Economics of EIP-1559

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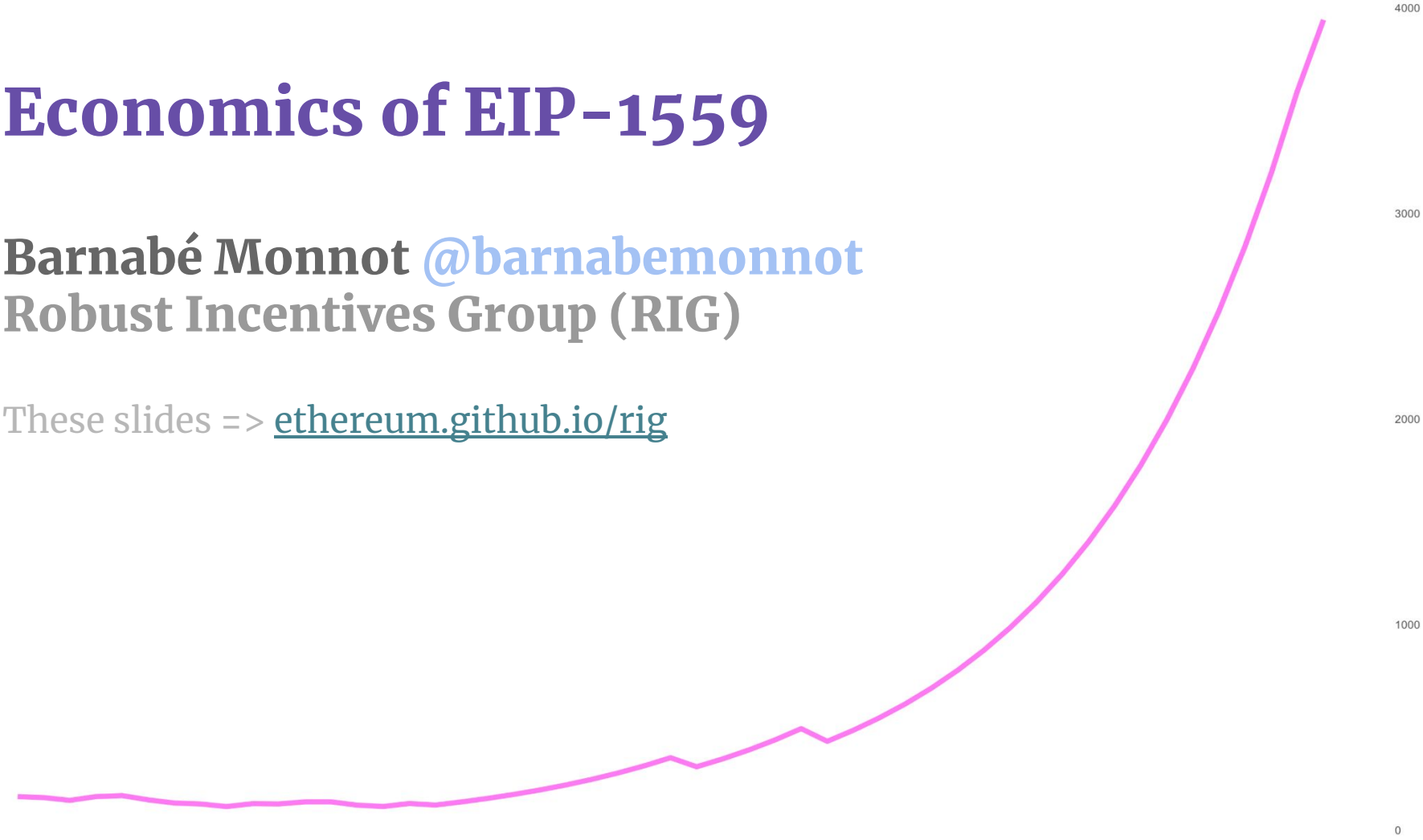
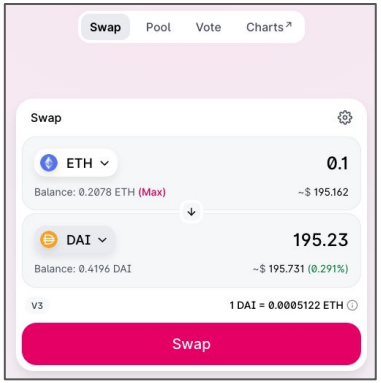
Robust Incentives Group (RIG)

