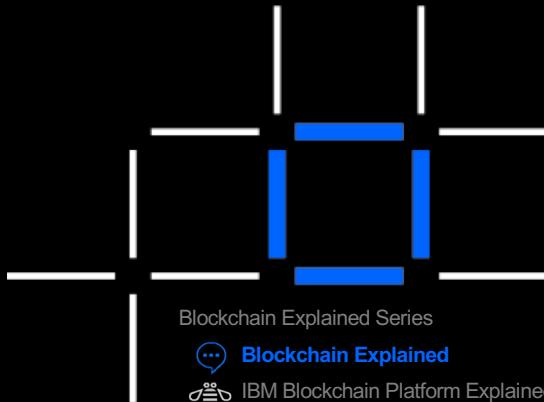


Blockchain Explained

An Introduction to Blockchain for Business

V5.16, 1 March 2019

IBM Blockchain



- [Blockchain Explained](#)
- [IBM Blockchain Platform Explained](#)
- [Solutions Explained](#)
- [Garage Explained](#)
- [What's New](#)
- [Next Steps](#)

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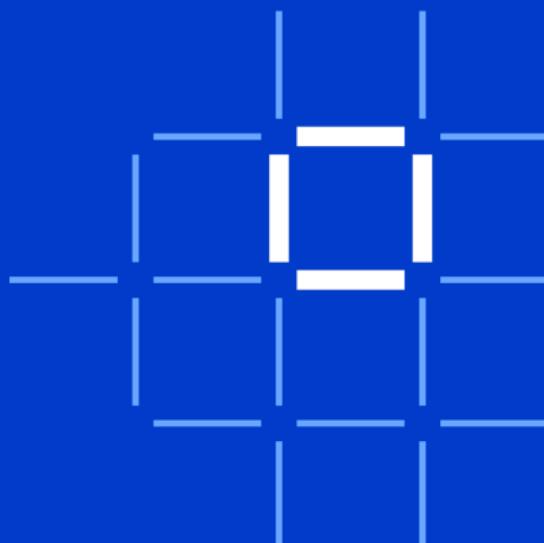
What is Blockchain?



Example networks



How can IBM help?

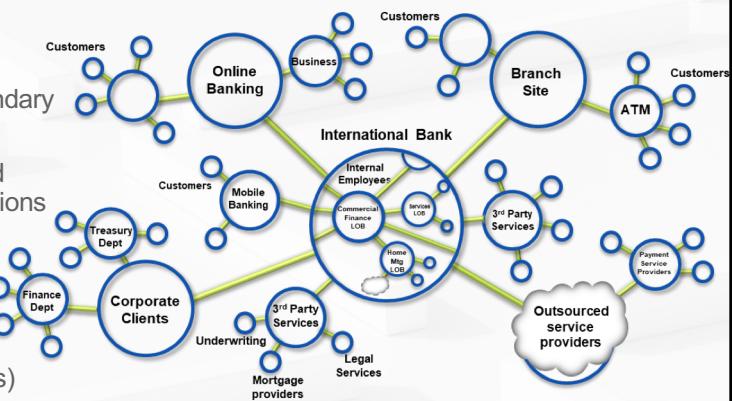


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Business networks, wealth and markets

- 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)



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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

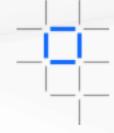
Cash is also an asset

- Has property of anonymity

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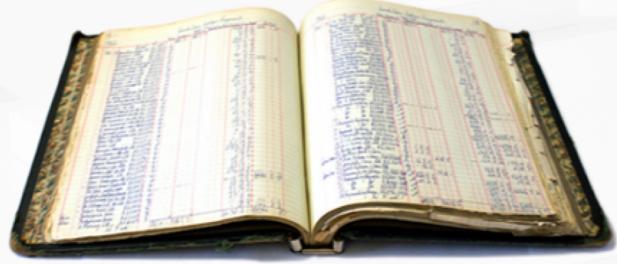
4

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)

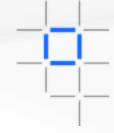
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Shared,
replicated,
permissioned
ledger

