

Scaling Autonomous Worlds

Building the foundations... and sewers
for millions of inhabitants.

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What's on the menu

Context

Who are we and what problem are we trying to solve?

Design patterns

Explore problems faced by MUD apps and the design space to solve them.

Pushing the boundaries of latency

How these design patterns led us to a new system we're currently prototyping.

Lattice

A full stack Ethereum company

Autonomous Worlds

Extending the vision for what fully onchain games can enable.

MUD

Solidity framework to simplify the creation of complex onchain worlds.

Redstone

Ethereum L2 adding cheap Alt-DA to the OP Stack.

Platform

Running the chain, RPC and indexer services so builders can focus on their worlds.



Rollups

Blobs

Totals

TPS ⓘ

307.80
(22.63x)

Mgas/s ⓘ

67.72
(52.91x)

KB/s ⓘ

152.45
(24.20x)

Filters

Expand

| ◊ Network | ◊ Block | ◊ TPS | ◊ Mgas/s | ◊ KB/s | ◊ Stack | ◊ DA | ◊ Settlement |
|------------------------|-----------|-------|----------|--------|-----------|----------|--------------|
| *G2 ProofOfPlay - Apex | 64468042 | 14.9 | 14.98 | 11.46 | arb-nitro | anytrust | arbitrum |
| *G2 ProofOfPlay - Boss | 22791239 | 14.0 | 12.40 | 10.06 | arb-nitro | anytrust | arbitrum |
| Base | 22222754 | 43.8 | 9.41 | 33.09 | op-stack | blobs | ethereum |
| Xai | 56599775 | 88.7 | 6.18 | 19.95 | arb-nitro | anytrust | arbitrum |
| WINR Chain | 25119842 | 11.9 | 4.66 | 10.18 | arb-nitro | anytrust | arbitrum |
| Redstone | 9524896 | 1.1 | 3.71 | 2.15 | op-stack | plasma | ethereum |
| OP Mainnet | 127818052 | 10.7 | 3.52 | 6.81 | op-stack | blobs | ethereum |
| Blast | 11212533 | 5.7 | 2.79 | 4.64 | op-stack | blobs | ethereum |
| ArbitrumOne | 272923882 | 17.1 | 2.39 | 10.48 | arb-nitro | blobs | ethereum |
| Taiko | 550465 | 55.3 | 1.91 | 7.58 | taiko | blobs | ethereum |
| *G2 Gravity | 17225833 | 26.7 | 1.88 | 11.91 | arb-nitro | anytrust | ethereum |
| Ethereum | 21156701 | 13.6 | 1.28 | 6.30 | ethereum | ethereum | ethereum |

Onchain games are gas guzzlers

Applications



EVE Frontier

Large team. Lot of custom systems. Physics are offchain. Progressively bringing more logic onchain.



Biomes

Small team. Would rather focus on building the world than running infra. World physics onchain from day 1.



Sewage hackers

Requirements

Real time multiplayer

Writes can propagate fast enough so multiple clients have the same view of the state.

Low gas fees

Users can interact with the world without paying expensive transaction fees.

Ethereum/EVM compatible

No changes to the Ethereum protocol.

MUD native

Easy to use and integrate for MUD builders.

Redstone

Scaling data availability with op-plasma

op-plasma: sync derivation with DA challenge contract state #9682

Merged · trianglesphere merged 20 commits into [ethereum-optimism:develop](#) from [latticexyz:plasma-full](#) on Mar 12

Conversation 92 · Commits 20 · Checks 6 · Files changed 35 · +2,262 -98

tchardin commented on Feb 27 · Contributor

Description

This PR focused on op-node and batcher completes the op-plasma mvp. It syncs DA challenge events at every block during derivation and moves the finalized head based on DA finality. Further, it adds versioned commitment implementation to the DA client and input max size validation as according to the spec.

Tests

Most of the diff in this PR is test coverage:

- complete e2e tests in op-e2e
- unit tests of the plasma data source for testing the different pipeline events based on challenge expired or missing data
- unit tests of the DA manager state and finalisation signal.

Additional context

Please note that some additional changes to the system config will also be added in a separate contract focused PR. The contract address as well as plasma activation flag will be contained in the system config in order to switch DA layer easily.

In this PR we rely on a usePlasma flag in the rollup config which will be moved to the system config.

Metadata

- [Link to the spec](#)

🕒 tchardin requested review from [protolambda](#), [trianglesphere](#), [ajbutton](#) and a team as code owners 9 months ago

Reviewers

- coderabbitai[bot]
- trianglesphere
- clabby
- protolambda
- ajbutton
- maurelian

Assignees

No one assigned

Labels

None yet

Projects

None yet

Milestone

No milestone

Development

Successfully merging this pull request may close these issues.

