

Base, Zora,
PGN, and Mode

The Rise of Optimism's OP
Stack and Superchain

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1 The Ethereum Landscape

As **Ethereum** serves as the cornerstone for our decentralized future, its ability to reach the internet's scale is paramount. However, currently, no individual Layer 2 (L2) solution on Ethereum has the capability to achieve this grand vision. This presents dapp developers with three options, each with its own set of trade-offs:

- Deploy directly on Ethereum's Layer 1 (L1), compromising scalability.
- Choose to deploy on a specific L2 on Ethereum, risking ecosystem dependency.
- Build and manage their own appchain, resulting in liquidity fragmentation and increased technical burden.

Moreover, achieving interoperability between these solutions remains a challenge. Existing **cross-chain bridges** have demonstrated vulnerabilities and have been prone to attacks by malicious actors.

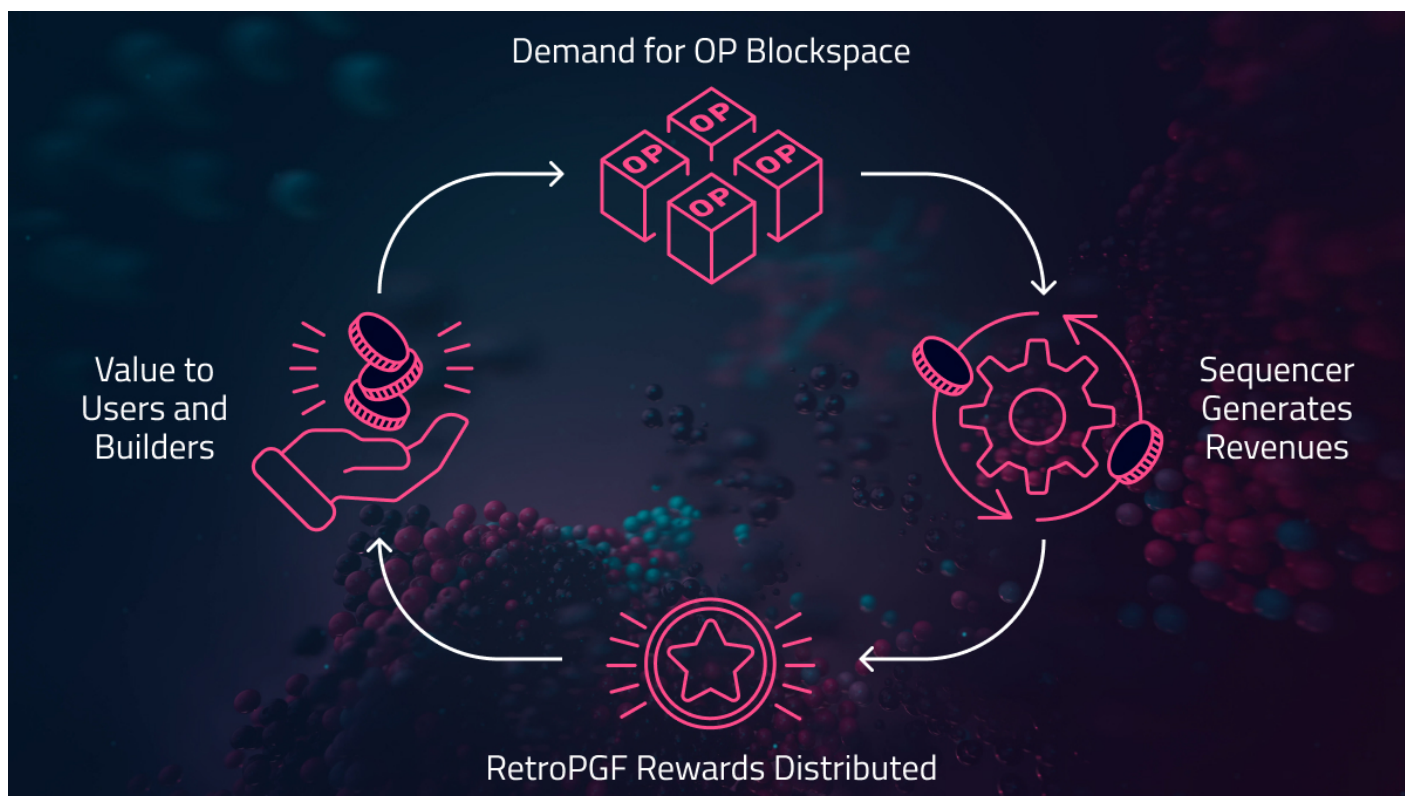
Enter the game-changer – **Optimism**. With groundbreaking developments like Bedrock, the OP Stack, and the Superchain, Optimism is poised to revolutionize the Ethereum landscape. In this research report, we'll explore:

- What is Optimism?
- Bedrock's Foundation
- Introducing the OP Stack
- The Vision of the Superchain
- The First OP Chains via the Law of Chains
- The Expanding Universe of OP Stack Forks
- Concluding Thoughts

Starting with Coinbase's **Base**, we're on the brink of a seismic shift. Here's why Optimism's OP Stack will be the blueprint for all future L2s and why the Optimism narrative is about to take center stage.

2 What is Optimism?

Through years of exploration, Ethereum's researchers and developers converged on what they believed to be the most optimal scaling solution – **rollups**. At its core, rollups bundle transactions into batches, submitting only the state transition data back to Ethereum. By processing these batches instead of individual transactions, Ethereum becomes less expensive, and it also alleviates blockspace congestion.



However, the journey to scale Ethereum through rollups was not without its hurdles, particularly in securing funding as a non-profit. To navigate this, Optimism emerged with two goals: **to supercharge Ethereum’s scalability and to champion the funding of public goods**. Optimism is the brainchild of Karl Floersch, Jinglan Wang, and Ben Jones – a trio that had previously collaborated on [Plasma](#), another Ethereum scaling solution. Their combined years of technical expertise and innovative vision are now channeled into Optimism.

Consider Optimism’s stance on governance. Unlike many of its L2 counterparts, Optimism’s token, [OP](#), wasn’t simply distributed in a singular airdrop. The [Optimism Collective](#) adopted a phased release via a process called [Retroactive Public Goods Funding \(RetroPGF\)](#). The brilliance of RetroPGF lies in its ability to continuously incentivize contributions to open-source software and the creation of public goods, which is crucial for the long-term success of Optimism and Ethereum.

As a strong proponent of open source, Optimism’s entire blockchain code is also [MIT-licensed](#), making it easily forkable. The broader crypto community has been quick to leverage this, especially since Optimism unveiled its much-anticipated Bedrock Upgrade. On that note, let’s dive deeper into what makes Bedrock so special.

