

BANKING ON THE FUTURE (of blockchains)

PRESENTED BY



neuroware

BUT LET ME FIRST INTRODUCE NEUROWARE



Mark Smalley - CEO

Living in Malaysia for the past 19 Years

Building Web Applications for 15 Years

Spent 10 Years Building Tech Communities

Developing Blockchains Apps for 5 Years

Ruben Tan - CTO

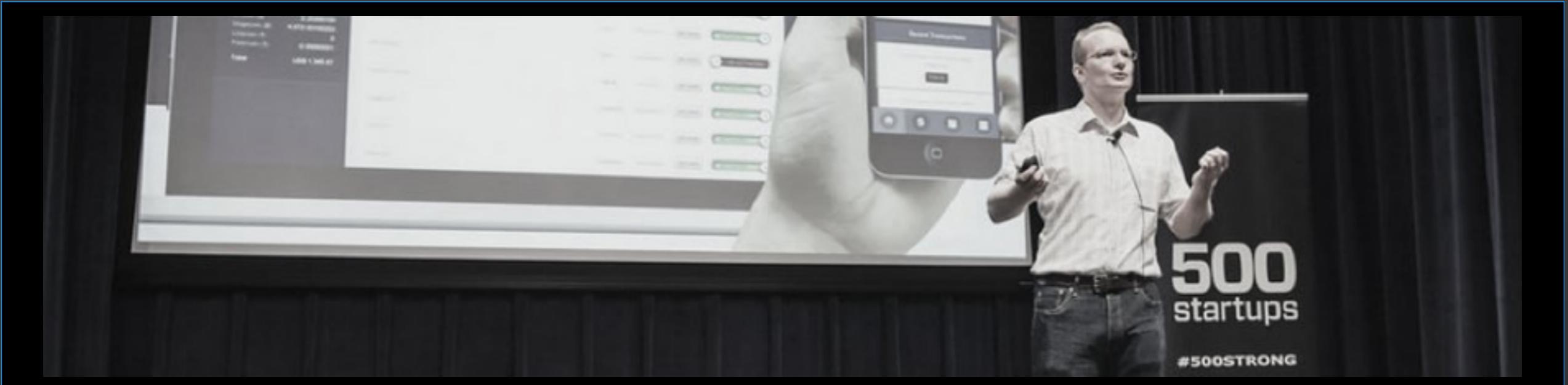
Building Web Applications for 10 Years

Active Community Evangelist & Presenter

Early Developer at MyTeksi and OnApp

Studying Distributed Consensus for 5 Years

EXPERIENCED INNOVATORS IN AN EARLY ECOSYSTEM



- **1st Malaysian Company** to Graduate from 500 Startups in Silicon Valley
- **1st Company in Asia** Providing Public Blockchain APIs & Developer Toolkits
- **1st in The World** to Develop Non-Financial Blockchain Agnostic Protocols
- Helped Organize World's 1st Bank-Backed Blockchain Hackathon (DBS)
- Over 15 Years of Collective Blockchain Development Experience

RECENTLY LAUNCHED CORTEX - WORLD'S 1ST BLOCKCHAIN O/S

CORTEX

dashboard add domain add user add database add api key help credits : 11.00000000 flush logout

DASHBOARD

DOMAINS

USERS

DATABASES

API

EXPLORER

WALLET

SETTINGS

You are currently logged-in with your private key!
Please remember to logout when you are done editing in order to remove the private key from localStorage.

YOUR PROFILE

EDIT

Name: Mark Smalley
Title: Co-Founder & CEO
Company: Neuoware

CURRENT USAGE

REPORTS

Domains: 3 / 10
Sub-Domains: 64 / 100
User Accounts: 5 / 10
Databases: 72 / 100
Active Modules: 2 / 7
Active Protocols: 3 / 8

RECENT ACTIVITY

MORE

Updated DNKey on mark.neuoware.io
12 seconds ago by Mark Smalley

Added new user johnny.neuoware.io
1 minute ago by Mark Smalley

New Everstore db at team.neuoware.io
3 minutes ago by Mark Smalley

New wallet for mark.neuoware.io
1 hour ago by Mark Smalley

Added new user johnny.neuoware.io
2 days ago by Mark Smalley

New Everstore db at team.neuoware.io
3 weeks ago by Mark Smalley

New DNKey on keys.neuoware.io
3 month ago by Mark Smalley

BUILT UP A REPUTATION AS THE BLOCKCHAIN GUYS

“Having finally seen Cortex in action, I can safely say these guys have something truly special on their hands, my only disagreement is that they should be based in Singapore!”

“Neuroware have been our ‘go to’ guys with respect to blockchains and critical in raising the understanding of distributed ledgers for our senior leadership teams and partners”

“Neuroware have consistently been our key consultants with regards to blockchain technology. Their participation provided us with use cases that weren’t first obvious”



Anson Zeal - CEO of CoinPip
Profitable Bitcoin Remittance Company



Amran Hassan
Head of Innovation



Max Tiong
Head of FinTech

A BRIEF HISTORY OF MODERN MONEY

WHERE NO IDEA IS A NEW IDEA

IT ALL STARTS HERE - ON THE ISLAND OF YAP



SHOPPING WAS NOT EASY



SO THEY CREATED THE WORLD'S FIRST PUBLIC LEDGER



WHERE UPDATES REQUIRED GROUP CONSENSUS

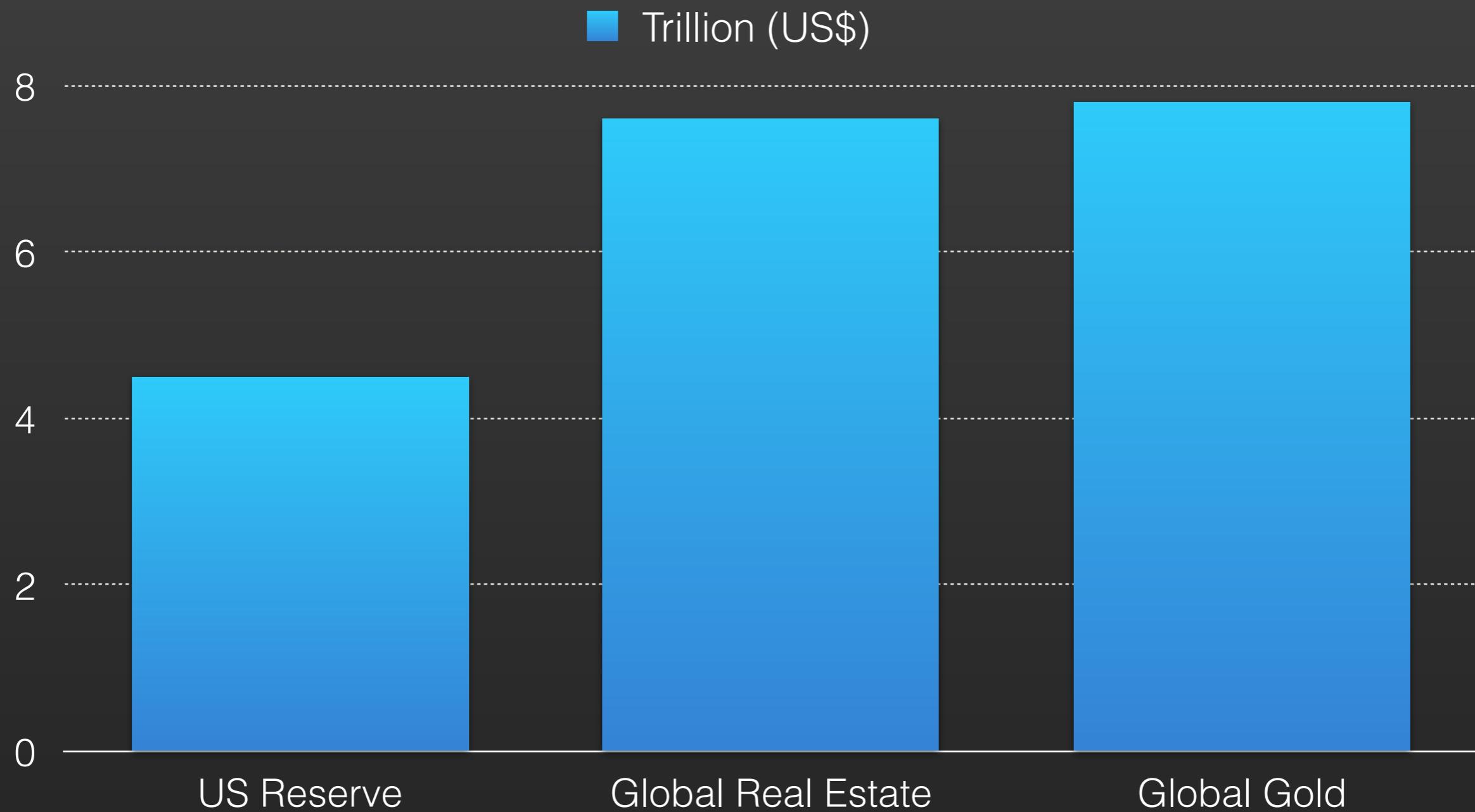


- Size wasn't everything
- The history of each stone determined it's individual value
- Conducting transactions quite literally involved a song & dance
- This required the majority of people from the village to be present