Blockchain
for
Business

Shared
business
rules

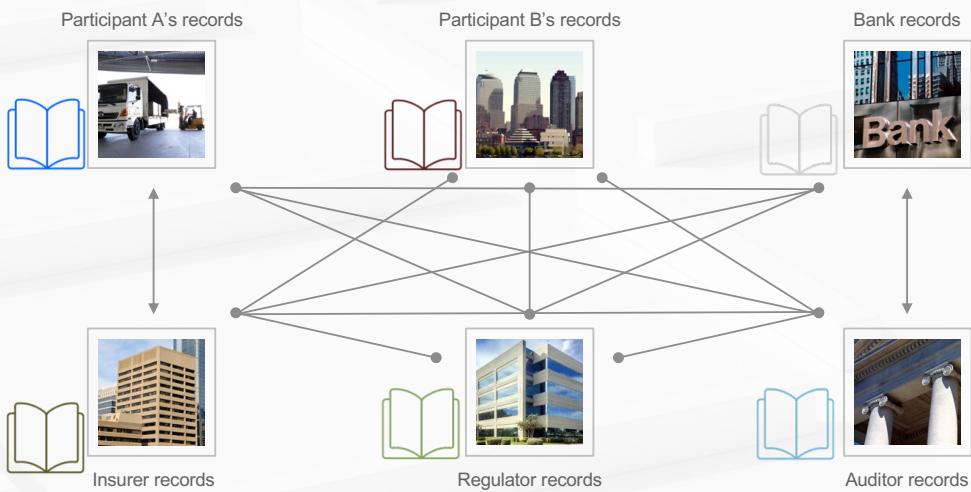
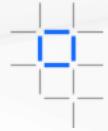


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Problem

inefficient, expensive, vulnerable

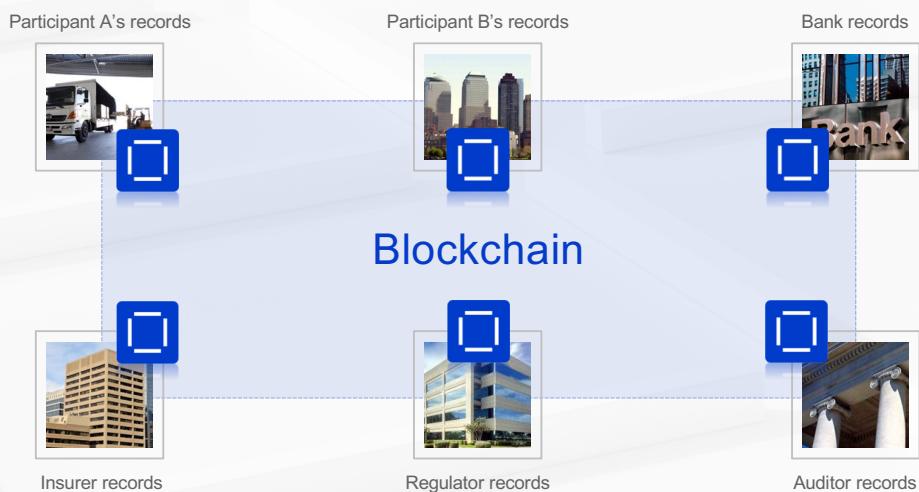
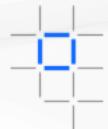


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Solution

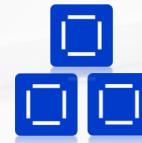
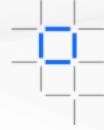
A shared, replicated, permissioned ledger...
...with consensus, provenance, immutability and finality



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Traditional databases cannot be used in untrusted networks



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

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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 generally prioritize
 - **Assets** over cryptocurrency; **Identity** over anonymity; **Selective endorsement** over proof of work



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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

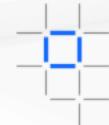
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Assets

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



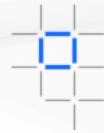
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Identity

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



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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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What is Blockchain?

[Example networks]

How can IBM help?

