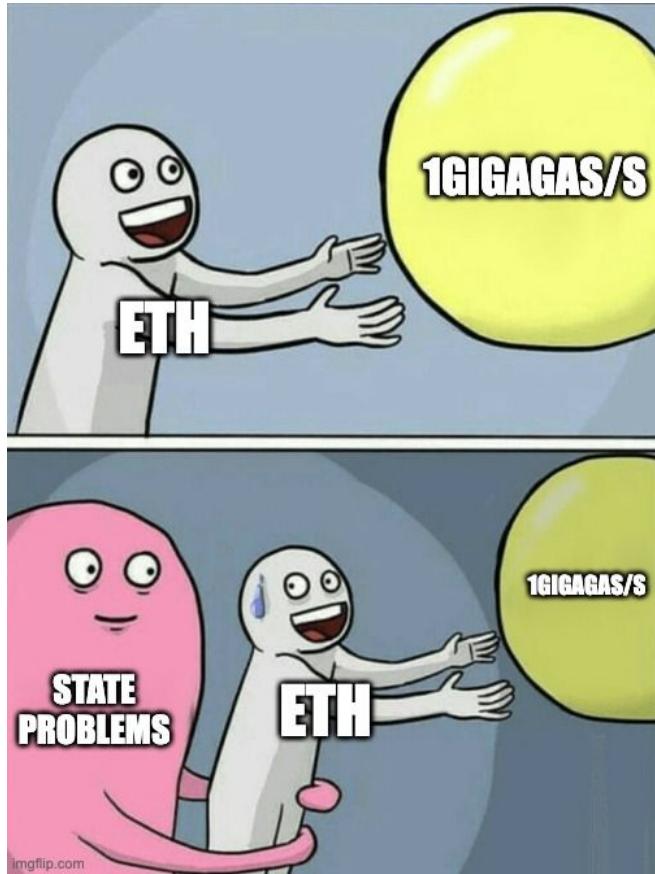




The Future of Ethereum's State

Wei Han Ng (@ngweihan_eth)
Stateless Consensus @ EF



vitalik.eth ✅ @VitalikButerin · 8h

Hyper-scaling Ethereum state by creating new forms of state:

ethresear.ch/t/hyper-scalin...

Summary:

* We want 1000x scale on Ethereum L1. We roughly know how to do this for execution and data. But scaling state is fundamentally harder.

* The most practical path for Ethereum may

Show more

Term	Long term
Block-level access lists and gas repricings → ~10x increase	ZK-EVMs (most nodes executing blocks entirely) increase
Smart contract movements, dimensional gas → ~10-20x	For a few specific types (signatures, SNARKS/aggregation could get ~100x)
With BALS, p2p agents, database agents → ~5-30x increase	Blocks in blobs + Peer-to-peer (~500x increase)
	?

Bitfield shows whether or not each UTXO has been "spent"

