Deanonymisation in Ethereum Using Existing Methods for Bitcoin

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Introduction

- Blockchain
  - Decentralised
  - Peer-to-peer
  - Miners
  - Anonymous reputation
- Forensics
  - Track malicious actors

Image source - thenounproject.com

Introduction

The integrity of the block*chain*

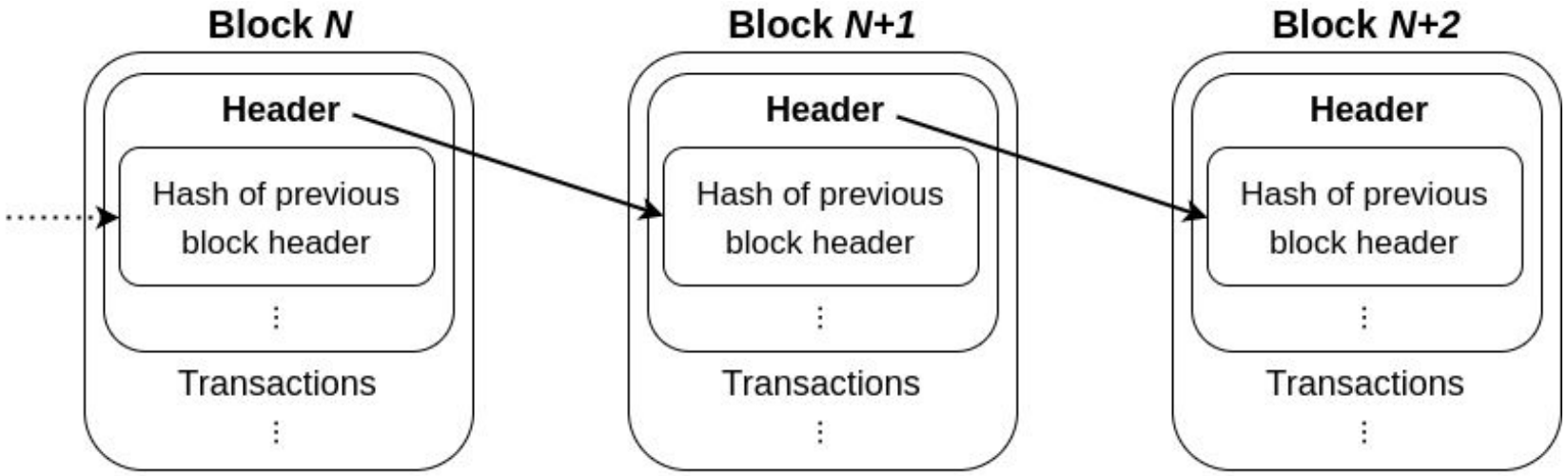


Figure 1: Overview of how blocks in a blockchain are linked to each other

Introduction

Blockchain popularity

- Bitcoin
  - 2009
  - ‘Satoshi Nakamoto’

- Ethereum
  - 2015
  - Vitalik Buterin

Research Question

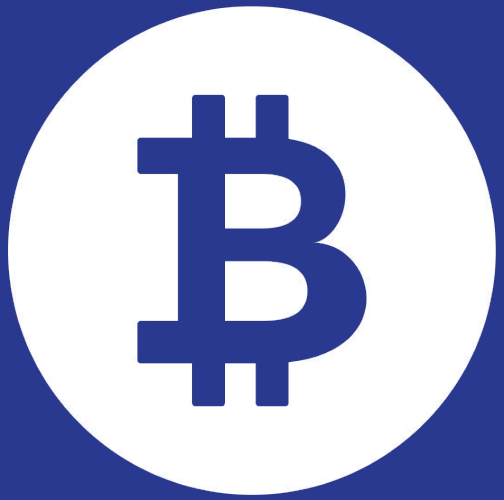
"Is deanonymisation of clients feasible for the Ethereum network?"

