

Caldera Whitepaper

Abstract

This document propose the Metalayer, a unifying layer for Ethereum rollups to foster enhanced coordination, communication, and resource sharing among blockchains across the ZK and Optimistic frameworks. Web3 is a technological movement on a mission to realize the long-lost dream of the original creators of the internet. It takes inspiration from a vision of a decentralized web, where information and value flow without any central entity controlling its movement.

Ethereum has emerged as the de facto substrate of choice for developers to build this new internet of value. Since adopting a rollups-for-scaling roadmap, the Ethereum ecosystem has experienced rapid growth and innovation. However, the modular nature of Ethereum rollups, each with its own stack implementation and unique architecture design, has led to fragmentation and inefficiencies. The Metalayer empowers rollups across all leading frameworks to enjoy seamless inter-rollup connectivity, shared security and scalability while maintaining their unique identity and technical advantages.

About Caldera

Caldera is a leading rollup platform on Ethereum. Created with the core insight that just attempting to make a single faster blockchain wasn't the best solution, Caldera was founded to enable Ethereum to reach true web-scale via horizontal scaling.

In 2023, the Caldera platform was launched. With the RaaS platform, projects could deploy a rollup with a single click, without an engineering team. We took care of deployment, customization, ongoing maintenance, and security, so projects could focus on building their vision.

Today, Caldera is one of the fastest growing rollup ecosystems in the world. Caldera empowers web3 teams to customize and launch over 60 high-performance rollups across a number of app categories, and projects have free reign to launch their rollup on Optimism, Arbitrum, ZKsync, and Polygon stacks.

At present, the Caldera ecosystem comprises 1.8 million unique wallets holding over \$550 million in TVL, with more than 80 million completed transactions. Some notable chains in our ecosystem include Manta Pacific, inEVM by Injective, ApeChain, Treasure, Plume Network, Towns, Kinto, RARI Chain, and Zero Network by Zerion.

The Problem Ahead

Rollups are helping to scale Ethereum, but they are still fragmented, with isolated liquidity and disparate communities. It's clear that there is a massive opportunity to bridge these siloed ecosystems and create a unified layer for rollups across different frameworks.

1.1 The Internet

Before the Internet reached its present global scale, it had to navigate around a critical challenge: the absence of native connectivity between various networks, systems, and protocols. Developers had to develop multiple versions of each website to ensure compatibility with different browsers; email providers utilized their own proprietary protocols and often struggled to communicate with each other, resulting in days-long delays in email delivery. These challenges limited the Internet's relevance outside of professional and governmental use. It wasn't until the development of connectivity layers that bridged disparate protocols to communicate with each other that we saw the complexity of internet use abstracted away from the users.

1.2 Ethereum

The Ethereum blockchain has emerged as the leading substrate for reimagining a new internet of value. Today, thousands of applications and protocols utilize Ethereum's distributed network for censorship-resistance and its virtual machine for cloud computing. Projects on Ethereum hold over \$60B in user assets and are attracting top developers from around the world to solve the most challenging societal problems like the sickening business models of Meta and Google, the restrictive nature of banking, and the user exploitation by telecom monopolies. However, Ethereum still has a long way to go and will need to grow its ecosystem 20-25x to be comparable to the Internet. To significantly improve the network's transaction throughput, reduce fees, and enhance the overall scalability while maintaining decentralization and security, Ethereum has publicly adopted a rollup-centric roadmap that encourages Layer 2 scaling solutions, particularly rollups. Rollups process transactions off the Ethereum layer 1, and only interact with it to post the final transaction data for security and finality. This has resulted

in hundreds of new rollups, each competing against another for users, liquidity, developers and more. This fragmentation results in:

- Isolated “city-states” of rollups with restricted connectivity
- Inefficient asset and data flow between different rollup environments
- Complexities for users and developers navigating multiple rollup ecosystems
- Misaligned business incentives to create siloes and walled gardens to lock users in.

Ethereum needs a unifying solution that preserves the benefits of modular rollups, while enabling seamless connectivity and collaboration.