546 284 1.7K 153K

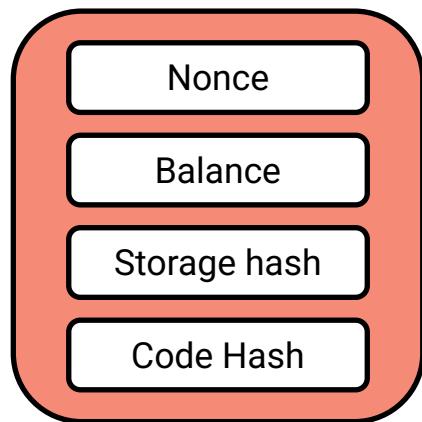


PRESENT

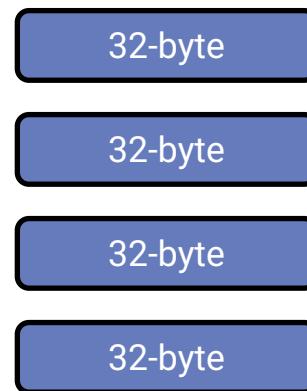


Ethereum's state

Accounts



Storage Slots

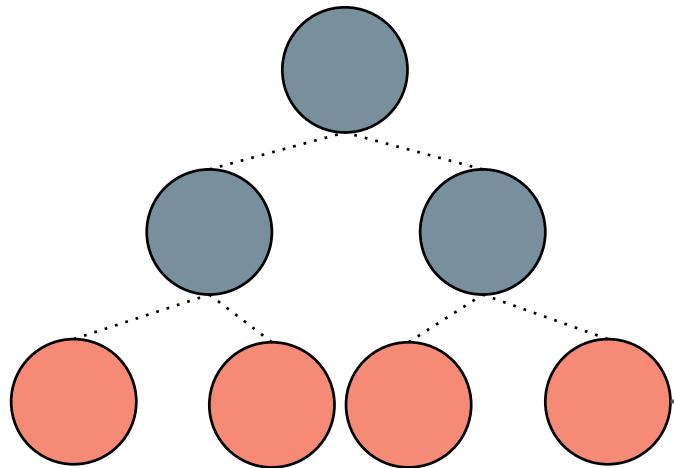


Contract Codes

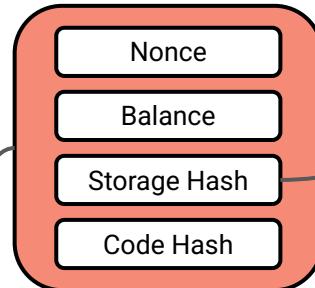


Ethereum's state

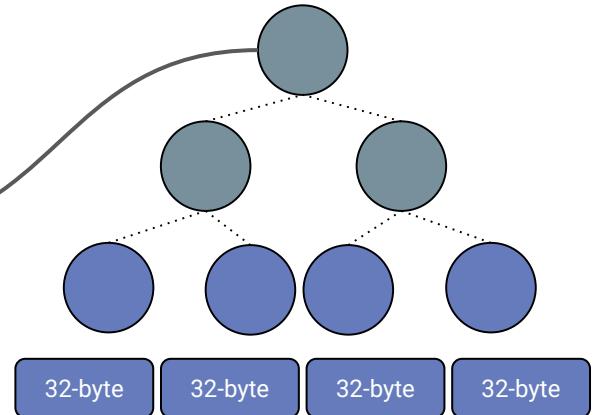
Account Trie (MPT)



Account



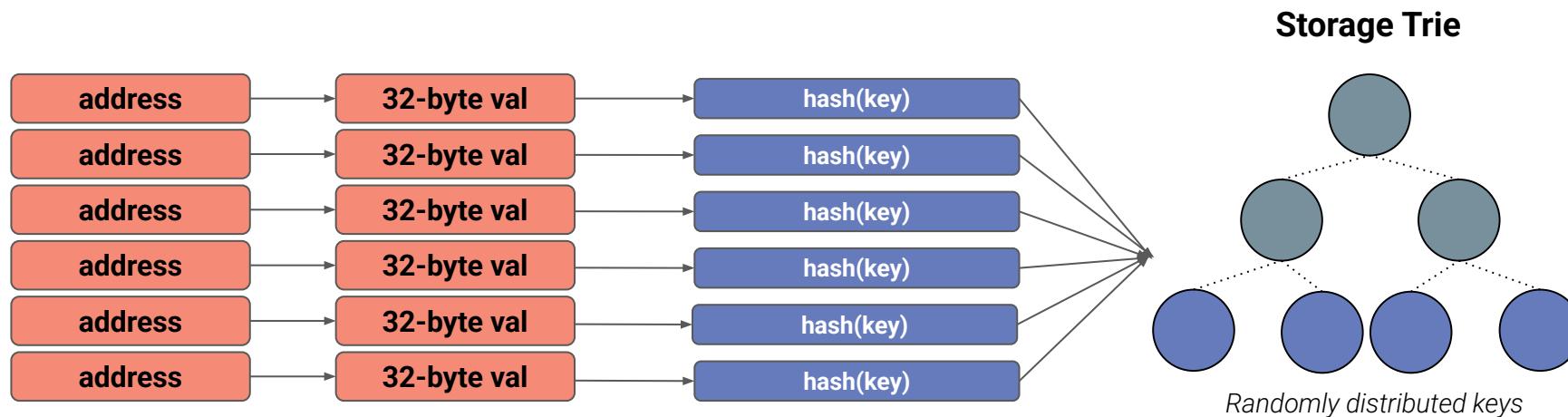
Storage Trie (MPT)



State is inefficient for real-world pattern

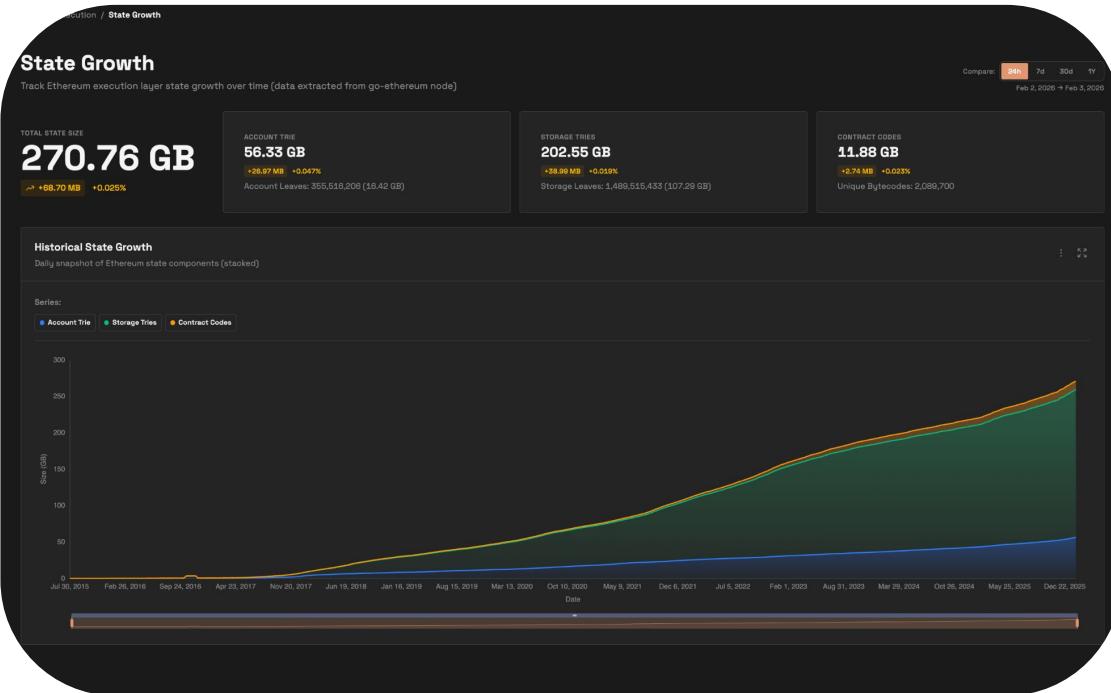
Majority of the state is

mapping(address => value)



