that is difficult to obtain at scale.
- Data/Privacy: As AI becomes further integrated into our lives, users will place a premium on being able to run models on applications that have privacy baked into them. Decentralized compute solutions can be integrated with external data and privacy solutions that provide users with autonomy over their data.



Source: Cloudmos.io



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