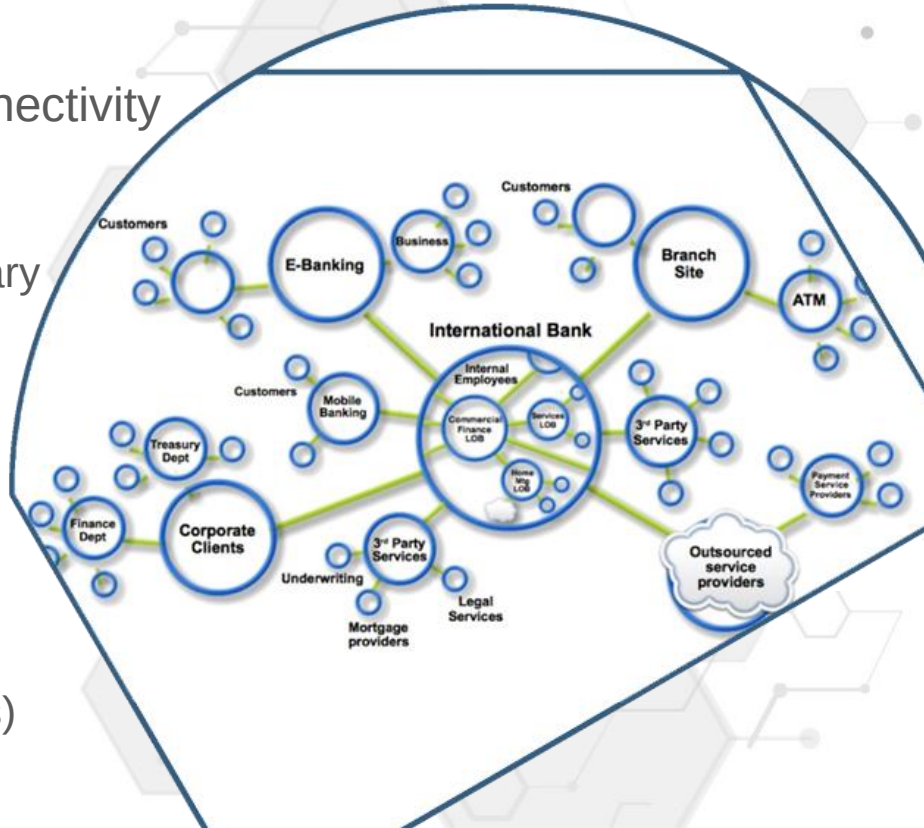
Blockchain
essentials

Contents

What

Business networks, wealth, and 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.

