Blockchain and Healthcare Privacy Laws Just Don't Mix

May 13, 2018

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What We Will Cover Today

- History
- Bitcoin – The First Use of Blockchain Tech
- Key Characteristics of Blockchain
- Smart Contracts
- Real-World Applications / Legal Considerations
- Health Care Use Cases / Regulatory Challenges

History

Distributed Networks

history

In 1959, **Paul Baran**, researcher at RAND, took on the task of designing a survivable "command and control network."

- ***network of unmanned nodes***
- ***routing information from one node to another to their final destinations***
- ***using scheme called "hot-potato routing" or distributed communications***

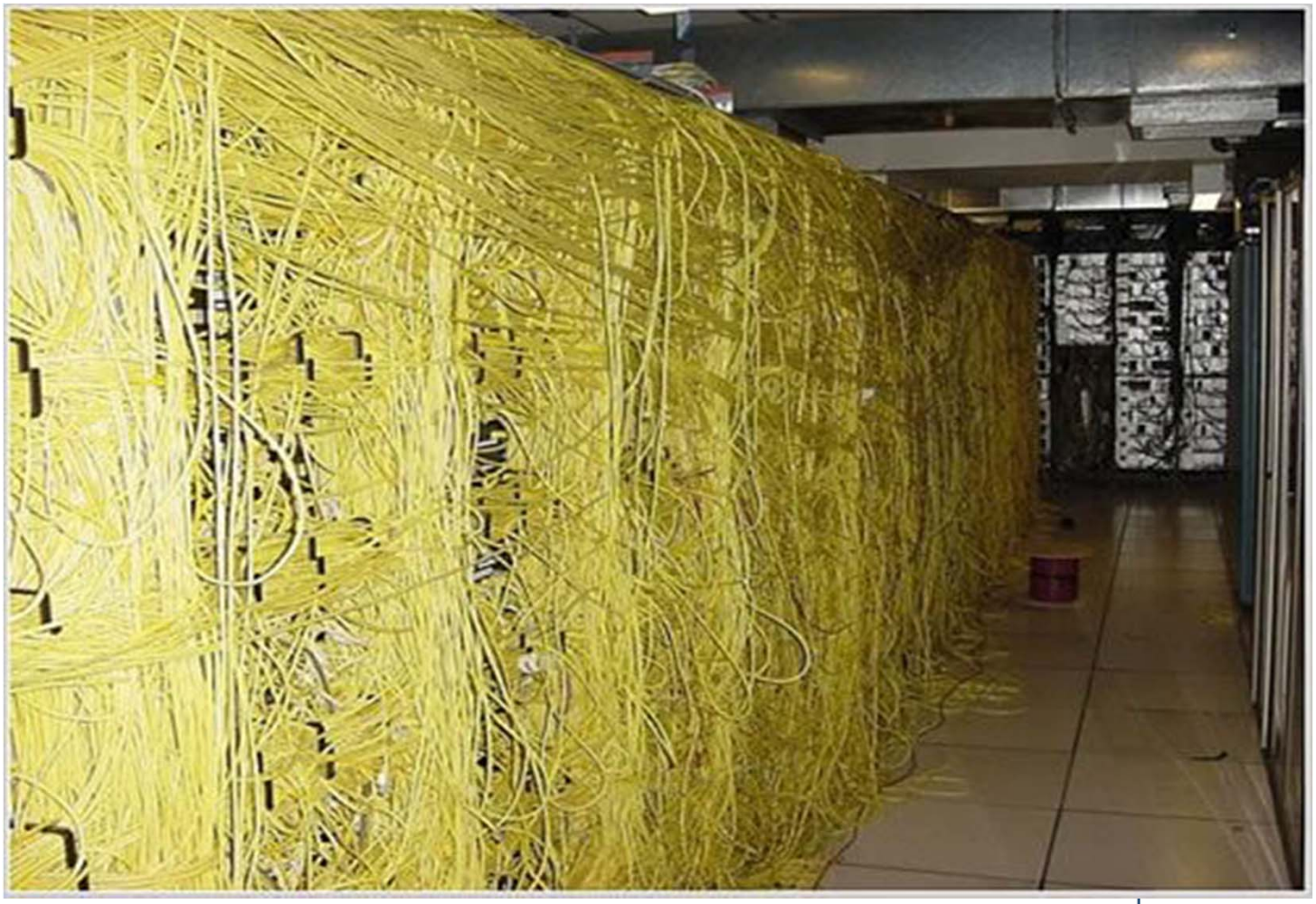
Challenges Today

history

The **Internet** optimized existing processes…

Challenges Today - Centralization

history



Revolution of Business

history

The **Internet** optimized existing processes…

The **Blockchain** …

presents a new medium for assets

eliminates processes

provides a new paradigm for shared facts

Today and The Future of Data

The **Internet** optimized existing processes…

Distributed Ledger Technology…

…..a new "database"

