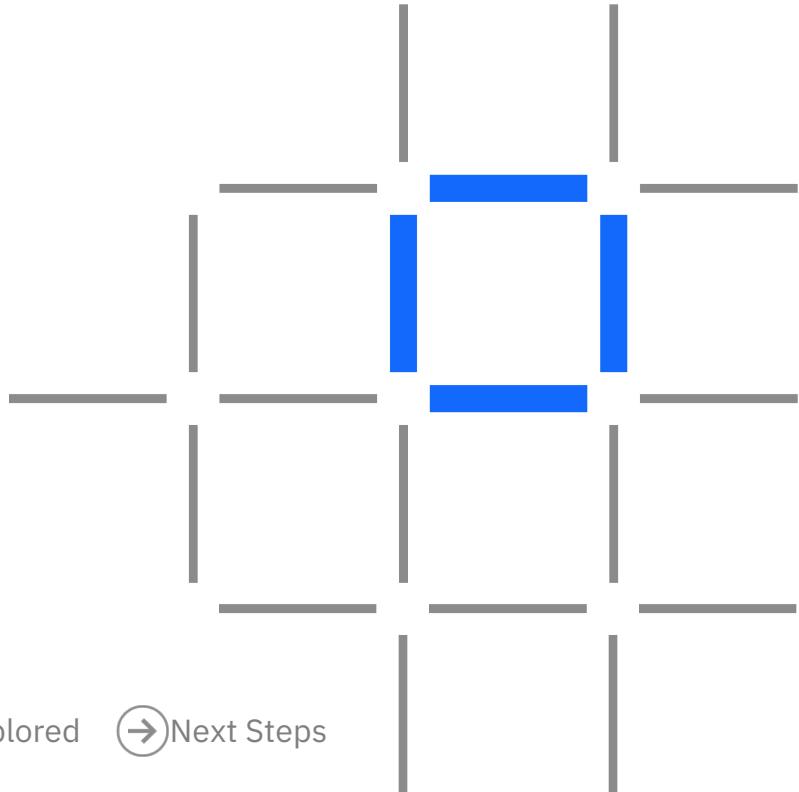


Blockchain Explained

An Introduction to Blockchain for Business

IBM Blockchain

Pål Krogdahl
IBM Blockchain Nordic



Explained

Solutions

Composed

Architected

Explored

Next Steps



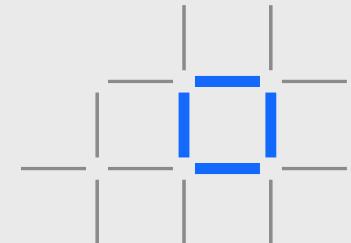
What is Blockchain?



Why is it relevant for
our business?

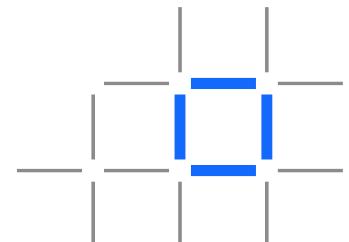
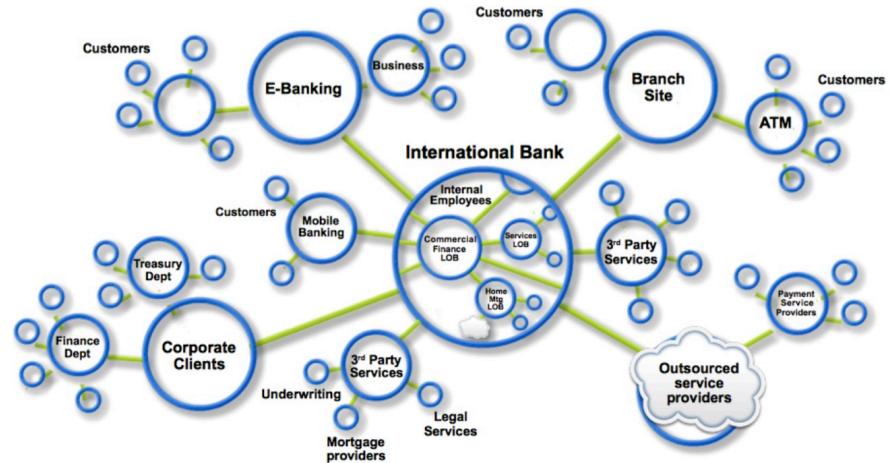


How can IBM help us
apply blockchain?



