



Explained



Composed



Solutions



Architected



Explored

IBM

Blockchain Explained



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Contents



What is Blockchain?



Why is it relevant
for our business?

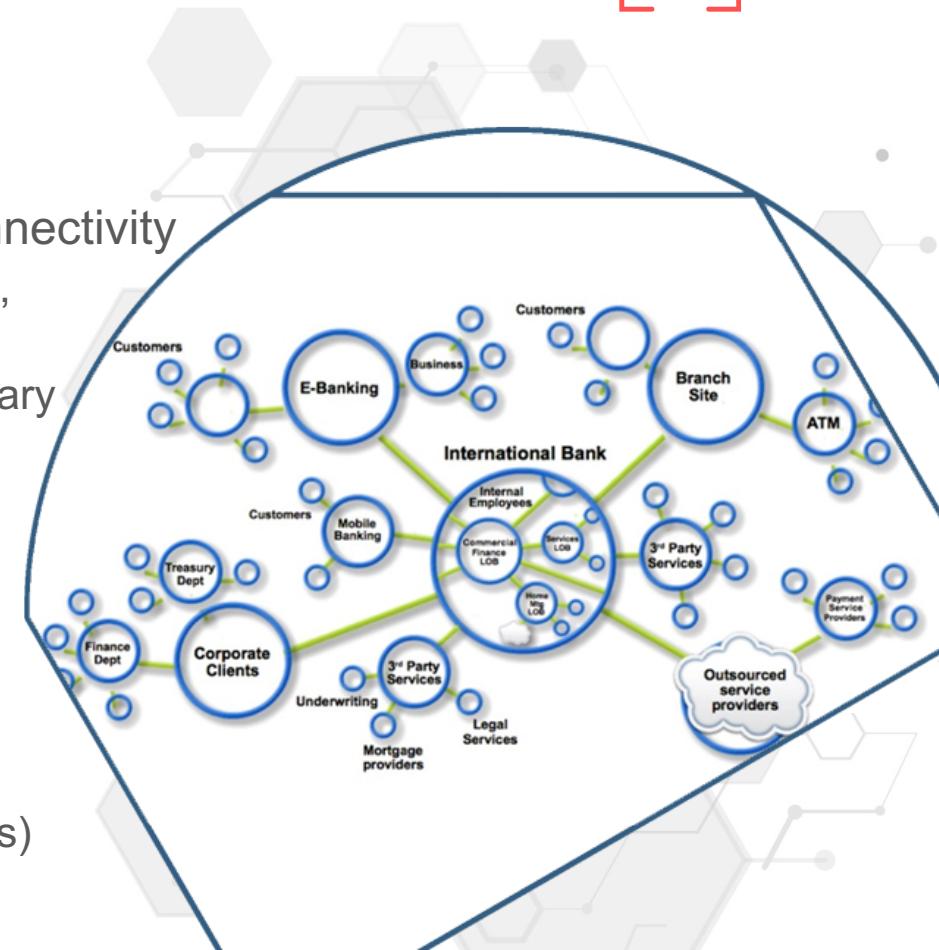


How can IBM help
us apply Blockchain?



Business networks, wealth & 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

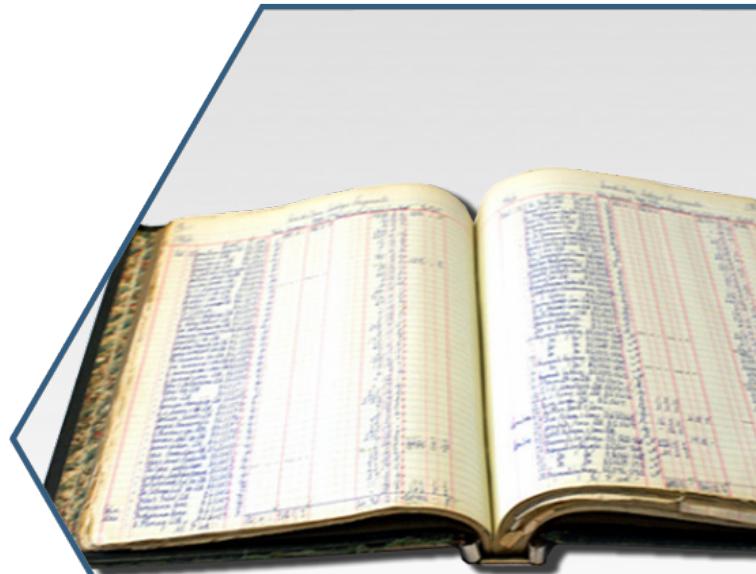
- Has property of anonymity

Ledgers are key ...