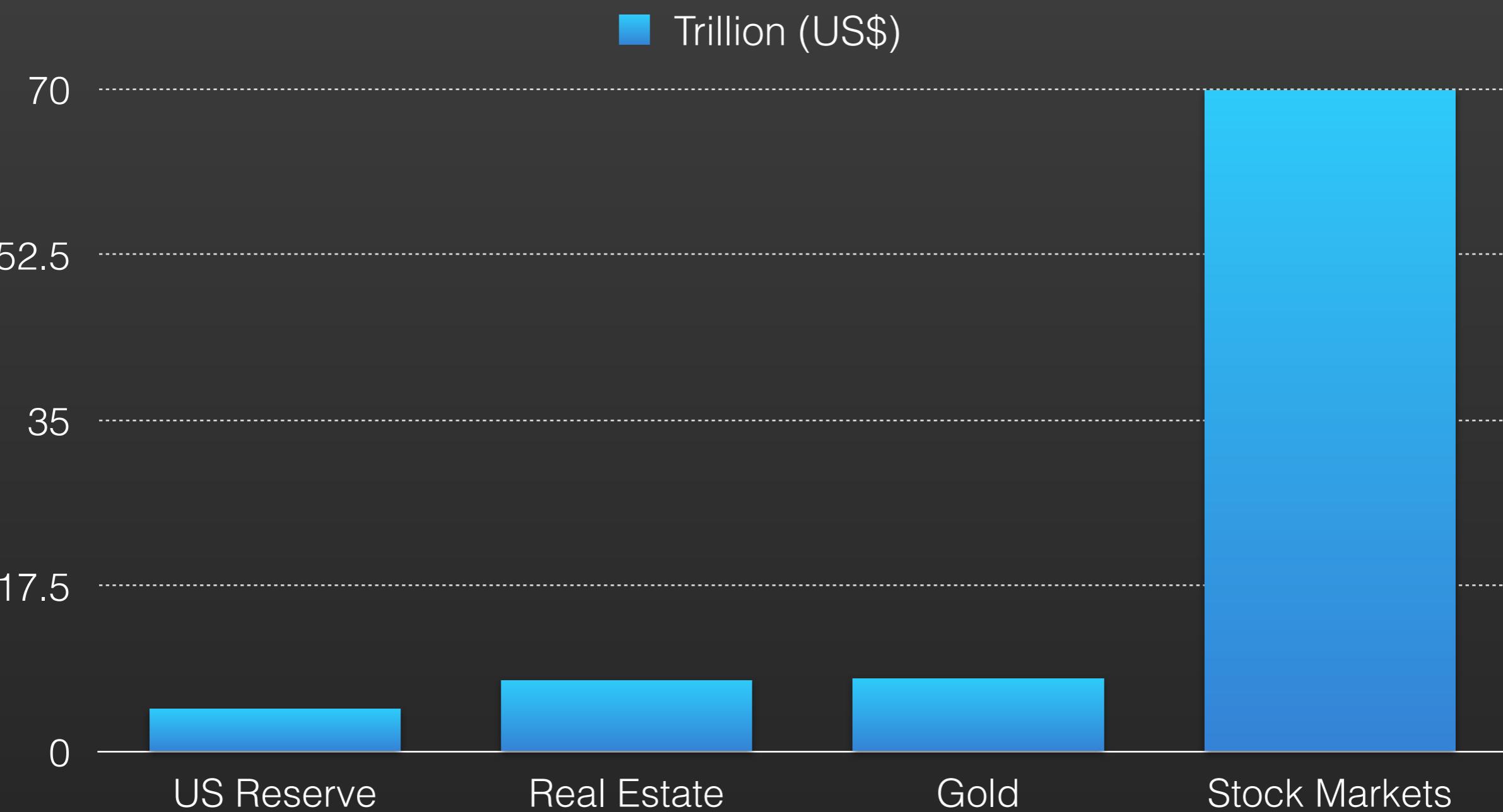
BUT IT COULD NOT SCALE - THEY EVENTUALLY SWITCHED TO US\$



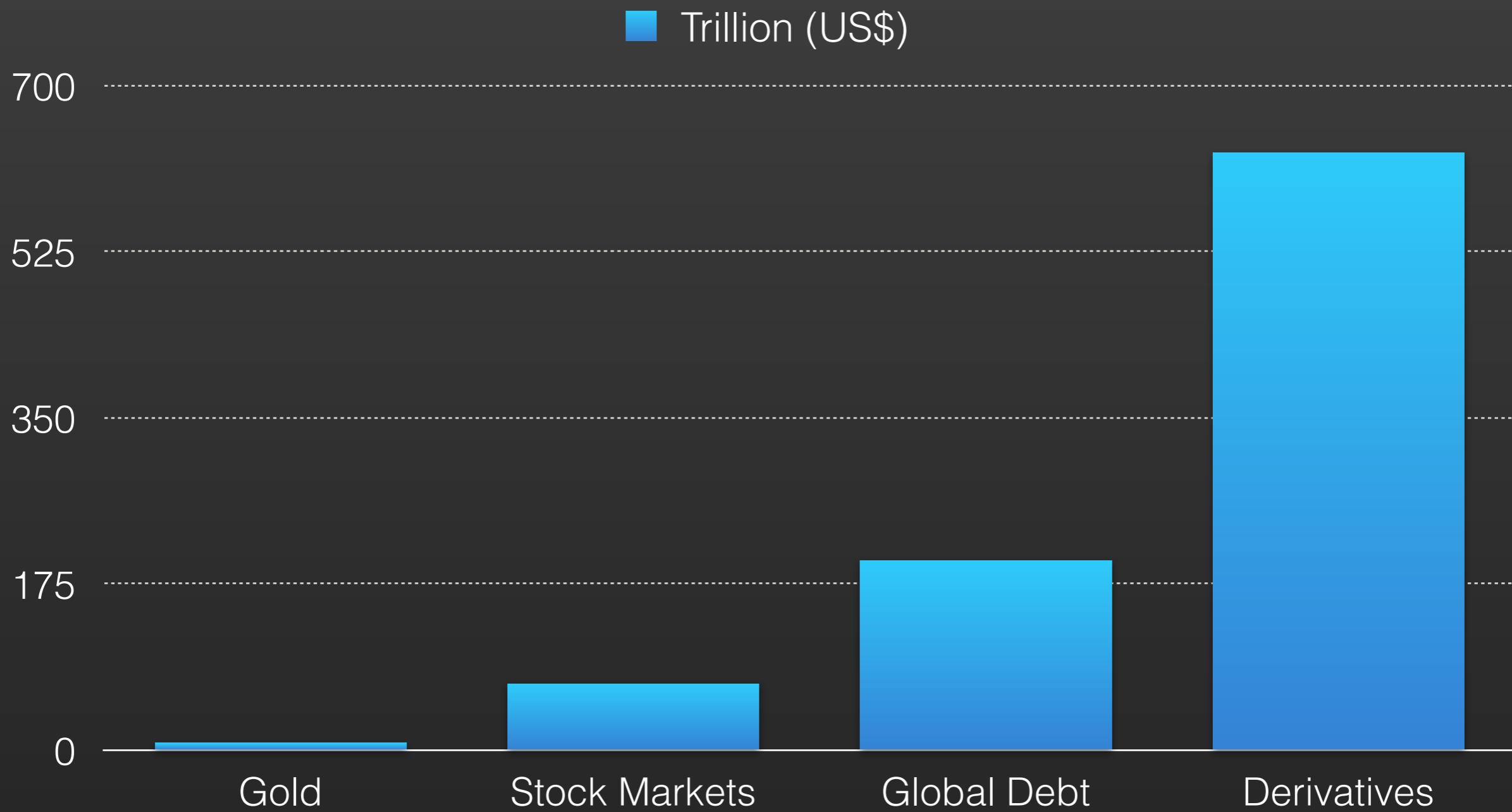
WHEN WE THINK OF THE US DOLLAR WE THINK OF **REAL MONEY**



AND THEN CAME DIGITAL CENTRALIZED ASSETS



AND WITH IT CAME THE RE-CREATION OF ~~MONEY~~ DEBT



IT ALL ENDS IN TEARS (512 US BANKS CLOSED SINCE 2008)



World War 2
US\$3 Trillion

2008 Bailout
US\$8.5 Trillion

All other US
Wars Ever

This really annoyed
Satoshi Nakamoto

NOTHING LASTS FOREVER



- Average lifespan of individual currencies is 27 years
- Every 30 or 40 years the reigning monetary system fails
- Over 3,800 fiat currencies worldwide have failed
- 15 of which happened in just the past 25 years

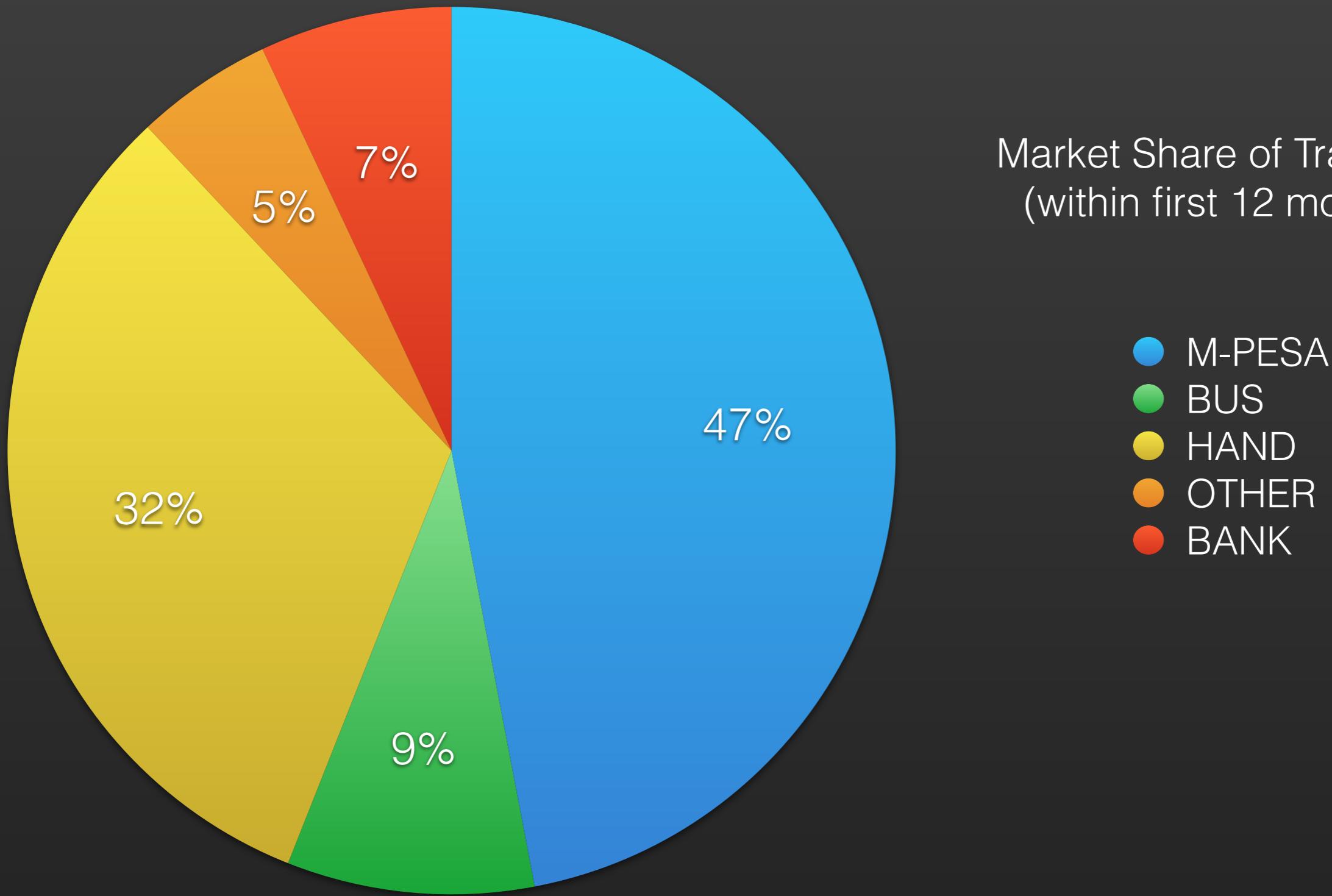
THE RECENT FAILURE OF FIAT

COUNTRY	YEAR	PROBLEM
Angola	1991-1999	1 New Kwanza = 1,000,000,000
Belarus	1994-2002	50,000 = 100,000,000 2000 Rublei
Bosnia	1993	Massive hyperinflation
Ecuador	2000	Pegged to USD after 70-80% drop in its dollar
Georgia	1995	1 new lari = 1,000,000 laris
Krajina	1993	Country folded became part of Croatia
Mexico	1993-1994	Defaulted in 1982 1 Nuevo Peso = 1,000 Old Pesos
Poland	1990-1993	1 new Zloty = 10,000 old Zlotych
Romania	2000-2005	1 new Leu = 10,000 old Lei
Russia	1992-1994	100 Rubels = 1 US\$ in 1991 30,000 Rubels = 1 US\$ in 1999
Turkey	1990-2005	1 New Turkish Lira = 1,000,000 Old Lira
Ukraine	1993-1995	1 Hryvnya = 100,000 Karbovantsivi
Zimbabwe	1999 – 2010	Ongoing mess

WHAT HAPPENS WHEN THE BANKS FAIL TO INNOVATE ...?



