

**REPORT DATE: 9/8/2022**



**CRYPTO  
PRAGMATIST  
PRO**

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## Intro:

Layer 2 season is upon us. Despite being frequently addressed by analysts and reporters, Ethereum's layer 2 scaling solutions have yet to break out to a point where their existence can be validated by their use. Before, the true 'use-case' for a layer 2 (referred to as L2 moving forward) was theoretical. The technology stack, while continuing to evolve, has not changed in a meaningful way, but user interaction has become *significantly easier* thanks to the wide array of dApps that are now launching on these networks.

L2's exist for one reason: solve the **scalability** problem with Ethereum. When constructing the network, Ethereum pretty clearly chose security and decentralization as its two important pillars by utilizing Proof of Work consensus. Well, this is great for the ethos of blockchains and cryptocurrency, but not so great for the genesis of DeFi. There can be a variety of UX issues when interacting on the Ethereum mainnet in *high transaction fees* and *slow or failed transactions*.

Thus, the L2 development has been steadfast throughout Ethereum's existence, but now we are reaching the boiling point. Before diving into the specifics of each protocol, we will outline the broad scope of this report:



## Ethereum:

If you are reading this, you are probably aware of what Ethereum is on a technical level. But in relation to L2's, there are a couple key considerations.

In our last narrative report on the Cosmos ecosystem, we discussed how the Interchain Foundation was building a framework for developers to create application specific blockchains in the broader IBC. While a different premise than that of Ethereum, it can be useful to compartmentalize different functions of the blockchain when thinking about how L2s technically operate.

A layer 2 blockchain exists separately from that of the Ethereum mainnet. All of the **computational work**, or transactions, is done on the layer 2 at a much faster rate than possible on Ethereum. The L2 relies on \$ETH for the following:

- Data Availability
- Security
- Decentralization

In this essence, the layer 2 inherits all of the functional guarantees of Ethereum that makes it a “decentralized ledger”, while speeding up all the operational side. This is why DeFi makes *much more sense* when thinking in terms of L2's.

Another way to increase the scalability of a blockchain is to increase the capacity on the main chain, in this case Ethereum. This is the *eventual* goal for transition to proof of stake which will allow sharding to be implemented, but we are a ways away from that.

“L2” in this context is a loaded word, and for our sake we will be looking into a specific section within this report.

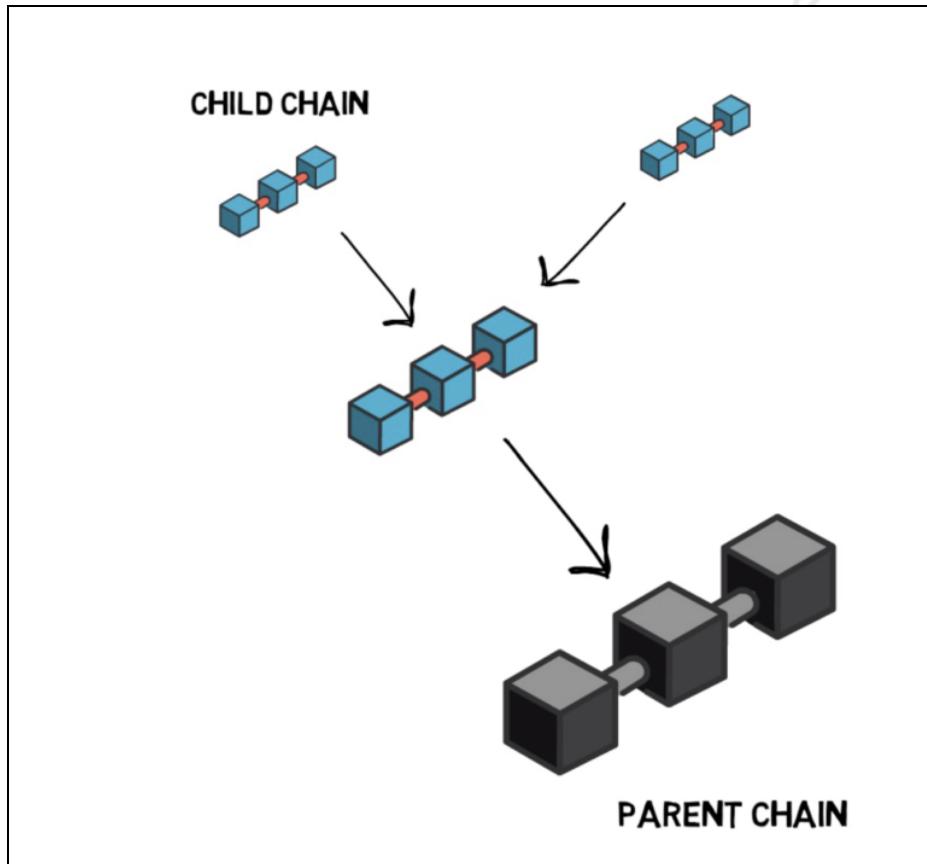
## Different Kinds of L2's:

Like anything in technology, there are lots of different groups trying to solve the problem of scalability in Ethereum, and no two approach it in the same manner.

### Plasma:

Plasma was one of the first scaling solutions for Ethereum, and was mainly brought to market by the team at Polygon. Originally proposed by Vitalik early on in Ethereum's development, plasma scaling is similar to that of side chains, but not *exactly* the same.

Plasma utilizes [merkle-trees](#) and child chains to offload computations from the main chain. Each child node maintains its own set of security assumptions, and uses fraud proofs to protect against malicious actors. Polygon uses Plasma and a Proof of Stake system with the \$MATIC tokens.



