Incentivization of correct behavior in a decentralized computing marketplace

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Key concepts

Smart Contract [1]

- Automated Agreements
- Trustless Transactions
- Transparency
- Immutability

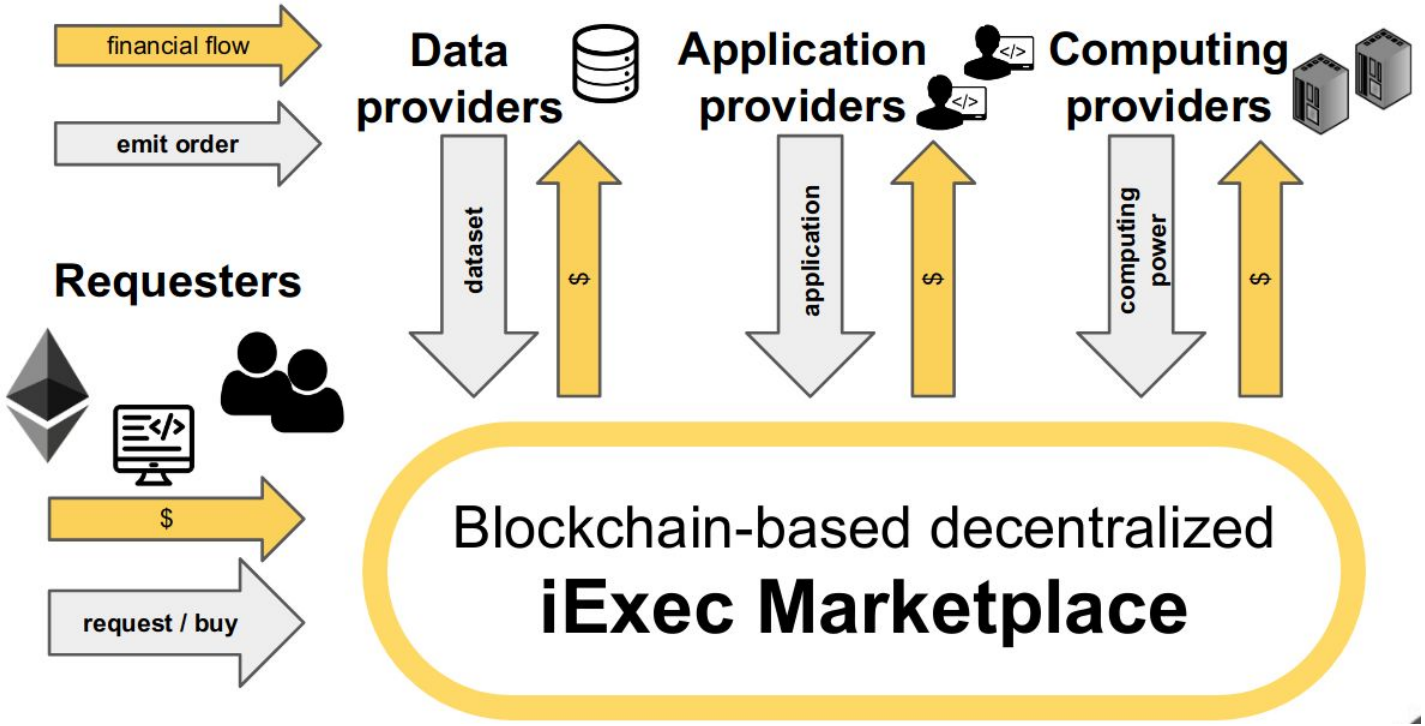
iExec [2]

