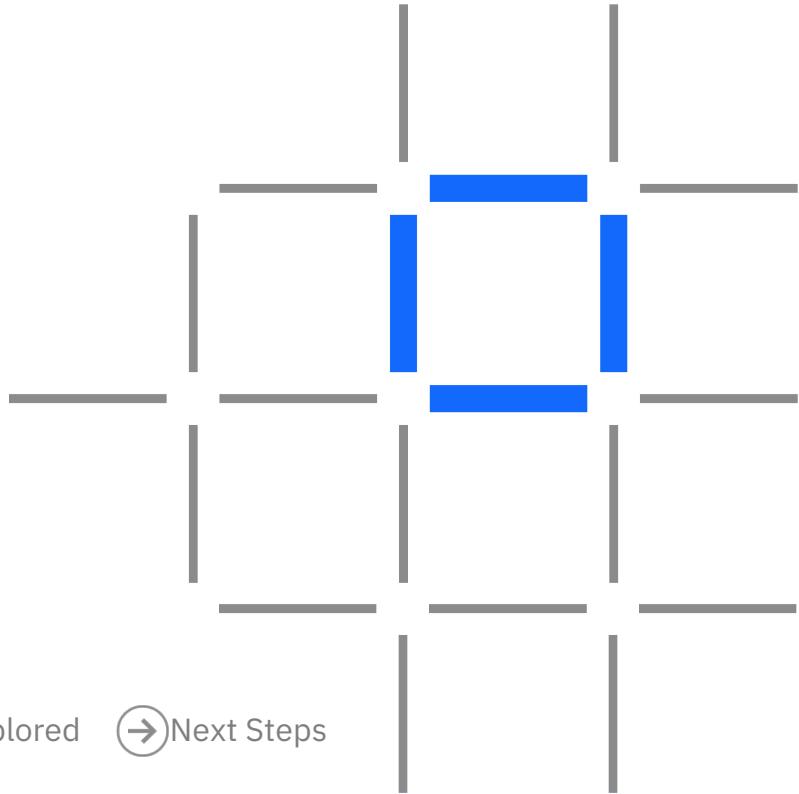


# Blockchain Explained

*An Introduction to Blockchain for Business*

IBM Blockchain



Blockchain education series





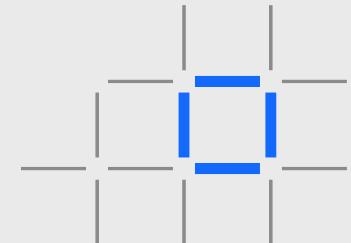
What is Blockchain?



Why is it relevant for  
our business?

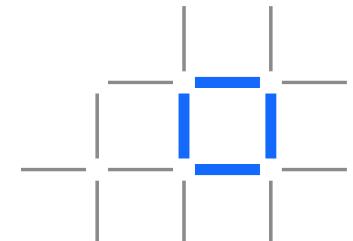
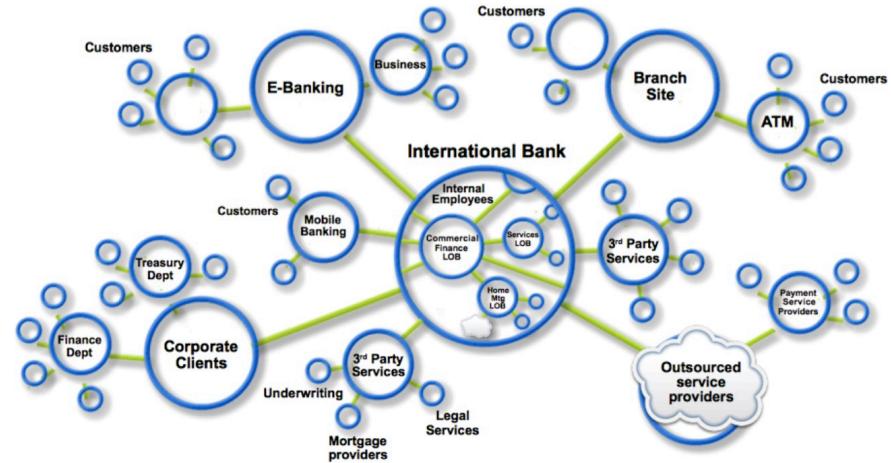


How can IBM help us  
apply blockchain?



# 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

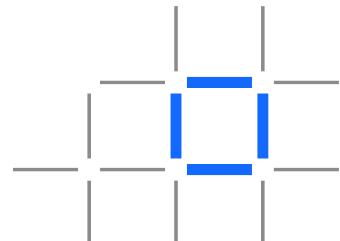
- Tangible, e.g. a house
- Intangible, e.g. a mortgage

## Intangible assets subdivide

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

## Cash is also an asset

- Has property of anonymity

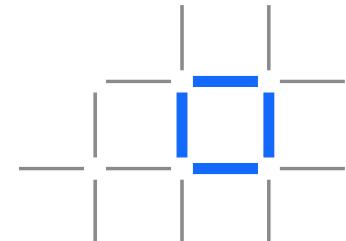
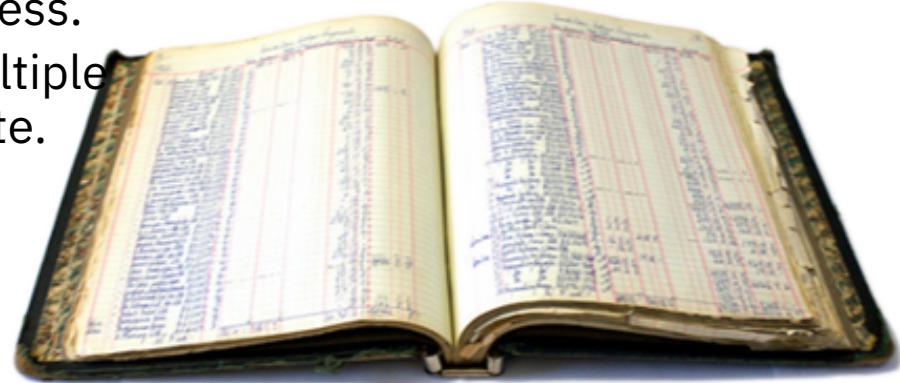