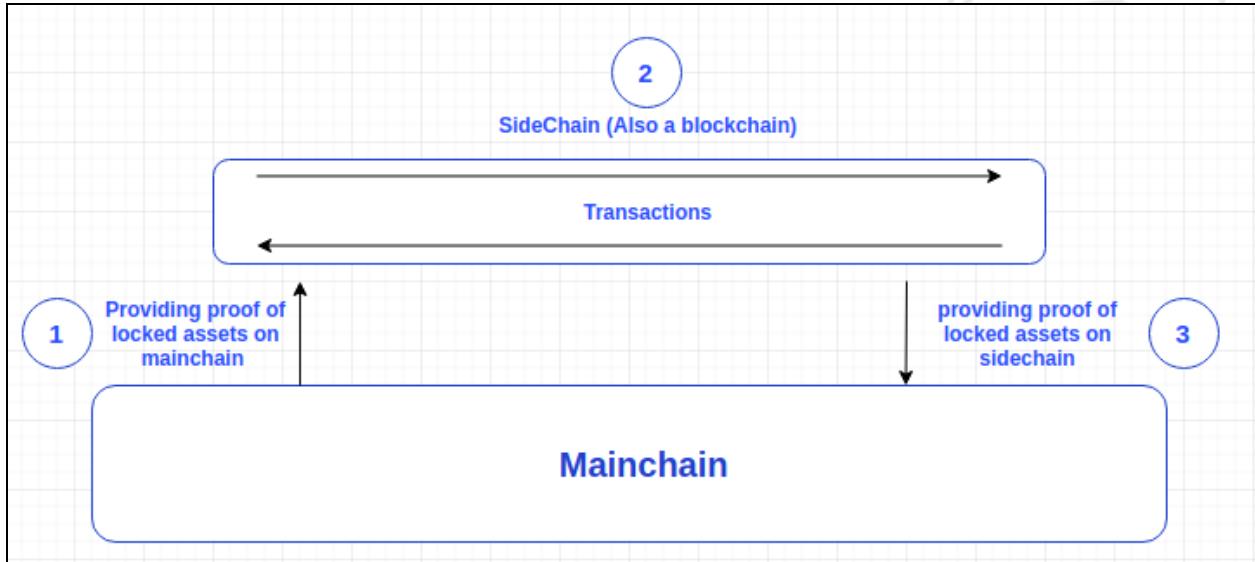
*Plasma Scaling*

The **disadvantages** with Plasma scaling lies in the challenge period for fraud proofs and flexibility for developers. The security of Polygon is unique (validators have to stake \$MATIC on the Ethereum mainnet,) and there is an added security advantage over the “standalone” sidechains. The tradeoff for this, however, is that there is less independence and flexibility for developers.

When withdrawing funds, the challenge period is from 7-14 days before users can access funds on the mainnet. This can be seen pretty clearly why Plasma scaling is not the preferred method.

#### Sidechains:

Similar to the plasma scaling, sidechains are separate blockchains that run in parallel to the Ethereum mainnet.



*Alchemy*

They have their own consensus protocols, and do not inherit the security of Ethereum. Polygon's **Proof of Stake** scaling solution simply is a sidechain, which can be thought of as a completely different network that just utilizes the network of Ethereum. These are not relevant for our report today in terms of true Ethereum scaling solutions.

#### Rollups:

Different from the previous solutions discussed, rollups do not rely on their own security mechanisms, they utilize the main chain's security. Rollups will be our main focus of the paper today. We believe this is the most exciting area being built in terms of scaling solutions on Ethereum, both in growth potential and the efficacy of the technology.

Additionally, rollups can be implemented in two main ways: through **optimistic or zero knowledge** (ZK) rollups. Thus, there is sufficient material and examples to cover just by looking into rollups alone. They have the approval of some of the smartest minds at the forefront of DeFi, and are gaining more traction every day.

Given this, when we refer to something as an 'L2' or 'scaling solution', know that **we are only talking about rollups**. All of the tech, risks, and benefits discussed at length below are only in consideration of rollups, not the other scaling solutions (that are also interesting, just out of the scope of this paper.)

#### **Differentiating Optimistic vs ZK**

Remember, rollups maintain both the security and smart contract capabilities of Ethereum mainnet, which is a **huge advantage** in terms of maintaining the integrity of the blockchain.

When helping increase the throughput for a chain, rollups operate in a pretty simple fashion:

- Execute transactions off-chain
- Compress the data into a rollup
- Send to Ethereum mainnet in a single batch

After the transactions are batched and sent to the mainnet, there can be two ways to prove that everything is clean of malicious actors, using zero-knowledge or optimistic proofs.

For the visual learners out there, here is a great graphic that breaks down the basic functions and differences between zero-knowledge and optimistic rollups:

	Optimistic Rollup	ZK-Rollup
Realistic Throughput Cap	~500 TPS	>2000 TPS
Fund Withdrawal Period	1 - 2 weeks	A few minutes to hours
Privacy	Hard and expensive	Easy and cheap
EVM Compatability	Easier - Solidity code with minor changes	Harder - Solidity code must be adjusted
Layer-2 Computation Costs	Lower - Not very hardware intensive	Higher - expensive and hardware intensive
Transaction Validation	1 honest validator is required at all times	ZKP setup/audit required once

[TokenInsight](#)

### Optimistic:

The first method of Optimistic rollups, which is used for the two largest L2s in Optimism and Arbitrum, utilize fraud proofs and dispute resolution periods for validating batched transactions. One of the key pieces to the puzzle in these rollups are called sequencers, and they are the ones that provide the initial source of funds onto the rollup when someone wants to bridge from mainnet.

This essentially proves the transaction and allows the user to interact with the L2, and the verification is posted by the sequencer onto Ethereum as “calldata.” Now, let’s say that the person wants to move off of the optimistic L2 and submits a withdrawal. Over a period of **7-10 days**, anyone can submit a fraud proof if some use of those specific funds were malicious/invalid. If so, the sequencer’s bond is submitting the fraudulent transaction bundle.

Compared to ZK-rollups, which utilize validity proofs, there are some pros and cons to consider. The most important and probably the reason why optimistic rollup use is much more ubiquitous, is their EVM compatibility. Building apps on Arbitrum or Optimism is much more attainable for developers than it is to do so on a ZK. Seamless integration allows developers to simply transport over their Solidity applications to an optimistic L2, which is not the same for ZK. Hence, we see a dApp board like this for Optimism and Arbitrum:

Arbitrum			Optimism		
1		GMX (GMX)	1		AAVE V3 (AAVE)
2		Uniswap (UNI)	2		Synthetix (SNX)
3		Sushi	3		Velodrome (VELO)
4		Stargate (STG)	4		Uniswap (UNI)
5		Curve (CRV)	5		Curve (CRV)
6		Radiant (RDNT)	6		PoolTogether (PO...)
7		Synapse (SYN)	7		Stargate (STG)
8		Beefy (BIFI)	8		Beefy (BIFI)
9		AAVE V3 (AAVE)	9		Perpetual Protocol ...
10		Dopex (DPX)	10		Homora (ALPHA)

*DefiLlama, total apps across the two chains total nearly 200*

The name “optimistic” comes from the fact that rollup tech accepts transactions as true *unless proven guilty*. The rollup will have a bundle of transactions that were conducted off-chain, submit it to the Ethereum mainnet to be posted and update the state, and the bundle is assumed to be valid unless proven otherwise.

[Hop Protocol](#) has been around for a while, and creates somewhat of a liquidity pool that allows users to send assets between optimistic L2s and the Ethereum mainnet without using the main

bridge that uses the 7-10 day challenge period. Additionally, bridges (which have their own security considerations) like [Anyswap](#) and [Multichain](#) allow users to move between different chains and L2s.

### **Zero-Knowledge Rollups**

The ZK rollup transactions work in the same way as the optimistic rollups: there are a bundle of transactions done off chain and then posted to Ethereum mainnet. The way things **differ** between the two is how they handle *verifying* the posted transactions.

ZK technology uses **validity proofs**, which provide immediate and absolute evidence that the transactions are valid. This is a bit more technical concept, and worth diving in deeper [here](#) if interested, but essentially a ZK proof **proves the existence of something without actually revealing what that something is**. It is a way for the mainnet to understand that the transactions are all true, without knowing the details of those transactions. This embeds a high level of privacy, as seen in popular products utilizing ZK rollups, [Aztech](#) and [Zcash](#).

This security does not come cost free, however. Providing validity proofs are much more expensive both from a hardware and computing standpoint. These upfront costs pay off with a more efficient batching of transaction data onto the mainnet which results in a better UX in cheaper **transaction fees** on the L2.

Another downside is that there is significantly less EVM-compatibility with ZK technology so far, but some of the projects we are going to take a look at today boast promising futures. To solve this, there has been significant development in building EVM compatibility wrapped in a zero knowledge proof. zkSync, and Polygon's zkEVM are in their infancy and development, but working on implementing this.

### **Growing Demand for L2's**

Currently, \$ETH denominated value, all L2's are near an ATH in TVL:

# Value locked

TVL: \$5.31B  
-4.72% / 7 days

2021 Sep 02 – 2022 Sep 01

7D 30D 90D 180D 1Y MAX

Ξ3.87M

Ξ2.91M

Ξ1.95M

Ξ990K

Ξ0.00K

USD ETH\*

Total Value Locked (\*ETH equivalent)



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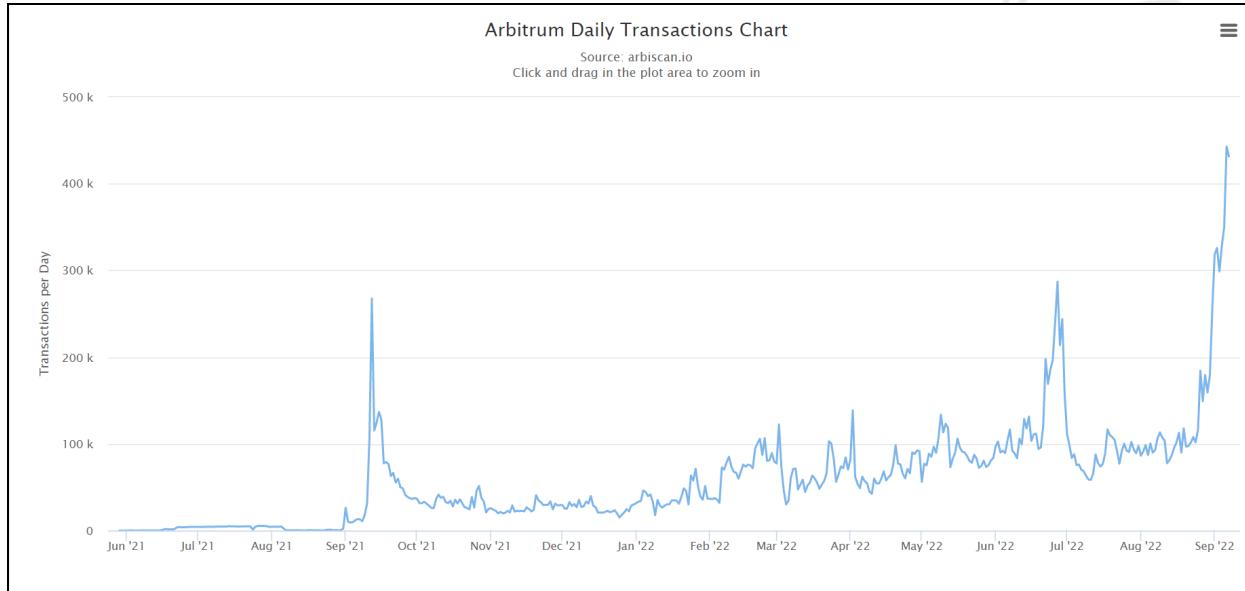
*L2Beat*

This doesn't really come as a surprise given both the incentive programs we've seen as well as the continued development across all applications. Bear markets, as we know, are times for programmers to build, and there is no doubt that building is going on in the Ethereum layer 2 ecosystem.

## Arbitrum:

Kicking off on the leaderboard in terms of both TVL and daily transactions is Arbitrum. The optimistic rollup was launched roughly one year ago by the team at Offchain Labs. Since launch, they've had quite a dominant position of market share, currently sitting at 58% of all L2s.

