Smart Contracts on the Move

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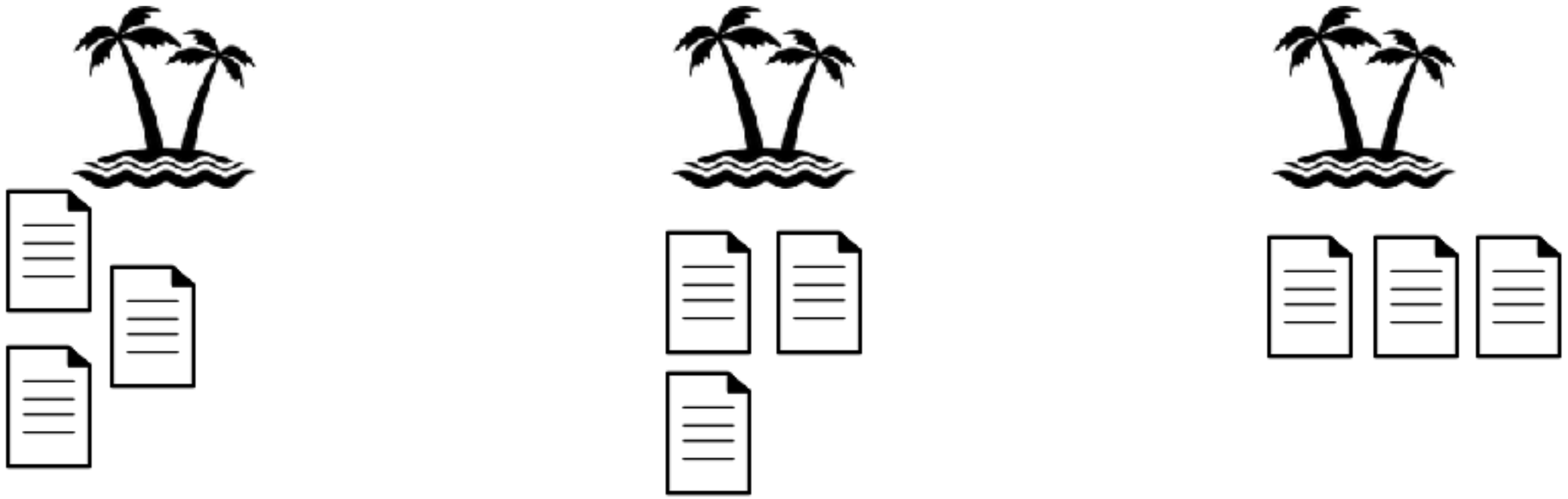
Smart Contracts

