galaxy | Research

The Rise of Rollups

Rapid Growth of New Chains and the Future of RaaS

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

Ethereum vs. L2s (cumulative): Daily Txs (30d-MA)
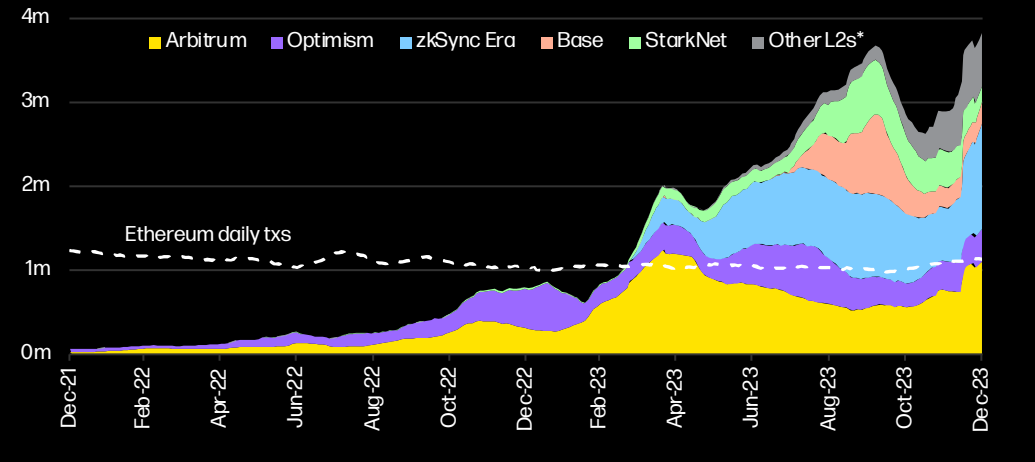
Ethereum Gas Spent by L2s vs. % of all Gas
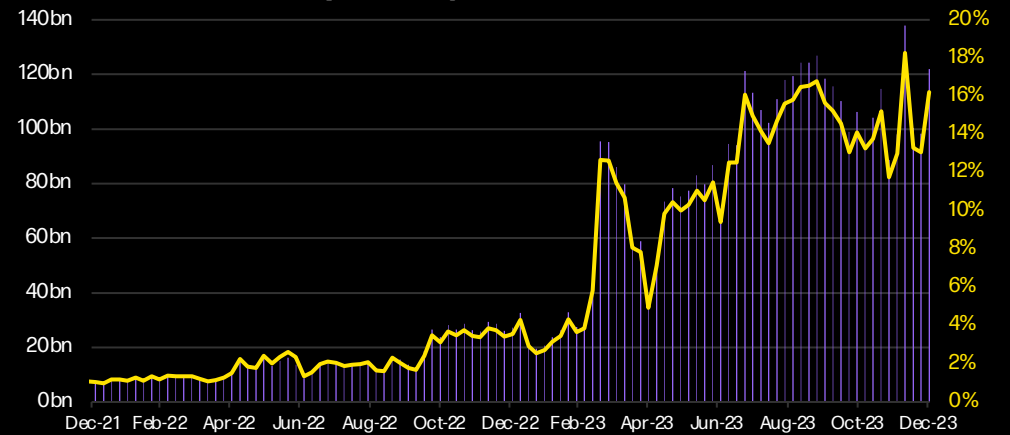
Rollup frameworks enable developers to deploy customized app-chains around L2 networks.

	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.

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.