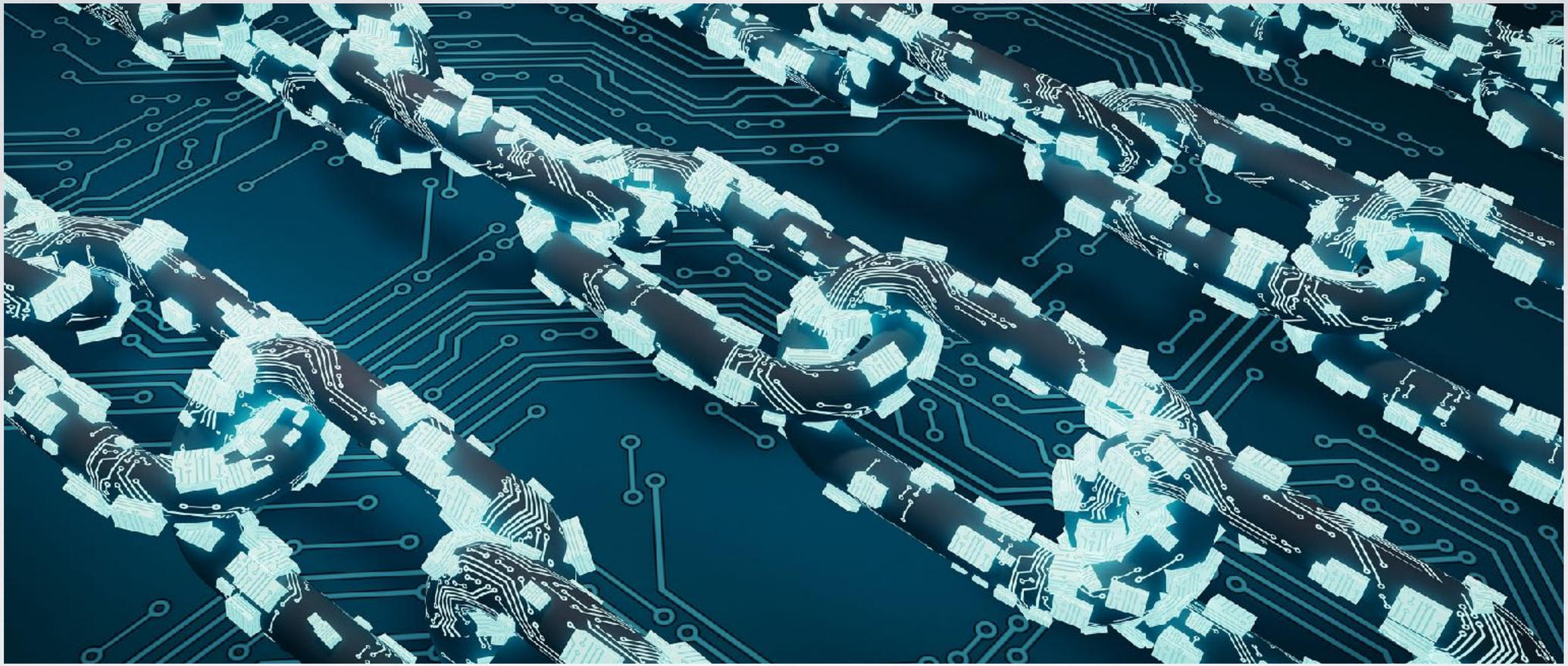


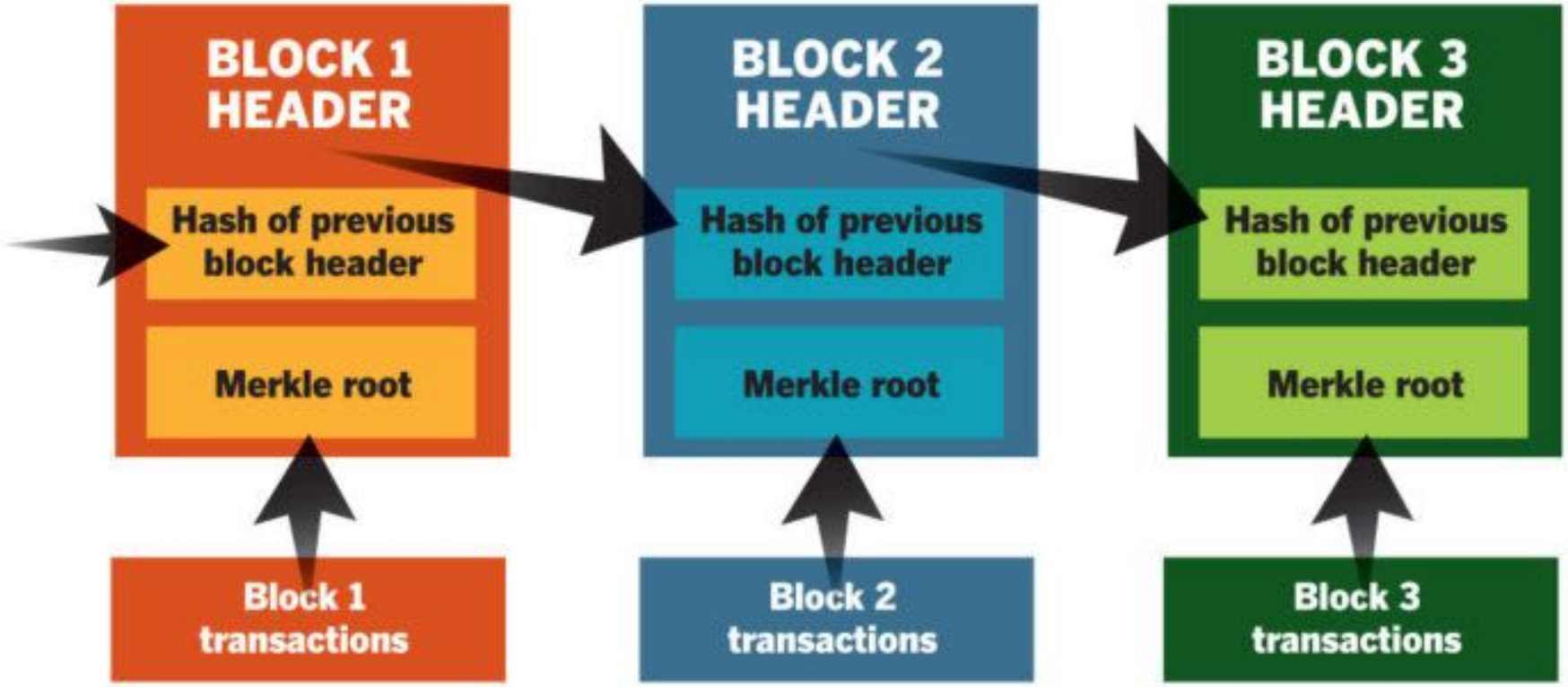
BLOCKCHAIN TECHNOLOGY FOR BUSINESS

Adopting Blockchain Technology for Digital Transformation

WHAT IS A BLOCKCHAIN ?

A block chain is a growing list of records, called blocks, that are linked using cryptography.

With blockchain technology, each page in a ledger of transactions forms a block. That block has an impact on the next block or page through cryptographic hashing. In other words, when a block is completed, it creates a unique secure code, which ties into the next page or block, creating a chain of blocks, or blockchain.



SIMPLIFIED BITCOIN BLOCK CHAIN

What is...
...a Blockchain?

1

A Digital Ledger

A Blockchain is a digital ledger which keeps records of all transactions taking place on a peer to peer network.

2

Encrypted Information

All Information transferred via blockchain is encrypted and every occurrence recorded, meaning once the block is created and added to the chain, it cannot be altered.

3

Peer to Peer

Lets you interact or send transactions with a peer, without an intermediary. Removes the middle man.

4

Data Sharing

The blockchain can be used for more than the transfer of currency. It can also be used to share contracts, records and any other type of data.