and information sharing paradigm

Bitcoin - First Use of Blockchain Tech

Introduced October 2009

bitcoin

Bitcoin: A Peer-to-Peer Electronic Cash System

Satoshi Nakamoto
satoshin@gmx.com
www.bitcoin.org

Abstract. A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.

New Digital Asset

bitcoin

Peer to Peer version of electronic cash transfer

Relies on **cryptographic** proof rather than trust

Winners of computational race earn Bitcoin

$6.9b market cap / 6500+ nodes

No central banking authority

Nodes agree/verify the history of the chain

Solves the double-spend problem

Block Creation

bitcoin

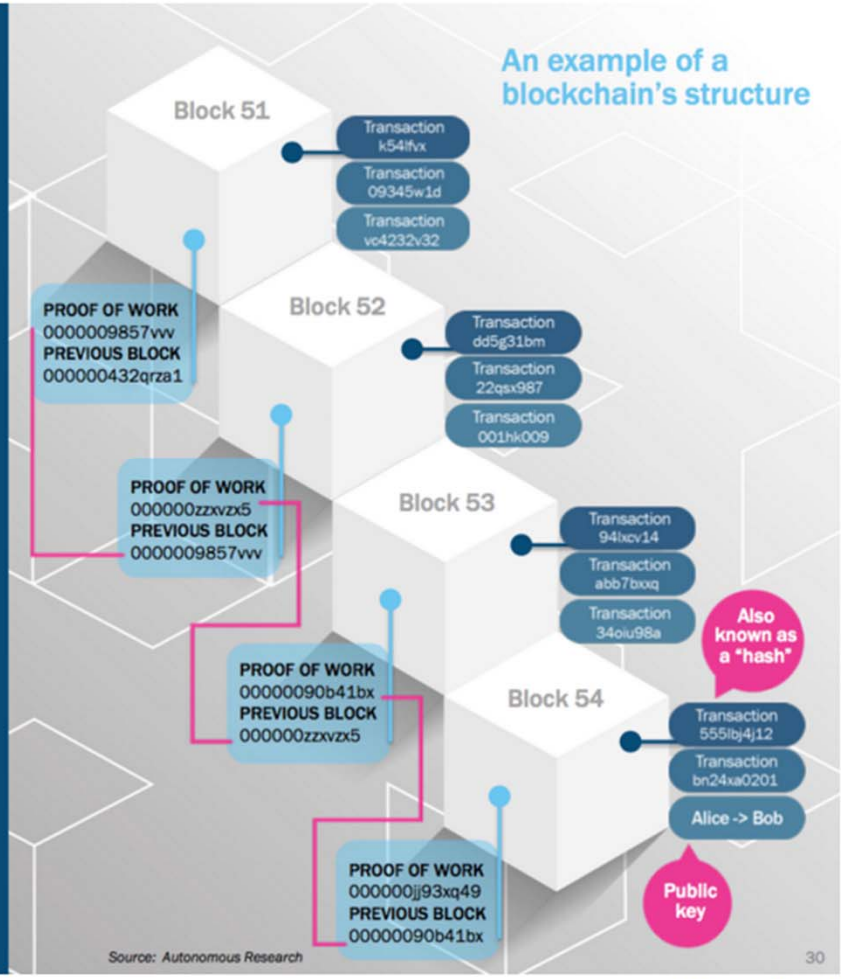
Blockchains control information and avoid duplication.

How Blockchain Transactions Work

Blockchains solve two major challenges for digital transactions, controlling the information and avoiding duplication, at once.

There are four major pieces of information in a block:

1. An ID referred to as a "hash" or consensus identifier. In the example below, it's called "proof of work." This is a random set of encrypted numbers.
2. The hash number from the previous block, which sets the chronological order in the ledger
3. Transactions that are included in the block. Can be one, but can also be thousands of transactions.
4. Public key (identities) for the sender and receiver to identify the transfer of information.