WITHIN FIRST 12 MONTHS - 17 MILLION SUBSCRIBERS BY 2011



Market Share of Transfers
(within first 12 months)

- M-PESA
- BUS
- HAND
- OTHER
- BANK

“ SOFTWARE IS EATING THE WORLD ” - Marc Andreessen



U B E R



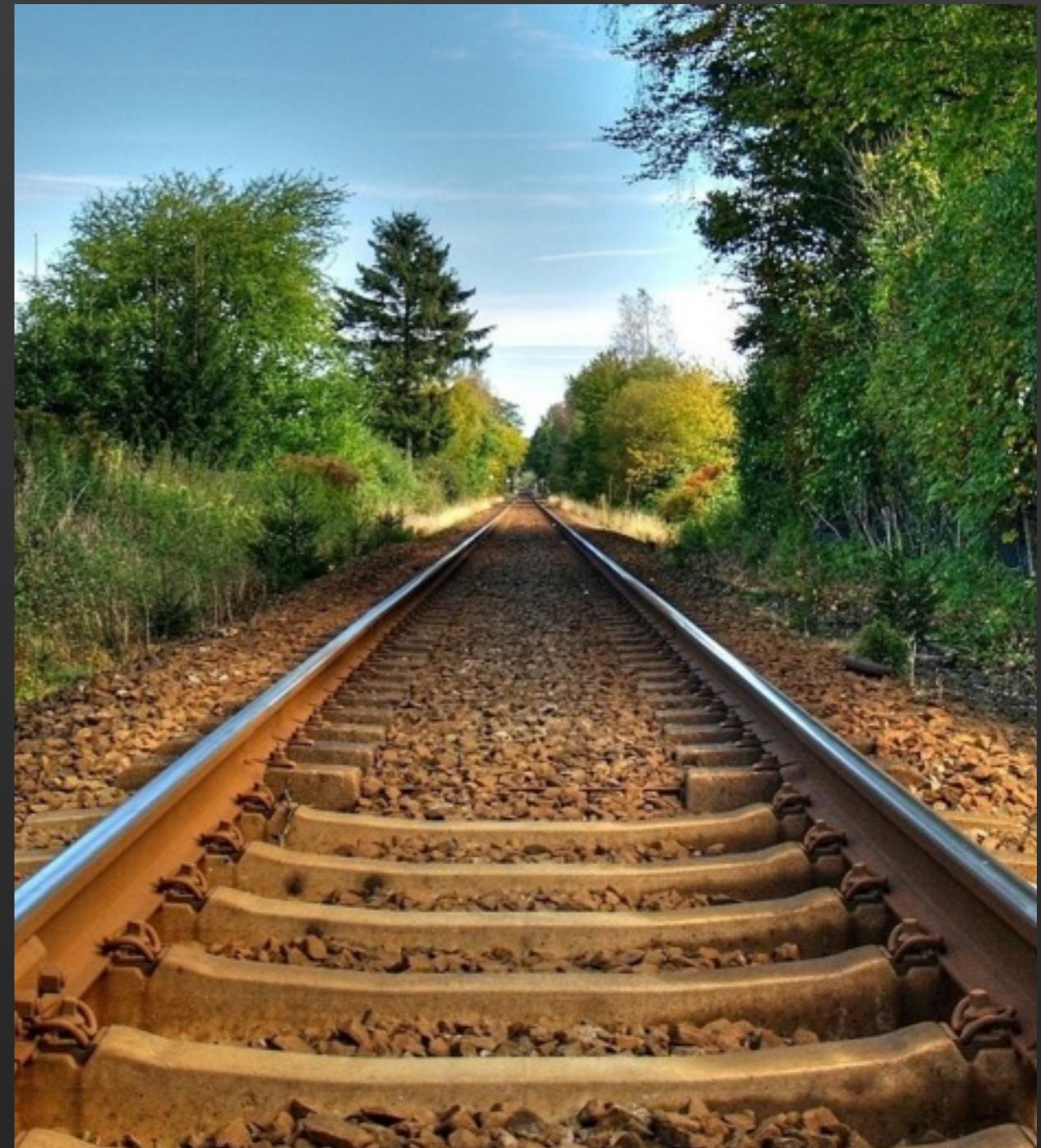
- Uber is the world's largest taxi company, but owns no cars
- AirBnB is the largest accommodation provider, but owns no real estate
- Facebook is the most popular media provider, but creates no content
- Alibaba is the most valuable retailer, but owns no inventory
- **Bitcoin is the most valuable digital currency, but there are no coins**

A TIP-TOE INTO BITCOIN
MAGIC INTERNET MONEY

BITCOIN

VS

BLOCKCHAINS



DOGECOIN

VS

RIPPLE



ETHEREUM

VS

PRIVATE CHAINS



WHAT ARE THE BENEFITS OF DISTRIBUTED PUBLIC LEDGERS?

- They provide an immutable tamper-proof audit-trail of the truth
- Data can be easily shared and independently verified by third-parties
- Vastly increased security that is much less vulnerable to attack or outage
- Programmable contracts that can radically reduce human errors and costs



“While Fintech Disrupts Banks,
the Blockchains Disrupt Fintech”

INTERESTING BITCOIN BLOCKCHAIN FACTS TO REMEMBER

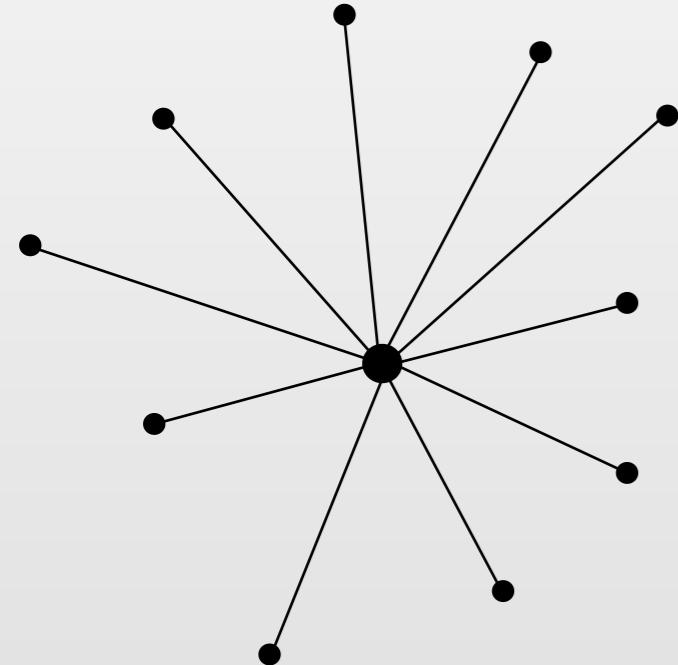
- Bitcoin blockchain released in January 2009 by Satoshi Nakamoto
- We do not know who Satoshi is, or what their religion or political views are
- However, the bailout of 2008 was cited as primary catalyst for its creation
- US\$13 per coin in 2013 (which is when we bought) - now US\$540 per coin
- The Bitcoin network is currently processing over 200,000 daily transactions
- The network's market capitalization is currently around US\$7 billion
- 21 million maximum finite supply, decreasingly dispersed every 10 minutes
- **But most importantly of all is the technology behind it...**

BITCOIN AND BLOCKCHAINS HAVE NO NEW TECHNOLOGY

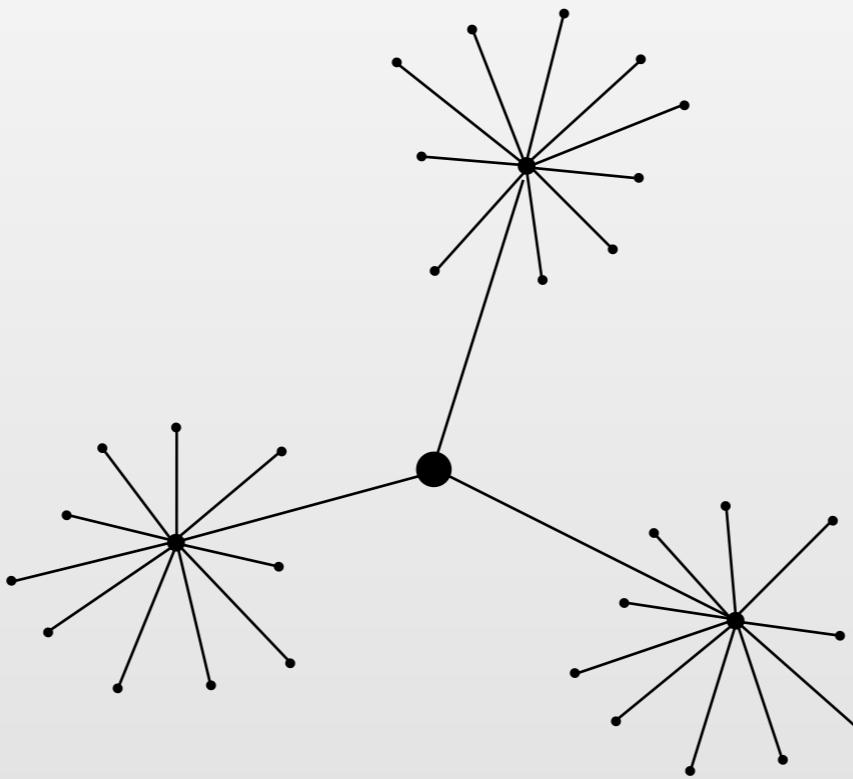


- HASH - Theorized in the 1800s - Coined by IBM in the 1950s
- SHA - Encryption method first introduced by US Navy in 1993
- P2P - Peer to peer protocol popularized by Napster in 1999

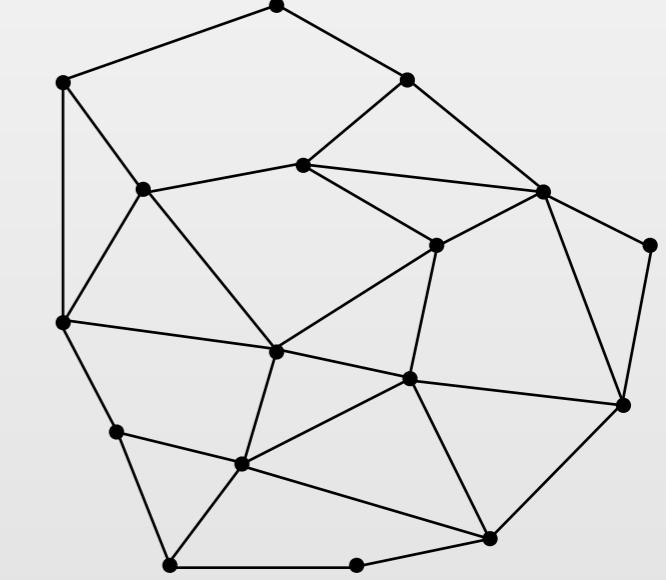
THE EVOLUTION OF EVERYTHING ...?