The Solution: The Metalayer

The Caldera Metalayer is a unifying layer for all Ethereum rollups. Each rollup has its unique implementation design, tech stack, and ecosystem. The Metalayer enables the rollups to coordinate, communicate, and share resources seamlessly without compromising their individual characteristics. At its core, the Metalayer is:

- A builder platform
- An ecosystem
- A coordination/economic engine

Metalayer: The Builder Platform

First and foremost, the Metalayer is a platform for builders who are building the next generation of this new Internet, which prioritizes creativity, innovation, and freedom. Web3 protocols and dApps are struggling to deliver mass-market products and services in the current blockchain landscape because it requires them to compromise on user experience (UX) to achieve more control over their block space. This reclaiming of blockspace is crucial for them to ensure enhanced, reliable performance, flexible customizability, and high security.

Just like dApp developers, web3 infrastructure providers face increasing challenges in supporting diverse dApps and protocols, each with their unique rollup implementation, service offering, and disparate, disconnected user communities.

The Metalayer builder platform elevates the developer experience on Ethereum with its builder-friendly features, like :

- **Message Passing and Relaying:** Facilitates efficient communication between rollups enabling development of novel multi-rollup applications.
- **Fast Finality and Preconfirmations:** Enhances transaction speed and security delivering web-2 like user experiences.
- **Guardian Nodes:** Provides additional security and community participation to rollups, allowing web3 teams to enshrine Ethereum's decentralization values at the network level.
- **Native Yield:** Delivers the building block for seeding ecosystem-native economies where value accrued is distributed among the most passionate and dedicated stakeholders.

The Metalayer empowers developers to build high-performance, user-friendly applications by leveraging the strengths of different rollups while mitigating their individual limitations.

The Breakthrough: Unified Networking Protocols

The development and widespread adoption of standardized networking protocols, such as TCP/IP, played a crucial role in overcoming the scalability and user-adoption challenges of the early internet.challenges. These protocols provided a common language for different networks and systems to communicate, ensuring reliable and efficient data exchange. Key developments during this period included:

- **Standardization:** The adoption of standardized protocols like TCP/IP allowed different networks to interconnect and communicate seamlessly. This standardization was instrumental in enabling the growth of the internet as a global network.
- **Middleware Solutions:** Technologies such as middleware and integration platforms emerged to bridge the gap between disparate systems, enabling interoperability and data exchange. These solutions played a crucial role in integrating legacy systems with modern internet technologies.
- **Unified Communication Standards:** Efforts to create unified communication standards, such as the Internet Engineering Task Force (IETF) and World Wide Web Consortium (W3C), helped establish common guidelines and protocols for internet communication and data exchange.

Much like the early stages of the internet, the Ethereum community has made tremendous progress but still has a long way to go. Ethereum– and the blockchain space more broadly – has coalesced around rollups as the end-state scaling solution.

Since its pivot to a rollup-centric roadmap in 2020, over \$38.5 Billion of value has been transferred into Ethereum L2s and L3s. Today, L2s account for about 10x as many transactions as occur on Ethereum mainnet directly.

Rollup proliferation has been bolstered by new innovations across the stack. Modular data availability layers – notably Celestia, EigenDA, Avail, and NearDA – have reduced costs (and therefore barrier to entry) to launch new blockchains. Rollup stack developers like Arbitrum, Optimism, zkSync, and Polygon offer out-of-the-box, increasingly customizable solutions for rollup development. And with these tools, Caldera has been able to provide a seamless rollup deployment and hosting service for 50+ teams, constituting \$1B of TVL.

As the number of rollups increase, however, the problems in the space become more apparent: Ethereum rollups, despite sharing a settlement layer, are **isolated**:

- **Isolated from each other**: rollups only have “native” interoperability via the Ethereum L1. Using the L1 for cross-rollup interoperability is expensive, and extremely slow
- **Isolated from other infrastructure**: building infra (for example, a bridge or oracle) for rollups currently requires maintaining several deployments, treating each chain as an island
- **Isolated from their users**, who cannot meaningfully participate in rollup network operations or validation

These problems threaten the Ethereum ecosystem’s viability as a new internet. As the space fragments across an increasingly large set of rollups, it becomes increasingly difficult to meaningfully transfer value and develop protocols across chains.

