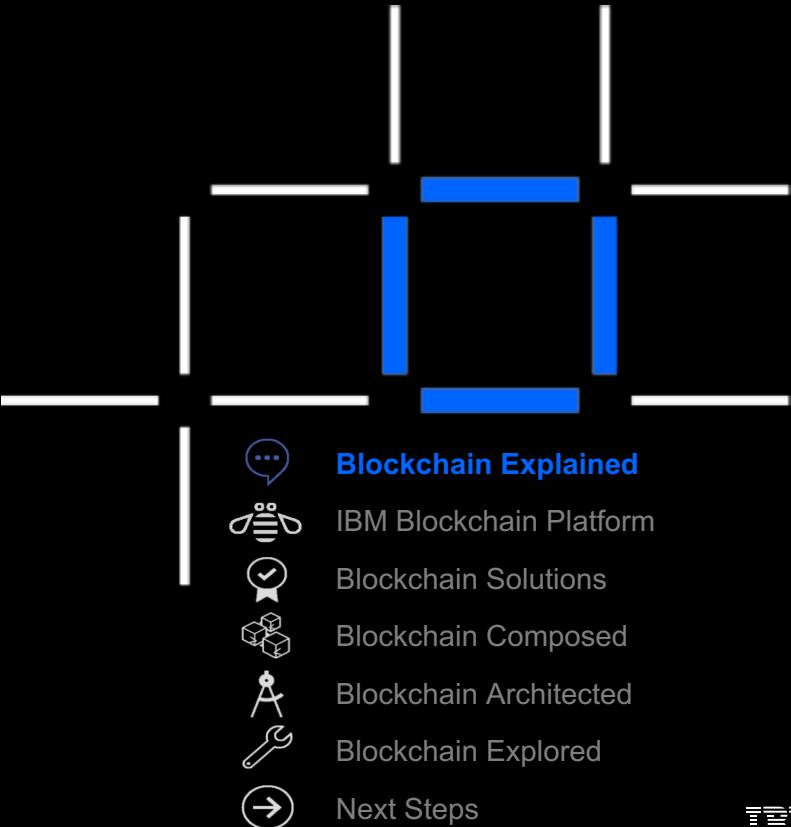


# Blockchain Explained

## An Introduction to Blockchain for Business





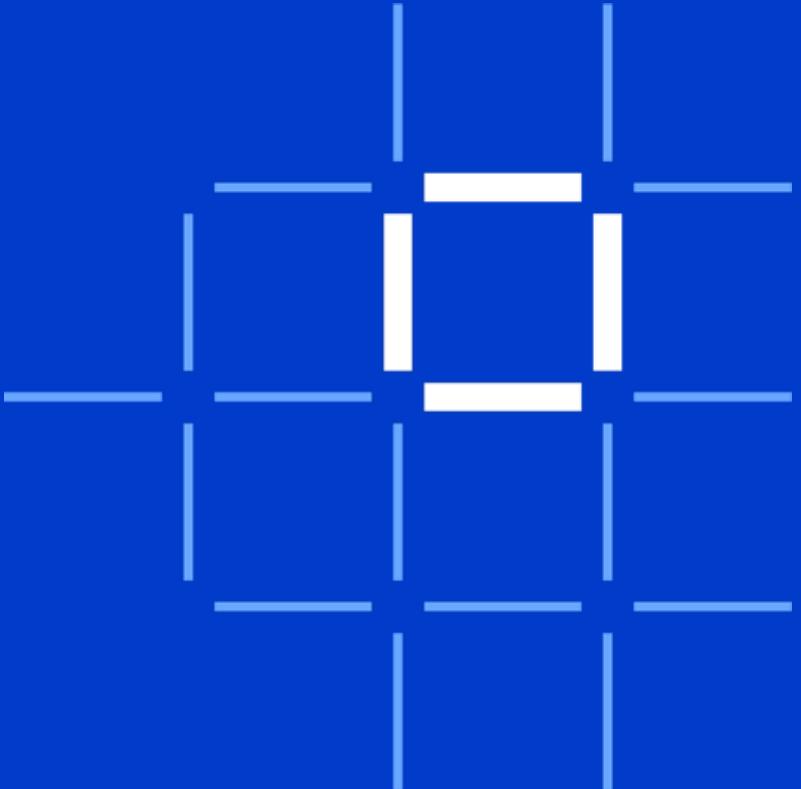
What is Blockchain?



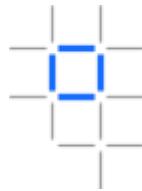
Why is it relevant for  
our business?



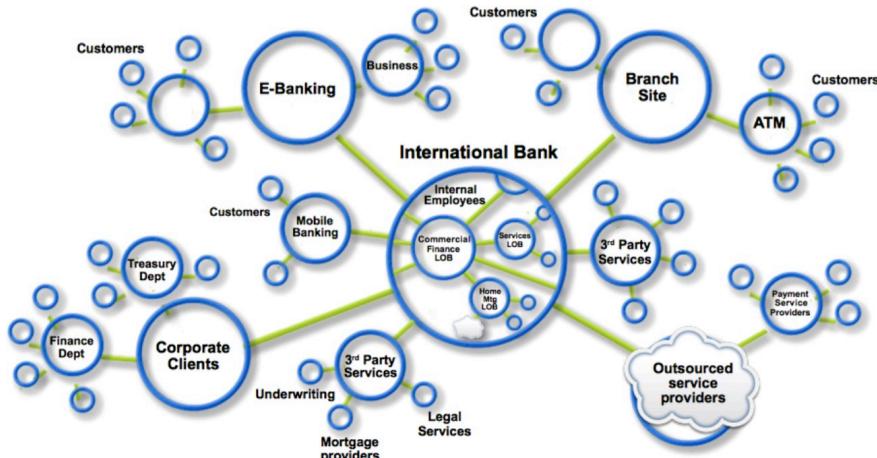
How can IBM help us  
apply blockchain?