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

Bank Guarantees	CLS Fund manager in FX	Trade Finance	stellar	RCBC	Clearing & Settlement	everledger	Borsa Italiana	Unlisted Securities
gsf	Carrefour	AIG	nab	WORLDCOM FINANCE	BBVA	M&S	U.S. Customs and Border Protection	SBI
Kroger	Tyson	Danamon	mandiri	Desjardins	BNI	MAERSK	FDA	Healthcare
MLANE	Food	Smithfield	Walmart	BANK BRI	Global Trade	Provenance	Belastingdienst	
Mc	Nestle	Driscoll's	we.trade	SMART DUBAI	Identity	Scotiabank	Insurance	tennet
					Government	sovrin	BMO	Distributed Energy
						Dole	ENERGY INTELLIGENCE LABS	
								16

Example: TradeLens

What?

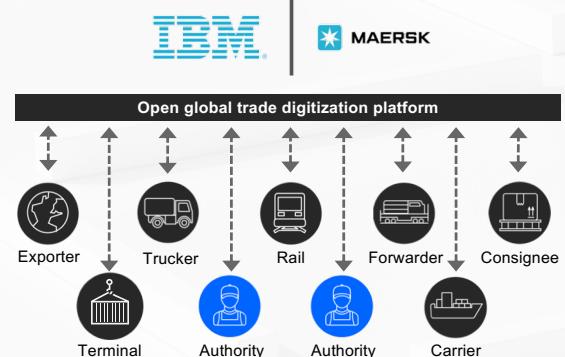
- An open, extensible platform for sharing shipping events, messages, and documents across all the actors and systems in the supply chain ecosystem.

How?

- Providing Shared Visibility and Shared State for Container Shipments

Benefits

- Increase speed and transparency for cross border transactions through real time access to container events.
- Reduced cost and increased efficiency through paperless trade



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Example: World Wire

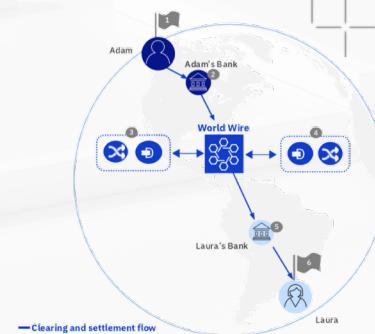
What?

- 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.

Current international payment system today



With IBM Blockchain World Wire tomorrow



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

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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

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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

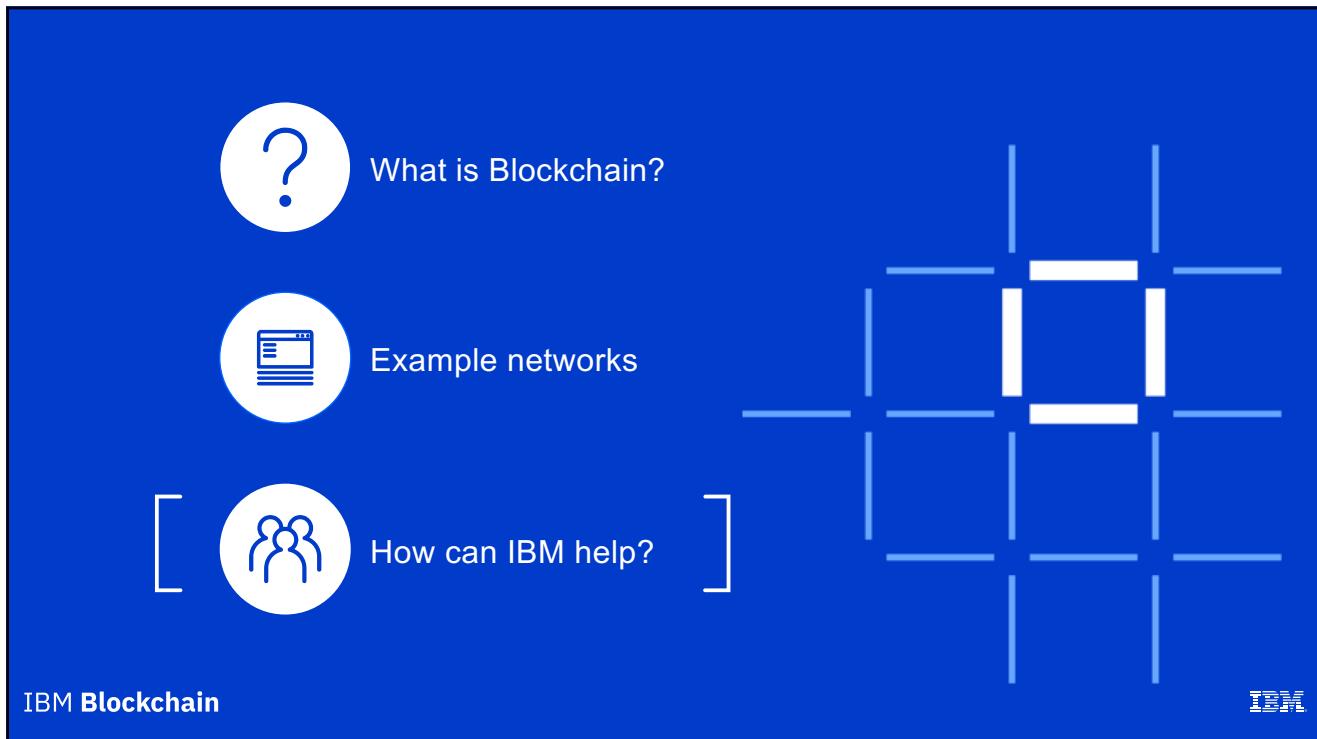
- Often funded by members of a business network
- Provide technical advice on industry trends
- Encourages best practice by making recommendations to members

