

Blockchain Explained

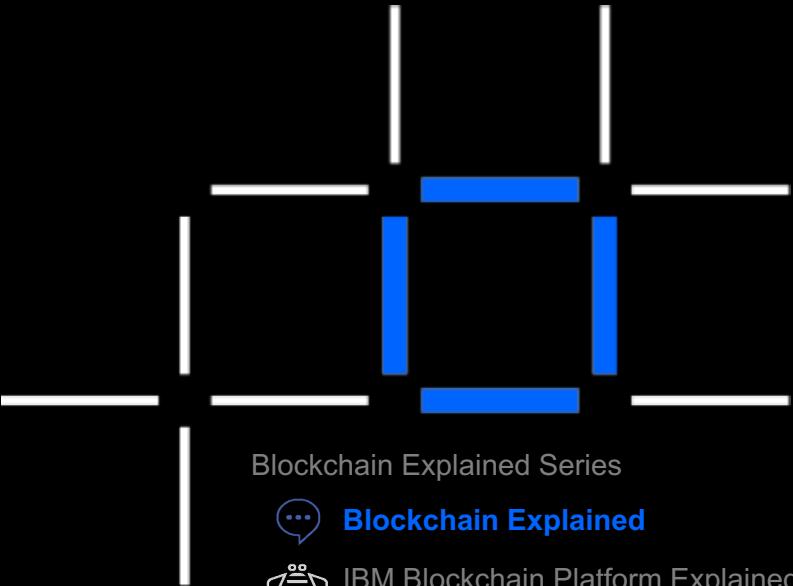
An Introduction to Blockchain for Business

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Blockchain Explained Series

-  [Blockchain Explained](#)
-  [IBM Blockchain Platform Explained](#)
-  [IBM Blockchain Usage Patterns](#)
-  [Solutions Explained](#)
-  [What's New](#)
-  [Labs Explained](#)





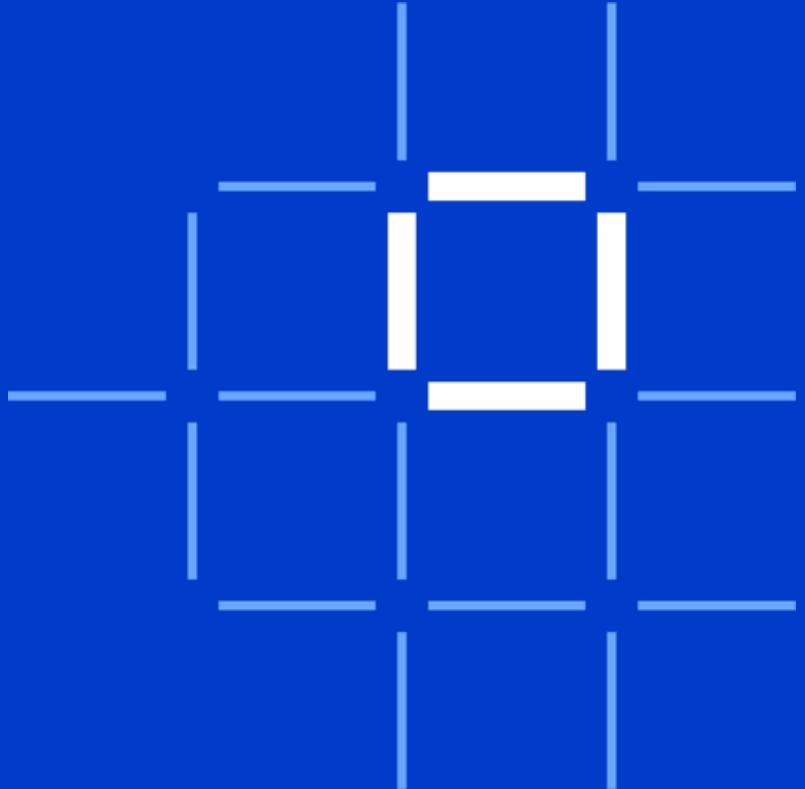
What is Blockchain?



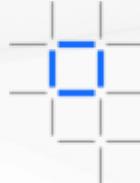
Example networks



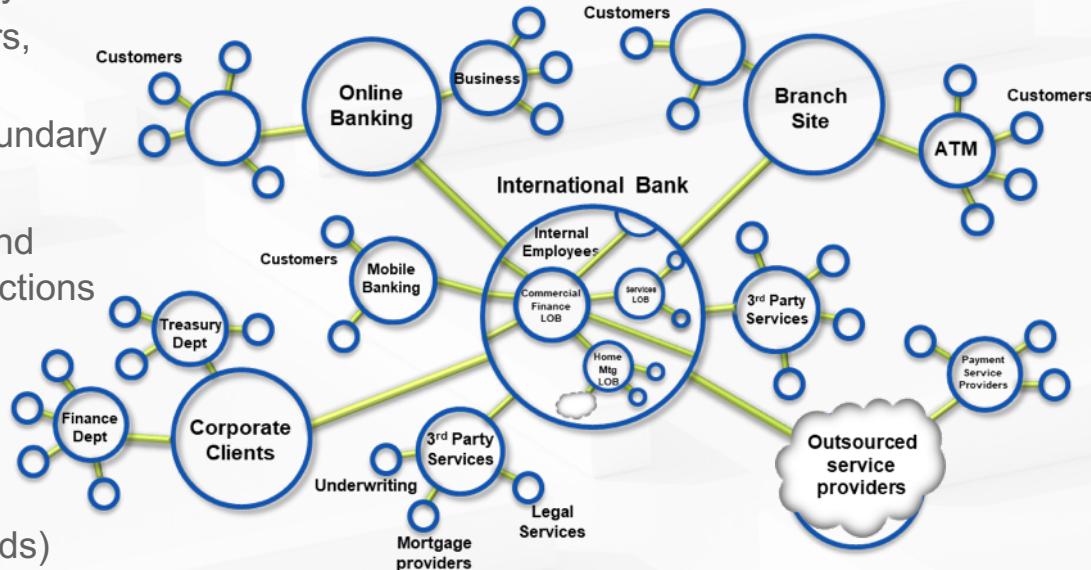
How can IBM help?

