Please

Ask questions through the app

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Thank you!





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This is the first time in a history of a mankind when …

…we are able to permanently record the history of a mankind.

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Yes, blockchain is a bubble.

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And it’s going to burst.

But that’s amazing! Because only genuine blockchain projects will survive.

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Ethereum could be one of them.

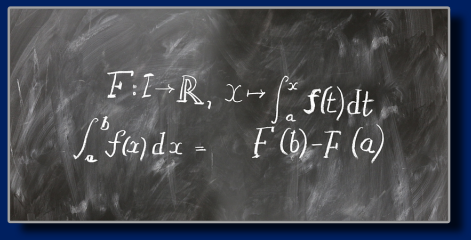
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About the author

- Jana Petkanic

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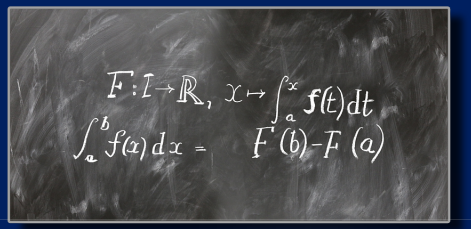
About the author



- Jana Petkanic
- MSc in Applied Mathematics

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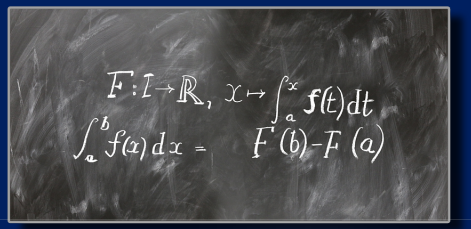


- Jana Petkanic

- MSc in Applied Mathematics
- IT Services Manager at Accenture; Forecast Analyst Henkel

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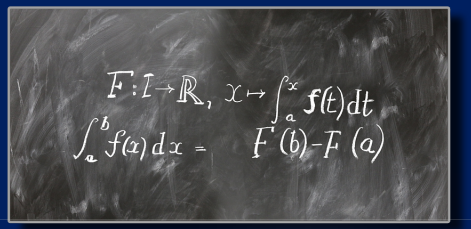
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- MSc in Applied Mathematics
- IT Services Manager at Accenture; Forecast Analyst Henkel
- Ran an NGO to fight the food waste

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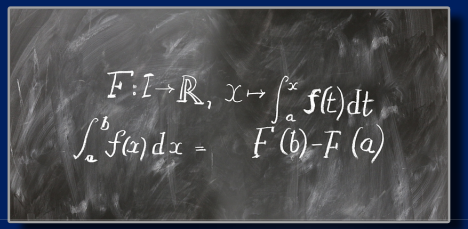
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- Ran an NGO to fight the food waste
- Blockchain consultant

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About the author



- Jana Petkanic

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- IT Services Manager at Accenture; Forecast Analyst Henkel
- Ran an NGO to fight the food waste
- Blockchain consultant

- **Now**: blockchain consultancy + token economy models

+ Blockchain Talks

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Today!

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Today!

- You will understand what blockchain is
  - What are the main features of Ethereum
  - Beauty of Merkle trees

Today!

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- You will learn more about some interesting use-cases

Today!

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- You will learn how can we potentially improve an industry which creates 2/3 global GDP

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Today!

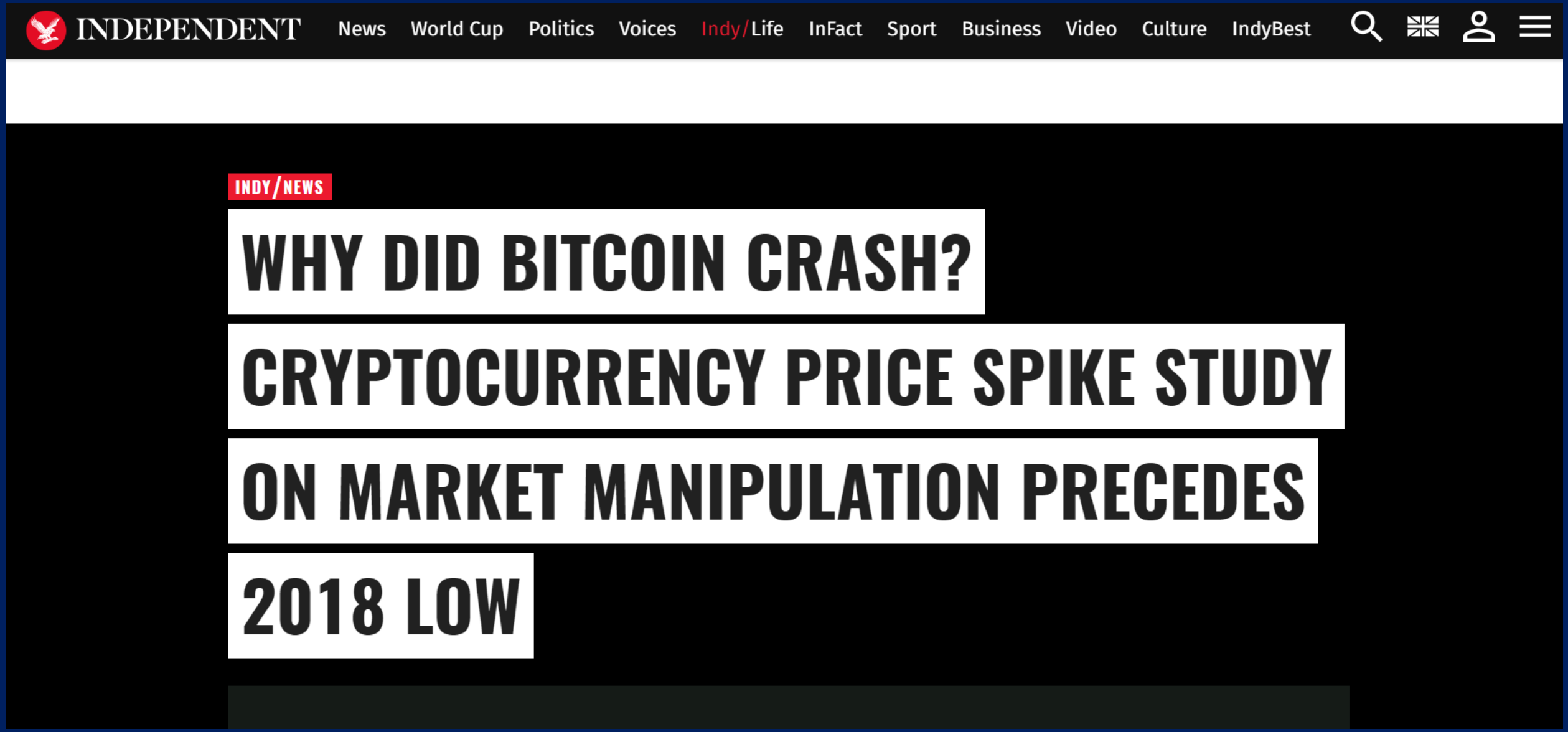
- You will understand what blockchain is
  - What are the main features of Ethereum
  - Beauty of Merkle trees
- You will learn more about some interesting use-cases
- You will learn how can we potentially improve an industry which creates 2/3 global GDP

- Perhaps you will find a new meaningful passion

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A roller-coaster

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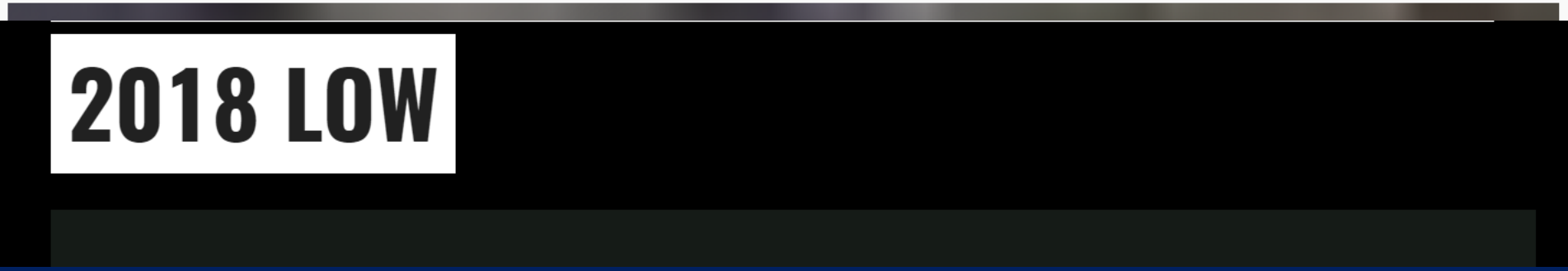
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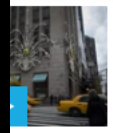
Bitcoin crashed after another crypto exchange got hacked



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BRIEFING

Toys 'R' Us Mascot, Orphaned by Bankruptcy, Finds Home



BRIEFING

These $500 Ray-Ban Aviators Are Plated in 24K Gold

THE LEDGER • BITCOIN

Bitcoin Hits a New Record High, But Stops Short of $20,000

2018 LOW

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Bitcoin Falls Below $7,000, Down More Than 60% From All-Time High



Charles Bovaird
Contributor
Feb 5, 2018, 03:39pm • 13,661 views • #MarketMoves



BRIEFING

These $500 Ray-Ban Aviators Are Plated in 24K Gold

Bitc

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e $500 Ray-Ban Aviators Are
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COINTELEGRAPH
The future of money

BTC	ETH	LTC
$6,419	$490	XRP
-2.07%	-2.93%	EOS

News Features Price Analysis Market Tools Cryptopedia Industry

By Jon Buck JAN 03, 2018

Total Crypto Market Cap Hits New All-Time High Over $700 Bln

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China bans initial coin offerings calling them 'illegal fundraising'