Problem: locality is terrible as keys are scattered in the trie

Ethereum's state size



[lab.ethpandaops.io/ethereum
/execution/state-growth](https://lab.ethpandaops.io/ethereum/execution/state-growth)



ethereum foundation
Stateless Consensus

Not all state is created equal

84% of accounts are active for **at most 1 year**.

55% of contracts are deployed once and **never touched again**.

63% of storage slots are written once and **never touched again**.

97% of contracts reuse the same **9% of unique bytecodes**.

Top 500 deployers deploy **57% of contracts**.

88% of contracts have **code size <1kB** and **0.2%** are **>20kB**



[ethereum-magicians.org/t/
not-all-state-is-equal](https://ethereum-magicians.org/t/not-all-state-is-equal)

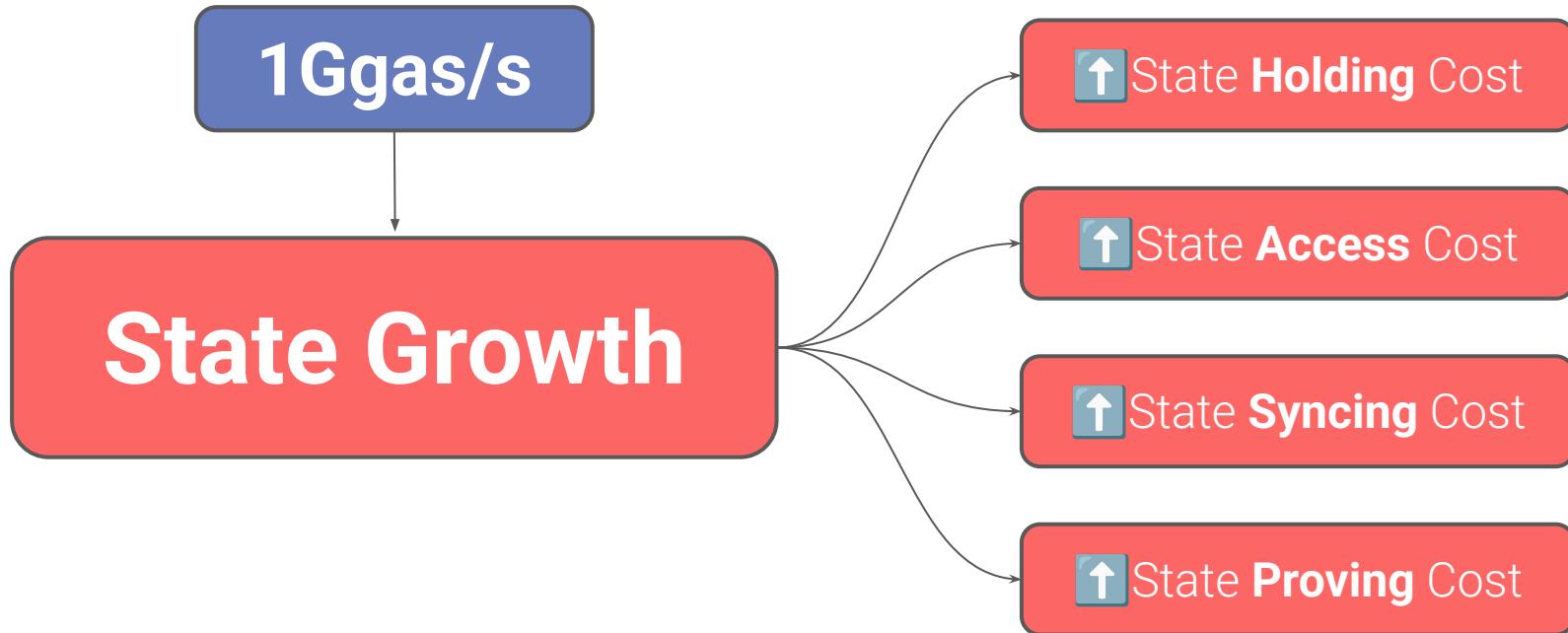




FUTURE



L1 Scaling



Bloatnet



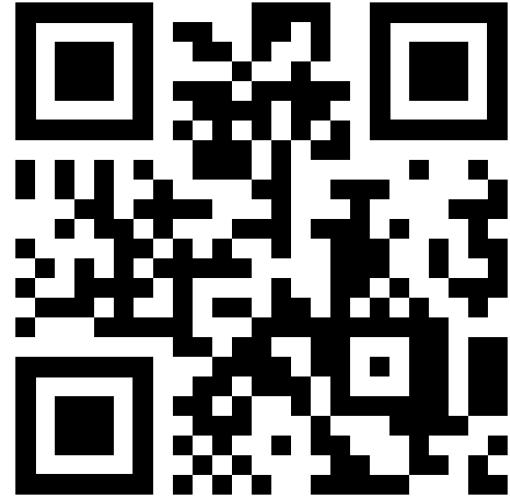
Nethermind × Stateless Consensus Team

Bloatnet Initiative

Advancing Ethereum's scalability through experimental blockchain parameters

Bloatnet is an ambitious effort to create a new Ethereum-like chain with altered parameters that enable greater throughput through bigger gas limits and smaller slot times.

