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Insight Driven Health

Blockchain: Securing a New Healthcare Interoperability Experience

ONC & NIST

Use of Blockchain for
Healthcare Workshop

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High performance. Delivered.

Introductions



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**BLOCKCHAIN
OVERVIEW**

**HEALTHCARE
APPLICATIONS**

**SUGGESTED
ACTIONS**

Blockchain Overview

What is a blockchain?



Open Access – share same data



Consensus – record of transactions with systematic validation



Distributed Network – decentralized transaction ledger database

































Secure – cryptographically secure

Some promising use cases for blockchain:

- Payments
- Clearing & Settlement
- Trade Finance
- Peer to Peer Networks (insurance, energy)
- Health Records – Secured & Trusted
- Linking Identities
- Recording Patient Consent
- Health Revenue Cycle

Blockchain Overview

What are core principles of blockchain technology?

	 Open Access	 Distributed Network	 Consensus	 Secure
Key Attributes	<p>All participants share access to the same data.</p> <p> Transparent</p> <p> Ease of Access</p>	<p>Ledger database that is shared by all parties in a defined, distributed network.</p> <p> Database Consistency</p> <p> Unique (No Duplication)</p> <p> No Single Point of Failure</p> <p> Redundant (Single Truth)</p>	<p>Record of consensus that stores every transaction that occurs via systemic validation.</p> <p> High Quality Validation</p> <p> Immutable</p> <p> Tamper-Evident</p>	<p>Data can't be tampered with, lost, or changed. Only the right people can access the right data.</p> <p> Controlled Confidentiality</p> <p> Authentication</p> <p> Encryption</p>
Value Proposition	<p> Borderless</p> <p> Open P2P Network</p>	<p> Eliminates Reconciliation</p>	<p> Providence</p> <p> Data Reliability</p>	<p> Trust</p>
Challenge	<p> Pseudonyms</p> <p> Regulators</p>	<p> Throughput</p> <p> Scale</p>	<p> Common Standards</p> <p> Resource Intensive</p>	<p> Infrastructure Investments</p> <p> Privacy</p>

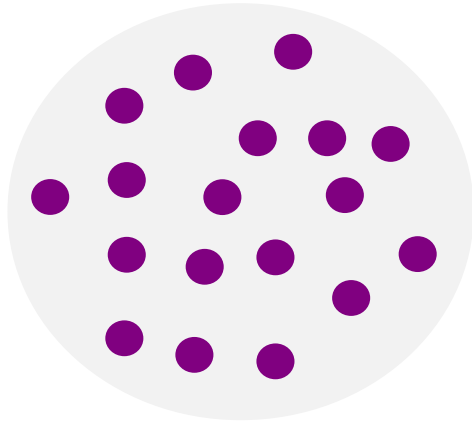
Blockchain Overview

What types of blockchain infrastructures are being implemented?

Semi- and fully-private Block Chains address concerns in privacy and permission management

Permission-less

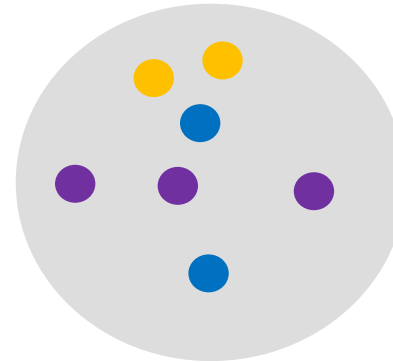
Permissioned



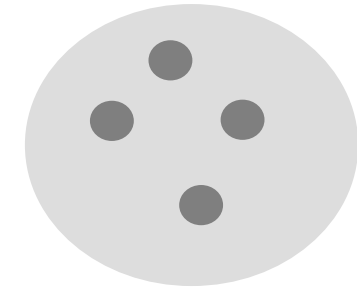
“internet”

Public blockchain:

- Permission less – anyone can use it
- “Proof” consensus – “Proof of Work” for Bitcoin
- Public nodes
- Cryptocurrency token
- Open wallet access/internet



“extranet”



“intranet”

Semi-private & private blockchain:

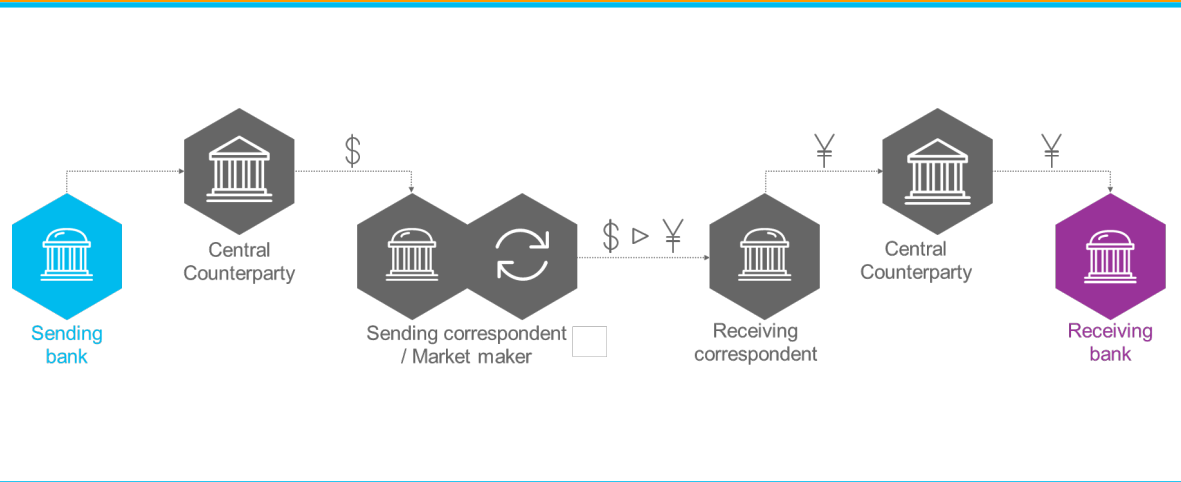
- Permissioned – defined group can participate
- Custom consensus engine – rules set by participants
- Private nodes – closed group
- Optional token
- Closed wallet access/VPN

Blockchain Overview

Case Study: Bank to Bank Money Movement

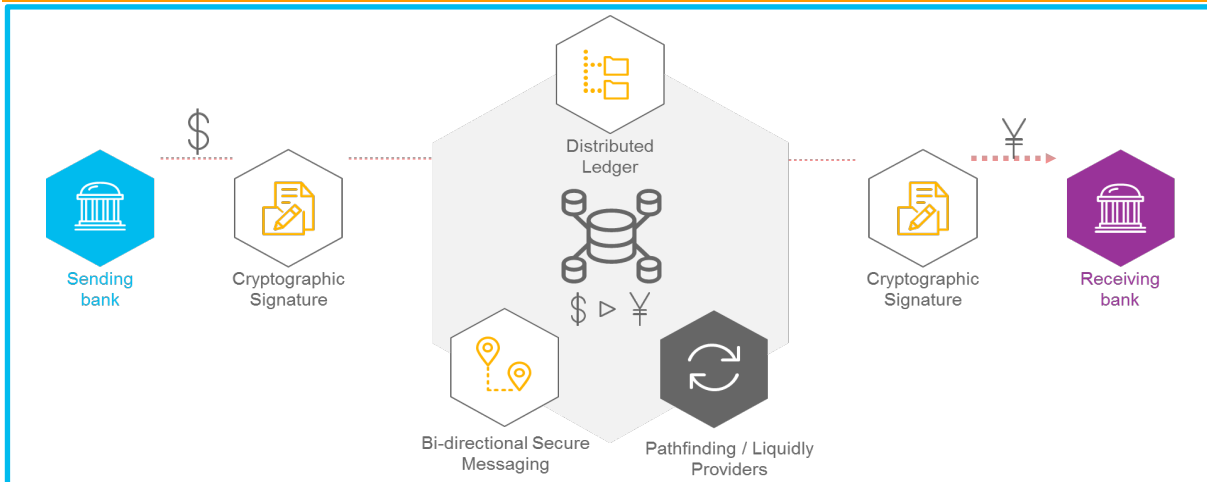
Moving Money Today:

clearing and settlement through one or more correspondent banks is slow, expensive and introduces counterparty risk



Moving Money Tomorrow:

direct clearing and settlement that reduces costs, delays and transaction risks



Limited visibility , fees and FX spread

Payment notification in minutes; settlement overnight; batch processing

Intermediary charges processing fees; limited FX providers

Counterparty risk due to intermediaries and long processing time

Bank reserves provides liquidity; capital is tied up nostro accounts



Full visibility into transaction status, fees and FX spread

Payment notification and settlement in seconds; processing 24/7/265

No intermediary to charge processing fees; competitive FX rates

Counterparty risk eliminated by straight through, instant processing

Option of liquidity provider to fund transaction and reduce bank capital

Healthcare Applications

What are important applications of blockchain relevant to ONC's mission?