03, 2018

5 September 2017

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d in 24K Gold

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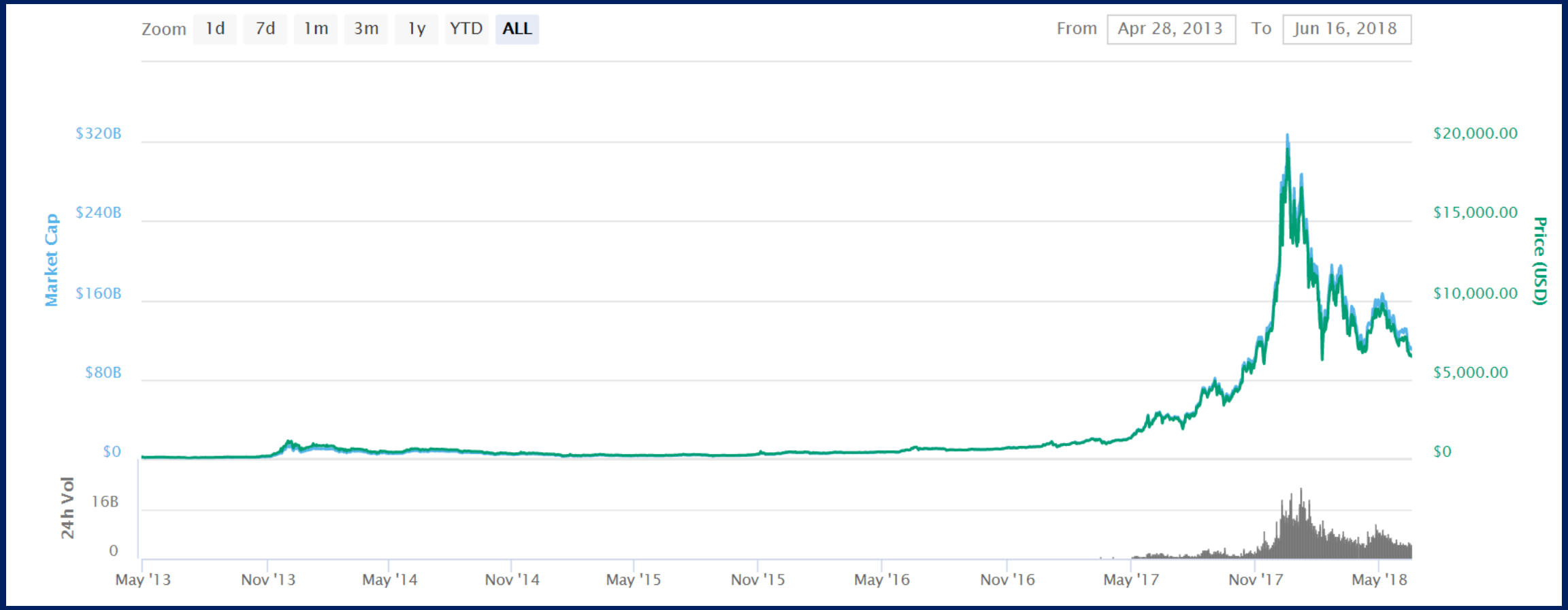
Chinese Initial Coin Offering Ban May End In 2018

By UseTheBitcoin in CRYPTOCURRENCY NEWS HOME January 26, 2018

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A demand for cryptocurrencies is increasing. Why?



What makes them so interesting, what is their utility?

