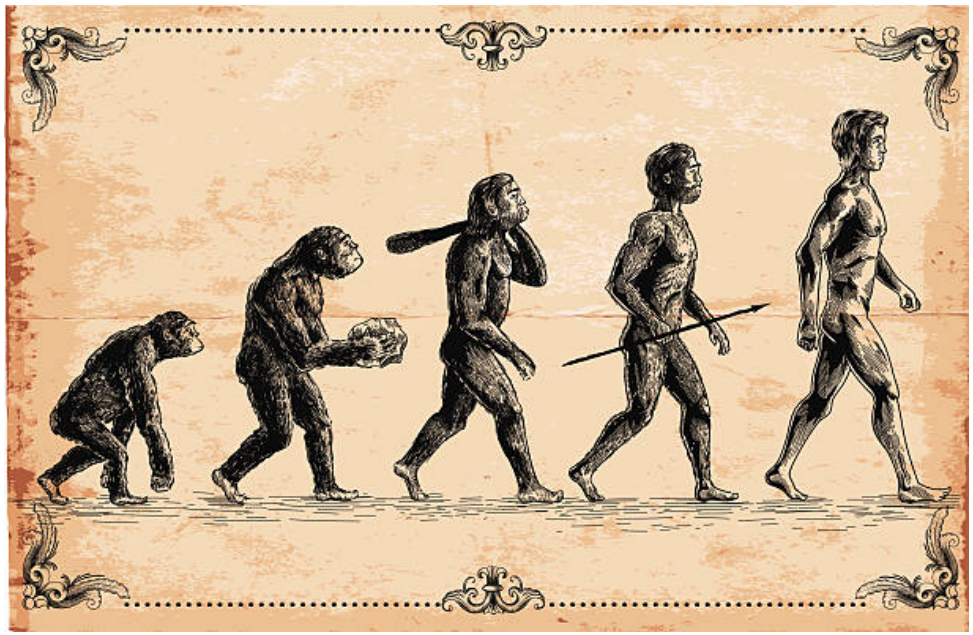
Ethereum PBS R&D Roadmap

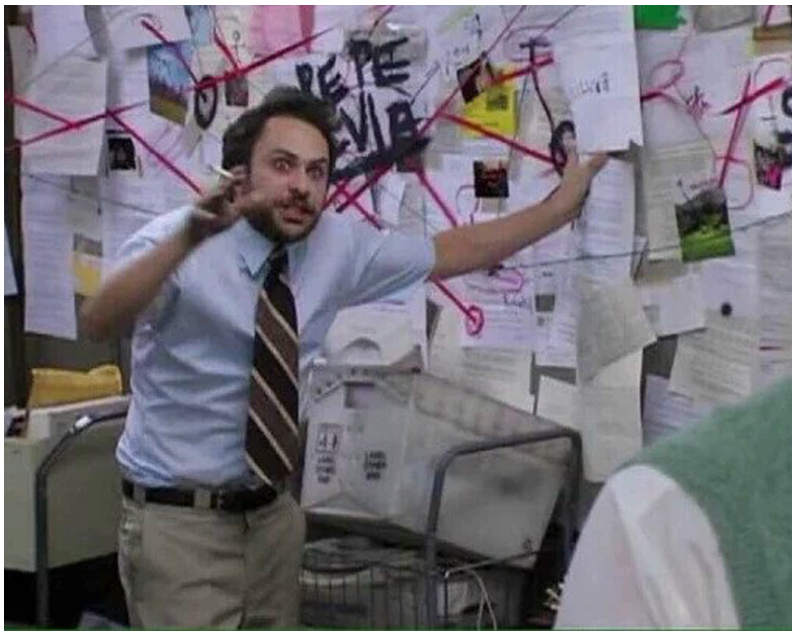


mike neuder – ethereum foundation

modular summit, pbs.day – july 22, 2023

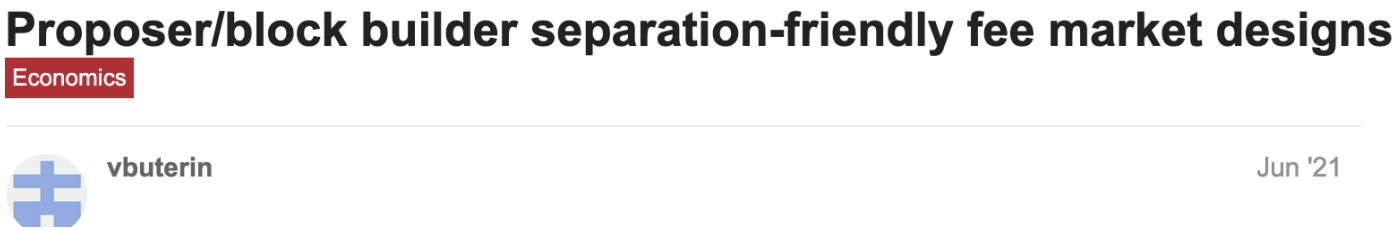
Outline

- What is PBS?
- PBS designs
  - `mev-boost` (OOP[a])
  - Two-slot PBS (IP[b])
  - PTC (IP)
  - Optimistic Relaying (OOP)
  - PEPC (IP)
- Synthesis
  - ♡ diagram
  - traffic light matrix



[a] out-of-protocol
[b] in-protocol

What is Proposer-Builder Separation?



Proposer/block builder separation-friendly fee market designs

Economics

vbuterin Jun '21

