



Blockchain for Transparent Food Supply Chain

SDLT, 2018

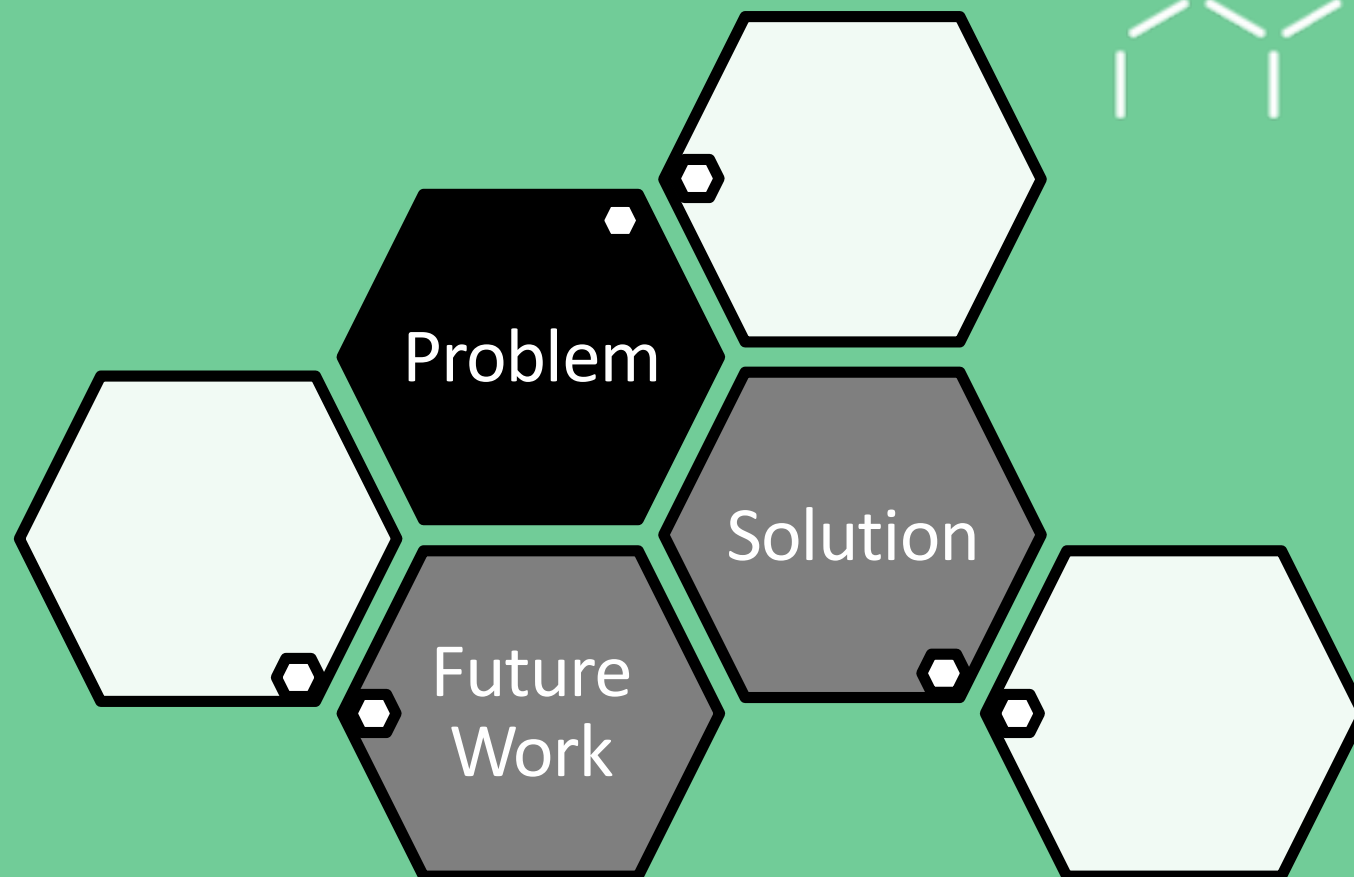
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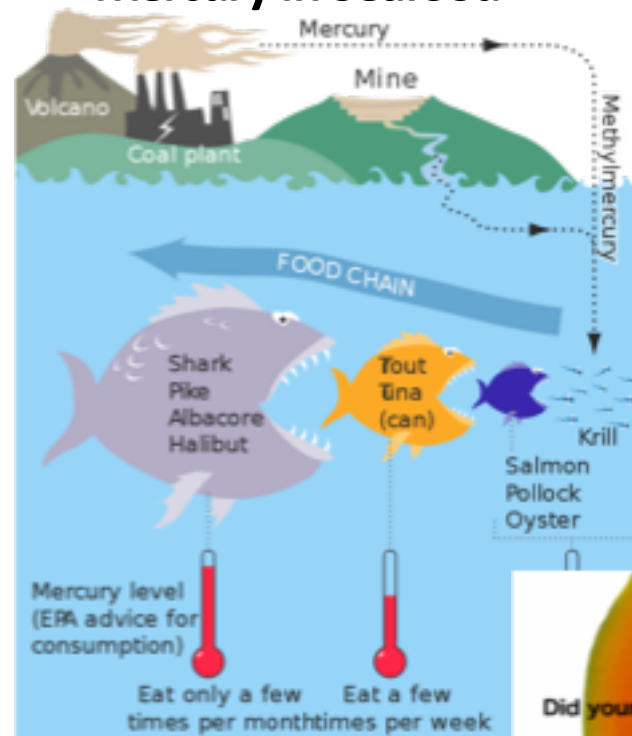