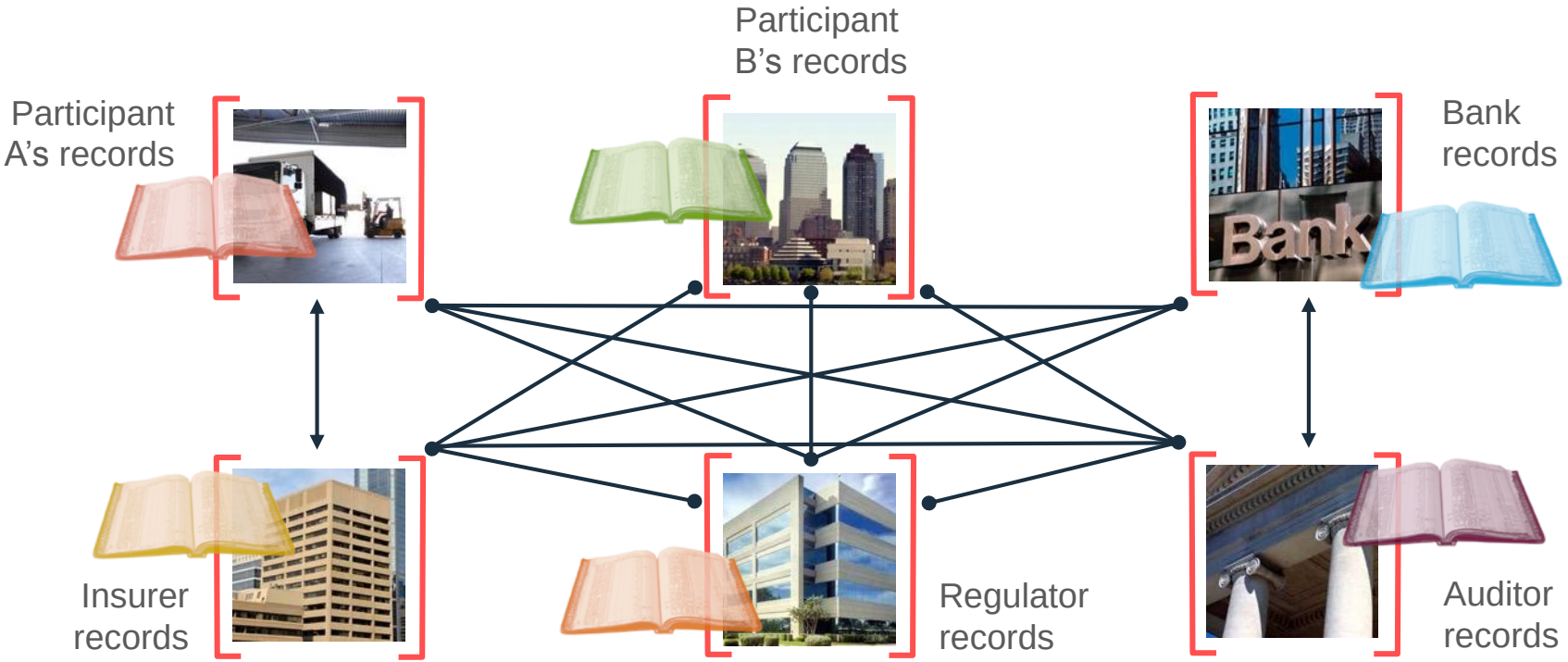
- **Transaction** – an asset transfer onto or off the ledger
  - John gives a car to Anthony (simple)
- **Contract** – conditions for transaction to occur
  - If Anthony pays John money, then car passes from John to Anthony (simple)
  - If car won't start, funds do not pass to John (as decided by third party arbitrator) (more complex)

