Updates on Proposer-Builder Separation (PBS)

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Section 1

In the previous episode...

The blockspace good

We're all learning what blockspace is,
what its properties are, how to sell it, how to provide for it.

We know it's valuable,
but some of it is more valuable than the rest...

BLOCK WARS

While the Resistance #stakefromhome, solo validators are rookies in a market of galactic proportions.

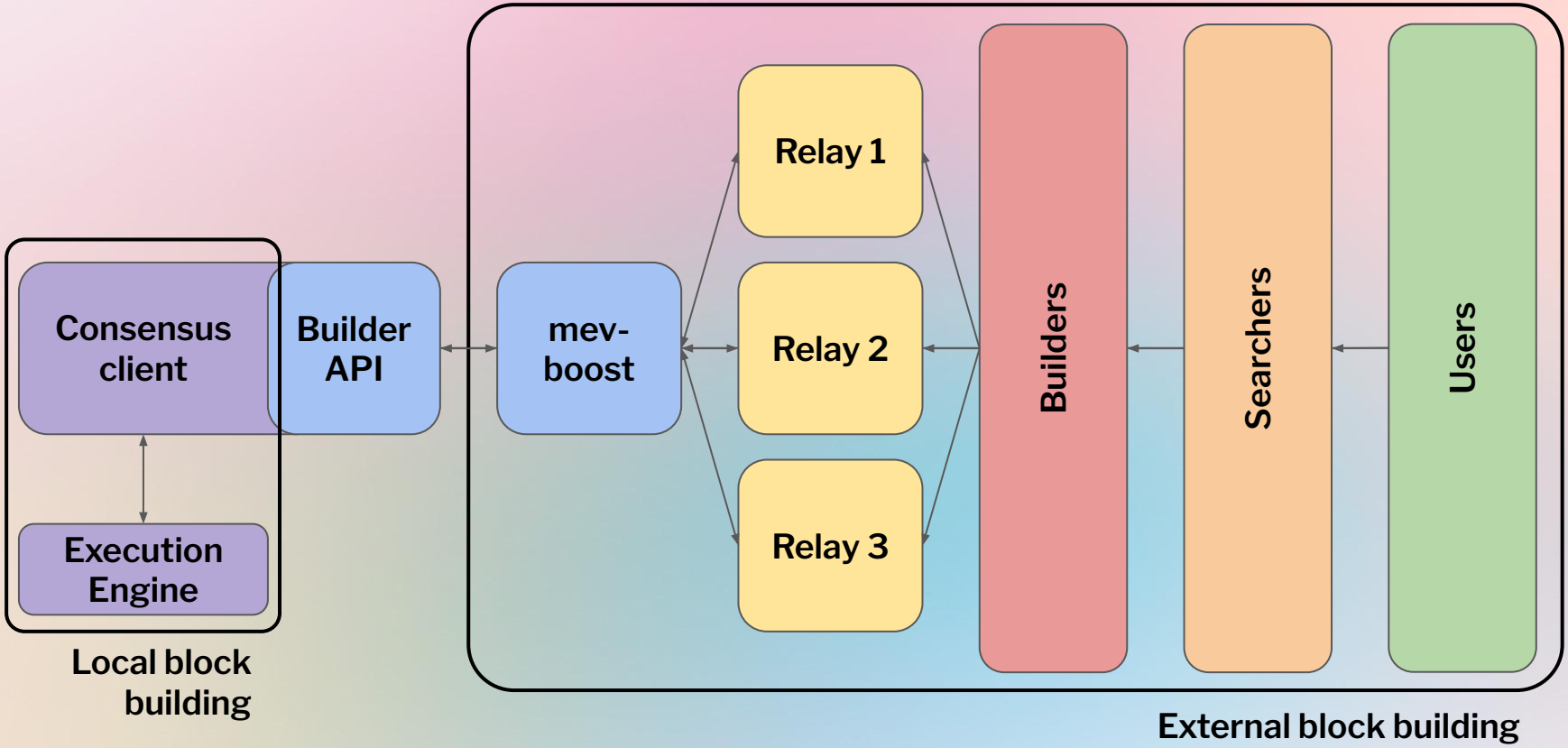
To keep up with the Empire, rebels source blocks from distant planets. But the trade is fraught with difficulties...

Prehistory of PBS: mev-geth in Proof-of-Work

Searchers submit **bundles** to (trusted) block producers.

Bundles are scored, merged, included by the **block producer**.

