The Rush Dilemma: Attacking and Repairing Smart Contracts on Forking Blockchains

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Abstract use of a Blockchain

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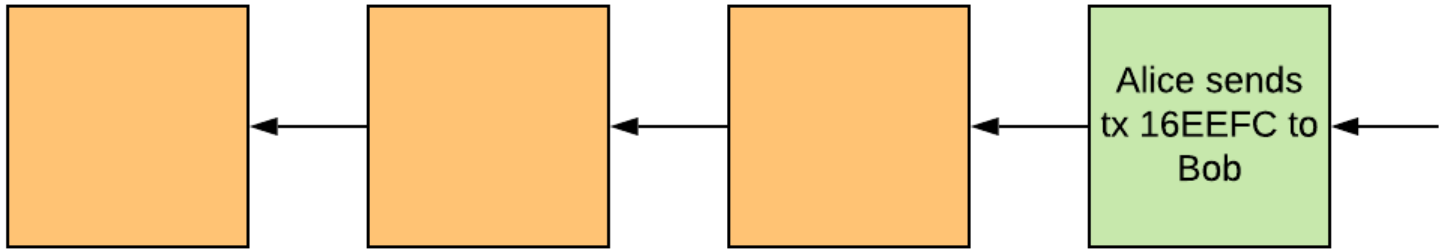
Many scientific results follow this abstraction and many implementations assume that the specific Blockchain used behaves like that

However, reality can be different…

Double Spending Attack

Double spending attack:

same money used in different transactions



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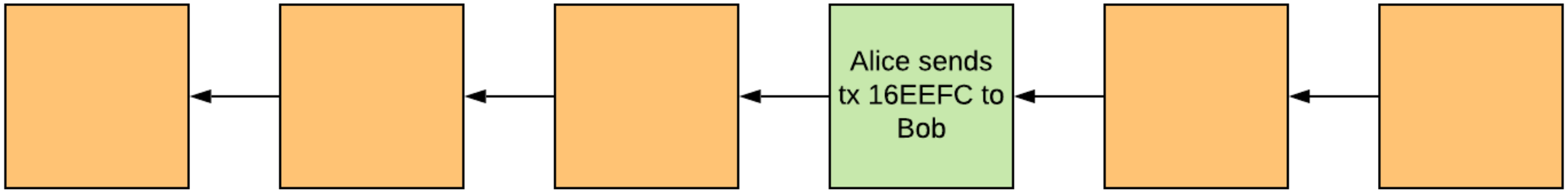

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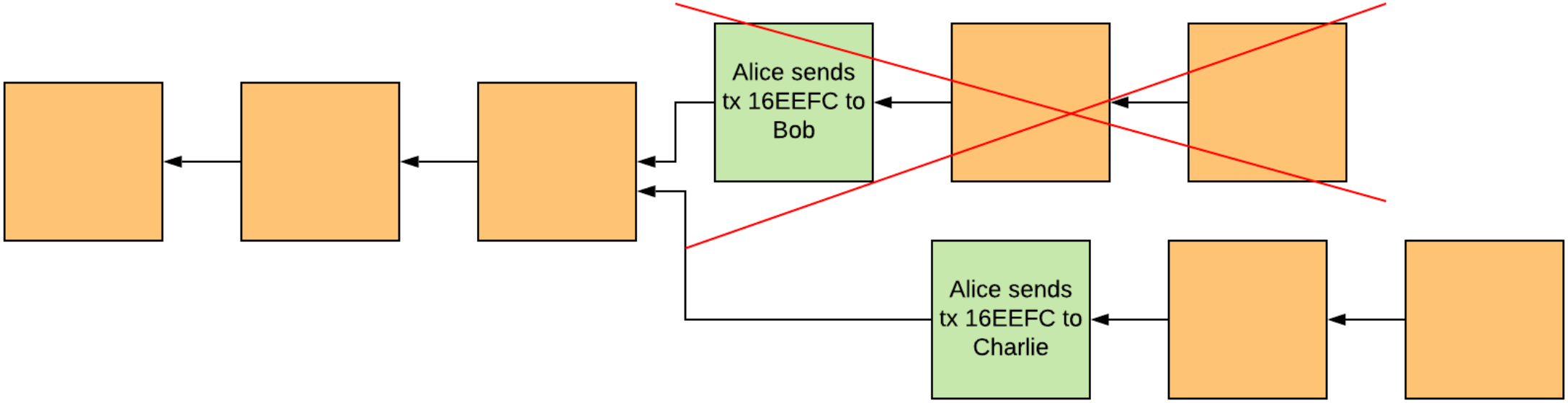

