

# 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
Chapter 2.1:	Architecture for the Story
Chapter 3:	Set up local HyperLedger Fabric V1 development environment
Chapter 4:	Build and test the network
Chapter 5:	Administration User Experience
Chapter 6:	Buyer Support and User Experience
Chapter 7:	Seller Support and User Experience
Chapter 8:	Shipper Support and User Experience
Chapter 9:	Provider Support and User Experience
Chapter 10:	Finance Company Support and User Experience
Chapter 11:	Combining for Demonstration
Chapter 12:	Events and Automating for Demonstration



# 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=PLnJzIOiv6cVTaS8k90R3T9AIS\\_kf5XWmX](https://www.youtube.com/playlist?list=PLnJzIOiv6cVTaS8k90R3T9AIS_kf5XWmX)



# Blockchain Explained

V4.06, 28 July 2017



# Contents



**What** is Blockchain?



**Why** is it relevant  
for our business?

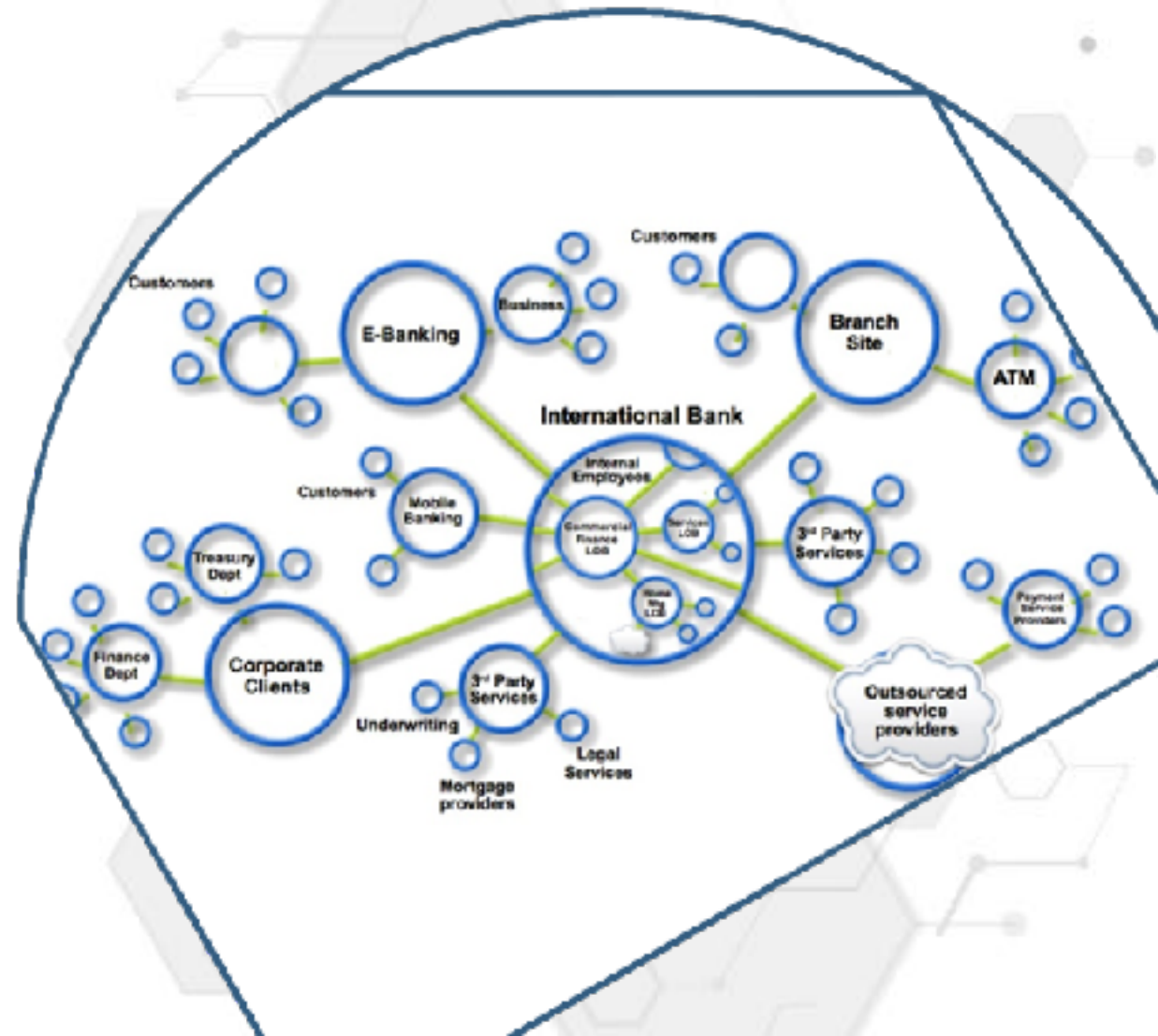


# Business networks, wealth & markets



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

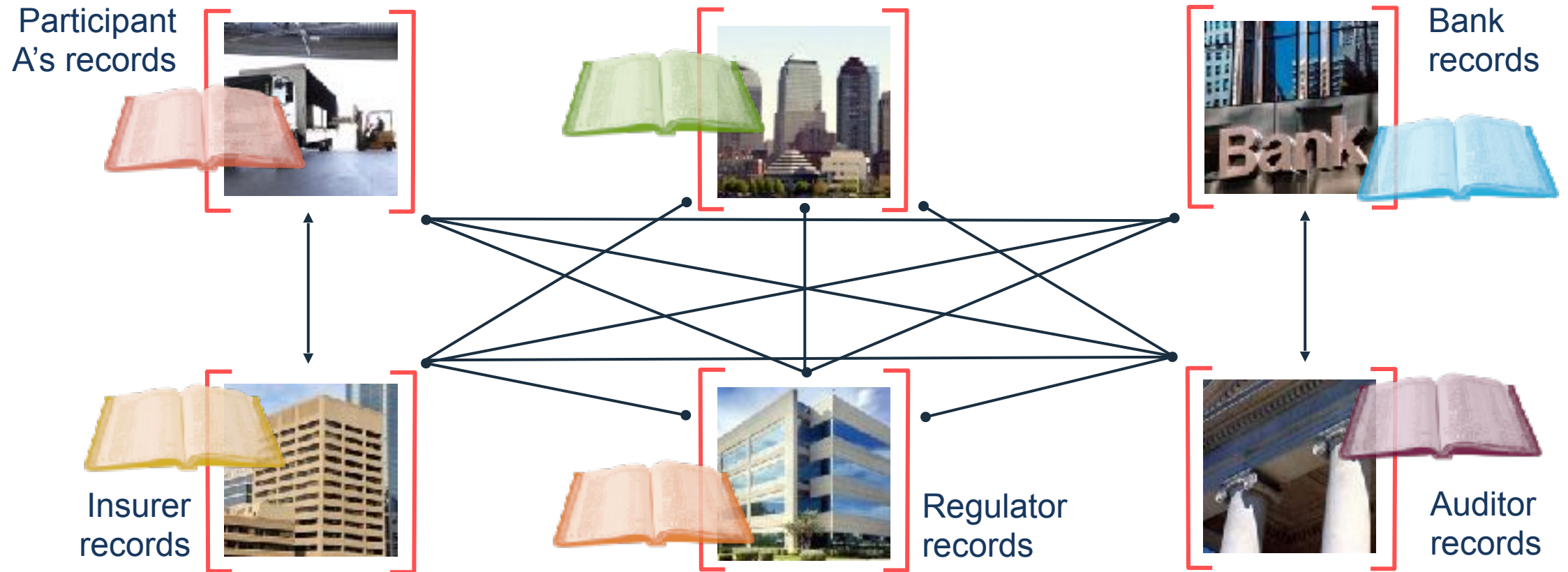
If Anthony pays John money, then car passes from John to Anthony (simple)

If car won't start, funds do not pass to John (as decided by third party arbitrator) (more complex)





