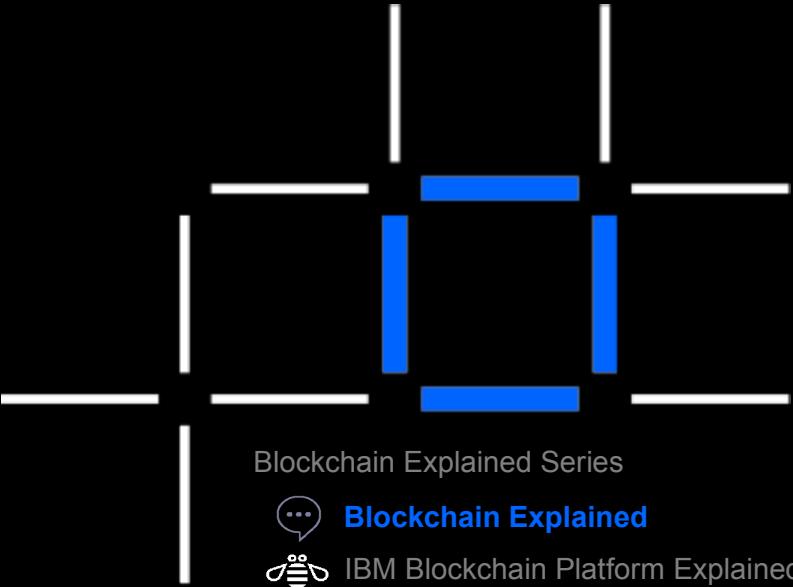


# Blockchain Explained

An Introduction to Blockchain for Business

Ross Cruickshank  
Developer Advocate @ IBM

@rcruicks  
ross@vnet.ibm.com



Blockchain Explained Series

- [Blockchain Explained](#)
- [IBM Blockchain Platform Explained](#)
- [Solutions Explained](#)
- [Garage Explained](#)
- [Next Steps](#)



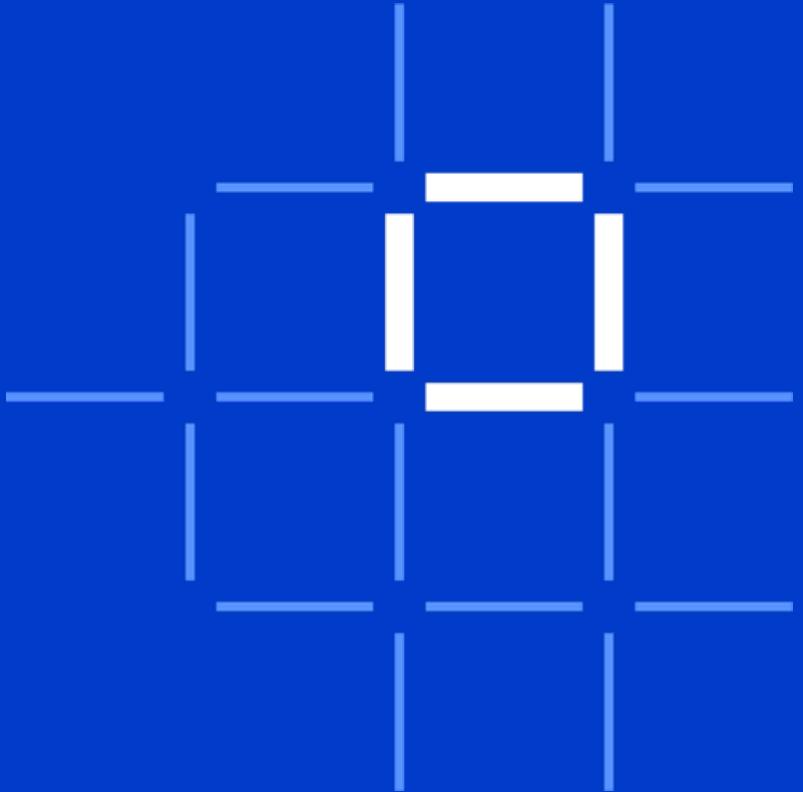
What is Blockchain?



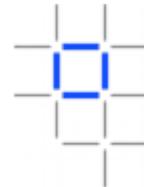
Why is it relevant for  
our business?



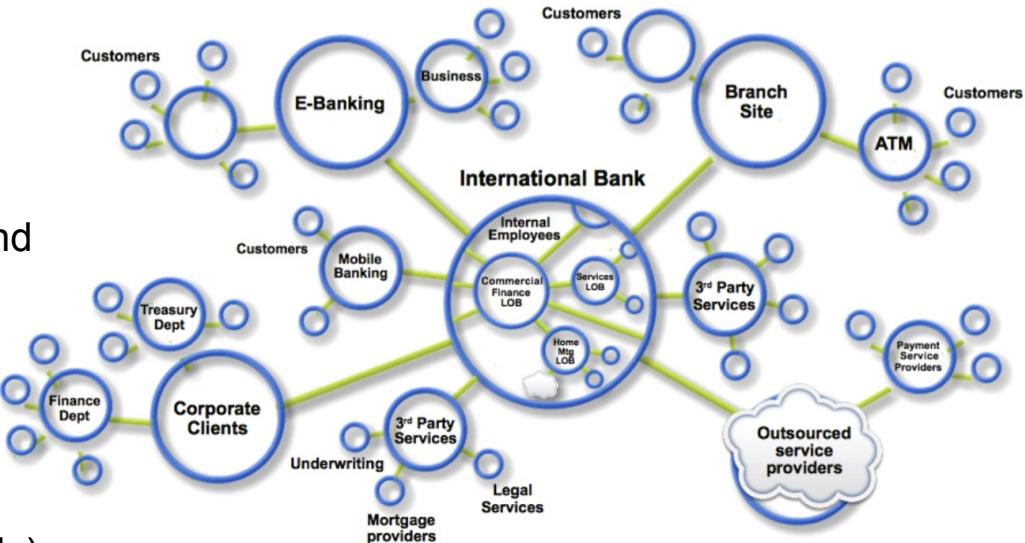
How can IBM help us  
apply blockchain?

