Scaling Blockchains

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Blockchain Scalability Challenges

- **Every** miner processes **every** transaction
  - ➔ All transactions compete to be included in the next block
- **All** transactions are recorded **indefinitely** by **every** full node
  - ➔ The size of the blockchain data is ever-increasing
- Transactions **must** get mined to be deemed valid
  - ➔ Recipients must wait for N confirmations from miners for transaction finality

Scalability

State Size

- Bitcoin: ~200 GB
- Ethereum: ~1TB

Transaction Speeds

- Bitcoin Core: ~5 tx/sec
- Ethereum: ~20 tx/sec
- Bitcoin Cash: ~100 tx/sec
- Nasdaq: ~10k tx/sec
- Visa: ~25k tx/sec

Scalability Solutions

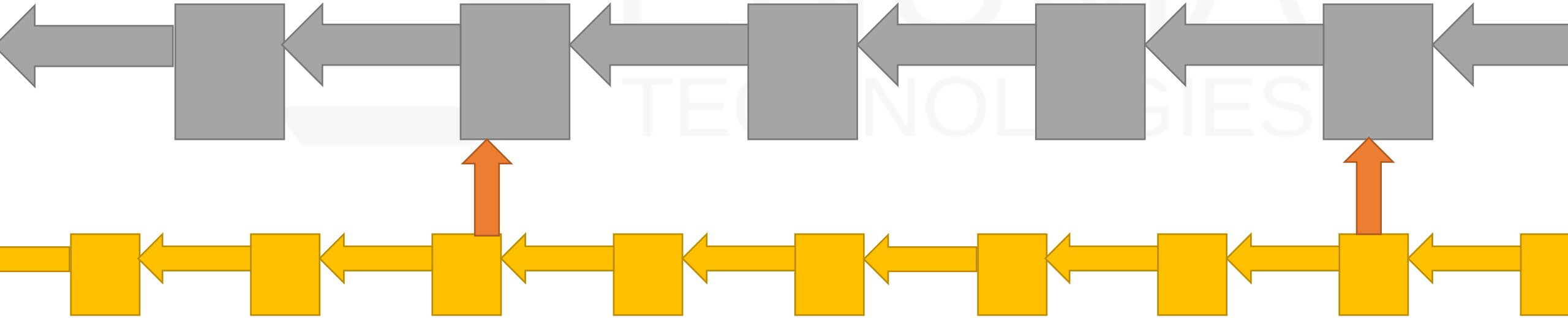
- Layer 1
  - Increase artificial limits (block size, gas limit)
  - New instruction sets
  - New consensus algorithm
  - Sharding
  - Etc.
- Layer 2 Technologies
  - Hierarchy of chains – e.g. Plasma, Cosmos, Polkadot
  - State Channels – e.g. Lightning Network, Raiden, Connext, Sprites

”Layer 2” technologies

- “Layer 1” is the “central” blockchain
- “Layer 2” relies on the security of ”Layer 1”
- “Layer 2” can use different consensus, rules, chain, tx speed, …