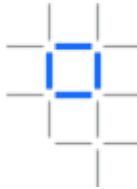
# Business networks, wealth and markets



- **Business Networks** benefit from connectivity
  - Participants are customers, suppliers, banks, partners
  - Cross geography and regulatory boundary
- **Wealth** is generated by the flow of goods and 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

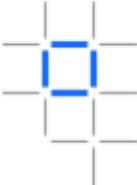
- Tangible, e.g. a house
- Intangible, e.g. a mortgage

## Intangible assets subdivide

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

## Cash is also an asset

- Has property of anonymity

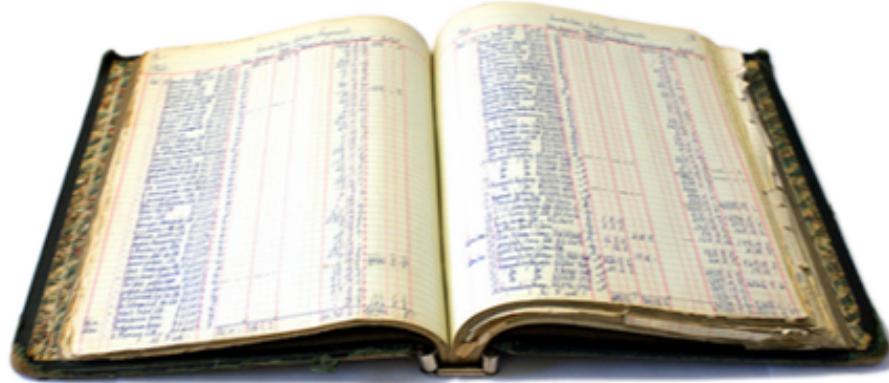


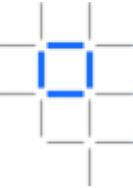
# Ledgers are key

**Ledgers** are THE system of record for a business.

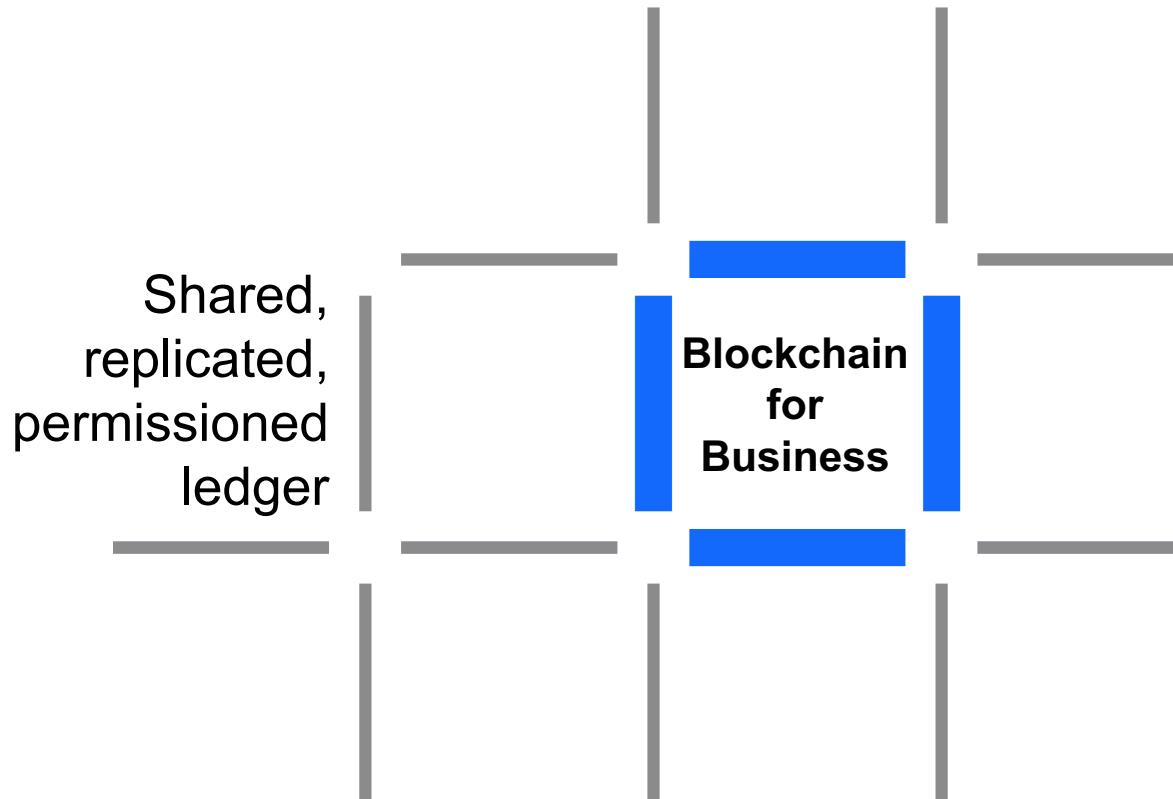
Businesses will have multiple ledgers for the multiple business networks in which they participate.

- **Transaction:** an asset transfer onto or off the ledger
  - John gives a car to Anthony (simple)
- **Contract:** the conditions for a 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)