Autonomous Research

Blockchain Defined

key characteristics and ecosystem

a **database** (aka ledger)…

that is publicly **distributed**…

where data is stored by **consensus**

and **can't be changed**

secure by modern **cryptography**

more than encryption

"computational hardness"

New Blockchain Platforms

key characteristics and ecosystem

Decentralized

Distributed

Immutable

Permissionless

Cryptography

Consensus Protocol

Trustless

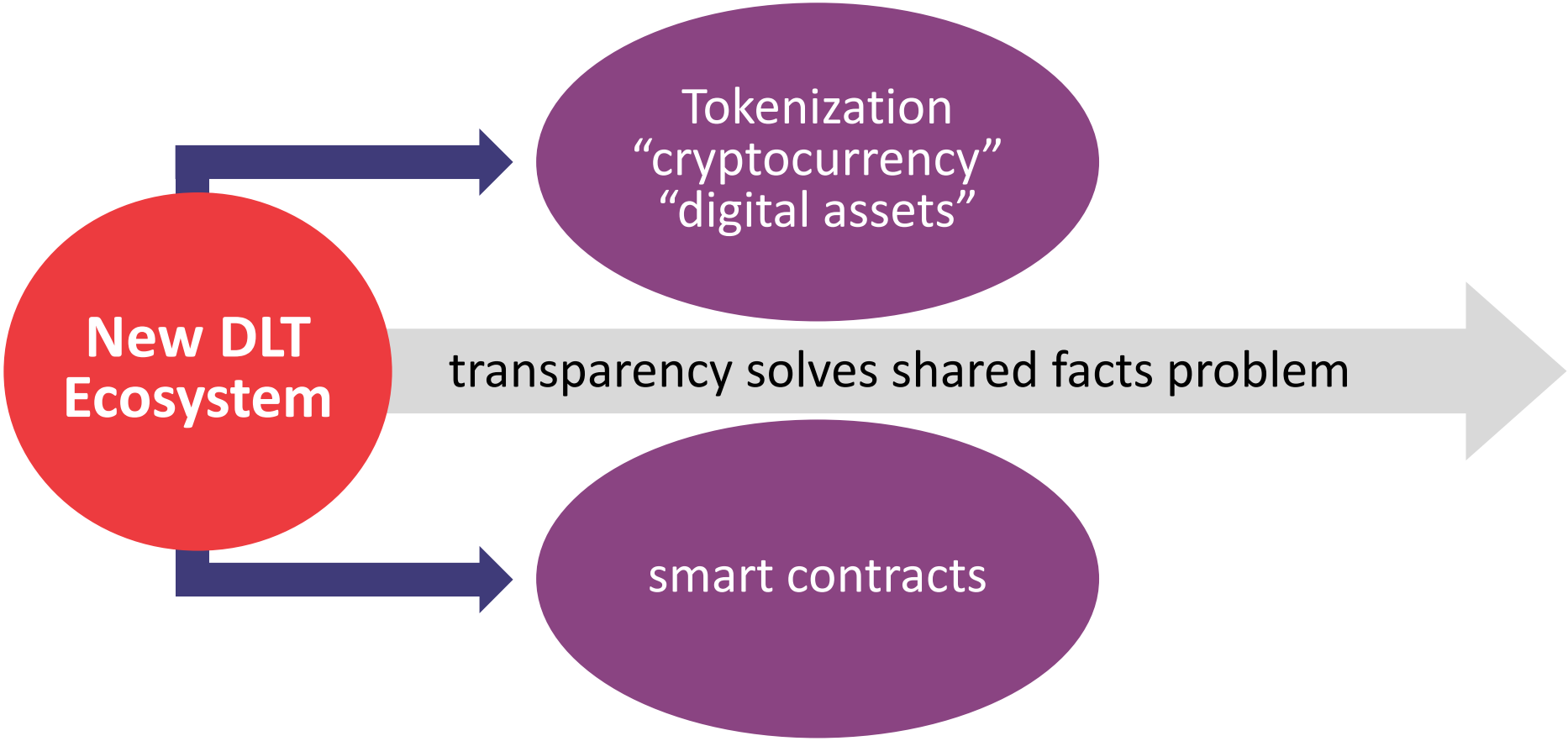
Network Effect

Public	Private
Permissionless	Permissioned

Consortium blockchains

Fully private blockchains

Emerging Economies and Use Cases



Smart Contracts

Smart contracts **enable execution based on conditions** (same blockchain building blocks)

