INTRODUCTION | Espresso

Overview

Espresso is a global confirmation layer designed to provide Layer 2 (L2) chains with fast and reliable transaction

confirmations backed by Byzantine Fault Tolerance (BFT) consensus.

Key Features

Fast Confirmations:

- Utilizes HotShot consensus protocol to confirm transactions within seconds. - Enables high-speed asset movement across

integrated chains with minimal risk.

Decentralized Sequencing:

- 100 nodes will operate the Espresso Network in a decentralized manner during Mainnet 0. - Rollups can opt for transaction

sequencing by these nodes instead of a centralized sequencer. - Plans to scale the number of nodes and enable permissionless proof-of-stake participation post-Mainnet 0.

Low-Cost Data Availability:

- Offers a cheaper alternative for data availability compared to Ethereum. - Provides strong data availability guarantees to enhance scalability for applications.

Integration Support

Espresso facilitates integration with various stacks, including:

- Arbitrum Orbit Chains
- Cartesi Applications
- OP Stack Chains
- Polygon CDK

Rollup Types Supported

- ZK Rollup
- Optimistic Rollup

Additional Information

Espresso's confirmation layer enhances cross-chain composability by providing near-instant access to reliable

information across all connected chains.

It helps prevent sequencer equivocation, protects against reorgs, and reduces finality risk in intent-based systems.

The network is currently in its Mainnet 0 release, supporting various applications.

Documentation and Resources

For detailed integration guides and further information on the inner workings of the Espresso Network, refer to the documentation section.

Conclusion:

Espresso is designed to enhance transaction speed, reliability, and scalability for various blockchain applications, making it a versatile solution for developers and chains looking for efficient confirmation and data availability solutions.

Espresso in the Modular Stack

How Espresso can optionally be used for data availability and sequencing

The Espresso Network has been designed with modularity in mind. We have seen that developers are best able to innovate when they have flexibility around designing their stack.

Espresso offers several benefits for chain operators and their developers to choose from:

- Confirmations: All chains that leverage Espresso benefit from fast, reliable confirmations—replacing the need for users, bridges, and beyond to depend on preconfirmations that come from centralized sequencers.
- Data availability: All chains using Espresso also benefit from highly efficient data availability offered by the Espresso Network. However, many of the chains that are using Espresso also choose to leverage another form of DA, such as EigenDA, Celestia, Avail, or Ethereum itself. We have designed Espresso to respect and to be additively compatible with these choices.
- Decentralized sequencing: Chains integrating Espresso may additionally use it as a decentralized sequencing layer, leveraging the network to determine the order of transactions on the chain. However, this is not required: chains that use their own sovereign sequencers to determine transaction ordering can still benefit from Espresso's confirmations. A few examples of how Ethereum rollups can use the Espresso network include:
- A standard rollup or validium that uses the L1 or an alternative data availability solution, leverages its own centralized sequencer, and settles to Ethereum may leverage Espresso for confirmations.
- A based rollup that uses Ethereum for DA, relies on the Ethereum proposer for sequencing, and looks to the L1 for settlement may also use Espresso for fast, reliable confirmations.
- A validium that leverages its own centralized sequencer can use Espresso for data availability and also for more robust confirmations than the preconfirmations that its sequencer could offer.
- A rollup or validium that wants to decentralize its sequencing without using the L1 proposer may use the Espresso leader as its sequencer for any given round and use Espresso for confirmations – while using its own choice of data availability.
- A rollup that uses Espresso for DA, sequencing, and confirmations is what we like to call a caffeinated chain.

While we only cover Ethereum rollups here, this also applies to sovereign rollups and beyond.