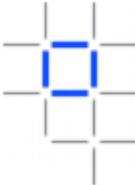


# Business networks, wealth and markets



- **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

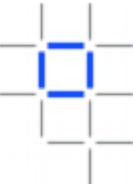
- Tangible, e.g. a house
- Intangible, e.g. a mortgage

## Intangible assets subdivide

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

## Cash is also an asset

- Has property of anonymity

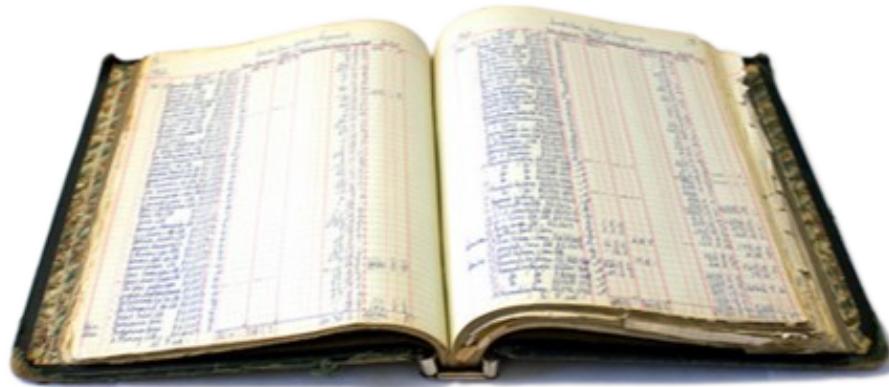


# Ledgers are key

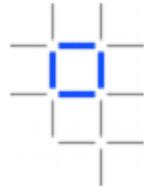
**Ledgers** are THE system of record for a business.

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)



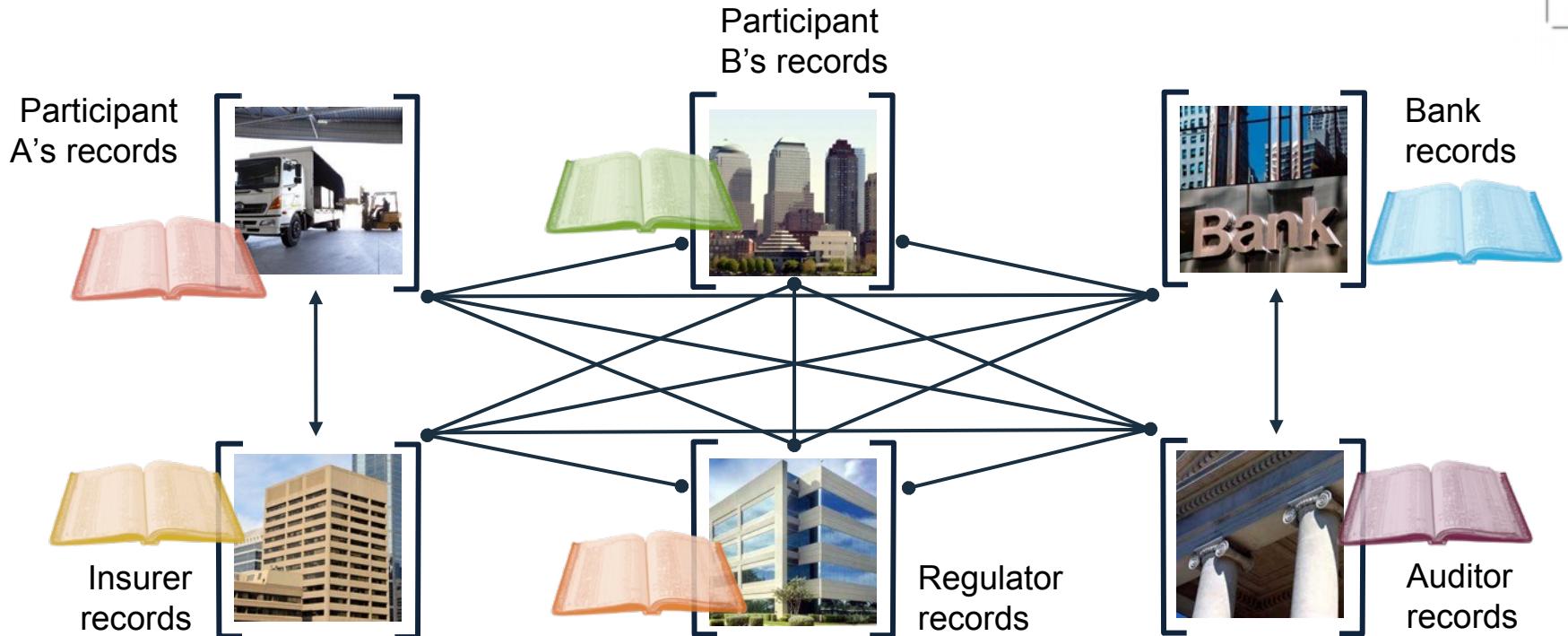
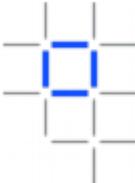
# Introducing Blockchain for Business...