3 Bedrock’s Foundation

In early June, Optimism unveiled plans to upgrade their flagship OP Mainnet to [Bedrock](#). This was a pivotal milestone, introducing a number of key improvements aimed at creating the most robust, customizable,

and forkable codebase known as the OP Stack. During its development, a dialogue with George Hotz, the founder of [comma.ai](#), sharpened **OP Labs'** focus on code simplification and standardization. The goal became clear: **minimize the lines of code and build a modular system.**

To put it simply, each additional line of code not only drives up engineering overhead but also introduces a potential vector for unintentional bugs. OP Labs achieved a **clean and minimal codebase** by reusing as much existing Ethereum code as possible, which ensured inherent security from battle-tested code and a familiar environment for developers.

By using the open-source **Go-Ethereum (Geth)** as Optimism's client software, Bedrock gives the OP Mainnet – and any future forks using the OP Stack – multiple advantages:

- **Lower Fees:** the upgrade has made the OP Mainnet the **most cost-efficient Ethereum L2** for token swaps, showing a 39% fee reduction.
- **Reduced Deposit Times:** deposit times have been reduced from 10 minutes to a mere 3 minutes, marking a 70% improvement.
- **Enhanced Proof Modularity:** the system can support both **fault proofs (formerly known as fraud proofs)** and **zk proofs (also known as validity proofs)**, providing the flexibility to switch to zk proofs in the future.
- **Optimized Node Performance:** multiple transactions can now be executed within a single rollup block.
- **Closer Ethereum Equivalence:** the OP Stack has been refined to closely mimic Ethereum's architecture.

It is also important to note that the Bedrock upgrade was a collective achievement, with noteworthy contributions from outside OP Labs. **Jesse Pollak and his team from Base** have made significant codebase improvements, while **Test in Prod's op-erigon** serves as the OP Stack's inaugural alternative execution client. Moreover, **Noah Citron from a16z engineered Magi**, the OP stack's first alternative consensus client. The journey doesn't end here; following Bedrock, the next step for the Optimism Collective is to further contribute to the OP Stack.

4 Introducing the OP Stack

Out of the Bedrock upgrade, the **OP Stack** emerged: **an innovative, open-source software stack engineered to power modular blockchains.** Far beyond just another L2 solution, the OP Stack provides a blueprint – akin to the **ERC-20 Token Standard** – for any project or team to create their own purpose-built rollup.

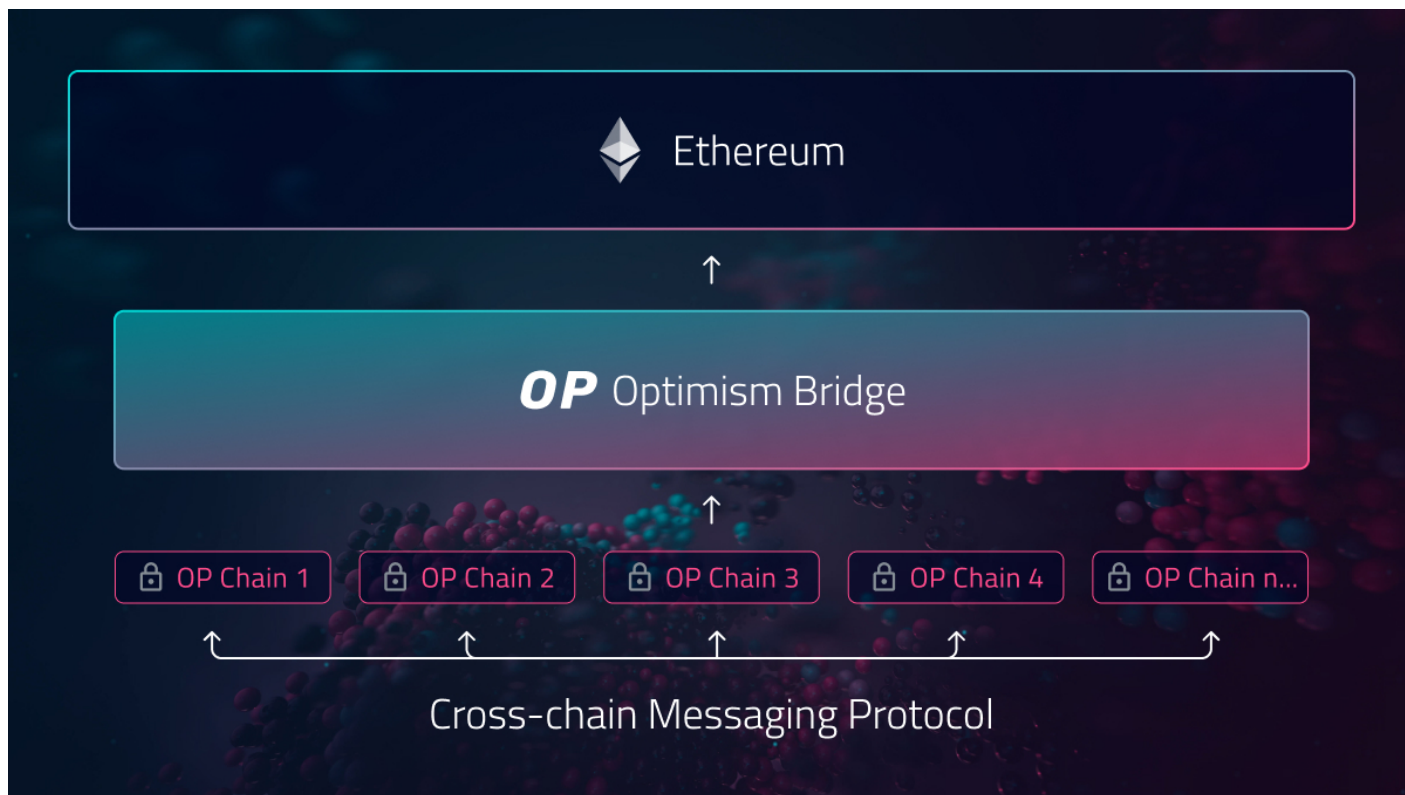
Think of the OP Stack as a curated collection of software components, maintained by the Optimism Collective. Each component either sets the foundation for new layers or seamlessly integrates as modules within the OP Stack, encompassing **governance, settlement, execution, derivation, sequencing, and data**

availability. This gives developers ready-made options that save them from reinventing the wheel.

The OP Stack’s layered approach also ensures that each component can be upgraded or substituted over time. For example, a standout advantage of the OP Stack is its ability to support zk proofs for settlement, leading to potential configurations like an OP Stack zk rollup. From an **optimistic rollup** with a fault prover, a rollup can transition to a **zk rollup** with a zk prover or even operate multiple provers concurrently. The OP Stack’s modular design opens the door to endless possibilities, as at every layer of the OP stack, substitutions can be made to redefine what the end product exactly is.

