

UNDERSTANDING BLOCKCHAIN FOR THE BIZ



Steve Wong

Cloud, Platforms & IT Outsourcing (CPI) Group

DXC Technology



@SteveWongLA



Pete Ludé

CTO

Mission Rock Digital

pete@MissionRockDigital.com

How many have heard of...

BLOCKCHAIN

?

“Blockchain allows for one Internet user to **transfer** a unique piece of **digital property** to another Internet user such that the transfer is guaranteed to be **safe and secure**...

The consequences of this breakthrough are hard to overstate.”

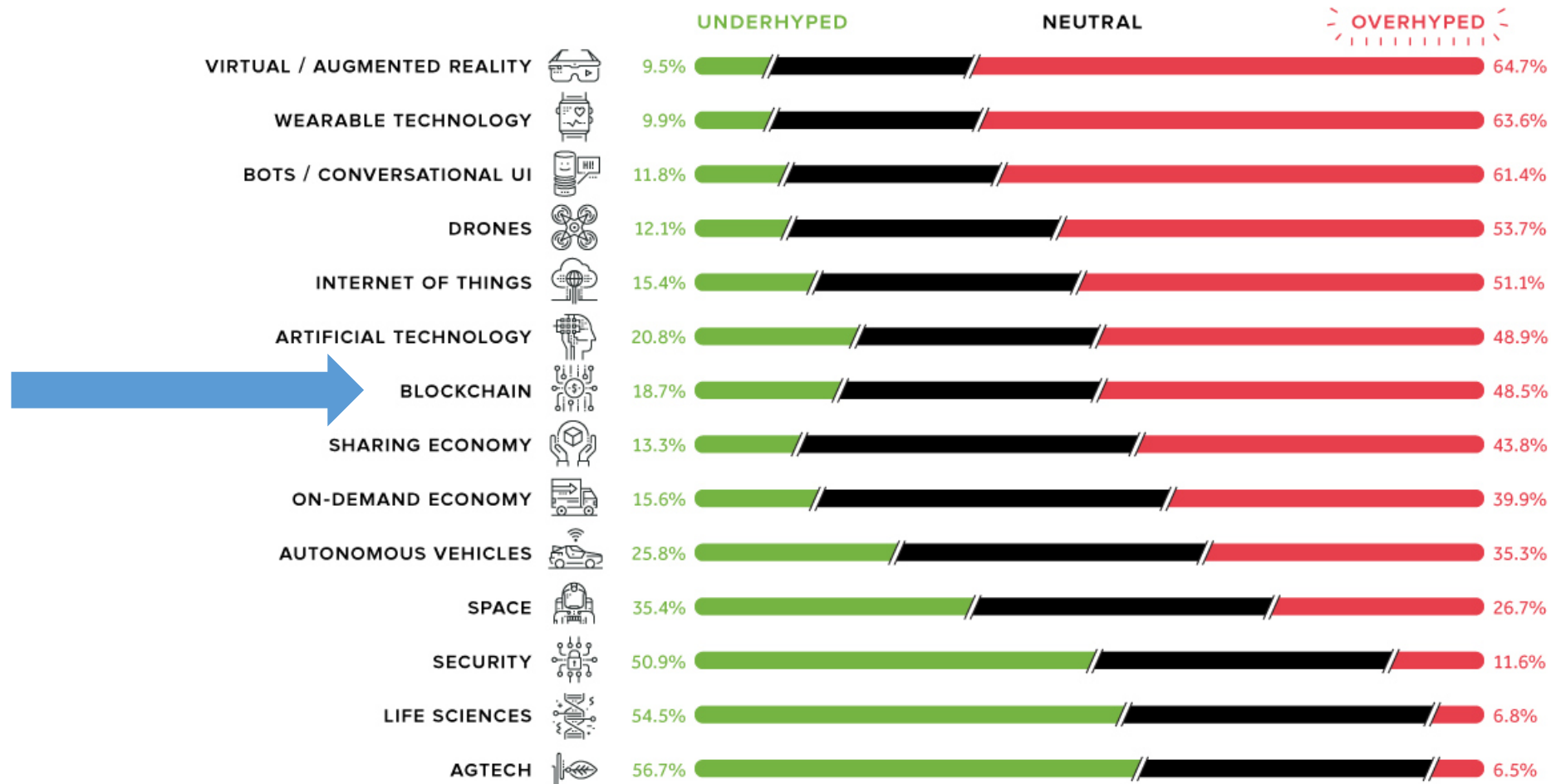
- **Marc L. Andreessen**, Co-founder Andreessen Horowitz & HPE Board of Directors

Agenda

- Isn't this a bunch of Hype?
- Well then, What is Blockchain again?
- How does it work?
- Where is Blockchain now?
- Businesses Benefits
- Blockchain applications
- Conclusions



Hype?



<https://www.visualcapitalist.com/overhyped-sectors-tech-entrepreneurs/>

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Hype?

Google Trends

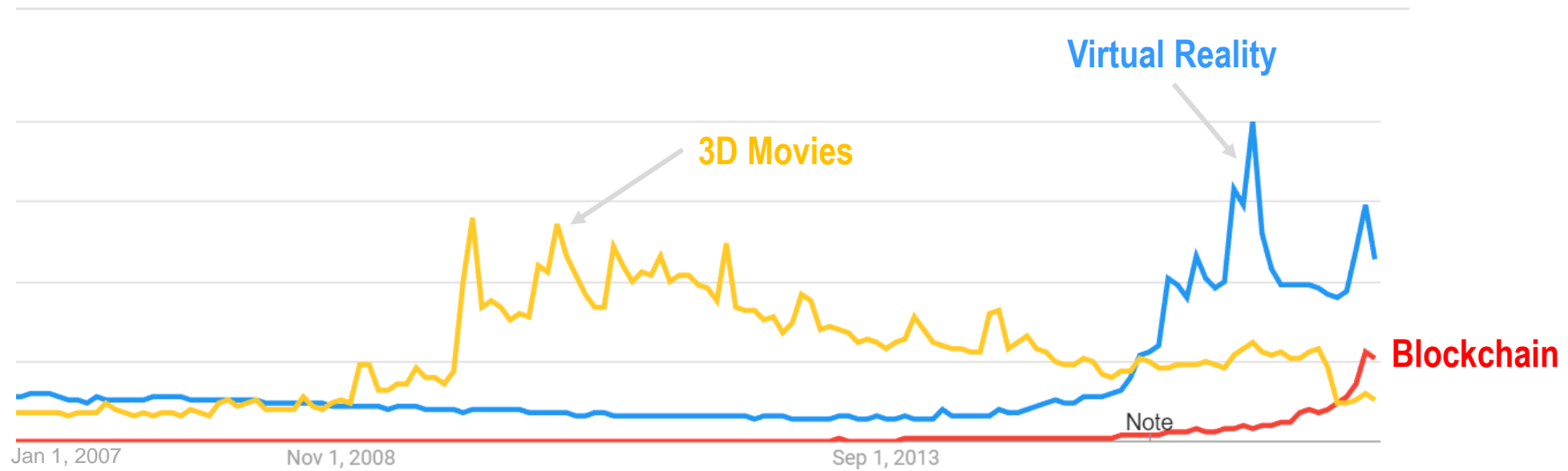
Interest over time ?

Searches on "Block Chain"






Hype?

Google Trends



ISO-IEC JPEG Exploring Blockchain



ISO/IEC JTC 1/SC29/WG1 N78005
78th Meeting – Rio de Janeiro, Brazil – 27 January - 2 February 2018

**INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC1/SC29/WG1
CODING OF STILL PICTURES**

ISO/IEC JTC1/SC29/WG1 N78005
Date: 2018-2-2

Press Release
Contacts: Antonio Pinheiro, Frederik Temmermans (pr@jpeg.org)

For immediate release

February 2, 2018 – Rio de Janeiro, Brazil

JPEG explores blockchain in its standards

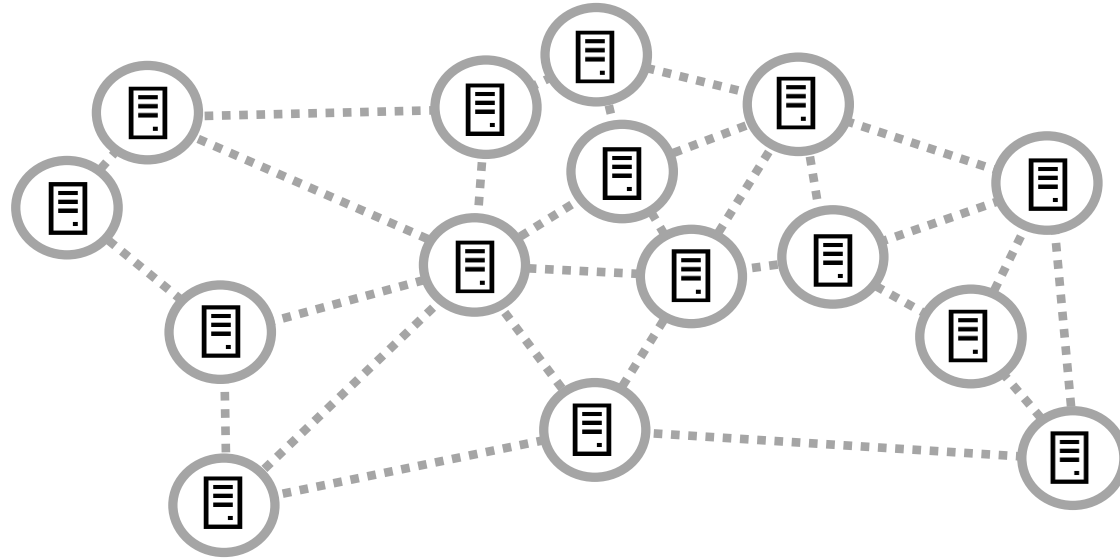
The JPEG Committee had its 78th meeting in Rio de Janeiro, Brazil. Relevant to its ongoing standardization efforts in JPEG Privacy and Security, JPEG organized a special session to explore how to support blockchain and distributed ledger technologies to past, ongoing and future JPEG family of standards. This is motivated by the fact that considering the potential impact of such technologies in the future of multimedia standardization will be required to

ISO-IEC JPEG Exploring Blockchain



“Blockchain and distributed ledger technologies promise a significant impact on the future of many fields. JPEG is committed to provide standard mechanisms to apply blockchain on multimedia applications in general and on imaging in particular.” said Prof. Touradj Ebrahimi, the Convenor of the JPEG Committee.

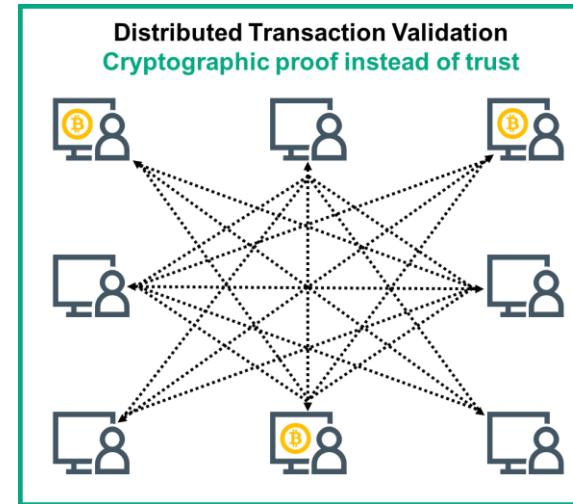
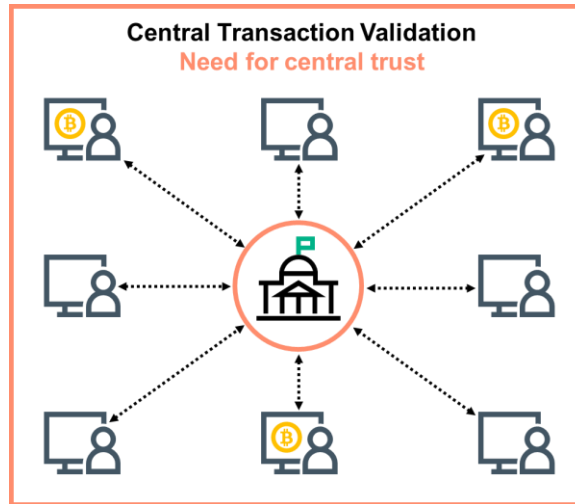
What is Blockchain again?



