

PORTAL

ASSET MANAGEMENT

THEMATIC REPORT ON LAYER 2

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Layer 2

'Ready layer 2'

- Layer 2 is often referred to as an “off-chain” solution for blockchains. Its main purpose is to scale blockchain transaction capacity.
- Layer 1 blockchain networks, like Bitcoin and Ethereum, face inherent scaling limitations. Ethereum processes roughly 15-20 transactions per second (compared to Visa with several thousand transactions per second).
- Solving the scalability problem helps blockchains get ready for mainstream adoption.

Background

- Bitcoin and Ethereum are layer 1 blockchains. For a layer 1 blockchain ecosystem to succeed in the long term it needs scalability.
- Bitcoin and Ethereum are not able to process thousands of transactions per second.
 - Why do they lag in processing?

When a transaction happens, there must be global consensus across the decentralized network. All nodes on the network keep a full copy of the transactions to validate the transactions on the network. This has been designed to solve the double spend problem without relying on a middleman.
- Not only are Bitcoin and Ethereum networks slower (than the likes of PayPal and Visa), but as the networks get busier, the fees get higher. These reasons limit Bitcoin and Ethereum's ability to effectively be adopted and used on a wider scale.
- Bitcoin is often referred to as digital gold. The settlement of physical gold, like bitcoin is a slow and expensive process. With a little bit of human creativity, gold certificates emerged as an easier, more flexible way to transact - forming an additional layer.
- The dollar, bank transactions, credit cards, are all layers upon the base layer money. That base layer was physical gold until 1929 when Australia left the gold standard due to an emergency measure during the Great Depression. 'Fiat' the Latin term used to express authoritative order, is now our legal tender that derives its value not from a scarce physical commodity but from our trust in governments.

- The concept of layered money is not new in monetary history. The base layer of a monetary system does not need to have the fastest transaction speed, but it needs to serve as a final settlement layer.
- Hal Finney (renowned cryptographer and Bitcoin pioneer) stated;
“Bitcoin itself cannot scale to have every single transaction in the world to be transmitted to everyone and included in the Blockchain. There needs to be a secondary layer of payment systems that are lighter and more efficient”
- Layer 2 is a collective term for solutions built on top of an existing blockchain system with the main goal to solve transaction speed and scaling difficulties.

How does layer 2 work?

Layer 2 platforms and protocols process data in a way that decreases the burden layer 1 usually bears. By offloading transactions from the main chain onto layer 2 platforms, the blockchain network can handle much higher transaction throughput.

Two examples of layer 2 solutions are the Bitcoin Lightning Network and the Ethereum Plasma. Both solutions strive to provide increased throughput to blockchain systems.

- The Lightning Network is based on state channels, which are basically attached channels that perform blockchain operations and report them to the main chain. State channels are mainly used as payment channels.
- The Plasma framework consists of sidechains, which are essentially small blockchains arranged in a tree-like structure.

One of the main advantages of using off-chain solutions is that the main chain doesn't need to go through any structural change because the second layer is added as an extra layer.

As such, Layer 1 serves as the security layer that anchors data transaction in a way that's immutable, cryptographically secured without a central authority. Layer 2 offers high throughput, being able to perform thousands of transactions per second, without sacrificing network security.

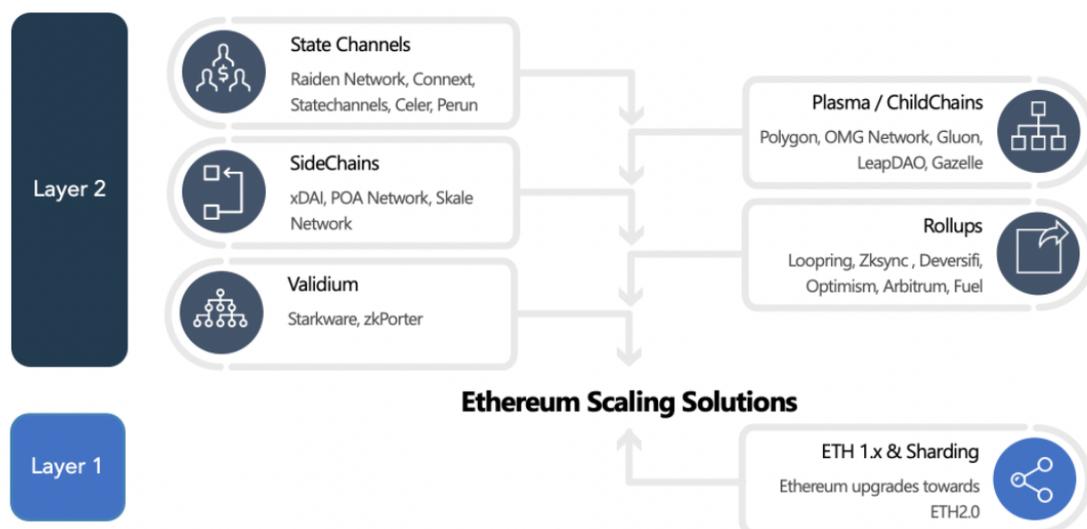
Current State of Scaling Solutions for Ethereum

There are a variety of layer 2 solutions that are competing to solve Ethereum's scalability issue – these fall into the categories: State channels, Sidechains, Validium, Plasma and Rollups.

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Ethereum Scaling Solutions by Type

Classification of scaling solutions and projects



Ethereum's evolution to ETH 2.0 also presents a layer 1 solution by:

- transitioning from a Proof-of-Work to a Proof-of-Stake
- sharding - splitting into many rails to process transactions in parallel (similar to spreading computing and storage across multiple servers)

Each layer 2 solution has its own unique optimizations and trade-offs. The solutions are difficult to develop (and even more difficult to understand) as they walk a very thin line between security and convenience.

Solution Comparison

	Scaling Solutions	Sidechains	Plasma	Optimistic RU	Validium	zkRollup
Category	Examples	Skale, POA	OMG, Matic	OVM, Fuel	StarkEx	zkSync, Loopring, StarkEx
Security	Liveness assumption	Bonded	Yes	Bonded	No	No
	The mass exit assumption	No	Yes	No	No	No
	Quorum of validators can freeze funds	Yes	No	No	Yes	No
	Vulnerability to hot-wallet key exploits	High	Moderate	Moderate	High	Immune
	Vulnerability to crypto-economic attacks	High	Moderate	Moderate	Moderate	Immune
	Cryptographic primitives	Standard	Standard	Standard	New	New
Performance / economics	Max throughput - ETH 1.0	10k+ TPS	1k..9k TPS	2k TPS	20k+ TPS	2k TPS
	Capital-efficient	Yes	Yes	Yes	Yes	Yes
	Cost of tx	Low	Very low	Low	Low	Low
Usability	Withdrawal time	1 confirm.	1 week	1 week	1..10 min	1..10 min
	Time to subjective finality	N/A (trusted)	1 confirm.	1 confirm.	1..10 min	1..10 min
Other features	Smart contracts	Flexible	Limited	Flexible	Flexible	Limited
	EVM-bytecode portable	Yes	No	Yes	No	No
	Native privacy options	No	No	No	Full	Full

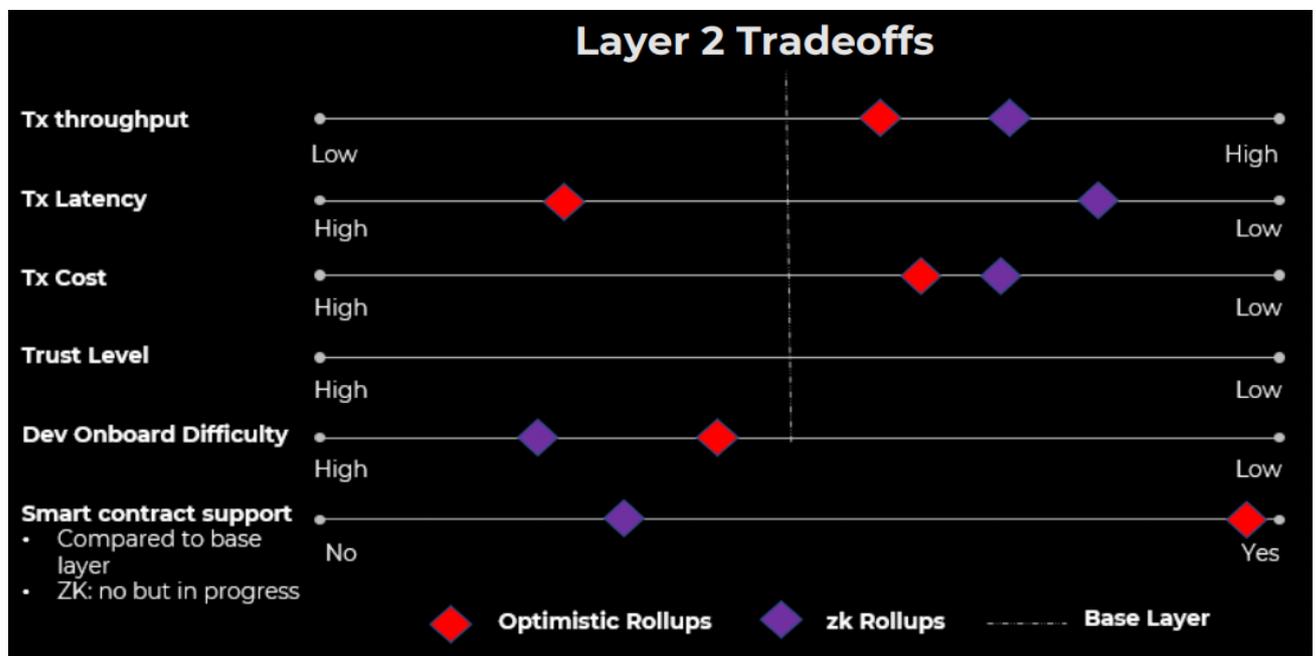
Source: [Delphi Digital](#)

