

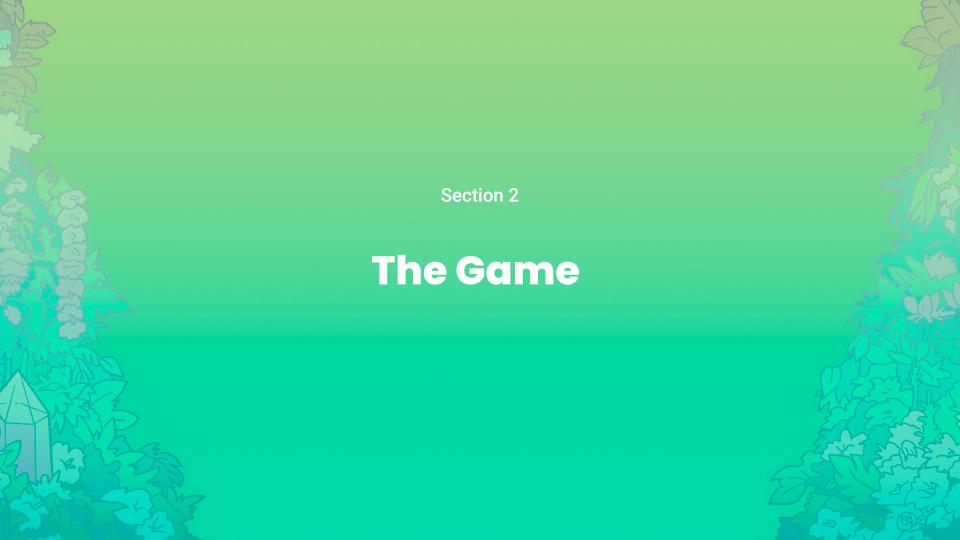


# **Motivation**

Maximum Extractable Value (MEV)

Main forms of MEV extraction

- CEX-DEX arbitrage
- Backruns
- Sandwiches
- Liquidations



### The Game

#### Players of the block-building process:

- A validator/proposer has the power to propose next block
- There are specialized arbitrageurs, called searchers
- Currently in Ethereum: Builders aggregate searchers inputs
- 📉 A finite set of searchers S (can be identified by an address i)
- Searchers submit bundles of transactions for inclusion
- B(A) denotes blocks that can be built from bundles submitted by searchers A  $\subseteq$  S
- Searcher i generates value for block B, if block B is realized
- A validator/proposer generates value from block

### **Cooperative Game Theory**

The interaction between searchers and validator can take many forms:

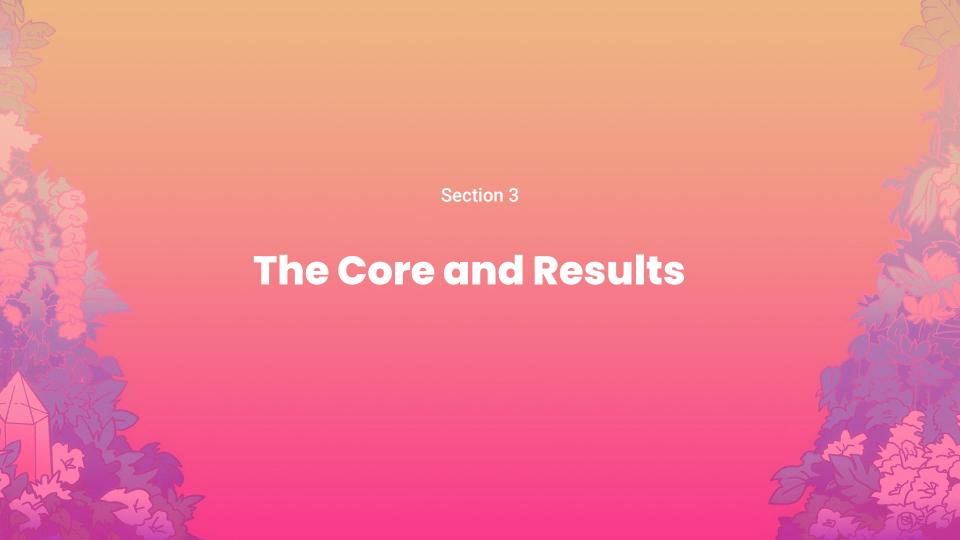
- abstract away from particular mechanisms
- study attainable value distributions

Value the coalition of searchers A and the validator V jointly achieve: maximum value block

v(A) = 0 for A that does not include V

This defines a coalitional (Transferable Utility-)TU-game

A natural solution concept is the core



### **The Core**

Definition:

There is no coalition of players that in total get allocated less than their value.

The value distribution is implemented:

- through utility maximizing block being published
- appropriate payments between searchers and the validator

### Insights

The core is always non-empty

give all the value to the validator

There are scenarios with searcher capturing all value in a core allocation

Additive value, and searchers don't clash/compete

In an additive model over bundles, the maximal value that any searcher can get is the sum of marginal values over all bundles

## **Stochastic Setting**

Consider a model with additive value and bundle clashing

- There are m opportunities
- There are n searchers
- Searcher i generates a value v[i][j] from opportunity j
- Let p denote probability of finding any of those opportunities

#### Theorem

For binary values, if  $p > 2 \log(n)/n$  and m < n, then w.h.p. the validator captures all value in all core allocations.

We can empirically validate this theory