CENTRALIZATION
DATABASE

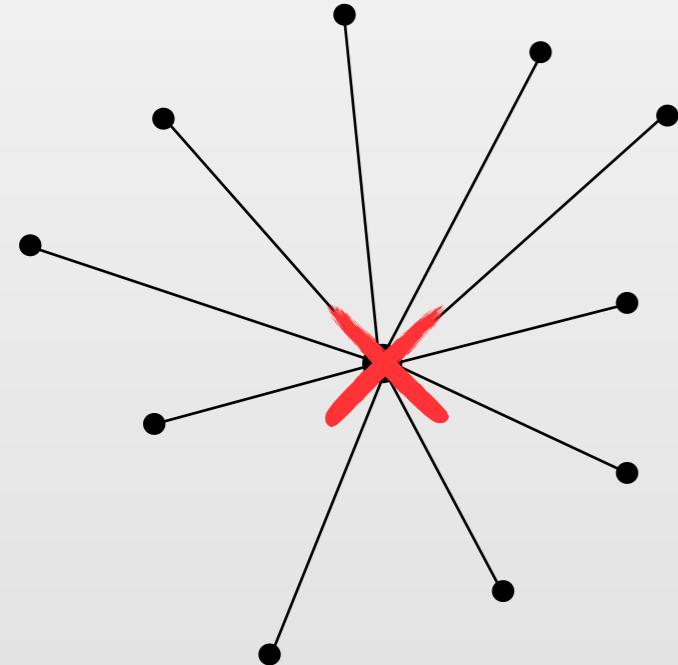


DECENTRALIZATION
THE CLOUD

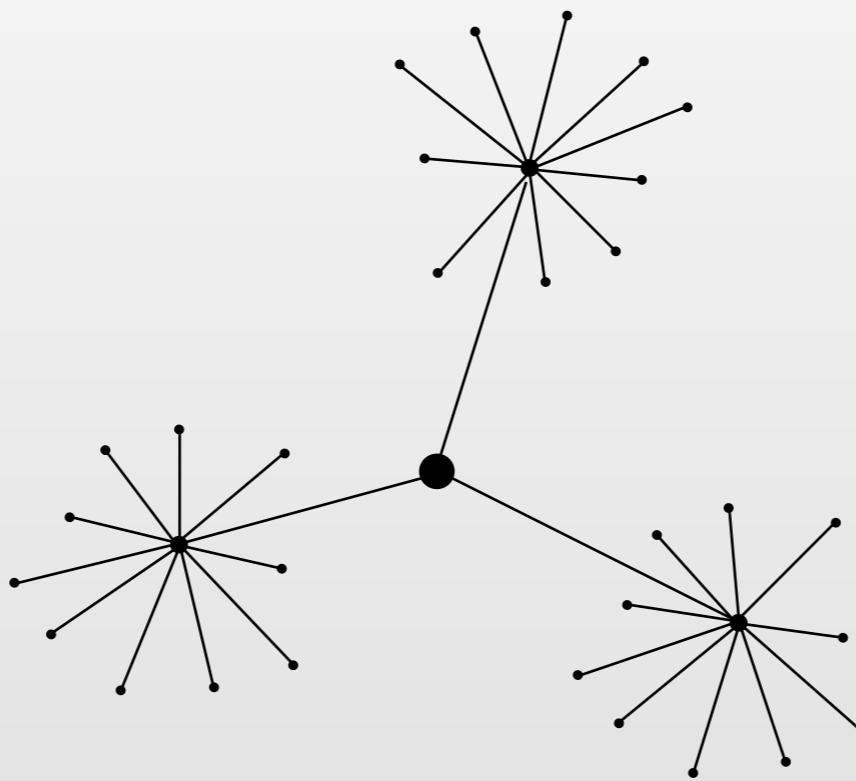


DISTRIBUTION
BLOCKCHAINS

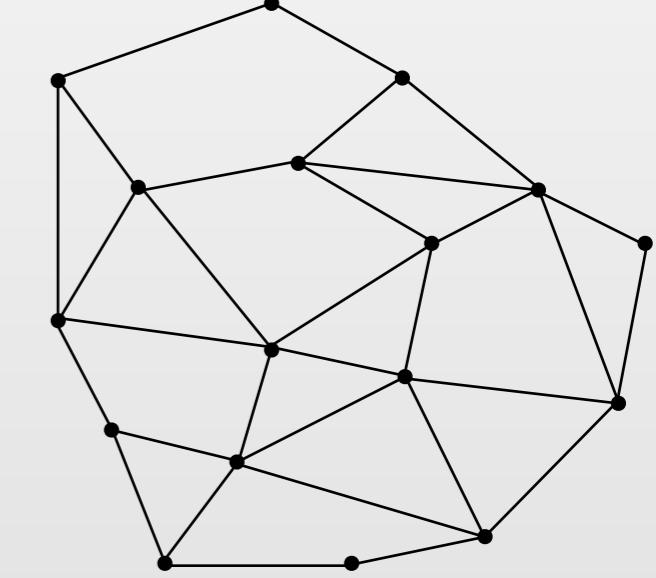
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CENTRALIZATION
DATABASE

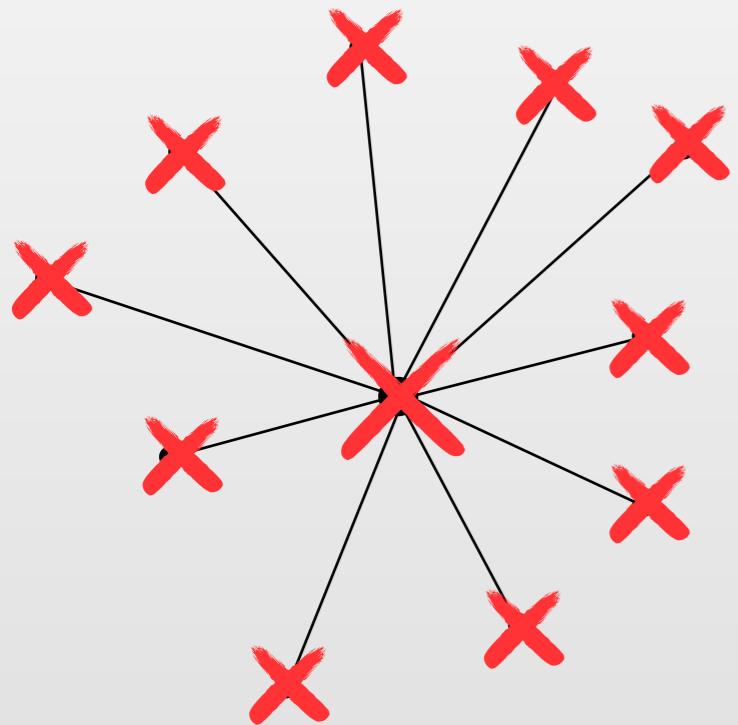


DECENTRALIZATION
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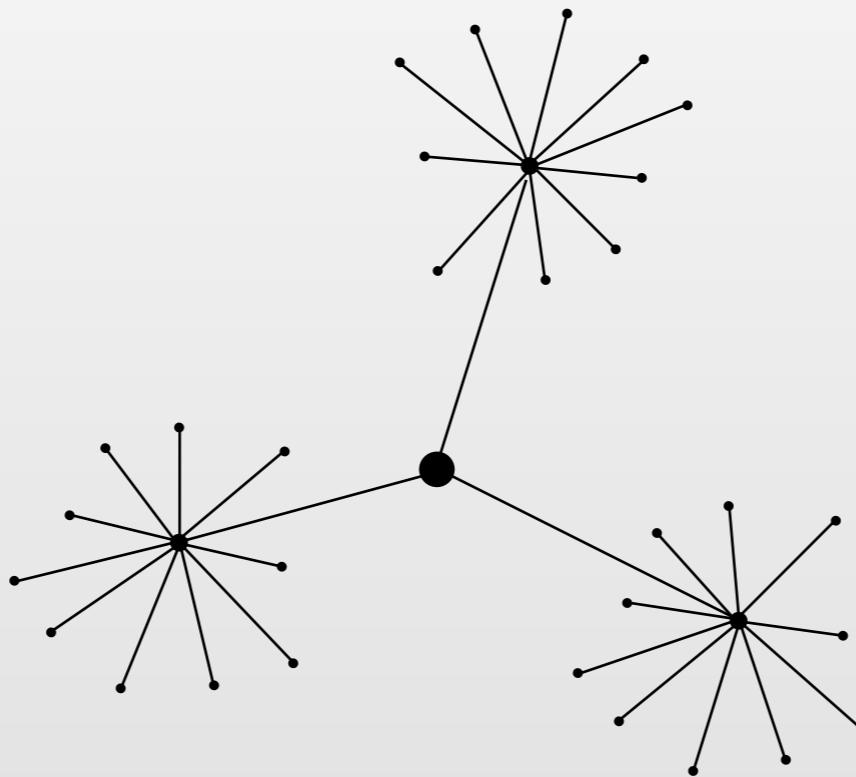


DISTRIBUTION
BLOCKCHAINS

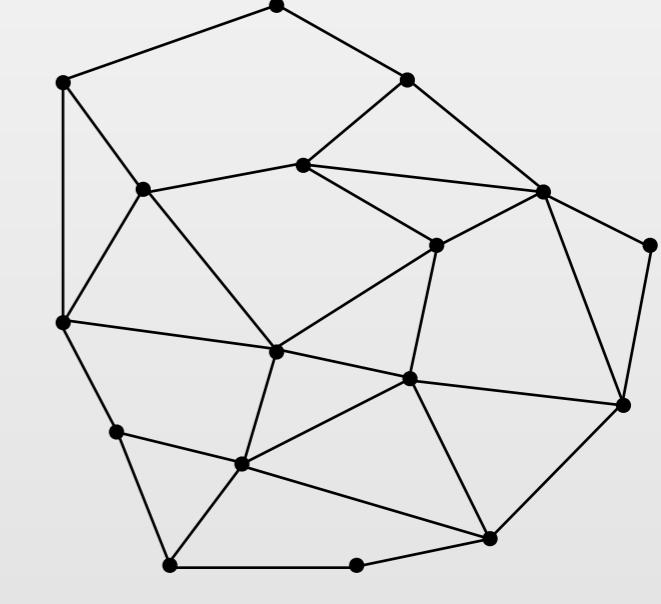
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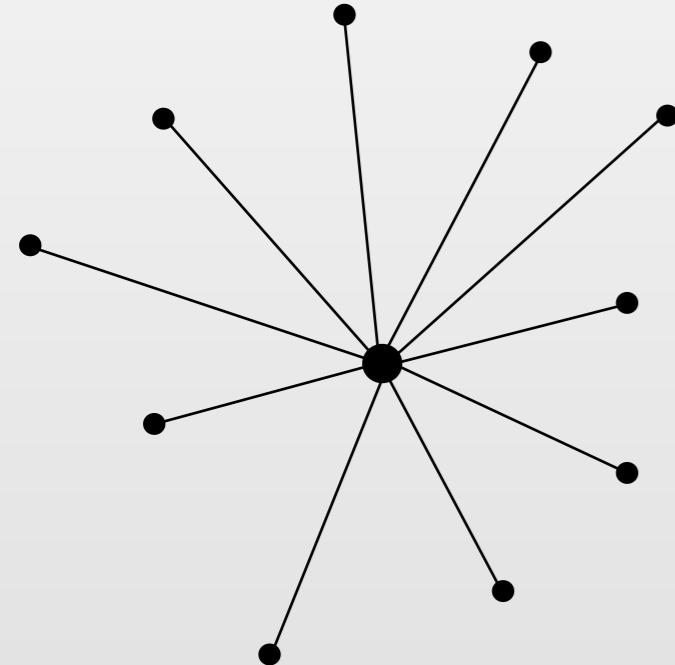


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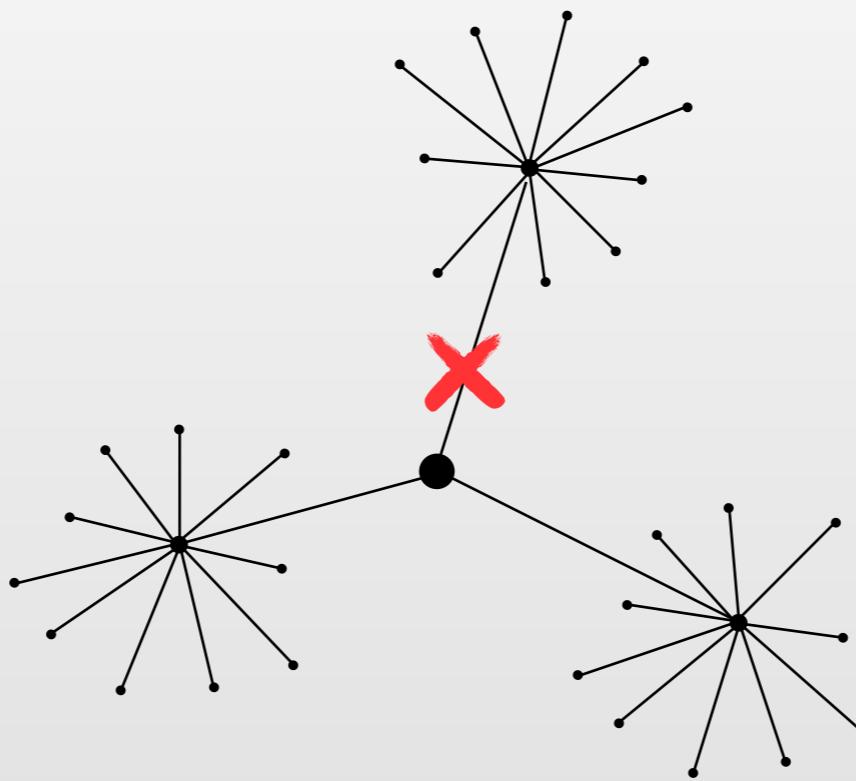


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BLOCKCHAINS

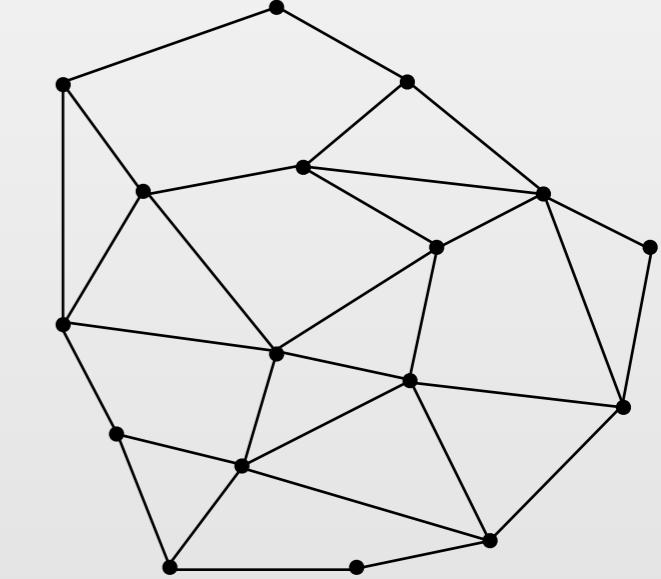
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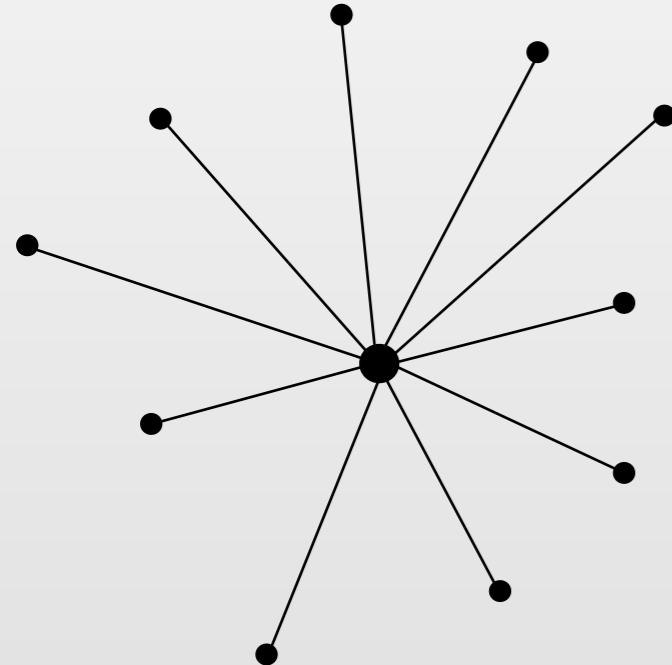