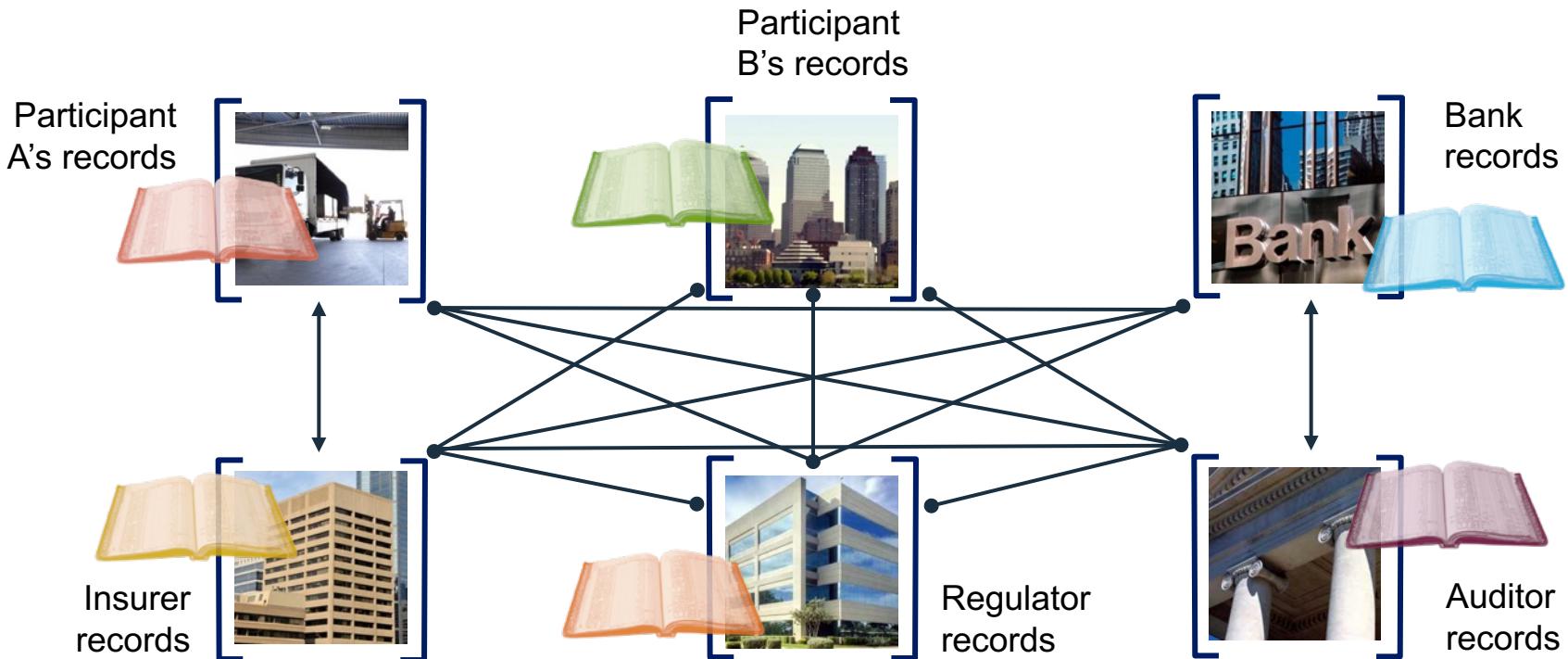
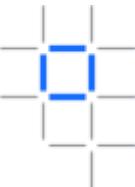




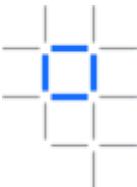
# Introducing Blockchain for Business...



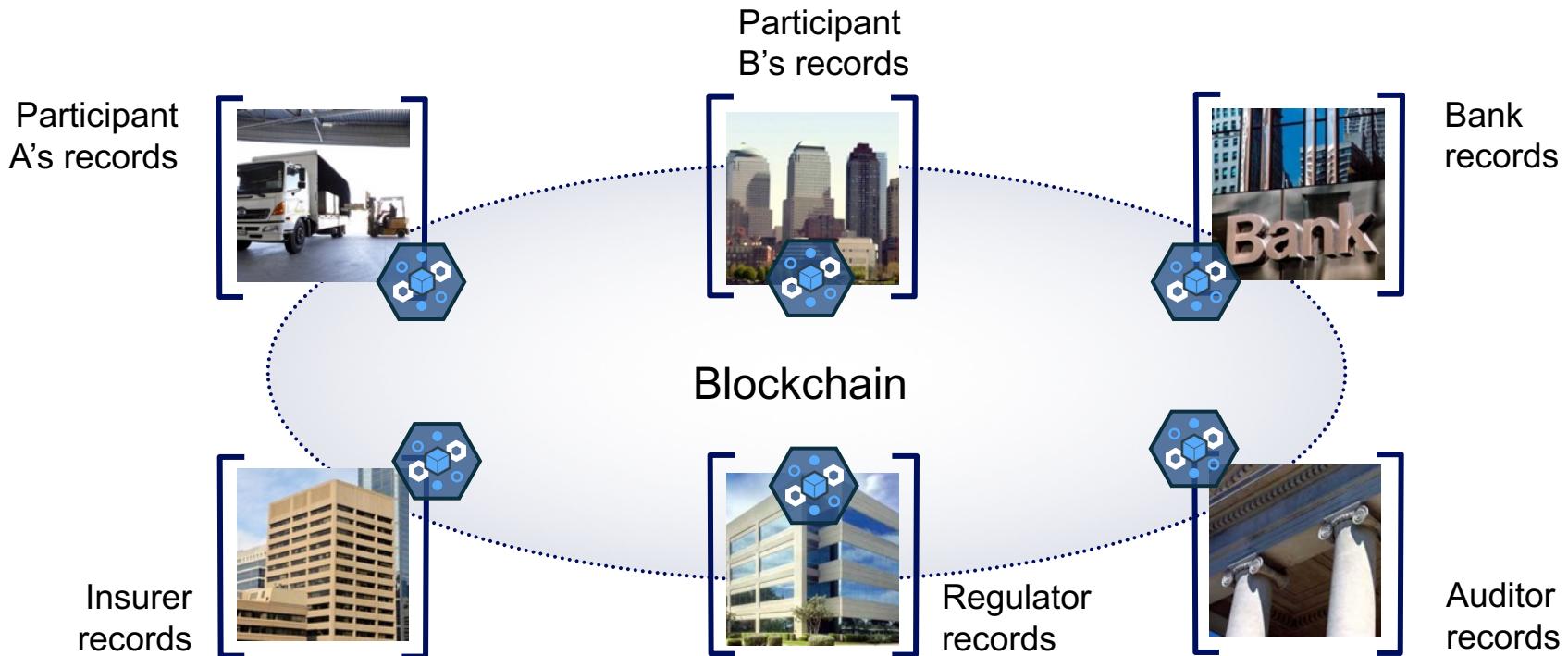
# Problem...



... inefficient, expensive, vulnerable

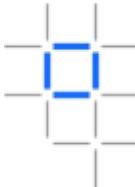


# A shared, replicated, permissioned ledger ...



... with consensus, provenance, immutability and finality

# Other types of blockchain exist

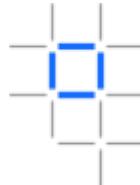


is an example of an unpermissioned, public ledger:

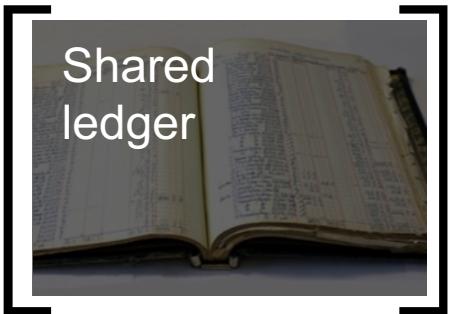
- The first blockchain application
  - Defines an unregulated shadow-currency
  - Resource intensive
- 
- **Blockchains for business** are generally permissioned and private, and prioritize:
    - Identity over anonymity
    - Selective endorsement over proof of work
    - Assets over cryptocurrency