- Blockchain startup
- Decentralized cloud computing
- Decentralized marketplace

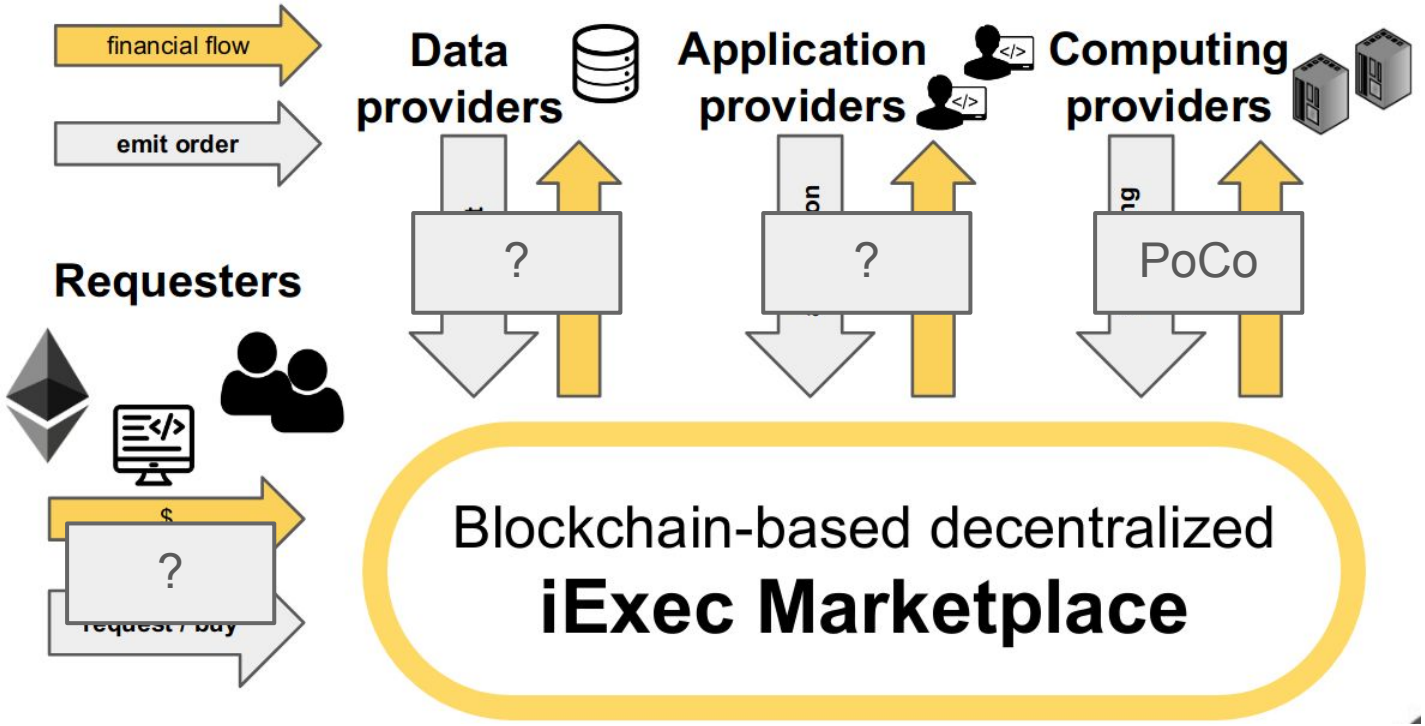
PoCo [3]

- Consensus Mechanism
- Incentives for Workers
- Staking System
- Outcome-based Payments