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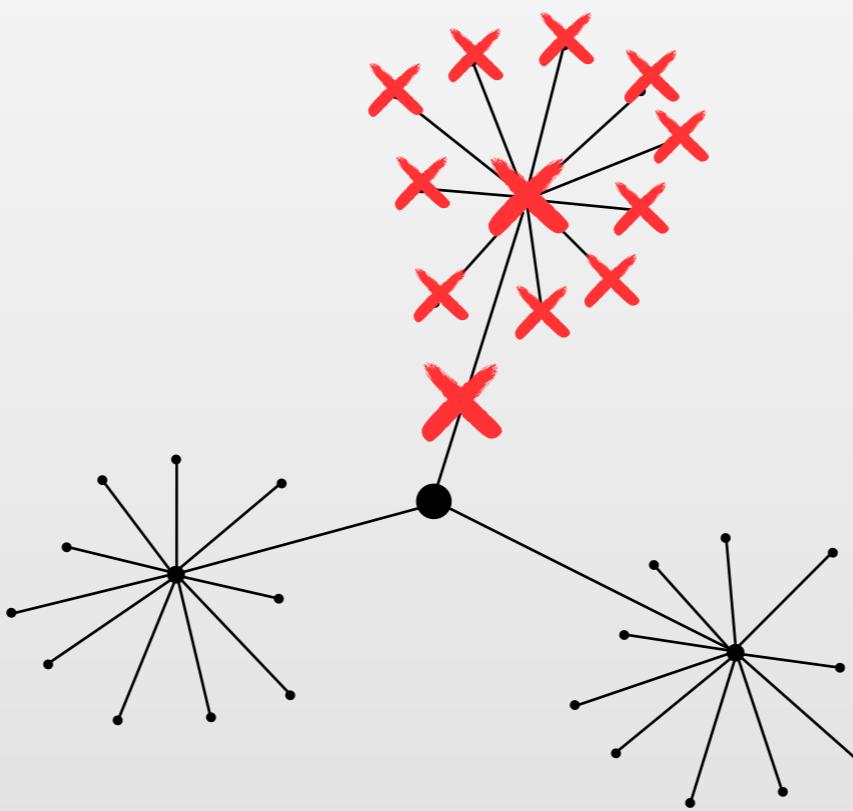


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BLOCKCHAINS

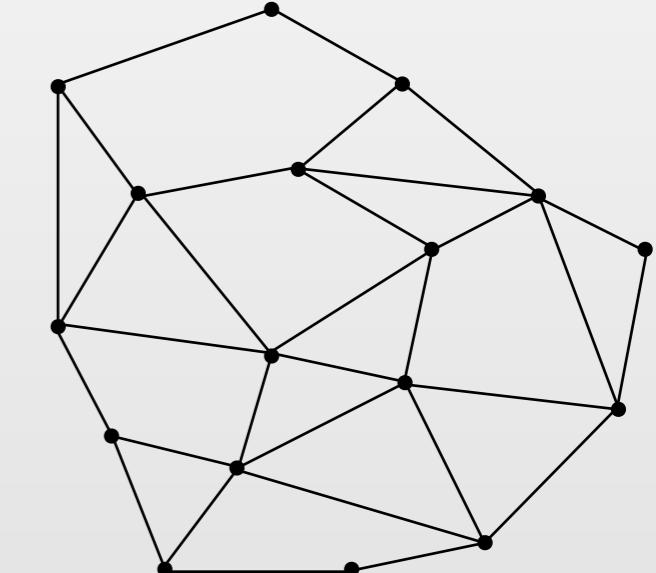
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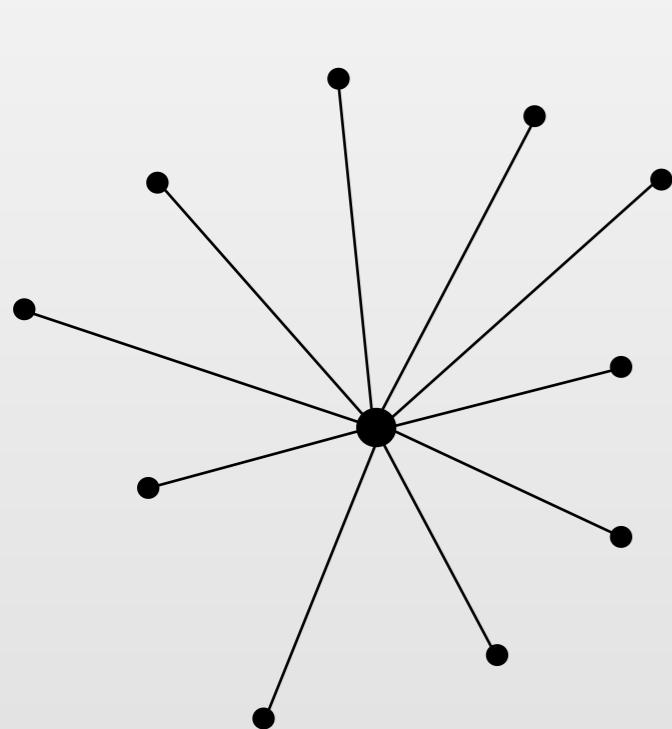


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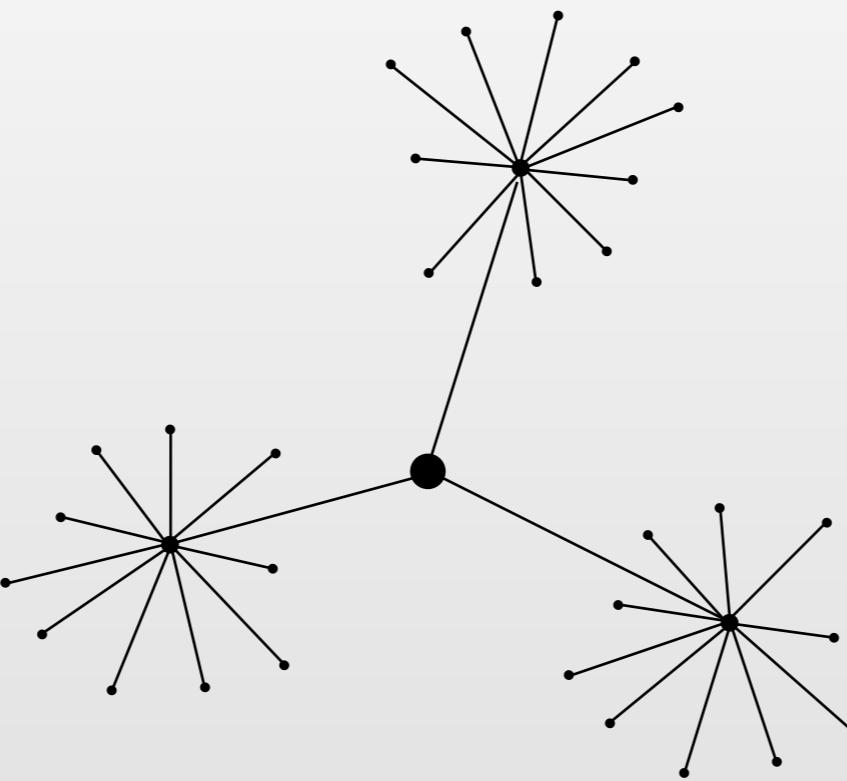


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BLOCKCHAINS

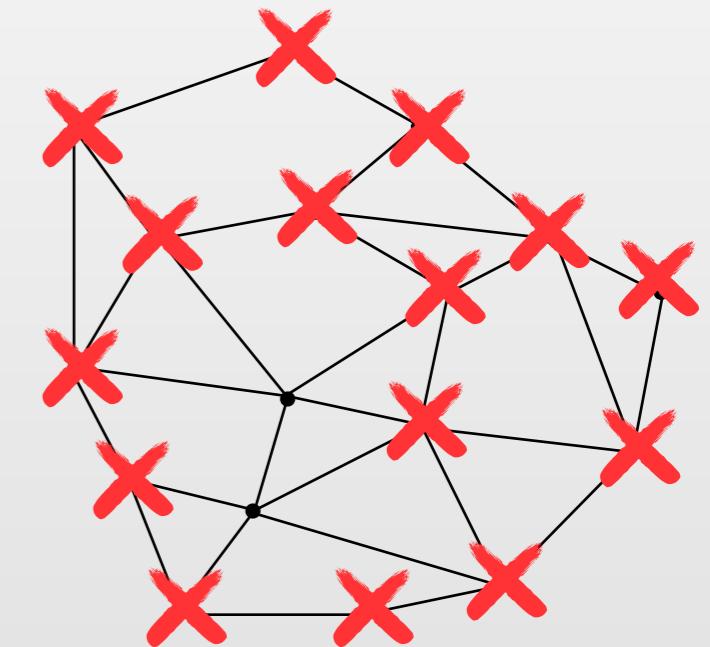
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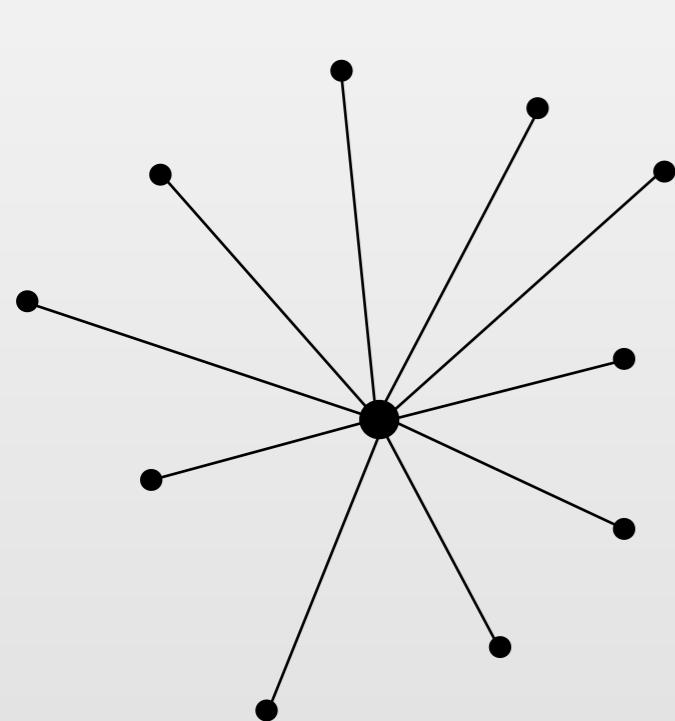