5

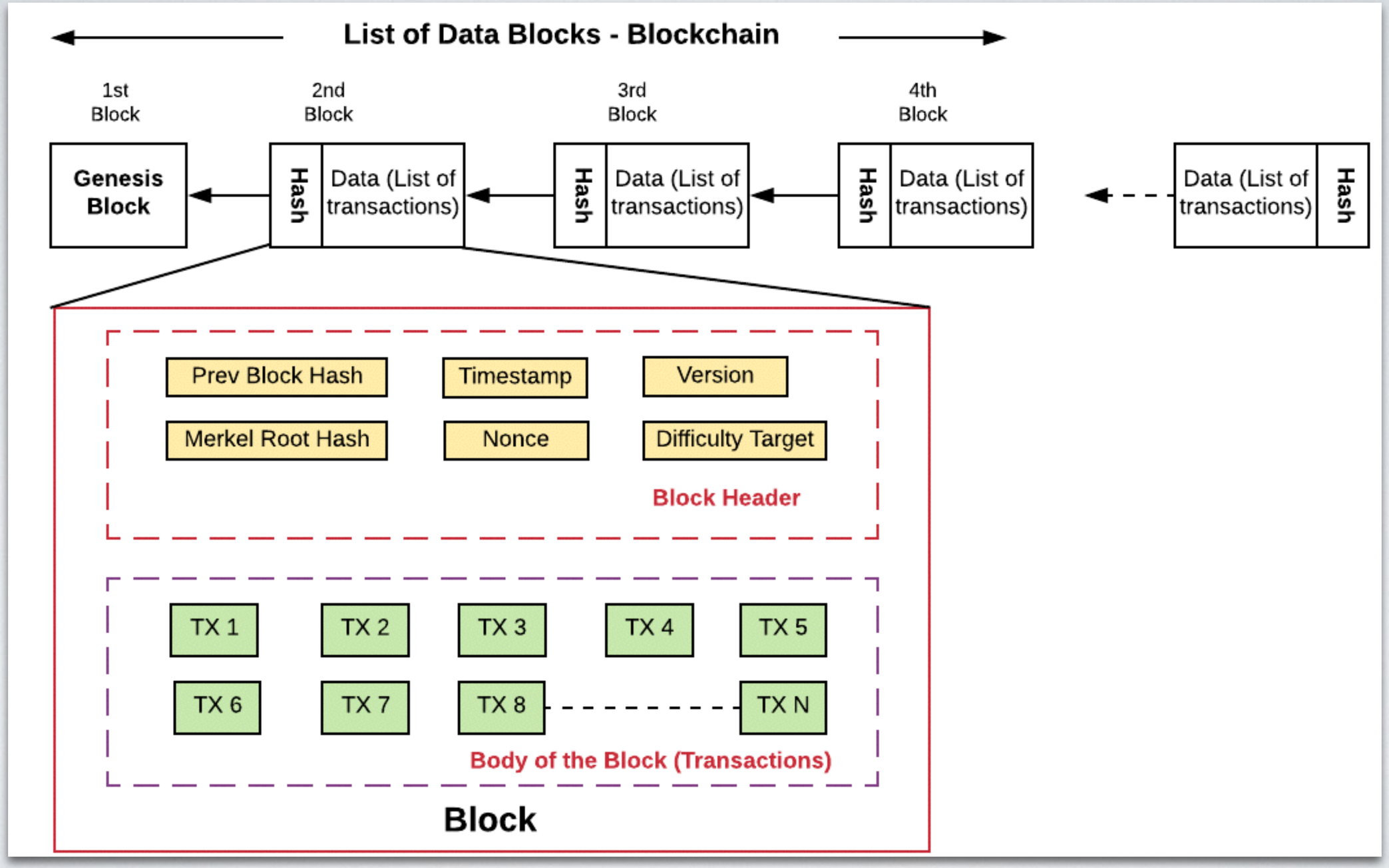
Decentralization

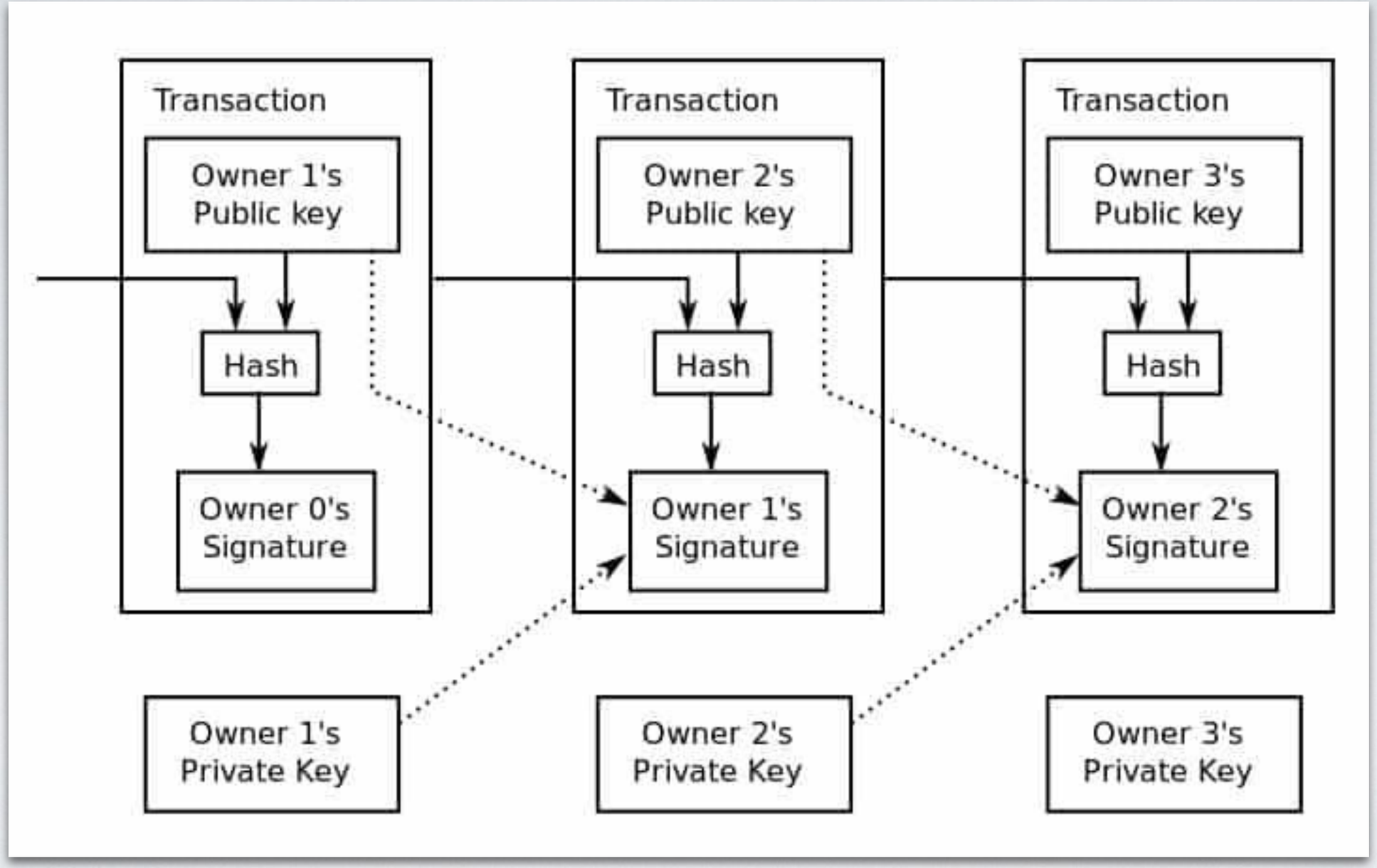
The blockchain is decentralized, so there isn't a need for a central, certifying authority.

BLOCKCHAIN.WTF

WHAT IS INSIDE A BLOCKCHAIN ?

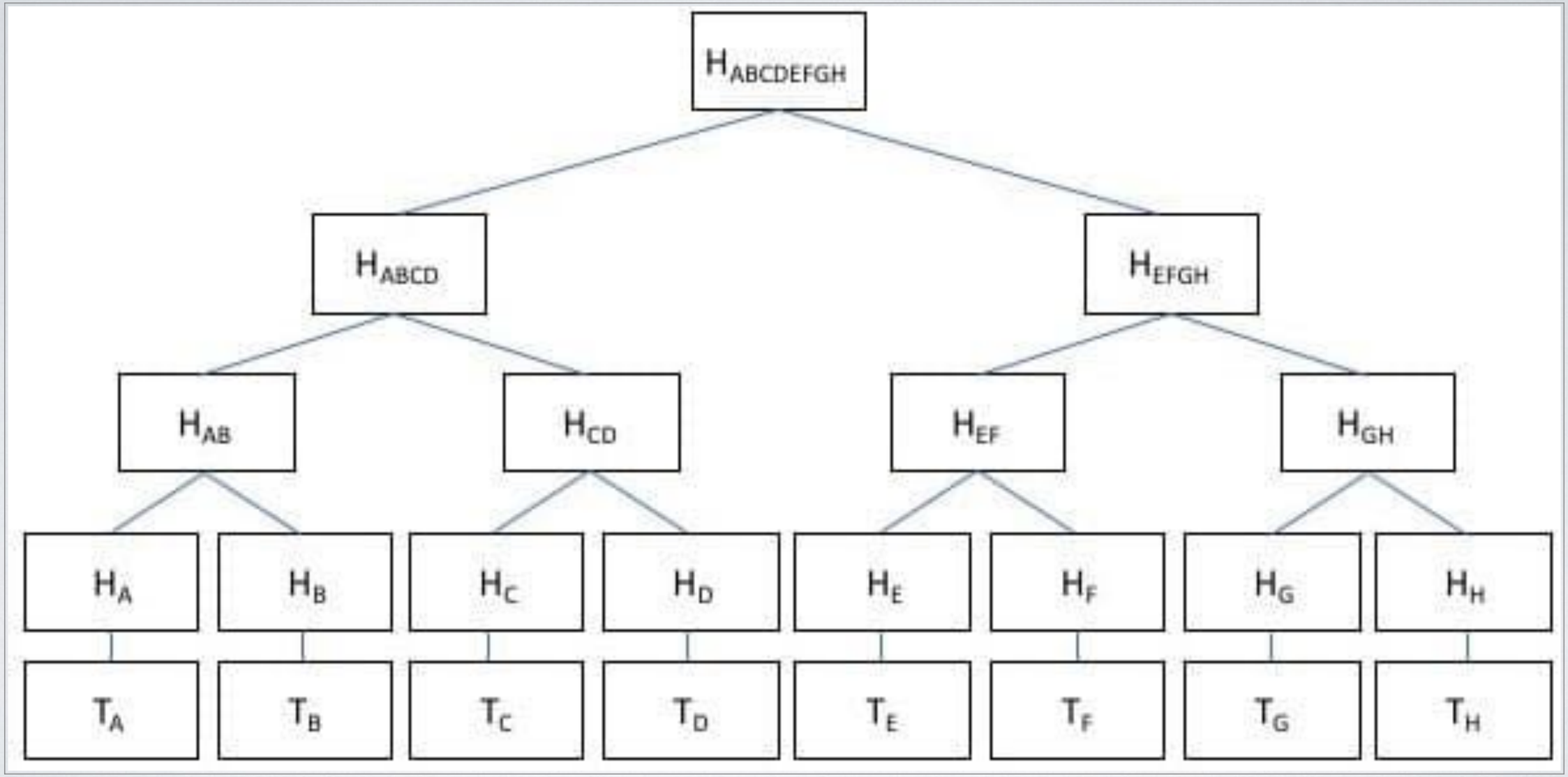
Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data (generally represented as a Merkle tree).


List of Data Blocks - Blockchain
1st Block
2nd Block
3rd Block
4th Block
Genesis Block
Hash
Data (List of transactions)
Hash
Data (List of transactions)
Hash
Data (List of transactions)
Data (List of transactions)
Hash
Prev Block Hash
Timestamp
Version
Merkel Root Hash
Nonce
Difficulty Target
Block Header
TX 1
TX 2
TX 3
TX 4
TX 5
TX 6
TX 7
TX 8
TX N
Body of the Block (Transactions)
Block


Transaction
Owner 1's Public key
Hash
Owner 0's Signature
Transaction
Owner 2's Public key
Hash
Owner 1's Signature
Transaction
Owner 3's Public key
Hash
Owner 2's Signature
Owner 1's Private Key
Owner 2's Private Key
Owner 3's Private Key

WHAT IS A MERKLE TREE ?

In cryptography and computer science, a hash tree or Merkle tree is a tree in which every leaf node is labelled with the cryptographic hash of a data block, and every non-leaf node is labelled with the cryptographic hash in the labels of its child nodes.


$H_{ABCDEFGH}$
H_{ABCD}
H_{EFGH}
H_{AB}
H_{CD}
H_{EF}
H_{GH}
H_A
H_B
H_C
H_D
H_E
H_F
H_G
H_H
T_A
T_B
T_C
T_D
T_E
T_F
T_G
T_H

WHAT IS THE DESIGN OF BLOCKCHAIN ?

By design, a blockchain is resistant to modification of the data. It is "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way"

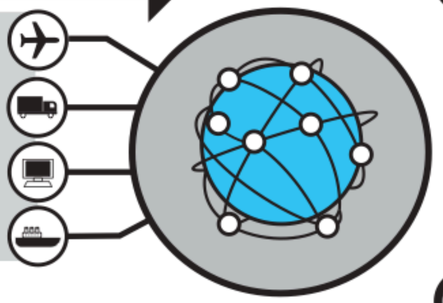
BLOCK CHAIN

How serialized block chain will revolutionize the supply chain

REQUEST SENT

A request to append a transaction to the supply chain is sent.

The transaction is then shared through a P2P network, without reliance on central vendor, for validation.



REQUEST VALIDATED

A block is created after every component of a transaction is completed and validated using proven, trusted algorithms. A verified transaction can contain data events and smart contracts.

BLOCK CREATED

APPENDED

TRANSACTION COMPLETED

Once you put data on the blockchain, it is there forever; it can never be removed or altered by any party or user.

Every addition to the blockchain has a time-stamp and a counterfeit-proof cryptographic key signature.

Because blockchain inherently protects the purity of the data, companies can forego computer systems validation — a huge cost saving.

Integrating sensors into blockchain reduces inefficiencies, sources of delay, bias, and potential for disagreement over when key milestones are met.

SMART CONTRACTS

Blocks can be data or can include smart contracts; smart contracts autonomously trigger other transactions when key milestones are reached or completed.

Milestone Ex.	Smart Contract Ex.
Goods Issued	Create Shipment
Pickup Confirmed	Activate Sensor
Proof of Delivery	Issue Bill / Invoice

WHY DO WE USE A BLOCKCHAIN TO BUILD A DISTRIBUTED LEDGER ?

For use as a distributed ledger, a blockchain is typically managed by a peer-to-peer network collectively adhering to a protocol for inter-node communication and validating new blocks.

Four elements characterize Blockchain

Replicated ledger

- History of all transactions
- Append-only with immutable past
- Distributed and replicated

Cryptography

- Integrity of ledger
- Authenticity of transactions
- Privacy of transactions
- Identity of participants

Consensus

- Decentralized protocol
- Shared control tolerating disruption
- Transactions validated

Business logic

- Logic embedded in the ledger
- Executed together with transactions
- From simple "coins" to self-enforcing "smart contracts"

Attributes of Blockchain

Verifiable

- Provenance
- Consensus-based

Immutable

- Indelible
- Tamper-proof

Programmable

- Smart Contract
- Scripts on Blockchain

Decentralized

- Shared
- No single point of failure

WHY DO WE SAY BLOCKCHAIN IS TAMPER PROOF AND TAMPER EVIDENT ?