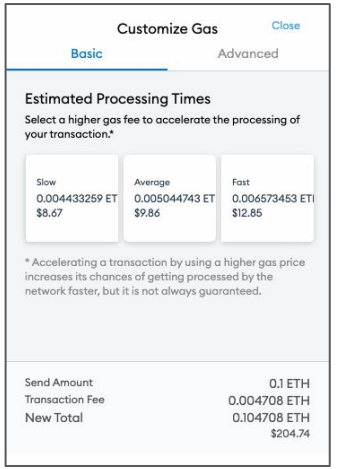
These slides => ethereum.github.io/rig

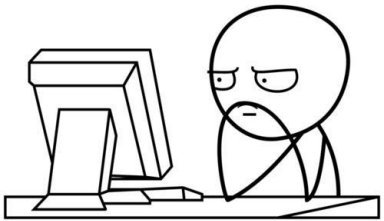


Ethereum gas market before 1559

- Go to your favourite Dapp
- Open your wallet to make a transaction
- Guesstimate the correct gas price
- Send the transaction
- Wait...







The price is right

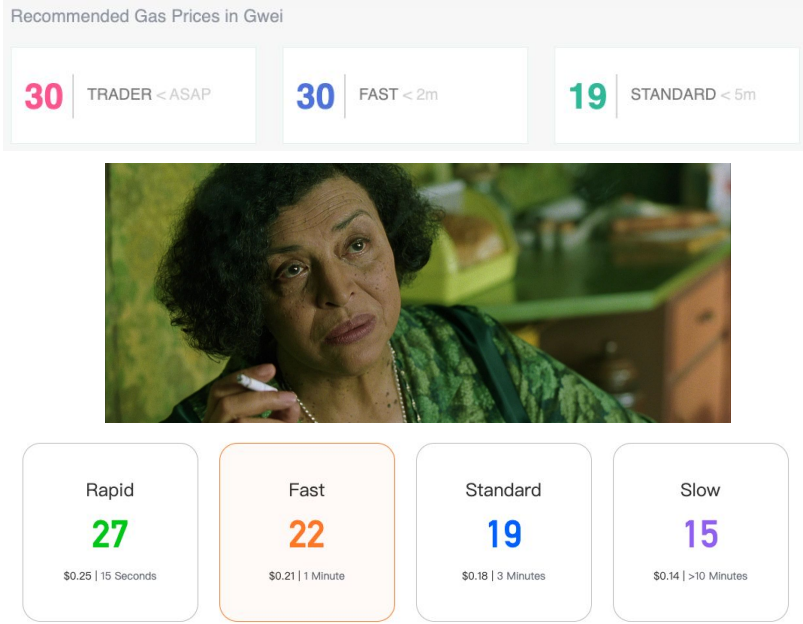
Guesstimate with oracles

> “Others are sending this much, let me send the same-ish”

Problems:

1. No objective pricing => Oracles can parrot bad data

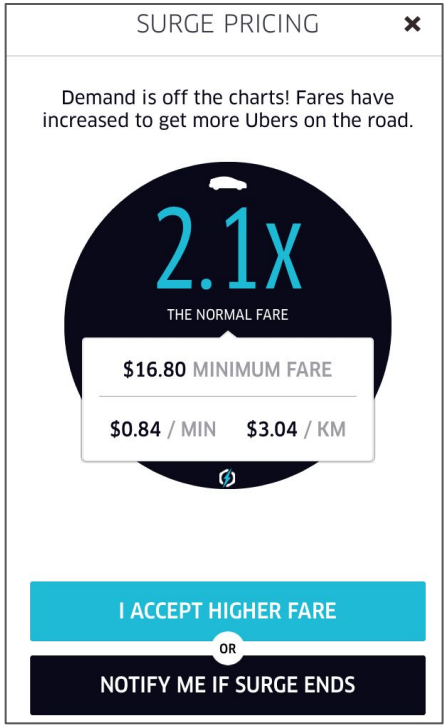
2. No flexibility => Set your price once, pay that price no matter what



In-protocol congestion pricing

Protocol mandates a minimum rate ("basefee") to include a transaction

- When demand is high, basefee increases
- When demand is low, basefee decreases



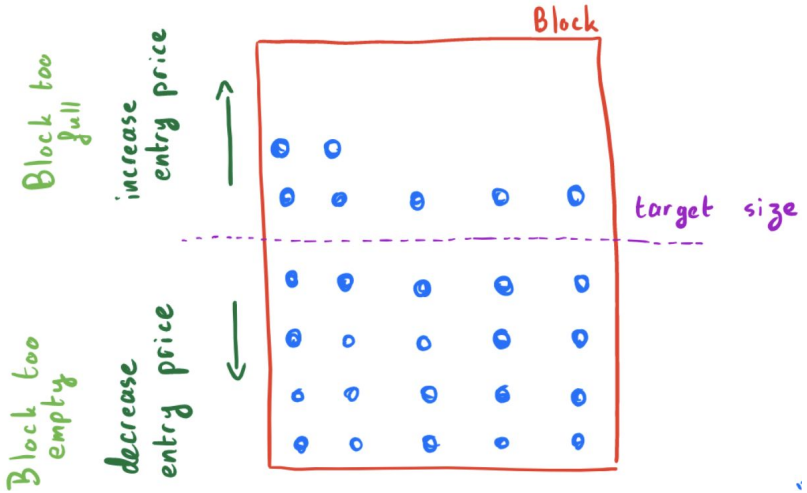
How is demand tracked?

Double the block size.

... but target half-full blocks!

- If block producer can fill up block above target, basefee increases
- If block producer fills up block below target, basefee decreases

Fixes problem 1. “No objective price”



EIP-1559 transactions

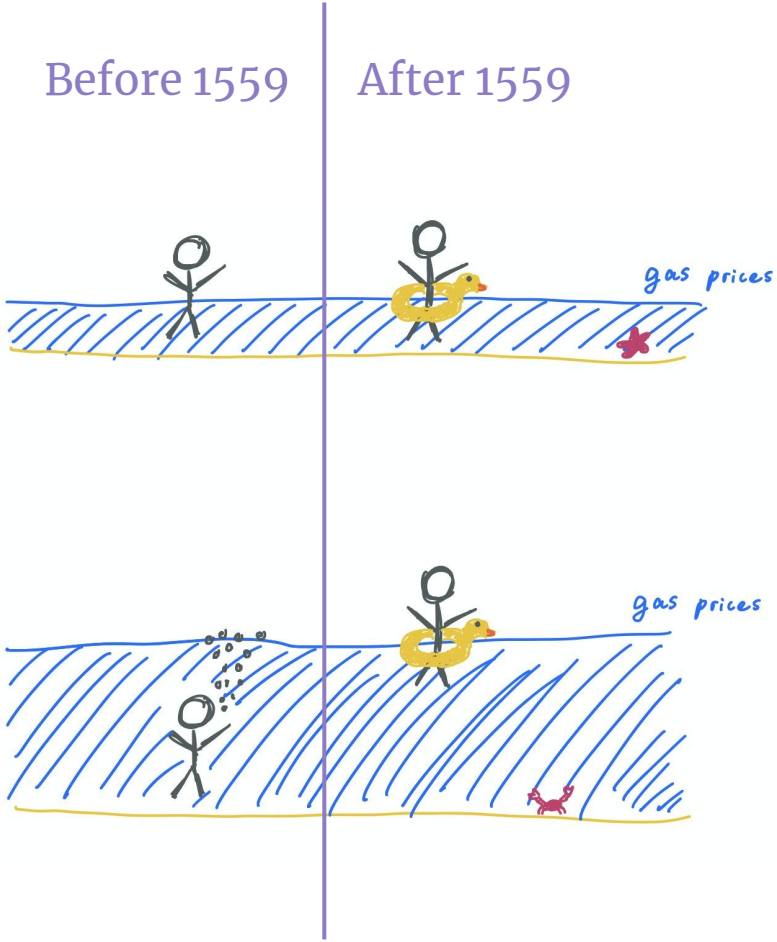
Addresses problem 2. “No flexibility”