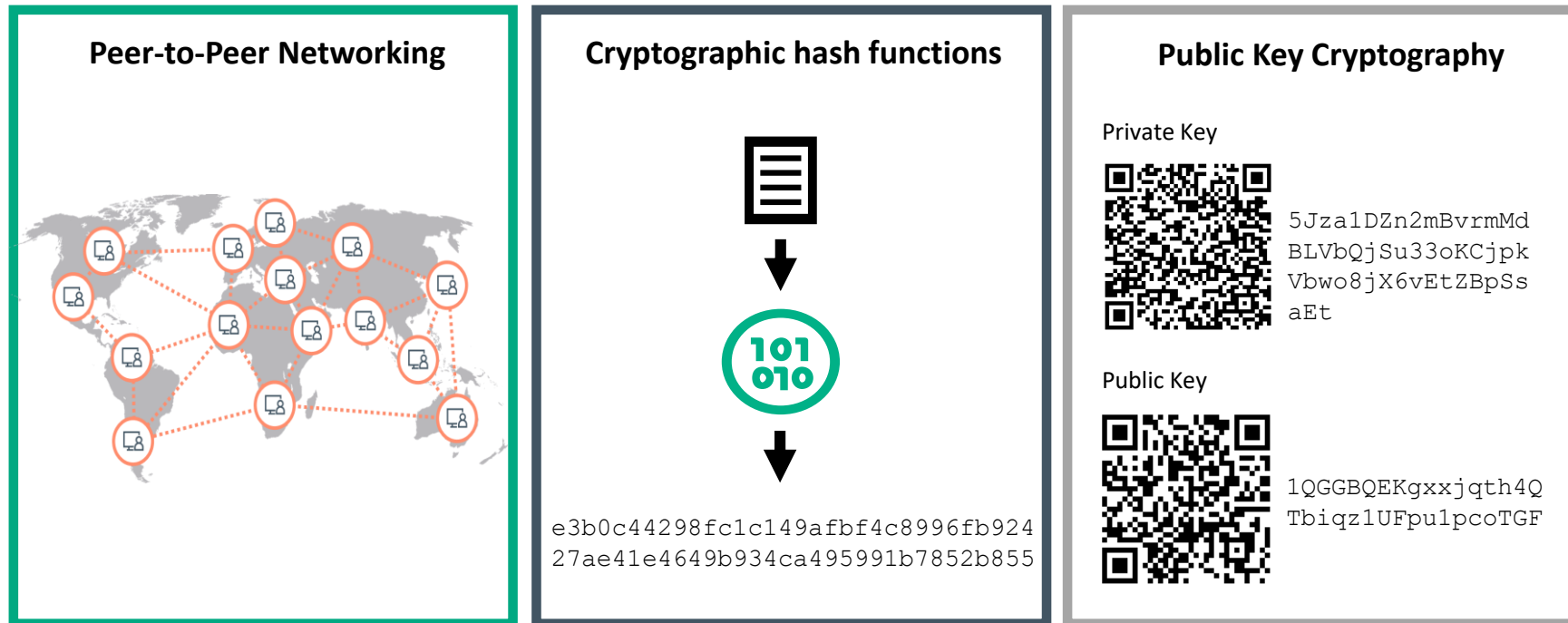
- The technology behind Bitcoin
- A **ledger of transactions** replicated to all servers
- Distributed, **peer-to-peer network**
- Requires no central authority
- Digital cryptography ensures
 - Transactions are verifiable
 - System is tamper-proof
- Ledger updates are applied through automated network consensus

...and why was it invented?

Because “... no mechanism exists to make payments over a communications channel **without a trusted party**”

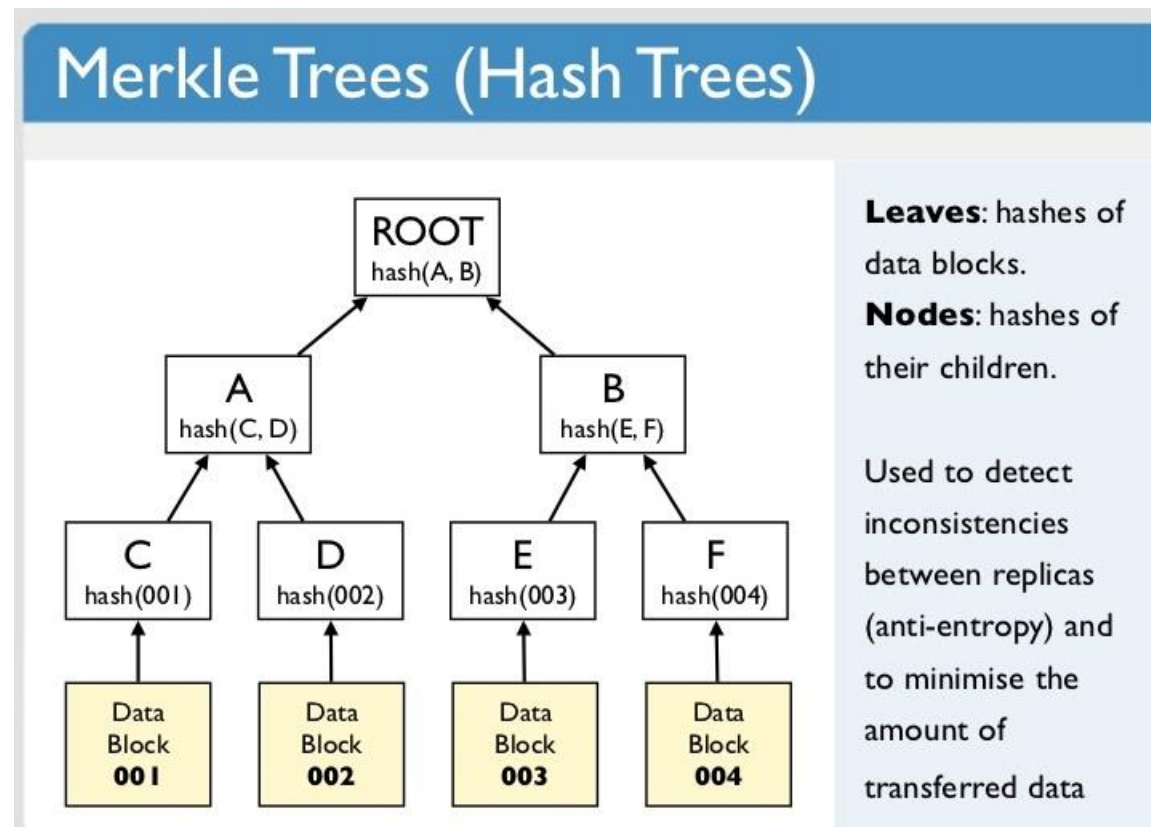


Technology Basics



Technology Basics

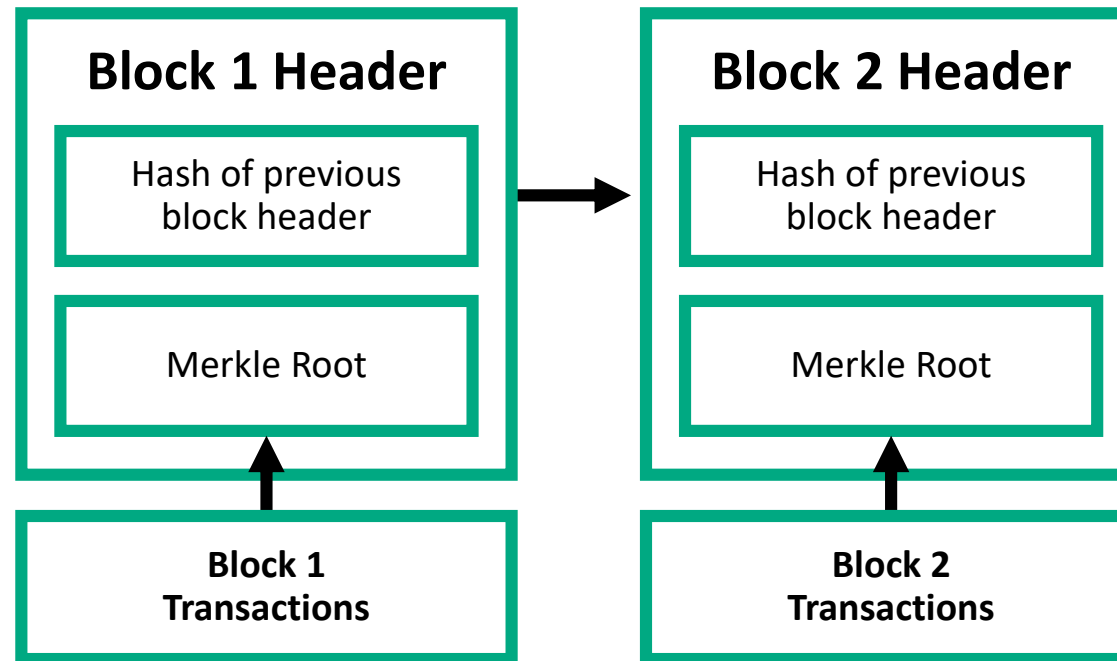
Merkle tree: every leaf node is labelled with a data block and every non-leaf node is labelled with the cryptographic hash of the labels of its child nodes.



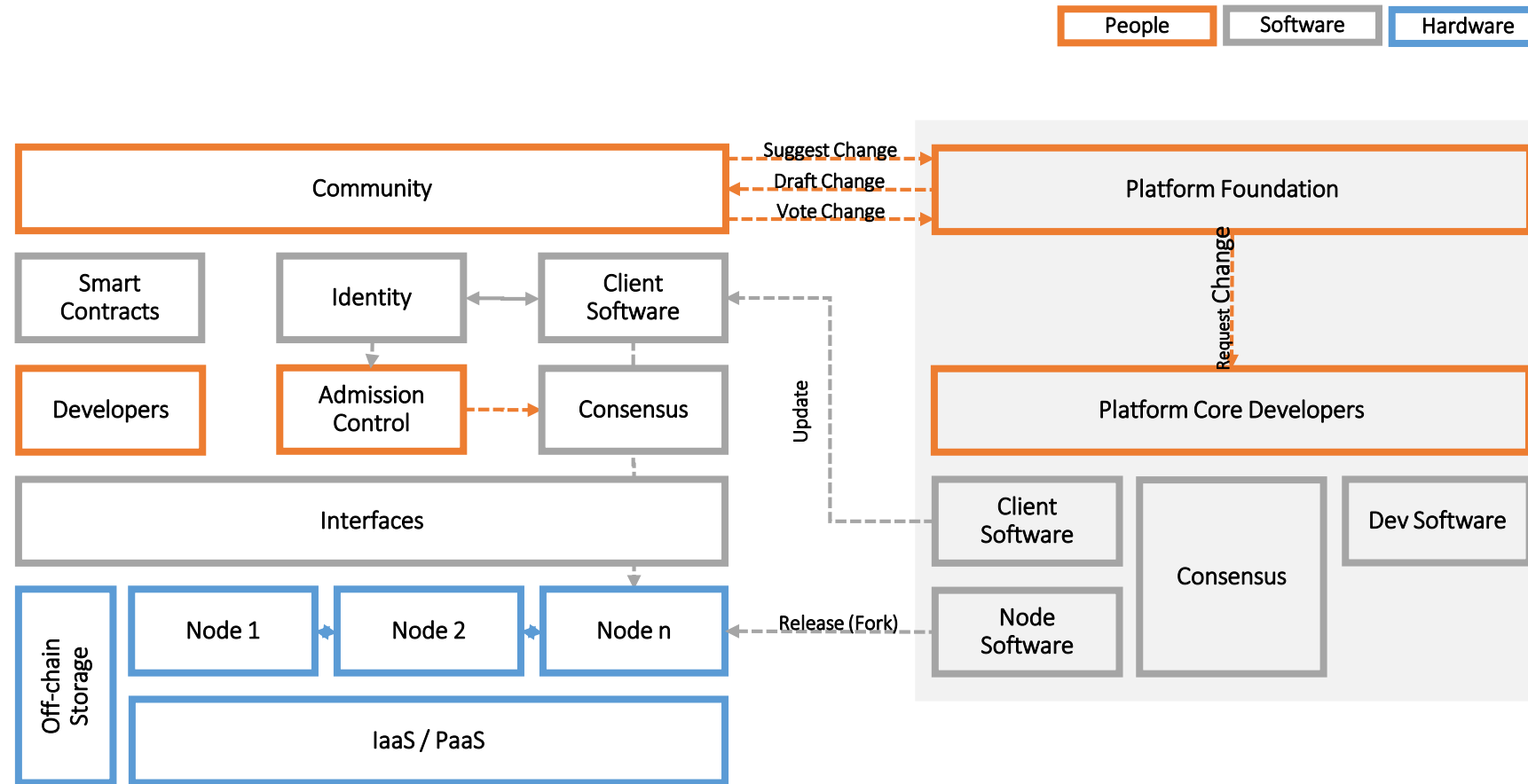
How does Blockchain work?



How does Blockchain work?



Blockchain Functional View





Don't cryptocurrency transactions take an extraordinary amount of electric power?

