

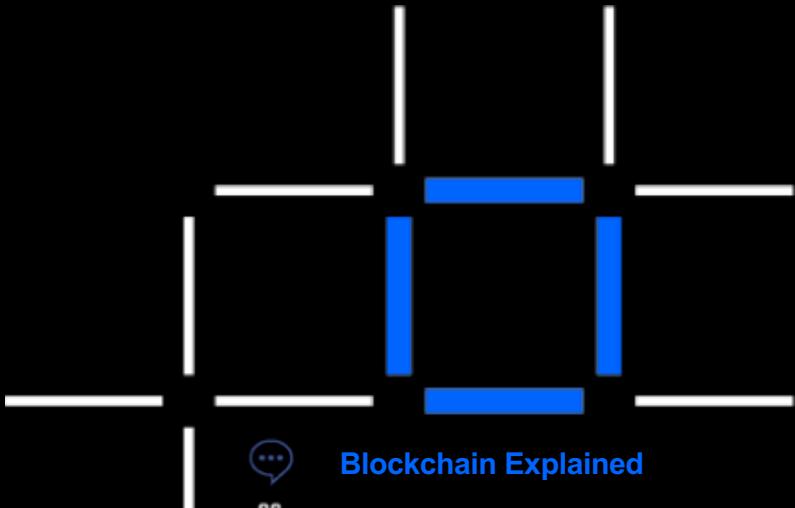
# Blockchain Explained

## An Introduction to Blockchain for Business

Dave Wakeman

Blockchain Technical Leader

IBM Cloud - US Public Markets



**Blockchain Explained**



IBM Blockchain Platform



Blockchain Solutions



Blockchain Composed



Blockchain Architected



Blockchain Explored



Next Steps





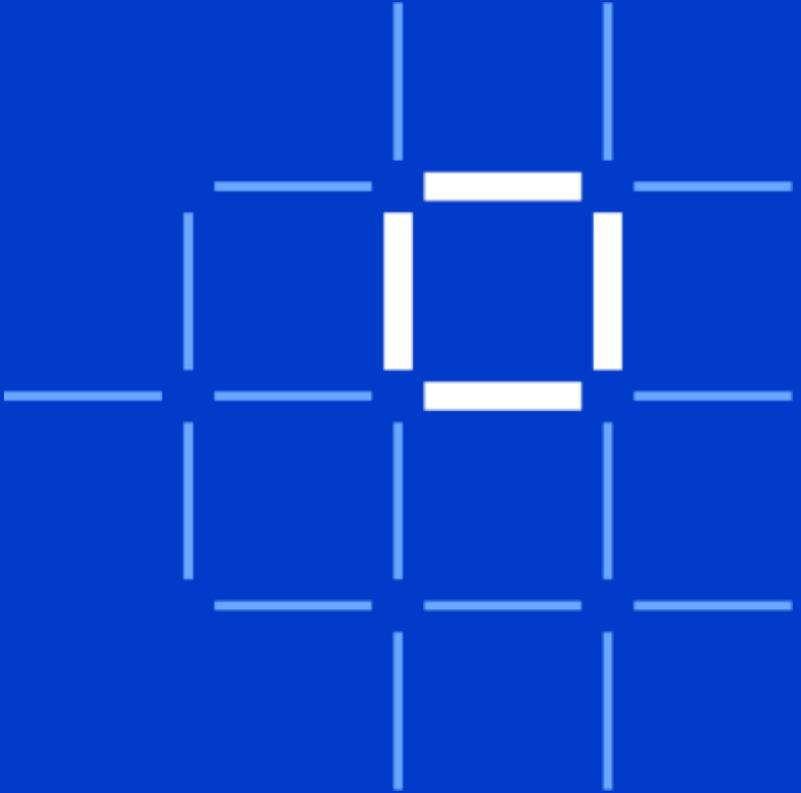
What is Blockchain?



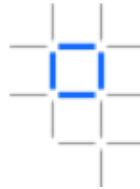
Why is it relevant for  
our business?