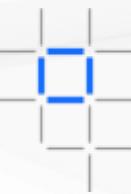


Business networks, wealth and markets



- **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

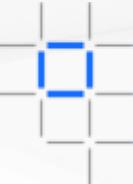
- Tangible, e.g. a house
- Intangible, e.g. a mortgage

Intangible assets subdivide

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

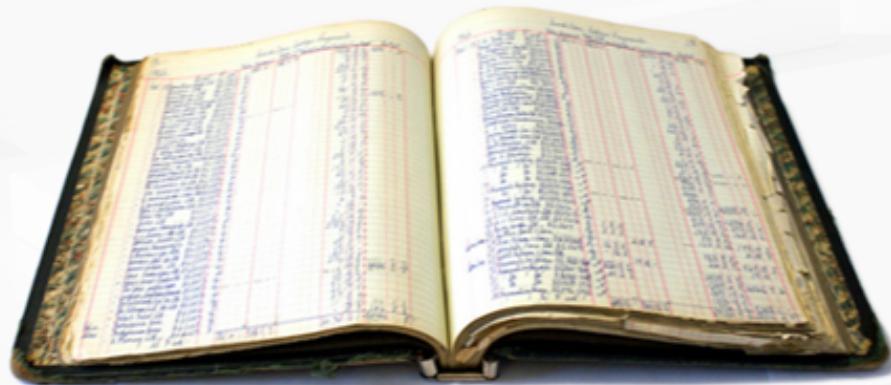
Cash is also an asset

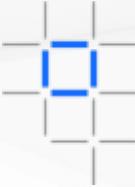
- Has property of anonymity



Ledgers, Transactions and Contracts

- **Ledger:** an important **log** of all transactions
 - Describes the inputs and outputs of the business
- **Transaction:** an **asset transfer** between participants
 - Matt gives a car to Dave (simple)
- **Contract:** the **conditions** for a transaction to occur
 - If Dave pays Matt money, then car passes from Matt to Dave (simple)
 - If car won't start, funds do not pass to Matt (as decided by third party arbitrator) (more complex)





Shared,
replicated,
permissioned
ledger

Blockchain
for
Business

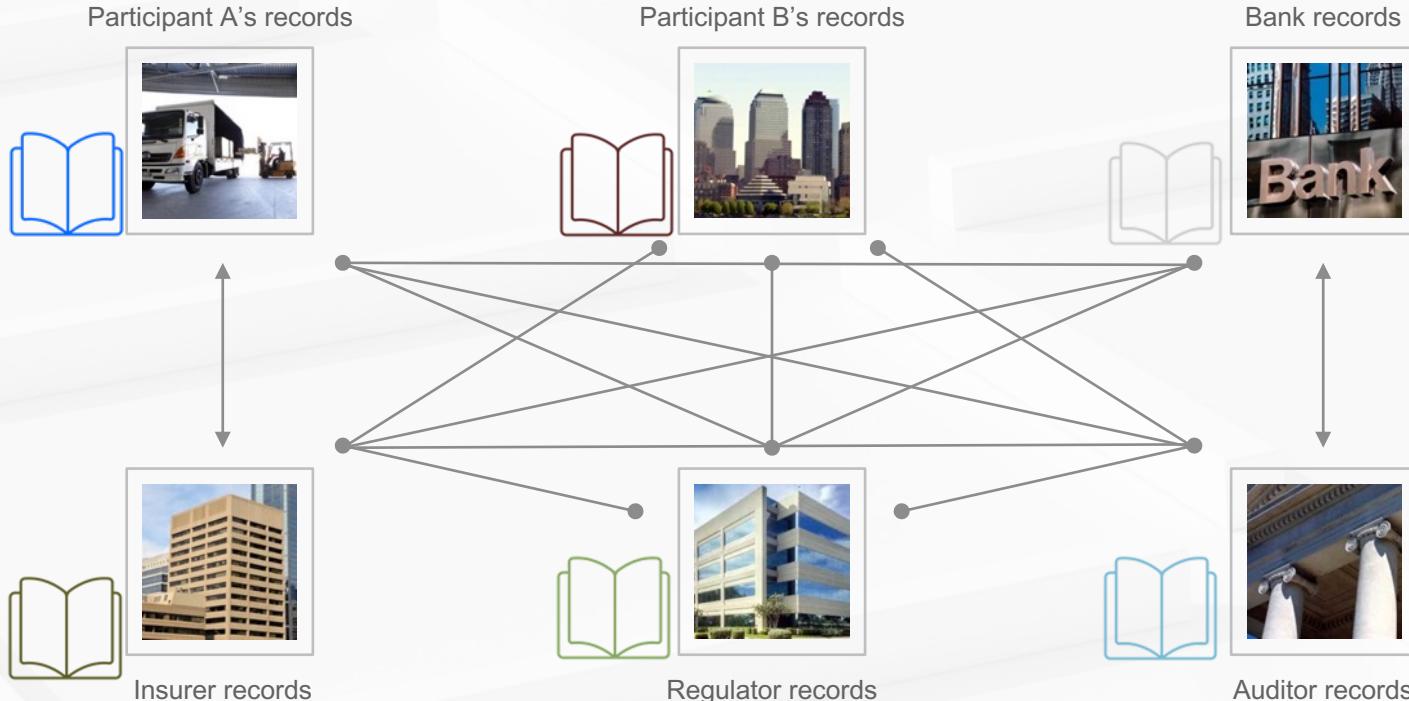
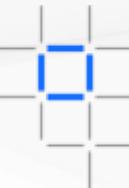
Smart
contracts

What is blockchain?

A growing list of records, called blocks, that are linked using cryptography. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data. By design, a blockchain is resistant to modification of the data.

Problem

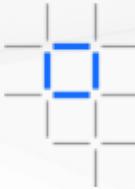
inefficient, expensive, vulnerable



Solution

A shared, replicated, permissioned ledger...

...with consensus, provenance, immutability and finality



Participant A's records



Participant B's records



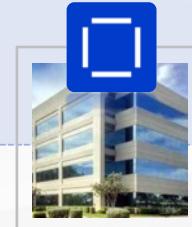
Bank records



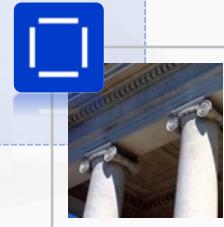
Blockchain



Insurer records



Regulator records



Auditor records

Different types of blockchain



- All blockchains aim to provide **irrefutable proof** that a set of transactions occurred between participants
- Different types of blockchain exist:



is an example of an unpermissioned, public blockchain

- The first blockchain application
 - Defines a shadow-currency and its ledger
 - Resource intensive
-
- Blockchains for business generally prioritize
 - **Assets** over cryptocurrency; **Identity** over anonymity; **Selective endorsement** over proof of work





Requirements of blockchain for business



ASSETS

Participants decide which assets to share



IDENTITY

Participants know who they are dealing with; information shared is need-to-know



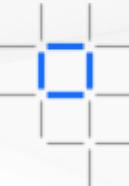
ENDORSEMENT

Participants give provable endorsement

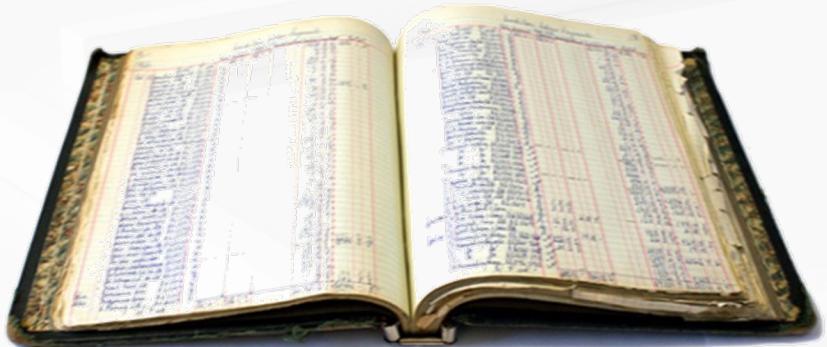


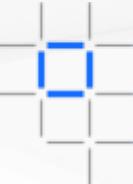
Assets

The business network decides what to share on the ledger



- **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





Identity

Knowing who you're dealing with

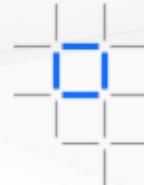
- Various regulations applied to businesses require them to know who they are dealing with
 - e.g. KYC, AML, CFT
- Identity is used to ensure business networks are kept **private** and individual transactions **confidential**
 - With transparency for the regulator
- There are established methods for obtaining and asserting identity
 - Cryptography is central to these
 - Identity allows transactions to be signed and encrypted





