

Blockchain Education for Aetna

IBM Blockchain

Presenters:



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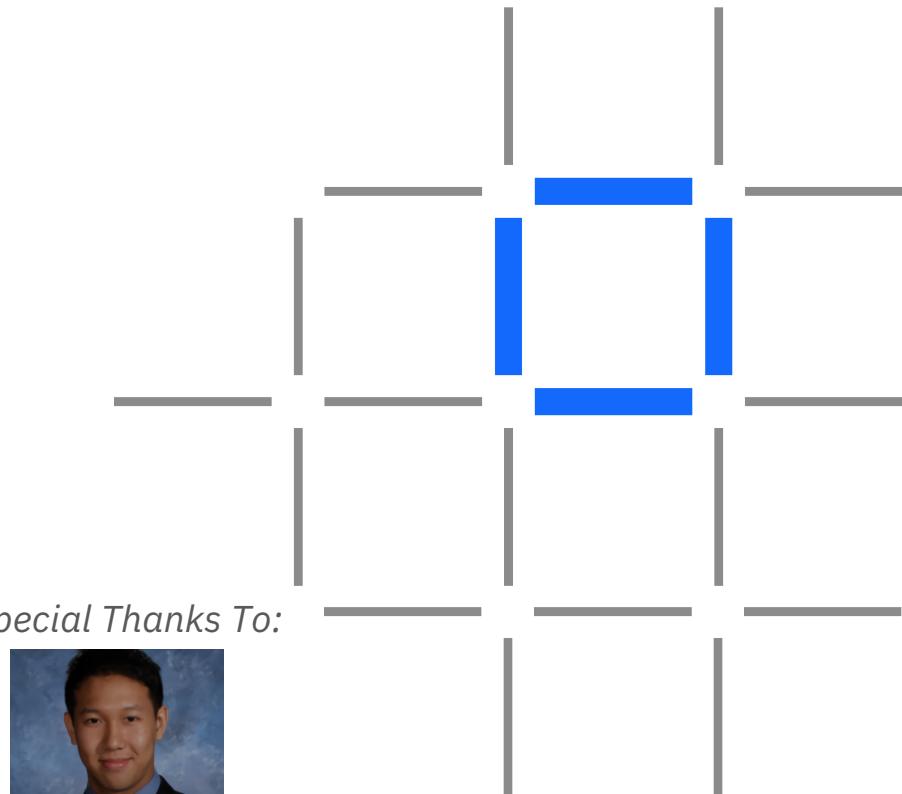


Daniel Acosta

Special Thanks To:



Kevin Lee



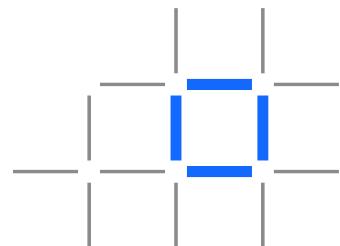
2-Day Education Agenda

– Day 1

- Blockchain Explained
- Blockchain Solutioned
- Demo of IMMUNICChain

– Day 2

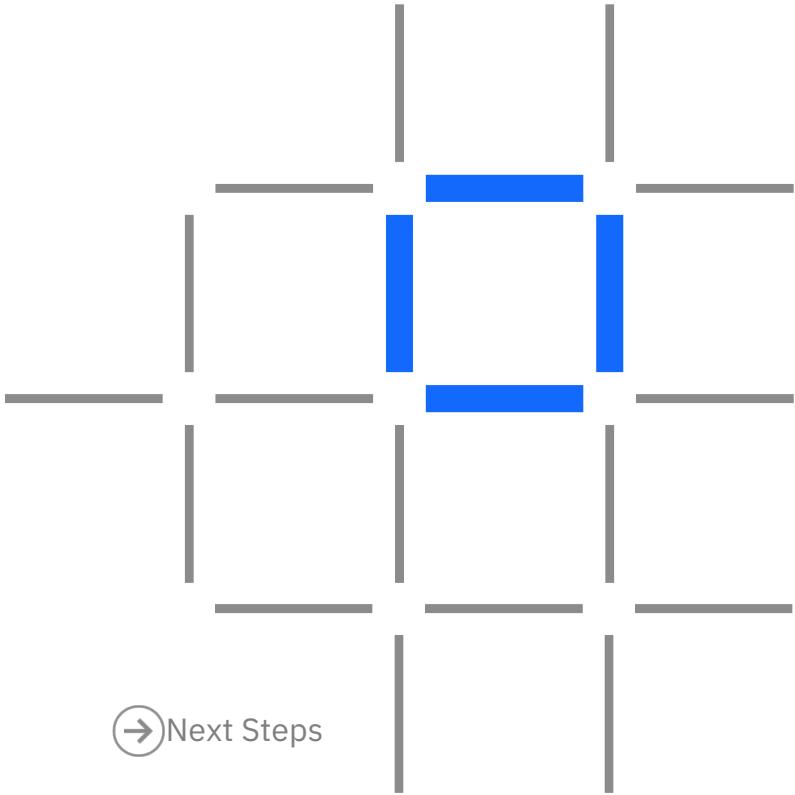
- Blockchain Composed
- Composer Lab using IMMUNICChain



Blockchain Explained

An Introduction to Blockchain for Business

IBM Blockchain



Blockchain education series





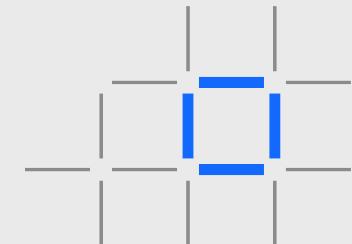
What is Blockchain?