Mining



Bitcoin mining – simple (in theory)

Bitcoin Mining involves

- 1) Picking a random number between 0 and 4,294,967,296 (the “nonce”)
- 2) Organizing recent transactions plus the nonce into a block
- 3) Perform a Hash Function
- 4) Check the results against known value

If it matches, **you win**

12.5 bitcoins

~ \$132, 000 as of today



Example of a Double SHA-256 Hash

(start with the character string): **Hollywood Professional Alliance**



Perform Hash Function

ee6fdd2164997c36209d06625b905c2ab8933a1bd3c11e282a771a2326c72227



Converted from hex to binary...

```
11101110 01101111 11011101 00100001 01100100 10011001 01111100 00110110
00100000 10011101 00000110 01100010 01011011 10010000 01011100 00101010
10111000 10010011 00111010 00011011 11010011 11000001 00011110 00101000
00101010 01110111 00011010 00100011 00100110 11000111 00100010 00100111
```

Try it yourself! <http://www.xorbin.com/tools/sha256-hash-calculator>

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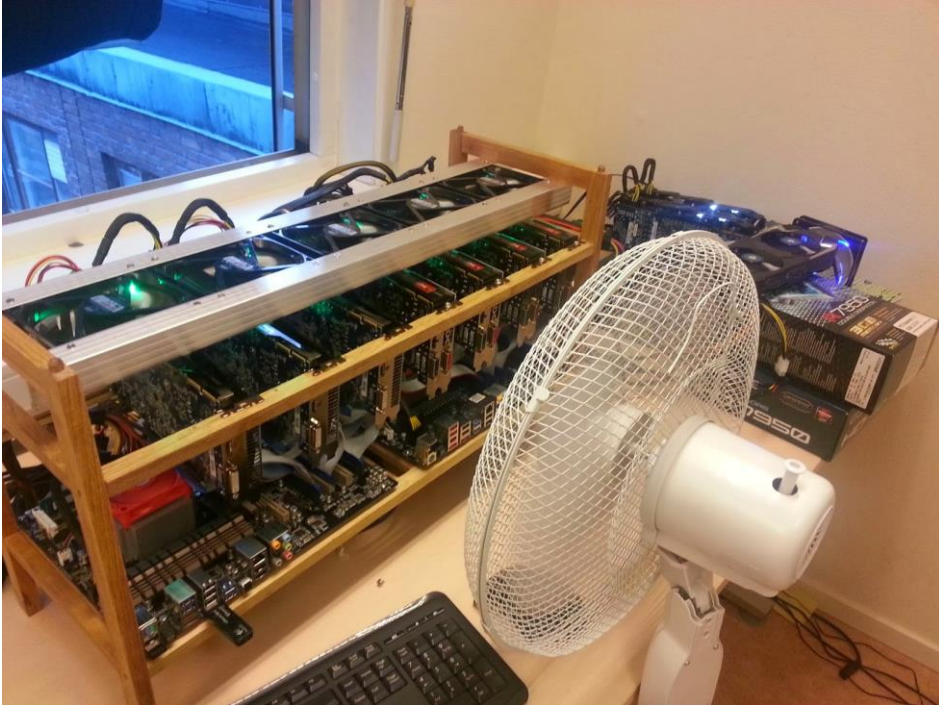
21

It's possible to try this by hand....

	c	e	2	0	b	4	7	e	
Σ	1100	111000	100000	100000	10110100	110100	01111110		Σ
>> 22	00100	111100	1100100	100100	11001110	11010101010000			Σ
>> 13	001100	11001110	1101101010100000	10010010011110					Σ
>> 2	110110	10100000	10001001110011001001001						Σ
A	6	a	0	9	e	6	6	7	Σ
B	b	b	6	7	a	e	8	5	Σ
C	3	c	6	e	f	3	7	2	Σ
maj	0011	1000	11011101110011011001010010						Σ
D	a	5	4	f	f	5	3	a	Σ
Σ	3	5	8	7	2	7	2	b	Σ
>> 25	1000	011100	101001001001001001111110101000						Σ
>> 11	0100	111111101010001000011100101010							Σ
>> 6	1111	1101010001000011100101001001							Σ
E	5	1	0	e	5	2	7	f	Σ
F	9	b	0	5	6	8	8	c	Σ
G	1	f	8	3	d	9	a	b	Σ
h	0001	111100	0101100100100110001100						Σ
H	5	b	e	0	c	d	1	9	Σ

Ken Shirriff <https://gizmodo.com/mining-bitcoin-with-pencil-and-paper-1640353309>

The Early days...



GPU mining



FPGA rigs

Latest generation of ASIC mining rigs

BITMAIN



- 189 ASICs (16 nm technology)
- Each ASIC: 100 cores
- 14 terahashes / second
- 1,440 watts



Mining ASIC's are a real business...



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TECH

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Samsung is making chips designed to mine cryptocurrencies like bitcoin

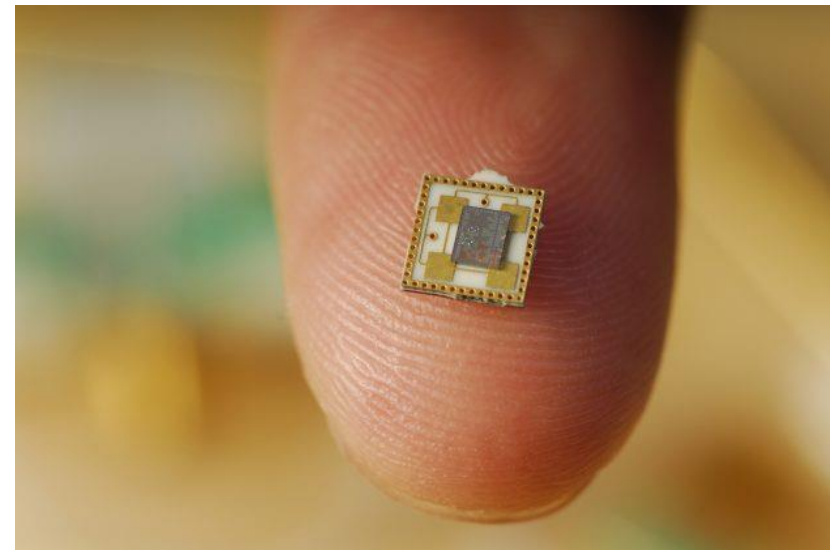
- Samsung Electronics is producing chips for a Chinese company to mine cryptocurrencies.
- Cryptocurrency mining requires super computers to solve complex mathematical problems to validate transactions on the bitcoin network.
- Specialized chips are a key part of the computer architecture.

Arjun Kharpal | @ArjunKharpal

Published 5:10 AM ET Wed, 31 Jan 2018



SAMSUNG

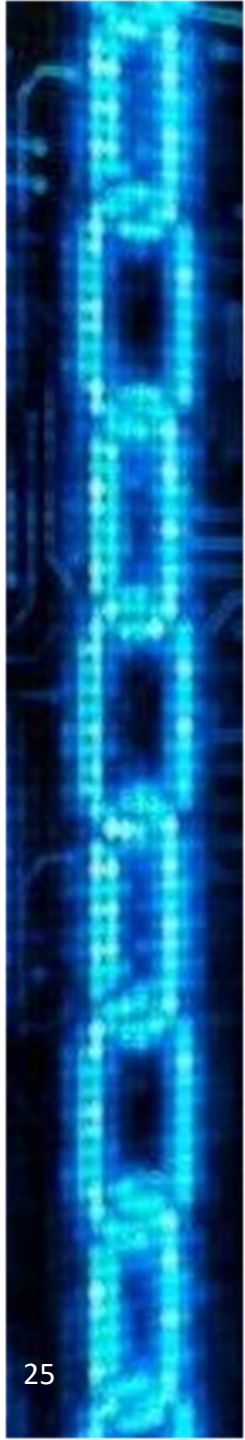


7nm technology



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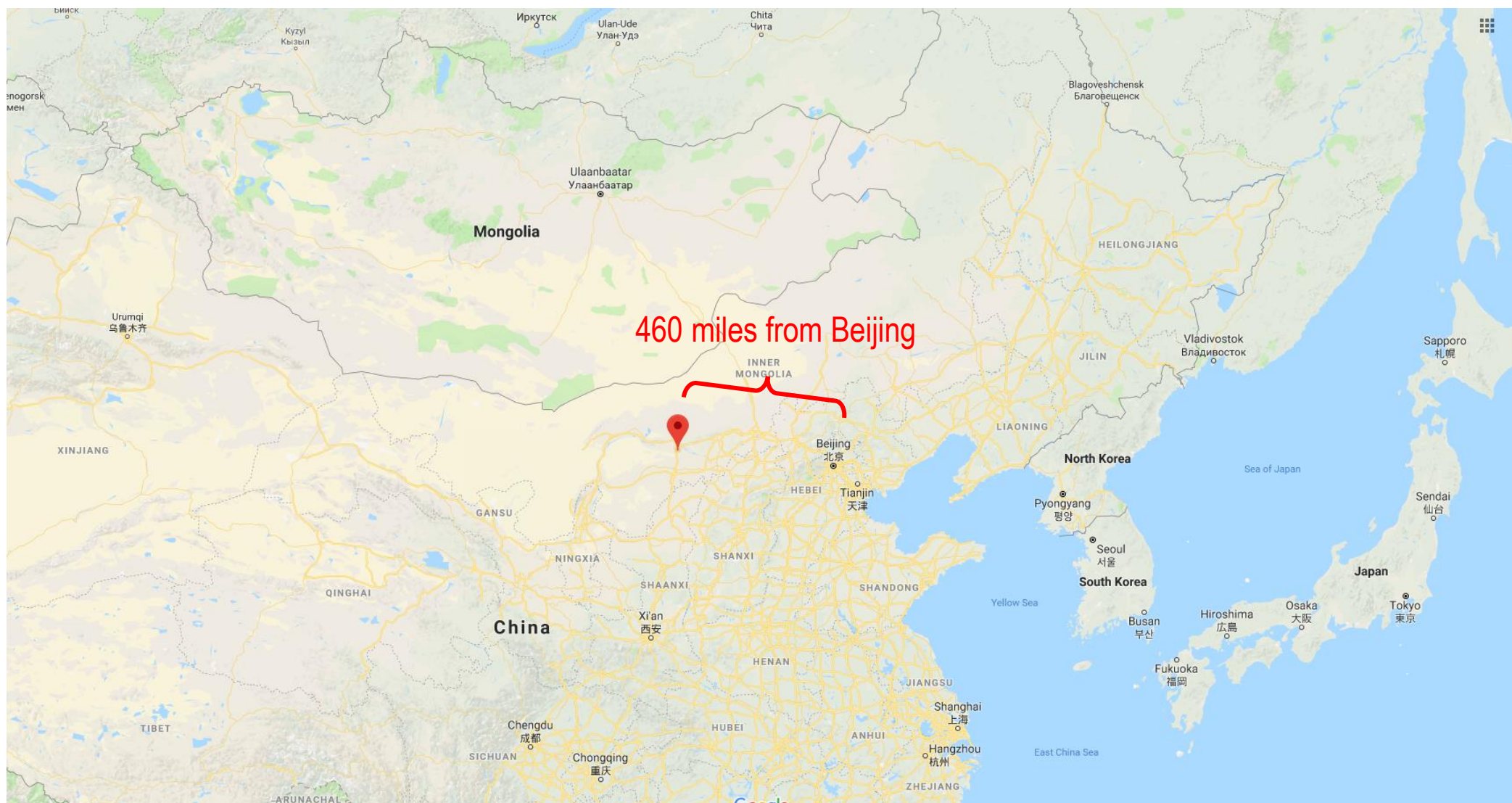
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One of the largest Bitcoin mining operations...



Ordos prefecture of Inner Mongolia



Ordos prefecture of Inner Mongolia

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Kodak slaps its name on a sketchy bitcoin-mining business

You can lease a Kodak KashMiner, but it might not be a wise idea.



Jon Fingas, @jonfingas
01.11.18 in Internet

11
Comments

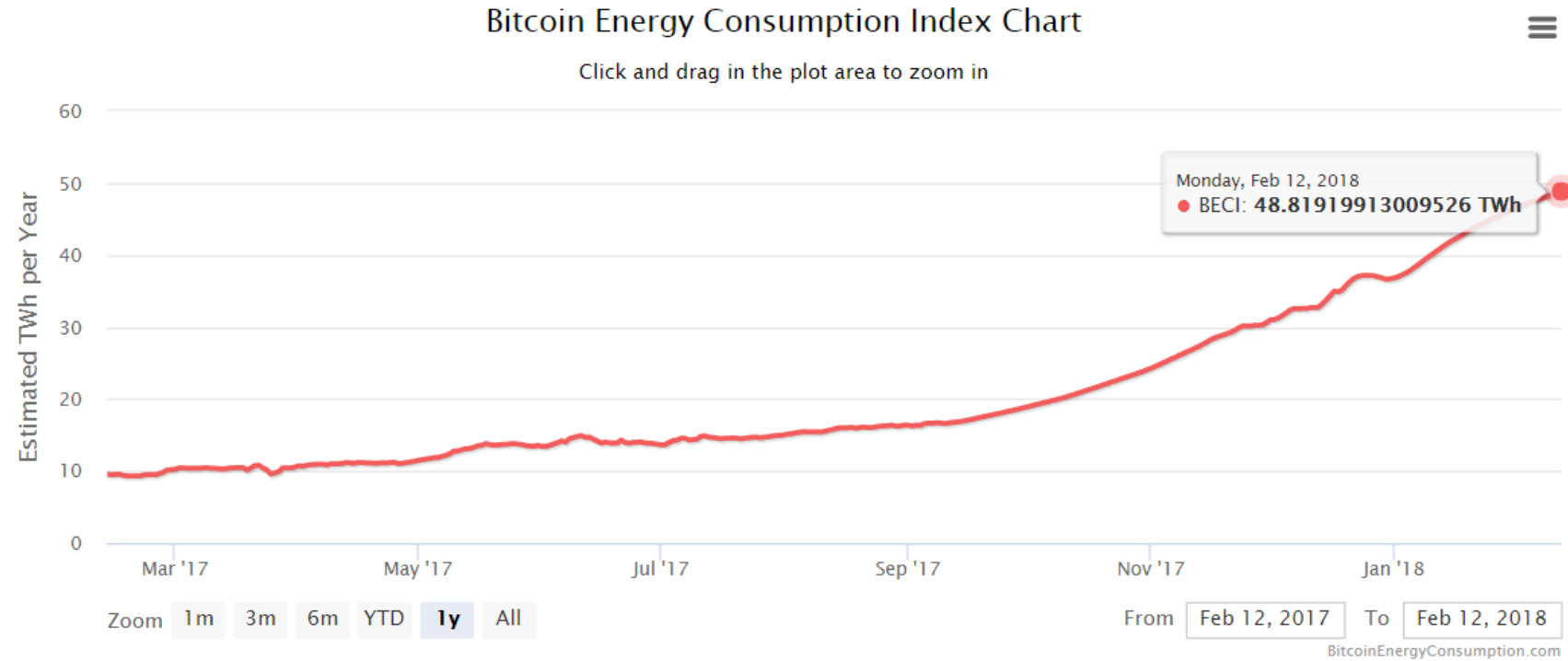
494
Shares



“It’s mind-bogglingly stupid.”