None yet

Keep the L1 data fee cheap even as blob space fills up.

Redstone

Increasing OP-Stack derivation throughput

MUD application higher calldata usage uncovered the need for larger rollup derivation payload size limits during load testing.

OP Stack Specification

» Increasing MAX_RLP_BYTES_PER_CHANNEL and MAX_CHANNEL_BANK_SIZE

With Fjord, `MAX_RLP_BYTES_PER_CHANNEL` will be increased from 10,000,000 bytes to 100,000,000 bytes, and `MAX_CHANNEL_BANK_SIZE` will be increased from 100,000,000 bytes to 1,000,000,000 bytes.

The usage of `MAX_RLP_BYTES_PER_CHANNEL` is defined in [Channel Format](#). The usage of `MAX_CHANNEL_BANK_SIZE` is defined in [Channel Bank Pruning](#).

Span Batches previously had a limit `MAX_SPAN_BATCH_SIZE` which was equal to `MAX_RLP_BYTES_PER_CHANNEL`. Fjord creates a new constant `MAX_SPAN_BATCH_ELEMENT_COUNT` for the element count limit & removes `MAX_SPAN_BATCH_SIZE`. The size of the channel is still checked with `MAX_RLP_BYTES_PER_CHANNEL`.

The new value will be used when the timestamp of the L1 origin of the derivation pipeline \geq the Fjord activation timestamp.

Rationale

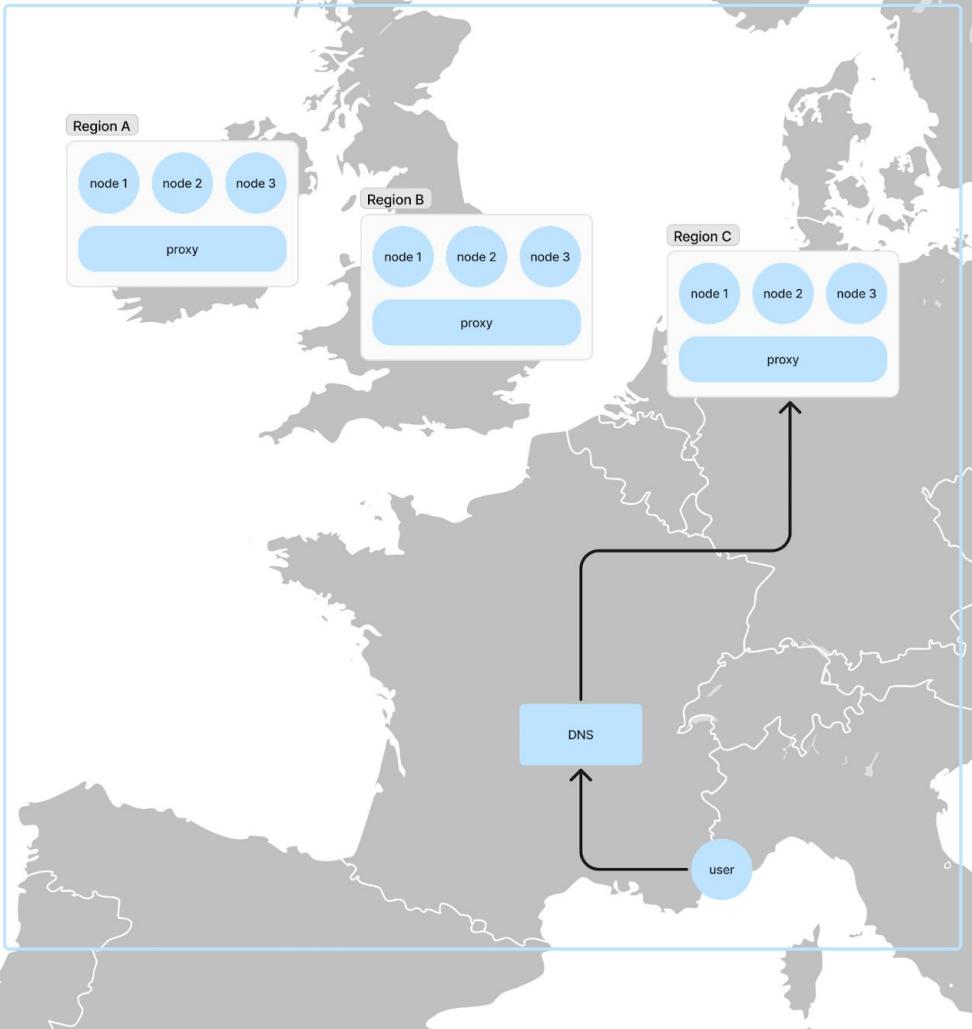
A block with a gas limit of 30 Million gas has a maximum theoretical size of 7.5 Megabytes by being filled up with transactions have only zeroes. Currently, a byte with the value `0` consumes 4 gas. If the block gas limit is raised above 40 Million gas, it is possible to create a block that is large than `MAX_RLP_BYTES_PER_CHANNEL`. L2 blocks cannot be split across channels which means that a block that is larger than `MAX_RLP_BYTES_PER_CHANNEL` cannot be batch submitted. By raising this limit to 100,000,000 bytes, we can batch submit blocks with a gas limit of up to 400 Million Gas. In addition, we are able to improve compression ratios by increasing the amount of data that can be inserted into a single channel. With 33% compression ratio over 6 blobs, we are currently submitting 2.2 MB of compressed data & 0.77 MB of uncompressed data per channel. This will allow use to use up to approximately 275 blobs per channel.