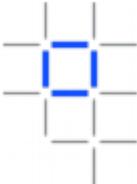
Shared,  
replicated,  
permissioned  
ledger

**Blockchain  
for  
Business**

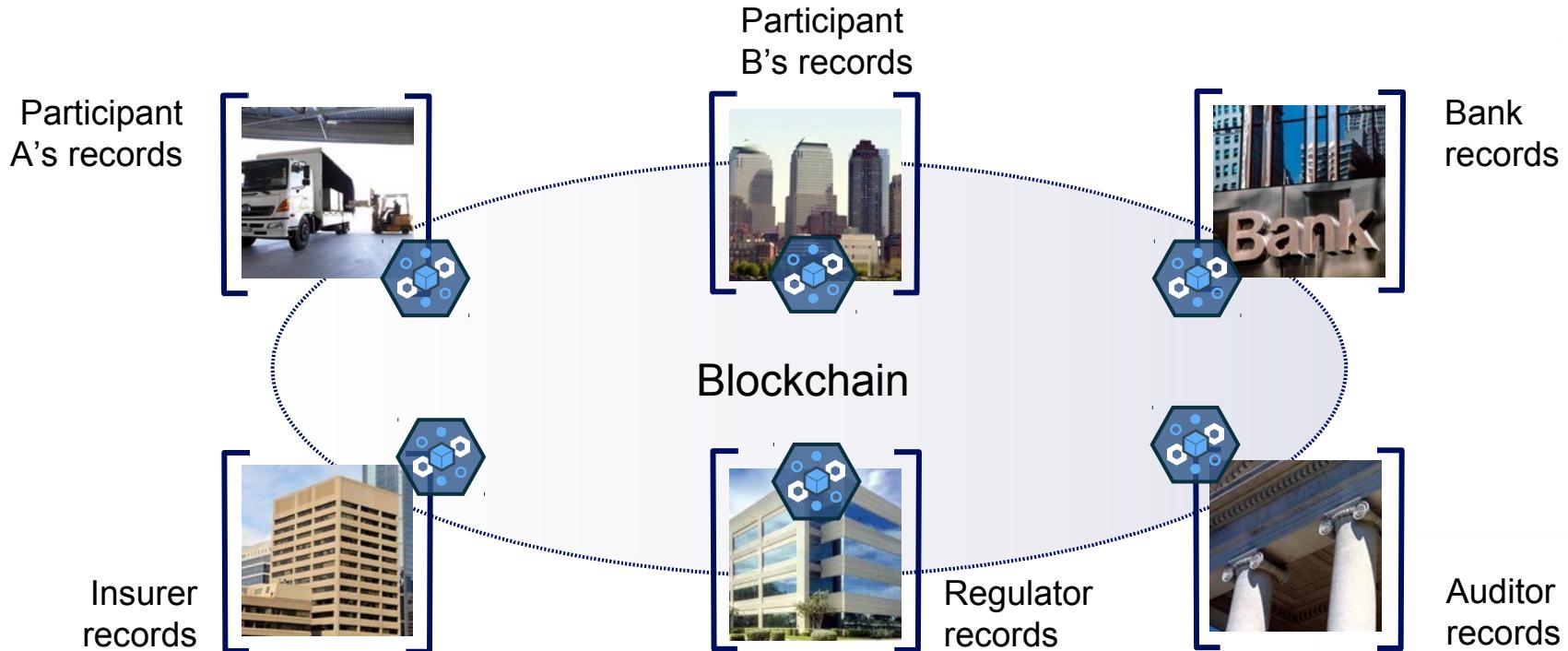
# Problem...



... inefficient, expensive, vulnerable

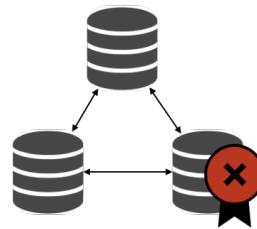
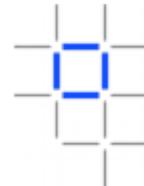


# A shared, replicated, permissioned ledger ...



... with consensus, provenance, immutability and finality

# Why not use a database?



- A traditional database is **centralized**
- Everyone needs to **trust** the administrator managing the database
- There's typically **no immutability or provenance**

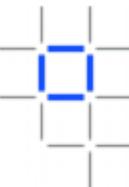
- Distributed databases do not alleviate the **trust** issue
- There are now **more copies** to worry about and **more administrators**



- **Blockchain** allows the concept of a distributed database to be deployed across an **untrusted network**
- Something a traditional database cannot handle

Traditional databases cannot be used in untrusted networks

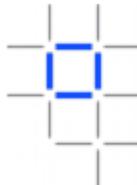
# Different types of blockchain



- All blockchains aim to provide **irrefutable proof** that a set of transactions occurred between participants
- Different types of blockchain exist:
  - Bitcoin is an example of an **unpermissioned, public blockchain**
    - The first blockchain application
    - Defines a shadow-currency and its ledger
    - Resource intensive
  - Blockchains for business are generally **permissioned and private**, and prioritize
    - Identity over anonymity
    - Selective endorsement over proof of work
    - Assets over cryptocurrency