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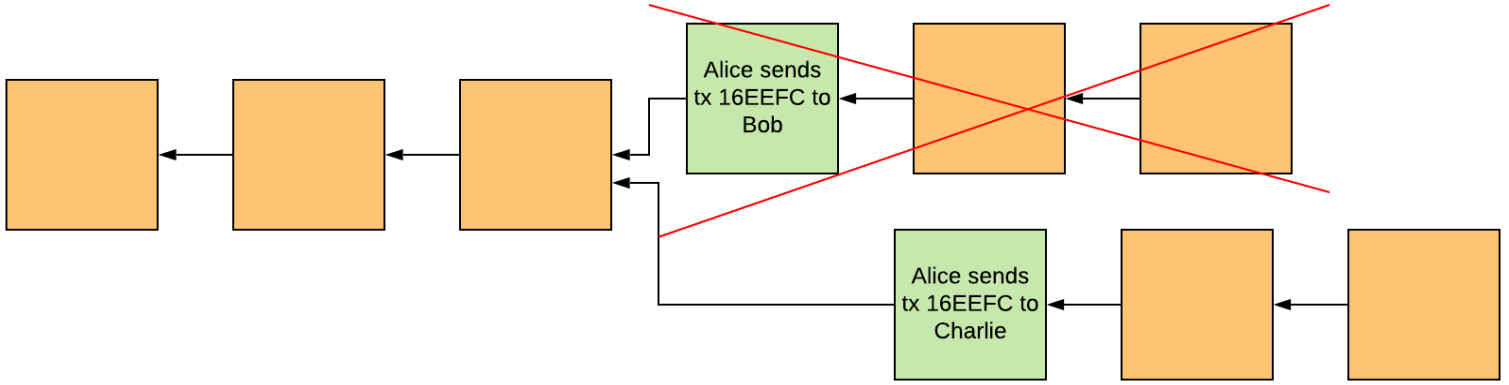

Issue in case of off-chain services

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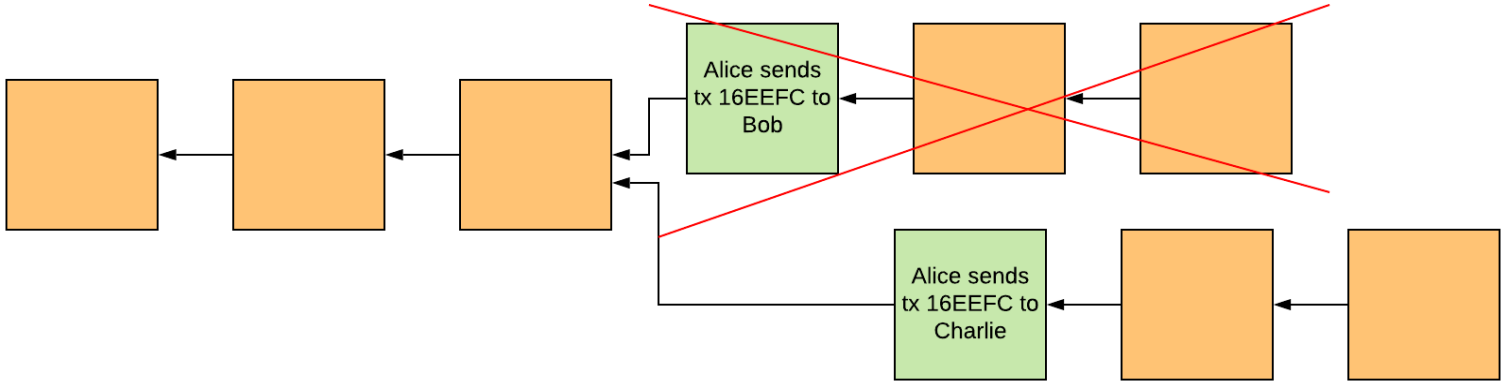

Issue in case of off-chain services

What happens if there is no off-chain impact?

