THE STARK TRUTH ABOUT DEXes

Eli Ben-Sasson, Chief Scientist (East) | February 2019

StarkWare

$40M

Funding
(equity + EF grant)

20

Team
members

Alpha

DEX scalability
engine

We're hiring! **Jobs@starkware.co**

Learn more! **workshop@starkware.co**

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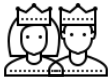
OUTLINE

1. STARKs as a Scalability Solution

2. DEXes

3. StarkDEX

STARKs and Scalability

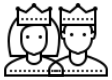


DELEGATED ACCOUNTABILITY

OLD WORLD
(banks, pension funds...)

TRUST — assumption

VERIFY — delegated to auditors, accountants, regulators



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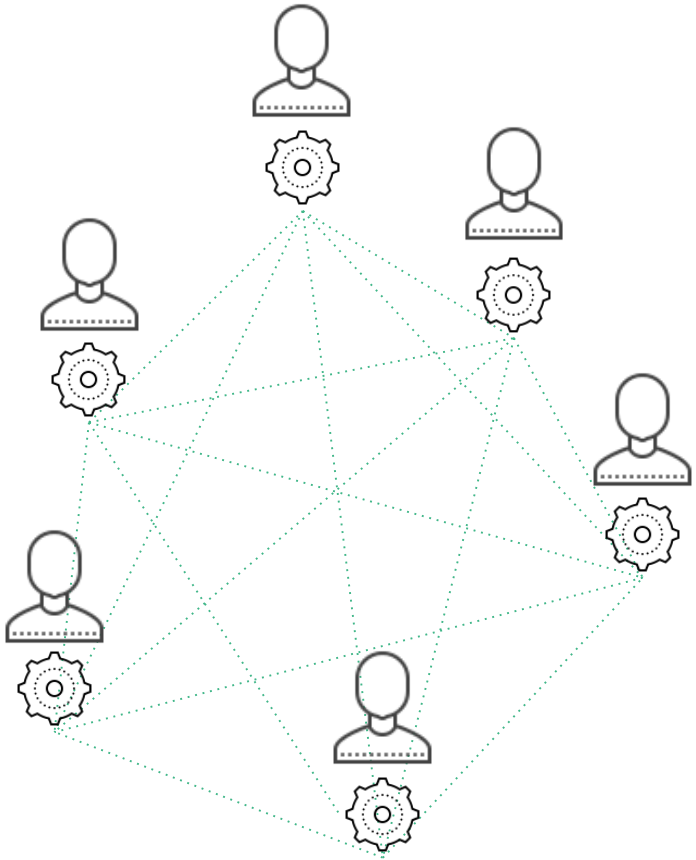
INCLUSIVE ACCOUNTABILITY

NEW WORLD

don't trust, verify

TRUST



INCLUSIVE ACCOUNTABILITY

NEW WORLD

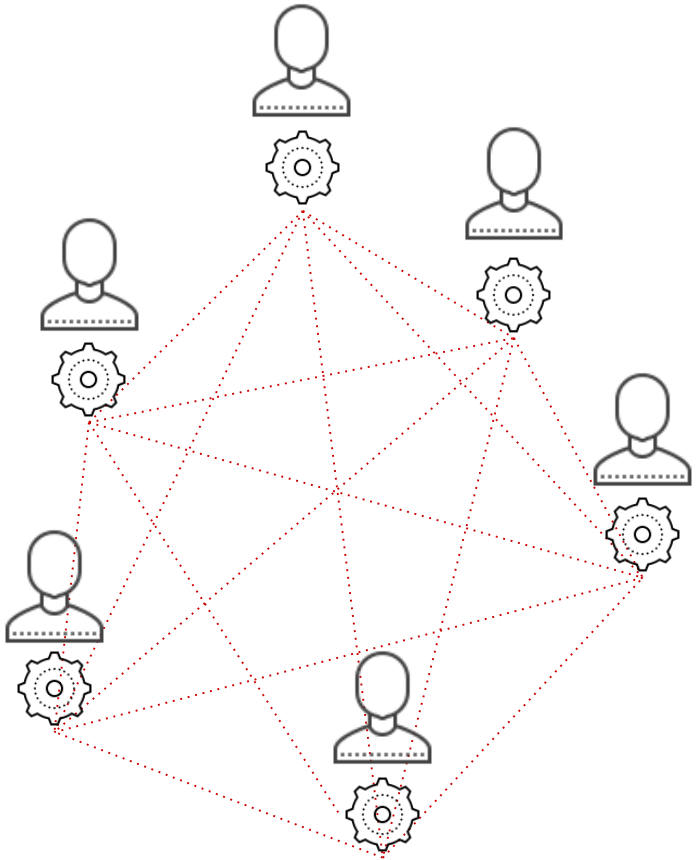
don't trust, verify

TRUST

everyone should be able to verify integrity of the system, using a laptop

VERIFY

STARKWARE

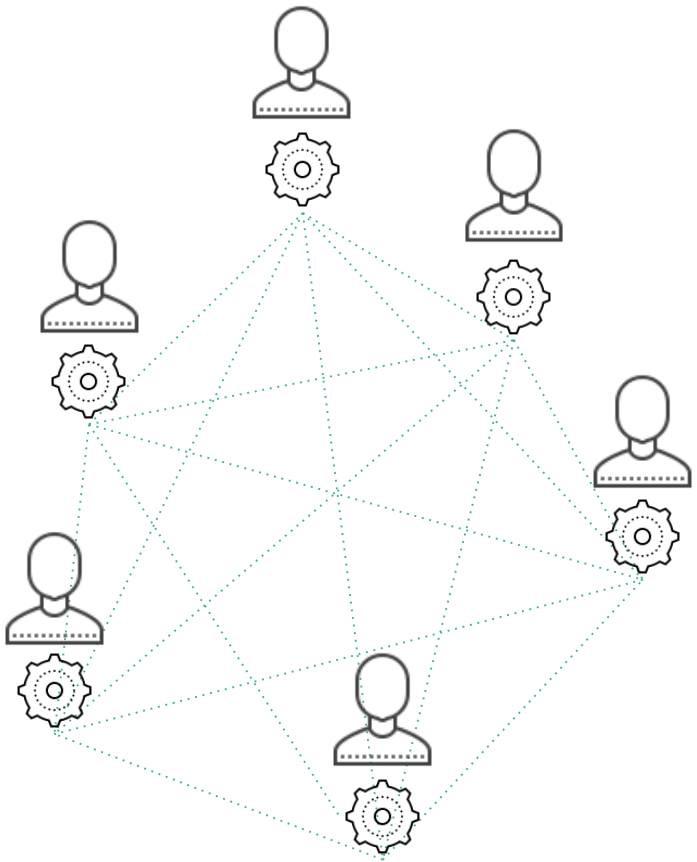


INCLUSIVE ACCOUNTABILITY

2 PROBLEMS

everyone sees every Tx — PRIVACY

require small throughput to allow accountability even on weaker devices (i.e: laptop) — SCALABILITY



INCLUSIVE ACCOUNTABILITY

STARK SOLVES BOTH

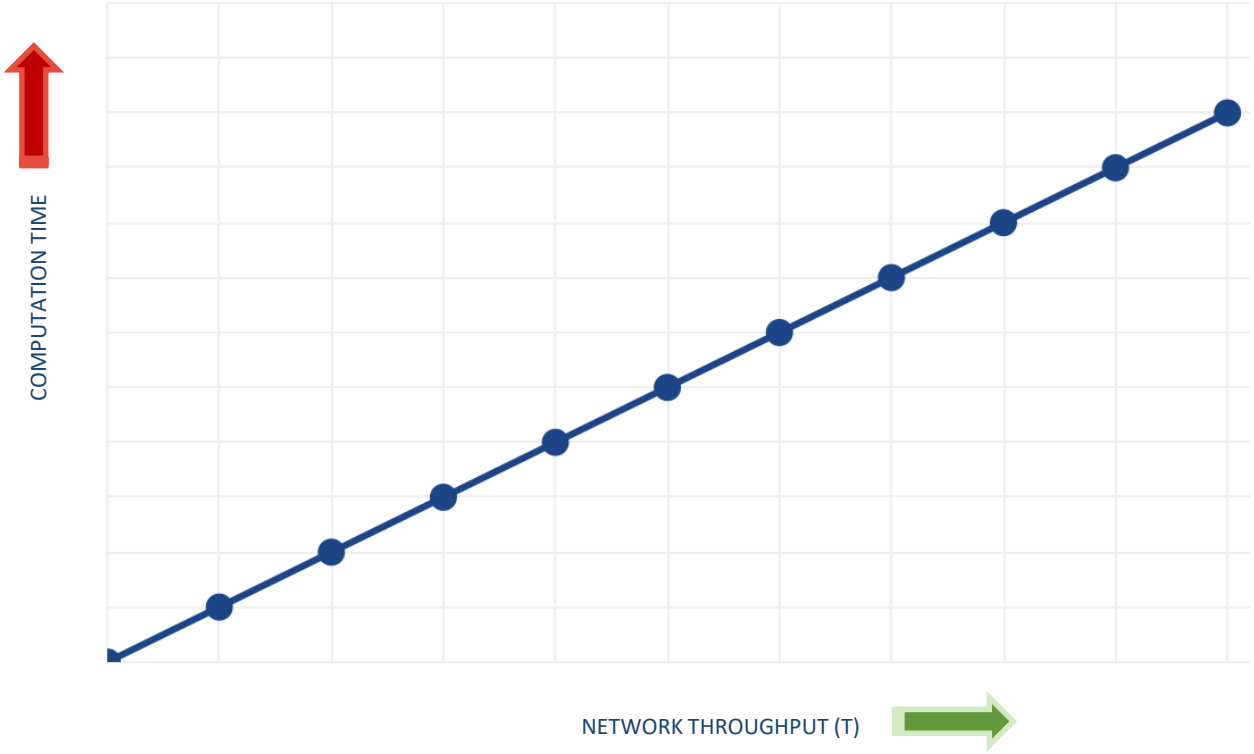
everyone sees every Tx — PRIVACY

shield transactions
(like ZK-SNARKs do for Zcash) — ZK-STARKs

require small throughput to
include accountability on
weaker devices (i.e: laptop) — SCALABILITY

S == scalability — ZK-STARKs

Inclusive Accountability - Scalability Problem



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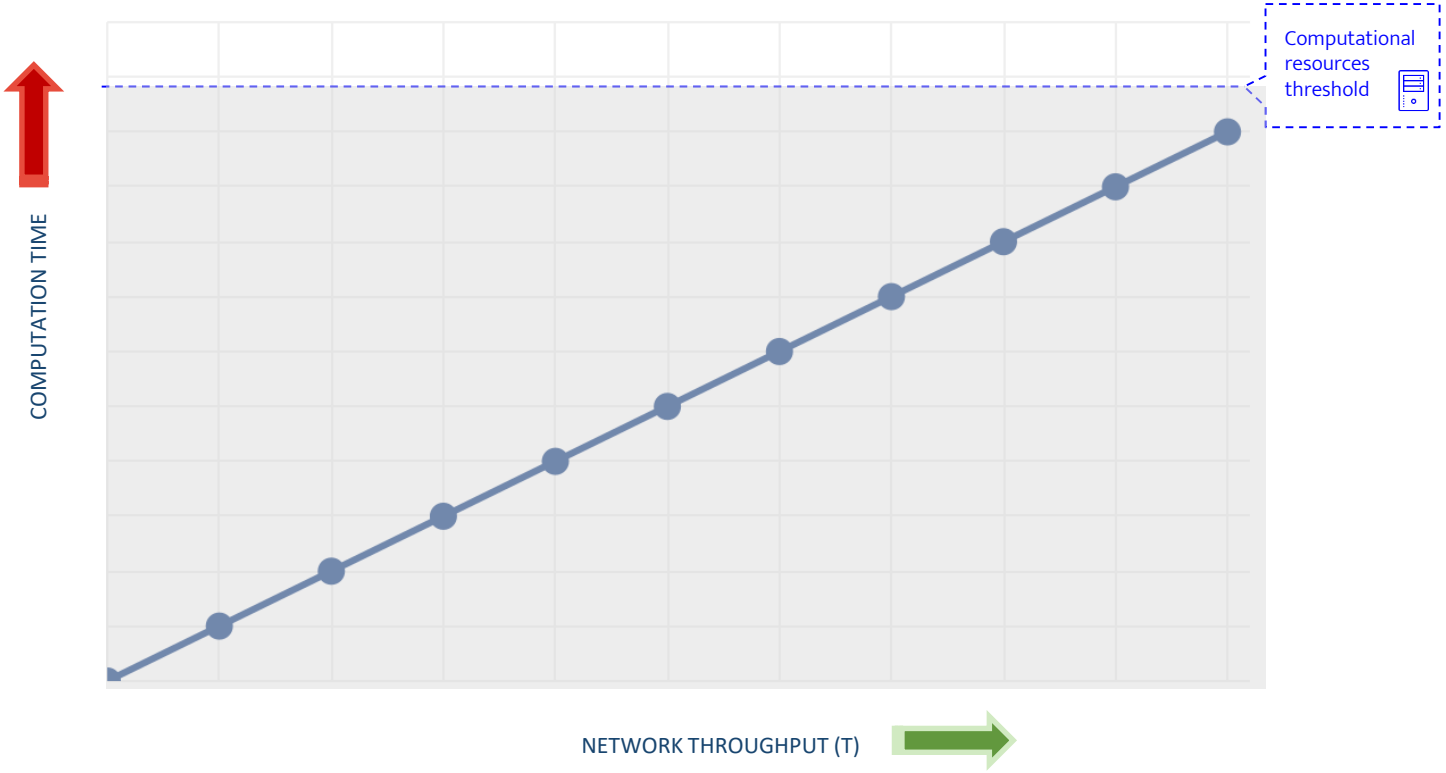
Inclusive Accountability - Scalability Problem



