Blockchain and the Healthcare Industry

Jul 24th, 2019

FIng

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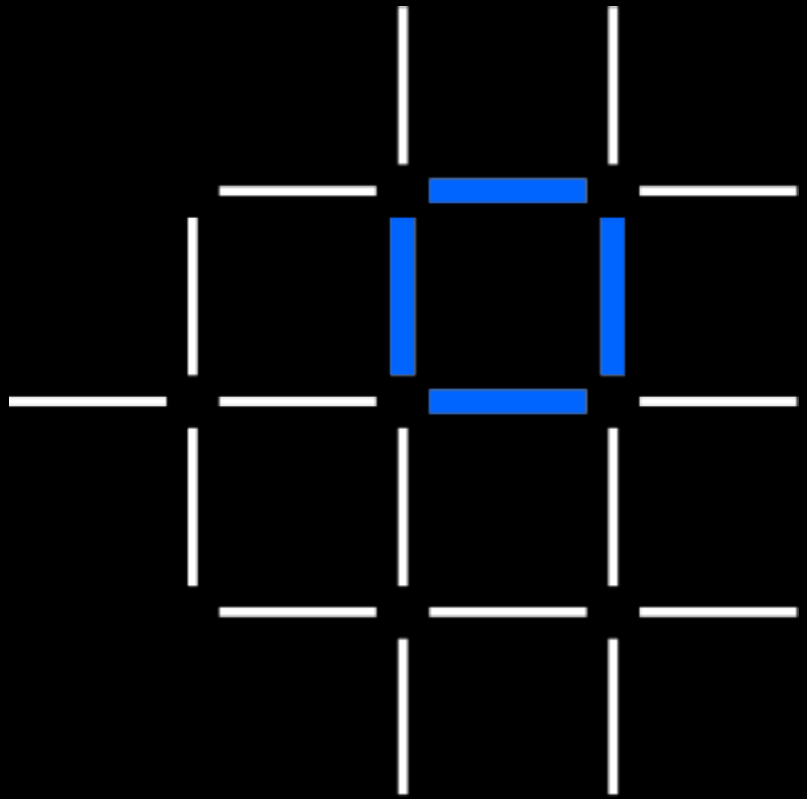


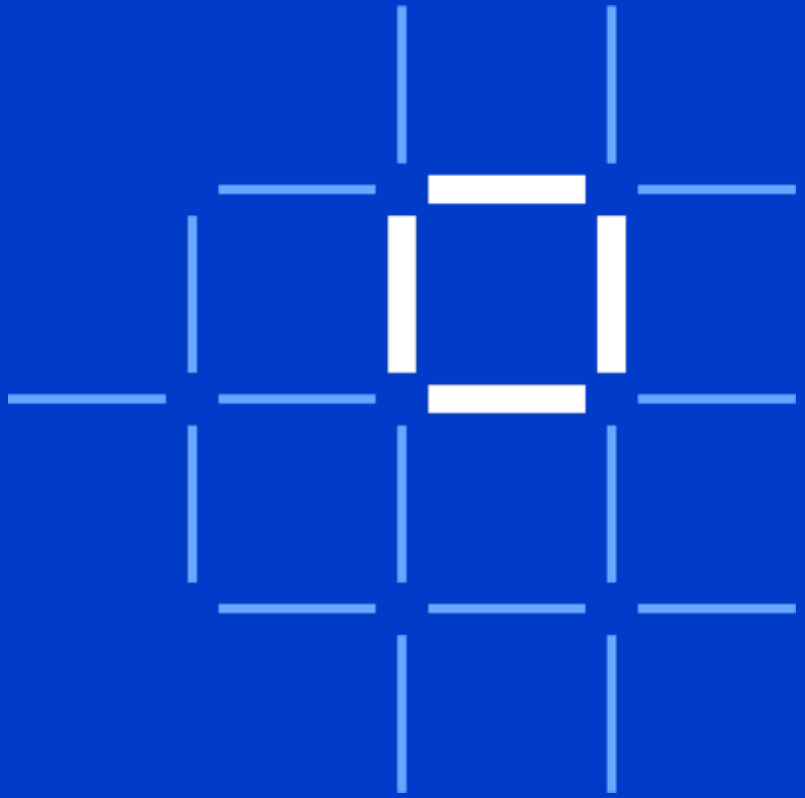
“ What the Internet did for communications,

blockchain will do for **trusted transactions**

”