Food Safety?

Dangers in Baby Food



Mercury in Seafood



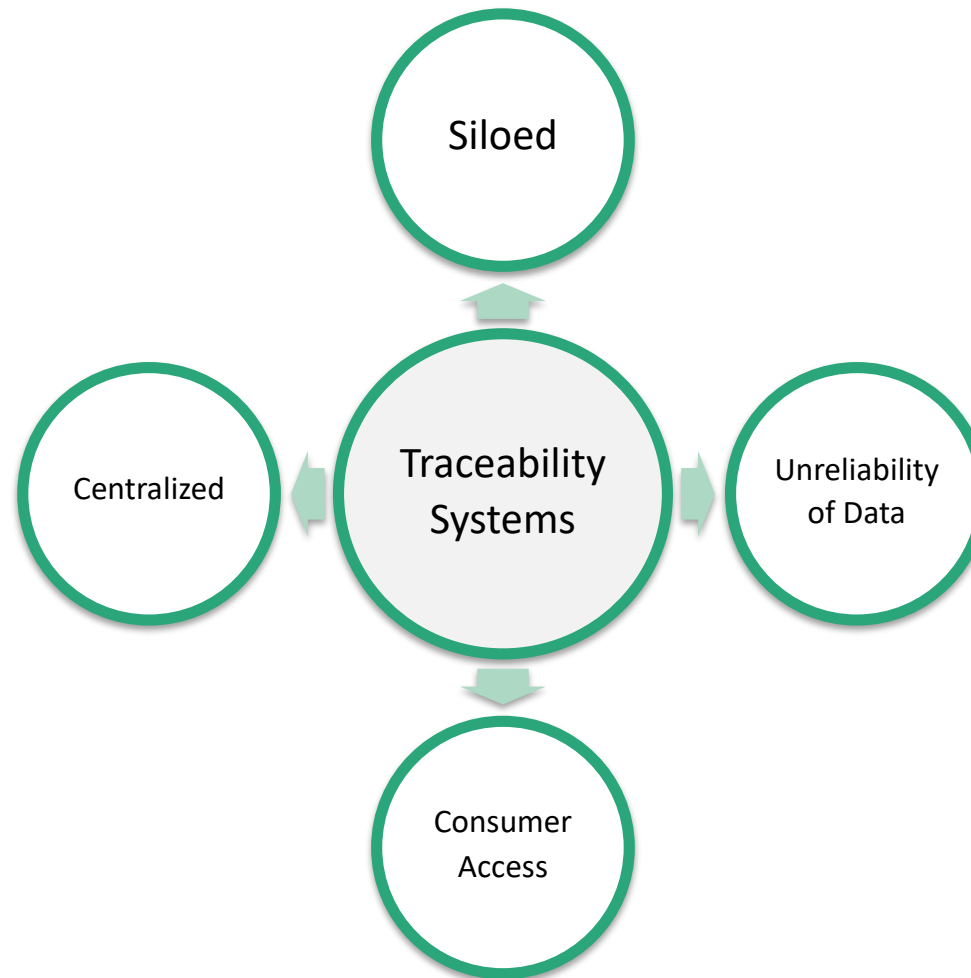
Salmonella Outbreak



Tracking Food to Farm



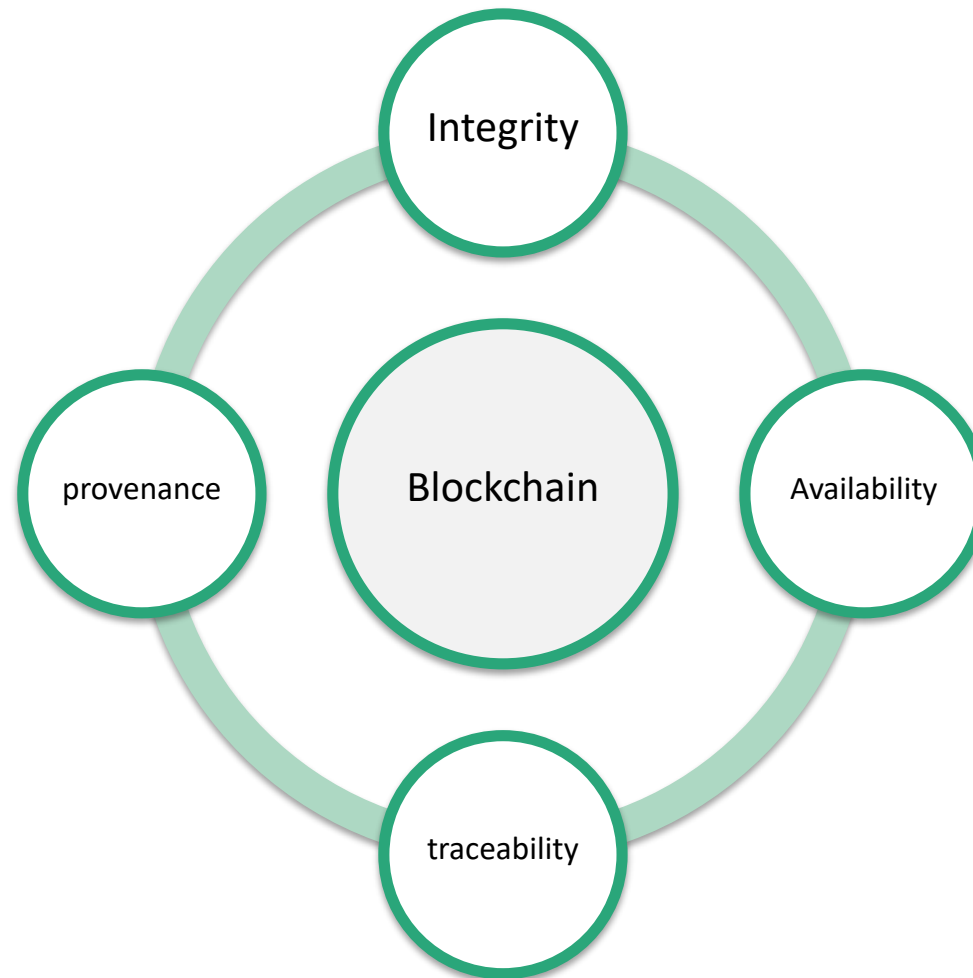
**CONSUMERS WANT TO
KNOW ORIGIN, QUALITY
OF THEIR FOOD**



Tracking Food to Farm



CONSUMERS WANT TO KNOW ORIGIN OF THEIR FOOD



Background

Summary: Traceability of FSCs



REF	APPLICATION	BC TYPE	PRIVACY OF TRADE FLOWS	IMPLEMENTATION	SENSOR INTEGRATION	SCALABILITY	CONSUMER DATA ACCESS
[1]	Agri-Food	public	✗	✗	✗	✗	✓
[2]	Agri-Food	public	✗	✗	✗	✓	✓
[3]	Wine	private	partial	✓	✗	✗	✗
[4]	Fresh Food	-----	-----	✓	✓	✗	✗
[5]	Wine	-----	-----	✓	✓	✓	✗

- **Application:** Type of Food item
- **BC type:** Type of Blockchain, public, private, permissioned
- **Privacy of Trade Flows:** Every Participant is able to view, participate
- **Implementation:** Use of existing platforms such as Ethereum, Hyperledger, Multichain, HydraChain
- **Sensor Integration:** Integrating Sensor information
- **Scalability:** Business Model and integration to existing infrastructure
- **Consumer Trust:** Availability of Information to Consumer

Blockchain Solution?