Why is it relevant for
our business?

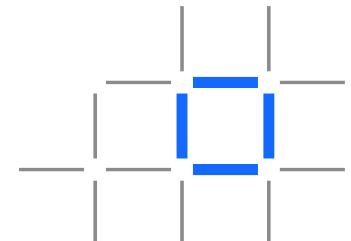
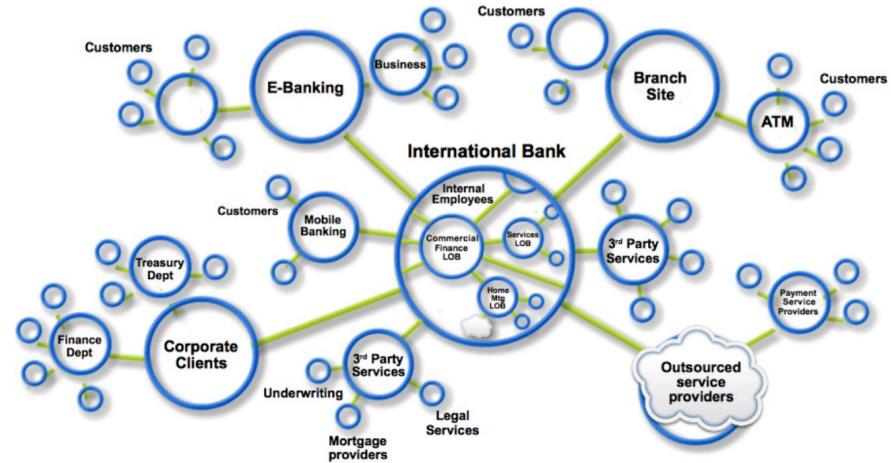


How can IBM help us
apply blockchain?



Business networks, wealth and markets

- **Business Networks** benefit from connectivity
 - Participants are customers, suppliers, banks, partners
 - Cross geography & regulatory boundary
- **Wealth** is generated by the flow of goods & services across business network in transactions and contracts
- **Markets** are central to this process:
 - Public (fruit market, car auction), or
 - Private (supply chain financing, bonds)



Transferring assets, building value

Anything that is capable of being owned or controlled to produce value, is an asset



Two fundamental types of asset

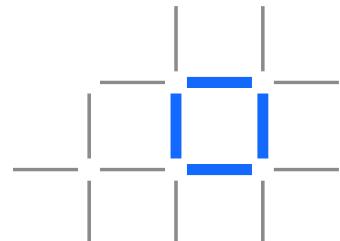
- Tangible, e.g. a house
- Intangible, e.g. a mortgage

Intangible assets subdivide

- Financial, e.g. bond
- Intellectual, e.g. patents
- Digital, e.g. music

Cash is also an asset

- Has property of anonymity

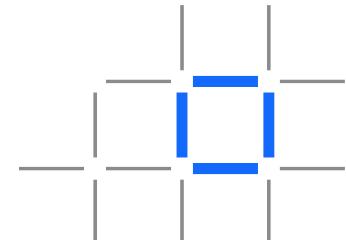
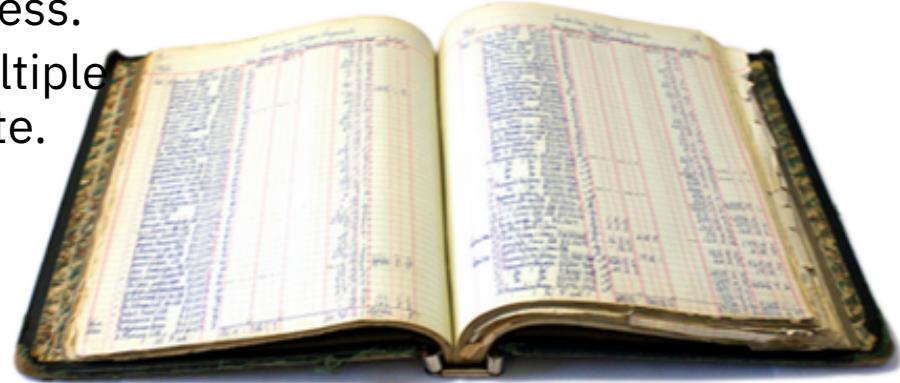


Ledgers are key

Ledger is THE system of record for a business.

Business will have multiple ledgers for multiple business networks in which they participate.

- **Transaction** – an asset transfer onto or off the ledger
 - John gives a car to Anthony (simple)
- **Contract** – conditions for transaction to occur
 - If Anthony pays John money, then car passes from John to Anthony (simple)
 - If car won't start, funds do not pass to John (as decided by third party arbitrator) (more complex)



Introducing Blockchain ...

