Virtual Blockchain Immersion

April 21-24

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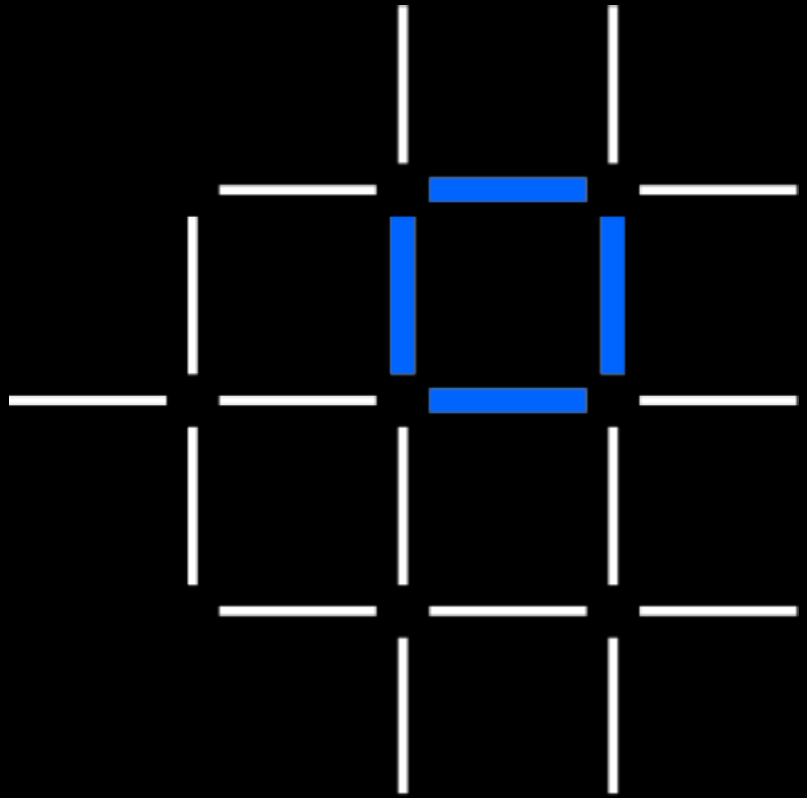


April 2020

IBM **Blockchain**

IBM

Schedule – April 21st & 22nd

April 21st:

Blockchain Introduction
Food Trust Demo
Vehicle Lifecycle Demo
Immunichain Demo
What Makes a Good Use Case

April 22nd:

Lab Instructions
Developer Journey Lab

Schedule – April 23rd & 24th

April 23rd:

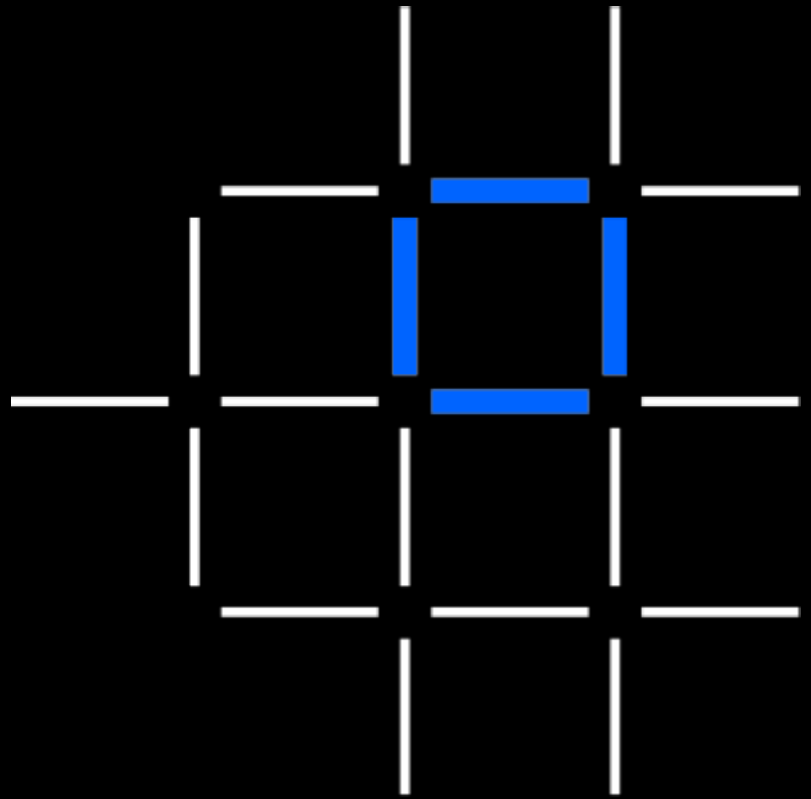
IBM Blockchain Platform & LinuxONE
Kubernetes 101

April 24th:

Lab Instructions
IBM Blockchain Platform: Deploy Network
IBM Blockchain Platform: Deploy Smart Contract

