Chapter 1: What is Blockchain?

Learning Bluemix & Blockchain

Bob Dill, IBM Distinguished Engineer, CTO Global Technical Sales
David Smits, Senior Certified Architect, IBM Blockchain

The Plan: 30 minute Chapters with an hour or two of practice

Chapter 1:	What is Blockchain? Concept and Architecture overview
Chapter 2:	What's the story we're going to build
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Zero To Blockchain

- Online, free tutorial on getting started with Blockchain and IBM Bluemix
- The tutorial will build a blockchain solution on IBM Bluemix using
  - HyperLedger Composer V 0.10 or higher.
  - Hyperledger Fabric V1.0 or higher
  - Go, NodeJS, Angular
  - HTML, CSS, Javascript
- All code for the tutorial is in github:
  - https://github.com/rddill-IBM/ZeroToBlockchain

- Basic introduction to coding for Bluemix, getting an id, setting up your workstation can be found in the popular ZeroToCognitive series:
  - https://www.youtube.com/playlist?list=PLnJzIOiv6cVTaS8k90R3T9AlS_kf5XWmX

Blockchain education series

Explained | Solutions | Composed | Architected | Explored | Next Steps

IBM

Blockchain Explained

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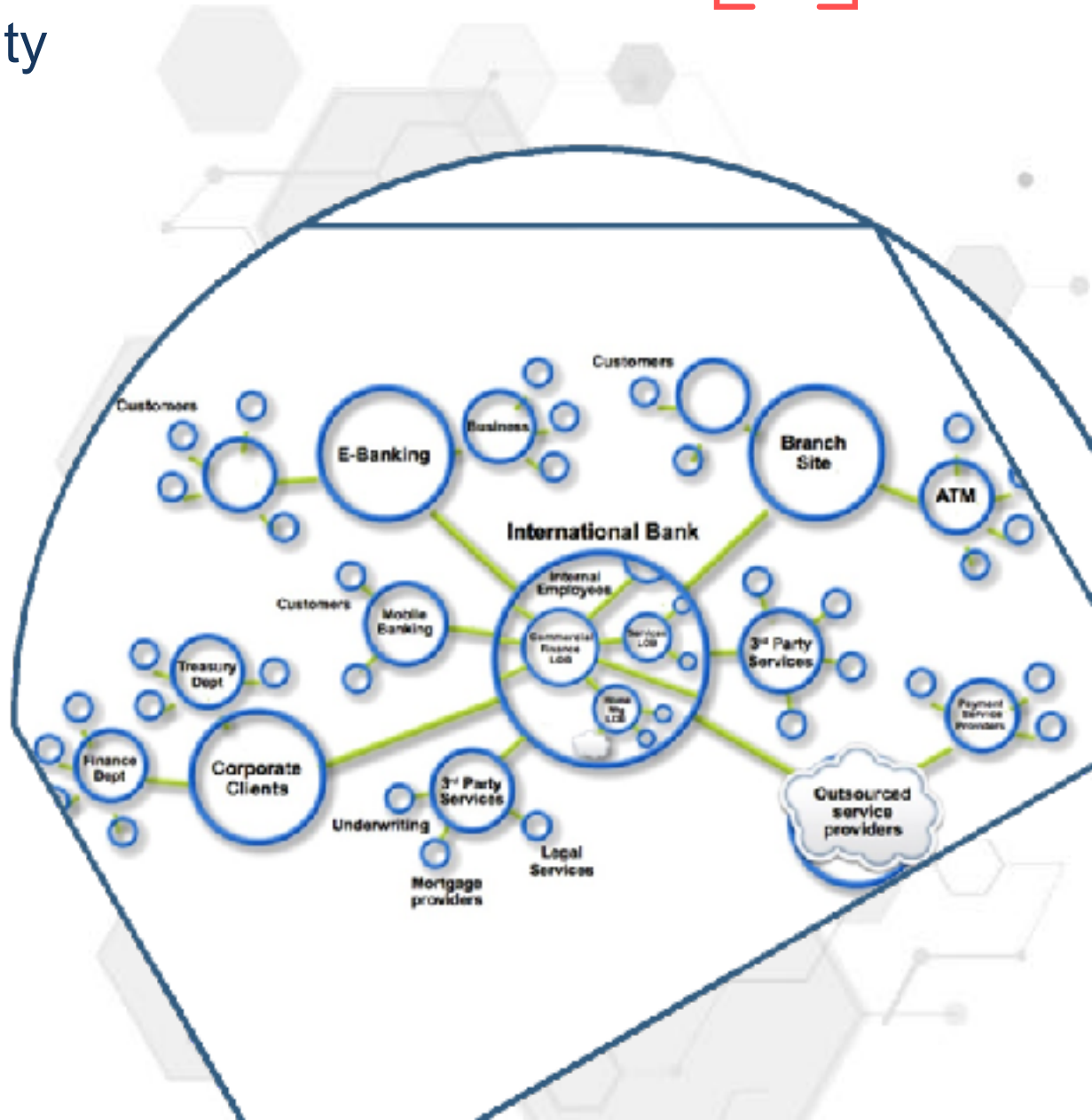
Contents

