# Ethereum and MEV status: “It’s complicated”

TU Munich Blockchain Salon

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# Main themes

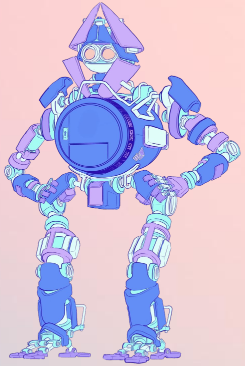
MEV is value — we shouldn’t be too quick to prevent its emergence!

But MEV is *mismatched* value — we should develop better mechanisms to channel it productively.

# Validators as protocol operators

# Who runs the network?

Ethereum requires **consensus** over state of the chain
This is done with **Proof-of-Stake-based mechanism**

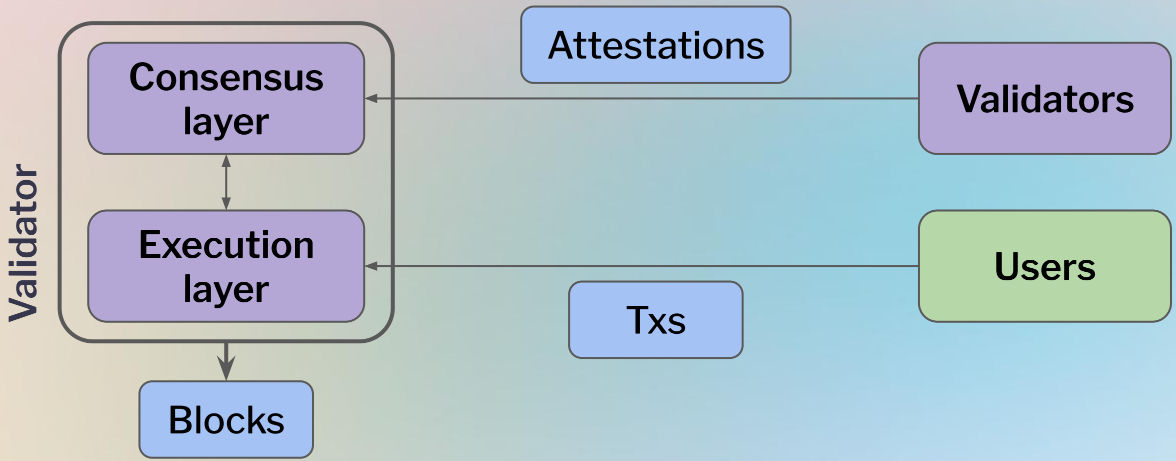


**Validators are first-class protocol operators**
Responsible for **maintaining a single view of the ledger**
Produce blocks, are accountable for safety faults

# How to become a validator

**Lock up 32 ETH** in the deposit contract, wait for activation

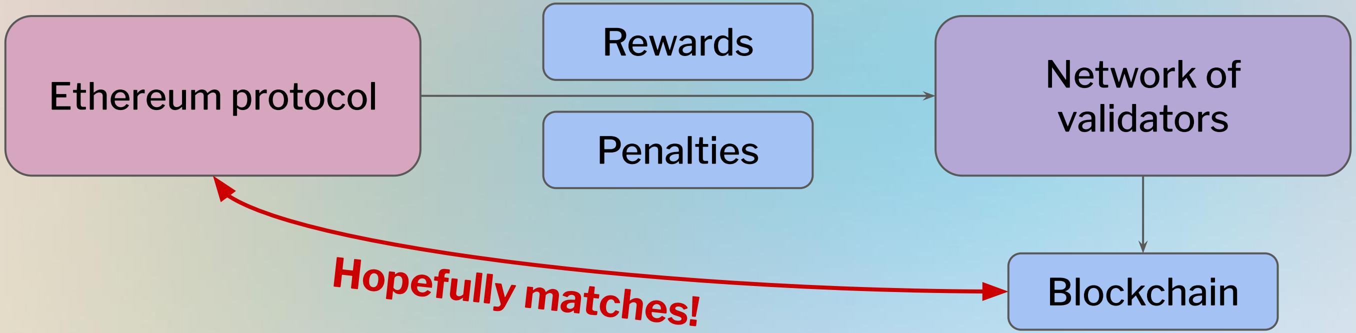
- **Block proposals:** Containing consensus and execution data
- **Attestations:** Provide view of block tree, finalise blocks



# Validator accountability

Protocol specifies rewards and penalties:

