CoinJoinXT

...and other techiques for deniable transfers

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03 July 2018

Building On Bitcoin 2018

Outline

Motivation

Intrinsic fungibility and “deniability”

CoinJoinXT

Extending CoinJoin across multiple transactions

CoinJoin Unlimited

Amount correlation, moving off chain

Accompanying blogpost:

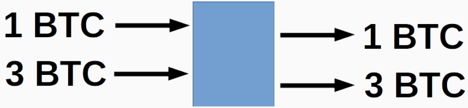
https://joinmarket.me/blog/blog/CoinJoinXT

Motivation

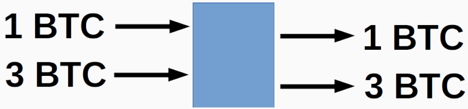
Fungible?

Intrinsic fungibility - satoshis are not watermarked

Who owns it?



Who owns it?



1 BTC

3 BTC

1 BTC

3 BTC

A Alice pays Bob 1 coin with 4 coins, Alice gets 3 change

B "CoinJoin" - Alice pays Alice 1, Bob pays Bob 3

C Alice pays Bob 2 (!) - Alice pays 3, gets 1, Bob pays 1, gets 3

D Alice pays Bob 4 coins (in 2 outputs for some reason)

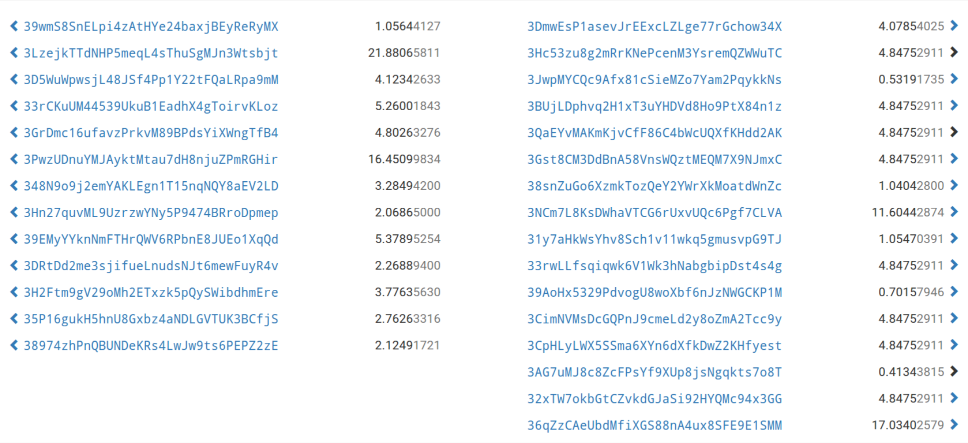
E Fake payment/Coinjoin - Alice owns everything

F Alice pays Bob 3 coins and Carol 1 coin

G Alice pays 3, Bob pays 1, Carol receives 3, David receives 1

H Alice and Bob pay Carol 4 coins

CoinJoin today[2]



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Blockchain Analysis Heuristics

Heuristic 1

All inputs are co-owned.[1]

Heuristic 2

One-time use change addresses (and other change-related)

Blockchain Analysis Heuristics

Heuristic 0

Each utxo is unilaterally controlled.

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Blockchain Analysis Heuristics

Heuristic 0

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Heuristic 1

All inputs are co-owned.[1]

Heuristic 2

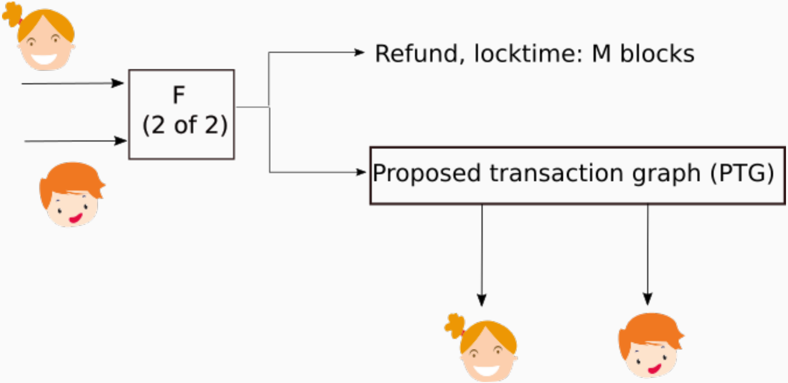
One-time use change addresses (and other change-related)