- Proposers = validators selected to propose a block during a slot (unsophisticated)
- Builders = participants capable of constructing high-value blocks (sophisticated)
- Decouple these two roles to avoid centralization pressures

What does this mean for block producers? Block production is likely to become a specialized market, and the domain expertise is likely to carry over across different domains. 90% of what

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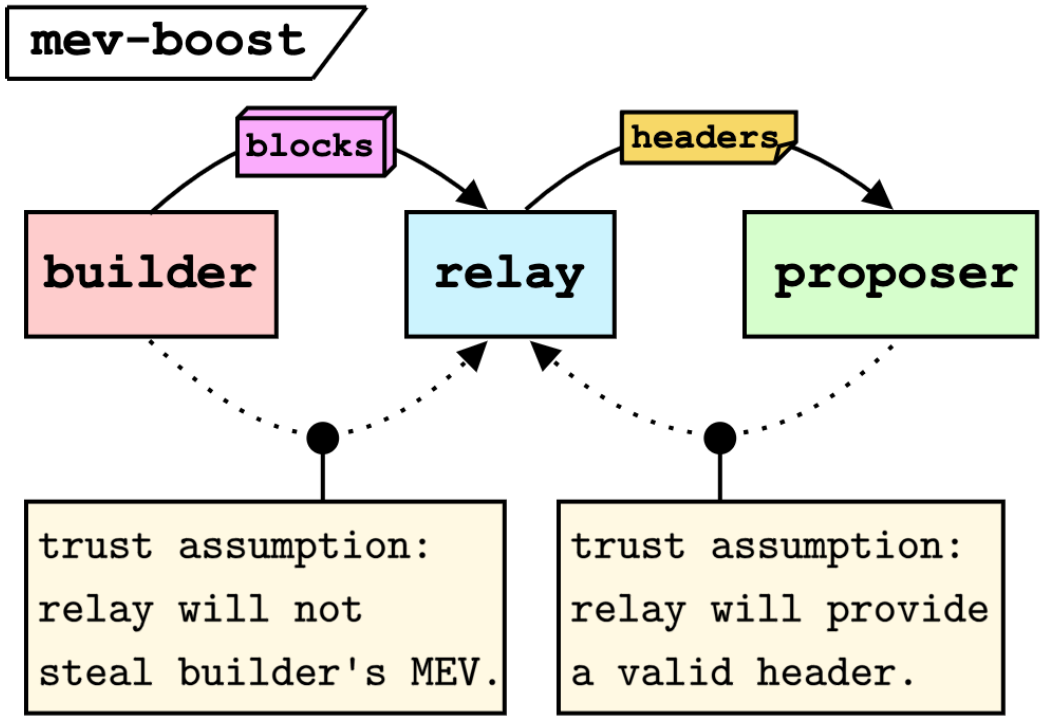
https://ethresear.ch/t/proposer-block-builder-separation-friendly-fee-market-designs/9725

