Technique de protection des données privées dans le contexte des marchés locaux d'énergie

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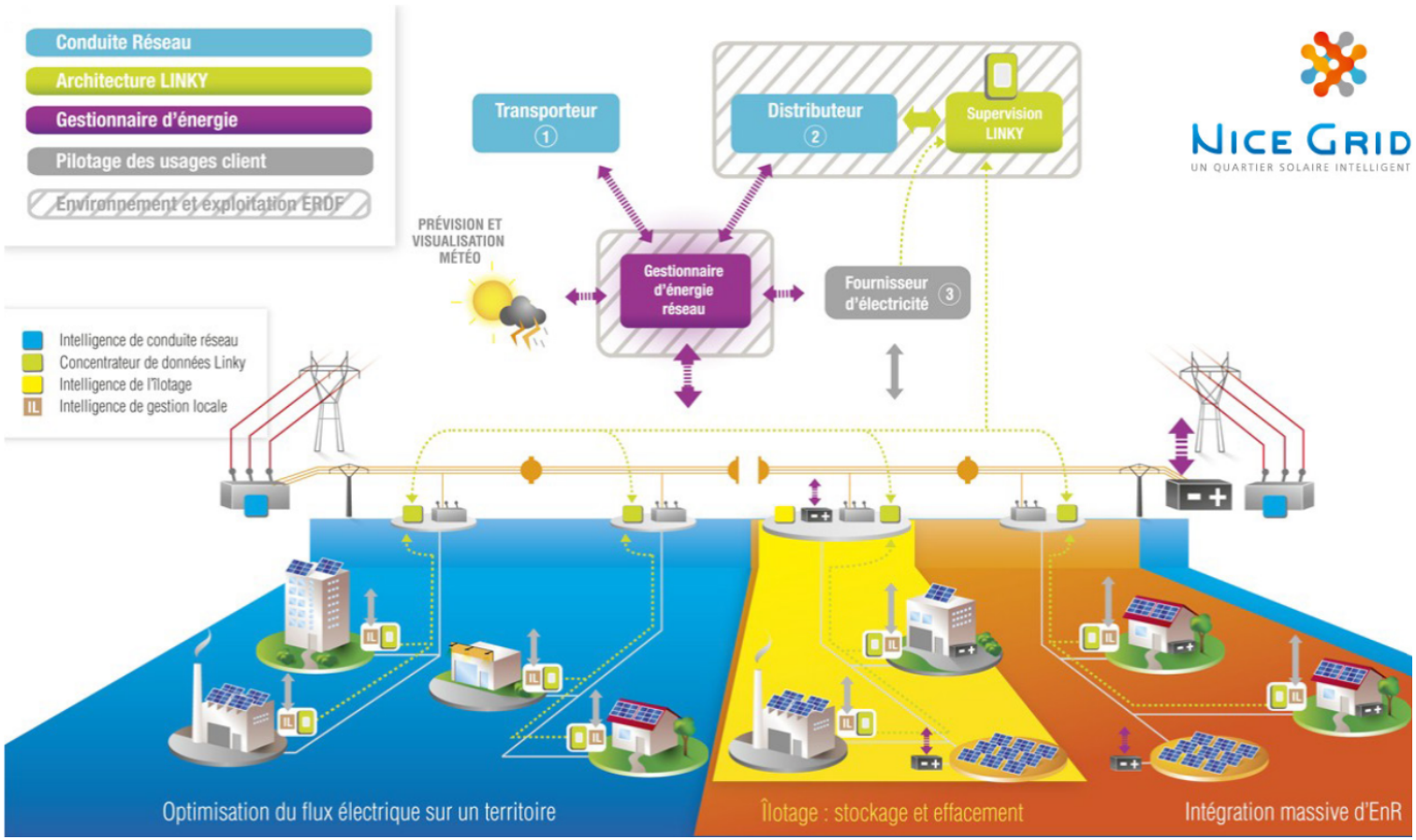
Collaborateur: Hamza Zarfaoui