Value transfer today

- 3 levels

Value transfer today

- 3 levels
    - Information flow

Value transfer today

- 3 levels
    - Information flow
    - Money (=value) flow

Value transfer today

- 3 levels
    - Information flow
    - Money (=value) flow
    - Product flow

Value transfer today

- 3 levels
  - Information flow
  - Money (=value) flow
  - Product flow



Supply chain

Value transfer today

- 3 levels
  - Information flow
  - Money (=value) flow
  - Product flow



Financial sector

Value transfer today

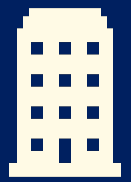


Bank A

Value transfer today

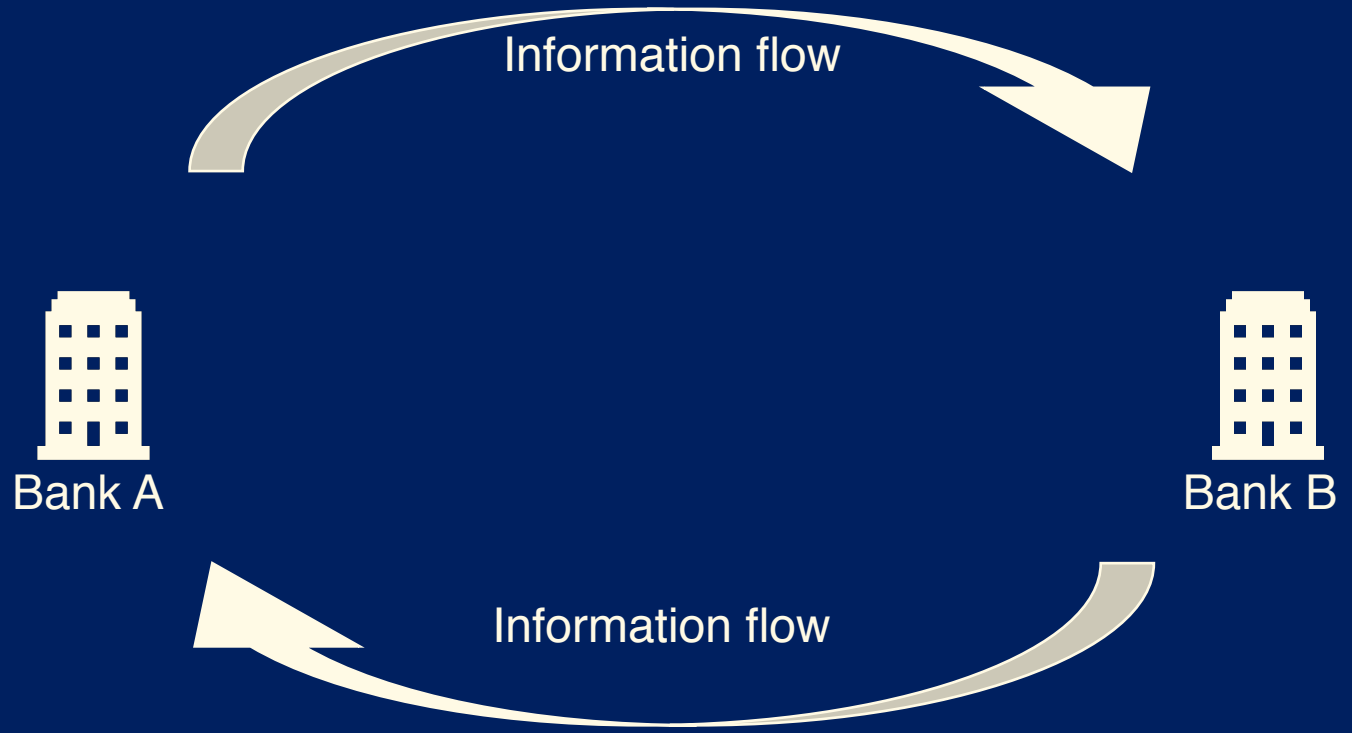


Bank A

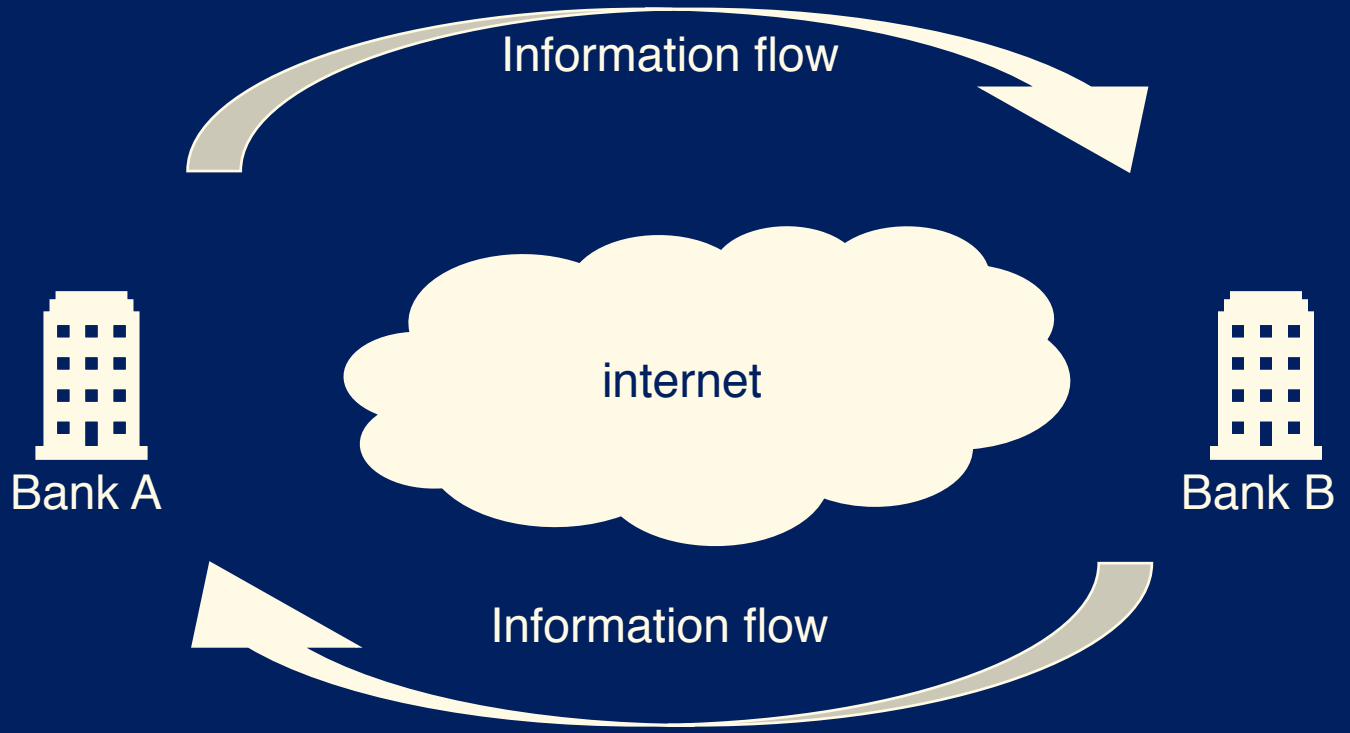


Bank B

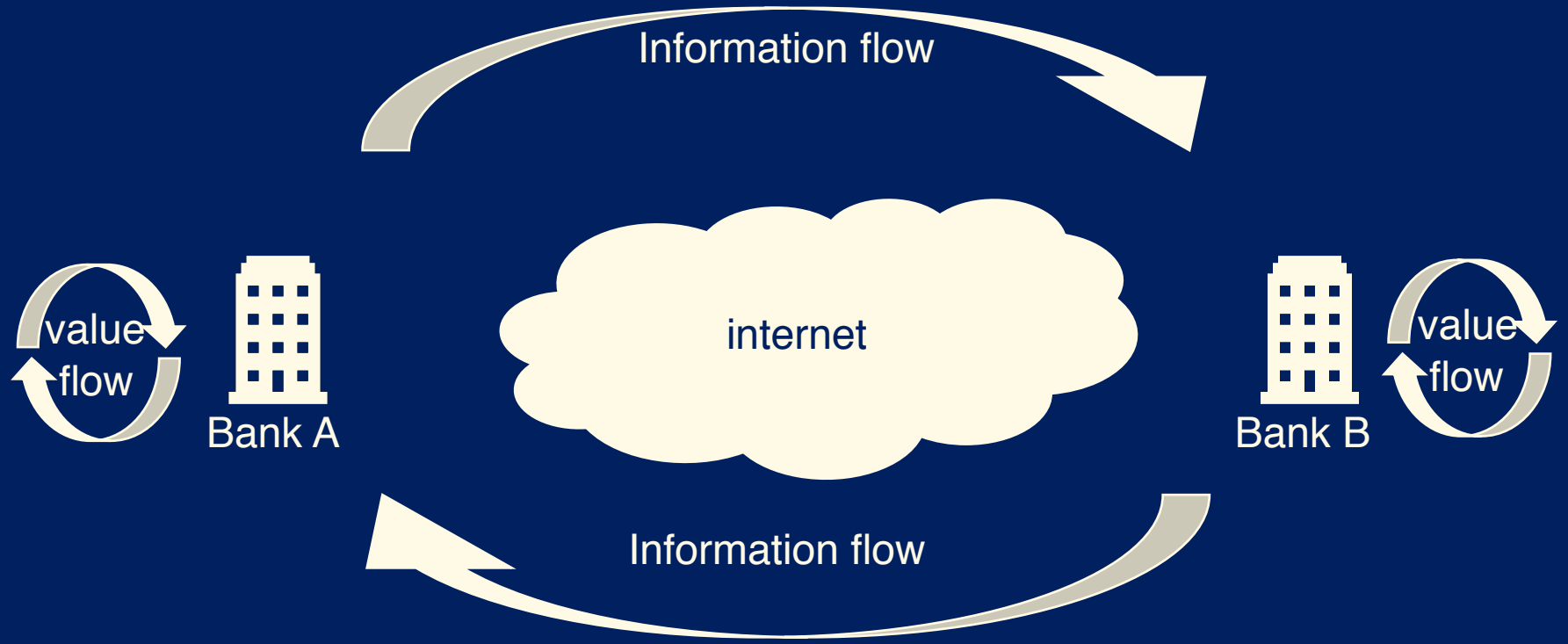
Value transfer today



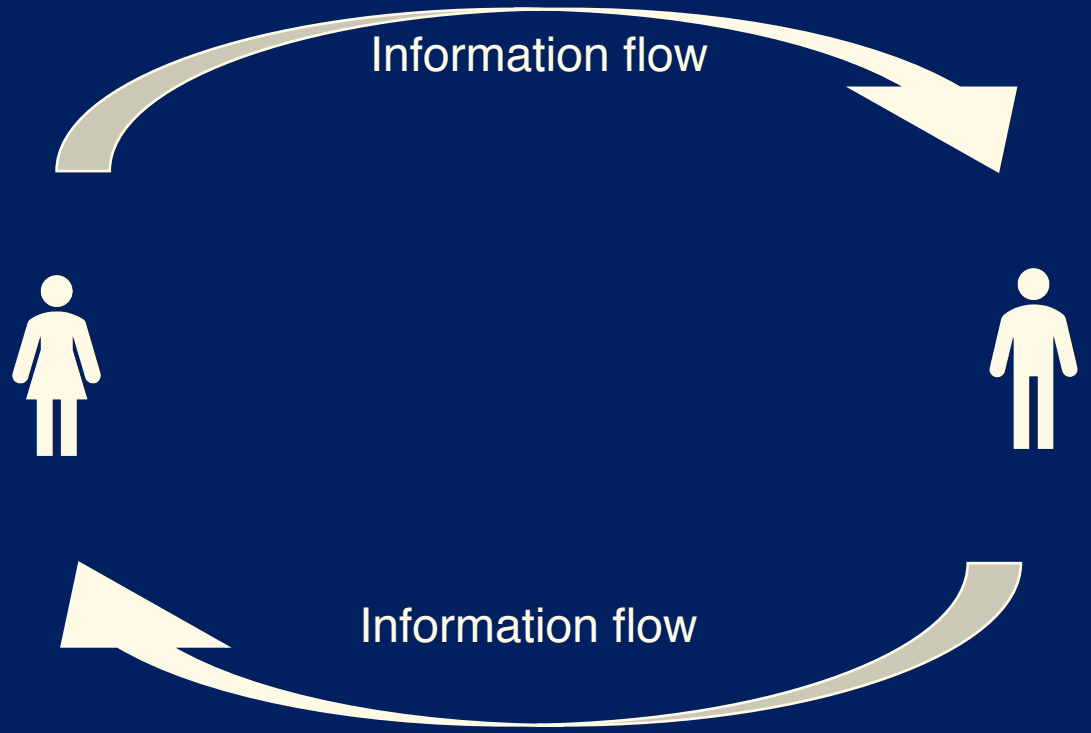
Value transfer today



Value transfer today

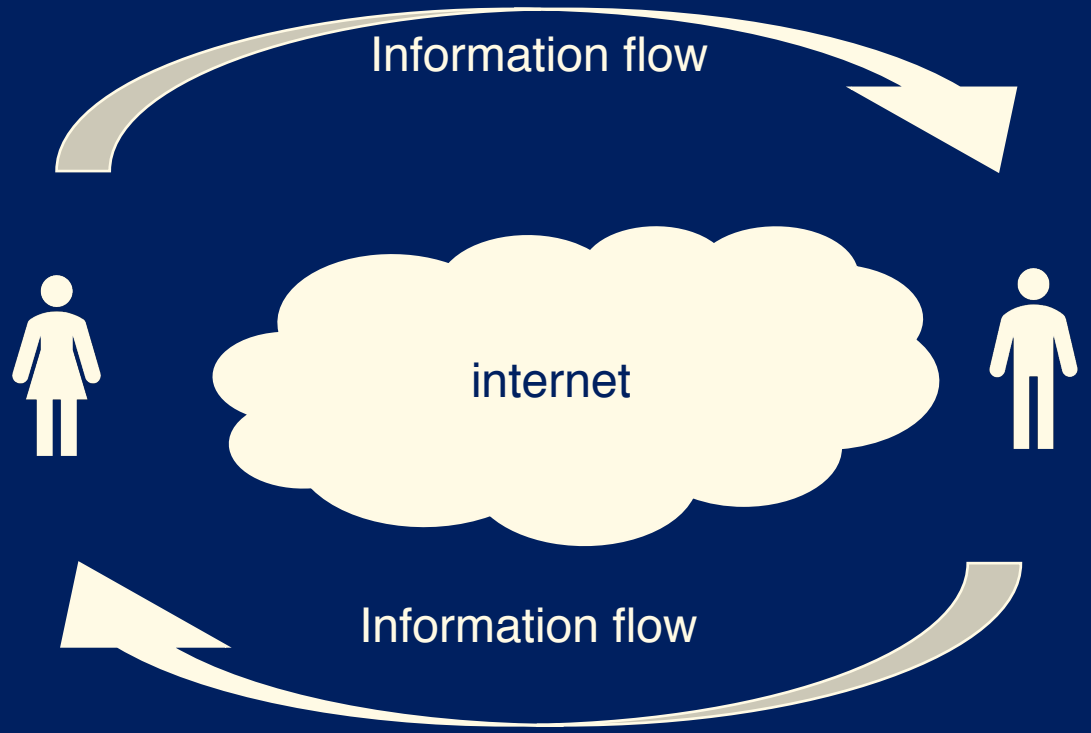


Value transfer tomorrow – use-case for 2 bln people

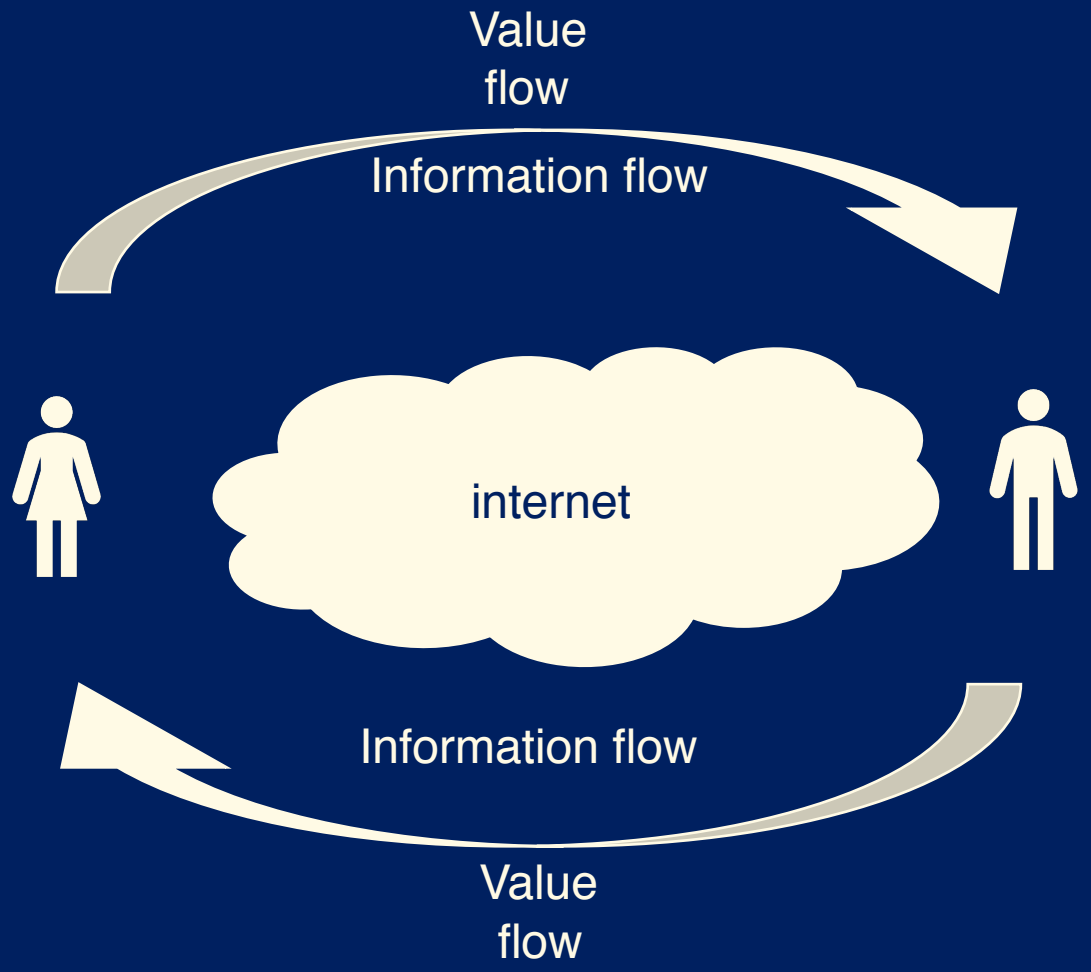


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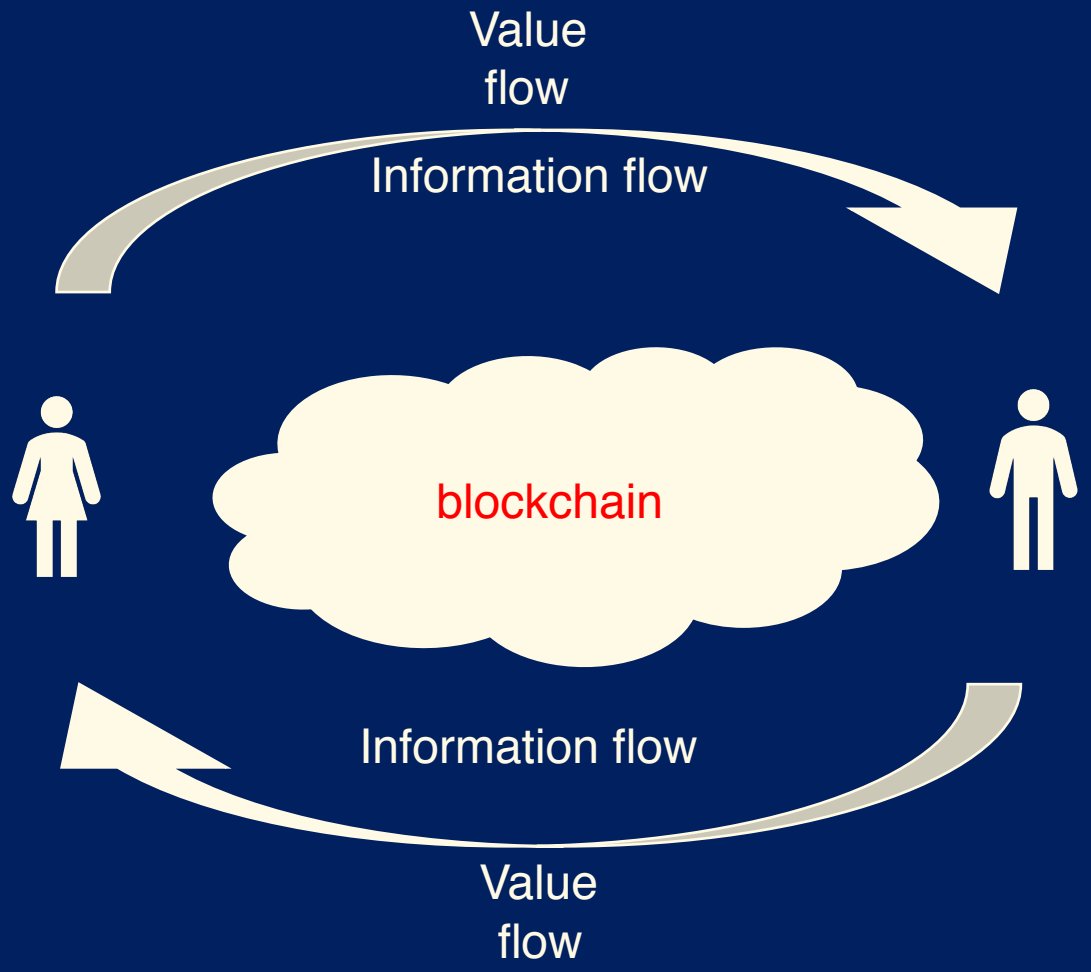
Value transfer tomorrow



Value transfer tomorrow



Value transfer tomorrow



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Transaction of a value across internet can be facilitated by blockchain

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Internet of values

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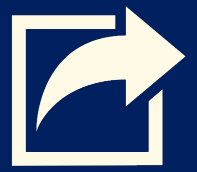
So what?