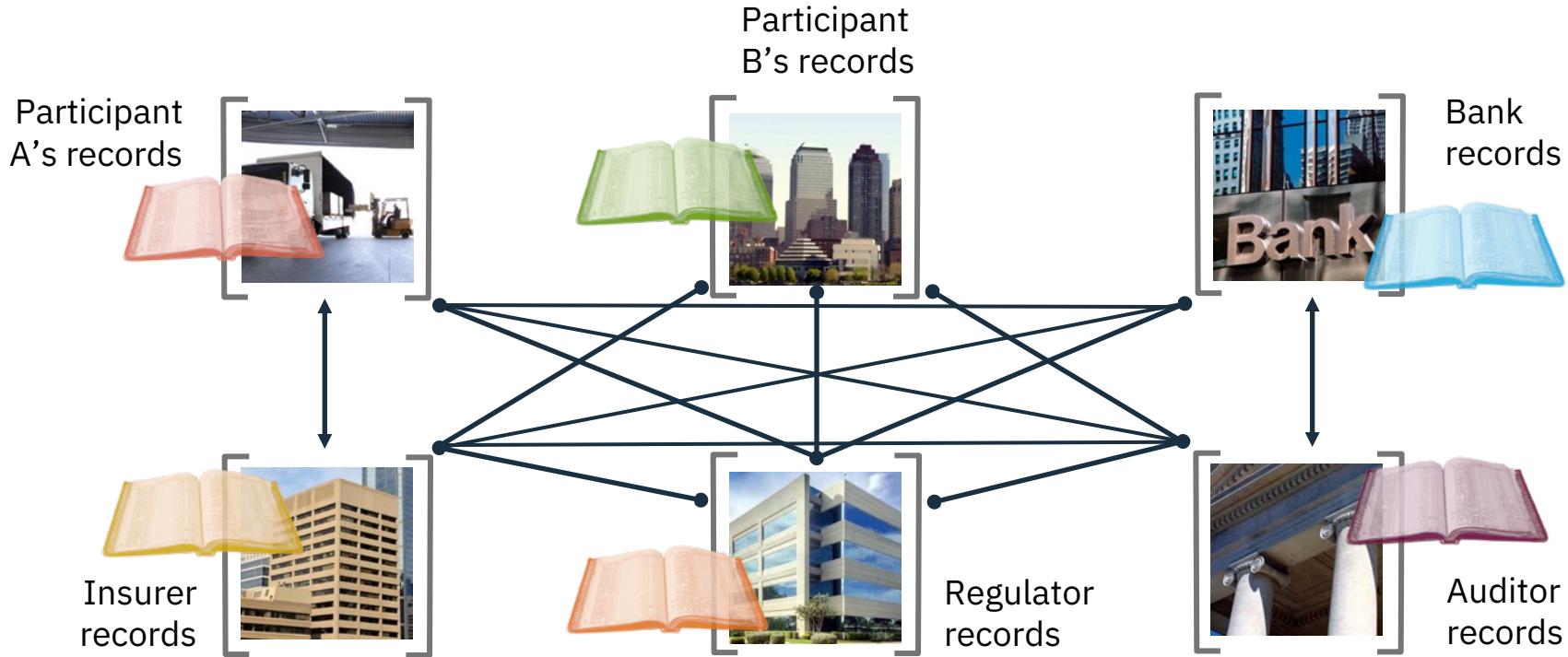
IBM Blockchain

A trusted,
distributed
ledger

Blockchain

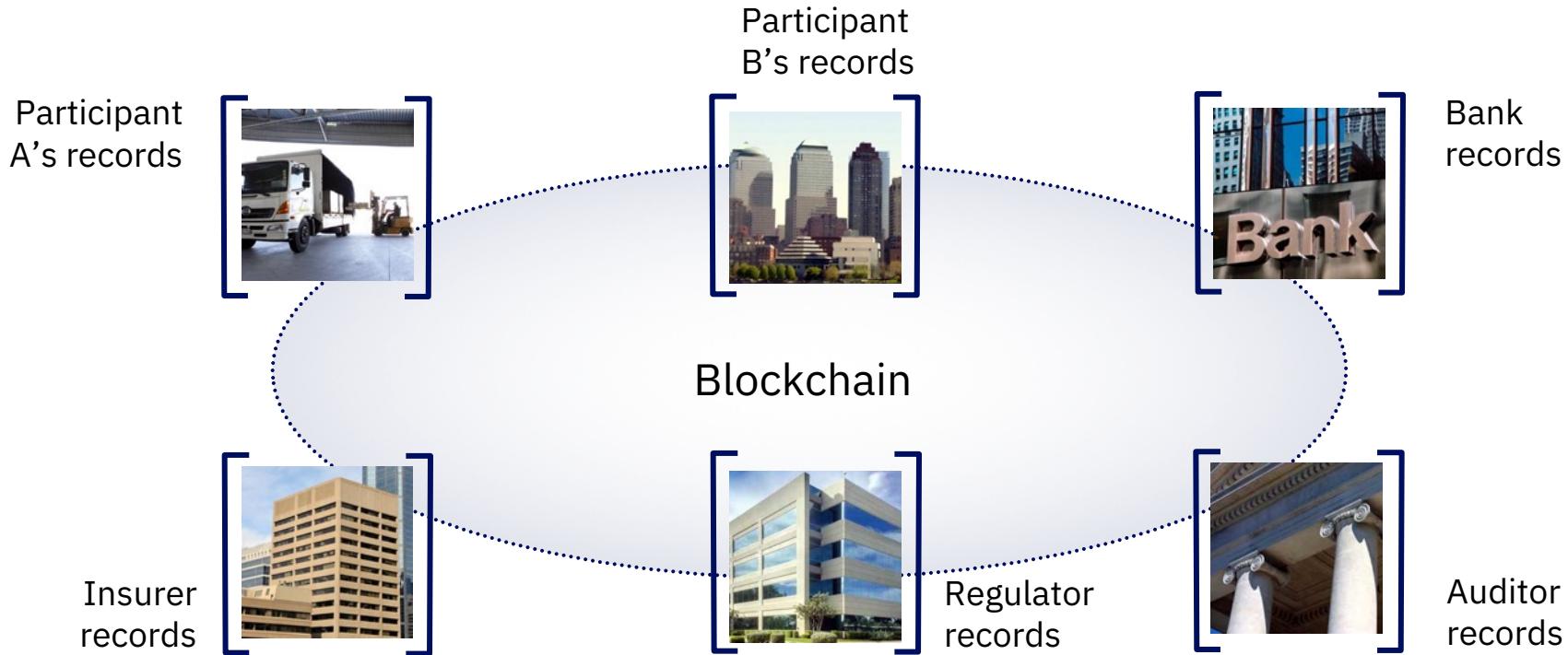
with shared
business
processes

Problem ...