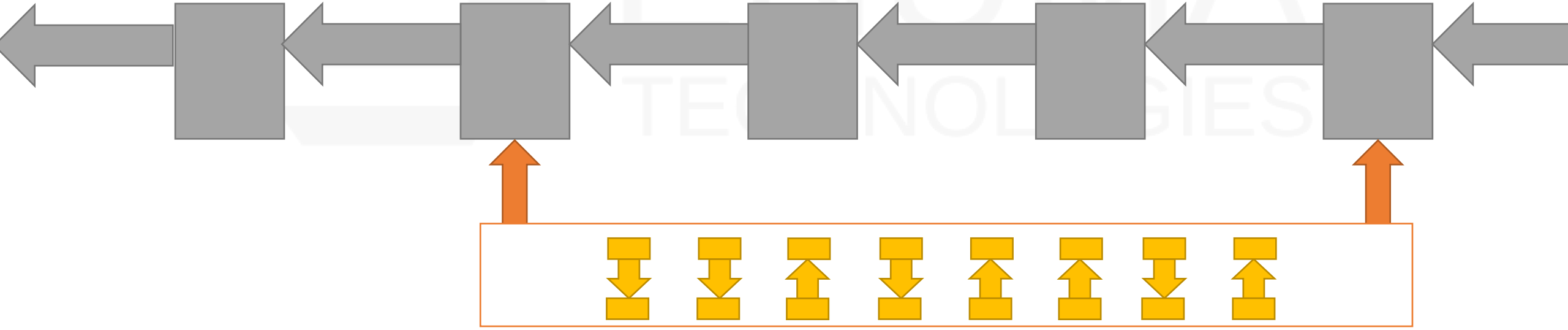
Hierarchy of chains

- Periodically sync the hash to parent to avoid tempering in child
- When the child chain can’t advance, parent allows withdrawal



State Channels

- Opening and closing a channel happens on the main chain
- An open channel allows for secure, off-chain transactions



Looks familiar?

Created by Atif Arshad
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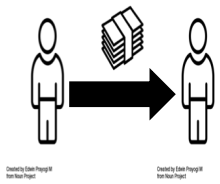
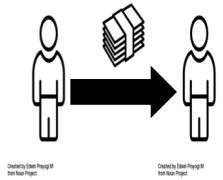
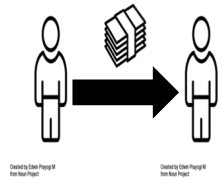
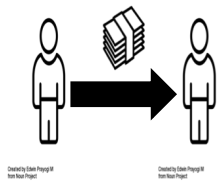
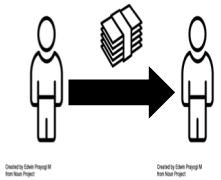