User specifies:

1. Extra fee for the producer (“priority fee”)
2. A maximum fee

When user is included, they pay

Basefee + Priority fee



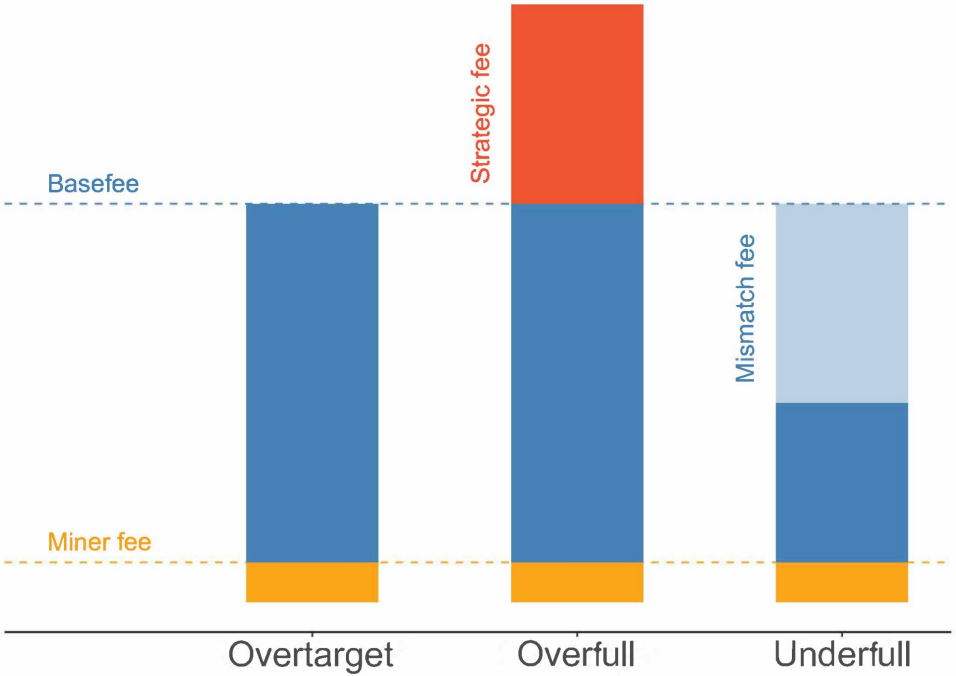
Why fees?