https://vitalik.ca/general/2021/12/06/endgame.html

PBS designs

mev-boost; out-of-protocol



- Relay serves as a mutually trusted auctioneer
- Validators run sidecar software to interact with relays
- Massive adoption: 95% of blocks are built using `mev-boost`

https://ethresear.ch/t/mev-boost-merge-ready-flashbots-architecture/11177

PBS designs

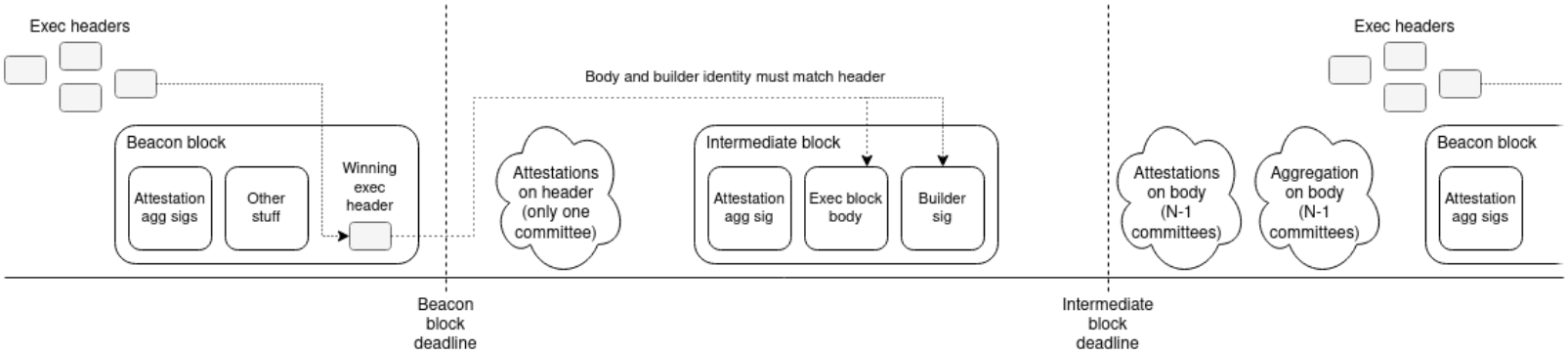
Two-slot PBS; in-protocol

Two-slot proposer/builder separation

Proof-of-Stake ■ proposer-builder-separation

vbuterin 4 Oct '21

See previous ideas on this topic: Proposer/block builder separation-friendly fee market designs 467

