




# CS5594

## Data Consistency, Transparency and Privacy in Blockchain

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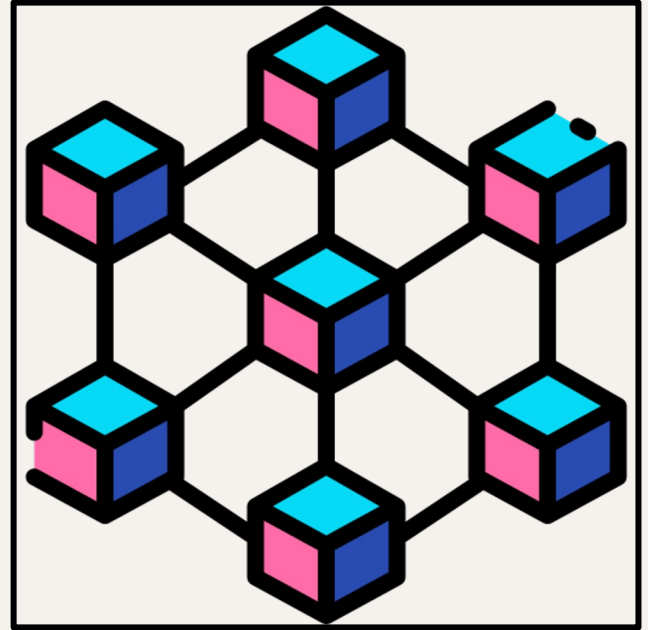
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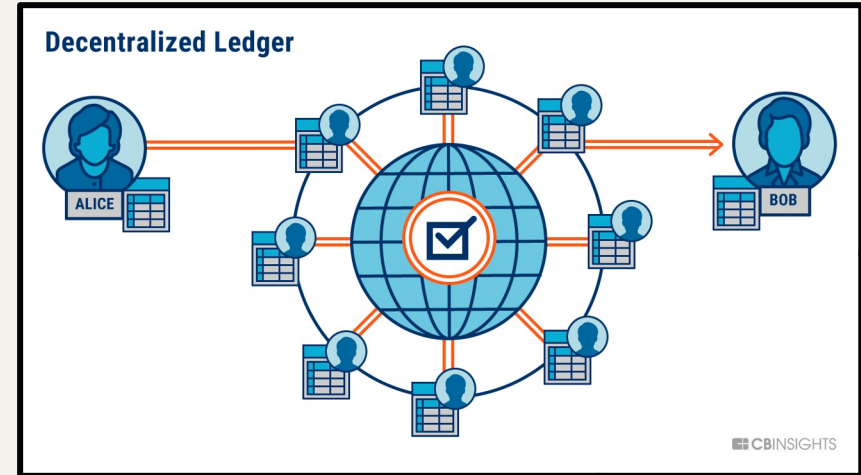
# 01 Introduction

What and why of blockchain.



# What is Blockchain?

- It is a decentralized digital ledger technology that allows for sharing of data across a network of computers.
- It is the underlying technology behind cryptocurrencies such as bitcoin, but it also has applications in many other fields such as finance, supply chain management and identity verification.



# Problem Statement

1

What is Data  
Consistency,  
Transparency and Privacy  
in Blockchain?

2

Why is it important for  
blockchain to maintain  
these?

3

Real world applications  
and impact of  
Blockchain.

# What is Data Consistency?

- Data consistency refers to the accuracy and reliability of the data stored on the blockchain.
- It is maintained using techniques like Consensus Mechanism, Cryptographic Hashing and Merkle Trees.