- Dr. Nicholas Weaver, UC Berkeley

Nearly 50 Terawatt-hrs per year



Key Network Statistics

Description	Value
Bitcoin's current estimated annual electricity consumption* (TWh)	48.82
Annualized global mining revenues	\$7,374,246,478
Annualized estimated global mining costs	\$2,440,959,957

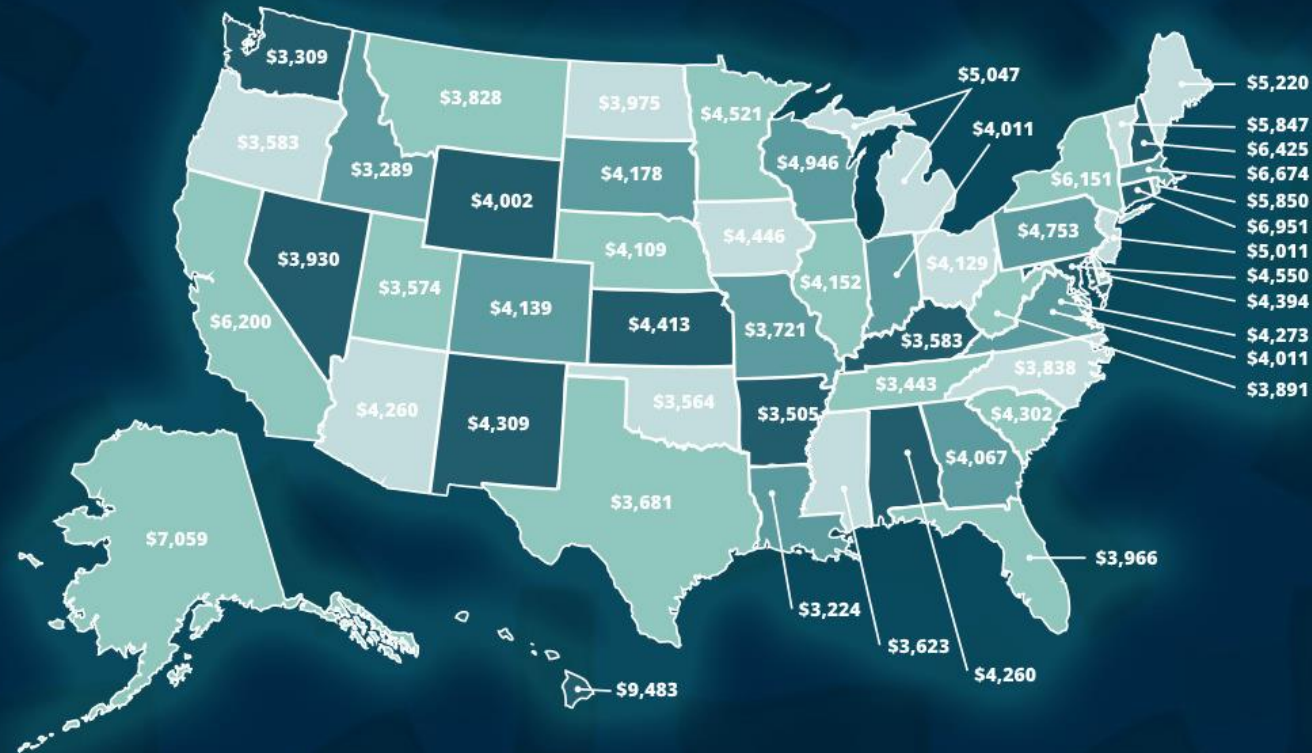
Source: Digiconomist
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THE COST TO MINE 1 BITCOIN

BASED ON AVERAGE ELECTRICITY RATE PER STATE

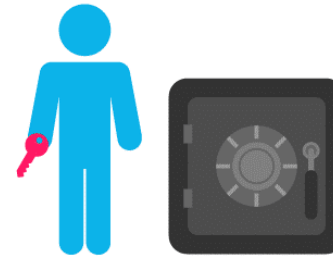


Proof of Stake may solve this

Proof of Work vs **Proof of Stake**



proof of work is a requirement to define an expensive computer calculation, also called mining

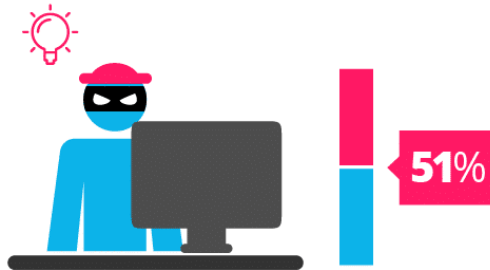


Proof of stake, the creator of a new block is chosen in a deterministic way, depending on its wealth, also defined as stake.

Source: BlockGeeks.com

Proof of Stake may solve this

Proof of Work vs **Proof of Stake**



A reward is given to the first miner who solves each blocks problem.

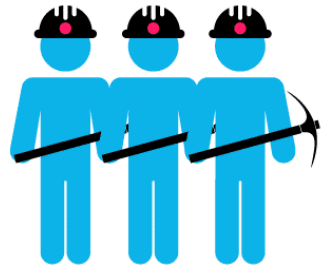


The PoS system there is no block reward, so, the miners take the transaction fees.

Source: BlockGeeks.com

Proof of Stake may solve this

Proof of Work vs **Proof of Stake**



Network miners compete to be the first to find a solution for the mathematical problem



Proof of Stake currencies can be several thousand times more cost effective.

Source: BlockGeeks.com

Proof of Stake: Testing now underway

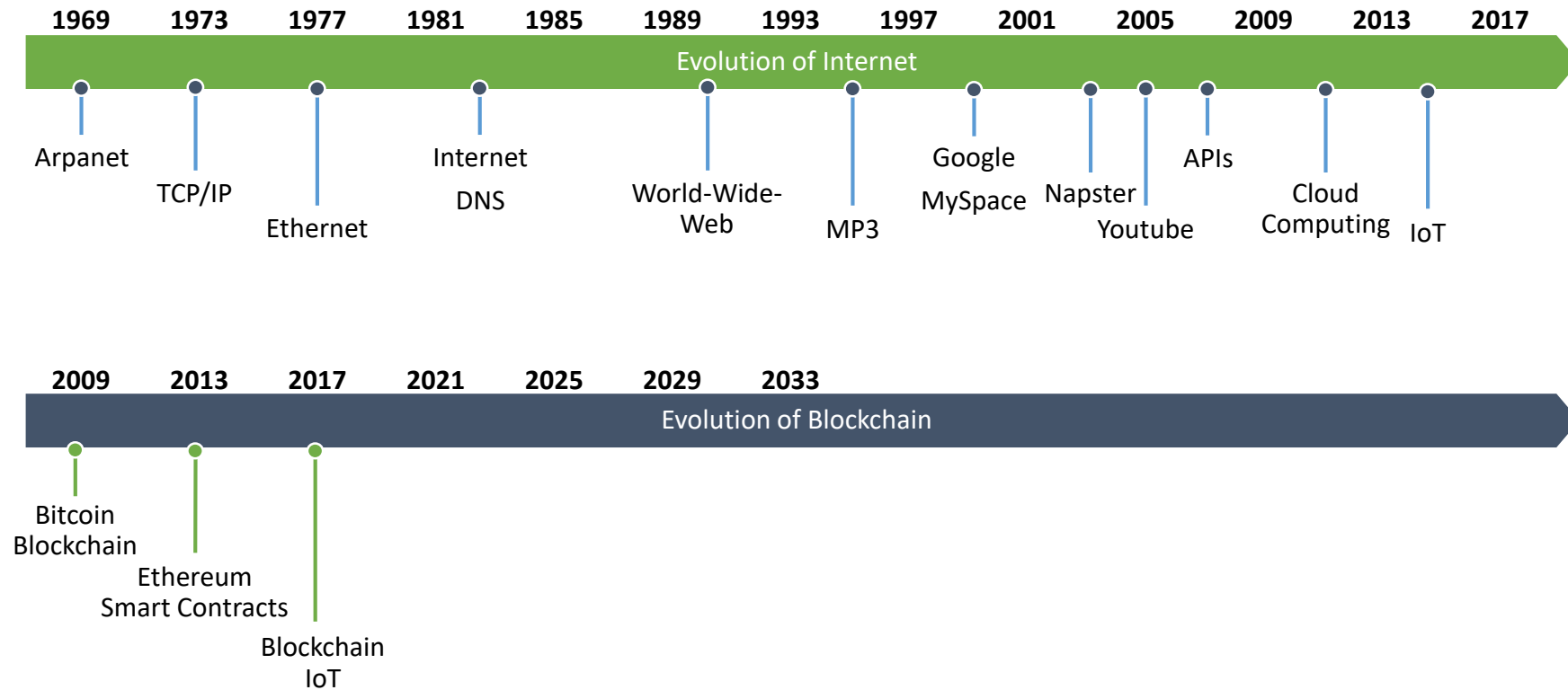


- Casper – a Proof of Stake protocol by which malicious actors can be punished
- Alpha test Launched on December 31 2017

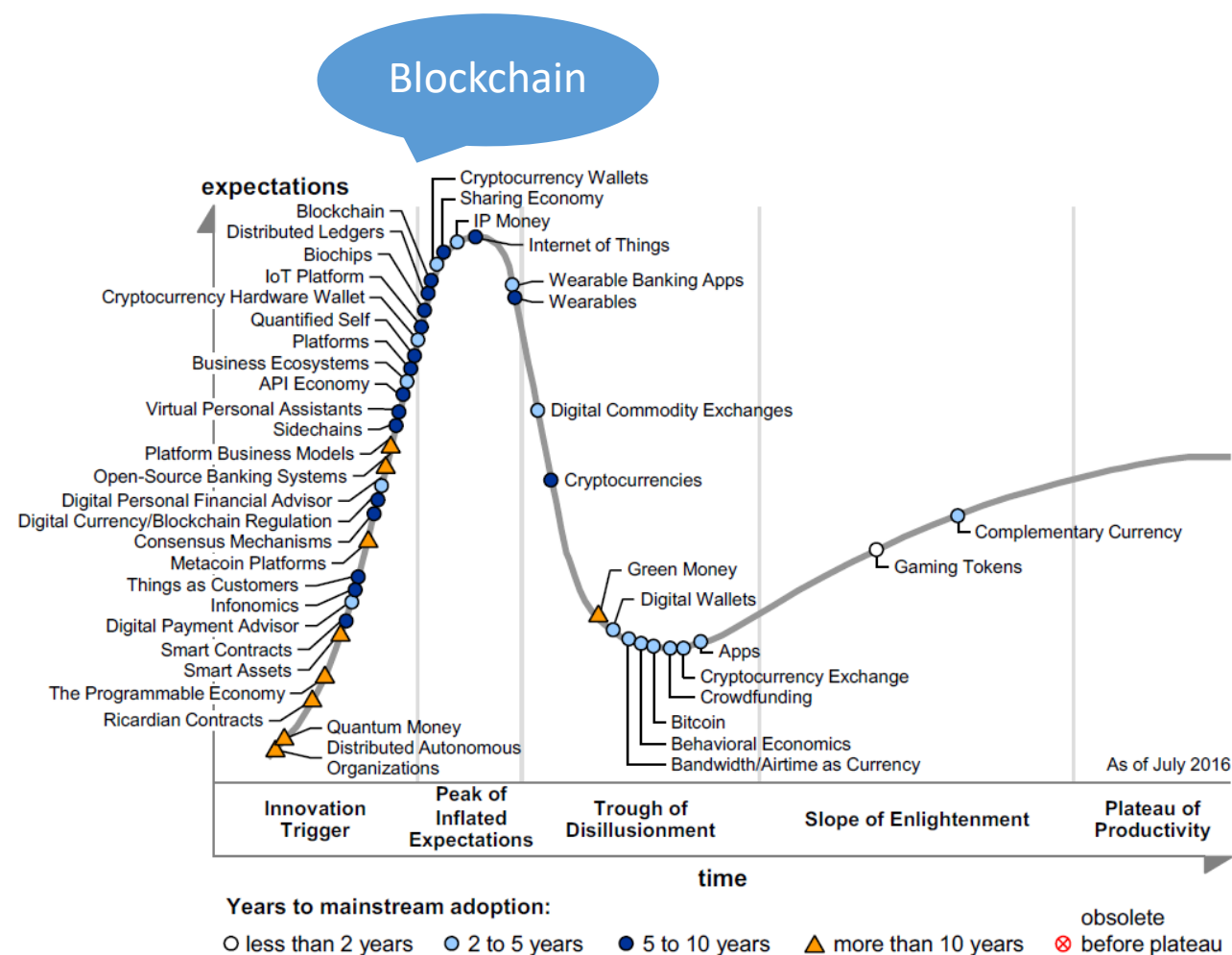
Where is Blockchain right now?