Forks and Double Spending Attack

Classic solution:

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wait until the associated transaction is confirmed on the blockchain

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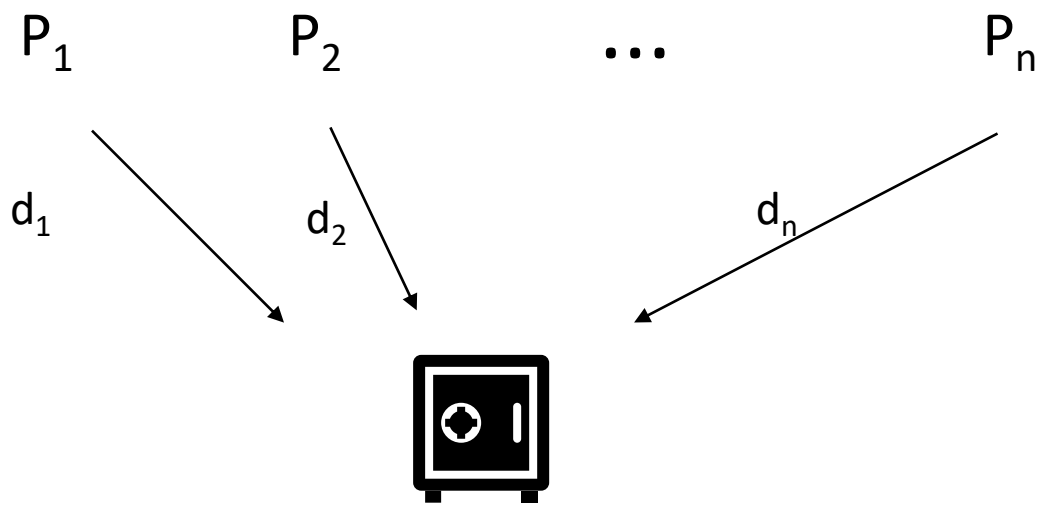
huge delays

Lottery Protocol(IEEE S&P 2014)

Step 1:



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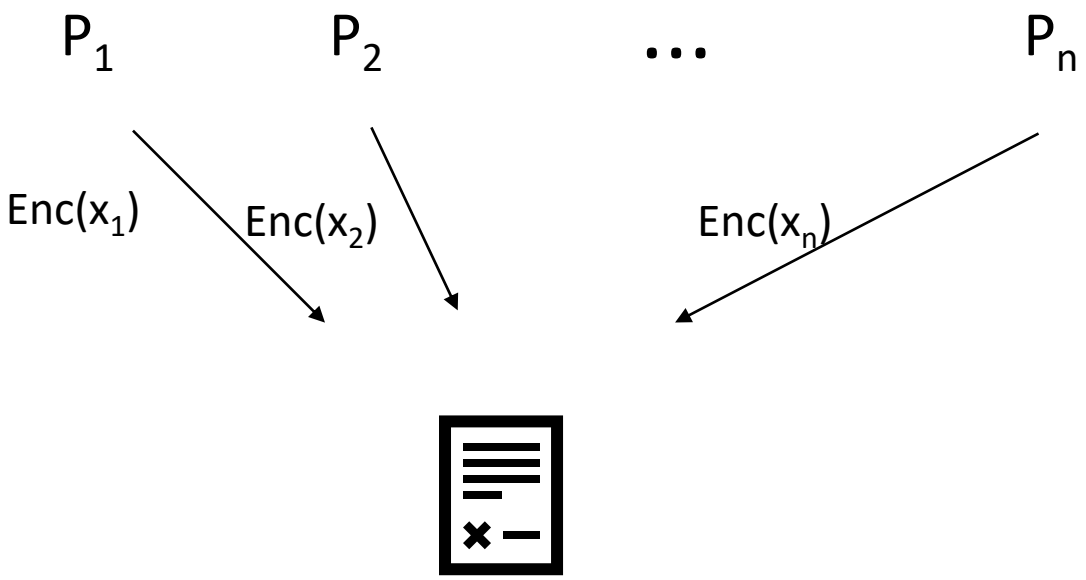