Business networks, wealth and markets

- **Business Networks** benefit from connectivity
 - Participants are customers, suppliers, banks, partners
 - Cross geography & 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

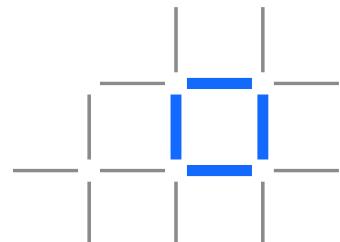
- Tangible, e.g. a house
- Intangible, e.g. a mortgage

Intangible assets subdivide

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

Cash is also an asset

- Has property of anonymity

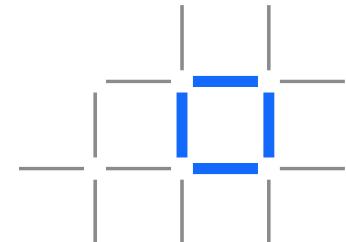
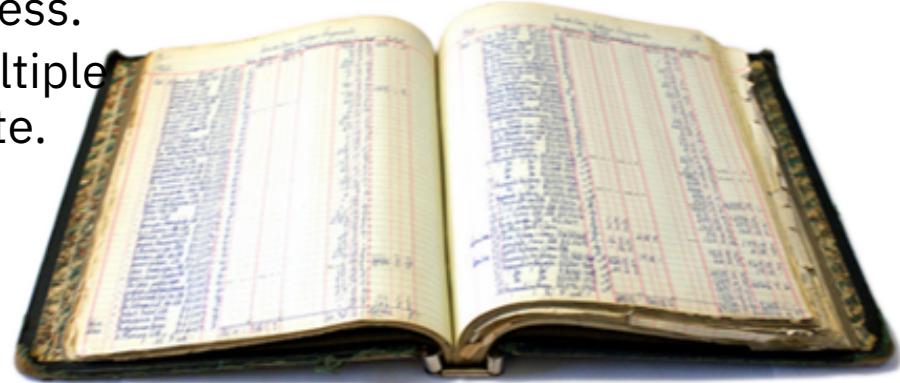


Ledgers are key

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 ...