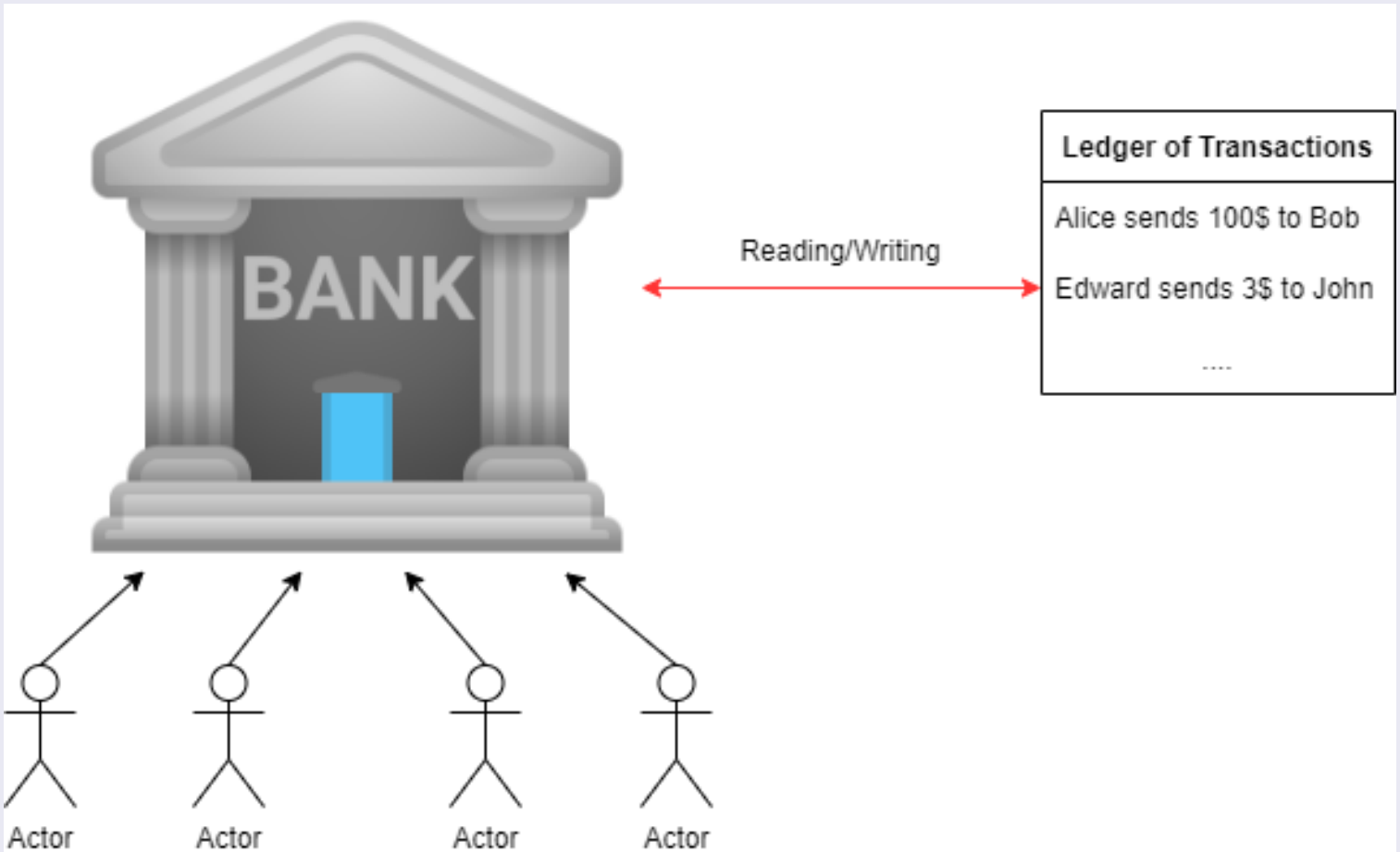
Microgrids

Development of renewable energy ⇒ Multiplication of local producers



Decentralisation VS Privacy, the example of bank system and Bitcoin

Central Authority



Decentralisation VS Privacy, the example of bank system and Bitcoin

Three different types of issues: Control, Single point vulnerability, Privacy:

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Can refuse some transactions from your account

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Single point vulnerability issue

If the bank server is attacked, the whole history of transaction may be lost.

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Control issues

Can refuse some transactions from your account
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Single point vulnerability issue

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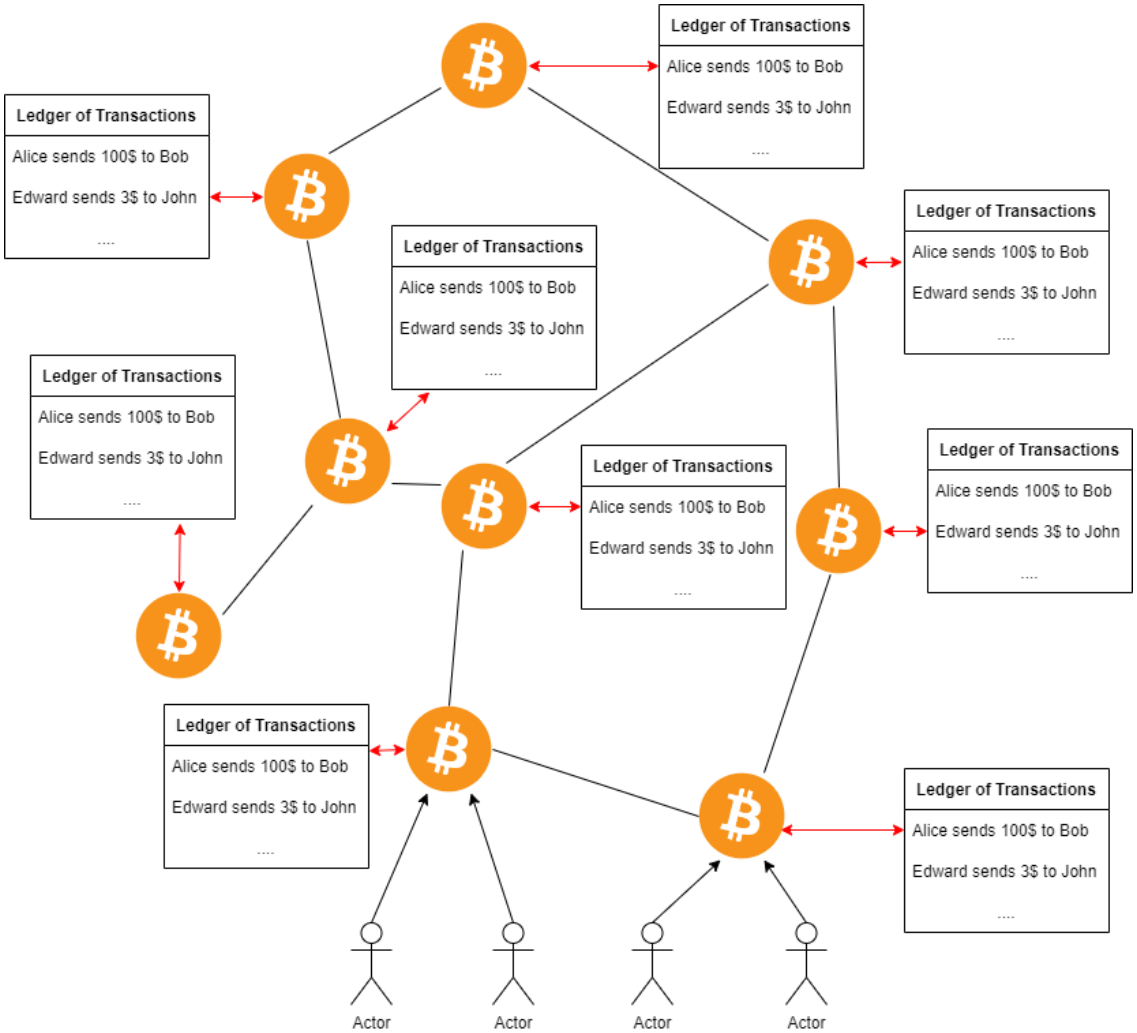
Privacy issues

Your assets and holdings
Your family and professional activities
Your habits
The diseases you suffer