Once recorded, the data in any given block cannot be altered retroactively without alteration of all subsequent blocks, which requires consensus of the network majority

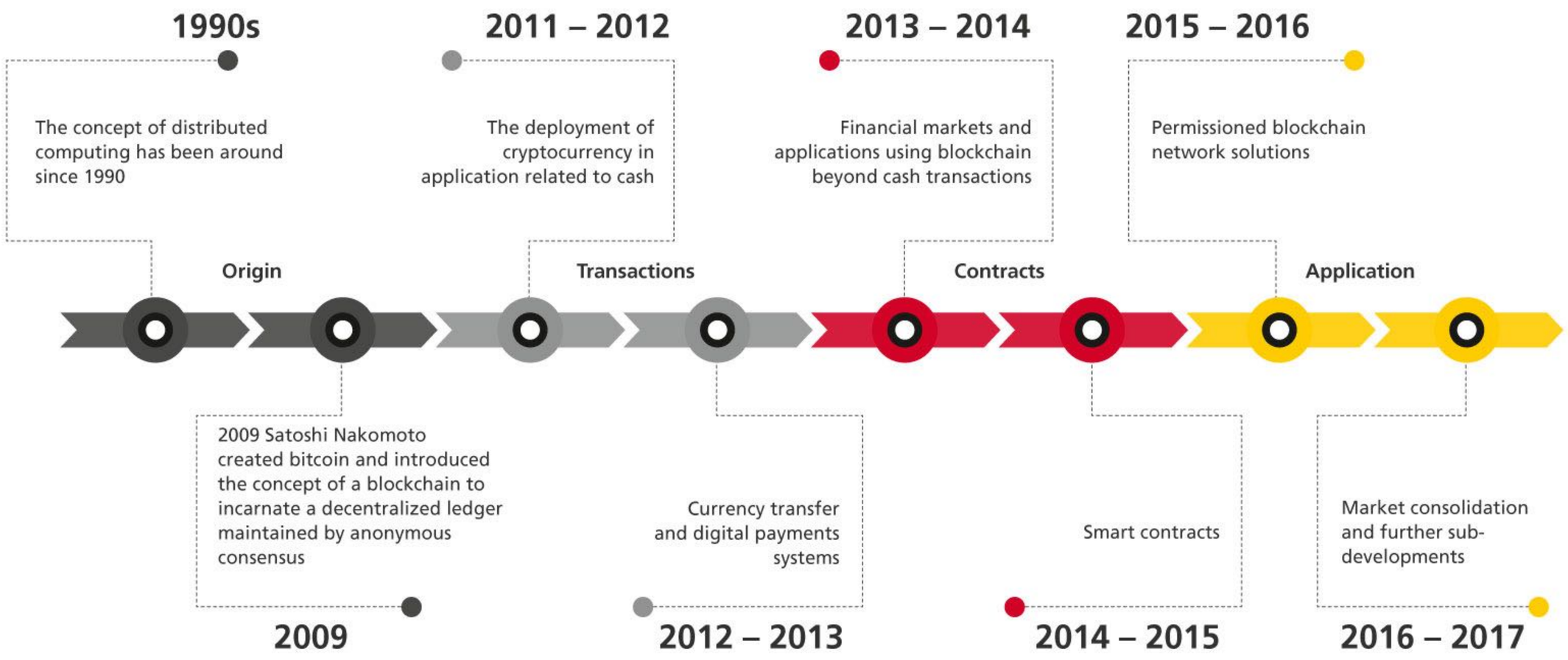
HOW IS BLOCKCHAIN CONNECTED TO BITCOIN PROTOCOL ?

The invention of the blockchain for bitcoin made it the first digital currency to solve the double-spending problem without the need of a trusted authority or central server.

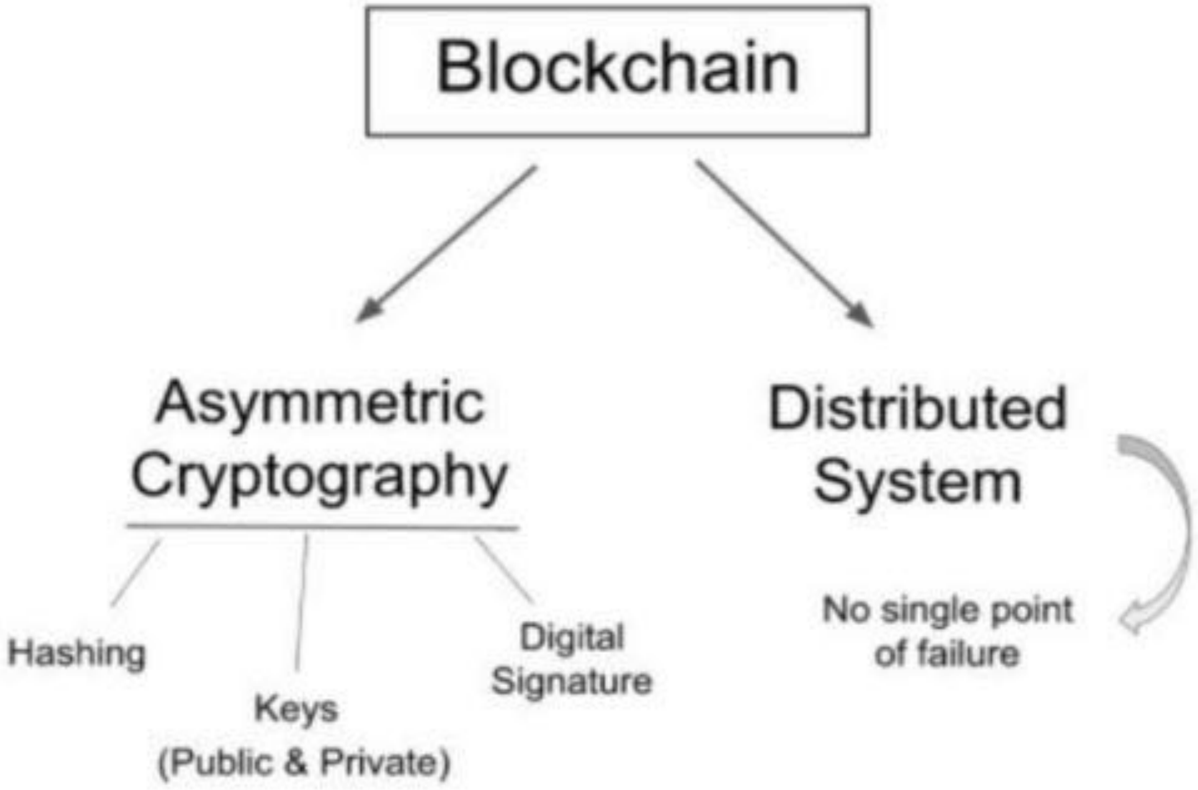
WHAT IS THE HISTORIC ORIGIN OF BLOCKCHAIN TECHNOLOGY ?

The first work on a cryptographically secured chain of blocks was described in 1991 by Stuart Haber and W. Scott Stornetta. They wanted to implement a system where document timestamps could not be tampered with. In 1992, Bayer, Haber and Stornetta incorporated Merkle trees to the design, which improved its efficiency by allowing several document certificates to be collected into one block

BLOCKCHAIN HISTORY



BLOCKCHAIN Insider



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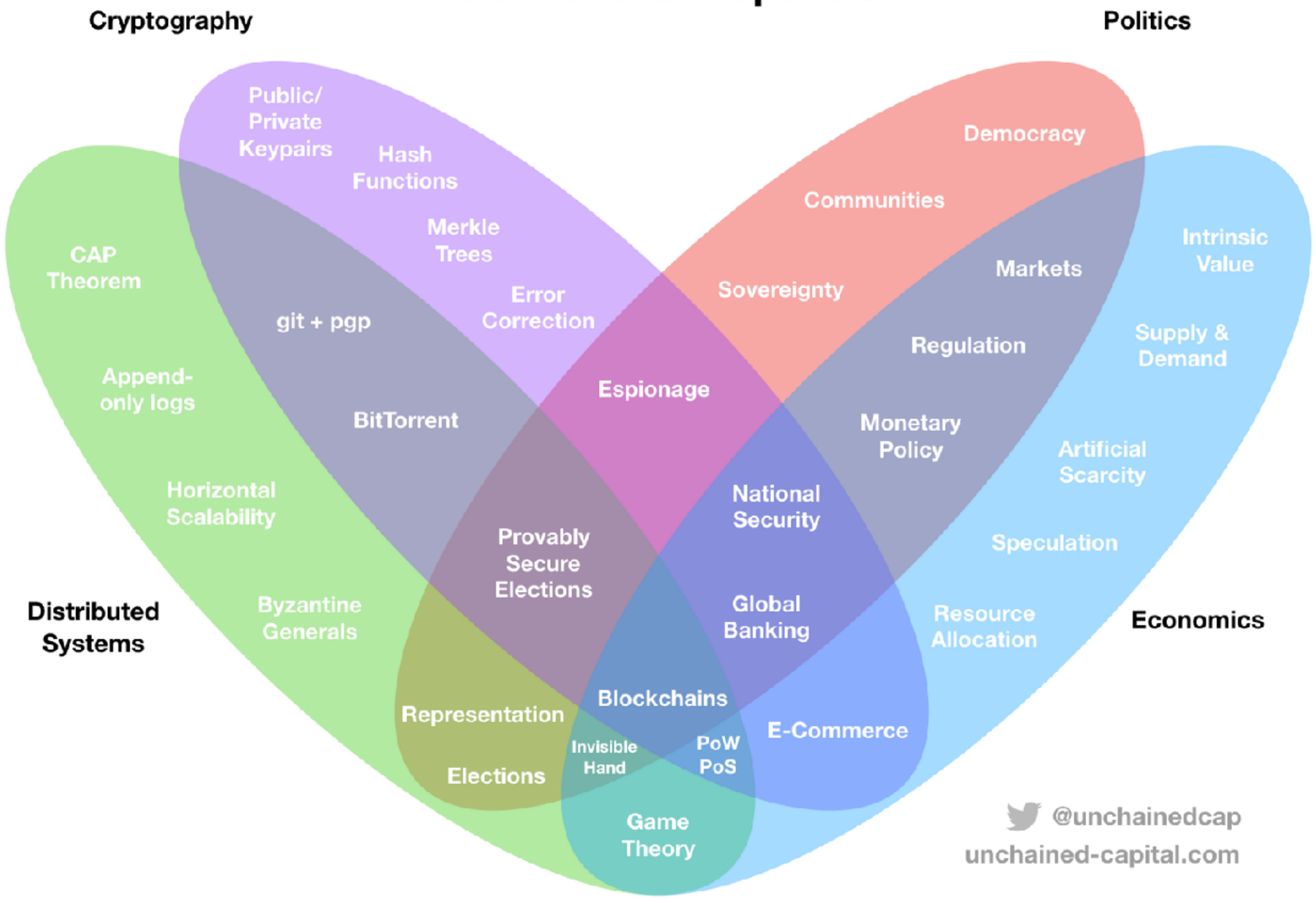
The Blockchain Spectrum