Transaction Endorsement

Provable verification by relevant participants



- 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





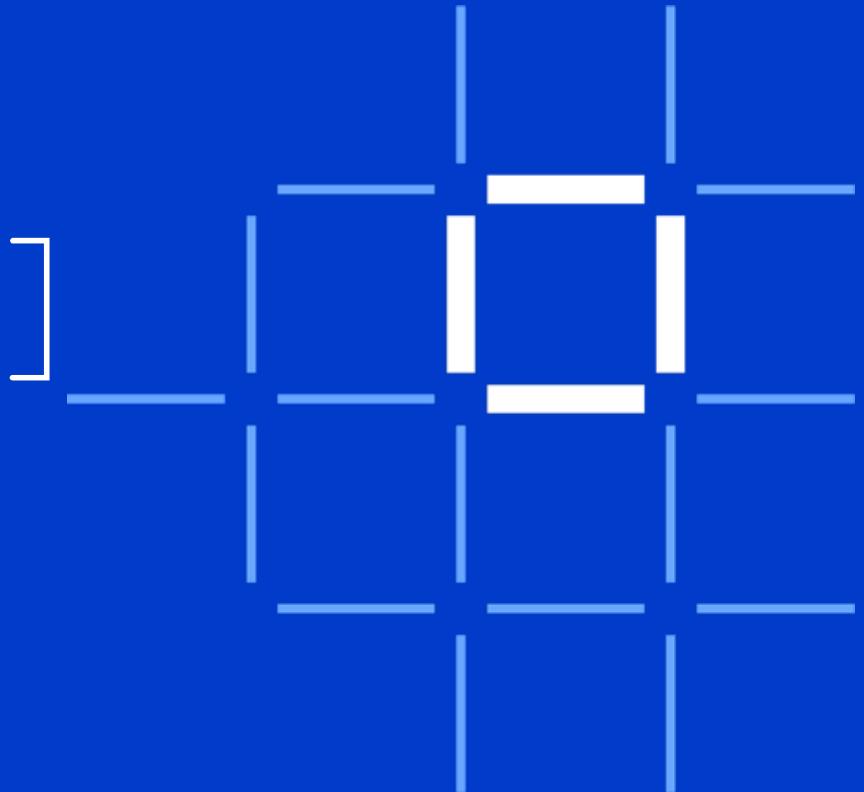
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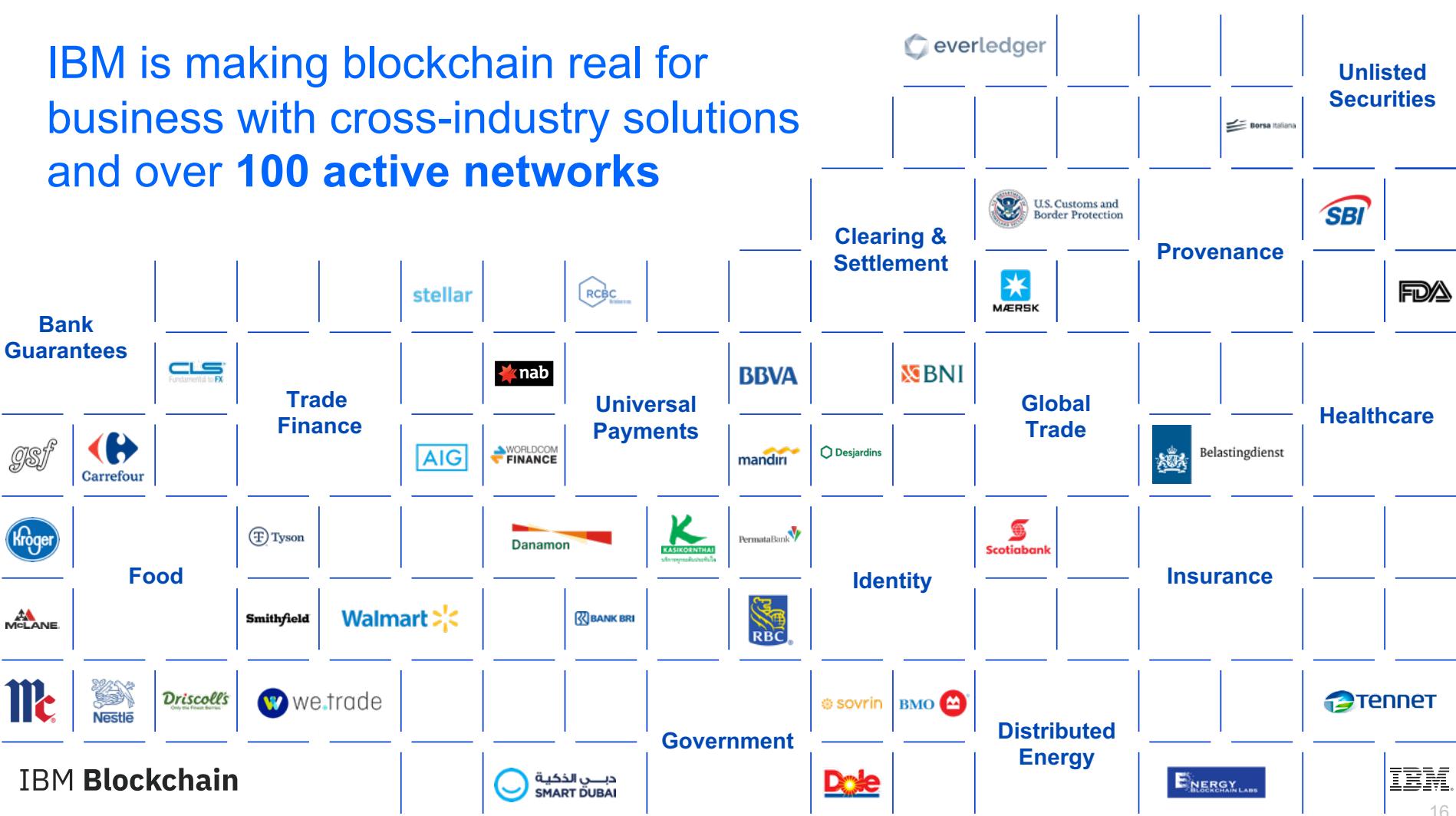
Example networks



How can IBM help?