ONC Interoperability Roadmap Building Blocks



Core Technical Standards and Functions



Certification to support adoption and optimization of health IT products



Privacy and security protections for health information



A supportive business, clinical, cultural and regulatory environment



Rules of engagement and governance of the exchange of health information

Three most important applications of blockchain technologies relevant to the mission of the ONC:



Creating Secure & Trusted Records



Linking Identities



Recording Patient Consent

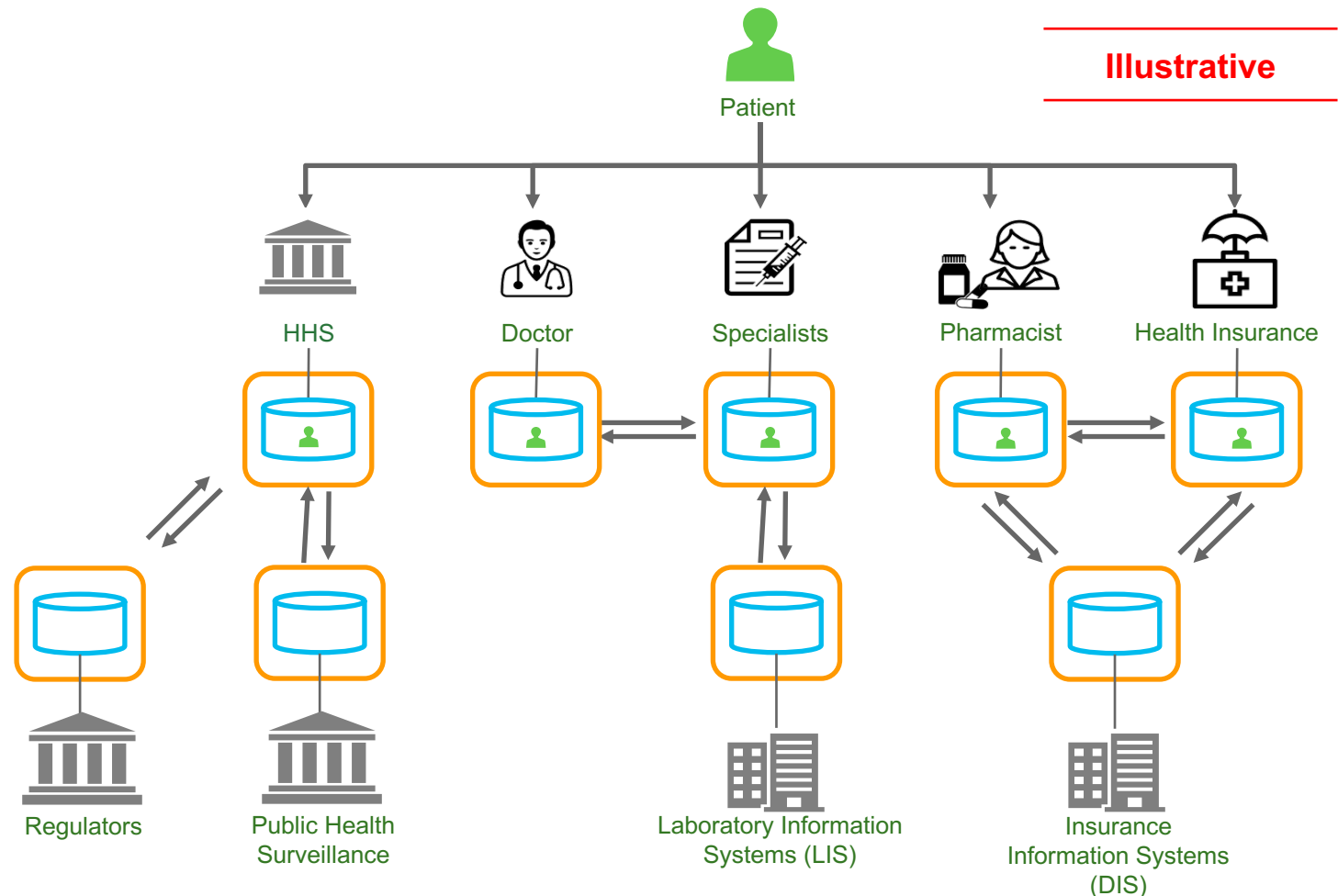
Healthcare Applications

What is the current state of healthcare data exchange?

Data is spread in silos across multiple healthcare stakeholders for the purposes of executing a process which is often prone to discrepancies, expensive reconciliation and storage costs.

