Making Blockchain Real for Business

Use Cases

Esra UFACIK
esra@sg.ibm.com
Blockchain IOT Lead for
AP Systems

© 2016 IBM Corporation
Blockchains shift the paradigm from information held by a single owner to the lifetime history of an asset or transaction. Instead of messaging-based communications, the new paradigm is state-based: Information that was once obscure now becomes transparent.

Source: IBM Institute for Business Value analysis
Transactions are validated by consensus and become indelible records of the transaction

Participants share a ledger that is updated with every transaction

Cryptographically secure, the shared ledger is updated by consensus and becomes an immutable and indelible record of all transactions

Source: IBM Institute for Business Value analysis
Full transformation value kicks in when a variety of industries and activities come together

Supply chains are prime examples of blockchain’s potential for transformation that spans industries

The value derived from something as fundamental as a blockchain-enabled bill of lading ripples out beyond the port of entry to span many industries

Source: IBM Institute for Business Value analysis
Client Examples of First Projects

- **Global Bank**
  - Trade Finance

- **Financial Services Company**
  - Collateral Management

- **Shipping Company**
  - Trade Logistics

- **Japanese Stock Exchange**
  - Low liquidity securities trading and settlement

- **Financial Institution**
  - Commercial Paper

- **Large European Bank**
  - Financial Audit and Compliance

- **Global Bank**
  - Mortgage servicing

- **IBM Global Financing**
  - Channel Financing
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

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

Bank of America Merrill Lynch, HSBC and the IDA (Infocomm Development Authority of Singapore)
Published on August 10th, 2016!
Bank of America Merrill Lynch, HSBC and the Infocomm Development Authority of Singapore have claimed success in demonstrating the application of distributed ledger technology.

Vivek Ramachandran, global head of product for HSBC’s trade finance business, says: “Letters of Credit are an important part of the trade system, but they are based on 20th century technology, not 21st. Our challenge is to take this from concept to commercial use; making it quicker and easier for businesses to connect with new suppliers and customers at home and abroad.”
Customer Documentation Provenance Use Case
KYC (Know Your Customer)

What?
- Client operates as a federation of business units each capturing and storing their own "know your customer" (KYC) related information. This is both inefficient for the bank and annoying for the customer.

How?
- Blockchain will be used as a "shadow chain" to keep an audit trail of which KYC related document(s) were collected by whom in the Arkea group. The existing systems of record for KYC document storage will remain.

Benefits
- Improved efficiencies for the Bank, and members of their federation.
- Improved customer satisfaction.
- Incremental growth into production, with risk reduction throughout.
- Offers a complete view of customers’ documents across decentralised network of systems.
Customer creates public identity on the blockchain, then puts certain documents to prove identity on the blockchain.

Customer gives Company A permission to view the documents – the permission is recorded on the blockchain.

Financial Services Provider A verifies identity and signs the person’s identity on the blockchain.

Customer applies. Instead of filling out all of the forms required, the customer simply permissions the bank to access the verified identity. The bank trusts Financial Services Provider A and therefore accepts the identity attestation and saves on KYC verification cost.

A business network of financial services providers cooperate to cut down KYC costs in the long run. Customers are saved from having to enter thousands of forms in their life.
IBM and Crédit Mutuel Arkéa Pioneer the Use of Blockchain to Manage Customer Identity and Improve Customer Satisfaction

PARIS and BREST, France - 30 Jun 2016: IBM (NYSE: IBM) and Crédit Mutuel Arkéa announced today the completion of their first blockchain project to improve the bank’s ability to verify customer identity.

The result of this successful pilot is an operational permissioned blockchain network that provides a view of customer identity to enable compliance with Know Your Customer (KYC) requirements. This demonstrates the disruptive capabilities of blockchain technology beyond common transaction-oriented use cases.
Shipping Company Use Case

Shipping company aiming to transform the shipping industry through the use of Blockchain and smart contracts to remove manual processes, inefficiencies, middle-men and explore new business models

- **Business Architecture:**
  - Blockchain platform involving shipping company, port authorities and ground transportation systems;
  - Eventually scale to include all parties including end-consumers, container utilities, insurers

- **Value:**
  - Secured shared access to data that is currently held by different entities; automation and streamlining of processes across the trade workflow through smart devices and contracts; reduced time, cost and risk

- **How it will transform the business:**
  - Improved visibility, reduced risk and greater automation will drive down costs, improve timely delivery of goods, reduce wastage, and enable new financial models that could eliminate middlemen

- **End game:**
  - A blockchain platform that serves as the backbone of the trade logistics industry, transforming it into the digital era; a deeper penetration of IoT devices that drive smart contract workflows enabling real-time visibility and control over trade logistics
Explore Watson IoT with Blockchain

Overview
Our interactive demo tracks the shipment of a package as it moves along the supply chain, passing through multiple carriers. It shows how an IoT-enabled package transmits required status information along the way and how each transaction is tracked and shared among all partners in a blockchain.
“We’re excited about the potential for blockchain to transform logistics value chains into a more seamless process that provides a trusted view of every piece of cargo.”