IBM is making blockchain real for business with cross-industry solutions and over **100 active networks**



Only 1 in 4 consumers trust today's food ecosystem

Food Safety



1 out of 10 people get sick each year, and 420,000 die from foodborne illness

Supply Chain Inefficiency



80% of CPGs business are partially or entirely paper-based

Food Waste



1 / 3 of fresh food is thrown out because it is considered unacceptable

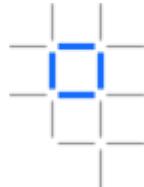
Food Fraud



1 in 5 seafood samples is mislabeled worldwide
(43% mislabeled in NYC)

The root of these issues, and many others, are the lack of trust and transparency

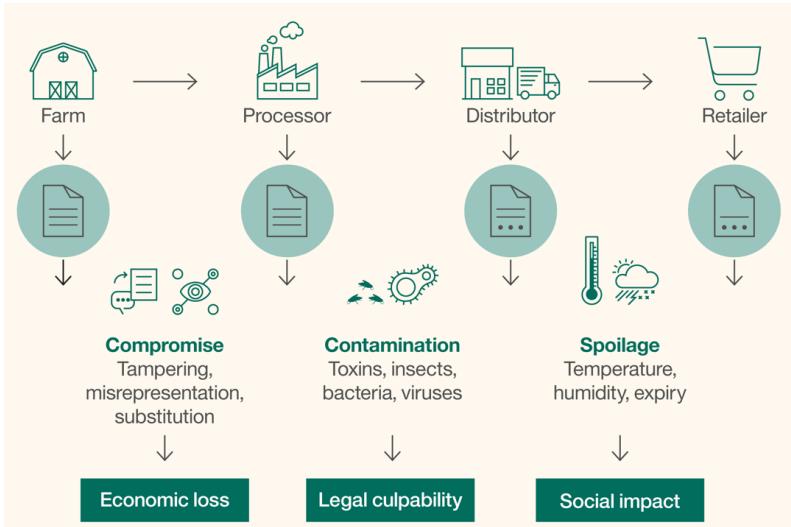
IBM Food Trust for supply chain transparency



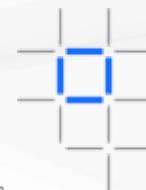
- IBM Food Trust is a set of modules providing traceability to improve food transparency and efficiency
- Blockchain is used to create a trusted connection with shared value for all ecosystem participants, including end consumers.

Benefits

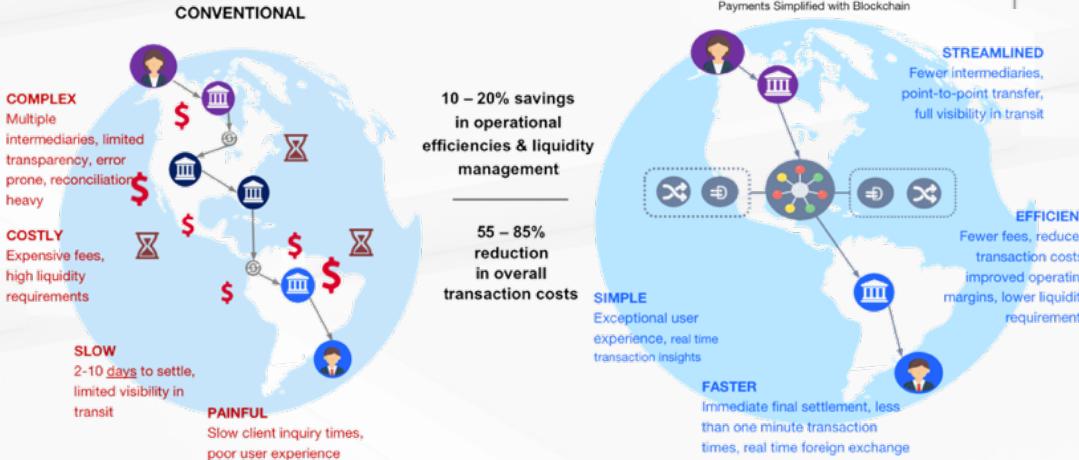
- Reduce impact of food recalls through instant access to end-to-end traceability data to verify history in the food network and supply chain.
- Help to address the 1 in 10 people sickened and 400,000 fatalities world wide which occur every year from food-born illnesses.



World Wire is revolutionizing global payments



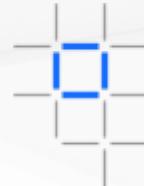
- IBM Blockchain World Wire is an integrated network for real-time clearing and settlement.
- Allows banks and financial institutions to send and settle payments around the globe with finality in a matter of seconds
- Eliminates enduring challenges that have long hampered the cross-border payments industry.



Benefits

- Payment support regardless of size, origination, destination or asset type
- Higher visibility for streamlined transactions with reduced disputes and reconciliation needs
- Enhanced regulatory compliance through improved transparency
- Secure network with interaction and eligibility criteria as well as robust access controls

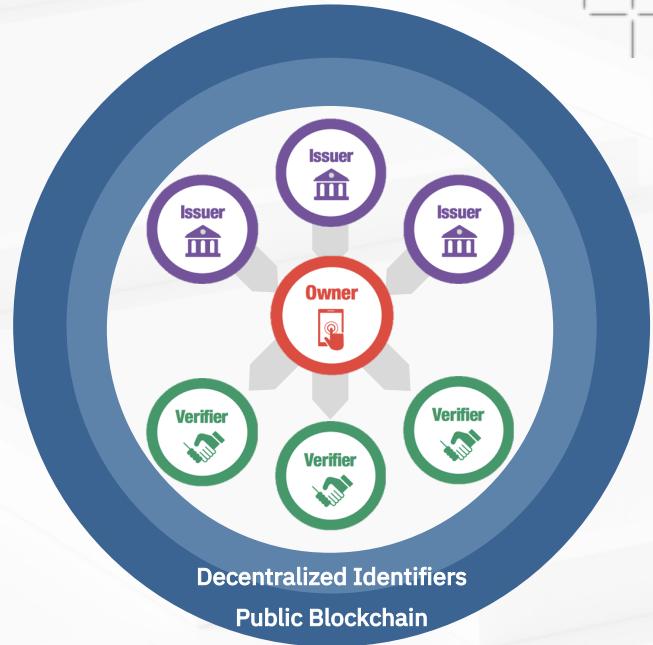
Decentralized trusted identity



- Sovrin pushes identity to the edge of the network
- Cryptographic, point to point exchange of identity
- Based on Hyperledger Indy technology