Heuristic 3

Transfer of control/ownership in one transaction implies payment

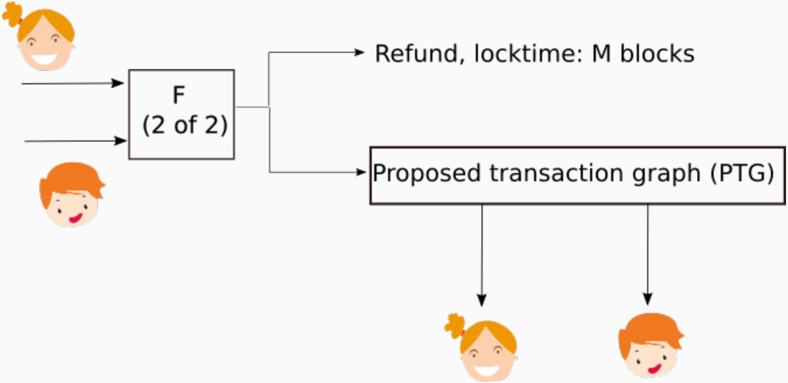
CoinJoinXT

CoinJoinXT - simplest case



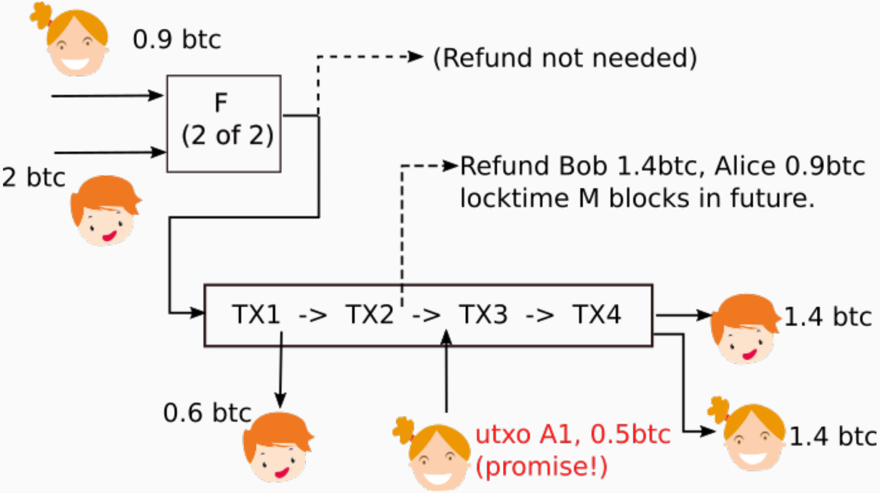
Sign first transaction last; we can do better!

CoinJoinXT - simplest case



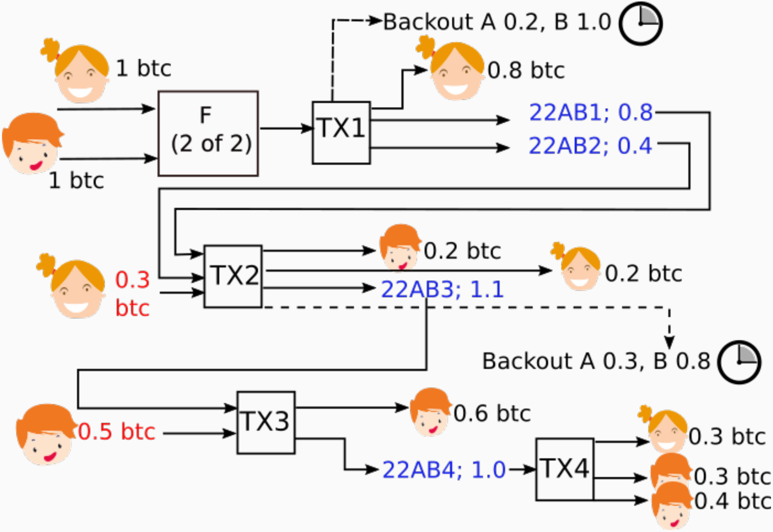
Sign first transaction last; we can do better!

CoinJoinXT - add a promise



Bob takes no risk of funds loss in case Alice double spends A1.