Blockchain Introduction

An Introduction to Blockchain for Business



Austin Grice

April 2020

IBM **Blockchain**

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What is Blockchain

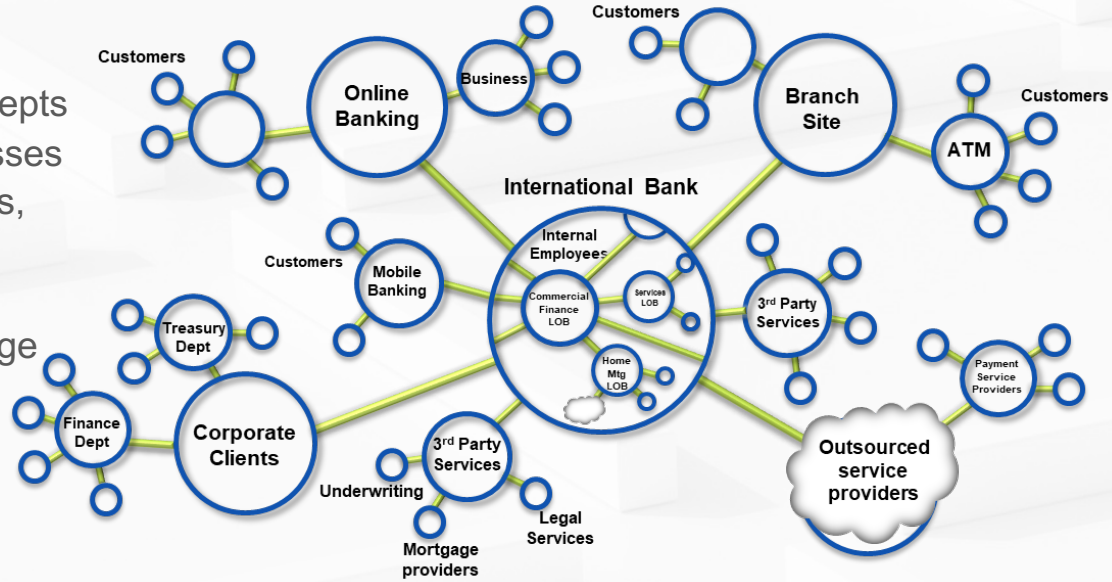
Example Networks

How IBM Can Help

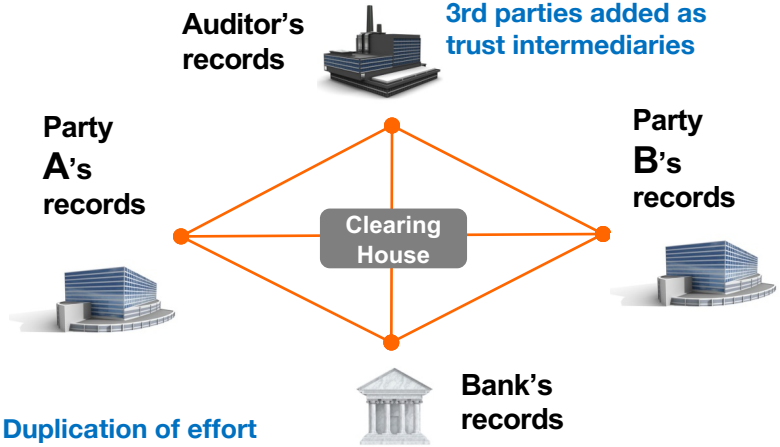
What is **blockchain?**

- Blockchain lets you build a decentralized **business network**

- Blockchain builds on basic business concepts
  - **Business networks** connect businesses
  - **Participants** are customers, suppliers, banks, partners
  - **Assets** flow over business networks
  - **Transactions** describe asset exchange
  - **Contracts** underpin transactions
  - The **ledger** is a log of transactions



Traditional

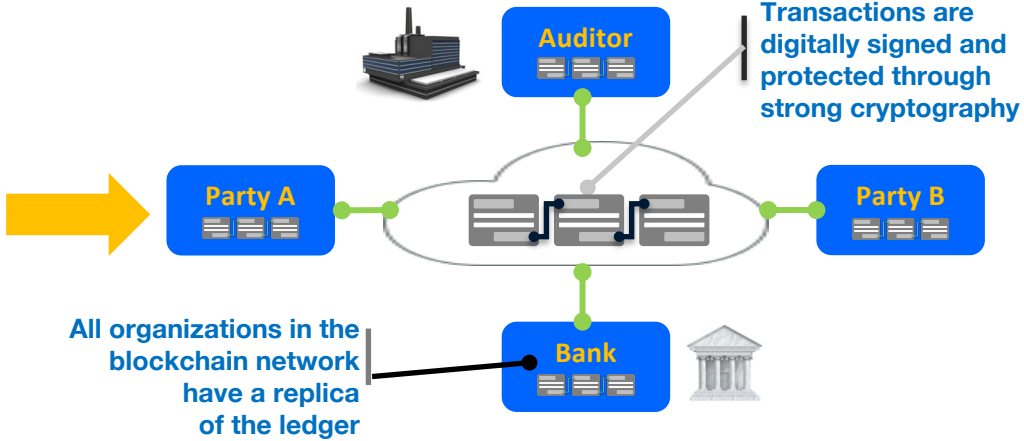


Transaction fees – Cost, Time
Data exposure - Security
Centralized entities - Risk
No central source of information - Truth

…inefficient, expensive, vulnerable

With Blockchain

A shared, replicated, permissioned ledger



…provenance, immutability, finality

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. data

Cash is also an asset

- Property of anonymity
- Hard to prove and track

Ledgers, Transactions and Contracts

- Ledger: an important **log** of all transactions
  - Describes the inputs and outputs of the business
- Transaction: an **asset transfer** between participants
  - Matt gives a car to Dave (simple)
- Contract: the **conditions** for a transaction to occur
  - If Dave pays Matt money, then car passes from Matt to Dave (simple)
  - If car won't start, funds do not pass to Matt (as decided by third party arbitrator) (more complex)

