Making Blockchain Real for Business

Explained

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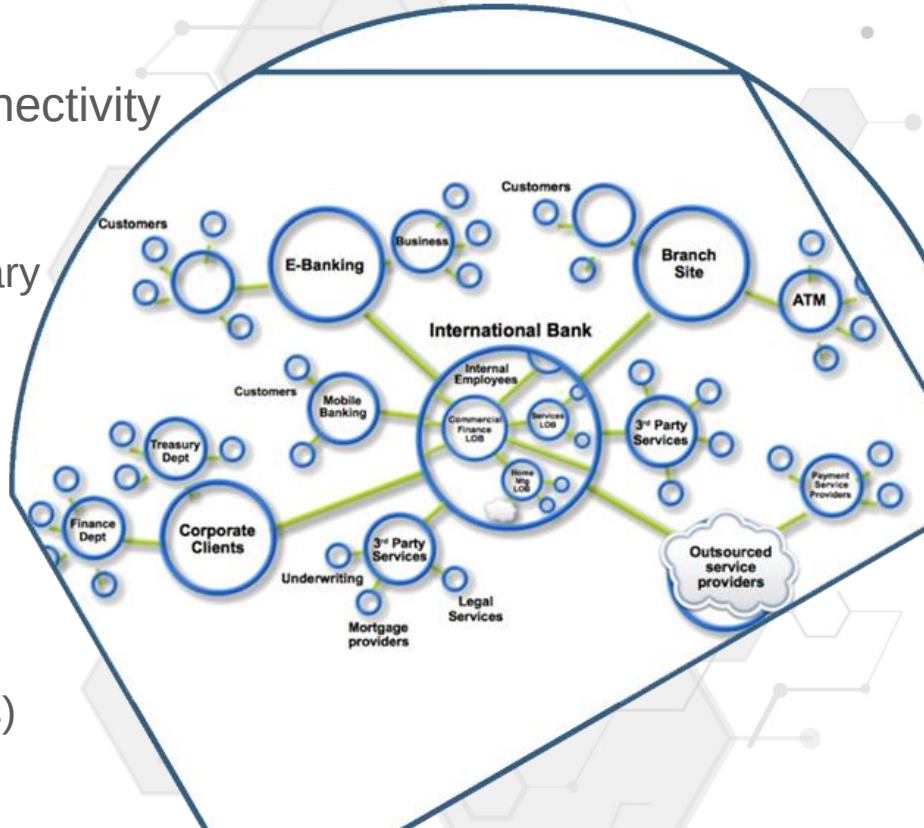
IBM Blockchain

Contents

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.

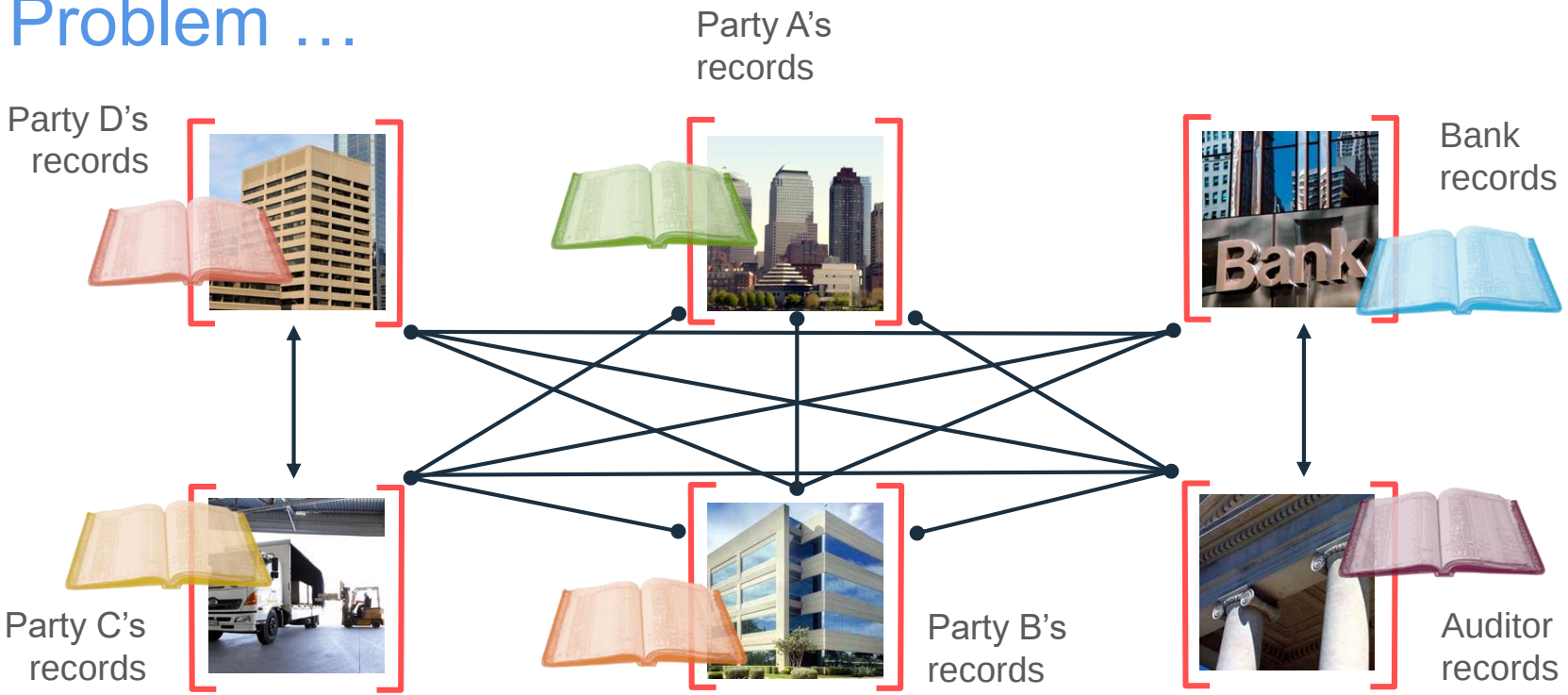
- **Transaction** – an asset transfer onto or off the ledger
  - John gives a car to Anthony (simple)
- **Contract** – conditions for transaction to occur
  - If Anthony pays John money, then car passes from John to Anthony (simple)
  - If car won't start, funds do not pass to John (as decided by third party arbitrator) (more complex)