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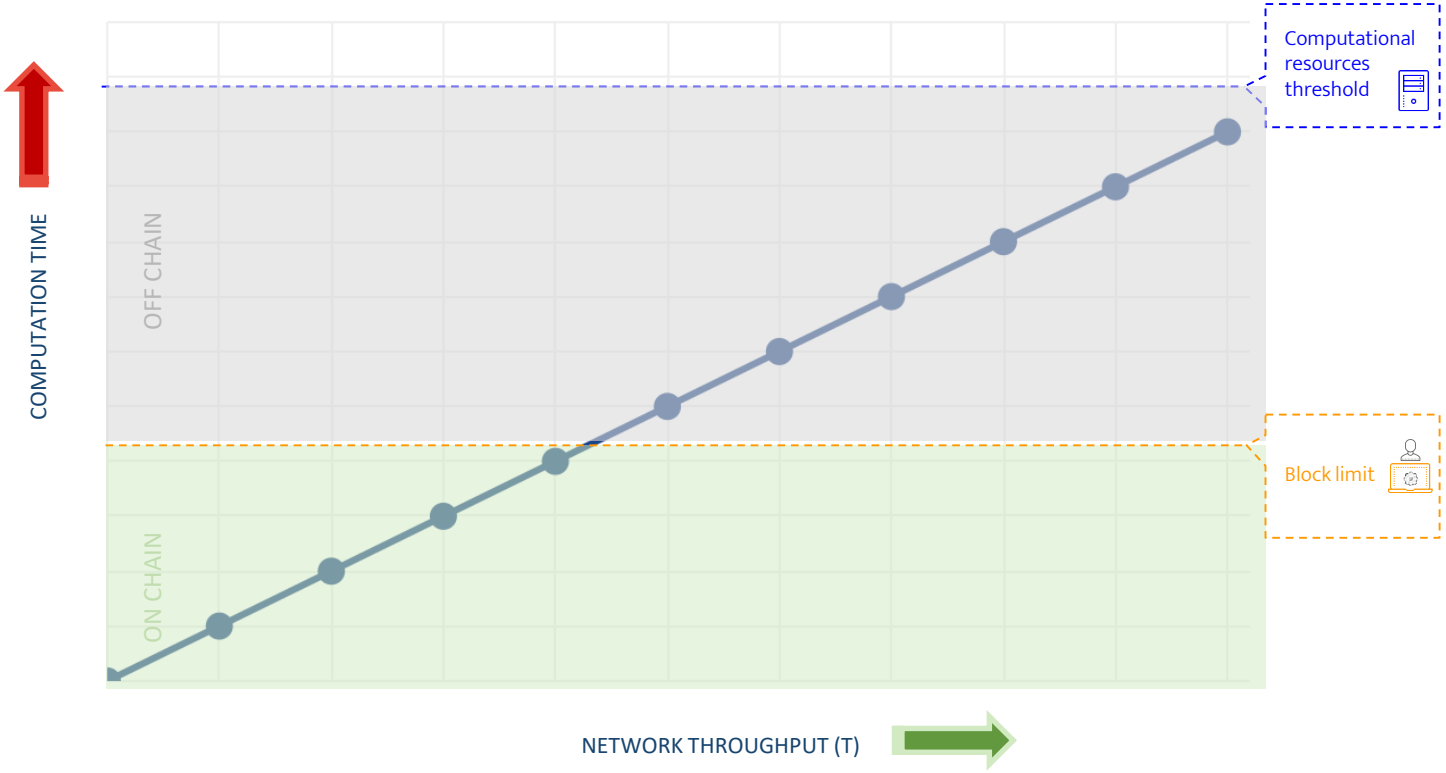
Inclusive Accountability - Scalability Problem



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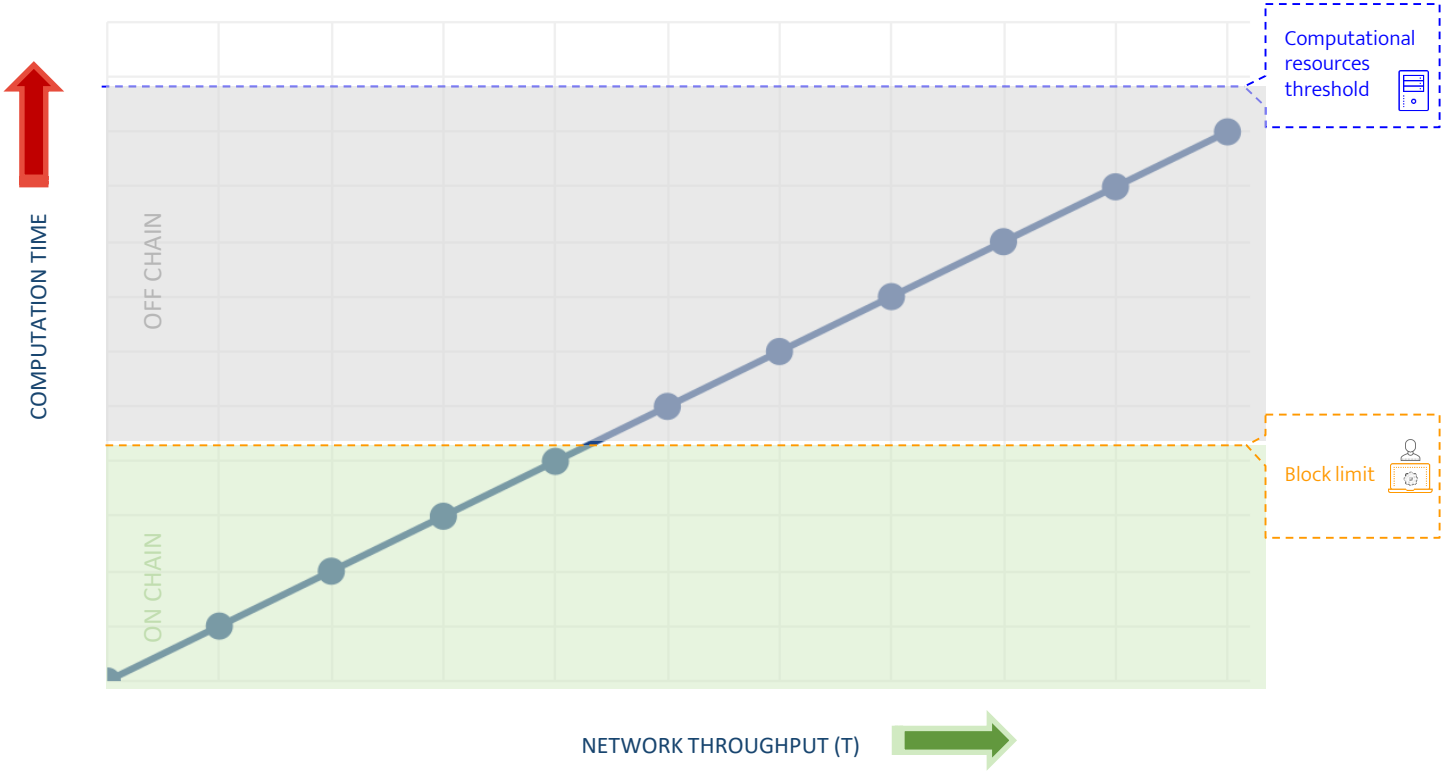
STARK Scalability

Prover time is nearly linear in T

&

Verifier time exponentially smaller than T



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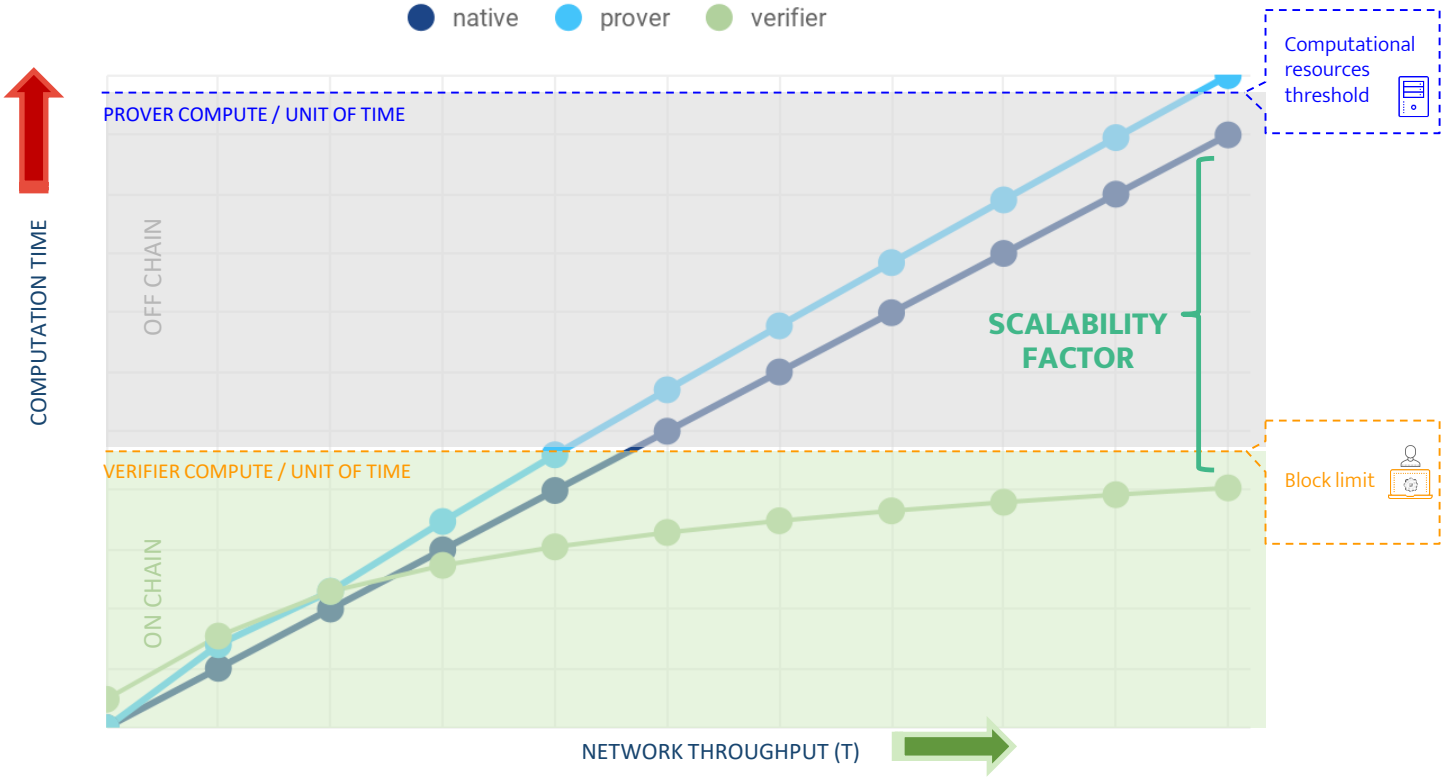