# Problem ...



... inefficient, expensive, vulnerable

# Introducing Blockchain



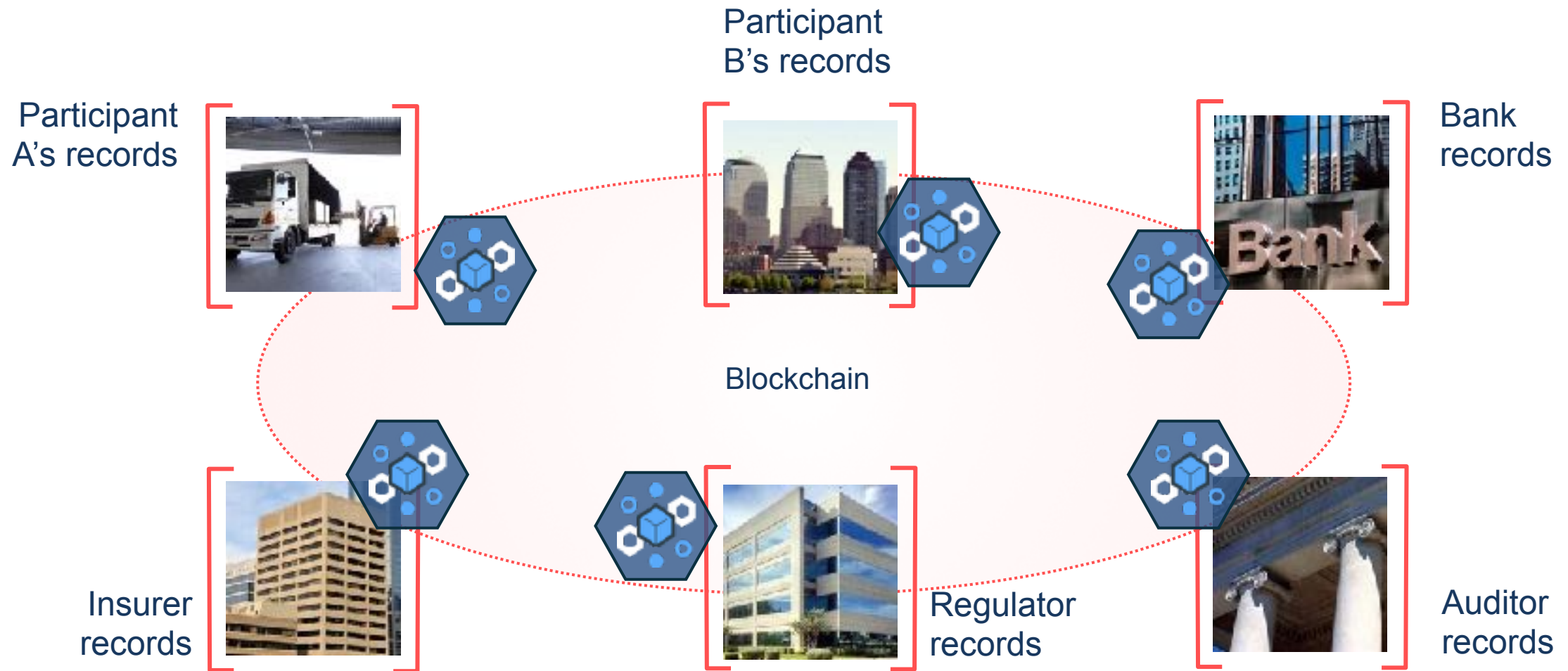
A trusted,  
distributed ledger



with shared business  
processes



# A shared replicated, permissioned ledger...



... with consensus, provenance, immutability and finality

# Blockchain underpins 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



Shared ledger



Smart contract

Business terms embedded in transaction database & executed with transactions

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable



Privacy



Trust

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



**What** is Blockchain?



**Why** is it relevant  
for our business?



# 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

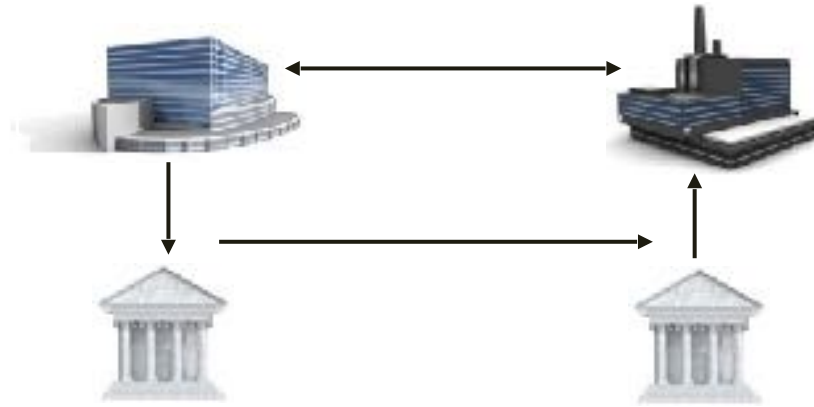
- Blockchain collects transaction records from diverse set of financial systems
- Append-only and tamperproof qualities create high confidence financial audit trail
- Privacy features to ensure authorized user access

## 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

# 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
Chapter 2.1:	Architecture for the Story
Chapter 3:	Set up local HyperLedger Fabric V1 development environment
Chapter 4:	Build and test the network
Chapter 5:	Administration User Experience
Chapter 6:	Buyer Support and User Experience
Chapter 7:	Seller Support and User Experience
Chapter 8:	Shipper Support and User Experience
Chapter 9:	Provider Support and User Experience
Chapter 10:	Finance Company Support and User Experience
Chapter 11:	Combining for Demonstration
Chapter 12:	Events and Automating for Demonstration



# Chapter 2: The Story

Learning Bluemix & Blockchain

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