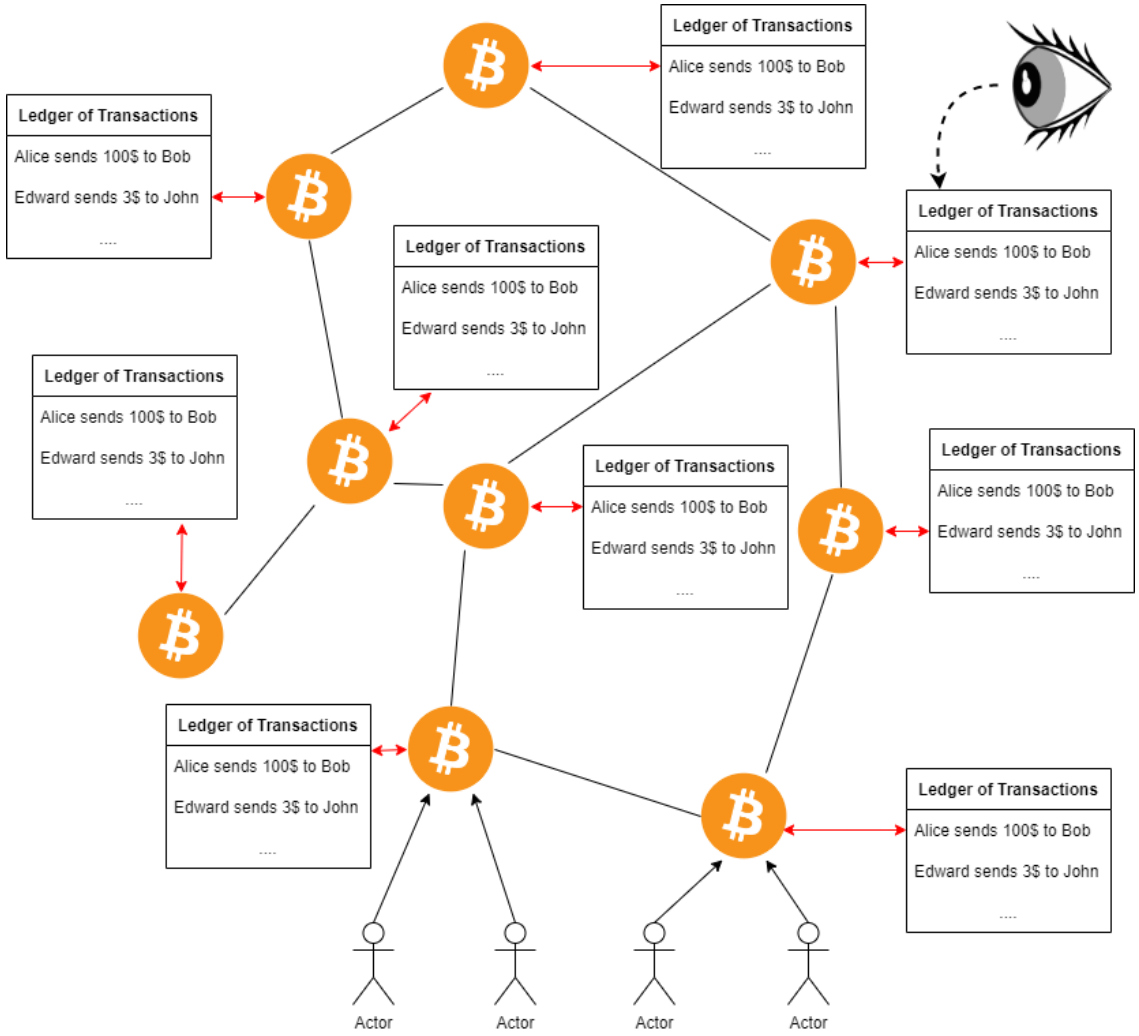
Decentralisation VS Privacy, the example of bank system and bitcoin

Bitcoin avoids centralised authority



Decentralisation VS Privacy, the example of bank system and bitcoin

Permissionless ledger ⇒ Everybody has access to transaction data!



Solution to the privacy-decentralisation dilemma ?

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Zero-Knowledge Proofs !

Or: How to prove that you know the solution to a certain problem without revealing it.

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"I know x such that $y = P(x)$"

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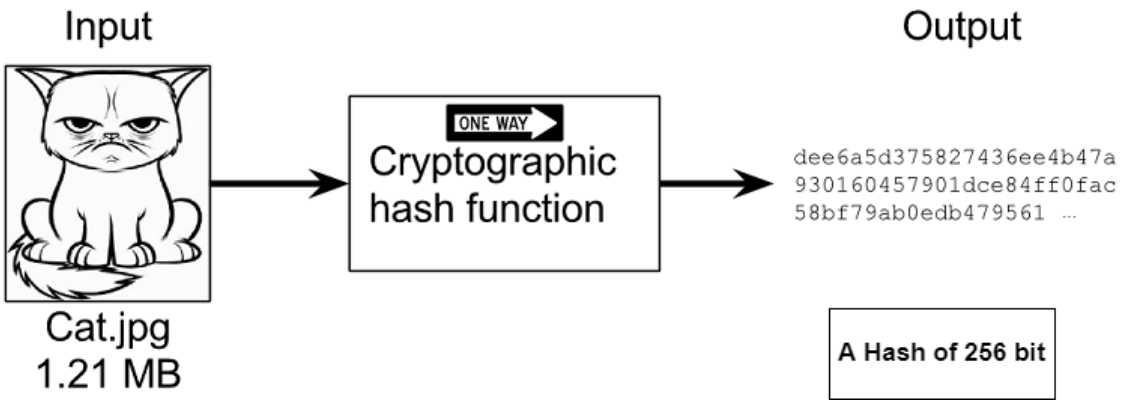
- Bonus: efficiency. It is exponentially faster to verify a succinct ZKP than to compute P knowing x

Building block: Hash functions H()



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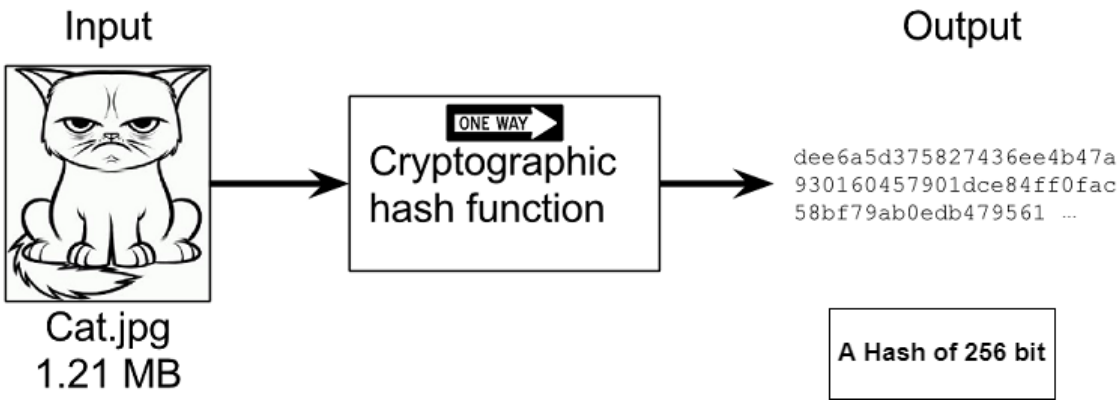