The Evolution



Hype Cycle for Emerging Technologies

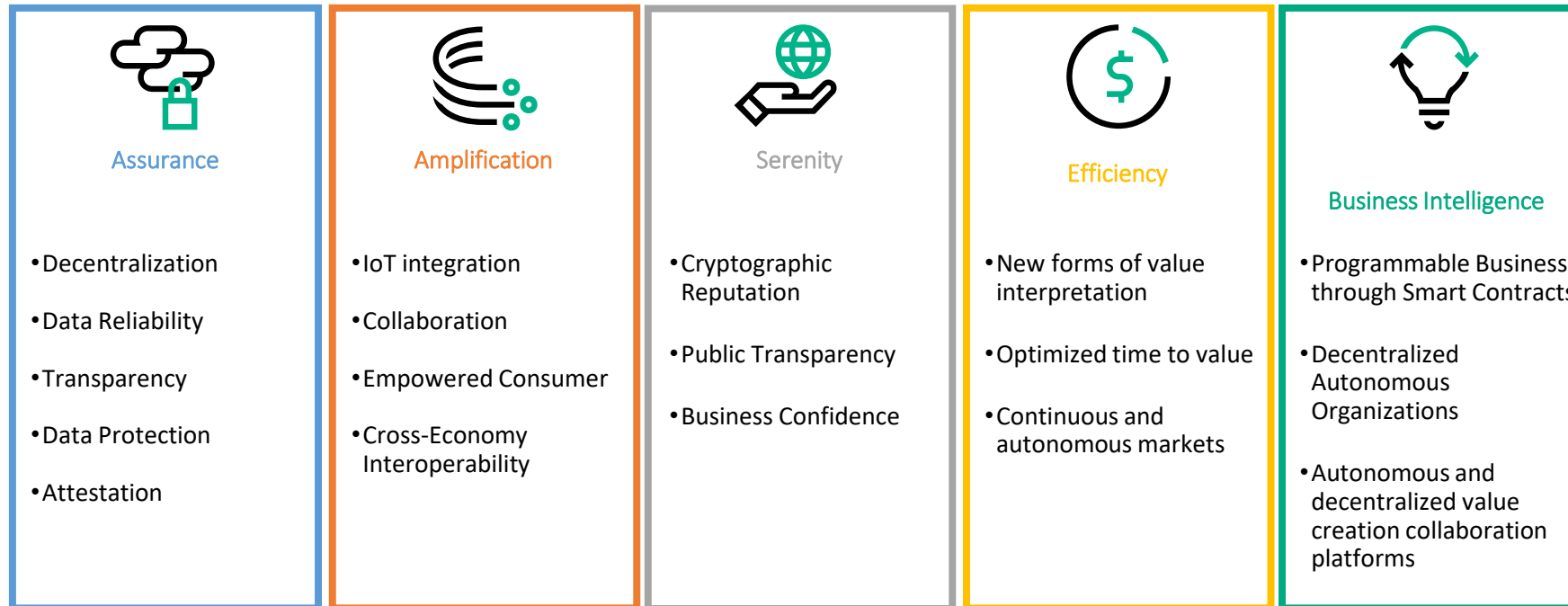


Source: Gartner (July 2016)

Blockchain Business Benefits



Blockchain Business Benefits





Is it secure?

There's been some bad press...

The New York Times

BUSINESS DAY

Apparent Theft at Mt. Gox Shakes Bitcoin World

By NATHANIEL POPPER and RACHEL ABRAMS FEB. 25, 2014



Haseeb Qureshi [Follow](#)

Engineering @earndotcom. @Airbnb alum. Instructor @Outco. Writer. Effective Altruist. Blockchainist. Former poker pro.

Jul 20, 2017 · 16 min read

A hacker stole \$31M of Ether—how it happened, and what it means for Ethereum



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BUSINESS

Biggest Hack In History Freezes \$156M In Tech Funds, Damaging Some Ent...

Biggest Hack In History Freezes \$156M In Tech Funds, Damaging Some Entertainment Startups

Trust No One: Ethereum Smart Contract Security Is Advancing



Alyssa Hertig
Nov 3, 2017 at 21:00 UTC

FEATURE

"Everyone here is a target for attack. Be paranoid."

That's how Ethereum Foundation security lead Martin Swende ended his deep-dive lecture on smart contract security at Devcon3 yesterday. At this point, he's witnessed his fair share of attacks on ethereum and wants the community to know what they're getting into.

There was [The DAO hack](#), where millions of dollars in ether was stolen due to a smart contract bug. There was the time ethereum transactions [slowed](#) because of an unknown attacker – this on one of Swende's first days working on the protocol, no less. And then just a few months ago, ethereum client [Parity lost](#) \$30 million after being hacked.

And that's not to mention all the bitcoin-related hacks.

With this, developers point out that – as revolutionary as ethereum can and could be – there's still a lot of kinks to iron out, one of the reasons the open-source project's flagship conference saw such a focus on security on its second day, with developers and academics alike releasing new tools to take smart contract security a step further.

Despite these major attacks, though, developers are optimistic about where smart contract security is heading.

RSK Labs chief scientist and cryptocurrency security consultant Sergio Demian Lerner told CoinDesk:

"Despite these major attacks, developers are optimistic about where smart contract security is heading"

[Alex Hern](#)

Wed 8 Nov 2017 06.29 EST
Last modified on Wed 8 Nov
2017 09.25 EST

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10,714

'\$300m in cryptocurrency' accidentally lost forever due to bug

User mistakenly takes control of hundreds of wallets containing cryptocurrency Ether, destroying them in a panic while trying to give them back



More than \$300m of cryptocurrency has been lost after a series of bugs in a popular digital wallet service led one curious developer to accidentally take control of and then lock up the funds, according to reports.

Unlike most cryptocurrency hacks, however, the money wasn't deliberately taken: it was effectively destroyed by accident. The lost money was in the form of Ether, the tradable currency that fuels the Ethereum distributed app platform, and was kept in digital multi-signature wallets built by a developer called Parity.

#img-1

lets require more than one user to enter their key before funds can be

theguardian

'\$300m in cryptocurrency' accidentally lost forever due to bug

User mistakenly takes control of hundreds of wallets containing



devops199 commented 2 days ago • edited ▼

I accidentally killed it.

<https://etherscan.io/address/0x863df6bfa4469f3ead0be8f9f2aae51c91a907b4>



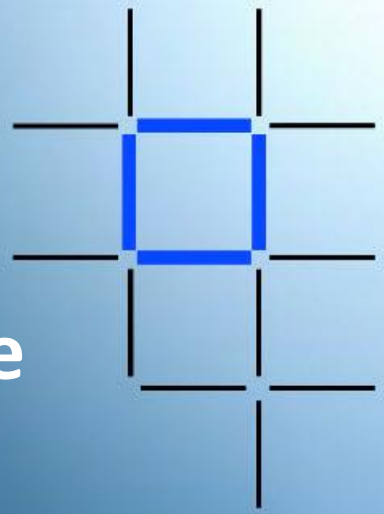
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#img-1

lets require more than one user to enter their key before funds can be

Security and Vulnerability



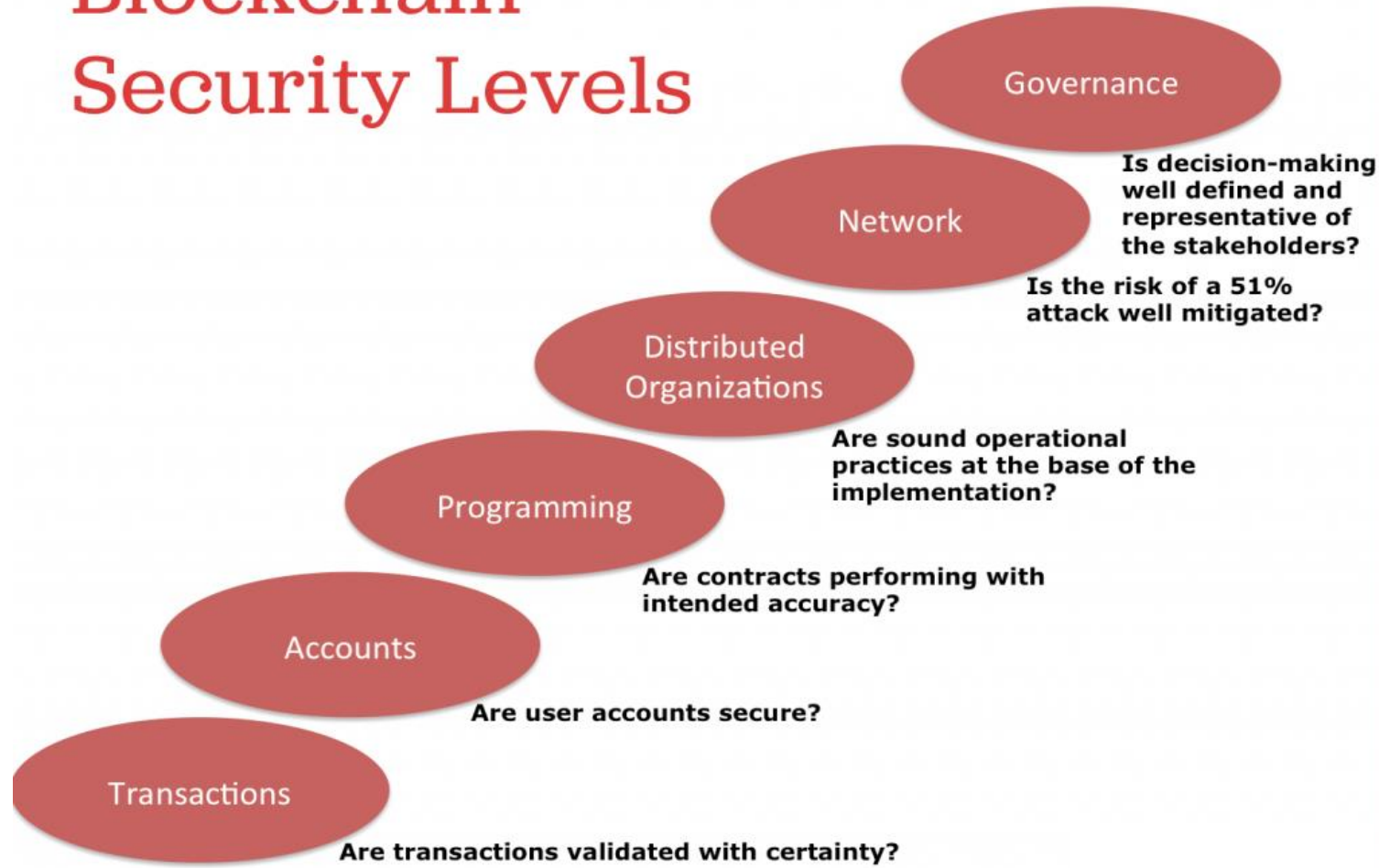
Cryptography used is VERY secure

Vulnerabilities have been due to:

- Programming errors (smart contracts)
- Carelessness (in digital wallets)
- Social Engineering
- Theft

Security and Vulnerability

Blockchain Security Levels



Source: **William Mougayar**

<http://startupmanagement.org/2016/08/08/blockchain-security-is-multi-layered-here-are-the-6-most-important-levels/>

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Is there enough capacity?