History

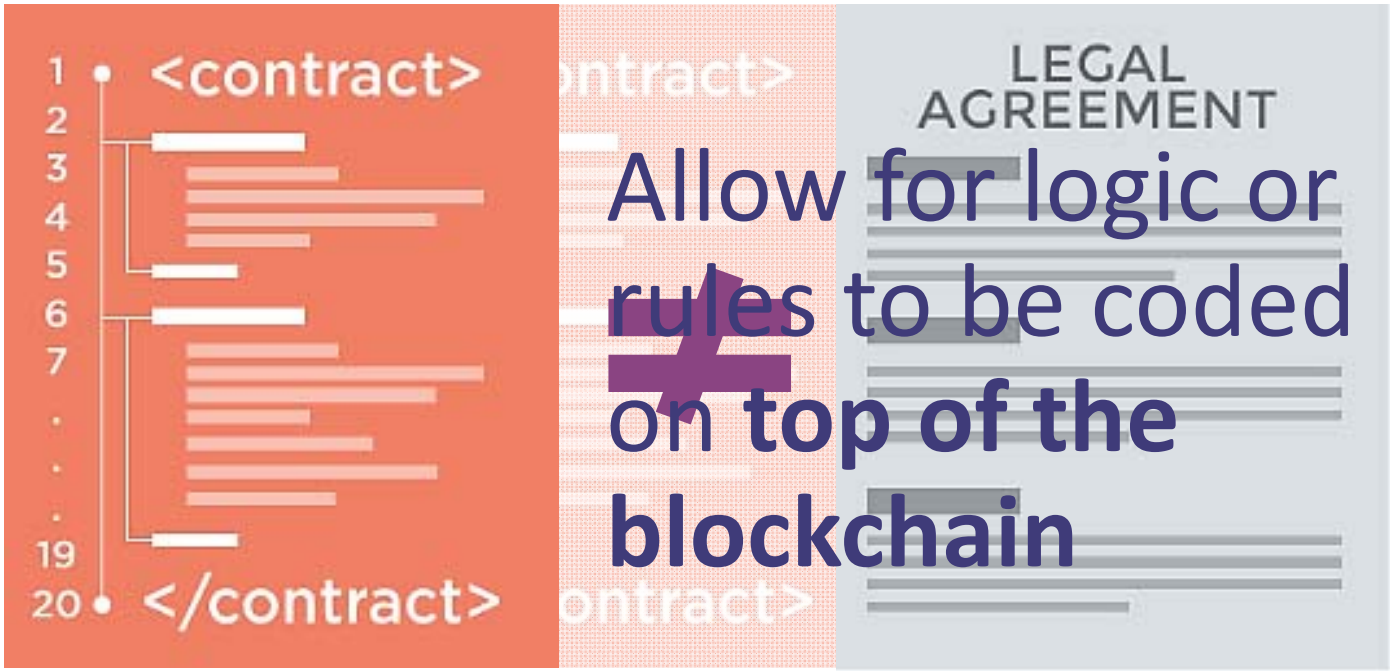
smart contracts

Coined by Nick Szabo, a computer scientist in *Smart Contracts: Building Blocks for Digital Markets* (1996)

self-executing
self-authenticating
immutable
reduces human factor
breach is expensive

Legal Agreements?

smart contracts



Allow for logic or rules to be coded on **top of the blockchain**

How should lawyers think about DLT?

Application of law to DLT

and

DLT changing the practice of law

Opportunities and Challenges

Skeptics / Recent Hacks

Regulatory

Idealogical Motives

Privacy / New Shared Economy

Interoperability / Fragmentation

Scalability

Open Source / Intellectual Property

Technology-Driven v Solutions-Driven

Real-World Applications

Real-World Applications

- Identity
- Provenance / Supply Chain
- Finance / Trade Settlement
- Corporate Governance
- Prediction Markets
- Energy
- Healthcare / Clinical Trials / Provenance

Platforms and Services

real-world applications

Platforms - Smart Contracts

new DLT economy/ecosystems

ethereum

Ethereum is a decentralized platform that runs smart contracts: applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third party interference

Corporate Governance

real-world applications

BoardRoom

BoardRoom provides a complete governance platform that empowers organizations with the power of the blockchain.

Notary Services

real-world applications

BlockNotary is a software which allows a business to offer clients an efficient and quick way to prove his identity in order for a business to take further actions.

Supply Chain Management

real-world applications

Provenance is a real-time data platform that empowers brands to take steps toward greater transparency by tracing the origins and histories of products.