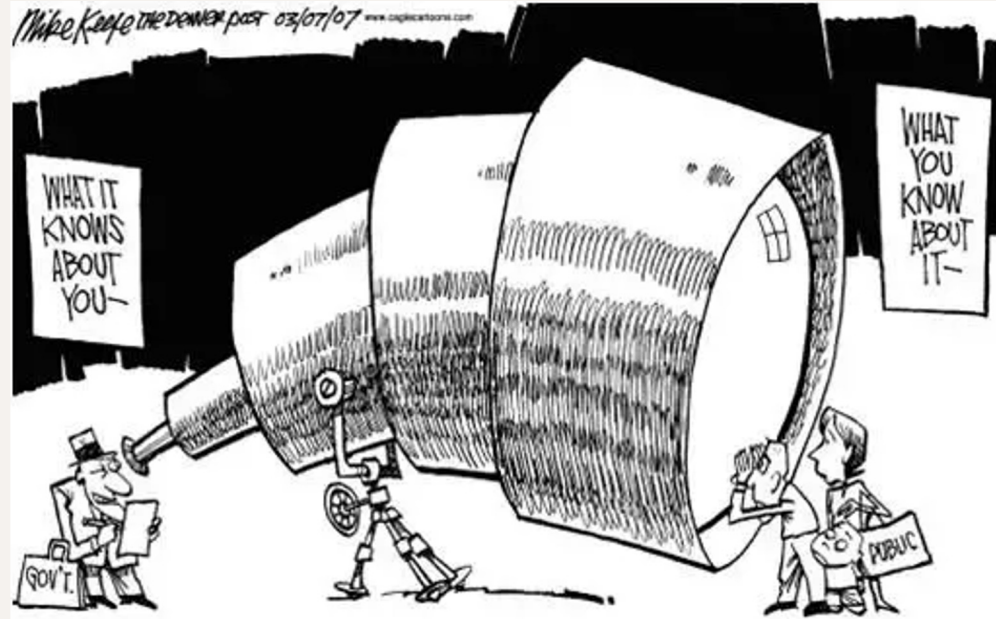
# Data Consistency in Blockchain - Challenges

- Forking
- Security
- Bugs in Smart Contract
- Scalability



# What is Transparency?

- Blockchain technology is designed to be transparent, which means that anyone can view the data stored on the blockchain.
- It is maintained using techniques like Public Ledger, Consensus Mechanisms, and Open-Source Code.





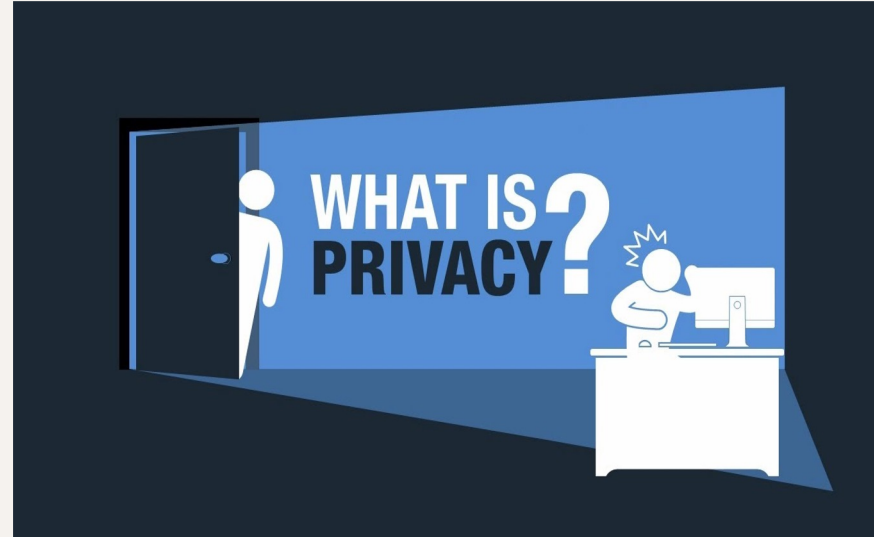
# Transparency in Blockchain - Challenges

- Privacy concerns
- Limited scalability
- Increased regulatory scrutiny
- Potential for abuse



# What is Privacy?

- Privacy is provided through the use of encryption and pseudonymity by which user data can be kept private.
- It is maintained using techniques like Zero-knowledge Proofs (ZKP), Private Ledgers and Off-chain transactions.