- Emphasis on transparency
 - *story of “honest” products*

But:

- Who should we trust?
- Who should be allowed to maintain blockchain?
- Are there any access limitations?
- Scalability?
- Privacy Issues?



Identified Research Gaps



- **Understanding Role of Blockchain**
 - traditional systems, processes and mediators.
 - Fear of adoption of new technology
 - read/write/monitor data restrictions
- **Scalability of Blockchain**
 - Throughput, latency and capacity
- **Sensor Integration**
 - Blockchain -IoT sensor integration
 - regulatory objectives – e.g. transparency or accountability
- **Consumer Access to traceability information**
 - Origin of Food
 - Privacy issues- protecting trade flows

Identified Research Gaps



- **Understanding Role of Blockchain**

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What is needed? A hybrid Framework: consortium, permissioned blockchain and services to Consumer

Identified Research Gaps

Solution



- **Understanding Role of Blockchain**

- discontent with intermediaries and mediators.
- It is difficult to manage business processes and complexities

Consortium of FSC participants,
Governing Bodies

- **Scalability of Blockchain**

- Throughput, latency and capacity

Network Architecture: Multiple Side
Chains

- **Sensor Integration**

- Blockchain
- no Audit/Re

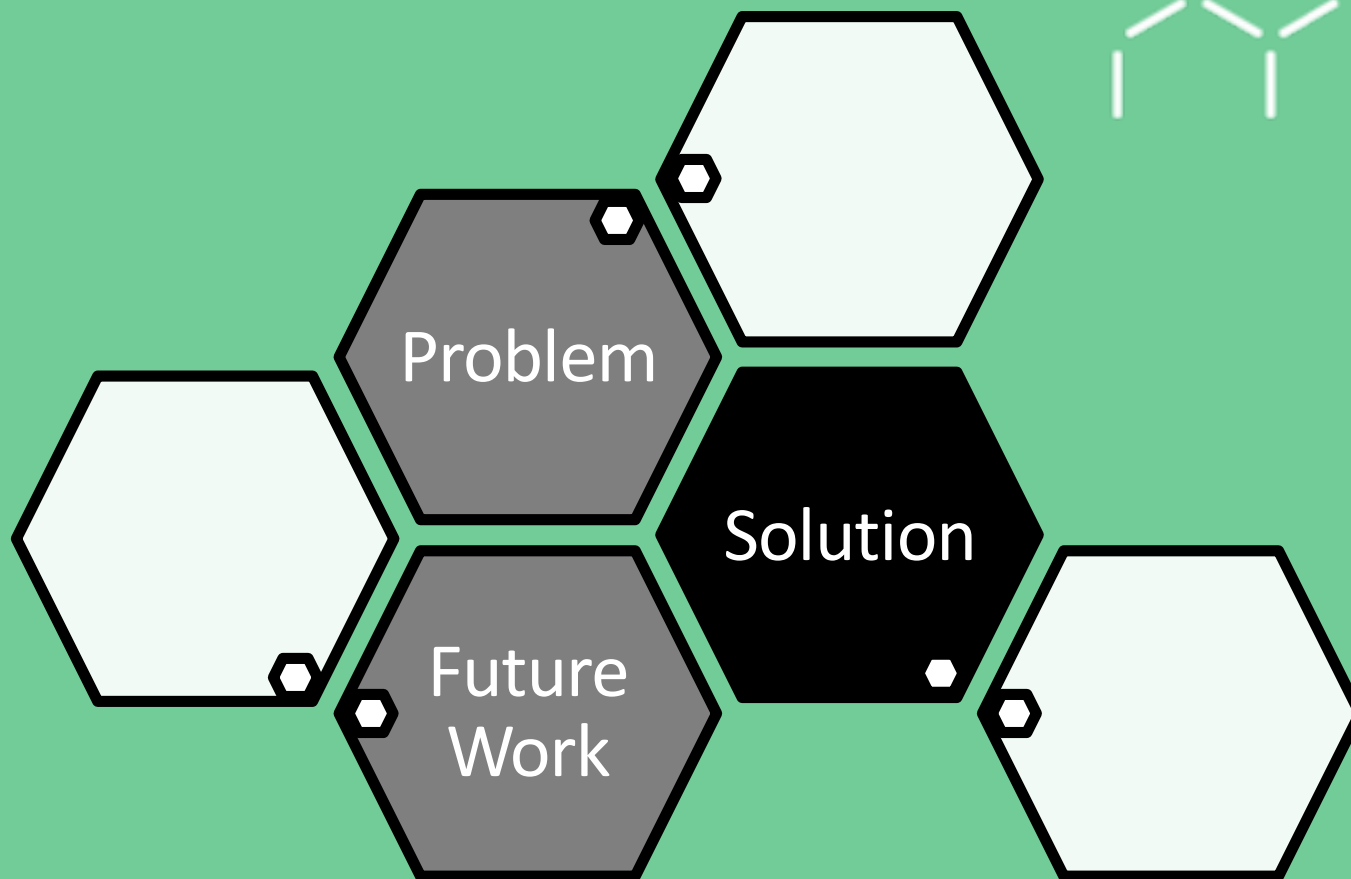
Transaction Types , Sensor Values: Meta Data
Audits by Regulatory