Current State

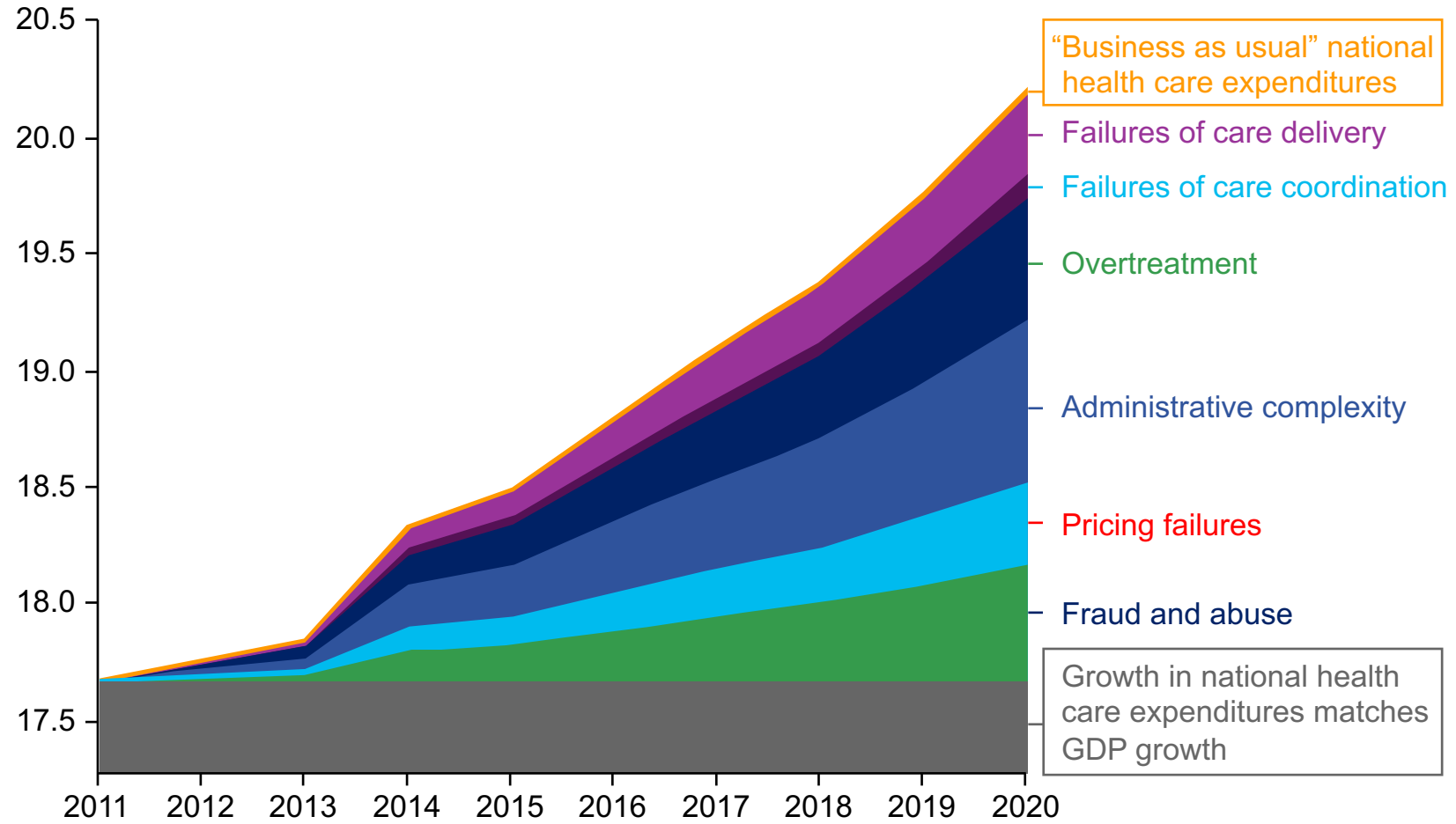
- Redundant data stores
- Lack of trust/data integrity results in expensive data reconciliation at each step of the process
- Incomplete end-to-end view of health information exchanges, patient, and services; as required by regulators
- Opportunities for data breach
- Inconsistent data storage and use across parties



Healthcare Applications

What are example costs associated with the current state?