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THE CLOUD

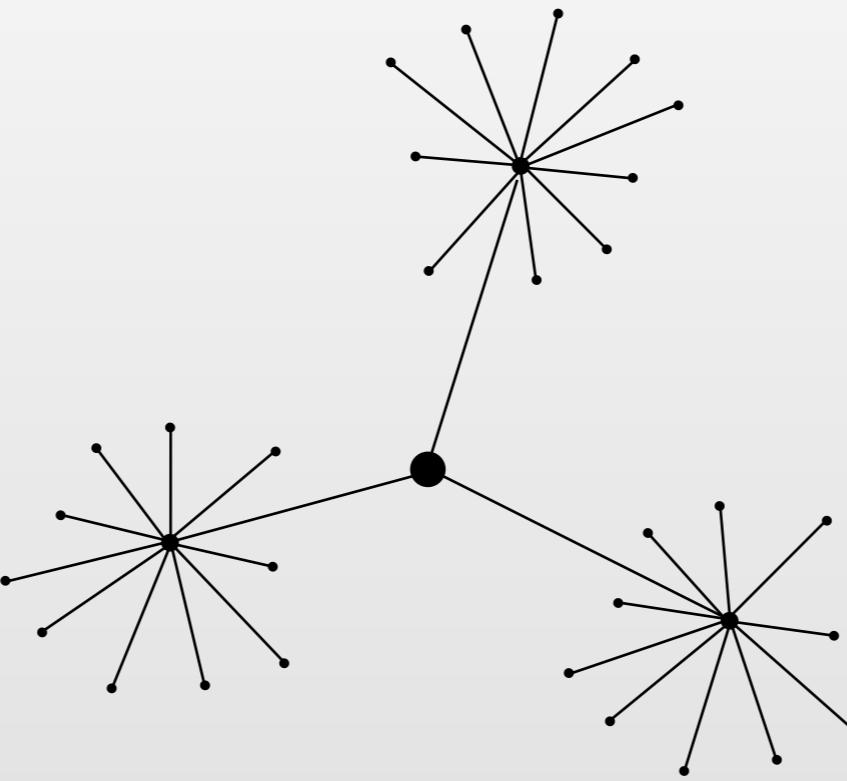


DISTRIBUTION
BLOCKCHAINS

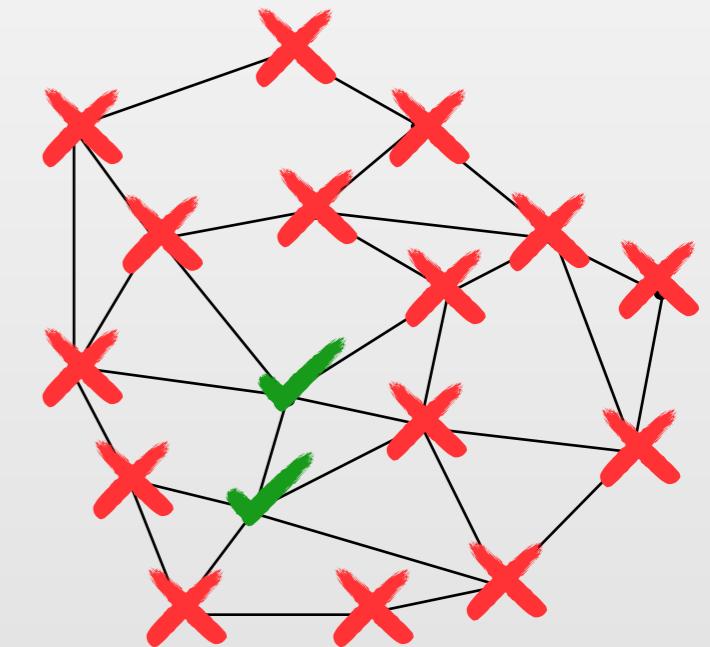
THE EVOLUTION OF EVERYTHING ...?



CENTRALIZATION
DATABASE



DECENTRALIZATION
THE CLOUD



DISTRIBUTION
BLOCKCHAINS

BLOCKCHAINS ARE SIMPLY A NETWORK OF NODES

- Each member of the network runs their own node and all nodes are equal
- The blockchain becomes more secure as more nodes join the network
- All transactions across the entire network are tracked by each node
- **There are no actual coins** - there is only a ledger of who owns what
- Cryptographic key-pairs represent accounts and passwords
- On the blockchain - no one knows you're a fridge



EVERY ACCOUNT IS MERELY A SET OF KEYS



EACH “ADDRESS” REQUIRES A PRIVATE KEY TO ACCESS IT



SOME ADDRESSES EVEN REQUIRE MULTIPLE KEYS



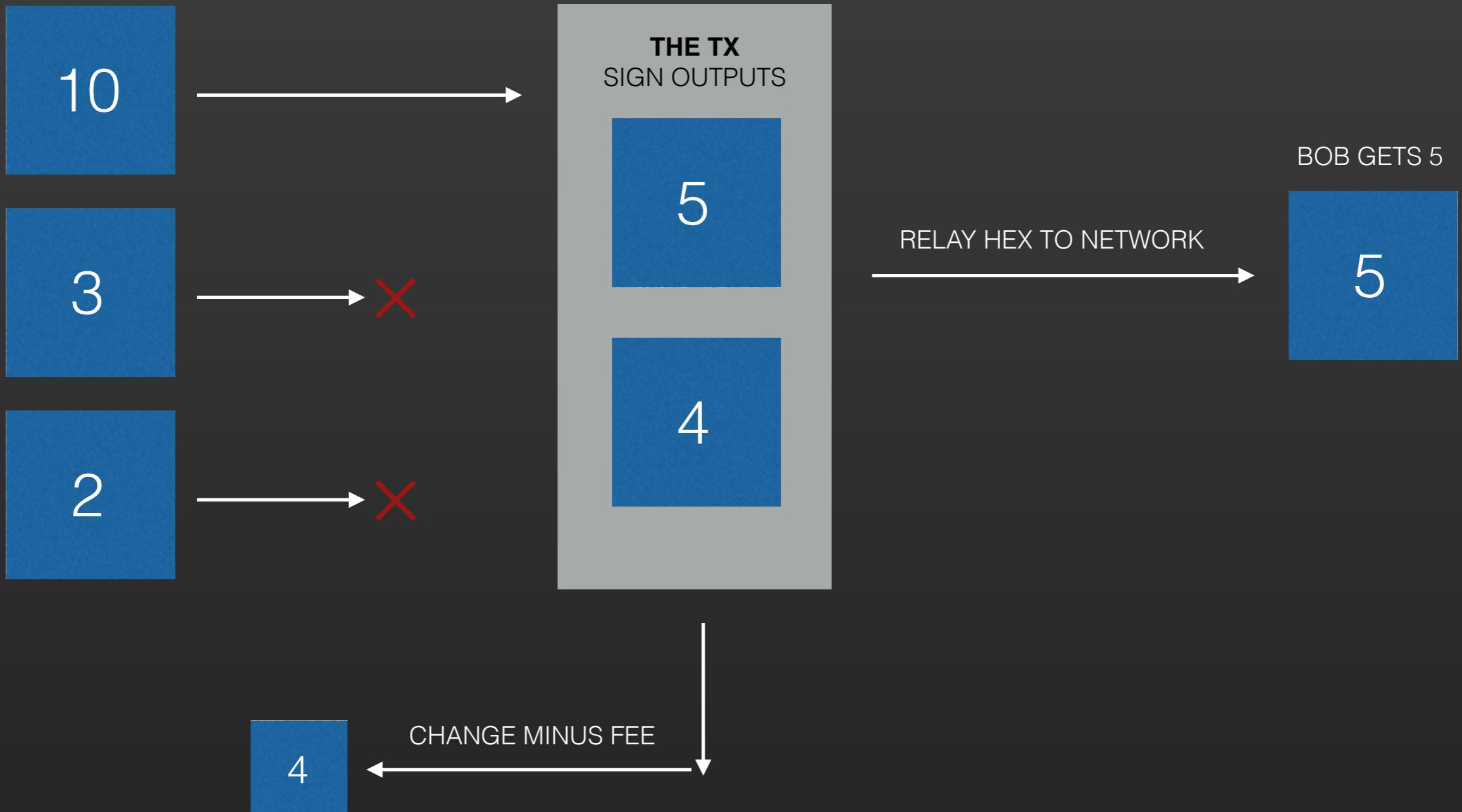
WHAT'S IN A BITCOIN TRANSACTION?

- Multiple unspent inputs are used in order to form the total value sent
- Cannot send proportions of inputs, must use all and send the change back
- Because a single transaction can send multiple values to multiple outputs
- Fees are based upon the total size (inputs and outputs) rather than value
- Paying these fees is done by forgetting to send some value to someone
- Transaction scripts can contain complex variables (multi-sig & timed locks)



ALICE CAN'T SEND WHAT SHE DOESN'T HAVE AND BOB WANTS 5

ALICE'S UNSPENT INPUTS

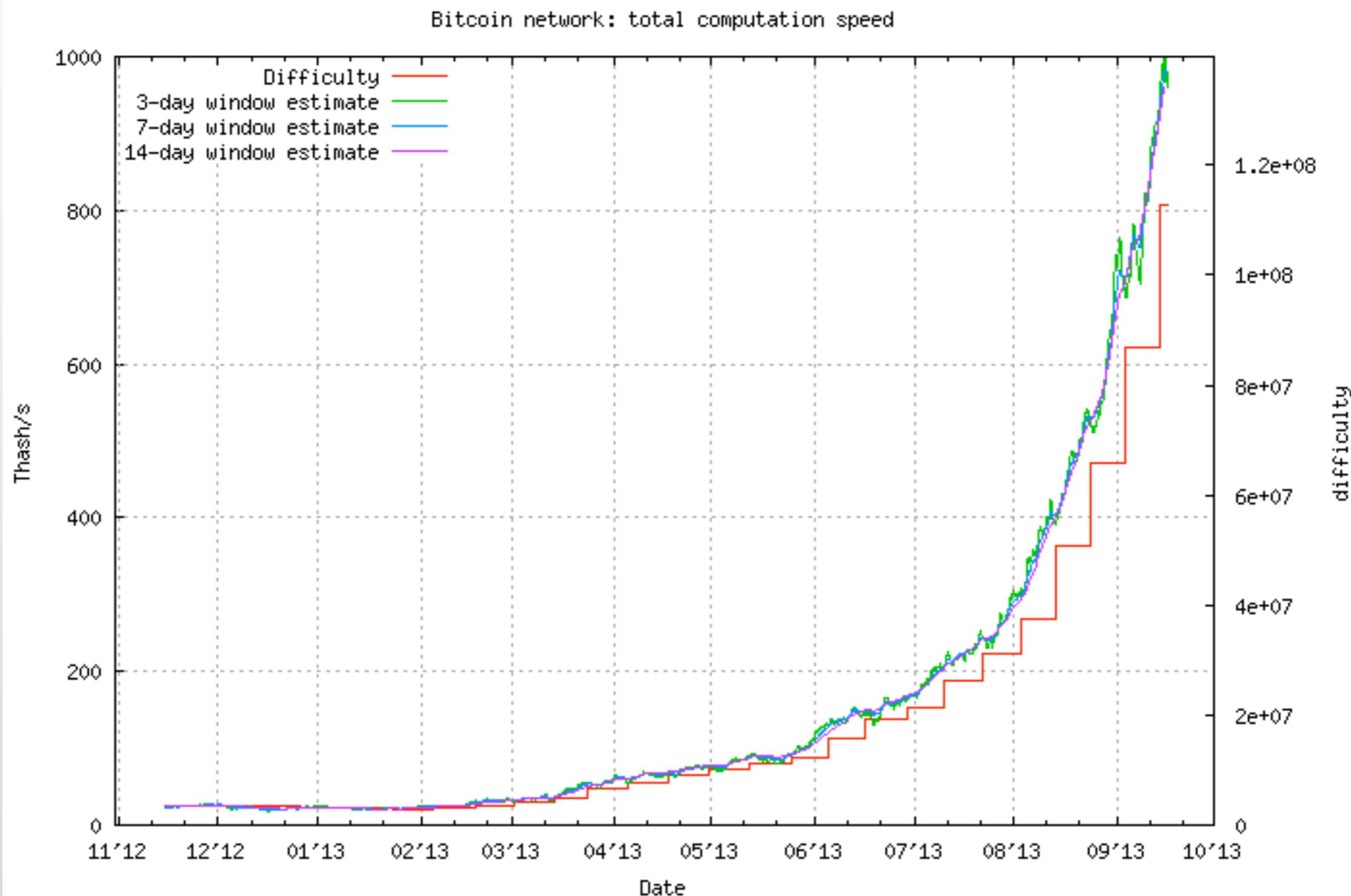


PUTTING THE BLOCKS INTO THE BLOCKCHAINS

- Transactions are batched into blocks every ten minutes (with Bitcoin)
- To reach **consensus** as to which node has the right to add the next block to the chain, miners compete in a race to solve cryptographic equations
- They then add a nonce (one use number) to the block and hash it
- If the hash has X number of zeros at the beginning it becomes a valid block
- Otherwise the miners increase the nonce and they hash the block again
- Solving these cryptographic equations is becoming increasingly difficult