Market Maker

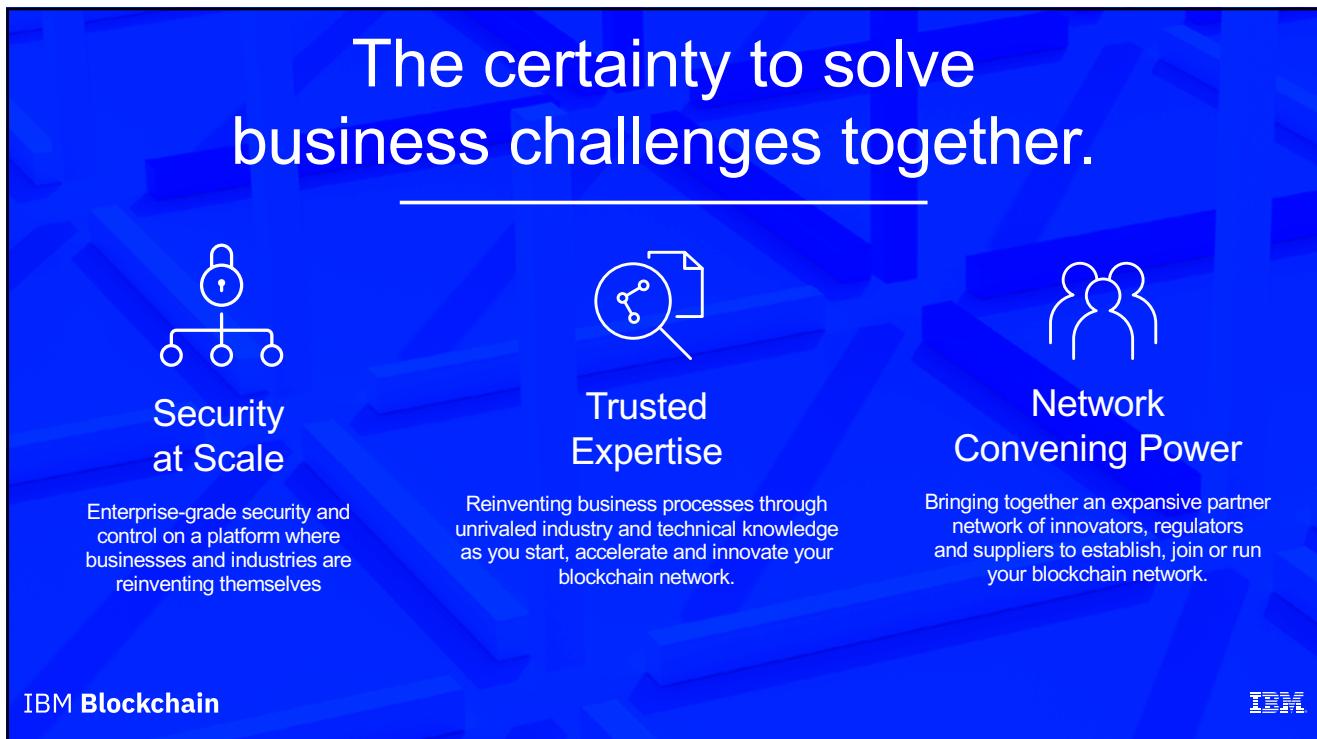
- In financial markets, takes buy-side and sell-side to provide liquidity
- More generally, the organization who innovates
- Creates a new product and business process, or a new business process for an existing product