- **Rewards**
  - **Block reward** for block proposal/correct voting
  - **Transaction fees** from execution payload
- **Penalties:** Inactivity penalty + Slashing



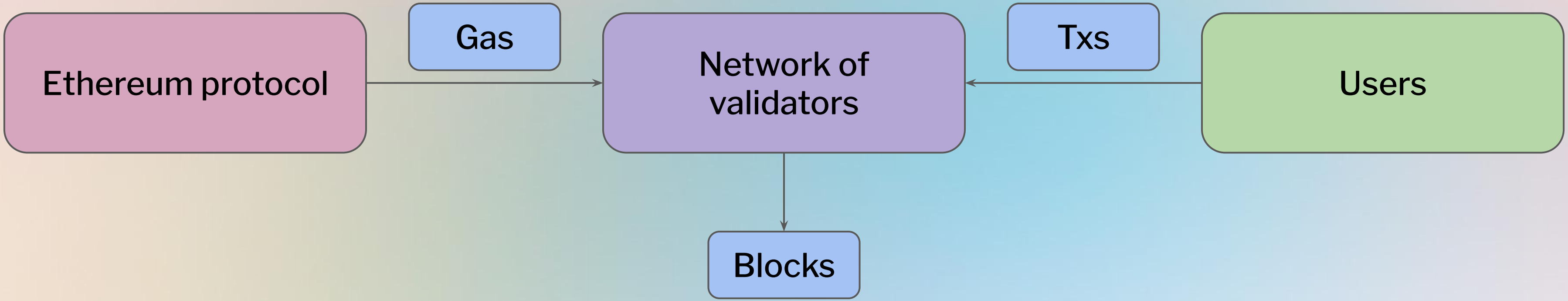
# Validator as block producers

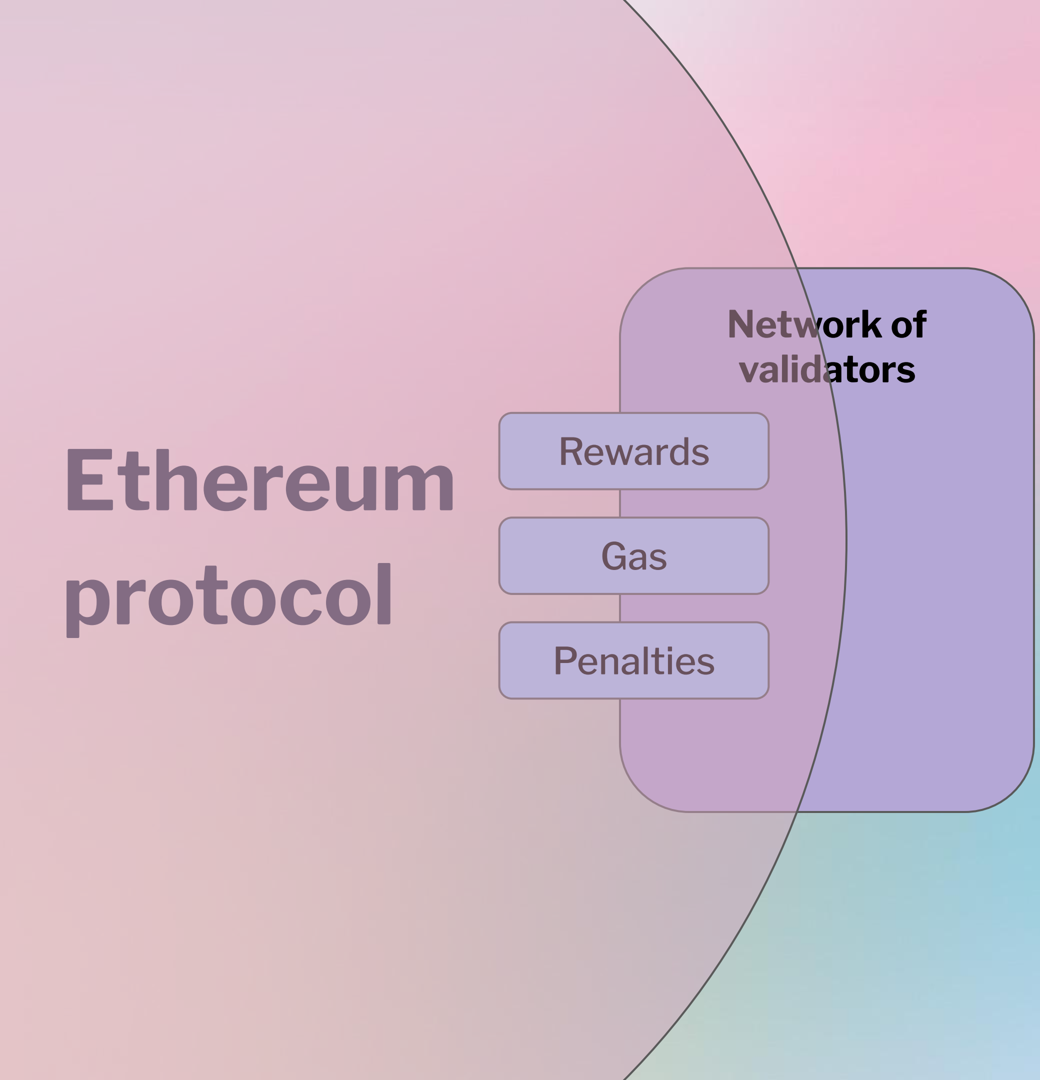
Protocol lets validators-as-block-producers **consume** resources