- Ginni Rometty (THINK Forum 2017)

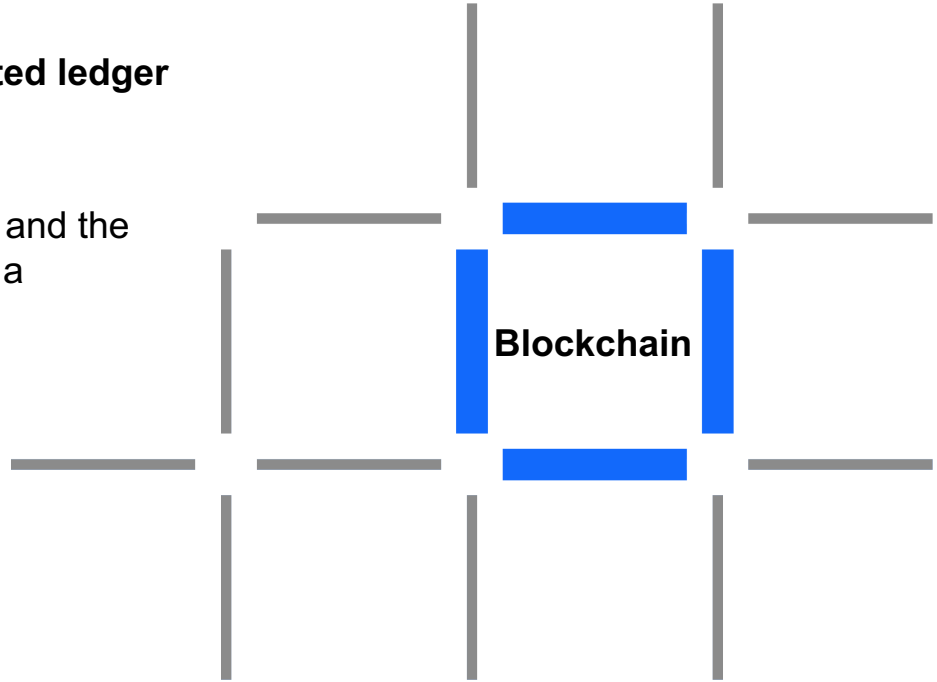
What is Blockchain?



What is blockchain?

Blockchain is a **shared, immutable and distributed ledger** for recording the history of transactions.

A **business blockchain**, such as IBM Blockchain and the Linux Foundation's Hyperledger Project, provides a **permissioned network** with known identities.



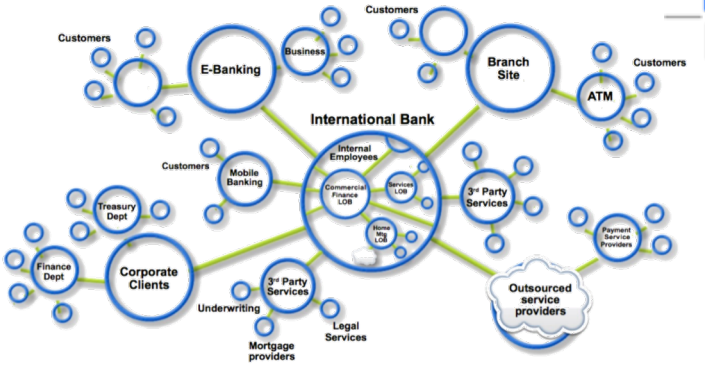
Business networks and assets transfer

- An asset is anything that can be owned or controlled to produce value, for example: goods and services

- Assets can be
  - Tangible, e.g. shipping containers, food products, spare parts, land,
  - Intangible, e.g. intellectual properties (patents, trademarks), financial (bonds, invoices), digital goods (music, e-books)

- Assets are transferred through business networks comprised of participants (for example, customers, suppliers, service providers, banks) across regulatory and geographical boundaries