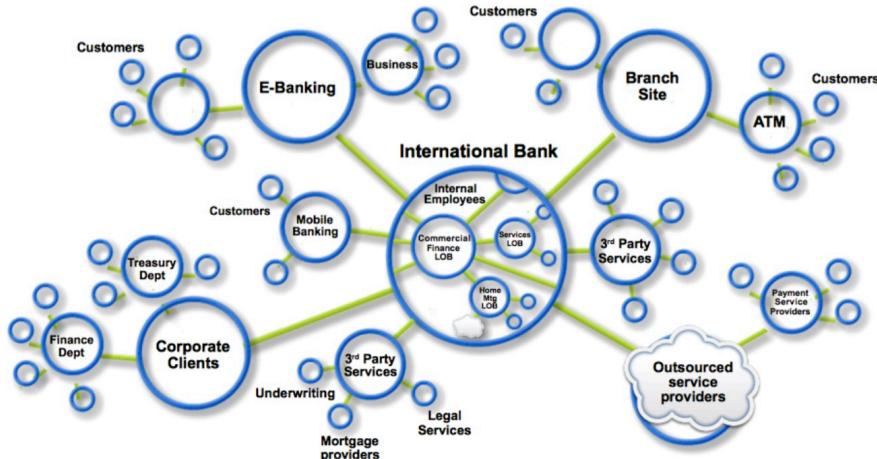
How can IBM help us  
apply blockchain?

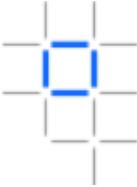


# Business networks, wealth and markets



- **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

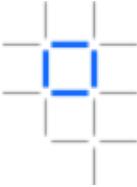
- Tangible, e.g. a house
- Intangible, e.g. a mortgage

## Intangible assets subdivide

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

## Cash is also an asset

- Has property of anonymity

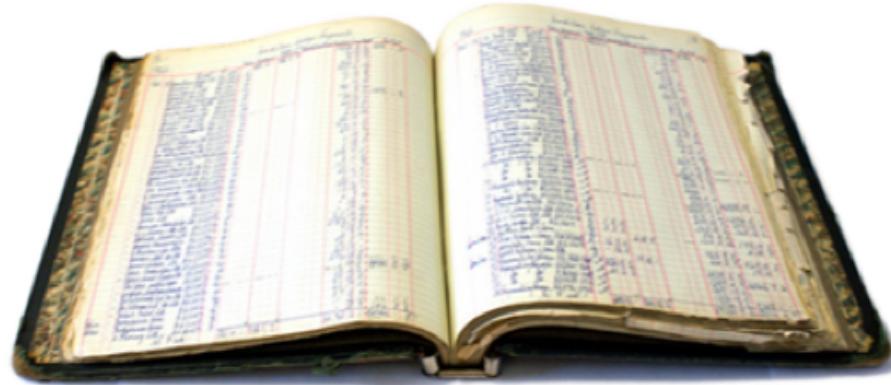


# Ledgers are key

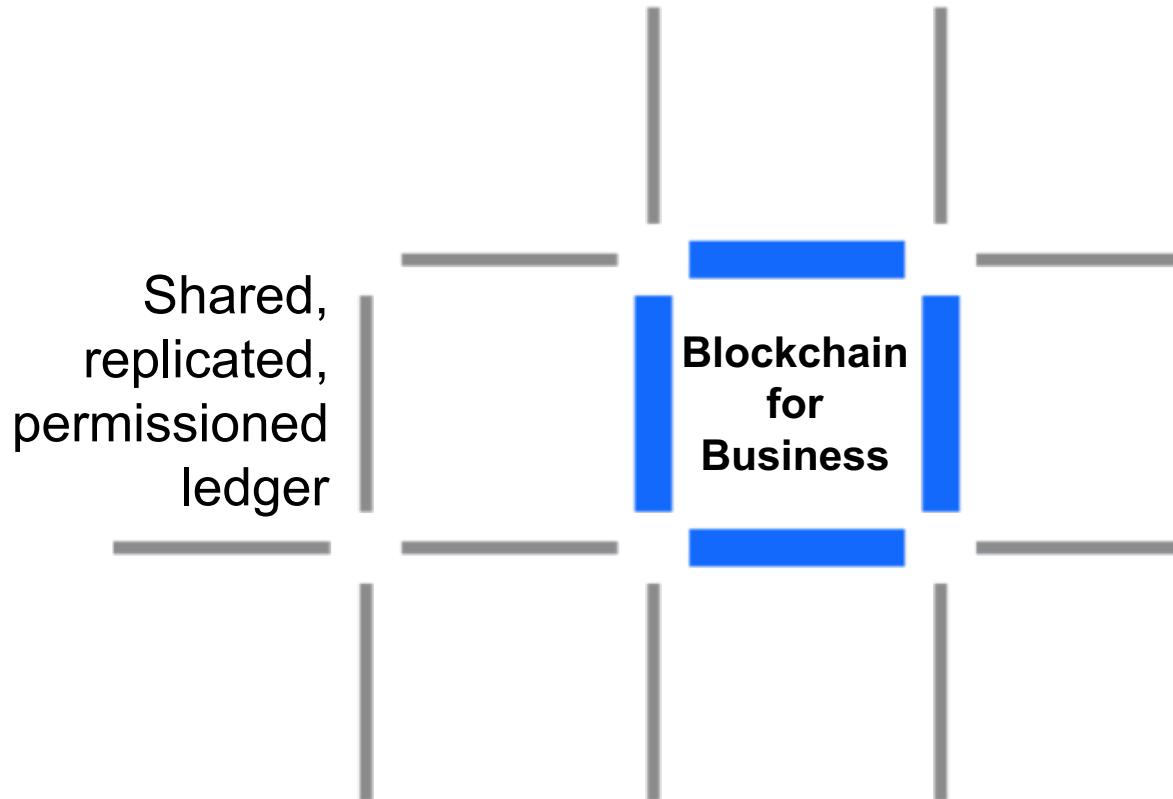
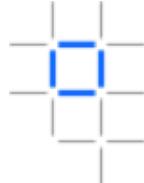
**Ledgers** are THE system of record for a business.