- *How do I know that the transaction I see is the same as the transaction you see?*
- *How do I know that the contract - the business rules associated with the transaction - are interpreted and implemented consistently between us?*
- Significant costs of reconciliation, dispute resolution and legal processes

Blockchain aims to solve the problems of ledgers and contracts

by allowing transactions and business rules to be **shared** between participants of the network

Shared Ledger

Distributed system of record, shared across business network. Replicated and synchronized ledger with no central administrator

Privacy

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable

Smart Contract

Provides the shared implementation of the business rules associated with each transaction

Consensus

Appropriate parties agree to valid transactions

This sharing is the foundation for innovative business solutions, including the ability to remove ambiguity and friction from trade

Broader participation, lower cost, increased efficiency

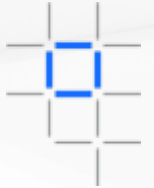
Different types of blockchain

bitcoin is an example of an unpermissioned, public ledger:

- The first blockchain application
- Peer to Peer electronic cash system
- Resource intensive

- Blockchains for business generally prioritize
  - **Assets** over cryptocurrency; **Identity** over anonymity; **Selective endorsement** over proof of work

Two Types of Blockchain



	Private/Permissioned	Public/Unpermissioned
Who?	Known invited parties	General public, unknown
Consensus	Selective Endorsement	Proof of Work/Stake
What is transferred?	Assets	Currency
Examples	Hyperledger Fabric	Bitcoin, Ethereum

Example Networks

Further examples by (selected) industry

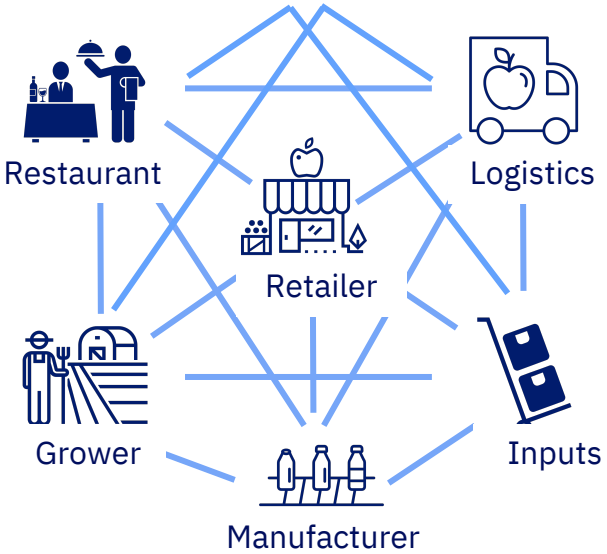
Financial	Public Sector	Retail	Insurance	Manufacturing
• Trade Finance • Cross currency payments • Mortgages • Letters of Credit	• Asset Registration • Citizen Identity • Medical records • Medicine supply chain	• Supply chain • **Loyalty programs** • Information sharing (supplier – retailer)	• Claims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

Today, traditional system constructs limit transparency

The Problem:

- **Data is siloed** within each company and accessing it requires a request and time
- Exchange of information takes place between a pair of partners; to get information from a distant partner may require **intermediaries** time, resources
- Most transactions are still **paper-based**, creating inefficiencies and opportunities for fraud
- Because everyone maintains their own record of transactions, **differences** take time and resources to reconcile

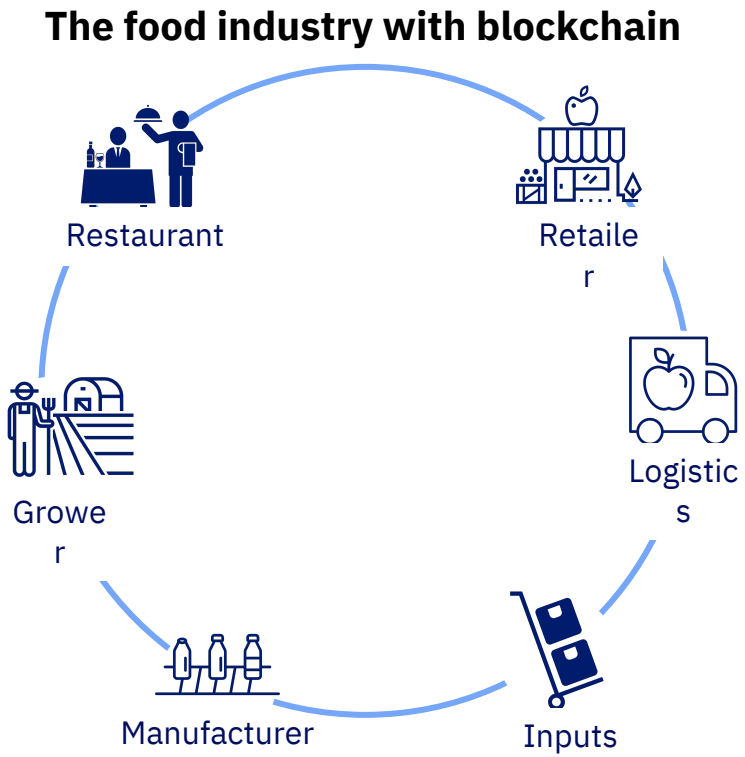
The food industry today



Blockchain transforms systems with trust and transparency

The Solution:

- Blockchain provides an **independent data-sharing platform**
- Once data is shared in a single data-sharing platform, everyone has **instant transparency** into the transactions they are authorized to view; no intermediation required
- **Data immutability** creates an auditable record of all transactions, disincentivizing fraudulent behavior
- **Dispute resolution** from the shared ledger can be automated saving time and resources

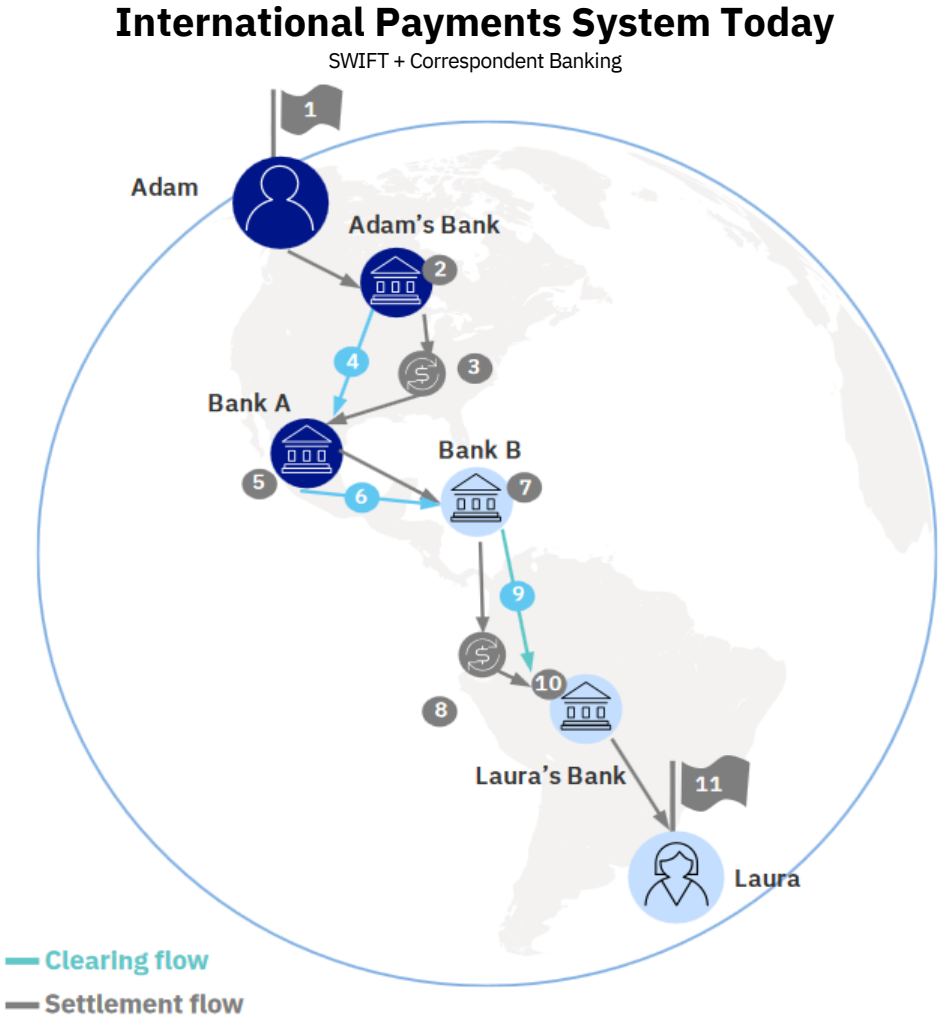


Cross-border payments today remain costly, complex and slow

Limited end-to-end transparency, fee opacity & delivery uncertainty

The Challenges

- Slow: Current international payments systems rely heavily on **coordination between several counterparties** exchanging both information and value, taking **days** or **even weeks to complete** transactions.
- Costly: **Reconciliation**, regulatory **compliance**, foreign exchange and the cost of trapped **liquidity** in correspondent banking accounts are a few factors that continue to **inflate** the true cost of cross-border payments.
- Limited Transparency: The involvement of multiple intermediaries creates a **complex** web of procedures and **hinders the end-to-end visibility** of cross-border payments – often resulting in **error-prone** and faulty transactions that must be reconciled later. Parties are also rarely aware of where exactly fees are deducted along the way.
- Complicated: Privacy and security concerns have given rise to new, often **competing regulatory requirements**, creating a **barrier** for payment processing in certain regions, **cutting off** high-potential emerging markets from participating in the global economy.