—**Mika Lammi**, Head of IoT business development, Kouvola Innovation, Finland
Use Case – Open, Trusted Supply Chain

- **What?**
  - Consumers demanding transparency on where and how their products are made.
  - EU requires more information about corporate supply chains, with penalties for non-compliance.

- **How?**
  - Blockchain enable safe digital transfer of property across the end to end supply chain.

- **Benefits**
  - verifiable, preventing any party from altering
  - efficiencies through greater transparency
  - consumers can make informed purchases
  - governments get reliable information
Use Case – Supply Chain

- **Animal and Crop Farms and Fisheries**
  - Commodity leaves 'ABC Farm. Data from sensors (time, handling conditions)

- **Handling and Processing Center**
  - Commodity leaves Processing center @place. Data from sensors (time, handling conditions)

- **Storage, Warehouse, Cold House**
  - Commodity leaves Storage /Warehouse @place. Data from sensors (time, handling conditions)

- **Transport and Distribution**
  - Commodity loaded on Storage truck. Data from sensors (time, handling conditions)

- **Market Centers and Retail Center**
  - Commodity reaches Market Center. Data from sensors (time, handling conditions)

**Blockchain – Hyper Ledger**

- Entities queries Hyper Ledger to check mishandling and/or identify contaminated batches
- Customer queries Hyper Ledger to confirm correct product handling

**Public Health Centers and Quality Assurance Entities**

- Parties queries the blockchain before accepting the food to check handling conditions
- Parties writes periodically to the blockchain (Read/Write Access)

**Consumers and Food Services**
Stock Exchange use case

An AP Stock Exchange is looking to introduce a Trading Platform for low liquidity equity and bond transactions to replace existing manually intensive approach

- **Business Architecture:**
  - Trading platform capable of handling 300 participants. Decentralized Peer-to-Peer architecture with nodes consisting of market participants (Banks, Securities Firms).

- **Client Value:**
  - Reduce operating costs and settlement time. Improved availability, through distribution of infrastructure

- **How it will transform the business:**
  - Reduced costs by removing intermediate systems and processing

- **End Game:**
  - Listed products trading, clearing and settlements.
Tokyo - 16 Feb 2016: IBM (NYSE: IBM) and Japan Exchange Group (JPX) announced an agreement to test the potential of blockchain technology for use in trading in low transaction markets.

Blockchain is an emerging digital technology that has the potential to enable securities trading organizations to significantly reduce the cost, complexity and speed of trading and settlement processes. IBM will work with JPX to jointly evaluate how the IBM open source blockchain code, that has been proposed to the Linux Foundation’s Hyperledger Project, could be used for trading and settlement in low liquidity markets. As the Hyperledger Project evolves, the joint IBM and JPX evaluation work will transition to use of the code produced by that effort.
“We believe this technology has the potential to drive change across the industry but will need to be developed in partnership with customers and industry participants under an open source approach.”

—Moiz Kohari, EVP, Group head of technology innovation, London Stock Exchange Group
Digital Asset Holdings, the blockchain startup run by former JPMorgan Chase & Co. banker Blythe Masters, raised $52 million from investors and won a contract to radically speed up settlement in Australia's stock market.

The deal with ASX Ltd., Australia's main exchange operator, is the boldest attempt yet to prove the worth of a so-called distributed ledger system. ASX agreed to invest A$14.9 million ($10.5 million) into Digital Asset, joining other investors including JPMorgan, CME Group Inc. and ICAP Plc. The funding round was more than two times oversubscribed and values New York-based Digital Asset at $100 million, according to people familiar with the matter.

Digital Asset is among about a dozen startups that are racing to prove that blockchain, the technology underlying bitcoin, can be applied to financial markets. While in today's securities markets a central authority oversees the transfer of cash for shares, DAH aims to link all participants in that process on the same database to allow real-time movement of assets. While the aim in Australia is to reduce settlement times to minutes, regulators in the U.S. are currently working to cut it to two days from three.
GOLDMAN SACHS AND IBM JOIN 13 INVESTORS IN DIGITAL ASSET, BRINGING FUNDING ROUND TO MORE THAN $60 MILLION

The Goldman Sachs Group, Inc. and IBM join other strategic investors to further accelerate the adoption of Digital Asset solutions

NEW YORK, February 2, 2016 -- Digital Asset Holdings, LLC, a developer of Distributed Ledger Technology for the financial services industry, today announced that The Goldman Sachs Group, Inc. and IBM have joined its recently announced funding round (read full press release here) bringing the total to more than $60 million from 15 industry leaders across the financial ecosystem.

