Introduction

While roll-ups can inherit censorship resistance from the DA layer via mechanisms such as inboxes or force-transaction-inclusion, protocols for decentralized sequencing remain of interest as a way of preserving liveness for roll-ups, and removing single-points-of-failure. Several families of decentralized sequencer schemes have been proposed, such as stake-based round-robin

, stake-based fork-choice rules

, and non-stake-based fork-choice rules

. Stake-based round-robins are worth investigating for their simplicity, and the possibility of constructions enabling safe L2 soft-confirmations to be faster than the DA layer's blocktime.

Leader Pipelining

Suppose we use T

DA layer blocks as a unit of time to denote an epoch. Every T blocks, we generate a new leader schedule by randomly assigning S

roll-up slot-heights to staked sequencers, based on stake-weighted random distribution: so every slot $epochStartingSlotHeight \dots S$

has a sequencer assigned to produce the block for that slot height.

We will also set a maximum gas limit denominated in gas units, or possibly a blocksize denominated in bytes, to the roll-up blocks.

When it becomes a sequencer N

's turn to build his block, sequencer $N+1$

will also build a block for the same height, in case N

fails. Similarly, $N+2$

may also build a block for that slot, in case both previous scheduled sequencers fail, and so on. This way, we can be reassured that some sequencer in the schedule will have a block built for the height that eventually makes it to the DA layer.

Once a leader has built his block and makes it available via the p2p network, the next leader in the schedule may build the subsequent roll-up block. This chain may progress faster than the DA layer's block time, although true finality cannot be known until the DA layer finalizes the chain segment.

Equivocation

If a leader builds, signs, and publishes one block in the p2p network, but signs a different block for the DA layer, he may easily be held accountable in-protocol for the griefing: his stake can be slashed, and the chain can be invalidated and rebuilt from the latest healthy roll-up block. This mechanism allows the signed soft-confirmations of the L2 p2p network to be relatively safe, and progress faster than the DA layer.

Profitable Baselayer Censorship

A Celestia validator has the ability to mess with the roll-up, by censoring leaders from posting their roll-up blocks. This would allow the next leader's block to be accepted, creating a collusion vector that could lead to Celestia validators and certain roll-up sequencers to conspire against other roll-up sequencers for a competitive advantage in collecting MEV.

However, this does not lead to a gas war, and thus is not a destructive form of MEV that leaks to the baselayer.