Introducing blockchain

What

Problem …

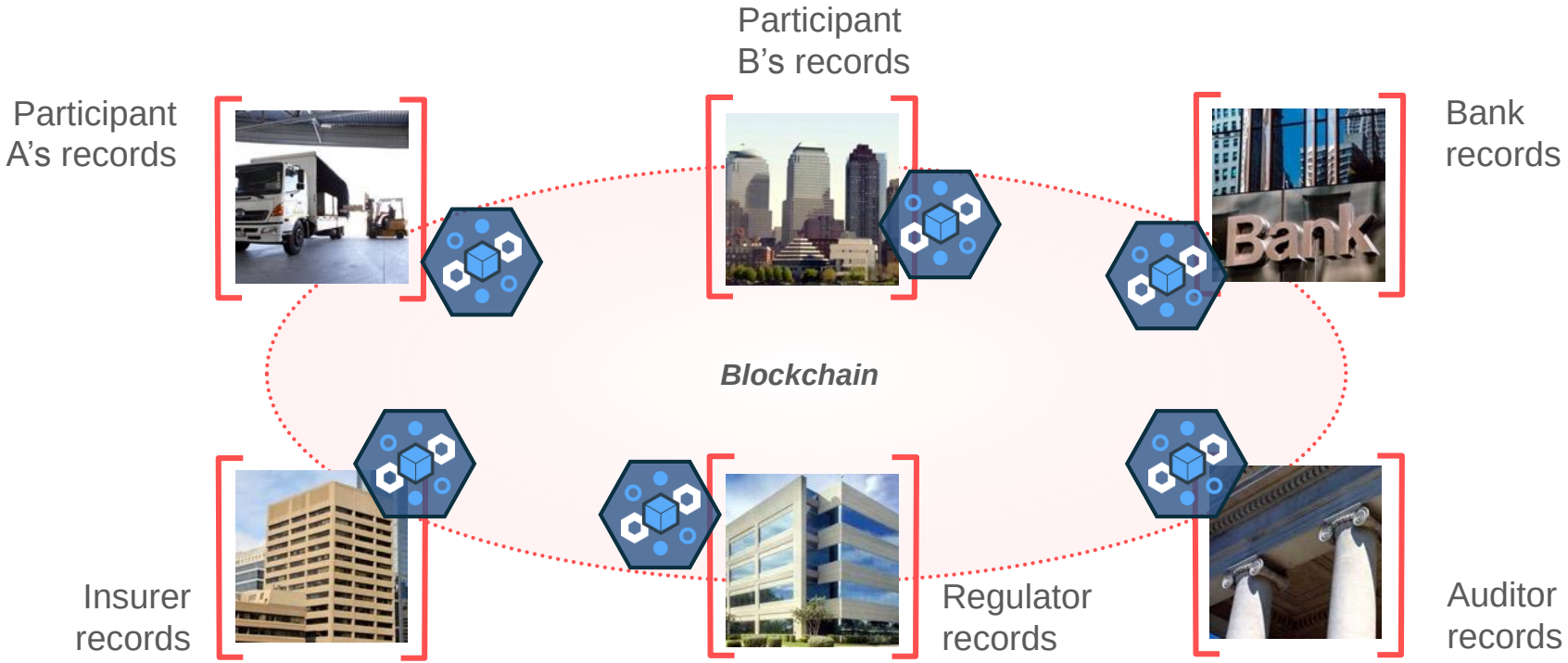
What



… inefficient, expensive, vulnerable

A shared replicated, permissioned ledger…

What



… with consensus, provenance, immutability and finality

Blockchain underpins Bitcoin …

What

bitcoin is:

- 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

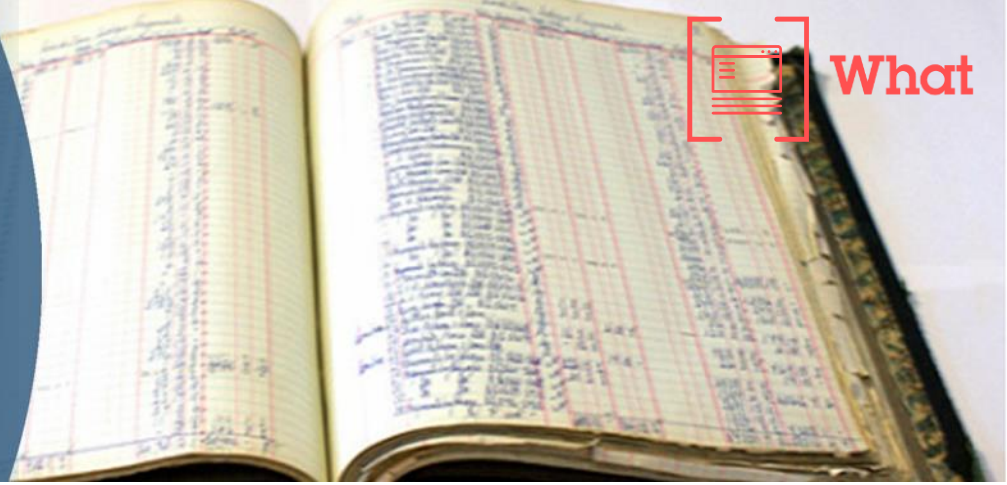
Append-only distributed system of record shared across business network