# Requirements of blockchain for business



Participants decide which assets to share



Transaction Endorsement



Participants give *provable* endorsement

Participants know who they are dealing with



Privacy and Confidentiality

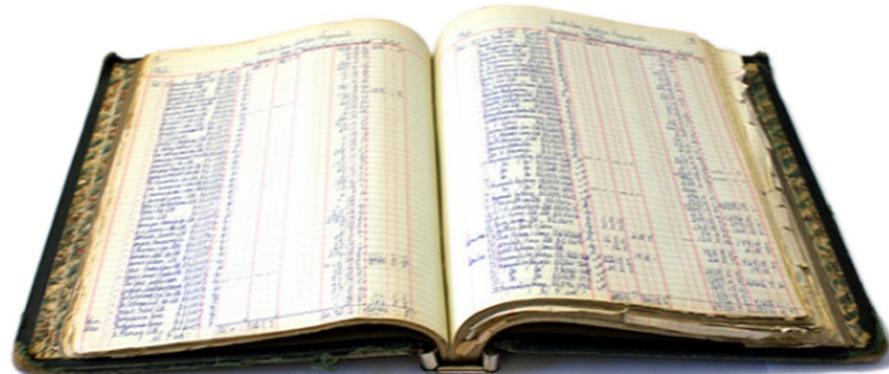


Information shared via need-to-know

# Choosing what to share

- **Assets** are anything of value
  - On the blockchain, these are represented digitally using a pre-agreed format
- **Transactions** change the state of an asset and are provably recorded on the blockchain
  - e.g. transfer ownership, change color
- Transactions are underpinned by **smart contracts**
  - Verifiable business rules that cause the asset to change state

*Business network decides what is shared on the ledger*



# Identity

- Various regulations applied to businesses require them to know who they are dealing with
  - e.g. KYC, AML, CFT
- There are established methods for obtaining and asserting identity
  - Cryptography is central to these
- Identity allows transactions to be **signed** and **encrypted**

*Knowing who you're dealing with*



# Transaction Endorsement

- Endorsement is the process in which a transaction is verified as “good”
  - Ensures that participants are happy to accept the transaction and prevents (e.g.) double spending
- Endorsement can be expensive in public blockchains
  - Without identity, transactions are thrown to the whole network for endorsement
  - Proof of work is particularly CPU intensive
- In the real world, transactions are endorsed by a **smaller number of participants**
  - e.g. sender bank, receiver bank, payments provider
  - Must be completed in an appropriate timeframe

*Transactions provably endorsed by relevant participants*



# Privacy and Confidentiality

- Identity also gives us a mechanism to make the blockchain private and confidential
- Blockchain for business networks are generally **private**
  - And restricted to the scope of the business network
- Individual transactions are usually **confidential**
  - Transparency for regulator is critical
  - However visibility to some participants could give unfair advantage

*Transaction visibility is need-to-know*





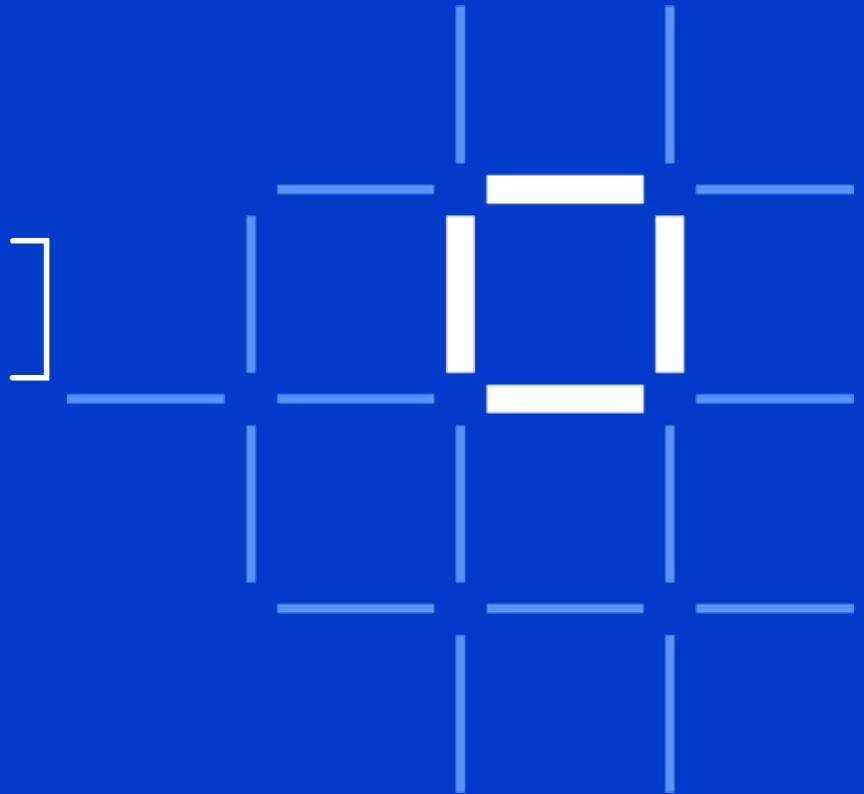
What is Blockchain?

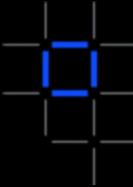


Why is it relevant for  
our business?