What

Introducing Blockchain

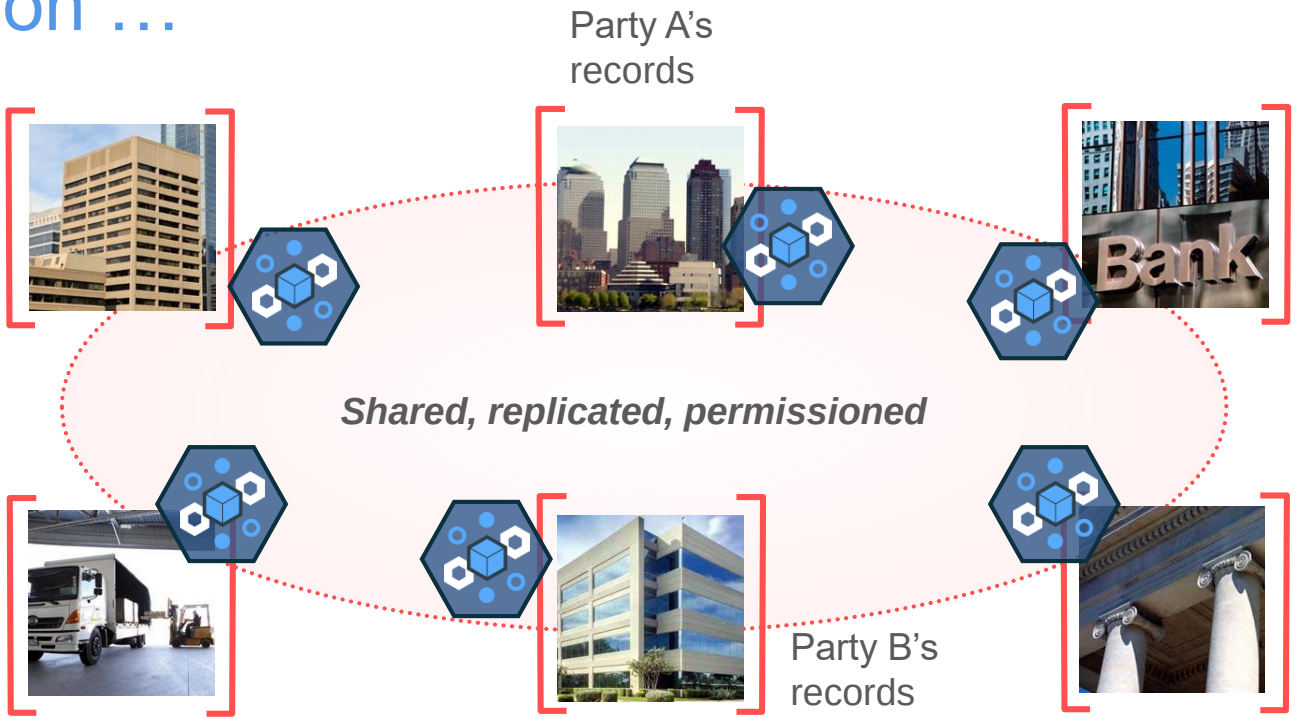
A shared ledger technology allowing any participant in the business network to see THE system of record (ledger)