Records Management

real-world applications

Factom is an irreversible publishing engine (write once, never erase), removing the need for blind trust by providing precise, verifiable, and immutable audit trail.

Internet of Things

real-world applications

FILAMENT

By leveraging its blockchain-based technology stack, **Filament** helps companies better manage physical mining operations or water flows over agricultural fields without relying on centralized cloud alternatives or pen-and-paper methods that result in human inefficiencies.

Media and Entertainment

real-world applications

Ujo is a new shared infrastructure for the creative industries that allows creators and their customers to achieve greater levels of transparency, fairness and profitability.

Finance

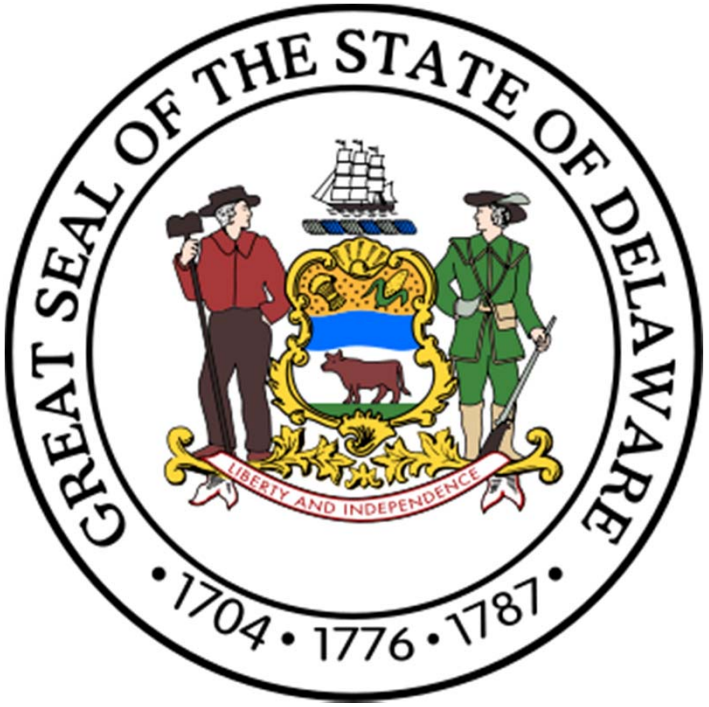
real-world applications

NASDAQ Linq – first use of blockchain ledger technology to complete and record a private securities transaction for **Chain.com**.

Overstock.com issues public shares of its stock on its **tØ** blockchain platform - traded, settled and recorded "entirely on a decentralized ledger."

Corporate Governance and Issuance

real-world applications



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Energy

real-world applications

TRANSACTIVEGRID

Based on the open source, cryptographically secure decentralized application platform of Ethereum, **TransActive Grid's** business logic layer delivers real-time metering of local energy generation and usage and other related data.