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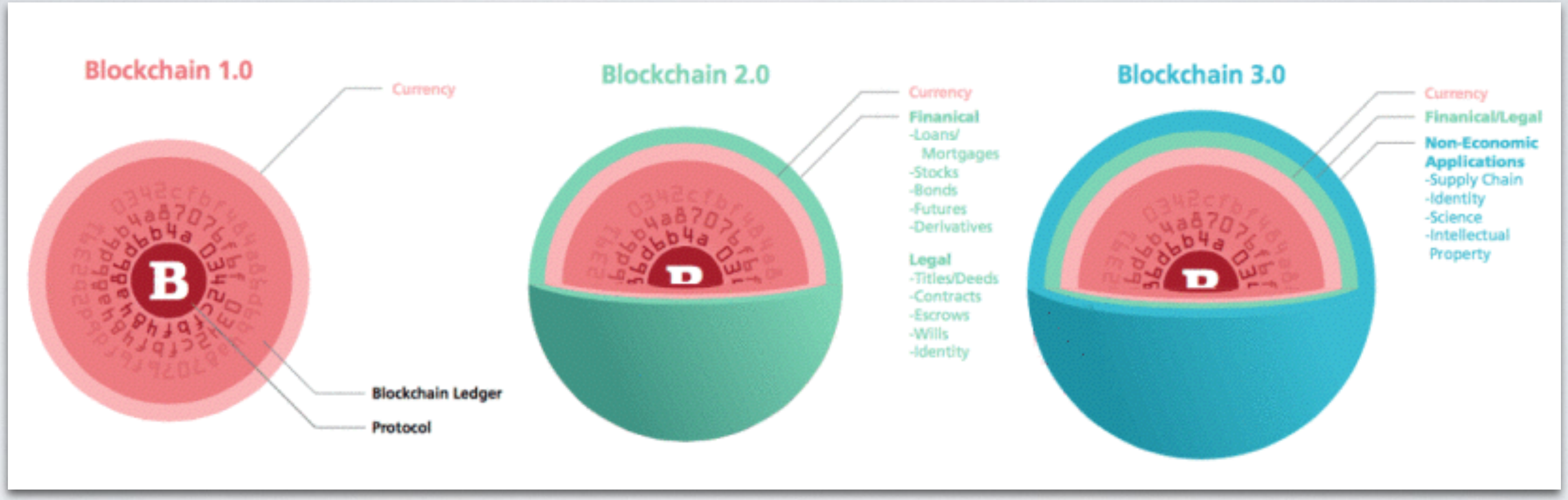
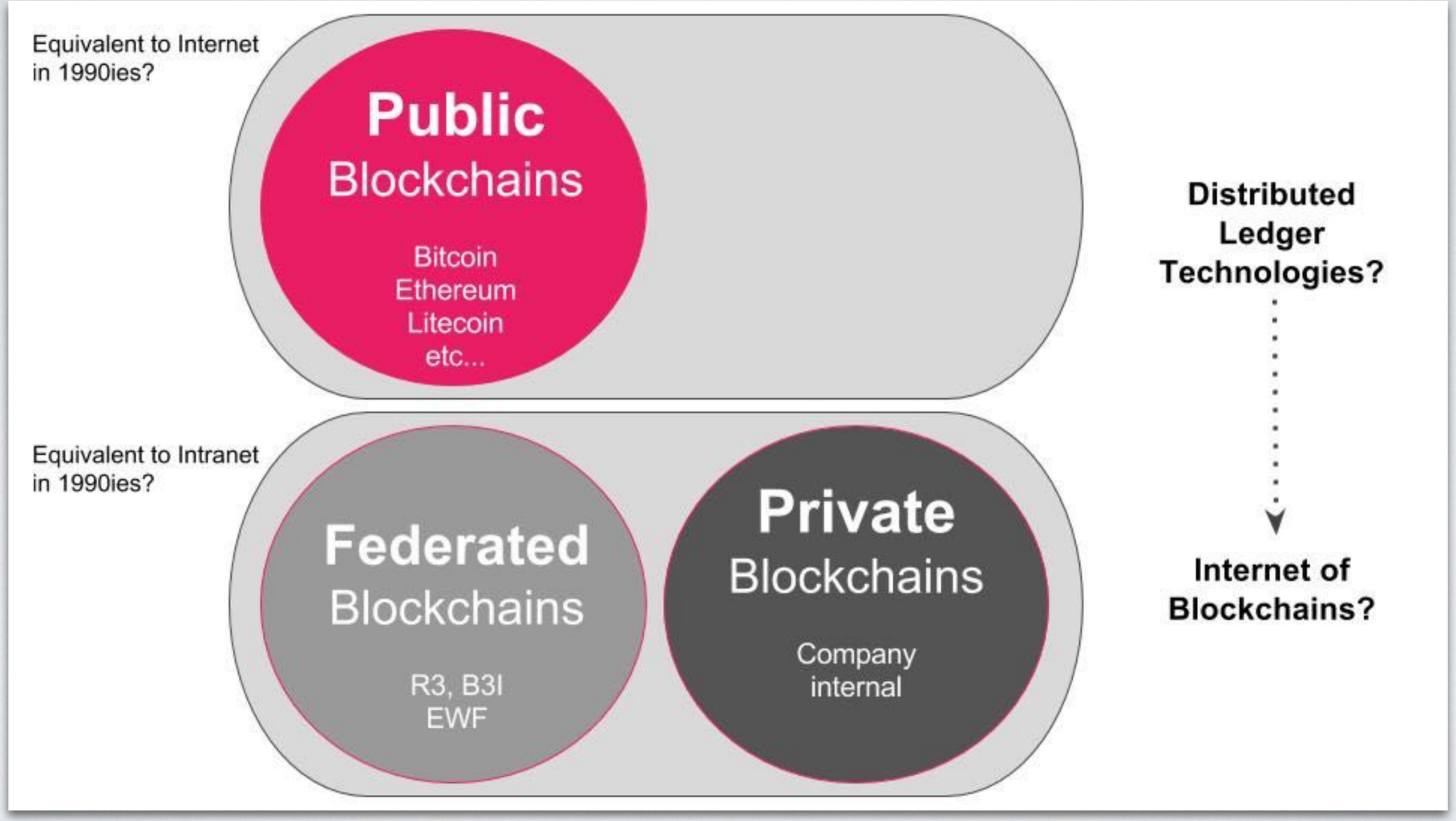
unchained-capital.com

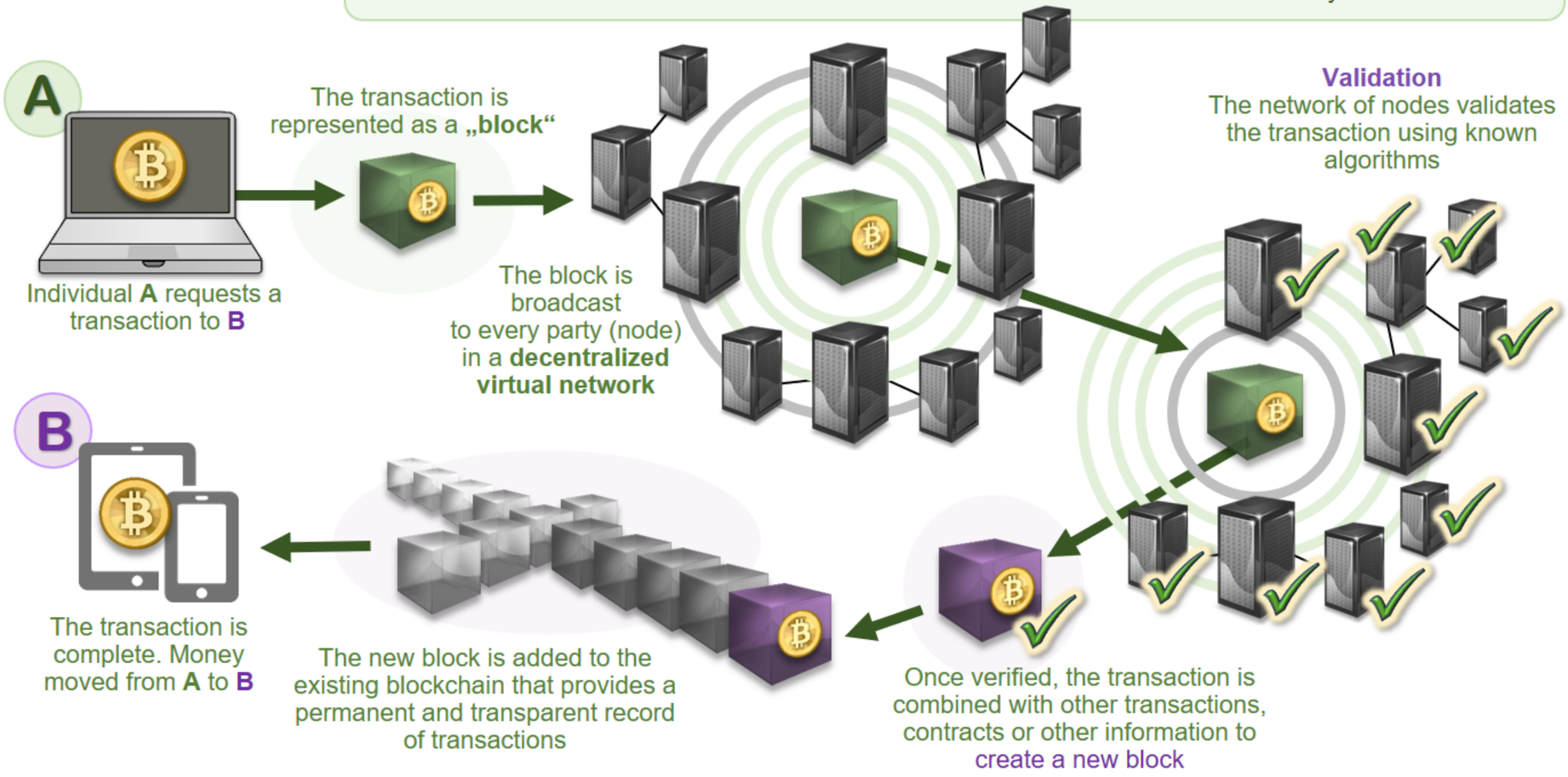

Blockchain 1.0
Currency
B
Blockchain Ledger
Protocol
Blockchain 2.0
Currency
Finanical
-Loans/
Mortgages
-Stocks
-Bonds
-Futures
-Derivatives
Legal
-Titles/Deeds
-Contracts
-Escrows
-Wills
-Identity
Blockchain 3.0
Currency
Finanical/Legal
Non-Economic
Applications
-Supply Chain
-Identity
-Science
-Intellectual
Property


Equivalent to Internet in 1990ies?
Public
Blockchains
Bitcoin
Ethereum
Litecoin
etc...
Equivalent to Intranet in 1990ies?
Federated
Blockchains
R3, B3I
EWF
Private
Blockchains
Company
internal
Distributed Ledger Technologies?
Internet of Blockchains?

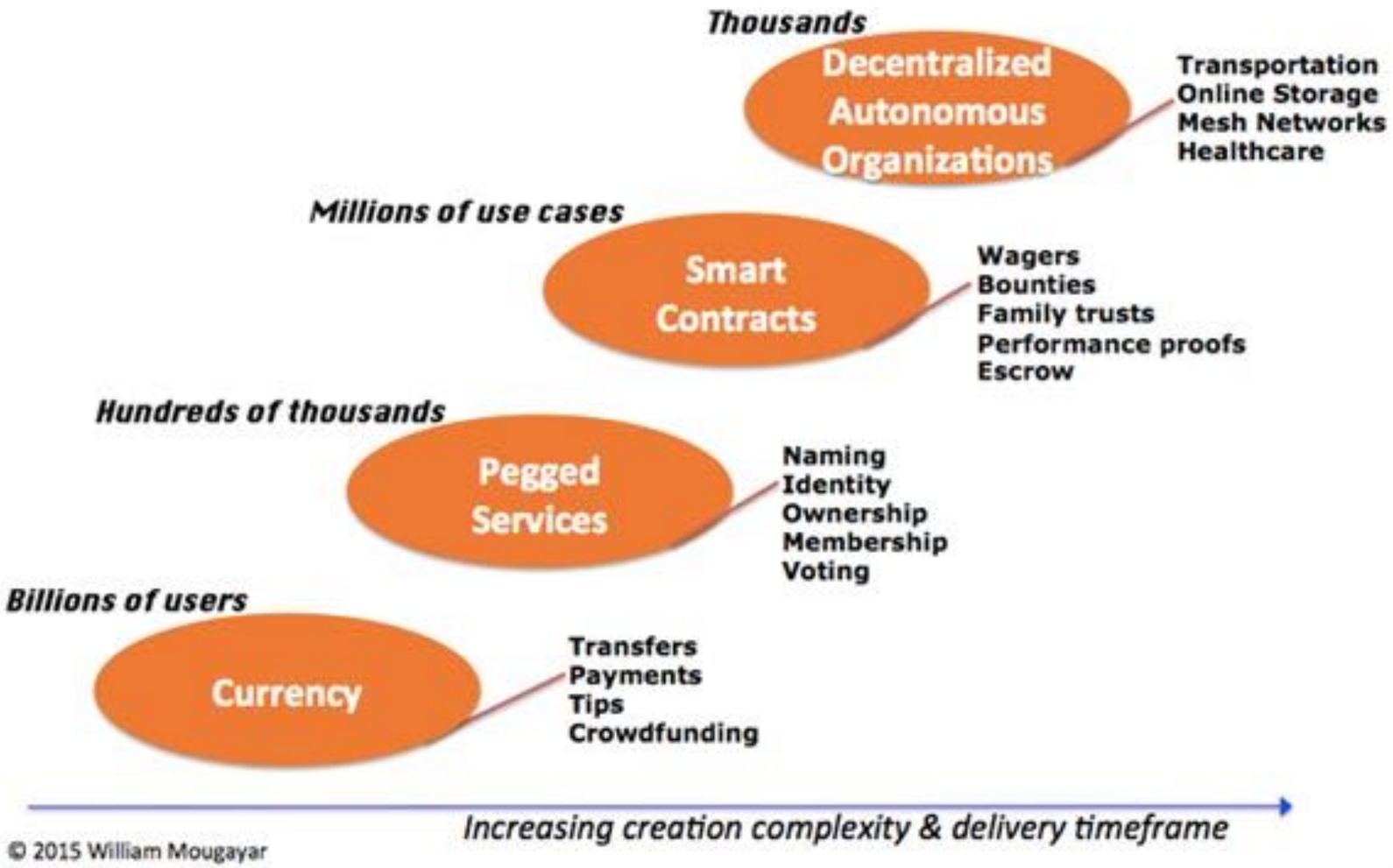
Blockchain Technology explained

Definition

The blockchain is a ledger of all transactions across a decentralized virtual network. Each successive block contains a unique fingerprint of the previous code; therefore, cryptography (via hash codes) is used to secure the authentication of the transaction source and removes the need for a central intermediary.