Think of a very simple use-case

Invoicing in 1970’s

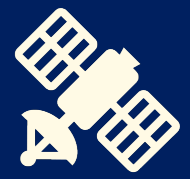
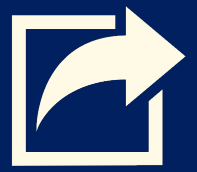



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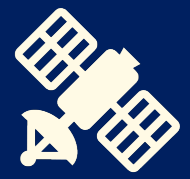
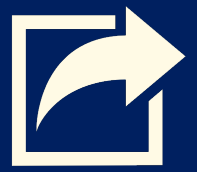
Invoicing in 1990’s




Invoicing in 1990’s



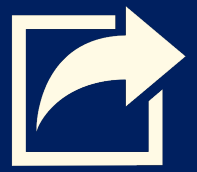




Average settlement time in global supply chains is

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Invoicing in 1990's




Average settlement time in global supply chains is 52 days…

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Invoicing of tomorrow

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Invoicing of tomorrow

No invoicing.



Invoicing of tomorrow

No invoicing.









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Invoicing of tomorrow

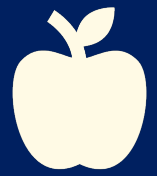
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Invoicing of tomorrow

No invoicing.



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Invoicing of tomorrow

No invoicing.



Smart contracts + cryptocurrency

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Invoicing of tomorrow

No invoicing.



Smart contracts + cryptocurrency – technically feasible on **Ethereum** blockchain

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What is a blockchain?

Key vocabulary, essential features

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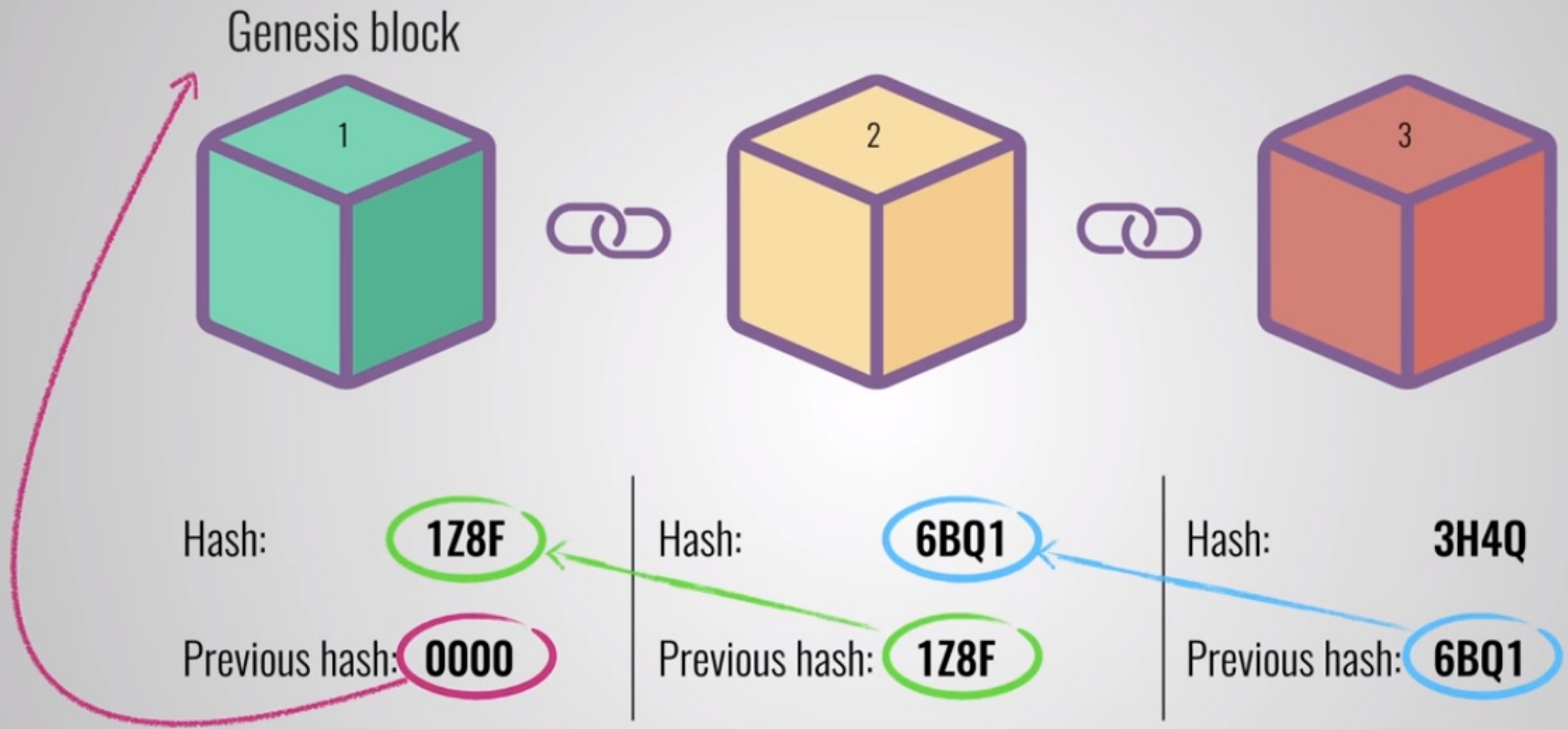
Blockchain