... inefficient, expensive, vulnerable

A shared, replicated, permissioned ledger ...



... with consensus, provenance, immutability and finality

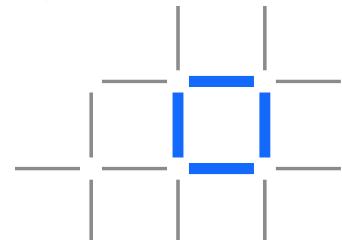
Blockchain underpins Bitcoin

 **bitcoin** is:

- An unregulated shadow-currency
- The first blockchain application
- Resource intensive

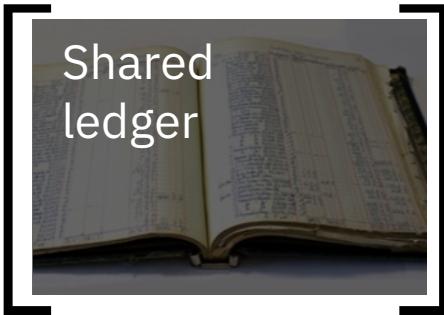
Blockchain for business differs in key areas:

- Identity over anonymity
- Selective endorsement over proof of work
- Assets over cryptocurrency



Requirements of blockchain for business

Append-only
distributed system of
record shared across
business network



Shared
ledger

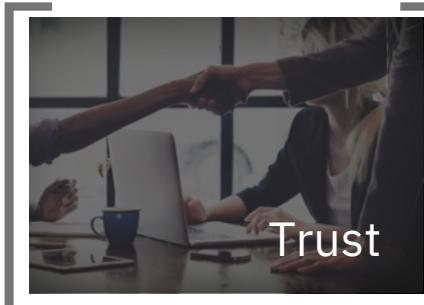


Smart
contract

Ensuring appropriate
visibility; transactions
are secure,
authenticated
& verifiable



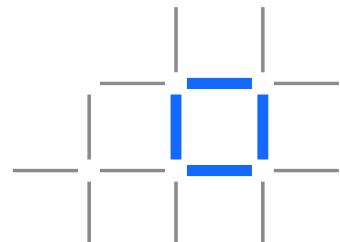
Privacy



Trust

Business terms
embedded in
transaction
database
& executed with
transactions

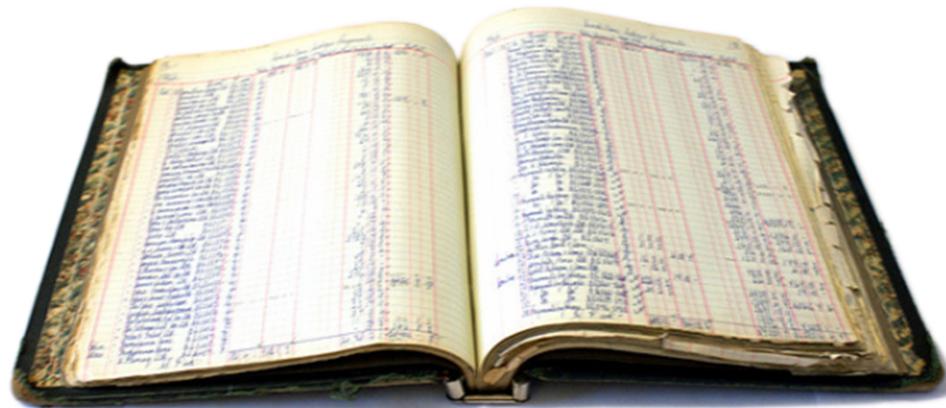
Transactions are
endorsed by
relevant
participants



Shared ledger

- Shared between participants
- Participants have own copy through replication
- Permissioned, so participants see only appropriate transactions
- THE shared system of record

Records all transactions across business network



Smart contract

- Verifiable, signed
- Encoded in programming language
- Example:
 - Defines contractual conditions under which a bond transfer occurs

Business rules associated with the transaction



Privacy

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

The ledger is shared, but participants require privacy



Trust

- Participants endorse transactions
 - Business network decides who will endorse transactions
 - Endorsed transactions are added to the ledger with appropriate confidentiality
- Assets have a verifiable audit trail
 - Transactions cannot be modified, inserted or deleted
- Achieved through consensus, provenance, immutability and finality

The ledger is a trusted source of information





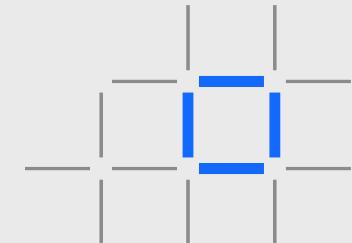
What is Blockchain?



Why is it relevant for
our business?



How can IBM help us
apply blockchain?