Essentials properties

Any size input $\rightarrow$ 256 bit output

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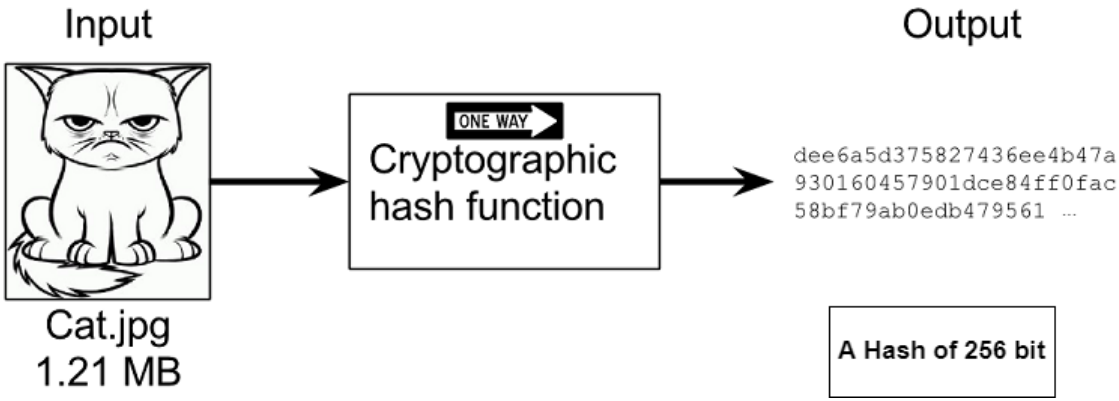

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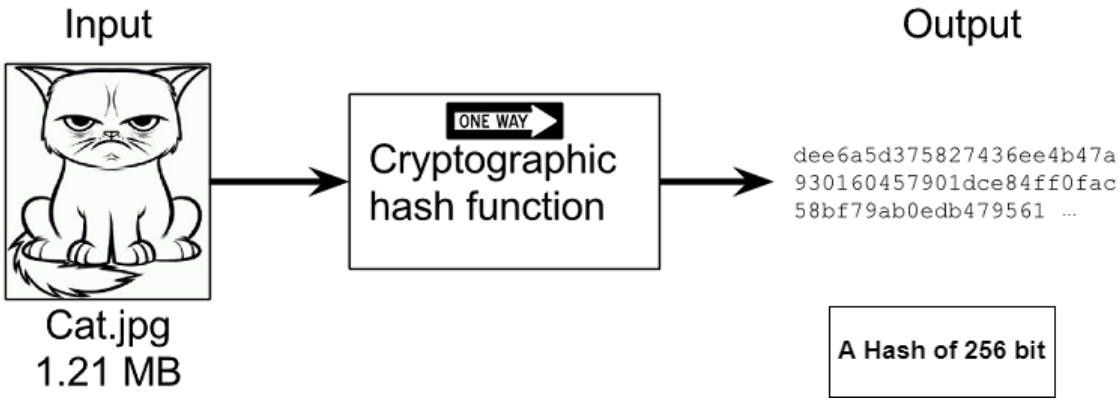

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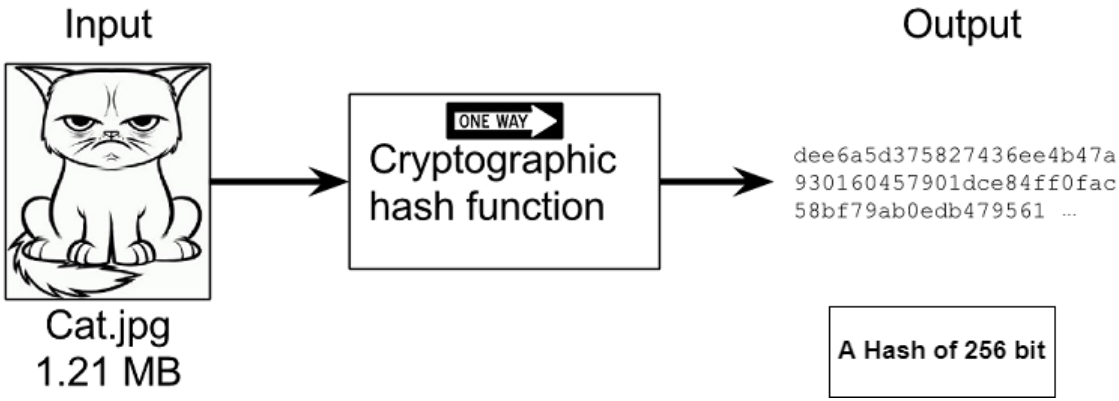

Essentials properties

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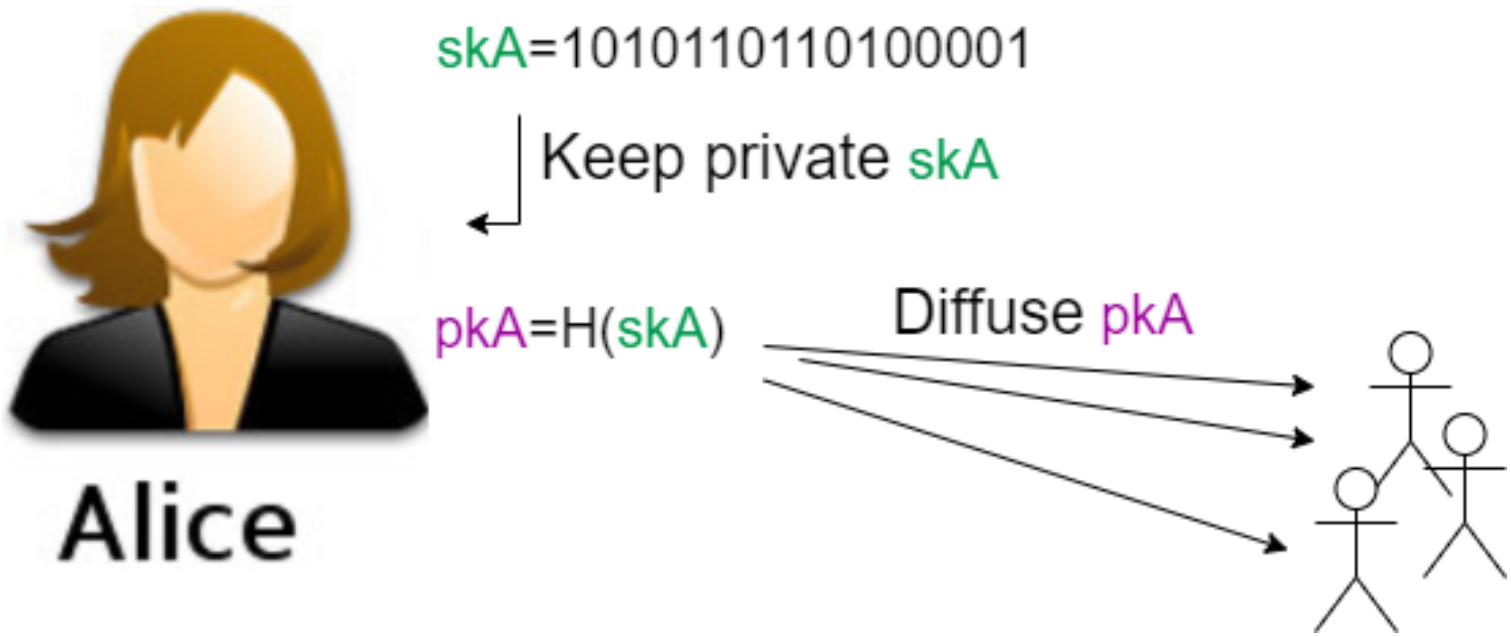
Easy: given x, computes $y = H(x)$