# Ledgers are key

**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 ...

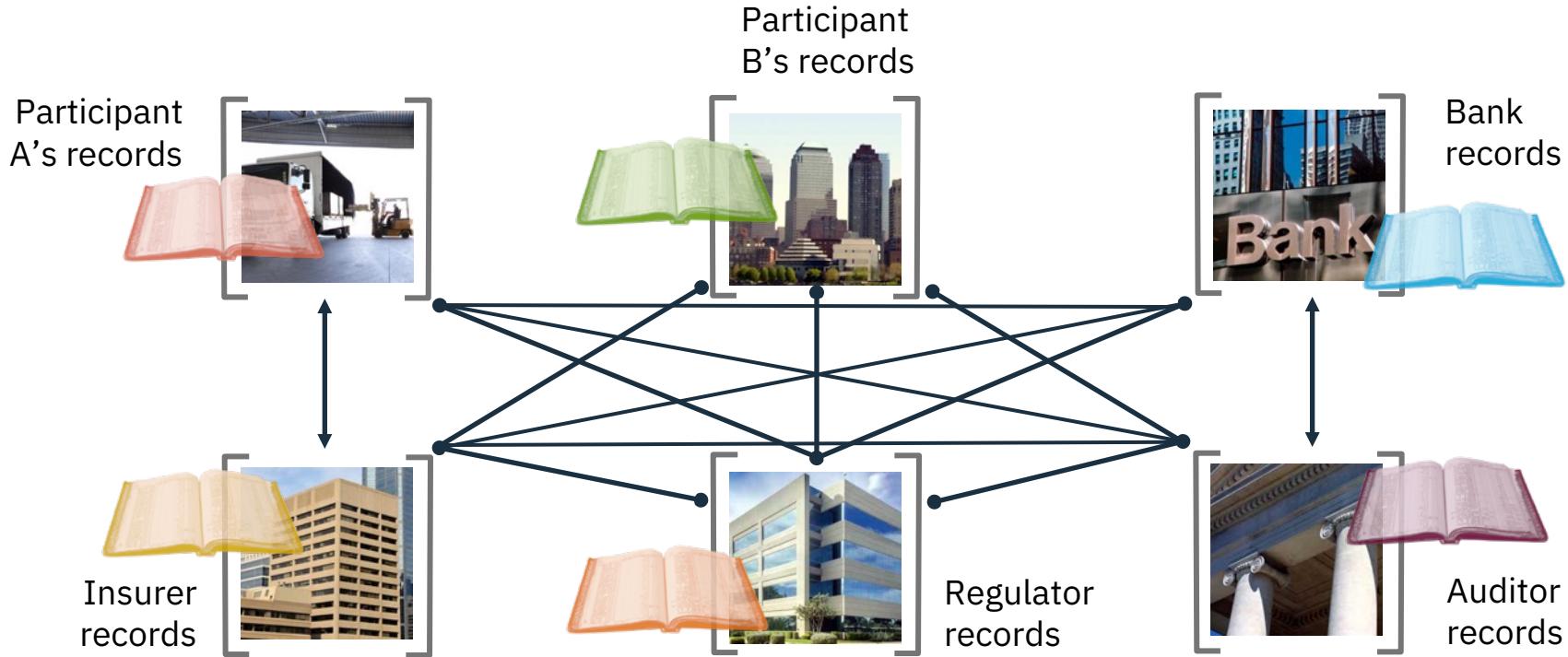
IBM Blockchain

A trusted,  
distributed  
ledger

**Blockchain**

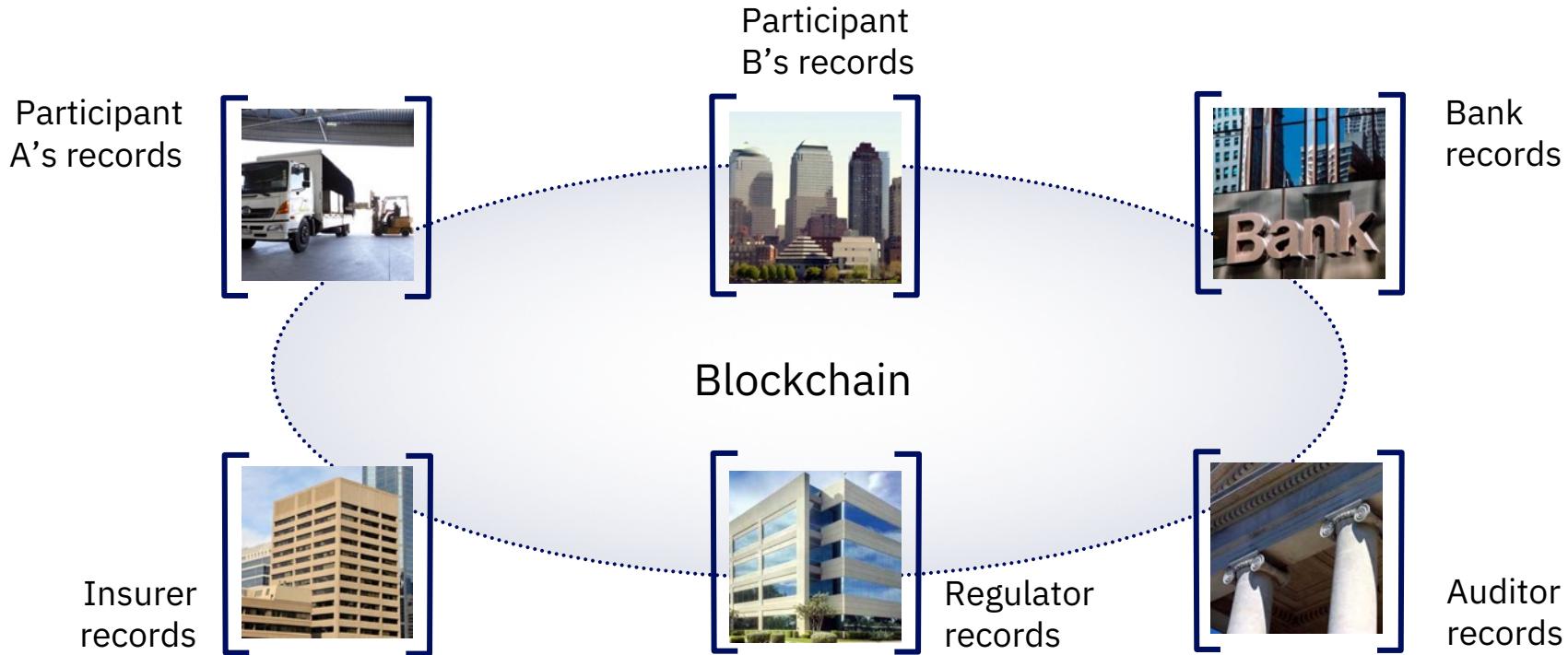
with shared  
business  
processes

# Problem ...



... inefficient, expensive, vulnerable

# A shared, replicated, permissioned ledger ...



... with consensus, provenance, immutability and finality

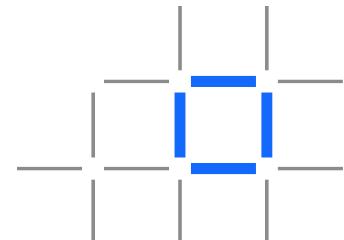
# Blockchain underpins Bitcoin

 **bitcoin** is:

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

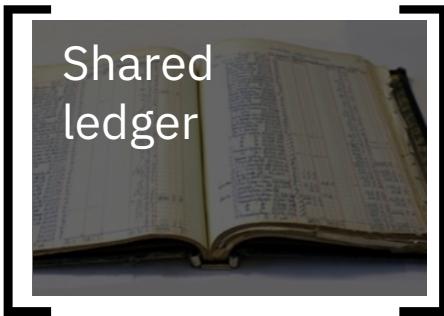
Blockchain for business differs in key areas:

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