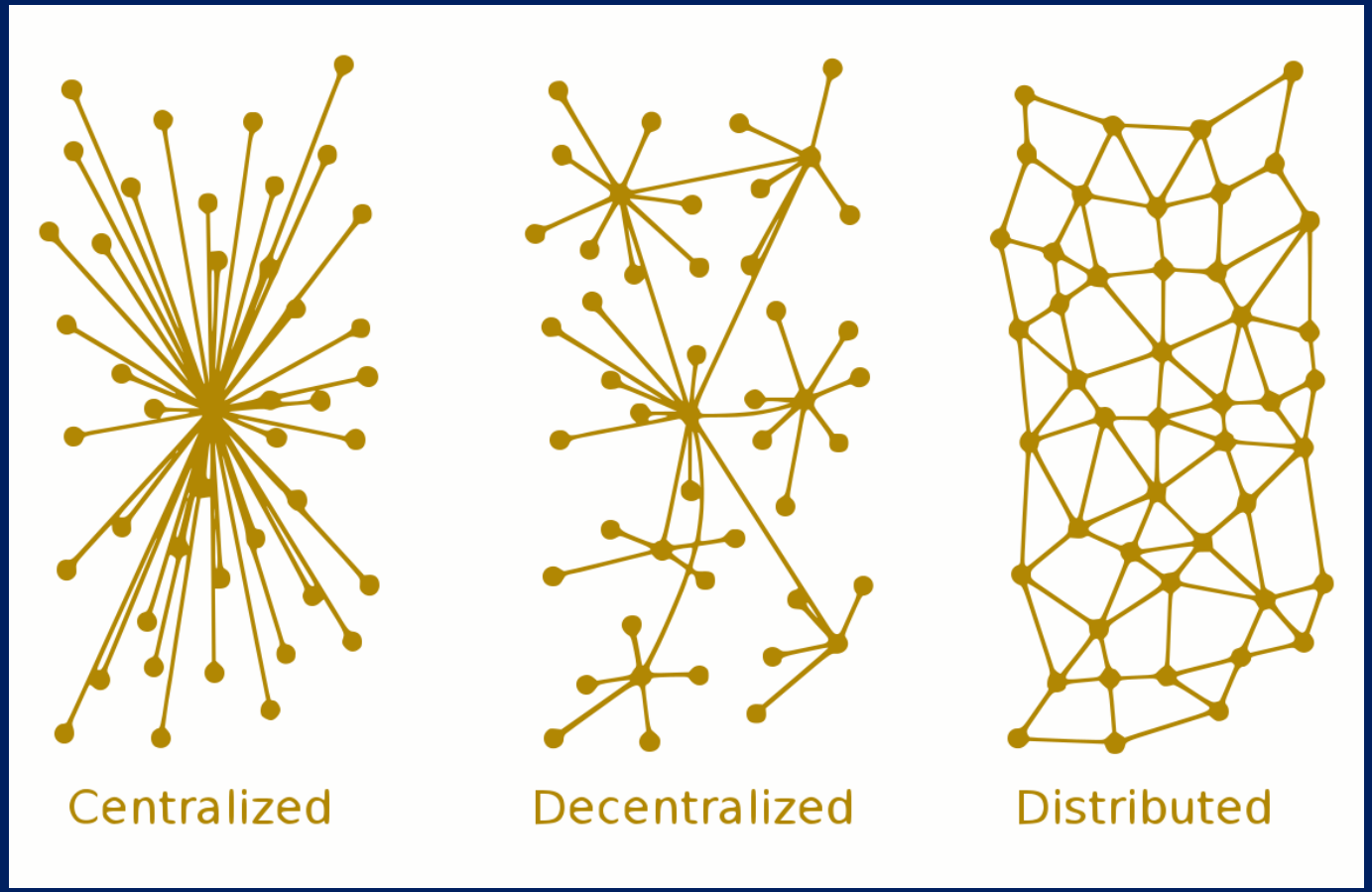
Blockchain – **immutable distributed ledger** of transactions performed by the network participants

But where is the chain and where are the blocks?




Genesis block
1
2
3
Hash:
1Z8F
Previous hash:
0000
Hash:
6BQ1
Previous hash:
1Z8F
Hash:
3H4Q
Previous hash:
6BQ1

Network types



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Node



Node; miner; participant of the network

A ledger of transactions



A ledger of transactions performed by the network – each node **holds the same copy** which is connected with each other

A wallet



Permissioned / permissionless blockchains

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Intranet / Internet

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Ethereum fundamentals

Ethereum – protocol

- Currency: Ether, ETH, Ξ

Ethereum – protocol

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- **Inflationary** model (no hard cap, deflationary model discussed)

Ethereum – protocol

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- Notable forks: Ethereum Classic

Ethereum – protocol

- Currency: Ether, ETH, Ξ
- **Inflationary** model (no hard cap, deflationary model discussed)
- **Proof-of-work** (soon proof-of-stake with Casper)
- Notable forks: Ethereum Classic
- dApps – applications built on top of ETH

Outline

- Development
- Upgrades
- Hacks
- Accounts
- Communication
- EVM

Outline

- **Development**
- Upgrades
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Development

- Idea: Vitalik Buterin, late 2013

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- Start of development: in Switzerland, early 2014



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- Jul-Aug 2014: public crowdsale (~15.5m USD in BTC)

Development

- Idea: Vitalik Buterin, late 2013
- Start of development: in Switzerland, early 2014 
- Jul-Aug 2014: public crowdsale (~15.5m USD in BTC)
- Name ‘Ethereum’ – Vitalik read wikipedia and he liked it

Outline

- Development
- **Upgrades**
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- Accounts
- Communication
- EVM

Upgrades

Version	Code name	Release date
0	Olympic	May, 2015
1	Frontier	30 July 2015
2	Homestead	14 March 2016
3	Metropolis (vByzantium)	16 October 2017
3.5	Metropolis (vConstantinople)	TBA[26]
4	Serenity	TBA

Old version **Latest version** Future release

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Upgrades

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Old version **Latest version** Future release

Privacy

- zk-SNARKs – zcash, privacy model
- ZKRP

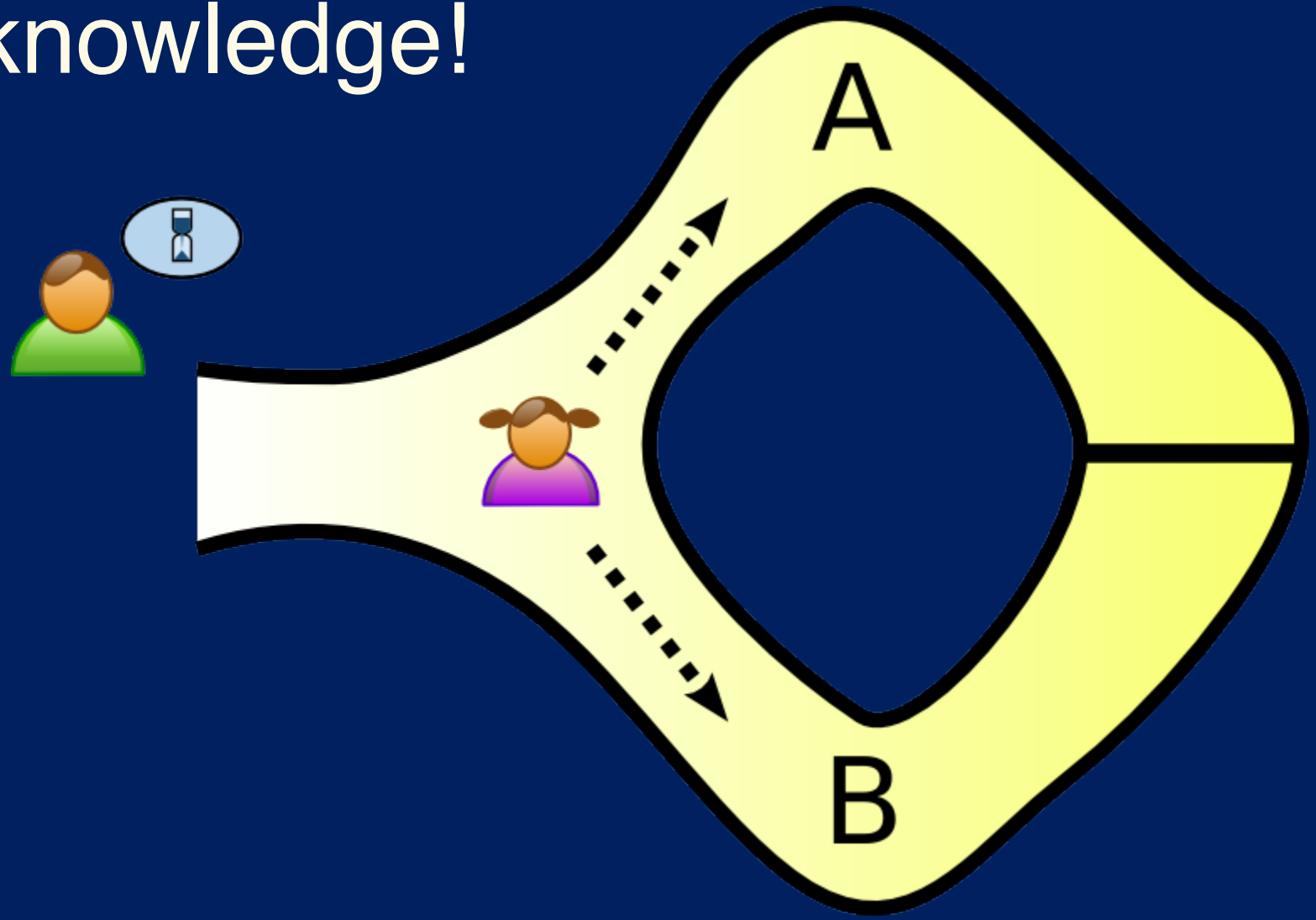
Zero knowledge?



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Zero knowledge!

Zero knowledge!