Block-building today (in Proof-of-Stake)



The present of PBS: mev-boost for PoS Ethereum

Bidding phase

Builders send full block + bid to **Relay**

Relay validates bids (block validity + bid amount)

Bid selection

Proposer receives bids from **Relays**

Default: **mev-boost** selects highest bid

Proposer signs bid, can no longer make another block

Delivery

Relay receives signed bid

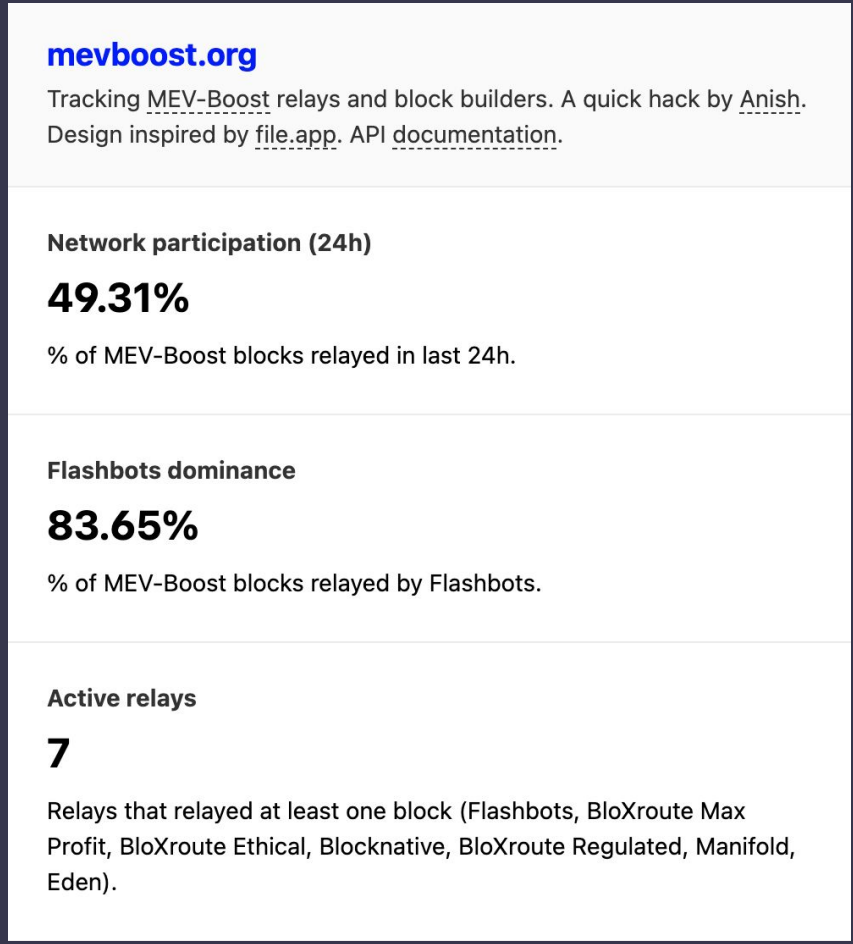
Relay releases full block to **Network**

Today's numbers

More and more validators choose to use external block building

Flashbots relay still dominant

7 identified relays



Section 2

What is PBS?

Let’s make sense of it together!

“Proposer-Builder Separation” separation

A market structure

There are duties that the proposer can’t or won’t do:

- Making an exec-block
- Danksharding block
- Computing block witness
- Computing validity proofs

Proposer-Builder Separation: The proposer outsources block construction to third-parties

An allocation mechanism

Whole block auction: The proposer sells off their *entire* rights to make a block.

Current design allocates the right to make an exec-block to a third-party:

- Builders submit bids
- Proposer selects their favourite
- Contract is entered into by both parties

mev-boost

Market structure

Relays are **“brokers”**

- Relay expected to guarantee validity of the good
- Relay could fail
  - Submit an invalid block
  - Pay proposer less than promised
  - Deliver late/not at all

Allocation mechanism

Whole block auction: The proposer sells off their *entire* rights to make a block.

Highest bid selected by mev-boost.

“In-protocol” PBS

Market structure

Protocol is the **“broker”**

- Builder bids are binding, whether they deliver a valid good or not
- **Valid good:** Valid block made by selected builder

Allocation mechanism

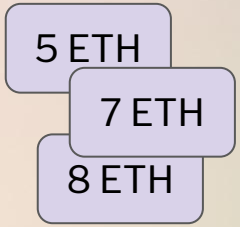
Whole block auction: The proposer sells off their *entire* rights to make a block.