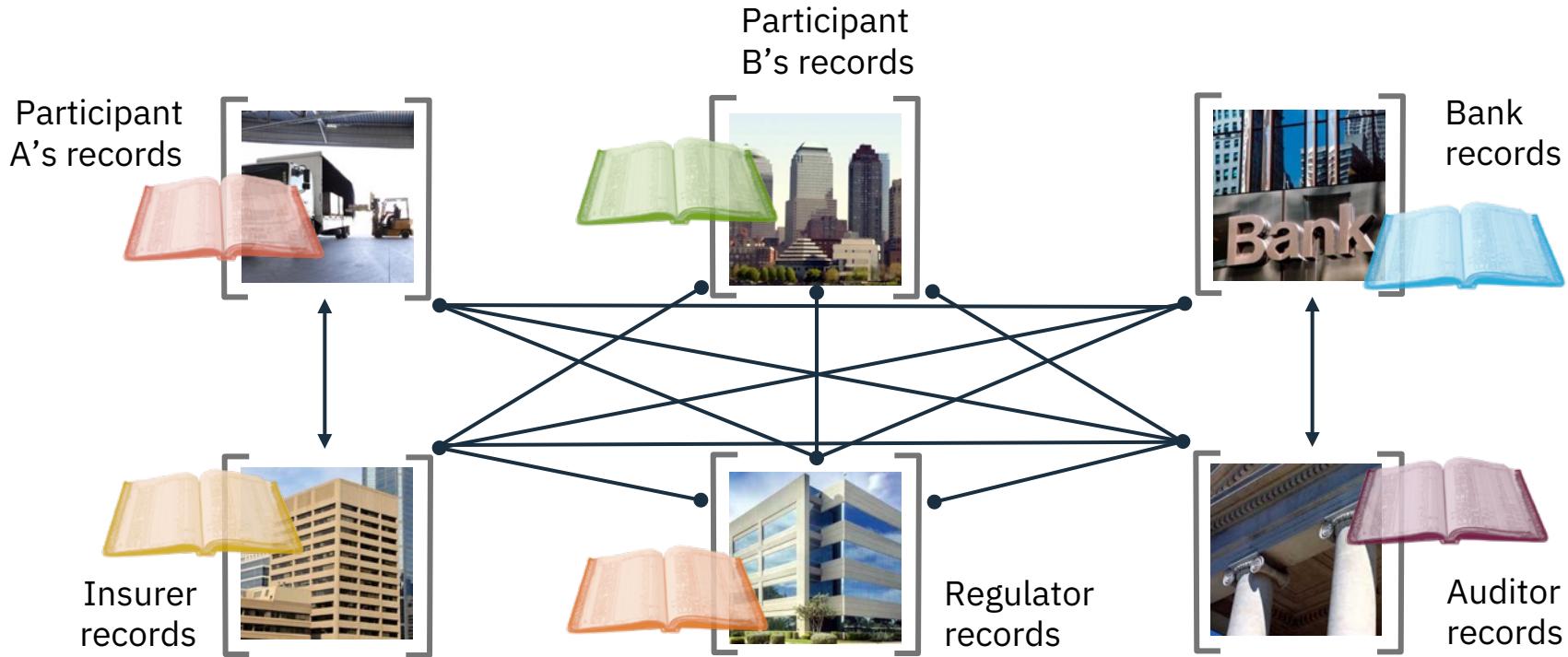
IBM Blockchain

A trusted,
distributed
ledger

Blockchain

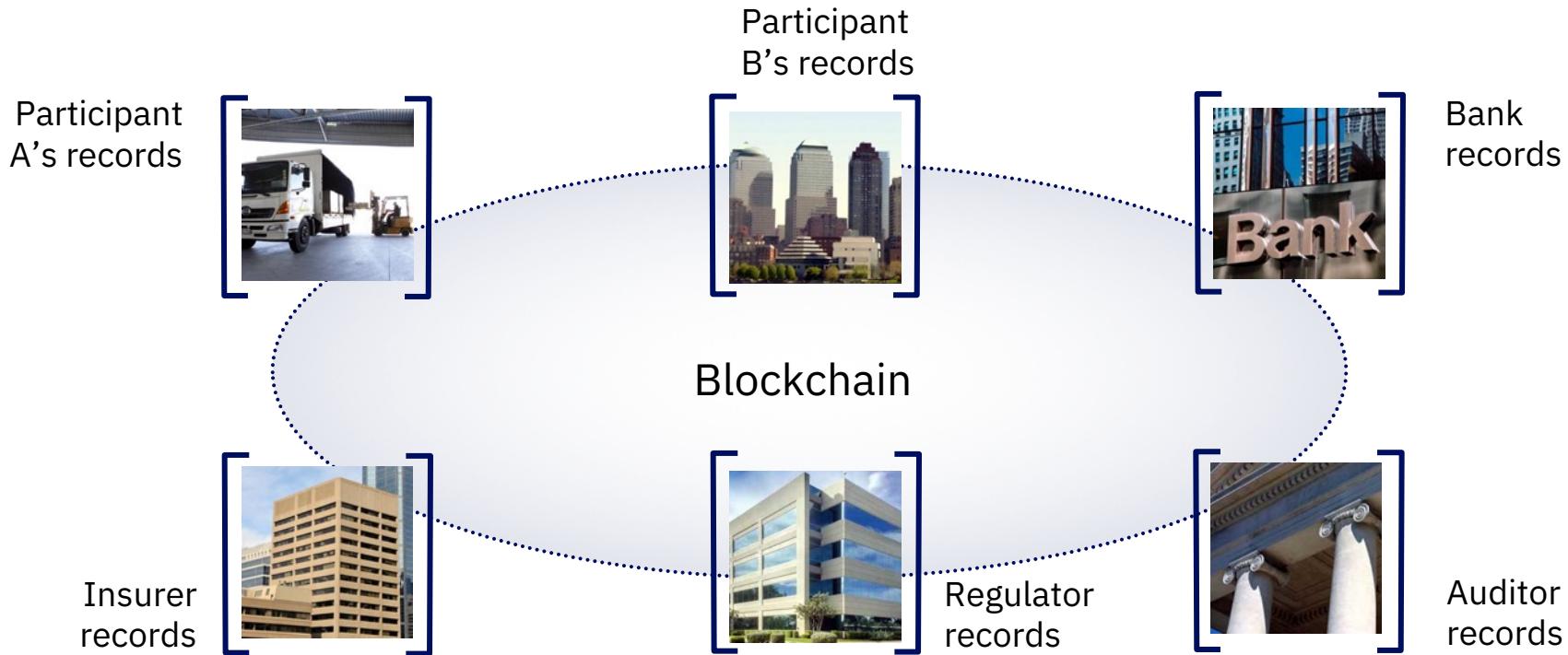
with shared
business
processes

Problem ...