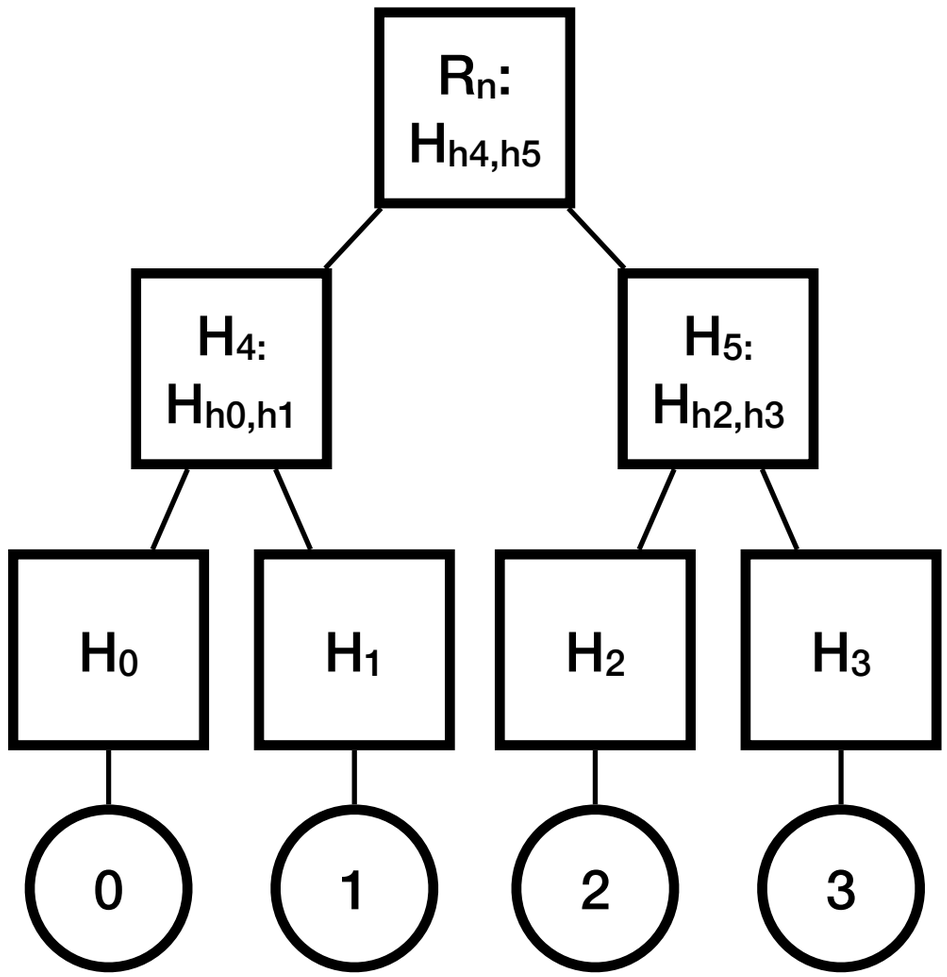
Blockchain isolation

On the Move

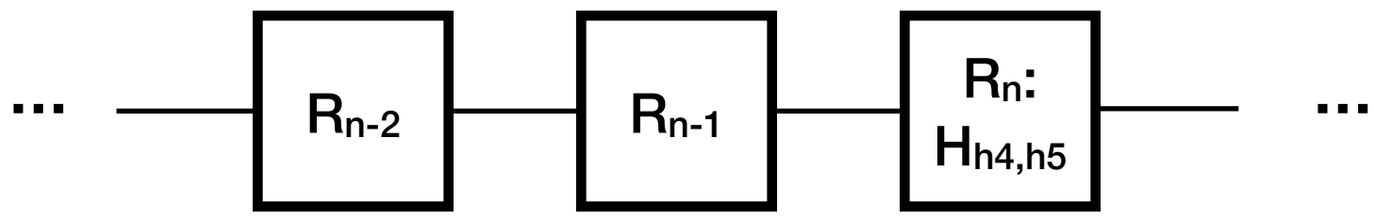
On the Move



Merkle-trees



Blockchain



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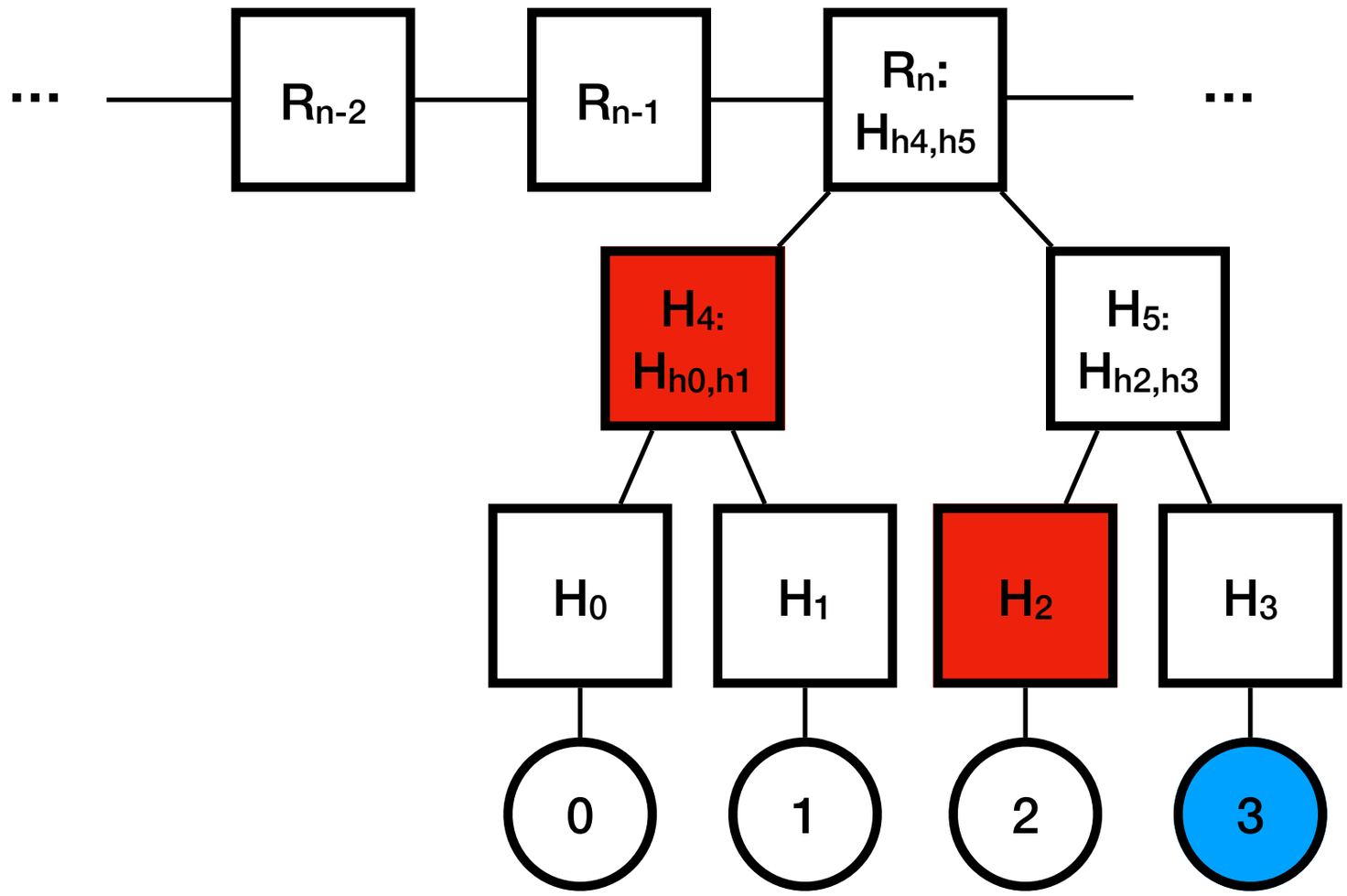

The Move protocol

- Core idea: Provide developers with a framework to move data between blockchains/shards.