Designed with unparalleled forkability and modularity, the OP Stack invites open experimentation and rapid iteration, giving rise to novel new rollups. As developers increasingly adapt and modify the OP Stack, it contributes to a **shared, evolving codebase.** This dynamic creates a flywheel effect: **developers launch their rollup on the OP Stack, contributing to the shared codebase and tooling, which in turn improves the developer experience and attracts more developers to launch their rollups on the OP Stack.** Code reuse is pivotal for robust, error-free L2 designs to realize the vision of the Superchain.

5 The Vision of the Superchain



In making its codebase publicly available under the MIT license, the OP Stack has ignited what could be likened to a Cambrian explosion of forks. These forks collectively contribute to the realization of Optimism’s ambitious vision: **the Superchain.** The Superchain is a cohesive, interlinked blockchain network, comprised of individual chains, known as **OP Chains.** This dynamic network is unified through both technological and social threads, aiming to create a collaborative ecosystem where innovations are

shared and goals are collectively pursued.

Today's blockchain landscape, although promising, falls short of the idealized **decentralized web**. A single rollup, no matter how efficient, hits a scalability ceiling due to hardware constraints. Conversely, a multichain approach amplifies systemic risks as more chains, standards, and bridges emerge. Highlighting this vulnerability, a staggering **\$2.66 billion in funds have been hacked from bridges**.

The Superchain is neither mono-chain nor multichain, but rather a hybrid that is the best of both worlds. One groundbreaking feature will be **atomic cross-chain transactions**. Enabled by a shared sequencer set, it will allow sequencers to produce blocks across multiple chains simultaneously, ensuring atomic interactions and thereby dissolving the boundaries that usually separate individual chains. This will eradicate the need for traditional, often vulnerable, cross-chain bridges, enhancing both user experience and security exponentially. A breakthrough of this magnitude could save billions of funds at risk.

In the Superchain future, chains will become almost like compute resources. Dapp developers can effortlessly auto-scale their applications across multiple chains without encountering the typical challenges – such as overhead costs – associated with deploying new chains. This allows the concept of a chain to become abstracted, turning this rich tapestry of interoperable chains into a single, cohesive Superchain. Navigating between OP Chains will be as effortless as browsing between websites today.

6 The First OP Chains via the Law of Chains

Every chain built on the OP Stack is welcome to join the Superchain, but to do so, they must first adhere to the **Law of Chains**, a set of community-driven guidelines aiming to uphold the values of the Optimism Collective. The current **Law of Chains v0.1** serves as an MVP, outlining how teams leveraging the OP Stack can contribute to the larger vision of the Superchain, support public goods, and promote decentralization.

Joining the Superchain offers many benefits, among which are:

- **Homogeneity, Neutrality, and Openness of Blockspace:** a pledge to safeguard the interests of users and developers. Whether a chain is nascent or established, being a part of the Superchain empowers it to credibly demonstrate the homogenous, neutral, and open properties of its blockspace, all reinforced by **Optimism Governance**.
- **Benefit From Continuous Advancements:** once a protocol upgrade is passed by the Optimism Collective, it is seamlessly pushed across all the Superchain's participating chains. This eliminates independent maintenance and siloed development, pooling the expertise of teams from across the Superchain.
- **Better, More Accessible Infrastructure:** the shared commitment to a standard within the Superchain allows for a collaborative approach to ensuring the accessibility and affordability of key services, such as **indexing** and **sequencing**.

As a public good, developers are free to use the OP Stack as they wish. Only the teams that choose to opt into

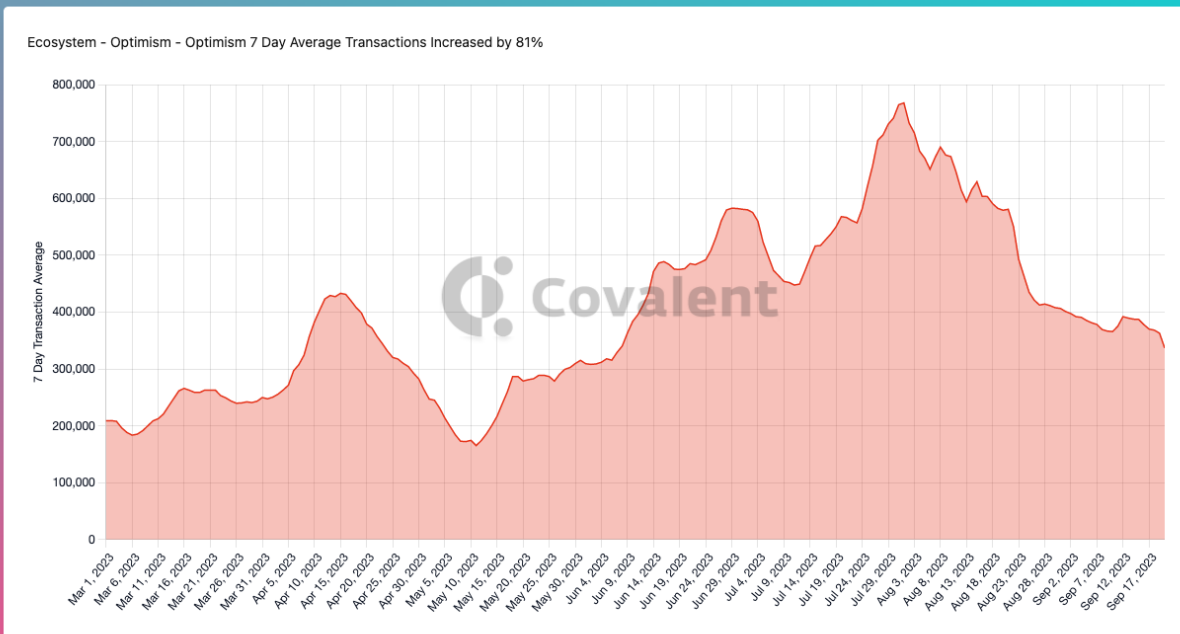
the Superchain are obligated to **contribute sequencer revenue back to the Optimism Collective** to further support the funding of public goods. The freedom to opt in or out of this arrangement is a feature, not a bug, respecting individual autonomy while encouraging collective buy-in.

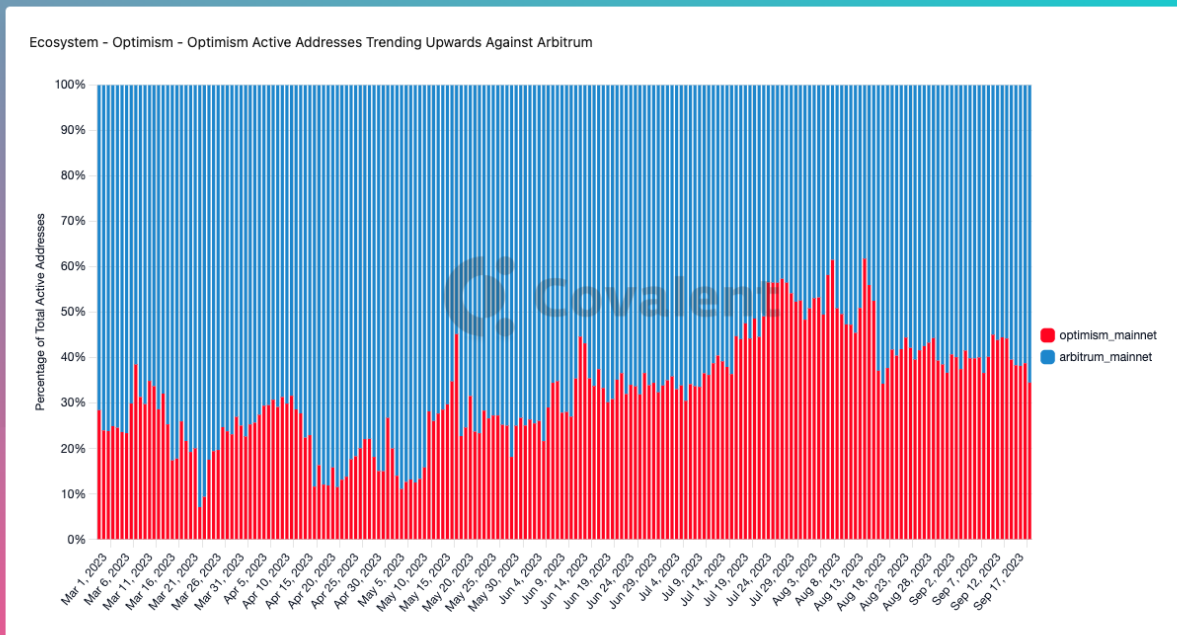
Drawing lessons from the early days of **Ethereum Governance**, Optimism understands that social consensus is crucial for the functioning of decentralized systems. By developing public goods and rewarding contributors, Optimism has created an environment where win-win scenarios aren't just possible; they're the norm. The early indications are promising, with numerous L2s already using the OP Stack and joining the Superchain as OP Chains.

7 OP Mainnet

OP Mainnet is a popular optimistic rollup and proudly holds the title of the inaugural member of the Superchain. In line with the Superchain's vision, OP Mainnet is one of many interlinked OP Chains, ensuring seamless communication with its counterparts.

OP Mainnet has experienced an impressive 81% surge in its 7-day average transaction count and in comparison with **Arbitrum**, its daily active addresses are on an upward trajectory, especially with Arbitrum's declining activity post-airdrop.



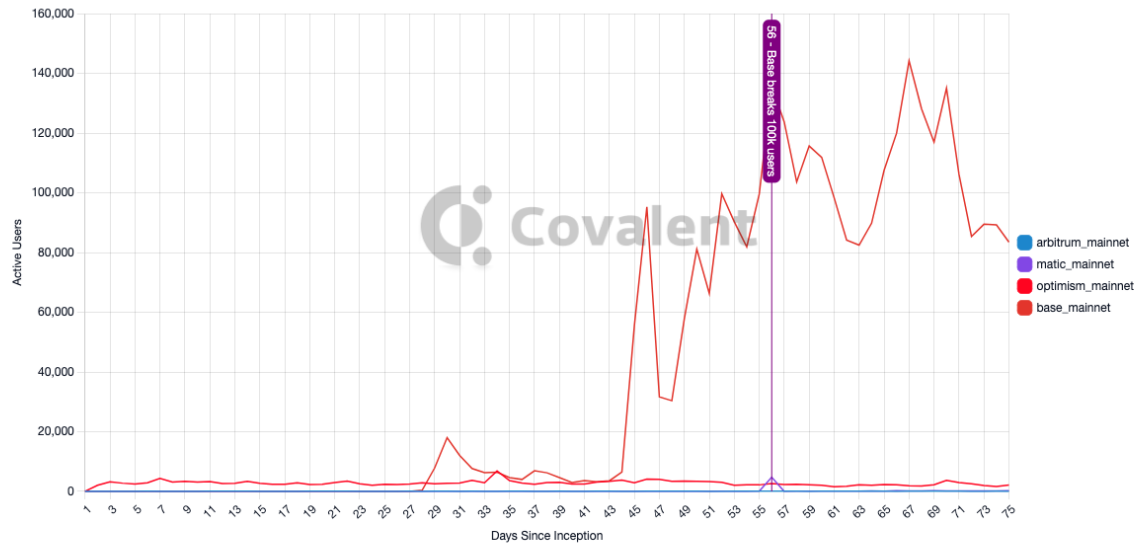


8 Base

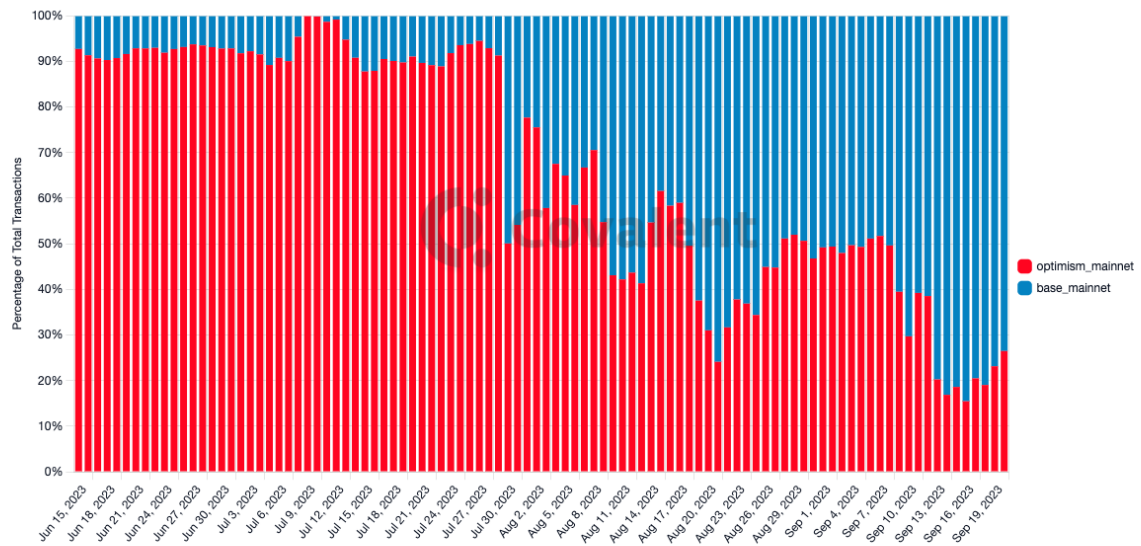
Incubated by [Coinbase](#), [Base](#) is aiming to become the home of the next billion users. As the second member of the Superchain, Coinbase has joined OP Labs as a core developer of the OP Stack. Base is also setting a [high standard for how OP Chains should contribute to the Superchain going forward](#). They have committed to giving the greater value between 2.5% of total sequencing revenue and 15% of L2 transaction profits back to the Optimism Collective. Additionally, Base is committed to helping the OP Stack evolve towards decentralization, including collaboration on the [op-geth](#) client implementation, coordination in developing [next gen fault proofs](#), and participation in the [Security Council](#).