Business networks, wealth & markets

What

- 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

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)

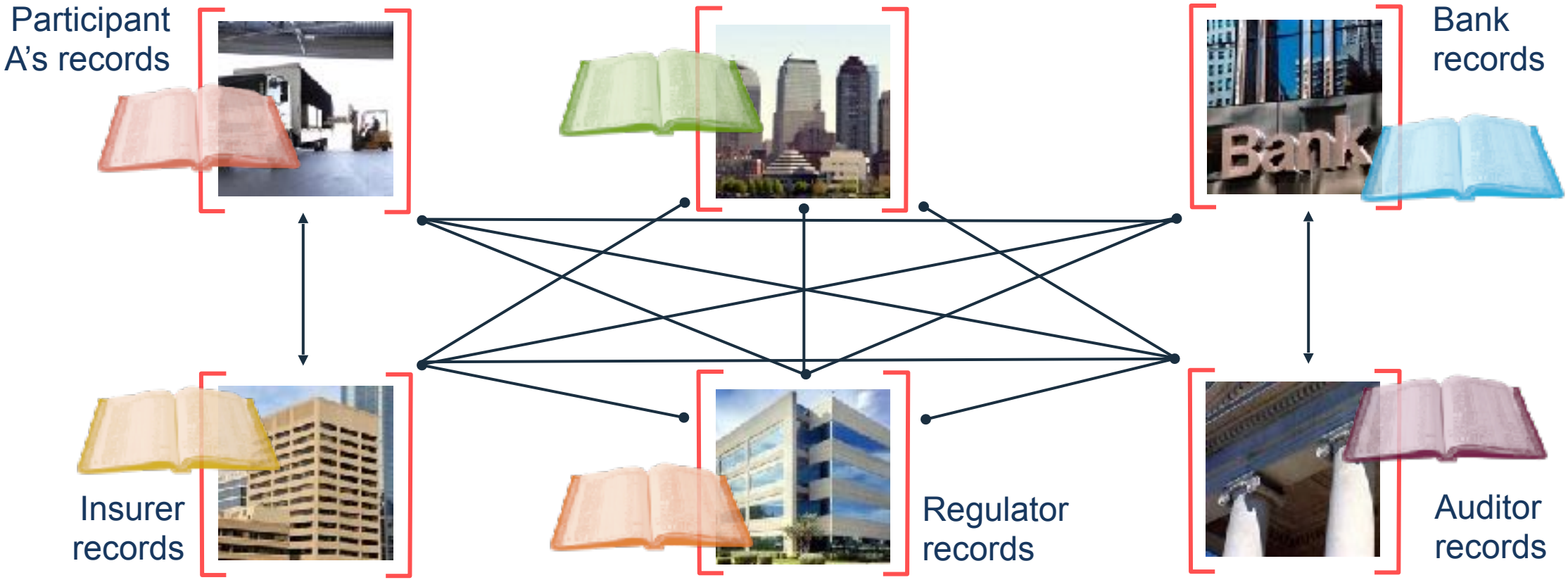
Contract – conditions for transaction to occur

- 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

Problem …

What



… inefficient, expensive, vulnerable

A shared replicated, permissioned ledger…

What

Participant
B's records

Participant
A's records

Bank
records

Blockchain

Insurer
records

Regulator
records

Auditor
records

… with consensus, provenance, immutability and finality

Blockchain underpins Bitcoin …

What

bitcoin

An unregulated shadow-currency

The first blockchain application

Resource intensive

Blockchain for business differs in key areas:

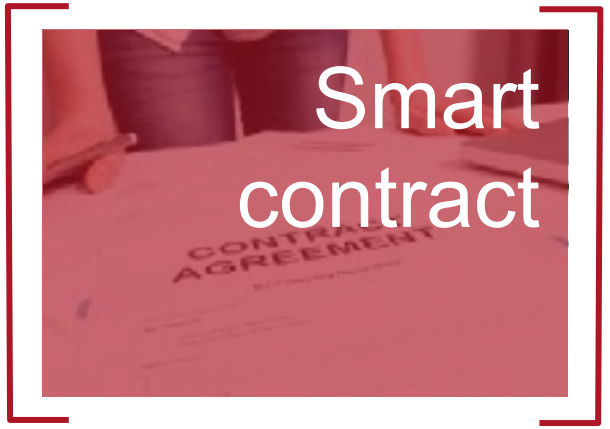
Identity over anonymity

Selective endorsement over proof of work

Assets over cryptocurrency

Requirements of blockchain for business

Append-only distributed system of record shared across business network

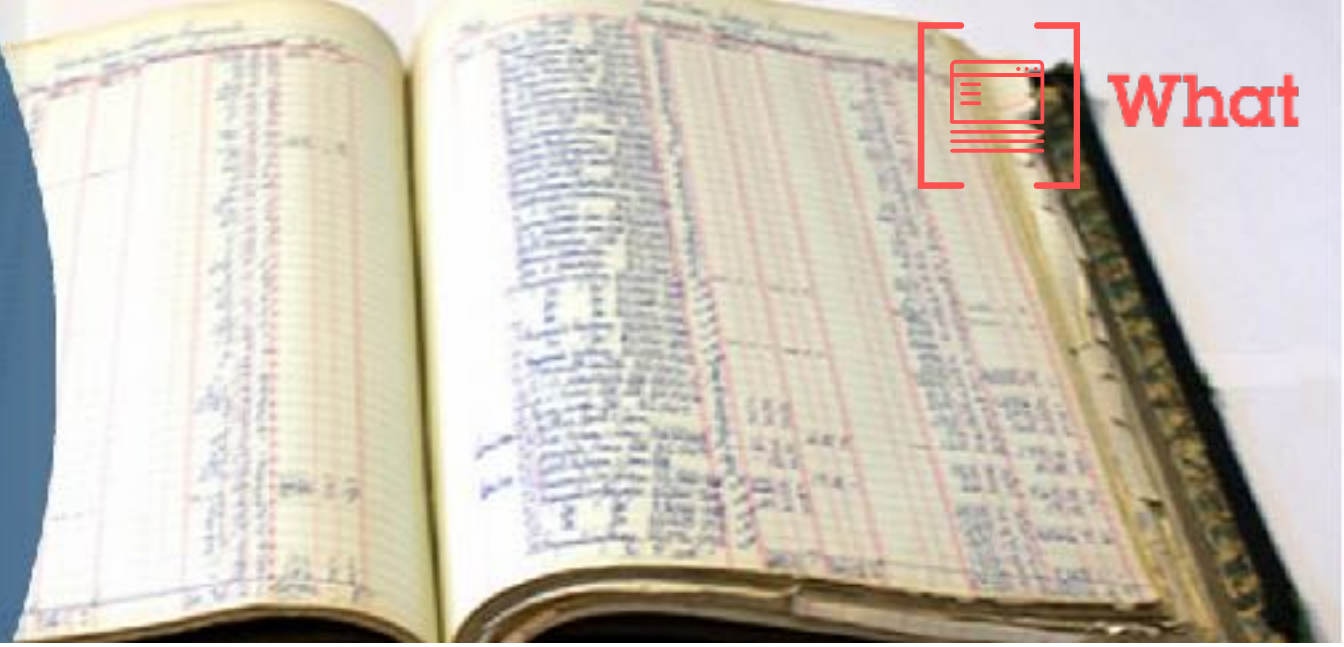


Business terms embedded in transaction database & executed with transactions

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable

Transactions are endorsed by relevant participants

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

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

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

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

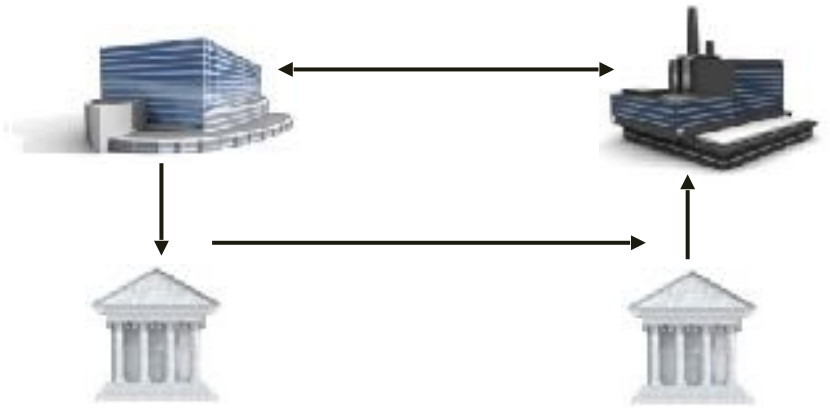
How

- 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

Trade Finance

Cross currency payments

Mortgages

Public Sector

Asset Registration

Citizen Identity

Medical records

Medicine supply chain

Retail

Supply chain

Loyalty programs

Information sharing (supplier – retailer)

Insurance

Claims processing

Risk provenance

Asset usage history

Claims file

Manufacturing

Supply chain

Product parts

Maintenance tracking

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Chapter 2: The Story

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