- **Consumer Access to traceability information**

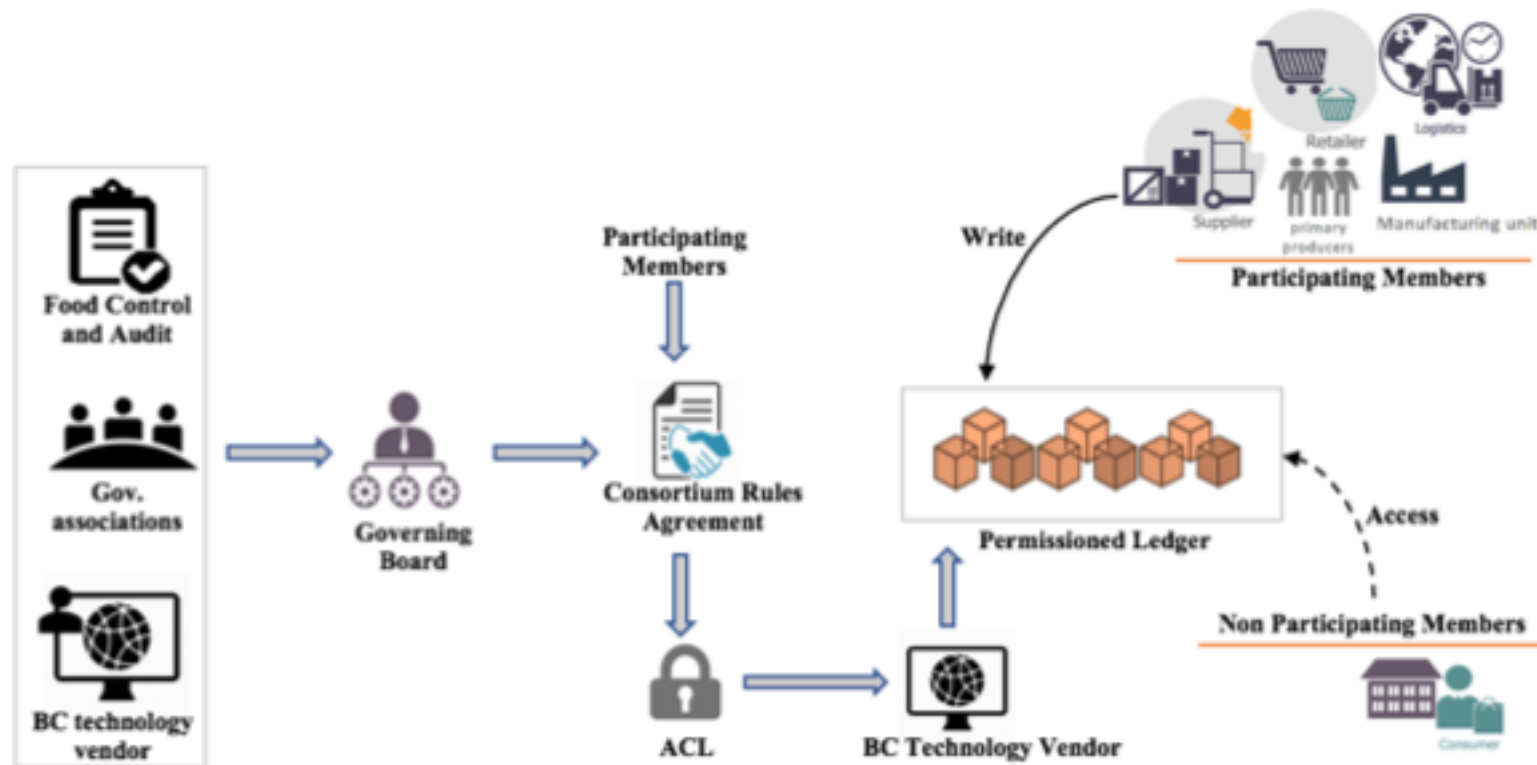
- Origin of Food
- Privacy issues- prote