Daily transactions have been in a steady grind up since launch and now completely shattering previous ATHs:



*Arbiscan.io*

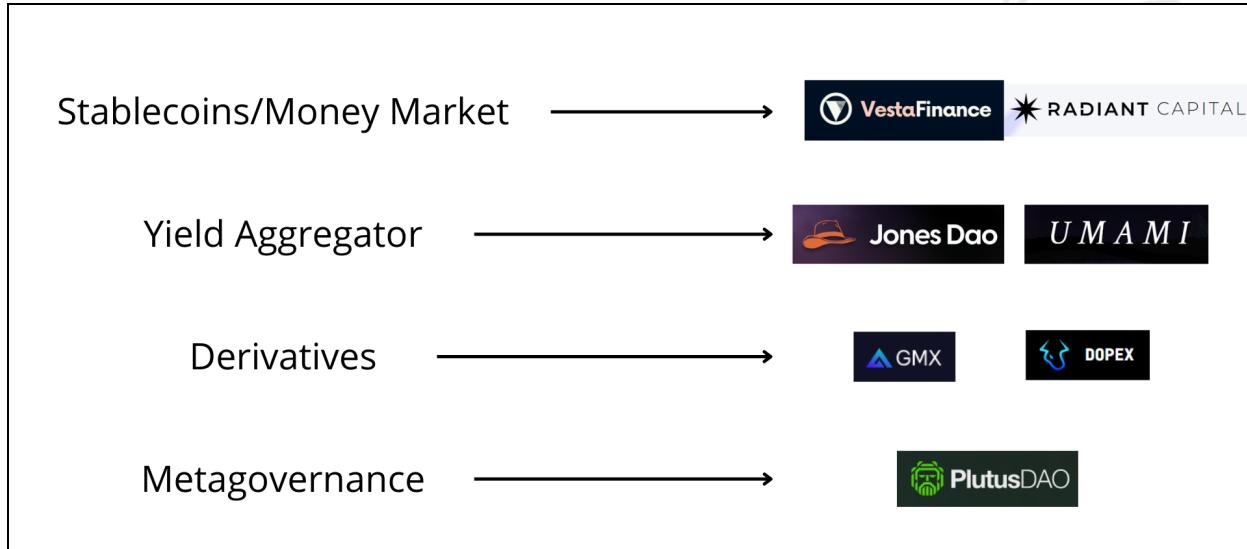
Arbitrum has been garnering a **ton** of attention recently for their potential airdrop program in “Arbitrum Odyssey”, which incentivizes a bunch of use on the platform. People speculate that participating in these transactions will earn them a spot for a token airdrop in the future (on top of the already promised NFT launched by Offchain.)

On top of this, the highly popular perps protocol GMX (which we wrote about a while back [here](#)) is on Arbitrum. dApps either moving their codebase to be operable on Arbitrum, or new protocols building that are choosing to participate in a lower fee environment have kept the excitement going.

We also wrote about Dopex in a previous report, which is finally getting some attention for its innovative product launch in Atlantic options (worth a refresher [here](#).)

### Some of the Best dApps in the Game

Arbitrum may feel like it is getting popularized due to Odyssey, but it still is minuscule compared to Ethereum. Despite this, there are applications being built that justify a lot of the hype:



Canva

All of these protocols are valued fairly against their Ethereum mainnet counterparts (**Beefy** for Jones and Umami, **Spell/MIM** for Vesta, **Convex** for Plutus.) Meaning, in the coming months/years, there will likely continue to be use, inflows, and development for all things Arbitrum. Expect to see somewhat of a “hype cycle” pattern with discussion of airdrops, incentive programs, and other developments related to Arbitrum **that can lead to overbought and oversold conditions**.

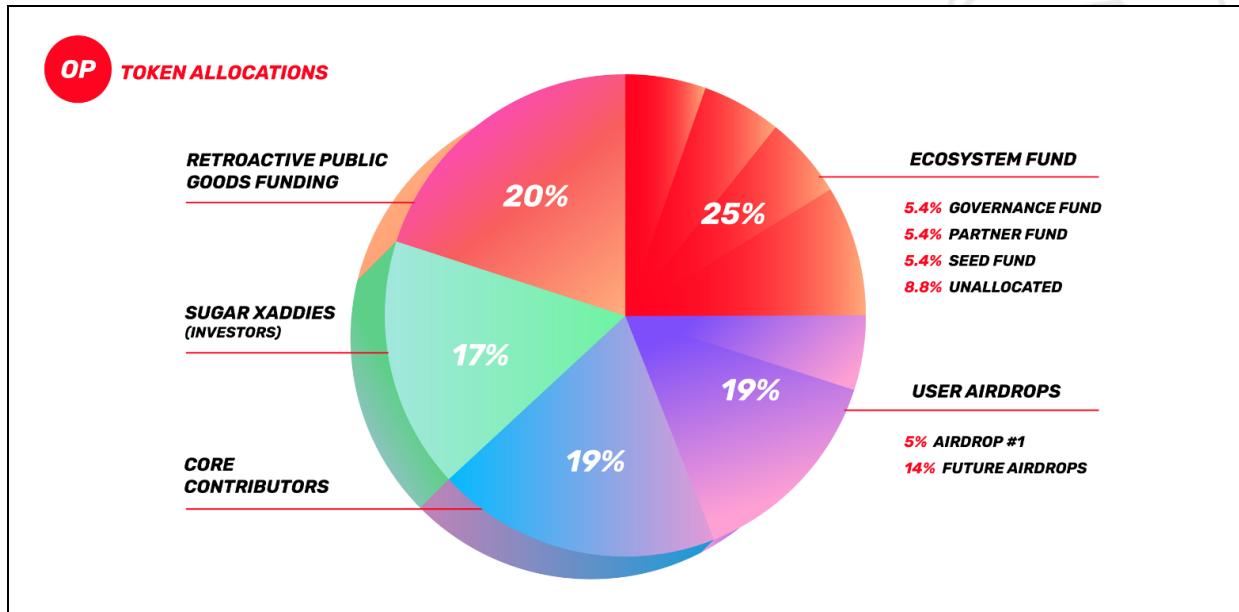
### Arbitrum Nitro

Fees during Odyssey actually *surpassed* those on Ethereum mainnet—kinda ruins the whole point of a rollup, right? While these scaling solutions are not by themselves an end game, they should be a sufficient means to an end, especially when used in conjunction with one another. This instance should truly be a one-off situation after the company recently underwent its [Nitro upgrade](#), which increases throughput and lowers gas fees for the network by reducing the calldata that is posted to the mainnet.

