Making Blockchain Real for Business

IBM Blockchain in Supply Chain

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Blockchain

Contents

> **What** is Blockchain?

Why is it relevant for our business?

How can IBM help us apply Blockchain?

Blockchain in the press

Business networks, wealth & markets
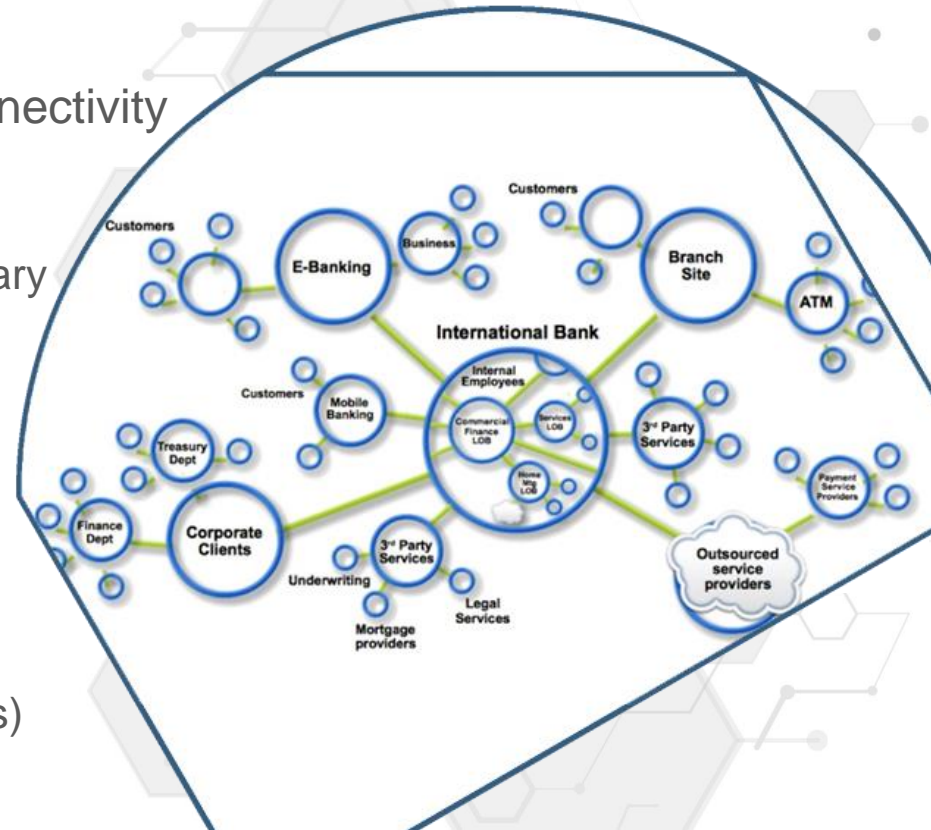
– **Business Networks** benefit from connectivity
  - Participants are customers, suppliers, banks, partners
  - Cross geography & regulatory boundary

– **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)

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 is the problem to solve?