Privacy

- zk-SNARKs – zcash, privacy model
- ZKRP

Privacy

- zk-SNARKs – zcash, privacy model
- ZKRP



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Privacy



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Outline

- History
- Upgrades
- **Hacks**
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- Mining
- Upgrades

The DAO ‘hack’

Version	Code name	Release date
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The DAO ‘hack’

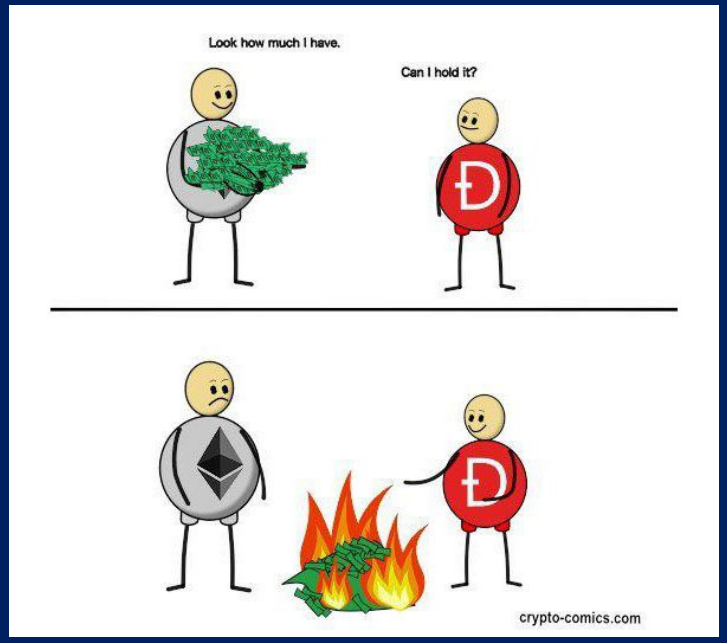
- In 2016, the DAO raised 150m USD in public crowdsale

The DAO ‘hack’

- In 2016, the DAO raised 150m USD in public crowdsale
- Anonymous entity managed to claim 50m USD
  - This activity was fully inline with protocol

The DAO ‘hack’

- In 2016, the DAO raised 150m USD in public crowdsale
- Anonymous entity managed to claim 50m USD



The DAO ‘hack’



Ethereum Classic



Ethereum

Upgrades

Version	Code name	Release date
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Old version **Latest version** Future release

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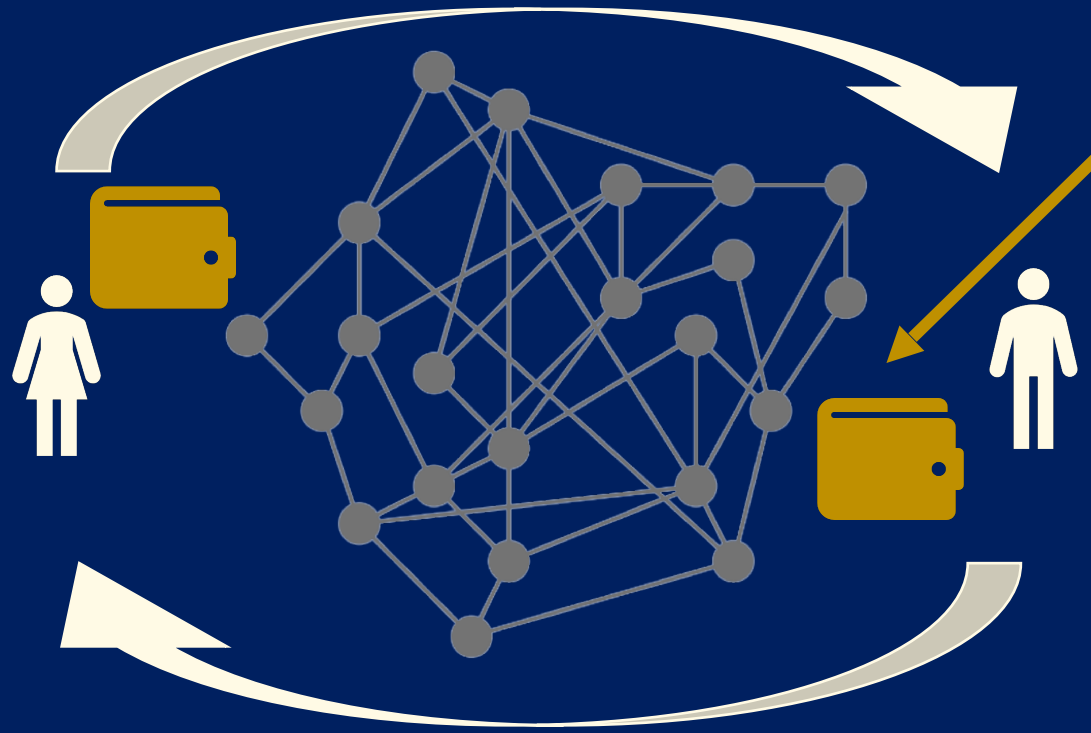
Accounts

- Interact with each other through a message-passing network
  - Account has a state and 20-byte address

Accounts

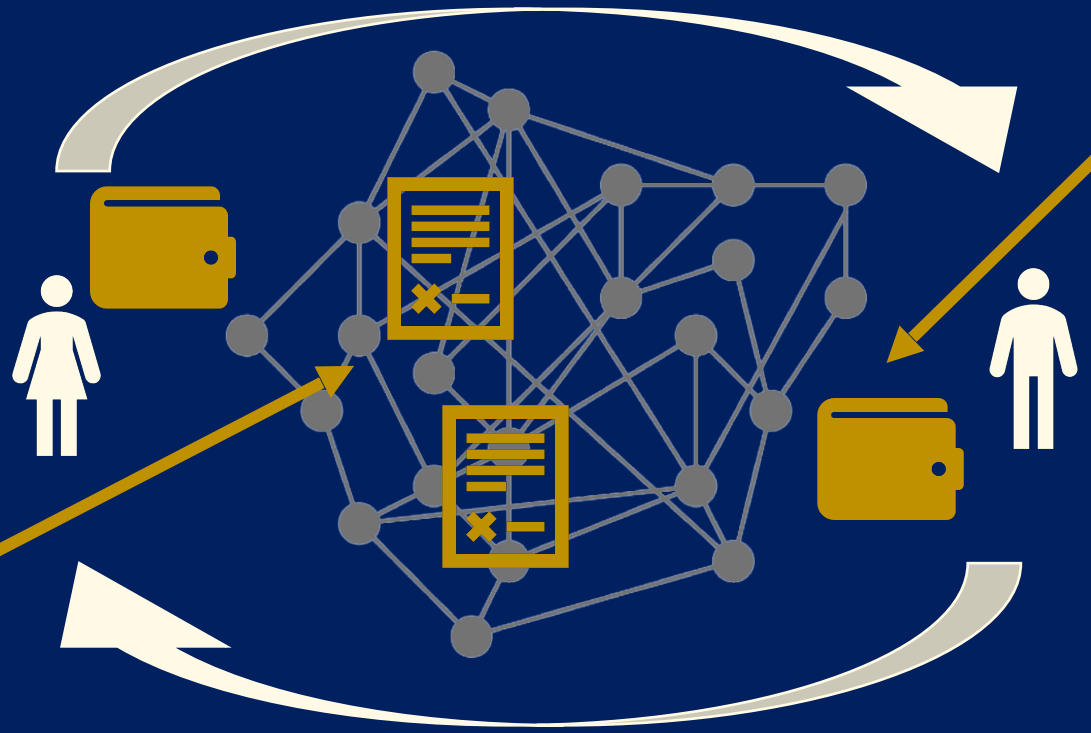
- Interact with each other through a message-passing network
  - Account has a state and 20-byte address
  - 2 types of accounts:
    - Externally owned accounts, controlled by private keys
    - Contract accounts, controlled by contract code and contain an associated code

Types of accounts



Wallet as externally-owned account

Types of accounts



Wallet as externally-owned account

Contract account containing the associated code

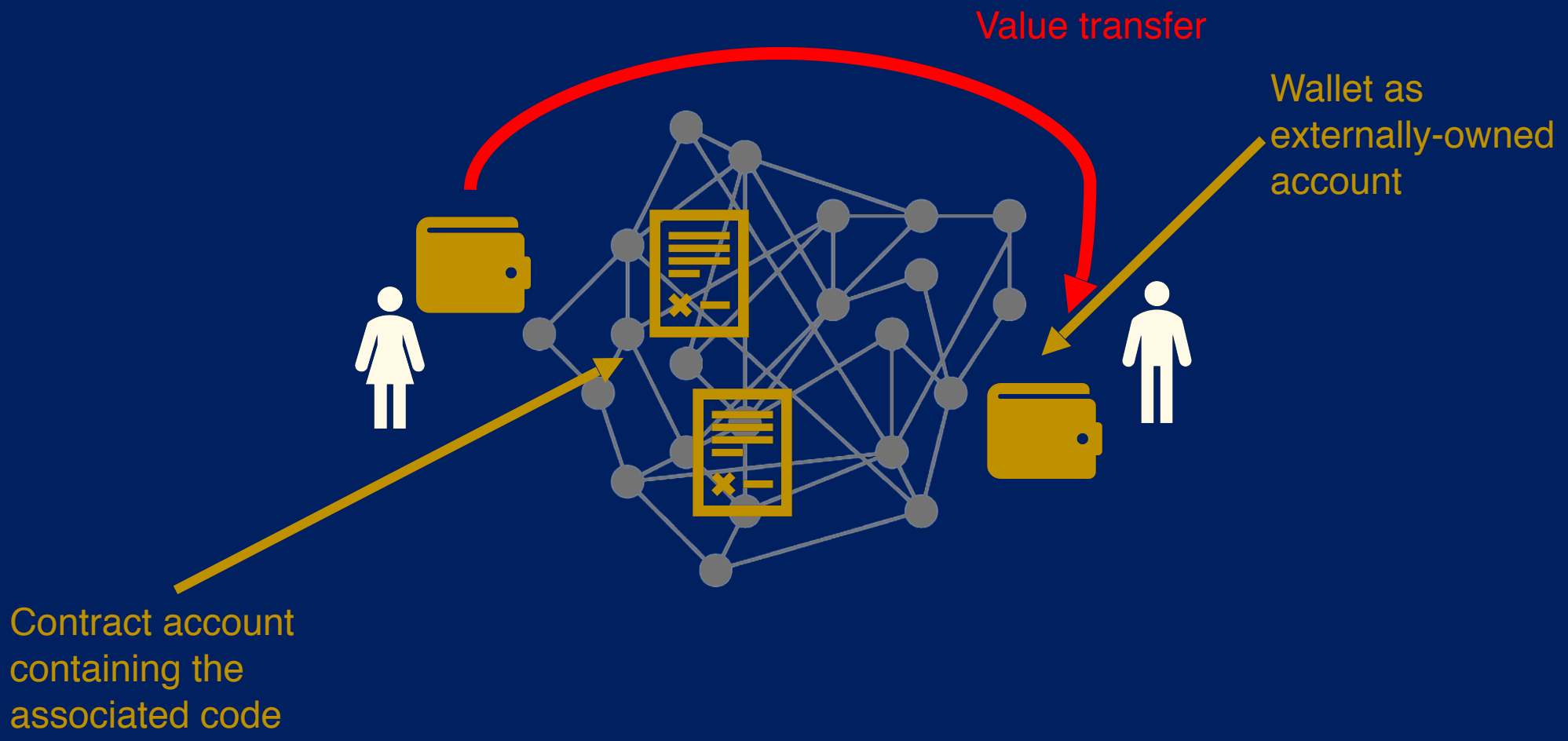
Accounts

- Interact with each other through a message-passing network
  - Account has a state and 20-byte address