STARK & Other ZKP Systems

BulletProof

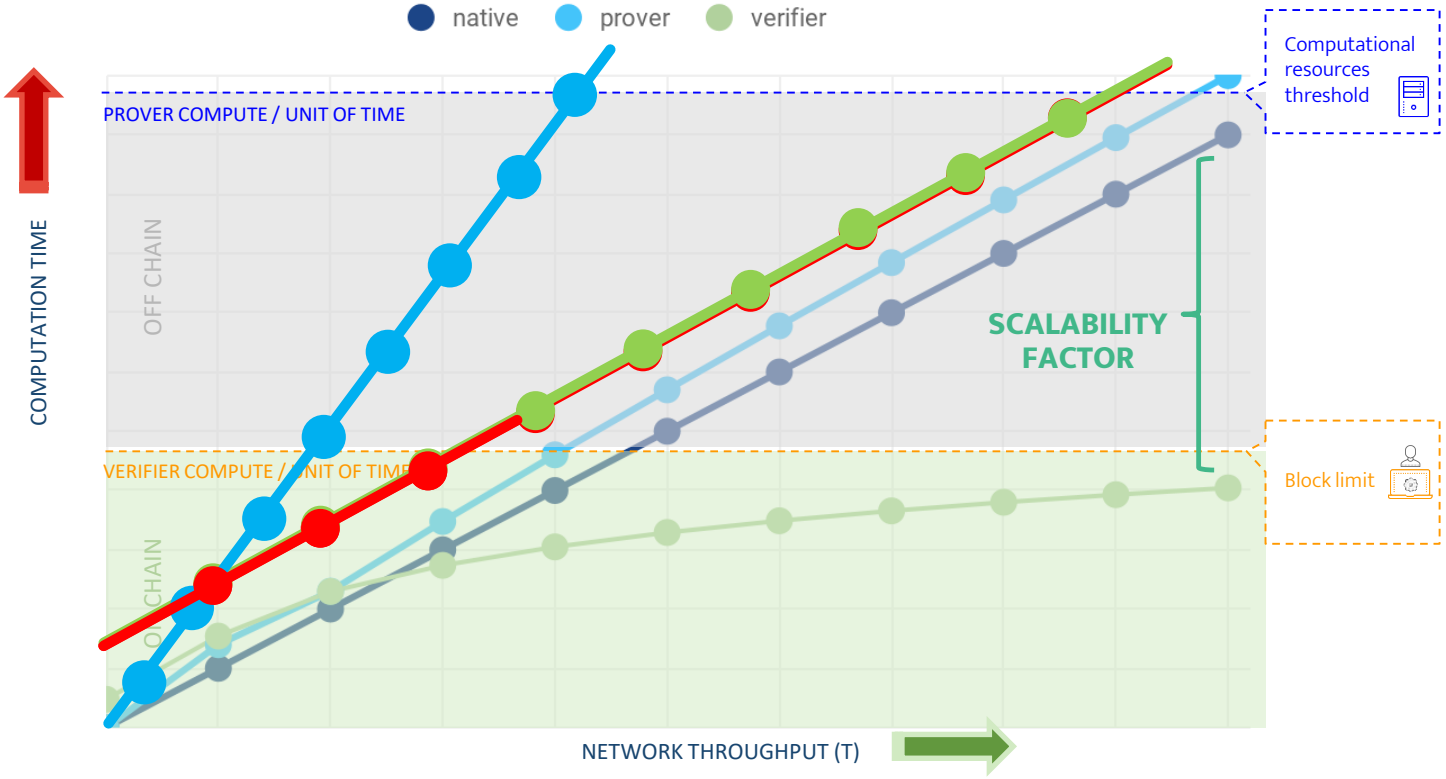
Verifier time scales linearly

SNARK

Trusted setup scales linearly

Recursive SNARK

Trusted setup, inefficient prover



STARKWARE

DEXes and Scalability

Exchange: the 3-Act Play

Exchange: the 3-Act Play

Centralized Exchange

(CEX)

Decentralized Exchange

(DEX)

CUSTODY	exchange holds all assets	stays with traders	CUSTODY
SETTLEMENT	off-chain	on-chain	SETTLEMENT
Tx / TRADES	#On-chain tx's << #trades	#On-chain tx's == #trades	Tx / TRADES

DEXes

ADVANTAGES

No central honeypot luring thieves & embezzlers

DEX does not assume counterparty risk:

- No exposure to 51% attack
- Faster/cheaper listing of crypto pairs

DISADVANTAGES

Total dex volume ~ 1% of total CEX volume

Transaction (settlement) cost: ~200K gas, implies upper bound of 3 tx/sec in Ethereum

low tx volume means poor liquidity

StarkDEX

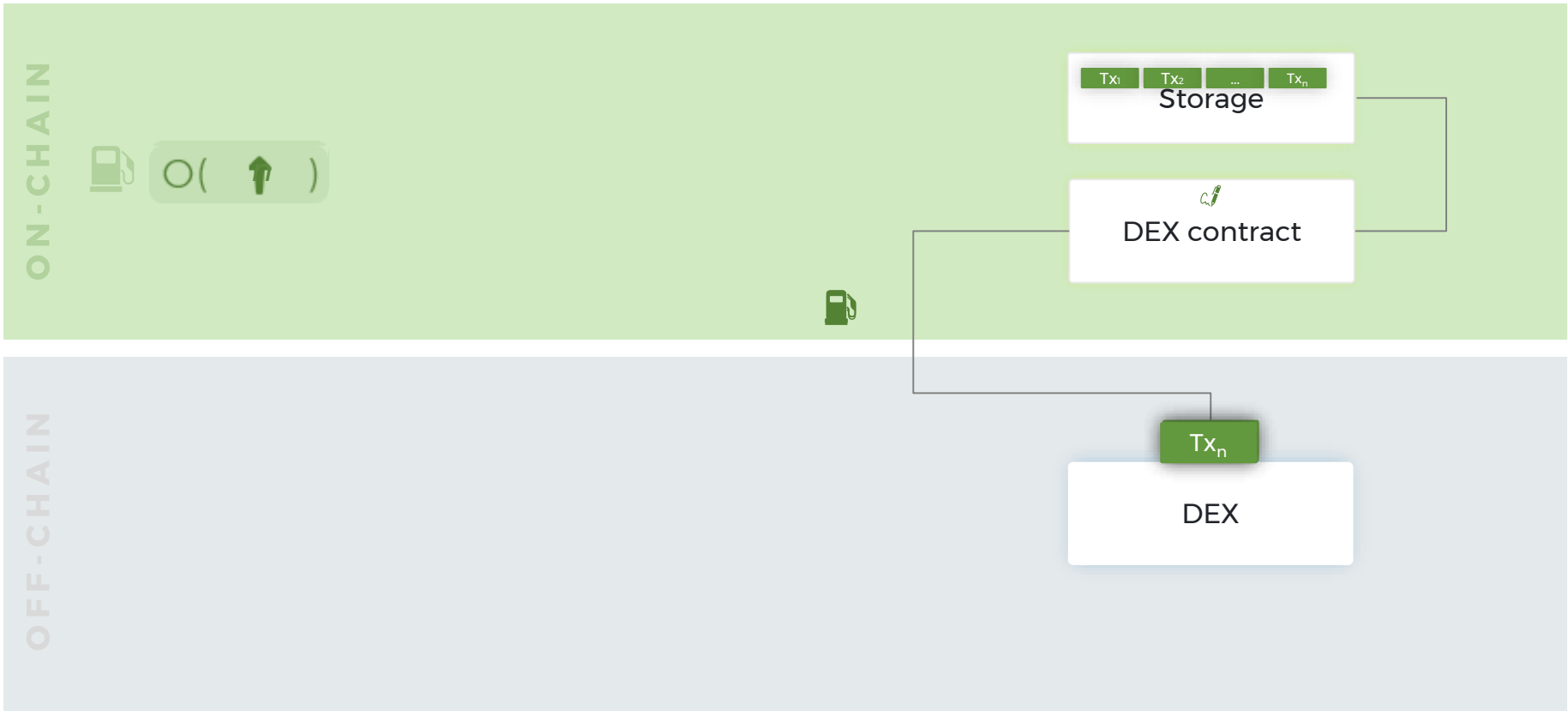
StarkDEX Overview

ON-CHAIN

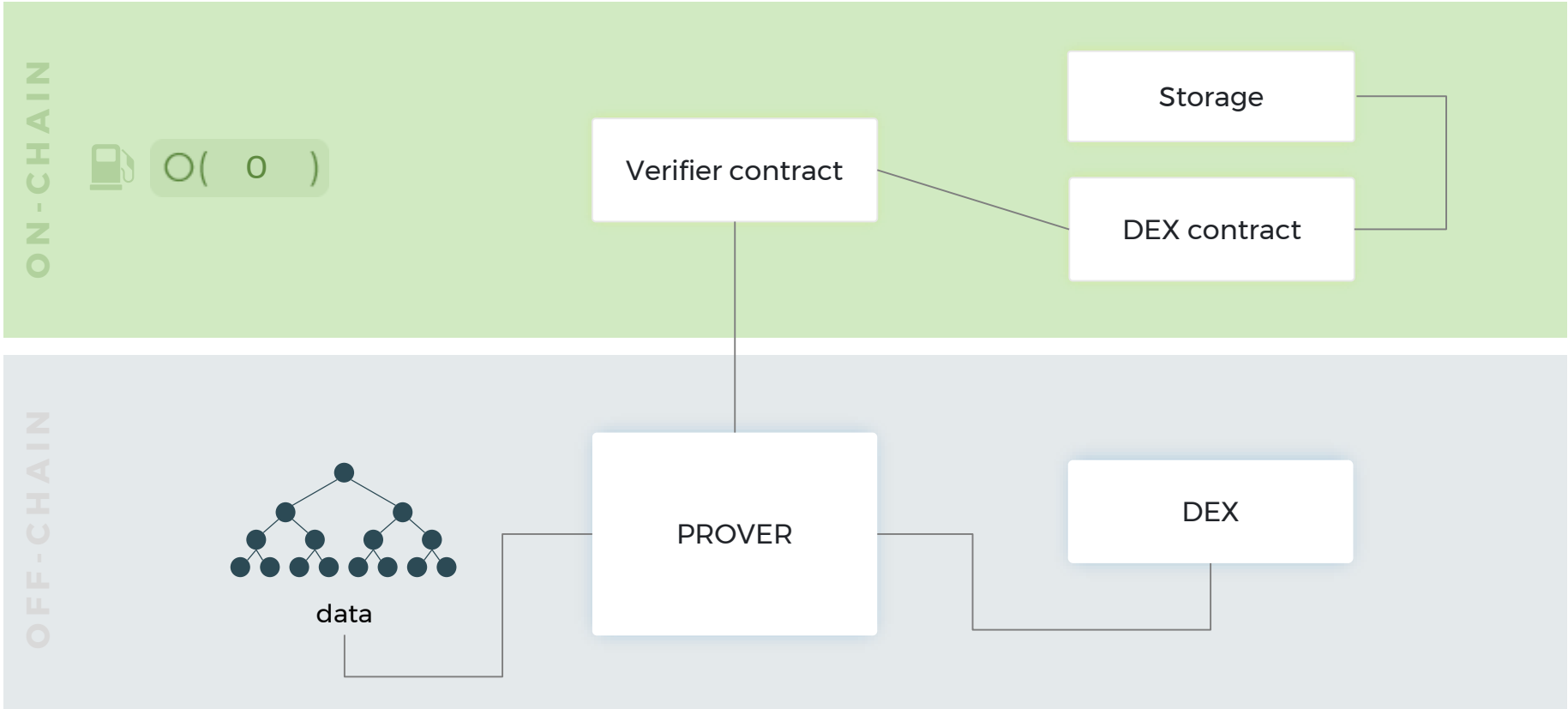
OFF-CHAIN

STARKWARE

Current DEXes



StarkDEX – High Level



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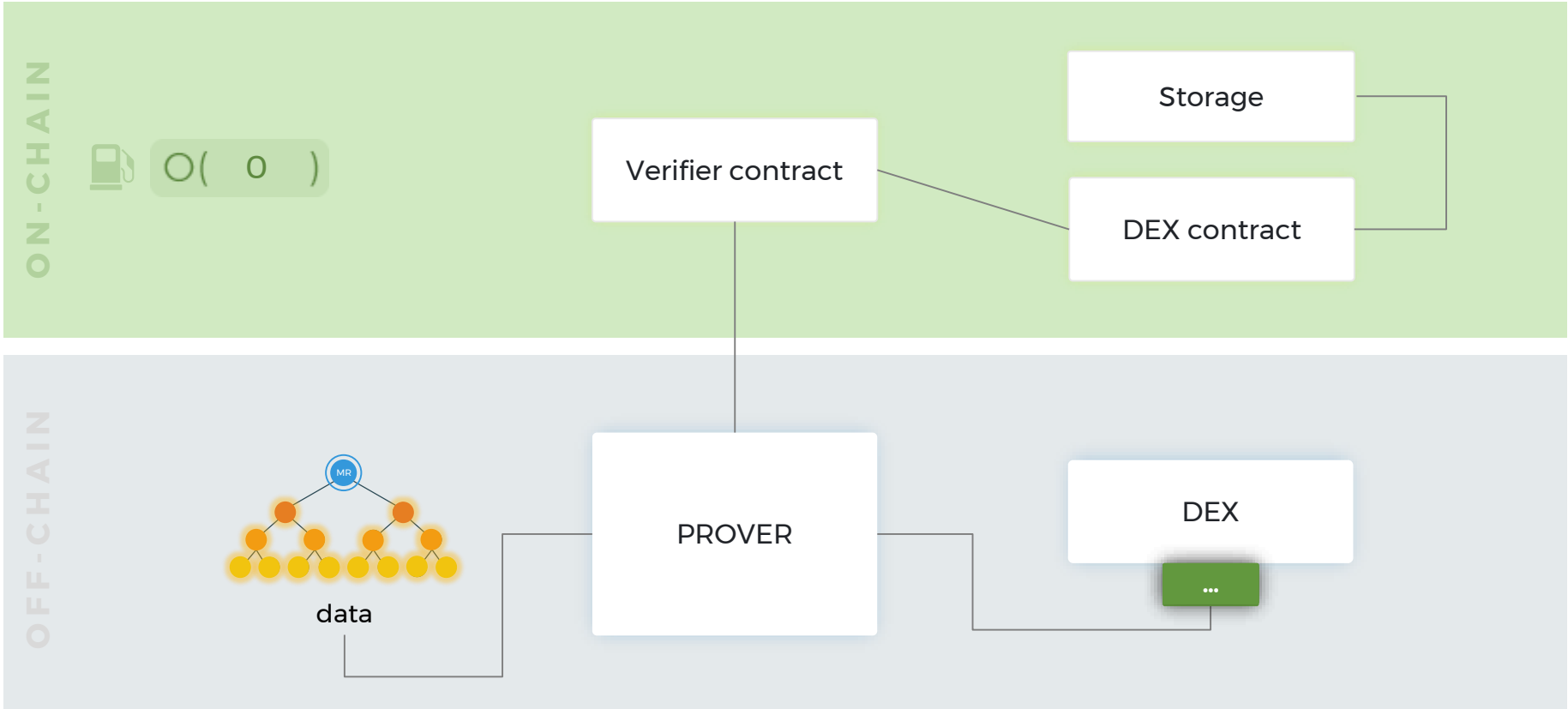
StarkDEX – High Level