Out of all categories, rollups have been the community favourite:

- Ethereum co-founder Vitalik Buterin [posted](#):
“The Ethereum ecosystem is likely to be all-in on rollups (plus some plasma and channels) as a scaling strategy for the near and mid-term future”

Rollups are a type of Layer 2 scaling solution that bundles or “rolls up” sidechain transactions into a single rollup block and posts to the Ethereum chain – think of it as a batched transaction.

- If you were impressed with plain vanilla rollups, then you’d be thrilled to know they also come in exotic flavours - the two most popular being Optimistic and Zero-Knowledge (ZK) rollups.
- In a ZK Rollup - Ethereum only accepts a batch of transactions if that batch can be cryptographically validated. In other words - guilty until proven innocent.
- By contrast, in an Optimistic Rollup - Ethereum assumes that a given batch of transactions is legitimate. It only rejects the batch if a participant monitoring the rollup chain submits a valid claim that the transactions are fraudulent. In other words - innocent until proven guilty.
- The cherry on top for rollups is their seal of approval from [Vitalik himself](#)
“Optimistic rollups are likely to win out for general-purpose EVM (Ethereum Virtual Machine) computation and ZK rollups are likely to win out for simple payments, exchange and other application-specific use cases.”



Source: [Delphi Digital](#)

Although there is broad community consensus on ZK rollups being the ideal solution for Ethereum's scaling landscape, it's difficult to predict whether other projects will survive. It's likely some consolidation in layer 2 solutions will occur however it is not a zero-sum game.

Anthony Sassano, co-founder of EthHub, says it best:

"You can think of what's happening in the layer 2 ecosystem right now as the adoption and innovation phase where many different solutions are being tried and tested at once in parallel. Of course, not all of them will succeed over the long-term. Ultimately I don't think there will be just one solution that "wins" the scalability wars. As I said, each scalability solution comes with its own trade-offs, trust assumptions and general strengths & weaknesses. Some are really good for payments, some allow for EVM-compatibility and some offer greater scalability at the cost of decentralization."

Rationale for Layer 2

"Innovation is the ability to see change as an opportunity not a threat" - Steve Jobs

Humans' innate ability to innovate has given rise to speech, the printing press, electricity and in our lifetime, the internet. With each technological breakthrough, it has changed the world and how we live in it.

The internet has transformed the way we learn, work, travel and communicate. It's become such a ubiquitous part of our lives, that it's hard to imagine that it was once only used by a small group of uber nerds.