Recording of events is becoming much more complex…

Party D's records

Party A's records

Bank records

Party C's records

Party B's records

Auditor records
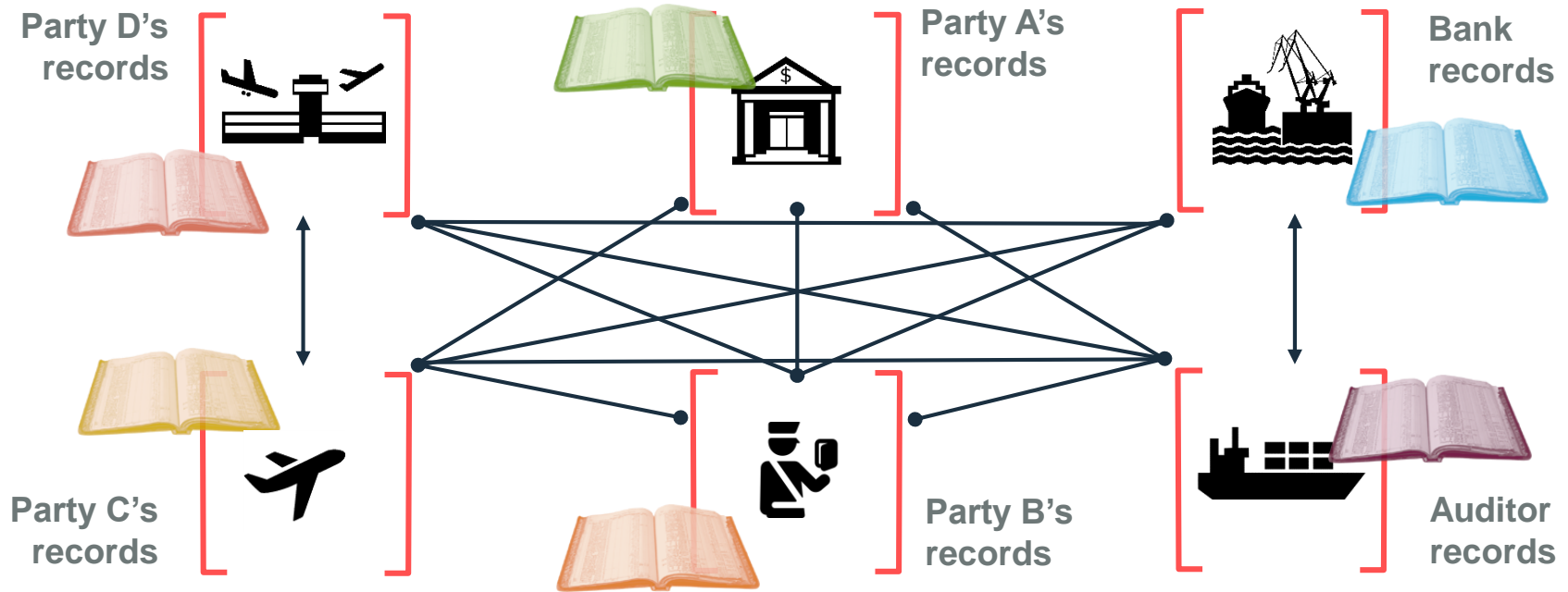
… Inefficient, expensive, vulnerable, lack of transparency

How to solve this Problem?