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

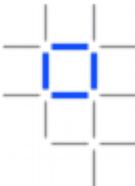
Streamline business processes and the exchange of value along your ecosystem

## Reduce Risk

Replace uncertainty with transparency and a trusted decentralized ledger



# Good blockchain use-case or bad?



Food  
Provenance

Holiday  
Tracking  
Tool

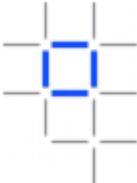
Know Your  
Customer

Secure  
Document  
Store

Track Your  
Child

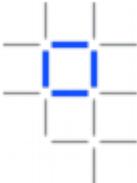
Electronic  
Medical  
Records





# 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 more efficiently solved with other technologies
    2. An identifiable **business network**
      - With Participants, Assets and Transactions
    3. A need for **trust**
      - Consensus, Immutability, Finality or Provenance

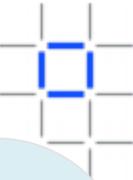


# What makes a good first blockchain use case?

– First use-cases are even more difficult to identify!

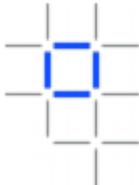
1. A limited scope, but still solves a real business problem
  - Minimum Viable Product in a few weeks of effort
2. A smaller business network
  - Usually without requiring regulators and consortia
3. Allows for scaling with more participants and scenarios
  - Consider shadow chains to mitigate risks

Start small, succeed and grow fast!



## Sample questions to ask for the selected use case:

1. What is the specific business problem / challenge that the first project will address?
2. What is the current way of solving this business problem?
3. Assuming the business problem is large, what specific aspects of this business problem will be addressed?
4. Who are the business network participants (organizations) involved and what are their roles?
5. Who are the specific people within the organization and what are their job roles?
6. What assets are involved and what is the key information associated with the assets?
7. What are the transactions involved, between whom, and what assets are associated with transactions?
8. What are the main steps in the current workflow and how are these executed by the business network participants?
9. What is the expected benefit of applying blockchain technology to the business problem for each of the network participants?
10. What legacy systems are involved? What degree of integration with the legacy systems is needed?



# Blockchain



Trusted,  
distributed  
ledger



Shared  
business  
processes



Transactions agreed by  
business network participants



Total clarity of who's done  
what, when



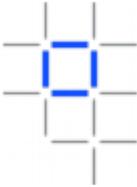
One view of truth shared  
across business network



Disputes easy to resolve



Resilient to failure or fraud



## A good blockchain use case needs ...



A business network,  
assets & transactions



Multiple participants  
to verify transactions



To know who's done  
what and when



Trusted transactions



A single view of truth,  
shared cross network

# 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



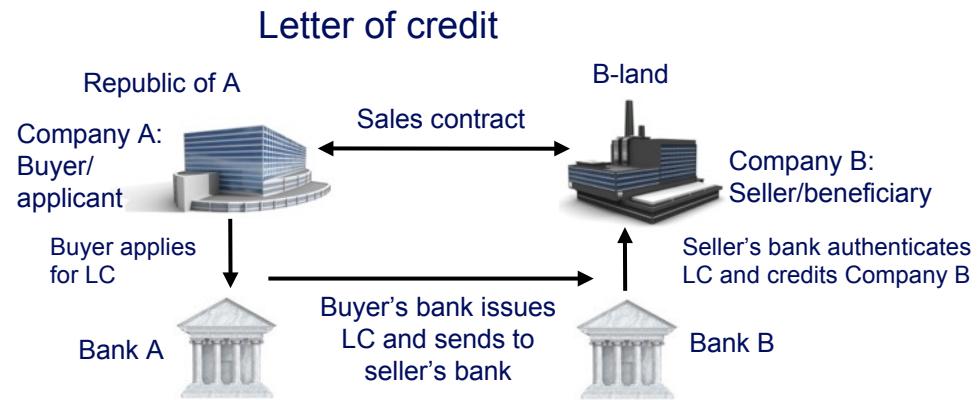
- What
- Financial data in a large organization dispersed throughout many divisions and geographies
  - Audit and Compliance needs indelible record of all key transactions over reporting period

- 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

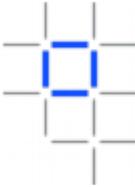
# Example: Letter of credit



- 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

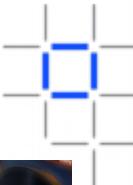


# Further examples by (selected) industry



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>

# 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



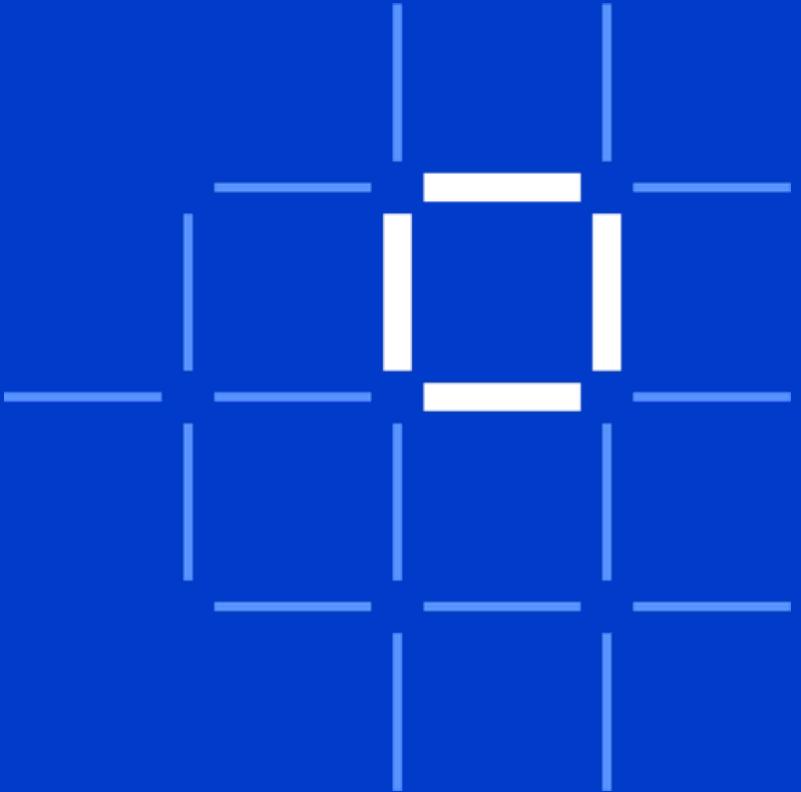
What is Blockchain?