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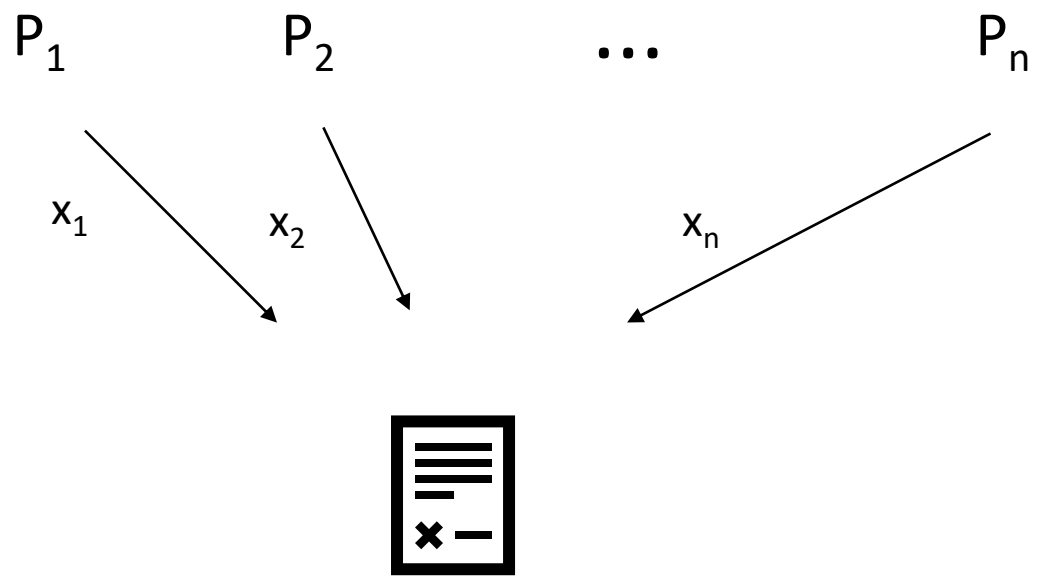

Lottery Protocol (IEEE S&P 2014)

Step 4:

Computes the winner of the lottery as

$w = x_1 + \ldots + x_n \bmod n$

and sends the moneys to P_w

Lottery Protocol with Rushing Players

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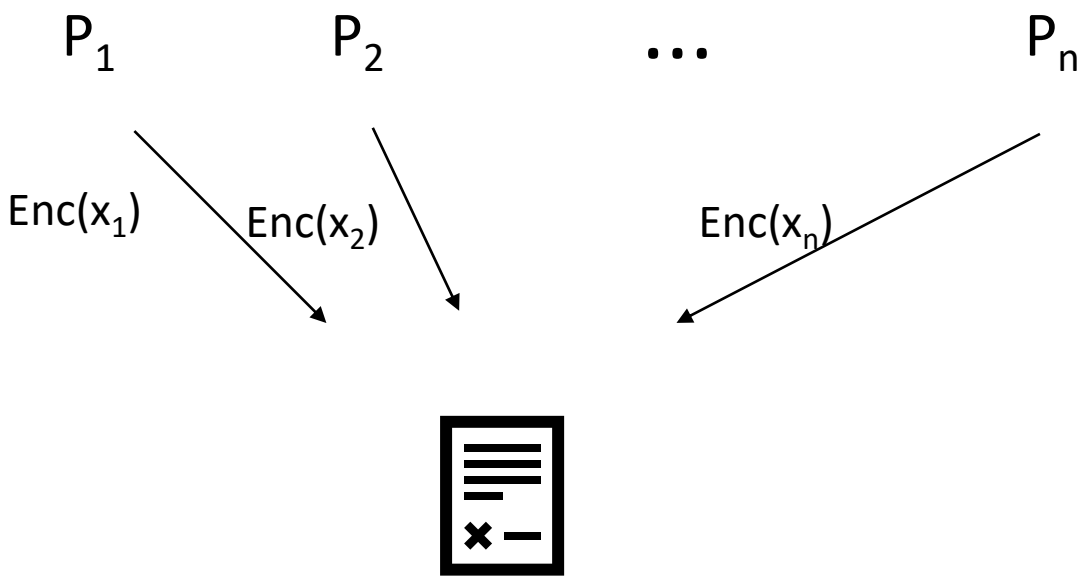