### Optimism

Optimism is proving to be a very interesting case study into what a token can do to a network. After releasing its token and claiming the infamous “\$OP summer” to be upon us, we can look back and compare this to other L2 tokens and where things might be headed in the future.

Optimism went for somewhat of a “vampire attack” strategy on alt-L1s and other L2s by launching its token through a juicy airdrop and offering consistent incentives. This has been clearly beneficial as seen with many of the \$OP grants given to certain protocols to incentivize use and watching money to flow into the rollup. **25% of total token allocation** is slated to go to ecosystem growth by way of grants and other partnerships:



*Optimism*

This means that the high rate of growth of TVL and transactions will continue, and there are some profitable opportunities to earn extra farming rewards in the form of \$OP. [We already covered Velodrome](#), which is currently running >100% APY for some of its farms with the help of an added \$OP bonus. By no means sustainable, but absolutely profitable in the short term.

Taking a step beyond a worthless governance token, Optimism's approach to governance structure is unique and was complimented by Vitalik himself.



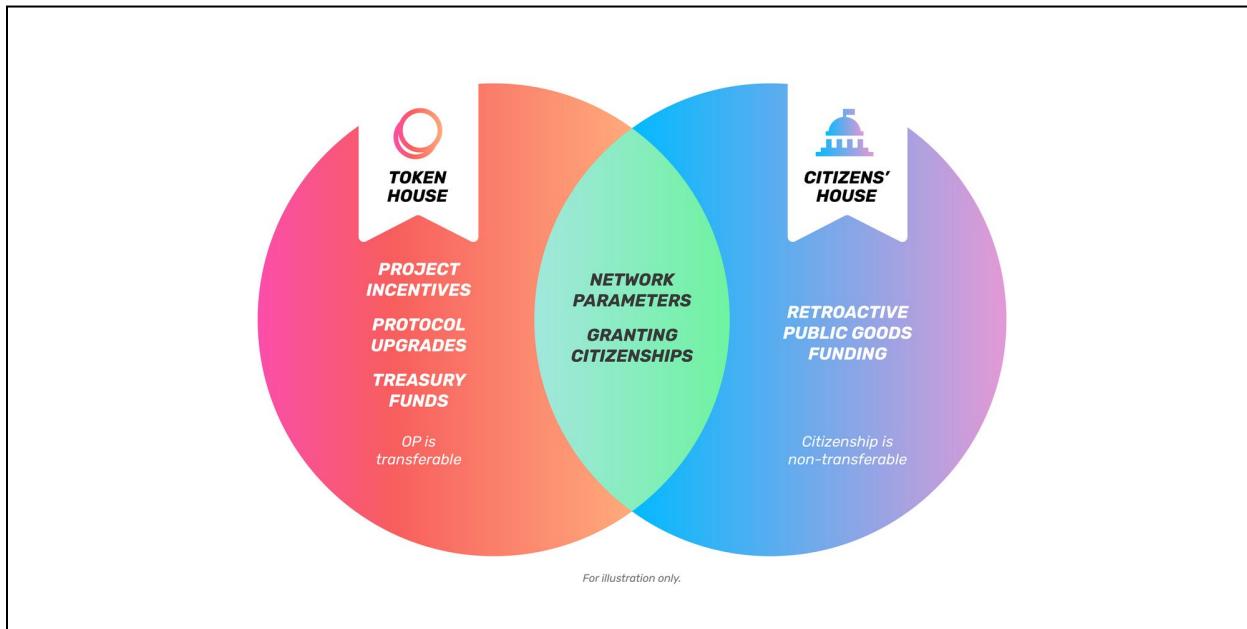
vitalik.eth ✅  
@VitalikButerin

...

This is a great example of why I'm so proud of [@optimismPBC](#) for adding non-token governance (the Citizen House).

Optimism explicitly has goals \*other\* than just "make OP go up", and the only way to do that long-term is with explicit representation of non-token-holder interests.

Essentially, the airdrop was established to distribute the token governance phase, and the citizen house section will allow interested users to participate in governance without having a financial incentive in the \$OP token. The “citizenship” will be established via non-transferrable tokens, and the constitution can be reviewed [here](#).



*Optimism*

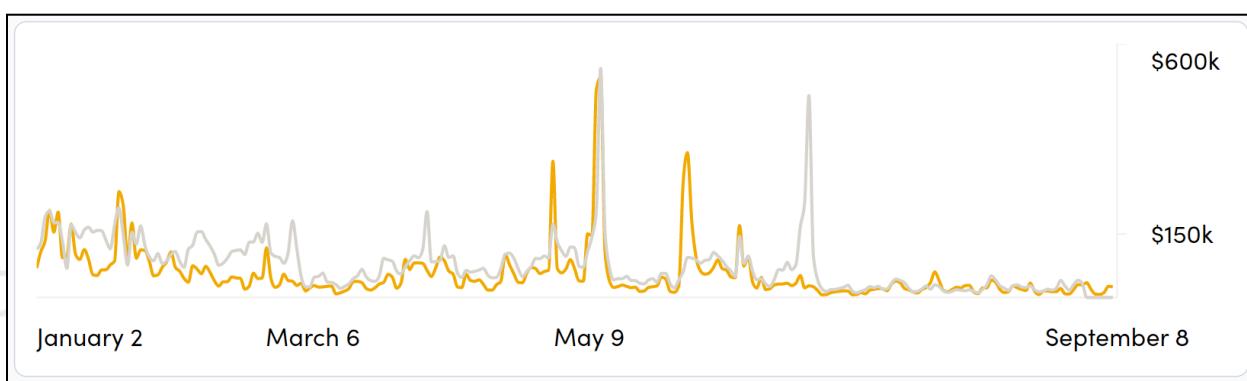
### Valuation - Justified or Not?