Benefits

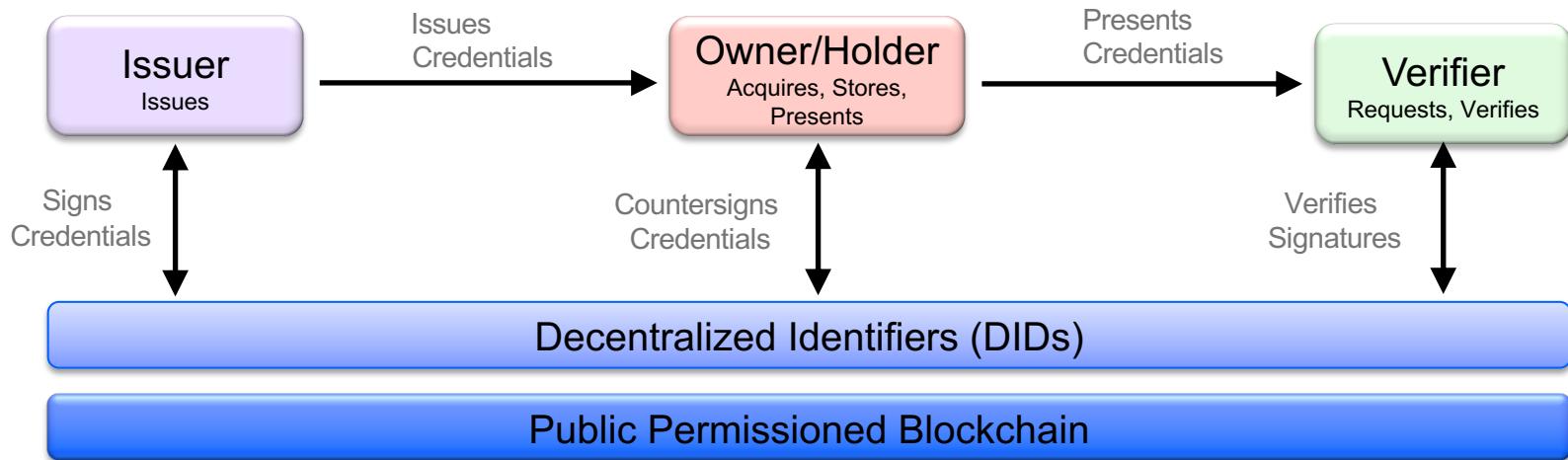
- A decentralized approach that establishes trust and puts the end user in control
- Every person, organization, and thing has a digital wallet to control the flow of their identity



