A Data-Availability Layer (DAL) for Tezos

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Scalability for Blockchains

- Execution scalability
- State scalability
- Bandwith scalability

Scalability for ~~Blockchains~~ Tezos

- Execution scalability ↪ enshrined rollups
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Rollups: TORU, SCORU, ZK-rollups

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- Execution scalability ↪ enshrined rollups
- State scalability ↪ enshrined rollups
- Bandwith scalability ↪ **Data-availability layer (DAL)**

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Vocabulary

In the following:

- L1 refers to the current chain in the Tezos protocol
- L2 refers to the implicit chains built by the rollups
- An L1 operation is an operation for the L1
- An L2 operation is an operation for the L2 dedicated to a particular rollup

Optimistic rollups

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4. The batch is included into a block by a baker
5. The operation can be executed by the rollup operator

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Consequences:

- Every L2 operation is included in an L1 block
- The bandwidth of all the nodes in the network becomes the limiting factor for scalability

The data-availability problem

- Safety of optimistic rollups depends on the availability of L2 operations
- Not including every L2 operation into an L1 block breaks down the bandwidth limiting factor
- If L2 operations are not in L1 blocks, how to guarantee the availability of L2 operations?

The data-availability layer

- A layer between the L1 and the L2 to ensure data-availability
- Permission-less and optional
- L2 operations only go through the data-availability layer

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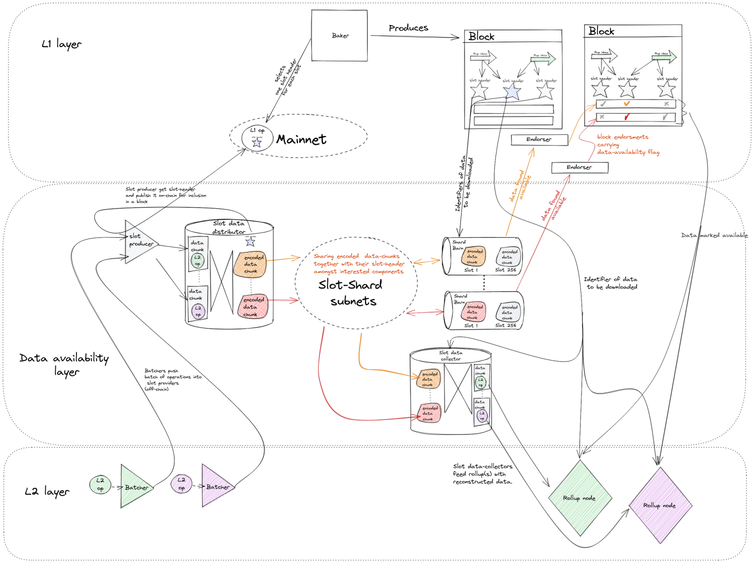
- The L1 uses those commitments of the stakeholders to decide whether the data is available
- If the data are available, it is the responsability of the rollup to download those data and execute the operations contained in it.

How it works: Big picture



Ensuring data-availability

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- Trusting the stakeholders of the L1
- Using also all the nodes of the L1

Data-availability is solely ensured by the stakeholders

Consequences:

- If enough endorsers lie, the L1 will declare the data as available while they are not.
- If enough endorsers are lazy (always declare data are unavailable), the DAL cannot be used.

Thanks to cryptography and erasure-codes, we only need 20% of honest stakeholders.

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This hypothesis can be mitigated using the sampling method:

- all the nodes of the L1 (regular nodes, indexers, stakeholders) sample the data onto the DAL
- A block is propagated only if:
    1. data are declared available by the protocol
    2. The sampling for this block succeeded (the fork chain rule is changed).

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- On how many levels should the nodes sample data? (bootstrapping could be stuck)
- How many samples a node needs to download at each level? What about a change of protocols?
- What should happen when sampling failed?
- What about an L1 network topology where all the bakers are a clique?

Bibliography

- A formal presentation of data-availability:
  `https://arxiv.org/pdf/1809.09044.pdf`
- The current in-progress specification for the Tezos DAL:
  `https://nomadic-labs.gitlab.io/das-design/`