... inefficient, expensive, vulnerable

A shared, replicated, permissioned ledger ...



... with consensus, provenance, immutability and finality

Blockchain underpins Bitcoin

IBM Blockchain

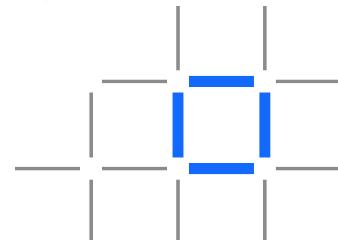


is:

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

Blockchain for business differs in key areas:

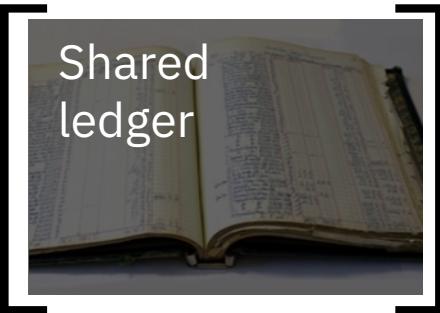
- Identity over anonymity
- Selective endorsement over proof of work
- Assets over cryptocurrency



Requirements of blockchain for business

IBM Blockchain

Append-only
distributed system of
record shared across
business network



Smart
contract



Business terms
embedded in
transaction
database
& executed with
transactions

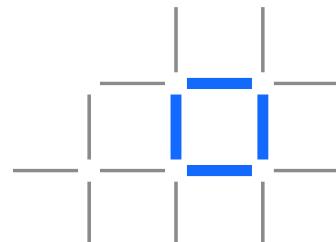
Ensuring appropriate
visibility; transactions
are secure,
authenticated
& verifiable



Trust



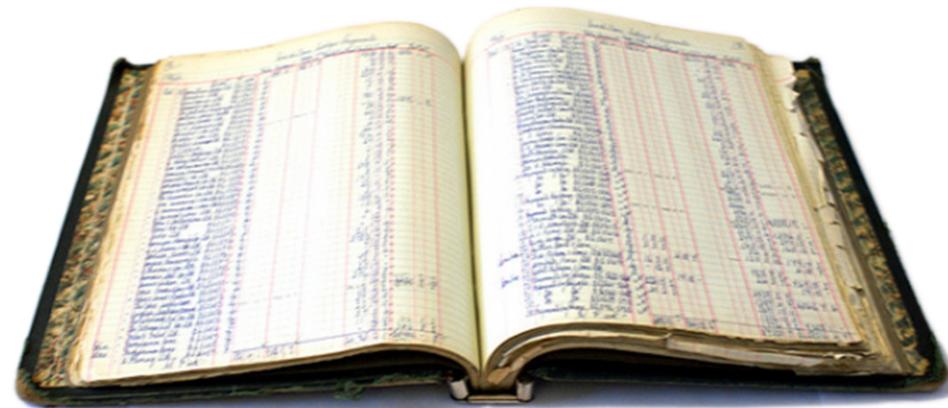
Transactions are
endorsed by
relevant
participants



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





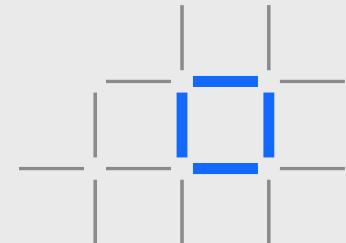
What is Blockchain?



Why is it relevant for
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How can IBM help us
apply blockchain?



Blockchain is creating extraordinary opportunities for businesses to come together in new ways

Create New Value

Exploit new business models and eliminate inefficiencies

Optimize Ecosystems

Streamline business processes and the exchange of value along your ecosystem

Reduce Risk

Replace uncertainty with transparency and a trusted decentralized ledger



Example: Shared reference data



What	• Competitors/collaborators in a business network need to share reference data, e.g. bank routing codes • Each member maintains their own codes, and forwards changes to a central authority for collection and distribution • An information subset can be owned by organizations	Benefits
How	• Each participant maintains their own codes within a Blockchain network • Blockchain creates single view of entire dataset	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