Proposer selects bid they would like to use.

The future of PBS? “Two-slot” in-protocol PBS

Bidding phase

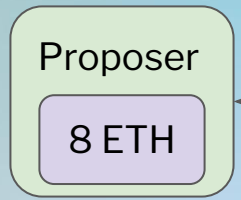
Builders send bids to **Proposer**



Bid selection (Slot 1)

Proposer selects bid, makes a beacon block committing to the bid

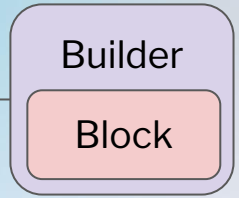
Attesters give weight to the beacon block



Delivery (Slot 2)

Builder releases builder block containing payload

Attesters give weight to the builder block



“In-protocol” PBS + inclusion list

Market structure

Protocol is the **“broker”**

- Builder bids are binding, whether they deliver a valid good or not
- **Valid good:** Valid block made by selected builder

Allocation mechanism

Inclusion-listed whole block auction:
The proposer sells off the right to make a block respecting some inclusion list.

Proposer selects bid they would like to use.

“In-protocol” partial PBS

Market structure

Protocol is the **“broker”**

- Builder bids are binding, whether they deliver a valid good or not
- **Valid good:** Valid block made by selected builder

Allocation mechanism

Partial block auction: The proposer sells off the right to make a partial block.

Proposer could be making block prefix, or suffix.

Proposer selects bid they would like to use.

“In-protocol” slot auction

Market structure

Protocol is the **“broker”**

- Builder bids are binding, whether they deliver a valid good or not
- **Valid good:** Valid block made by selected builder

Allocation mechanism

Slot auction: The proposer sells off the right to make a block, but the bid doesn’t commit the builder to any specific block.

Proposer selects bid they would like to use.

Selected builder can release any block they want.

In-protocol PBS variations

Several designs for the allocation mechanism

- **Whole or partial block auction** (which part?)
- **Inclusion lists** (made by whom?)
- **Slot auction** (auctioned when?)

Should the protocol make that decision?

Or simply **guarantee the market structure?**

See my recent ***Protocol-enforced proposer commitments (PEPC)*** proposal!

Section 3

Looking ahead

What if we had in-protocol PBS?

- Would proposers use it?
  IP-PBS bid may not be an **objective oracle** of block value to proposer
  Possible to enter into **off-chain agreements** (builder colocation)
  MEV-smoothing would make it binding, but more questions there...
- Would relays still exist?
  How to design the **"protocol-side" gossip channel** for bids?
  Proposers could still decide to connect to **relays for freshest bids**
  or **constrained bids** (e.g., censorship)
  Some builders might even want to use mev-boost (no upfront capital)

Seeing like a protocol 👀

- What does PBS value exactly?

  Total extractable value by the proposer.

  Or is it? Can a builder realise this value? Can a distributed builder?

  Or is PBS bid = “**spot price** of value for the block”?

  Is there EV from selling rights before the proposer’s slot?

  Selling rights to multiple builders?

Is this value?

What is Ethereum? 💫

Where do Ethereum's concerns stop?

- **At the client level?** Provide more ways for **out-of-protocol markets** to organise? e.g., proposer specifies inclusion list, block prefix... to mev-boost
- **At the market structure?** E.g., making sure proposer is paid when things go south? **PEPC** is a proposal in that direction
- **At the allocation mechanism?** Determine some/all markets/mechanisms, fully specify contracting space between proposers and third-parties

Some (incomplete) ways to think about it:

Risk for the protocol? Safety, liveness, throughput? Does it maximise welfare? Outsourcing may be good! Sometimes, more incentive-alignment.

Risk for the proposer? Should the protocol protect them?

More PBS at devcon

DEVCON BOGOTA

Session Talk

Block building after the Merge

Day 2 — Oct 12, 2022

Alex Stokes

DEVCON BOGOTA

Session Talk

Hybrid PBS from CL's Perspective

Day 3 — Oct 13, 2022

Terence Tsao

DEVCON BOGOTA

Session Talk

Evaluating the PBS Experiment: Early insights from MEV-Boost and the Builder Market

Day 3 — Oct 13, 2022

Jolene Dunne

DEVCON BOGOTA

Session Talk

MEV for the Next Billion: It's Time to Get Serious...

Day 4 — Oct 14, 2022

Philip Daian

Thank you!

Strong research background?
Mechanism design expert?
Want to help us make sense of it?
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