- Introduce programmability in the moving operations

- Tradeoff is transparency. Developers should think about “scalable” smart contracts

The Move protocol

- User locks the smart contract in source blockchain
- User recreates contract in target blockchain (prove it!)
- When a contract is locked and recreated a portion of the contract’s code runs

How a contract is moved

```
contract A {
uint v;
function moveTo(b) public;
function moveFinish() public;
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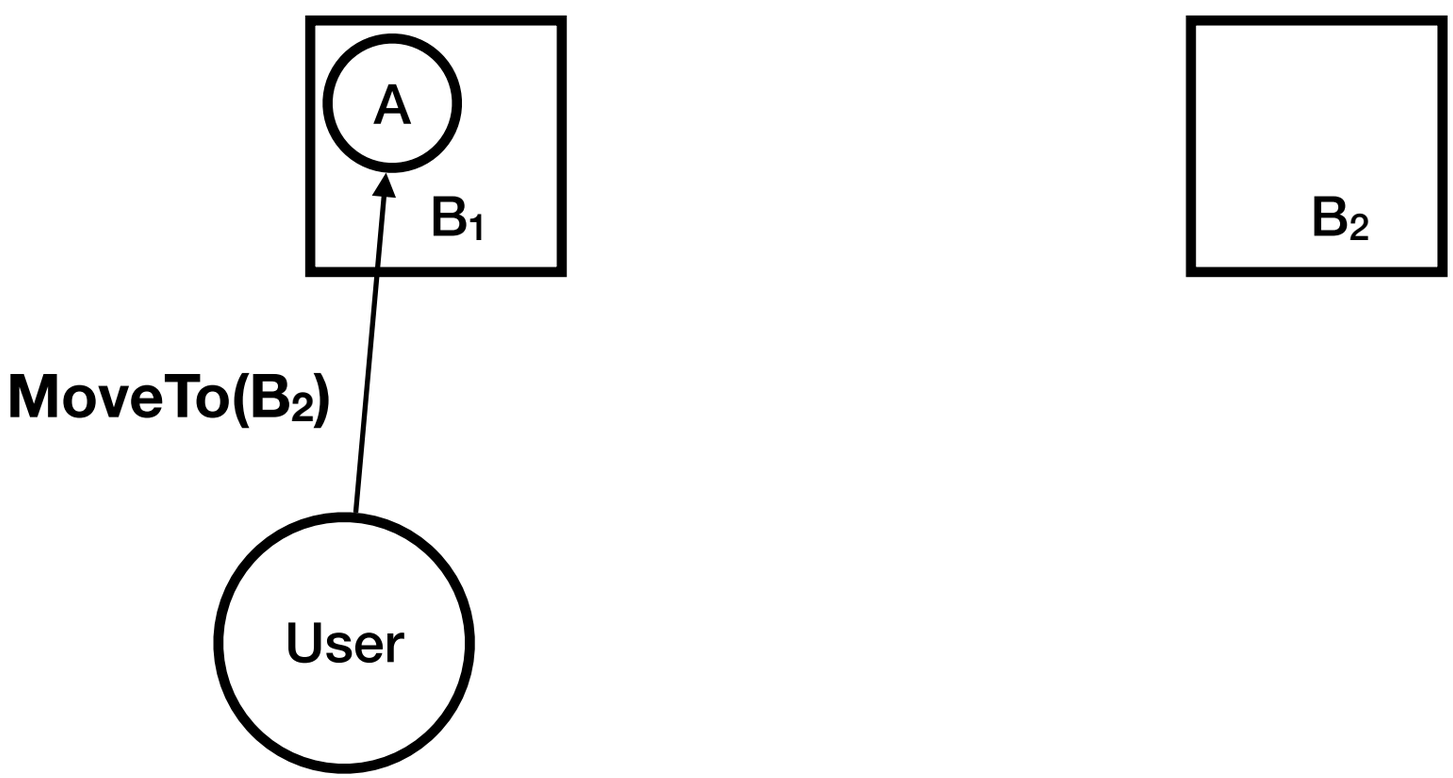

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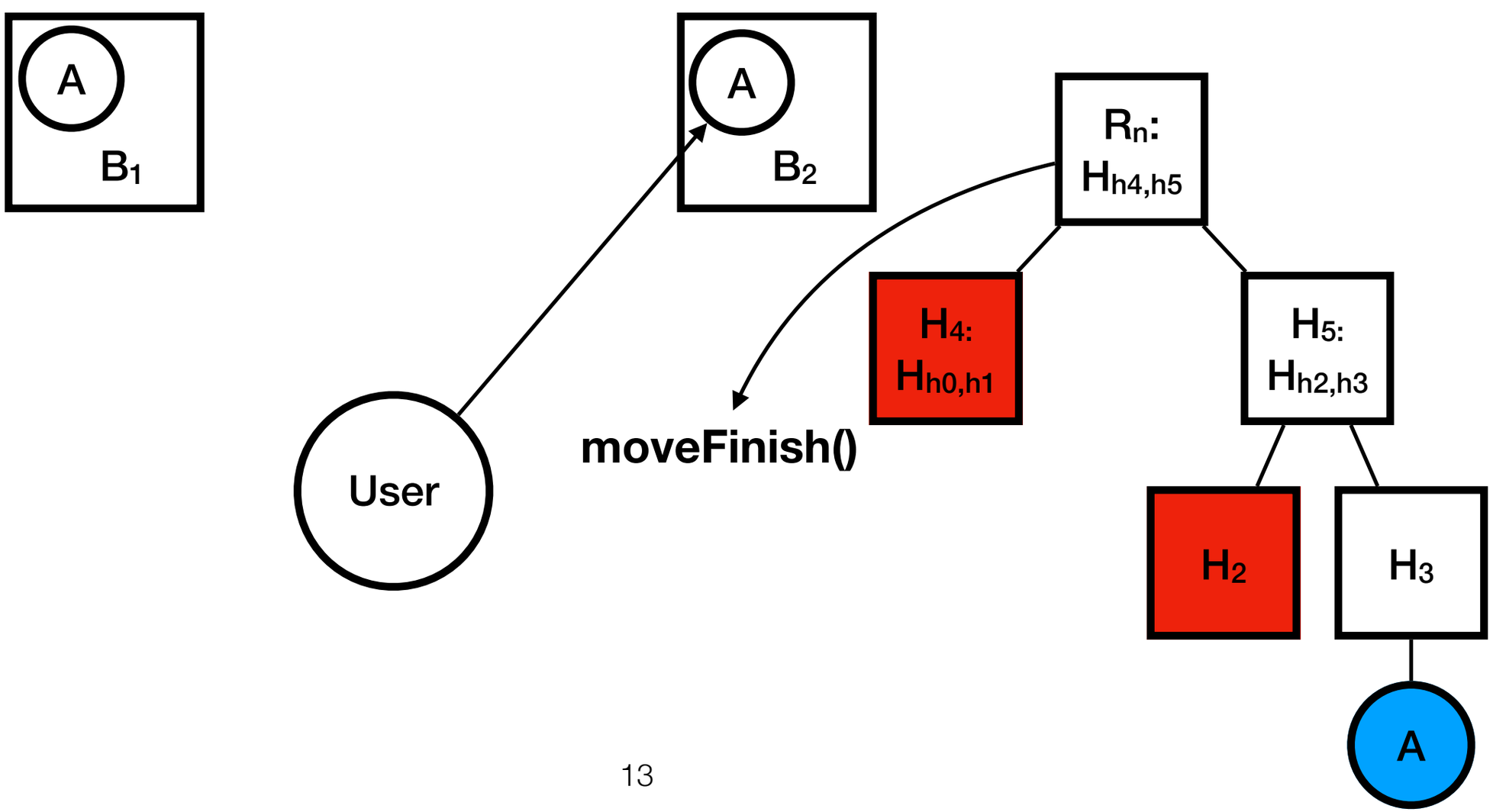


Expressivity