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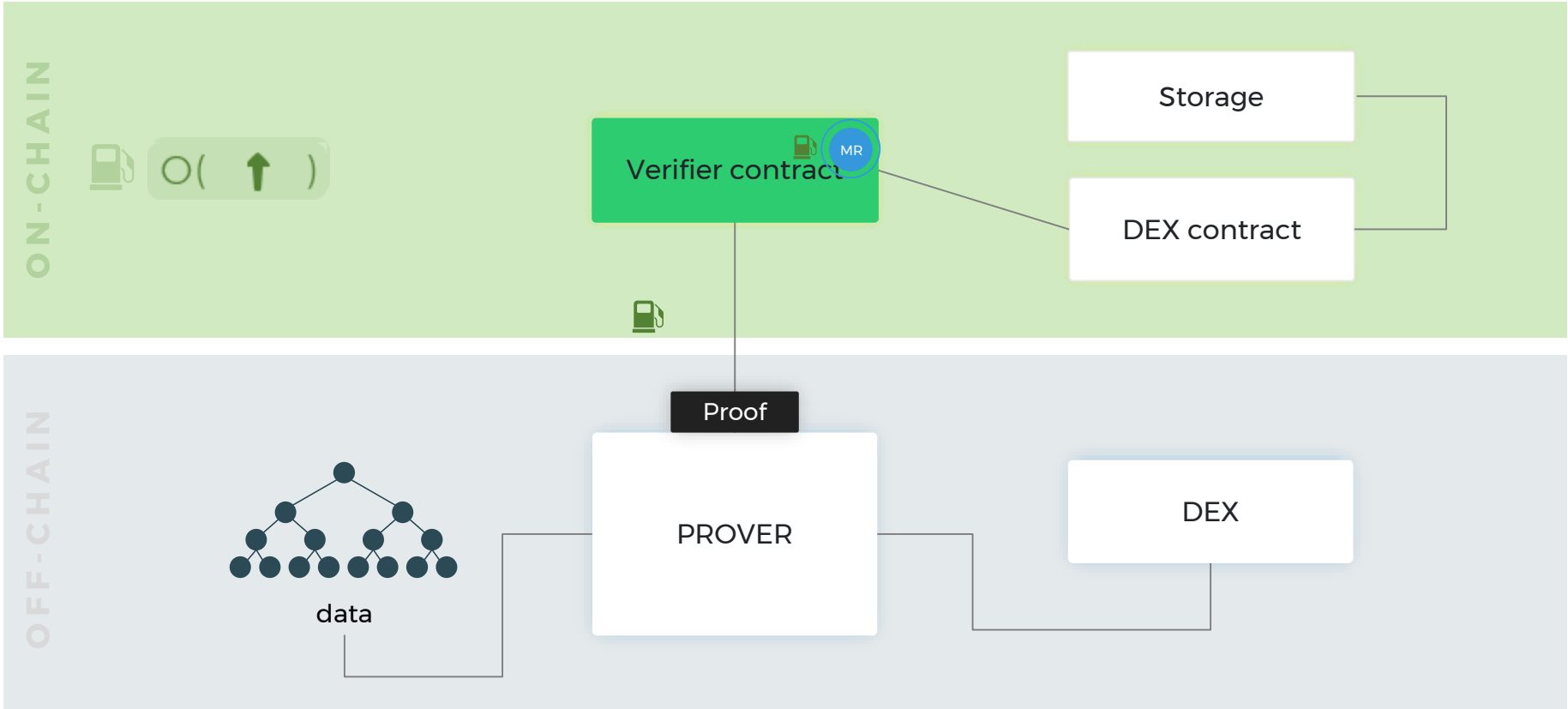

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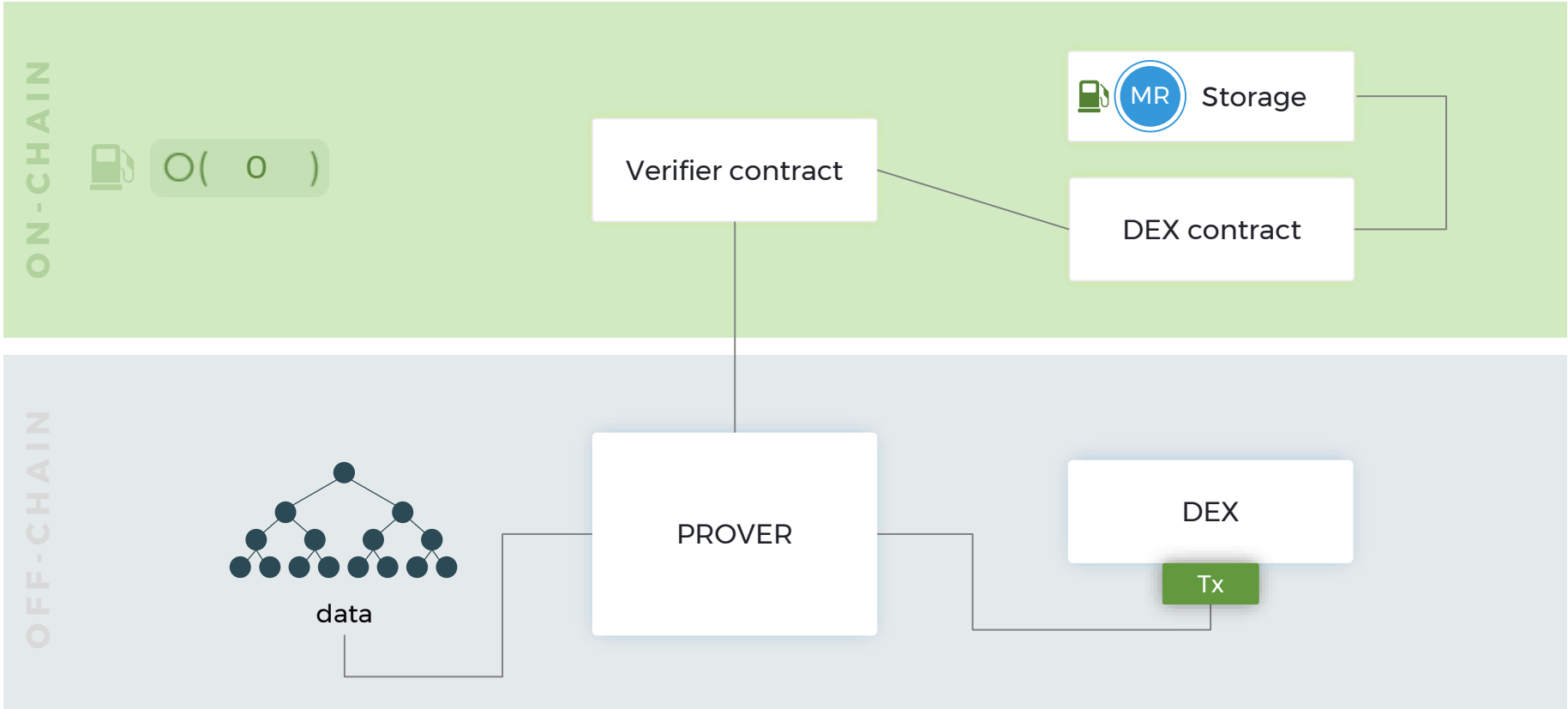

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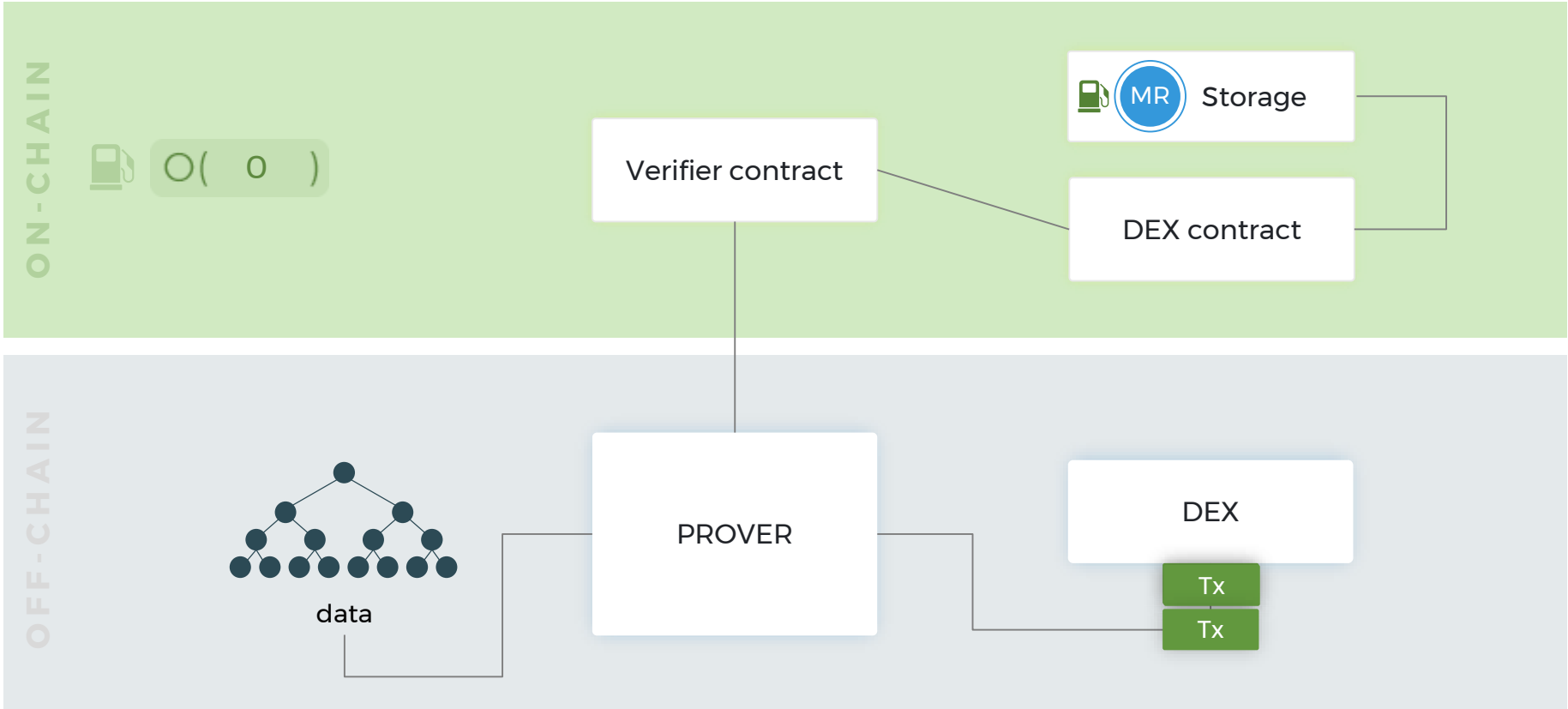