# Privacy in Blockchain - Challenges

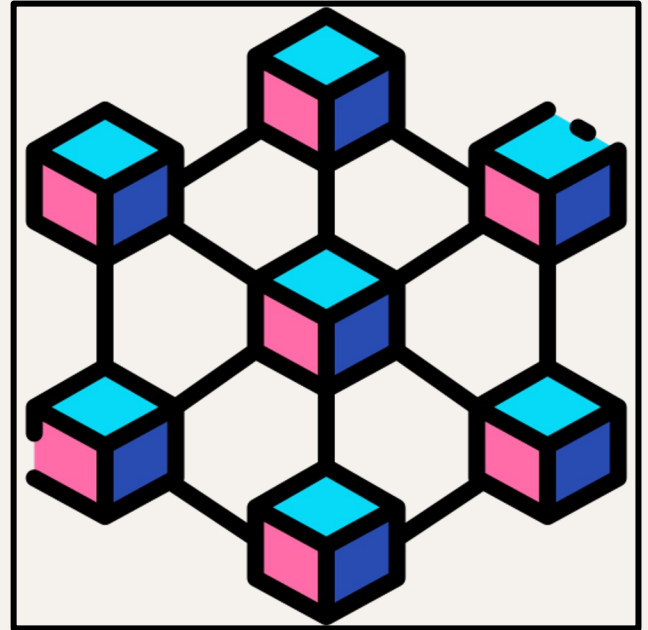
- Pseudonymity
- Traceability
- Public Key Cryptography
- Smart Contract Vulnerabilities



# 02

## Agri-Foods

How Blockchain is changing the agri-foods sector?



# Safety of Agri-Foods

- The safety of agri-foods is of paramount importance for global food distribution.
- Issues can be due to pesticides, heavy metal residue, mislabeling, no monitoring.
- Blockchain can help solve these issues.



# Agri-Foods and Blockchain

- Collaboration model of blockchain tech in agriculture.
- Farmer Connect initiative.
- “Thank my Farmer” App for your coffee.