Problem …



… Inefficient, expensive, vulnerable

Solution …



… Consensus, provenance, immutability, finality

Blockchain underpins Bitcoin …

What

– Unregulated, censorship-resistant shadow currency
– First Blockchain application
  • Pioneer of Blockchain technology

bitcoin

BUT

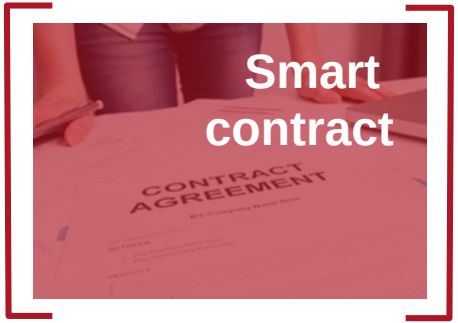
BLOCKCHAIN

is not *bitcoin*

… Digital currencies different from cryptocurrency

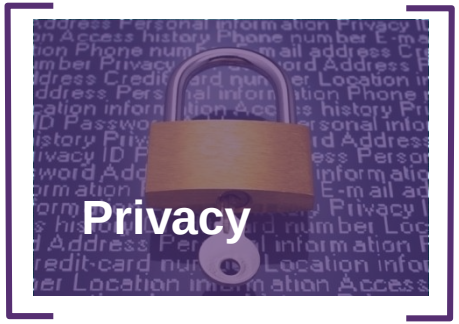
Blockchain for business …

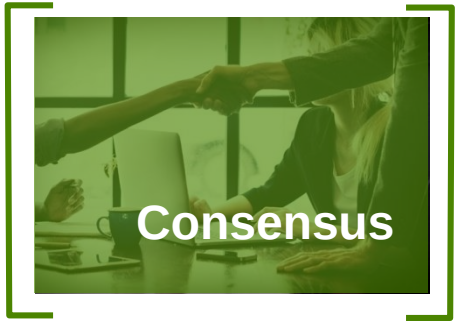
Append-only distributed system of record shared across business network



Business terms embedded in transaction database & executed with transactions

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable

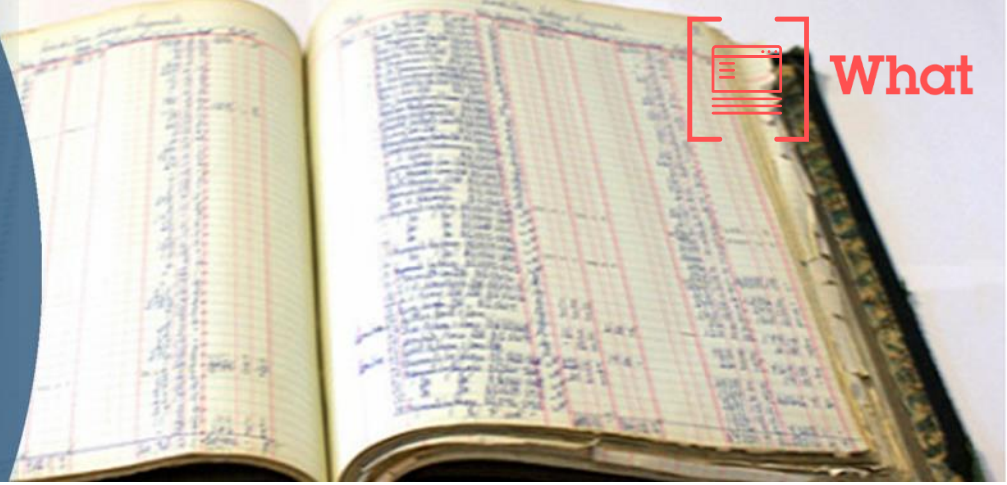




All parties agree to network verified transaction

… Broader participation, lower cost, increased efficiency

Shared ledger



What

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

What

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

What

Ledger is shared, but participants require privacy

- Participants need:
  - Transactions to be private
  - Identity not linked to a transaction
- Transactions need to be authenticated
- Cryptography central to these processes

Consensus

What

… the process by which transactions are verified

- Anonymous participants
  - Bitcoin *cryptographic mining* provides randomized selection among anonymous participants
  - Significant compute cost (proof of work)
- Known & trusted participants
  - Commitment possible at low cost
  - Byzantine fault tolerance (BFT)
- Multiple alternatives
  - Proof of stake, where influence is determined by risk of validators
  - Multi-signatures, validation needs consent from 3 out of 5 validators
- Industrial Blockchain needs “pluggable” consensus

Contents

Why

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

Consensus use case – Shared routing codes

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 of reference data
3. Naturally supports code editing and routing code transfers between participants