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The landing page features a blue header with the IBM logo. Below the header, there's a large white circle containing a question mark icon, followed by the text "What is Blockchain?". Below that is another white circle containing a computer monitor icon, followed by the text "Example networks". At the bottom is a white circle containing two people icons, followed by the text "How can IBM help?". To the right of the text is a graphic of a grid of lines forming a cube-like structure. The bottom left corner has the text "IBM Blockchain" and the bottom right corner has the "IBM" logo.



The page has a blue background with a central white text area. The main heading reads "The certainty to solve business challenges together." Below this are three service sections: "Security at Scale" (with a lock icon), "Trusted Expertise" (with a magnifying glass icon), and "Network Convening Power" (with a people icon). Each section includes a brief description. The bottom left corner has the "IBM Blockchain" logo and the bottom right corner has the "IBM" logo.

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.

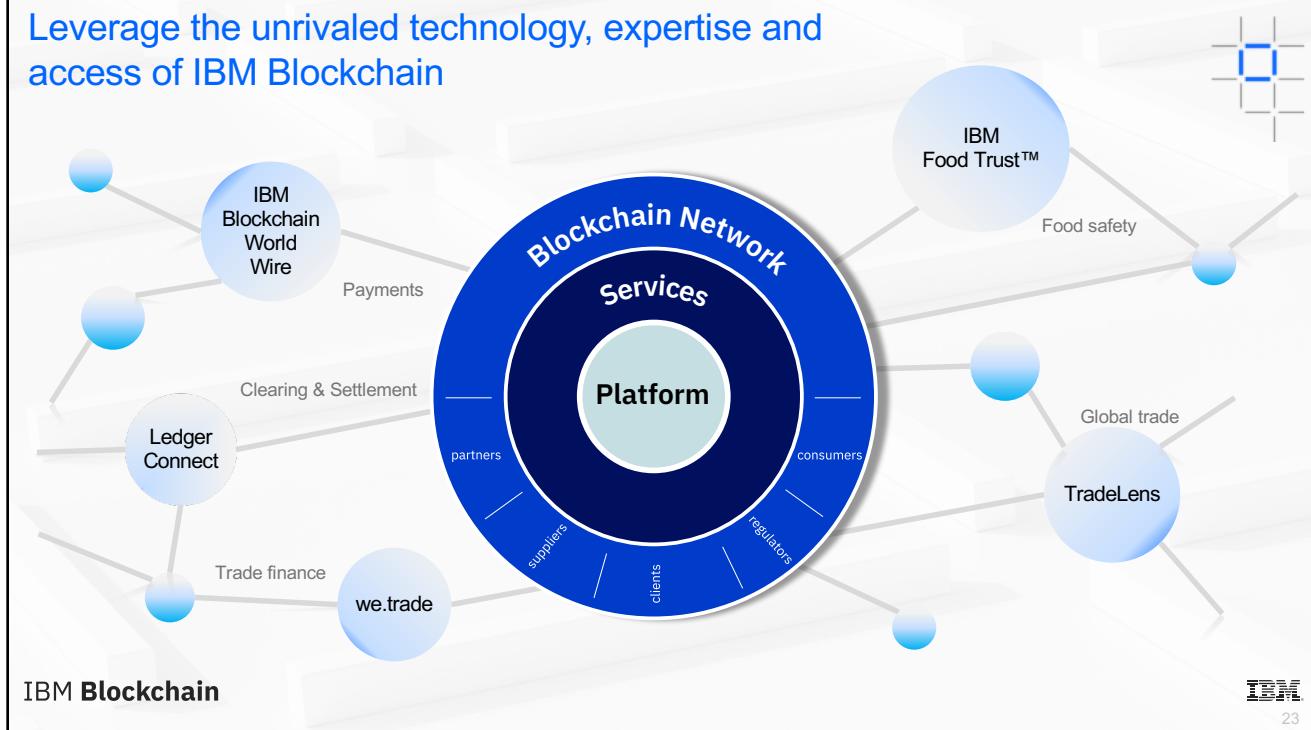
Network Convening Power

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

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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 will make use of Hyperledger Fabric SDK, to quickly build your blockchain application
- Hyperledger Fabric also provides the ledger, which is managed through a set of intuitive **operational tools**