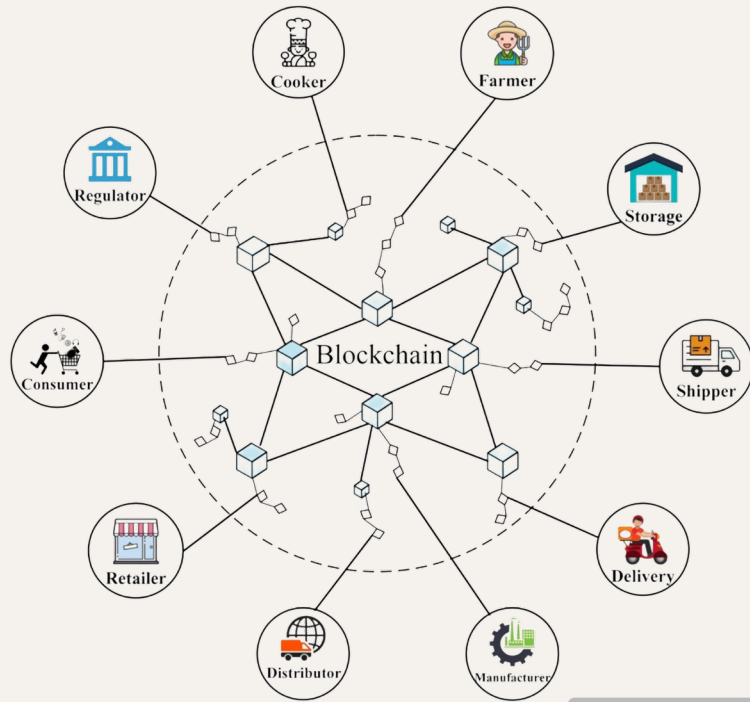
HungryCoin



# Agri-Foods and Blockchain Collaboration

Examples of collaboration models using blockchain technology in agri-foods area.			
Blockchain Company	Food Company Partners	Food Products	Country
IBM	Walmart, Carrefour, Nestle, Unilever, Farmer Connect, Tyson, Foods, Raw Seafoods Inc. Cermaq salmon and Labeyrie, El Ordeño	Mousseline purée, scallop, pork, lettuce, mango slices, infant nutrition, line chicken, coffee beans, seafoods (shrimps and claims)	US, China, UK, France, Ecuador
SAP	Target, Kelloggs, Tate & Lyle, Johnsonville, Natura & Co and Maple Leaf, Bumble Bee	yellowfin tuna,	US
FoodlogIQ	Tyson Foods, Subway, UK's Food Standards Agency, Testo, AgBiome Innovations,	Tomato, coffee,	US
SIM	Refresco, Albert Heijn	Orange juice	Dutch
JD.com	InterAgri	Pure Black Angus Beef	Australia, China
OpenSC	Nestlé	Milk and palm oil	Switzerland, New Zealand
OriginTrail&TagItSmart	Plantaze	Grape, wine,	Montenegro, China
BloomBloc	Malaysian Palm Oil Council (MPOC)	Palm oil	Malaysia

# Data transparency in food supply chain



- Most of the participants in the supply chain can only connect with entities immediately downstream.
- Blockchain technology leverages the decentralized-distributed P2P communication.
- The real advantage : reliability of the data maintained.



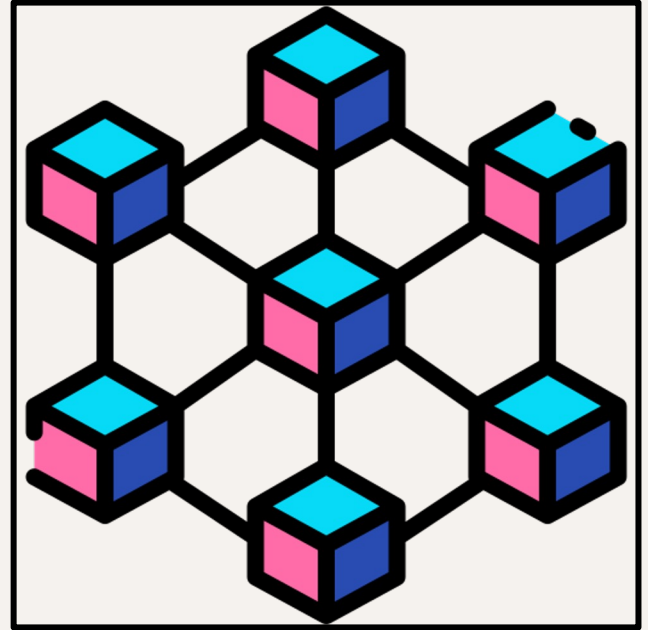
# Data traceability in food supply chain



- Most of the participants in the supply chain can only connect with entities immediately downstream.
- Blockchain technology leverages the decentralized-distributed P2P communication.
- The real advantage : reliability of the data maintained.

# 03 Solutions

What companies have built to improve food traceability?

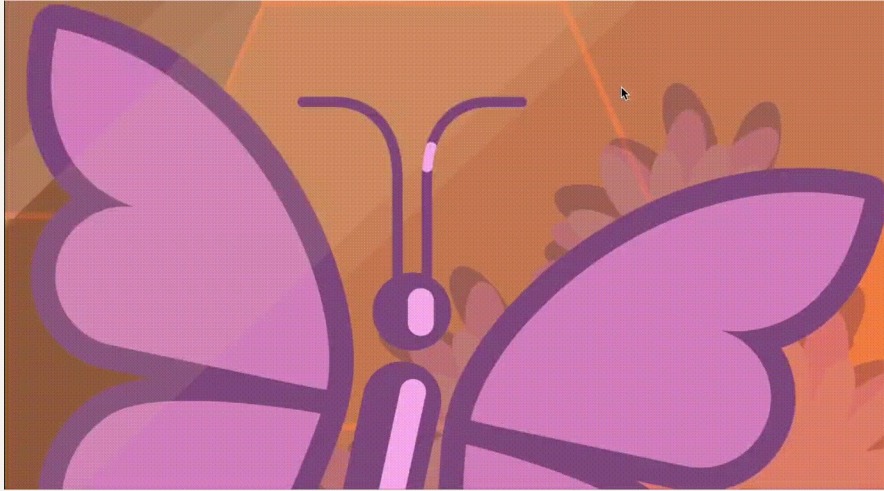


# What is the Hyperledger Foundation?



- The Hyperledger Foundation was founded by fostering a thriving ecosystem around open source blockchain software.
- Goal: To bring transparency and efficiency to the enterprise market.
- Blockchain enables trust where it did not exist and removes layers of inefficiency, when it comes to enterprise software.