HealthCare and Regulatory

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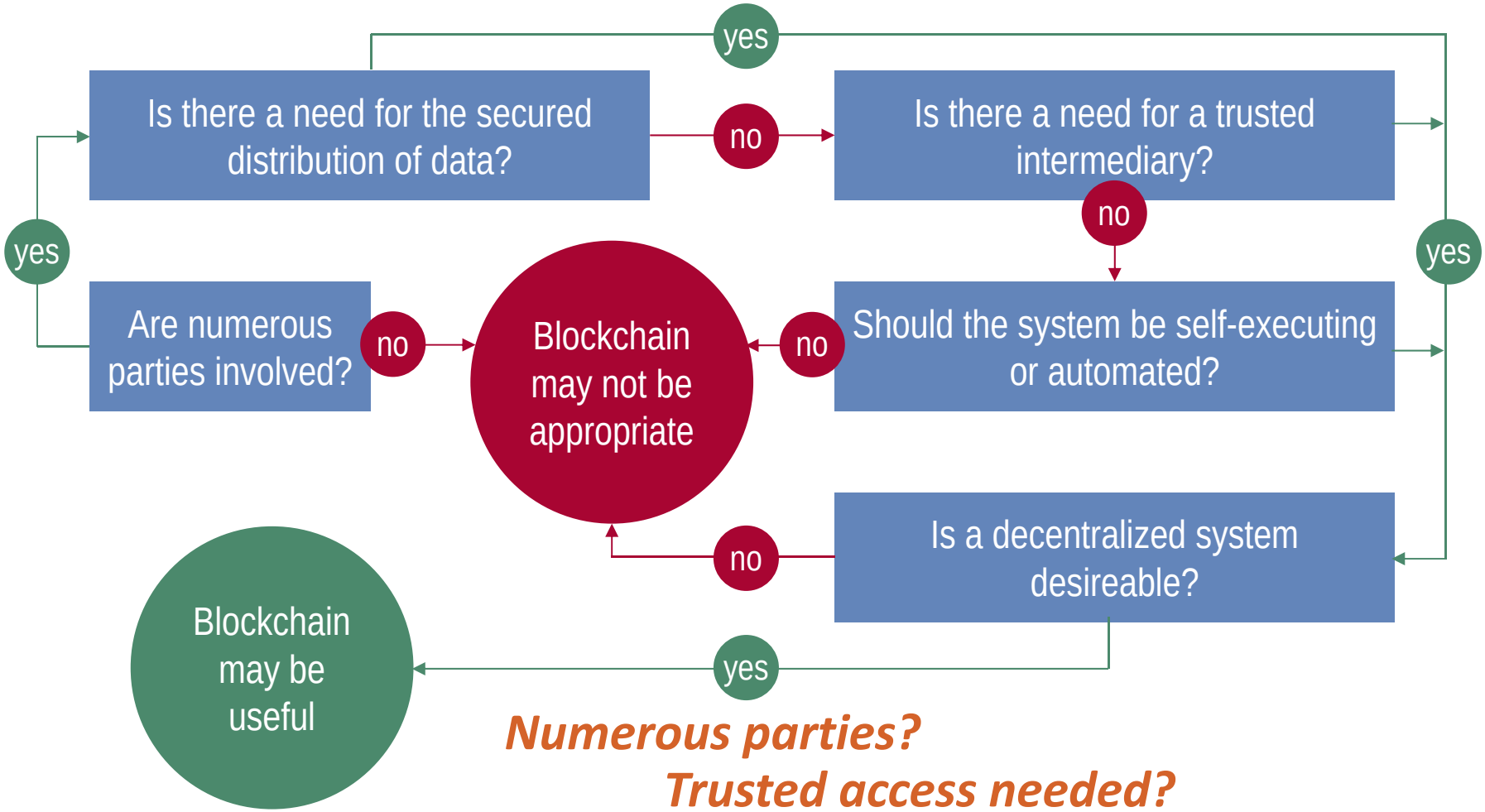
“Triple Aim” of Modern Healthcare

health care

Can blockchain be a potential solution?

Appropriate Applications of Blockchain Technology



Numerous parties?

Trusted access needed?

Immutable data desirable?