Raising `MAX_CHANNEL_BANK_SIZE` is helpful to ensure that we are able to process these larger channels. We retain the same ratio of 10 between `MAX_RLP_BYTES_PER_CHANNEL` and `MAX_CHANNEL_BANK_SIZE`.

RPC Proxy

Scaling the reads

We can add multiple nodes in different regions and balance RPC request load between them.



Indexer

Load the initial state faster from an indexer database

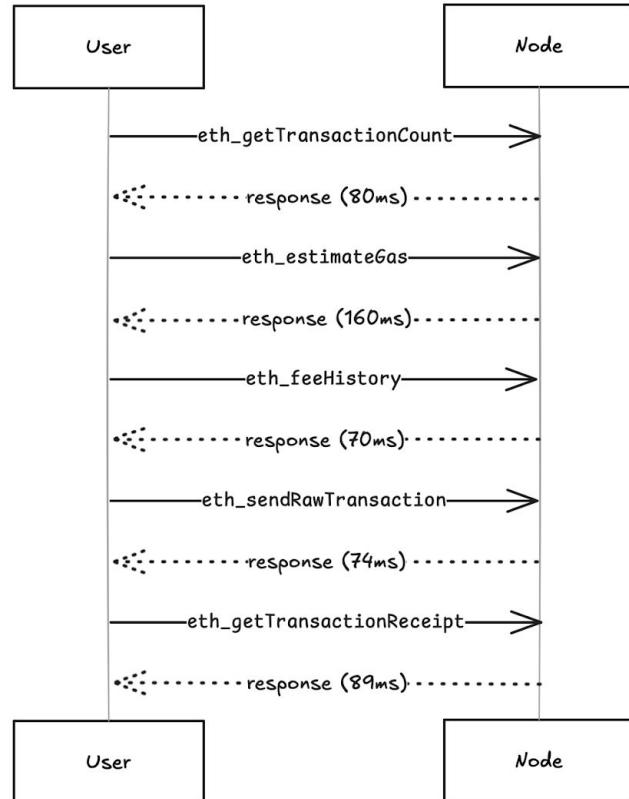
Only query what you need in order to display the app's initial load from a postgres database replicated in multiple regions. In collaboration with indexsupply.com.