CoinJoinXT - example



Boundary may be unclear to attacker

CoinJoin Unlimited

Amount correlation problem

- CJXT still suffers from amount correlation in simplest form

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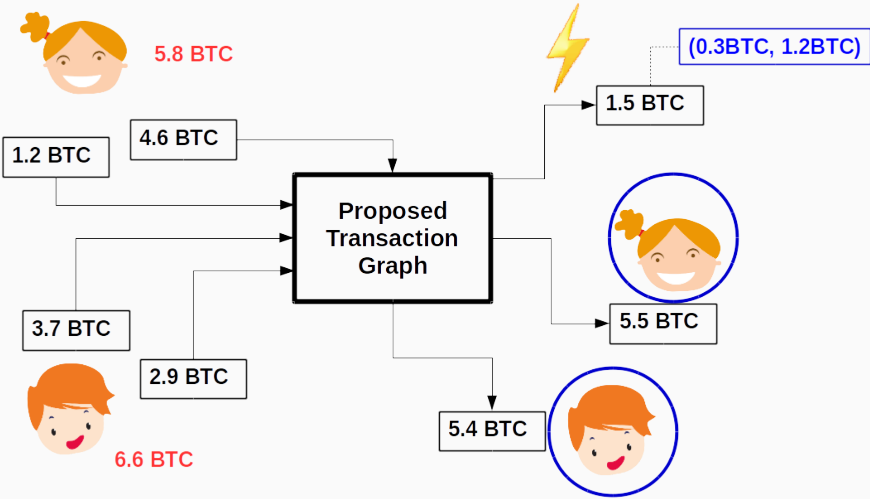
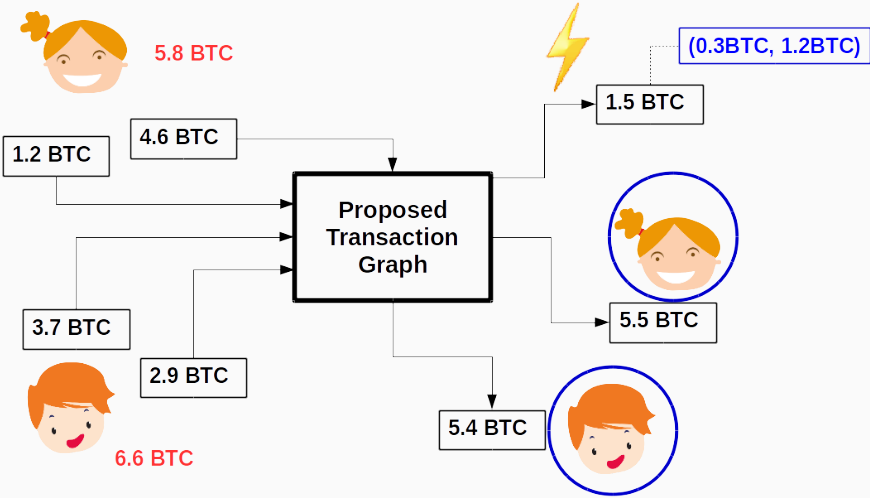
- CJXT still suffers from amount correlation in simplest form
- Subset sum (exponential time? but not really)
- Another approach - combine with ⚡

Decorrelation via funding

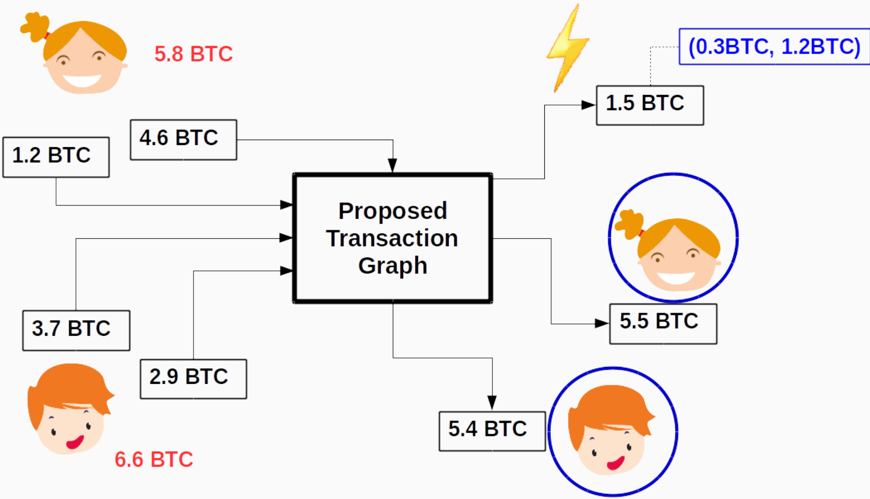


Decorrelation via funding



No valid subsets at funding time

Decorrelation via funding



No valid subsets at funding time

Even *after* close, no subsets if spending off-chain occurred

Thank you

Blog post on this topic:

https://joinmarket.me/blog/blog/CoinJoinXT

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gpg: 4668 9728 A9F6 4B39 1FA8 71B7 B3AE 09F1 E9A3 197A

References

References

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