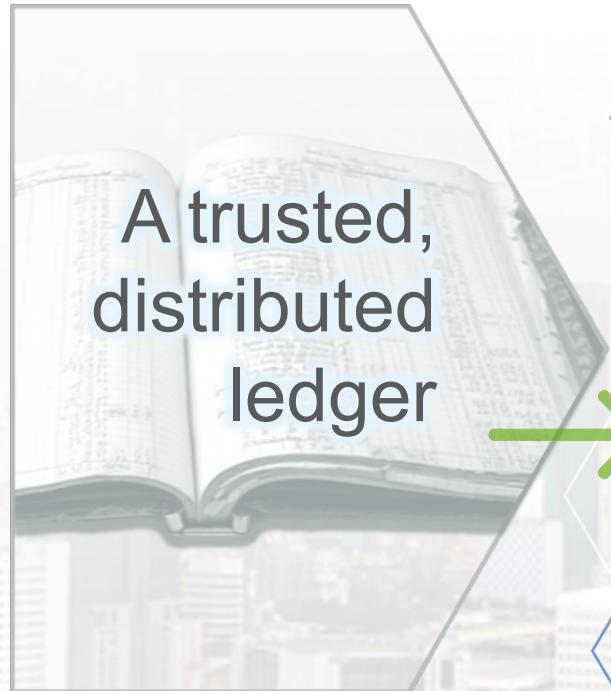
Ledger is THE system of record for a business.

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)