```
address owner;
uint movedAt;
  function moveTo(uint _blockchainId) public {
    require(owner == msg.sender);
    require(now - movedAt >= 3 days);
  }
  function moveFinish() public {
    movedAt = now;
  }
```

- One can program complex logic in between move operations
- In this case a contract is bound to a blockchain for at least 3 days after being moved again

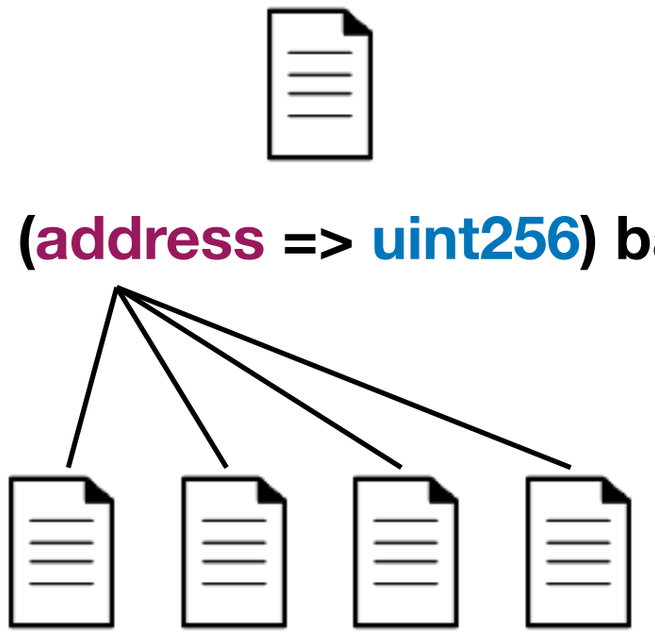
Usecase: ERC-20

- Widely used Ethereum interface
- Allow different implementations of tokens to interact

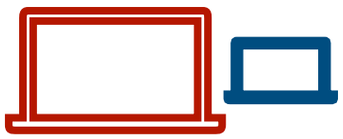
ERC-20 token