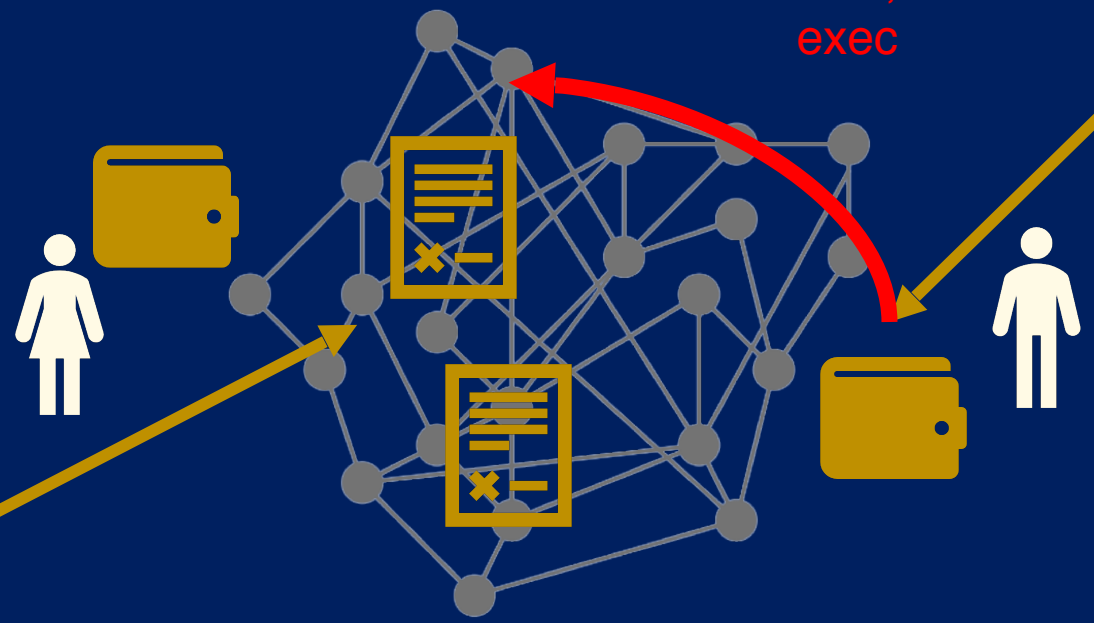
  - 2 types of accounts:
    - Externally owned accounts, controlled by private keys
    - Contract accounts, controlled by contract code and contain an associated code

    - Communication:

Communication between accounts



Communication between accounts

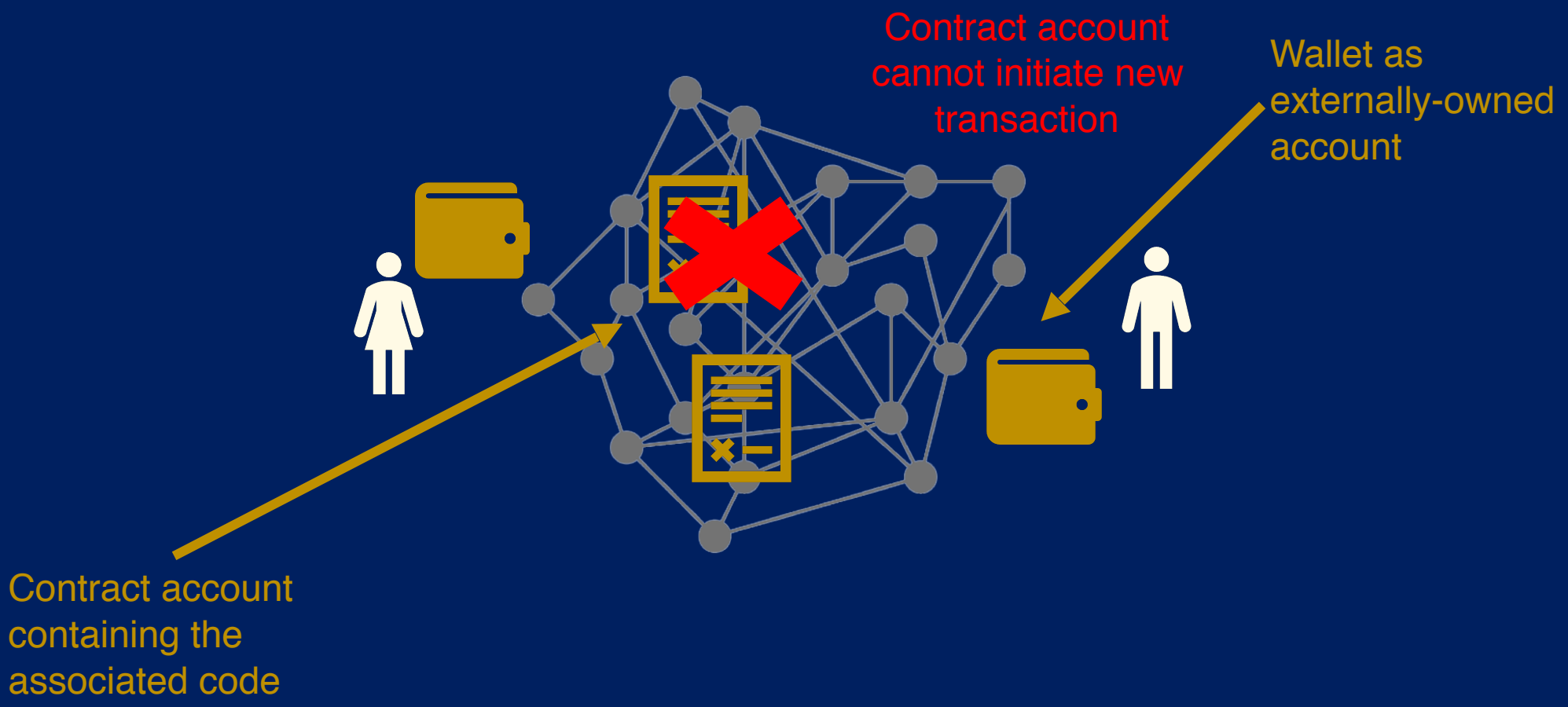


Can trigger an event – new contract, contract exec

Wallet as externally-owned account

Contract account containing the associated code

Communication between accounts



!

- Part of the protocol which handles transactions is called EVM – Ethereum Virtual Machine

Account state

- 4 components
  - **Nonce** – either No of transactions sent from acc address OR No of contracts created by the acc
  - **Balance** – No of Wei owned by the address (1 ETH = 10^18 Wei)
  - **storageRoot** – a hash of the root node of Merkle tree
  - **codeHash** – the hash of EVM code of this acc (for ext owned – empty string)

World state

- Mapping between account addresses and the account states

World state

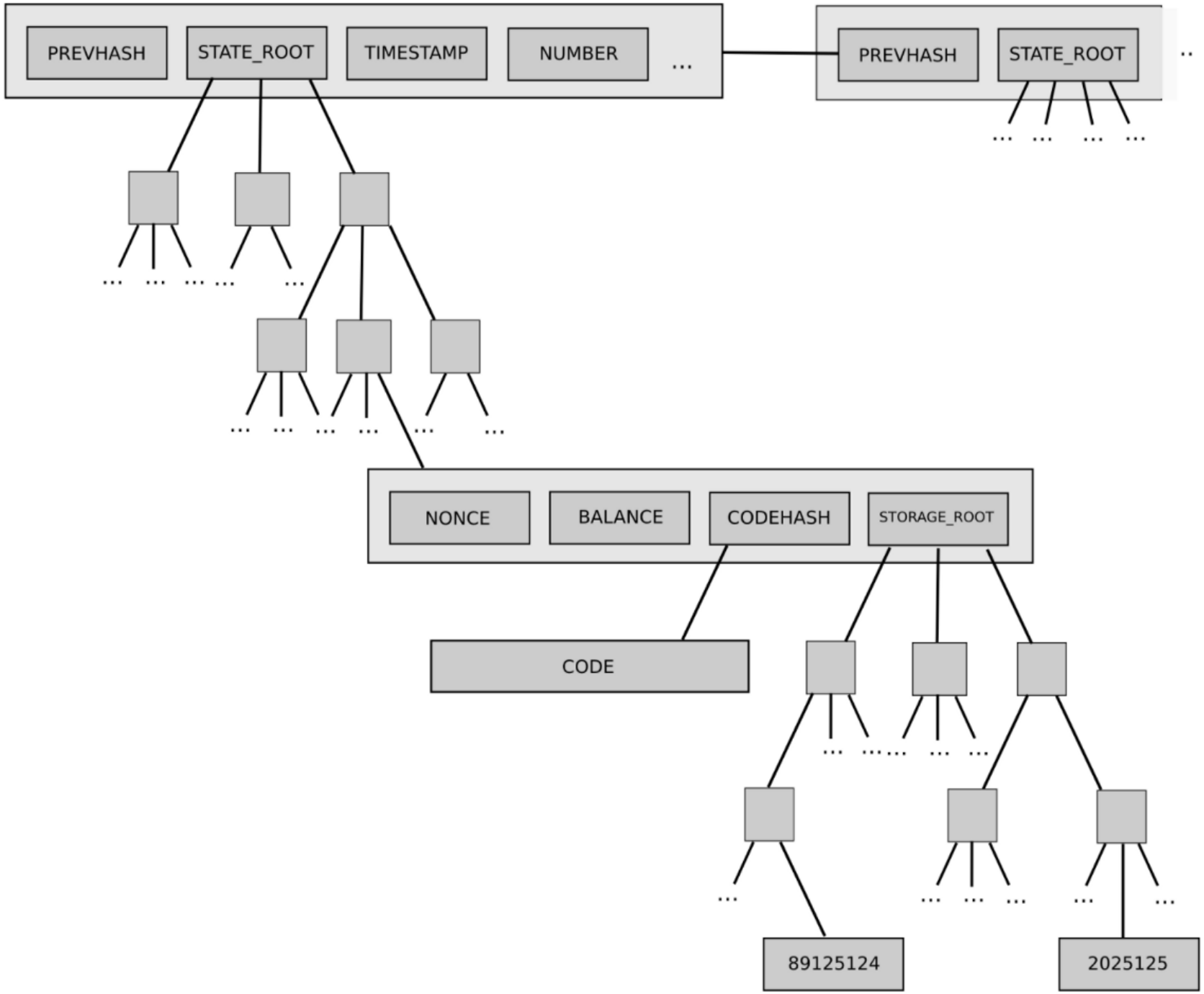
- Mapping between account addresses and the account states
- Merkle tree

Merkle is not Merkel.

