

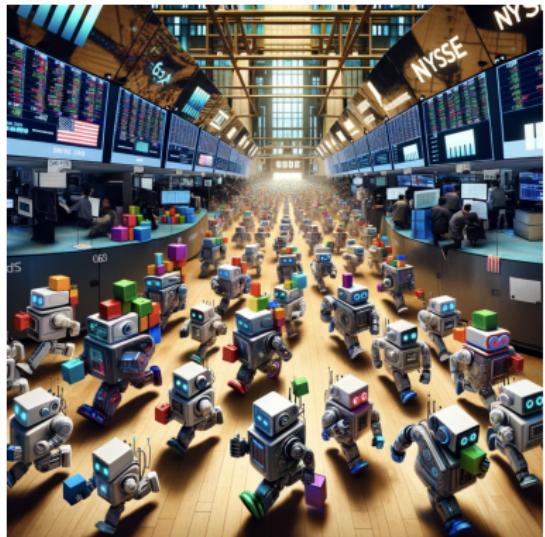
Execution Tickets



mike neuder
beyond the block, titan & hashkey
friday, march 1, 2024

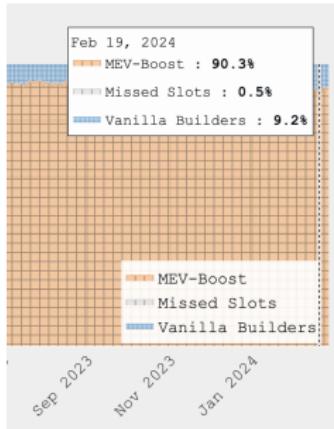
Outline

- Problems
 - ◊ Proposer-Builder Separation
 - ◊ Consequences
 - ▶ Warping validator economics
 - ▶ Timing games
 - ▶ Censorship
 - ▶ Fragility
- Solutions
 - ◊ ePBS ≠ enshrined-mev-boost
 - ◊ Execution Tickets
 - ▶ Slot construction
 - ▶ Block production
 - ▶ Secondary markets
 - ▶ Brief ™ analysis



Proposer-Builder Separation

"almost all proposers sell their full blocks to three builders"



Builder (extra_data)	Blocks	Percent
beaverbuild.org	2,844	42.59 %
Titan (titanbuilder.xyz)	1,787	26.76 %
rsync-builder.xyz ⓘ	1,333	19.96 %
Illuminate Dmocratize Dstribute	159	2.38 %
jetldr.xyz	146	2.19 %
rpc.tbuilder.xyz	101	1.51 %
f1b.io	94	1.41 %
builder0x69 ⓘ	40	0.60 %

- Vitalik's endgame – December 2021: “So what's the result? Block production is centralized, block validation is trustless and highly decentralized, and censorship is still prevented.”
- Not that far off! But we have a few issues...

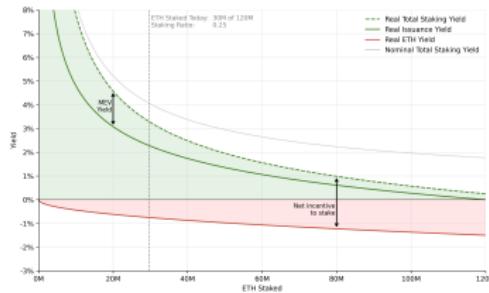
<https://mevboost.pics/>

<https://www.relayscan.io/>

<https://vitalik.eth.limo/general/2021/12/06/endgame.html>

Consequences

(i) Warping validator economics



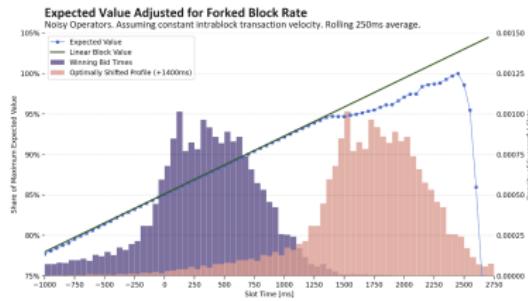
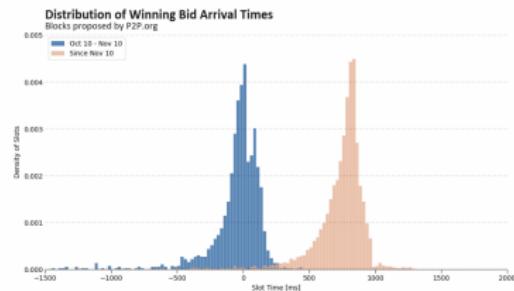
- MEV rewards make it more attractive to be a validator.
- Centralizing force: high-variance rewards make pooling attractive.