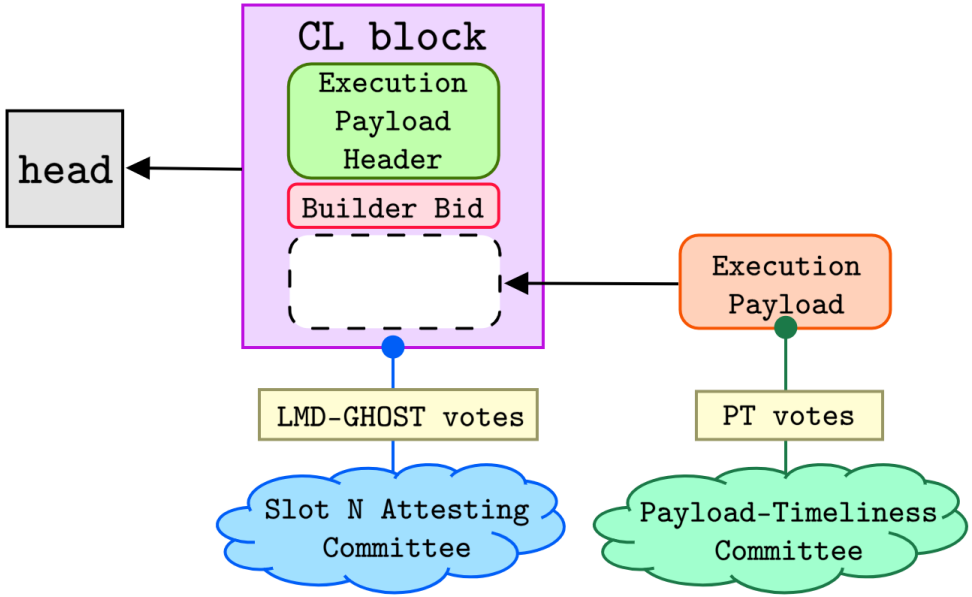


- Gives the builder block attestation weight by partitioning the attesting committee
- Weakens the security properties of the consensus layer

https://ethresear.ch/t/two-slot-proposer-builder-separation/10980

PBS designs

Payload-Timeliness Committee (PTC); in-protocol

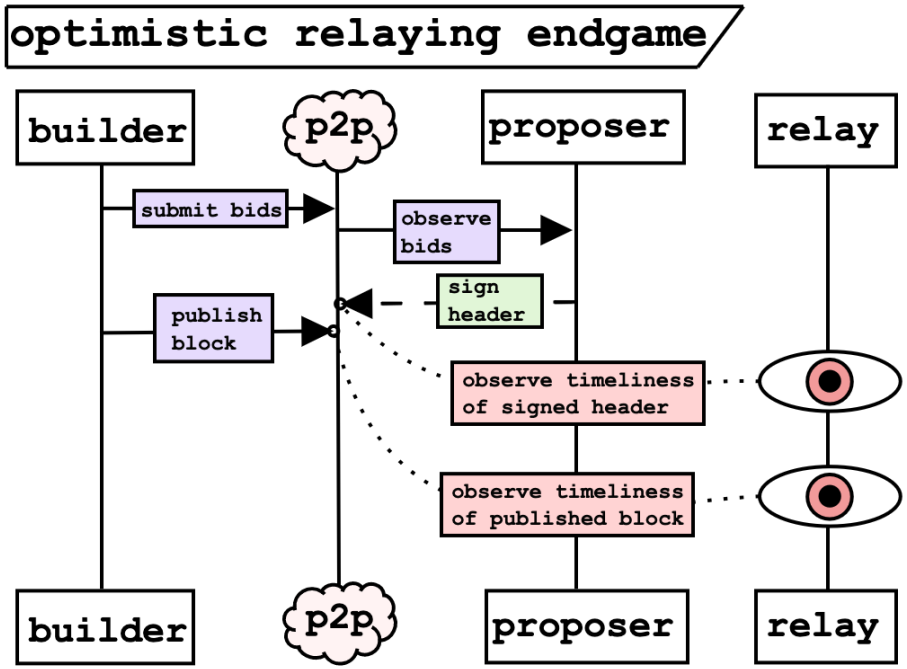


- Consensus-layer block is produced *without* any transactions
- Consensus-layer attestations remain the same
- Builder reveals the payload (list of transactions)
- Payload-Timeliness Committee votes on if the payload was published

https://ethresear.ch/t/payload-timeliness-committee-ptc-an-epbs-design/16054

PBS designs

Optimistic relaying; out-of-protocol



- Lots of latency in the block submission flow
- How can we make this look more like ePBS?
- Work from the bottom-up, removing relay responsibilities!

https://ethresear.ch/t/why-enshrine-proposer-builder-separation-a-viable-path-to-epbs/15710