Hard(i.e, practically infeasible): given y, find x such that $y = H(x)$

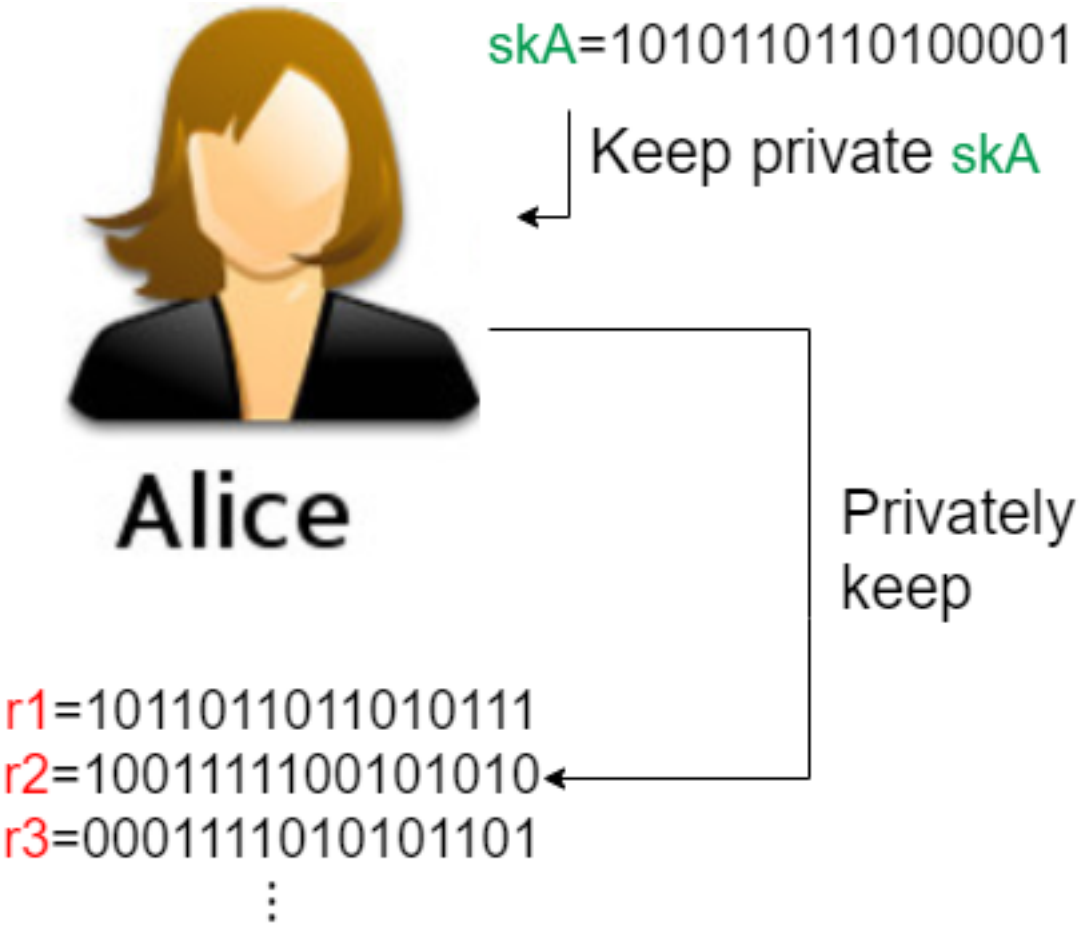
Anonymous Cruptocurrency on Public Ledger