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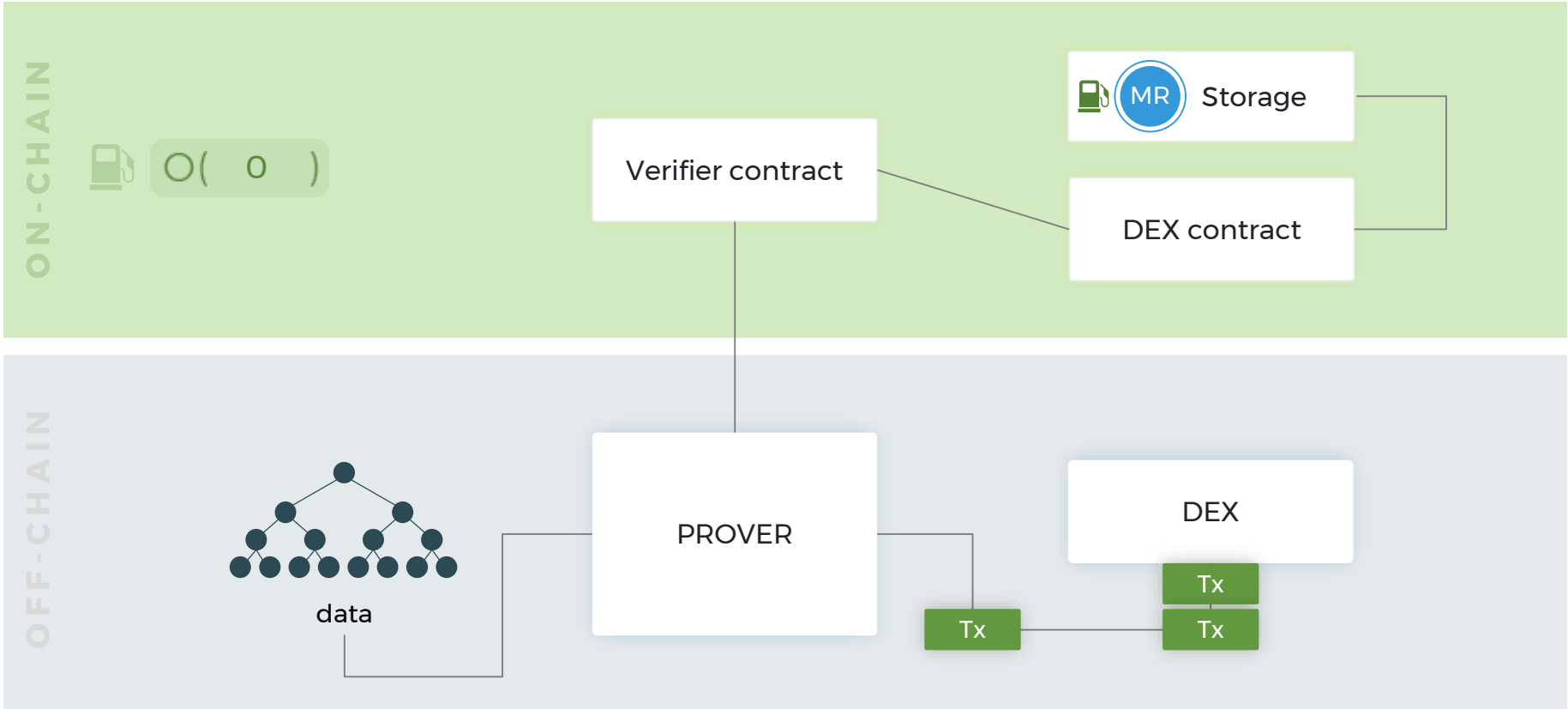
StarkDEX – High Level



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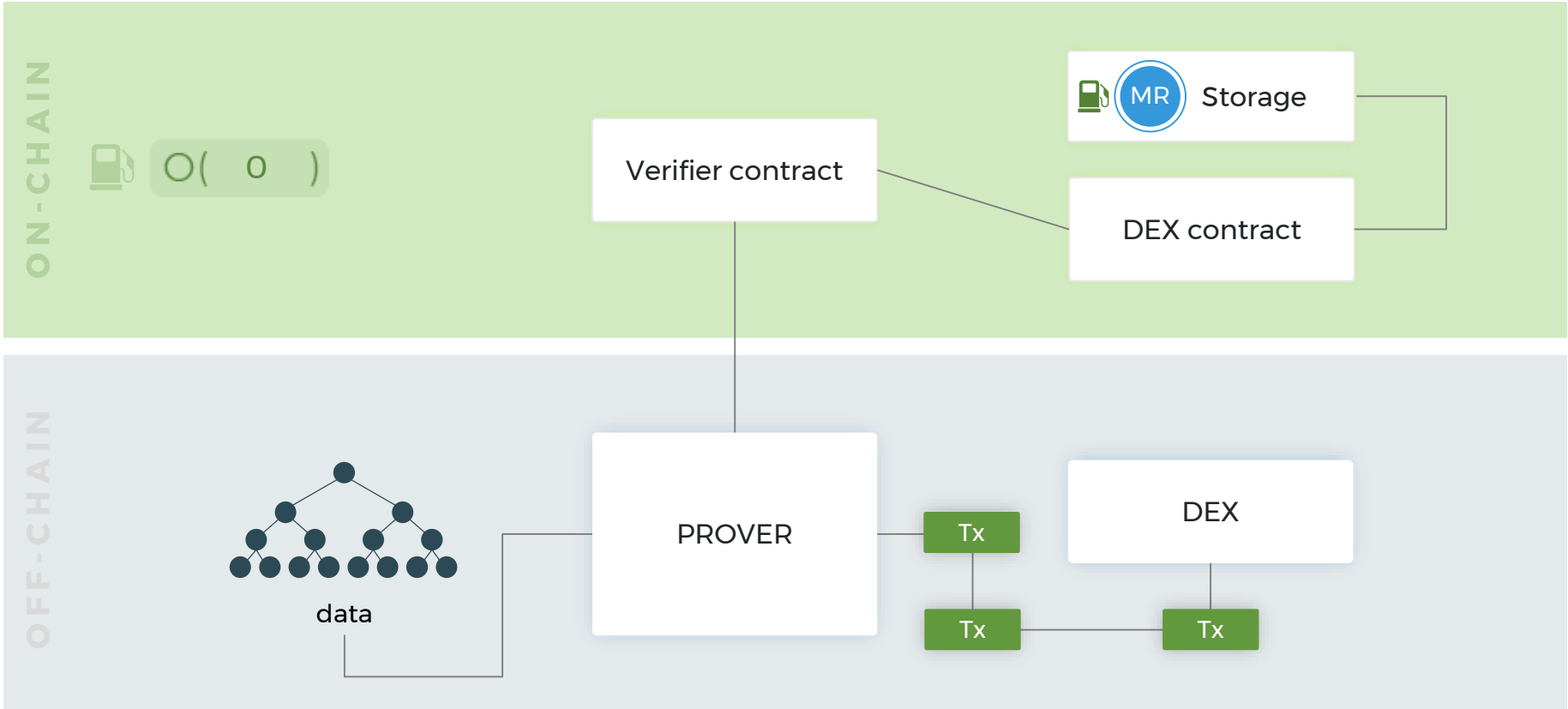
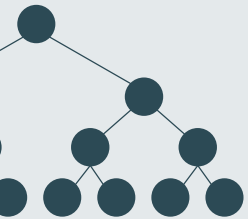