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

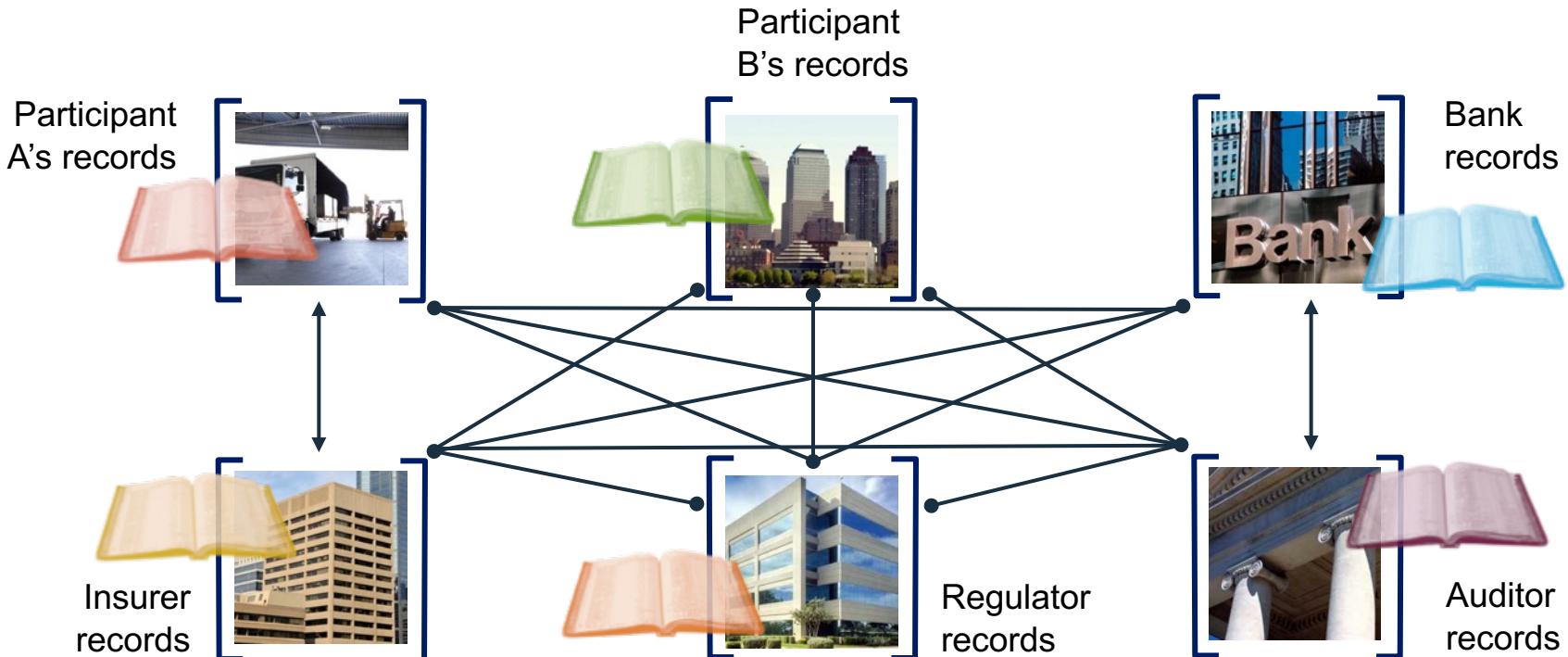
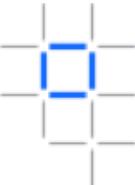
- **Transaction:** an asset transfer onto or off the ledger
  - John gives a car to Anthony (simple)
- **Contract:** the conditions for a transaction to occur
  - If Anthony pays John money, then car passes from John to Anthony (simple)
  - If car won't start, funds do not pass to John (as decided by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