Context: The iExec decentralized marketplace

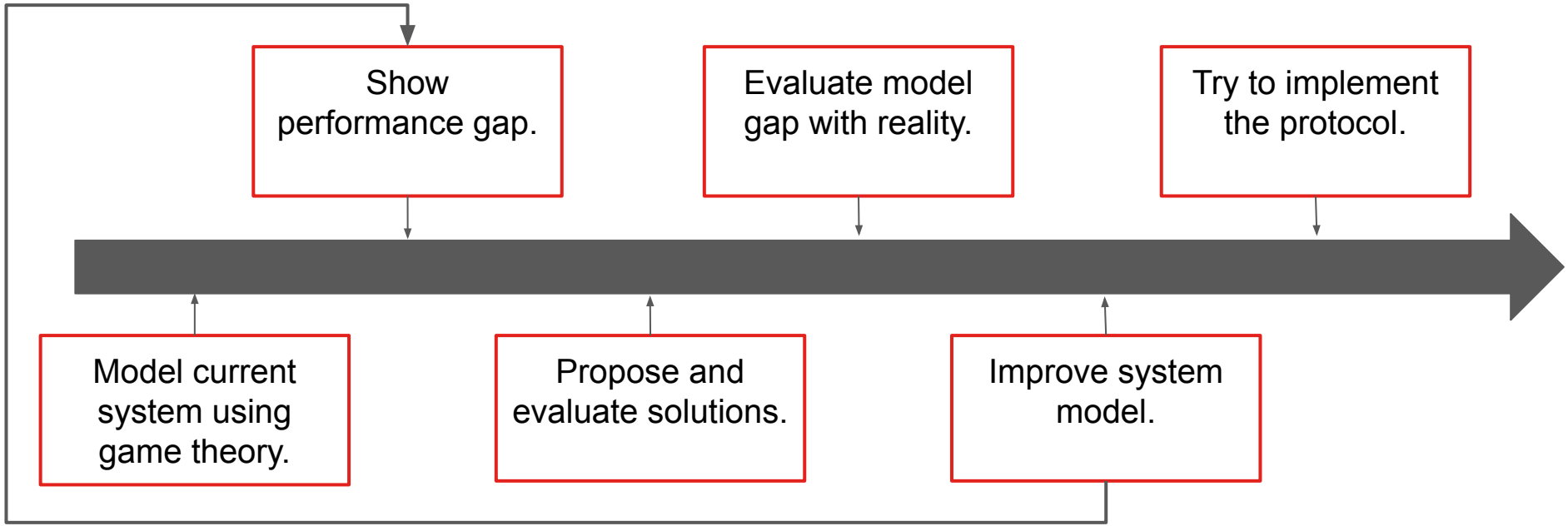


Identified problem



⇒ Currently no incentive mechanisms for Requesters, Data providers and Application providers.

Planning


Show performance gap.
Evaluate model gap with reality.
Try to implement the protocol.
Model current system using game theory.
Propose and evaluate solutions.
Improve system model.

Game Theory based system model [4]

Requester: S

Asset		Computing provider: S	Computing provider: F
	S	(U_r-($Price_a$+$Price_c$) , $Price_a$, $Price_c$-$Cost_c$)	(0 , 0, -($Cost_c$+$Slash_c$))
	F	(0, 0, -($Cost_c$+$Slash_c$))	(0, 0, -($Cost_c$+$Slash_c$))

Requester: F

Asset		Computing provider: S	Computing provider: F
	S	(0 , 0 , $Price_c$-$Cost_c$)	(0 , 0, -($Cost_c$+$Slash_c$))
	F	(0, 0, -($Cost_c$+$Slash_c$))	(0, 0, -($Cost_c$+$Slash_c$))

U_r: Utility from the result
$Slash_c$: Computing provider slash
$Price_a$: Asset price
$Price_c$: Computing price
$Cost_c$: Computing cost

Strategies:

- S: Do the work correctly
- F: Do the work incorrectly

Results:

- ⅘ Nash Equilibria leads to failure.
- The successful strategy seems to be Pareto superior.

Shortcomings:

- Only honest payoff is accounted for.
- Malicious actors might not be interested in putting in the effort to earn the honest payoffs.

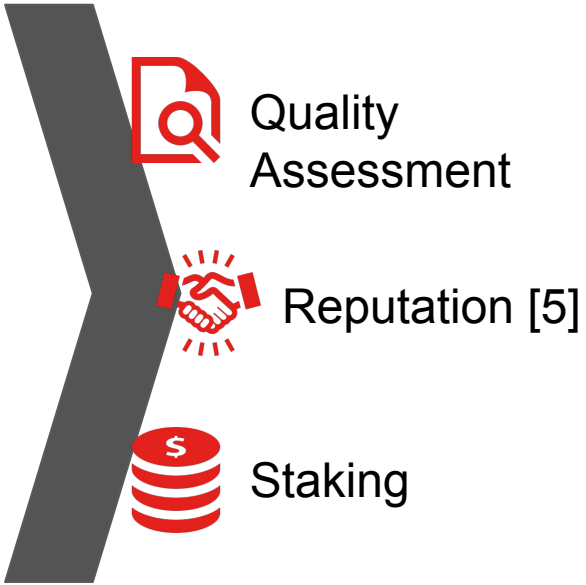
⇒ Current work: improve this model.

Proposed solutions

To ensure the system's reliability, it must incentivize good behavior from all actors.

We need to:

- Detect when any actor engages in erroneous or malicious activities.
- Punish faulty behaviors.
- Reward good behaviors.