Base was one of the most exciting chain launches of the year and is well-positioned to attract a lot of new users due to Coinbase's reputation. This can be seen by Base being the fastest L2 to 100,000 users, a feat accomplished in only 56 days post-launch. Moreover, Base has surpassed Arbitrum, [Polygon](#), and OP Mainnet in daily transaction count, reinforcing its promising position in the space.

Ecosystem - Base - Base Reaches 100k Users in 56 Days



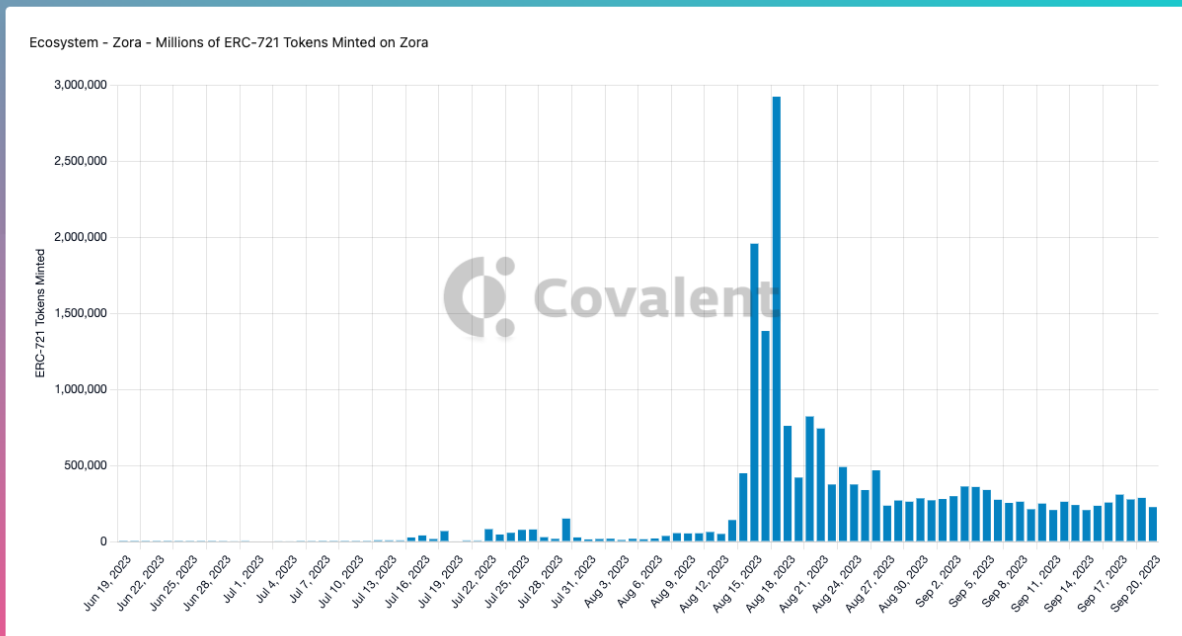
Ecosystem - Base - Base Gaining Transaction Volume Against other L2s

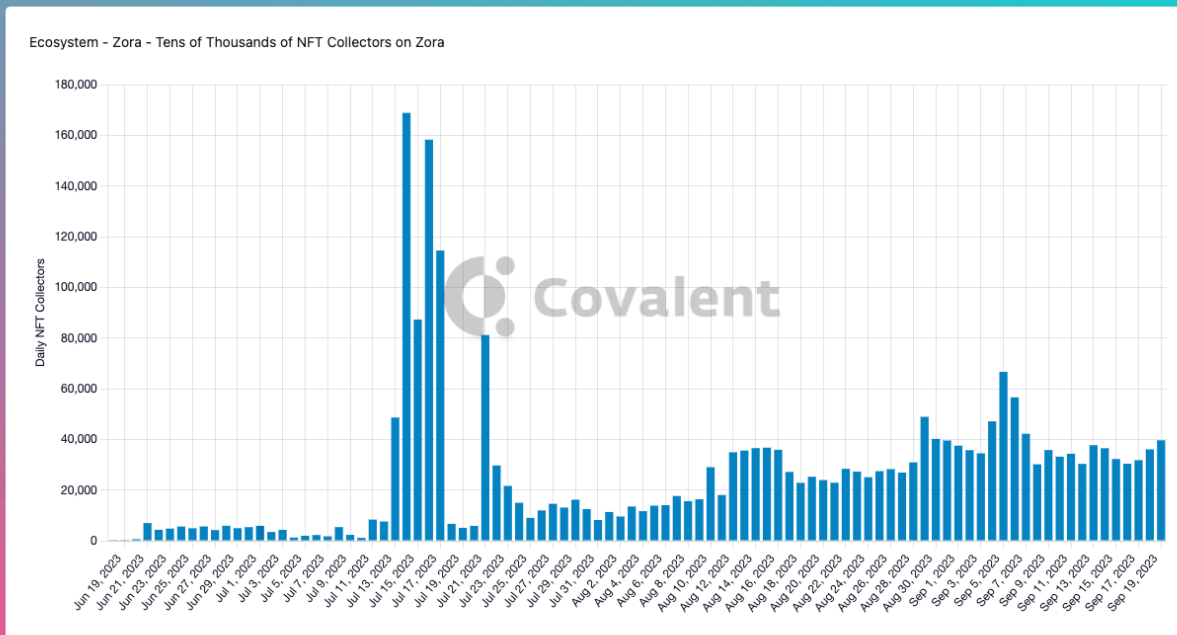


9 Zora Network

The **Zora Network** is a unique OP Chain, collaboratively developed by **Zora** and Conduit, aimed at supporting NFT creators, collectors, and applications. In contrast to many L2s that predominantly focus on DeFi, the Zora Network cultivates an ecosystem that puts NFTs first, with a focus on bringing culture and creativity onchain. Zora offers a **toolkit** enabling creators to transform artworks, songs, videos, podcasts, animations, or memes into NFT collections.

Since its inception, the Zora Network has been a bustling hub of NFT activities. It has had over 4 million ERC-721 tokens minted onchain and more than 828,000 addresses collecting Zora NFTs, highlighting the extensive reach and impact of Zora in the NFT landscape.