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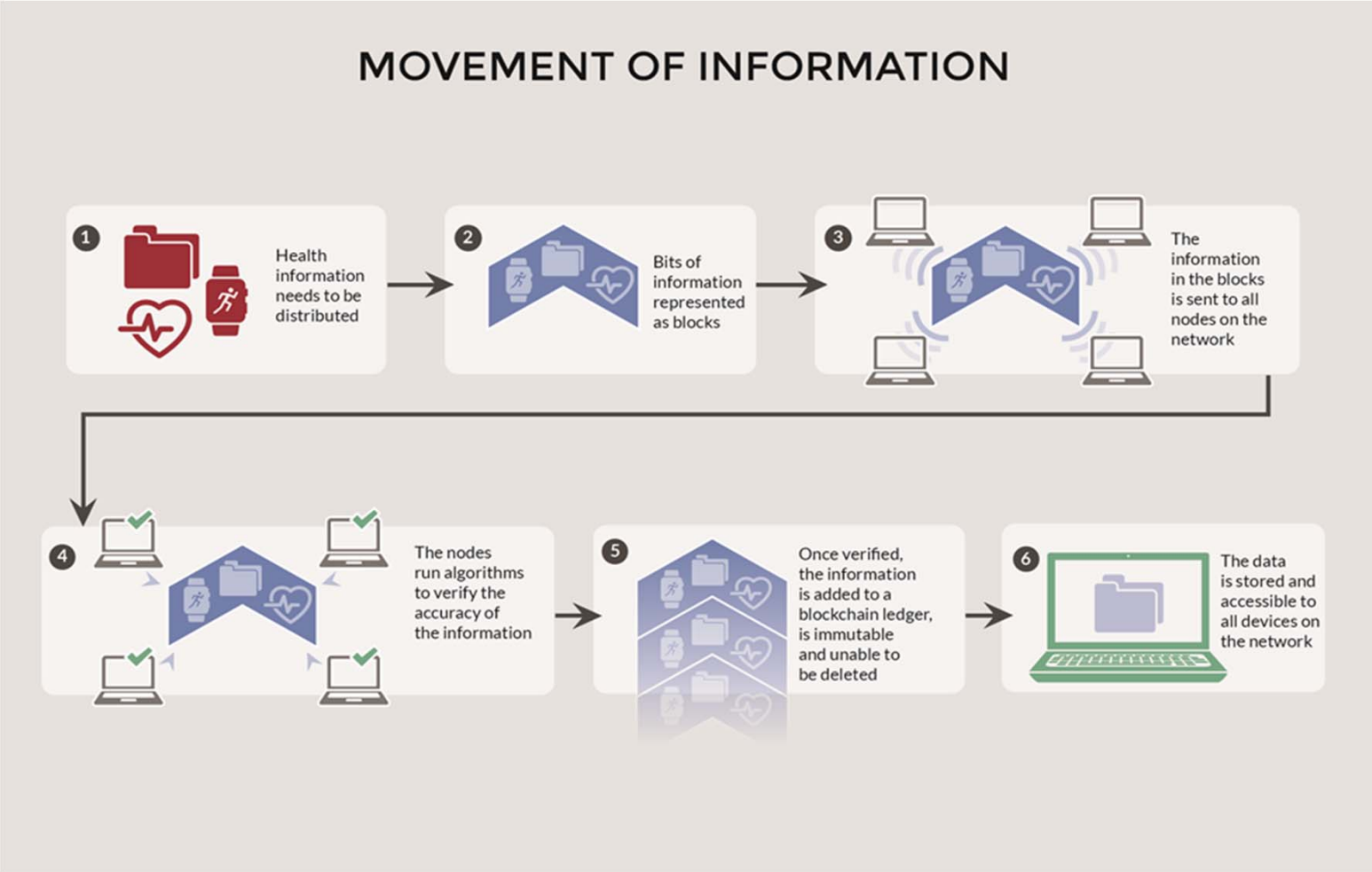
Setting the Stage: Inoperability Problem

health care

- Patients are more mobile; care is more specialized
- Incomplete and fragmented data:
  - Records at each provider
  - Wearable devices
  - Mobile medical apps
- Lack of interoperability costs **150,000 lives and $18.6 billion** per year

A Vision for Health Care Blockchain

health care



Potential Blockchain Applications

health care

Medical records

Data integration with real-time medical devices

Track clinical trial information

Aggregate data on pharmaceutical drugs & prescriptions

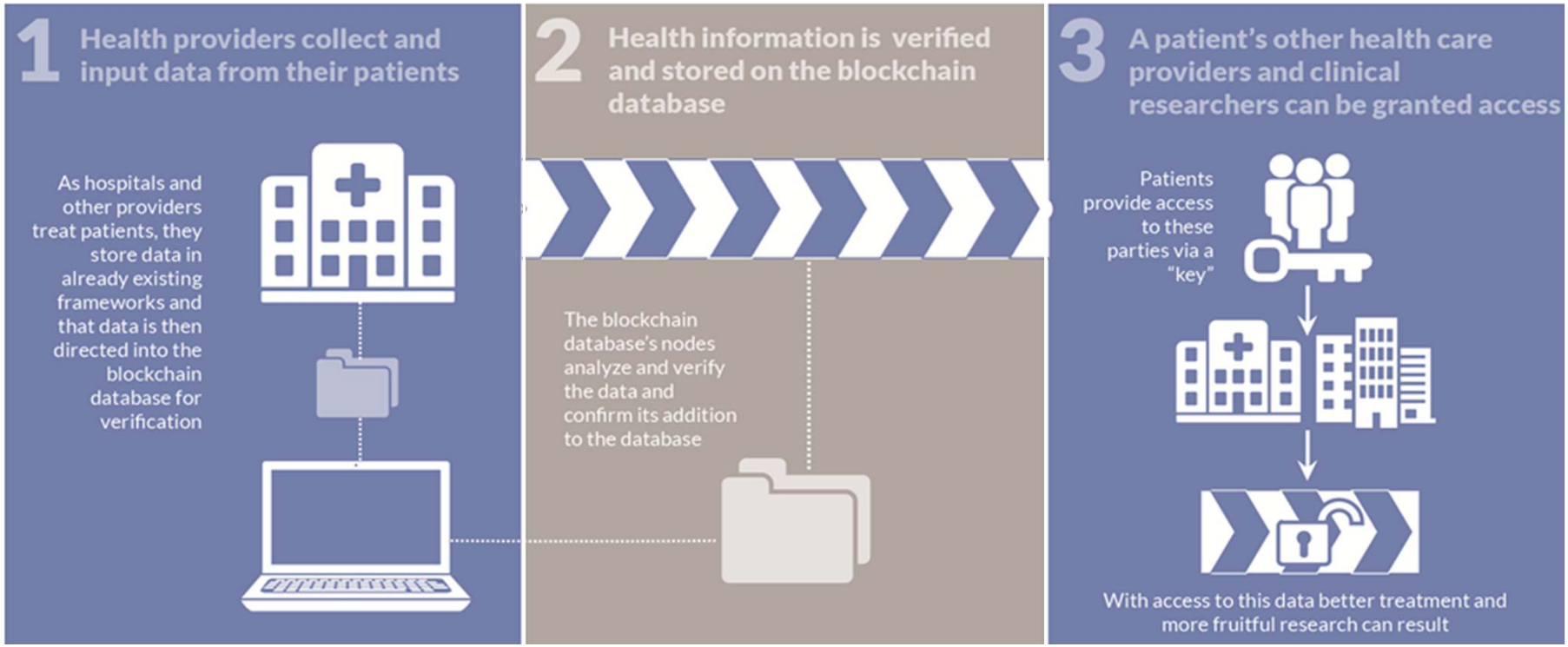
Analyze large pools of de-identified data for research