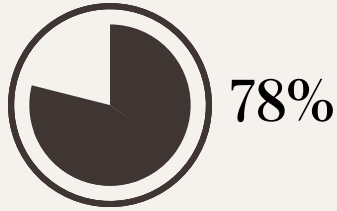
# IBM's Hyperledger Fabric !



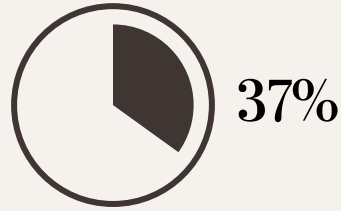
- An enterprise-grade, distributed ledger platform that offers modularity and versatility for a broad set of industry use cases.
- Modular Architecture, supporting consensus, privacy and membership.
- Benefits: Permissioned Network
  - Confidential Transactions
  - Pluggable Architecture
  - Support for many languages

# IBM Supply Chain Suite: Blockchain

## Transparent Supply



Of companies surveyed say that increased visibility into end-to-end product movement is a major benefit of blockchain.



Of companies surveyed have a blockchain solution in development, pilot or production.

- Blockchain-based supply chain with real-time data visibility.
- Companies can build their own blockchain-enabled collaboration and data-sharing ecosystem with their supply chain partners.
- Features: Quality Assurance
  - Improved Forecasting
  - Reduced Friction
  - Extensive Automation

# IBM Supply Chain Suite: Trust Your Supplier



- Cross-industry blockchain platform for buyers & suppliers.
- Features: Global industry standards
  - Compliance and risk validators
  - Supplier profile management
  - Continuous monitoring
  - Visualize, report and audit management
  - Blockchain-based supplier information management.

# IBM Supply Chain Suite: Food Trust

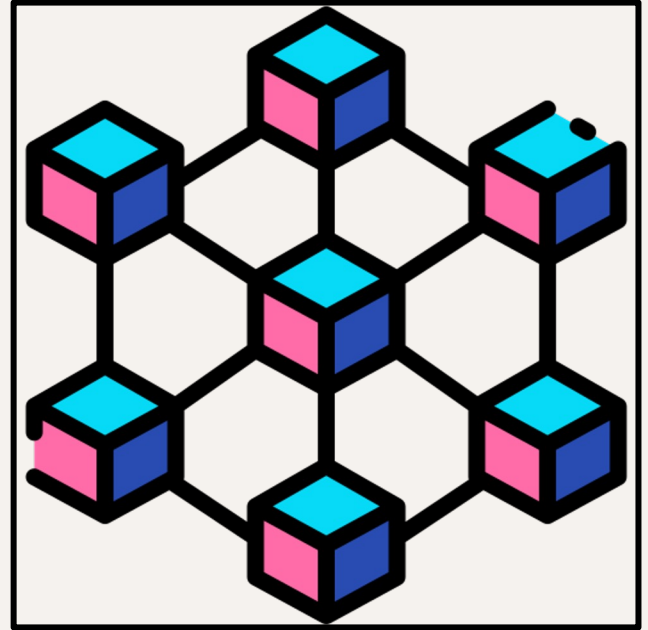


- Secure, decentralized blockchain platform for sharing trusted information about food product.
- Blockchain technology leverages the decentralized-distributed P2P communication.
- Features: Greater brand trust
  - Compliance confidence
  - Enhanced sustainability
  - Improved safety monitoring
  - Fraud prevention
  - Reduced waste