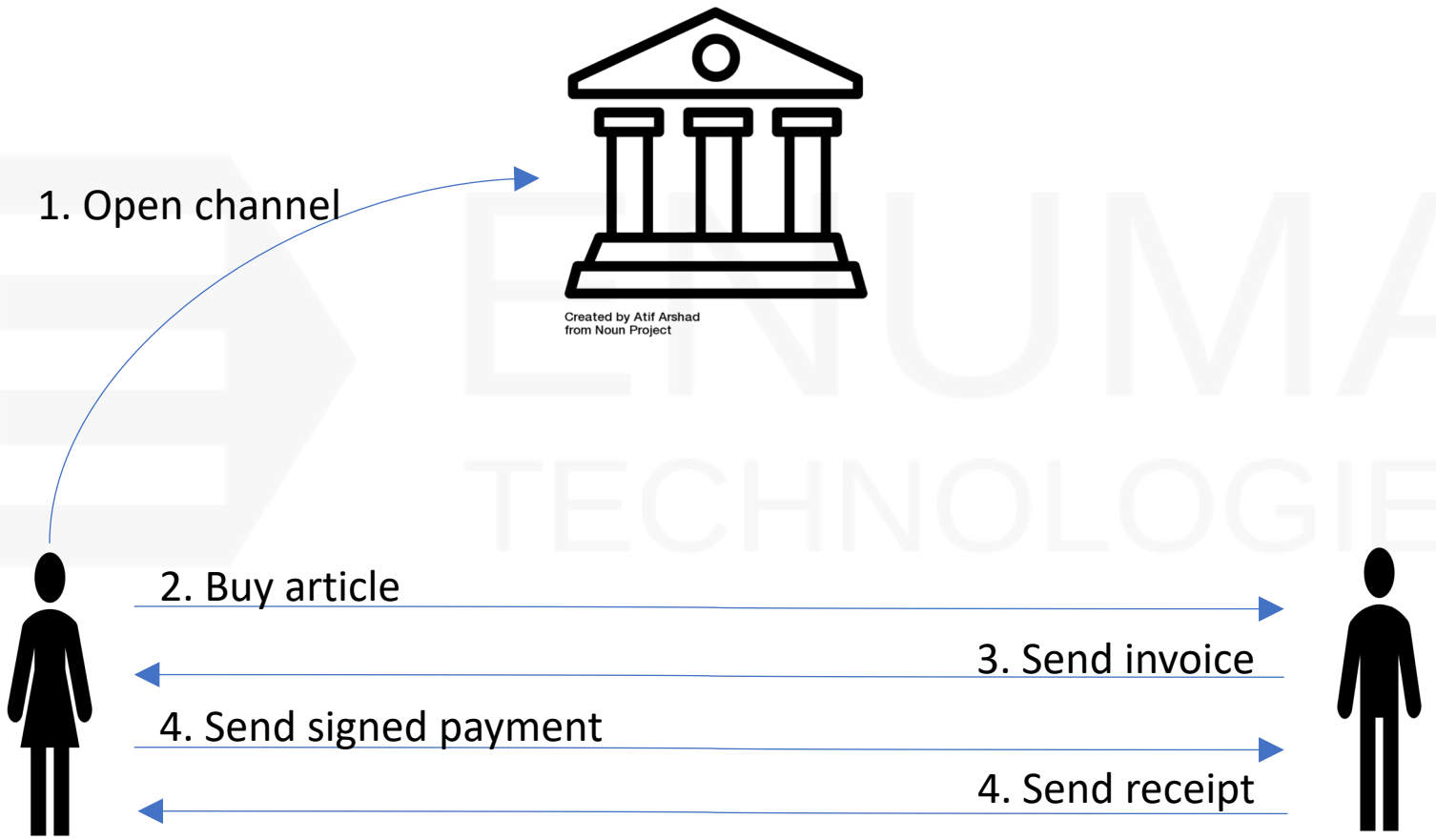
State Channels Scalability

Each state channel

- allows 2 peers to transact
- requires opening (and closing) on-chain
- requires a deposit
- requires client-side bookkeeping

Sprites – unconditional payments

ethereum foundation grants



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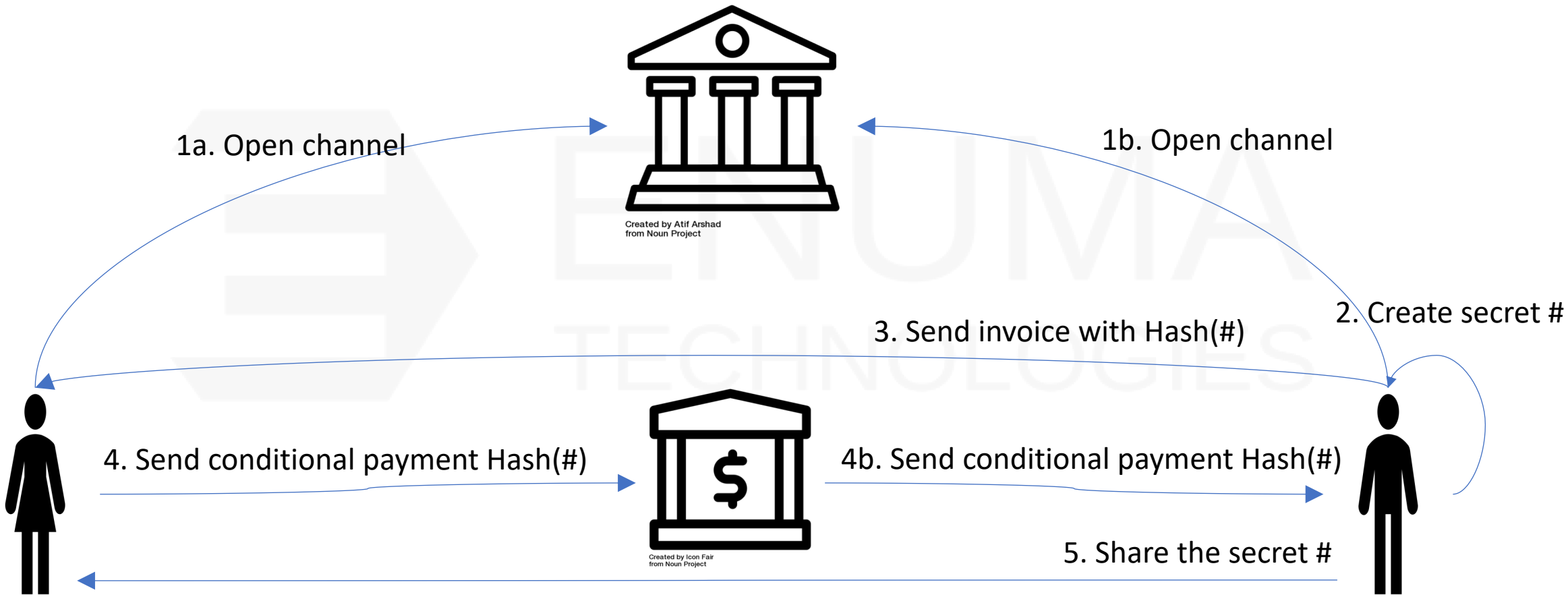
Sprites – conditional payments