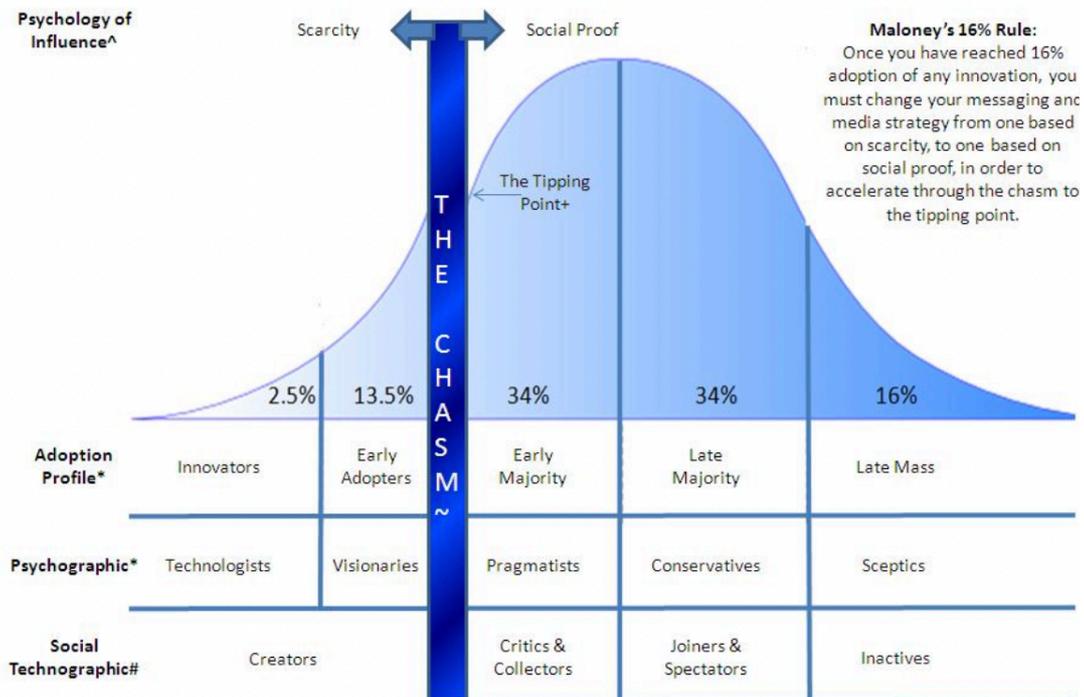
Fast forward to the present and the largest listed companies by market cap are all tech companies (Apple, Microsoft, Amazon, Google, Facebook) totalling a market cap of \$8 trillion USD – equivalent of almost 40% of US GDP.

Human ingenuity means that technology is an ever-evolving process of exploration and innovation. Blockchain is the latest iteration of that process, a revolution built on the infrastructure of the revolution of information, the internet.

The early days of new technology always present issues for mainstream adoption. Like how the internet was once clunky to use, blockchain with its slow processing speed, high transaction fees and complicated wallets, make it hard for the wider public to adopt.

Besides, not everyone is enthusiastic about new technology – as Everett Rogers (communication theorist and sociologist) highlighted with his Diffusion of Innovation theory, there is a distribution of a population's willingness to adopt innovation.

Accelerating Diffusion of Innovation: Maloney's 16% Rule[©]



A new idea/product starts slowly at first with the innovators and early adopters, who make up just 16% of the population - in bitcoin's case, these were the cypherpunks, cryptographers and radical libertarians who were willing to experiment and change the status quo.

To gain traction and spread to the early majority (who are more wary but still eager) and then to the late majority (who are risk-averse and sceptical), the idea needs to (what marketers call) 'cross the chasm'.

The marketing that's required for blockchain to reach the majority is functionality, convenience, and social proof of benefits. This is where layer 2/scalability solutions will play a crucial role.

The idea of sound money, censorship-resistance, and a hedge against inflation/modern monetary theory, gets the technologists and visionaries to jump onboard, but it doesn't resonate strongly enough to the masses for them to see the benefits of decentralized systems.

[Mattia Gagliardi, Partner at Zee Prime Capital](#) explains that the last cycle of 2017 focused on bitcoin as a replacement for hard money. The current cycle however has been much more micro-oriented and DeFi apps have jumped too far ahead.