MUD Client

Optimising the browser client

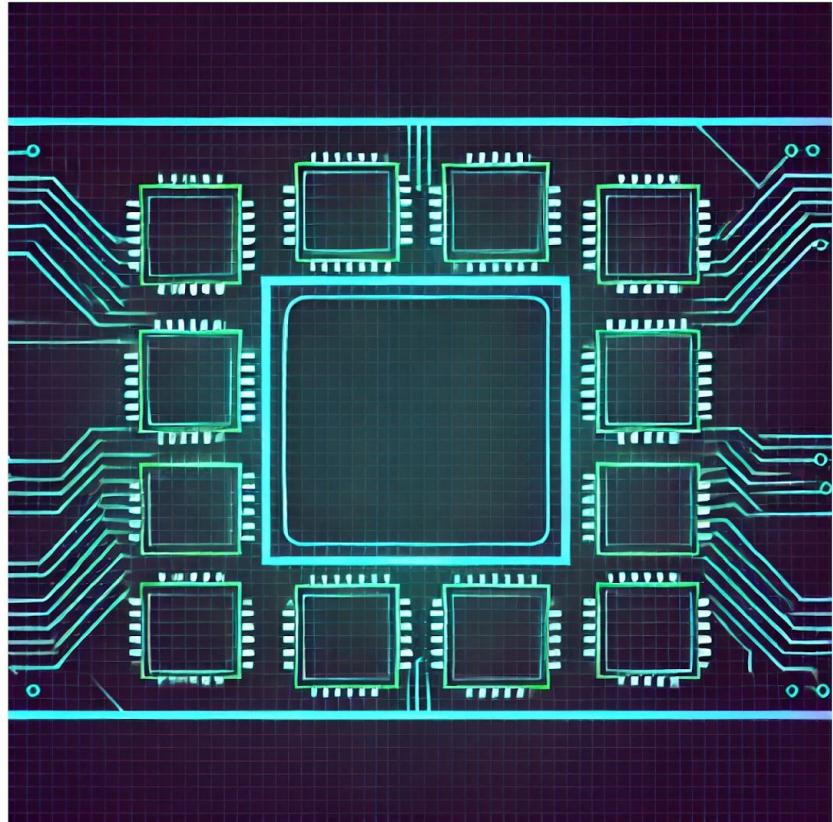
Reduce the number of roundtrips by pre-loading and caching the gas and tip values.



Block Building

Scaling the writes

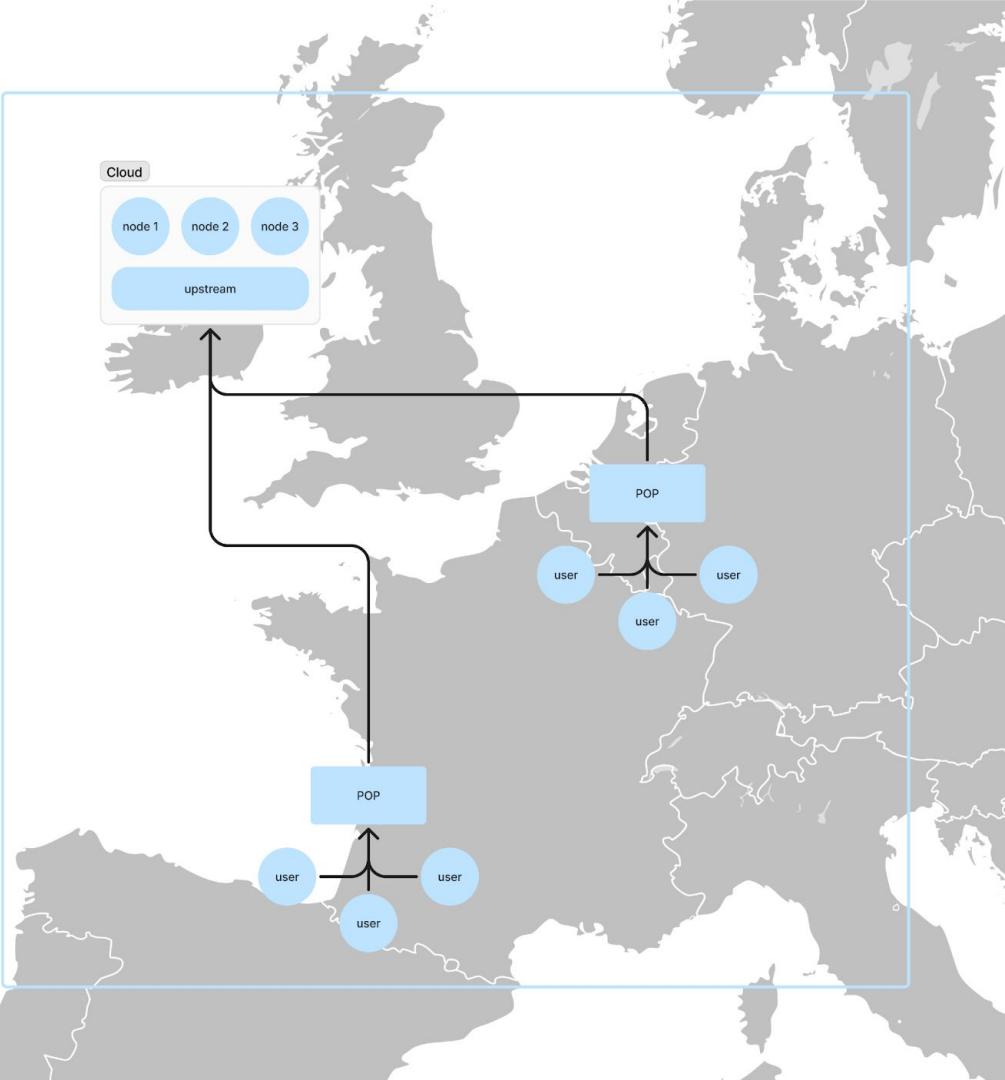
Can we speed up block building?