# Requirements of blockchain for business

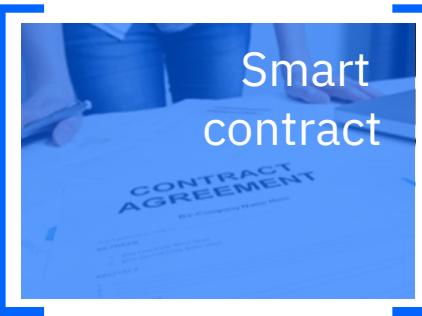
Append-only  
distributed system of  
record shared across  
business network



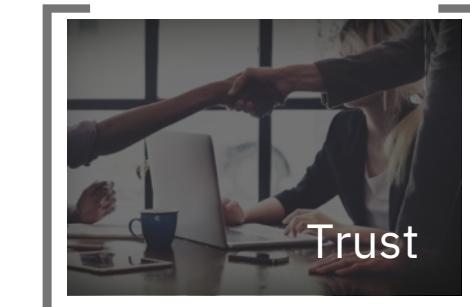
Ensuring appropriate  
visibility; transactions  
are secure,  
authenticated  
& verifiable



Smart  
contract

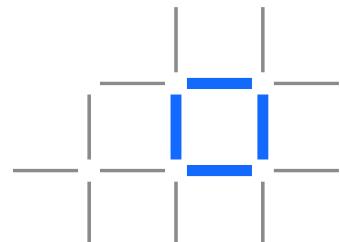


Business terms  
embedded in  
transaction  
database  
& executed with  
transactions



Trust

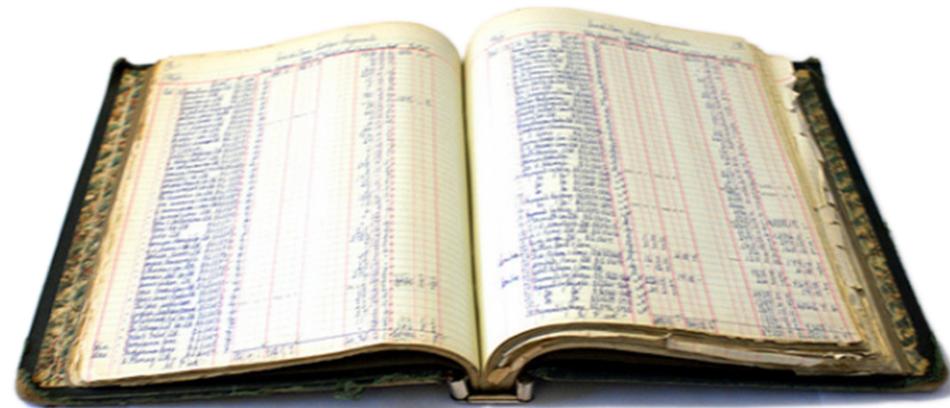
Transactions are  
endorsed by  
relevant  
participants



# 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*





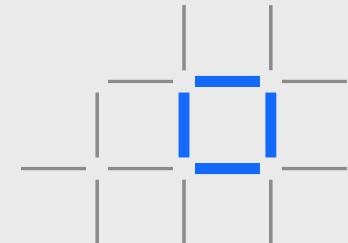
What is Blockchain?



