Agenda

- **What types of preconfirmations are there?**

- **The preconf pipeline from a proposer POV.**

- *Game A: Optimally sourcing transactions.*

- *Game B: Pricing and optimal inclusion.*
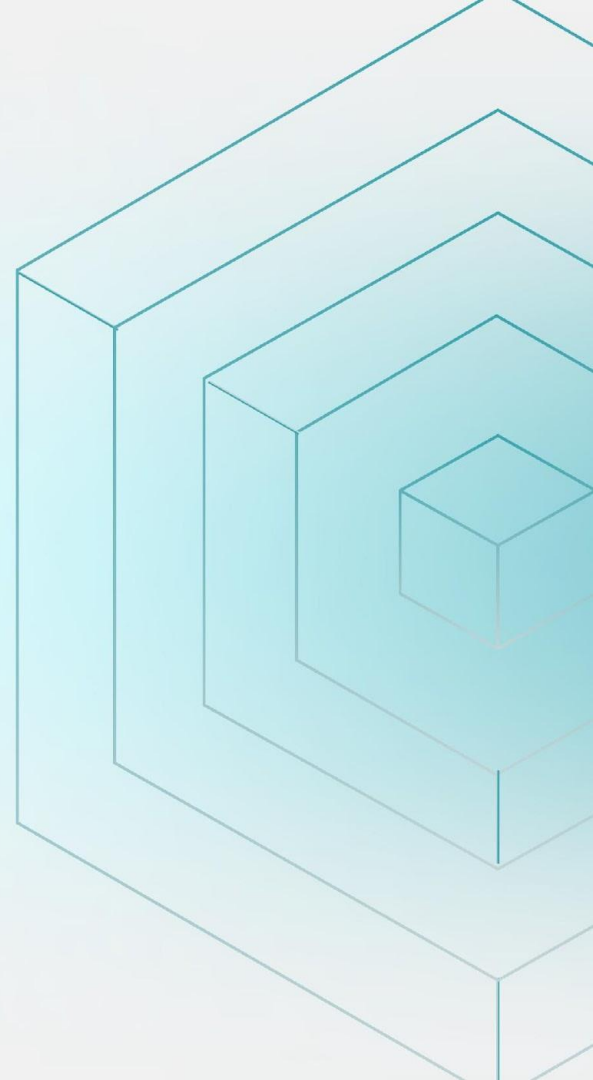
What types of preconfirmations are there?

There are inclusion- and execution preconfirmations

- An inclusion preconfirmation commits to the transaction being present in the block. It may fail.

- An execution preconfirmation commits to the transaction being (1) present and (2) executed in the block. It should not fail.

This means that:

(1) Execution preconfirmations may touch contentious state and require the block to be simulated.

=> These are best issued by builders.

=> As: Builders have (a) private flow (b) sophisticated pricing.

(2) Inclusion preconfirmations typically would not touch contentious state.

=> These are best issued by proposers.

=> As: the proposer is ~certain to propose. The builder may not win the auction.

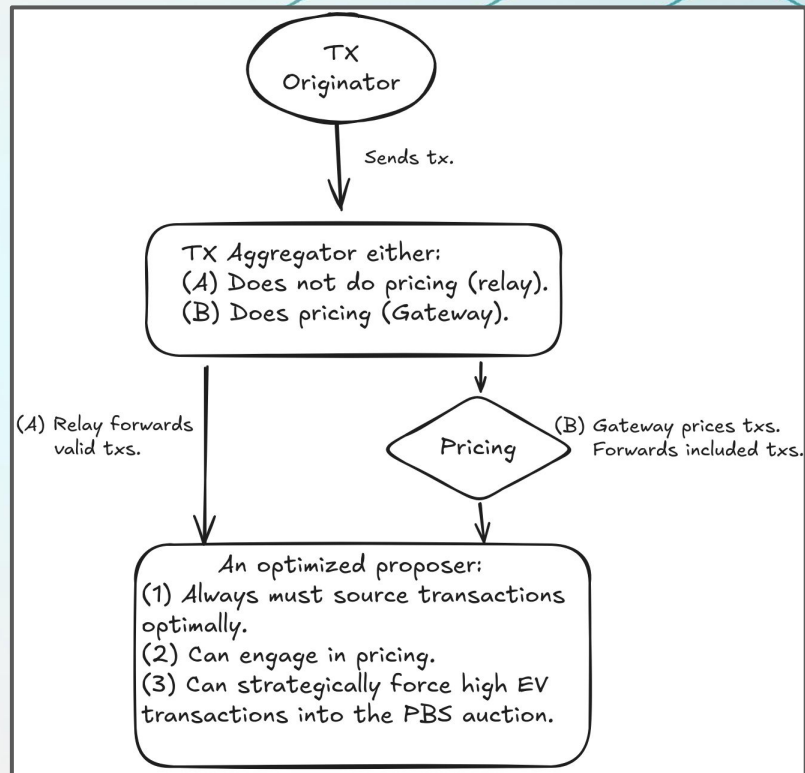What does the inclusion preconf tx pipeline look like for a proposer?