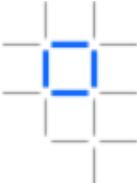
# Introducing Blockchain for Business...



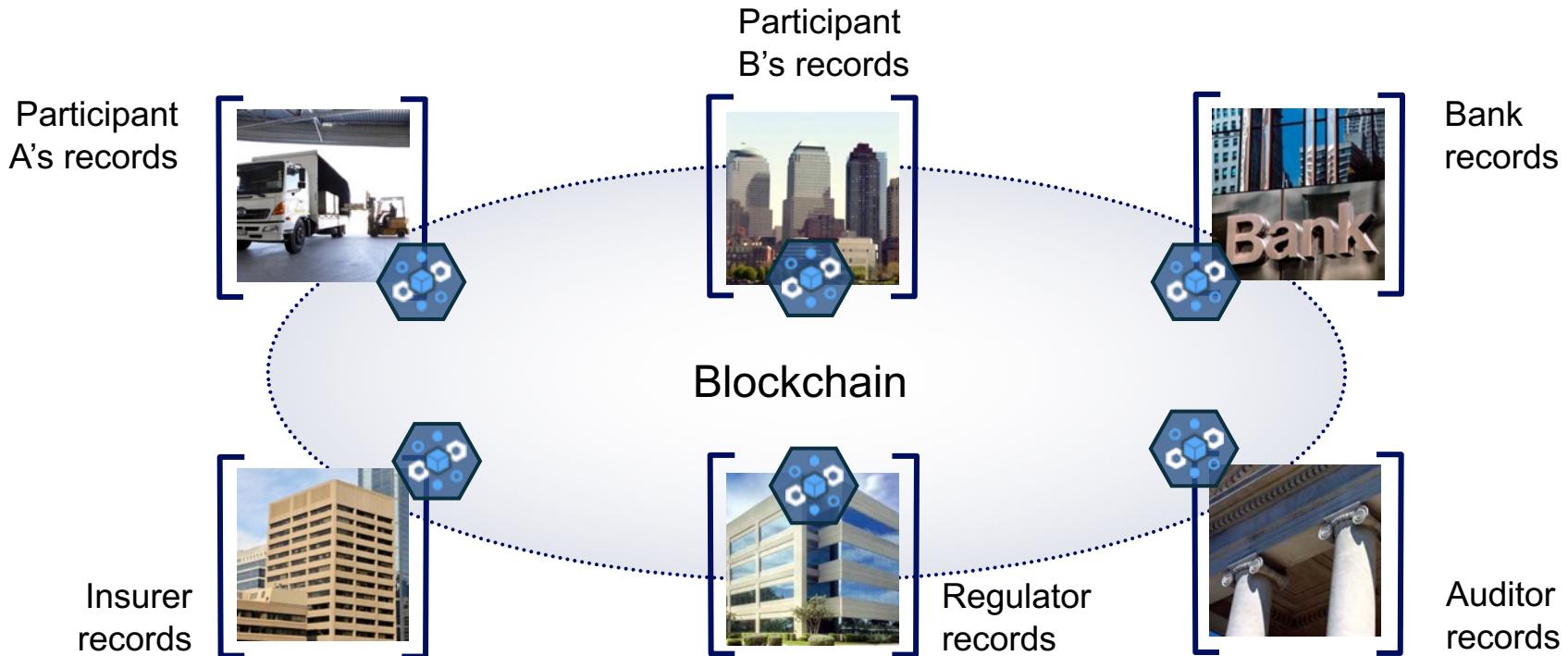
# Problem...