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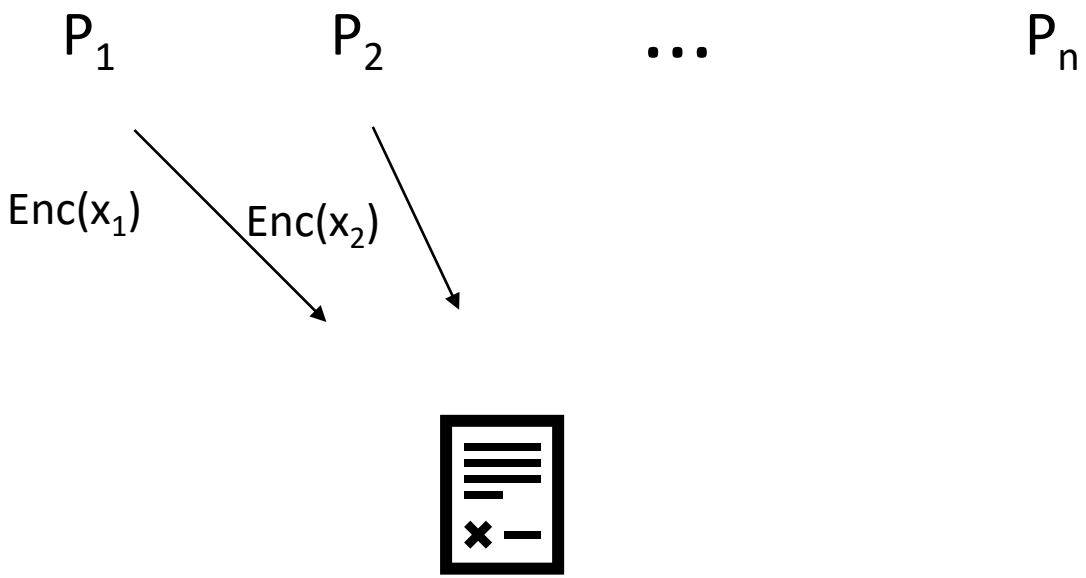

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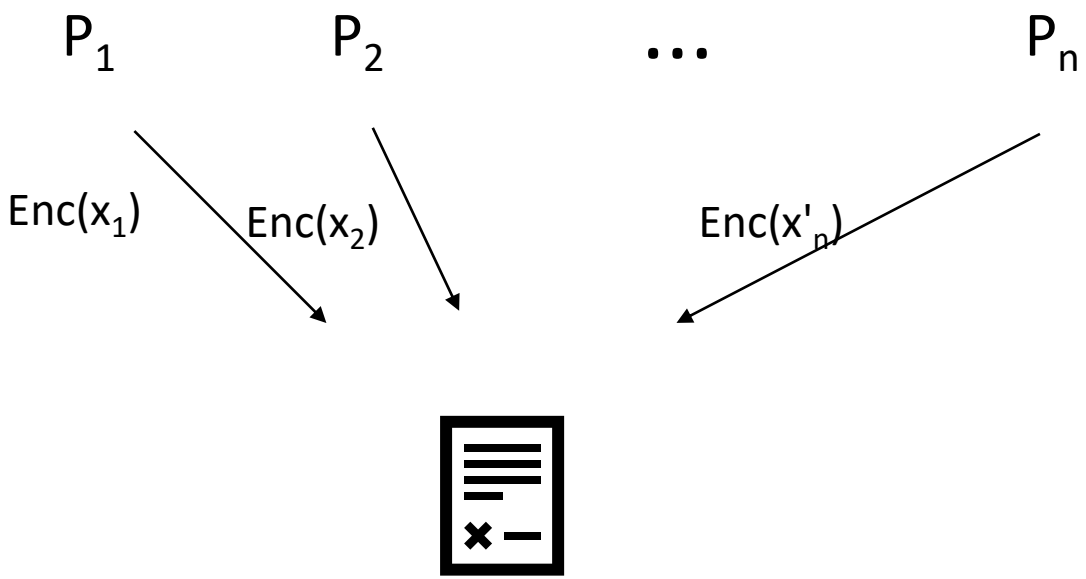

Lottery Protocol

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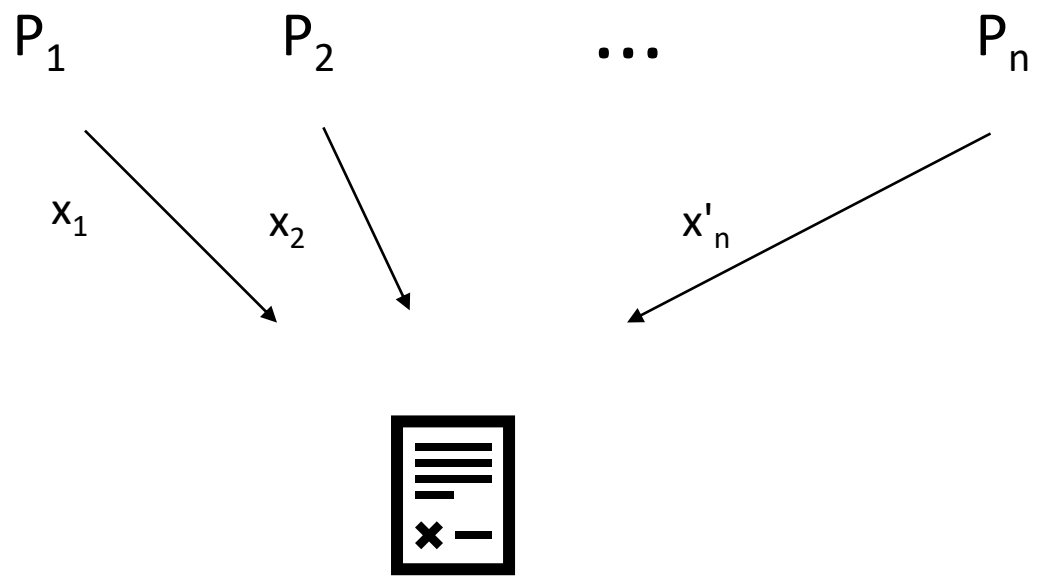