Blockchain is creating extraordinary opportunities for businesses to come together in new ways

Create New Value

Exploit new business models and eliminate inefficiencies

Optimize Ecosystems

Streamline business processes and the exchange of value along your ecosystem

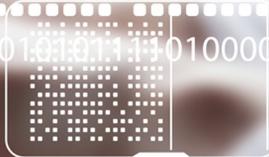
Reduce Risk

Replace uncertainty with transparency and a trusted decentralized ledger



10100101011101011101010010101

100011110101011101000010100010111



Example: Shared reference data

What

- Competitors/collaborators in a business network need to share reference data, e.g. bank routing codes, medical codes
- Each member maintains their own codes, and forwards changes to a central authority for collection and distribution
- An information subset can be owned by organizations

How

- Each participant maintains their own codes within a Blockchain network
- Blockchain creates single view of entire dataset

Benefits

1. Consolidated, consistent dataset reduces errors
2. Near real-time access to reference data
3. Naturally supports code editing and code transfers between participants

Example: Supply chain



What

- Provenance of each component part in complex system hard to track

How

- Blockchain holds complete provenance details of each component part

- Accessible by each manufacturer in the production process, the aircraft owners, maintainers and government regulators

Benefits

1. Trust increased, no authority "owns" provenance
2. Improvement in system utilization
3. Recalls "specific" rather than cross fleet

Example: Audit and compliance



- What
- Financial data in a large organization dispersed throughout many divisions and geographies
 - Audit and Compliance needs indelible record of all key transactions over reporting period

- How
- Blockchain collects transaction records from diverse set of financial systems
 - Append-only and tamperproof qualities create high confidence financial audit trail
 - Privacy features to ensure authorized user access

- Benefits
1. Lowers cost of audit and regulatory compliance
 2. Provides “seek and find” access to auditors and regulators
 3. Changes nature of compliance from passive to active

Example: First Party Medical Claims Processing



What

- The claims process today involves multiple parties, and has the potential for multiple calls, partial payments, disputed coverages, errors in billing, and crossed payment / billing cycles with delinquent bills sent through collection process

How

- Capturing and tracking changes to the claims file on a shared ledger, and using smart contracts to confirm the applicable terms and conditions at various processing steps in the claims processing chain.

Benefits

- Errors and re-work can be reduced and the accuracy and traceability of claims can be improved
- Shortens time to bill & receive payment
- Simplifies audit process

Example: Healthcare Benefits Accumulator



What

- Benefits accumulators are used by insurance providers to track benefits usage by patients against their health plan allotments. Accumulators can be updated from many sources including physicians, hospitals, pharmacies etc. and synchronization issues can happen requiring inefficient remediation. The process is also open to fraud & miss-use. Transaction integrity and data quality issues can drive rework and errors in patient care and benefits tracking.

How

- A blockchain mechanism could replace the core enterprise datastore with blockchain instances that could be partitioned by a few dimensions, such as patient account, benefit type, or some other attribute.

- Benefits
1. All parties agree to any changes to benefits accumulator
 2. Remediation costs eliminated or drastically reduced
 3. Much less prone to fraud & mis-use

Example: Healthcare Payments Prior authorization



What

- Prior authorization is the process of determine if and how much of a medical good or procedure is 'covered' based on a patients health records and their insurance coverage. The medical provider, patient and payer are involved in this network, and timely agreed updates are essential for all parties.

How

- A blockchain shared ledger contains the patient's entitlement and smart contracts (encoding the pre-authorization conditions) specify the conditions under which this is changed, and by whom. Blockchain simplifies this complicated relationship and automates the information collection and sharing.

Benefits

1. Speed up time to service
2. Value added services, e.g. suggest alternative better covered services
3. Reduce error, fraud and misuse
4. Improve patient outcome and experience

Further examples by (selected) industry



Financial	Public Sector	Retail	Insurance	Manufacturing
<ul style="list-style-type: none"> • Trade Finance • Cross currency payments • Mortgages 	<ul style="list-style-type: none"> • Asset Registration • Citizen Identity • Medical records • Medicine supply chain 	<ul style="list-style-type: none"> • Supply chain • Loyalty programs • Information sharing (supplier – retailer) 	<ul style="list-style-type: none"> • Claims processing • Risk provenance • Asset usage history • Claims file 	<ul style="list-style-type: none"> • Supply chain • Product parts • Maintenance tracking

Patterns for customer adoption



- Transfer of high value financial assets
- Between many participants in a market
- Regulatory timeframes



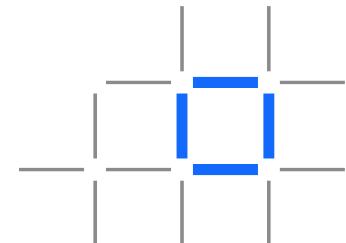
- Sharing of assets (voting, dividend notification)
- Assets are information, not financial
- Provenance & finality are key



- Created by a small set of participants
- Share key reference data
- Consolidated, consistent real-time view



- Real-time view of compliance, audit & risk data
- Provenance, immutability & finality are key
- Transparent access to auditor & regulator



Key players for blockchain adoption

IBM Blockchain



Regulator

- An organization who enforces the rules of play
- Regulators are keen to support Blockchain based innovations
- Concern is systemic risk – new technology, distributed data, security

Industry Group

- Often funded by members of a business network
- Provide technical advice on industry trends
- Encourages best practice by making recommendations to members

Market Maker

- In financial markets, takes buy-side and sell-side to provide liquidity
- More generally, the organization who innovates
 - Creates a new good or service, and business process (likely)
 - Creates a new business process for an existing good or service



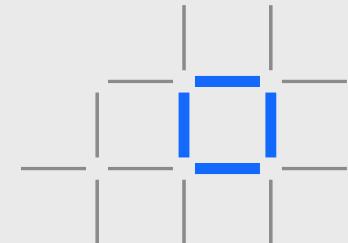
What is Blockchain?