“The addition of Goldman Sachs and IBM as investors in Digital Asset will continue to help drive the global adoption of this transformative technology,” said Blythe Masters, CEO of Digital Asset.

Launched in 2015, Digital Asset’s mission is to improve efficiency, security, compliance and settlement speed while reducing costs through the implementation of Distributed Ledger Technology. Its products serve the entire financial ecosystem through the creation of tailored business logic applications using privately permissioned networks that employ a cryptographically secure and shared infrastructure. Digital Asset software has the potential to significantly improve post-trade processing efficiency and security, while reducing cost, latency, errors, risk and capital requirements.
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
Real-time Financial Audit and Compliance Ledger Use Case

- **Business Architecture:**
  - A shared ledger for asset quality inspectors. Future step extends ledger access to a variety of external inspectors.

- **Client Value:**
  - Cost effective audit and compliance process.

- **How it will transform the business:**
  - An efficient and cost-effective Asset Quality Review (AQR) process provides real-time, accurate insight on key assets.

- **End Game:**
  - Full regulatory and audit access in real-time to all financials. IBM establishes leadership in auto-compliance technologies. Ledger data helps existing IBM Algorithmic Credit and Asset Inspector solutions.

Another possible scenario involves how blockchain might solve issues in the *Financial Audit and Compliance Ledger*, in the area of Financial Recovery and Restructuring (FR&R). Together with IBM, we are exploring whether blockchain could help create data uniformity in the FR&R chain, based on a single shared ledger. IBM and ABN Amro will equally share the blockchain knowledge gathered in the project. Cashing in
IBM to Launch One of the Largest Blockchain Implementations in the World

IBM Global Financing brings Blockchain to Real World

IBM Global Financing is the world's largest IT captive financier and helps their clients access solutions that they require for their growth. They finance IT hardware, software and services. IBM will soon be implementing a Blockchain solution that will allow them to handle dispute resolution more effectively, making this particular implementation of Blockchain the world's largest.
Channel Finance Solution: Smart Contract for Credit Issuance - IBM Global Financing Use Case

- Immutability / Non-repudiability of blockchain ledger => Comprehensive view of all operational data
- Less disputes, faster settlement => Free flow of capital between parties
- Distributed & Replicated => Less Outages, Highly extensible
Consensus use case—Shared routing codes

**What**
- Competitors/collaborators in a business network need to share reference data, e.g. bank routing codes
- Currently each member maintains their own codes, and forwards changes to a central authority for collection and distribution

**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
Hyperledger Project Expands Again With Airbus

Posted on Aug 25, 2016

Executive Brief

Formed by the Linux Foundation, Hyperledger is an ongoing initiative that pools the collective experience of around 80 different organizations to better progress the applications and abilities of blockchain technology. With names such as Intel and IBM involved, as well as several banking giants, focus on technology and finance is unsurprising, but new contributor Airbus, the aviation manufacturer, shows the diversity of application that blockchain possesses, and just why so many major businesses are investing so much into it.

Read the full story below.
Everledger brings blockchain tech to fight against diamond theft

Grace Caffyn (@GCaffyn) | Published on August 1, 2015 at 12:30 BST

Diamonds have an unlikely new best friend – the blockchain.

London startup Everledger is using the technology behind bitcoin to tackle the industry’s expensive fraud and theft problem. Or as CEO Leanne Kemp describes it, “putting bling on the blockchain”.

According to a 2012 study from the Association of British Insurers, around 65% of fraudulent claims go undetected, at an expense of £2bn to insurance companies annually.
Use Case – Vehicle registration

- Bike Blockchain with Vehicle Registration Authority (NL RDW, similar to UK DVLA)
- Bicycles can be registered in case they get stolen. When the police find the bike they can trace back to the owner. This is increasingly a problem because of more expensive e-bikes, which are stolen in large quantities.
- Small commercial engagement with RDW (delivery June 2016) to build prototype of Bike Blockchain
- See draft use case below, only a part will be implemented.