Much like a public utility grid supplies reliable electricity to diverse households and businesses, the Metalayer offers a consistent and efficient infrastructure for all rollups. It connects heterogeneous rollup chains, enabling the free flow of assets and data, and fostering an inclusive and scalable environment. The Metalayer is designed to evolve with the ecosystem, supporting its growth while maintaining the unique characteristics of each rollup.

By offering core functionalities such as message passing, fast finality, and guardian nodes, the Metalayer enhances the performance and reliability of rollups. It empowers developers to build innovative applications, driving mass adoption and realizing the full potential of the blockchain ecosystem. The Metalayer is not just another interoperability protocol; it is the backbone of a connected, efficient, and inclusive Ethereum rollup ecosystem, paving the way for a more integrated and prosperous future.

Metalayer Technical Design

The metalayer enables contracts to interact with other chains by reading data, executing calls, and sending transactions to them. The core primitives of the design for the metalayer will be a message passing system and a fast finality system with support for preconfirmations. All other parts of the metalayer will build on top of these two systems.

The message passing system will leverage a decentralized validator network to relay messages from a source chain to a destination chain. We will have multiple trusted third parties running validators with an M of N signing threshold. For this threshold, N will be greater than 2, ensuring that no one trusted party can neither unilaterally censor nor relay messages. In the future, the message passing system will incorporate an intents-based architecture to improve its efficiency without compromising on decentralization.

In addition to relaying messages initiated by users, the validators of the message passing layer will also post to all chains in the metalayer an aggregate hash of state roots of all chains in the metalayer. This hash allows users on one chain to submit a Merkle proof of state on any other chain in the metalayer, allowing state access from any other chain.

Signatures from the validator network will be verified on-chain to ensure that any message passed through the network has accumulated enough signatures to exceed the signing threshold.

A New \$ERA: The Caldera Token

As the Ethereum ecosystem expands into an increasingly large number of rollups, rollup abstraction becomes increasingly important. Caldera's metalayer is the rollup abstraction layer.

Caldera's native utility and governance token, \$ERA, serves to power this layer.

Utility

Omnichain gas token

\$ERA is used as the standard gas token for operations on the metalayer. On the metalayer, transactions that initiate cross-chain interactions, as well as data propagations across chains, will incur a fee denominated in \$ERA.

Staking and Subnets

Nodes that wish to participate in the Metalayer will be required to stake \$ERA. A proof-of-stake or restaking consensus mechanism on these \$ERA tokens will be run, such that a node's participation in the metalayer will be relative to the amount of \$ERA tokens staked or delegated to that node.

Utility-specific subnetworks may be created atop or alongside the metalayer, in order to provide specific functions to rollups. For example, a subnet might be created to generate and propagate zero-knowledge proofs on-chain, for rollups that require them. These networks will also use the \$ERA token to power proof-of-stake consensus.

Governance

\$ERA token holders have the opportunity to participate in on-chain governance of the Caldera metalayer protocol, chains launched with the Caldera platform, and beyond. Concretely, \$ERA token holders will be able to vote on the following through governance:

Protocol Upgrades

All upgrades or changes to the Caldera metalayer protocol will be governed by an on-chain vote of the Caldera DAO.

Proposals

\$ERA holders will have the ability to both create and vote on CIPs (Caldera Improvement Proposals) submitted to the DAO. These proposals can cover decisions surrounding treasury use, grants, the Caldera brand and IP, among others.

Foundation Directors

\$ERA holders will have some ability to affect the directors of the Caldera Foundation, a Cayman Islands foundation company.

Special Council

On occasion, there will be a DAO-wide vote to determine which DAO members will serve on a special council on the Caldera Foundation. The purpose of the council is to administer DAO proposals and serve the vision of the community, as well as making discretionary decisions regarding the foundation as appropriate.