Why is it relevant for
our business?



How can IBM help us
apply blockchain?



Bringing together the world's most advanced expertise, technology and ecosystem to transform industries

Experts

Collaborate with comprehensive services teams from ideation all the way to production

Solutions

Solve critical industry challenges by building and joining new business networks

IBM Blockchain

Platform

Develop, govern and operate enterprise blockchain networks with speed and security

HYPERLEDGER

As a founding and premier member of Hyperledger, we're committed to open source, standards and governance

Hyperledger: A Linux Foundation project

- A collaborative effort created to advance cross-industry blockchain technologies for business
- Announced December 2015, now around 150 members
- Open source, open standards, open governance
- Five frameworks and three tools projects
- IBM is a premier member of Hyperledger



Hyperledger members

Premier



General

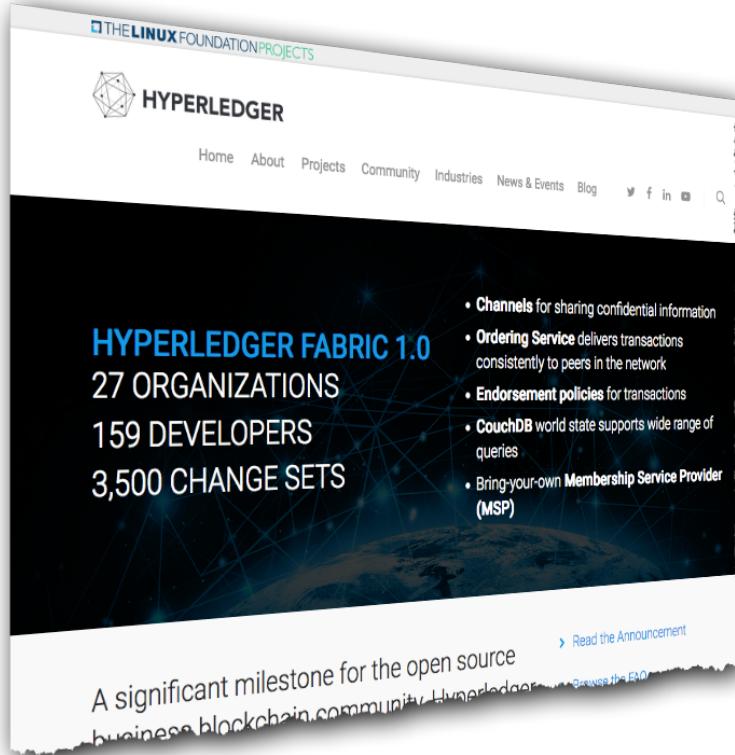


Associate

Source: <https://www.hyperledger.org/about/members>
Updated 21 August 2017

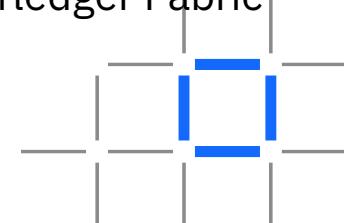
Hyperledger Fabric: Distributed ledger platform

IBM Blockchain



- An implementation of blockchain technology that is a foundation for developing blockchain applications
- Emphasis on ledger, smart contracts, consensus, confidentiality, resiliency and scalability.
- V1.0 released July 2017
 - 159 developers from 27 organizations
 - IBM is one contributor of code, IP and development effort to Hyperledger Fabric

<http://hyperledger-fabric.readthedocs.io/>

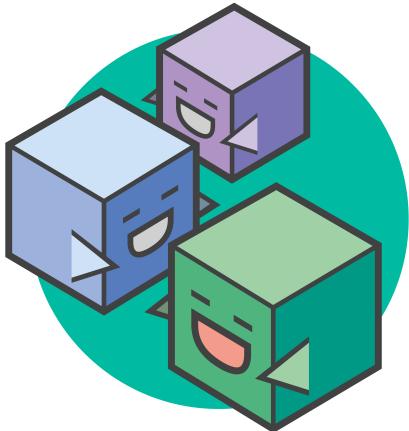


Hyperledger Composer: Accelerating Time to Value

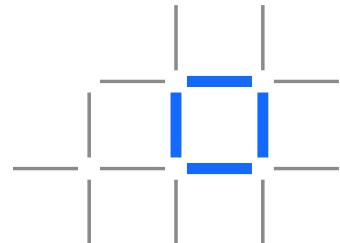
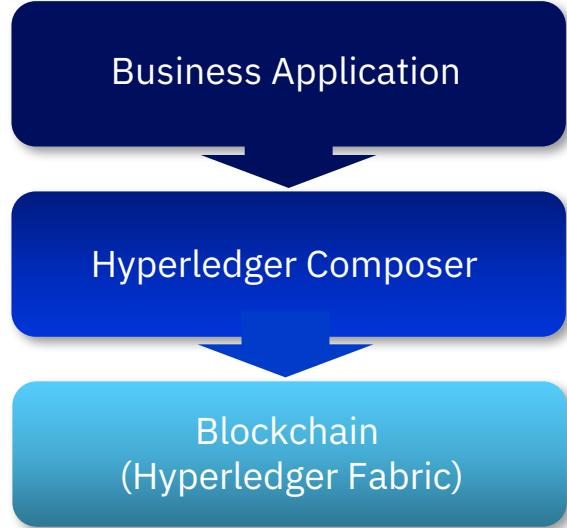
IBM Blockchain

<https://hyperledger.github.io/composer/>

- A suite of high level application abstractions for business networks
 - Emphasis on **business-centric vocabulary** for quick solution creation
 - Reduce risk, and increase understanding and flexibility



