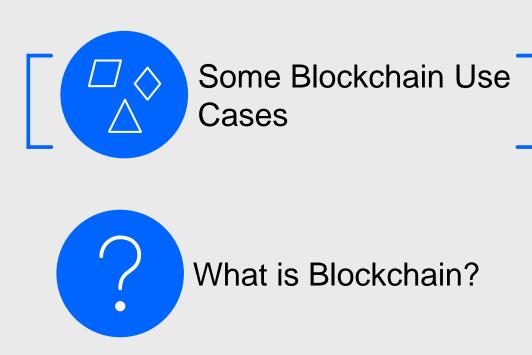


Blockchain Explained

An introduction to Blockchain

Ravi Subramaniam IBM Public Sector Market Leader for Blockchain E-mail: <u>subra@us.ibm.com</u> Linked-in:<u>www.linkedin.com/in/ravi-subramaniam-046b6a5</u>

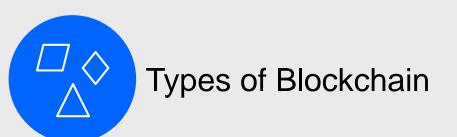
December 2019





Getting Started With Blockchain

Typical Industry Use Cases





Example Use Case: IBM Food Trust in collaboration with Walmart



Blockchain enables tracking food from farm to fork (Source)

More than 4,00,000 people die each year from food poisoning (World Health Organization)

Estimates for impact on US Economy from food poisoning range from \$4 billion to \$90 billion

Example Use Case: IBM Global Financing (IGF) - Dispute resolution

IGF provides working capital to IT suppliers, distributors and partners through financing of inventory and accounts receivables

Objective:

Improve the efficiency of IGF's commercial financing business by sharing data in a secure and transparent manner on Blockchain

How?

Blockchain enables comprehensive view of key operational data Purchase Order->Transaction approval->Shipments->Invoices->Remittance

Benefits?

- Few disputes, faster settlement
- Reduction in dispute resolution time from 40+ days to under 10 days
- Improved capital efficiency, freer flow of capital





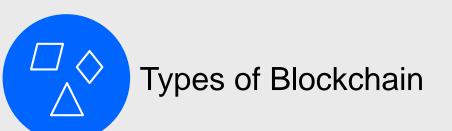
Some Blockchain Use Cases







Getting Started With Blockchain





Background and Introduction – Evolution of Business, Trade, Finance

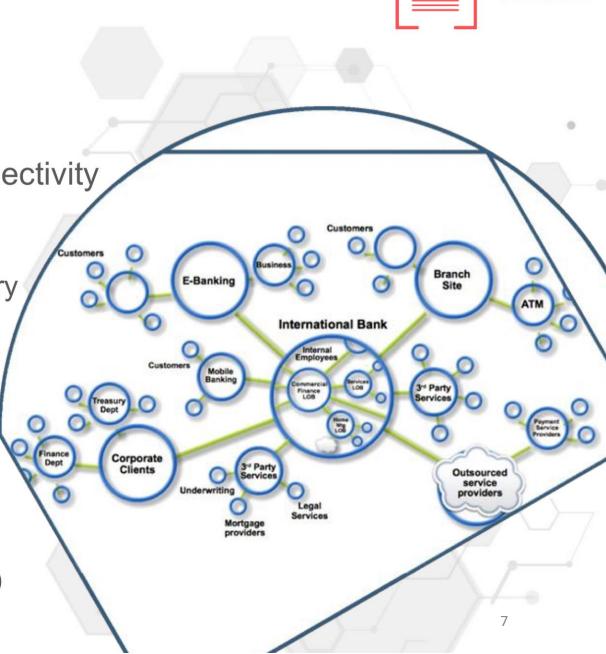


What

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

8



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.