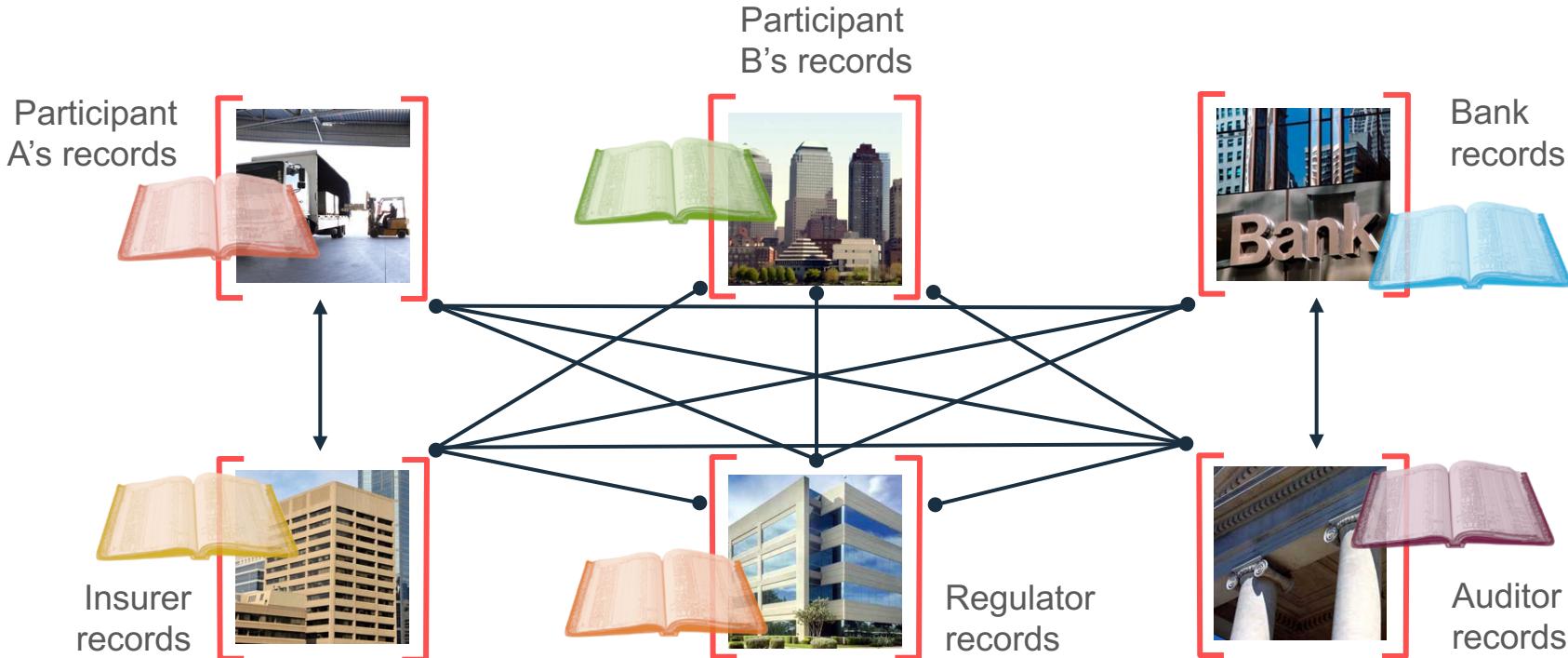


Introducing Blockchain



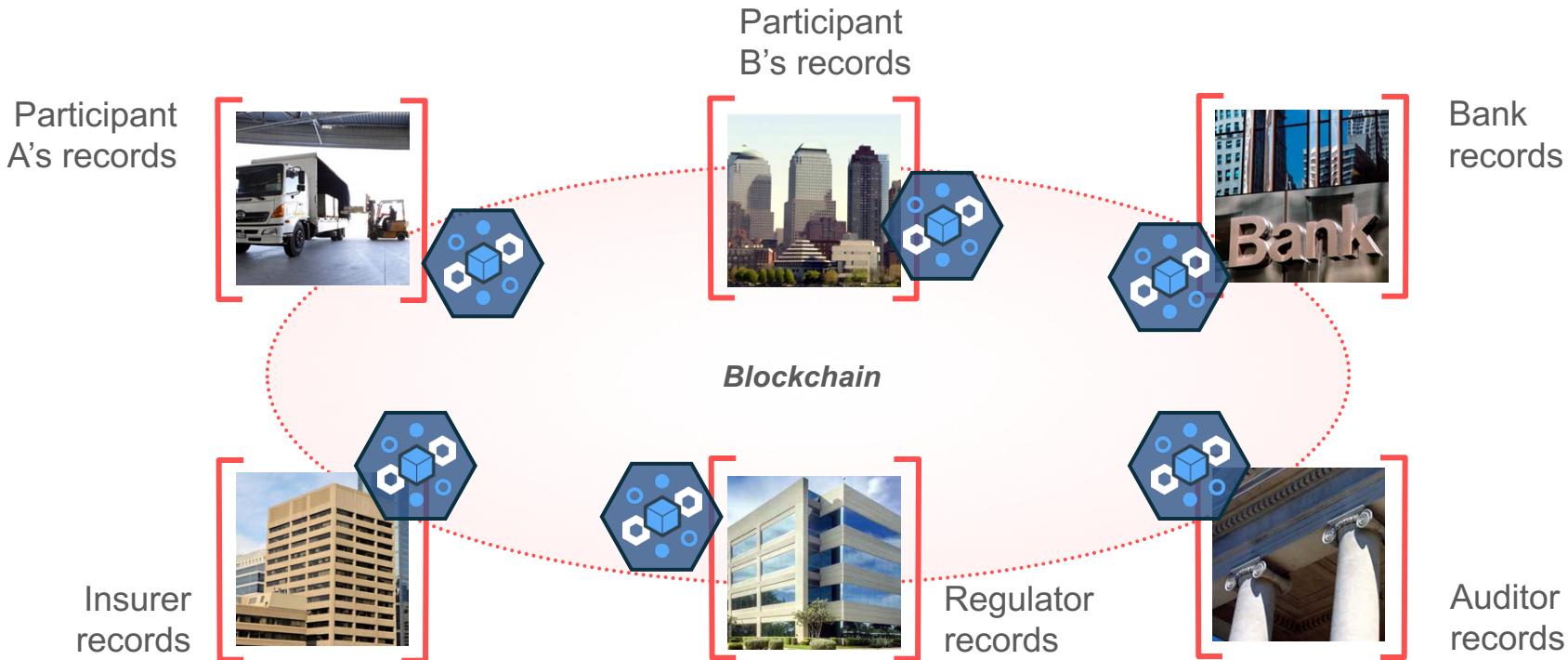
with shared
business
processes

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

Shared ledger



Smart contract



Business terms embedded in transaction database & executed with transactions

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable

Privacy



Trust



Transactions are endorsed by relevant participants



Shared ledger



Records all transactions across business network

- Shared between participants
- Participants have own copy through replication
- Permissioned, so participants see only appropriate transactions
- THE shared system of record



Smart contract



Business rules implied by the contract ... embedded in the Blockchain
and executed with the transaction

- Verifiable, signed
- Encoded in programming language
- Example:
 - Defines contractual conditions under which corporate Bond transfer occurs



Privacy



The ledger is shared, but participants require 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

Trust



The ledger is a trusted source of information

- 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

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How can IBM help
us apply Blockchain?

Blockchain benefits



Saves time

Transaction time from days to near instantaneous



Removes cost

Overheads and cost intermediaries



Reduces risk

Tampering, fraud & cyber crime



Increases trust

Through shared processes and recordkeeping

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

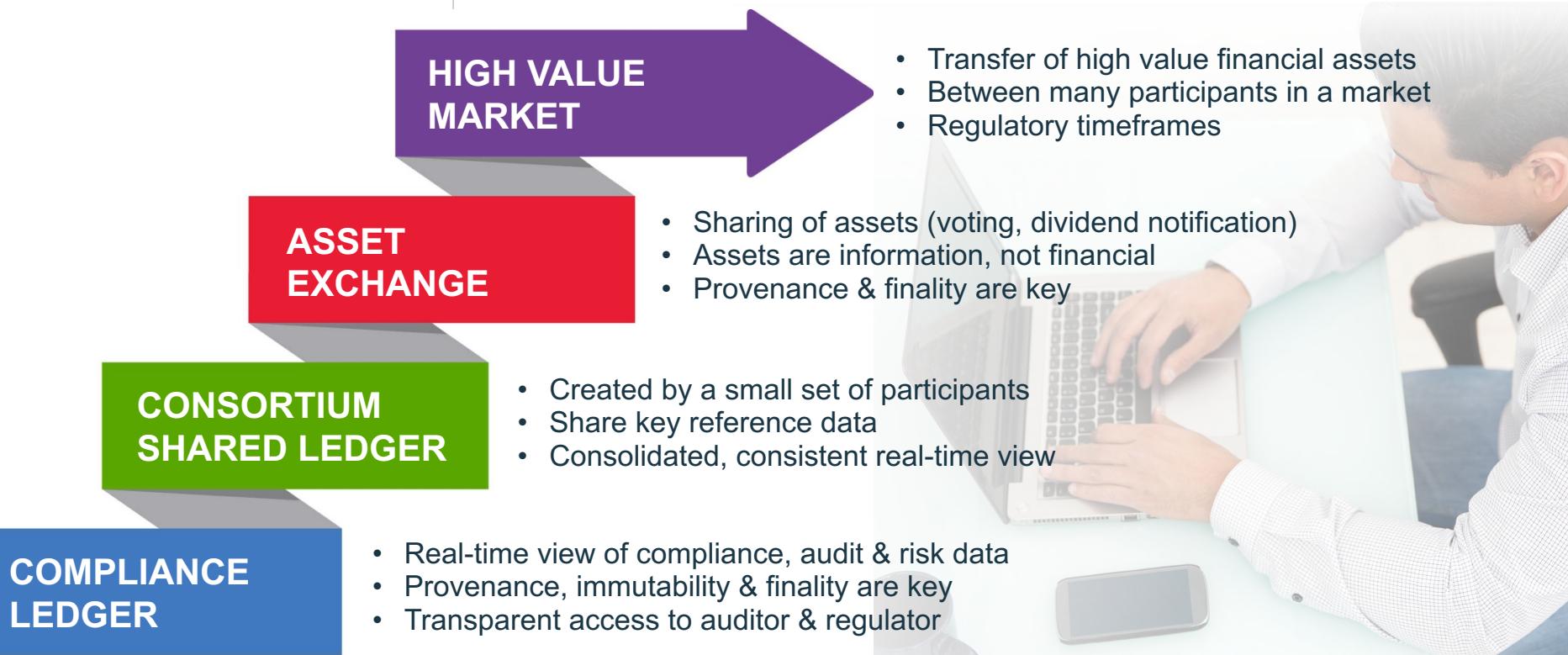
Further examples by (selected) industry



Financial	Public Sector	Retail	Insurance	Manufacturing
Trade Finance	Asset Registration	Supply chain	Claims processing	Supply chain
Cross currency payments	Citizen Identity	Loyalty programs	Risk provenance	Product parts
Mortgages	Medical records	Information sharing (supplier – retailer)	Asset usage history	Maintenance tracking
	Medicine supply chain		Claims file	



Patterns for customer adoption



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

Contents



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for our business?



How can IBM help
us apply Blockchain?