Party D's records

Party A's records

Bank records

Shared, replicated, permissioned

Party C's records

Party B's records

Auditor records
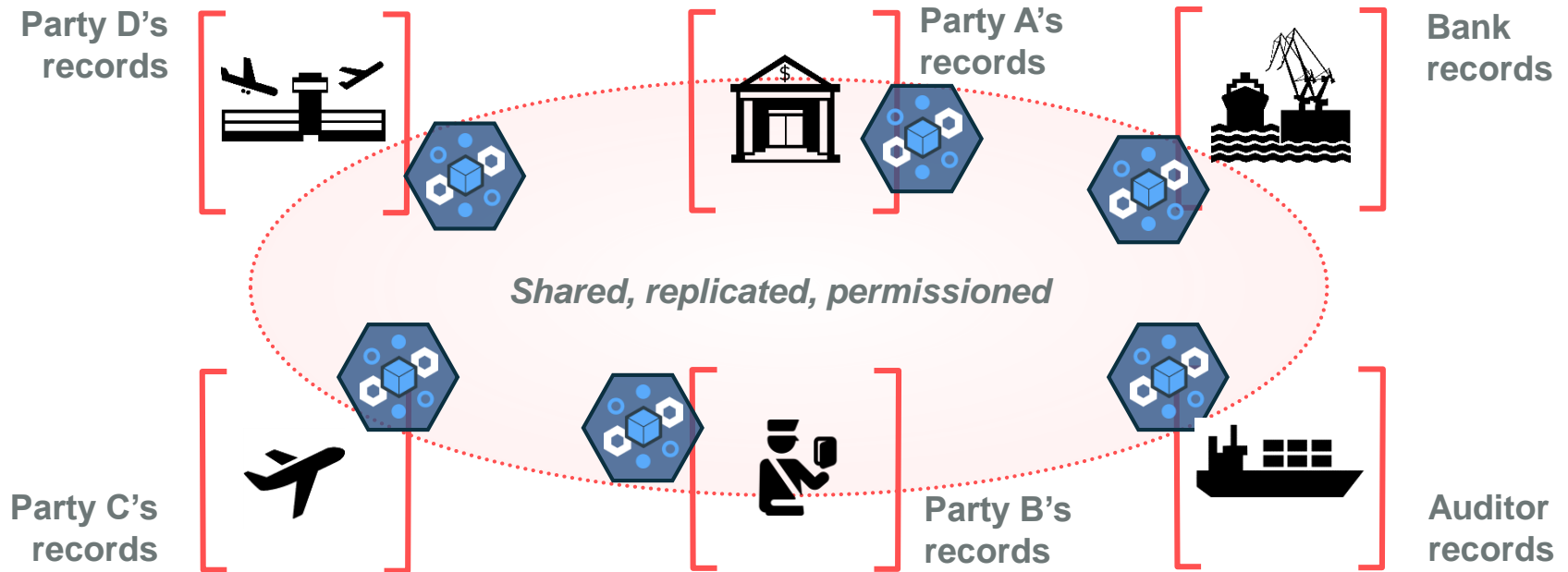
… Consensus, provenance, immutability, finality

Blockchain in a nutshell

"The end game for public and private blockchains isn't just digital currency—it's digital business flows" - PwC

Blockchain …

– a shared, replicated, permissioned ledger technology

– opens up business networks by taking out cost, improving efficiencies and increase accessibility

– provides full visibility to all actors across business ecosystems

Key Benefits …

– Reduces settlement time from days to near instantaneous

– Removes overhead and cost intermediaries

– Reduces risk of collusion and tampering

– Increases trust through shared processes and recordkeeping

– eliminates fraud

– reduces integration complexity and the need for intermediation whilst increasing efficiency

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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

IBM Global Financing: Providing Financial Services to Suppliers & Partners

IBM Global Financing (IGF)

Commercial Financing

Provides working capital and supply chain financing for technology manufacturers, distributors and resellers

Client Financing

Provides leases and loans to help clients acquire solutions and technology

Global Asset Recovery Services

Offers comprehensive services for technology assets including remanufacturing, buyback and resale

Experts in financing technology solution

- The world's largest technology financier, providing services in more than **60 countries**
- **Thirty-five years** of IT financing expertise enables exceptional understanding of organizational technology and financial needs

Some key figures:

- Manages $36 billion of financial assets

- Serves 125,000 clients in 20 industries

- Provides $41 billion new financing to IT channel annually

- Originates $14 billion new end-user financing annually

- Processes 37,542 returned IT assets per week; that's 54 million pounds of IT equipment annually

- Reuses 99% of all IT equipment returned at end-of-product life

Blockchain for IBM Global Financing

Over 4,000 Suppliers and Partners Worldwide

25,000+ Disputes Every Year

$41 Billion Financed / Year

$

2.9 Million Invoices / Year

Blockchain utilized to significant improve resolution time for common disputes

❖ Utilized data available from suppliers to deliver enhanced information to both Suppliers and Business Partners

❖ Accomplished with no code changes to our core Commercial Financing system using shadow ledge approach

❖ Integrated blockchain into existing user interface

❖ Enhanced data includes key information regarding shipments status which minimizes proof of delivery disputes

❖ Established a 'platform' for competitive advantage

❖ Continuing to work with our Suppliers and Business Partners to further expand blockchain capabilities

Today's Systems	Today's Systems	Today's Systems
approximately **$100 million** tied up at any given time	**44 days** on average to resolve	**$31,000** average disputed invoice value

Today's Systems

Today's Systems

Blockchain

supplier supplier supplier supplier supplier supplier supplier supplier supplier supplier supplier

Use case: Efficient and cost-effective Trade Logistics

What?