CryptoKitties

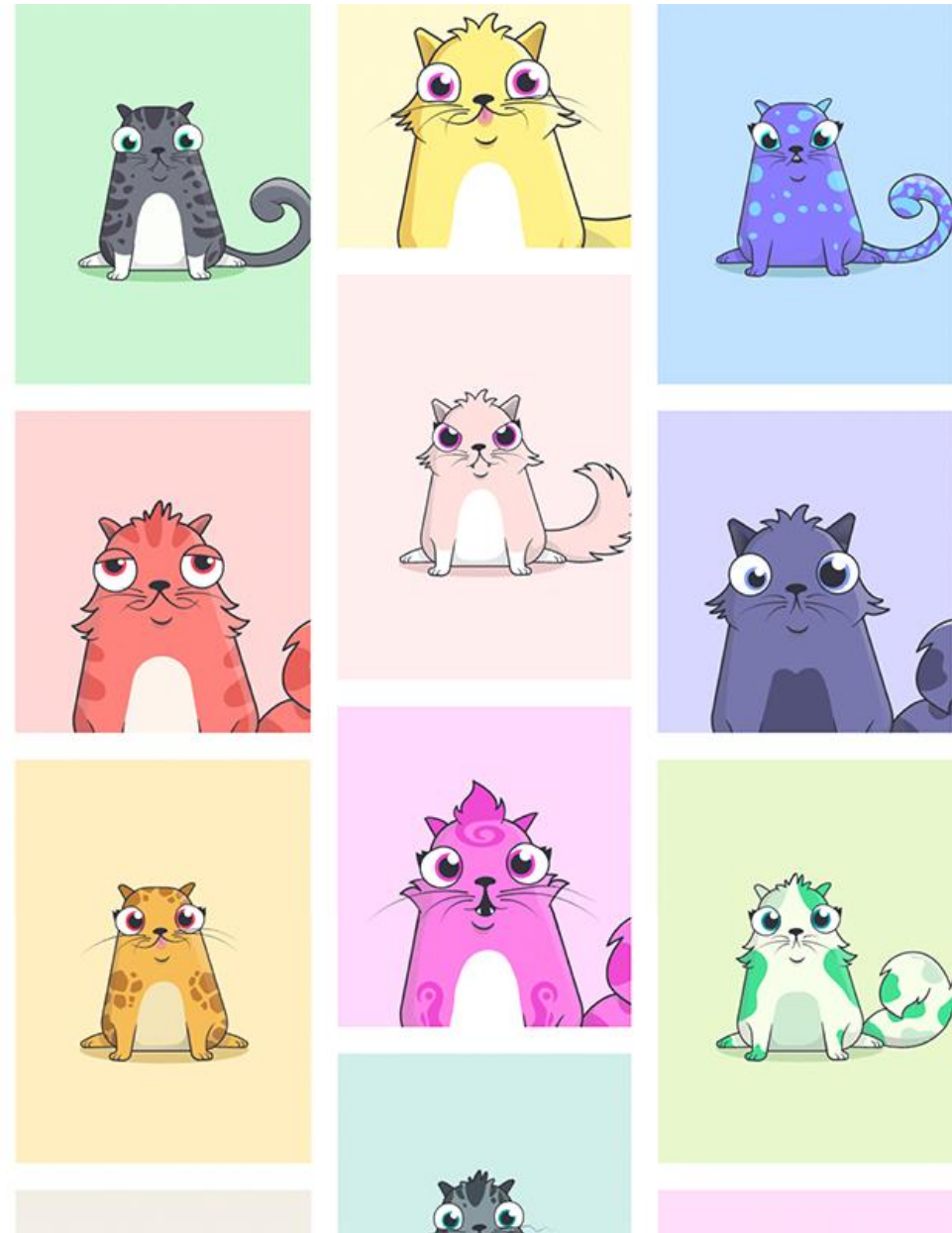
Sign in

Marketplace

Collectible. Breedable. Adorable.

Collect and breed digital cats.

Start Meow



Ethereum's blockchain is jamming up because of a new game that lets people buy virtual cats



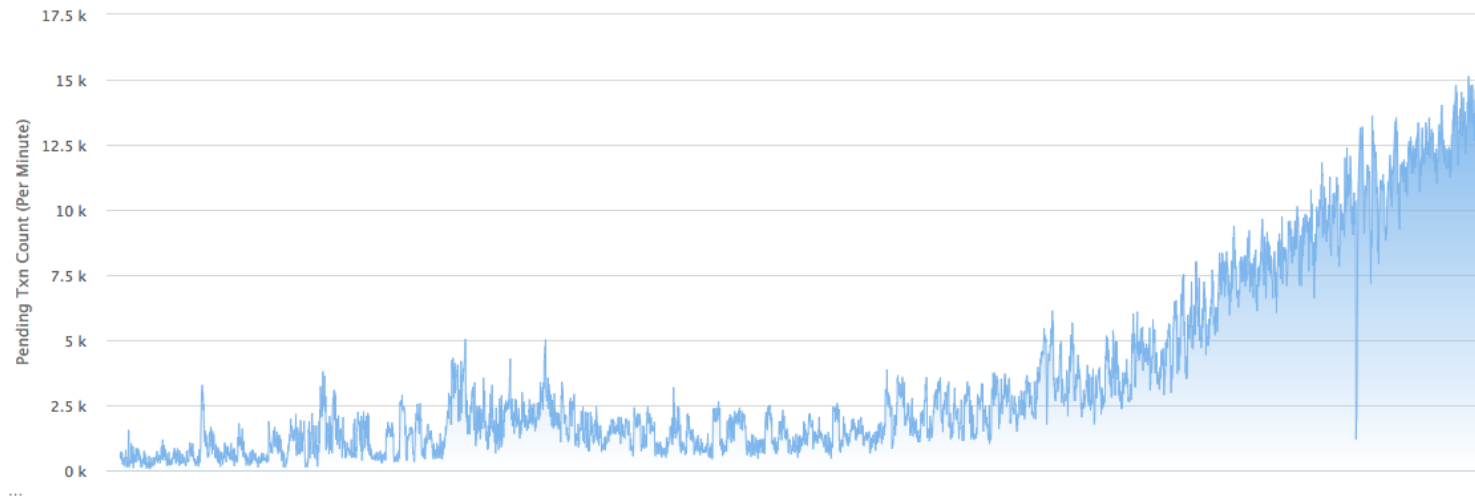
Frank Chaparro

Dec. 4, 2017, 3:42 PM 🔥 19,363







Ethereum Pending Transactions Queue – Time Series

Source: Etherscan.io
(From 7/30/2015 to 12/4/2017)
Click and drag in the plot area to zoom in



Comparing Capacity

	Transactions Per Second
	24,000
 ethereum	15
 ripple	1,500
	7,000

Enabling off-chain and scaling solutions



Off-chain scaling solution for performing ERC20-compliant token transfers



A novel incentive structure guarantees fast, reliable, and affordable results without third-party trust.

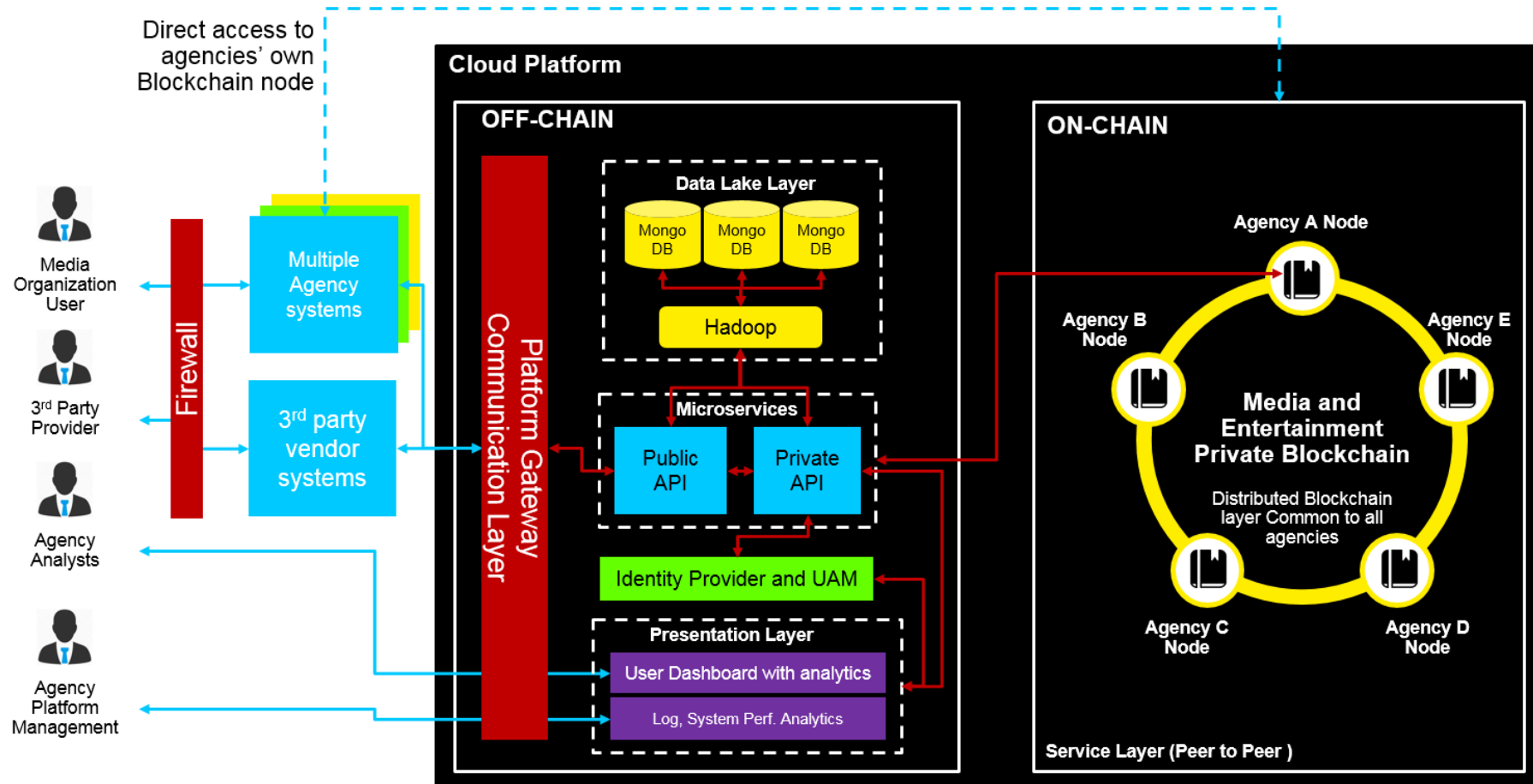
Plasma

Proposed framework for incentivized and enforced execution of smart contracts which is scalable to potentially billions of state updates per second



IOTA Tangle enables companies to explore new B2B models by making every technological resource a potential service to be traded on an open market in real time, with no fees.

Enabling off-chain and scaling solutions



Blockchain Applications



ERC*-20 Tokens

- Used by Decentralized Applications (Dapps)
- A cryptocurrency built on top of Ethereum
- Smart Contracts platform
- Used in vast majority of Initial Coin Offerings (ICO's)
- Token creation and transaction MUST follow ERC-20 rules
- Over **37,000 Token Contracts**[‡]

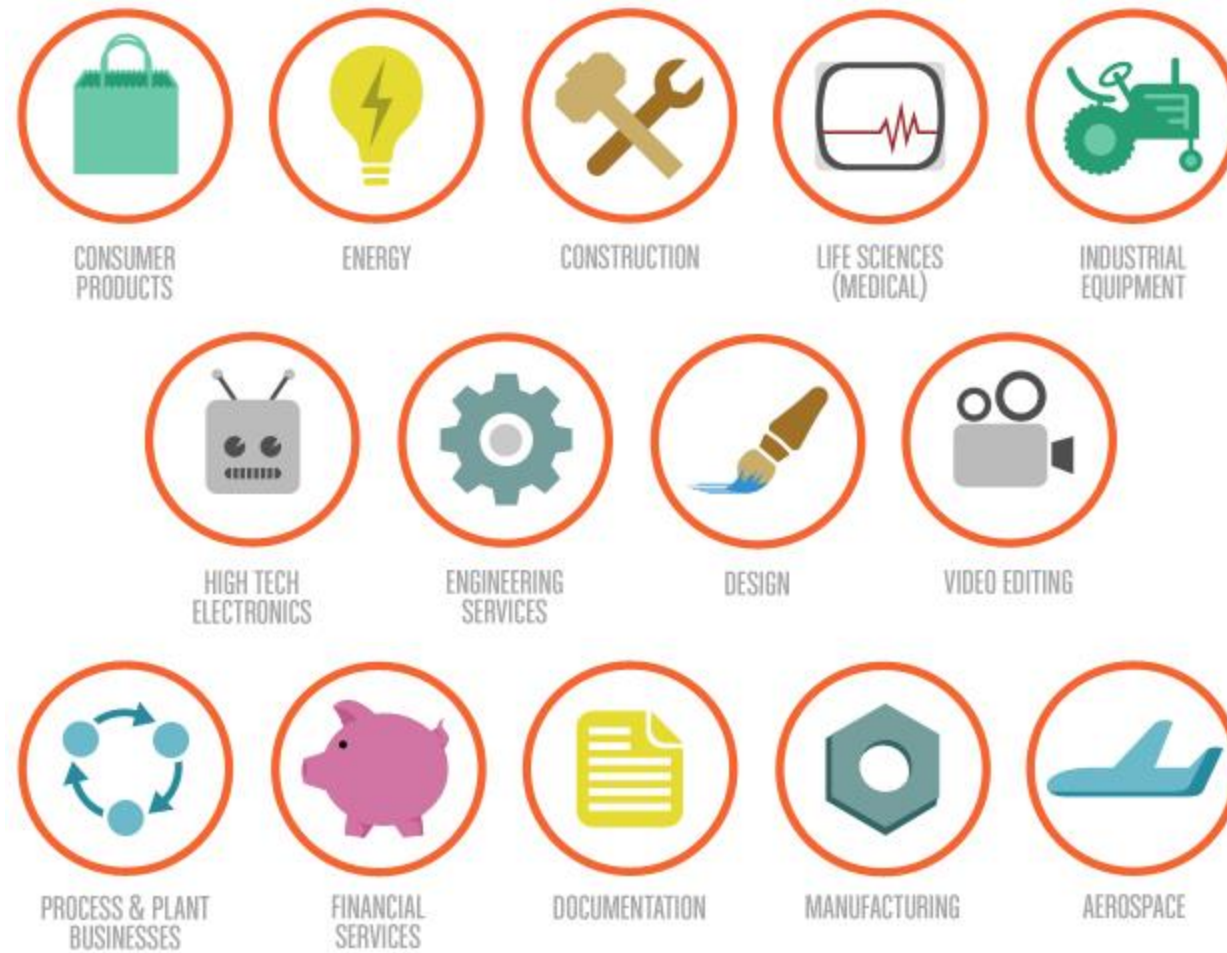
ERC20



*ERC = Ethereum Request for Comments

[‡]Source: <https://etherscan.io>

Blockchain Tokens now in every industry



Blockchain Tokens now in every industry



**BANANA
COIN**

**World's first
blockchain option
for investing in
production of
*organic bananas***

Bananacoin is a new
Ethereum based token
that is tied to the price of
1 kg of bananas on the
international market





Useless Ethereum Token

The world's first 100% honest Ethereum ICO.