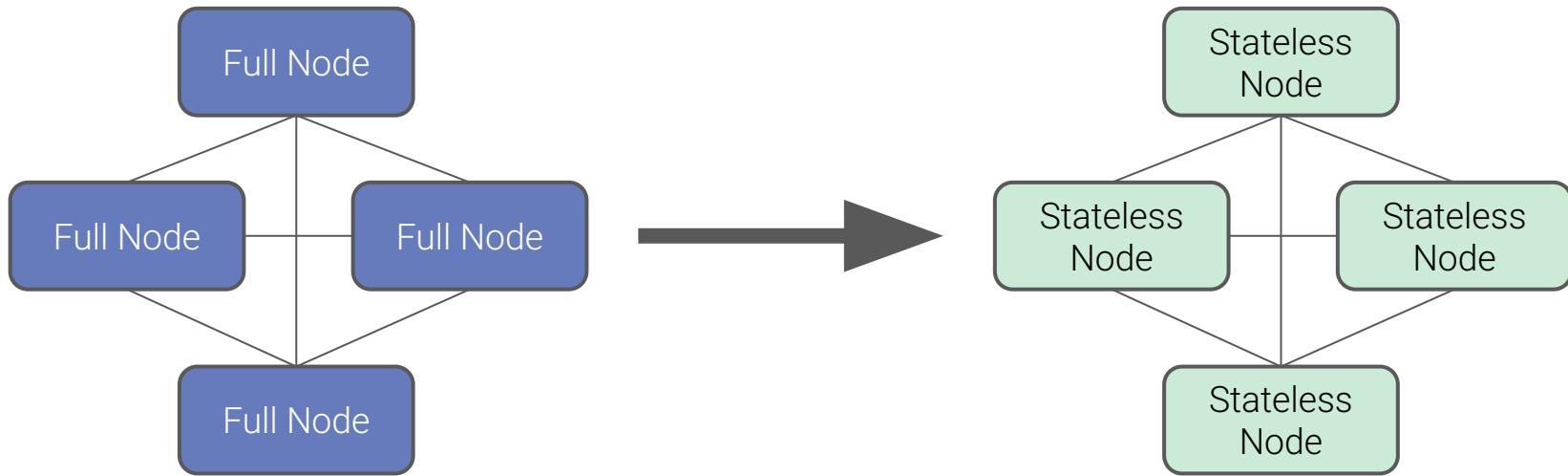
Explore Progress



bloatnet.info



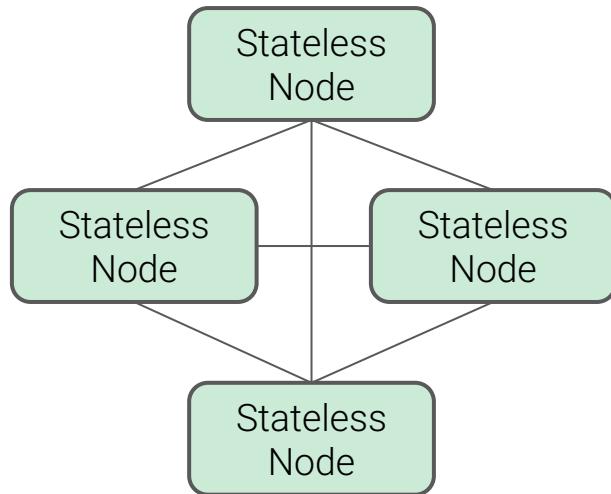
Stateless Validators



Stateless validators are inevitable for scaling.

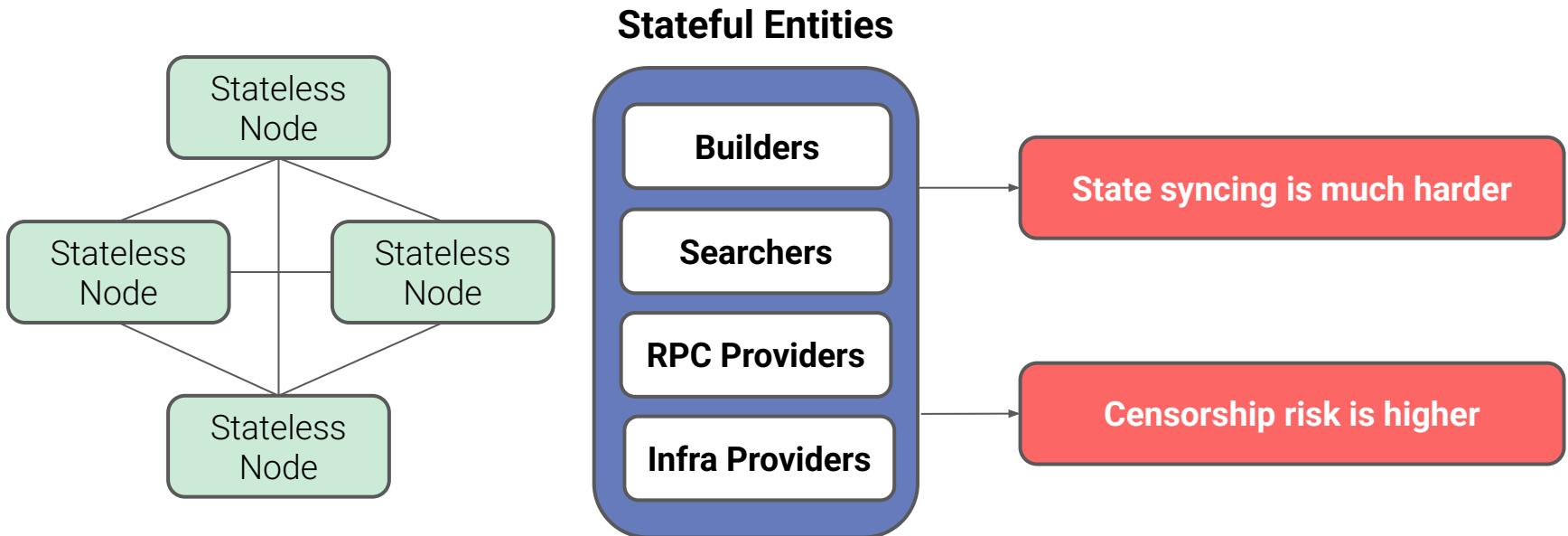


Who holds the state?



via 9GAG.COM

Who holds the state?