- Transform international trade through automation, increased transparency and effective multi-party co-ordination of logistics using the Blockchain.

How?

- Logistical information continuously fed on to the blockchain

  (good status/position, documents, container free capacity, etc.)

- Maze of regulations effectively implemented through *smart contracts*

- On-boarding of all the players on to the same distributed ledger

Benefits:

- Reduced cost and risk through automation, verifiable and secure tracking of physical risk and events in supply chain.

- Increased visibility of logistic info. / docs. across the supply chain

- Enables new business model innovations for trade commerce

e.g.: a global digital trade platform that enables logistics, finance and supply chain as a single integrated business
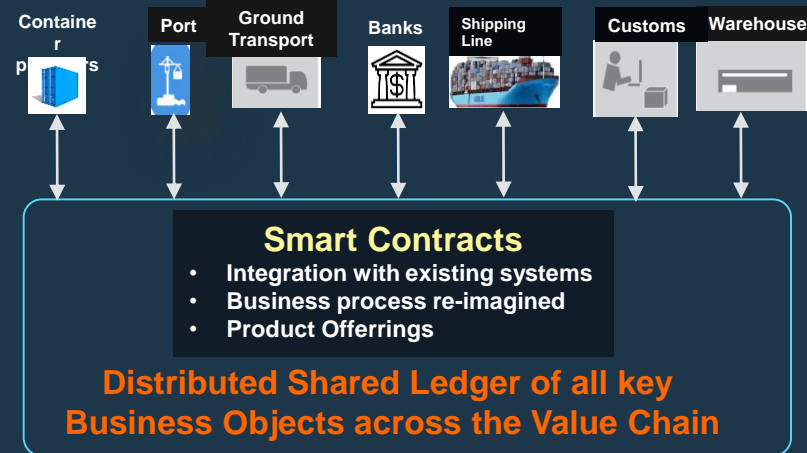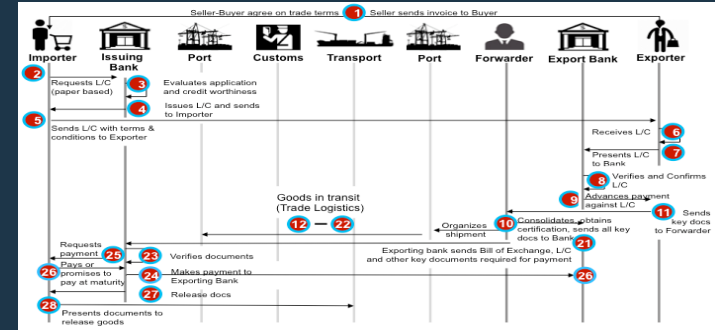
Manage the supply chain for container shipping at **MAERSK**

- Blockchain gives each participant in the trade to have visibility
- The supply chain ecosystem can view the progress of goods through a network with customs status, bills and data
- Supply chain events and documents are exchanged in real time
- No party can modify, delete or append a record without consensus from others in a network
- Transparency will cut fraud and reduce the time products are in transit

Provenance Baggage Management

What	• Track status of each piece of baggage in order to ease baggage claim
	• The Challenges:
	   • Messages arrive delayed or not at all so that subsequent status changes have to be "assumed" or concluded.
	   • No reliable information
	   • Many partners: airports, ground handlers, airlines using various technologies, different networks
	   • Thousands of messages moved/exchanged across partner

How	• Manage Electronic Baggage Tag (EBT) information in blockchain • EBT will have an RFID or likewise device to retrieve ID • Associate validity period, travel & passenger information in blockchain
Who	• Airlines, Ground Handlers, Airports • Business Partners (e.g. SITA, Amadeus, Sabre)