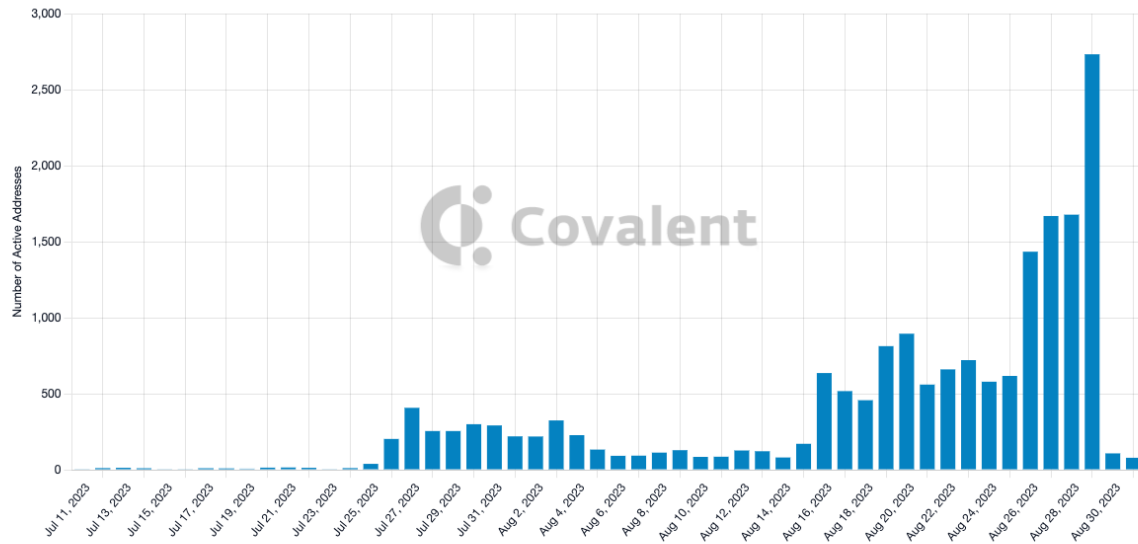


10 Public Goods Network

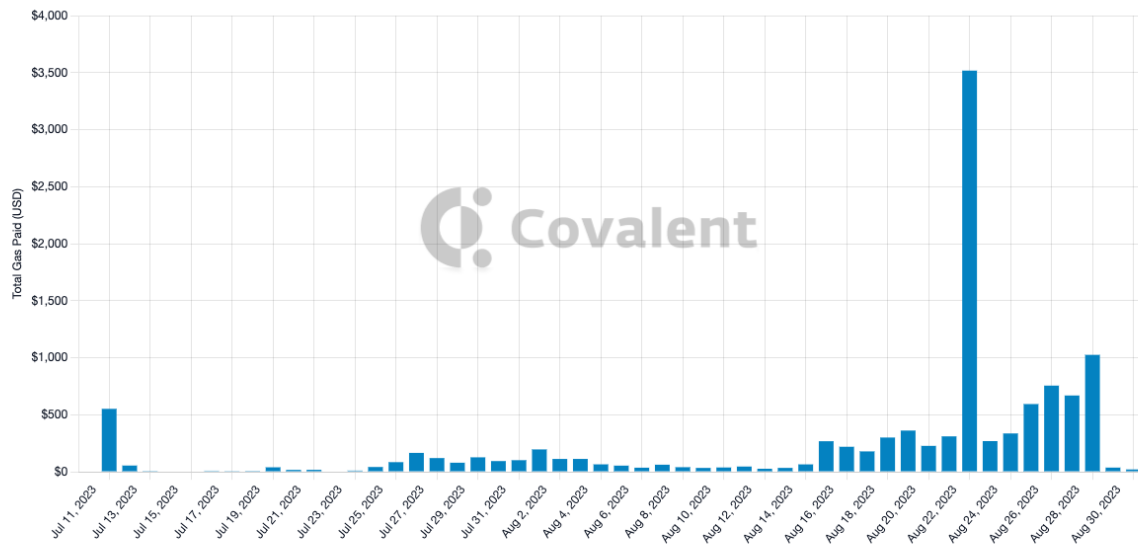
The **Public Goods Network (PGN)** stands as another unique OP Chain, incubated by **Gitcoin** and Conduit with the mission of creating durable and recurring funding mechanisms for public goods within the Ethereum ecosystem and beyond. It distinguishes itself as the only L2 where the **vast majority of net sequencer fees are allocated to projects focused on building or supporting public goods**. Gitcoin’s **GG18** grants included the first round on PGN. Within GG18, this was the second biggest round, totaling over 12,000 unique donors, \$124,000 donated, and 67,700 donations.

Towards the end of August, PGN witnessed a surge in the number of daily active addresses on the network, resulting in a corresponding increase in gas revenue generated. This revenue will be used to further the development of public goods, showcasing PGN’s commitment to a collective future where public goods funding is abundant and sustainable.

Ecosystem - PGN - PGN Active Addresses



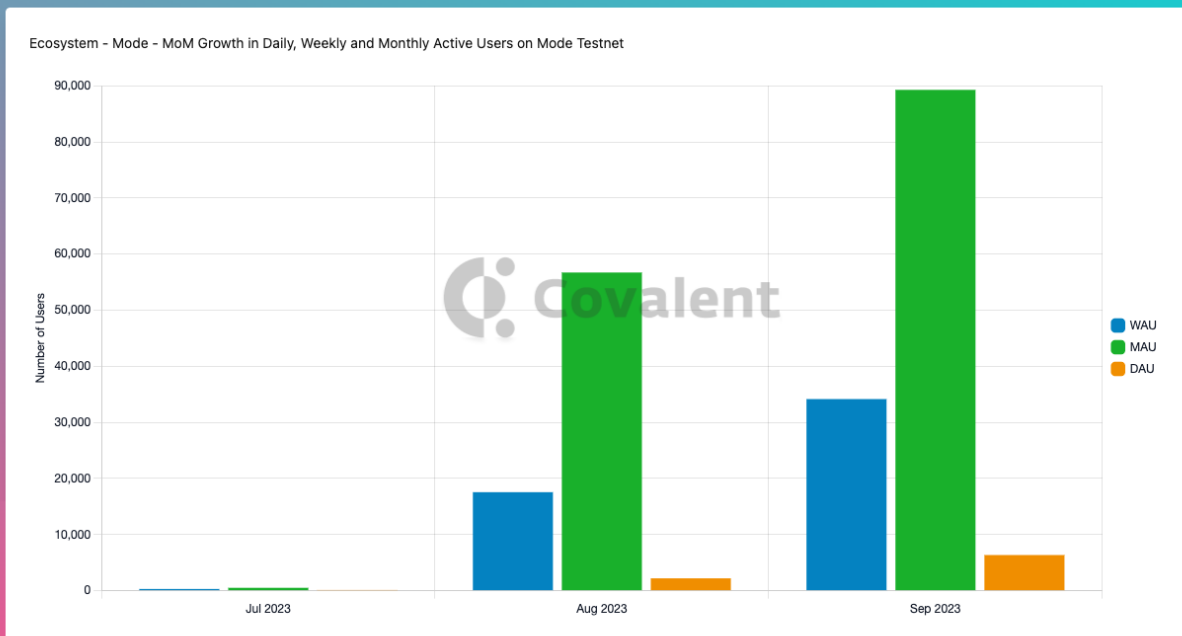
Ecosystem - PGN - PGN Experienced A Great Increase in Gas Revenue