Blockchain Apps: End-User View



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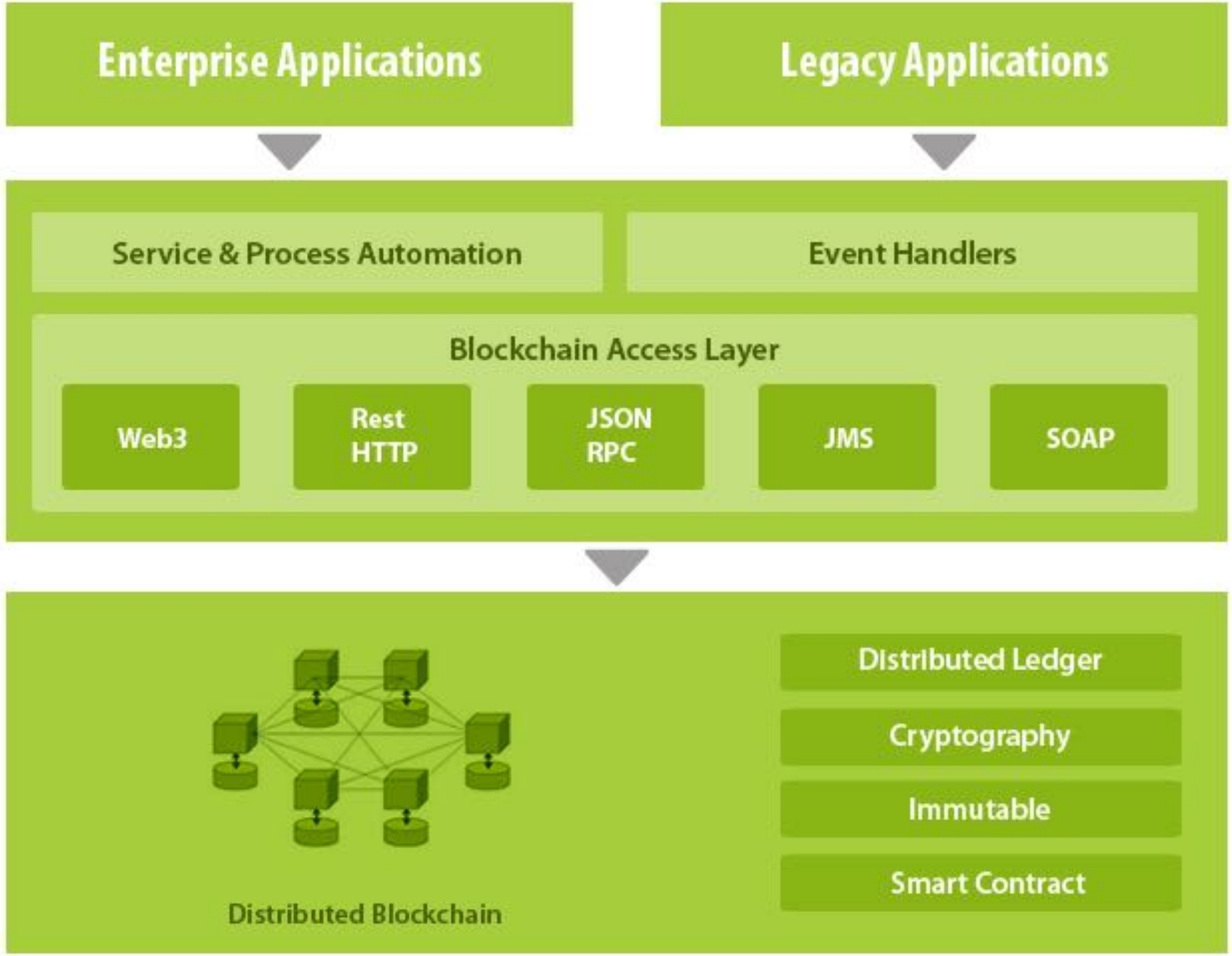
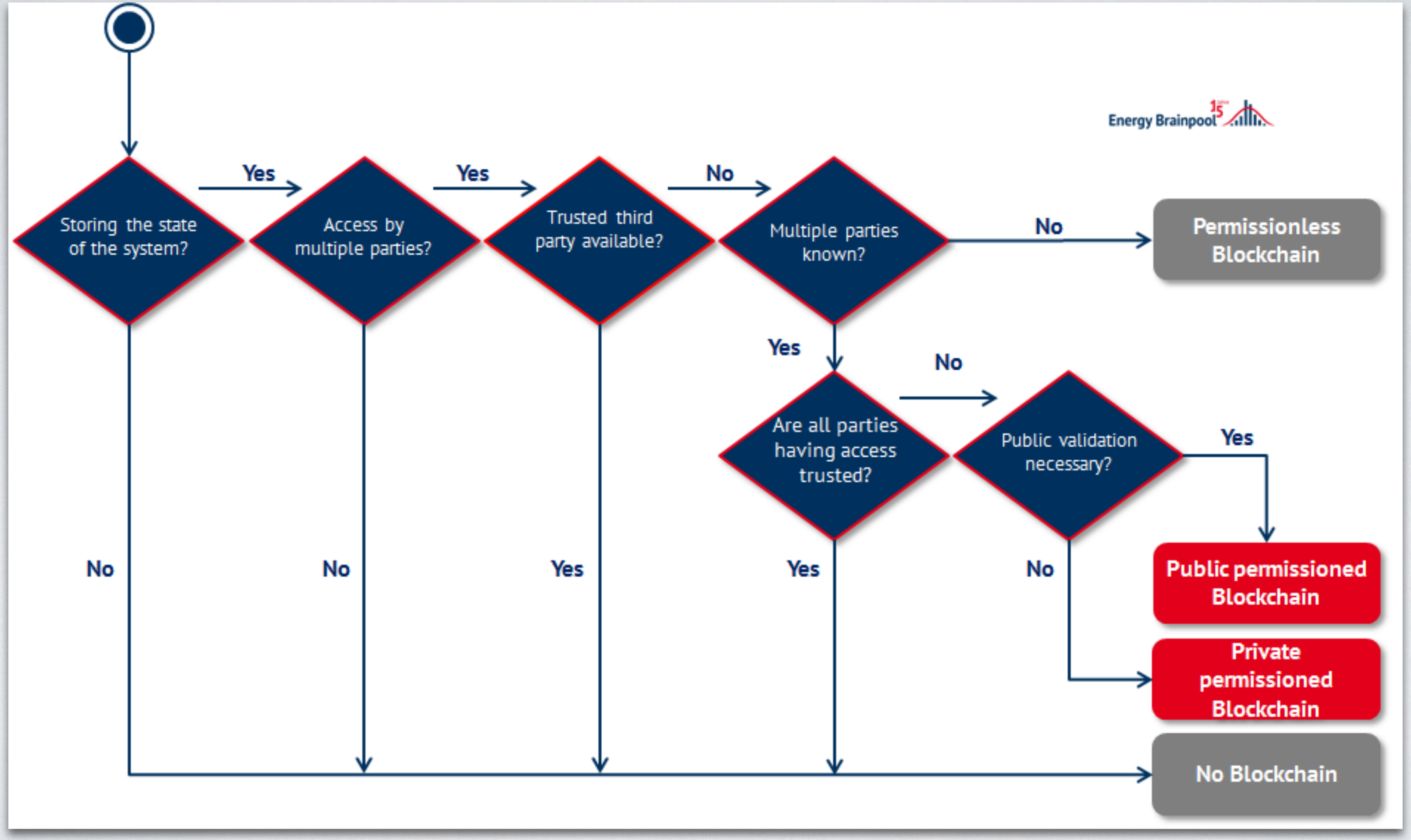
Blockchain Platforms

- Ethereum
- Hyperledger
- Corda




Energy Brainpool
Storing the state of the system?
Yes
Access by multiple parties?
Yes
Trusted third party available?
No
Multiple parties known?
No
Permissionless Blockchain
Yes
Are all parties having access trusted?
No
Public validation necessary?
Yes
Public permissioned Blockchain
No
Private permissioned Blockchain
No
No
Yes
Yes
No Blockchain

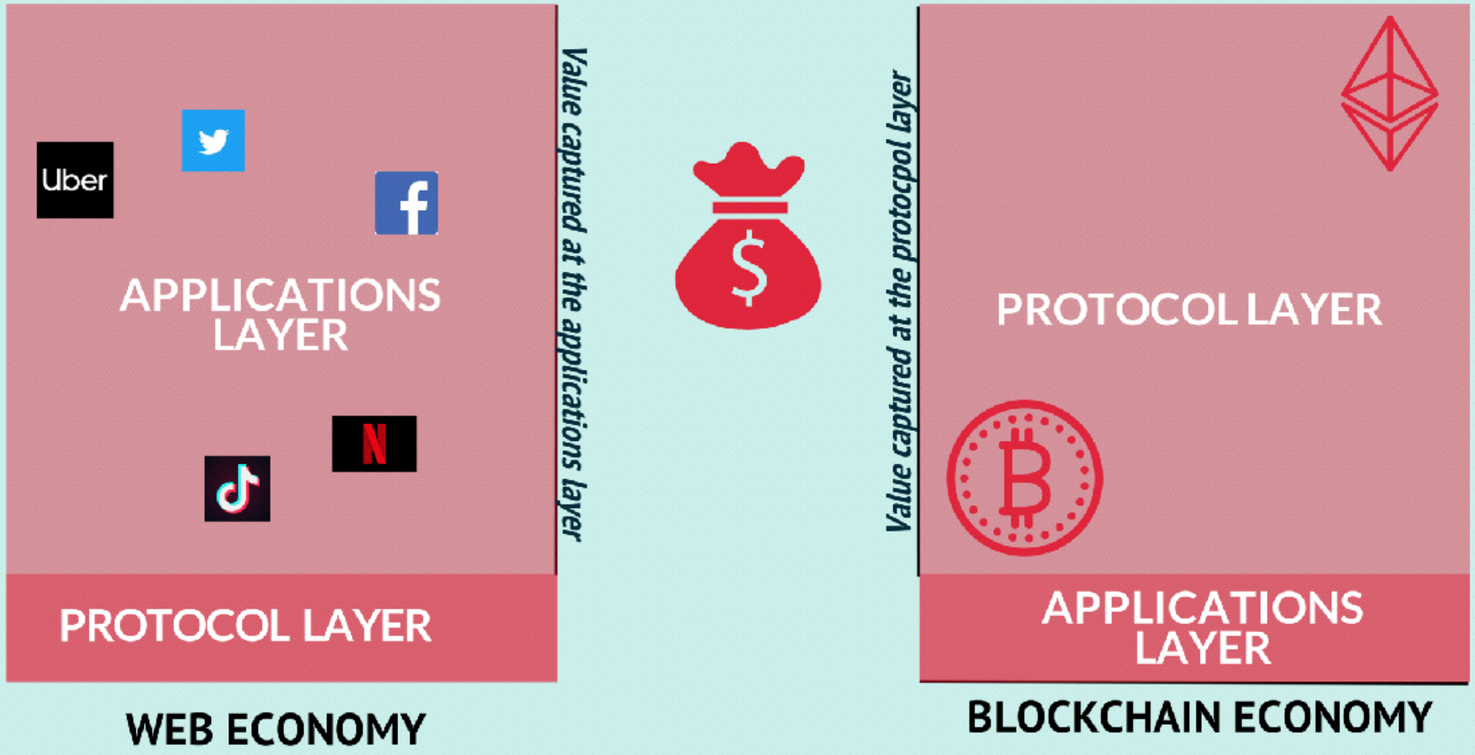
Blockchain isn't a Solution for Everything

Blockchains are useful when at least 50% or more of these conditions are met

Parameter	Criteria	Check
Usage	What is the purpose of the service/ application?	-
Function	How does it function to meet the user's needs?	-
Process	Does the process have inefficiencies/ duplication of effort?	Yes / No
Parties	Are multiple parties needed to facilitate the end-to-end process? Are there intermediaries?	Yes / No
Costs	Are there costs incurred due to inefficiencies or several parties?	Yes / No
Time	Are there inefficiencies that result in additional time for the end-to-end process?	Yes / No
Trust	Is there a general sense of distrust or skepticism amongst users or parties?	Yes / No
Transparency	Is the degree of visibility into the process and data to users / parties poor?	Yes / No
Immutability	Will it be acceptable if the data cannot be changed?	Yes / No
Security	Is the application / system vulnerable to attacks or errors?	Yes / No

Web vs. Blockchain Business Models

The emergence of the Blockchain has also favored the development of new business models. It is essential to understand the implication of these new business models from a different standpoint. According to Joel Monegro, from USV (a venture capital firm) the blockchain implies value creation in its protocols. Where the web has allowed the value to be captured at the applications layer (take Facebook, Twitter, Google, and many others). In a Blockchain Economy, this value might be captured by the protocols at the base of the blockchain, where the apps built on top of it will have a fraction of the value.