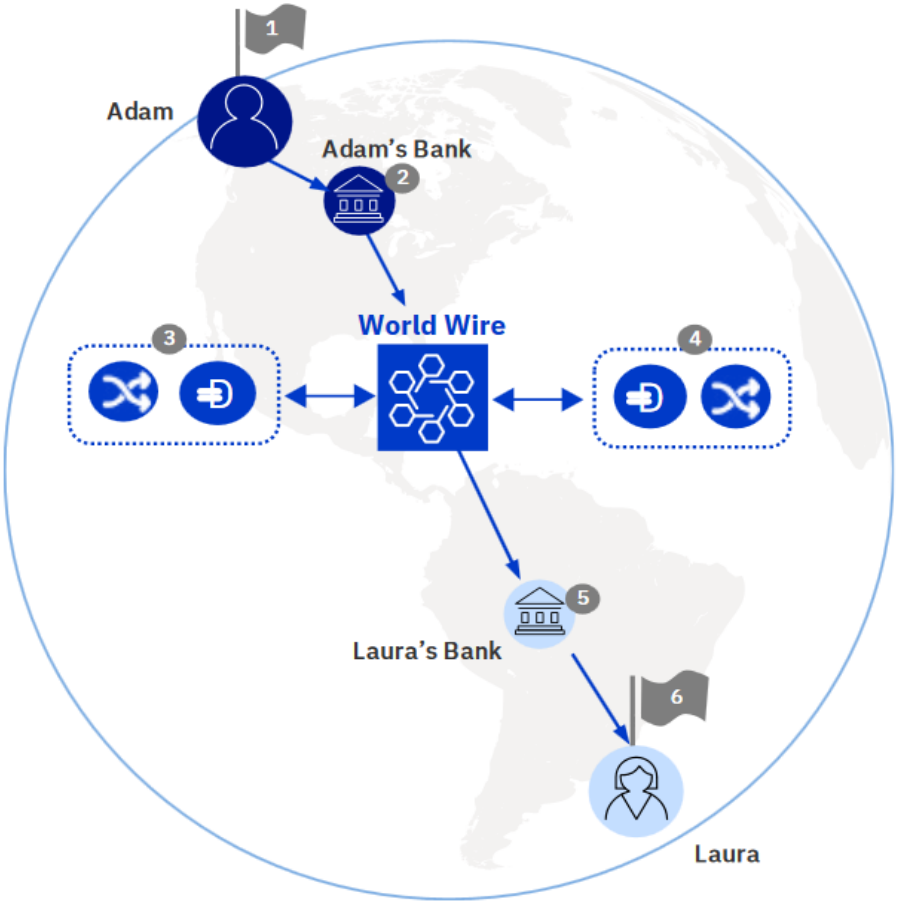
World Wire simplifies clearing & settlement to streamline cross-border payments

Faster, Cheaper & More efficient

World Wire targets industry pain points

- Clear & Settle Faster: Near **real-time clearing and settlement** reduces a process that traditionally takes 2-10 days, to mere **seconds**.
- Reduce Costs: Costs per transaction are reduced – this includes the removal and reduction of correspondent banking fees, capital requirements, regulatory costs, and reconciliation costs – allowing for **improved capital efficiency**.
- Increase Transparency: Financial institutions receive unprecedented **end-to-end transparency** of a payment from initiation through receipt by the receiving financial institution – **reducing the occurrence of disputes** and need for reconciliation.
- Build Trust: The use of distributed ledger technology creates the irrevocable and irrefutable audit trail of transactions, **enhancing regulatory reporting** capabilities and easing compliance concerns, while also **removing barriers of entry** for Financial Institutions entering **new markets**.

International Payments with World Wire



Clearing and settlement flow

How it Works

1. Sender from Canada (CAD) wants to send a payment to a recipient in Brazil, who is expecting Brazilian Real ($R).

2. Sender's Financial Institution (OFI) calculates the FX fees to send a payment using World Wire and debits the sender's account the total amount in CAD **plus** fees. The fee total will be a sum of both the OFI and RFI's fees.

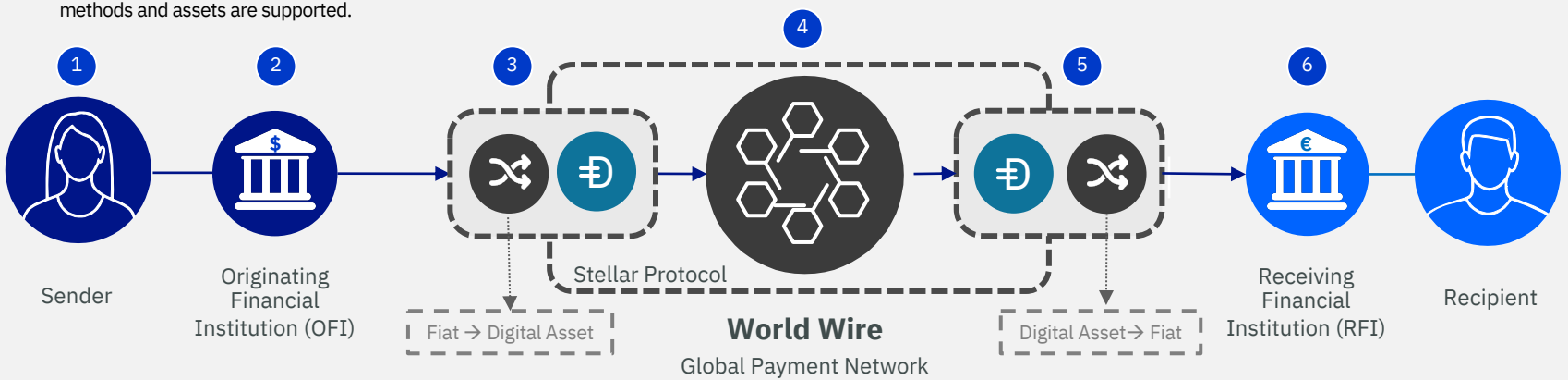
3. Using World Wire's messaging capabilities, the OFI **clears** the payment with the RFI and the CAD (plus fees) is converted to the *chosen* digital asset (e.g., XLM) equivalent.

* World Wire allows Participants access to real-time FX liquidity to fulfill payments on the network. Market Makers on the network facilitate the exchange of fiat to digital assets and conversely, digital assets to fiat. Multiple settlement methods and assets are supported.