<https://ethresear.ch/t/endgame-staking-economics-a-case-for-targeting/18751>

<https://www.validatorqueue.com/>

Consequences

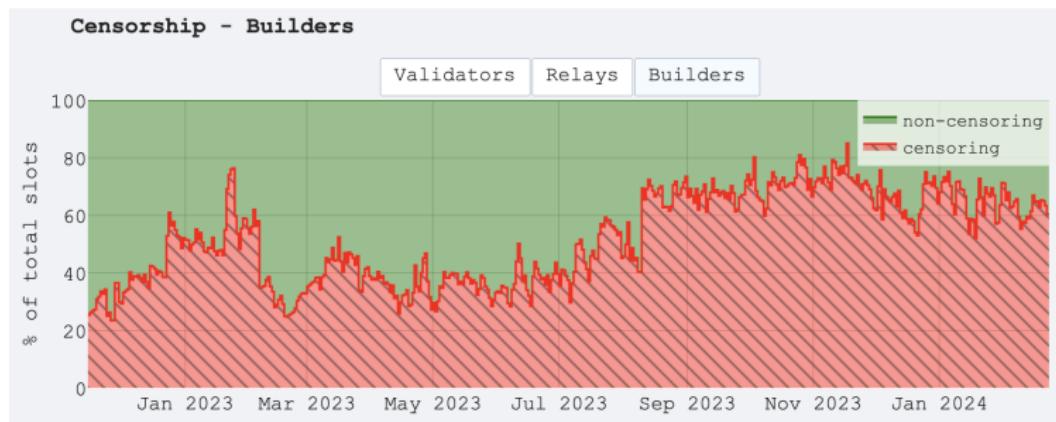
(ii) Timing games



- Delaying block production increases MEV rewards.
- Centralizing force: latency-optimized validation is more profitable.

Consequences

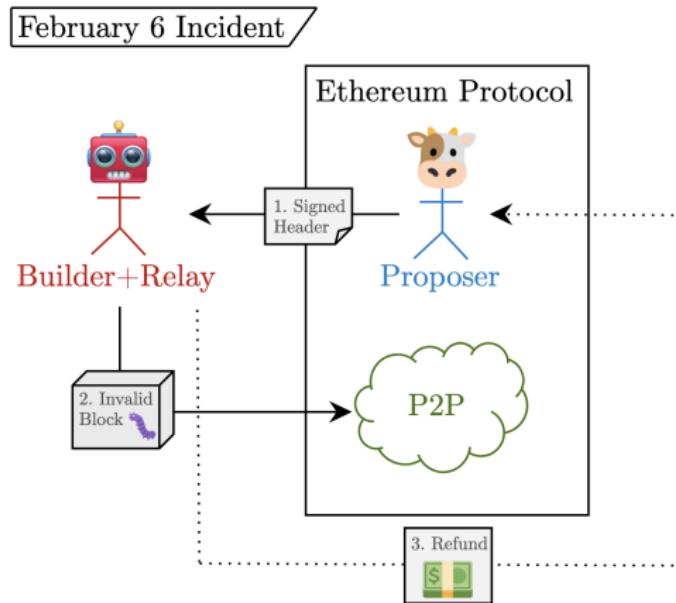
(iii) Censorship



- Builders dictate the set of included & excluded transactions.
- **Vitalik's endgame – December 2021:** “... and censorship is still prevented.”

Consequences

(iv) Fragility



- Out-of-protocol software continues to be a thorn in everyone's side.

ePBS ≠ enshrined-mev-boost

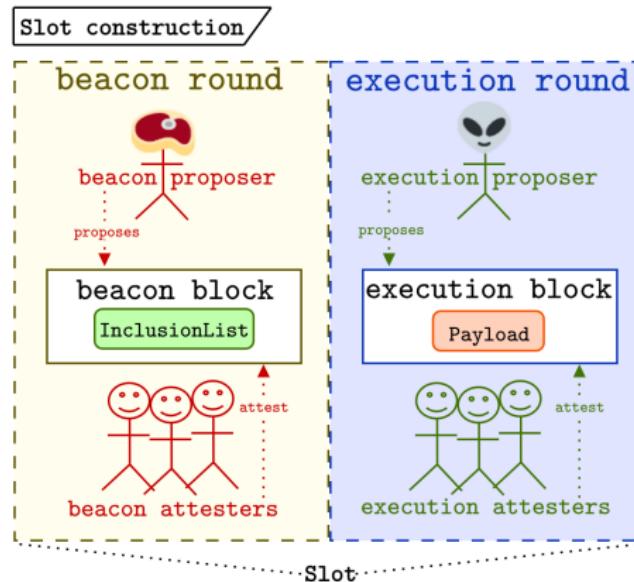
there is no limit on imagination



- PEPC, Top-of-Block/Rest-of-Block, slot auctions, multiplicity gadgets, inclusion lists, etc. ...