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Our solution

The previous scenarion is insecure in presence of forks and rushing players

But we have **good news**!

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But we have **good news**!

Using crittographic tools we can produce an efficient protocol that evaluates a random string in presence of forks and rushing players!

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The contribution to the coin-tossing protocol of each player P_i depends on the identifiers of other players

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If an adversary changes its input all honest parties will automatically change their inputs too

We achieved this result using a unique signature scheme

Our Solution

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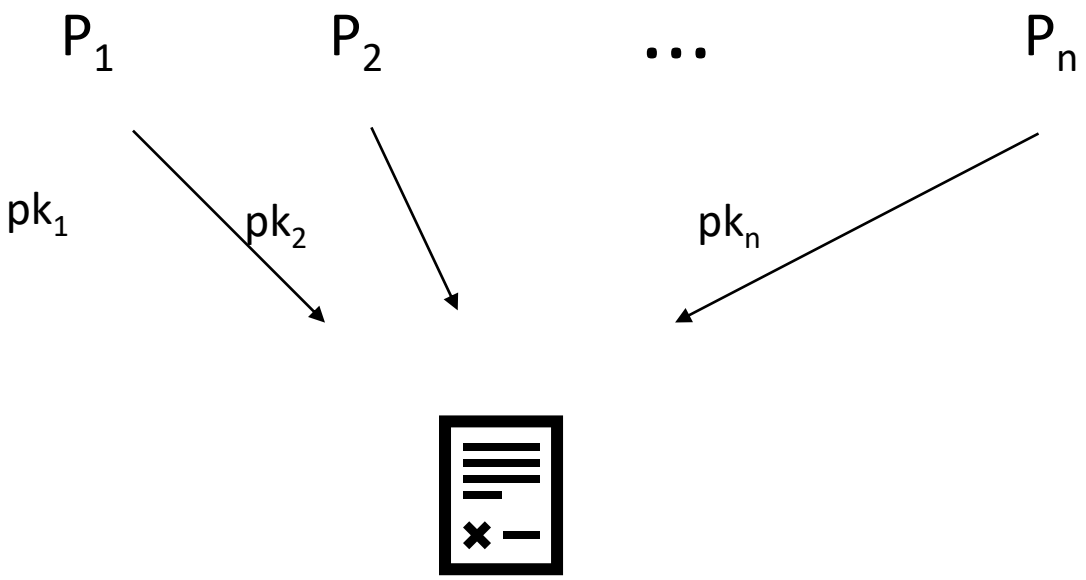