4. The digital asset (e.g., XLM) equivalent is then sent to the RFI accepting the payment on behalf of their client, the Recipient. The transaction details are recorded to the ledger and the payment is **settled**.

5. The Receiving FI is able to then convert the digital asset to the Brazilian Real ($R) equivalent and deduct their portion of the FX fee calculated in Step 2.

6. Transaction balance ($R) is transferred to Recipient's account for immediate use.



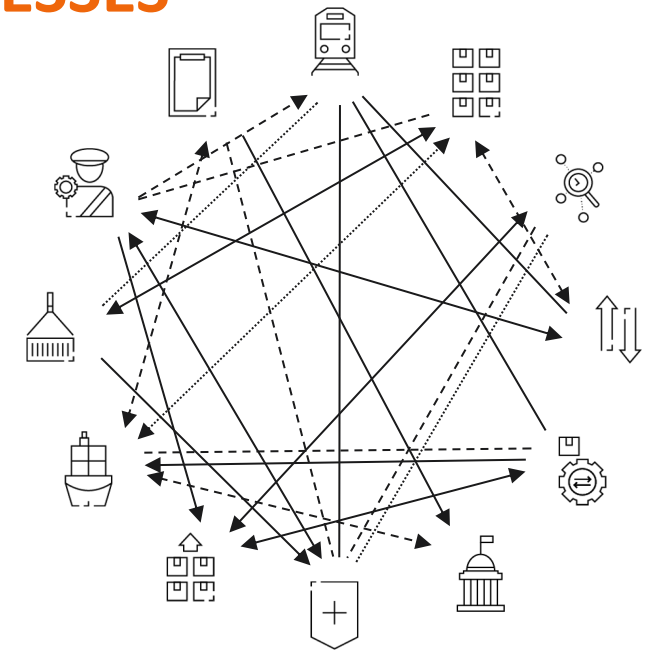
GLOBAL TRADE IS HIGHLY INEFFICIENT AND BURDENED BY PAPER-BASED PROCESSES

+ **Data trapped in organizational silos**
  Information is held in paper and various digital formats across dozens of service providers along the supply chain, requiring complex, cumbersome, and costly peer-to-peer messaging. The result is inconsistent information across organizational boundaries, latency in obtaining shipment visibility, and blind spots that hinder the efficient flow of goods.

+ **Manual, time-consuming, paper-based processes**
  The collection and processing of up-to-date data, as well as inefficient trade document exchange, requires manual checks and frequent follow-ups and results in errors, delays and high compliance costs. Late filings are common due to missing information.

+ **Clearance takes too long and is often subject to fraud**
  Risk assessments by customs authorities lack sufficient and trusted information resulting in high inspection rates, added prevention measures against fraud and forgery, and delayed customs clearance.

+ **High costs and poor customer service**
  These challenges have significant downstream repercussions. The inability to forecast and plan effectively, address supply chain disruptions in near real-time, and share trusted information across the supply chain leads to excessive safety stock inventory, high administrative costs, operational challenges, and ultimately poor customer service.



OUR MISSION

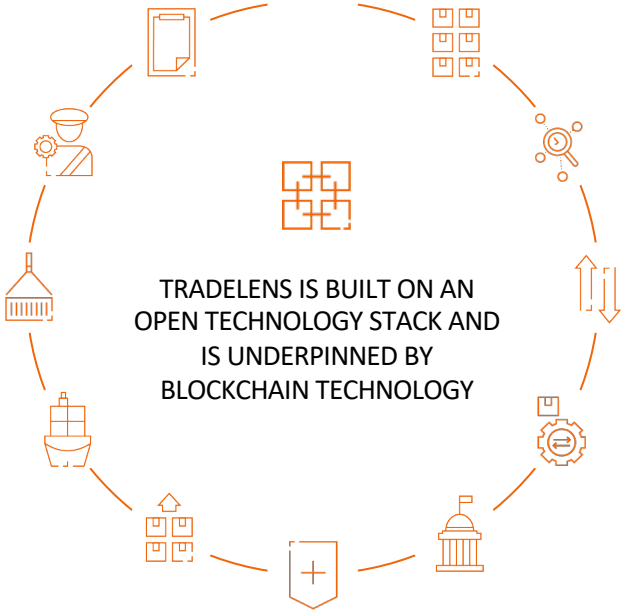
DIGITIZE THE GLOBAL SUPPLY CHAIN

+ **Connect the ecosystem**
  Bring together all parties in the supply chain - including shippers, freight forwarders, intermodal operators, ports and terminals, ocean carriers, customs and other government authorities, and others - onto a blockchain-based platform with a secure permission and identity framework.

+ **Drive true information sharing**
  Provide for the seamless, secure sharing of near real-time, actionable supply chain information across all parties to a trade - encompassing shipping milestones, cargo details, trade documents, the structured data embedded in trade documents, customs filings, sensor readings, and more.

+ **Foster collaboration and trust**
  Enable the digitization and automation of the cross-organization business processes integral to global trade, including import and export clearance, with blockchain ensuring secure, auditable, and non-repudiable transactions.