Let's take a look at how Optimism activity and TVL has been compared to that of Arbitrum. Over the course of 2022, Arbitrum and Optimism have pretty much been in lockstep in terms of revenues earned based on transaction activity, with Arbitrum slightly edging it out:

#### 2022 Daily Revenues Optimism and Arbitrum

Optimism: ORANGE

Arbitrum: GRAY



[L2fees](#)

The token FDV comes in at \$5 billion, which is almost inside the top 100. Compared to other L2s with tokens already out on the market, \$OP pretty much shatters the next closest competitor in ImmutableX:

<b>As of 9/8/22</b>	<b>Fully Diluted Market Cap</b>	
LRC	\$	1,641,809,199.47
<b>OP</b>	<b>\$</b>	<b>5,049,198,065.70</b>
IMX	\$	1,641,809,199.47
METIS	\$	285,762,263.89
BOBA	\$	154,807,516.78

*Coinmarketcap*

It is hard to place a value on this token, given that the direct comparisons are slim. What we know is that compared to \$ETH, Optimism is an actual *shrimp* in terms of transaction revenue, daily transactions, wallet addresses, etc. Ethereum has roughly **1 million daily transactions**, compared to Optimism's 100k. Unique addresses are even more of a landslide—Ethereum has nearly 130x the amount of addresses.

Currently, it seems that the network has to have a premium based on its current valuation. Transaction revenues, because it is a rollup, do not amount to much—the past 365 days they have done about \$20m in revenue.

While the network is full of cheap transactions and efficient protocols (Uni v3), the token seems like it is a bit of a stretch at this point. Inflating supply with grants and incentive programs will just continue to bog down on the market cap and leave the token with minimal room to run. The best thing, in our opinion, to do would be try to take advantage of some of the protocols with live \$OP grant incentives:

 <span>★ Live incentives</span> <p><b>Lyra</b> app.lyra.finance</p> <p>Lyra is an automated market maker (AMM) for options trading</p>	 <span>★ Live incentives</span> <p><b>Synthetix</b> synthetix.io</p> <p>Synthetix is a system designed to let users hold and trade synthetic assets whose value can be tied to real-world assets.</p>	 <span>★ Live incentives</span> <p><b>Thales</b> thalesmarket.io</p> <p>Allows the creation of peer-to-peer parimutuel markets that anyone can join. The foundation of novel on-chain initiatives, from AMM-based positional markets to immersive gamified experiences.</p>	 <span>★ Live incentives</span> <p><b>Perpetual Protocol</b> perp.com</p> <p>Decentralized perpetual swap</p>
 <span>★ Live incentives</span> <p><b>PoolTogether</b> app.pooltogether.com</p> <p>Save money and win prizes! PoolTogether is a no loss prize savings protocol. The more you deposit the better your chances to win!</p>	 <span>★ Live incentives</span> <p><b>Velodrome</b> app.velodrome.finance</p> <p>Velodrome is an AMM modeled on Solidly and designed to be a public good that provides deep liquidity and low slippage to token pairs critical for the growth of the Optimism ecosystem.</p>	 <span>★ Live incentives</span> <p><b>1inch</b> 1inch.io</p> <p>1inch's aggregation protocol, which allows you to choose the best decentralized exchange for your transaction, is available on Optimistic Ethereum.</p>	 <span>★ Live incentives</span> <p><b>Kwenta</b> kwenta.io</p> <p>Kwenta allows you to trade real world assets and derivatives on-chain.</p>
 <span>★ Live incentives</span> <p><b>Stargate</b> stargate.finance</p> <p>Stargate is a fully composable liquidity transport protocol that lives at the heart of Omnipool DeFi.</p>	 <span>★ Live incentives</span> <p><b>Aave</b> aave.com</p> <p>open source and non-custodial liquidity protocol for lending and borrowing.</p>	 <span>★ Live incentives</span> <p><b>Exotic Markets</b> exoticmarkets.xyz</p> <p>Exotic Markets: Permissionless on-chain prediction markets for real world events built on top of Thales.</p>	 <span>★ Live incentives</span> <p><b>Layer2DAO</b> layer2dao.org</p> <p>Layer2DAO is expanding the Ethereum L2 ecosystem and investing in L2 ecosystem projects. The DAO uses its treasury to invest into high-impact L2 protocols and ecosystem plays.</p>

## OpSummer

### Other Optimistic Rollups:

Besides the two leaders in Optimism and Arbitrum, there are some other competitors trying to carve out some market share for themselves. One of the most promising is Metis, an Optimism fork that changes up some of the tech stack to create a **more decentralized and scalable L2**.

Metis has a key competitive advantage in its effort to build DACs, or Decentralized Autonomous Companies. Essentially, a DAC is able to be a centralized company and/or business that utilizes the advantages of the blockchain. This means that payroll, insurance, legal work, and finances of the company can be stored in Metis's integrated IPFS.

The competitive advantage is its own consideration that is compelling, but what we really like is the \$100 million ecosystem fund that is being allocated over the next year when the **FDV of the entire network is only \$288M**. It does not take a math major to realize how important and beneficial a \$100M injection into that small of a network will be.



*Metis*

Boba, another rollup, touts that its advantage for developers is that they can utilize AWS Lambda programs, which tend to require a high computing power and thus are expensive and slow to complete on-chain. While this seems valuable in theory, there can be a point where we start to wonder if the **saturated alt-L1 trade is now moving to a saturated L2 trade**.

There is no way to tell at the moment, and given that we are truly just starting to see real adoption of these L2s, it is highly unlikely that that will happen soon. But be sure to consider the competitive advantage of each Optimistic rollup and how they might be differentiating from those already on the market.

#### ZK Rollups:

As discussed, ZK rollups are a bit more of a technical challenge, and are earlier along in the development stage. When it is all said and done though, ZK tech will be unequivocally superior to Optimistic rollups. Faster transaction finality and larger data processing, albeit more expensive to build, is a crucial component of the scalability issue.

One thing to differentiate between is STARK and SNARK zero-knowledge proofs, which you will absolutely encounter in learning about different networks. The differences are minimal but impactful, and the end result (and all that matters for our sake) is that **STARKs are more scalable and secure** based on the cryptographic methods used. STARK rollups do have one disadvantage in that they are *underdeveloped* compared to SNARKs.