US National Health Care Expenditures, By Year as % of GDP

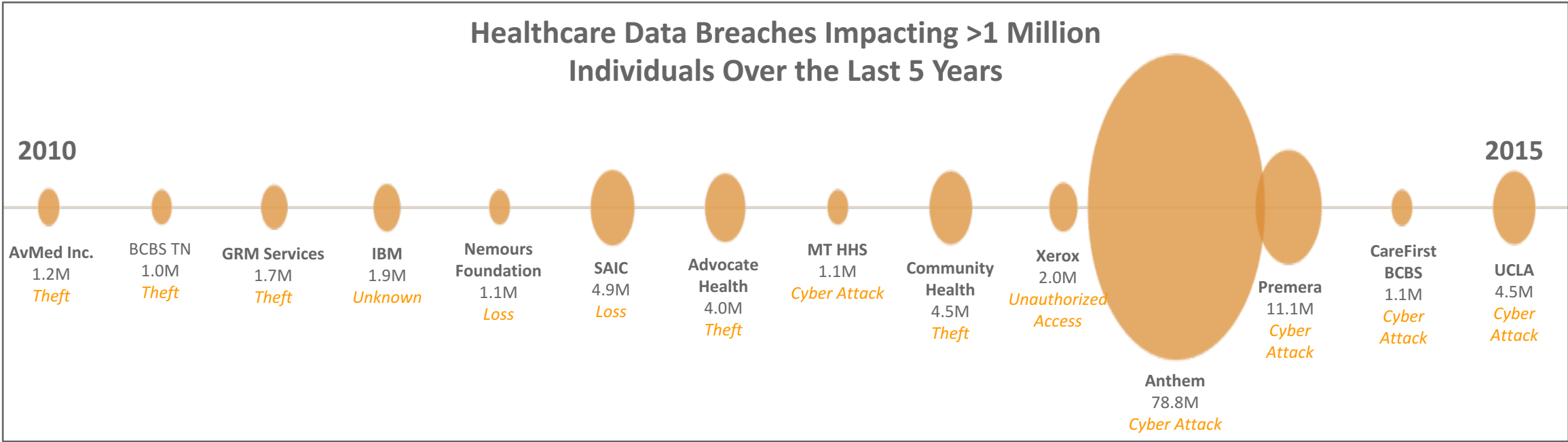


Source: Berwick, D. M. et al. JAMA April 11, 2012

Healthcare Applications

What are example costs associated with the current state?

Number of healthcare data breaches impacting more than 500 individuals increased more than 40% over the past 5 years.

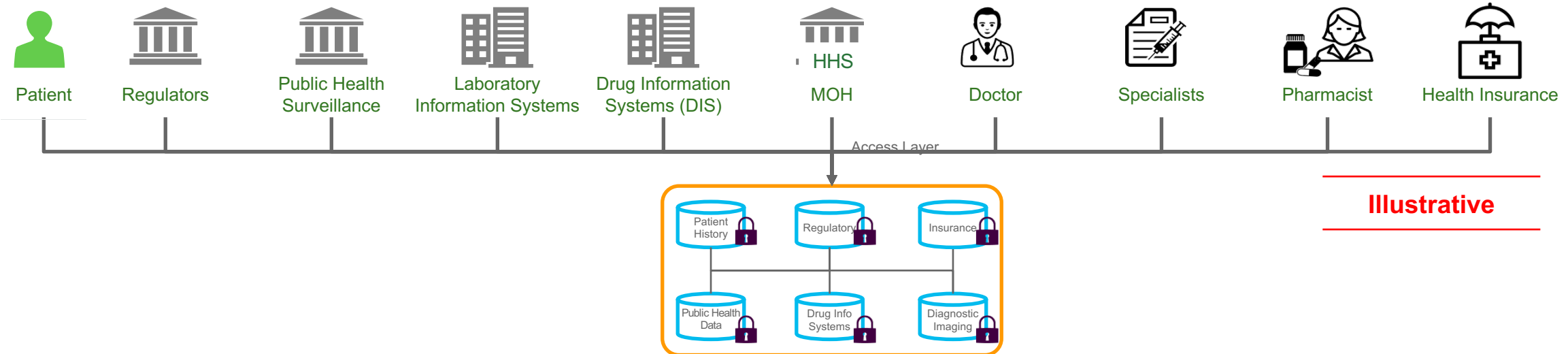


Sources: Accenture analysis based on data from the HHS Office for Civil Rights breach portal. Data accurate as of July 2015.

Healthcare Applications

What is a potential target state enabled by blockchain technology?