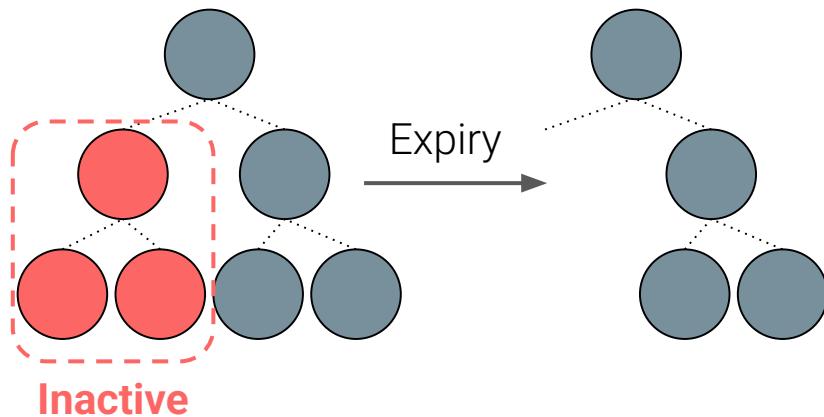


SOLUTIONS

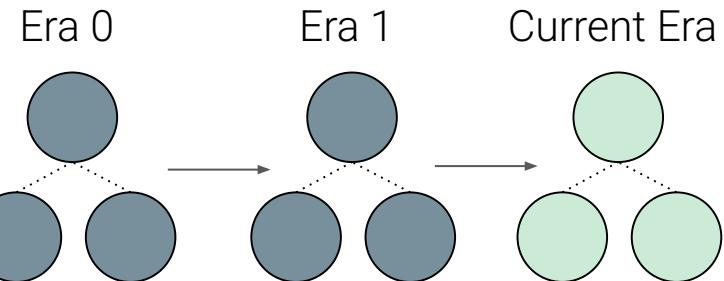


State Expiry

Mark, Expire, Revive



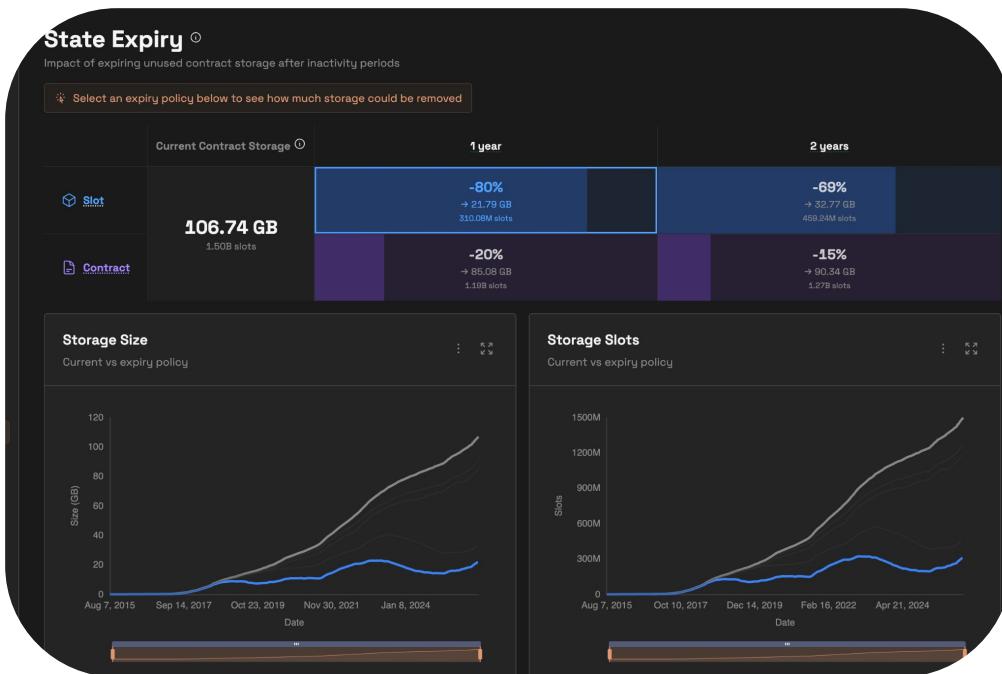
Multi-era Expiry



Remove inactive state and allow users to revive later.



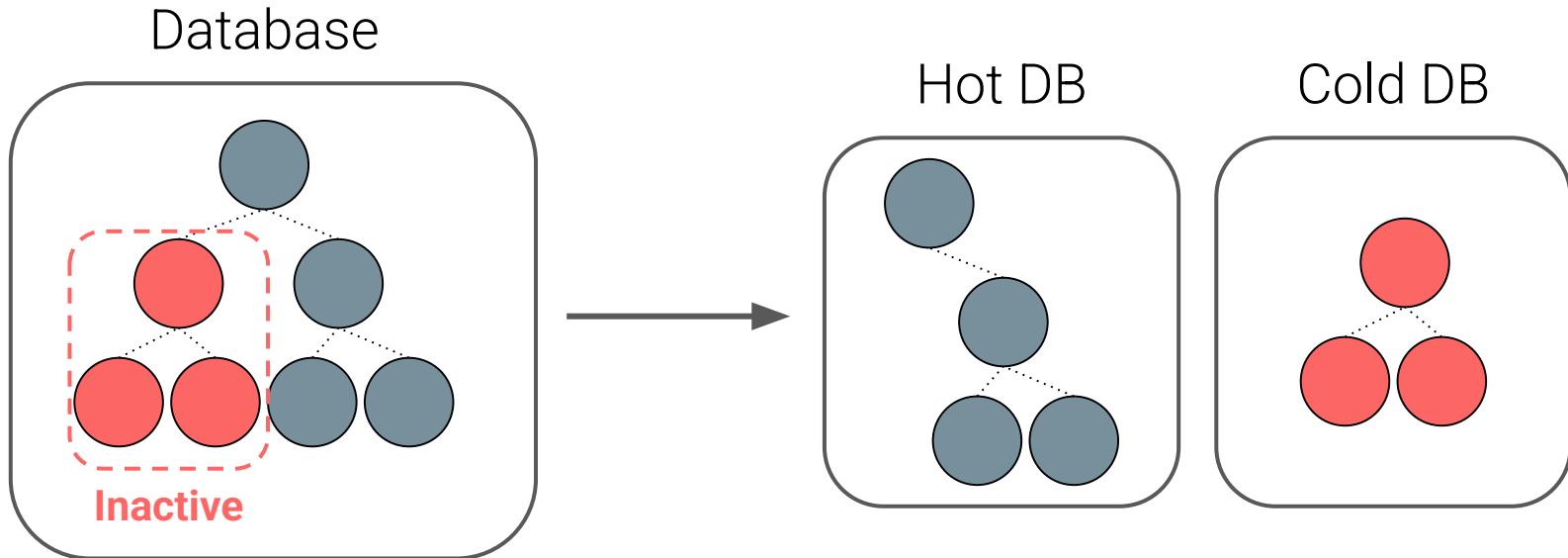
State Expiry



[lab.ethpandaops.io/ethereum/
execution/state-expiry](https://lab.ethpandaops.io/ethereum/execution/state-expiry)