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

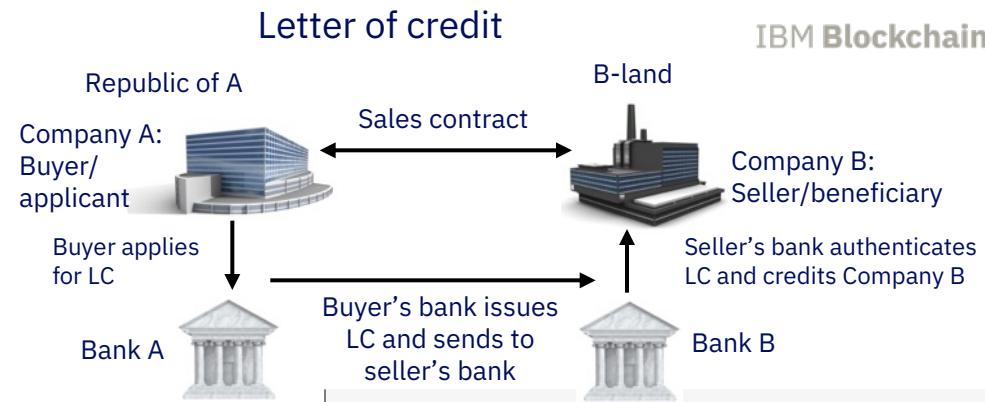


- What
- Financial data in a large organization dispersed throughout many divisions and geographies
 - Audit and Compliance needs indelible record of all key transactions over reporting period