You're going to give some random person on the internet money, and they're going to take it and go buy stuff with it. Probably electronics, to be honest. Maybe even a big-screen television.

Seriously, don't buy these tokens.

The UET crowdsale has finished. Thanks to everyone who contributed!

(Regardless of the fact that none of you read any of the warnings on this page.)

You can view the token contract and transactions on [Etherscan](#).

Crowdsale Statistics

Ether contributed

310.445

I had a feeling someone would waste their money.

Contributions in USD

\$328960

Enough to buy 274 televisions!

Tokens issued

3965716.097

Including 591.000 bonus tokens!

<https://uetoken.com/>

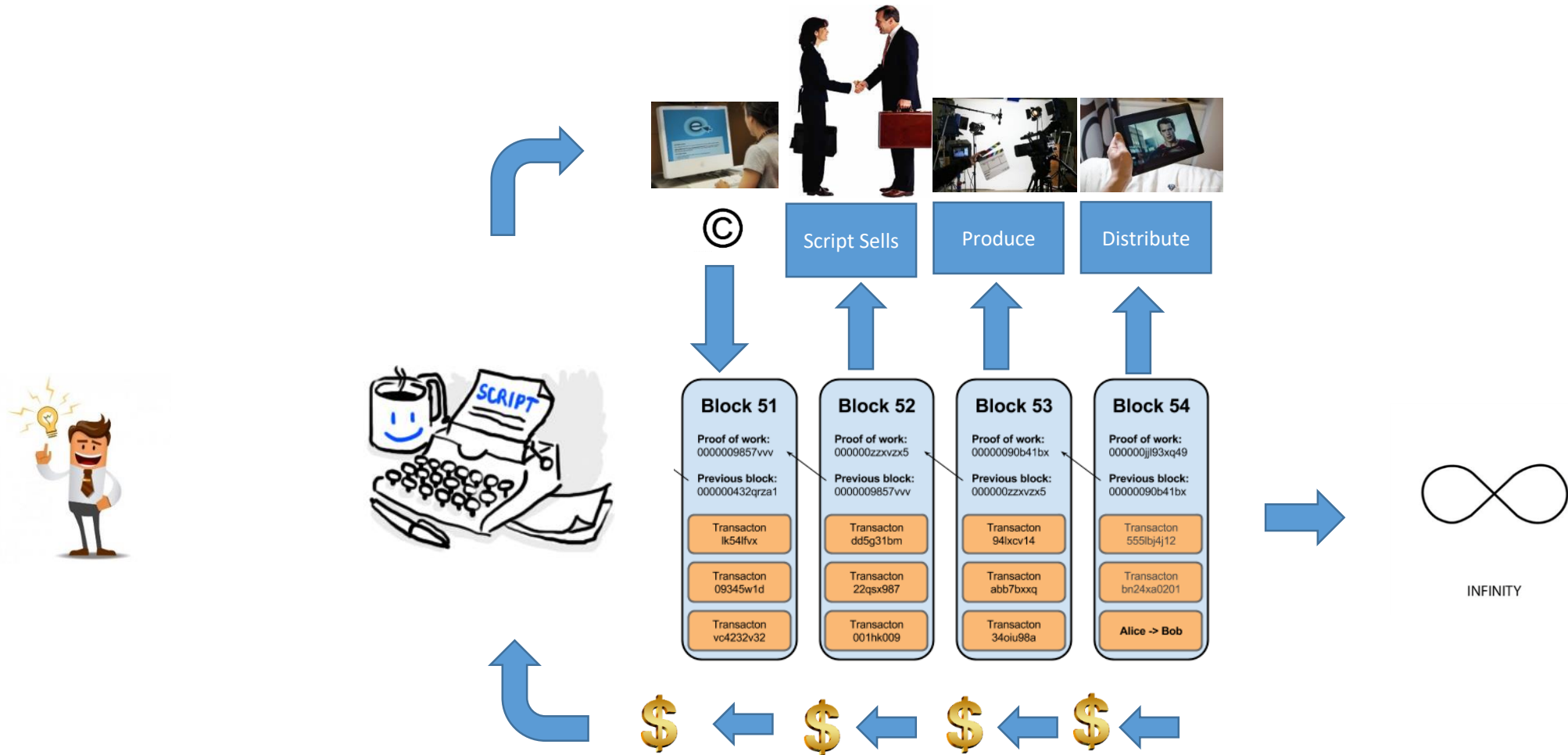
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Hollywood Implementation



The Hollywood Hustle



Blockchain: For Pre-Production

Cryptographic hash

Steve sends his script to his agent Alice. To protect his work, Steve encrypts it using Steve's public key.

Alice receives the script from Steve. In order for her to see Steve's script, Alice decrypts it using her private key.

5Jza1DZn2mBvrm
MdBLVbQjSu33oK
CjpkVbwo8jX6vE
tZBpSsaEt

Steve
PubKey

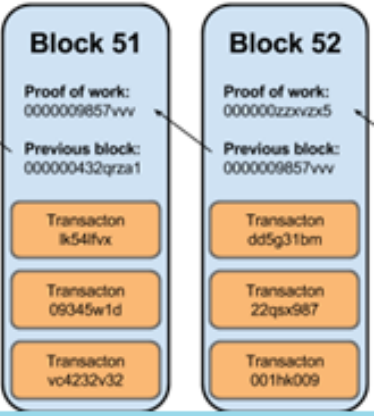
(Script) PublicKey Steve

Alice
PrKey

1QGGBQEKgxxjqth4Q
Tbiqz1UFpulpcotGF



22 February 2018



Blockchain: For Production

Cryptographic hash

DIT / Data Manager Dave uploads digital dailies to editor Kim. To protect his work, Dave encrypts it using his public key.

Kim receives the camera file from Dave. In order for her to see Dave's camera file, Kim decrypts it using her private key.

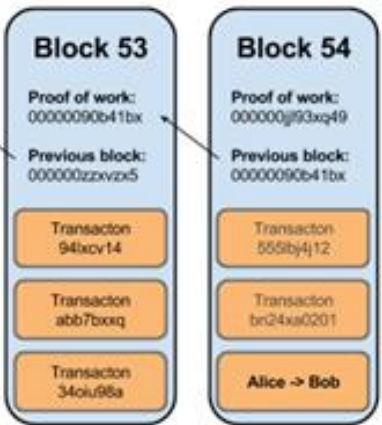
5Jza1DZn2mBvrm
MdBLVbQjSu33oK
CjpkVbwo8jX6vE
tZBpSsaEt

Dave
PubKey

Kim
PrKey

1QGGBQEKgxxjqth4Q
Tbiqz1UFpulpcoTGF

(Camera File) PublicKey
Dave



Blockchain: For Distribution

Cryptographic hash

XYZFlix streams a movie viewer Tom . To protect their licensed movie, XYZFlix encrypts it using their public key.

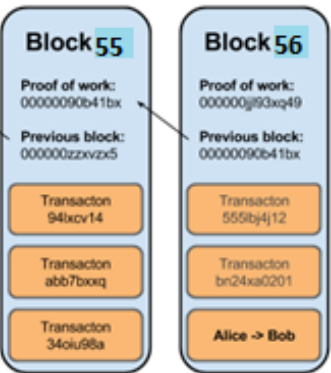
Tom receives the movie file from XYZFlix. In order for Tom to see the movie, Tom decrypts it user his private key

XYZFlix
PubKey

Tom
PrKey

(Camera File) PublicKey
Dave

1QGGBQEKgxxjqth4Q
Tbiqz1UFpulpcoTGF



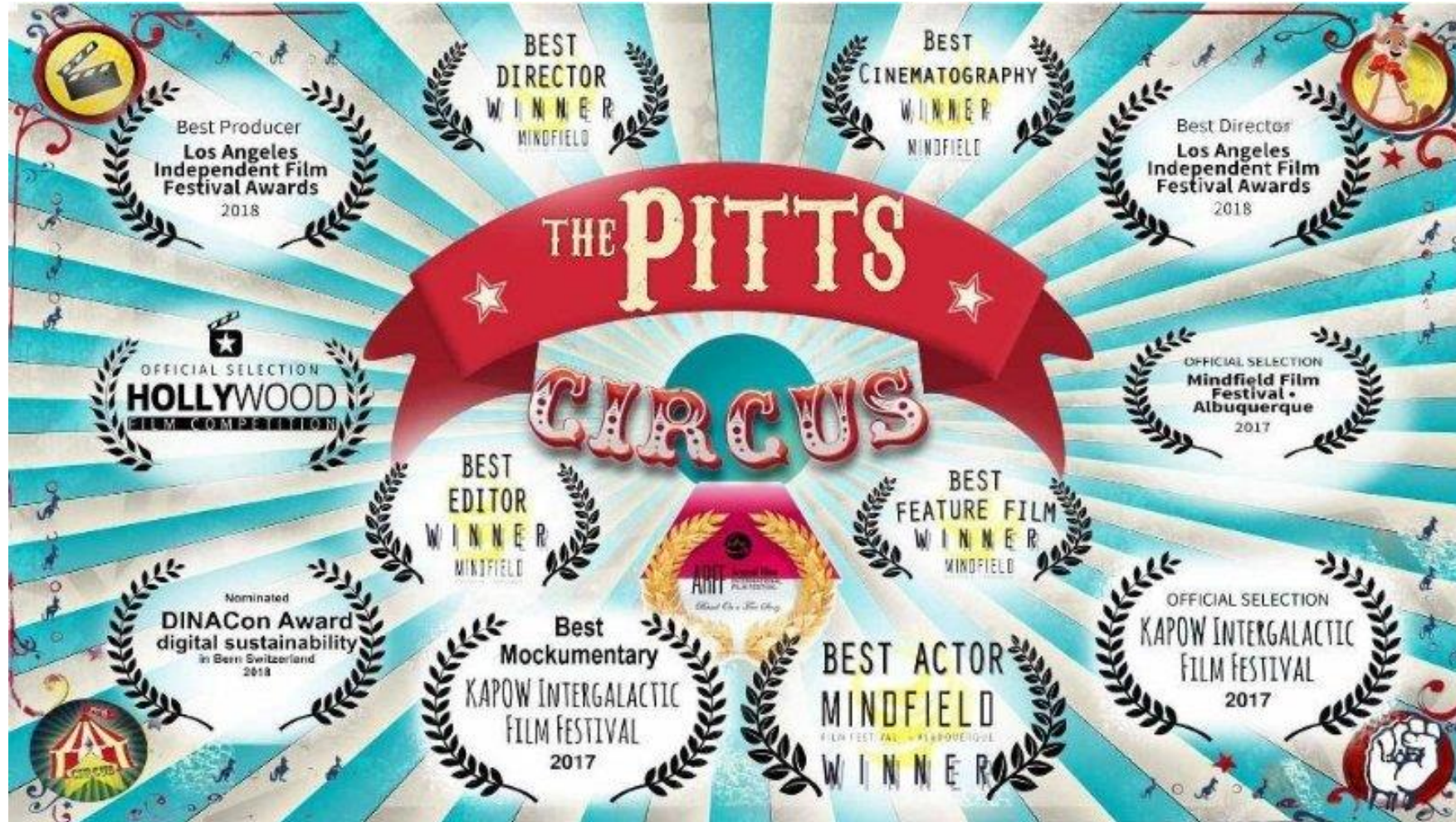
Some Current Examples



Feature Film Financing



Feature Film Financing



Feature Film Financing

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Film Slate To Be Financed By Digital Currency And Distributed Via Blockchain

by [Bruce Haring](#)
December 7, 2017 8:15pm

[f](#) [t](#) [g+](#) [in](#) [5](#) [✉](#) [🖨](#)

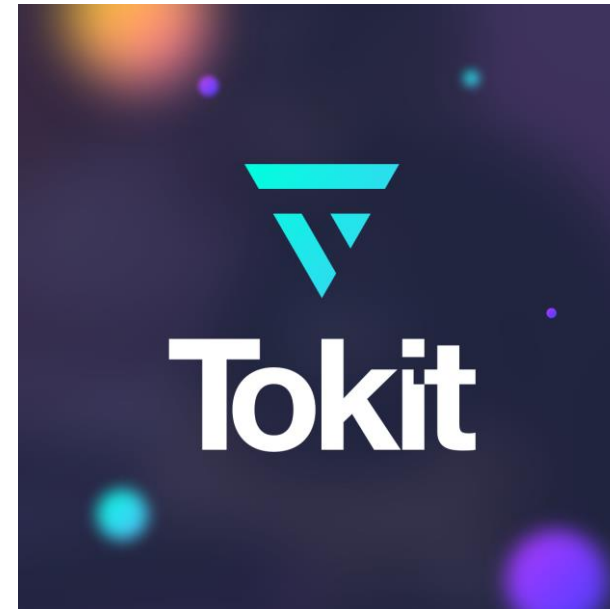


SingularDTV

EXCLUSIVE: In what may be the first group of features to be financed by cryptocurrency and distributed via the blockchain, a consortium of companies plans to release *New Frontiers*, a sci-fi anthology of five segments that will combine into one feature.