Cost to miners is ~linear in the supply (execution + uncle risk)

=> Priority fee pays for this

=> Mostly fixed value

Basefee prices congestion in the system = “damage caused by included users to non-included users”



From https://barnabe.substack.com/p/understanding-fees-in-eip1559

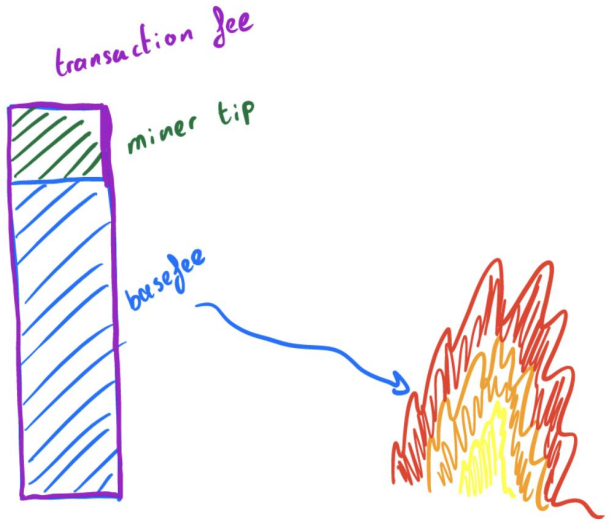
Watch the burn

When user is included, they pay

Basefee + Priority fee

Block producers receive the priority fee.
The basefee is “burned”.