- Transactions describe the exchange of assets between participants



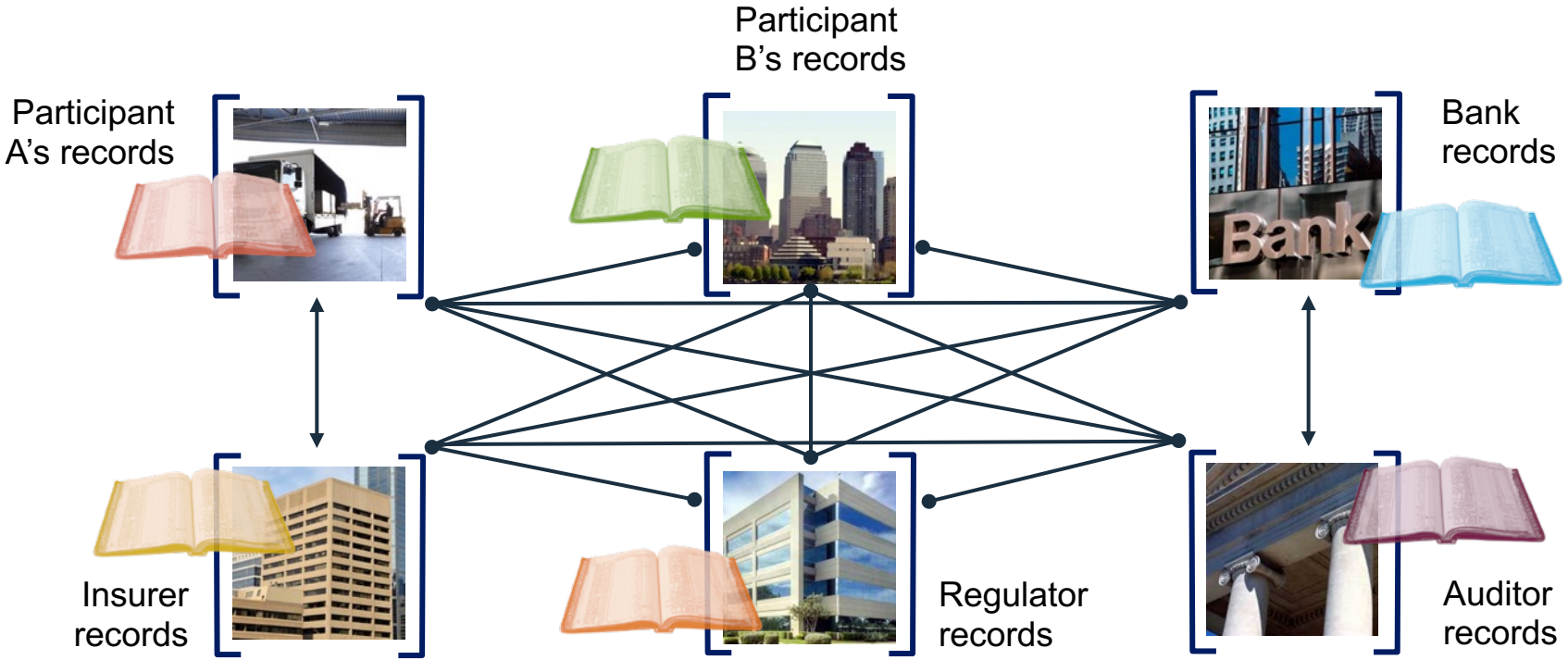
Each participant records transactions in ledgers. The ledger is a log of transactions, and the key system of record for asset exchange for a business.

Contracts are a set of business terms that should be met by participants before a transaction is completed.

A market is the flow of assets across business networks

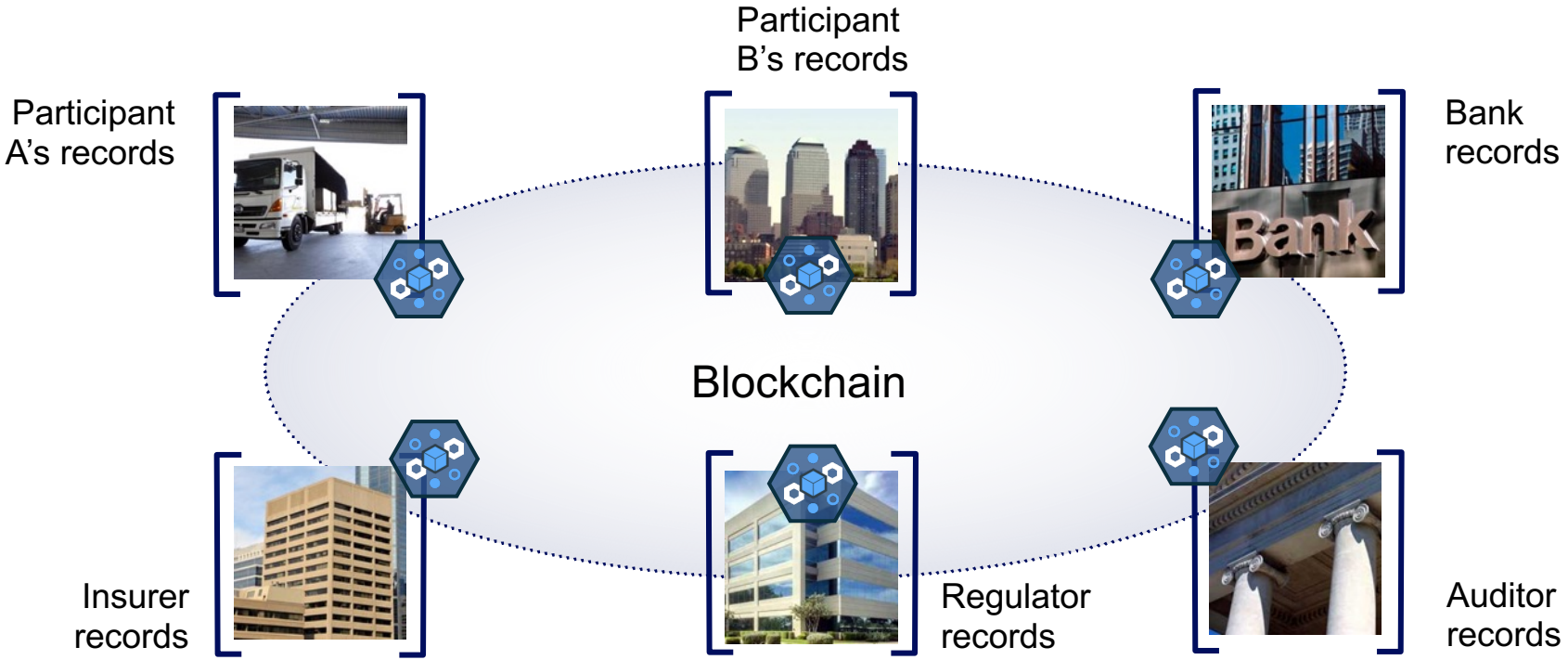
- Public (market, car auction)
- Private (supply chain financing, bonds)

Problem: transferring the ownership of a vehicle



… inefficient, expensive, vulnerable

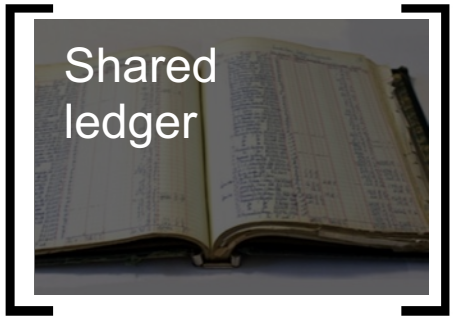
A shared, replicated, permissioned ledger …

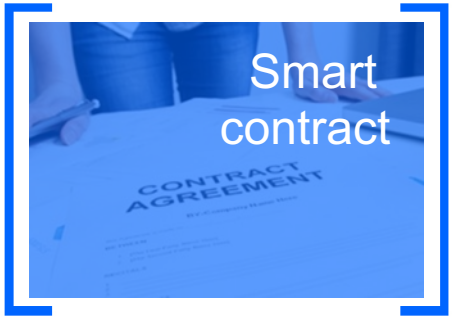


… with consensus, provenance, immutability, and finality

Blockchain for business requirements

Append-only distributed system of records shared across business networks





Business terms executed with transactions

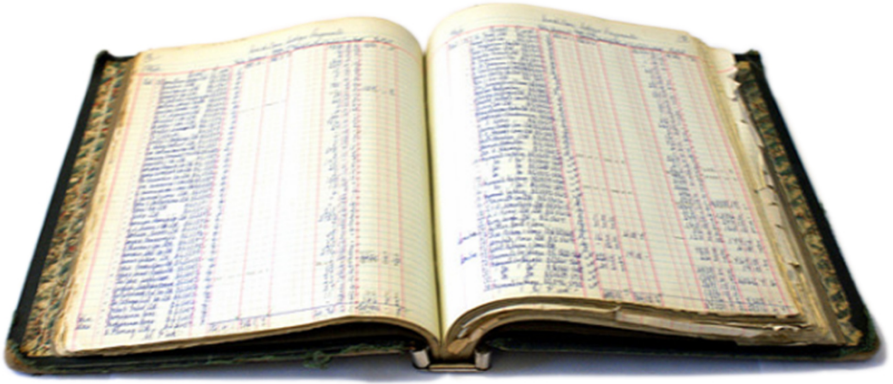
Transactions are secure with appropriate visibility