+ **Spur innovation**
  Lay the foundation for ongoing improvement and innovation through an open, publicly -available API, the use of standards and promotion of interoperability, and the launch of an Application Marketplace that parties can use to build and deploy TradeLens-powered applications for themselves, their partners, and their customers



Decentralized trusted identity

Personally manage your digital IDs online with the Sovrin Network – an open source project creating a global public utility for self-sovereign identity

- Pushes identifies to the edge of the network frictionless, secure identity verification of self-sovereign identity. It's time to evolve the current system of siloed identities, endless passwords, and insecure databases.
- The Sovrin Network is the new standard for digital identity – designed to bring the trust, personal control, and ease-of-use of analog IDs – like driver's licenses and ID cards – to the Internet.
- Cryptographic, point to point exchange of identity - Every person, organization, and thing has a digital wallet to control the flow of their identity
- Based on Hyperledger Indy technology

sovrin
identity for all

HYPERLEDGER
INDY

Further examples by (selected) industry

Financial

- Trade Finance
- Cross currency payments
- Mortgages
- Letters of Credit

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

Making blockchain real for business…

Trade Finance	Pre and Post Trade	Complex Risk Coverage
we.trade more trust. more trade. · MIZUHO · NATIXIS · TRAFIGURA	DTCC · CLS Fundamental to FX · Bolsa Comercio Santiago · JPX	AIG · Standard Chartered
Identity/ Know your customer (KYC)	**Unlisted Securities/ Private Equity Funds**	**Incentive Program**
SECURE KEY · Crédit Mutuel ARKEA · DIACC	NORTHERN TRUST · BORSA ITALIANA · SBI証券	Interac · UnionPay 银联
Medicated Health Data Exchange	**Government**	**Distributed Energy/ Carbon Credit**
FDA	دبي الذكية SMART DUBAI	TenneT · Energy Blockchain Labs
Supply Chain	**Food Trust**	**Provenance/ Traceability**
MÆRSK · PSA The World's Port of Call	Walmart · Driscoll's Only the Finest Berries · Tyson · McLane · Dole · Kroger · Nestlé · Unilever · gsf golden state foods · McCormick	everledger

IBM **Blockchain**

How IBM Can Help

How **IBM can help**

The certainty to solve business challenges together

Security at Scale

Enterprise-grade security and control on a platform where businesses and industries are reinventing themselves

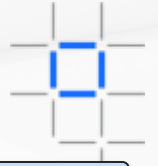
Trusted Expertise

Reinventing business processes through unrivaled industry and technical knowledge as you start, accelerate and innovate your blockchain network.

Network Convening Power

Bringing together an expansive partner network of innovators, regulators and suppliers to establish, join or run your blockchain network.

IBM's end-to-end **Blockchain Strategy**



Services

Collaborate with services teams from ideation all the way to production

Ecosystem

Tap into our diverse ecosystem to develop strategic partnerships and create your competitive advantage

Solutions

Solve critical industry challenges by building and joining new business networks and applications

IBM **Blockchain Platform**

Build, operate and grow blockchain networks in heterogeneous environments

HYPERLEDGER

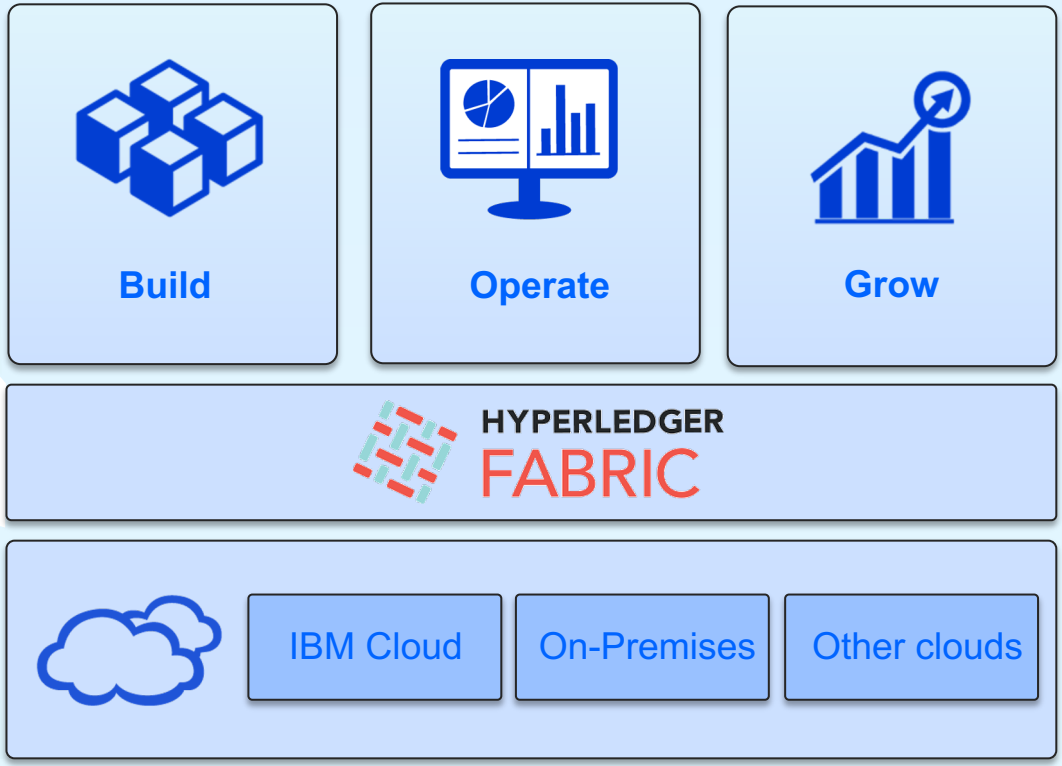
A founding, premier member of Hyperledger, IBM is committed to open source, standards & governance