Secret identifier (skA) to spend coins
Public identifier (pkA) to receive coins



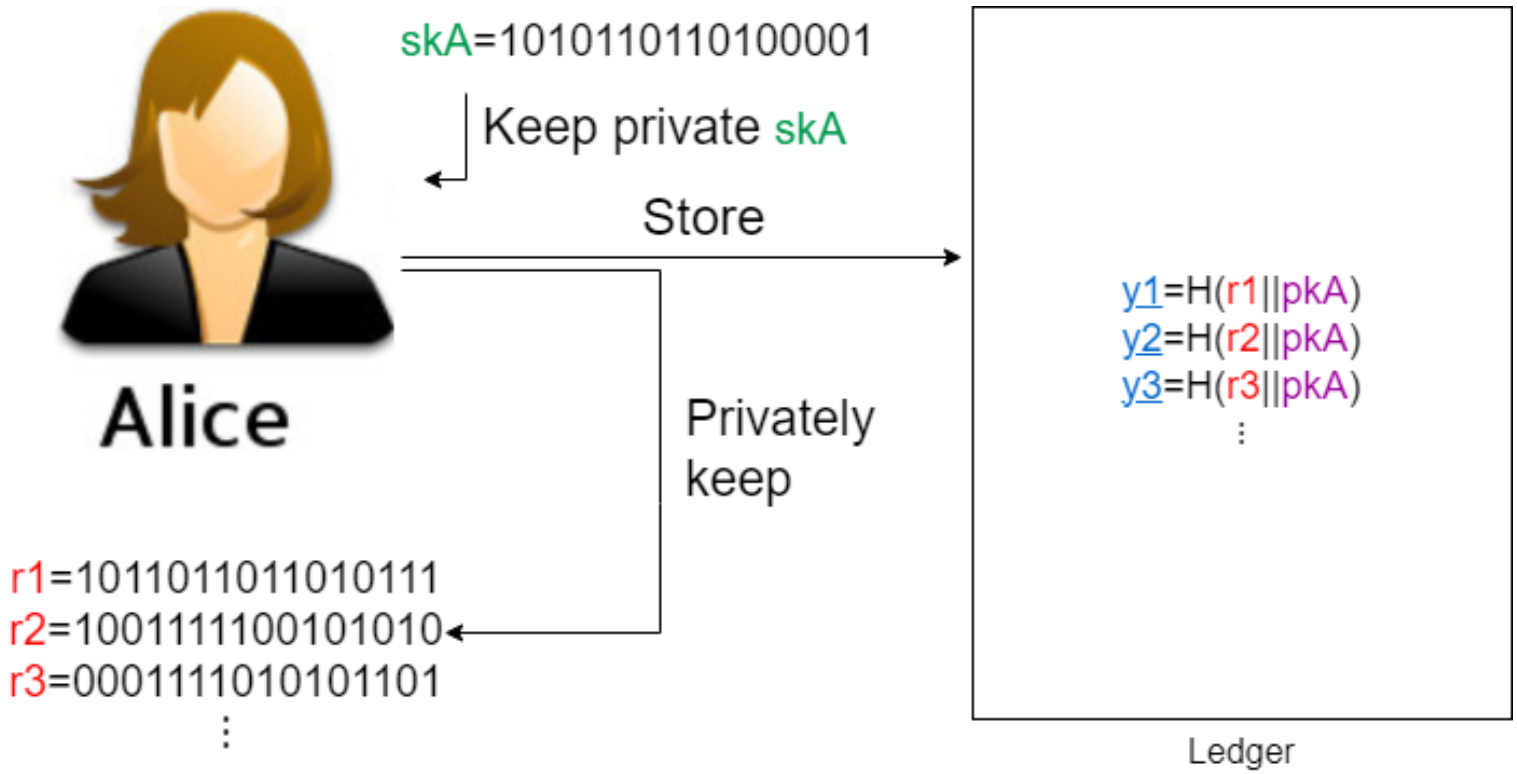
Anonymous Cruptocurrency on Public Ledger

Coins represented as random numbers



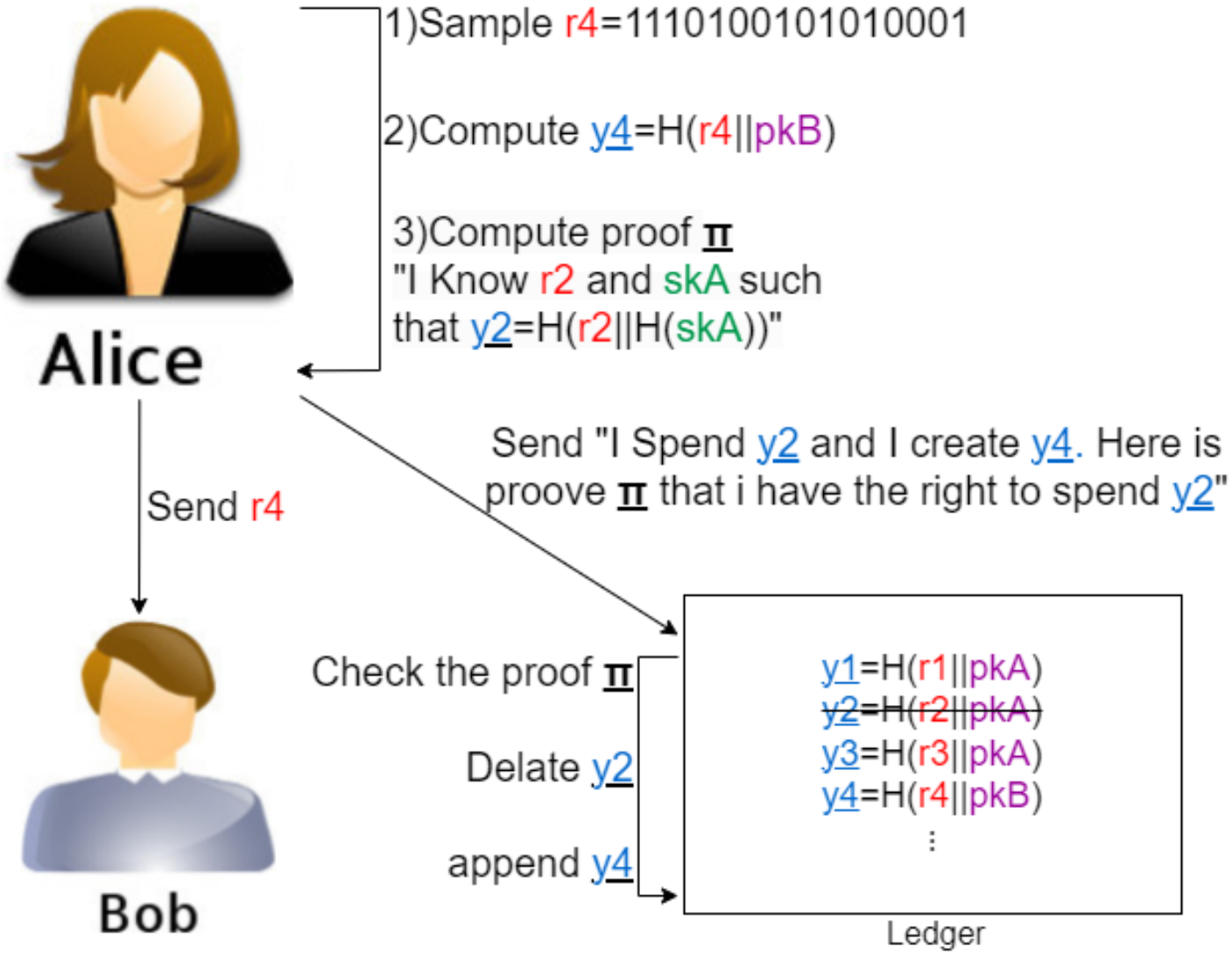
Anonymous Cruptocurrency on Public Ledger