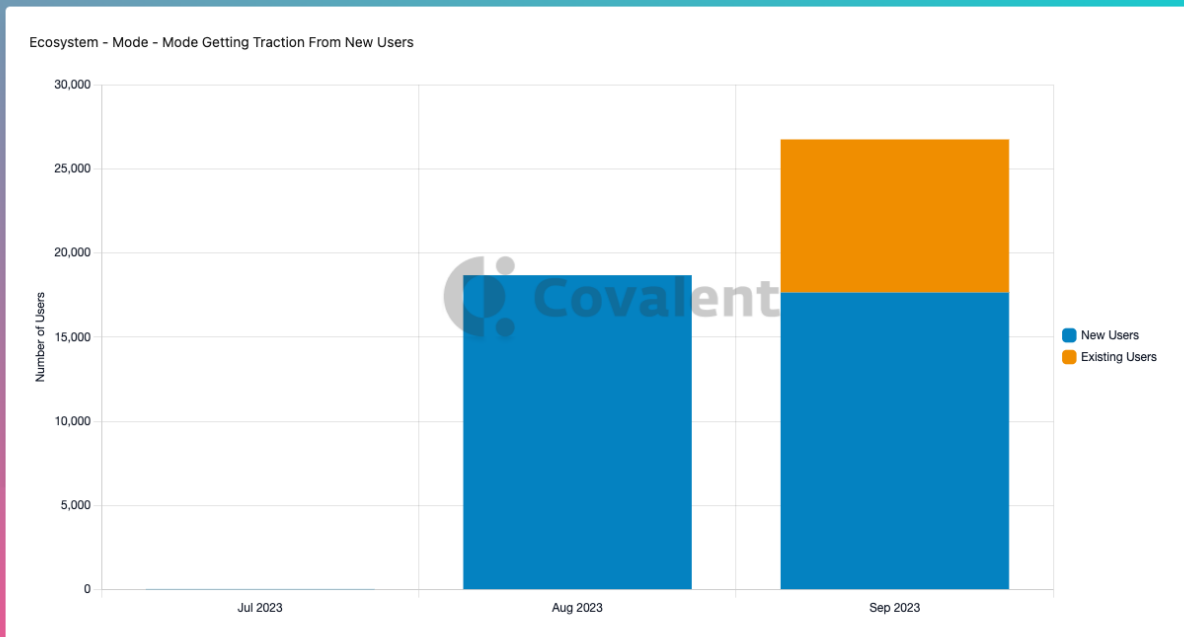


11 Mode

Mode is a growth-first OP Chain powered by Conduit that **directly rewards users, developers, and protocols for fueling the growth of Mode and the broader Superchain ecosystem**. Mode's ambitious goal is to build **onchain frameworks** that redefine the ecosystem growth playbook by distributing network sequencer profits instantly to contributors and offering developers a new way to earn from their smart contracts.

Drawing from growth strategies honed over two decades in the tech and crypto sectors, Mode's Testnet has seen substantial increases in daily, weekly, and monthly address activities. As of mid-September, the influx of active addresses has already surpassed the total for August, primarily driven by new users while maintaining a strong foundation of returning users.





12 Lyra Chain

Lyra is the most sophisticated derivatives protocol ever built that is now scaling through an OP Chain with the help of Conduit. Through the **Lyra Chain**, the **Lyra DAO** not only creates a new economic model for itself, earning ETH transaction fees from sequencing, but also recreates the centralized exchange (CEX) experience entirely onchain. This further highlights the versatility of the modular and open-source OP Stack codebase as more dapps choose to harness its capabilities for their bespoke OP Chains.

13 Ancient8 Chain

Originating as a gaming guild, **Ancient8** deployed an OP Chain in partnership with Conduit that is laser-focused on gaming. The **Ancient8 Chain** aims to fill the gap in blockchain infrastructure essential for onchain gaming by providing a suite of services to help studios develop, launch, and market onchain games. Utilizing the modular architecture of the OP Stack codebase ensures not only interoperability but also compatibility with the Superchain, allowing for more integrations in the gaming space.

14 The Expanding Universe of OP Stack Forks

While we've gone over existing OP Chains, it's crucial to understand that the Superchain ecosystem is continuously expanding, thanks to the guidelines established by the Law of Chains. Numerous other **OP Stack Forks** exist – these refer to chains built using the MIT-licensed OP Stack but do not operate under Optimism's governance nor contribute sequencer revenue back to the Optimism Collective, thereby not members of the Superchain.

This idea of **appchains and app-specific rollups** isn't new. However, what sets the OP Stack apart is that it is bringing them to the Ethereum Virtual Machine (EVM), where the lion's share of user activity and integrations are. This compatibility with wallets, validators, bridges, and nodes in the EVM landscape magnifies the reach and impact of each OP Stack Fork.

Additionally, it's important to take into account Optimism's community-building efforts. In today's L2 landscape, having the best technology is not sufficient; without attracting developers, projects, and users, an ecosystem risks irrelevance and failure. The enduring value of the OP Stack is its ability to capitalize on its **network effects**. Therefore, the OP Stack is more than just a technological play – it's also a community play.

Within this year alone, Base, Zora Network, Public Goods Network, Mode, Lyra Chain, and Ancient8 Chain have joined the Superchain. But there are even more OP Stack Forks that exist, despite not inherently sharing security or interoperability with the Superchain:

- **opBNB**: the **BNB Chain** team adapted the OP Stack to optimize opBNB as a specialized L2 scaling solution tailored for the BNB Chain. opBNB offloads transaction processing and resource consumption while still posting data to the BNB Chain via its sequencers.
- **Mantle**: a modular rollup that forked the OVM codebase and then added a decentralized data availability layer, **MantleDA**, powered by **EigenLayer**'s technology, for enhanced scalability. EigenLayer is a re-staking protocol that leverages Ethereum's existing trust network to enable any rollup to guarantee data availability to its execution layer.
- **Metis Andromeda**: a fork of the OVM codebase, Metis Andromeda's vision is to build a platform to facilitate the accommodation of businesses onto the blockchain through onchain entities known as **Decentralized Autonomous Companies (DACs)**. These DACs, much more powerful than DAOs, encompass functionalities such as payroll management, messaging, and ERP systems.
- **Boba Network**: one of the first OVM forks, Boba is multichain L2 that operates across multiple L1s and prioritizes integration with Web2. Boba's **Hybrid Compute** technology enables the onchain incorporation of Web2 external APIs for the first time, pulling in real-world data through a single atomic transaction.
- **Manta Pacific**: an OP Stack fork delivered through Caldera and leverages **Celestia** for data availability, Manta Pacific is building a multi-modular ecosystem designed for zk applications that emphasize

privacy. It utilizes **Universal Circuits** to streamline zk coding for Solidity developers, providing a platform where privacy and innovation converge.

- **Kinto**: a fork of the OP Stack, Kinto positions itself as the safe L2 specifically tailored for financial services, integrating **KYC measures**. It aspires to be a chain where institutions can effortlessly meet counterparty requirements, retail users can benefit from inherent insurance at the chain level, and Real-World Assets (RWA) and securities can be brought onchain.
- **Loot Chain**: an OP Stack Fork created by the **Adventure Gold (AGLD) DAO** and Caldera, the Loot Chain aims to be the go-to chain for crafting games, tools, and self-governing realms within the Lootverse. Recognizing that the high gas fees on Ethereum hinder the Lootverse's growth, the Loot Chain will be a new home for builders within the Lootverse.
- **Celo**: after extensive research and initial discussions with members of the Celo and Ethereum communities, Celo will be **transitioning from an EVM-compatible L1 to an L2 utilizing the OP Stack**. Celo is following Mantle's footsteps by becoming the second rollup to partner with EigenLayer for data availability, opting for this over ETH call data, leading to reduced transaction fees for users.
- **Aevo**: an OP Stack Fork built by **Ribbon** and Conduit, Aevo is a decentralized options exchange that aims to bring more traders onchain. Launching their own chain has enabled them to have a dedicated gas environment suitable for a high-throughput exchange and to offer a user experience that is familiar for traders accustomed to traditional finance.
- **DeBank Chain**: widely recognized for its **portfolio tracker**, DeBank is launching an OP Stack Fork due to the revenue potential and the ability to customize user experience at the protocol level. The DeBank Chain will primarily focus on reducing gas fees and providing a native, intuitive Account-Abstraction-like experience.
- **Molten Network**: dedicated for **UniDex Exchange's** perpetual aggregator, the Molten Network is a new OP Stack Fork that aims to deliver a smooth and desirable trading experience. This design choice not only allows them to customize their user experience but also significantly reduces transaction fees while maintaining the same level of security.
- **Rollux**: a fork of the OP Stack, Rollux is the first rollup secured by Bitcoin which runs on **Syscoin**. The Rollux Suite is designed to support a diverse range of rollups, with the goal of integrating both optimistic and zk rollups as L2 solutions on top of the Syscoin ecosystem.

15 Concluding Thoughts

As the **narrative surrounding L2s** continues to gain momentum, it becomes increasingly clear that L2s will dominate the next cycle as L1s did in the previous cycle. Unlike L1s, which rely on new and often less reliable trust assumptions, L2s inherit the established security of Ethereum and also offer lower transaction fees and faster finality.

The OP Stack's open-source, battle-hardened, and Ethereum-aligned L2 codebase has fundamentally simplified the process of launching rollups. Self-serve Rollup-as-a-Service (RaaS) platforms like **Conduit** and **Caldera** have taken it a step further by offering plug-and-play capabilities, transforming what was once a complicated process into a streamlined, one-click operation. The OP Stack is not just a marginal improvement – it's a quantum leap in accelerating the development of L2s.

The OP Stack, however, is not alone. It is part of a broader L2 movement that includes other formidable players like Polygon, Arbitrum, and zkSync, each launching their own unique scaling solutions. The wide range of options – from the **Polygon CDK** to **Arbitrum Orbit L3s** and **zkSync Hyperchains** – empowers anyone to create a customized environment that serves their unique objectives. In this context, launching a new rollup is as straightforward as creating a new website.

As the so-called **L2 wars** heat up, it's essential to remember the overarching mission: **transitioning from an internet dominated by profit-maximizing corporations to one governed by decentralized, open-source principles**. This shift is propelled by pressing challenges – ranging from global coordination failures to the need for enhanced public goods funding. Within this grand tapestry, the OP Stack and the Superchain serve as indispensable tools that can help our society align impact with profit.

16 Quote from the Optimism Collective

“OP Mainnet has saved Ethereum users billions in fees. But Ethereum still doesn't have internet-level scale. We need a multi-chain solution that doesn't fracture our ecosystems, our applications, or our ability to work together. The Superchain is a horizontally scalable network of chains that share security, a communication layer, and an open source development stack. A permissionless system for deploying new chains to a shared network opens the door to massive scale, novel applications, and a new revenue model that rewards application developers for the fees their chains generate, and rewards protocol developers for the public goods they create.”

17 Quote from Jesse Pollak, Contributor #1 at Base

“We chose to build Base on the OP Stack because of Optimism's alignment with Ethereum's values of decentralization and unification of all rollup architectures.”

18 Quote from Zora

“Zora's mission is to make creating on the internet free and valuable. Zora designs for people as creators, not products. We believe more creative sovereignty reveals the inherent value in all ideas rather than extracting value from them. The internet is our collective infinite garden. Our creativity should not be locked in but be free to flourish in systems where we imagine, create, and win, together.”

19 Quote from Nicole d’Avis, Protocol Lead at Public Goods Network

“PGN is a natural evolution in exploring how we generate funding in the digital realm for public goods. As our work and social lives transcend physical boundaries, so too will we need to extend our thinking beyond traditional public goods funding models. PGN is a first step in this process, and welcoming Covalent to PGN ensures strong and dependable data infrastructure necessary to continue scaling our ecosystem.”

20 Quote from James Ross, Founder at Mode

“Our collaboration with Covalent now enables developers to tap into the power of Mode, with the ability to build complex apps, explore on-chain trends, and easily create advanced data queries through Covalent’s unique API services. This means the focus can be on building the best applications and user experiences rather than worrying about reliable back end tools for integration. This is more important than ever for developers on Mode because of sequencer fee sharing (SFS) at the protocol layer. Applications and users that scale the Mode blockchain and build a strong user base for the ever-expanding Superchain ecosystem, will directly receive a proportion of network sequencer profits from the Mode network. Mode is hyper-focused on creating the best possible experience and onboarding process for both users and builders.”

21 Quote from Ganesh Swami, Co-Founder and CEO at Covalent

“The OP Stack has pioneered the foundational building blocks for crafting more expressive rollups, embodying Ethereum’s inherent vision of achieving scalability through modularity. It’s a privilege to collaborate with the Optimism Collective, contributing to an open-source rollup ecosystem that will one day be a Superchain unifying hundreds of OP Chains.”

Written by David Tso