Supply constrained to guarantee **low verification costs**

Validators produce **blocks**,

meeting **demand for transactions** with **supply of resources**





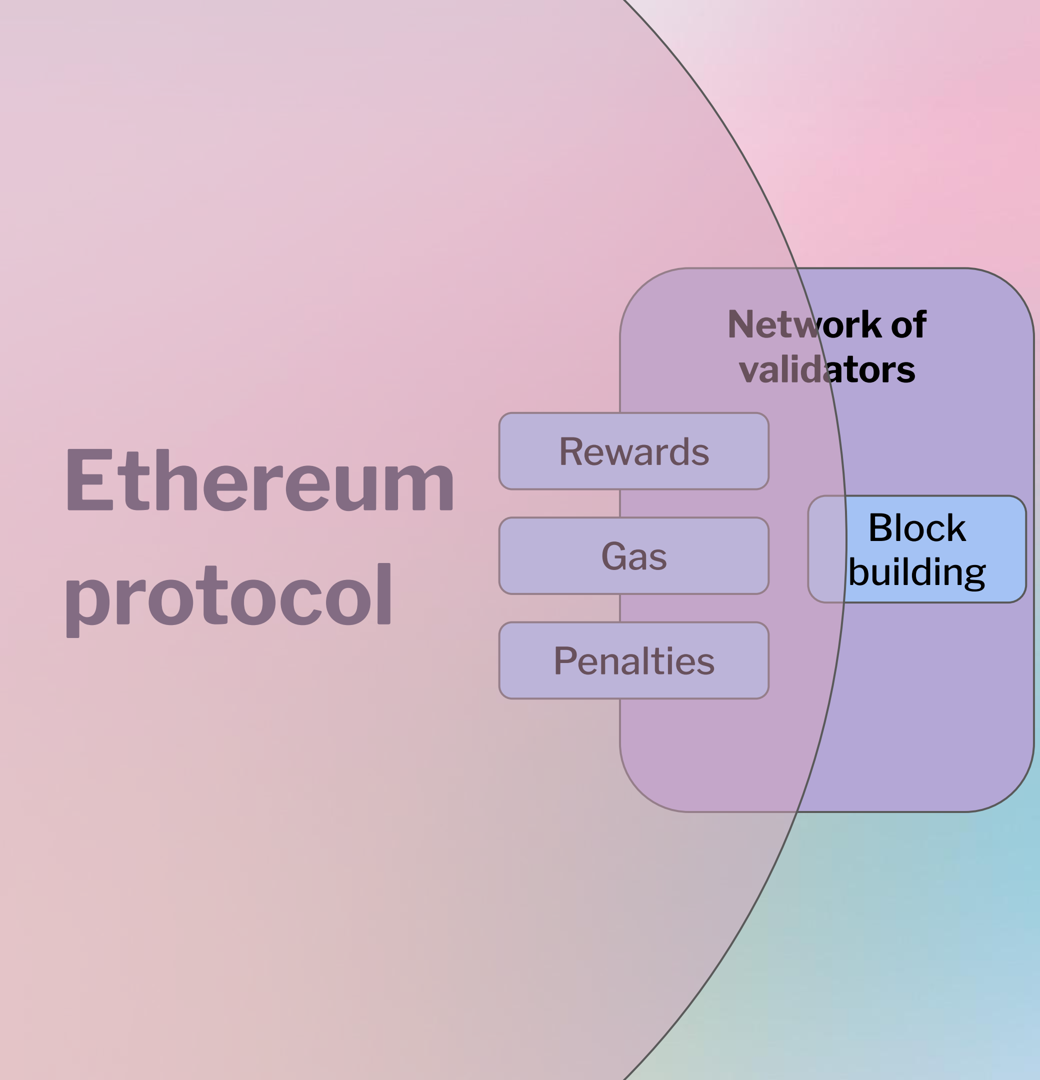
Ethereum protocol

Network of validators

Rewards

Gas

Penalties



Ethereum protocol

Network of validators

Rewards

Gas

Penalties

Block building

# Towards minimum rent for validators

# Validator privilege

Validators have a *privileged* position on the network.