- Features
 - Model your business networks, test and expose via APIs
 - Applications invoke transactions to interact with business network
 - Integrate existing systems of record
 - Fully open and part of Linux Foundation Hyperledger
 - Try it in your web browser now:
<http://composer-playground.mybluemix.net/>



Introducing the IBM Blockchain Platform

The only fully integrated enterprise-ready blockchain platform designed to accelerate the development, governance, and operation of a multi-institution business network

- Based on Hyperledger Fabric V1 runtime optimized for enterprise requirements
- Specialized compute for security, performance and resilience
- Delivered via the IBM Cloud on a global footprint with 24x7 Integrated Support
- Full lifecycle tooling to speed activation and management of your network

Develop

Explore and accelerate development time with tools that ensure close alignment between business leaders and developers

Govern

Speed activation, customization and management of your business network with democratic, multi-party governance tooling

Operate

Deploy and operate always-on networks with production-ready enterprise performance and security for most demanding use cases

[http://ibm.biz/Platform_Demo]

Making blockchain real for business with over 400 engagements and multiple active networks

Trade Finance	Pre and Post Trade	Complex Risk Coverage
   	  	  
Identity/ Know your customer (KYC)	Unlisted Securities/ Private Equity Funds	Loyalty Program
 	 	 
Medicated Health Data Exchange	Fraud/ Compliance Registry	Distributed Energy/ Carbon Credit
		 
Supply Chain	Food Safety	Provenance/ Traceability
 	         	

IBM Engagement Model overview

IBM Blockchain



1. Discuss Blockchain technology
2. Explore customer business model
3. Show Blockchain Application demo

1. Understand Blockchain concepts & elements
2. Hands on with Blockchain
3. Standard demo customization

1. Design Thinking workshop to define/refine business challenge
2. Agile iterations incrementally build project functionality
3. Enterprise integration

1. Scale up pilot or Scale out to new projects
2. Business Process Re-engineering
3. Systems Integration

Remote

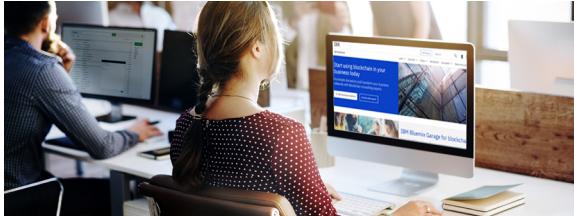
Digital

Face to face

Face to face

Getting started on your blockchain journey

IBM Blockchain



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[Develop a Blockchain
Application](#)



[Activate and Grow your
Blockchain Network](#)

Thank You

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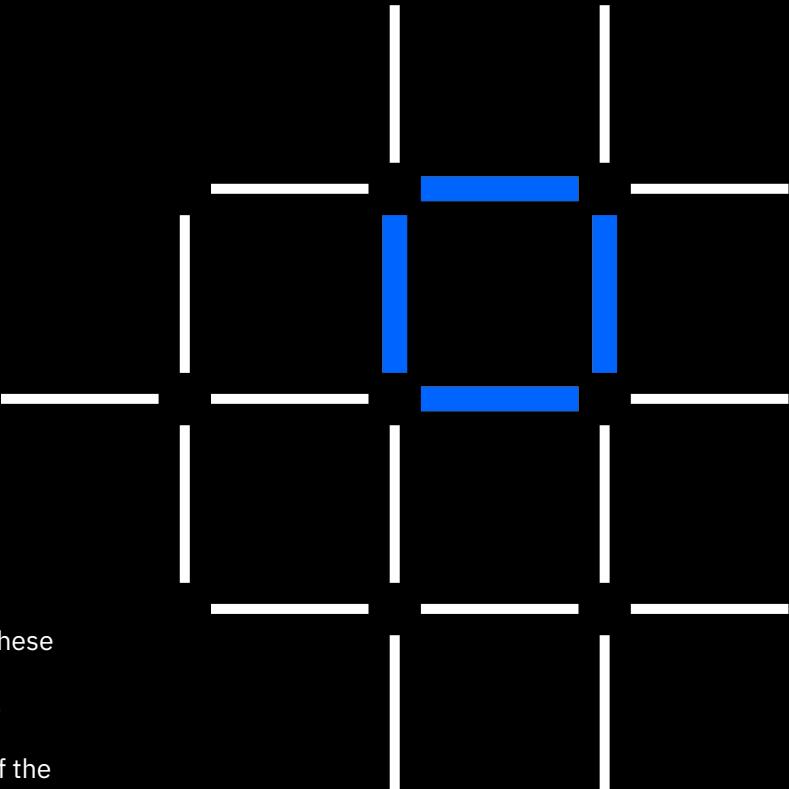
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IBM



Introducing IMMUNIchain

Designed by Suzie Wendler, Guy Shevik, Mark Rader and Mike Bonett from the IBM Washington Systems Center, won an internal Blockchain Hackathon