Benefits

• EBT is protected against tampering and misuse
• Trustable information about baggage routing
• All participating partners can validate an EBT and check integrity/authenticity

eID – Virtual Digital Passports

What
- Provide **authentication services** without storing sensitive personal info
- Automatic authentication process **without physical travel documents**
- Protect **user privacy** in a trustless environment

How
- Store only hashed value of the personal information on Blockchain
- Use digital signature technology with immutable transaction history enforced by Blockchain to provide tamper-resistant authentication service
- Generate virtual eID numbers for different purposes of usage
- User can choose to only expose selected fields of the eID to another party
- User travel records on different virtual numbers are unlinkable without permission

Benefits

Secure authentication of passengers throughout the journey within across borders and could eliminate the need for multiple travel documents without passengers having to share their personal data.
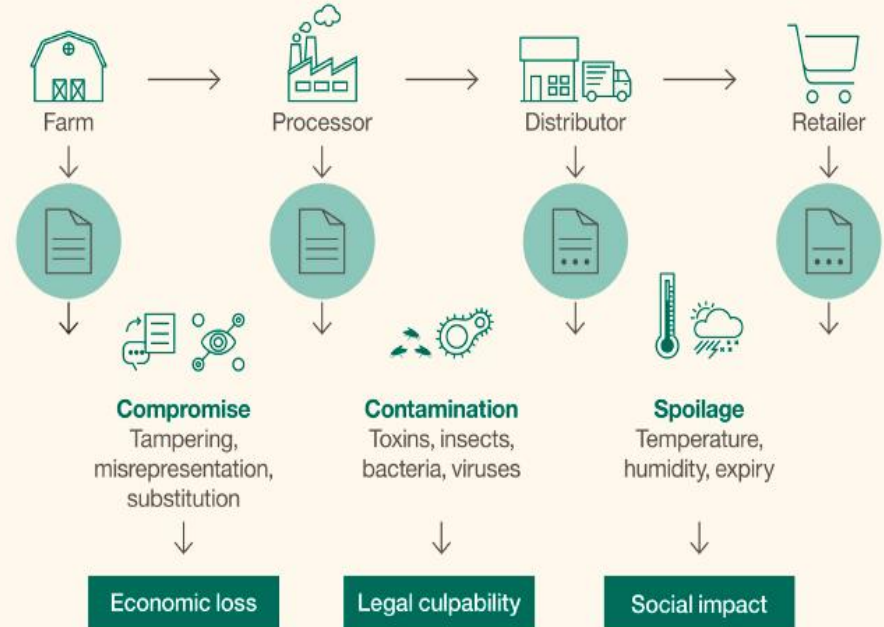
Digitally traced food

IBM is tapping blockchain for a more transparent, authentic and trustworthy global food supply chain.

Disparate ledgers and lack of transparency in the supply chain put food at risk.

Farm → Processor → Distributor → Retailer

Compromise
Tampering, misrepresentation, substitution
↓
Economic loss

Contamination
Toxins, insects, bacteria, viruses
↓
Legal culpability

Spoilage
Temperature, humidity, expiry
↓
Social impact

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

Selected References

FX Netting	**Settlements through digital currency**	**Identity management**
CLS Fundamental to FX	MIZUHO	Crédit Mutuel ARKEA

Food Safety	**Trade Finance**	**Channel Financing**
Walmart	Bank of America Merrill Lynch / HSBC	IBM Global Financing

Low liquidity securities trading and settlement	**Reward points management**	**Contract Management**
JPX TOKYO STOCK EXCHANGE	UnionPay 银联	MUFG

Trade Finance - Dubai

- **With support from both <u>Dubai Customs</u> and Dubai Trade, <u>IBM</u> has so far courted a telecommunications service provider, a letter of credit issuing bank, a responding bank, a freight company and an airline in a trial centered on what major financial firms believe is one of the tech's most promising use cases.**