```
mapping (address => uint256) balances;
```

ERC-20 token



Burrow - Ethereum bridge



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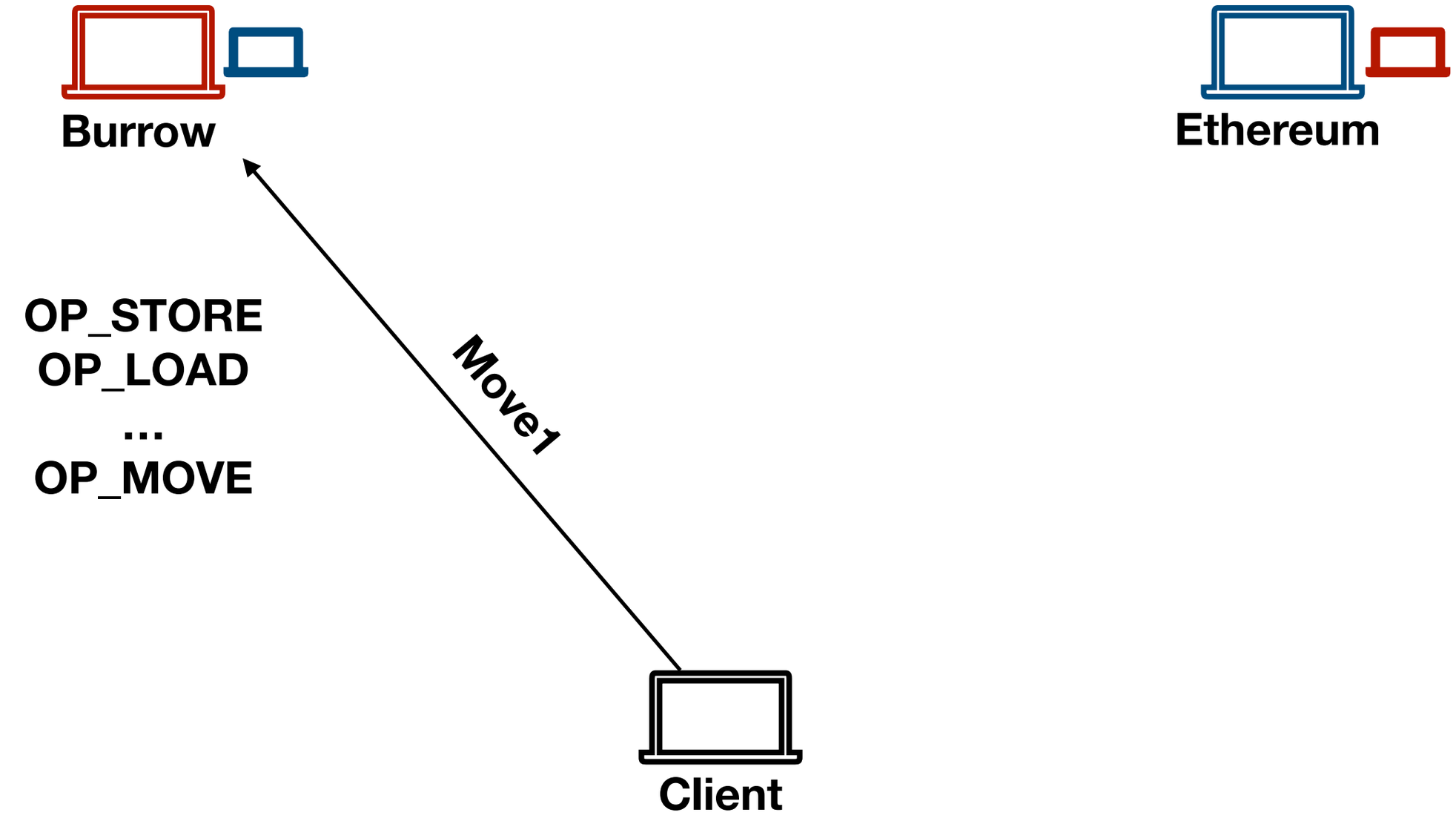

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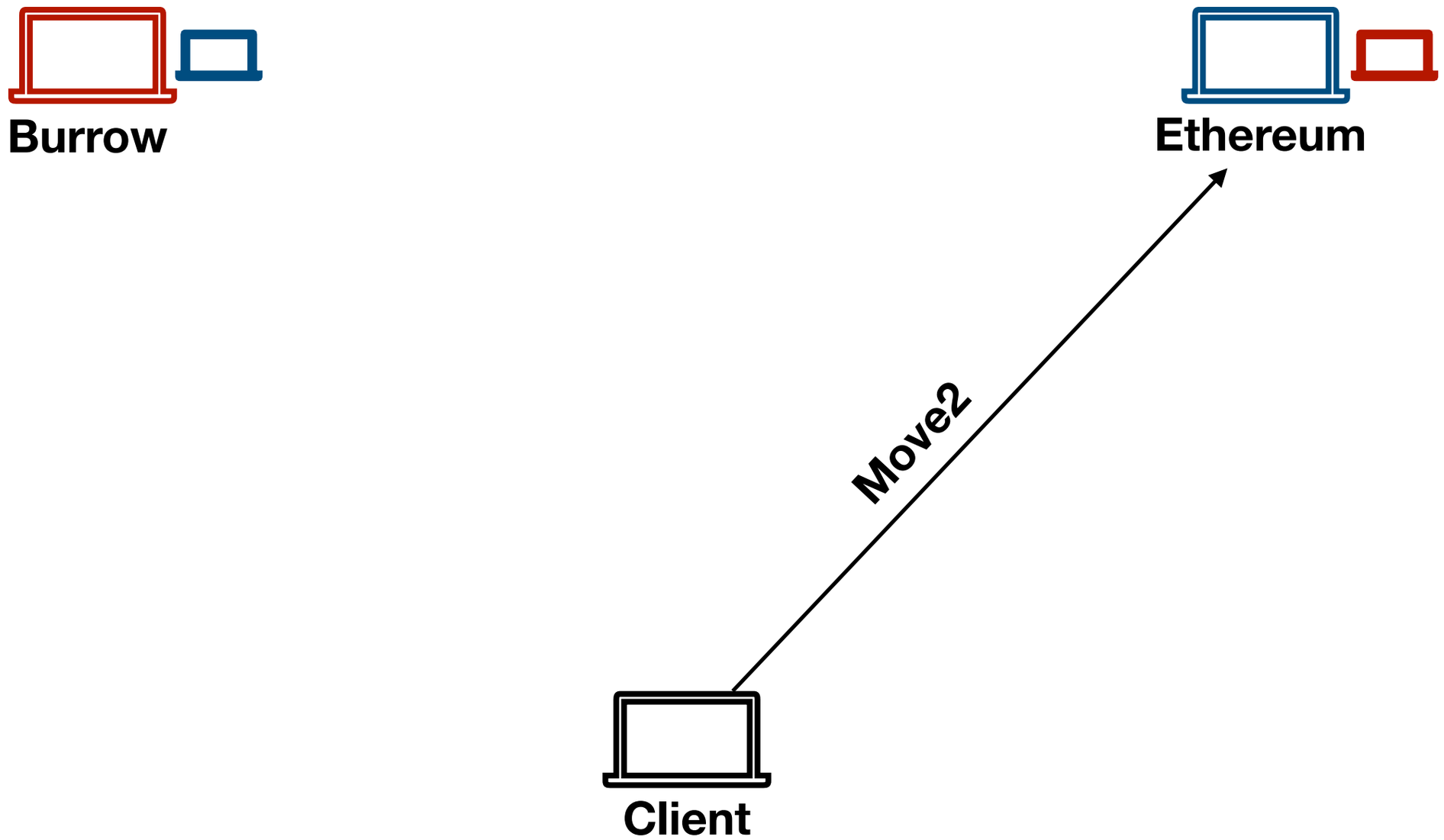

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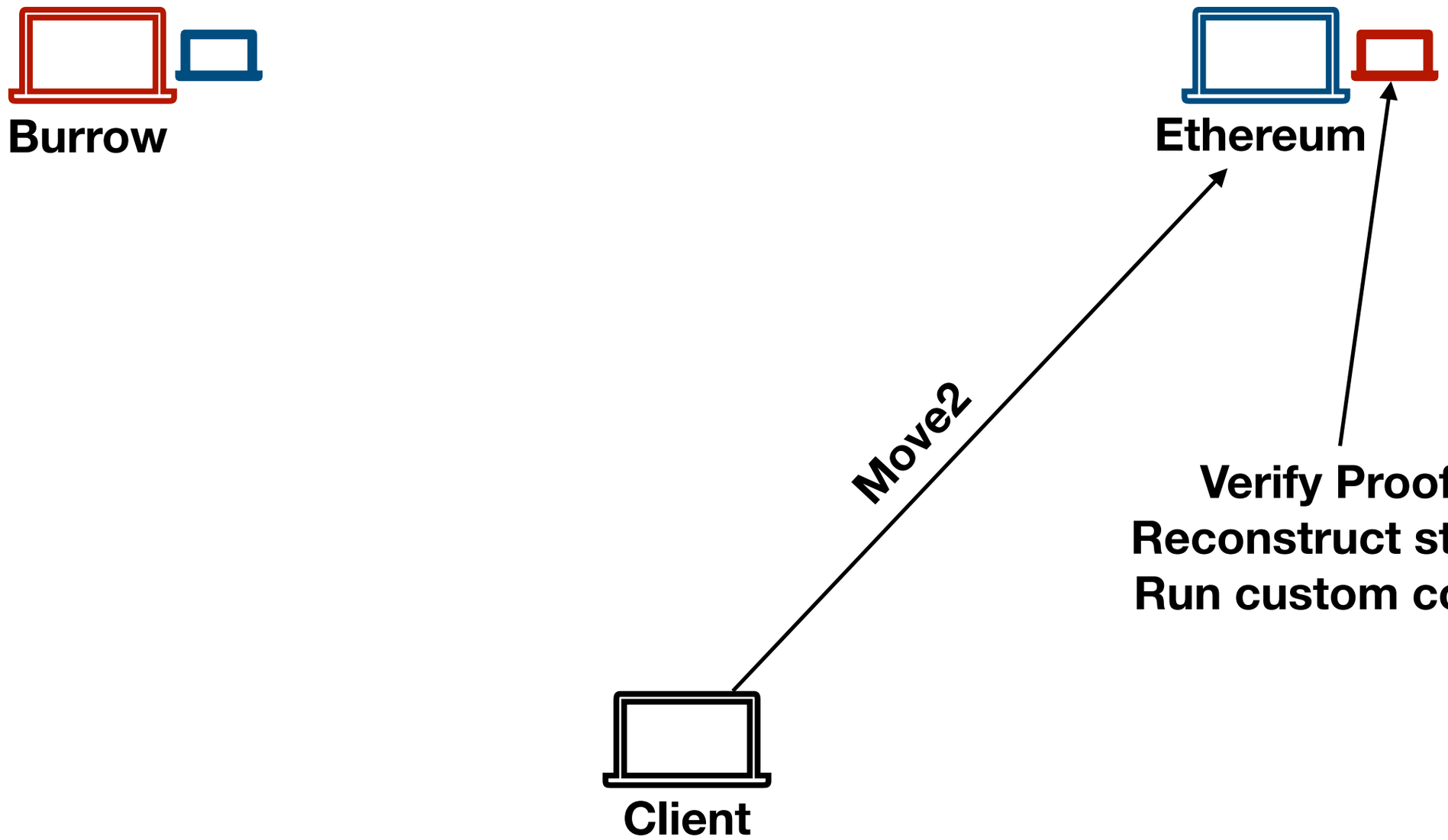