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- ▶ ETHEREUM
- ▶ GROUND CONTROL ENTERTAINMENT

Feature Film Financing



Feature Film Financing

THE FIRST MAJOR FEATURE FILM
TO BE FUNDED THROUGH
AN ETHEREUM CROWDSALE



CAMPAIGN STATS

1.7m

USD Raised
/Tokens Issued

1.7m

Funding Goal
(USD)

Production & Post Production Workflow



Blockchain for Computing & Rendering



Global, open source, decentralized supercomputer that anyone can access. It is made up of the combined power of users' machines, from PCs to entire data centers.



The first network to transform the power of GPU compute into a decentralized economy of connected 3D assets.




Open Source project aimed to create a decentralized trustless SuperComputer by utilizing cryptography and blockchain technology.

Distributed Computing Example: Render Token

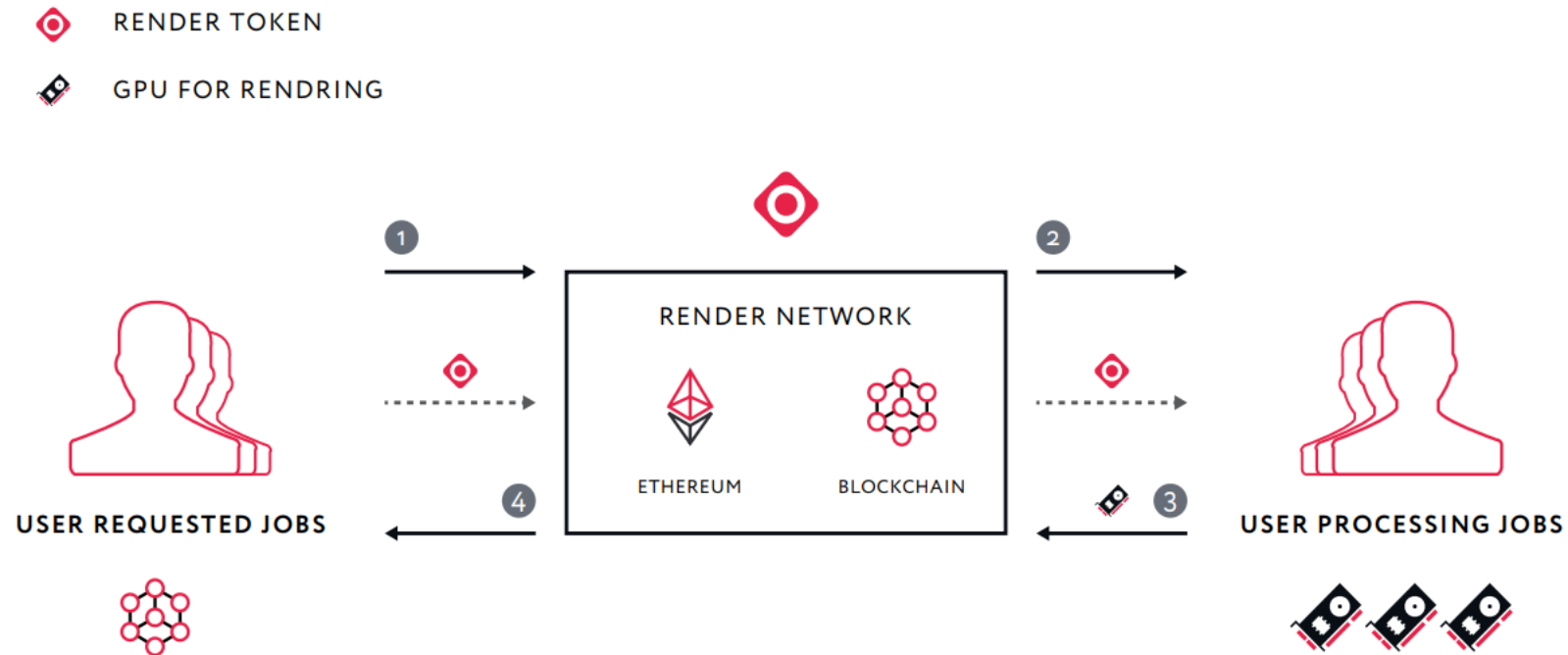


- >50,000 GPU's in today's public cloud
- 247 million GPU's available on the internet
- If RNDR tokens leverage 1% ...
- Equivalent of \$21 billion of central cloud infrastructure

 US009197642B1	
(12) United States Patent Urbach	(10) Patent No.: US 9,197,642 B1 (45) Date of Patent: Nov. 24, 2015
(54) TOKEN-BASED BILLING MODEL FOR SERVER-SIDE RENDERING SERVICE	(56) References Cited U.S. PATENT DOCUMENTS
(75) Inventor: Julian Michael Urbach , Sherman Oaks, CA (US)	6,117,188 A * 9/2000 Aronberg et al. 717/176 2008/0271130 A1 * 10/2008 Ramamoorthy 726/9 2009/0019163 A1 * 1/2009 Pecus 709/226 2009/0183243 A1 * 7/2009 Ruppert et al. 726/5 2009/0313477 A1 * 12/2009 Park et al. 713/182 2010/0077216 A1 * 3/2010 Kramer et al. 713/172 2010/0146512 A1 * 6/2010 Chen et al. 718/103 2010/0235882 A1 * 9/2010 Moore 726/3 2010/0251352 A1 * 9/2010 Zarchy et al. 726/9 2010/0325441 A1 * 12/2010 Laurie et al. 713/185 2011/0093371 A1 * 4/2011 Clemm et al. 705/34 2011/0296521 A1 * 12/2011 Bernabeu 726/19 2012/0039326 A1 * 2/2012 Chia et al. 370/342
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1173 days.	* cited by examiner
(21) Appl. No.: 12/964,153	Primary Examiner — Jungwon Chang
(22) Filed: Dec. 9, 2010	(74) Attorney, Agent, or Firm — James J. DeCarlo; Greenberg Traurig, LLP
Related U.S. Application Data	
(60) Provisional application No. 61/285,283, filed on Dec. 10, 2009.	

RNDR

RENDER SYSTEM FLOW



Blockchain for Music rights



A platform letting music fans share ownership with artists in their favorite songs



Rights Management, Decentralized Storage, Metadata repository



A growing collective of music professionals, music lovers and tech partners,



Unique currency, fair compensation, transparent contracts and no intermediaries



Innovative cryptocurrency powered solution for the music industry that allows artists to monetize their work in a collaborative P2P marketplace.



choon



Blockchain for Music rights



Three of the largest member-owned collection societies in the world announced a “groundbreaking partnership” to prototype a new shared system of managing authoritative music copyright information using blockchain technology.

Blockchain for Storage



STORJ.IO

Blockchain-based, end-to-end encrypted, distributed object storage, where only you have access to your data

Simple pricing

Pay only for what you use. No setup fees, no minimum usage.

STORAGE



\$0.015

PER GB PER MONTH

BANDWIDTH



\$0.05

PER GB DOWNLOADED

Blockchain for Storage



STORJ.IO

Blockchain-based, end-to-end encrypted, distributed object storage, where only you have access to your data



Sia is the first decentralized storage platform secured by blockchain technology.

How many TB?

Storage Provider	Monthly Storage Cost	Download Bandwidth Cost	Private	Decentralized	Included Multi Region Redundancy
Sia	\$2	\$1	✓	✓	✓
Amazon S3	\$23	\$92	✗	✗	✗
Google Cloud	\$20	\$110	✗	✗	✗
Microsoft Azure	\$24	\$87	✗	✗	✗

Blockchain for Storage



STORJ.IO

Blockchain-based, end-to-end encrypted, distributed object storage, where only use have access to your data



Sia is the first decentralized storage platform secured by blockchain technology.



Filecoin

A decentralized storage network that turns cloud storage into an algorithmic market.

Blockchain for Distribution



Blockchain-based decentralized protocol for a worldwide free content entertainment system



Decentralized video infrastructure for web streaming, with tokens for payment



Video sharing platform based on blockchain, where authors are paid for their content, and users are rewarded for watching free videos.



Tokens designed to decentralize the buying, selling, and rewarding of attention across media platforms, including Spectiv VR and 360-video



Blockchain Based Token to Connect Creators and Consumers of Digital Media



Blockchain for Advertising



Allows brands make ad buys on both broadcast and OTT TV using blockchain technology.



Basic Attention Token radically improves the efficiency of digital advertising by creating a new token that can be exchanged between publishers, advertisers, and users.



The first blockchain ecosystem dedicated to advertising: a new foundation for creating a trusted pipeline for data exchange and collaboration



Allows the digital advertising supply chain to coordinate in a scalable, trustworthy and secure way using the blockchain

Blockchain Implementation Considerations



Permissionless vs Permissioned Blockchains

A question of control and trust

Permissionless Blockchains



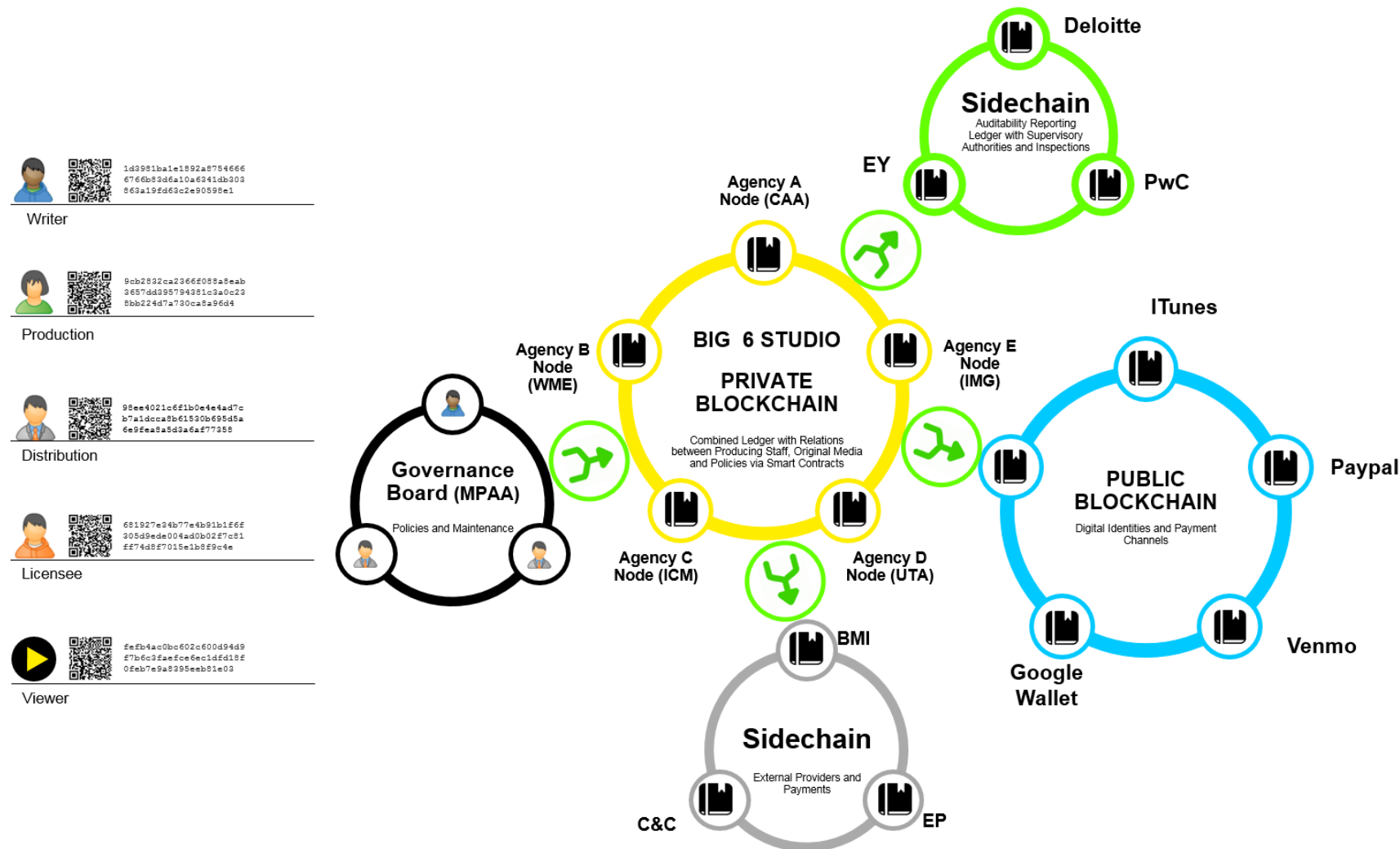
Trust is enforced by Cryptographic proof
from the Software Protocol

Permissioned Blockchains



Trust is enforced through restricted
access to transaction validation

Blockchain: Disintermediated Style of Hollywood Business



Summary

- Blockchain is a distributed, peer-to-peer ledger
- It is the Underlying technology to cryptocurrency
 - But not just for Bitcoin...
 - A fundamentally useful technology for many B2B applications
- Can eliminate the need for intermediaries
- Not without risks
 - Security, Scaling, Power consumption, coding errors
- There will be lots of experimenting
 - Some scams
 - Many failures
 - But some impactful successes are likely!



UNDERSTANDING BLOCKCHAIN FOR THE BIZ



Steve Wong

Cloud, Platforms & IT Outsourcing (CPI) Group

DXC Technology



@SteveWongLA



Pete Ludé

CTO

Mission Rock Digital

pete@MissionRockDigital.com