Why is it relevant for  
our business?



How can IBM help us  
apply blockchain?



# 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>

# Trade Finance for Small and Medium Enterprises

## What?

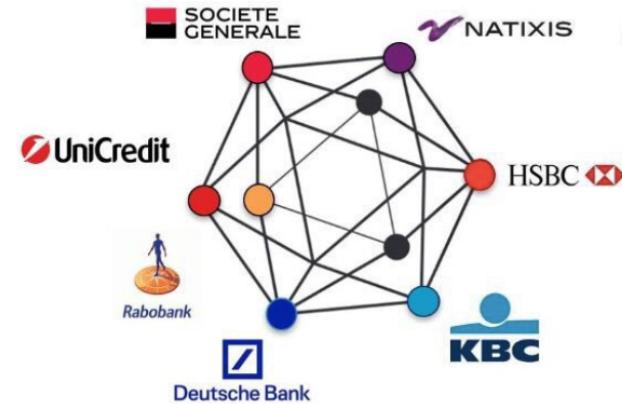
- **Small and medium enterprises** (SMEs) are a traditionally underserved segment in the market, often without access to finance options. According to the World Bank, **50 percent** of SMEs don't have access to formal credit.

## How?

- **Digital Trade Chain (DTC) Consortium** consisting of: Deutsche Bank, HSBC, KBC, Natixis, Rabobank, Societe Generale and Unicredit, have selected IBM to build a **new blockchain network** designed to simplify and facilitate domestic and cross-border trade for SMEs in Europe.

## Benefits

- Simplify trade finance by managing, tracking and securing international trade transactions.
- Gain access to capital
- Increase overall trade transaction transparency
- Reduce risk



# Common KYC Data

## What?

- View of customer identity to enable compliance with Know Your Customer (KYC)

## How?

- A complete view of customers' documents across a distributed network



## Benefits

1. Creation of a single but cross-businesses KYC platform to inform all of the banks processes.
2. Crédit Mutuel Arkéa could enable its customers to deliver proof of their identity to third-parties such as local utilities, retailers or regulated service providers.



# ABN·AMRO Financial Audit and Compliance Ledger

## What?

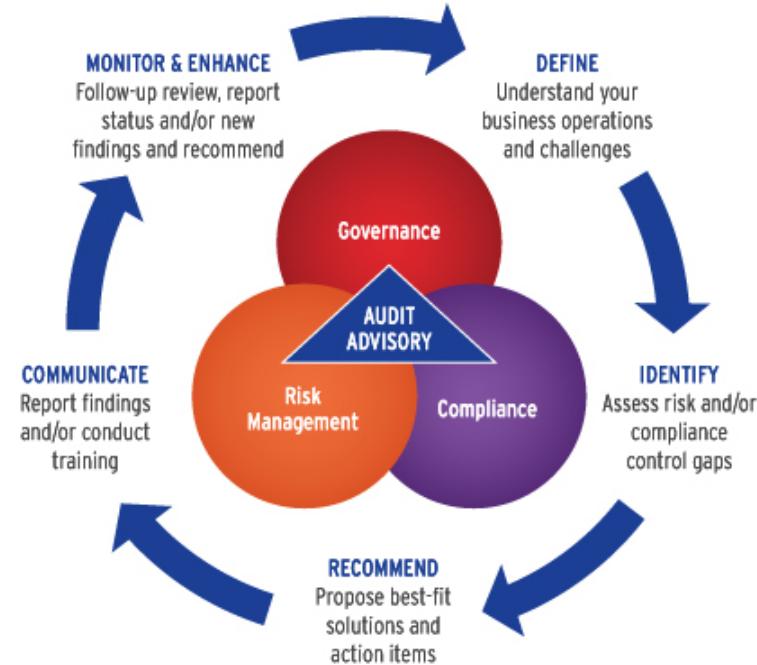
- Reimagine current expensive audit process requiring integrating data – often inconsistent and outdated - from various sources on the blockchain

## How?

- Shared replicated ledger serves as single point of truth
- Auditors are guaranteed that no one has tampered the data via immutability of blockchain

## Benefits

1. Clients, bank and regulators all see single version of truth
2. No data inconsistencies => clear audit trail
3. Enables efficient lower-cost Asset Quality Reviews (AQR)



## What?

Track diamonds across supply chain from mine to retail

## How?

Shared ledger for storing digital certification with supporting material

## Benefits

1. Protect against the occurrence of fraud, theft, trafficking and black markets
2. Assist in the identification and reduction of synthetic stones being labelled as authentic
3. Increase speed of transparency for cross border transactions for insurance companies, banks and claimants