ethereum foundation grants



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Demo

- https://github.com/enumatech/sprites

- Using

  nix, direnv, overmind, pnpm, node, solc, geth, rambda

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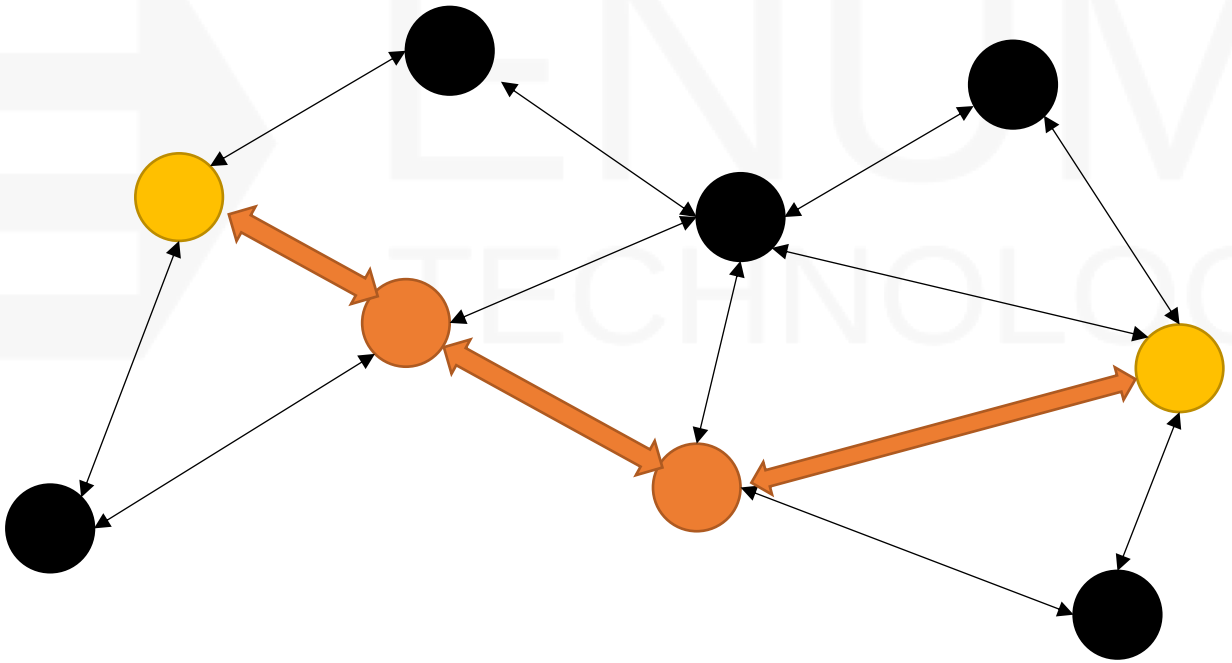
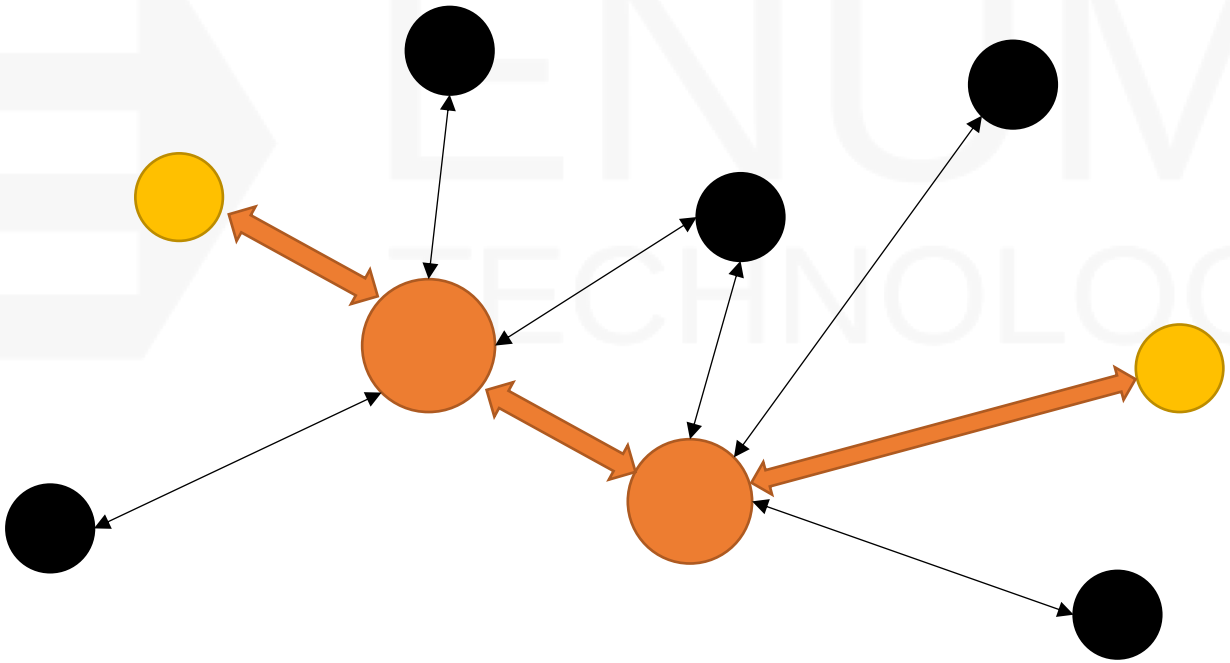
State Channels Solutions: Routing