PBS designs

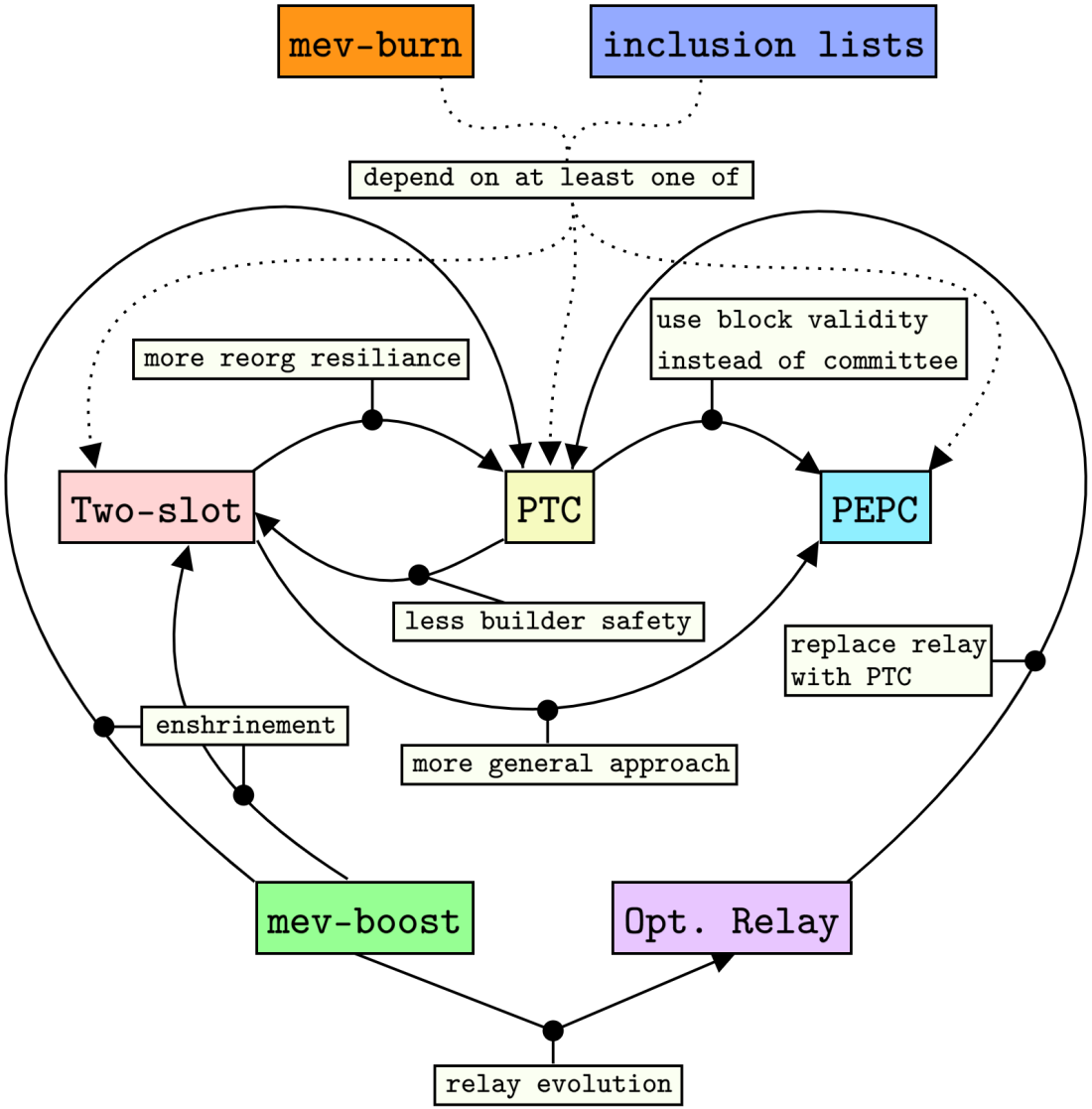
Proposer-Enforced Protocol Commitments (PEPC); in-protocol

- A more general framework for enshrining proposer commitments into the protocol, which is actively being worked on by Barnabé and Diego
- *Key idea:* block validity used to enforce commitments
- PBS can be enshrined *through* PEPCs

https://ethresear.ch/t/unbundling-pbs-towards-protocol-enforced-proposer-commitments-pepc/13879

Synthesis

♡ diagram; connecting the dots



Synthesis

Traffic light matrix; categorical comparison

	mev-boost/ opt. relay	PTC or two-slot	PEPC
time to ship/ protocol diff			
decentralization			
bypass-ability			
censorship resistance			
flexibility			
unknown unknowns			
mev-burn compatibility			
~ vibe check ~	move fast & break things	let's enshrine *something* ASAP	aesthetic and/ or opening pandora's box

thanks!