- 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

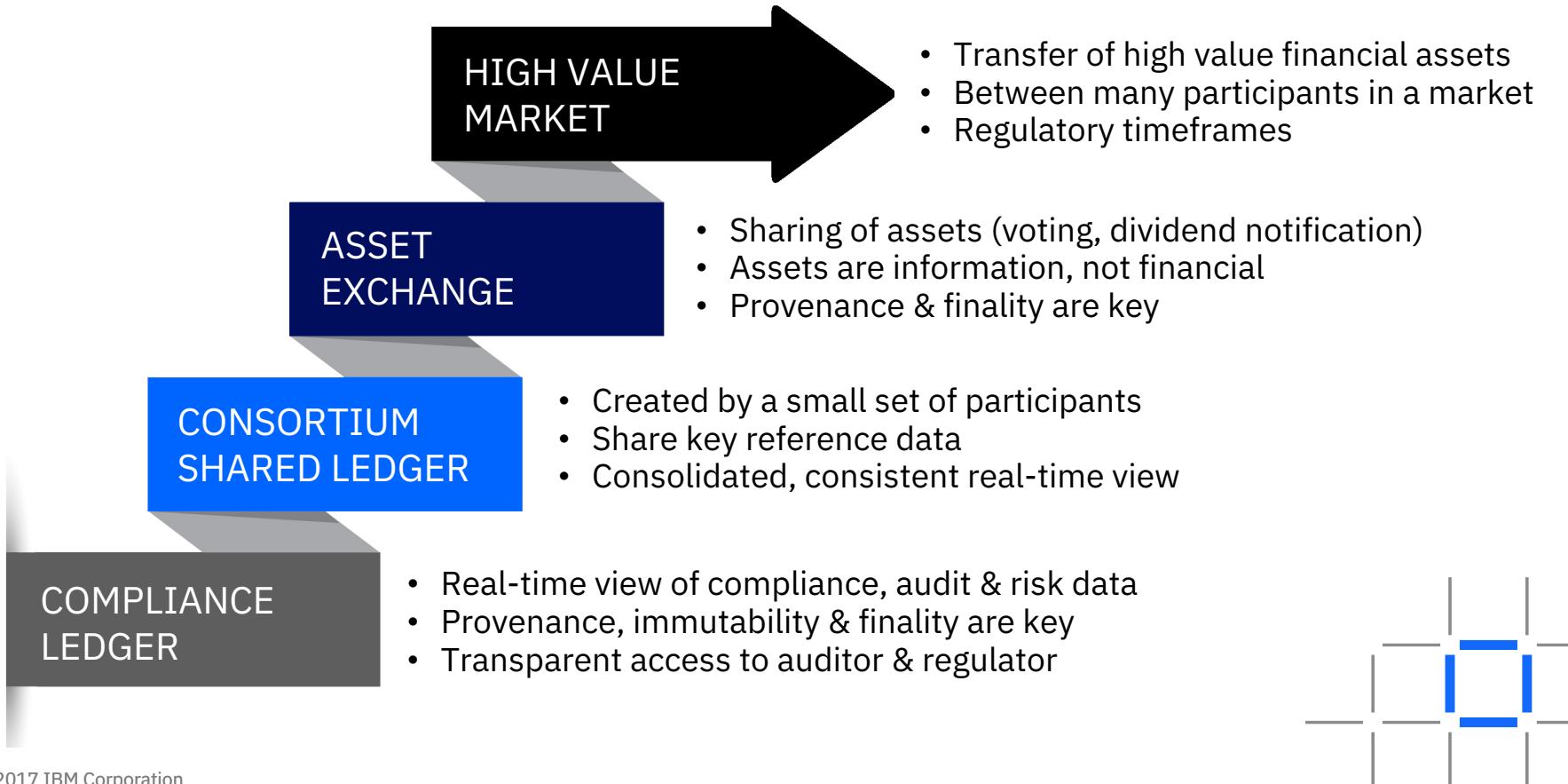
Further examples by (selected) industry



Financial	Public Sector	Retail	Insurance	Manufacturing
<ul style="list-style-type: none"> • Trade Finance • Cross currency payments • Mortgages • Shared Ref Data 	<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

Patterns for customer adoption

IBM Blockchain



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



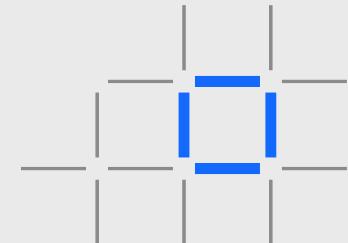
What is Blockchain?



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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

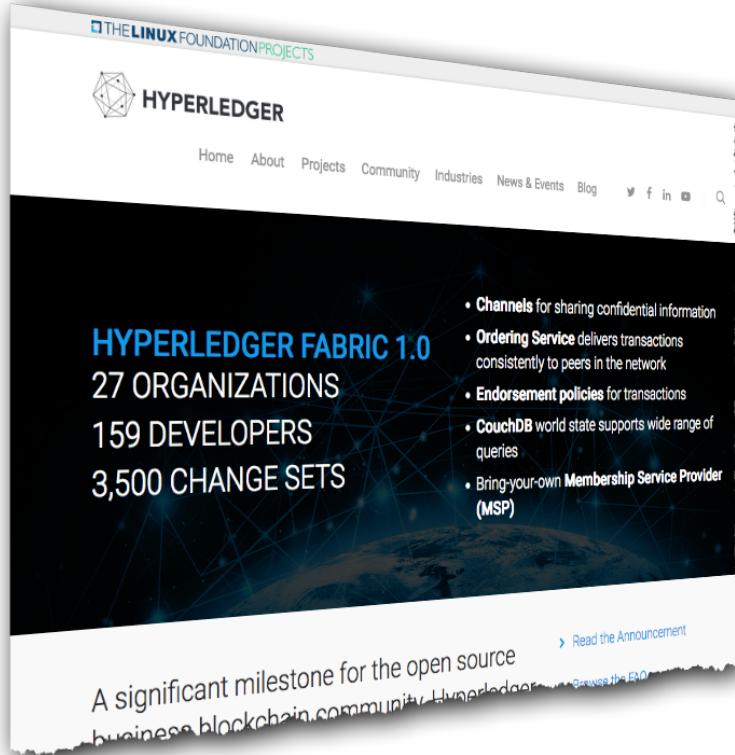


Associate

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

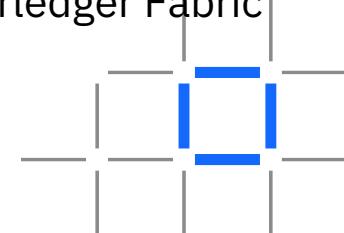
Hyperledger Fabric: Distributed ledger platform

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

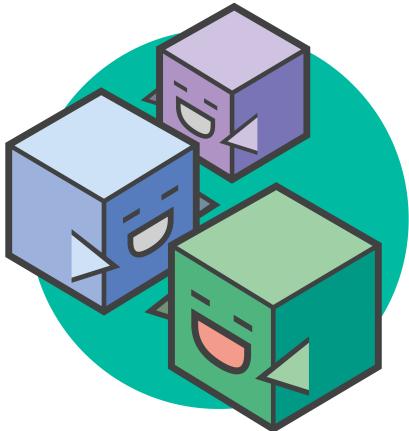
<http://hyperledger-fabric.readthedocs.io/>