A generalized proposer inclusion preconf tx pipeline

- Transactions likely will be sent to a proxy (e.g. relay) that filters spam.

- Pricing can be delegated to a third party ("a gateway") or covered by the proposer.

Proposers may optimize over two axes:
(1)   Optimal transaction sourcing.
    (a)   <mark>There may be a "reverse" timing game around transaction sourcing.</mark>
    (b)   TX categories with increasing payoff over time may be forced into the PBS auction (e.g. widening arbitrage spreads).
(2)   Pricing.
    (a)   <mark>If in-house: pricing txs versus the predicted future block value.</mark>
    (b)   If gateway: dynamically selecting gateway with most private flow.

TX Originator

Sends tx.

TX Aggregator either:
(A) Does not do pricing (relay).
(B) Does pricing (Gateway).

(A) Relay forwards valid txs.

Pricing

(B) Gateway prices txs. Forwards included txs.

An optimized proposer:
(1) Always must source transactions optimally.
(2) Can engage in pricing.
(3) Can strategically force high EV transactions into the PBS auction.

Optimally sourcing Transactions.

Timing Games Reversed: Maximizing builder efficiency

Gas use is dynamical, and varies heavily between- and within-blocks.

PBS timing games capture value by soliciting the block late.

This means that:

(1) PBS timing games profit from expected transaction gas use going up over slot time.

(2) PBS timing games profit from winning over txs from the next block.

(3) Inclusion preconfirmations are unlikely to mirror this behavior, and may reverse it.

    (a) The preconf inclusion premium users scales with the expected wait time.
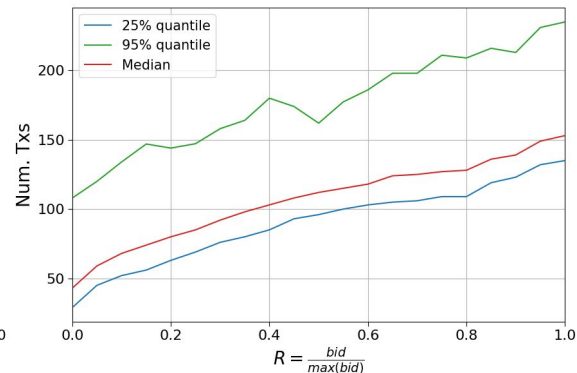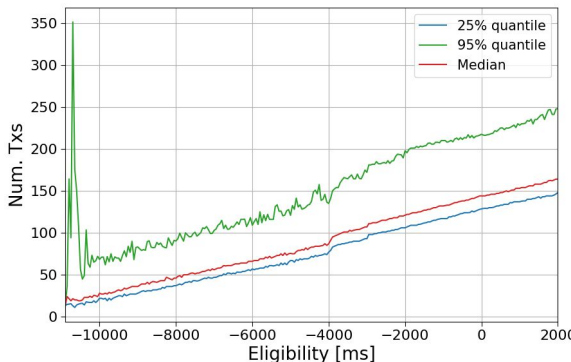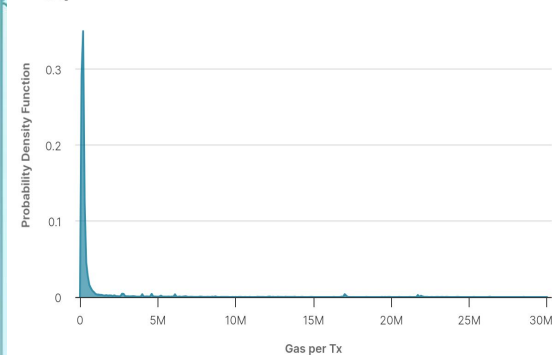
=> Preconf value may cluster early. Giving more optimization time to the builder looks optimal.
=> There is an optimal, early end to the auction that is a function of the tx arrival distribution and price decay.