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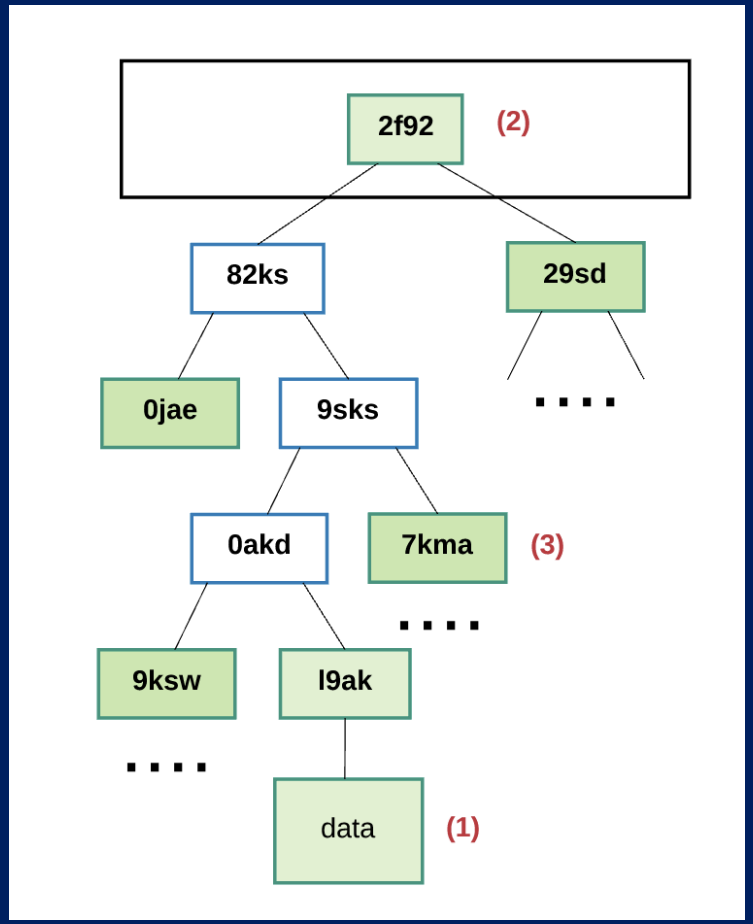


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PREVHASH
STATE_ROOT
TIMESTAMP
NUMBER
PREVHASH
STATE_ROOT
NONCE
BALANCE
CODEHASH
STORAGE_ROOT
CODE
89125124
2025125

Merkle proof

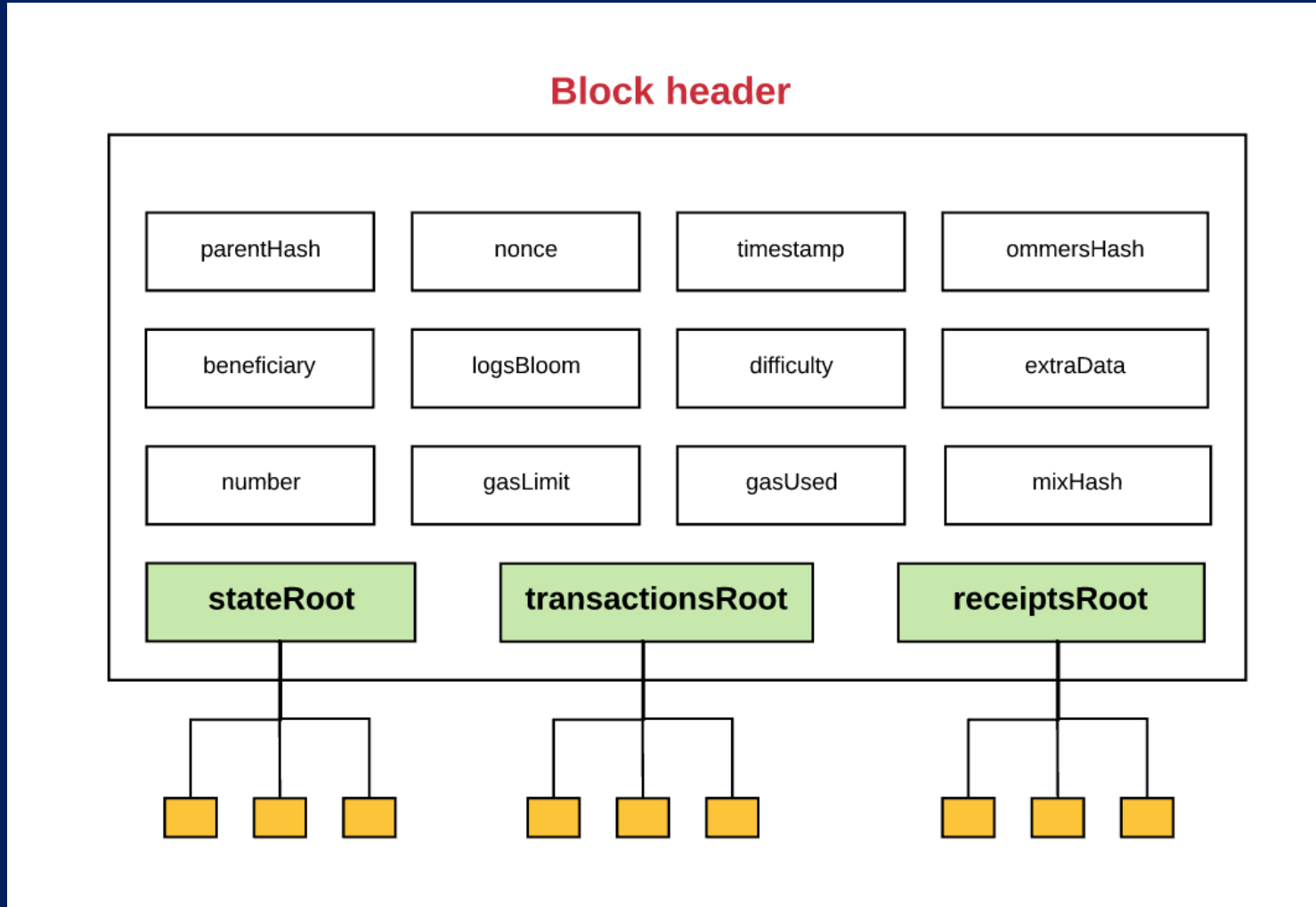
Merkle proof



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Block header

- State tree
- Transactions tree
- Receipts tree



Nodes – full, light

- Full node – entire blockchain
- Light node –only the chain of headers

Node



Node; miner; participant of the network

Gas and fees

- Everything is paid
- This payment is called ‘gas’

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- Every transaction
  - Gas limit
  - Gas price

  - Sender is refunded for any unspent gas

Gas and fees

- In case a sender does not have enough gas – transaction does not go through

- The higher the gas price, the more likely are miners (as beneficiaries) to process it

Gas and fees

- Gas is used to pay the storage use as well

- Incentive of the network – the storage as low as possible
- Sender rewarded when freeing up the storage

Fees – role is to save some energy and prevent loops

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- Tokenomics (= token economy models) is a set of rules within ecosystem which **incentivize** key players to contribute to the prosperity of the system

- Miner’s rewards, gas, etc.

- Due to the ability to transfer small amounts of a value (with a certain liquidity) at almost zero fees, we’re able to completely transform some business models

Blocks

- All transactions are stored in a block
- Block consists of
  - The block header
  - Information about the set of transactions included in that block
  - A set of other block headers for the current block’s ommers

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- Used for determining which chain is valid
- “GHOST” = “Greedy Heaviest Observed Subtree”
- We pick the path that has had the most computation power done upon it

Block header

- parentHash
- ommersHash
- Beneficiary
- stateRoot
- transactionsRoot
- receiptsRoot
- logsBloom
- Difficulty
- Number
- gasLimit
- gasUsed
- Timestamp
- extraData
- mixHash
- nonce

Comparison to Bitcoin protocol

- Block time – BTC: ~10 mins; ETH: ~14-15 sec
- Mining ETH reward: 3 ETH/block
- Different PoW algorithm
- Scripting language to create smart contracts
- Average block size



Ethereum and smart contracts

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Take-aways

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You can forget what precisely is in the ETH block header – only remember following:

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1. Never stop studying and always be curious

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  - Buying = voting. The more you buy, the more support for the creators you show.

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3. Be patient with regulators – they just don’t know

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- Blockchain is an innovation, flying car is an innovation. So what’s the difference?

3. Be patient with regulators – they just don’t know

- Imagine you are really building such flying car



3. Be patient with regulators – they just don’t know

- … And you want to have it fully regulated.



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- Regulators can merge and tweak existing regulations because





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- But what about blockchain?



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- But what about blockchain?





4. Support #BUIDLing

- Don’t ride the hype – support projects with genuine purpose which are here to stay

5. cryptohumor

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