# Blockchain for business requires trust



Append-only  
distributed system of  
record shared across  
business network



Shared  
ledger



Smart  
contract

Business  
terms  
executed with  
transactions

Transactions  
are secure with  
appropriate  
visibility



Privacy



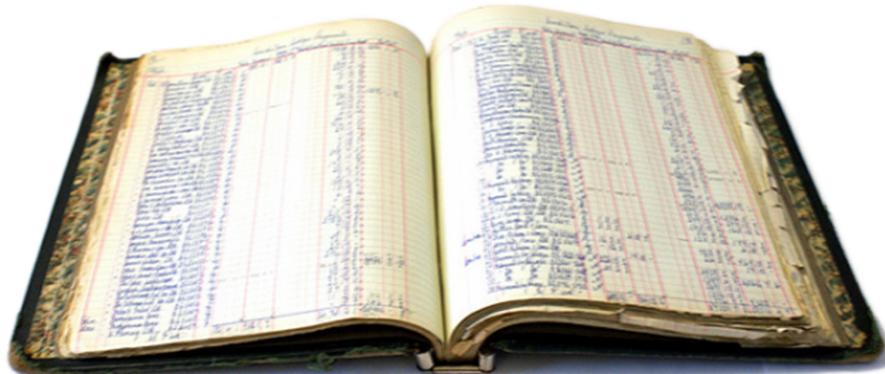
Proof

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

*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*



# Proof

- 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*





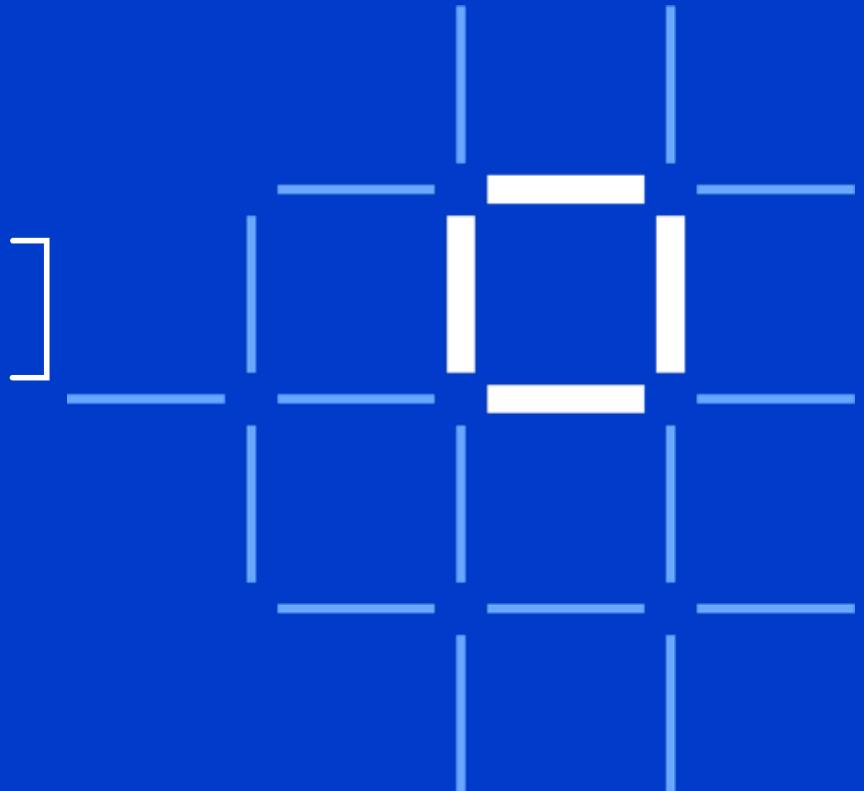
What is Blockchain?

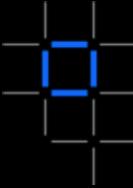


Why is it relevant for  
our business?



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

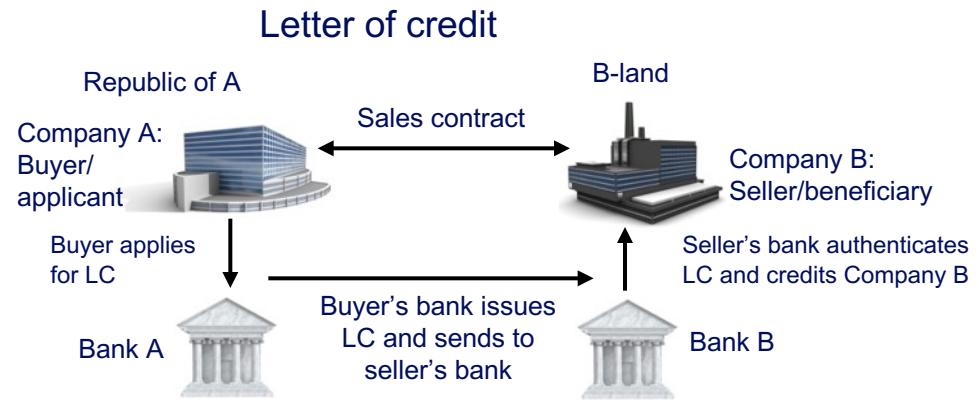


# Example: Supply chain



What	• Provenance of each component part in complex system hard to track • Manufacturer, production date, batch and even the manufacturing machine program	Benefits
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	<ol style="list-style-type: none"><li>1. Trust increased, no authority "owns" provenance</li><li>2. Improvement in system utilization</li><li>3. Recalls "specific" rather than cross fleet</li></ol>

# Example: Letter of credit



- What**
- Bank handling letters of credit (LOC) wants to offer them to a wider range of clients including startups
  - Currently constrained by costs & the time to execute

- How**
- Blockchain provides common ledger for letters of credit
  - Allows all counter-parties to have the same validated record of transaction and fulfillment

- Benefits**
1. Increase speed of execution (less than 1 day)
  2. Vastly reduced cost
  3. Reduced risk, e.g. currency fluctuations
  4. Value added services, e.g. incremental payment

# Blockchain Healthcare Use Cases

## Patient Consent and Health Data Access



- Personal record storage
- Outcome based payments
- Notarization and identity
- Consumer generated data and health IoT
- Health research commons
- Genomics data exchange