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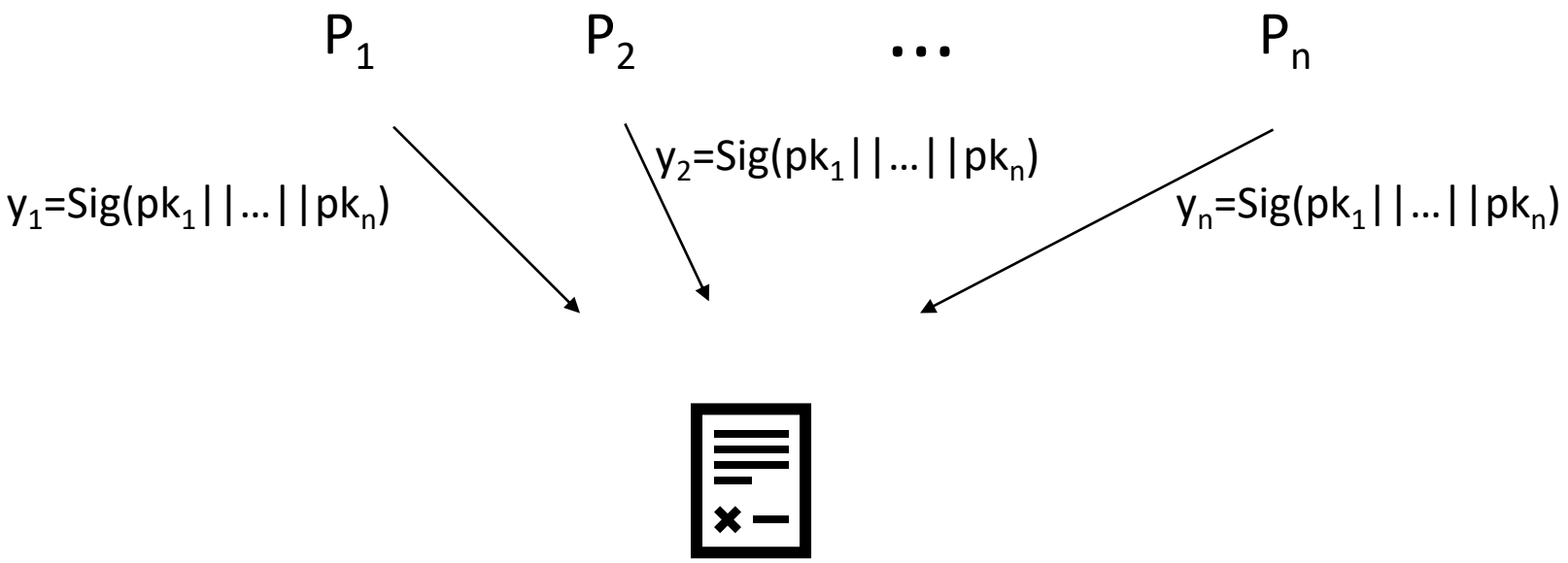

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Computes Hash($y_1||\ldots||y_n$)

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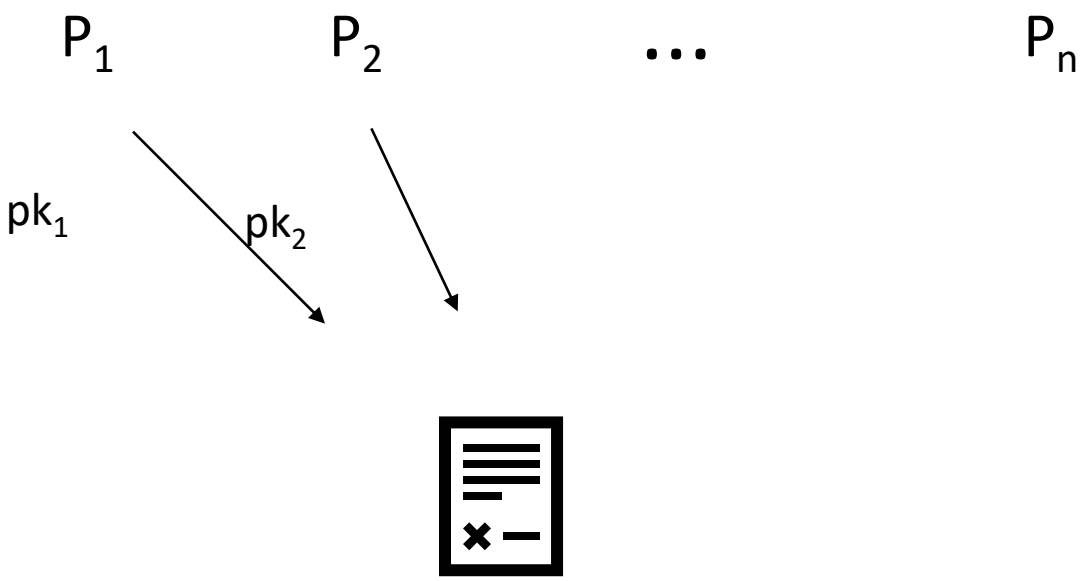