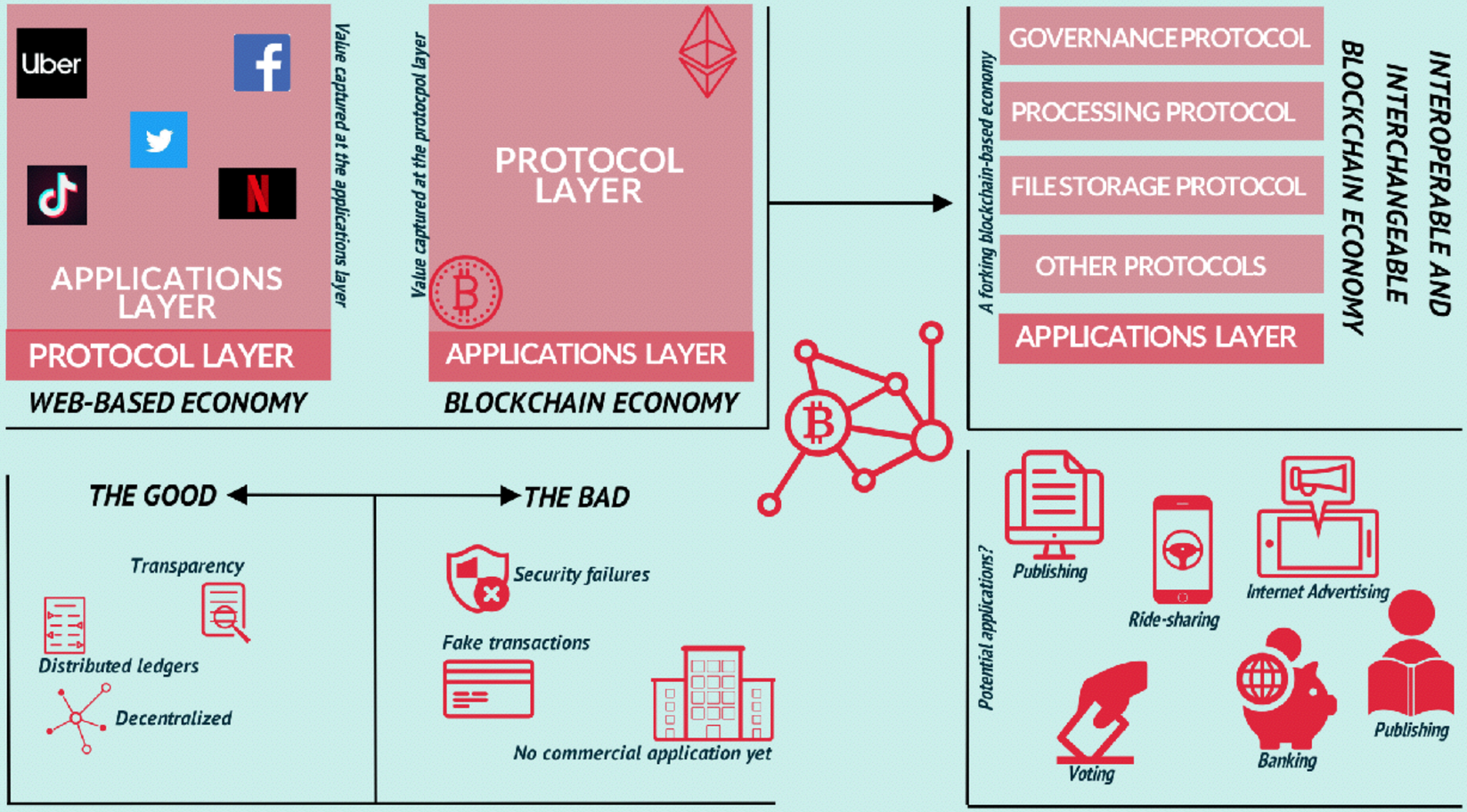


Read: fourweekmba.com/blockchain-business-models

FourWeekMBA.com

Blockchain Economics 101

According to Joel Monegro, a former analyst at USV (a venture capital firm) the blockchain implies value creation in its protocols. Where the web has allowed the value to be captured at the applications layer (take Facebook, Twitter, Google, and many others). In a Blockchain Economy, this value might be captured by the protocols at the base of the blockchain (for instance Bitcoin and Ethereum). However, according to blockchain investor Paivinen due to ease of forking, incentives to compete and improved interoperability and interchangeability also in a blockchain-based economy, protocols might get thinner. Although the marginal value of scale might be lower compared to a web-based economy, where massive scale created an economic advantage. The success of the Blockchain will depend on its commercial viability!



FourWeekMBA.com

BLOCKCHAIN FOR BUSINESS

BUSINESS VALUE FROM BLOCKCHAIN

Settlement Speed
Efficiency
Security
Traceability

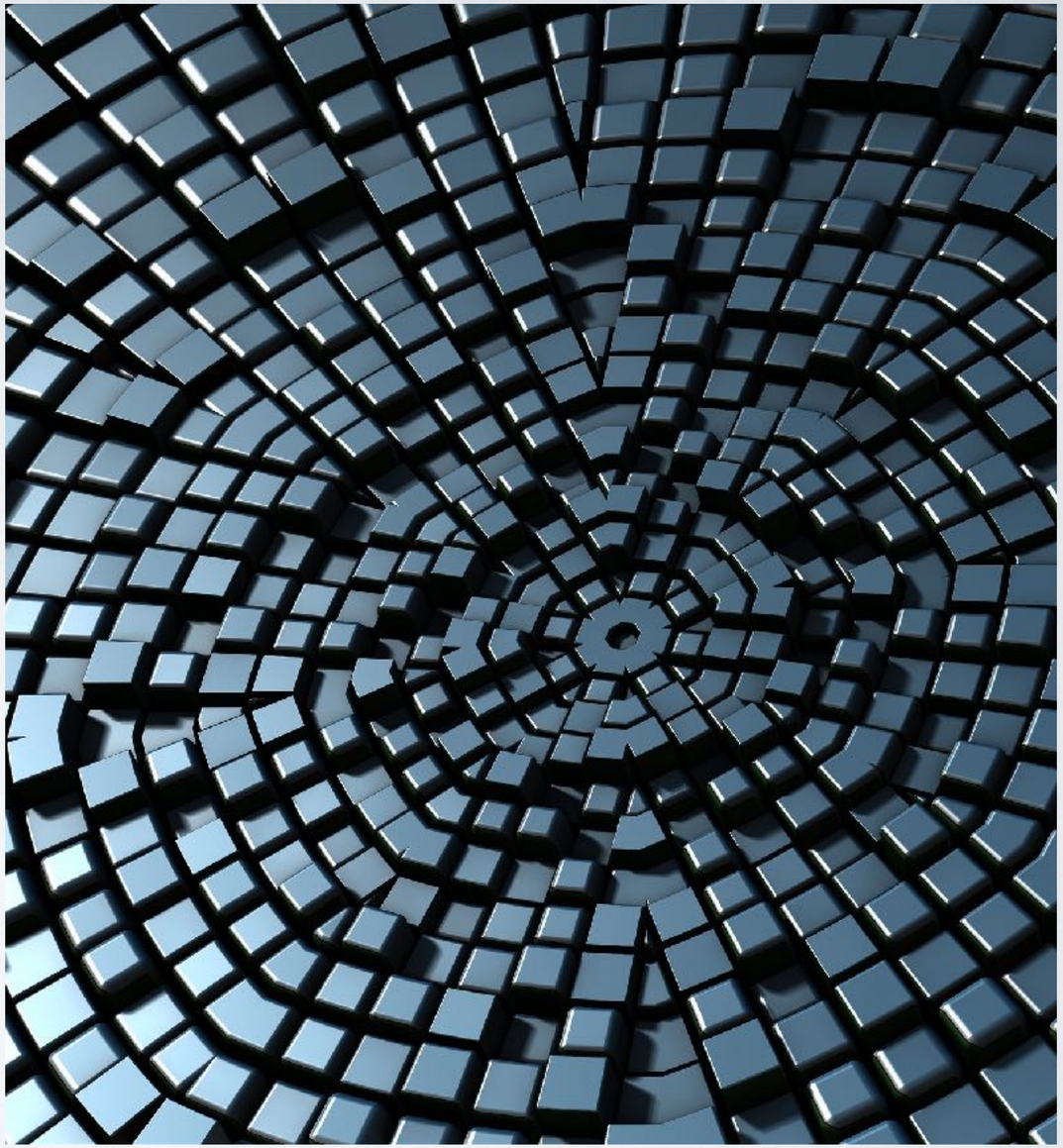
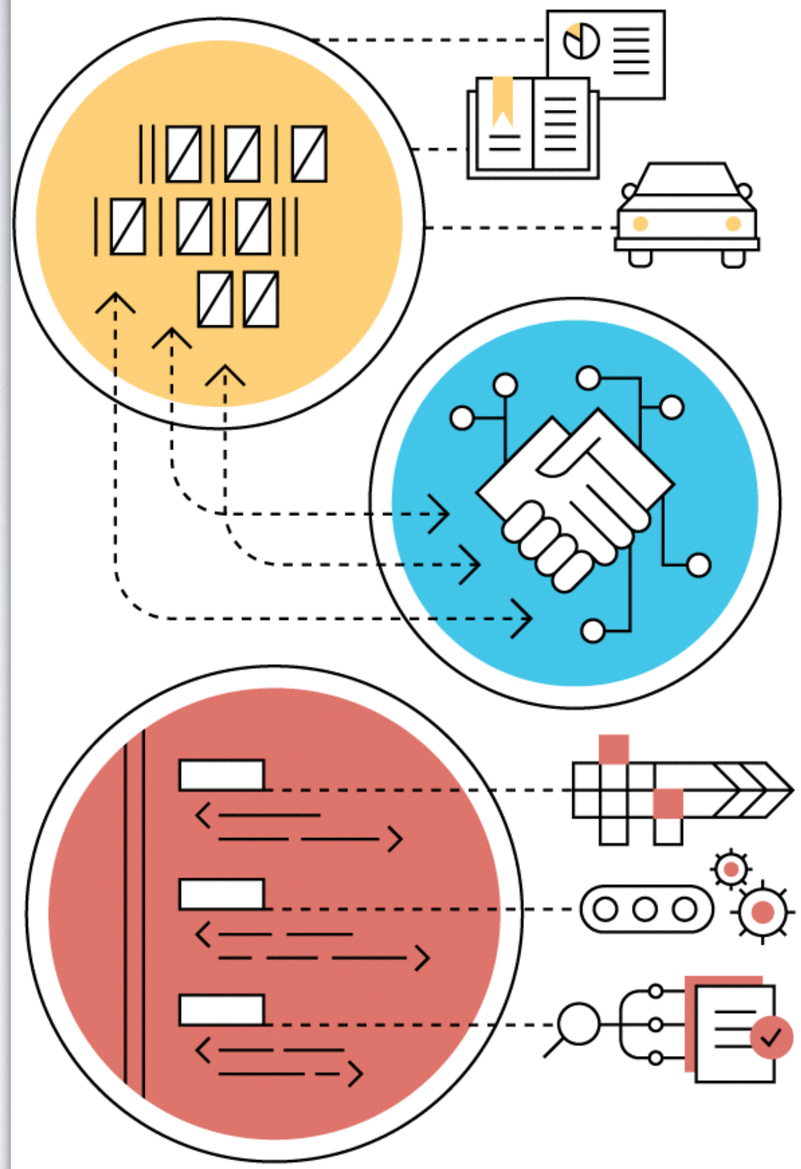


Figure 1. Three levels of blockchain



1 Storing digital records

Blockchain allows unprecedented control of information through secure, auditable, and immutable records of not only transactions but digital representations of physical assets.

2 Exchanging digital assets

Users can issue new assets and transfer ownership in real time without banks, stock exchanges, or payment processors.

3 Executing smart contracts

Self-governing contracts simplify and automate lengthy and inefficient business processes.