Why is it relevant for  
our business?



How can IBM help us  
apply blockchain?



# IBM Blockchain Strategy

Drive the development of **applications** for specific business use-cases, to be deployed to active **blockchain networks**



Services

Collaborate  
with services  
teams from  
ideation all the  
way to  
production



Ecosystem

Tap into our diverse ecosystem to develop strategic partnerships and create your competitive advantage



Solutions

Solve critical industry challenges by building and joining new business networks and applications



Platform

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



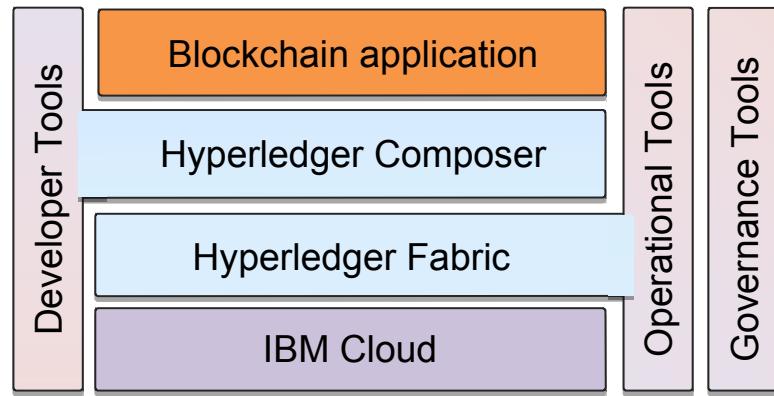
**HYPERLEDGER**

A founding, premier member of Hyperledger, IBM is committed to open source, standards & governance

# Introducing the IBM Blockchain Platform

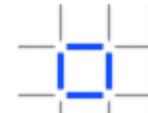
**IBM Blockchain Platform is a fully integrated enterprise-ready blockchain platform designed to accelerate the development, governance, and operation of a multi-institution business network**

- Developer tools that make use of Hyperledger Composer to quickly build your blockchain application
- Hyperledger Fabric provides the ledger, which is managed through a set of intuitive operational tools
- Governance tools for democratic management of the business network
- Flexible deployment options, including a highly secure and performant IBM Cloud environment



IBM Blockchain Platform Explained

# Hyperledger: A Linux Foundation project



- IBM Blockchain Platform is underpinned by technology from the Hyperledger project
- Hyperledger is a collaborative effort created to advance cross-industry blockchain technologies for business
- Founded February 2016; now more than **240 member organizations**
- Open source  
Open standards  
*Open governance model*

Premier



General



Associate



Academia Associate



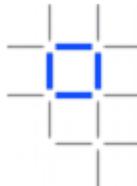
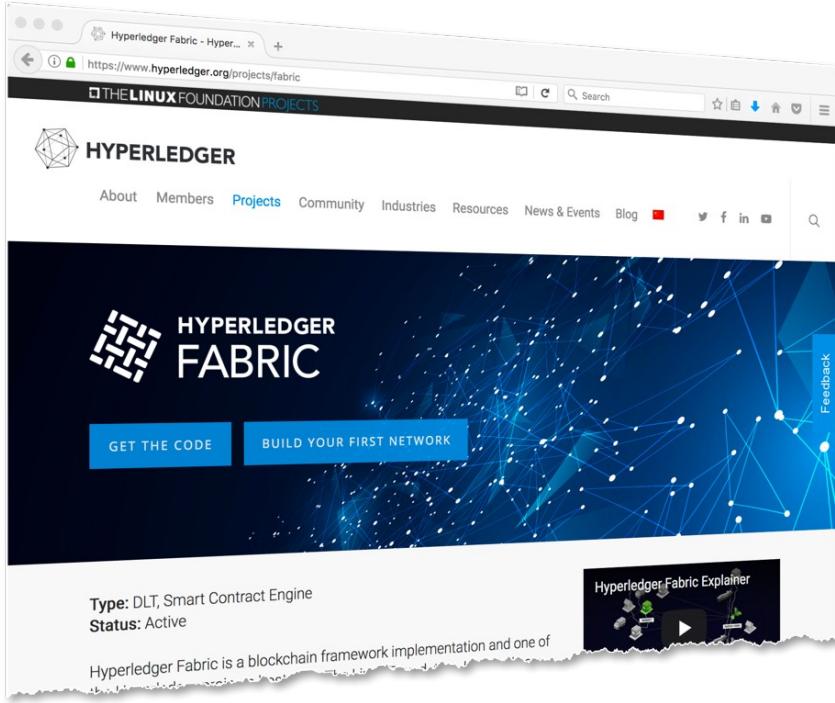
General