... inefficient, expensive, vulnerable

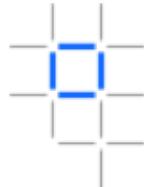


# A shared, replicated, permissioned ledger ...



... with consensus, provenance, immutability and finality

# Other types of blockchain exist

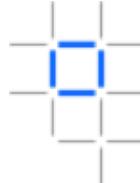


is an example of an unpermissioned, public ledger:

- 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



# Smart contract



Business  
terms  
executed with  
transactions

Transactions  
are secure with  
appropriate  
visibility



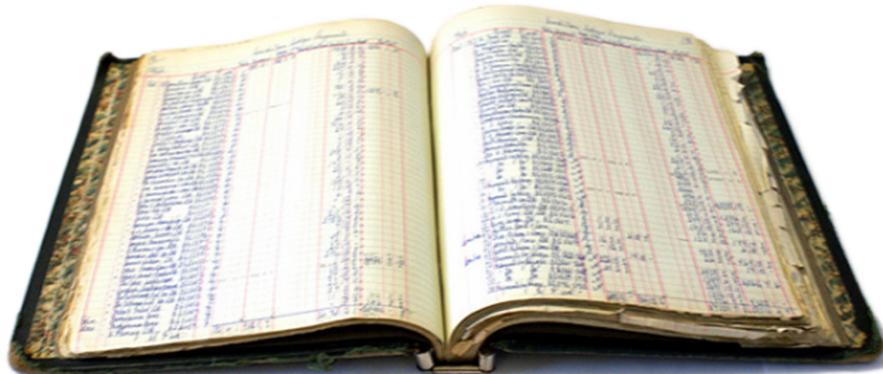
# Proof

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 **privacy** and **confidentiality** between subsets of participants
  - Identity not linked to a transaction
- Transactions need to be authenticated
- Cryptography is central to these processes

*The ledger is shared, but participants require privacy and confidentiality*



# 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*





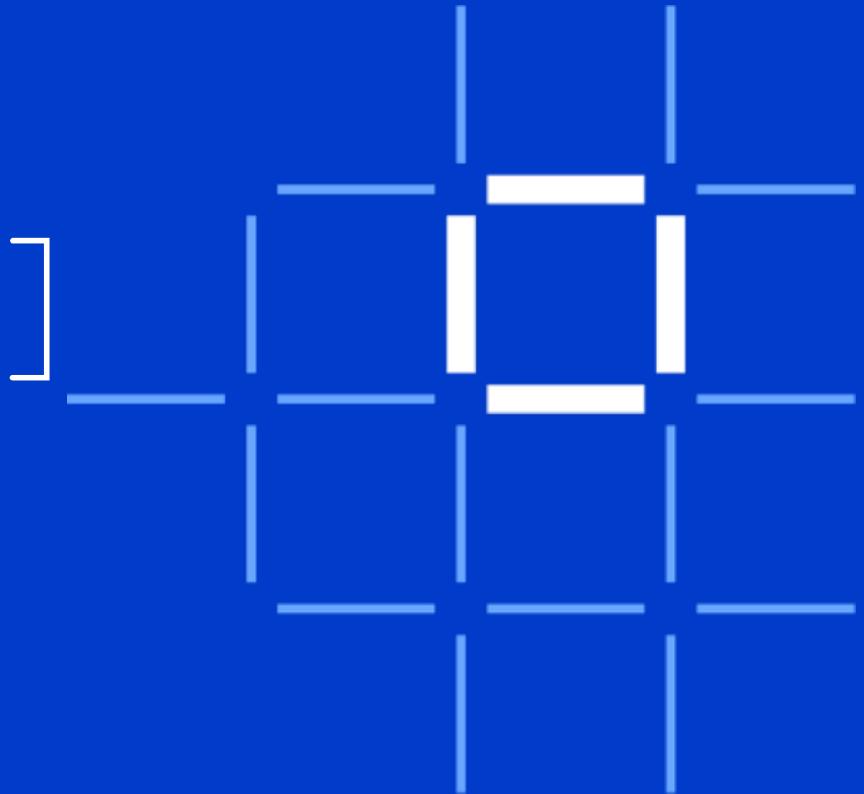
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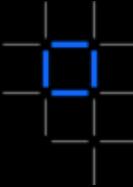


Why is it relevant for  
our business?