# 04

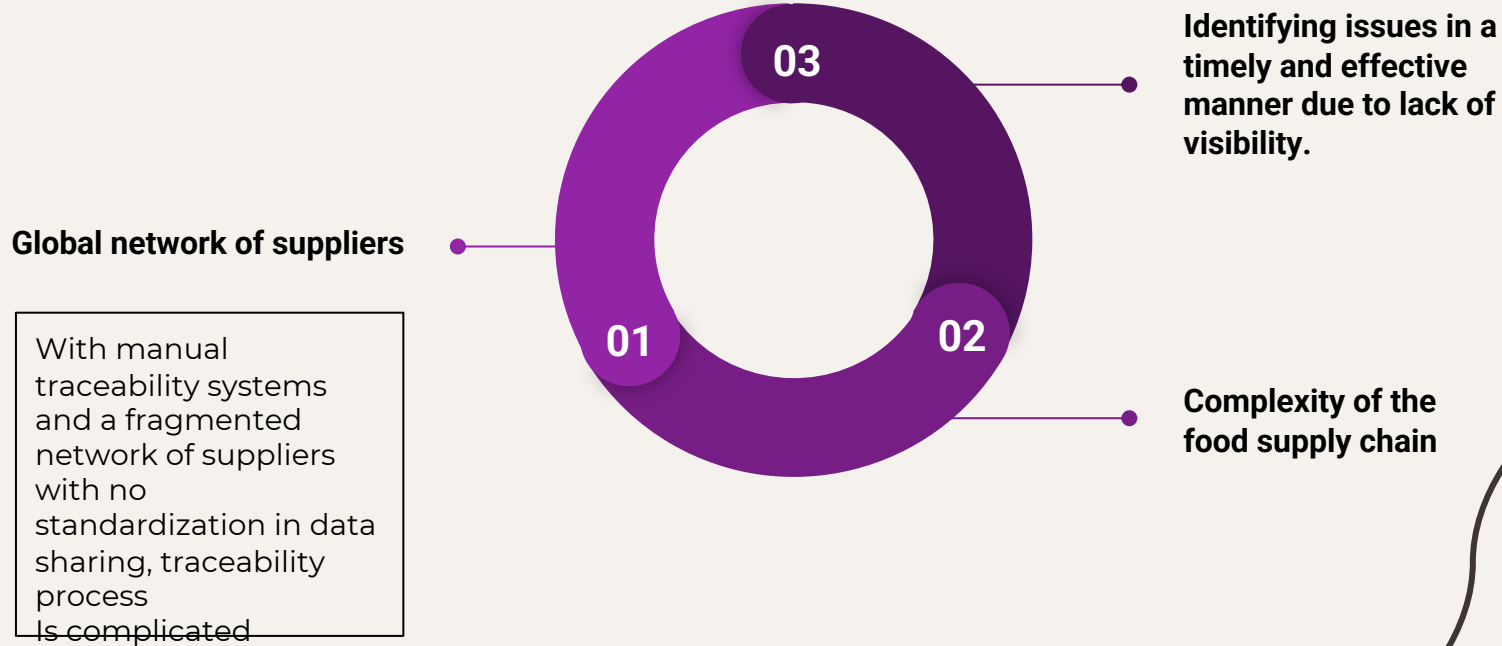
## Case Study

How Walmart used blockchain?