Solutions comparison

Quality Assessment

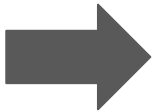
- ✚ Identify faulty actor.
- ✚ Objective Evaluation.
- ✚ Early Detection.
- ▬ Not one size fit all.
- ▬ Difficult to automate.

Staking

- ✚ Financial incentive.
- ✚ Accountability.
- ▬ Capital Requirement.
- ▬ Risk of Loss.
- ▬ Who is to blame ?

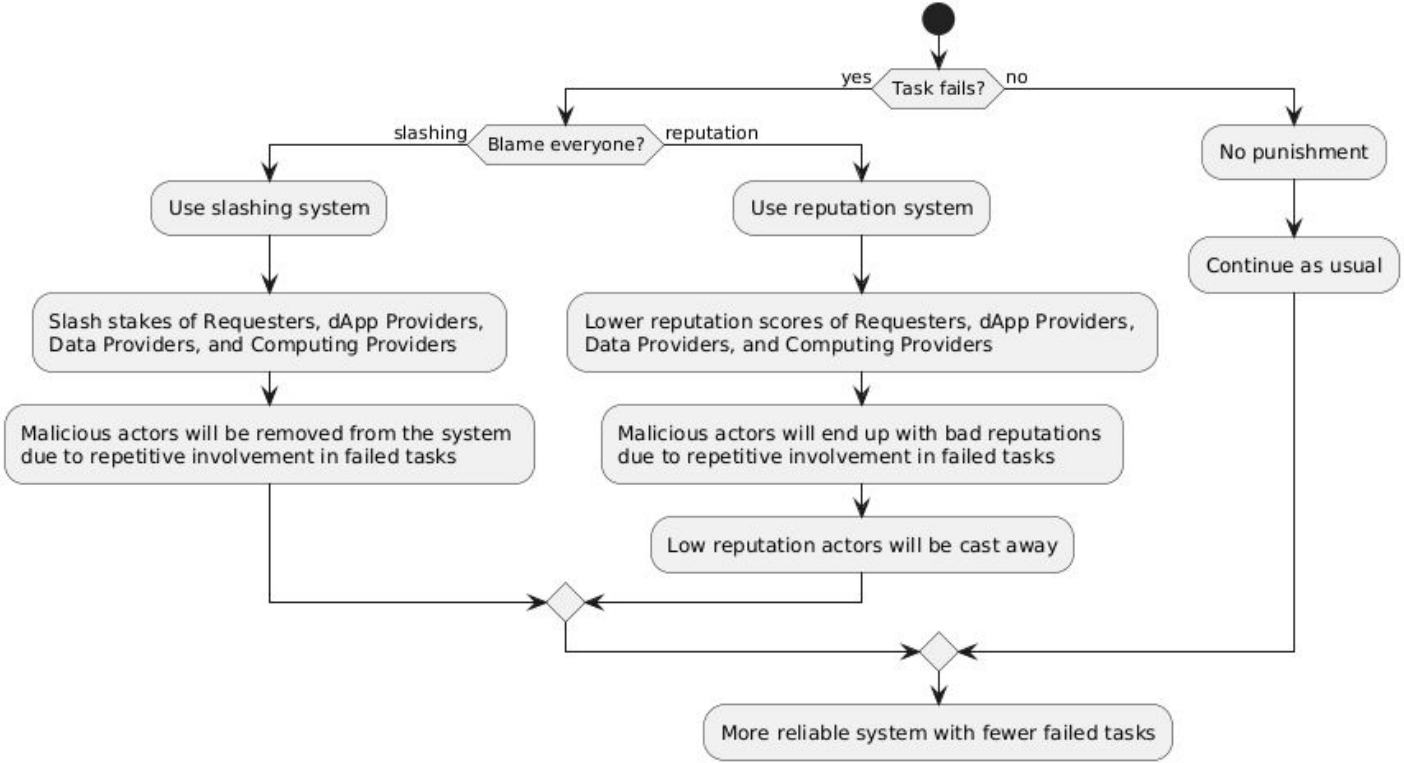
Reputation

- ✚ Behavioral Incentives.
- ✚ Accountability.
- ▬ Reputation Manipulation.
- ▬ Initial Bias.
- ▬ Who is to blame ?



Would blaming everyone work ?

Future work: Blaming every involved actor



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