---

**Bicycle manufacturer**
- Registers bike
- Transfers ownership

**Bicycle shop**
- Registers bike identification
- Registers lock with bike
- Transfers ownership

**LoRa Lock**
- Registers open/close status and location

**Owner**
- Deregisters bike (wreck, disposed)

**Municipality**
- Receives anonymized parking locations as registered by LoRa lock for urban planning

**Insurer**
- Validates stolen claim (smart contract: owner report lost + police report)
- Update claim status

**Police**
- Register ‘notice’ of owner of Lost (potentially stole) bike
- Registers bike and ID found
- Registers bike scrapped (smart contract: after 3 months registers as found and owner did not claim)

**Owner**
- Reports lost
- Transfer ownership
- Request insurance claim
- Check status claim

---

**Diagram Notes**
- Green dots indicate registration.
- Red dots indicate deregistration.
- Blue dots indicate updates or actions.
Use Case – Scheduled Personal Property Claims Processing

1. Dealer provides custom guitar specification
2. Manufacturer ships to dealer warehouse
3. Buyer purchases guitar online
4. Buyer obtains quote from insurer
5. Insurer adds scheduled item to homeowner policy
6. After 3 policy periods, guitar is stolen and police report filed
7. Buyer files claim
8. Insurer verifies police report
9. Insurer determines payout or replacement
10. Insurer communicates claim determination to insured

1. Serial number, description, photos, etc registered on blockchain when manufacturer builds guitar
2. Shipping info to dealer warehouse added to blockchain
3. Warehouse inventory control info added to blockchain
4. Electronic payment information is added when guitar is purchased
5. Smart contract initiates quote preparation based on market price to add scheduled item to homeowner policy
6. Quote accepted and new premium payment info recorded
7. In each policy period, current value of guitar recorded
8. Police report registered by insured on blockchain
9. Claim registered on blockchain, smart contract validates claim using police report evidence
10. Value determined by limit or tracked value; Payment or replacement provided; Guitar tracking information updated
Banking & Finance Use Cases

- Federal Reserve Stress Test
- The Stock Exchange
- Trade Finance
- Foreign Exchange Payments
- Assets that Pay Dividends or Interest
- Structured Finance
Insurance Industry Use Cases

- Sales and Underwriting
- Claims Processing and Settlement
- Assessment of Possible Settlement Costs
- Regulatory Compliance
- Underwriting Expense
Healthcare Industry Use Cases

Patient Profile

Patient Data Security

Validation & Payment of Claims

Prescription & Drug Information

Historical Data – Outcome-Based Payments
Automotive Industry Use Cases

- Supply Chain Markets
- Navigating Regulatory Boundaries
- Minimizing Vehicle Recalls
- Auto Repair & Services
- Buying & Selling on The Secondary Market
Use Case – Asset depository

Problem:
• Assets such as financial securities must be able to be dematerialized on a blockchain network so that all stakeholders of an asset type will have direct access to that asset, allowing them to initiate trades and acquire information on an asset without going through layers of intermediaries.

Solution:
• An ID management system which allows for only the parties with the correct keys have access to the asset.

Benefits:
• The blockchain removes the need for intermediaries and unnecessary cost overhead.
Use Case – Business to Business (B2B) Contracts

- **What?**
  - Buyer wants efficient way of converting a purchase order into validated, self-executing contract updated to reflect the status of the supply.
  - Agreement must be visible to the buyer, the seller, banks, logistics partners and other stakeholders.

- **How?**
  - Blockchain provides a shared record of the contract status which is updated as the contract progresses.
  - Available to all parties to the agreement, their banks and partners.

- **Benefits**
  - Increased efficiency and transparency across the supply chain.
  - Risk management improved through the near real-time update of all contracts.
Use Case – Corporate Debt (or Bond)

- **What?**
  - Bank holding a corporate debt would like to
    - pay vendors quickly for transactions validated by the client
    - allow the corporate client to see the payment is made
    - provide government with oversight of the process

- **How?**
  - Blockchain provides a common ledger for recording the corporate debt / bond, available to bank, corporate client, vendors & government.

- **Benefits**
  - Speeds up vendor payments bigger net discounts
  - Eliminates risk and accelerates decision making
  - Owning bank can spread the cost across each market.
Use Case – Syndicated Loans

- **What?**
  - Corporate loans have very long, unpredictable settlement times
  - Market is decentralized by nature, no central clearing house

- **How?**
  - Blockchain enable loans to be tracked and settled from origination, syndication, through to secondary

- **Benefits**
  - Track loans through entire lifecycle and easily see where there are hold ups
  - Insert hash of documents into title token to track documentation changes
  - See a real time and historical cap table for each loan
  - Documentation can be automatically generated

![Syndicated Loans Process](source: DBJ Development Bank of Japan)
Mizuho Financial Group and IBM to Test Blockchain Technology for Settlements Using Virtual Currency

Tokyo - 23 Jun 2016: Mizuho Financial Group and IBM (NYSE: IBM) announced today a test of the potential of blockchain for use in settlements with virtual currency. By incorporating blockchain technology into settlements with virtual currency, Mizuho will explore how payments can be instantaneously swapped, potentially leading to new financial services based on this rapidly evolving technology. The pilot project uses the open source code IBM contributed to the Hyperledger Project.