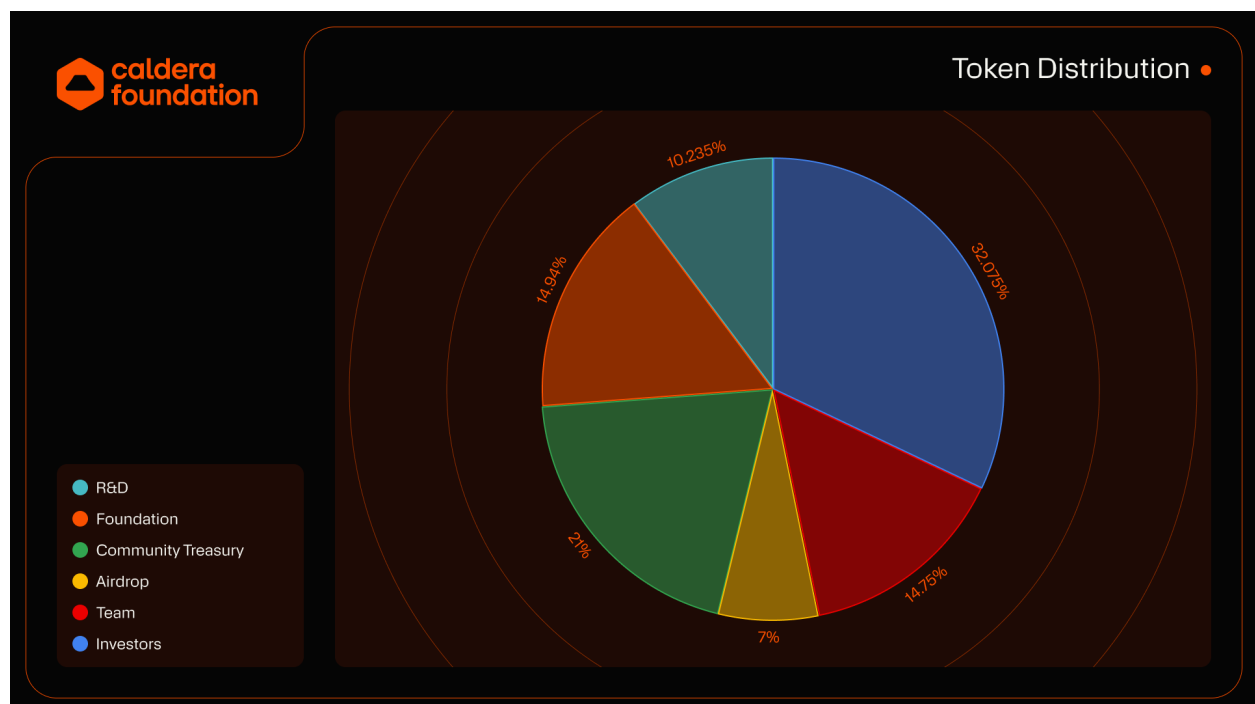
Special council elections will occur at least once per year, and elect members to fixed-length terms

Security Council

Tokenholders will additionally elect members of the security council, a group of technical experts to oversee mission-critical protocol upgrades in

The security council will optionally be made available as an option for rollups launched into the metalayer, as a pluggable security option for their chains. In doing so, new rollups on Ethereum can “rent” security from the Caldera DAO.

Token Distribution



Airdrops: 7.0%

- 8.0% of total supply will be distributed across airdrops to top Caldera community members, Caldera chain users, and participants on top layer twos.

Foundation (Community and Foundation Treasury): 35.94%

- Allocated directly to the Caldera foundation. These tokens will be additionally used by the foundation to help steward the Caldera protocol's success
- A significant portion of the tokens allocated to the foundation will be delegated to community (ie tokenholder) control, via a DAO

R&D: 10.235%

Tokens allocated to core developers for future research, development, and ecosystem initiatives, such as :

- Protocol maintenance and development
- Expanding the team size of core contributor(s)
- Programs for rollup developers, infrastructure, node operators, and more

Core Team: 14.75%

- Members of Constellation Labs, the first core contributor to Caldera

Investors: 32.075%

- Early investors of Constellation Labs, the first core contributor to Caldera. Across four funding rounds (pre-seed, seed, strategic, and Series A)

Unlock Schedule