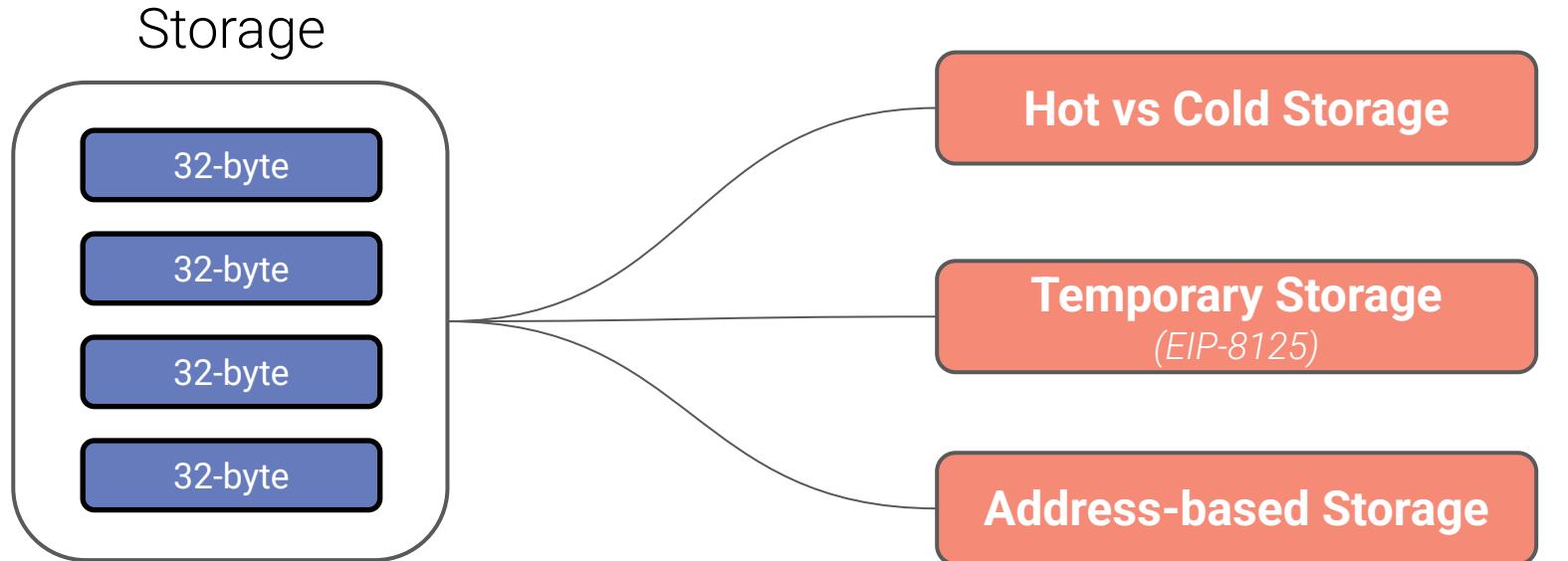
State Archive



Decouple state access cost from state growth.



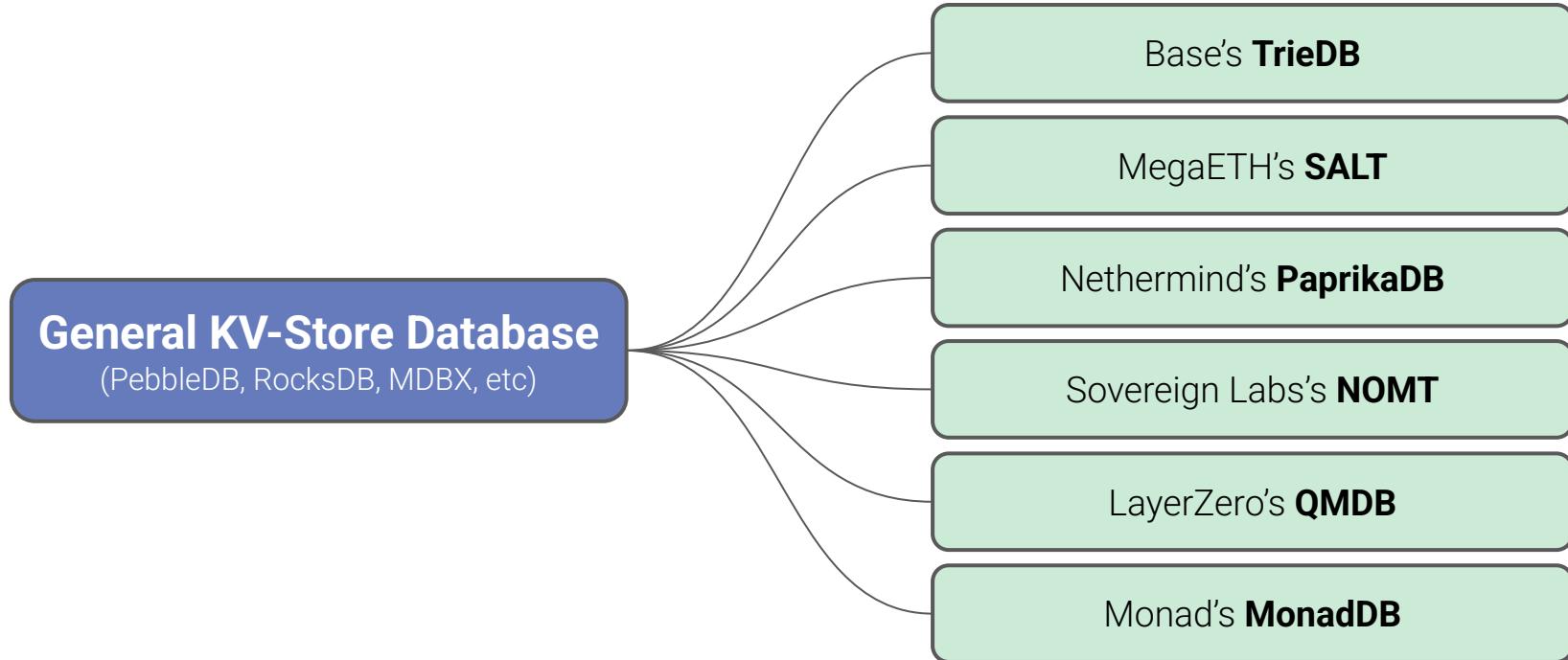
State Separation



Optimize protocol's state layout for real-world usage.