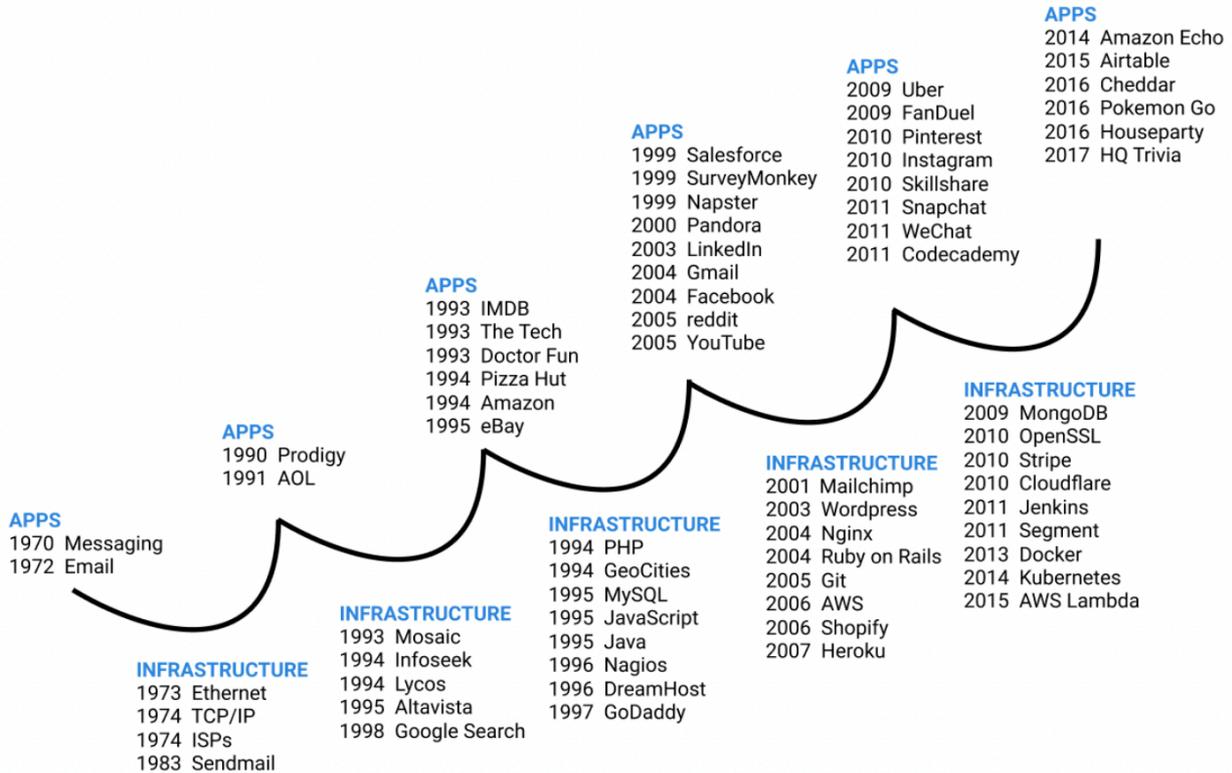
Mattia concludes that now is the time we need to improve the infrastructure;

"DeFi rocks and will spearhead the overfinancialization movement of the next decade. But we miss what connects the niche application and the former bigger picture. We believe we need

to improve the underlying tech if we aim to move forward without compromising some of the core values of crypto movement”

This isn't to suggest that we will see a slowdown in end-user apps and head into an infrastructure improvement phase, but rather apps and infrastructure evolve in responsive cycles.

This pattern of infrastructure improvement can be seen with the evolution of the internet.



Source: [Grant & Grossman](#)

Apps inspire infrastructure to improve; with more advanced infrastructure it allows broader consumer adoption and inspires more app developments.

In 1993, Mosaic was the first web browser to achieve popularity among the general public. Because Mosaic was easy to use and enabled people to see images within pages, it quickly gained fans.

It's 1993 for blockchain.

As the applications of DeFi, Web3, NFTs get adopted by early users, this drives the need for scalability solutions (Layer 2) to improve the underlying infrastructure.

Dr. Raffael Huber (Head of Research at Bitcoin Suisse) writes:

“In the future, such L2 solutions could contribute strongly to blockchain adoption overall, since they lower cost, enhance speed and therefore improve usability of the chain. The last pieces of the puzzle are broad deployment of these solutions and user-friendly interfaces that do not

require thorough blockchain knowledge – all that the end user will notice is that speed has increased, and costs have decreased.”

Throughout history, humans have proven our ability to innovate, evolve ideas and improve our quality of life.

Mathematics and the internet - two pivotal human creations, invented millennia apart have given birth to blockchain. As blockchain matures, its synergy with scalability solutions will evolve the internet and disrupt every industry sector as it ushers in a digital renaissance.

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