## Payment and Claims



- Validation and Payment of Claims
- Real-Time / Contextual Forms of Insurance
- Health Document Notary Services
- Medical Banking: Disintermediating counterparties

## Provenance and traceability



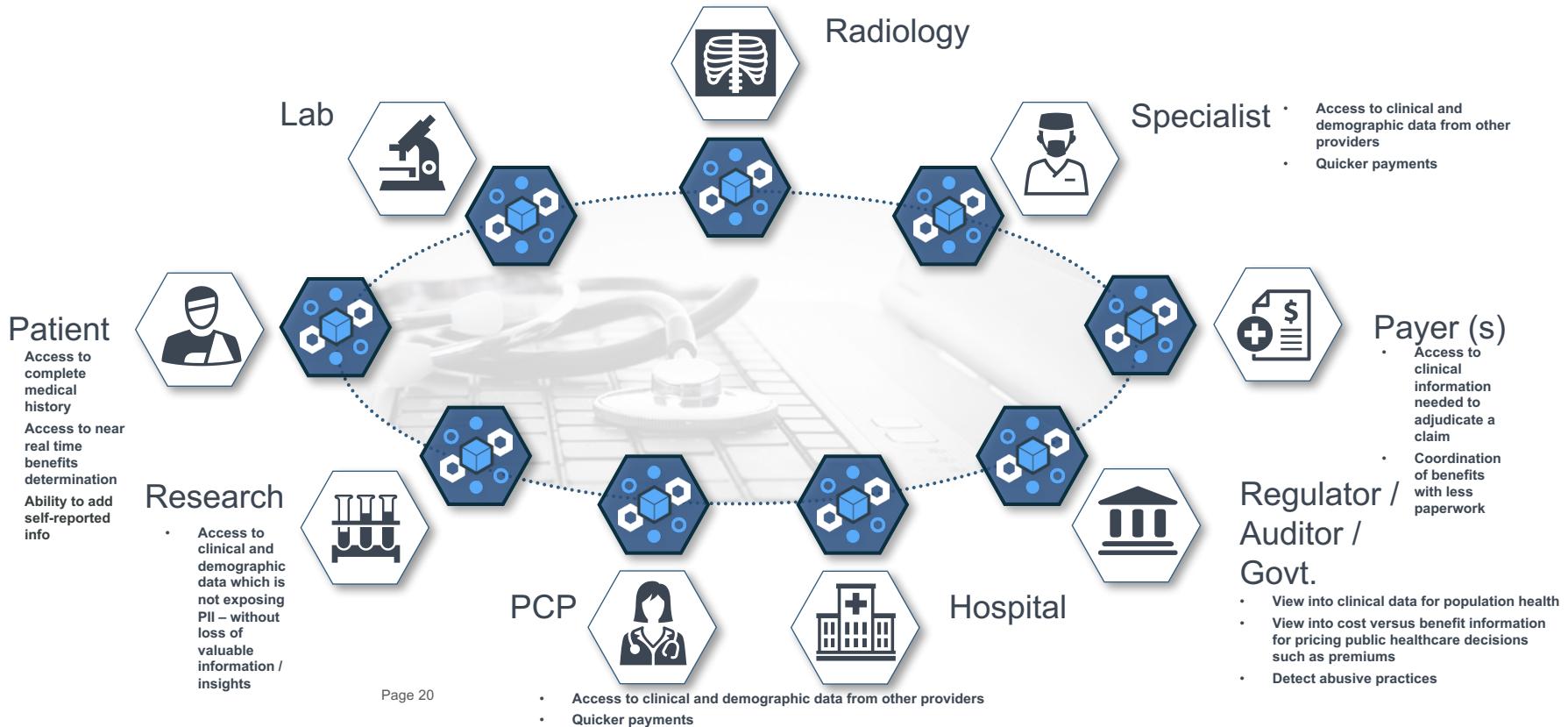
- Counterfeit Drug Prevention and Detection
- Smart Property for healthcare assets

## Clinical Trial Results / Other



- Improve accountability and transparency in the clinical trial
- Doctor-Vendor RFP Services
- Collaborative Crowdsourcing

# Healthcare and Blockchain



# Electronic Health Records (EHR)

Aka. Electronic Medical Record (EMR), which is a subset of EHR

- Produced by provider, pharmacies, labs, clinical trials and many more
  - Through smart contract between patient / provider / other parties
- Accessed by payer
  - Through smart contract between payer / patient / provider
- Regulated by the government (HIPAA in the US)
- Not collected in one place in many countries
  - e-Health Ontario changed this for 11 million people, with IBM's help
- Different from Personal Health Records
  - Kept by third parties like Microsoft HealthVault
  - Added by patient manually or electronically
- EHR is profitable
  - Medical research relies and pays significant amount of money for de-identified EHR