# Walmart Food Traceability in China

## What?

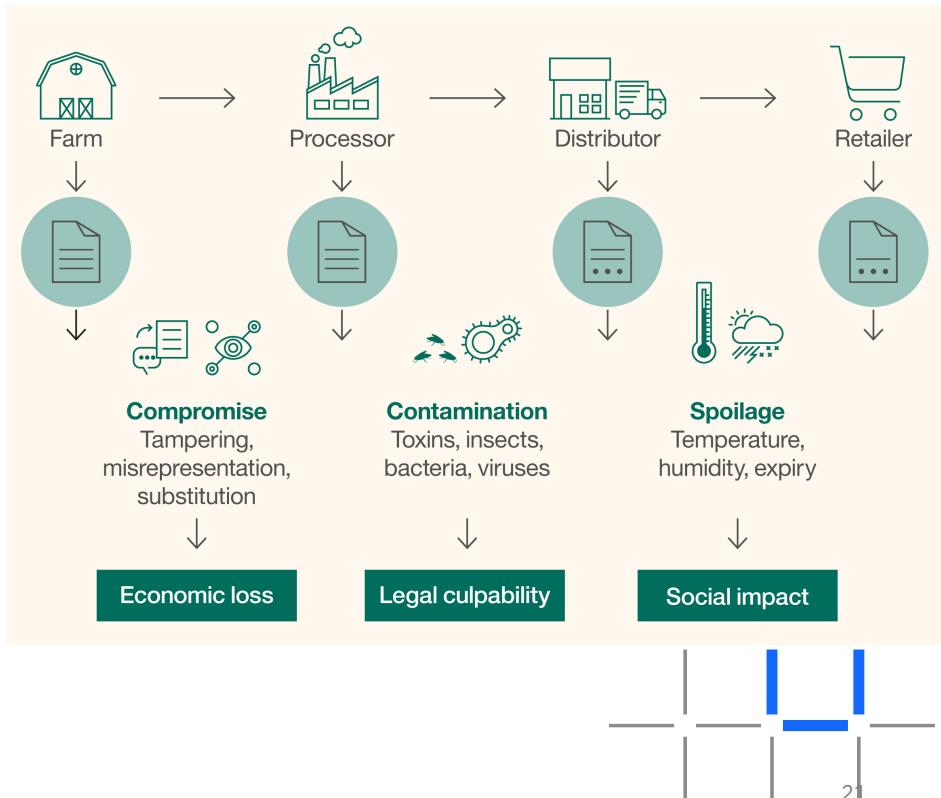
Traceability of food from “farm to fork”

## How?

Blockchain holds history of food items processed through entire supply chain

## Benefits

1. Increased trust – multiplied by each participant in food supply chain
2. Pinpoint source of compromised food, reducing the unnecessarily broad recall
3. Improved co-ordination in food supply chain



# IBM Global Financing: Dispute Resolution



## What?

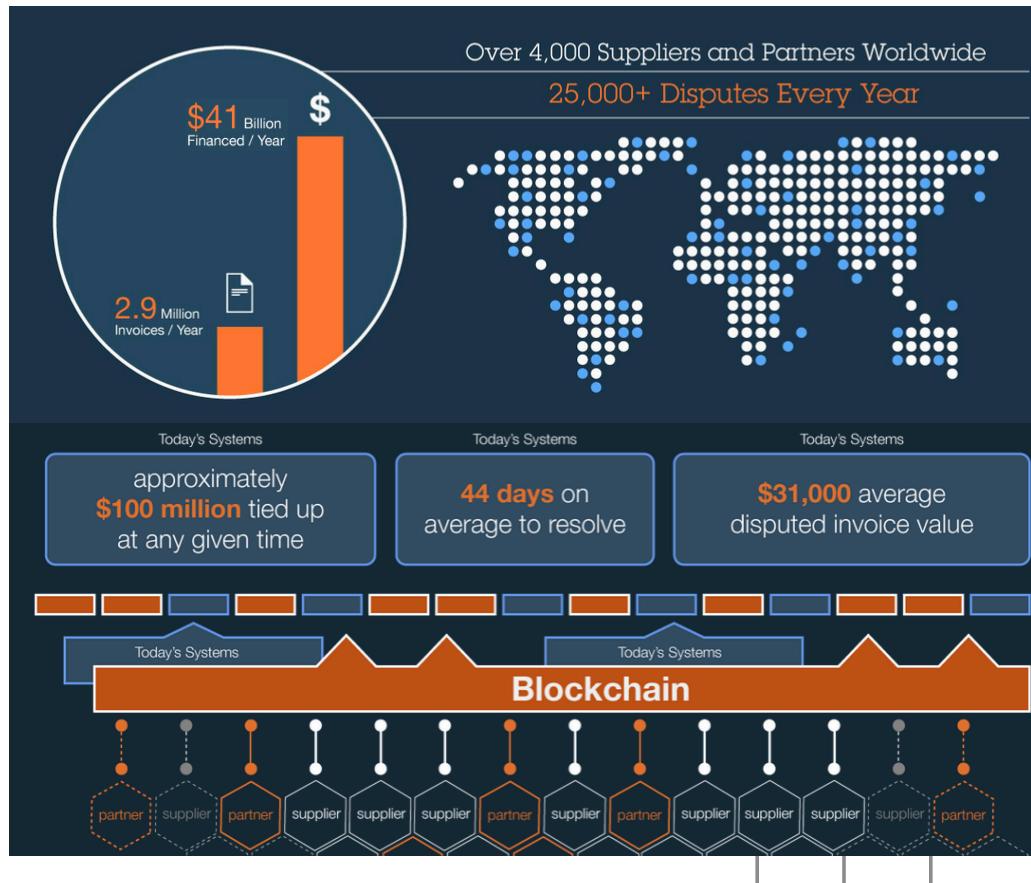
- IBM Global Finance provides a \$41bn channel financing per year. There are a number of disputes that take time to resolve and can lock up transactions costing time and money