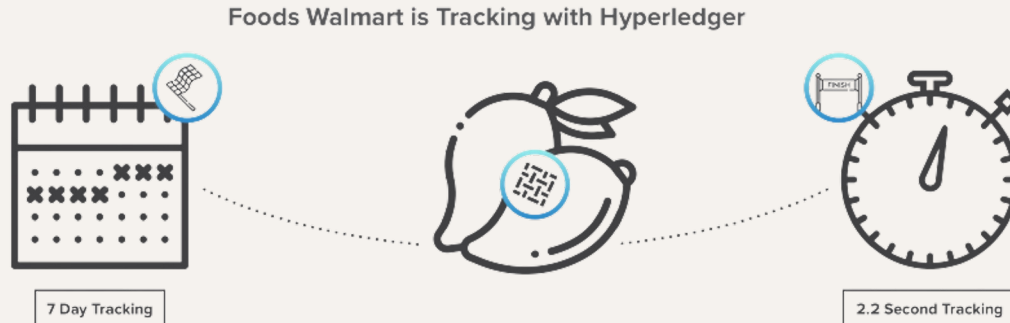


# Challenges faced by Walmart



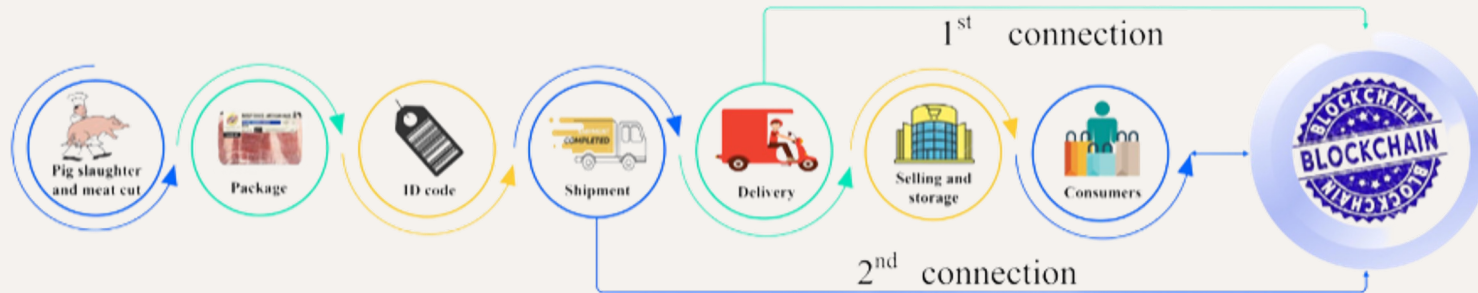
# Walmart's Proof-Of-Concept

- Conducted 2 PoCs in collaboration with IBM to explore the use of blockchain technology for food traceability.
- For mangoes sold in Walmart's US stores, the time needed to trace their origin went from nearly seven days to just 2.2 seconds.
- For pork sold in Walmart's China stores, the system allowed uploading certificates of authenticity to the blockchain, bringing more trust to a system where that used to be a serious issue.



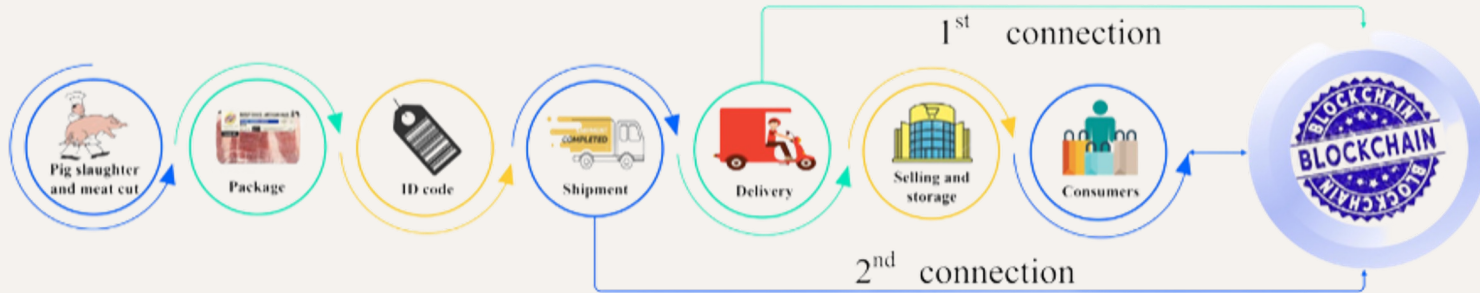
# Establishing IBM Food Trust

- Walmart externalized the PoC and collaborated with IBM, Nestle, and Unilever to establish IBM Food Trust.
- IBM Food Trust enables the participants to view and track the movement of goods throughout the food supply chain, from farm to table.



# Establishing IBM Food Trust

- By establishing an open and decentralized system, Walmart was able to increase transparency and accountability throughout the supply chain.
- By creating an open system like IBM Food Trust, Walmart aims to promote collaboration and build trust among its stakeholders.



# Conclusion

- The use of blockchain technology has expanded beyond cryptocurrency and is now being adopted in various industries.
- The agri-foods industry is one of the sectors that can greatly benefit from the use of blockchain technology.
- Using data consistency and transparency, food safety and quality can be ensured by implementing blockchain-based data traceability in the agri-foods industry.
- As we saw the case study of Walmart in China and US, blockchain technology is being used to solve agricultural problems.

# Thank You!