- **Governance tools** for democratic management of the business network
- **Deploy anywhere** - including AWS, on-premises and a highly secure and performant IBM Cloud environment

IBM Blockchain Platform Explained

Developer Tools

Blockchain application

Hyperledger Fabric

Multi-cloud hybrid environments

Operational Tools

Governance Tools

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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 **260 member organizations**
- Open source
Open standards
Open governance model



Source: <https://www.hyperledger.org/members>

Updated: 8 January 2019

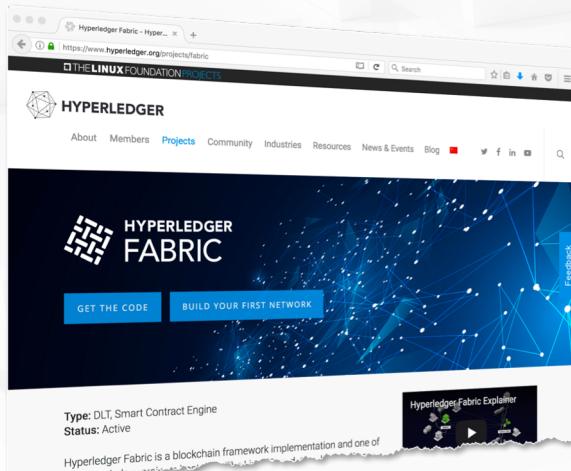
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**HYPERLEDGER
FABRIC**

Distributed ledger



- 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 released January 2019
 - Long Term Service release with emphasis on production operational and serviceability enhancements
 - New programming model abstractions for ease of development
- IBM is one of the many contributing organizations



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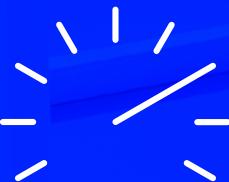
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Get started on your blockchain journey

Start



Accelerate



Innovate



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.

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

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

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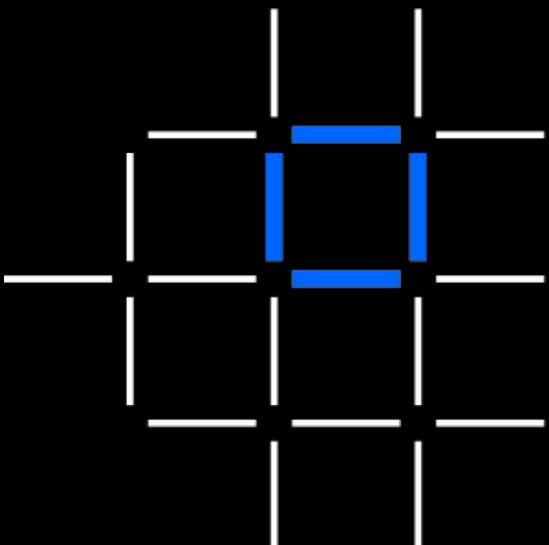
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Thank you

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