# Blockchain and EHR

**Streamline processing**  
*Direct visibility from all parties*



**Accessibility**  
*All EHRs in one place*



**Provenance**  
*All records can be traced back to origin*



**Control**  
*EHRs can not be accessed without patient's consent*



**Accountability**  
*Patients know who has access to their EHRs, and keep them accountable*



**Transparency**  
*EHRs are not for sale as a commodity. Regulators can detect abusive practices*

**Security**  
*Security in Blockchain is hardened from ground up*

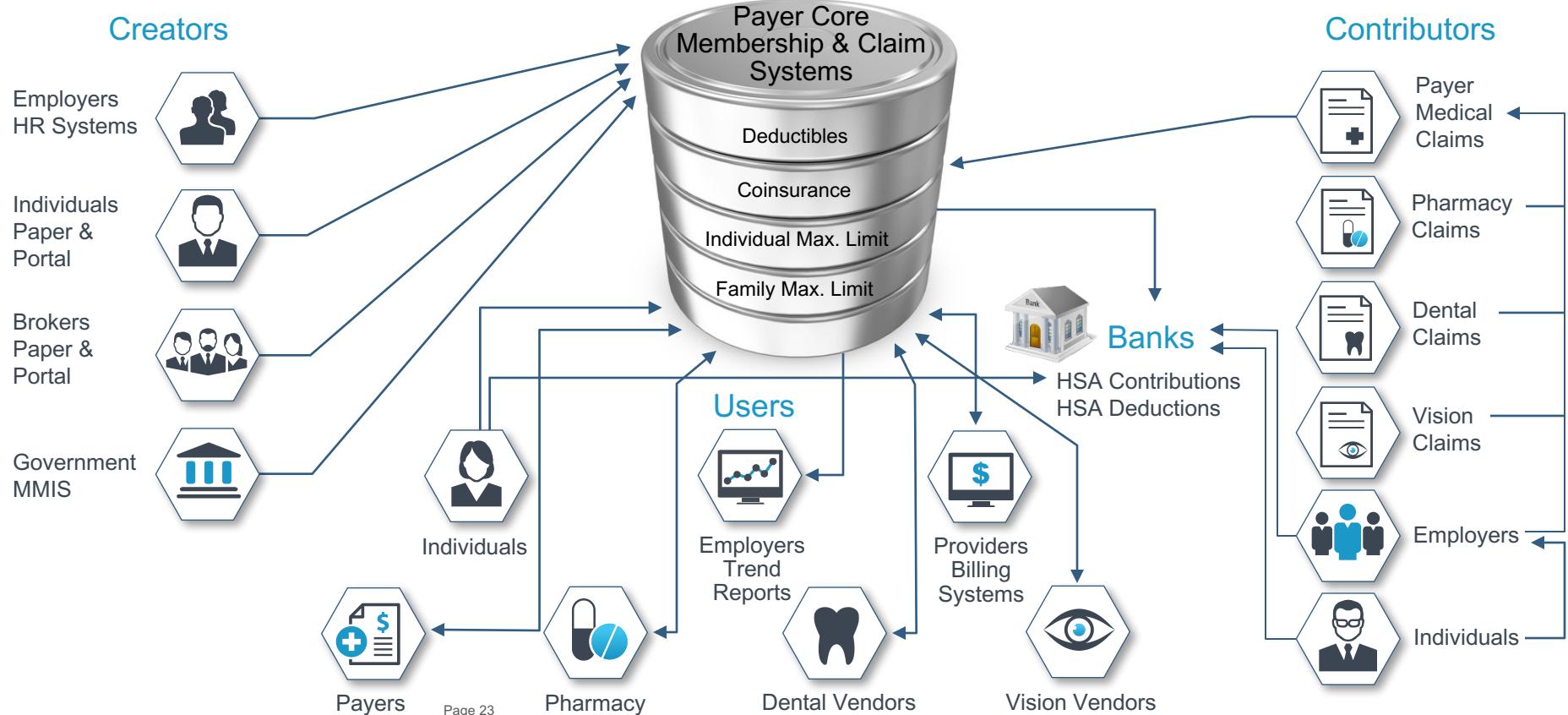


**Privacy**  
*Only authorized parties can see EHRs and only what they are supposed to see*

# Benefit Accumulator



## Member record ecosystem – current state



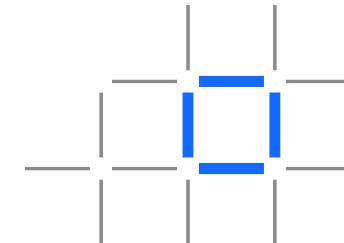
# Blockchain Benefit Accumulator

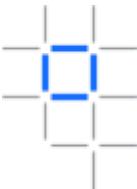


# Additional use cases and POV

- Prior Authorization for Medical Tourism - gaining traction in Singapore
- Supply Chain Management for Pharmaceutical Companies – especially pertaining to track and trace for controlled substances
- Patient Medical Data Exchange – utilize blockchain to enable and simplify patient consent of their medical data
- Clinical Trial Management-using Blockchain to streamline and improve the reporting of clinical trials reporting
- Blockchain: The Chain of Trust and its Potential to Transform Healthcare – Our Point of View

[https://www.healthit.gov/sites/default/files/8-31-blockchain-ibm\\_ideation-challenge\\_aug8.pdf](https://www.healthit.gov/sites/default/files/8-31-blockchain-ibm_ideation-challenge_aug8.pdf)

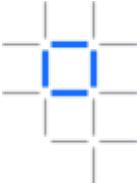




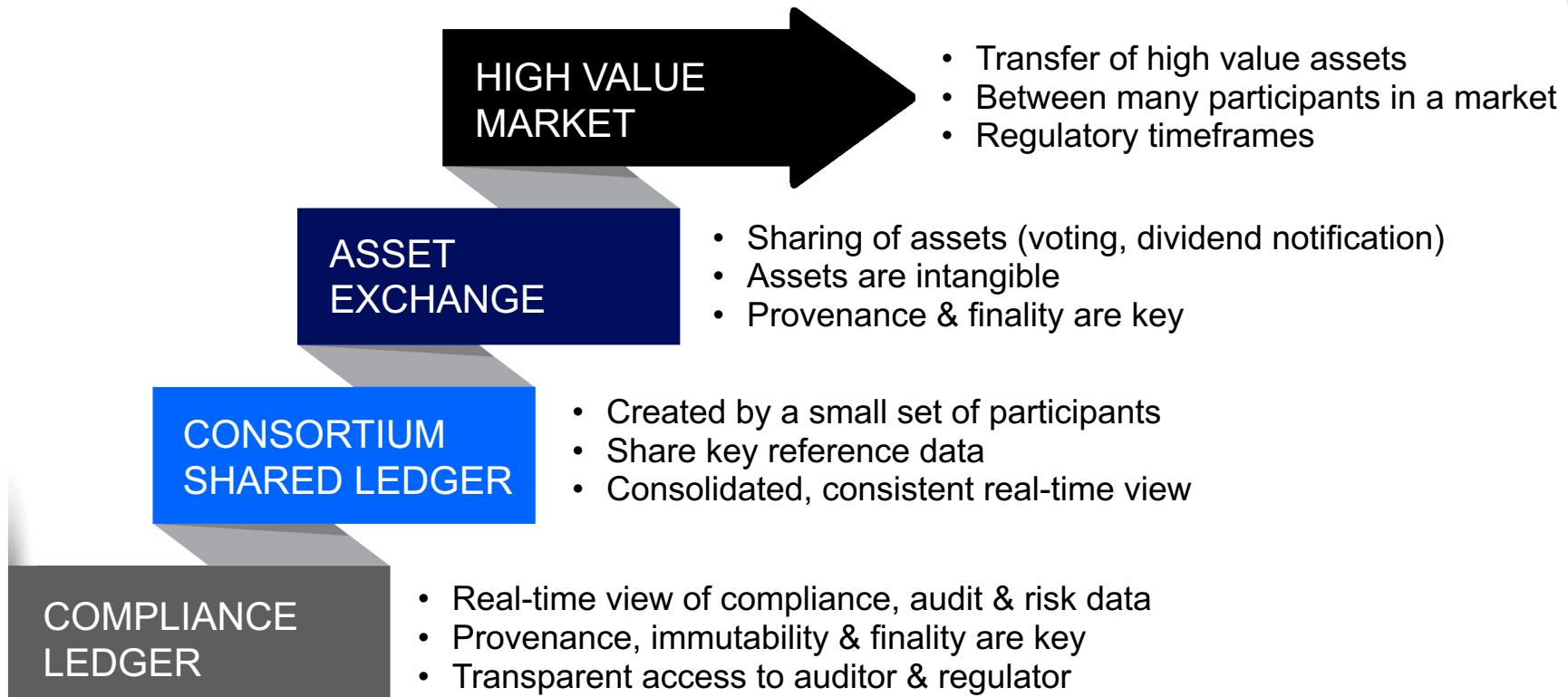
# Further examples by (selected) industry