 **sovrin**
identity for all

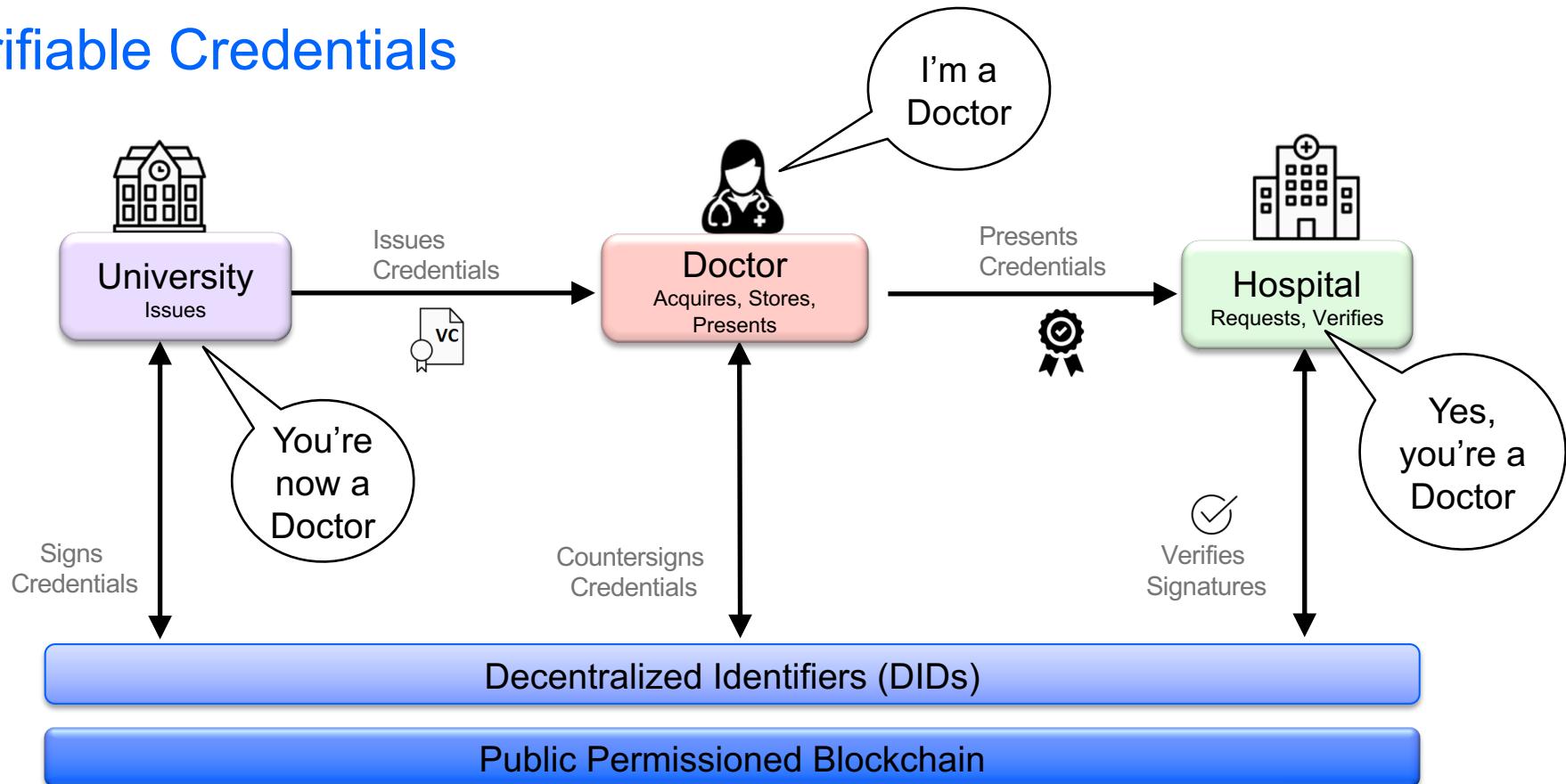
IBM

Decentralized Identity

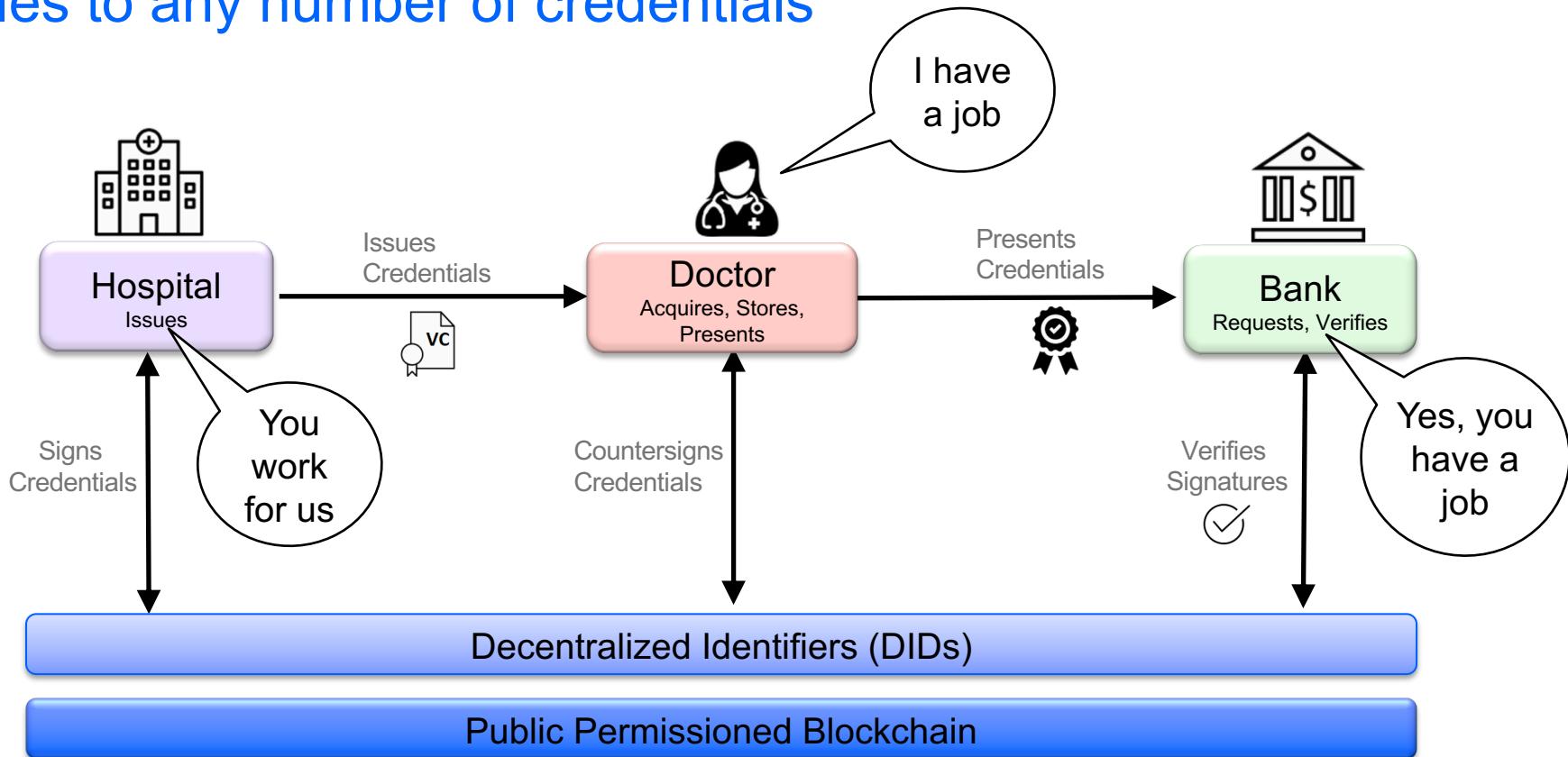


- All interactions between entities are point to point
- The public ledger serves as the distributed root of trust instead of CAs
- Credentials are accumulated over time through every peer to peer relationship

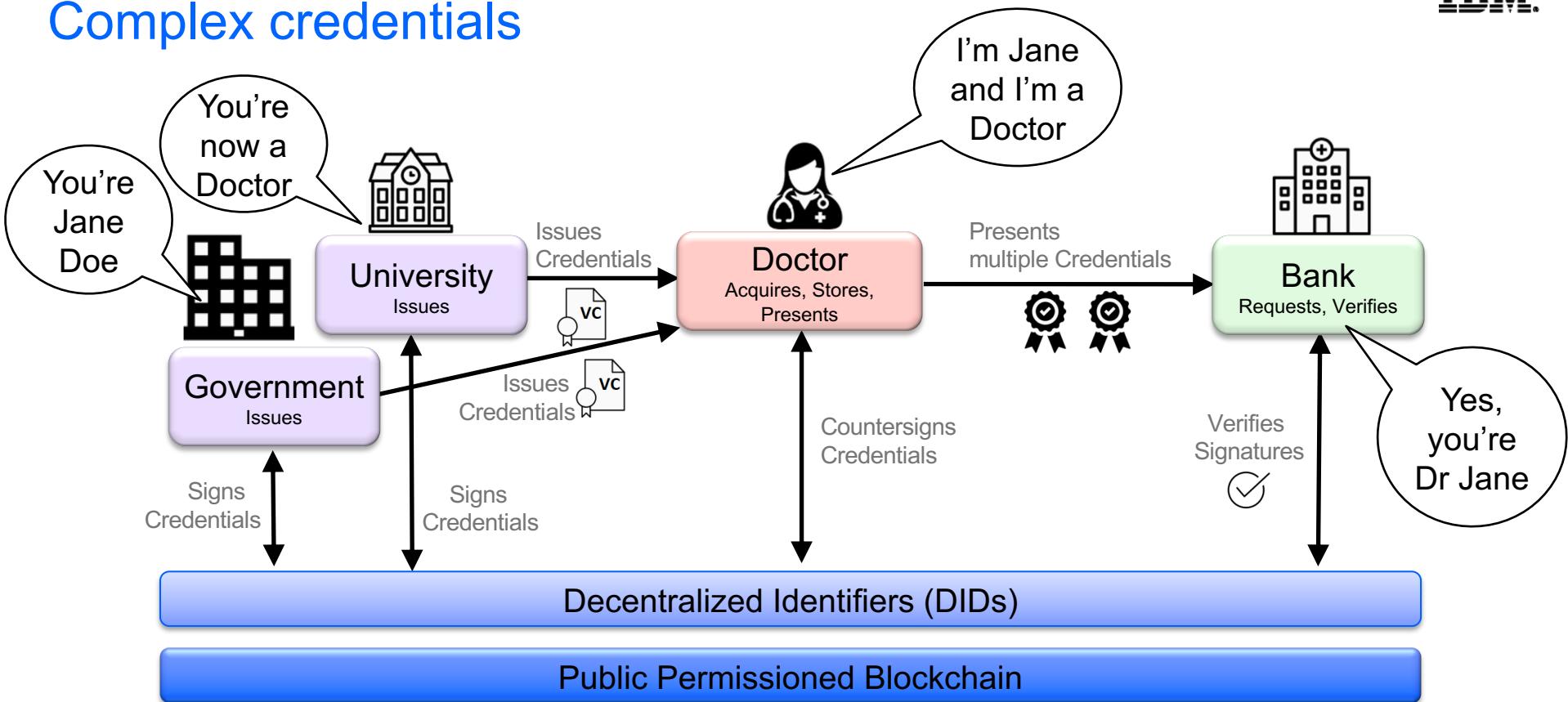
Verifiable Credentials



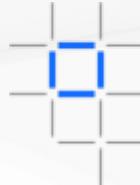
Scales to any number of credentials



Complex credentials



Further examples by (selected) industry



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

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 product and business process, or a new business process for an existing product



What is Blockchain?