Gas Usage vs Position
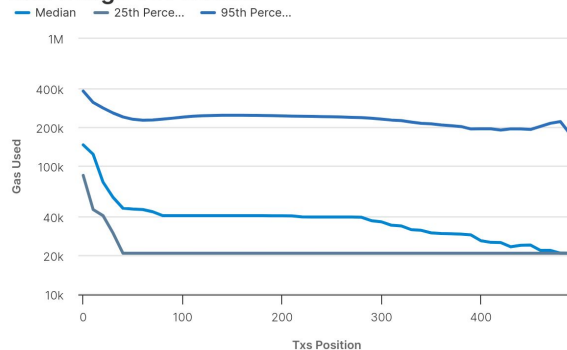
Gas per Txs Distribution

$$R = \frac{bid}{max(bid)}$$

Pricing and optimal inclusion.

In-house pricing: sketching out a model

We define 3 tiers as a function of transaction positioning. Tx position is a function of the priority fee.

Validators compete for tier 2 and tier 3 transactions. Not all tx fit in a block.

A valid model:

(1) Can be built on public flow as inclusion preconfs don't touch contentious state.

(2) Separates out the base fee and priority fee estimation.

    (a) The base fee is the "opportunity cost" of preconfing txs.

    (b) The priority fee is the "preconf premium" and corresponds to a distribution on tier 2 and tier 3 txs.

=> There is enough public information to build a reasonable model.

=> The base fee estimate should include all txs; the priority fee distribution should exclude tier 1 txs.

=> A percentile on the priority fee distribution is the preconf premium and added to the base fee estimate.
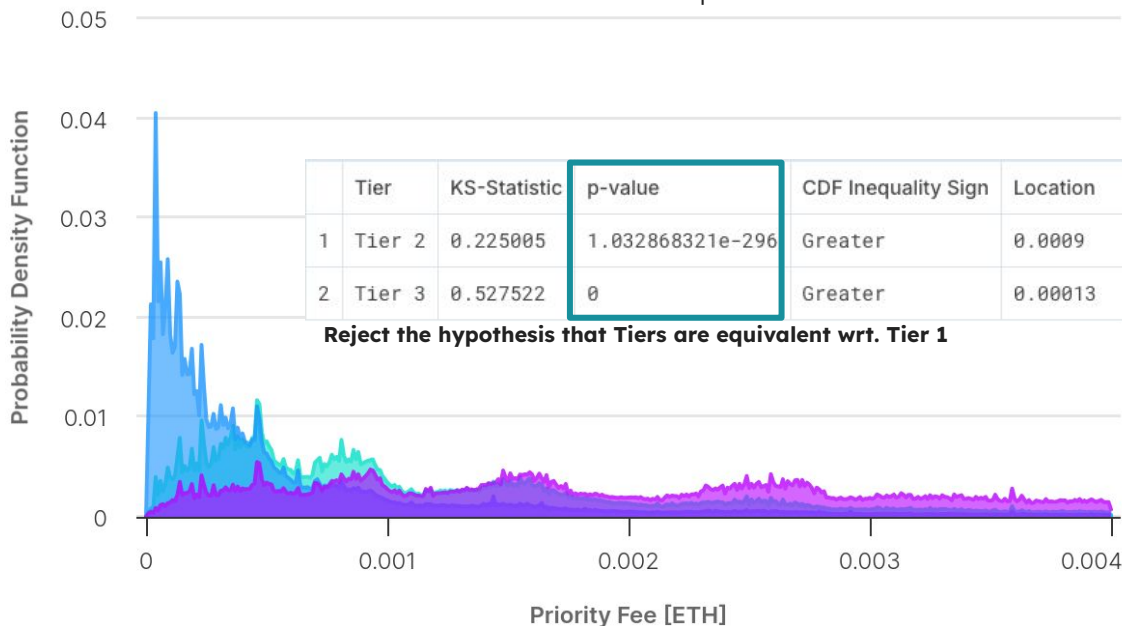
PFs by Tiers - Last 180 days

Legend: — Tier 2   — Tier 3   — Tier 1

Tier 1: Tx position <= 10
Tier 2: 10 < Tx position <= 20
Tier 3: Tx position > 20

	Tier	KS-Statistic	p-value	CDF Inequality Sign	Location
1	Tier 2	0.225005	1.032868321e-296	Greater	0.0009
2	Tier 3	0.527522	0	Greater	0.00013

Reject the hypothesis that Tiers are equivalent wrt. Tier 1

Probability Density Function vs Priority Fee [ETH]

Thank you -

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