Image source - thenounproject.com

Related Work

- Survey on Bitcoin security and privacy issues
  - Essential background knowledge
  - Attacks on Bitcoin
    - BitIodine
- Survey on Ethereum smart contracts
  - Aimed at illegitimately obtaining funds
  - DAO attack

Bitcoin



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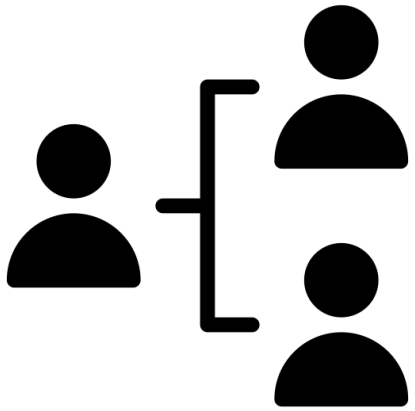
Bitcoin P2P Network

Discovering clients:

- Hardcoded seed servers
- Clients maintain 8 entry-nodes
- `getaddr` message



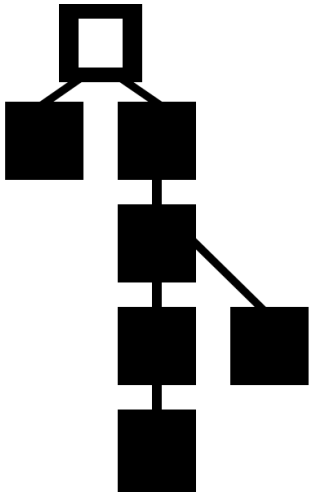
Transaction propagation:

- Trickling
  - Queueing `inv` messages
  - 100ms

Bitcoin Blockchain

Transactions

- Based on UTXO
- Use up all inputs
- Change



Blocks:

- Merkle tree
- Header hash
- Forks

Image source - thenounproject.com

Bitcoin (& Ethereum) Consensus Model

PoW (Proof of Work):

- Based on computational power
- Against Sybil attack

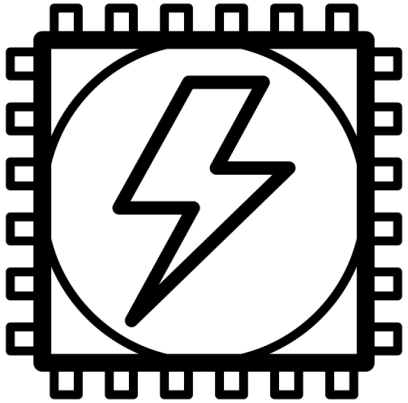


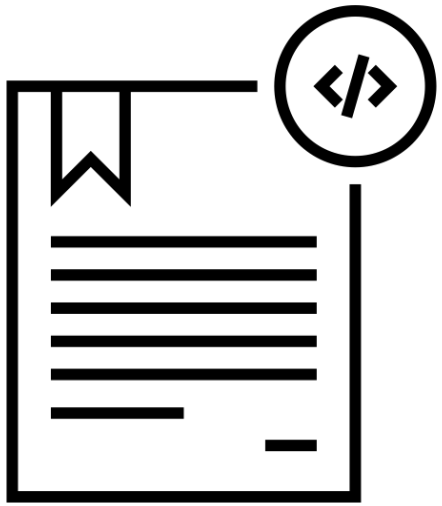
Image source - thenounproject.com

Ethereum

Image source - thenounproject.com

Ethereum Smart Contracts

- Code written for EVM
  - Turing complete
  - Solidity
- Immutable once deployed
- Miners paid in gas - prevent DoS
- Crowd funding



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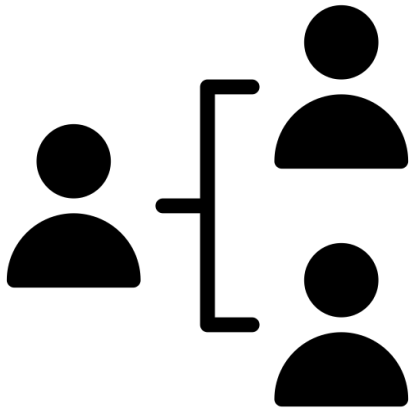
Ethereum P2P Network

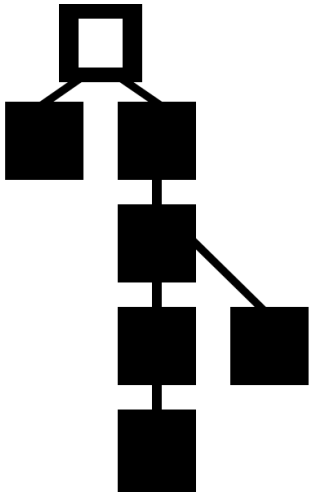
- Kademlia based
- Bootnodes
- Find nodes
  - `nodeID` from public key
  - Closeness
  - XOR of SHA-3 hash