## How?

- Blockchain provides visibility and provenance end-to-end across supply chain

## Benefits

1. Reduced dispute resolution time by 75%
2. Released working capital from \$100m
3. Combine IGF and Supplier info to further expand benefits further
4. In production since Sept 2016





# Cross Border Supply Chain

## What?

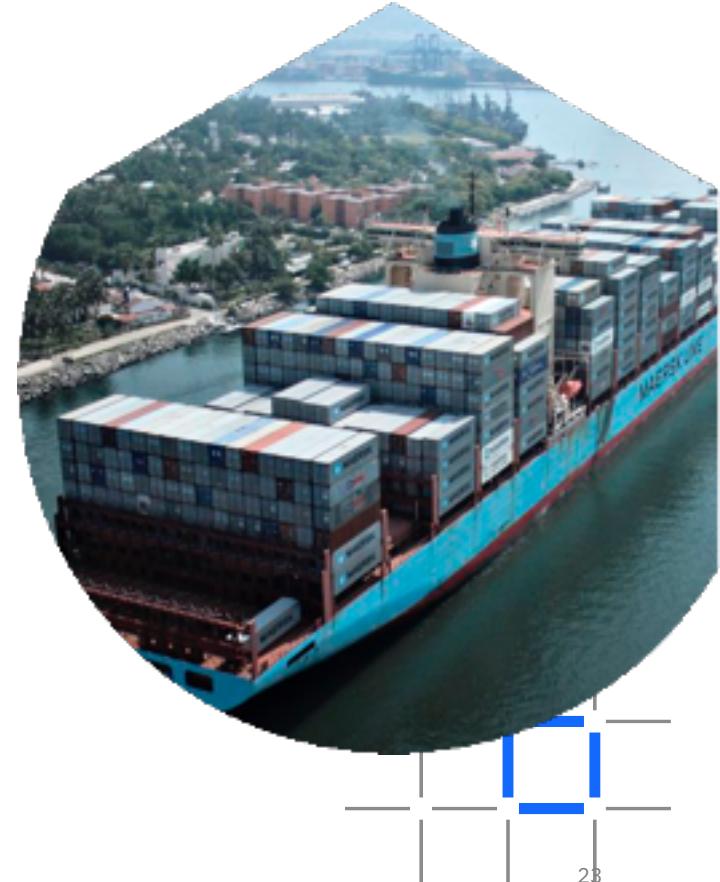
- Ninety percent of goods in global trade are carried by the ocean shipping industry each year. Costs associated with trade documentation processing and administration are estimated to be up to one-fifth the actual physical transportation costs.

## How?

- A new blockchain solution from IBM and Maersk will help manage and track the paper trail of tens of millions of shipping containers across the world by digitizing the supply chain process.

## Benefits

- Enhance transparency and the highly secure sharing of information among trading partners and customs officials.
- Reduce fraud and errors, reduce the time products spend in the transit and shipping process, improve inventory management and ultimately reduce waste.
- Potential to save the industry billions of dollars.





## What?

- Infrastructure supporting private equity has seen little innovation in recent years at a time when investors are seeking greater transparency, security and efficiency.

## How?

- Creation of an innovative private equity ecosystem designed to deliver increased efficiency, security and transparency.

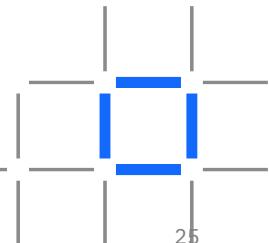
## Benefits

1. Provides real-time insight and transparency to all parties, including the fund managers and investors.
2. Designed to allow regulatory access as required.
3. Support compliance of local regulations.
4. In production.



# What makes a good blockchain use case?

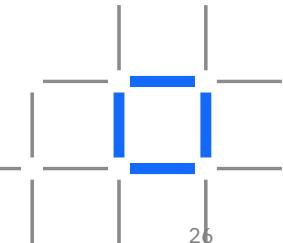
- Identifying a good blockchain use-case is not always easy!
  - However there should always be:
    1. A **business problem** to be solved
      - That cannot be solved with more mature technologies
    2. An identifiable **business network**
      - With Participants, Assets and Transactions
    3. A need for **trust**
      - Consensus, Immutability, Finality or Provenance



# What makes a good first blockchain use case?

- First use-cases are even more difficult to identify!
  1. A limited scope, but still solves a real business problem
    - Minimum Viable Product in a few weeks of effort
  2. A smaller business network
    - Usually without requiring regulators and consortia
  3. Allows for scaling with more participants and scenarios
    - Consider shadow chains to mitigate risks

**Start small, succeed and grow fast!**



# 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



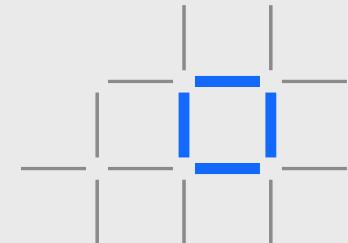
What is Blockchain?