Source: <https://www.hyperledger.org/members>  
Updated: 21 June 2018



# Distributed ledger

Hyperledger Fabric - Hyper...  
<https://www.hyperledger.org/projects/fabric>

THE LINUX FOUNDATION PROJECTS

**HYPERLEDGER**

About Members Projects Community Industries Resources News & Events Blog

Feedback

Type: DLT, Smart Contract Engine  
Status: Active

Hyperledger Fabric is a blockchain framework implementation and one of

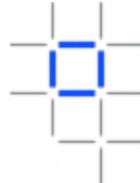
Hyperledger Fabric Explainer

- An implementation of blockchain technology that is a foundation for developing blockchain applications
- Emphasis on ledger, smart contracts, consensus, confidentiality, resiliency and scalability.
- V1.1 released March 2018
  - Includes significant performance, security, migration and smart contract improvements
- IBM is one of the many contributing organizations

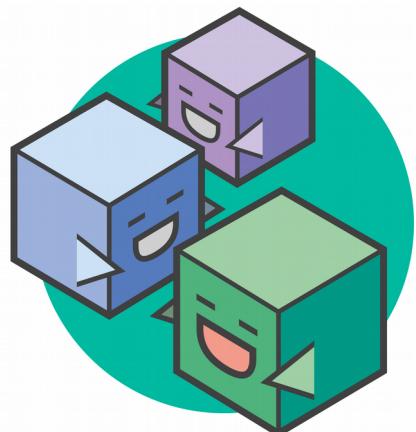




# Accelerated development



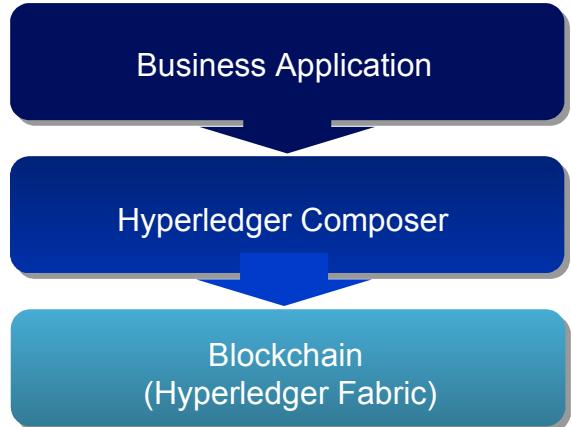
- A suite of high level application abstractions for business networks
- Emphasis on **business-centric vocabulary** for quick solution creation
- Reduce risk, and increase understanding and flexibility



## Features

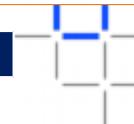
- Model your business networks, test and expose via APIs
- Applications invoke transactions to interact with business network
- Integrate existing systems of record

Try it in your web browser now:  
<http://composer-playground.mybluemix.net/>



# Making blockchain real for business...

Blockchain Solutions



Trade Finance

Pre and Post Trade

Complex Risk Coverage

Commercial Real Estate

## Digital Trade Chain



Identity/ Know your customer (KYC)

Unlisted Securities / Private Equity Funds

Loyalty Program Mgt.

Distributed Energy & Grid Mgt.



Medical Health Data Exchange

Anti-Fraud & Port Mgt.

Carbon Credit Mgt.

Asset Tracking



Supply Chain & Logistics

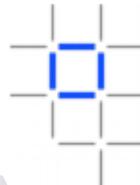
Food Safety

Audit

Digital Rights & Copyright Mgt.



# 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

Remote

Digital

Face to face

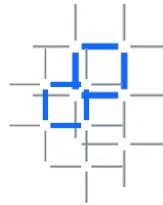
Face to face

# IBM Cloud Garage with Blockchain

## At-A-Glance

### The IBM Cloud Garage with Blockchain

helps you collaborate on business network problems and quickly build blockchain solutions.



#### What we offer

##### Discovery Workshop

Understand market opportunities and select a use case which represents the value your organization and your business network seek, while also gaining a deeper insight in blockchain technology. Mandatory for every new partnership.

**Length:** Half-day

##### Design Thinking Workshop

Apply IBM Design Thinking principles to evaluate current business processes, identify business network and define the minimal viable product for your blockchain solution.

**Length:** 2 days

##### Architectural Consultancy

Enlist the support of a blockchain architect in an IBM Cloud Garage to help define the framework of your blockchain solution.

**Length:** 1 week

##### MVP Build-up

Develop a functioning blockchain solution using agile methodologies, leveraging experts in IBM Blockchain, UX/UI design and development, and cloud architecture.

**Length:** 4-10 weeks

#### Where to find us

Partner with IBM Cloud Garage around the globe or we bring a pop-up garage to your site.



Dubai



London



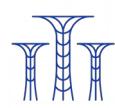
Munich



New York



San Francisco



Singapore



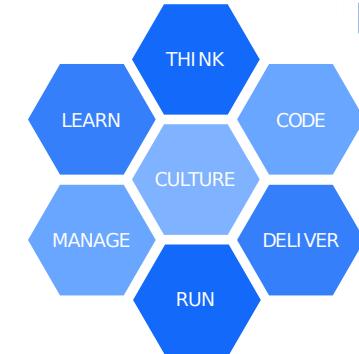
Tokyo



Toronto



Anywhere



#### How we do it

Together we use the IBM Blockchain Platform to quickly develop your blockchain solution, define the governance of the network, and establish the network operations.