- **Once the all-inclusive supply chain and trade finance proof-of-concept is completed, it will be integrated with Watson's AI, making it one of IBM's most pervasive blockchain projects to date.**

- **The proof-of-concept is being designed to track the shipment of fruit from India via a cargo ship to Dubai. Once in Dubai, the fruit will be turned into juice and exported to Spain via airplane, as just one example.**

- **The POC is expected to be powered by self-executing code, or smart contracts, on the open-source Hyperledger platform.**

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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

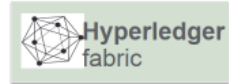# Hyperledger Project Members

IBM Blockchain Offerings

Hyperledger fabric

IBM Bluemix

Starter

- Start writing chaincode in seconds
- Integrated dashboard, logs and tools
- Community samples, tutorials, and quickstarts

High Security Business Network

- High performance and reserved capacity
- Best in Industry security, isolation and spec support
- Proven Audit environment for compliance and forensics

IBM Blockchain Starter for Developers

Public Beta

provision now on IBM Bluemix!

IBM Blockchain for High Security Business Networks

Generally Available

Available on IBM Bluemix!

self managed

Docker

. any Docker environment
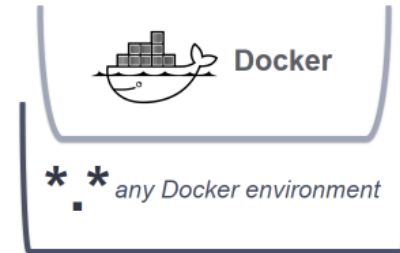
IBM offers technical support for x86, Power and System z

Support for Hyperledger Fabric

Generally Available

https://hub.docker.com/r/ibmblockchain/fabric/

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Engagement model overview

Let's Talk

1. Discuss Blockchain technology
2. Explore customer business model
3. Show Blockchain Application demo

Blockchain Hands-on

1. Understand Blockchain concepts & elements
2. Hands on with Blockchain on Bluemix
3. Standard demo customization

First Project

1. Design Thinking workshop to define business challenge
2. Agile iterations incrementally build project functionality
3. Enterprise integration

Scale

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*

Blockchain for Business – Our Point of View

How

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

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/

Back up

IBM Blockchain in Financial Services Sector

PAYMENT NETTING (FX)

Provide efficiency and resiliency across global FX markets in a standardized manner

LOW-LIQUIDITY SECURITY TRADING

Reduce trade settlement time by automating the end-to-end multi-party interactions for low liquidity trading

LOYALTY POINTS

Build a peer-to-peer reward point trading system between banks, credit card users, gift shops, for seamless exchange of loyalty reward points

CONTRACT MANAGEMENT

Accelerate the Design, Management and Execution of Contracts among business partners on the Blockchain

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

IBM Blockchain in International Trade and Supply-chain

DOCUMENT WORKFLOWS

Automate current inefficient, manual and error-prone workflows in documentary trade finance

SUPPLY-CHAIN VISIBILITY

Provide single view for purchase order life-cycle across the supply-chain as the *truth*

TRADE/SUPPLY-CHAIN FINANCE

Improve the efficiency of (our) commercial financing business by sharing data in a secure and transparent manner

SUPPLY-CHAIN PROVENANCE

Provide provenance across the supply-chain cutting through complex distribution and processing ecosystems

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

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

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

CLIENT EXAMPLES

CLS
FX Netting

Mizuho Financial
Settlements through virtual currency

Crédit Mutuel Arkéa
Identity management

Walmart
Food Safety

BAML HSBC
Trade Finance

IBM Global Financing
Channel Financing

Japanese Stock Exchange
Low liquidity securities trading and settlement

CUP
Reward points management/IoT

BTMU
Contract Management

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!

Blockchain for business …

Shared ledger

Append-only distributed system of record shared across business network

Smart contract

Business terms embedded in transaction database & executed with transactions

Privacy

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable

Consensus

All parties agree to network verified transaction

… Broader participation, lower cost, increased efficiency