Example networks



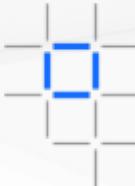
How can IBM help?

]



How IBM can help

The certainty to solve business challenges together



Security at Scale

Enterprise-grade security and control on a platform where businesses and industries are reinventing themselves

Trusted Expertise

Reinventing business processes through unrivaled industry and technical knowledge as you start, accelerate and innovate your blockchain network.

Network Convening Power

Bringing together an expansive partner network of innovators, regulators and suppliers to establish, join or run your blockchain network.

IBM's end-to-end Blockchain Strategy



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



IBM Blockchain Platform

Build and operate blockchain networks in heterogeneous environments

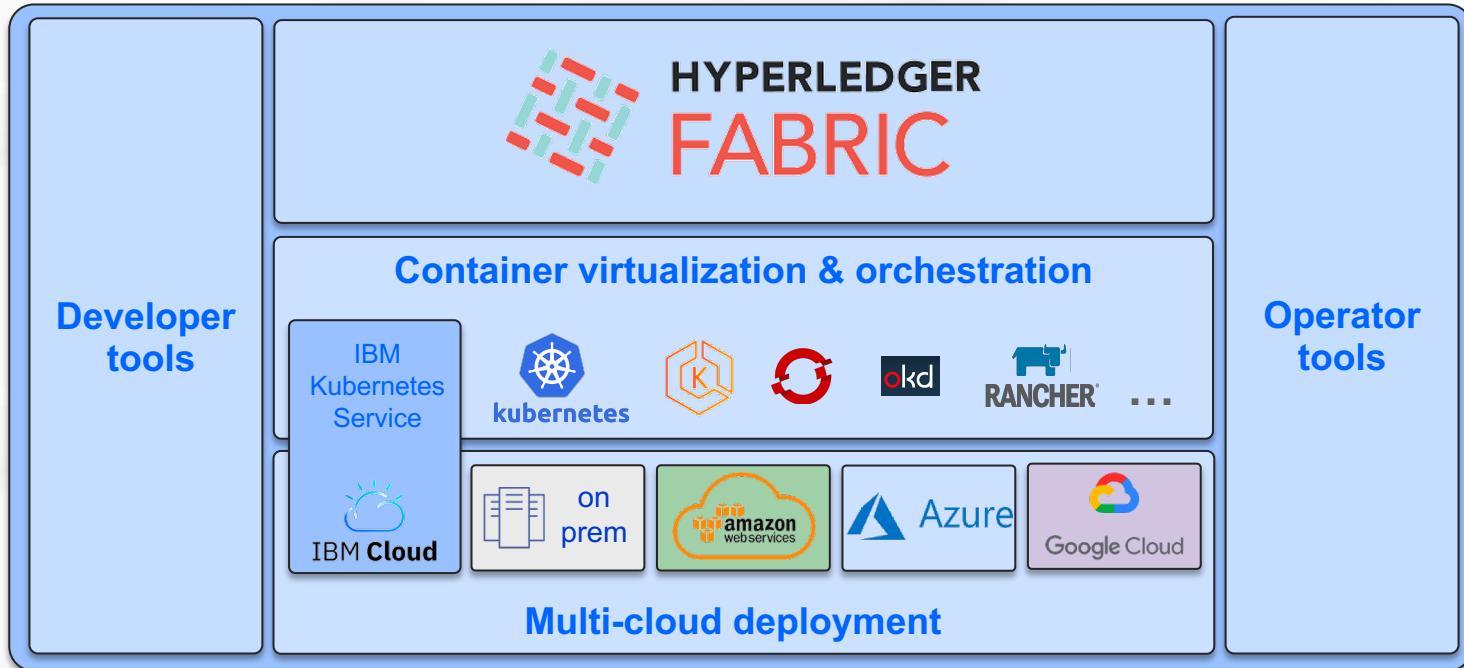
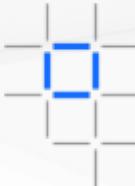


HYPERLEDGER

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

Introducing IBM Blockchain Platform

Build and operate Hyperledger Fabric networks



Advanced tooling

Create & manage smart contracts,
applications & networks

IBM Blockchain

Open technology

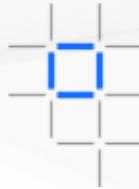
Hyperledger Fabric,
Containers, Kubernetes

Deploy anywhere

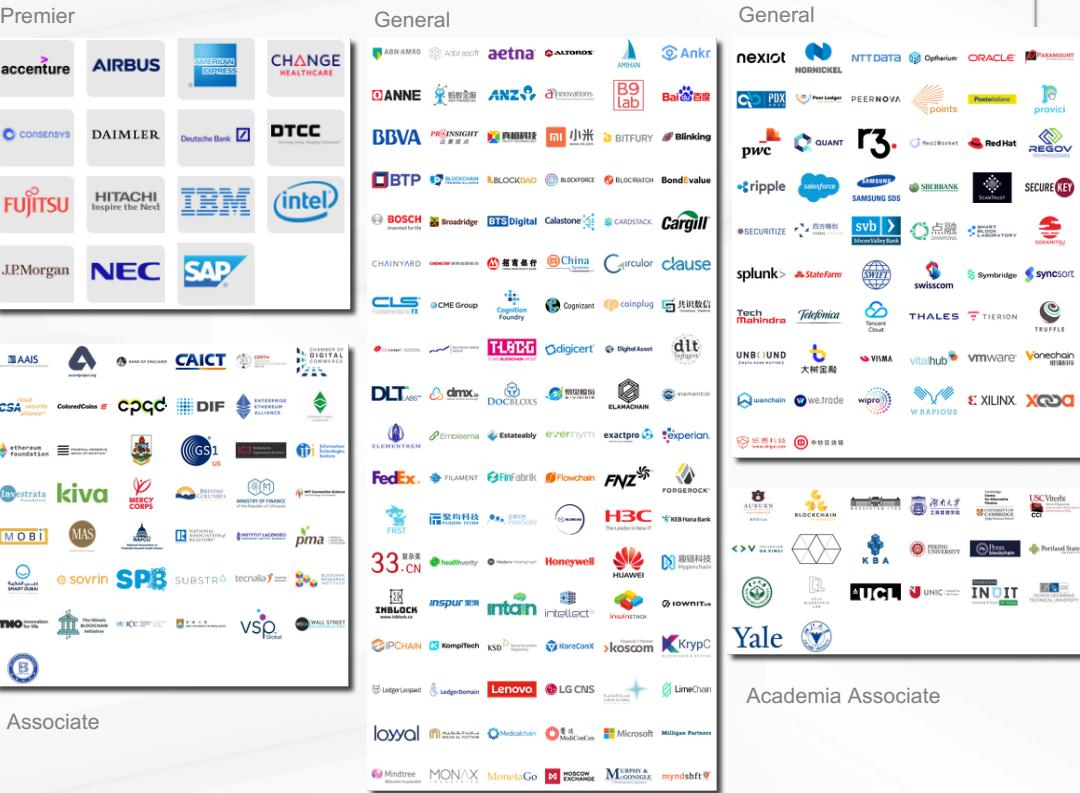
Comprehensive cloud &
on-premises options