Recordkeeping for physician licenses

Monitor public health trends and epidemics

Medical Records – Distribution and Access

health care



Blockchain Pros

health care

- Provides a uniform, consistent structure for data management, helping solve a critical inoperability program for the industry
- Health care is efficiently and securely distributed to a patient's providers, allowing for more seamless and effective care and decreased transaction cost
- Data is stored more securely, and parties can have confidence in data integrity
- Researchers could benefit from access to anonymized data
- Government entities could use the data to more effectively track public health trends in real time

Blockchain Cons

health care

- Immediate access to expansive data, such as entire medical records, might be impossible under the current structure
- Computing demands can be great
- Payment issues-“miners” may not have as much incentive as in other blockchain applications
- The immutable nature of the data on the blockchain database may not be HIPAA-compliant
- No oversight of data governance

Implementation Challenges

health care

- Large amounts of data could slow transaction speeds
- Great demands on computer systems and networks
- Payment and incentive problem for “miners”
- Data analytics on the chain
- Privacy challenges may remain

Regulatory Challenges

health care

- As currently configured, blockchain technologies may not be HIPAA compliant:
  - Immutability of data vs allowing patient amendments
  - Stored data not necessarily private- miners allowed
  - Test for de-identification
  - Business associate agreements
- Lack of government enforceability and governmental rules

Proposed Legislative Approaches

health care

Notable State Legislative Efforts

Arizona: 2017 law regarding "electronic signatures" obtained via blockchain

Nevada: Same as Arizona; also prohibits state taxes, fees, or license requirements on blockchain

Delaware: Blockchain may be used to maintain corporate records

Five other states have floated bills calling for studies and evaluation task forces

- Modest federal legislative and regulatory efforts
  - Several hearings, but no legislation or guidance passed
  - Two bills dead in committee
- "Hands-off" approach by Congress invites states to experiment

Current Use Cases

health care

- Medical Records
- Payment Exchange
- Research
- Licensure

Current Health Care Use Cases

- The **MIT Media Lab's** project, **MedRec**, is aiming to tackle medical records with blockchain
- **Change Healthcare** has launched a blockchain network allowing hospitals, physicians and payers to track the real-time status of claims and remittances to help with revenue cycle management
- Startup **SimplyVital** health has developed a health care cryptocurrency token

Current Health Care Use Cases

- The **Illinois Blockchain Initiative**, a consortium of Illinois state and county agencies, is developing a blockchain program to track medical licenses and credentials
- The U.S. **FDA** and **IBM Watson** have teamed to explore research opportunities
- The **U.S. CDC** and the **Department of Health and Human Services** have solicited white papers and launched investigatory initiatives

In summary

- The technology is advancing ahead of regulations and legislation
- Patient centric focus is essential
- Important to analyze where blockchain can be most effective in workflow
- The success of small projects in healthcare will dictate greater adoption

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Questions & Answers