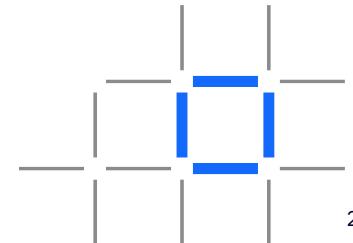
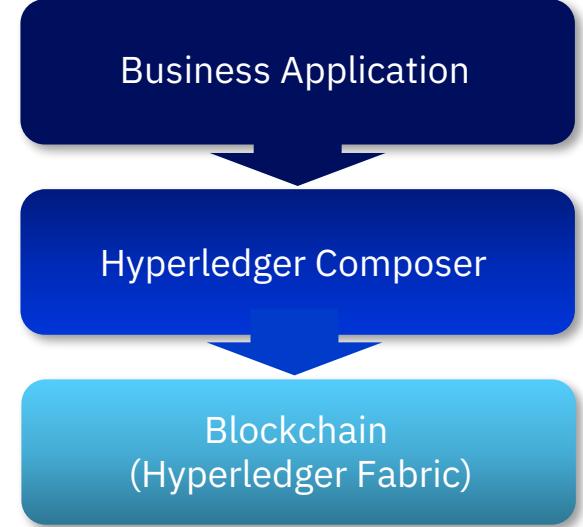
Hyperledger Composer: Accelerating Time to Value

<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]

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
 	         	

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

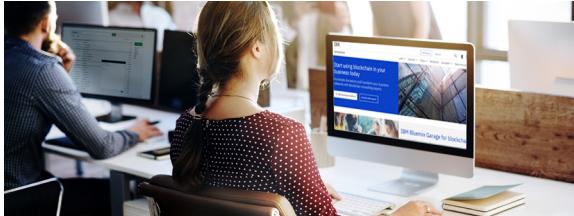
Digital

Face to face

Face to face

Getting started on your blockchain journey

IBM Blockchain



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IBM Blockchain](#)



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Blockchain Workshop](#)



[Develop a Blockchain
Application](#)



[Activate and Grow your
Blockchain Network](#)

Thank you

Pål Krogdahl

IBM Blockchain Nordic

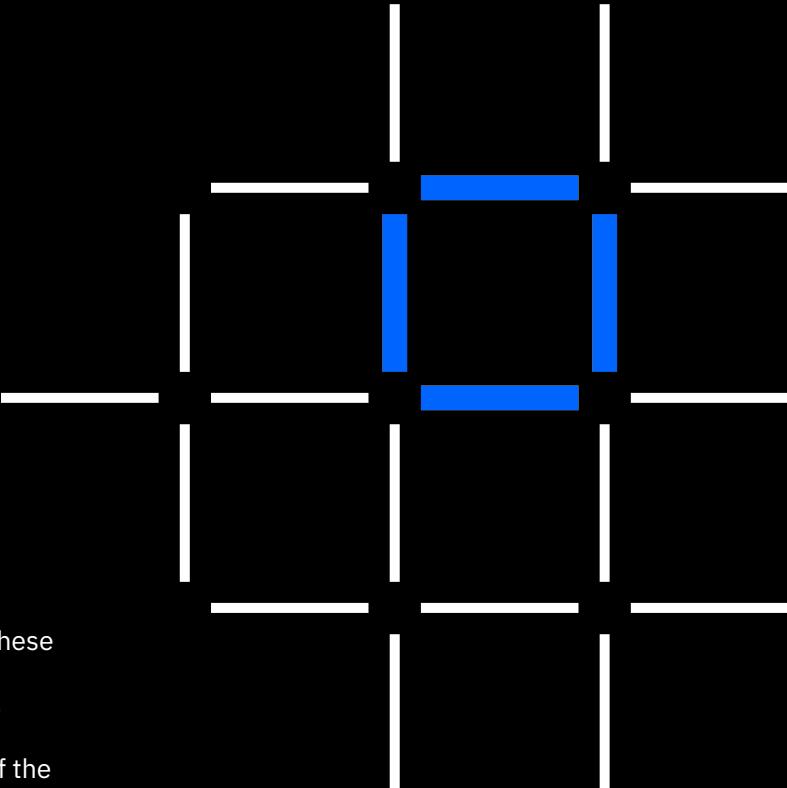
Pal.krogdahl@fi.ibm.com

IBM Blockchain

www.ibm.com/blockchain

developer.ibm.com/blockchain

www.hyperledger.org



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