**TLDR: STARKs > SNARKS**

The projects discussed below have much more to develop, but are the leaders in the space today and worth watching in the near future.

### **StarkWare:**

StarkWare is the company that launched StarkNet, a ZK rollup that was launched in November of 2021. They recently went through a new round of funding and raised \$100M in May '22 at an [\\$8B valuation](#). We know how private markets work, and May, even though the start of the big crypto crash, was still a frothy time. Despite this, a simple comparison that StarkWare, which is still undergoing massive development and has a long way to go before the products are considered fully developed, would be valued \$3B higher than Optimism's publicly traded token could be promising for the future of ZK technology.

StarkWare also has a different scaling solution called Starkex. The differences between the two are important:

1. StarkNet is a general purpose rollup chain. StarkEx is a toolkit made specifically for applications.
2. StarkNet scales Ethereum. StarkEx scales decentralized exchanges.
3. StarkNet allows interoperability between DApps but StarkEx does not.

*h/t TokenInsight*

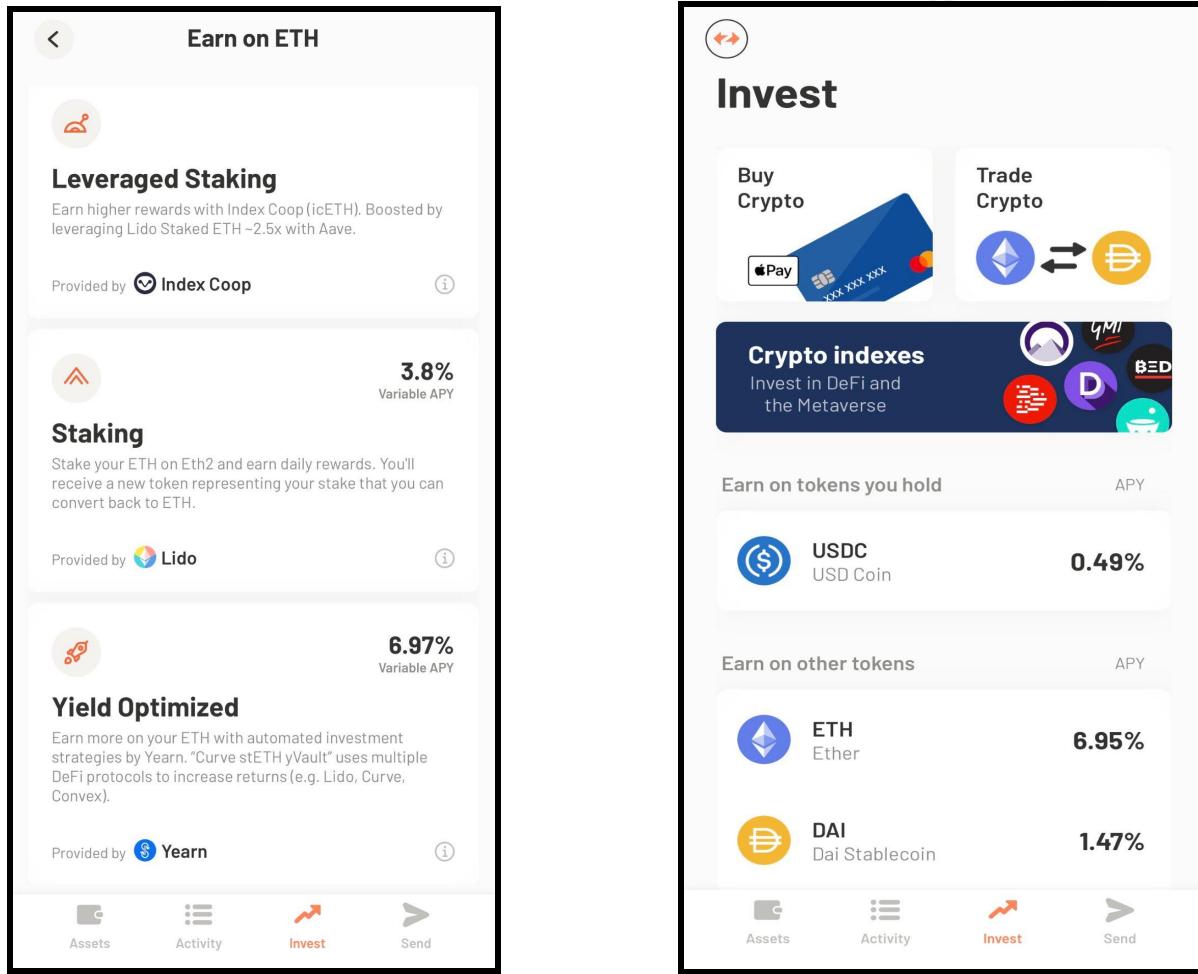
The ecosystem within StarkNet is plentiful, but TVL is quite the contrary. DeFi, NFTs, GameFi, and lots of Infrastructure related projects are launched on the testnet or mainnet of Starknet. Check them out [here](#).

### **zkSync:**

zkSync was released by MatterLabs back in 2020, and just recently launched their **EVM-compatible** rollup on the Ethereum testnet in February 2022.

As we mentioned in the intro, ZK rollup development and use is still in its infancy. But, some amazing products can already be seen in the market today, one of our favorites being Argent. The non-custodial wallet is probably the most simple and user-friendly self custody wallet out there.

While onboarding funds can be a little cumbersome (utilizing Ramp), the end result is a trustless wallet which you can interact with dApps on the wallet interface. Currently, Yearn and Index Coop being the most popular, users can earn yield on stables or \$ETH.



*Argent*

## Token

With a zkSync token already confirmed by the team in their docs, the next question is how to get it. While an airdrop is never confirmed until announced, it may be worthwhile to set up an account with Argent and play around with some transactions. Besides gaming a potential airdrop, it is worthwhile to be acquainted with these apps when ZK use-cases start blowing up.