Verifier contract

DEX contract



data

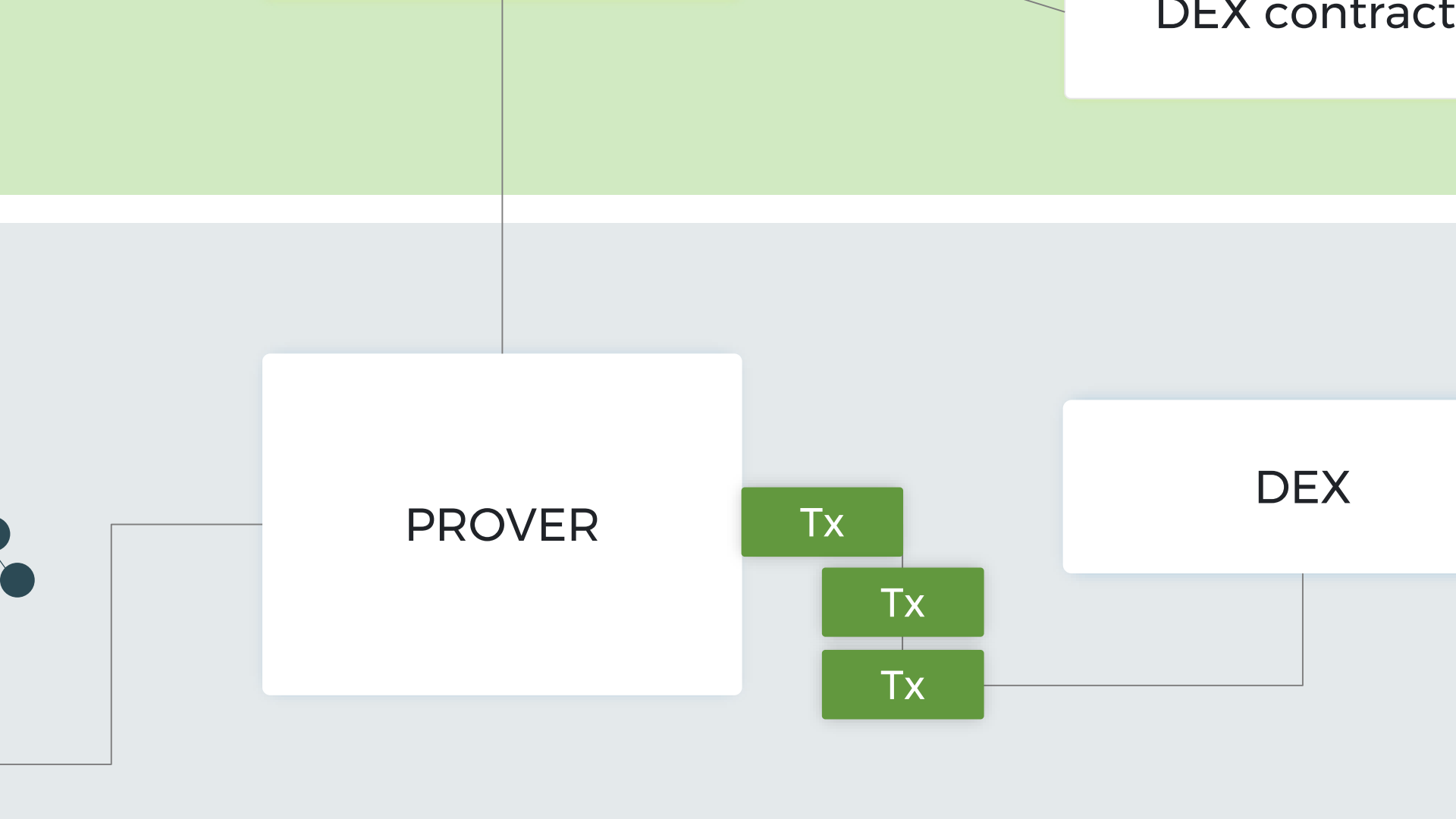
PROVER

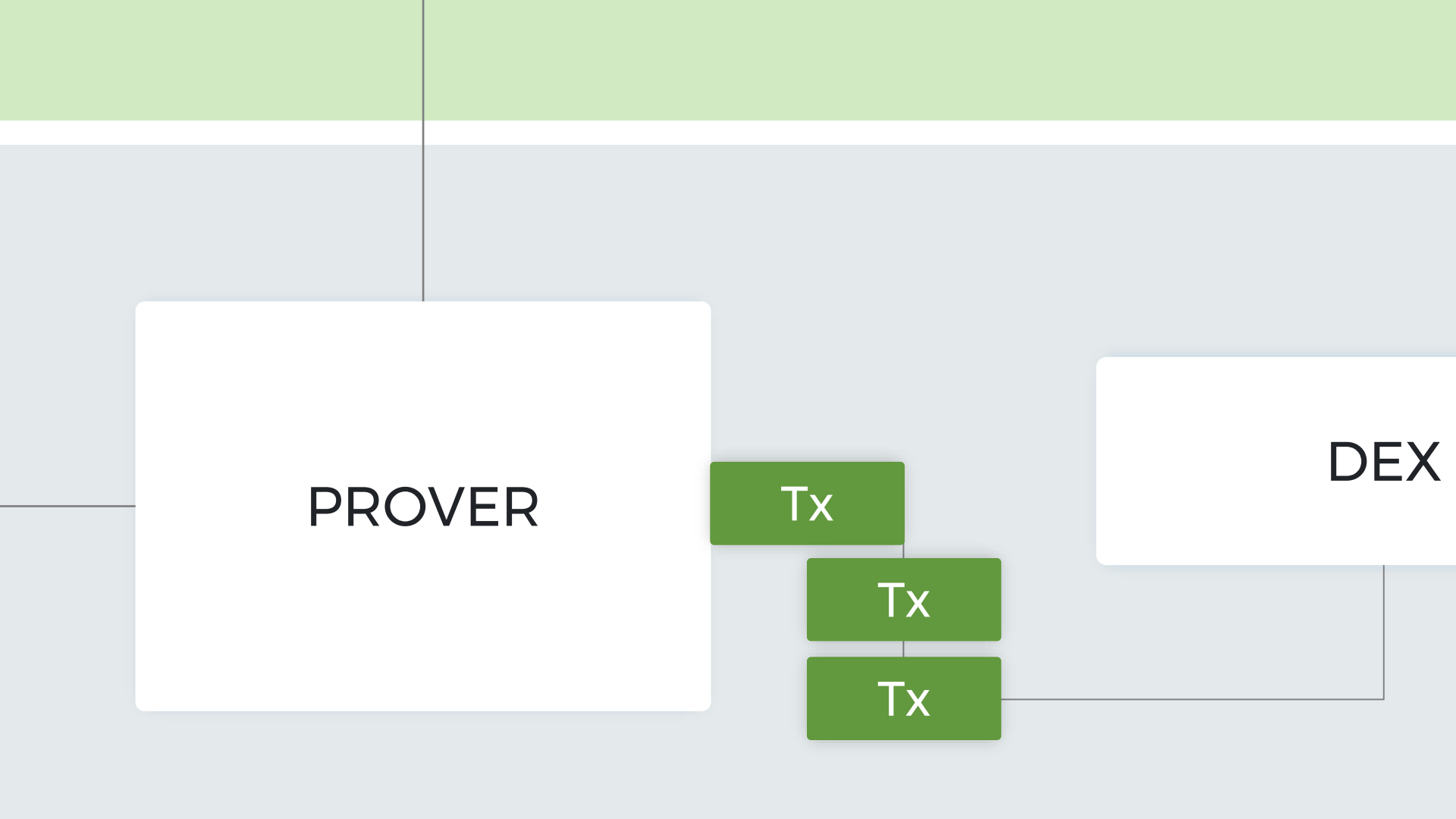
Tx

Tx

Tx

DEX


DEX contract
PROVER
Tx
Tx
Tx
DEX


PROVER
Tx
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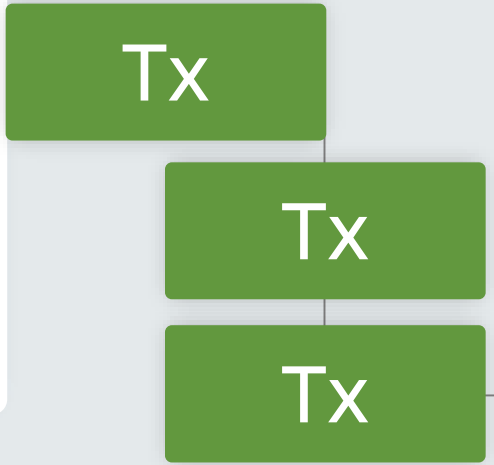
DEX

PROVER



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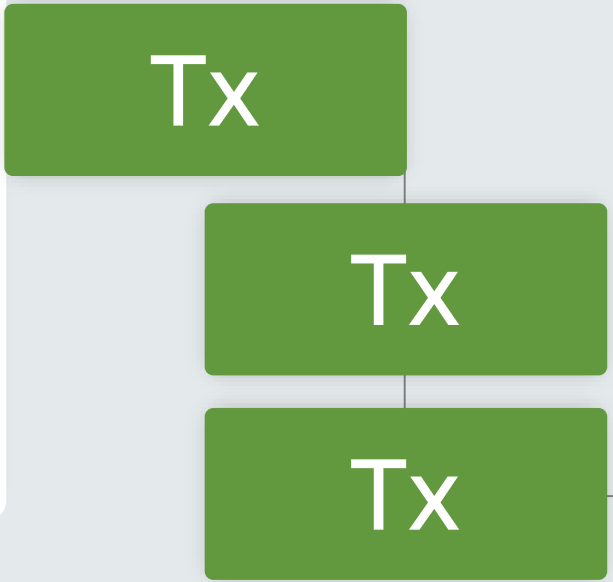

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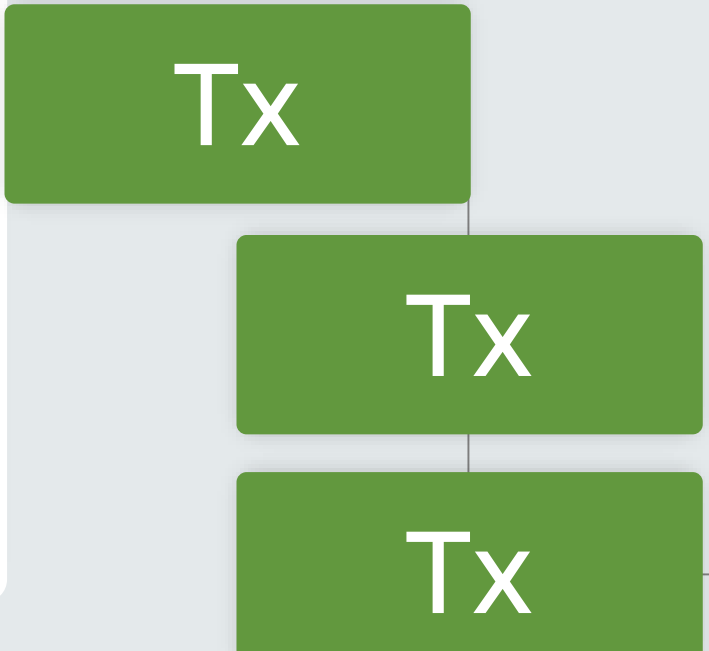

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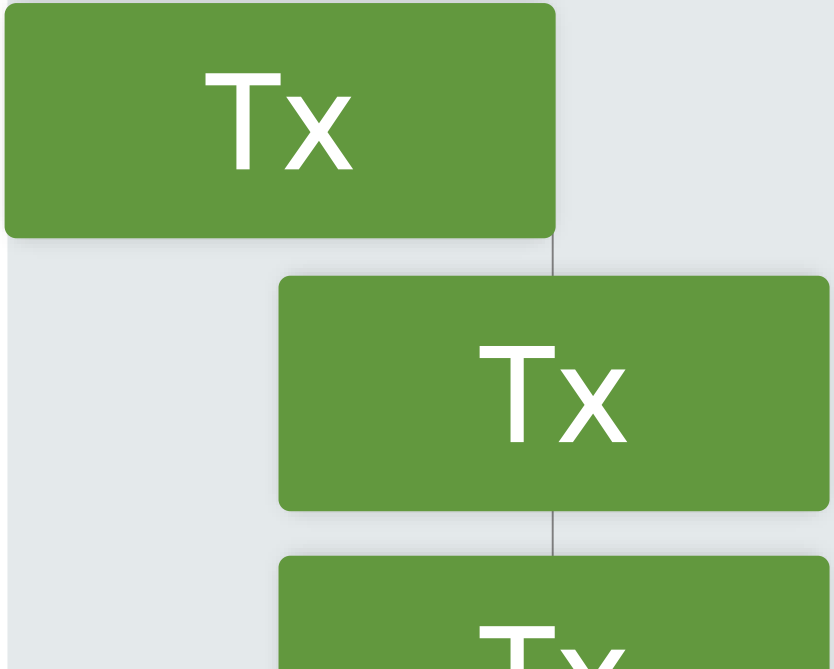
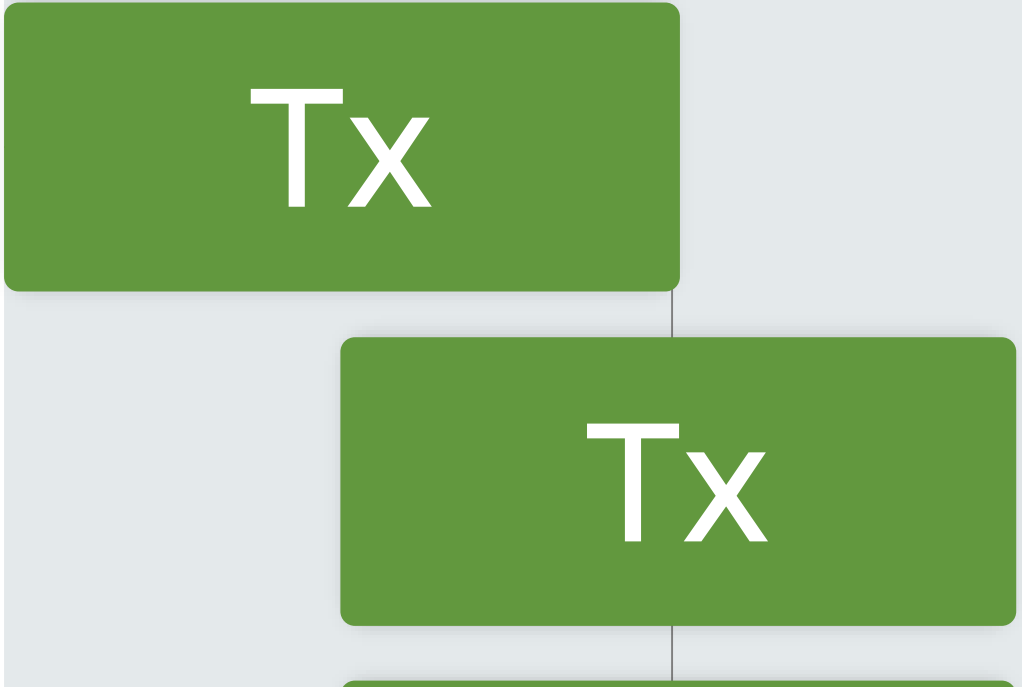
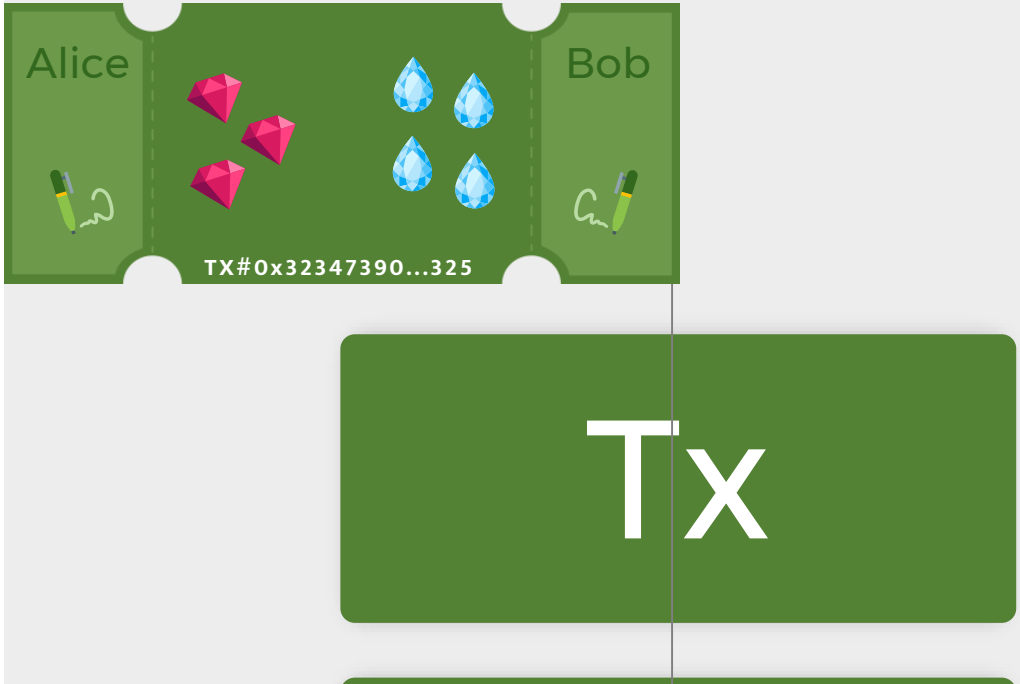



Tx
Tx


Alice
Bob
TX#0x32347390...325
Tx

OVER

Tx

Tx

PROVER

Tx

Tx

Verifier Contract

PROVER

Tx

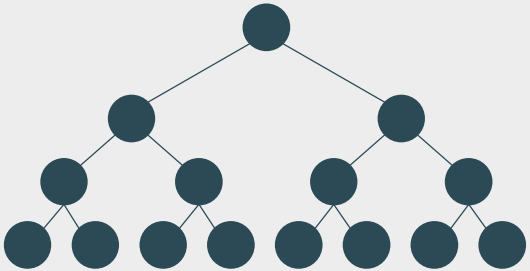
Tx

DEX

ON-CHAIN

Verifier Contract

OFF-CHAIN



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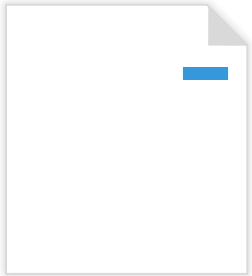