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

IBM Blockchain

# Premier



## General

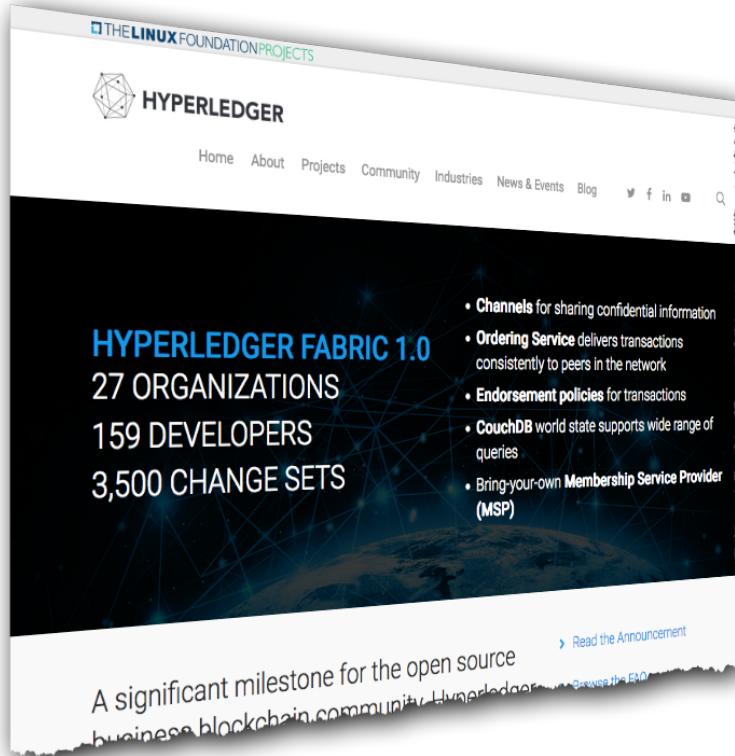


## Associate

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

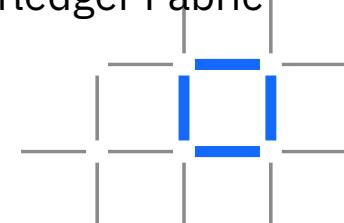
# Hyperledger Fabric: Distributed ledger platform

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/>



# Why Hyperledger Fabric?



## Open Governance

Anyone can join or contribute



## Built from the ground up for enterprise

With a maturity model to help companies move to production



## Performance

Supports up to 1000 tps\*



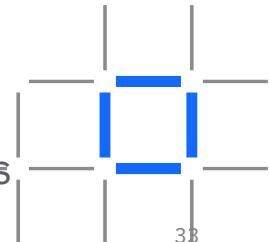
## Confidentiality and privacy

Built-in channels for isolation and membership services for signing and encryption. Supports IBM High Security Business Network.



## Modularity and flexibility

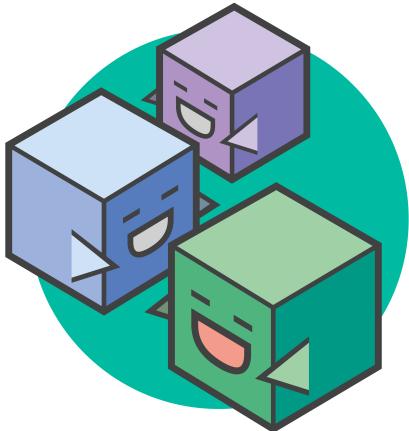
Choice of consensus algorithms and programming languages



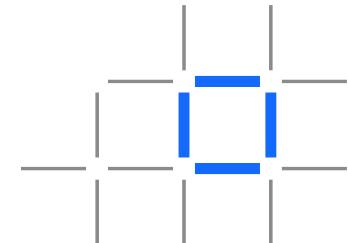
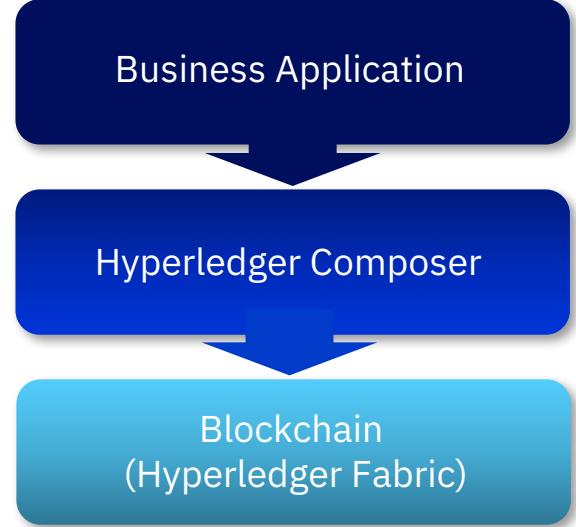
# Hyperledger Composer: Accelerating Time to Value

<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 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](http://ibm.biz/Platform_Demo)]

# IBM Blockchain Platform membership plans

Plans	Key Features	Availability
Entry	Hourly charges w/basic services levels	Coming soon
Enterprise	<b>Monthly subscription with advanced service levels</b>	<b>Available Now</b>
Enterprise Plus	Monthly subscription with the highest performance and isolation for even the most demanding use cases and regulated industries	Coming soon
Self Managed	Signed and certified images of Hyperledger Fabric you can install in a location of your own choosing	Coming soon

Each membership plan includes all the platform tools to develop and govern a complete blockchain network and the tools to operate 1 blockchain peer.

