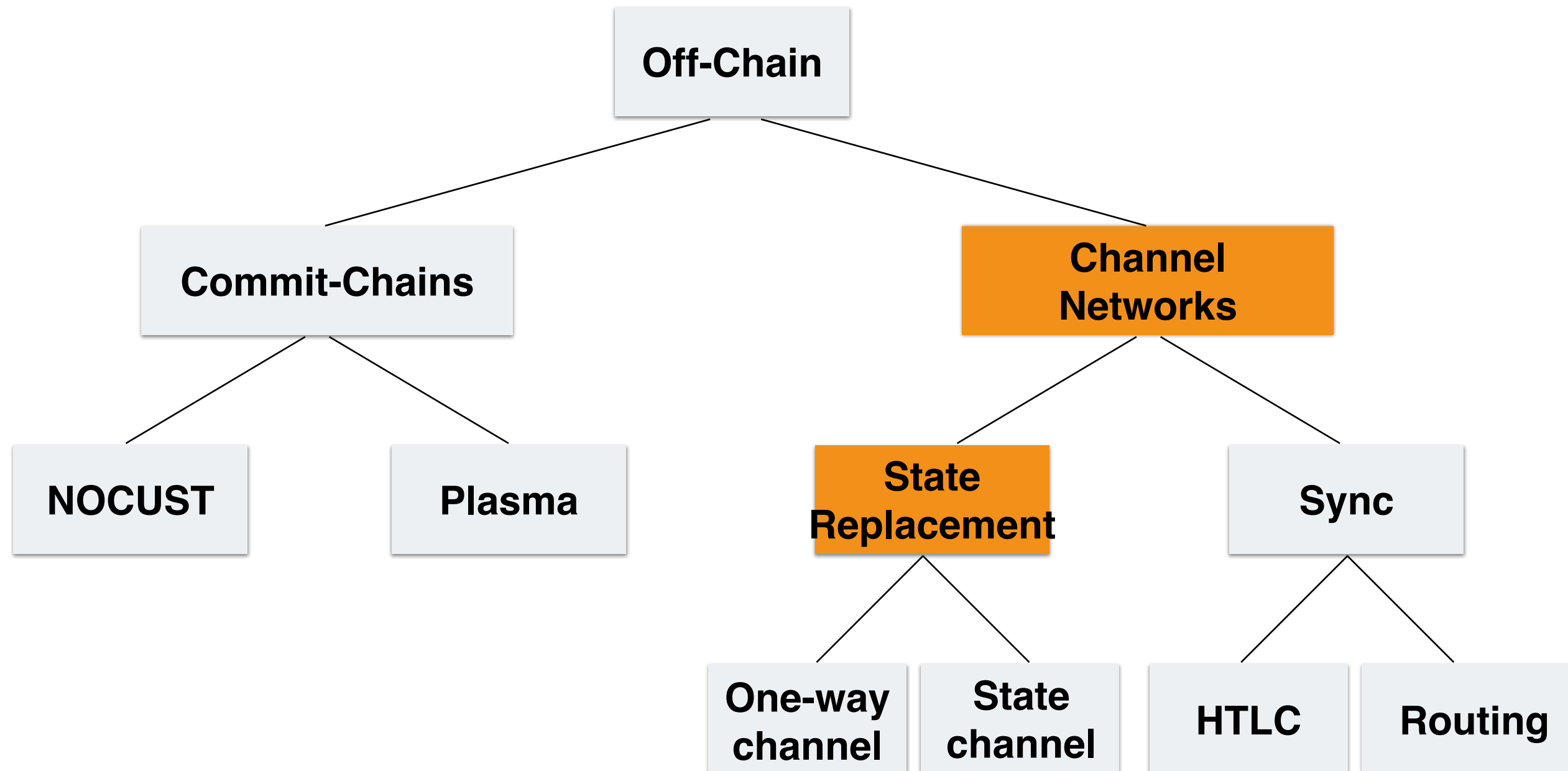


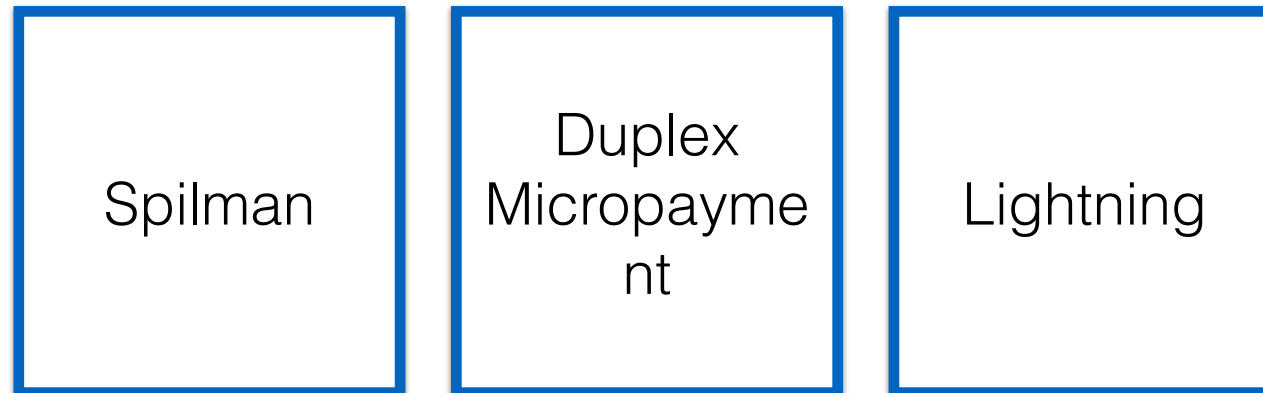