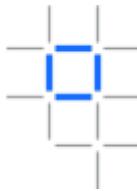
Financial	Public Sector	Retail	Insurance	Manufacturing
<ul style="list-style-type: none"><li>• Trade Finance</li><li>• Cross currency payments</li><li>• Mortgages</li></ul>	<ul style="list-style-type: none"><li>• Asset Registration</li><li>• Citizen Identity</li><li>• Medical records</li><li>• Medicine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



# Patterns for customer adoption



# Key players for blockchain adoption



## 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



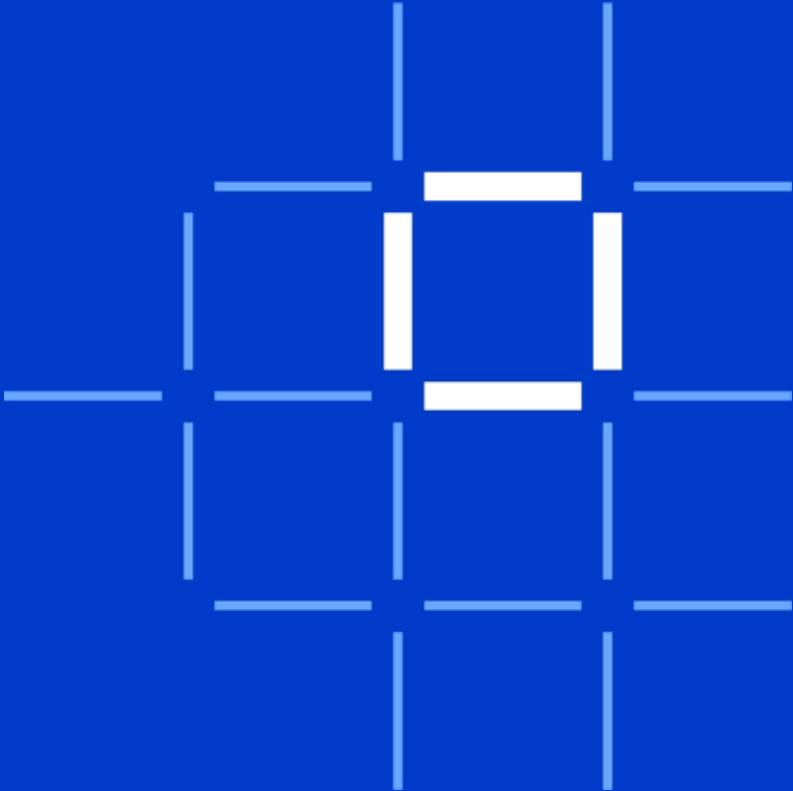
What is Blockchain?



Why is it relevant for  
our business?



How can IBM help us  
apply blockchain?



IBM Blockchain brings 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

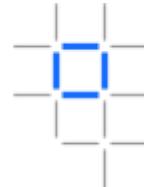
## HYPERLEDGER

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

## Platform

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

# Hyperledger: A Linux Foundation project

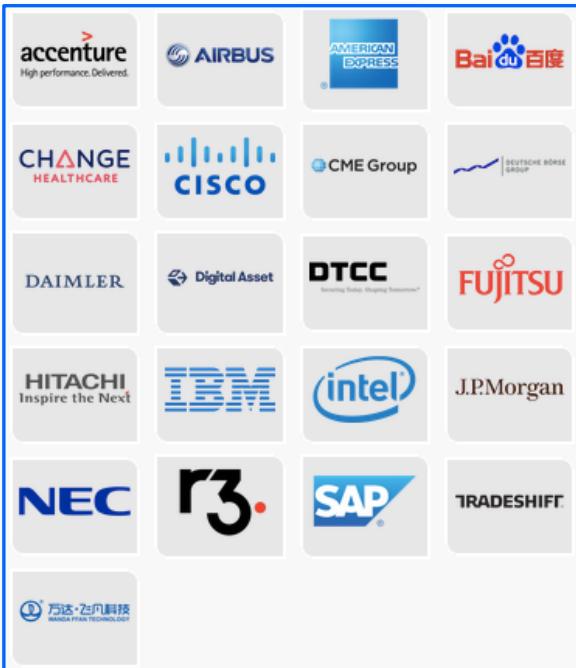


- A collaborative effort created to advance cross-industry blockchain technologies for business
- Announced December 2015, now over 180 members
- Open source, open standards, open governance
- Five frameworks and four tools projects
- IBM is a premier member of Hyperledger



# Hyperledger Members

## Premier



Source: <https://www.hyperledger.org/members>  
Updated 30 November 2017

## General



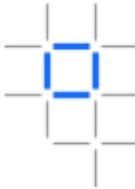
## General



## Associate



# Hyperledger Fabric: Distributed ledger platform

A screenshot of a web browser displaying the Hyperledger Fabric 1.0 announcement page. The header includes the Linux Foundation Projects logo and the Hyperledger logo. The main content features a large image of the Earth with a network overlay. Text on the left highlights milestones: "HYPERLEDGER FABRIC 1.0", "27 ORGANIZATIONS", "159 DEVELOPERS", and "3,500 CHANGE SETS". To the right, a bulleted list details features: "Channels for sharing confidential information", "Ordering Service delivers transactions consistently to peers in the network", "Endorsement policies for transactions", "CouchDB world state supports wide range of queries", and "Bring-your-own Membership Service Provider (MSP)". A call-to-action button at the bottom right says "Read the Announcement".