Transactions are provably endorsed by relevant participants

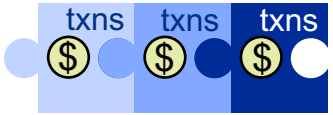
Shared ledger

- Shared between participants
- Participants have own copy through replication
- Permissioned, so participants see only appropriate transactions
- THE shared system of record
- Immutable due to an append-only data structure

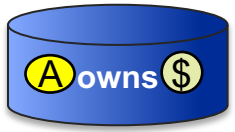
Records all transactions across business networks



Shared ledger: Components



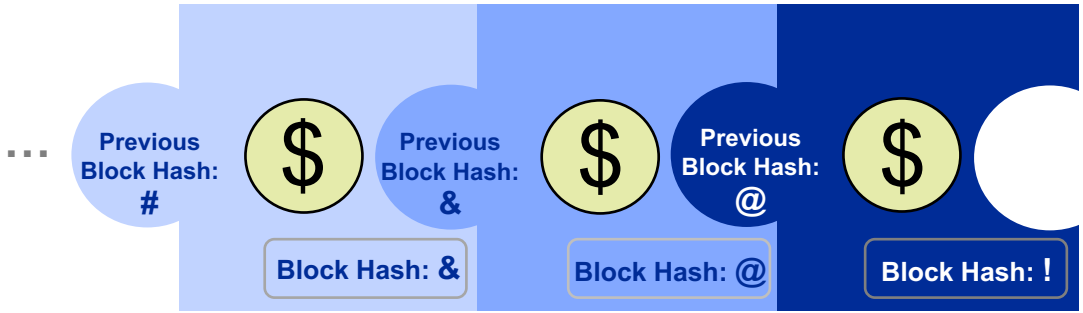
Blockchain



World state

- Blockchain
  The chain provides an immutable, transparent record of transactions
  - A linked list of blocks
  - Each block describes a set of transactions
  - Immutable – blocks cannot be tampered with
- World State
  The world state stores the current state of assets
  - An ordinary database (e.g. key/value store)
  - Stores the combined outputs of all transactions
  - Not usually immutable

Shared ledger: Blockchain immutability



- A blockchain is made up of a series of blocks, with new blocks always added to the end
- Each block includes the result of a hash function of the previous block
- Immutability: If someone tries to tamper with a transaction's outcome, the block's hash is updated, violating the integrity of the blockchain. Hence the change is rejected.

Smart contract

- Verifiable, signed
- Business rules, written in programming languages, supported by the blockchain technology
- Examples:
  - Defines contractual conditions under which a bond transfer occurs
  - Defines rules on which a vehicle can be transferred to a new owner

Business rules associated with the transaction

Privacy

- Participants require:
  - Appropriate **privacy** and **confidentiality** between subsets of participants
  - Identity not linked to a transaction
- Transactions need to be authenticated
- Cryptography is central to these processes

The ledger is shared, but participants require privacy and confidentiality

Accountability

- Participants endorse transactions
  - **Consensus**: Participants agree that a transaction is valid
    - Business network decides who will endorse transactions
    - Endorsed transactions are added to the ledger with appropriate confidentiality