Usecase: CryptoKitties

- Ethereum game that congested the network at its peak
- Breeding cats and selling them for fun and profit

CryptoKitties state

- All cats are in the same contract

Kitties[ ]
mapping (uint256 => address) kittyIndexToOwner
mapping (uint256 => address) sireAllowedToAddress
...

CryptoKitties state

- All cats are in the same contract

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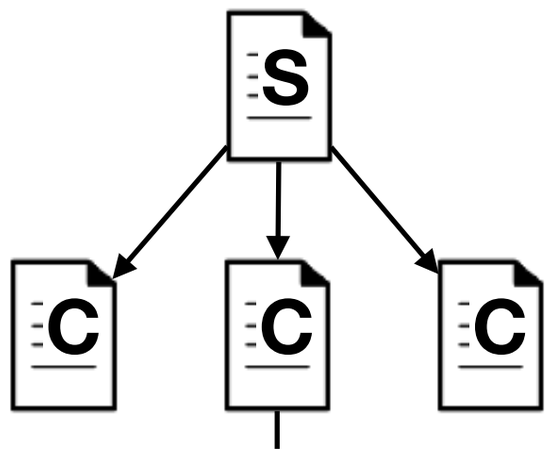
- Cats can move

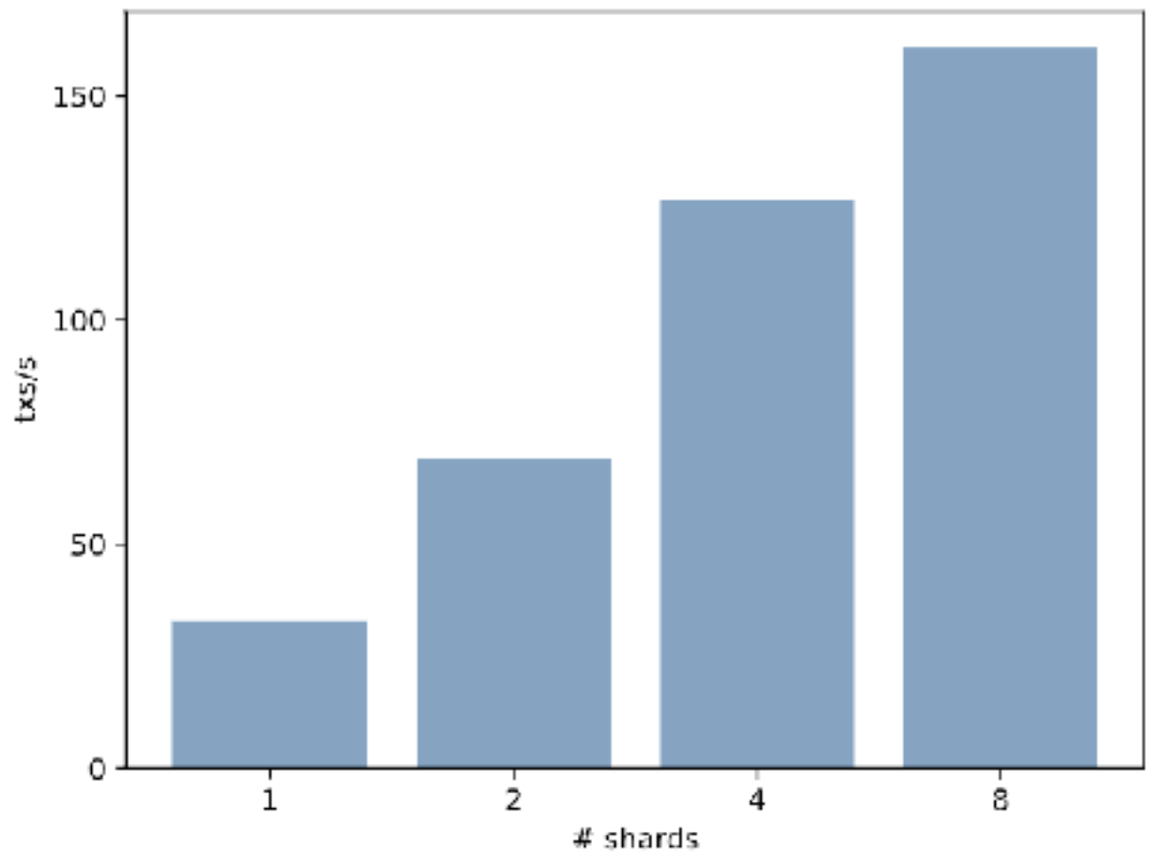


address owner
address sireAllowedToAddress
...

Experiment

- Scan transactions in the CryptoKitties smart contract
- Translate transactions
- Measure performance

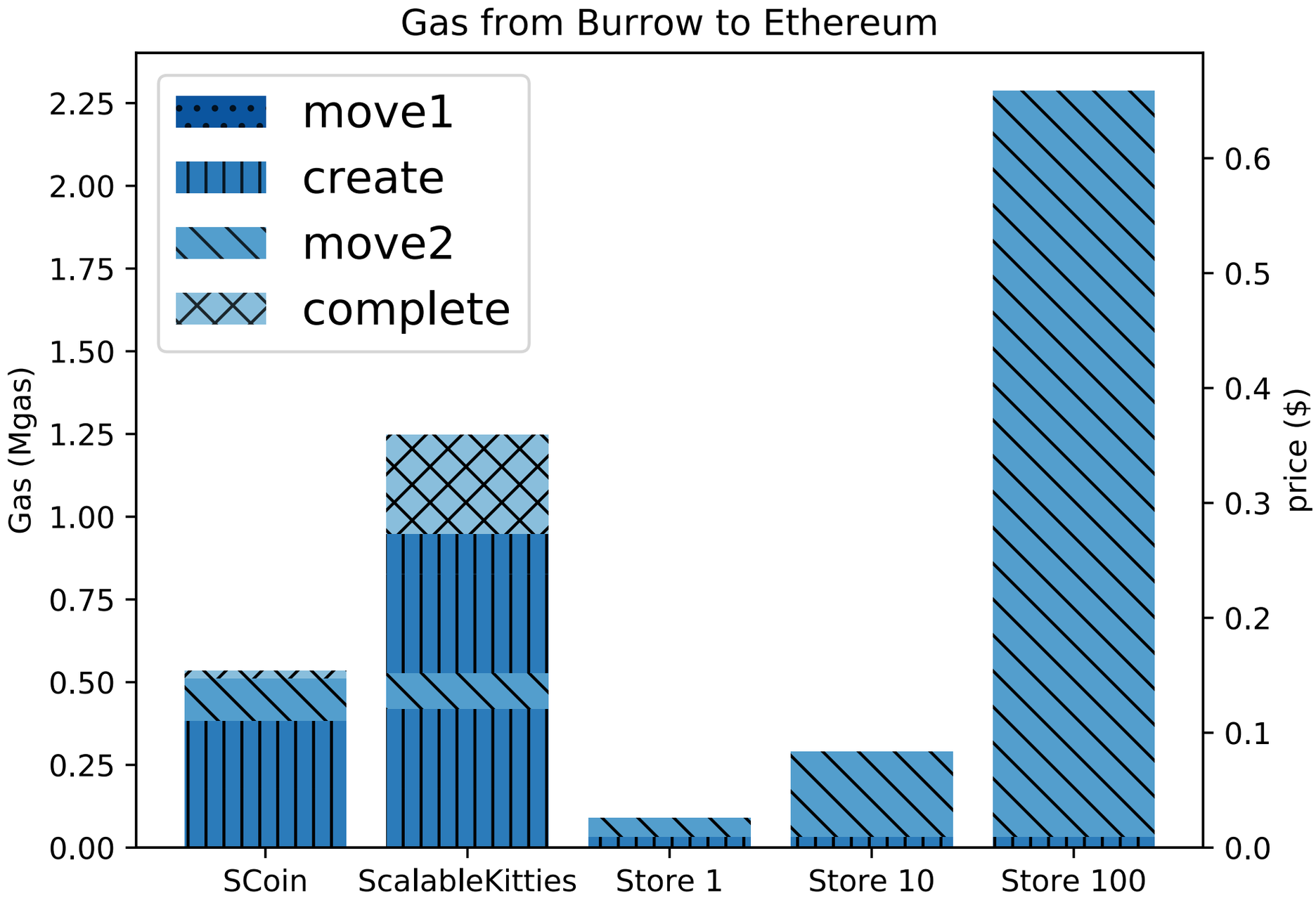
Increase in performance



EVM execution

- Gas is modelled to represent the smart contract's cost
- Users specify the amount and price of gas
- Free market between miners and users

Gas consumption



Smart Contracts on the Move

- A paradigm and protocol to execute user-centric cross-shard or IBC transactions
- Tests on two applications:
  - ERC20
  - Crypto Kitties
- How smart contracts have to be designed to inter-operate