We combine industry best practices including IBM Design Thinking, agile development, and continuous delivery.

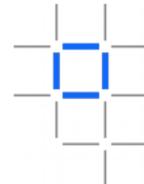
We connect you to experts in IBM Blockchain, UX/UI design and development, as well as cloud architecture.

**Request a consultation**

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

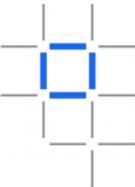


# Cloud Garage locations



*Leverage the IBM Cloud Garage with Blockchain for industry best practices in building and delivering blockchain solutions for your first project.*

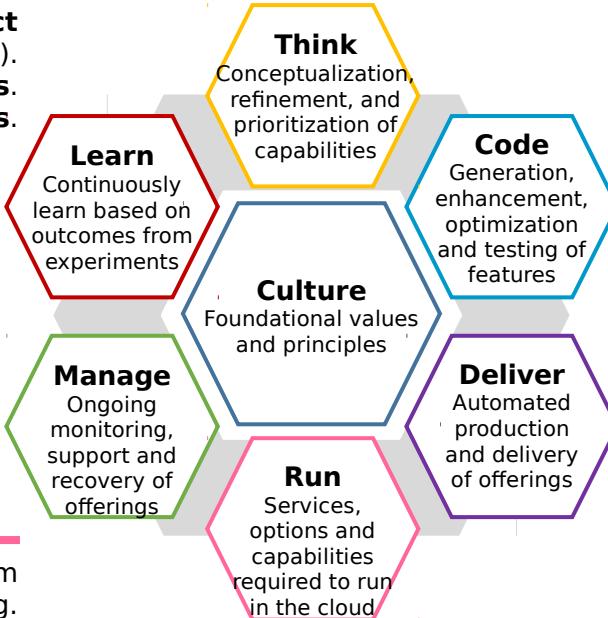
# Cloud Garage Method



Deploy the **minimum viable product** (MVP).  
Gather feedback from **sponsor users**.  
Drive improvements with **iterations**.

Use **IBM Blockchain** to develop, govern and operate networks.

Leverage the **IBM Cloud** platform instead of worrying about the plumbing.



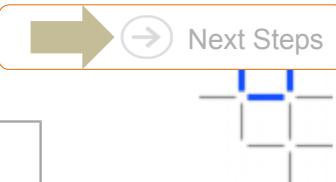
Begin with an **IBM Design Thinking workshop** to design a solution that meets user needs and delivers business value.

Use the agile method called **extreme programming** for MVP projects.

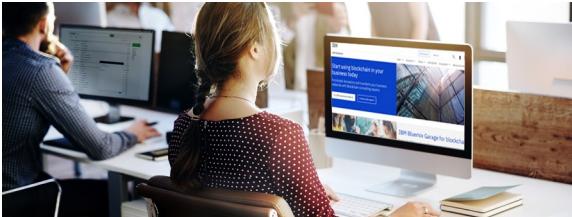
Use **DevOps** coupled with **test-driven development**.

*The Cloud Garage Method and blockchain expertise combines industry best practices for building and delivering blockchain solutions.*

# Getting started on your blockchain journey



[Learn More About IBM Blockchain](#)



[Schedule an IBM Blockchain Workshop](#)



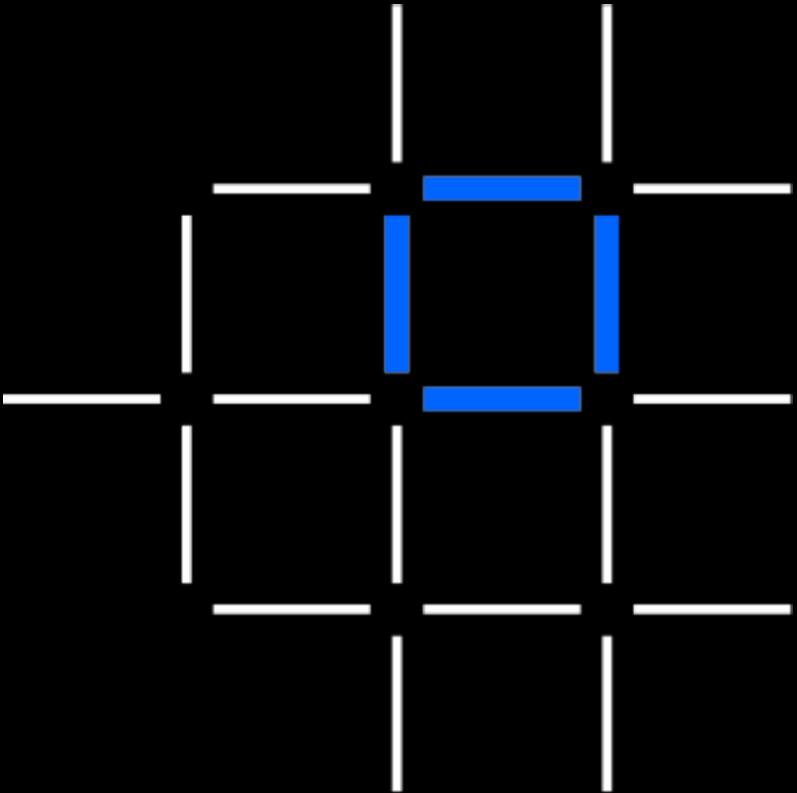
[Develop a Blockchain Application](#)



[Activate and Grow your Blockchain Network](#)



# Thank you



Questions? Tweet us or  
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