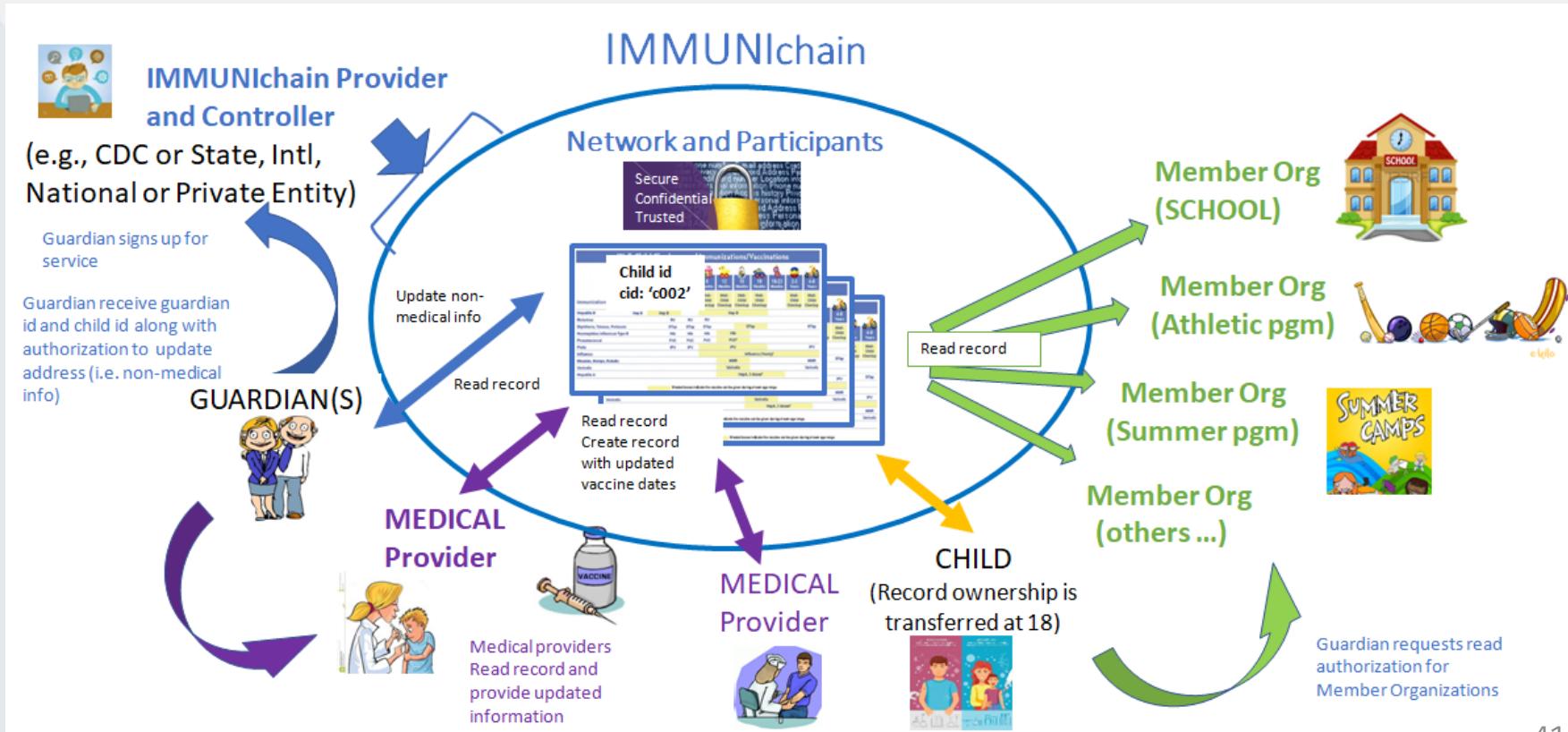
The challenge

- A child's immunization record is one that:
 - Is updated and maintained (annually) by only medical providers
 - Is kept by guardians who ensure that the child is immunized
 - Conforms to the requirements defined by the CDC/state/school district
 - Is requested/required by:
 - Schools on an annual basis
 - Summer camps, athletic programs, etc.
- Today, when requested, the record:
 - Must be current with the most recent updates
 - Is usually provided as a paper printout
 - Is mailed/delivered/faxed to different organizations throughout the year (could be multiple times)

The Solution - Streamlined, Fast, Secure



A blockchain allowing doctors/medical practitioners to provide updated records of the child's immunizations.
Guardians may authorize service providers (member) to view the record.



Participants, Roles, and Transactions



Controller

Role:

- Creates the record
- Assigns IDs
- Controls authorization



Guardian(s)

Role:

- Signs up for IMMUNIchain
- Updates non-medical info
- Views/tracks record
- Requests authorizations:
 - > (update) Medical providers
 - > (read) Member Organizations
- Requests transfer of record ownership to adult child

```
{ gid: 'g0001',
  name: 'Guardian Names' }
```

Transactions:

- addGuardian
- addMedProvider
- authorizeMedProvider
- addMember
- authorizeMember
- removeMemberAuth
- assignOwnershipToChild
- addNewImmToForm

Child

Role: (at age 18)

- Receives ownership and responsibilities formerly assigned to guardian



Medical Provider(s)

Role:

- Views existing record
- Updates information
-



Member Organizations

Role:

- View existing record

```
{ memorgid: 's0001',
  name: 'County Public Schools' }
```

```
{ memorgid: 's0002',
  name: 'Lakeway Camp' }
```

```
{ memorgid: 's0003',
  name: 'City Soccer Club' }
```

Transactions:

- reqMedID
- addImmunizations
- listImmunization

```
{ id: 'c0002',
  name: 'jane smith',
  guardian: 'g0001',
  address: '10 maple street',
  dob: '20060609',
  MedProviders: [ 'm0001' ],
  MemberOrgs: [],
  Immunizations: []
}
```

```
}
```

Lab Prereqs

- Day 2 Agenda
 - Blockchain Composed
 - Composer Lab using IMMUNICChain

- Download files related to the lab from:
 - <https://github.com/grice32/immunichain>
 - Get the Chrome browser