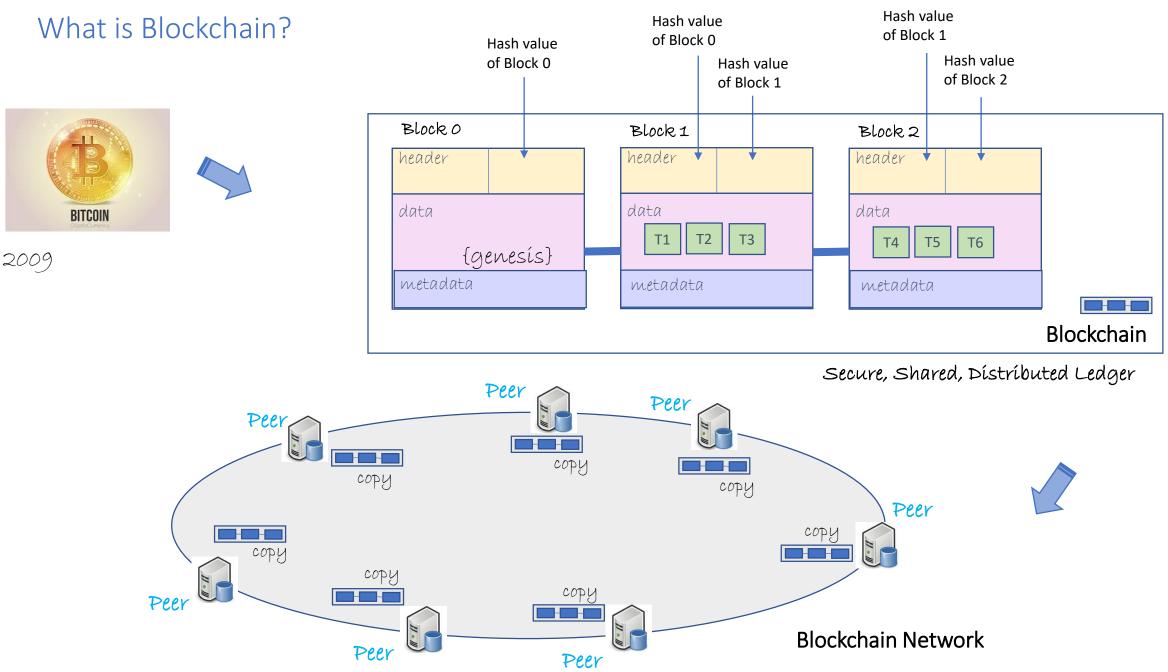
- Transaction an asset transfer onto or off the ledger
 - John gives a car to Anthony (simple)
- **Contract** conditions for transaction to occur
 - If Anthony pays John money, then car passes from John to Anthony (simple)
 - If car won't start, funds do not pass to John (as decided by third party arbitrator)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