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: Shared reference data



What

- Competitors/collaborators in a business network need to share reference data, e.g. bank routing 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 routing code transfers between participants

# 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

- 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



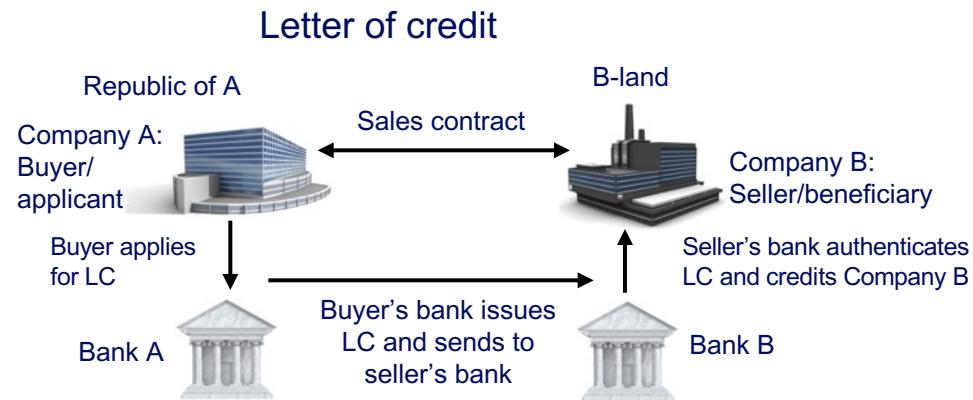
- What
- Financial data in a large organization dispersed throughout many divisions and geographies
  - Audit and Compliance needs indelible record of all key transactions over reporting period

- 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

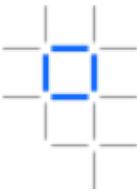
# Example: Letter of credit



- 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

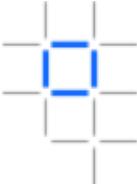
- Benefits
1. Increase speed of execution (less than 1 day)
  2. Vastly reduced cost
  3. Reduced risk, e.g. currency fluctuations
  4. Value added services, e.g. incremental payment



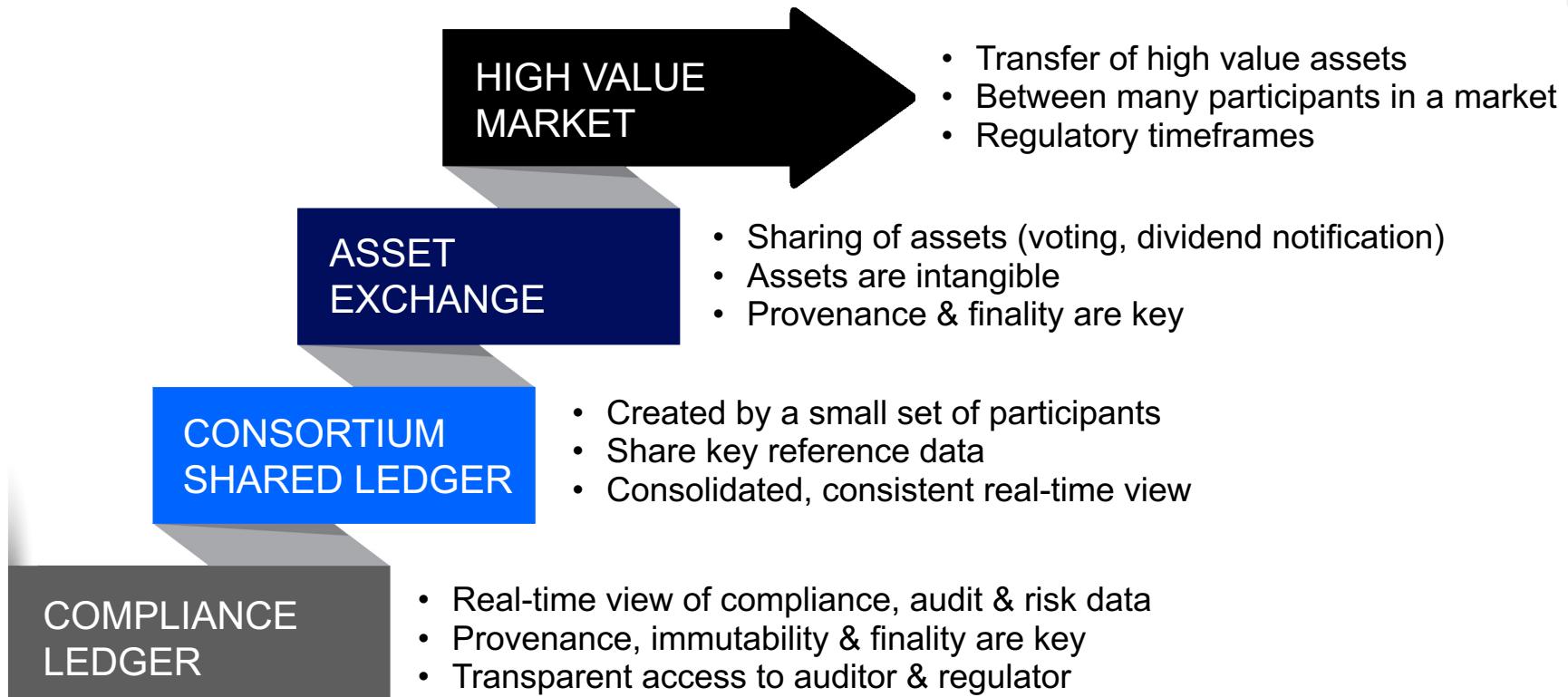
# Further examples by (selected) industry