- Route transactions through other channels



State Channels Solutions: Hub-Spoke

- Route transactions through **hubs**



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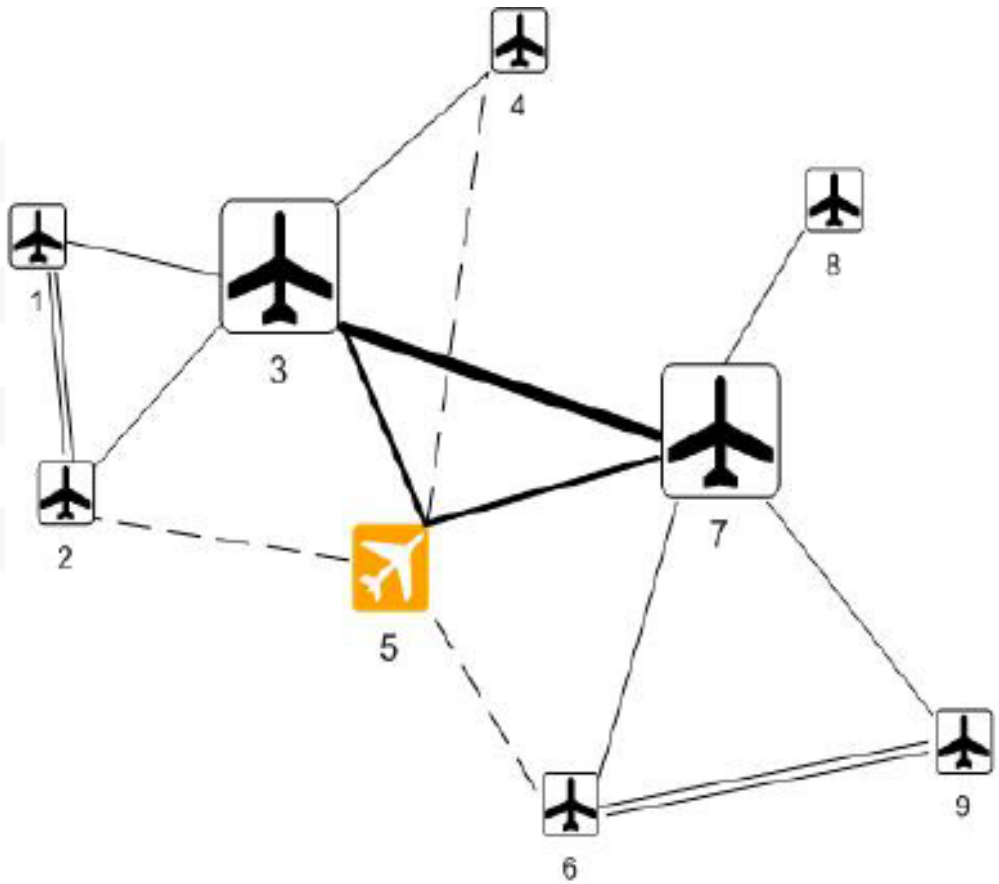