Introducing blockchain

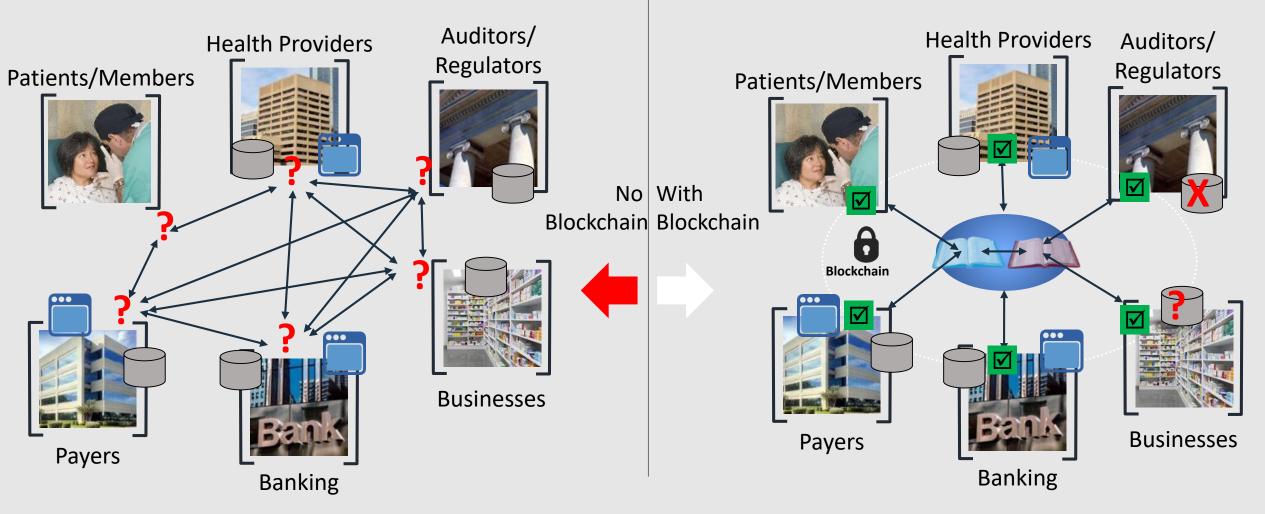






Blockchain solves fragmentation by providing a shared, replicated ledger ...





... with consensus, provenance, immutability and finality



Requirements of blockchain for business

Append-only distributed system of record shared across business network

Shared ledger contract

Business terms embedded in transaction database & executed with transactions

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable





Smart

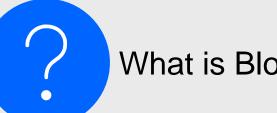
Transactions are endorsed by relevant participants

10



Some Blockchain Use Cases

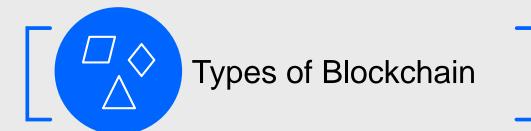




What is Blockchain?



Getting Started With Blockchain





Permissioned vs. Non-Permissioned and Public vs. Private Blockchains

<u>Permissioned</u>		Non-Permissioned/Permissionless	
• Identity		Anonymity	
Restricted access		Unrestricted	
 Create/execute smart contracts 			
 Participate in consensus Higher transaction throughput No mining / low energy consumption 		 Lower Transaction throughput Mining / high energy consumption 	
Private: an invitation is required to join		Public: anyone can participate	
	Permissioned	Non-Permissioned	
Public	Academic degrees, Land titles	Bitcoin, Ethereum, etc.	
Private	Medical records	Polls, Voting	

For its use in government and large scale industry applications, a Permissioned Blockchain is needed

Behind the Architecture of Hyperledger Fabric

There is on-going work to speed up consensus protocols.

Hyperledger Fabric deployed in a single cloud data center achieves an end-to-end throughput of more than 3,500 transactions per second with latency less than one second.

IBM Blockchain



Some Blockchain Use Cases

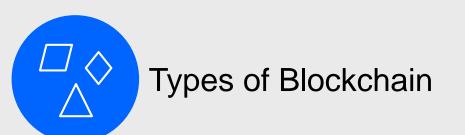




What is Blockchain?



Getting Started With Blockchain





Blockchain offers the potential to transform the Business of Business for the better...

Common Use Cases

- Identity & Credentials
- Clearance, Settlement & Account Reconciliation
- Disputes & Dispute Resolution
- Supply Chain
- Logistics and Transportation
- Audit & Compliance

Banking, Finance & Treasury

- Security Trading
- Asset Custody
- Customer Identity / Know Your Customer (KYC)

State & Local Government

- Delaware Blockchain Initiative for Uniform Commercial Code
- Citizen Identity
- Regulation of the Marijuana (Alcohol, Tobacco) Industry
- Criminal Justice & Parole
- Verifying eligibility for welfare payments
- Comprehensive Annual Financial Report (CAFR)

Education

- Academic and Medical Credentials
- Educational Services

Healthcare

- Consumer-mediated health data exchange & digital health wallet
- Medical/clinical treatment adherence
- Claims settlement, adjudication and billing management
- Patient cost liability estimation
- Drug supply chain integrity
- Pharmacovigilance
- Secure Internet of Medical Devices
- Medical & academic credentialing

Transportation

- Shipping and Global Trade
- Vehicle Maintenance

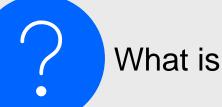
Blockchain is consumed in 2 ways:

© 2019 IBM Corporation (1) As a stood-up business service and (2) as a platform for your own applications



Some Blockchain Use Cases





What is Blockchain?







What makes a good *first* blockchain use case?

- First use-cases are even more difficult to identify!

- 1. A limited scope, but still solves a real business problem
 - Minimum Viable Product in a few weeks of effort

2. A smaller business network

- Usually without requiring regulators and consortia
- 3. Allows for scaling with more participants and scenarios
 - Consider shadow chains to mitigate risks

Start small, succeed and grow fast!

Hyperledger: A Linux Foundation 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

Source: <u>https://www.hyperledger.org/members</u> Updated: 3 December 2018

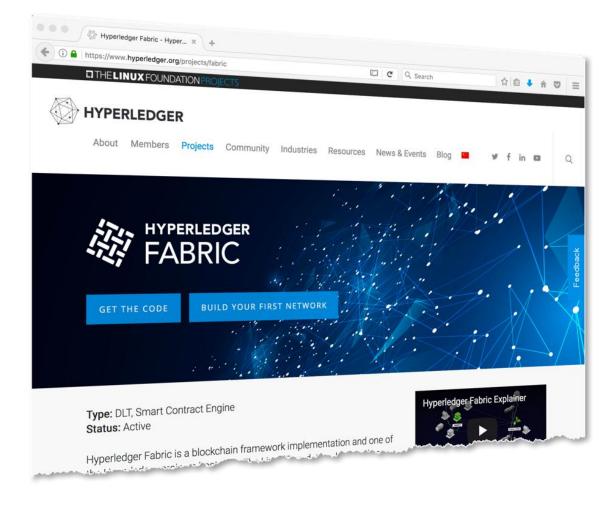
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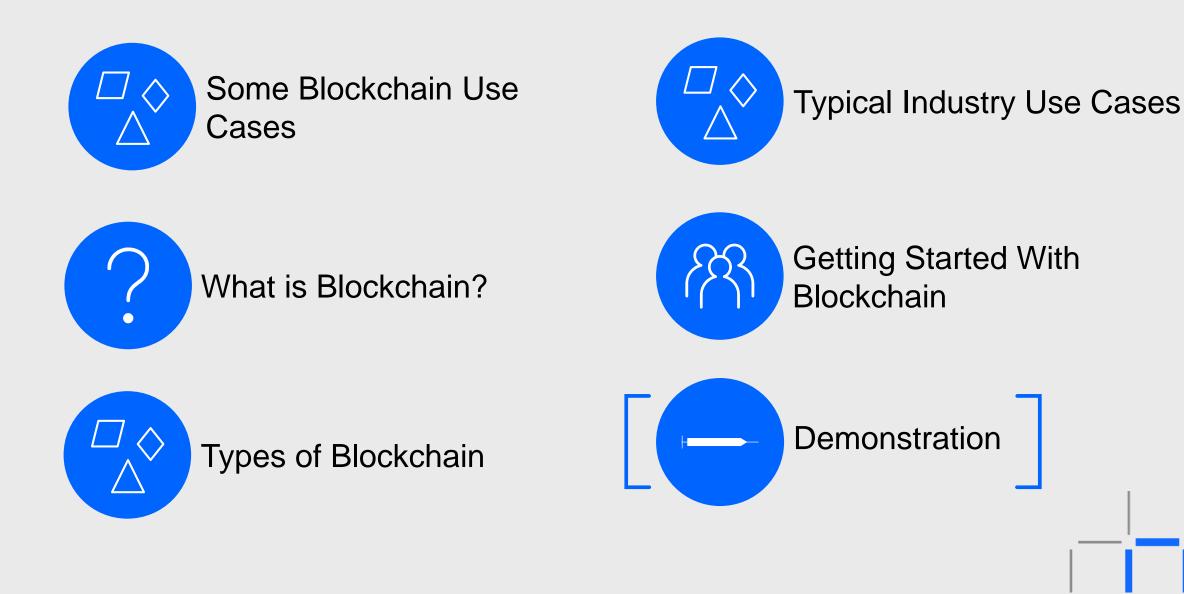
Distributed ledger



- An implementation of blockchain technology that is a foundation for developing blockchain applications
- Emphasis on ledger, smart contracts, consensus, confidentiality, resiliency and scalability.
- IBM is one of the many contributing organizations

IBM Blockchain





Demo overview – Vehicle lifecycle