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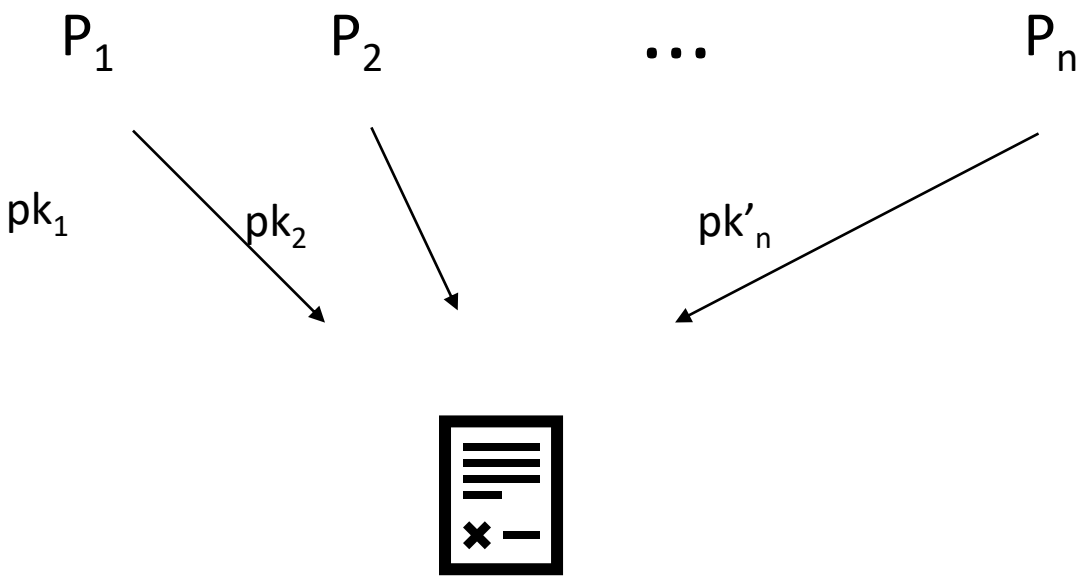

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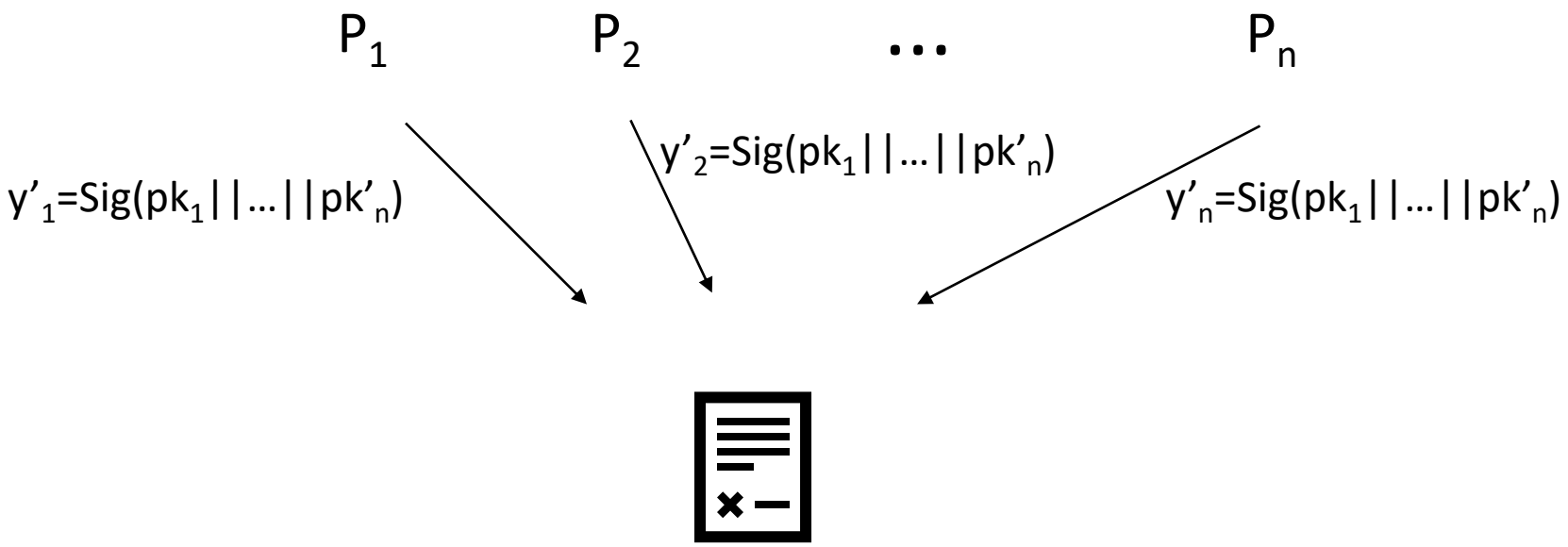

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Questions?