**In this talk**

**MEV =** All revenue achievable by validator *from this position*

Includes “revenue achievable by re-ordering, inserting or censoring transactions”

# Rent 1: Congestion pricing

Validators pack blocks, but block space is **scarce**
⇒ Users express inclusion preferences via **fees**

**Monopoly without a monopolist** (Huberman, Leshno, Moallemi, 2021)
Operators *cannot* enforce monopoly pricing (Bitcoin-type TFMs)

**Ethereum with EIP-1559 fee market** (Roughgarden, 2021)
Fees / Congestion costs are *internalised* by the protocol
🧮 **Data point:** ~6 billion USD captured and removed since EIP-1559 (Aug. ‘21)

# Rent 2: Validator privilege

Validators include user transactions in the blocks they make

**Last look** ⇒ Validators capture value from externalities

### ⚖️ Arbitrage

**User** makes a swap order for token A against token B on a market 1

⇒ Creates price imbalance with another market 2

**Validator** buys B low on 1 ⇒ **Validator** sells B high on 2

⇒ Price imbalance is resolved, **Validator** pockets the difference

# Rent 2: Validator privilege

Validators include user transactions in the blocks they make

**Last look** ⇒ Validators extract value from users

🥪 **“Sandwich” attack**

**User** makes a swap order for token A against token B

**Validator** places: **1)** Order for A/B *before* **user** swap

+ **2)** Order for B/A *after* **user** swap

🍞 **Validator** buys low ⇒ 🧀 **User** buys high ⇒ 🍞 **Validator** sells high

Permissionless [validators + programmability] ⇒ **No “outlawing”**

+ Sandwiches may create surplus! (Kulkarni, Diamandis, Chitra, 2022)

# Rent 2: Validator privilege

Maximising extractable value for **validator** is hard

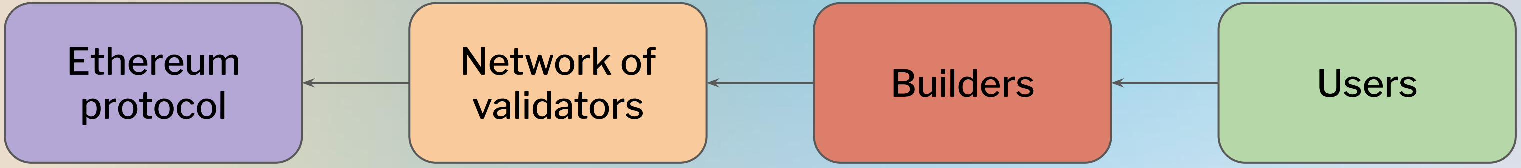
Requires sophistication and/or access to exclusive order flow

**Division of labor:** **Validators** source their blocks from **builders**

~ Procurement auction, **builders** extract value, bid it away

**Future: Protocol is the auctioneer, permissionless auction**

Bid values are captured and internalised ⇒ **Minimum rent**



# Recovering max user welfare

**Protocol** captures **validator** rent, but **user** is still hurt 🥪😖🥪

**Question:** How to protect user, *without hurting coordination?*

**Tensions**

Permissionless programmability ⇒ **Max coordination value**
Defensive “protections” add constraints ⇒ **May destroy value**

**Are we lost?**

# Recovering max user welfare

**Operator** may have last look, but **user** has **commitment power!**

**Examples**

- Order Flow Auctions (OFAs): User sells order to bidders
- Contextual execution
- ??? ⇒ Permissionless innovation in **cryptography** and **mechanism design**

**This is the most exciting place to do research in!**

mevconomics.wtf ⇒ 7 hours of great content :)

# Thank you!

## Seeing like a protocol

Where does protocol credibility come from?

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**Go further:**

- ethereum.github.io/rig
- barnabe.substack.com
- mevconomics.wtf

**Get in touch! barnabe@ethereum.org**