Hash of existing coins are stored on the ledger



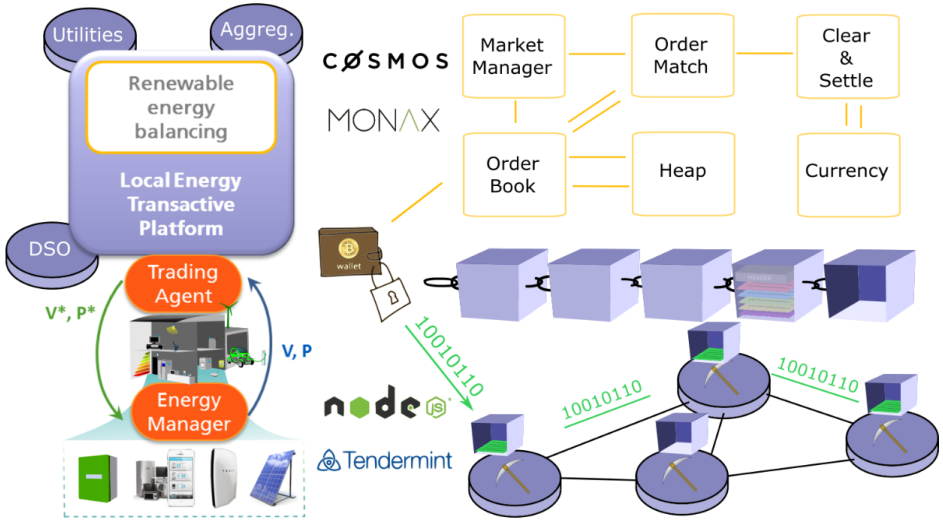
Anonymous Cruptocurrency on Public Ledger

Transaction from Alice to Bob = Destruction of one Alice's coin and creation to one Bob's coin.



Anonymous sealed bid exchange mechanism

Energy market use case by José Horta [**horta**].



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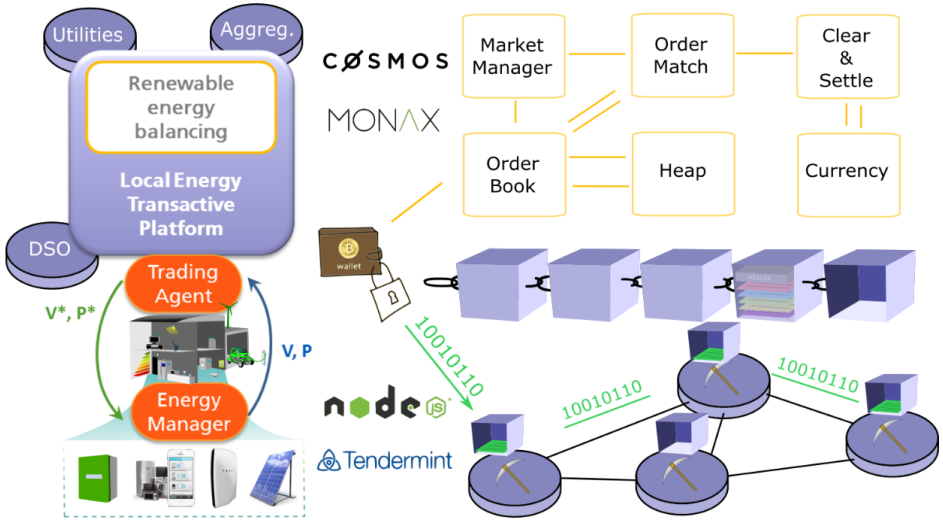
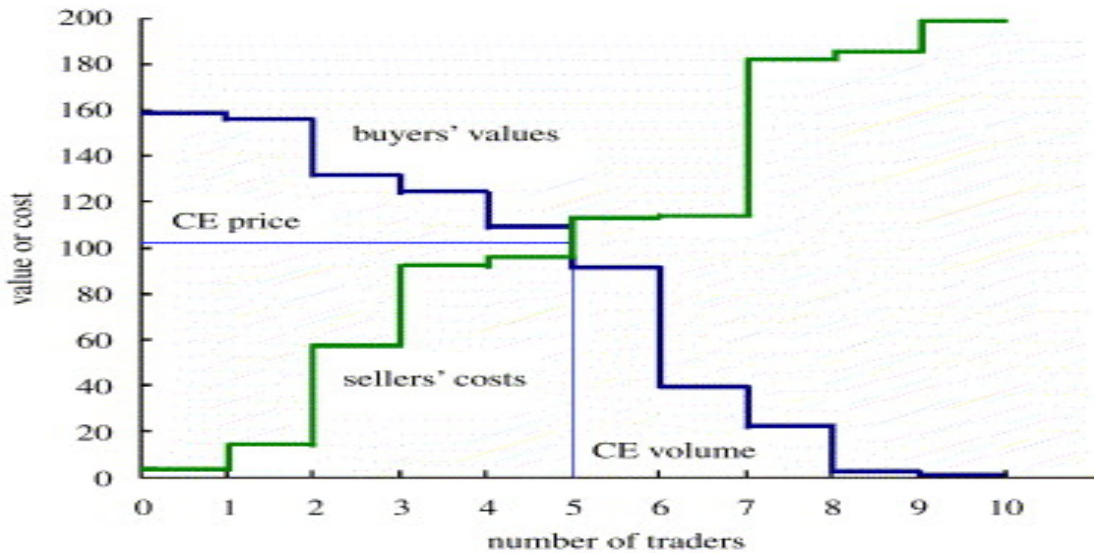
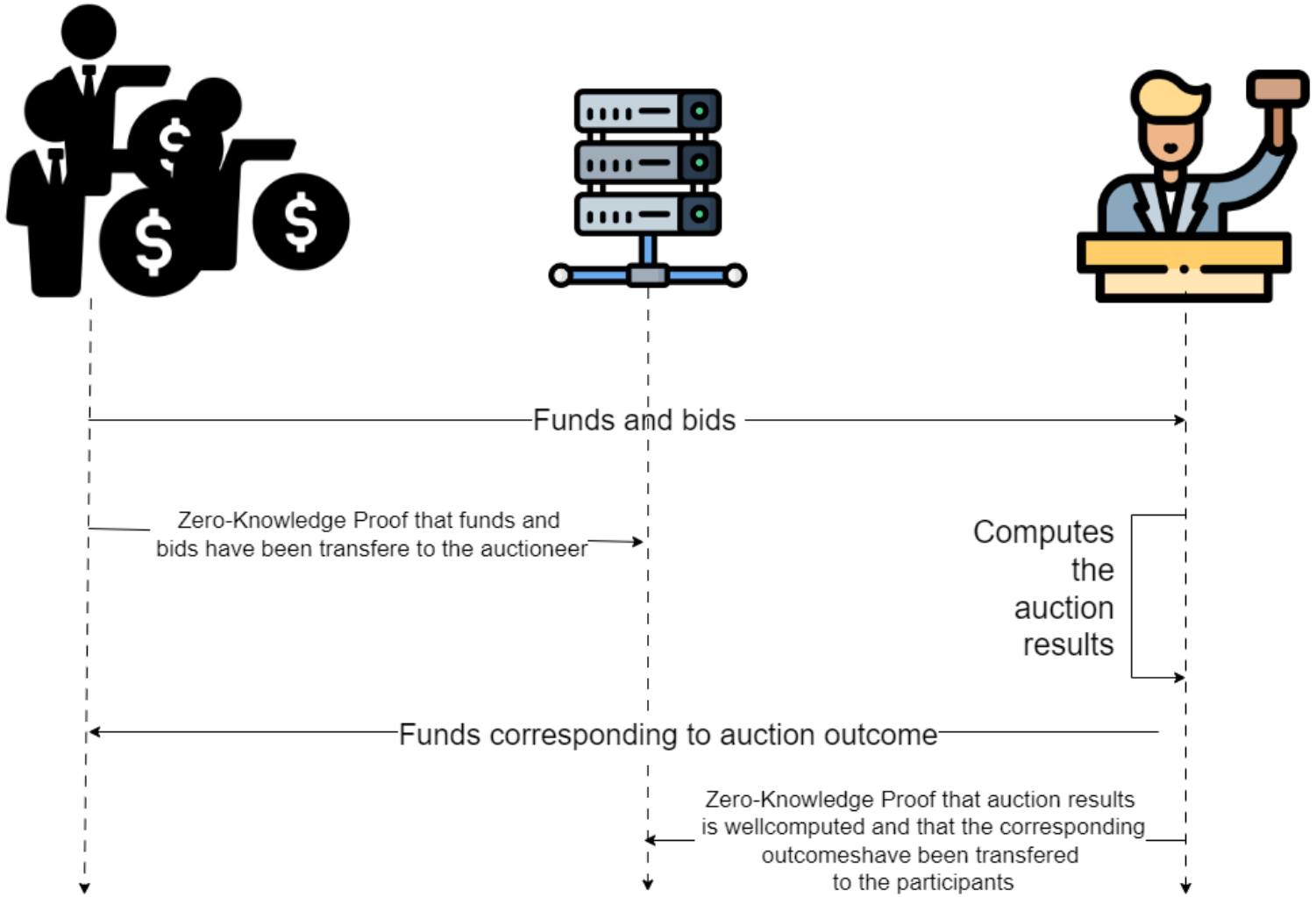