Execution Tickets

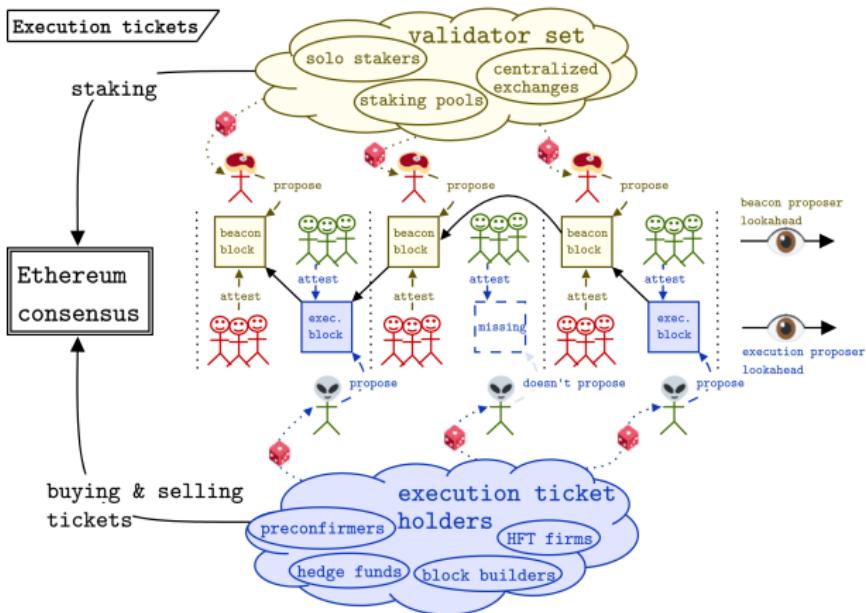
Slot construction



- Split slot into two rounds \implies two separate proposers and attesting committees.

Execution Tickets

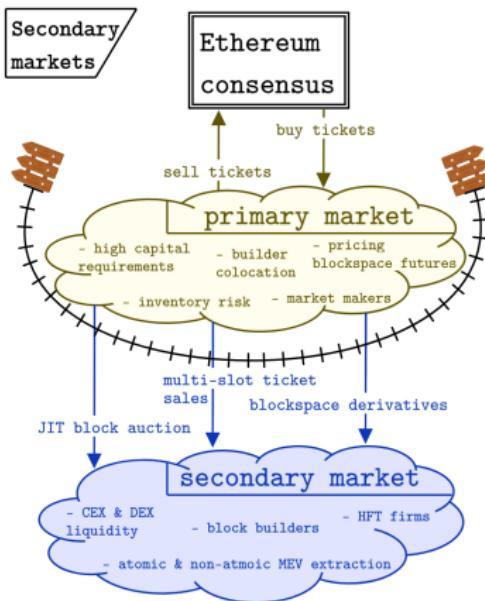
Block production



- Completely decouple consensus and execution.

Execution Tickets

Secondary markets



- Market structure of secondary ticket sales evolves out of protocol.

Execution Tickets

Brief TM analysis

- Pros:

- ◊ Clean abstraction.
 - ▶ Simplification of validator tasks (no timing games).
 - ▶ Removes MEV from validator rewards (no warping consensus economics).
- ◊ Roadmap compatibility.
 - ▶ MEV burn out of the box.
 - ▶ Protocol simplicity/endgame aesthetic.
 - ▶ Inclusion lists constructed by beacon proposers (improved CR).
 - ▶ Execution proposers can be punished more heavily (less fragility).

- Cons:

- ◊ Multi-slot MEV concerns.
- ◊ Centralization generally.
- ◊ Fork-choice implications.
- ◊ Are inclusion lists sufficient?
- ◊ Unknown unknowns...

thanks! :-)



<https://ethresear.ch/t/execution-tickets/17944>