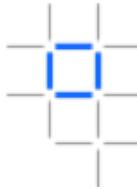
Financial	Public Sector	Retail	Insurance	Manufacturing
<ul style="list-style-type: none"><li>• Trade Finance</li><li>• Cross currency payments</li><li>• Mortgages</li></ul>	<ul style="list-style-type: none"><li>• Asset Registration</li><li>• Citizen Identity</li><li>• Medical records</li><li>• Medicine 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

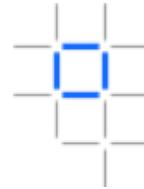
### HYPERLEDGER

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
- Founded February 2016; now more than 185 member organizations
- 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: 26 January 2018

## General

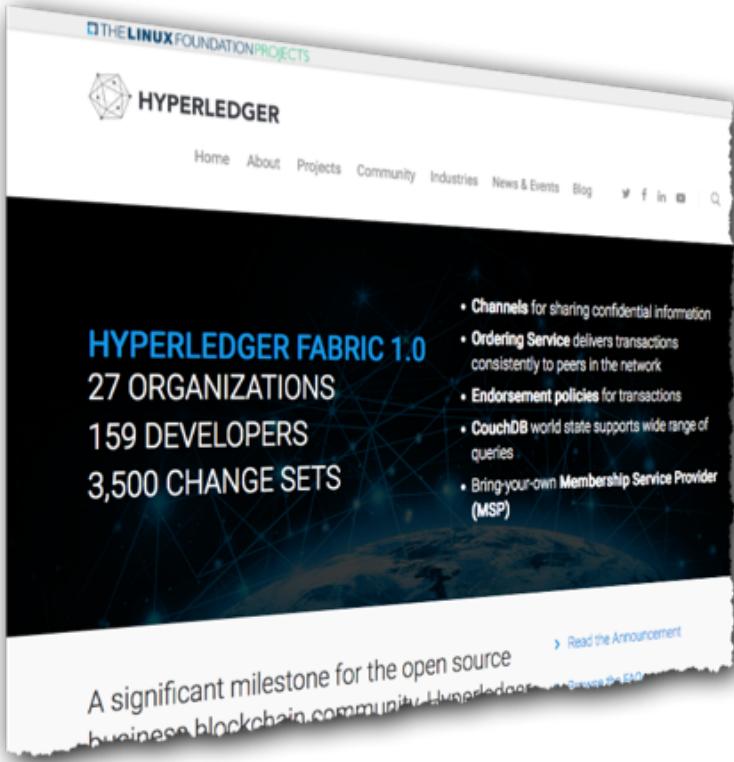
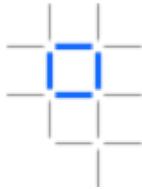


## Associate

## General



# Hyperledger Fabric: Distributed ledger platform



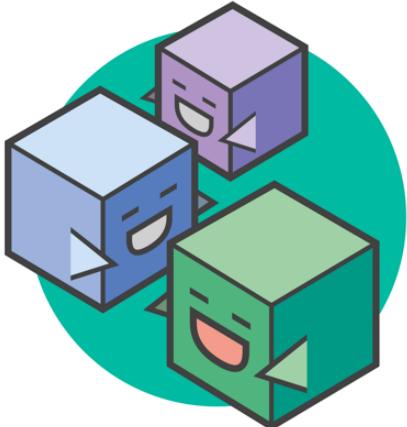
- An implementation of blockchain technology that is a foundation for developing blockchain applications
- Emphasis on ledger, smart contracts, consensus, confidentiality, resiliency and scalability.
- V1.0 released July 2017
  - 159 developers from 27 organizations
  - IBM is one contributor of code,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

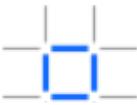


- Features
  - Model your business networks, test and expose via APIs
  - Applications invoke transactions to interact with business network
  - Integrate existing systems of record
- Fully open and part of Linux Foundation Hyperledger
- Try it in your web browser now:  
<http://composer-playground.mybluemix.net/>

Business Application

Hyperledger Composer

Blockchain  
(Hyperledger Fabric)



# 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

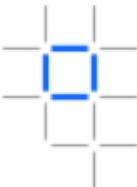
Speed activation, customization and management of your business network with democratic, multi-party governance tooling

## 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)

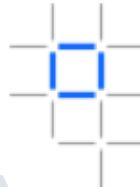




# Making blockchain real for business with over 400 engagements and multiple active networks

Trade Finance	Pre and Post Trade	Complex Risk Coverage
<b>Digital Trade Chain</b>   	<b>DTCC</b>  <b>CLS FundamentalFX</b> 	<b>AIG</b> 
Identity/ Know your customer (KYC)	Unlisted Securities/ Private Equity Funds	Loyalty Program
<b>SECURE KEY</b>  	<b>NORTHERN TRUST</b>  <b>SBI証券</b> 	
Medicated Health Data Exchange	Fraud/ Compliance Registry	Distributed Energy/ Carbon Credit
		<b>Tennet</b> 
Supply Chain	Food Trust	Provenance/ Traceability
<b>MAERSK</b>  The World's Port of Call	<b>Walmart</b>  <b>Dole</b>  <b>Nestle</b>  <b>golden state foods</b> 	<b>everledger</b> 

# 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



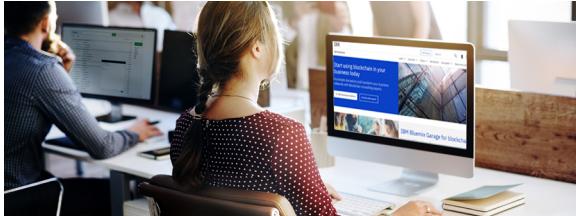
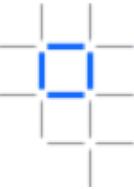
1. Design Thinking workshop to define business challenge
2. Agile iterations incrementally build project functionality
3. Enterprise integration



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

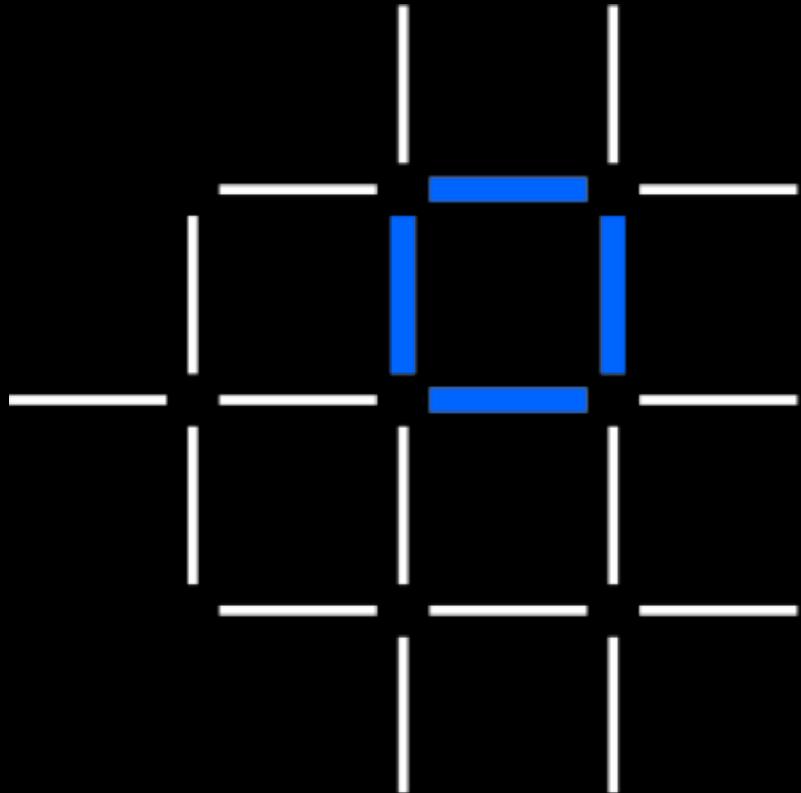
*Dave Wakeman  
Blockchain Technical Leader  
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*Questions? Tweet us or  
go to [ibm.com/blockchain](http://ibm.com/blockchain)*

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