Microsoft Blockchain in Healthcare

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Blockchain in Healthcare - Layered View

Layer 4: Artificial Intelligence and Machine Learning Enable Major New Insights, Value

Layer 3: Cryptocurrencies and Tokens Enable New Commerce and Incentive Systems

Layer 2: Smart Contracts Increasingly Automate Transactions, Improving Efficiency

Layer 1: Blockchain Enables Secure Sharing of Healthcare Data Across B2B Networks

Layer 0: Healthcare Data Mostly in Silos, Little Sharing, Massive Untapped Potential
Blockchain Architecture

Blockchain Network
“B2B Middleware”
(Private / Consortium, Permissioned, Validated)

Org A
Org B
Org C
Org D

Key
- Blockchain Node
- Decentralized Ledger
- Enterprise System
- Enterprise Internal Firewall
- Secure Link
Blockchain Node Deployment

- On premises
- In cloud
- Heterogeneous deployment options
- Consistent consensus
Today

- Redundant Maintenance of Common Data
- Inconsistencies, Causing Friction

Blockchain

- Common Data Maintained by Consortium
- Update Once, Near Realtime Visibility Across

Organization A
- Private Data
- Common Data

Organization B
- Private Data
- Common Data

Organization C
- Private Data
- Common Data
Is Blockchain a Missing Cog in Health IT?

- Major healthcare benefits in **secure, targeted sharing** of patient data
- Today enterprise systems and data **siloed** within healthcare organizations
- Only **limited sharing** of healthcare data
- **Blockchain**
  - Enables secure targeted sharing of healthcare information
  - Co-exists and integrates with enterprise systems
  - Can provide the “**missing cog**” for secure exchange of data
- Enables **new levels of collaboration** to **reduce costs** and **improve outcomes, engagement, experiences**
Blockchain Strengths

- Secure, targeted sharing of data, where it makes business sense
- Data integrity
- Transparency
- Decentralization, resilience, availability of the network
- Anti-fraud
Identifying Use Cases and Business Value Propositions

- It's about the network of organizations, not a database
- Collaboration around shared data for business value
  - Reducing healthcare costs
  - Improving patient outcomes
  - Improving patient engagement, experience
  - Improving healthcare professional experience
- Existing healthcare B2B networks are near term opportunities
# Delivering Value with Blockchain – Healthcare Examples

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<tr>
<th>Use Case</th>
<th>Reduce Cost</th>
<th>Improve Patient Outcomes</th>
<th>Engage Patients, Enhance Experience</th>
<th>Enhance Healthcare Professional Experience</th>
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Challenge

• Lack of patient participation in clinical trials, and consequently inadequate data available for clinical research.
• Inadequate data provenance leads to irreproducible clinical trials.

Strategy

• Grapevine World blockchain enriched IHE solution enables patients to opt-in to clinical research, incentivizing them to do so with crypto-tokens. Provenance information for clinical data was managed using blockchain.

Results

• Hyperledger Fabric blockchain powered by Microsoft Azure enables tracking of provenance information for clinical data, reproducibility is ensured.
• Ethereum based crypto-tokens reward patients for participation in clinical trials.
Challenge

- Slow medical device recalls which can often take over a year to complete, increasing risk to patient safety, and increasing costs and delays.
- Lack of longitudinal record of history of maintenance of medical devices.

Strategy

- Spiritus blockchain enables tracking of medical devices from implants, to wearables, to machines such as MRI's from manufacturing through the supply chain and the complete lifecycle, and maintenance.

Results

- Blockchain powered by Microsoft Azure enables tracking of medical devices and their maintenance, enabling expedited recalls, improving patient safety and lowering costs, and improving the quality of medical devices.
Challenge
• OECD estimates 10% of pharmaceutical products sold worldwide and 2.5% of global imports are counterfeit, increasing costs, and adding risk to patient safety.

Strategy
• Adents NovaTrack, powered by Microsoft Azure, offers open, integrated blockchain-based end-to-end supply chain traceability.

Results
• Secures the supply chain, reduces counterfeit drugs, lowers costs, improves patient safety.
Building the Consortium, Buy-in, Trust

- B2B middleware
- Building the consortium, trust is the hard part
- Existing B2B networks are early opportunities and points of traction
- Add blockchain to deliver additional business values
- Prove blockchain out, pave way for revolutionary use cases
Security

- Protect CIA of sensitive data and systems
  - Integrity
  - Availability
  - Nodes
  - Confidentiality

- Adequacy of security across the consortium
Privacy

- Privacy risks, and strengths
- Minimal but sufficient data
- Avoid PII / PHI on blockchain where possible
- Ability to review and amend data
- Consent, opt-in / opt-out
- Transparency through data lifecycle: collection, storage, use, disclosure, disposal
- Access: audit trails, user ability to review
Compliance

- Types of data on blockchain
  - PHI
  - PII

- Location of blockchain nodes

- Data sovereignty / trans-border data flow

- Immutability and right to be forgotten
Performance, Throughput, Scalability

· Bitcoin: ~ 1 per 10 minutes
  · Public, untrusted, conservative consensus

· Vast majority of blockchain is private
  · No mining. Not storage or compute bound. Network bound
  · Consensus algorithm type paramount
  · Typical throughput from 100’s to 1000’s blocks per second

· Batching transactions in blocks for higher throughput
· Check your use case performance and throughput requirements early for blockchain suitability
Integration, Interoperability

- B2B middleware integrated with enterprise systems
- Interoperability critical for success
- Blockchain doesn’t deliver interoperability
- Blockchain depends on interoperability
- Blockchain should maximize use of existing applicable interoperability standards, eg FHIR
- Blockchain is a forcing function and opportunity for us to get interoperability right!
Multiple blockchain pilots in progress, ending in 2019
Consortiums of recognizable, respected organizations
Centered on use cases and business value(s)
  - Provider Directory
  - Provider Credentialing
  - Etc
Results and case studies with attestations of business values, and areas to improve are imminent
Establish a solid foothold to scale consortiums, use cases
Blockchain Evolution: Opportunities and Barriers

- Mostly private / consortium blockchains
- An archipelago of blockchain islands
- Interoperability challenge
- Pilots, case studies, attestations
- Natural selection
- Winners scale in size, use cases, network effect
- Gradual move over time to larger islands
- Pave way for richer smart contracts, DAOs
Blockchain Ethical Considerations

- Patients Own Data
- Patients Monetize Data
- Disintermediation, and Disruption
- Hyper-Efficiency, Job Loss
- Environmental Impacts
- Anonymity, Cryptocurrency, and Crime

Source: Blockchain: 6 Key Ethical Considerations
Blockchain at Microsoft

- **Platforms**
  Azure runs most blockchains. Ethereum, R3 Corda, Hyperledger Fabric are currently the most enterprise ready blockchain platforms. All three run on Azure today across 54 regions and 140 countries **worldwide**. Azure has 91+ **certifications and attestations** including HIPAA, HITRUST, GDPR, and many more.

- **Tools**

- **Partnership**
  Microsoft partners with startups, ISV’s, SI’s, and other solution providers serving healthcare to empower them to do more to reduce healthcare costs, improve patient outcomes, engagement, and experiences.
1. **Microsoft Azure Blockchain**
   - Develop, test, and deploy secure blockchain apps on Hyperledger Fabric, R3 Corda, or Ethereum

2. **Azure Blockchain Workbench**
   - Rapid development and deployment of new blockchain applications

3. **EBC Topic:** Blockchain as a Service in Azure
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Thank You