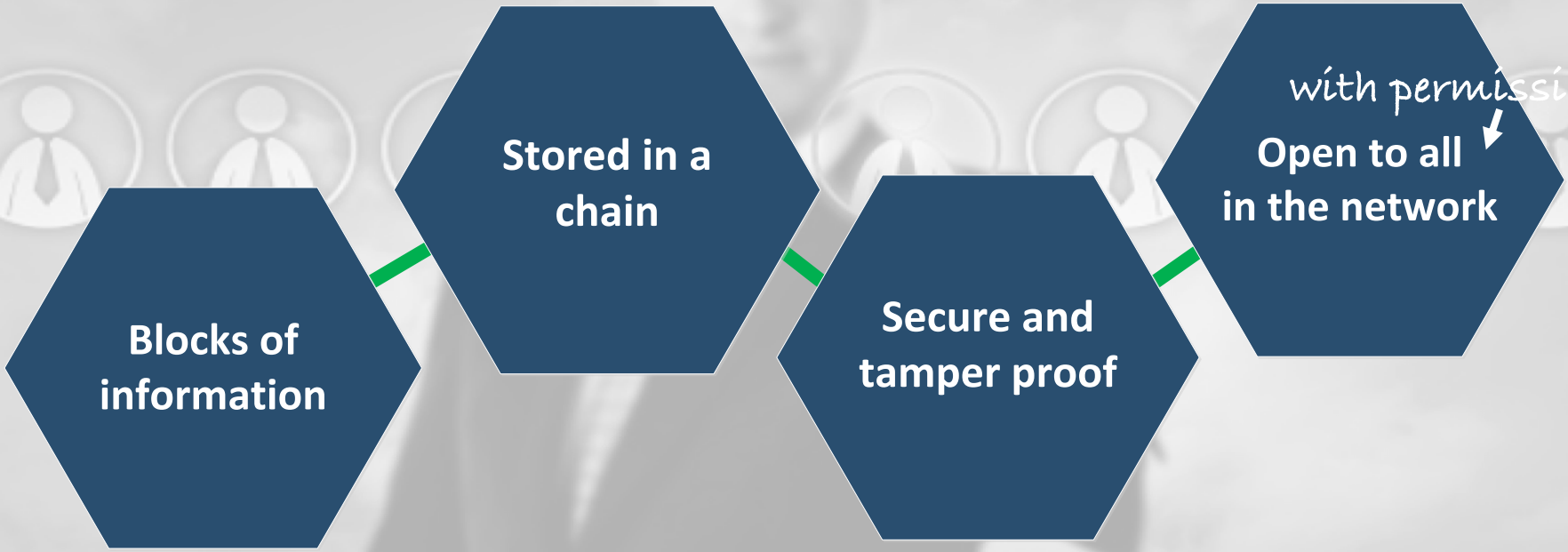
The ledger is a provable source of information

Accountability (continued)

- Assets have a verifiable audit trail
  - **Provenance**: Participants know where the asset came from and how it's ownership has changed over time
  - **Immutability**: No participant can tamper with a transaction once it is agreed upon
    - Transactions can not be modified, inserted or deleted
  - **Finality**: Only one place to determine the ownership of an asset or completion of a transaction (the shared ledger).

The ledger is a provable source of information

The basic premise of Blockchain is simple…



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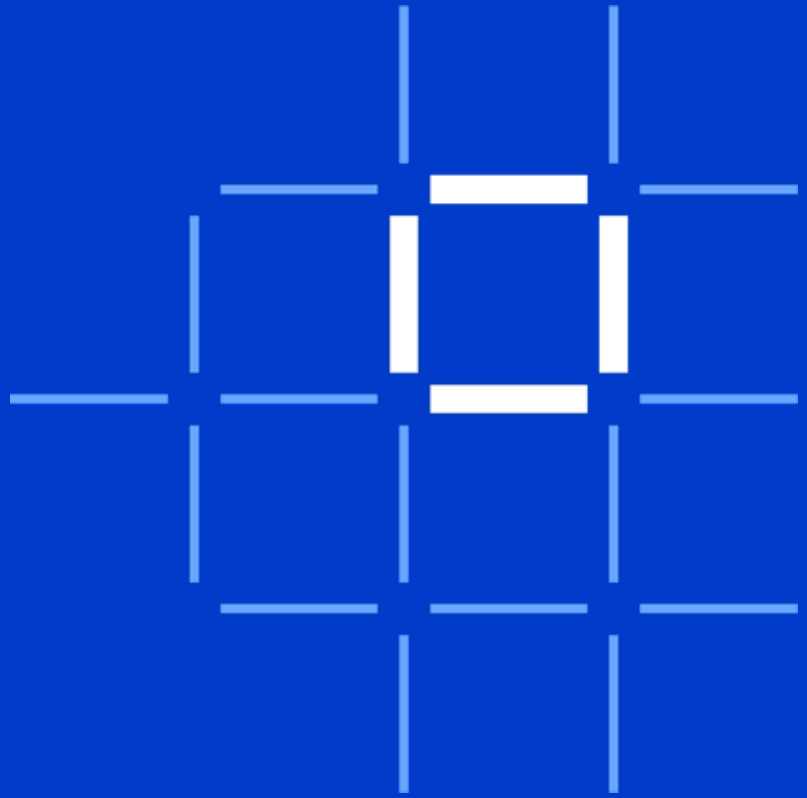
Blockchain for Healthcare