🌱 “Protocol captures
+ redistributes its own value” 🌱



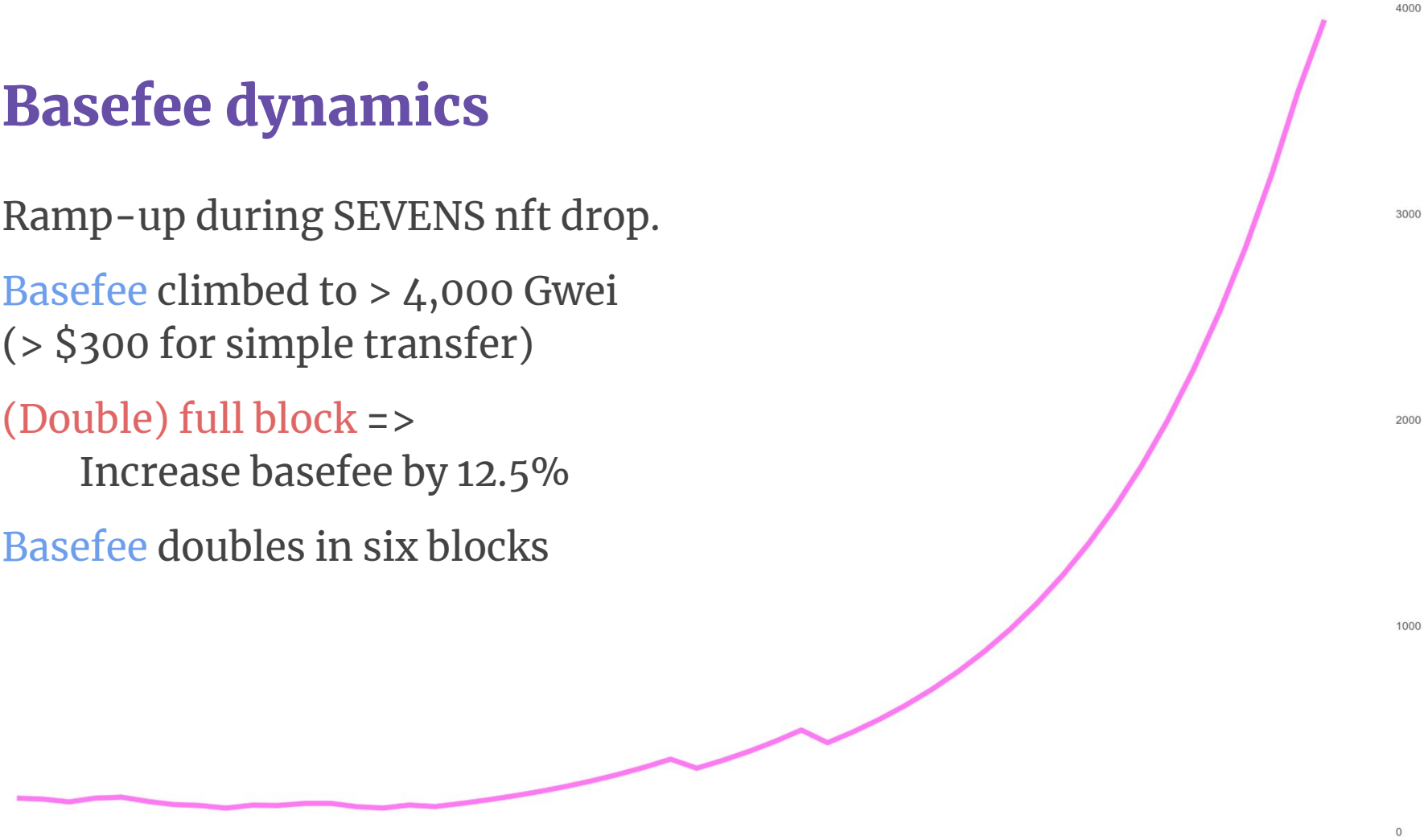
Basefee dynamics

Ramp-up during SEVENS nft drop.

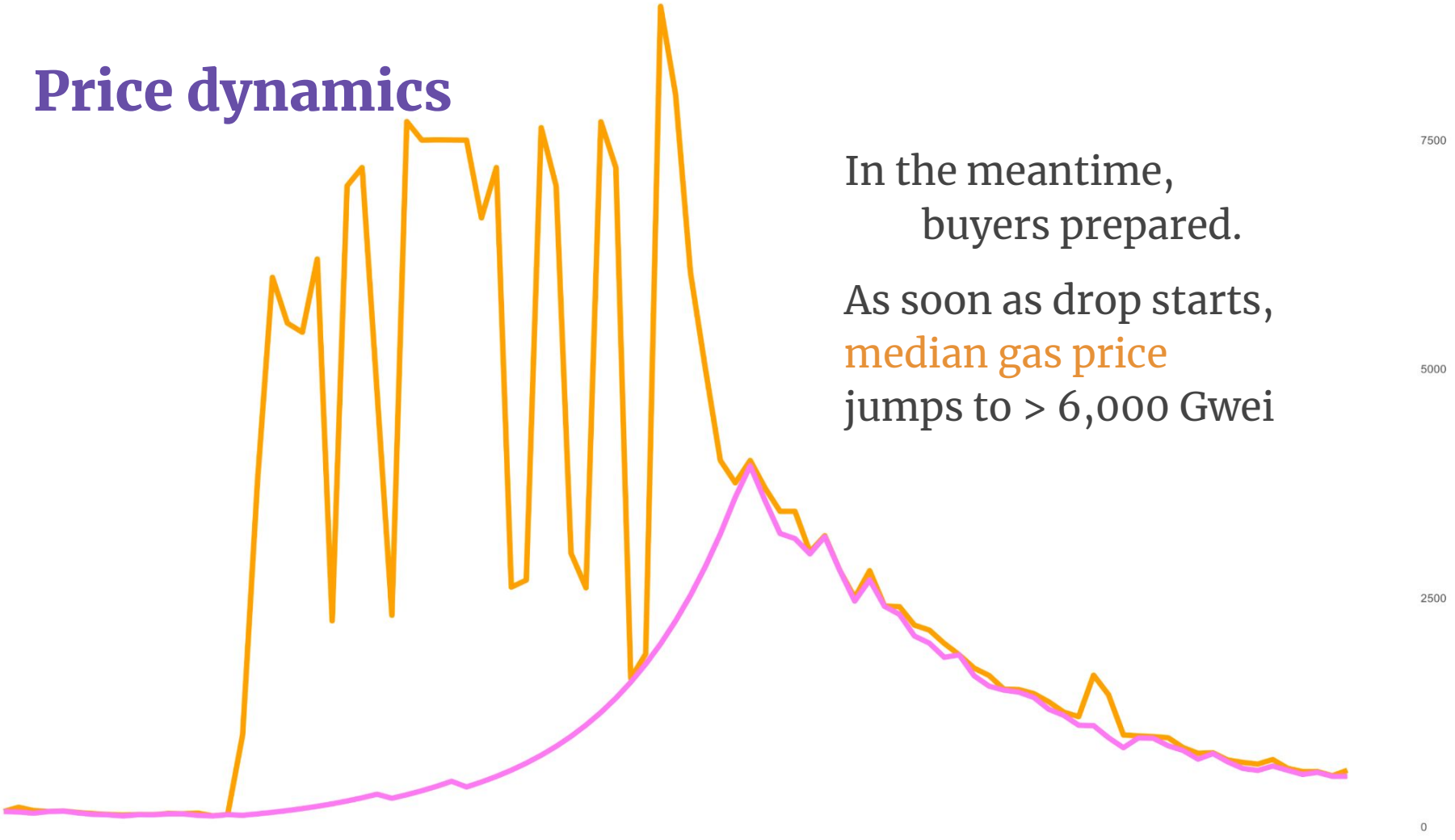
Basefee climbed to > 4,000 Gwei
(> $300 for simple transfer)