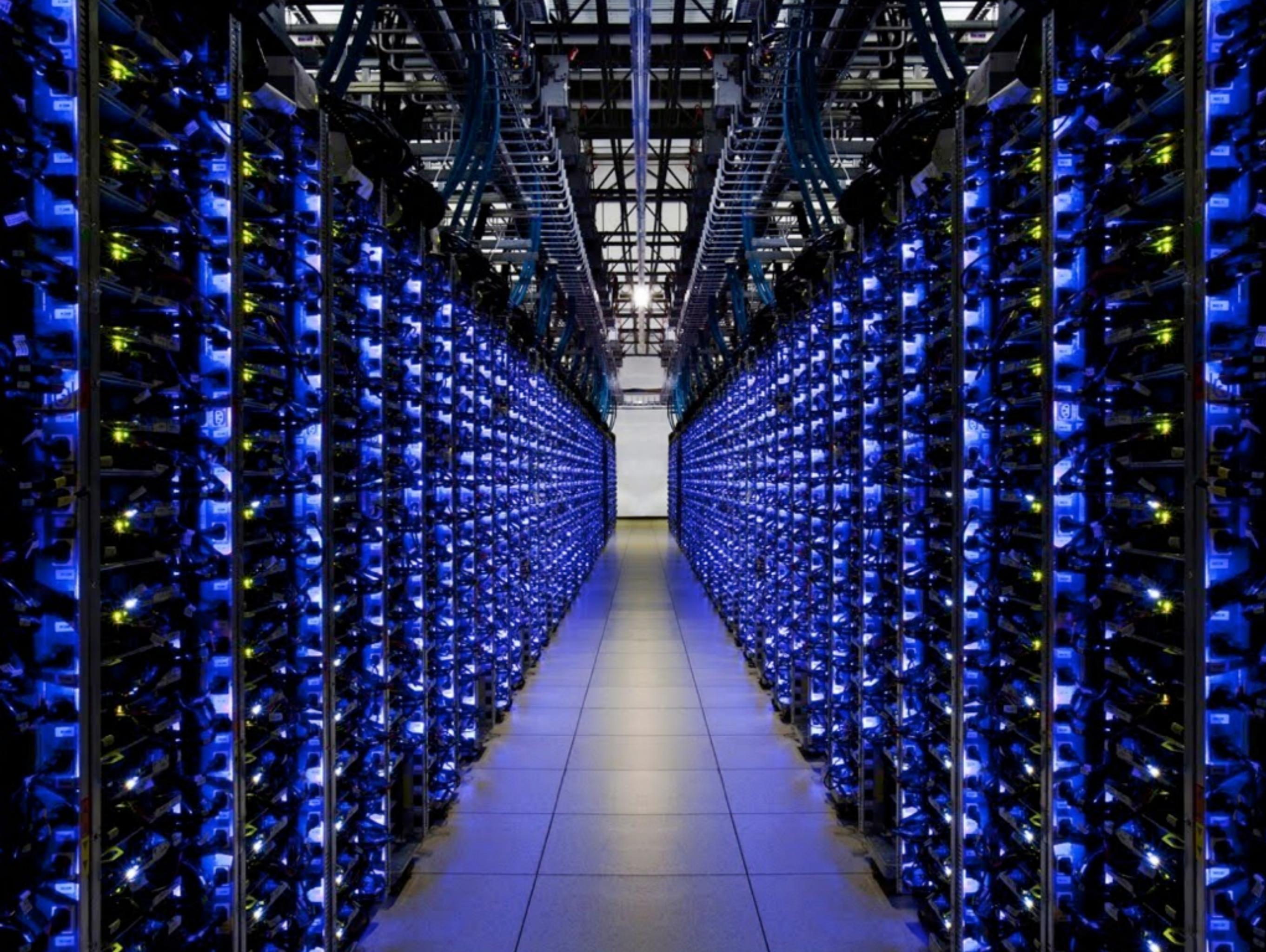
THIS IS THE HASHING POWER OF THE NETWORK IN 2013





MINING IS NOW A BILLION DOLLAR BUSINESS





BITCOIN ISN'T EVERYTHING
BILLIONS INVESTED IN BLOCKCHAINS

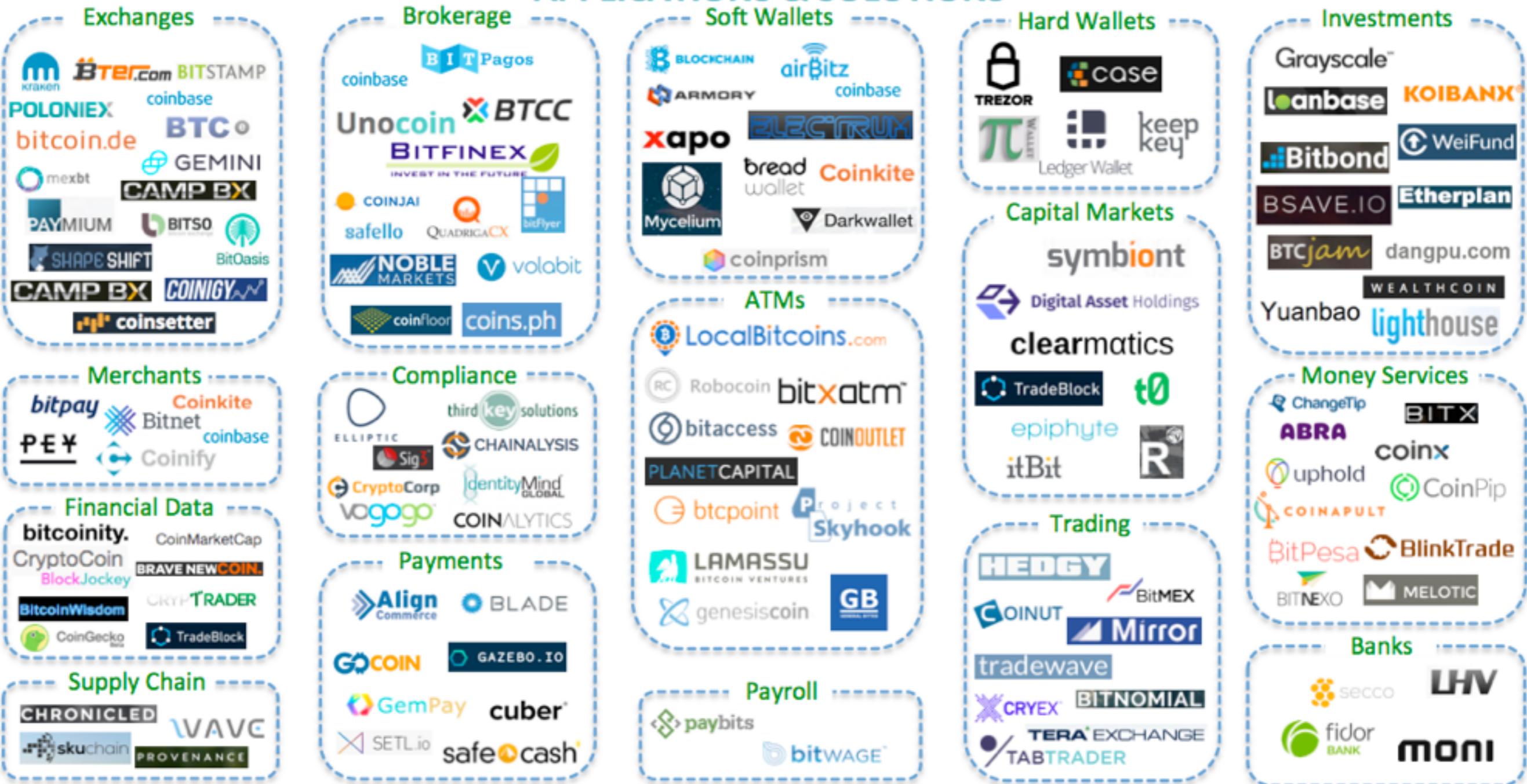
BANKS ARE MOVING FAST DUE TO ECOSYSTEM MATURITY

As of January 2016, more than 60 banks and leading financial institutions have made statements confirming that they are actively working on blockchain projects.



BLOCKTECH in FINANCIAL SERVICES Landscape

APPLICATIONS & SOLUTIONS



MIDDLEWARE & SERVICES



INFRASTRUCTURE & BASE PROTOCOLS



SOME OF THE INSTITUTIONS LEADING THE WAY



Custom blockchain
for settlements



Standard
Chartered



Blockchain based
trade finance platform

Blockchain based
loyalty platform

Blockchain based
remittance platform



multiple blockchains for cross-
border payments and loyalty

Deutsche Bank



Exploring KYC and AML
via the blockchains



Patented a blockchain
based wire transfer system



NASDAQ®

IBM

IMITATION IS THE BEST FORM OF FLATTERY



- 1st Generation of Alt-Coins forked each other with minor tweaks
- Basic breakout alt-coin successes included Litecoin and Dogecoin
- Dash (previously known as DarkCoin) worth noting due to governance
- See the Malaysian-Based **CoinGecko** for a better list!

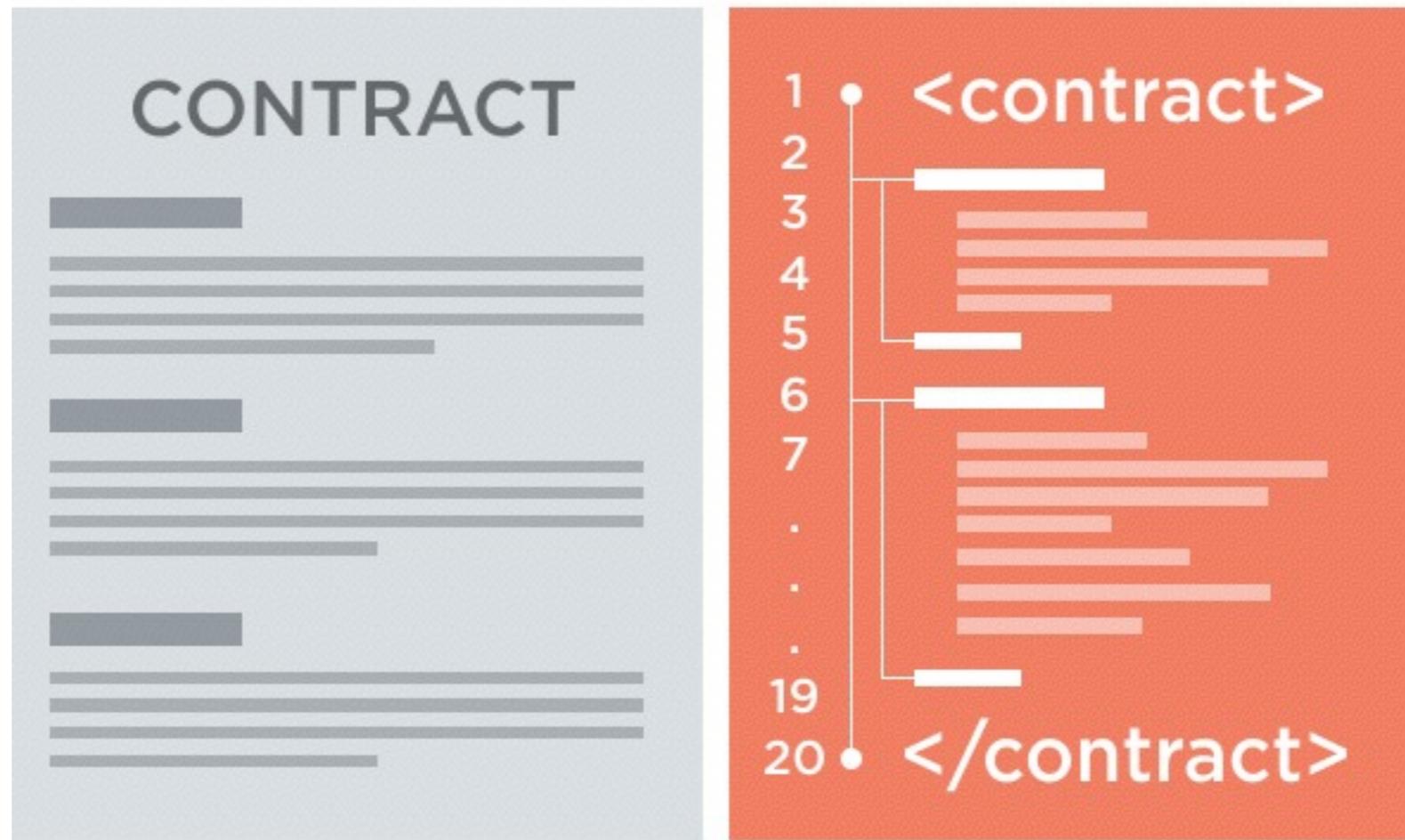
ETHEREUM TAKES THINGS ONE STEP FURTHER



THE WORLD'S SUPER COMPUTER...?