Trust Challenges are Inherent in Complex Ecosystem …

Each day, leaders, advocates and influencers in health strive to progress towards a healthier future for individuals, families, communities, and work places

Outcome-based Care
- Fee-for-value instead of Fee-for-Services

Interoperability and Data Ownership
- Data silos and data complexity
- Lack of clear data ownership
- Data hoarding for competitive advantages

Regulation and Compliance
- Complex regulatory landscape with increasing regulation for patient access, consent and control of their data

Privacy & Security
- Frequent cyber attacks and large-scale data breaches
- Increasing patient concerns about data privacy

Fraud, Abuse & Complexity
- False claims, corruption and abuse
- Limited traceability and accountability

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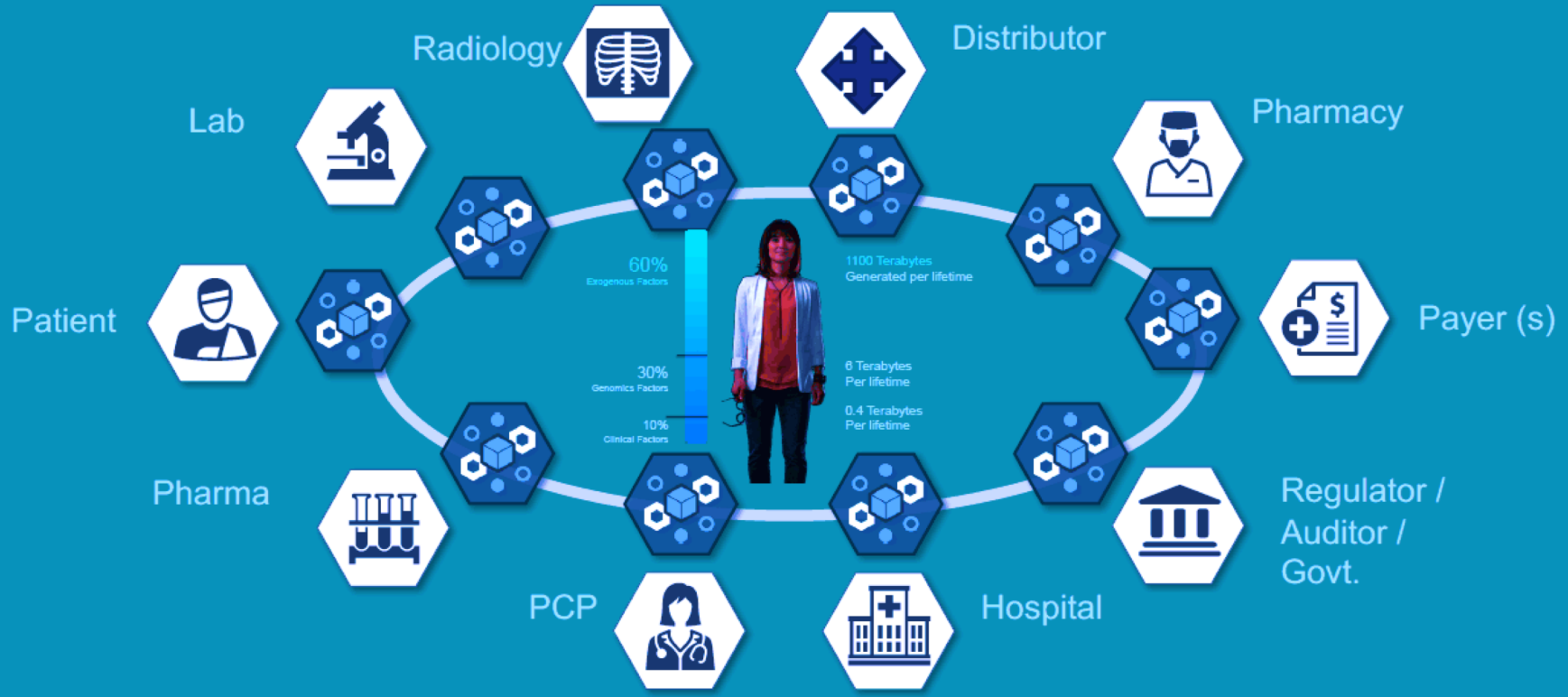
Healthcare and Blockchain

Secure, data exchange and sharing across the health eco-system

Compliance, integrity, provenance



Blockchain use cases in Healthcare and Life Sciences

Patient Consent and Health Data Exchange

- Patient control of his/her health data
- Secure medical data exchange including EMR, genomics, image, exogenous
- Blockchain ensures consent, compliance, auditability, provenance, governance

Outcome-based Care Platform

- Contract between Payer and Provider or Pharma for outcome based payment in BC
- Contract, data and computation of outcomes in SmartContracts
- Outcomes accessible by authorized participants
- Blockchain provides trust among parties on outcomes with provenance and auditability

Clinical Trial Management

- Clinical trials data exchange automation with auditability, provenance, traceability
- Use blockchain for regulatory processes, oversight, fraud detection
- Traceability of protocol design elements to data collection

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Blockchain use cases in Healthcare and Life Sciences

Provider Credentialing/ Directories

- Provider information is often out-of-date, incomplete, and inaccurate. It creates a burden on payers, consumers and also providers. Increases fraud
- Validation and updating of data can be tracked much easier. Benefits plans and patients. Lessens provider burden

Payment and Medical Claims Processing

- Reimbursement rules unclear and not transparent
- Smart Contract between Provider / Payer / Patient
- Rethinking medical claims processing and replacing healthcare clearing house
- Reduce process time and friction, including compliance with contract terms, less audits

Prior Authorization

- Delays care. Creates confusion with providers and patients. Increases costs of care.
- Smart contracts allow rules to be codified and automated

Eligibility-eg. Medicaid

- Large amount of people coming on and off Medicaid creates admin expenses and fraud opportunities
- Decreased expenses and fraud. Better service

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Blockchain use cases in Healthcare and Life Sciences

Drug Supply Chain Provenance and traceability

- Motivated by patient safety, counterfeit fraud, drug traceability, brand protection
- FDA and EMA regulations, e.g. FDA DQSA

Gross-to-Net Revenue (Rebates) Management

- Revenue leakage costs Life Sciences companies billions in lost revenue
- Fewer disputes, faster settlement, improved accrual forecast accuracy, fewer revenue dollars lost to leakage

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Thank you

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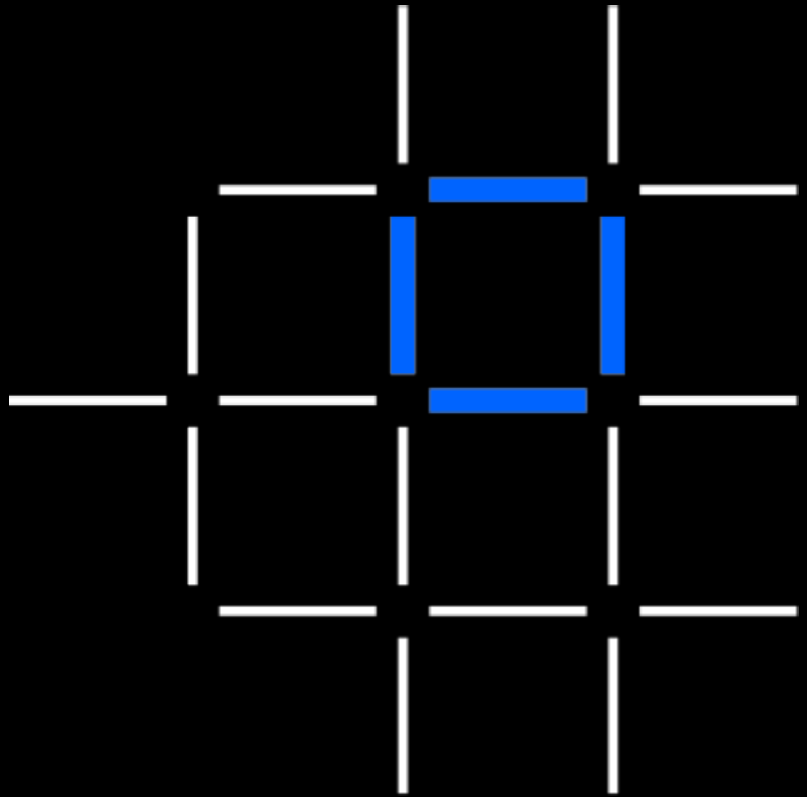

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