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

What

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

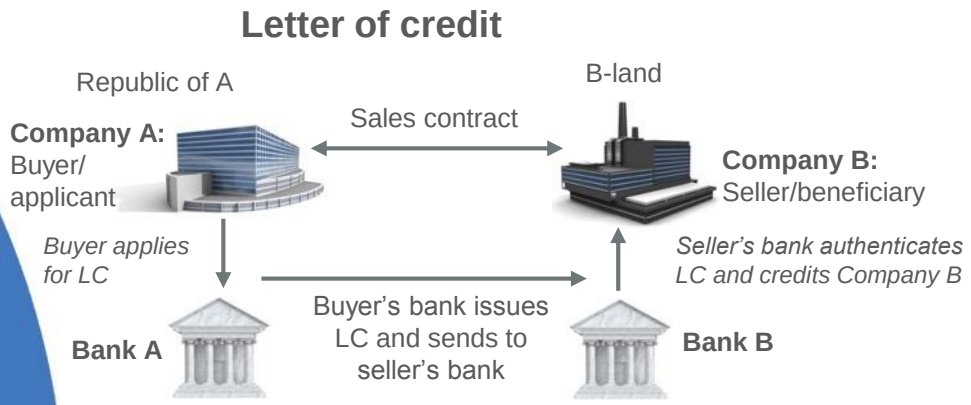
How

- 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	Public Sector	Retail	Insurance	Manufacturing
Trade Finance	Asset Registration	Supply chain	Claims processing	Supply chain
Cross currency payments	Citizen Identity	Loyalty programs	Risk provenance	Product parts
Mortgages	Medical records	Information sharing (supplier – retailer)	Asset usage history	Maintenance tracking
	Medicine supply chain		Claims file	

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

Why

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

Contents

How IBM can help

How

Technology

HYPERLEDGER
BLOCKCHAIN TECHNOLOGIES FOR BUSINESS

Hyperledger Fabric

Hyperledger Composer

Hosting and Support

High Security Business Network

IBM Bluemix

docker

Making blockchain real for clients

Garages

Engagement

How

Hyperledger, a Linux Foundation Project

- A collaborative effort created to advance cross-industry blockchain technologies for business
- Announced December 2015, now over 140 members
- Open source, open standards, open governance
- One active framework (“Fabric”) and seven projects in incubation
- IBM is a premier member of Hyperledger

Brian Behlendorf
Executive Director

Blythe Masters
Board Chair

Chris Ferris
TSC Chair

www.hyperledger.org

Hyperledger members

Premier

accenture
AIRBUS
AMERICAN EXPRESS
CHANGE HEALTHCARE
CME Group
DEUTSCHE BÖRSE GROUP
DAIMLER
Digital Asset
DTCC
FUJITSU
HITACHI
IBM
intel
J.P.Morgan
NEC
r3
SAP
万达·飞凡科技

General

1World Blockchain
ABN·AMRO
AESTHETIC INTEGRATION
AlphaPoint
ALTOROS
ANZ
loyyal
Lykke
MadHive
Milligan Partners
MIRACL
MONAX
BBVA
博图纵横
belink
BITMARK
bitse
BLOCKCHAIN
MonetaGo
ML
MOSCOW EXCHANGE
MURPHY & McGONIGLE
NSE
NEC
blocko
Blockstream
bloq
BNP PARIBAS
BNY MELLON
Broadridge
NETKI
NEX
NOKIA
norbloc
NTT DATA
onchain
bubi.币比
ca technologies
Calastone
链链
JBI
招商银行
橙色魔方
PAXOS
PDX
RadarWin
redhat
SAMSUNG
SAMSUNG SDS
cisco
中信 CITIC
clause
cloudsoft
CLS
coinplug
SANY
SBERBANK
Schroders
SECURE KEY
GINGKCO
onechain
collector
colu.
ConsensusBase
consensys
Cuscal
Deloitte.
四方精创
NEXGO
点融网
SORAMITSU
STATE STREET
ENERGY
EY
Eurostep
FACTOM
房掌柜 FZG360.COM
Gem
SWIFT
swisscom
symbiont
tequa creek
THOMSON REUTERS
PeerSafe
guardtime
33.CN
HASHED HEALTH
HUAWEI
HUNDSUN
TMX
UMF 联动优势
vmware
WELLS FARGO
云象 YUNPHANT
梧桐树
趣链科技 Hyperchain
intellect
intuit
INVOSHARE
IROOTECH
KAISER PERMANENTE
保全网
KRX KOREA EXCHANGE
KSD
koscom
kubique
LedgerDomain
Libra