Visiting the [zkSync website](#) (on Goerli) and creating an account/moving funds around would also likely qualify you for an airdrop. On zkSync, the spot exchange ZigZag (with a not so great UI) can be a spot to send some transactions through:



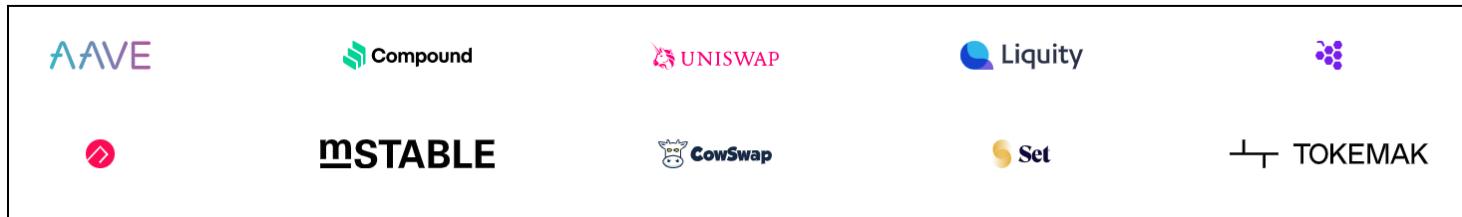
### Zigzag

Like StarkNet, [zkSync has a ton of projects going through the development phase](#) right now. Most applications are only on the testnet or announced that they will be working with zkSync's scaling solutions, but it means one thing: the demand is there.

#### Aztec:

Originally founded in 2017, Aztec focuses on making privacy the norm in blockchain interactions. Their current flagship product, [zk.money](#), allows users to "shield" (ie. wrap) their assets into a privacy-first alias before interacting with popular dApps. In a time where censorship is becoming increasingly possible (Tornado Cash and Circle), privacy networks could become more and more important.

Here are some of the popular apps that can be used with zk.money, including liquid staking service Lido:

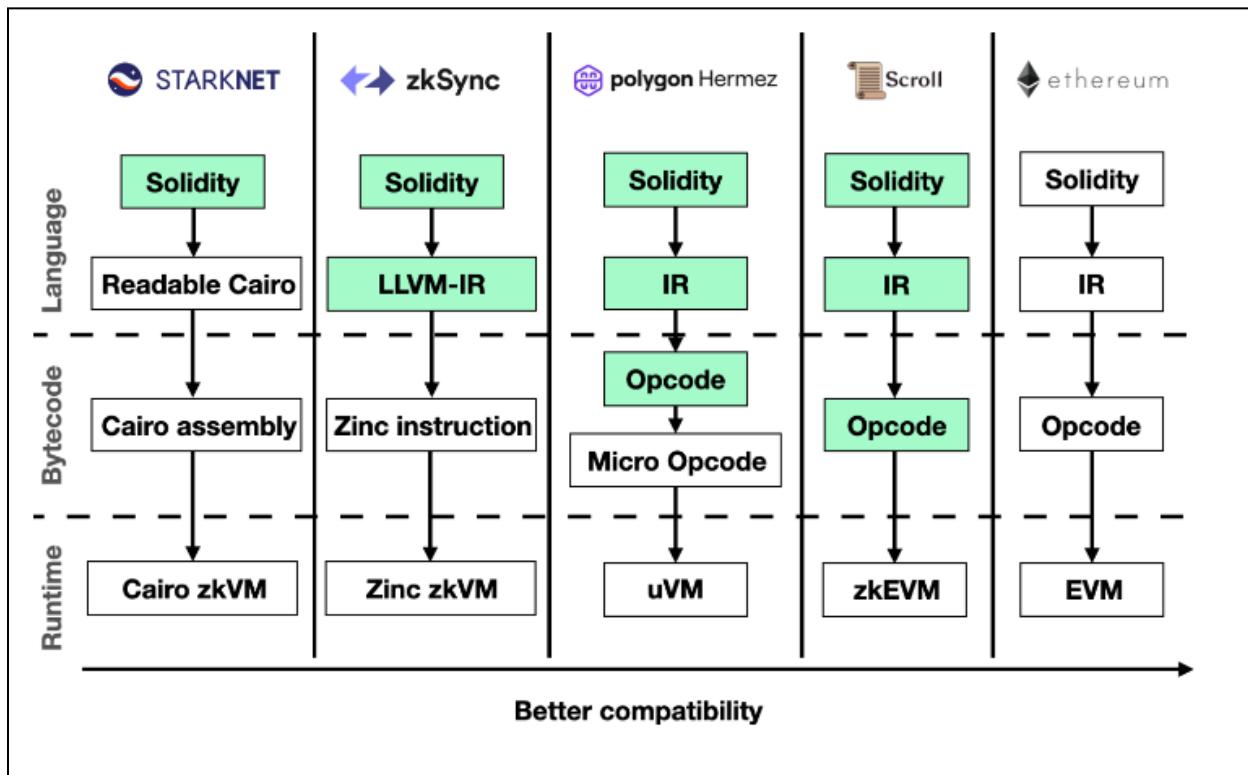


### Aztec

#### EVM Compatibility

Zero-knowledge EVM rollups are a much bigger deal than we have been able to discuss, mostly because of the [technical headache they provide](#). Just know that the closer a ZK rollup integration can be to utilizing the Ethereum Virtual Machine, the better off it will be. zkEVM will

be prevalent in the future of Ethereum and blockchains, but the development is beyond cumbersome and it will take time.



[Msfew.eth](https://msfew.eth) - A fantastic source for those interested

## Conclusion

In terms of thinking about the future of L2s, all there is to say is that opportunity is out there: for investors, developers, and users alike. The alt-L1 and ETH-killer trades simply cannot hold their ground in an extended bear market. If market activity continues to wane, and this shakeout phase continues, Ethereum and all *extensions of Ethereum* are where we want to be.

The future holds improved development of zero-knowledge proofs and EVM compatibility, the near term will be a continuation of developers launching on optimistic rollups and improvements (like Arbitrum Nitro) continuing to happen.

The transition from alt-L1s to L2s seems like it is happening in real time, both in a large tick up in transaction activity and TVL (mainly from the first two and largest networks, Optimism and Arbitrum). With the merge roughly one week away, all eyes will be on the Ethereum ecosystem (*if everything goes well.*) This source of demand could lead to people continuing to try out scaling solutions, and given enough time, the ZK rollup space can and should dominate.