Time in Ethereum

Implications of replacing our dear friend Poisson

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wtf is time ?! *
Time in Ethereum

slot $n$  slot $n+1$  slot $n+2$  slot $n+3$

12 sec  12 sec  12 sec  12 sec
Where does the deterministic nature of time in PoS Ethereum come from?
exogenous randomness : random block time ::
on-chain pseudo-randomness : deterministic time
Time in PoW vs. Time in PoS
Guess when Ethereum merged ...
Implications of deterministic time
One important corollary of this is better EIP 1559 performance (because fewer blocks bump up against the 2x limit). So far, the percentage of full blocks has dropped from ~20% to ~10%.

etherscan.io/blocks?ps=100&...
But proposers can abuse their guaranteed monopoly power.
Progression of a slot

Attesting

A validator is expected to create, sign, and broadcast an attestation during each epoch. The `committee`, `assigned_index`, and `assigned_slot` for which the validator performs this role during an epoch are defined by `get_committee_assignment(state, epoch, validator_index)`.

A validator should create and broadcast the `attestation` to the associated attestation subnet when either (a) the validator has received a valid block from the expected block proposer for the assigned `slot` or (b) $1 / \text{INTERVALS\_PER\_SLOT}$ of the `slot` has transpired ($\text{SECONDS\_PER\_SLOT} / \text{INTERVALS\_PER\_SLOT}$ seconds after the start of `slot`) -- whichever comes first.
Fork choice rule: LMD GHOST-ish
But proposers can abuse their guaranteed monopoly power.
Block receival time: 0s–4s into slot ("on time"-ish)
Block receipt time: >4s into slot ("late")

- 0s: Start of slot n+1
- 4s: Attestation deadline
- 12s: Start of slot n+2
Proposer monopoly... wat do?
Fork choice fun TODAY: **proposer boost**
Fork choice fun TOMORROW: (block, slot)-voting
Idea: Incentivizing **timeliness explicitly**

Today: Block proposers are rewarded in proportion to the profitability of attestations they include in their block.

Idea: Scale the proposer’s reward by the **share of same-slot committee votes that the block receives and are included in the subsequent block.**

![Diagram showing the relationship between blocks and the rewards for timeliness](image)
load stability, good.
guaranteed monopoly, bad.
Thank you!

Strong research background? Mechanism design expert? Want to help us make sense of it? **Apply to the RIG now!**

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