(Double) full block =>
Increase basefee by 12.5%

Basefee doubles in six blocks



Price dynamics



In the meantime,
buyers prepared.

As soon as drop starts,
median gas price
jumps to > 6,000 Gwei

Blink and it's gone

New paper!

Market has two regimes:

- Relative stability
- Crazy mode

During relative stability, we don't need a very responsive basefee

But during crazy mode, we have

- Short "attack": many txs at once
- Long "release": backlog absorbed over time

AIMD scheme

Transaction Fees on a Honeymoon: Ethereum's EIP-1559 One Month Later

1st Daniël Reijsbergen
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https://arxiv.org/abs/2110.04753

Peep a (post-merge) EIP-1559

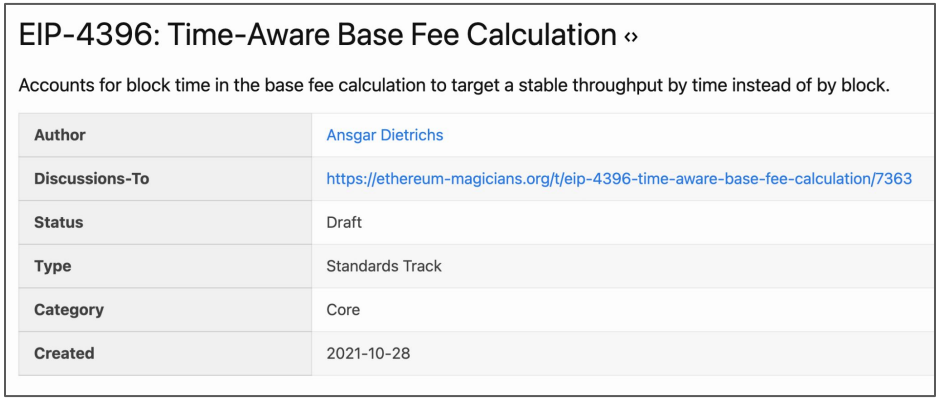
Today, blocks arrive ~Poisson process of mean 13 seconds.

Post-merge, deterministic block time, every 12 seconds a new slot.

Slot may be empty!
Then capacity is lost.

EIP-4396: Update the update rule to make up for lost capacity.

Constant throughput over time vs. over blocks



EIP-4396: Time-Aware Base Fee Calculation ‹›

Accounts for block time in the base fee calculation to target a stable throughput by time instead of by block.

Author	Ansgar Dietrichs
Discussions-To	https://ethereum-magicians.org/t/eip-4396-time-aware-base-fee-calculation/7363
Status	Draft
Type	Standards Track
Category	Core
Created	2021-10-28

Deeper dive

We've published open research (and will continue to do so!)

Check out ethereum.github.io/abm1559

Thank you for attending!