How IBM can help



Technology



Linux Foundation
Hyperledger Fabric



Linux Foundation
Hyperledger Composer



Hosting and Support



High Security
Business Network



IBM Bluemix



docker



Making blockchain real for clients



Garages



Engagement

Linux Foundation Hyperledger

- A collaborative effort created to advance cross-industry blockchain technologies
- Announced December 2015, now over 120 members
- Open source, open standards, open governance
- One active framework (“Fabric”) and four incubators
- IBM is a premier member of Hyperledger



Hyperledger Project Members



Premier



General



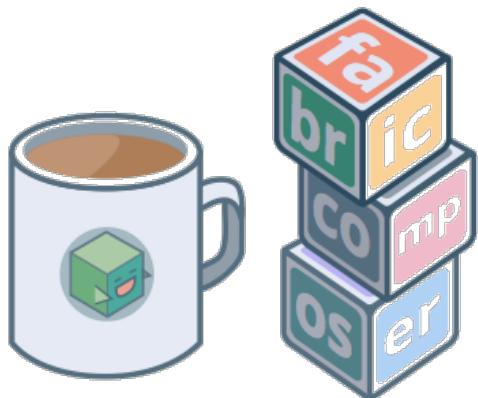
Associate



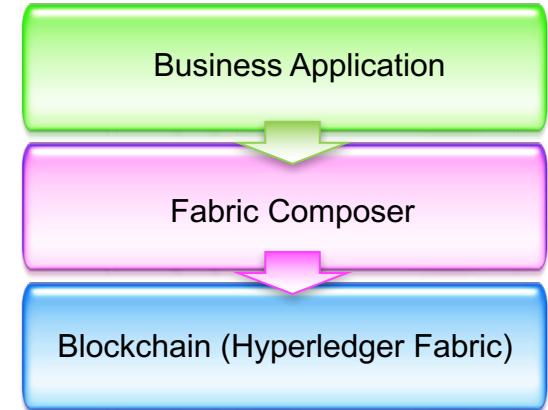
Source: <https://www.hyperledger.org/about/members>
Updated April 2017

Fabric Composer: Accelerating time to value

- 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 APIs transactions to interact with business network
 - Integrate existing systems of record using loopback/REST
- **Fully open** and part of Linux Foundation Hyperledger
- Try a demo now! - <http://fabric-composer.mybluemix.net/>



Selected References

FX Netting



Settlements through
digital currency



Identity management



Food Safety



Private Equity



Channel Financing



Low liquidity securities
trading and settlement



Cross Border
Supply Chain



Contract
Management



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

Continuing your education journey...



Explained

- What is blockchain for business
- Why is it relevant
- How IBM can help



Composed

- What is Fabric Composer
- Modelling assets, transactions and participants



Solutions

- Use cases, patterns and references
- Solution best practices



Architected

- Understand key blockchain technical concepts
- Designing a solution



Explored

- Technical deep dive on Linux Foundation Hyperledger Fabric

Thank you!

www.ibm.com/blockchain

developer.ibm.com/blockchain

www.hyperledger.org



Further Information – Use case Links

Northern Trust: <http://www-03.ibm.com/press/us/en/pressrelease/51655.wss>

Maersk: <http://www-03.ibm.com/press/us/en/pressrelease/51712.wss>

HSBC, Bank of America, IDA: <http://www.coindesk.com/hsbc-bank-america-blockchain-supply-chain/>

ABN AMRO: <https://www.abnamro.com/en/newsroom/blogs/arjan-van-os/2016/walking-the-walk-exploring-the-power-of-blockchain.html>

Crédit Mutuel Arkéa: <http://www.coindesk.com/ibm-completes-blockchain-trial-french-bank-credit-mutuel/>

JPX: <http://www.ibm.com/press/us/en/pressrelease/49088.wss>

Kouvola Innovation: <http://www.ibm.com/press/us/en/pressrelease/49029.wss>

London Stock Exchange: <http://www.ibtimes.co.uk/linux-foundation-blockchain-consortium-digital-asset-ibm-credits-london-stock-exchange-board-1533798>

Mizuho: <http://www.coindesk.com/mizuho-digital-currency-powered-blockchain-settlement/>

IBM Global Finance: <http://www.coindesk.com/ibm-building-blockchain-dispute-resolution-system/>

Everledger: <https://www-03.ibm.com/press/us/en/pressrelease/50169.wss>

Bank of Tokyo Mitsubishi: <https://www-03.ibm.com/press/us/en/pressrelease/50544.wss>

China UnionPay: <http://www.coindesk.com/ibm-china-unionpay-blockchain-loyalty-exchange/>

CLS: <http://www.coindesk.com/cls-to-develop-blockchain-payment-service-on-ibm-fabric/>

UBS: <http://www.coindesk.com/ubs-blockchain-prototype-trade/>