"Mizuho Financial Group has a history of adopting new technologies to continuously improve customer services," said Masahiko Katou, Senior Technical Officer, Mizuho Financial Group. "In an era of technology transformation, Mizuho is testing blockchain, Watson, and other technologies to deliver high quality and more efficient customer services."
Use Case – Smart Refrigerator

- **What?**
  - Value of connected smart devices limited by ability to interact with business systems

- **How?**
  - Blockchain to manage automated interactions with the external world
  - ordering and paying for food to arranging for its own software upgrades and tracking its warranty.

- **Benefits**
  - business value from connected technology
  - efficiencies in network and supply chains.
  - status transparent to all network members
Use Case – On Line Gaming

- **What?**
  - Game player wants to trade “gold” earned in current game for the currency or assets of another game
  - Use experience with the current game to put me ahead and not have to start cold in the new game

- **How?**
  - Blockchain holds tokens of value shared across on line gaming platform

- **Benefits**
  - Transparency to game player, game owners & infrastructure providers
  - Efficiencies through elimination of intermediaries
  - Increased trust for all involved parties.
Other potential use cases

- **Securities**
  - Derivative contracts
  - Securities issuance

- **Trade Finance**
  - Bill of Lading
  - Cross-currency payment

- **Industrial**
  - Manufacturing Process

- **Government**
  - Government Tender Process
  - Voting

- **IOT**
  - Decentralized device registration, management, and communication
  - Auto insurance -- e.g., driver habits tracking
  - Manufacturing provenance
  - Device-to-device transactions

- **Retail Banking**
  - Cross border remittances
  - Mortgage verification & contracts

- **Public Records**
  - Real estate records
  - Land Registry
  - Vehicle registrations
  - Citizen Identity
  - Birth/death records, inheritance
  - Business license and ownership records

- **Media & Gaming**
  - Micro-payments, Content licensing, Virtual goods exchange
  - Digital Rights Management

- **Cross Industry**
  - Identity Management
  - Trusting Industry
  - Capital Asset Management
Making Blockchain Real for Business

Demo
Traditional Trade Finance: >10 parties, ~30 documents, physical presence and overwhelmingly paper-based. Almost completely manual with a single “transaction” taking as long as 50 days.

“The trade happens in seconds, but it takes days to complete the transaction.”

Global Head of Technology Business Development, Goldman Sachs
Trade Finance Smart Contract

IBM Blockchain Applications

- IMS
- CICS
- TPF
- DB2z
  - Port Authority Chain code
  - Customs Authority Chain code
  - Trucking Service Chain code
  - Import Bank Chain Code
Car LifeCycle – Asset Transfer Demo

1. Manufacturer
   • Manufactures cars
   • Transfers ownership to Dealers

2. Dealer
   • Sells cars
   • Transfers ownership to Leasing Companies

3. Leasing Company
   • Provides lease cars
   • Transfers ownership to Lessee

4. Lessee
   • Leases Cars
   • Transfers ownership to Scrap Merchant

5. Scrap Merchant
   • Disposes of Cars

Regulator
• Creates “Vehicle Template”
How could participants work with blockchain?

1. Manufacturer
2. Dealer
3. Leasing Company
4. Lessee
5. Scrap Merchant

Regulator

Shared Ledger

Smart Contracts

Records of asset transfer
Condition for asset transfer

Records of asset transfer node
Condition for asset transfer node

Publicly Available IBM Blockchain Demos

- IBM joins Linux Foundation to advance Blockchain
- Car Lease Demo
- Trade Finance/Logistics 1
- Trade Finance/Logistics 2
- International Trade Solution on Blockchain
- IBM Blockchain Solution for IBM Global Finance
- Cognitive Shopping with Blockchain, Deep Analytics, IoT
- Everledger uses Blockchain on IBM LinuxONE™
- Explore Watson IoT with Blockchain
- Trading Commercial Paper via blockchain with IBM Bluemix
- IBM Blockchain: Getting Started with Marbles App
Thank you!