Ethereum Blockchain

Transactions:

- No UTXO
- Account balance



Blocks:

- Global state
- Transaction *trie*
- Ommers

Image source - thenounproject.com

Attacks

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Existing Attacks - Finding IP Addresses

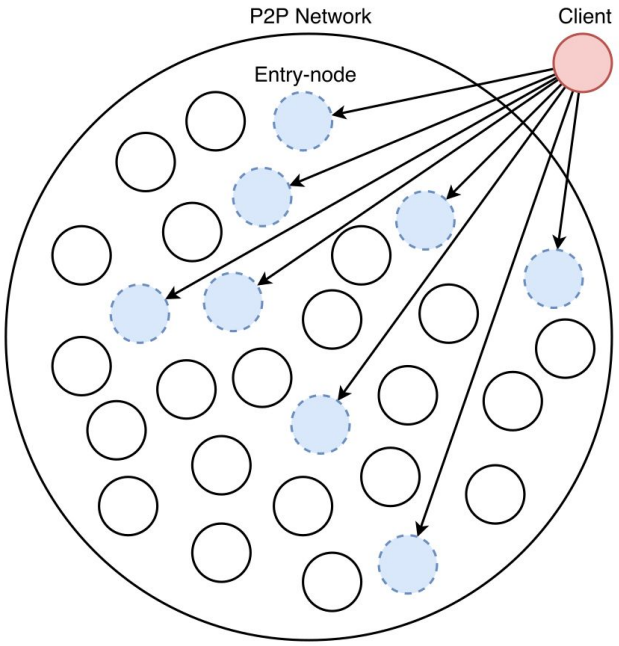


Figure 2: Entry-nodes in Bitcoin

- Identifying entry-nodes
  - Monitor ‘server’ nodes
  - Listen for `addr` messages
- Monitor network
- Transaction broadcasts
- Very resource intensive

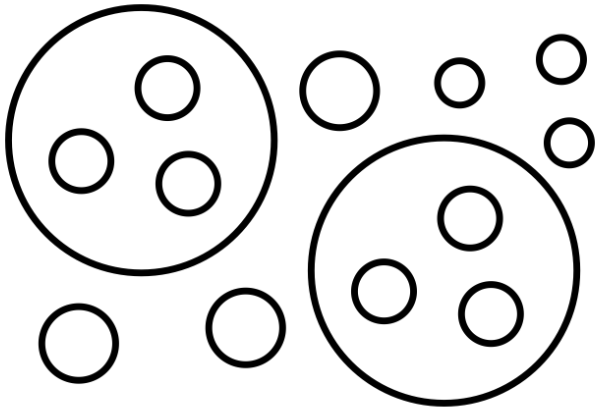
Effectiveness - Finding IP Addresses

- Peers of a node more volatile
- No set number of peers

Image source - thenounproject.com

Existing Attacks - Clustering

- Crawler
- Multi-input transactions
- Transaction ‘change’



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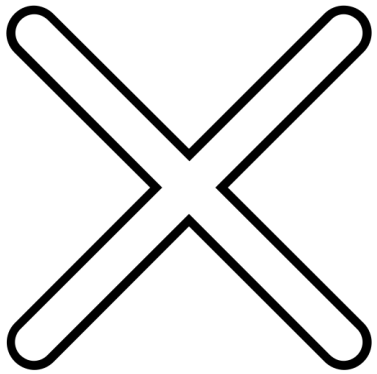
Effectiveness - Clustering

- No multi input
- No change
- No shadow addresses



Discussion & Conclusion

"*Is deanonymisation of clients feasible for the Ethereum network?*"

Deanonymisation attacks difficult to apply:

- Finding IP
  - Nodes not static
- Clustering
  - No multiple addresses

But, possibilities for similar attacks

Future Work

- Bootnodes
  - Shadow network
  - Government
- Peer selection protocol
  - Create nodes
  - Identify nodes
- Attack wallet software
  - Less resource intensive

References

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Questions

Image source - thenounproject.com