- Raised US\$15 Million in crowd-funding when launching their Ether currency
- Aiming to be the first turing complete blockchain, they have almost achieved it
- Heavily supported by Microsoft & also being used by IBM for their IoT platform
- Recently raised US\$150 Million in crowd-funding their own venture fund
- However, the more moving parts a system has - the more likely it is to break

SMART CONTRACTS ARE EVERYWHERE



- Even Bitcoin utilizes basic smart contracts (with over 100 script functions)
- Smart contracts are snippets of code stored and executed by the network
- They can perform transactional based events if defined conditions are met

WHAT'S REALLY IN A TRANSACTION?

CO-FOUND... BLOCKSTRA... Blockstrap msmalley/f... Everstore ATA-Plus A... Legality of ... bitcoin tran... mining bitc... Mining Bitcoin i... BlockAuth http://...0fd21

api.blockcypher.com/v1/btc/test3/txs/235a88e9853c1c116ef47f795f13ce200c2e1bf37667e99973e1c829f95t bitcoin transaction script

```
{ "block_hash": "00000000009f30c59abf2f8556c0949c79b54764f4cbb223ca43527394d3ee2f", "block_height": 847281, "block_index": 24, "hash": "235a88e9853c1c116ef47f795f13ce200c2e1bf37667e99973e1c829f95b95f7", "addresses": [ "mpNENnsFcL8a5hPxwfPrYPkZqAkbbFpxLF", "mq7tNFrbi3E3fsuUbsTsA7keoeYL6gYzv2" ], "total": 86124000, "fees": 10000, "size": 339, "preference": "medium", "relayed_by": "", "confirmed": "2016-05-16T07:51:20Z", "received": "2016-05-16T07:51:20Z", "ver": 1, "lock_time": 0, "double_spend": false, "vin_sz": 2, "vout_sz": 1, "confirmations": 19557, "confidence": 1, "inputs": [ { "prev_hash": "bb4cef4d48dba1916c73552342b660be00535c43ad47462abf43a402cc2a61a1", "script": "4730440220618bd76a683d2603edb570e66b851f85dd594abd7a3c25a2b29064b01695907502201edeac4cd777e04a393cf1bca0d7ba5916e3fc8c67efa33268a936bf96b9a7e012103530d0cbdfcd448b8d96ac9c1cbdc88a2f60e05a7f16e7ab321185afb0523e9fc", "output_value": 86124000, "sequence": 4294967295, "addresses": [ "mpNENnsFcL8a5hPxwfPrYPkZqAkbbFpxLF" ], "script_type": "pay-to-pubkey-hash" }, { "prev_hash": "42662b2544a7f59alabd004a8e15c714f108f553f1dd3f0617982eb5b8ac468c", "script": "483045022100f7ab281bcb605550098f62a097b6dbef79a9f35261aae9dc01aec54a08e8212b02201261b2d0f44545a551fe54f1777597e747523f0a66b7fcfc74521828c67f23887012103530d0cbdfcd448b8d96ac9c1cbdc88a2f60e05a7f16e7ab321185afb0523e9fc", "output_value": 75550000, "sequence": 4294967295, "addresses": [ "mpNENnsFcL8a5hPxwfPrYPkZqAkbbFpxLF" ], "script_type": "pay-to-pubkey-hash" } ], "outputs": [ { "value": 86124000, "script": "76a914695469844938fd58e5cf59987f4cc063d4d657a788ac", "addresses": [ "mq7tNFrbi3E3fsuUbsTsA7keoeYL6gYzv2" ] } ] }
```

DECODING SCRIPT HEXES

- 80% of transactions are known as **standard transactions**
 - OP_DUP OP_HASH160 <pubKeyHash> OP_EQUALVERIFY OP_CHECKSIG
- Approximately 1% of transactions contain **OP>Returns**
 - OP_RETURN <hexedData> - can you find Gandhi?
- There are even a few hidden puzzles on the blockchain...

OP_HASH256

6fe28c0ab6f1b372c1a6a246ae63f74f931e8365e15a089c68d6190000000000

OP_EQUAL

ETHEREUM TAKES THINGS ONE STEP FURTHER

```
contract MyToken {
```

```
    /* Public variables of the token */
    string public standard = 'Token 0.1';
    string public name;
    string public symbol;
    uint8 public decimals;
    uint256 public totalSupply;
```

```
    /* Allow interface to create tokens */
    function MyToken( ... )
```

```
    /* Send coins */
    function transfer( ... )
```

```
    /* Allow another contract to spend some tokens in your behalf */
    function approveAndCall( ... )
```

```
    /* A contract attempts to get the coins */
    function transferFrom( ... )
```

```
}
```

CURRENCIES CAN BE MANY THINGS - EVEN VOTING RIGHTS

- Symbol = %
- Decimals = 2
- Name = Equity

Contracts can also be linked, which allows governance contracts (DAOs) to then be able to vote and control upon custom currency transfers...

**THE BANKS OF THE FUTURE
HAVE ZERO EMPLOYEES**

BANKING ON THE FUTURE OF BLOCKCHAINS

- With banks already KYC and AWL compliant, there are no entities more suited to be offering digital currency brokerage and key management
- With the advent of smart-contracts, banking becomes a sequence of code
- Regulation and compliance would be designed as part of the protocol
- If retail and commercial banking processes were 100% based upon blockchains, staffing requirements could be reduced by at least 90%
- Existing internal infrastructure can be replaced by distributed protocols



2ND PLACE WINNER OF THE DBS BLOCKCHAIN HACKATHON

The image shows a hand holding a white smartphone displaying the HyperBank mobile application. The app's interface includes a header with the 'hyperbank' logo and a user profile for 'Tristan Gomez'. Below this are two main sections: 'Monthly Accounts' (12) and 'Monthly Transactions' (128) on top, and 'Total Accounts' (28) and 'Total Transactions' (1,286) on the bottom. A transaction history section follows, showing three entries: '2 Hours Ago - New Account Manuel Rigardo', '18 Hours Ago - TX Jarvis Silo to Manuel Rigardo', and '1 Day Ago - New Account Jarvis Silo'. At the bottom are five navigation icons. To the right of the phone is a laptop screen displaying the HyperBank website with the tagline 'hyperlocal banking for the unbanked'. It features a search bar for 'enter your email for updates or application for beta access' and a yellow 'APPLY' button. The background of the slide is a blue textured pattern.

The application that was previously known as NuBank won 2nd place at the recent [DBS Hackathon](#) in Singapore and is now HyperBank.

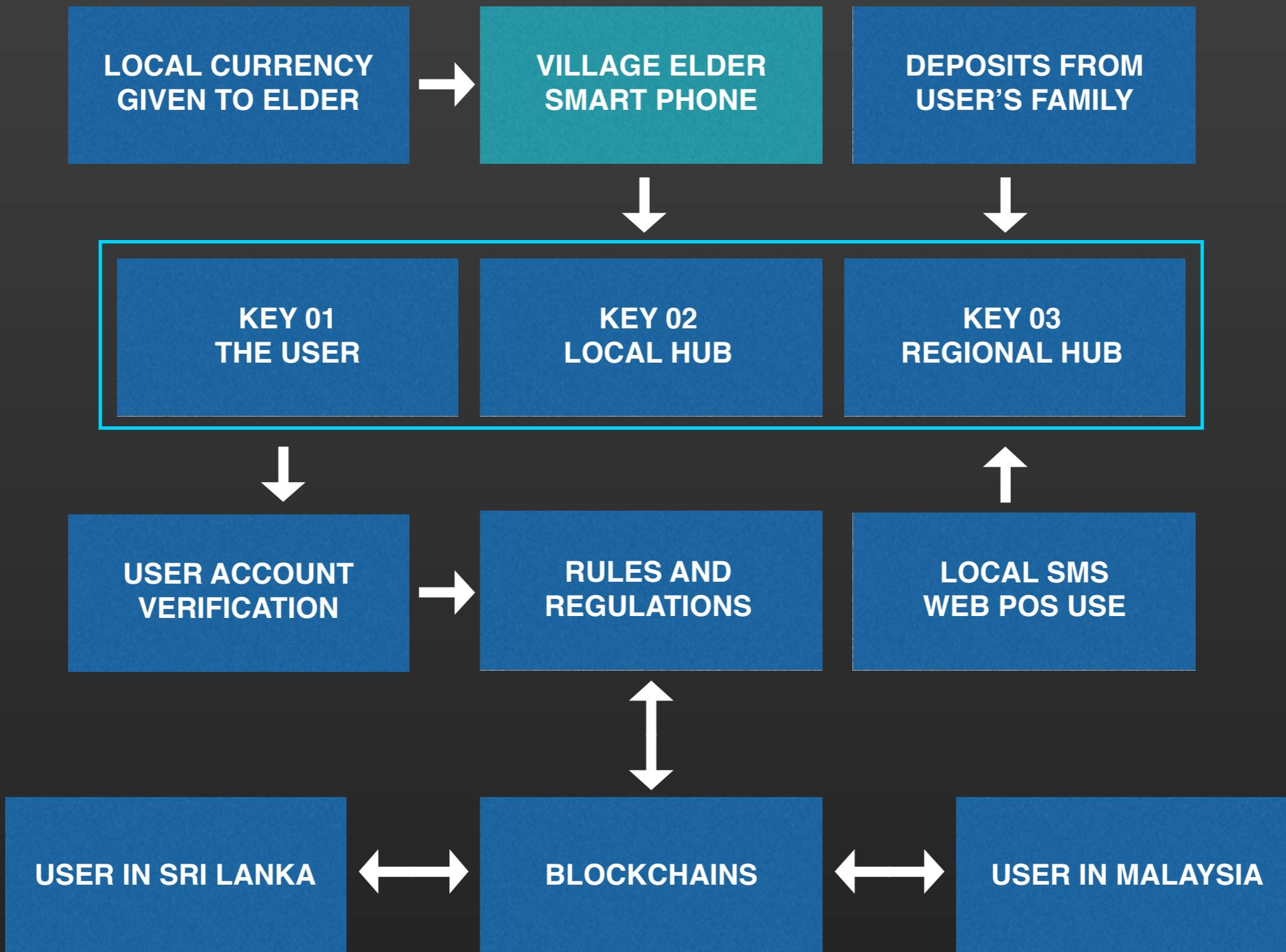
We utilize the blockchains in order to provide a secure and fully auditable digital trail of transactions but avoid volatility by keeping transfers at fixed local currencies with multi-signature signing from top-tier institutional financial partners.

Consumers communicate using standard SMS functionality directly with their village elders who then use their smartphones to record and relay transactions to the blockchain - providing fully distributed M-Pesa functionality.

PROVIDING HYPERLOCAL BANKING TO THE UNBANKED

- One village elder with smart-phone creates and verifies accounts locally
- Multi-signature keys provided to elder, account owner and regional hub
- Regional hubs could be traditional banks - acting as arbitrators for disputes
- Deposits can be made in any currency accepted both locally or regionally
- Local users transfer directly via local hubs or internationally via regional hub
- Standard SMS can be used to transfer funds and make direct payments
- Web-based technology can be utilized by other inter-network participants

HYPERLOCAL BANKING IN A GLOBAL WORLD



THANK YOU

NOW IS THE TIME TO QUESTION THINGS

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