IBM **Blockchain Platform**

Advanced tooling
allows you to quickly build, operate and grow blockchain networks

Open technology
uses the popular Hyperledger Fabric distributed ledger

Deploy anywhere
fully managed, or flexible deployment on-premises or on other cloud vendors



Hyperledger: A **Linux Foundation** project

- IBM Blockchain Platform is underpinned by technology from the Hyperledger project
- Hyperledger is a collaborative effort created to advance cross-industry blockchain technologies for business
- Founded February 2016; now more than **280 member organizations**
- Open source
  Open standards
  Open governance model

Premier

Associate

General

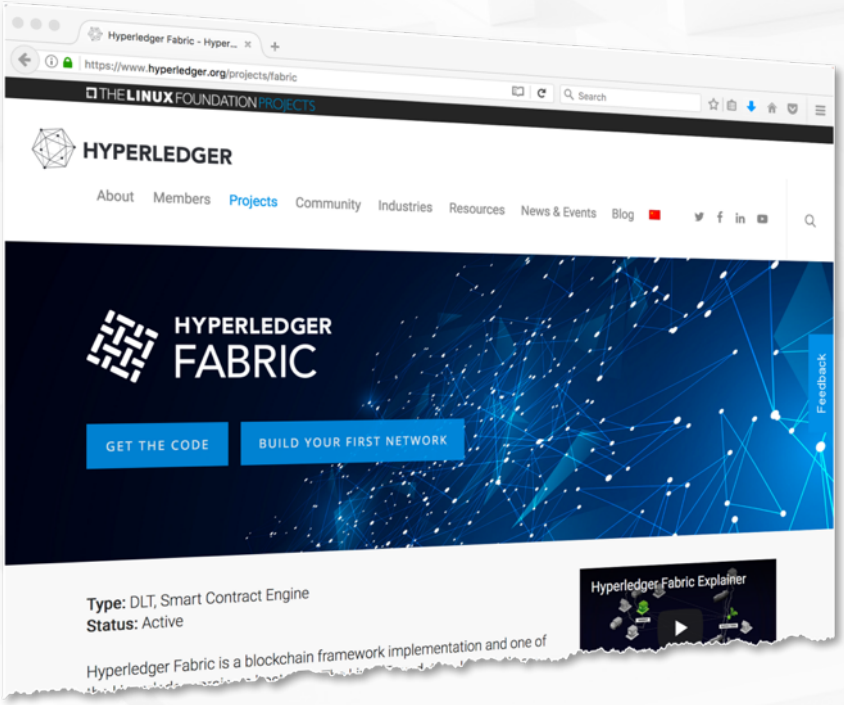
General

Academia Associate

Source: https://www.hyperledger.org/members
Updated: 11 September 2019

HYPERLEDGER FABRIC

Distributed ledger



- An implementation of blockchain technology that is a foundation for developing blockchain applications
- Emphasis on ledger, smart contracts, consensus, confidentiality, resiliency and scalability.
- v1.4.6 released in February 2020
  - v1.4.x Long Term Service release with emphasis on production operational and serviceability enhancements; new programming model abstractions for ease of development
  - v2.1 is out now
- IBM is one of the many contributing organizations

Thank you

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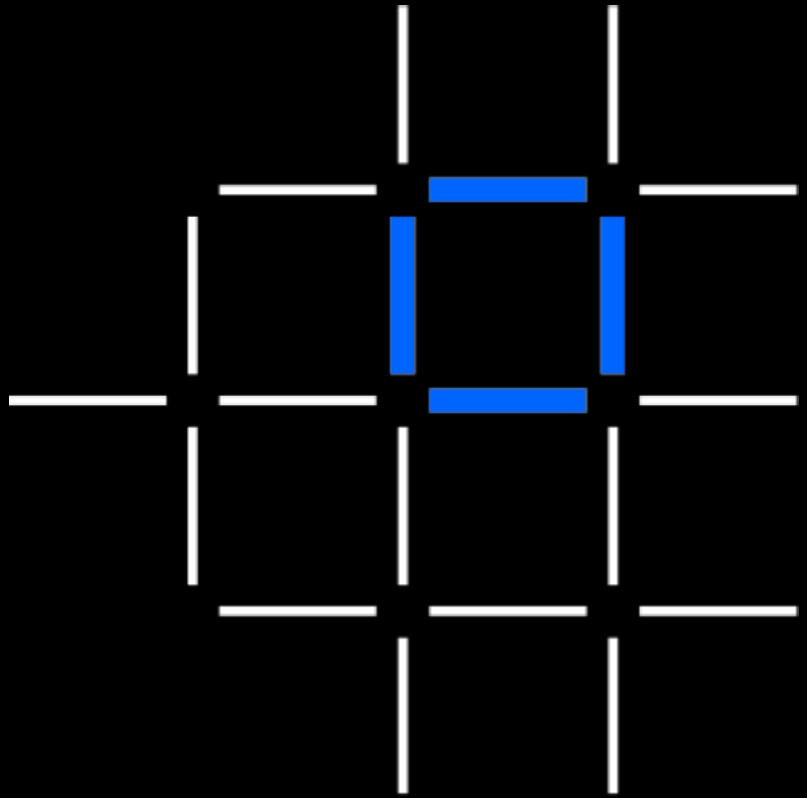

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