IBM

Hyperledger: A Linux Foundation project

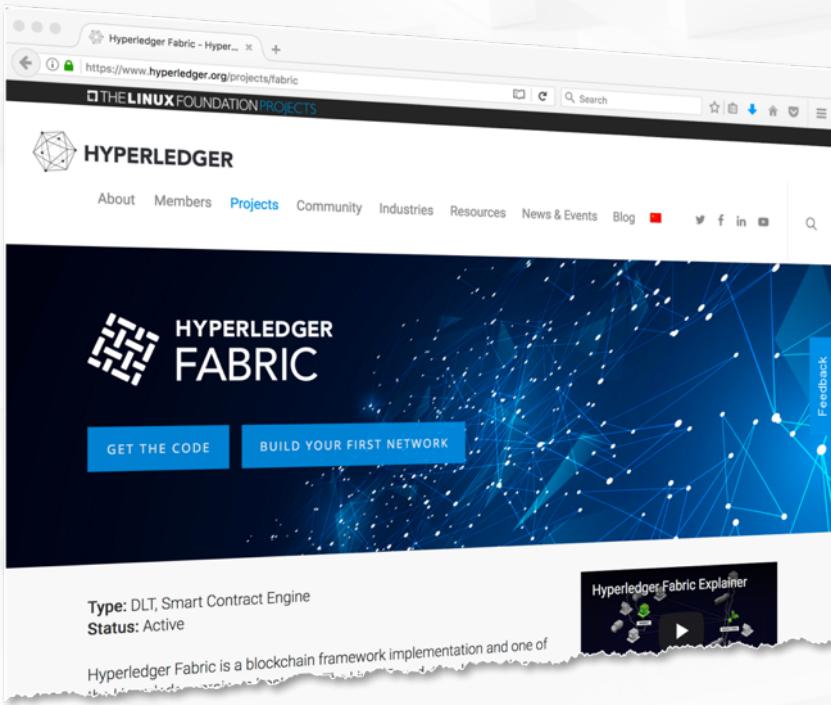
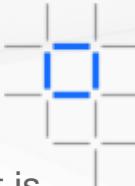


- IBM Blockchain Platform is underpinned by technology from the Hyperledger project
 - Hyperledger is a collaborative effort created to advance cross-industry blockchain technologies for business
 - Founded February 2016 and has since gathered significant cross-industry momentum
 - Open source
Open standards
Open governance model



Source: <https://www.hyperledger.org/members>
Updated: 24 January 2020

Distributed ledger



The screenshot shows the Hyperledger Fabric project page on the Linux Foundation website. The header includes the Hyperledger logo and navigation links for About, Members, Projects, Community, Industries, Resources, News & Events, and Blog. The main content features the Hyperledger Fabric logo and a large blue network graphic. Buttons for "GET THE CODE" and "BUILD YOUR FIRST NETWORK" are visible. Below the graphic, text indicates it's a DLT, Smart Contract Engine, and provides a status of Active. A note states it's a blockchain framework implementation. A "Hyperledger Fabric Explainer" video thumbnail is also present.

- An implementation of blockchain technology that is a foundation for developing blockchain applications
- Emphasis on ledger, smart contracts, consensus, confidentiality, resiliency and scalability.
- V1.4.4 released November 2019
 - V1.4 Long Term Service release with emphasis on production operational and serviceability enhancements; new programming model abstractions for ease of development
 - V2.0 currently in beta
- IBM is one of the many contributing organizations

Demo: Food Trust





Alex
Agency for Vehicle Standards



Paul
Buyer/Owner



Debbie
VDA
Regulations Administrator



Tommen
Insurer



Mike
Arium Logistics
Employee



Vada
Police

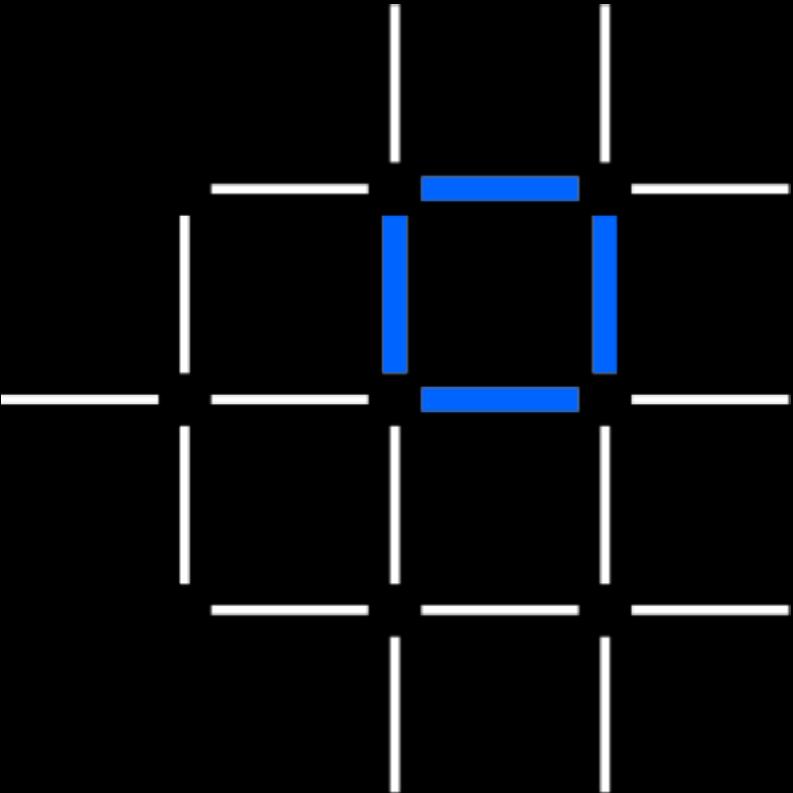
A central graphic features the word "BLOCKCHAIN" in large, bold, orange capital letters, enclosed within a rectangular frame that resembles a block. This frame is part of a larger, dark grey hexagonal shape that looks like a blockchain node. Three smaller, empty rectangular boxes are attached to the sides of this central node, representing additional blocks in the chain.

Thank you

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Questions? Tweet us or
go to ibm.com/blockchain

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-  IBM Blockchain
-  IBM Blockchain



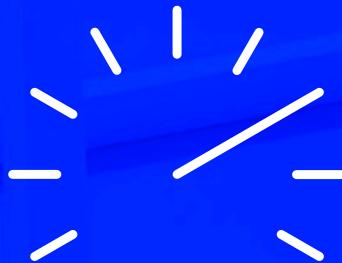
Get started on your blockchain journey

Start



Create or Join a network
Prioritize the best use cases and networks for your business, and rapid development of a minimum viable network in 12 weeks or less.

Accelerate



Commercialize your network
Apply proven frameworks & expertise to address complex legal/ governance & operational challenges, & deliver a production network.

Innovate



Extend a network
Build business models & new applications through the integration with established networks & advanced technologies.



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