A significant milestone for the open source business blockchain community. Hyperledger

Read the Announcement

Browse the FAQ

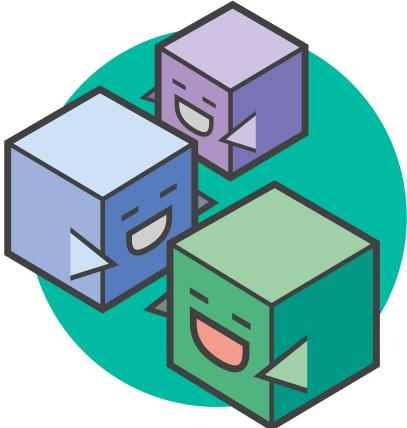
- An implementation of blockchain technology that is a foundation for developing blockchain applications
- Emphasis on ledger, smart contracts, consensus, confidentiality, resiliency and scalability.
- V1.0 released July 2017
  - 159 developers from 27 organizations
  - IBM is one contributor of code,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

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

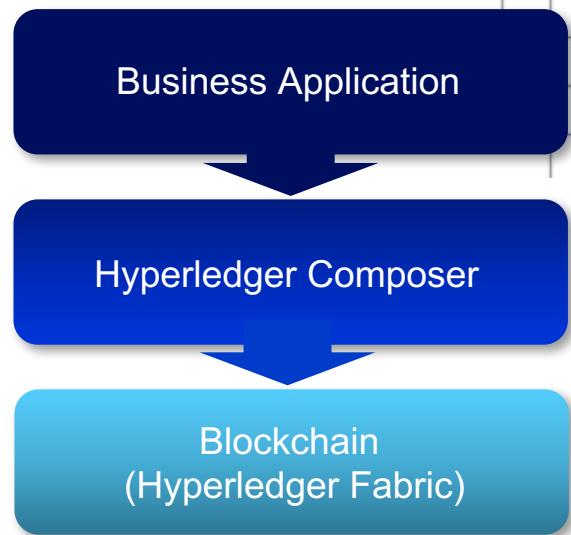
# Hyperledger Composer: Accelerating Time to Value

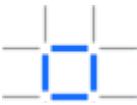
<https://hyperledger.github.io/composer>

- 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 IBM Blockchain Platform

**IBM Blockchain Platform is a fully integrated enterprise-ready blockchain platform designed to accelerate the development, governance, and operation of a multi-institution business network**

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

## Develop

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

## Govern

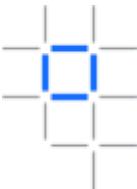
Speed activation, customization and management of your business network with democratic, multi-party governance tooling

## Operate

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

[http://ibm.biz/Platform\\_Demo](http://ibm.biz/Platform_Demo)

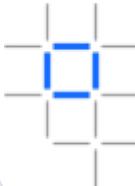




# Making blockchain real for business with over 400 engagements and multiple active networks

Trade Finance	Pre and Post Trade	Complex Risk Coverage
Digital Trade Chain   	  	  
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 Blockchain		

# IBM Engagement Model overview



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



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



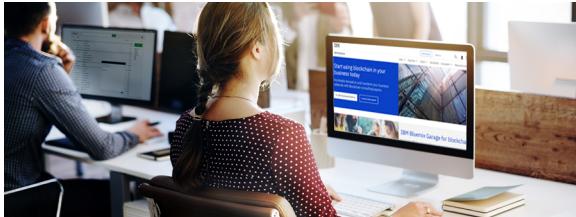
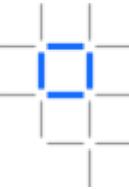
1. Design Thinking workshop to define business challenge
2. Agile iterations incrementally build project functionality
3. Enterprise integration



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



# Getting started on your blockchain journey



[Learn More About  
IBM Blockchain](#)



[Schedule an IBM  
Blockchain Workshop](#)

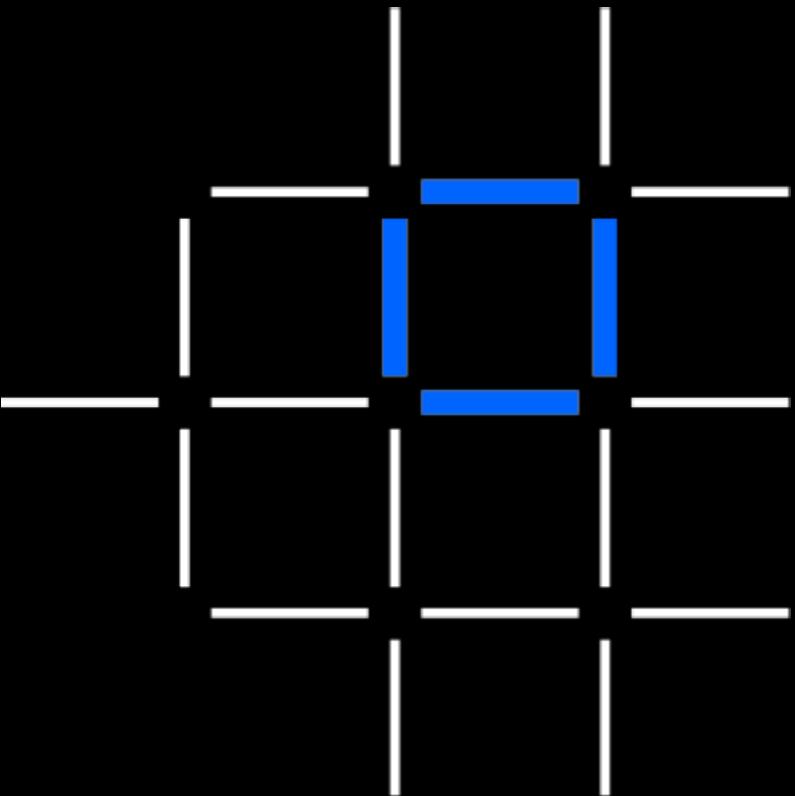


[Develop a Blockchain  
Application](#)



[Activate and Grow your  
Blockchain Network](#)

# Thank you



Questions? Tweet us or  
go to [ibm.com/blockchain](http://ibm.com/blockchain)

 @IBMBlockchain

 IBM Blockchain

 IBM Blockchain



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