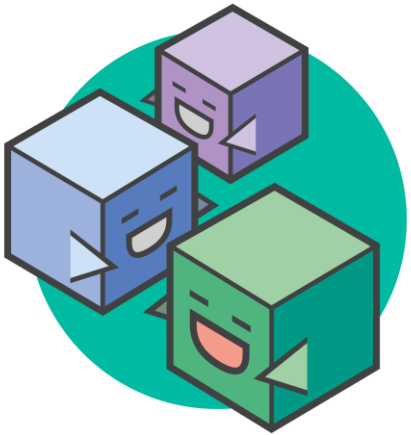
Associate

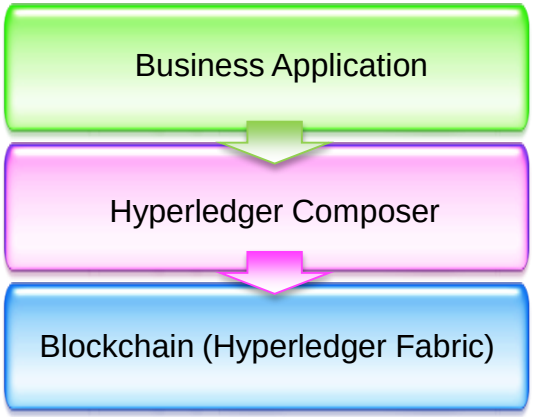
BANK OF ENGLAND
CHAMBER OF DIGITAL COMMERCE
CSA cloud security alliance
ColoredCoins
FEDERAL RESERVE BANK OF BOSTON
IC3
Investrata
NXT FOUNDATION
OSCRE
sovrin
BLOCKCHAIN RESEARCH INSTITUTE
TNO innovation for life
The Illinois BLOCKCHAIN Initiative
INDIT
vsp Global

Source: https://www.hyperledger.org/about/members
Updated June 2017

Hyperledger Composer: Accelerating time to value

- A suite of high level application abstractions for business networks
- Emphasis on business-centric vocabulary for quick solution creation
- Reduce risk, and increase understanding and flexibility





- Features
  - Model your business networks, test and expose via APIs
  - Applications invoke APIs transactions to interact with business network
  - Integrate existing systems of record using loopback/REST
- **Fully open** and one of eight Hyperledger projects
- Try a demo now! - http://composer-playground.mybluemix.net/

Selected references

FX Netting

CLS Fundamental to FX

Settlements through digital currency

MIZUHO

Identity management

Crédit Mutuel ARKEA

Food Safety

Walmart

Private Equity

NORTHERN TRUST

Channel Financing

IBM Global Financing

Low liquidity securities trading and settlement

JPX TOKYO STOCK EXCHANGE

Cross Border Supply Chain

IBM | MAERSK

Contract Management

MUFG

How

IBM engagement model overview

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

Remote

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

Digital

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

Face to face

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

Face to face

Continuing your education journey…

Explained

- What is blockchain for business
- Why is it relevant
- What is IBM doing

Solutions

- Use cases, patterns and references
- How IBM can help

Composed

- What is Hyperledger Composer
- Assets, transactions & participants

Architected

- Learn key blockchain technical concepts
- Designing a solution

Explored

- Technical deep dive on Linux Foundation Hyperledger Fabric
- Covers V1 content

Next Steps

- How to proceed with a first project
- Design Thinking Workshop logistics