# Only the IBM Blockchain Platform provides must-have features for production distributed business networks

	MUST HAVE	IBM Blockchain Platform	 Microsoft Azure	 SAP	 Amazon Web Services
Enterprise ready	Security	✓ Integrated HSM with highest FIPS level compliance	✗ Lack of dedicated blockchain security	✗ Lack of dedicated blockchain security	✗ Lack of dedicated blockchain security
	Scalability	✓ Fastest Linux compute and high speed network	✗ Cannot scale beyond basic test network	✗ No production offering	✗ No production offering
	Support	✓ 24x7x365 support coverage backed by deep Fabric expertise	✗ No dedicated Fabric support	✗ No dedicated Fabric support	✗ No dedicated Fabric support
Trusted	Transformation expertise	✓ Services and infrastructure support for new distributed business networks	✗ No transformation services	✗ No transformation services	✗ No transformation services
	Industry focus	✓ Active networks for key industries (Retail, Supply Chain, FSS, etc.)	✗ Limited to no active networks	✗ No industry focus	✗ No industry focus
	Tools and management	✓ Network governance and development tools	✓ Development tools, limited interoperability	✗ No tooling	✗ No tooling
Open	Open governance	✓ Fabric governed by enterprise-focused Hyperledger Project	✗ Only supports EEA	✓ Supports Hyperledger project	✗ No governance support
	Ecosystem	✓ 25+ organizations contributed to Hyperledger Fabric v1.0	✓ Support from Ethereum ecosystem	✗ No ecosystem support	✗ No ecosystem support
	Licensing	✓ Apache 2 and MIT licensing make using and contributing to code easier	✗ Ethereum GPL/LGPL licensing	✗ No licensing support	✗ No licensing support

# 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 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

Remote

Digital

Face to face

Face to face

# IBM Garage: Many Possibilities

Blockchain  
Hands-on

1 day

IBM Design  
Thinking  
Workshop

2 days

Sprint Zero

3 days

First Project  
Sprints

10 days/sprint

Blockchain  
Hackathon

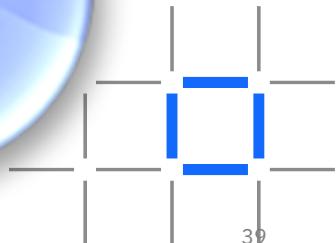
3 days

Port your  
experiment

T&M

Business  
Network  
Design

2 days



# Why IBM?



Industry Expert

- Hundreds of experienced consultants, researchers and developers
- Deep systems integration and middleware experience



Secure by Design

- IBM Blockchain High Security Business Network
- Dedicated compute, cryptography hardware, tamper-resistant container.



Open By Design

- Linux Foundation Hyperledger founding member
- Ongoing donation of code, developers and intellectual property to Hyperledger



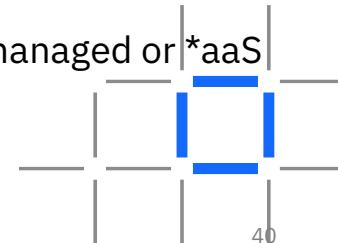
Fast Start

- 400+ clients in engagement pipeline in 2016
- IBM Blockchain Garage engagement model to implement MVP rapidly



Hyper Scale

- Choice of deployment including on-prem, off-prem, self-managed or <sup>\*aaS</sup>
- Supports rapid expansion of initial solution.



# 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
	   	

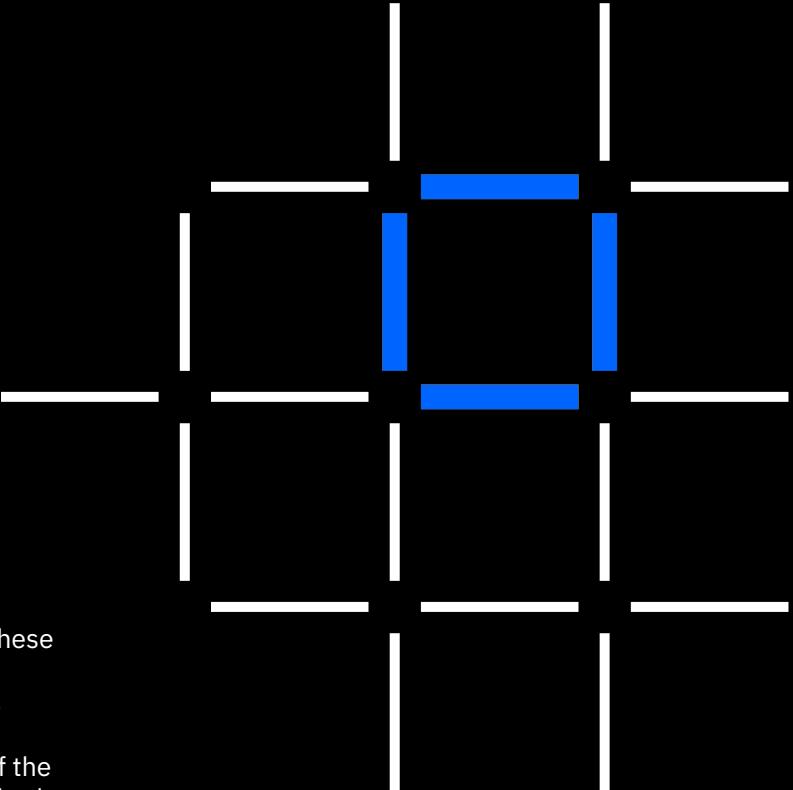
# Thank you

## IBM Blockchain

[www.ibm.com/blockchain](http://www.ibm.com/blockchain)

[developer.ibm.com/blockchain](http://developer.ibm.com/blockchain)

[www.hyperledger.org](http://www.hyperledger.org)



© Copyright IBM Corporation 2017. All rights reserved. The information contained in these materials is provided for informational purposes only, and is provided AS IS without warranty of any kind, express or implied. Any statement of direction represents IBM's current intent, is subject to change or withdrawal, and represents only goals and objectives. IBM, the IBM logo, and other IBM products and services are trademarks of the International Business Machines Corporation, in the United States, other countries or both. Other company, product, or service names may be trademarks or service marks of others.



IBM