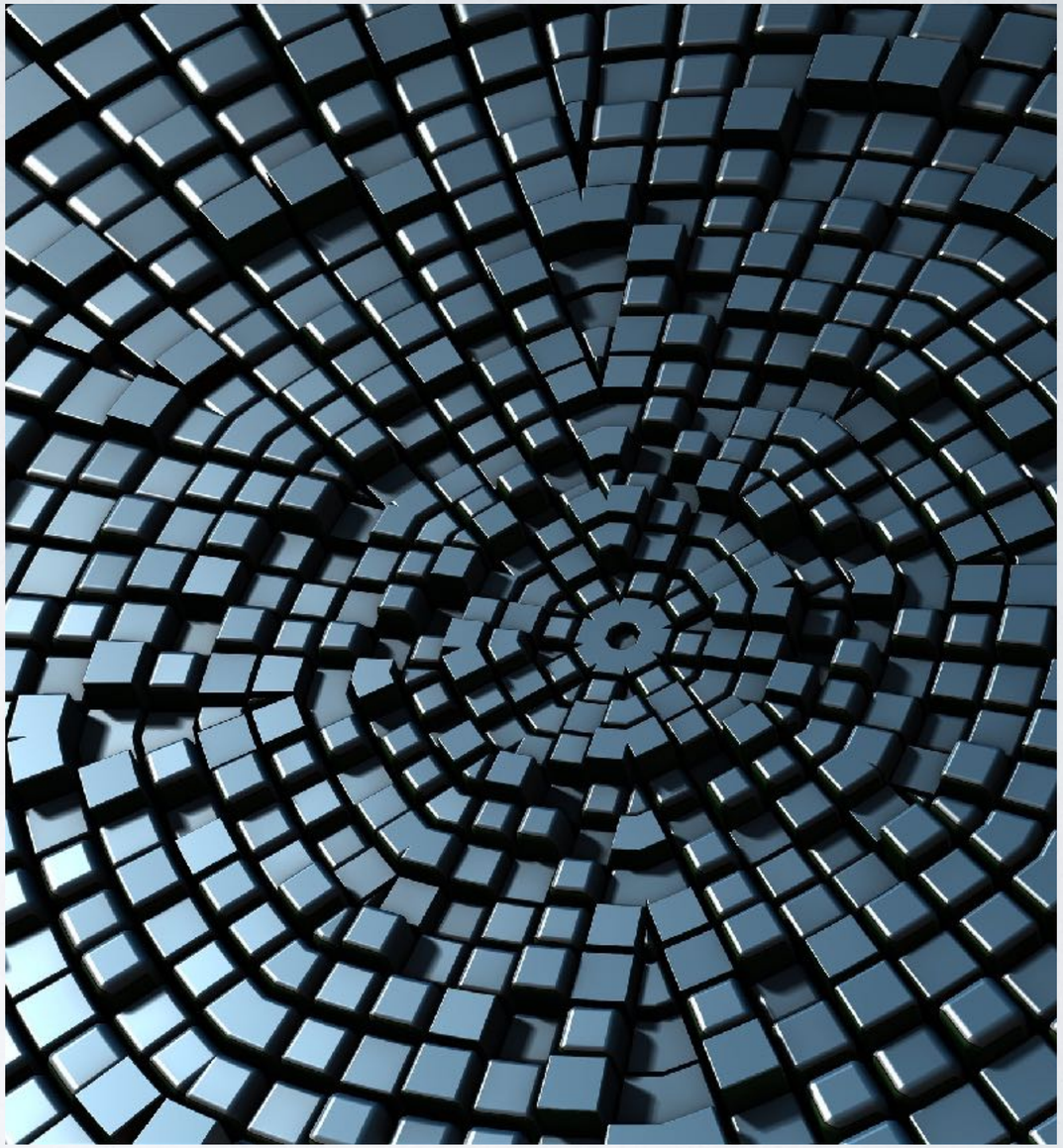
Ground rules Terms and conditions are recorded in the contract's code.

Implementation The shared network automatically executes the contract and monitors compliance.

Verification Outcomes are validated instantaneously without a third party.

BLOCKCHAIN FOR BUSINESS

Finance
Food / Agriculture
Media / Advertising
Tickets
Healthcare
Education
Real Estate
Government



101 Blockchains | 20+ BLOCKCHAIN TECHNOLOGY USE CASES

SUPPLY CHAIN MANAGEMENT
Product tracking, non-tampering, improved transparency, isolate problems easily, authenticity and verifiability, cost reduction.

INSURANCE
Automate insurance with a faster approach, easy claims, and better information access; removes mediator to a certain extent.

HEALTHCARE
Improved health care facilitates with secure storage and retrieval; improved research efforts and insurance claim.

CRYPTOCURRENCY
A cryptocurrency is a digital asset which eliminates the middleman and facilitates peer-to-peer transactions.

ASSET TOKENIZATION
Tokenization of real-world assets with improved efficiency, less time, and access to the global market.

NOTARY
Removes the need for trust in the notary system with a decentralized approach. Also, provides proof-of-existence.

REAL ESTATE
Improved property ownership verification and transfer, safe and secure global marketplace without any middle man.

DIGITAL IDENTITY
One single identity works on multiple platforms, immune to data breaches, no physical documents needed.

SUSTAINABLE SOLUTIONS
Improve sustainability in different industries.

RETAIL LOYALTY REWARDS PROGRAM
Maximize reach with the better reward system and flexible approach.

ENERGY MARKET
Improved energy market by providing cheaper energy, peer-to-peer network.

BLOCKCHAIN DIGITAL TRANSFORMATION
101 Blockchains

CONTENT PLATFORM
Earn without a middleman, instant payments.

INTERNET OF THINGS (IoT)
Improved and secure data sharing with tokenization and cost-effective approach.

VOTING
Voting becomes more transparent with immutable, verifiable, and trustworthy votes.

DECENTRALIZED AUTONOMOUS ORGANIZATION (DAO)
DAO offers an automated approach with better decision making in an organization; handles bureaucracy and mismanagement.

FOOD SAFETY
More trustworthy and traceable food with supply chain tracking; issues get resolved faster.

MUSIC
Creators can sell their music with zero cuts from a centralized player, improves privacy, and provide intellectual rights protection.

GAMING
Better eSports management, improved crowdfunding for indie developers, decentralized games, and better production process.

COPYRIGHT AND ROYALTY PROTECTION
Protects creators with automated copyright and takes action automatically.

TRAVEL
Secure payments, better luggage management, identification services, and customer loyalty schemes.

BANKING
Improved KYC model, smooth international transactions, and better interbank clearing.

CYBER SECURITY
Better cybersecurity with use of decentralized data storage; no single point of attack and control over DDoS attacks.

CREATED BY **101BLOCKCHAINS.COM**

101 Blockchains | USE CASES AND IMPLEMENTATION CHALLENGES OF ENTERPRISE BLOCKCHAIN

WHAT ARE THE USE CASES OF ENTERPRISE BLOCKCHAIN?

GLOBAL TRANSACTIONS
- Faster processing of cross-border payment
- Reduced costing
- Greater efficiency in transaction

HEALTHCARE
- Gets rid of drug counterfeits
- Tracks patient information
- Streamlines multiple test results at the same time

TRADING
- Improved transparency and trust for trade finance
- More control for manufacturers
- Reduced paperwork and cost

OIL AND GAS
- Secured freight payment and auditing
- Improves efficiency by calculating shipment routes
- Saves 5% revenue with accuracy

FOOD SAFETY
- Accountability for food safety
- Reduce food wastage
- Gets rid of food fraudulence

REAL ESTATE
- Reduces costing of the property
- Promotes fractional ownership
- Increases scalability

SUPPLY CHAIN
- Secured ledger system with visibility for the supply chain
- Tracks all products
- Quickly detects the corrupted personal with acute info.

HUMANITARIANISM
- Ensures that the donation goes to the right place
- Offers transparency for the donating citizens
- Promote fairness and trust

RETAIL
- Helps to fight counterfeit products
- Keeps track of all luxury goods
- Deals with theft issues

MEDIA AND ENTERTAINMENT
- Better artist value
- Connects artist with a better paycheck
- Efficient marketing on social media

GOVERNMENTAL SERVICES
- Secure way to preserve all citizen rights
- Offers exponential growth of the economy
- Digitizing citizen identification

TRAVEL
- Streamline passenger processing
- Promotes cross border identification
- Schedules all flights with greater accuracy

INTELLECTUAL PROPERTY
- Ensures trademarking and patenting intellectual properties
- Offers payment for patented work
- Reduced intellectual property abuse

INSURANCE
- Reduces the number of paper trails
- Faster insurance claims
- No more exploiting consumers

ARE THERE ANY IMPLEMENTATION CHALLENGES?

INTEROPERABILITY
The current enterprise blockchain technologies lack the ever needed interoperability between all networks.

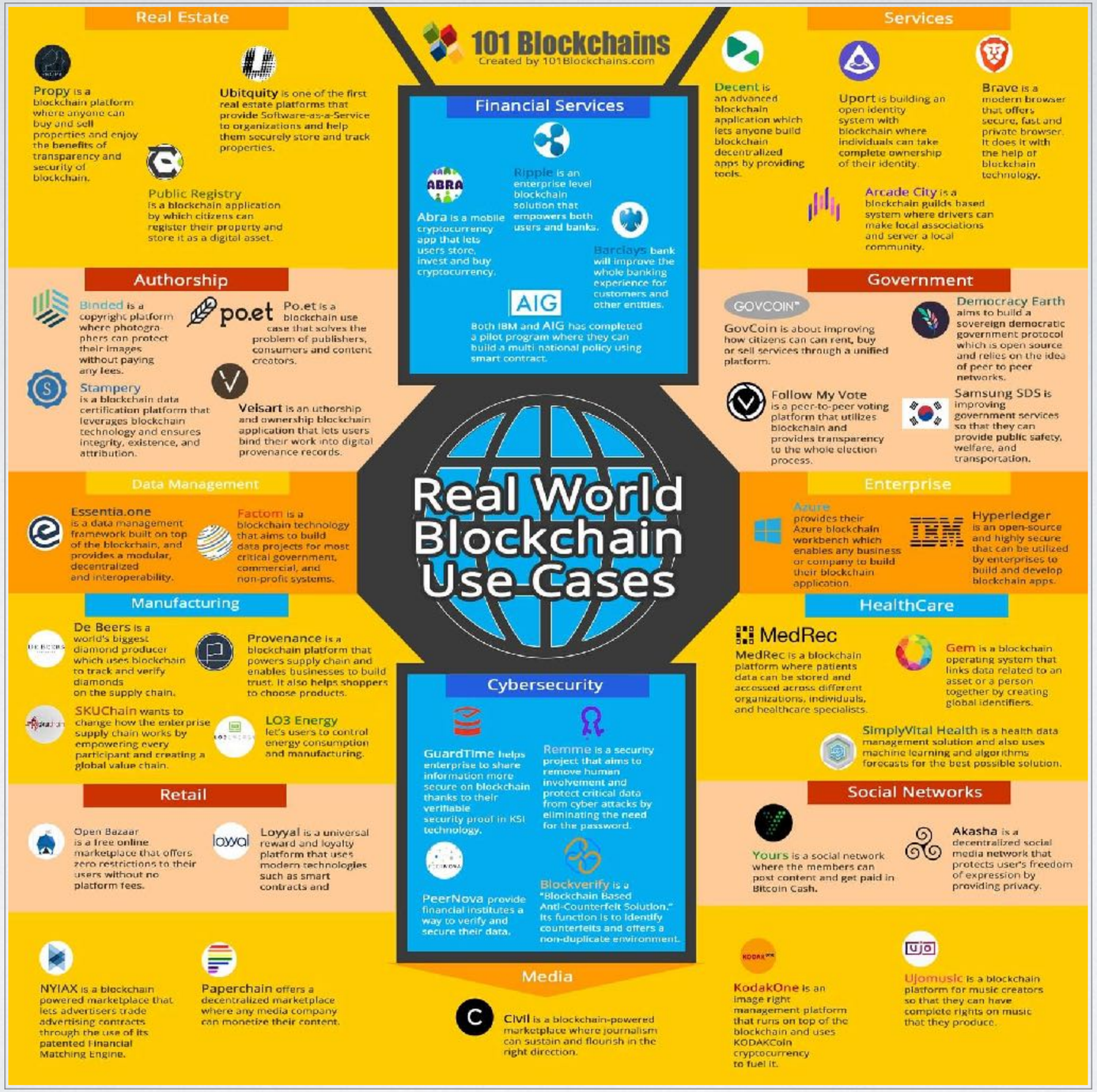
LEGACY NETWORKS
Transforming all legacy networks with blockchain may require a lot of time and money.