Provenance use case – Vehicle maintenance

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

Immutability use case – Financial ledger

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

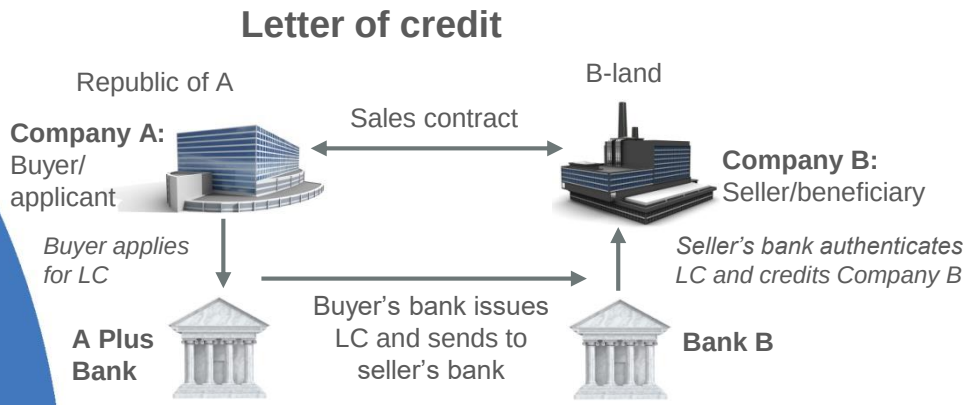
How

- 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

Finality use case – 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

Use case 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	

Why

Patterns for customer adoption

HIGH VALUE MARKET

- Transfer of high value financial assets
- Between many participants in a market
- Regulatory timeframes

ASSET EXCHANGE

- Sharing of assets (voting, dividend notification)
- Assets are information, not financial
- Provenance & finality are key

CONSORTIUM SHARED LEDGER

- Created by a small set of participants
- Share key reference data
- Consolidated, consistent real-time view

COMPLIANCE LEDGER

- Real-time view of compliance, audit & risk data
- Provenance, immutability & finality are key
- Transparent access to auditor & regulator

Why

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

How

Blockchain for Business – Our Point of View

Community + Code

Linux Hyperledger Project

Open Source Code: Blockchain for business;

Consensus | Provenance
Immutability | Finality

Open Governance – 100 member cross industry board

Cloud

IBM Blockchain

Blockchain managed service on IBM Cloud and z Systems;

Identity | Consensus | System Integration |
Hardware-assist for Performance & Security

IBM Blockchain on Bluemix

Clients

Blockchain Solutions
Blockchain Garage

Making Blockchain real for business

Blockchain Garage;
New York | London | Singapore | Tokyo

Blockchain Services Practice

How

Blockchain NOW

Hyperledger fabric on Docker Hub	Fastest development of blockchain solutions Certified Hyperledger fabric instances Supported by IBM – available cross platform
High security business blockchain on Bluemix	Dedicated compute power – isolated partition Secure key management (FIPS 140-2 Level 4) Tamper resistant service container Performance optimized (Operating System & Privacy Services)
Bluemix blockchain service	Fast blockchain network on Bluemix – also now China Samples for deployment, customization & usage Tool support for development and deployment

Supporting serious blockchain deployment!

How

Linux Foundation's Hyperledger Project

- *Open Ledger Project* announced December 17, 2015 with **17** founders, now over **100** members
- *Hyperledger Project* rebrand in February 2016
- Collaborative effort to advance Blockchain technology by identifying and addressing important features for a cross-industry open standard for distributed ledgers that can transform the way business transactions are conducted globally
- Open source, open standards, open governance

Enable adoption of shared ledger technology at a pace and depth not achievable by any one company or industry

QUICK FACTS	
Chairman	Blythe Masters/DAH
Executive Director	Brian Behlendorf
Technical Chair	Chris Ferris/IBM
Contribution	44,000 lines of code in February 2016
Sprint to one codebase with unified thinking	Staged releases

www.Hyperledger.org

Hyperledger Project Members

Premier

General

Associate

Updated Jan 2017

How

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 or face to face	***Remote or face to face***	***Face to face***	***Face to face***
Free of charge	***Free of charge***	***For fee***	***For fee***

Selected References

FX Netting

CLS Fundamental to FX

Settlements through digital currency

MIZUHO

Identity management

Crédit Mutuel ARKEA

Food Safety

Walmart

Trade Finance

Bank of America Merrill Lynch

HSBC

Channel Financing

IBM Global Financing

Low liquidity securities trading and settlement

JPX TOKYO STOCK EXCHANGE

Reward points management

UnionPay 银联

Contract Management

MUFG

Summary

Blockchain …

- is a shared, replicated, permissioned ledger technology
- can open up business networks by taking out cost, improving efficiencies and increase accessibility
- addresses an exciting and topical set of business challenges, which cross every industry

IBM …

- supports the Linux Foundation Hyperledger open standard, open source, open governance Blockchain
- has an easy to access, proven and incremental engagement model giving customers the confidence to get started NOW

Thank you!

Further Information – Use case Links

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/