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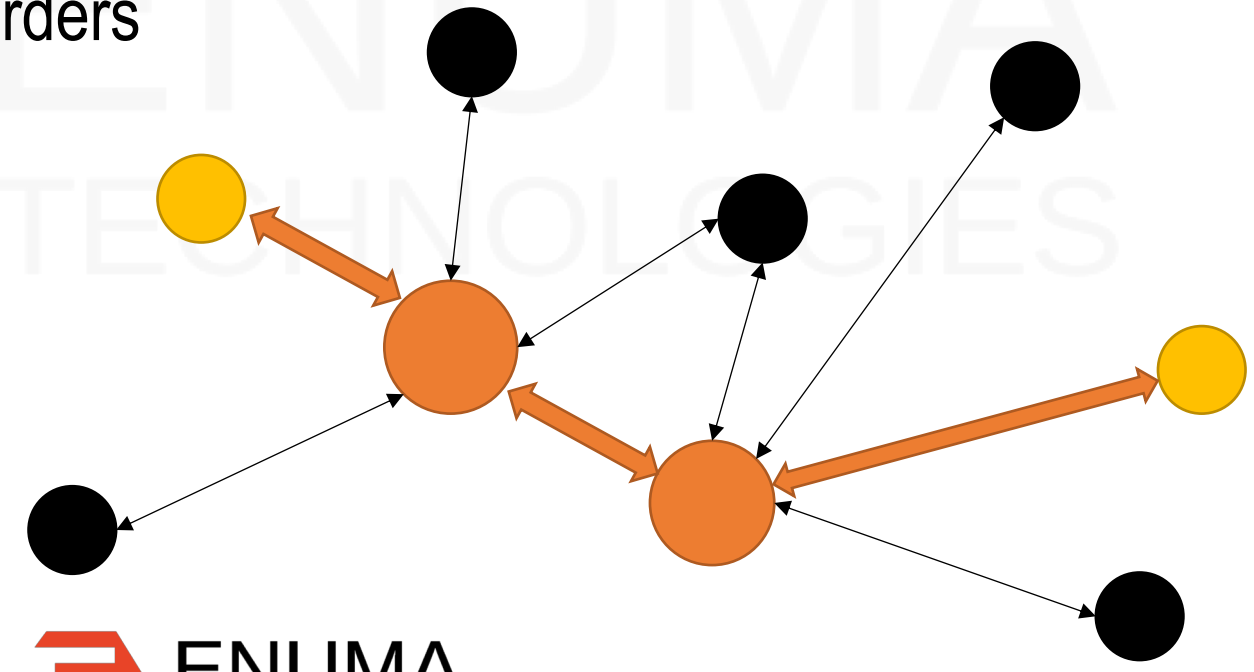
Decentralized Exchange