SKILLSET
There isn't an adequate workforce with the skillset to develop new enterprise-grade technology.

METHODOLOGY
Lack of proper methodology makes newer innovations full of flaws.

MASS ADOPTION
In reality, mass adoption isn't yet possible as the network deals with slower output.

COST CHALLENGES
Transforming the whole legacy network ecosystem may require more budget.


101 Blockchains
Created by 101Blockchains.com
Real World Blockchain Use Cases
Real Estate
Propy is a blockchain platform where anyone can buy and sell properties and enjoy the benefits of transparency and security of blockchain.
Ubitquity is one of the first real estate platforms that provide Software-as-a-Service to organizations and help them securely store and track properties.
Public Registry is a blockchain application by which citizens can register their property and store it as a digital asset.
Financial Services
Ripple is an enterprise level blockchain solution that empowers both users and banks.
Abra is a mobile cryptocurrency app that lets users store, invest and buy cryptocurrency.
Barclays bank will improve the whole banking experience for customers and other entities.
Both IBM and AIG has completed a pilot program where they can build a multi-national policy using smart contract.
Services
Decent is an advanced blockchain application which lets anyone build blockchain decentralized apps by providing tools.
Uport is building an open identity system with blockchain where individuals can take complete ownership of their identity.
Brave is a modern browser that offers secure, fast and private browser. It does it with the help of blockchain technology.
Arcade City is a blockchain guilds based system where drivers can make local associations and server a local community.
Authorship
Binded is a copyright platform where photographers can protect their images without paying any fees.
Po.et is a blockchain use case that solves the problem of publishers, consumers and content creators.
Stampery is a blockchain data certification platform that leverages blockchain technology and ensures integrity, existence, and attribution.
Velsart is an uthorship and ownership blockchain application that lets users bind their work into digital provenance records.
Government
GovCoin is about improving how citizens can can rent, buy or sell services through a unified platform.
Democracy Earth aims to build a sovereign democratic government protocol which is open source and relies on the idea of peer to peer networks.
Follow My Vote is a peer-to-peer voting platform that utilizes blockchain and provides transparency to the whole election process.
Samsung SDS is improving government services so that they can provide public safety, welfare, and transportation.
Data Management
Essentia.one is a data management framework built on top of the blockchain, and provides a modular, decentralized and interoperability.
Factom is a blockchain technology that aims to build data projects for most critical government, commercial, and non-profit systems.
Enterprise
Azure provides their Azure blockchain workbench which enables any business or company to build their blockchain application.
Hyperledger is an open-source and highly secure that can be utilized by enterprises to build and develop blockchain apps.
Manufacturing
De Beers is a world's biggest diamond producer which uses blockchain to track and verify diamonds on the supply chain.
Provenance is a blockchain platform that powers supply chain and enables businesses to build trust. It also helps shoppers to choose products.
SKUChain wants to change how the enterprise supply chain works by empowering every participant and creating a global value chain.
LO3 Energy let's users to control energy consumption and manufacturing.
HealthCare
MedRec
MedRec is a blockchain platform where patients data can be stored and accessed across different organizations, individuals, and healthcare specialists.
Gem is a blockchain operating system that links data related to an asset or a person together by creating global identifiers.
SimplyVital Health is a health data management solution and also uses machine learning and algorithms forecasts for the best possible solution.
Cybersecurity
GuardTime helps enterprise to share information more secure on blockchain thanks to their verifiable security proof in KSI technology.
Remme is a security project that aims to remove human involvement and protect critical data from cyber attacks by eliminating the need for the password.
PeerNova provide financial institutes a way to verify and secure their data.
Blockverify is a "Blockchain Based Anti-Counterfeit Solution." Its function is to identify counterfeits and offers a non-duplicate environment.
Retail
Open Bazaar is a free online marketplace that offers zero restrictions to their users without no platform fees.
Loyyal is a universal reward and loyalty platform that uses modern technologies such as smart contracts and
Social Networks
Yours is a social network where the members can post content and get paid in Bitcoin Cash.
Akasha is a decentralized social media network that protects user's freedom of expression by providing privacy.
NYIAX is a blockchain powered marketplace that lets advertisers trade advertising contracts through the use of its patented Financial Matching Engine.
Paperchain offers a decentralized marketplace where any media company can monetize their content.
Media
Civil is a blockchain-powered marketplace where journalism can sustain and flourish in the right direction.
KodakOne is an image right management platform that runs on top of the blockchain and uses KODAKCoin cryptocurrency to fuel it.
Ujomusic is a blockchain platform for music creators so that they can have complete rights on music that they produce.

Blockchain In Agriculture
10 Possible Use Cases

- Overseeing Farm Inventory
- Enhancing Agricultural Supply Chains
- Modernizing Farm Management Software
- AgTech IoT Optimization
- Fair Pricing
- Agricultural Subsidies Oversight
- Community-Supported Agriculture
- Mobile Remittance for Small Farmers
- Greater Accountability for Multinationals
- Incentivizing Sustainable Practices

Blockchain For Automotive
12 Possible Use Cases

- Smart Vehicle Derived Data
- Regulatory & Environmental Transparency
- Automating Maintenance
- Rewarding Safe Driving
- In-Vehicle Wallets
- Manufacturing Transparency
- Smart Contracts for Leasing or Financing
- Smart Contracts for Insurance
- Theft Prevention
- Transparent Vehicle History
- Document & Title Transfer
- Blockchain Insurance Platforms

Blockchain For Government Services

101 Blockchains | BLOCKCHAIN BUSINESS STRATEGY IMPLEMENTATION STEPS

Identify Underlying Issues & Set Goals

- Take a closer look at a business and identify an issue that can leverage blockchain capabilities
- Come up with a use case that would make the technology useful
- Come up with goals that the blockchain technology must achieve upon implementation

Develop a Proof of Concept

- Brainstorm with a team to come up with a blockchain solution
- Sketch a POC upon brainstorming
- Develop a schedule for implementation

Trial Blockchain Solution

- Build a prototype of a POC
- Test out the blockchain solution
- Evaluate all the errors and successes and try to polish the blockchain solution

Roll Out the Blockchain Solution

- Roll out the blockchain solution, upon carrying out tests
- Check out to ensure that it meets all the benchmarks

Blockchain Implementation Models

- PUBLIC BLOCKCHAIN
- PRIVATE BLOCKCHAIN
- HYBRID BLOCKCHAIN
- FEDERATED BLOCKCHAIN

created by 101blockchains.com

101 Blockchains | TOP 7 BLOCKCHAIN BUSINESS MODELS

1 Token Economy

A business model which uses utility token as a way to perform different activities and provides an incentive to end users.

2 Blockchain as a Service(BaaS)

BaaS is all about providing an ecosystem for other companies to thrive and utilize blockchain technology.

3 Development Platforms

Development platforms provide blockchain technology stack to other organizations.

4 Blockchain Based Software Products

Companies develop blockchain based solutions and products in order to sell the solution to other organizations.

5 Network Fee Charge

A business model where network fee is charged from the end users or other entities in the blockchain.

6 Blockchain Professional Services

Professional services related to blockchain such as dApp development, consulting, auditing, etc.

7 P2P Blockchain Business Model

P2P based business model utilizes blockchain where peers are able to execute direct tasks.

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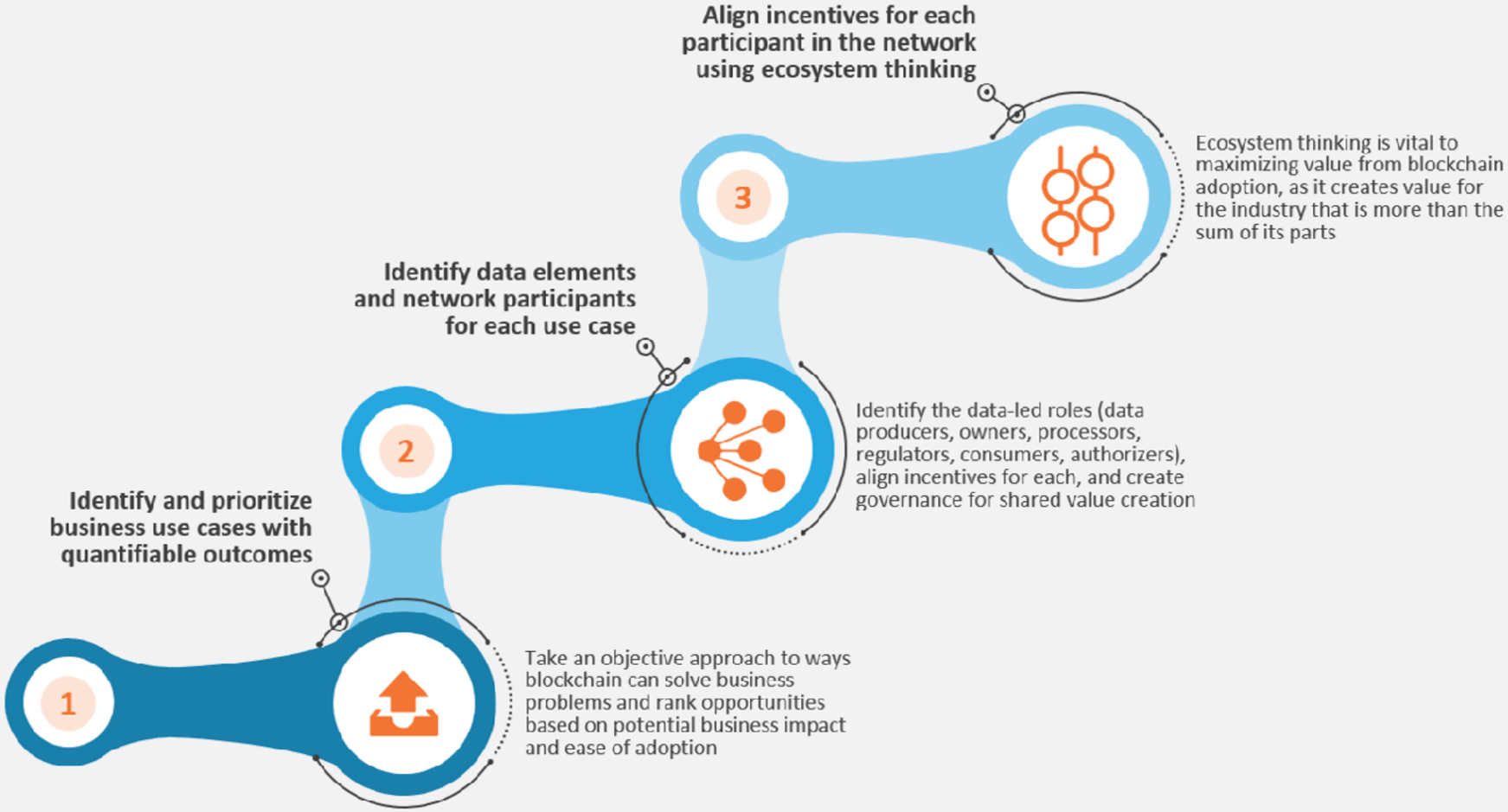
A structured approach to blockchain adoption

To maximize the benefits of blockchain, enterprises need to take a planned and measured approach to adoption



Everest Group® Blockchain Services PEAK Matrix™ Assessment 2019: Race to Make Enterprise Blockchain Real

Figure 3. Blockchain Strengths, Weaknesses, Opportunities and Threats (SWOT)

Strengths	Weaknesses
▪ Distributed resilience and control ▪ Decentralized network ▪ Open source ▪ Security and modern cryptography ▪ Asset provenance ▪ Native asset creation ▪ Dynamic and fluid value exchange	▪ Lack of ledger interoperability ▪ Customer unfamiliarity and poor user experience ▪ Lack of intra-ledger and inter-ledger governance ▪ Lack of hardened/tested technology ▪ Limitation of smart contract code programming model ▪ Wallet and key management ▪ Poor tooling and poor developer user experience ▪ Skills scarcity and cost ▪ Immature scalability ▪ Lack of trust in new technology suppliers
Opportunities	**Threats**
▪ Reduced transaction costs ▪ Business process acceleration and efficiency ▪ Reduced fraud ▪ Reduced systemic risk ▪ Monetary democratization ▪ New business-model enablement ▪ Application rationalization and redundancy	▪ Legal jurisdictional barriers ▪ Politics and hostile nation-state actors ▪ Technology failures ▪ Institutional adoption barriers ▪ Divergent blockchains ▪ Ledger conflicts/competition ▪ Poor governance

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Source: Gartner (March 2017)