Making Blockchain Real for Business

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IBM Blockchain
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

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 …

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

BUT

Blockchain is not bitcoin

… Digital currencies different from cryptocurrency
Blockchain for business …

Append-only distributed system of record shared across business network

Shared ledger

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable

Privacy

Smart contract

Business terms embedded in transaction database & executed with transactions

Consensus

All parties agree to network verified transaction

… Broader participation, lower cost, increased efficiency
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
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
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

… 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
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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
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

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<td>Cross currency payments</td>
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<td>Mortgages</td>
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<td>Information sharing (supplier – retailer)</td>
<td>Asset usage history</td>
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<td>Medicine supply chain</td>
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<td>Claims file</td>
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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
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# Blockchain for Business – Our Point of View

| **Community + Code** | Open Source Code: Blockchain for business; **Consensus | Provenance**  
|                     | **Immutability | Finality**  
| Linux Hyperledger Project | Open Governance – 100 member cross industry board |

| **Cloud** | Blockchain managed service on IBM Cloud and z Systems; **Identity | Consensus | System Integration | Hardware-assist for Performance & Security**  
|           | IBM Blockchain on Bluemix |

| **Clients** | Making Blockchain real for business  
|             | Blockchain Garage; **New York | London | Singapore | Tokyo**  
| Blockchain Solutions | Blockchain Services Practice |
| Blockchain Garage |
## 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

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Supporting serious blockchain deployment!
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

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<tr>
<th>Role</th>
<th>Details</th>
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<tr>
<td>Chairman</td>
<td>Blythe Masters/DAH</td>
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<tr>
<td>Executive Director</td>
<td>Brian Behlendorf</td>
</tr>
<tr>
<td>Technical Chair</td>
<td>Chris Ferris/IBM</td>
</tr>
<tr>
<td>Contribution</td>
<td>44,000 lines of code in February 2016</td>
</tr>
<tr>
<td>Sprint to one codebase with unified thinking</td>
<td>Staged releases</td>
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www.Hyperledger.org
Hyperledger Project Members

Premier

General

Associate

Updated Jan 2017
Engagement model overview

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

Let’s Talk

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

Blockchain Hands-on

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

First Project

1. Scale up pilot or Scale out to new projects
2. Business Process Re-engineering
3. Systems Integration

Scale

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

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<thead>
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<th>FX Netting</th>
<th>Settlements through digital currency</th>
<th>Identity management</th>
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<td><img src="ARKEA.png" alt="Crédit Mutuel ARKEA" /></td>
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<td><img src="Bank.png" alt="Bank of America Merrill Lynch" /></td>
<td><img src="IBM.png" alt="IBM Global Financing" /></td>
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<th>Low liquidity securities trading and settlement</th>
<th>Reward points management</th>
<th>Contract Management</th>
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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:

ABN AMRO:

Crédit Mutuel Arkéa:

JPX:

Kouvola Innovation:

London Stock Exchange:

Mizuho:

IBM Global Finance: