



# Blockchain Explained

*An introduction to Blockchain*

Ravi Subramaniam

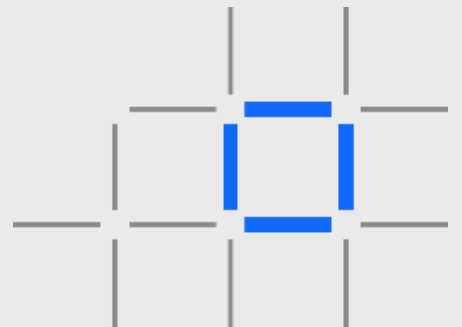
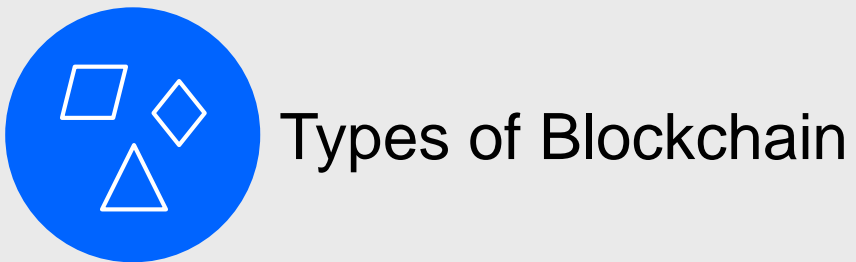
IBM Public Sector Market Leader for Blockchain

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December 2019

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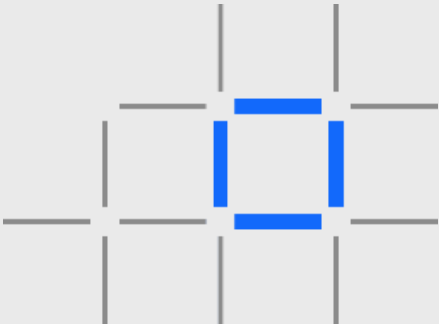
# Example Use Case: IBM Food Trust in collaboration with Walmart



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:

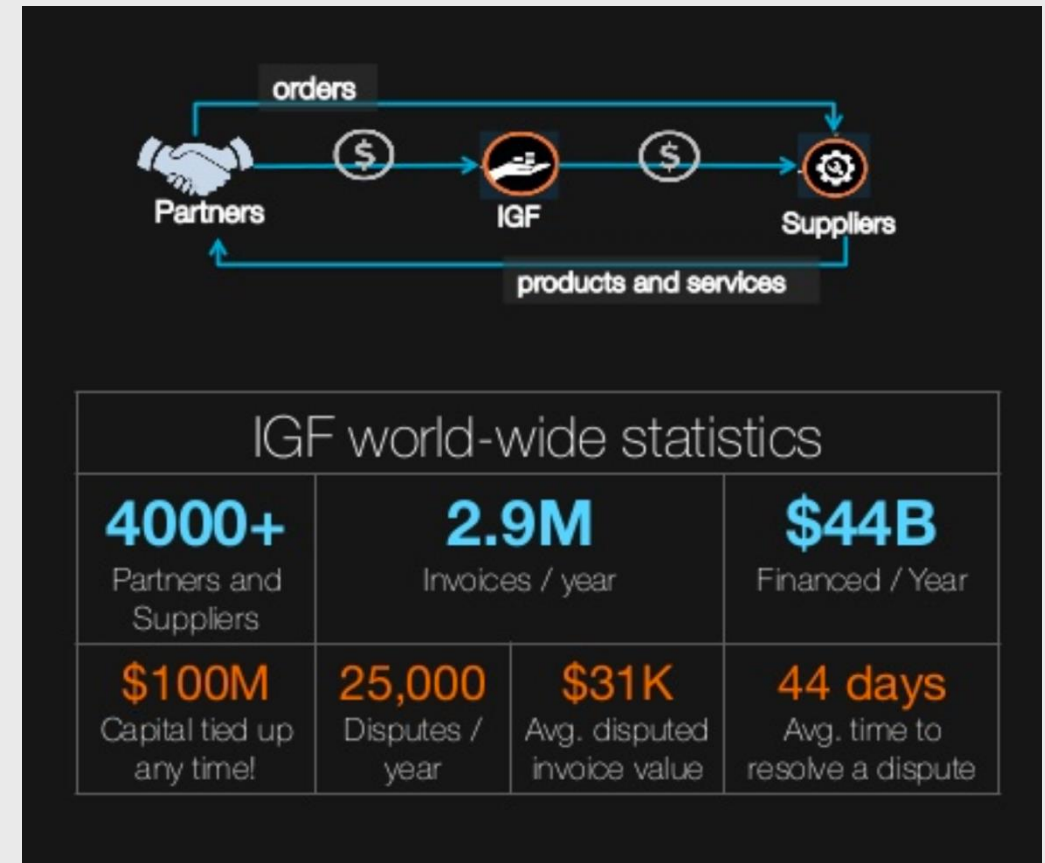
Improve the efficiency of IGF's commercial financing business by sharing data in a secure and transparent manner on Blockchain

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



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Some Blockchain Use Cases



Typical Industry Use Cases



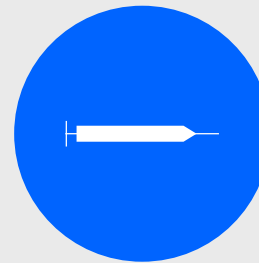
What is Blockchain?



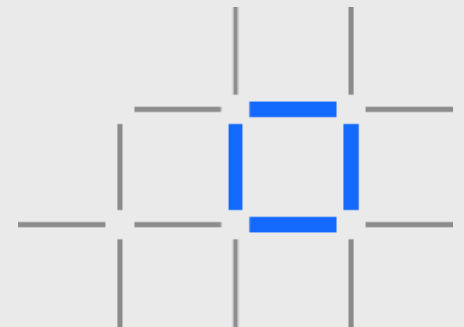
Getting Started With Blockchain



Types of Blockchain



Demonstration



# Background and Introduction – Evolution of Business, Trade, Finance

Exchange of value



Geographic expansion



Silk Route,  
Spice Route,  
Other Routes

Buyer



Seller



Shipping example

Intermediaries



Brokerages, etc.



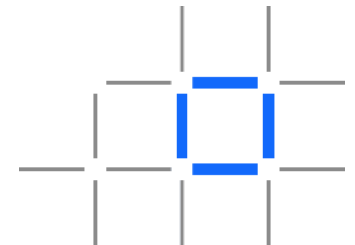
Banks



Govt



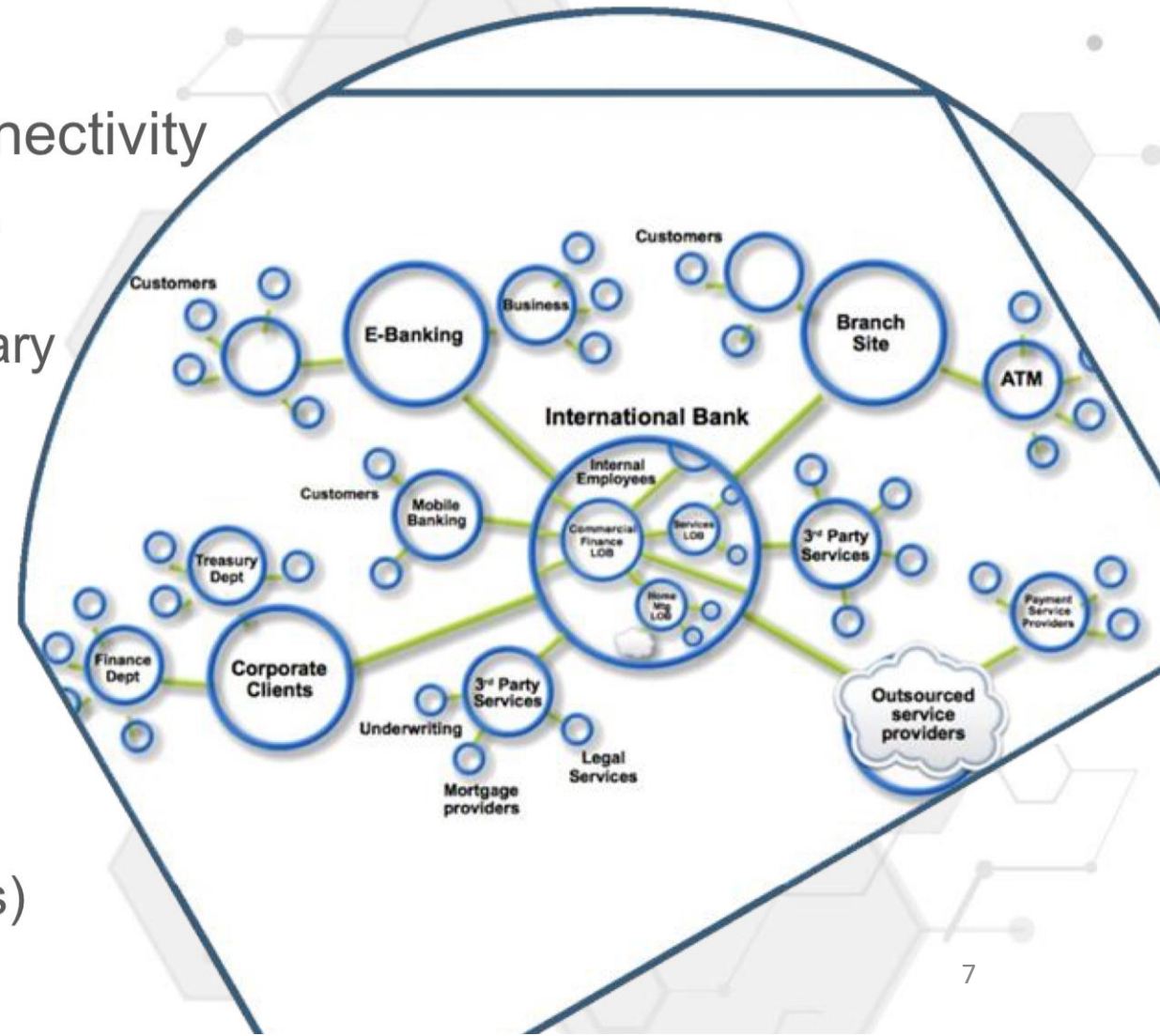
Blockchain





# 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)



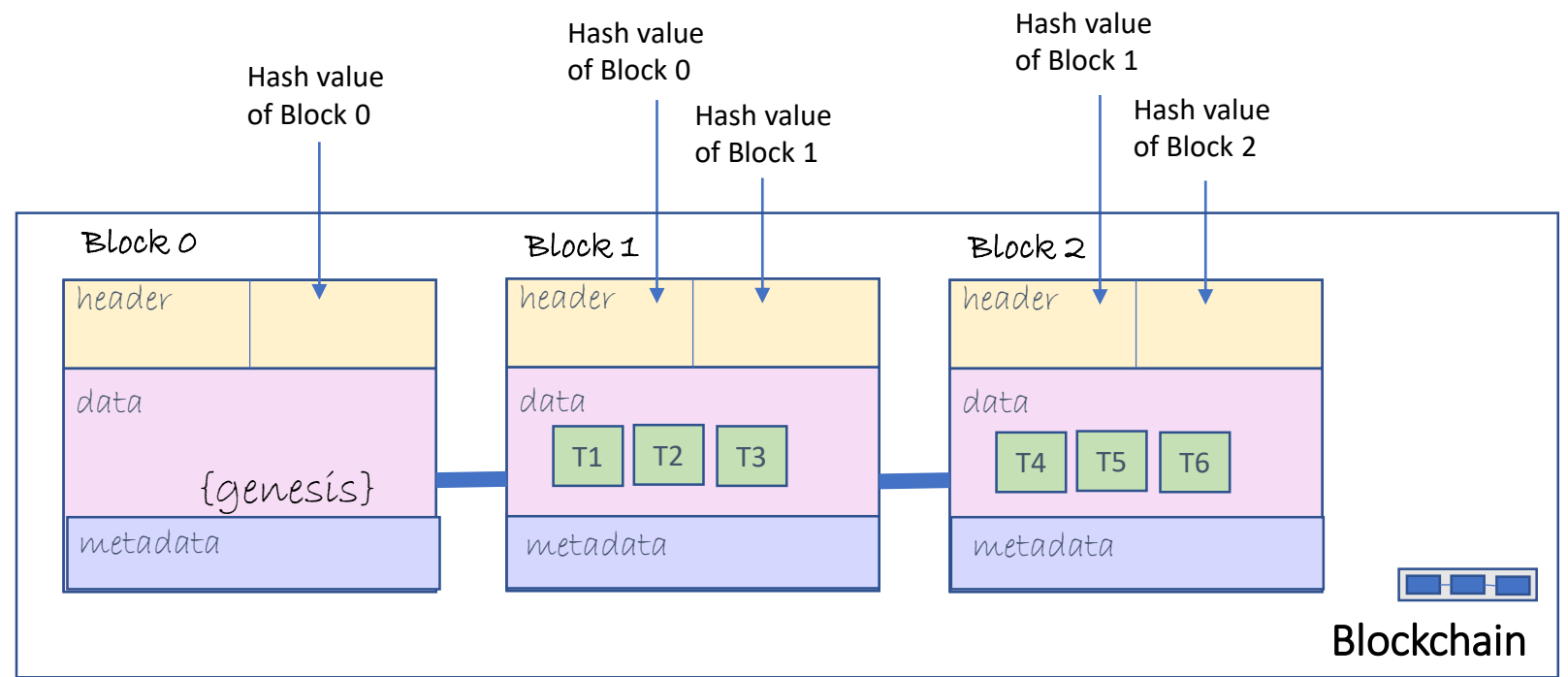
# Introducing blockchain



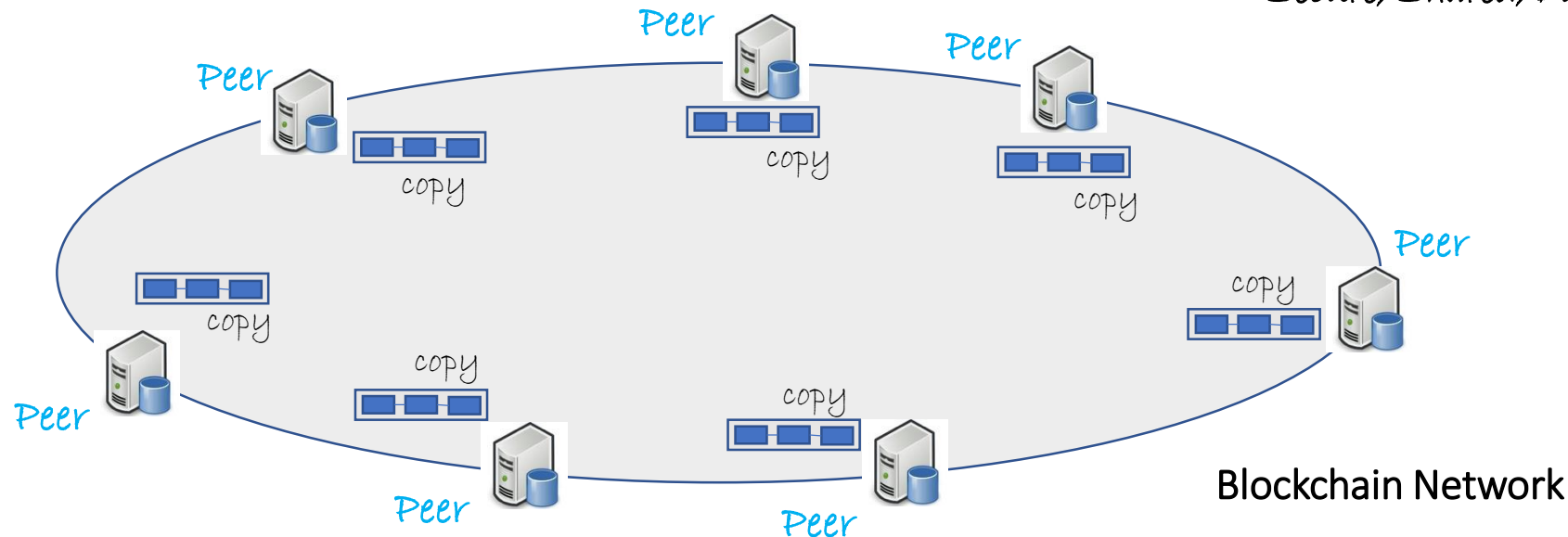
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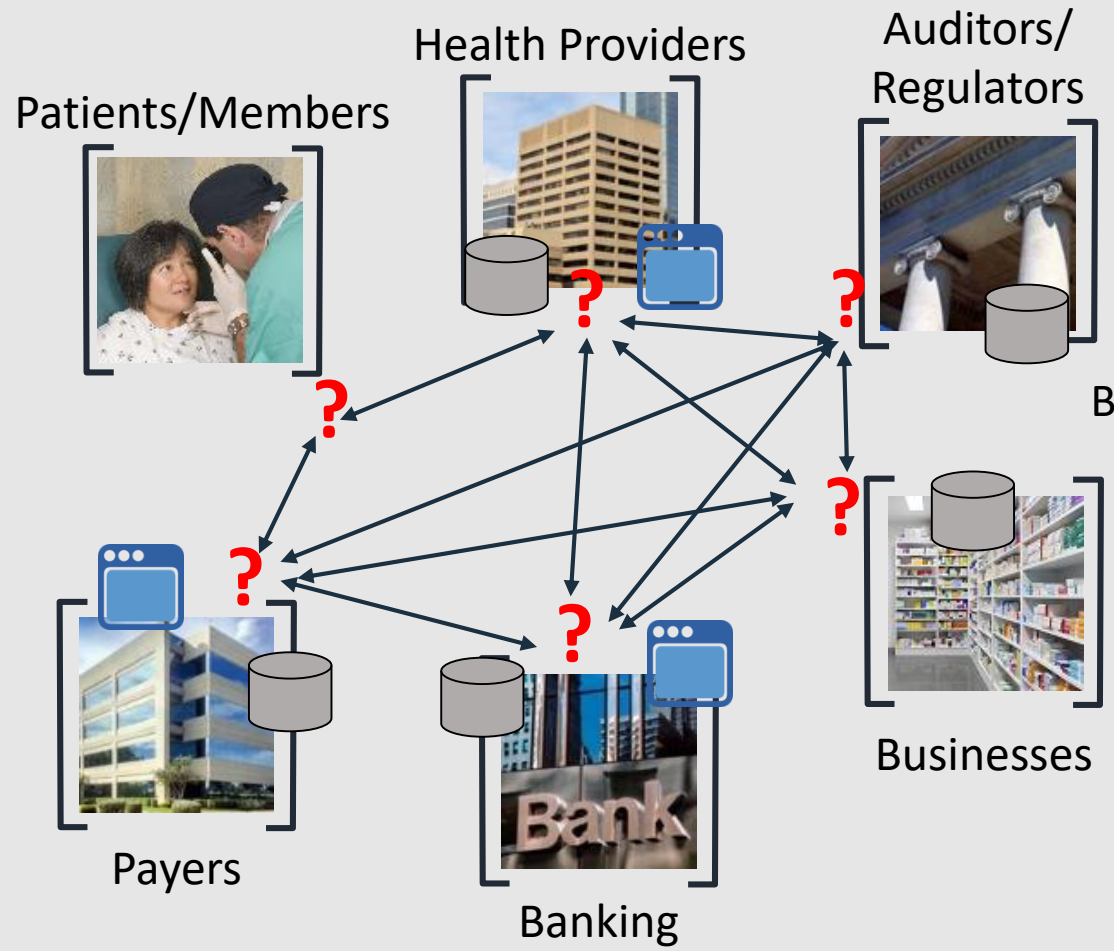
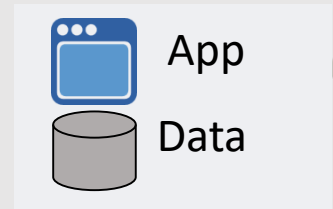
2009



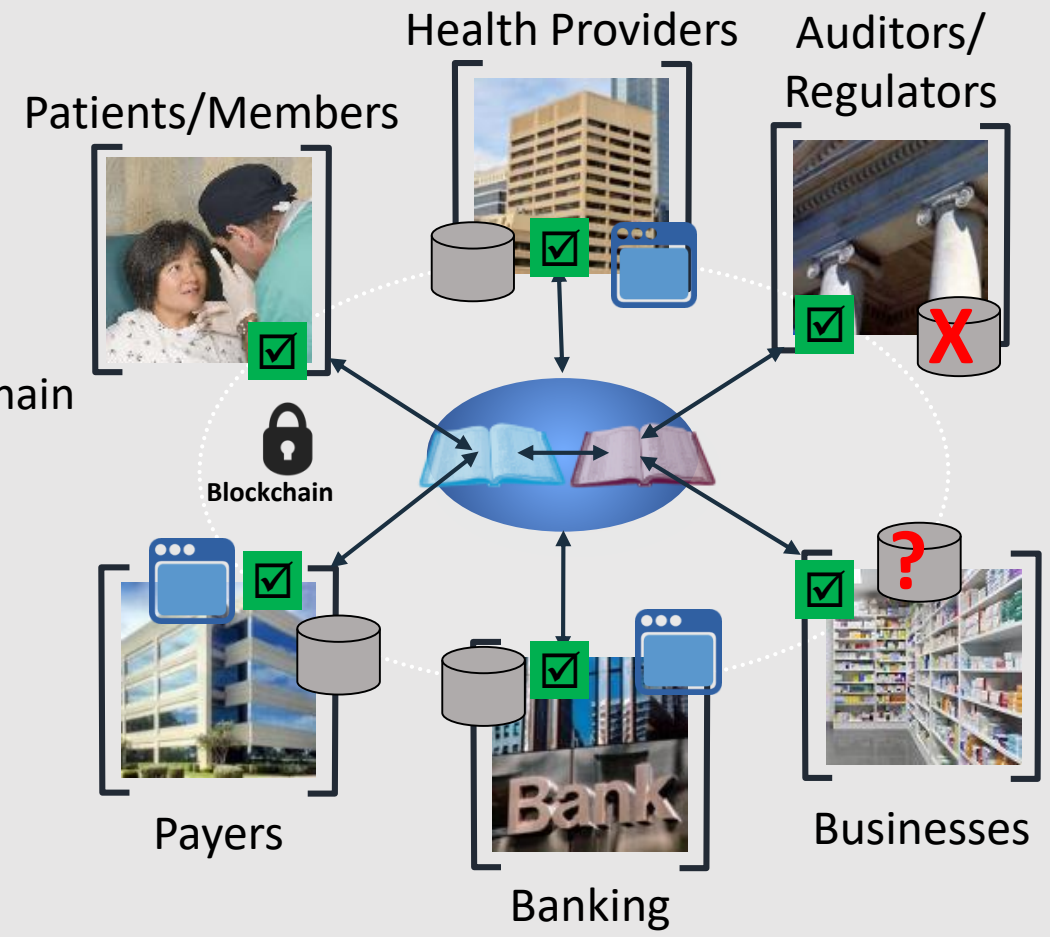
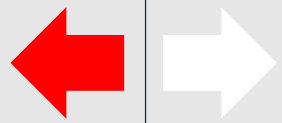
Secure, Shared, Distributed Ledger



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



No Blockchain      With Blockchain



... with consensus, provenance, immutability and finality



# 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

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Some Blockchain Use Cases



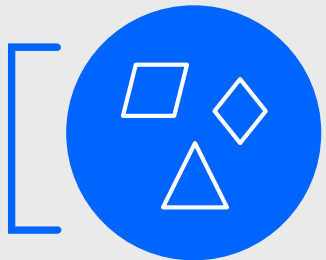
Typical Industry Use Cases



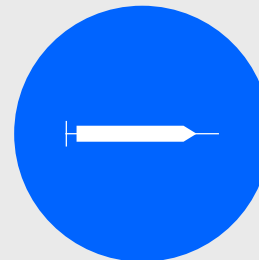
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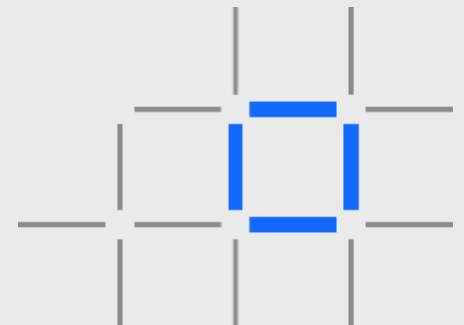
Getting Started With Blockchain



Types of Blockchain



Demonstration



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

<u>Permissioned</u> <ul style="list-style-type: none"> <li>• Identity</li> <li>• Restricted access                     <ul style="list-style-type: none"> <li>• Create/execute smart contracts</li> <li>• Participate in consensus</li> </ul> </li> <li>• Higher transaction throughput 🚀</li> <li>• No mining / low energy consumption</li> </ul>		<u>Non-Permissioned/Permissionless</u> <ul style="list-style-type: none"> <li>• Anonymity</li> <li>• Unrestricted</li> <li>• Lower Transaction throughput 🚀</li> <li>• Mining / high energy consumption</li> </ul>	
<b>Private:</b> an invitation is required to join		<b>Public:</b> anyone can participate	
	<b>Permissioned</b>	<b>Non-Permissioned</b>	
<b>Public</b>	Academic degrees, Land titles	Bitcoin, Ethereum, etc.	
<b>Private</b>	Medical records	Polls, Voting	



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

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

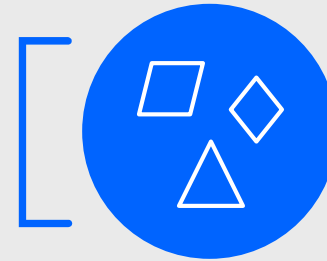
[Behind the Architecture of Hyperledger Fabric](#)

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.

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Some Blockchain Use Cases



Typical Industry Use Cases



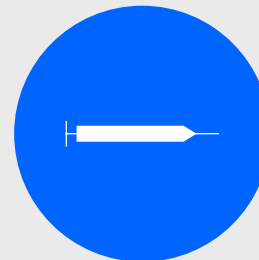
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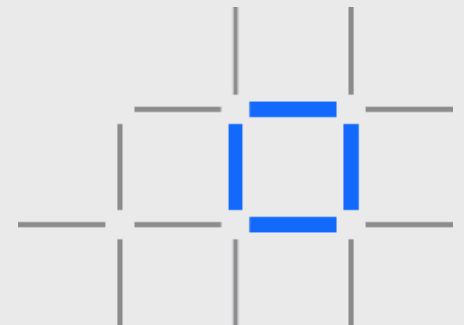
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# Blockchain offers the potential to transform the Business of Business for the better...

## 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 stand-up business service and (2) as a platform for your own applications**

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Typical Industry Use Cases



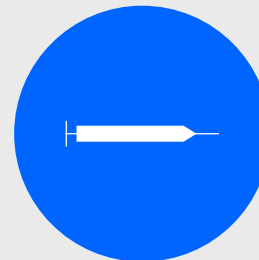
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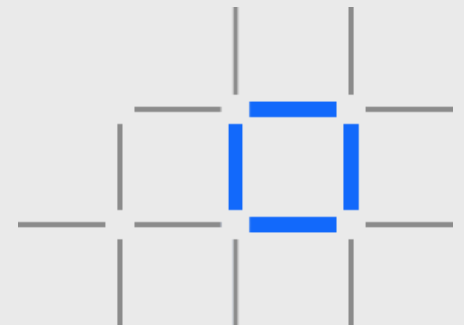
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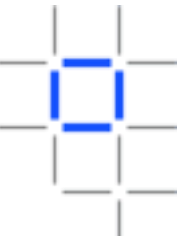
# What makes a good *first* blockchain use case?

– 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*

## Premier



## Associate

## General

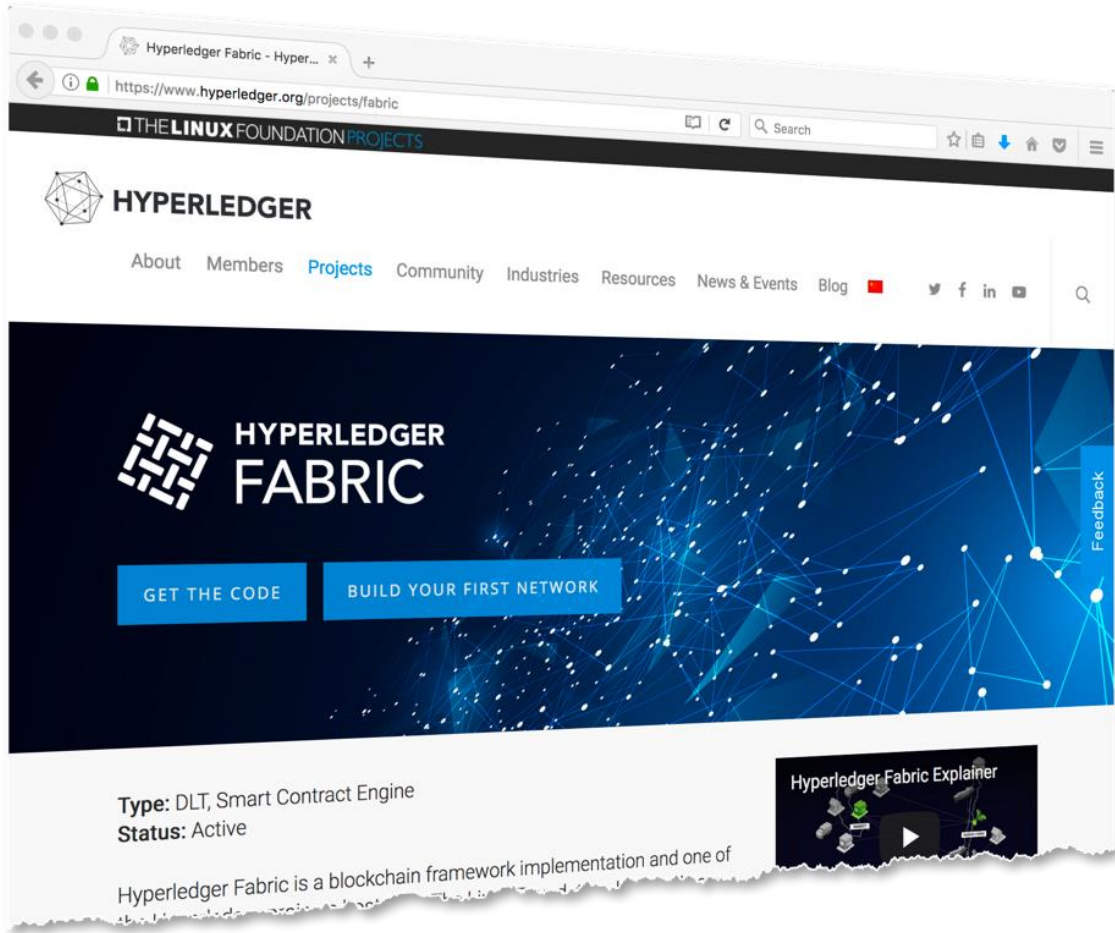
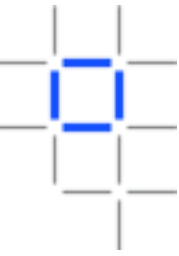


## Academia Associate

## General



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



- 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

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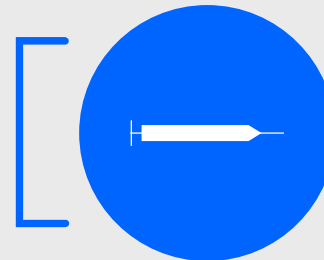
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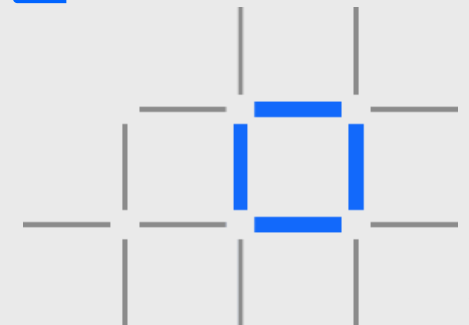
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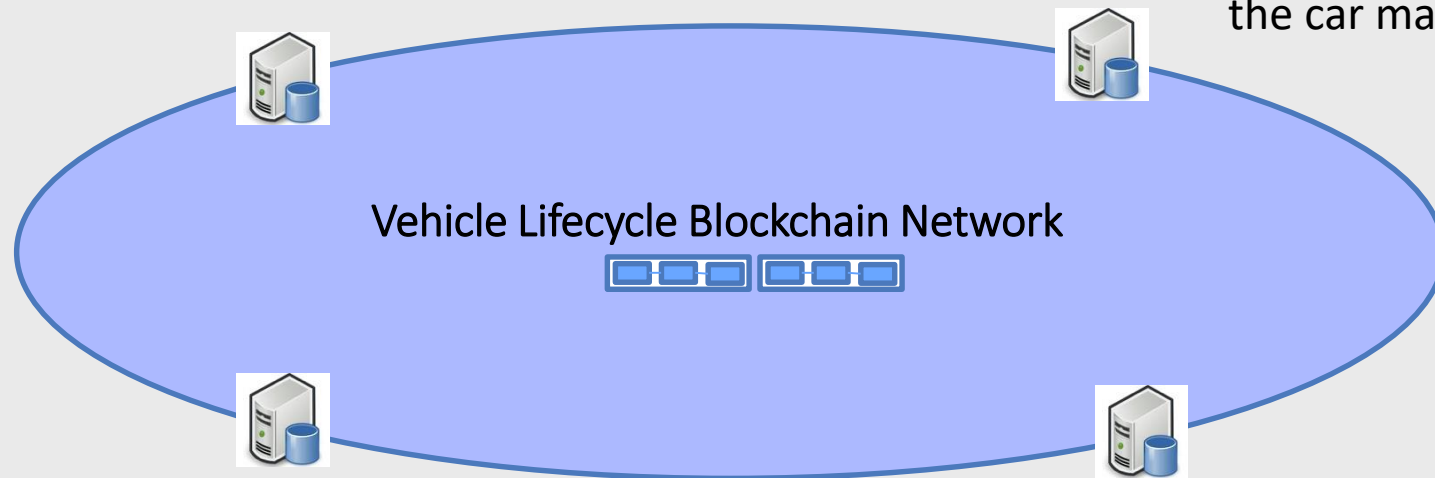
Demonstration



# Demo overview – Vehicle lifecycle

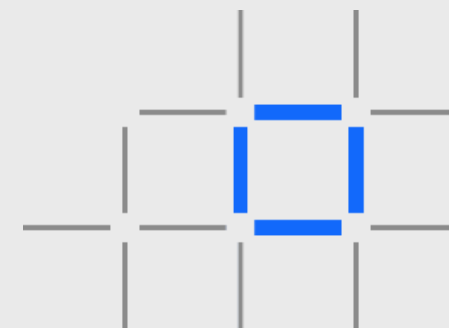
*Paul* –  
the buyer/owner of a car

*Mike* - an employee for  
the car manufacturer (“Arium”)



*Debbie* –  
an administrator for the regulator  
("Vehicle & Drivers Authority" or "VDA")

*Tommen* –  
an Insurer from an insurance company  
called Prince



спасибо 谢谢  
GRACIAS 谢谢  
**THANK YOU**  
ありがとうございました MERCI  
DANKE धन्यवाद  
شكراً OBRIGADO