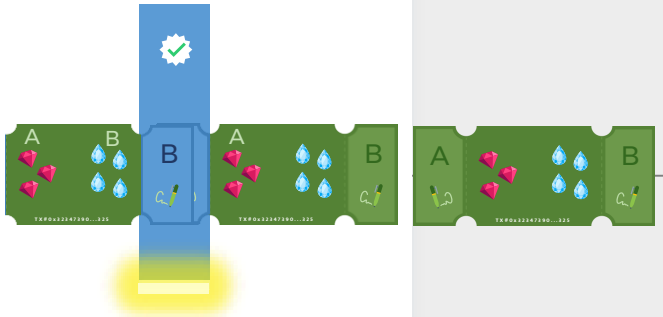

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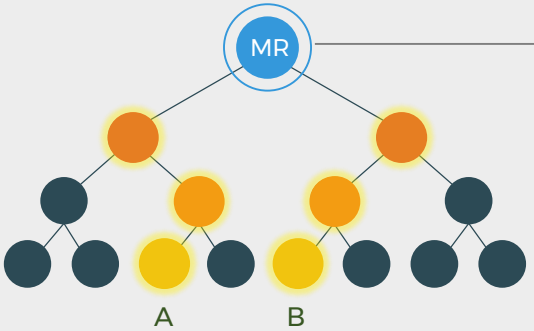
ON-CHAIN

Verifier Contract

OFF-CHAIN



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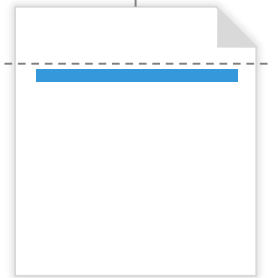

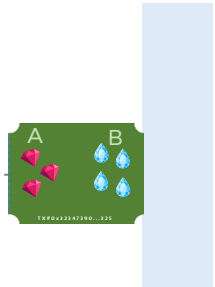

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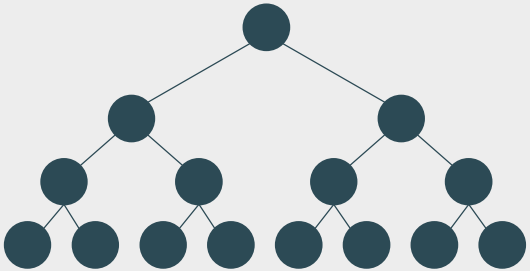
Verifier Contract

OFF-CHAIN



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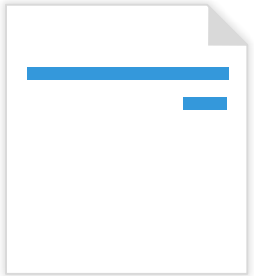

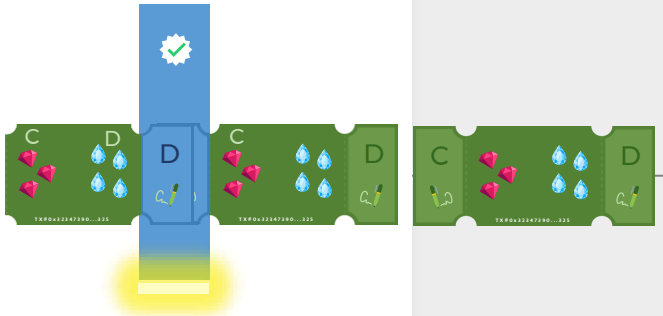

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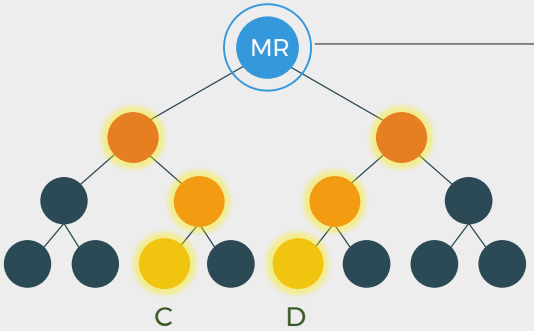
Verifier Contract

OFF-CHAIN



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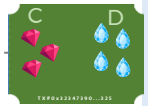

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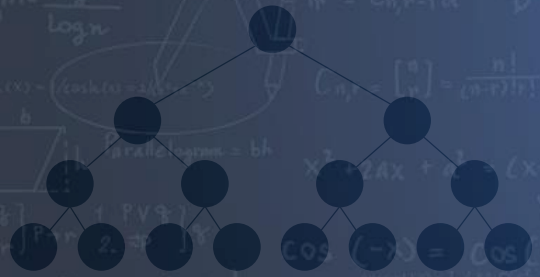

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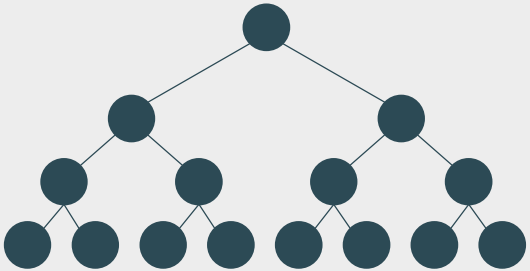
ON-CHAIN

Verifier Contract

OFF-CHAIN



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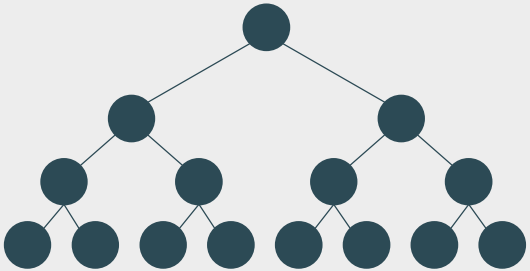
Verifier Contract

OFF-CHAIN



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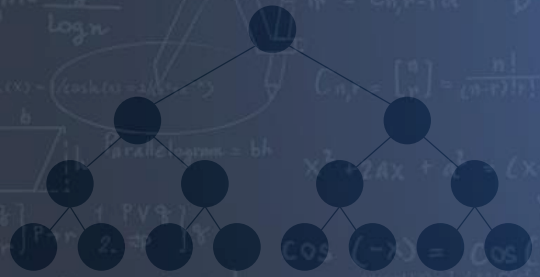

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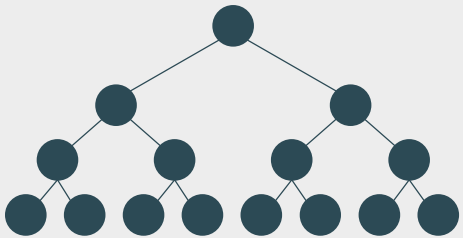

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PROVER

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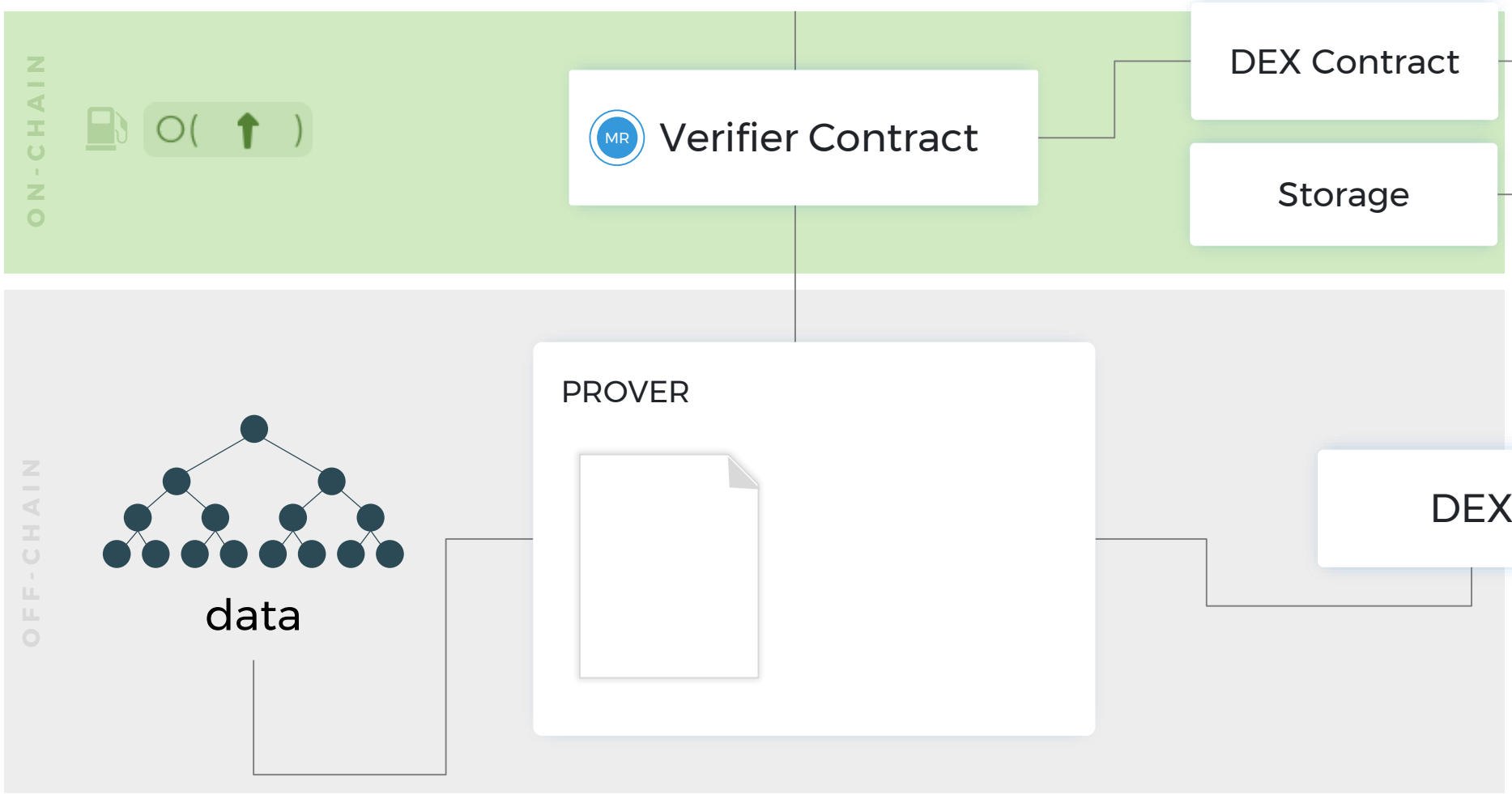
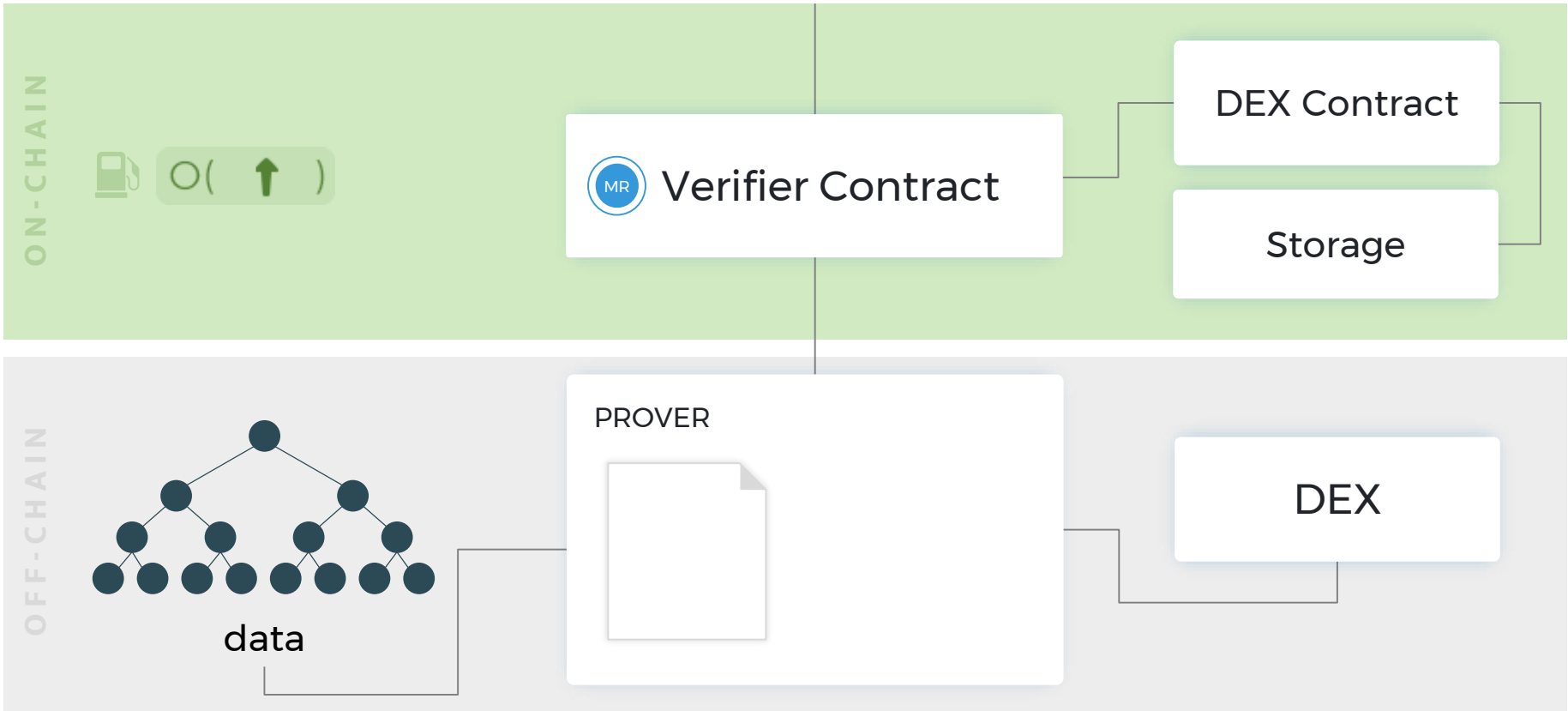
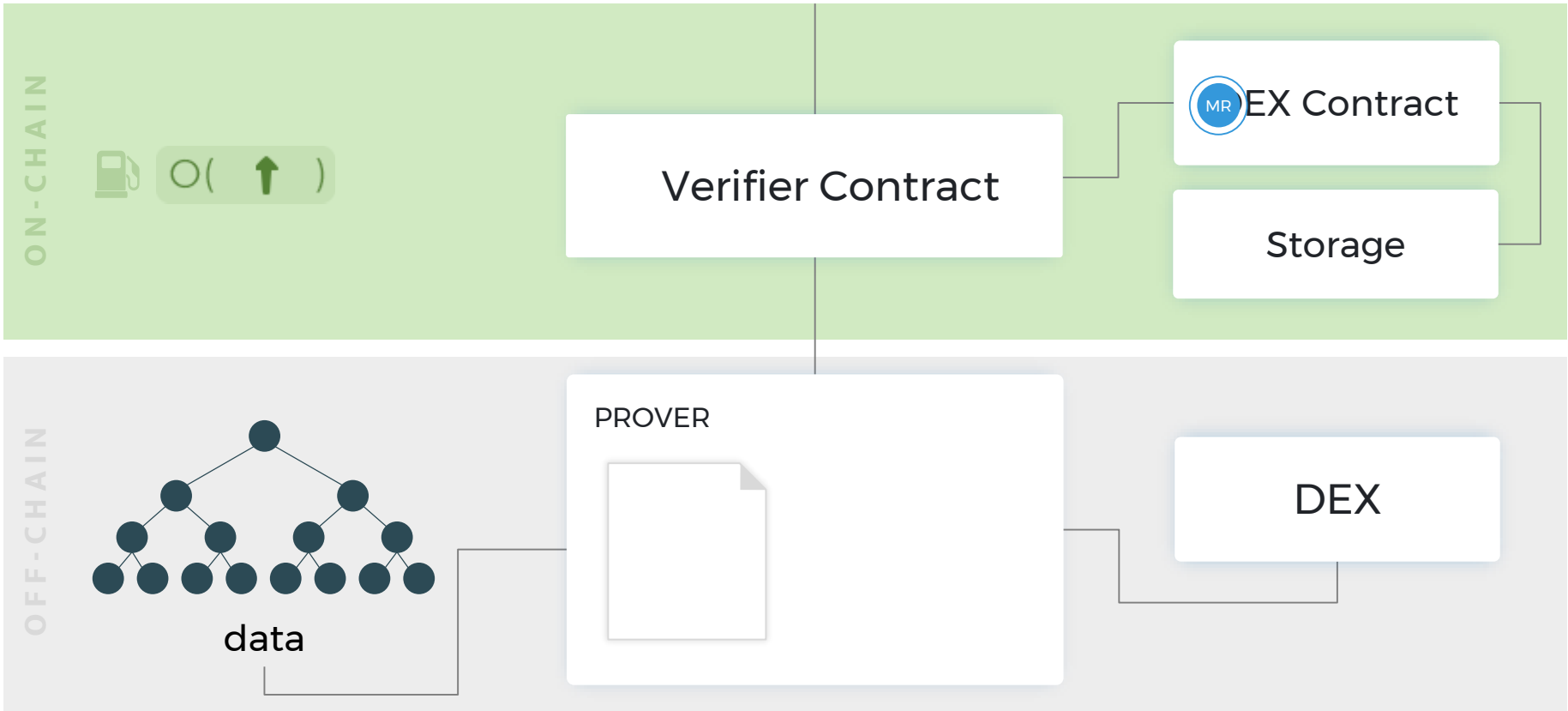
Stateful DEX - TX Anatomy