General auction mechanism (in particular multi unit double auction).



Anonymous sealed bid exchange mechanism

Proposed scheme based on an extension of Zerocash



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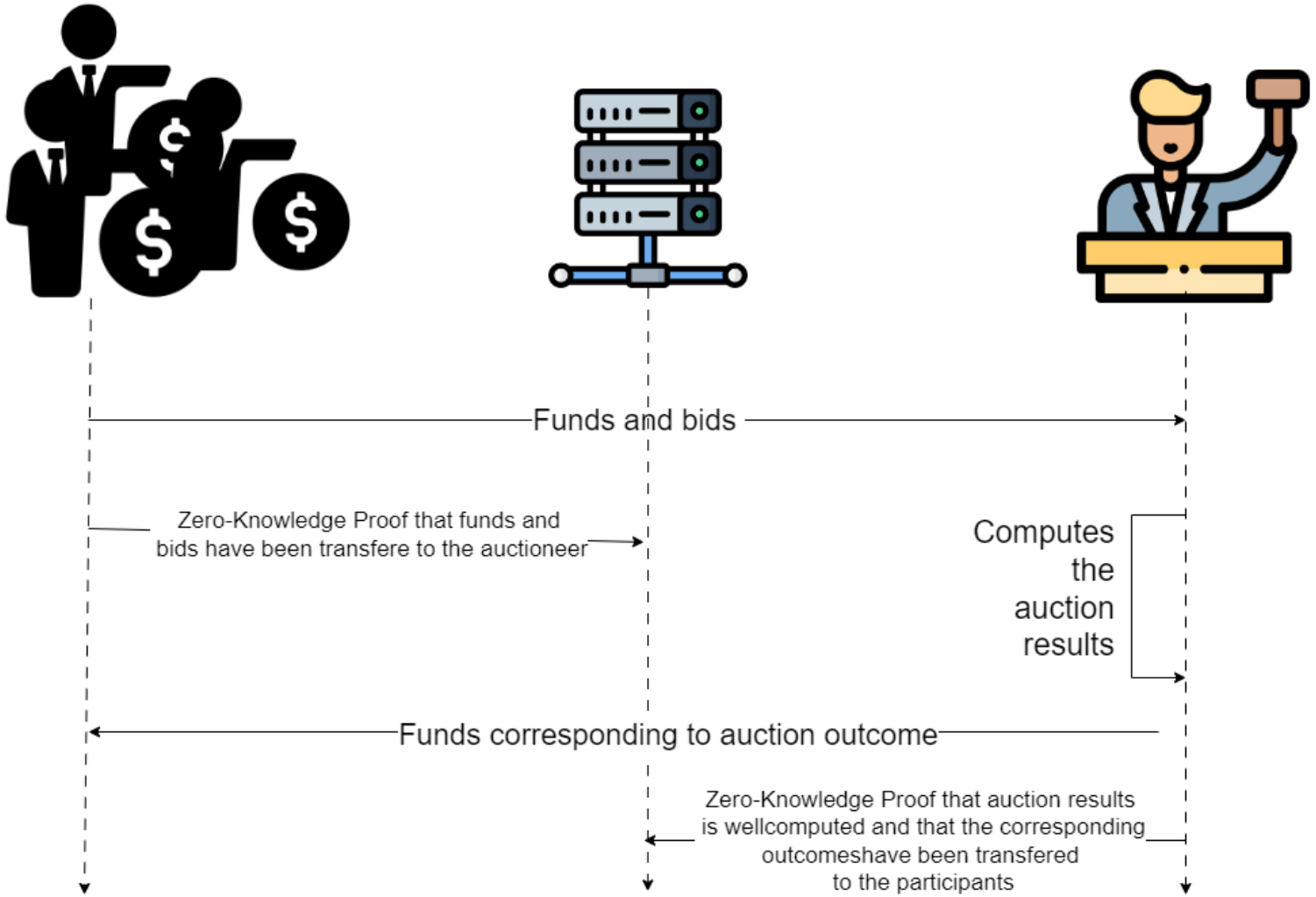

Anonymity against the auctioneer and the ledger. *Confidentiality* against the ledger.

Thank you for your attention.

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Any question?