# Channel Networks State Replacement



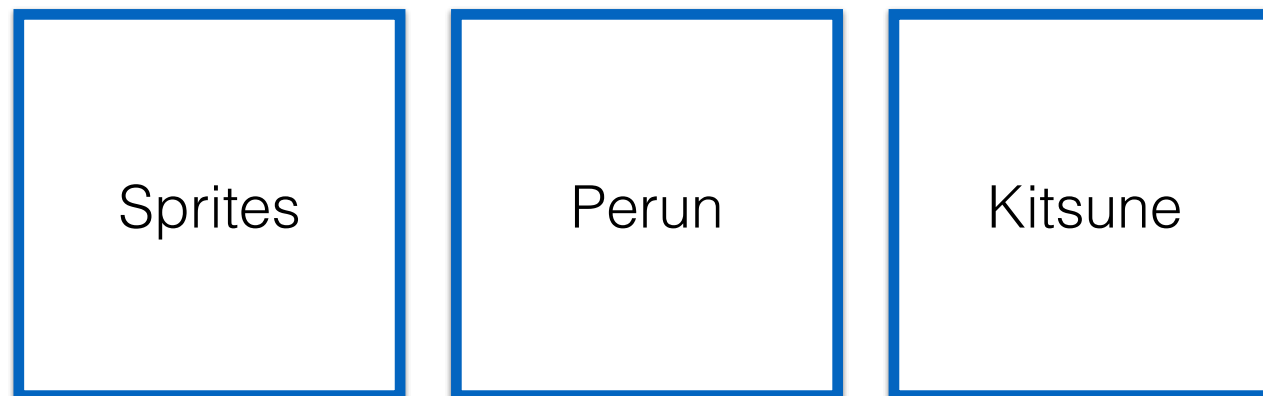
# Which Off-Chain Solution?



