Celestia

Celestia offers a scalable modular data availability network that securely scales with user numbers, enabled by Data Availability Sampling (DAS). It facilitates the deployment of high-throughput and low-cost validium and sovereign rollups on Gelato. Layer 2 solutions utilize Celestia as a network for publishing transaction data, making it available for download by anyone.

Celestia DA layer key features

Dynamic Scaling

Celestia uses data availability sampling to enable scaling that increases with the number of users, ensuring dynamic adaptability to growing demands

Virtual Machine Flexibility

Offers the ability to choose any Virtual Machine, facilitating the development of applications with specialized features and diverse use-cases.

Ease of Deployment

Users can deploy their own L2 Blockchain quickly, with a simplicity comparable to deploying a smart contract.

Design Principles

Data Availability Sampling (DAS)

This process allows light nodes in Celestia to verify the availability of block data without downloading the entire block. Light nodes randomly sample small portions of the data, and if these samples are verified, it indicates that the full block's data is likely available. This method ensures efficient and scalable data verification.

Namespaced Merkle Trees (NMTs)

NMTs are used to organize block data into distinct sections (namespaces), each corresponding to different applications like rollups. They enable applications to download and verify only the data relevant to them, ignoring data from other applications. This system ensures that applications receive all the necessary data for their specific namespace.

Celestia with Gelato execution frameworks

Gelato integrates with Celestia so execution frameworks post the calldata to Celestia rather than directly on Ethereum. This reduces data storage costs significantly and enables higher transaction throughput making the roll-ups more attractive for applications that require high performance and lower fees.

Celestia x Arbitrum Orbit

Gelato's support Celestia integration with Arbitrum Orbit provides developers with an alternative data availability layer facilitating the launch of high-throughput, optimistic-powered Ethereum Layer 2 chains. This integration enables the deployment of Arbitrum Rollups using Celestia for data availability instead of Ethereum, scaling securely with numbers of users' with data availability sampling (DAS).

In the case of ERC20 transfer rollup transactions on OP stack with 1M transactions and an average callData size of 120 bytes, the expected cost is 122,413 while using Celestia for callData, the cost is significantly lower at 347, resulting in 99.74%% savings.

Celestia x OP Stack

Gelato's support for Celestia's integration with OP Stack facilitates the launch of high-throughput, optimistic-powered Ethereum Layer 2 chains made possible by Celestia’s data availability sampling (DAS). If Celestia experiences downtime or temporary unavailability, L2s can fallback to posting transactions as calldata on Ethereum or another DA layer to maintain data availability.

In the case of ERC20 transfer rollup transactions on OP stack with 1M transactions and an average callData size of 120 bytes, the expected cost is 78,558 while using Celestia for callData, the cost is significantly lower at 332, resulting in 99.61% savings.

Celestia x Polygon CDK

Gelato supports integration of Celestia's modular DA layer with Polygon CDK enabling the easy launch of high-throughput,

zero knowledge-powered Ethereum Layer 2 chains. This integration is poised to reduce Ethereum L2 transaction fees significantly and improve scalability through data availability sampling (DAS), where users can participate with a Celestia light node.

In the case of ERC20 transfer rollup transactions on OP stack with 1M transactions and an average callData size of 120 bytes, the expected cost is 65,315 while using Celestia for callData, the cost is significantly lower at 306, resulting in 99.53% savings.

Get more information aboutCelestia , orSchedule call to set up your custom Op Stack Gelato L2 testnet.

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