A centralized view of the data across all parties would allow for access to relevant data, guarantee data integrity and significantly reduce reconciliation costs – permissioned blockchain on existing Health IT Investments

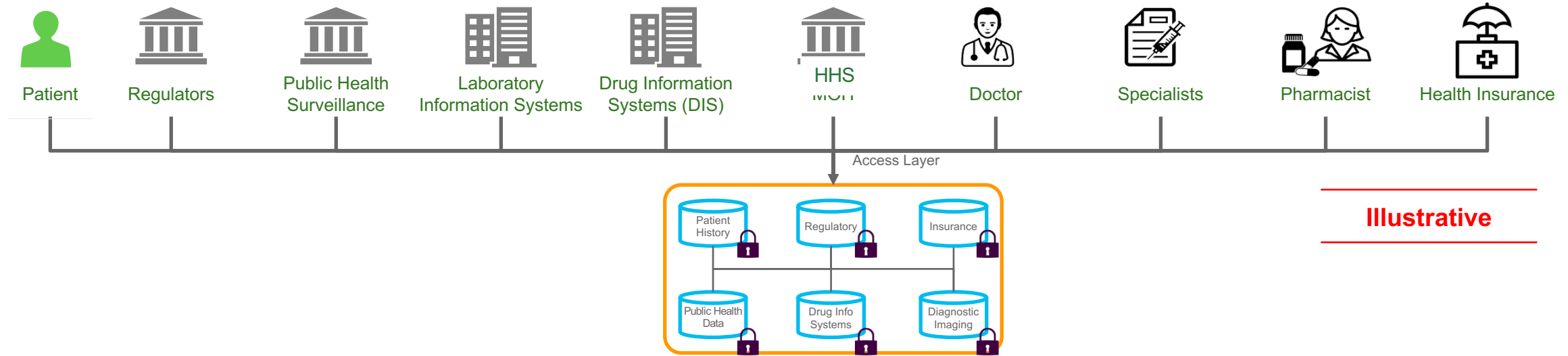


Target State

- Central store or “golden state” of data
- Guarantee data quality and availability
- Improved security (e.g., data-level encryption)
- Entitlement-based access
- Consistent data storage and use
- End-to-end view
- Auditability

Healthcare Applications

Summary of the three applications of blockchain relevant to ONC's mission



Creating Secure & Trusted Records

- **Data:** No Personal Health Information is stored on blockchain
- **Authentication:** Cryptographic keys used to authenticate a user
- **Authorization:** Governance rules predefine access & control permissions to ensure appropriate mix of privacy vs transparency



Linking Identities

- **Distributed:** Complete record integrity and transparency
- **Nonrepudiation:** Ensures party cannot deny the authenticity of their signature on a document or sending of a message that they originated
- **Verification:** A number of other entities inside and outside of healthcare could provide, support and attest to identity claims



Recording Patient Consent

- **Trust:** Patient consent statements captured in the immutable blockchain allowing health professionals and others to trust the consent
- **Empowerment:** Patients are empowered to add consents at any point in their care with confidence they will be secured
- **Directives:** Healthcare professionals can act upon consent statements with the assurance they are adhering to patient wishes

Healthcare Applications

What are other potential applications of blockchain technology in healthcare?



Patient profiling for population health



Improved audit logging



Patient data as a service



Improve health IT application development



New access points for healthcare data



Connecting traditional databases in a blockchain environment

Healthcare Applications

What are potential barriers to blockchain implementation in healthcare?

There are implementation barriers that must be overcome for blockchain technology to gain a legitimate place in the healthcare industry.

Barriers



Redefining legal and regulatory frameworks to govern use of this new socio-political paradigm



Finding solutions that can handle the required volume



Determining optimal verification process to avoid latency over time as the data on the blockchain grows



While blockchain protocol is stable and secure, supporting infrastructures have suffered from security breaches



Governance models and solutions must exist for situations when users need to remove data from the blockchain, for privacy or legal reasons

Suggested Actions

What are suggested actions for ONC related to blockchain in healthcare?

ONC should support, track and highlight demonstration projects for the application of blockchain platforms to encourage private sector innovation and inform future policy.



1 Environmental Scans and industry outreach



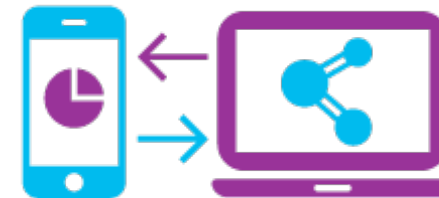
2 ONC Blockchain White Paper



3 Blockchain Workshops



4 Federal Advisory Committees



5 Blockchain Demonstrations



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