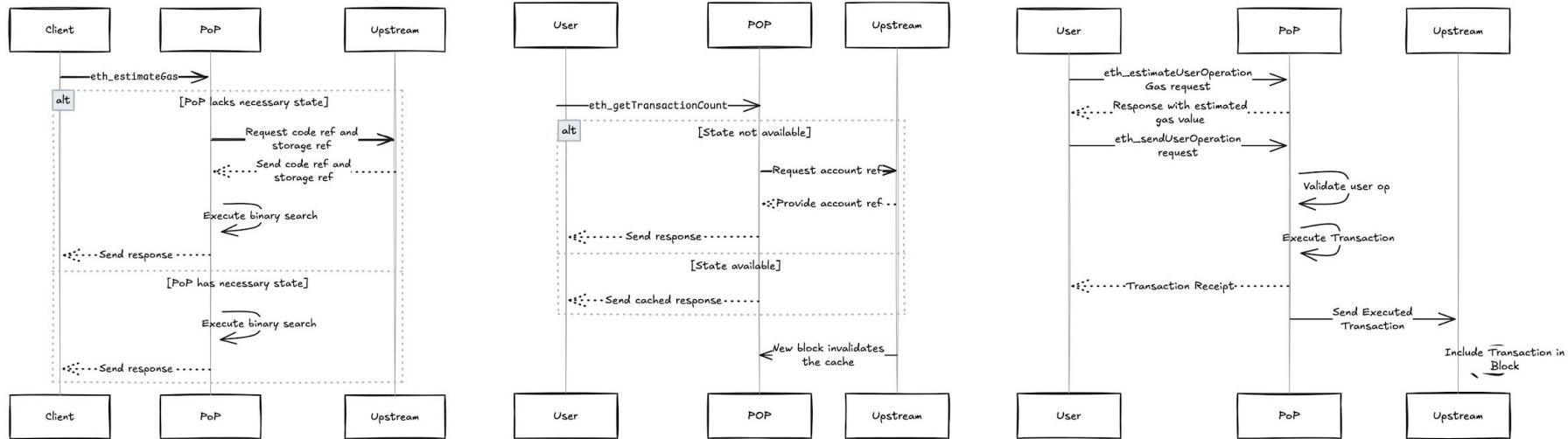
Edge

The MUD CDN

Execute transactions at the edge.



Things we can speed up



Estimate Gas

The point of presence only pulls the state it needs when the EVM executes the transaction during binary search.

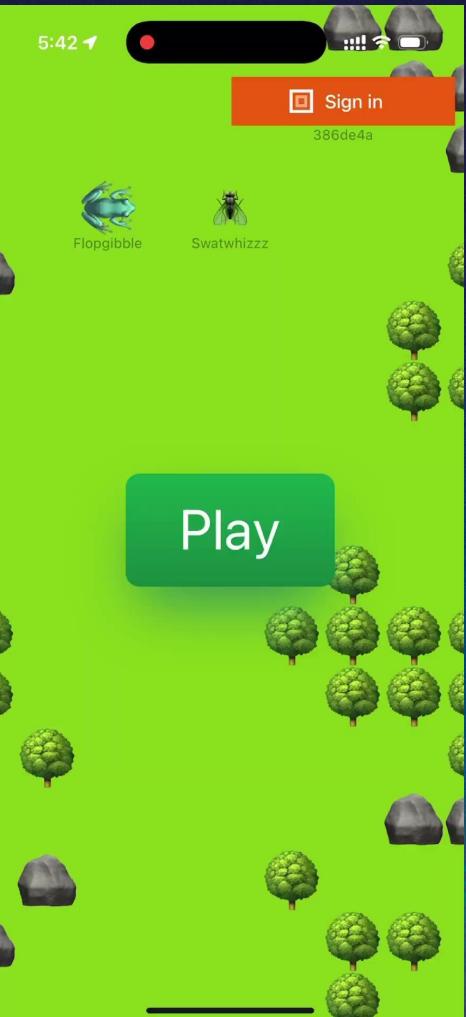
Nonce management

Caching and updating the account state on the edge increases speed when fetching the next nonce.

ERC4337 user op bundling

Validate user operations and sign transactions directly on the edge.

Demo



Thank you!

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