OAX DEX

- Open channel with an exchange
- Atomic swap
- Exchanges aggregate their orders



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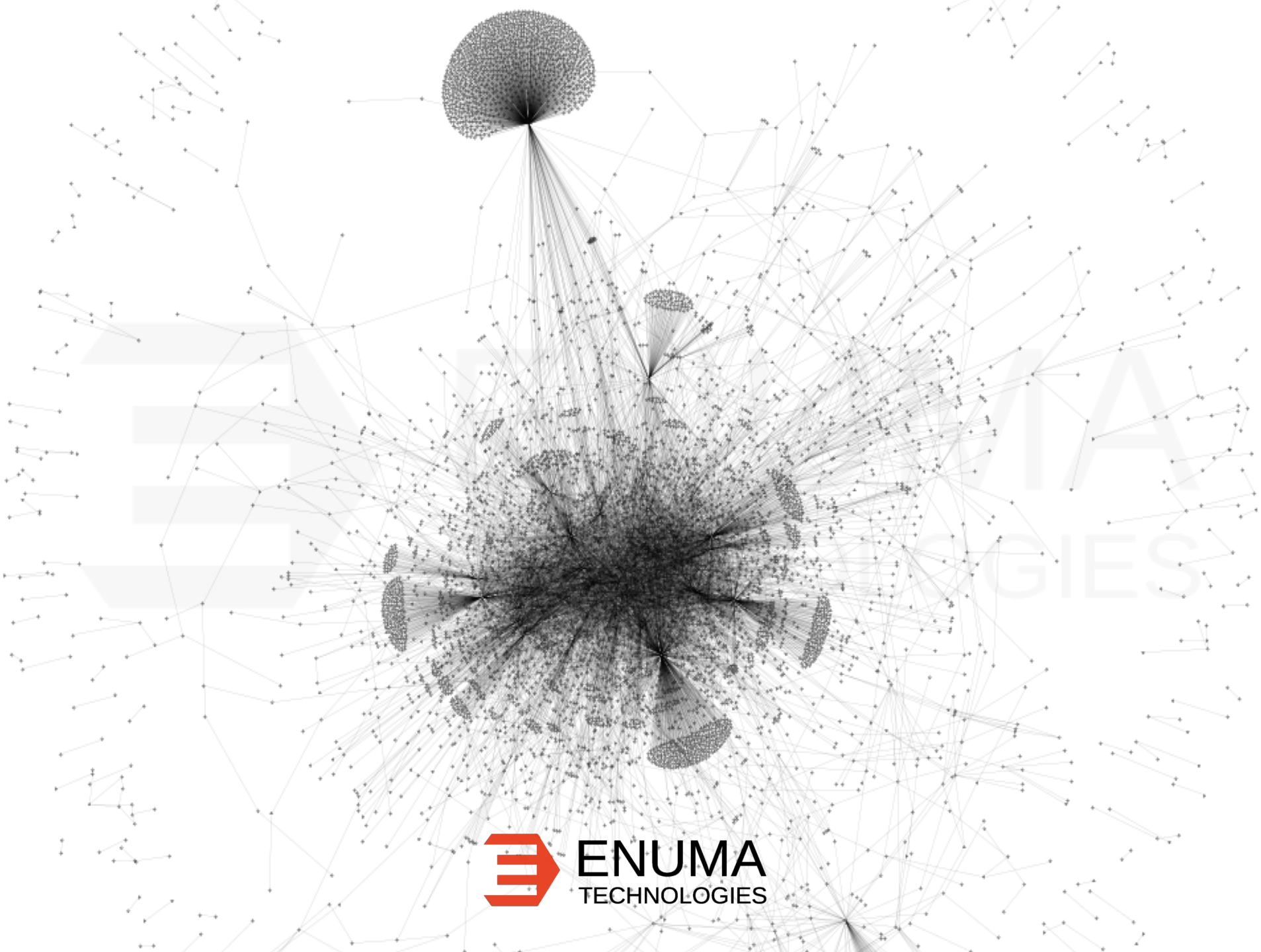

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Thank You
多謝

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