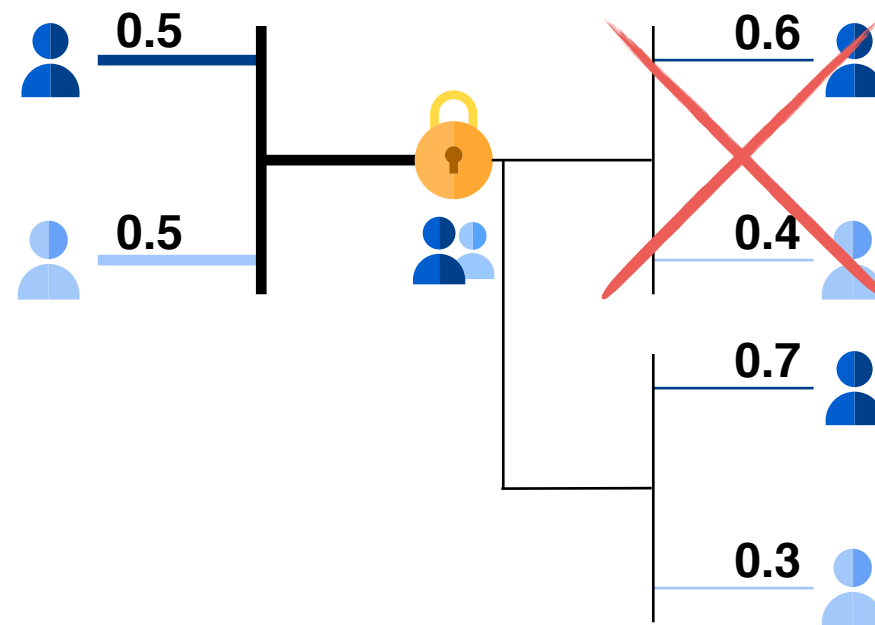
## **Payment Channel (redistribution of assets)**



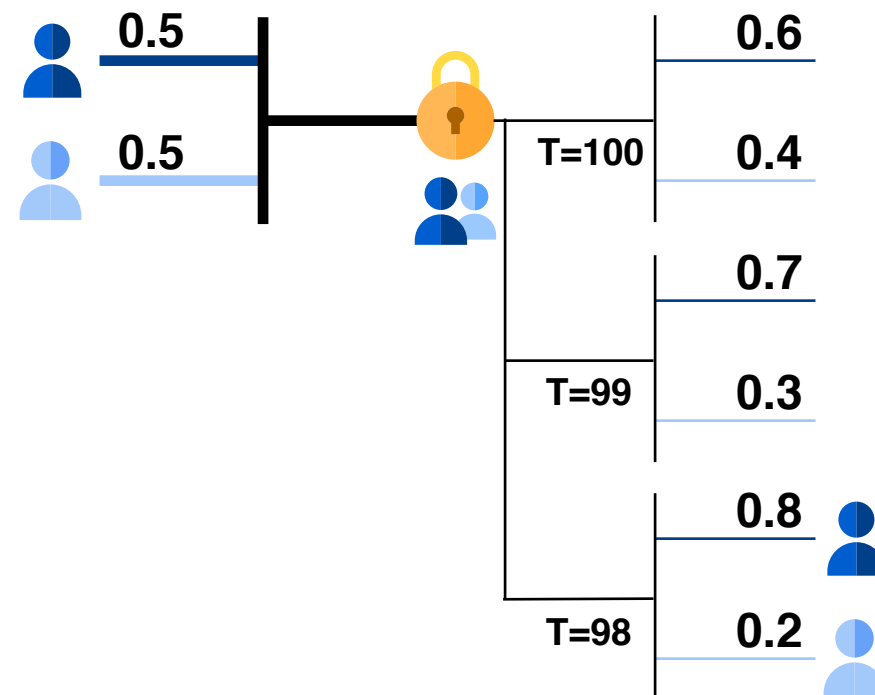
## **State Channel (game, voting, auctions, etc)**