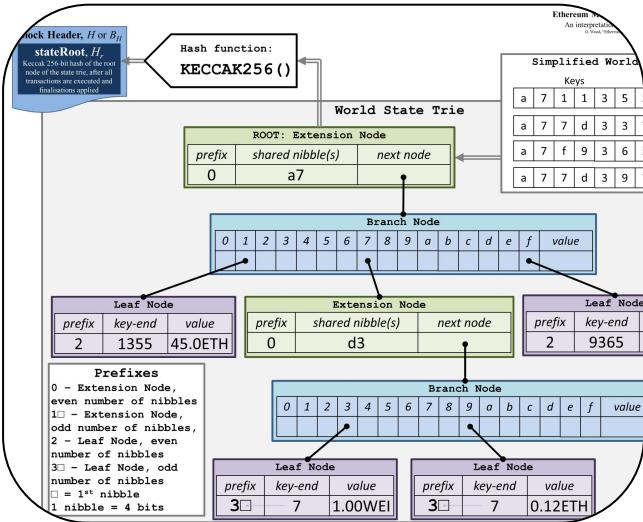


Custom-built Databases

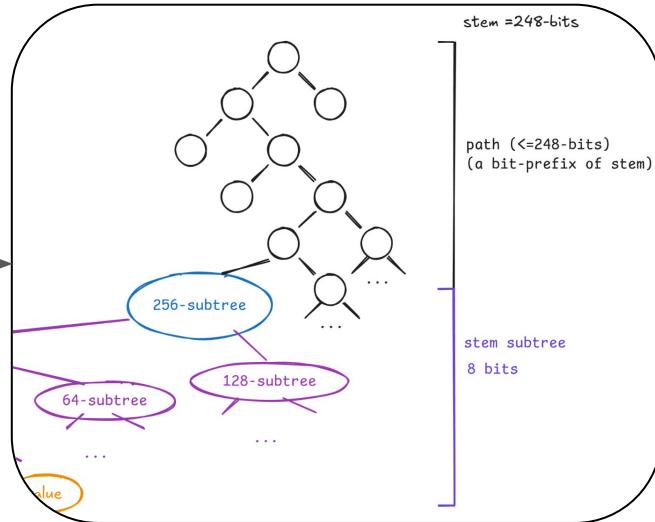


Tree Change

MPT



Binary Trie (EIP-7864)



Prover-friendly, quantum-resistant, and locality-optimized.



Partial Statelessness

Light Client + Snap Sync + BALs

CPerez.eth 🦀 @CPerez19

Partially-stateful nodes might be closer than you think..

If you want to serve RPC for ONLY SOME CONTRACTS, need <15GB of storage for your EL, be able to keep mempool health and not carry the burden of holding ALL the state, you should look into this.

BALs were the unlock 🌟🌟

```
INFO [02-04|14:50:53.350] Partial state sync stats          sto
rageSkipped=2,739,741 bytecodeSkipped=7,334,008 storageSynced=0 bytecode
deSynced=0
INFO [02-04|14:51:00.677] Forkchoice requested sync to new head      num
ber=24,383,901 hash=eb630a..e76b99 finalized=24,383,828
INFO [02-04|14:51:01.242] Syncing: chain download in progress      syn
ced=12.10% chain=3.406iB headers=2,951,441@905.68MiB bodies=2,951,44
1@1.73GiB receipts=2,951,441@799.77MiB eta=47m17.400s
INFO [02-04|14:51:01.368] Syncing: state download in progress      syn
ced=11.00% state=8.016iB accounts=39,150,332@8.016iB slots=0@0.00B
codes=0@0.00B eta=52m9.100s
```

VOPS

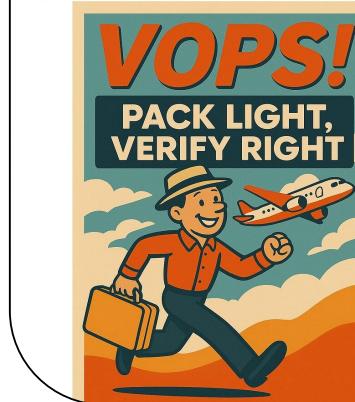
pragmatic path towards Validity-Only Partial Statelessness (VOPS)

Execution Layer Research stateless



soispoke

3 Apr 2025



Hold your state, hold your coins.

THE FUTURE OF ETHEREUM'S STATE



imgflip.com

Stateless Summit (ETHCC 2026)



The landing page for the Stateless Summit 2026 features a large title "Stateless Summit 2026" in white and light blue. Below the title is a circular logo featuring a stylized tree. To the right of the title is the Ethereum State logo. The main content area is titled "Stateless Summit" and contains a paragraph about the event's purpose: "The Stateless Summit is a one-day event planned during EthCC 2026 for in-depth sessions on Stateless Ethereum - an update to the Ethereum protocol that brings many scalability and usability features that the Ethereum community has been anticipating for a long time." Below this is a section titled "Basic Event Information" with the following details:

- Date: April 1st, 2026
- Location: Cannes, France
- Venue: TBA
- Format: Talks and Panel Discussions
- Who's the event for?



Apply to attend/speak!





THANK YOU!

