

Sharding and the Ethereum Roadmap

July 21, 2026 · Document #340 · bip39-phrase.com



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Sharding is a database scaling technique that splits a network into smaller partitions, called shards, each capable of processing transactions and storing data independently. For Ethereum, sharding has been a long-discussed solution to its persistent throughput limitations, where the base layer historically processed only 15 to 30 transactions per second. The core idea is that instead of every node validating every transaction, nodes are assigned to specific shards, reducing the computational burden and increasing overall network capacity.

How Ethereum's Sharding Vision Evolved

Ethereum's original sharding roadmap, outlined before 2020, proposed 64 shard chains running in parallel alongside the Beacon Chain. Each shard would handle its own transactions and smart contract execution, with the Beacon Chain coordinating cross-shard communication and validator assignments. This design was complex, and execution sharding — where each shard runs the Ethereum Virtual Machine — proved technically difficult to implement safely without introducing new attack vectors.

The rise of rollups changed Ethereum's priorities significantly. Layer 2 rollups, including Optimism, Arbitrum, and zkSync, demonstrated that execution could be offloaded from the base layer while still inheriting Ethereum's security guarantees. This prompted Ethereum researchers, led by Vitalik Buterin, to pivot toward a rollup-centric roadmap where the base layer focuses on data availability rather than execution throughput.

Danksharding and EIP-4844

The current sharding approach is called Danksharding, named after researcher Dankrad Feist. Rather than sharding execution, Danksharding focuses on sharding data availability — specifically, the blob data that rollups post to Ethereum for verification. In this model, the base layer becomes a highly efficient data availability layer, while rollups handle computation.

EIP-4844, also known as Proto-Danksharding, was the first step in this direction and was implemented in the Dencun upgrade in March 2024. It introduced a new transaction type carrying binary large objects, or blobs, which are large chunks of data attached to blocks but not permanently stored by the Ethereum execution layer. Blobs are available for roughly 18 days before being pruned, which is sufficient for rollup fraud proofs and validity proofs to be submitted. EIP-4844 immediately reduced rollup transaction fees by orders of magnitude.

The Path to Full Danksharding

Full Danksharding will extend EIP-4844 by increasing the number of blobs per block from the current target of three to potentially 64 or more. This requires implementing Data Availability Sampling, or DAS, a cryptographic technique that allows light nodes to verify that blob data is available without downloading it entirely. Nodes sample small random portions of the data, and using erasure coding, they can confirm with high probability that the full dataset exists.

Peer Data Availability Sampling and distributed blob storage among validators are active areas of research and development. Full Danksharding is expected to arrive in a later phase of Ethereum's roadmap, following other planned upgrades such as Verkle trees and further improvements to the consensus layer. When complete, it could provide Ethereum with enough data throughput to support tens of thousands of transactions per second across the rollup ecosystem.

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- next curious audit vibrant panda slogan fatal page toe inner march remove
- tell bike asthma boost shoot find sand agent world novel auction early
- myself trophy label imitate wish country cabin hungry win deposit milk fluid
- phone traffic fuel student old end earn inherit asthma rocket response wire
- myth spot occur tell jewel lobster liberty pull scheme time mail find
- bike item maximum office cost arm someone again trophy runway relief dinosaur
- echo aerobic job source foam hero remove nation sponsor oyster steel rocket
- parent outer elder movie life lunar fitness can absent obtain segment mail
- clay firm truck head order assist forget fish alpha clog talent canal
- keen agent cruise tail omit stadium reopen core glue erode slim donate
- actor under above poet alpha snack cart major easily donkey public elite
- earn inside bracket object auction bring airport afraid pitch fall light gain
- foot detail casual battle together famous cover enroll oblige page duck box
- axis waste refuse track because prepare wealth clever bunker near deputy siren
- damp habit similar buddy ancient hunt quiz suffer drama mistake learn upgrade
- stadium ranch obvious catch sea bottom train improve tip fury profit mechanic
- turkey eagle brain fashion brisk middle common dumb trash cigar hidden pumpkin
- kidney very flat orchard used reunion service spend venture rabbit flame weasel

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ENTROPY-GENERATED WORD LISTS

- general picture midnight cousin turkey inherit math vital violin such general assist
- draft solution scout multiply also caution solution grief pencil oblige absent gospel
- between bright silent another cancel film cinnamon cash blame dinosaur embrace state
- lunar text output account laugh parade blade resource nothing jungle boring bulk
- armed shiver skull bounce orchard wrong build enroll bamboo dial oil ordinary
- kidney antenna adult dolphin enjoy panel half grab nest safe pond digital
- lion inflict fiber atom setup ride treat pipe canvas play merge improve
- valley dutch solid tenant front involve divide abstract defy salmon often young
- smart chimney spirit impact choose limb danger logic whisper eight month parent
- distance find orphan win quantum impulse ride exist legal glue cycle fringe
- useful final tell clap divorce drip then key hand rally story decrease
- whale lobster night what erupt zebra quality someone help coral state eight
- panther aware raise uphold fiber rude mention estate when viable various gaze

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