# State Replacement

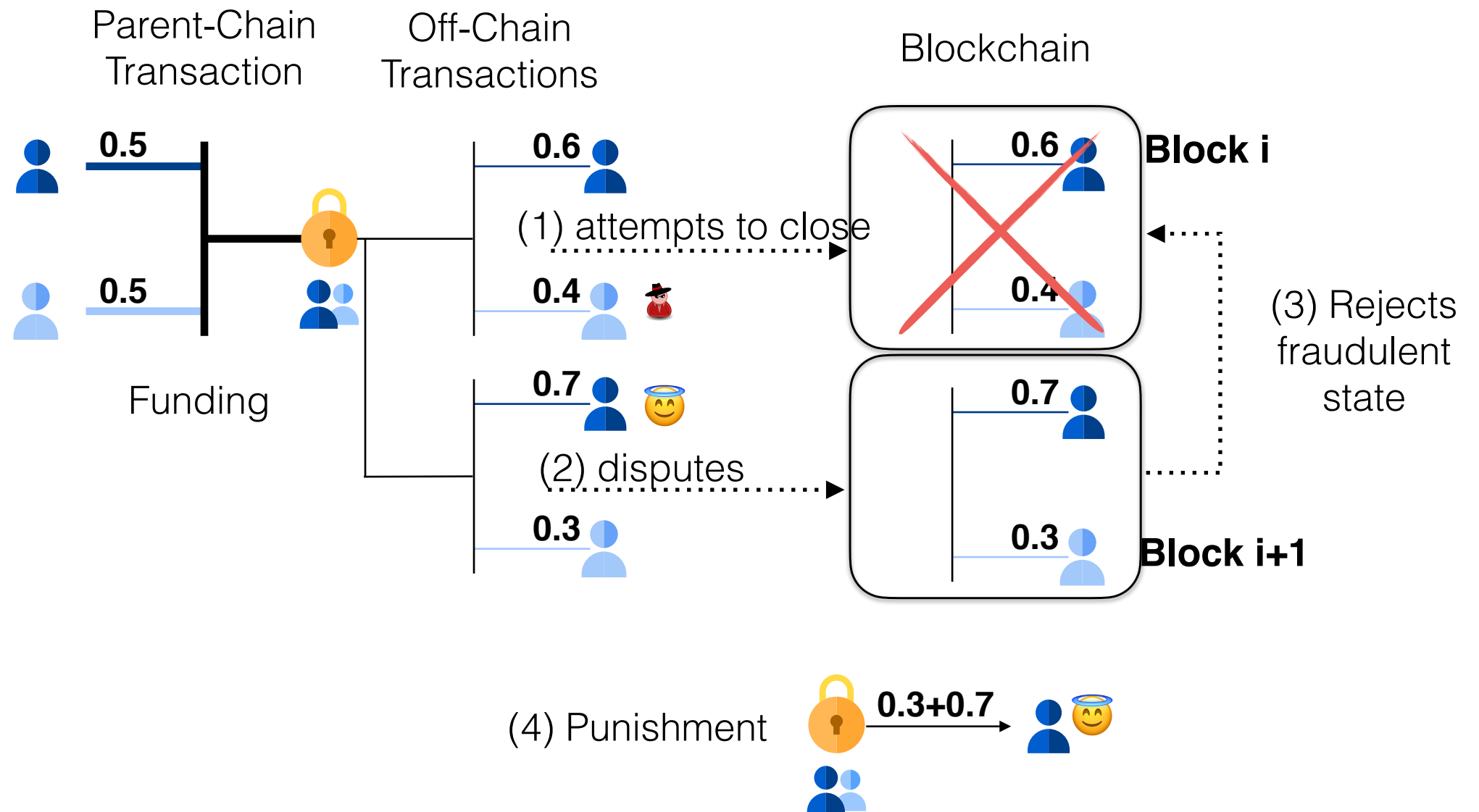


# Time Lock State Replacement



Lowest timelock is first included in the blockchain.

# Revocation State Replacement (Lightning)



# State Replacement Techniques (2013 - 2015)

Replace by..

## Incentive

Spilman



## One-way payments

Receiver signs and publishes final statement

## Time Lock

Duplex Micropayment Channels



## Bi-directional

Tension between throughput and on-chain costs  
Expiry time (later removed)

## Revocation

Lightning



## Bi-directional, no expiry

Agree on last state, keep all previous revoked states

Protocol  
Complexity



Bitcoin's model makes it challenging to remove expiry time and throughput limitations

# State Replacement Techniques (2016+)

Replace by..

**Version**



**State change, everyone signs**

Increment version

Sig(A), Sig(B), Hash of State(i), i