Starked Dex - Tx Anatomy



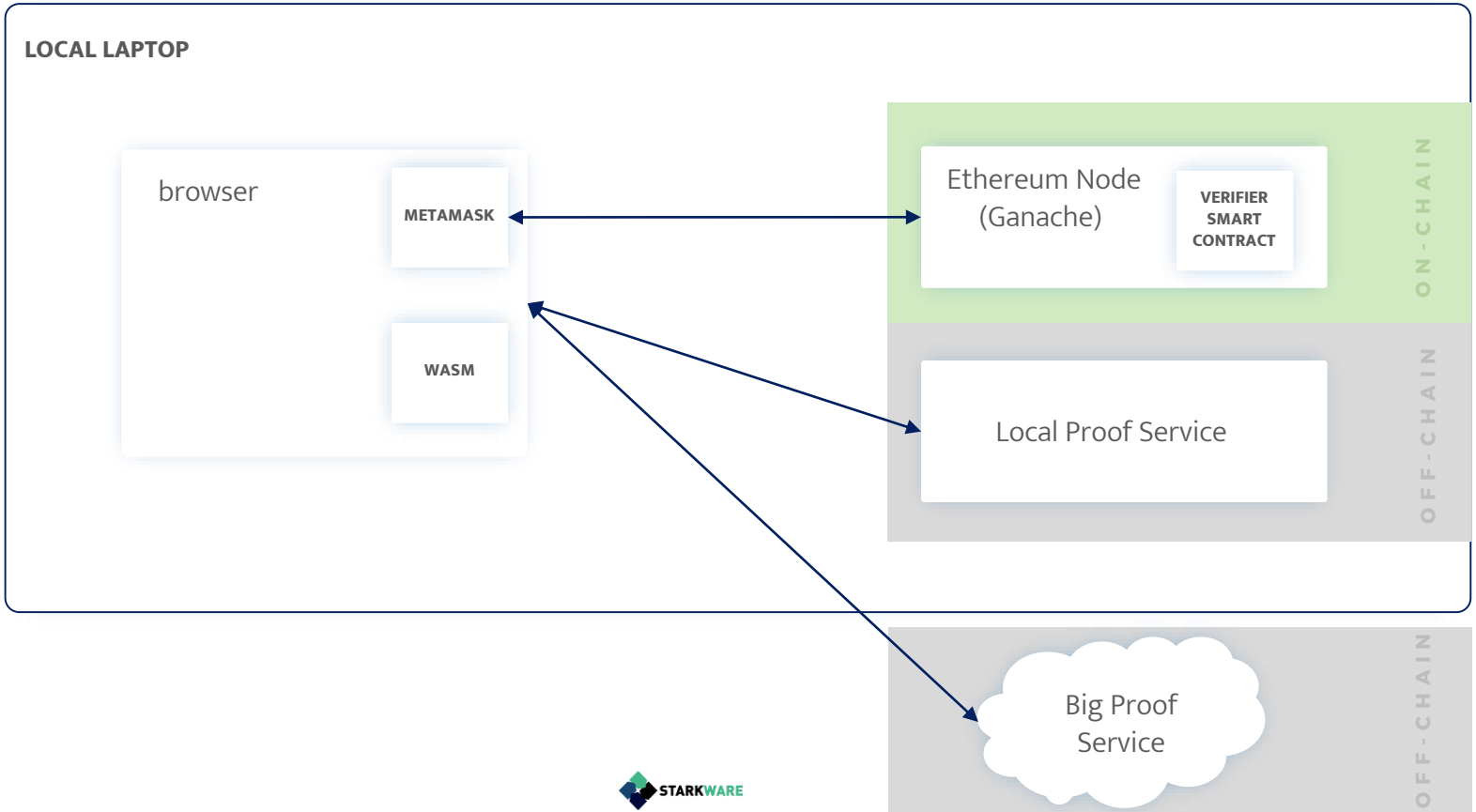
Starked Dex - Tx Anatomy



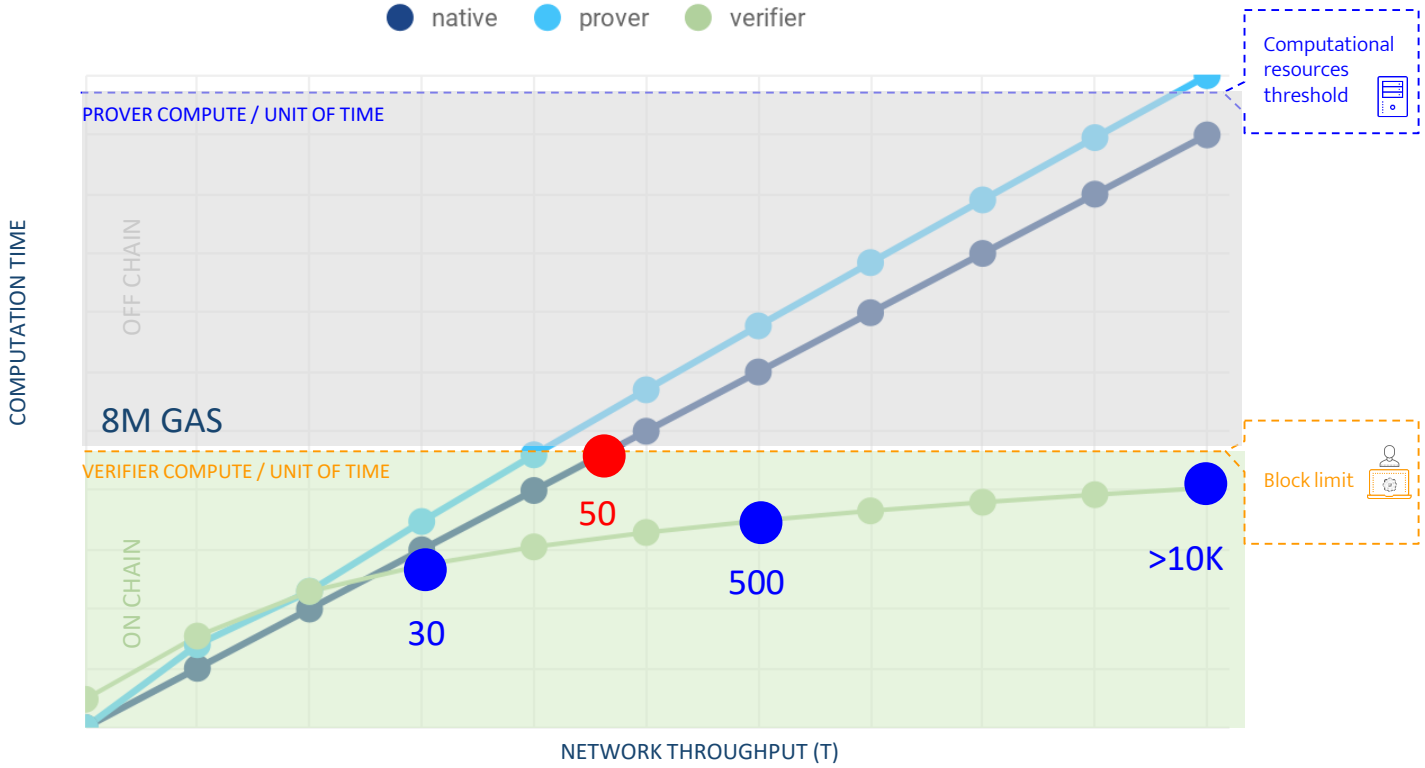
STARKWARE

ONE MORE THING...

DEMO


LOCAL LAPTOP
browser
METAMASK
WASM
Ethereum Node
(Ganache)
VERIFIER
SMART
CONTRACT
ON-CHAIN
Local Proof Service
OFF-CHAIN
Big Proof
Service
OFF-CHAIN

STARK Scalability



Current DEX

max out @ **50 DEX Txs / Block**
(100K-200K gas / DEX tx)

StarkDEX

30 DEX Txs @ **5.5M** gas
(180K gas / StarkDEX tx)

500 DEX Txs @ **6.7M** gas
(13.5K gas / StarkDEX tx)

verification **on-chain** can be done for **over 10K txs/block**
(800 gas / StarkDEX tx)

Blockchain-Bound → **AWS-Bound**

THANK YOU