On shelf access through customized BC
explorers

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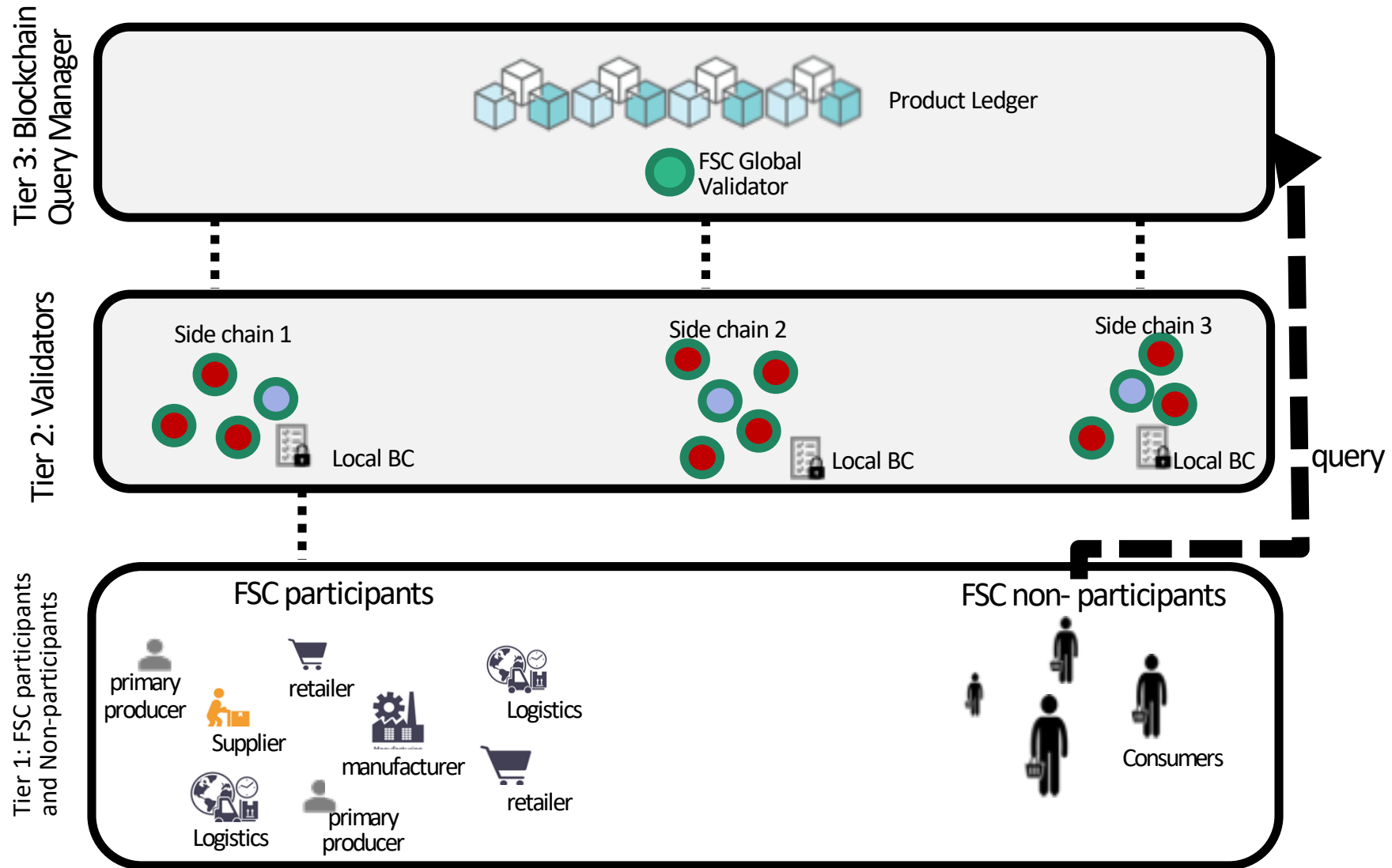


Blockchain for FSCs... Consortium



Blockchain for FSCs...

Network Architecture



Blockchain for FSCs...

Tier 1:FSC Transaction Vocabulary

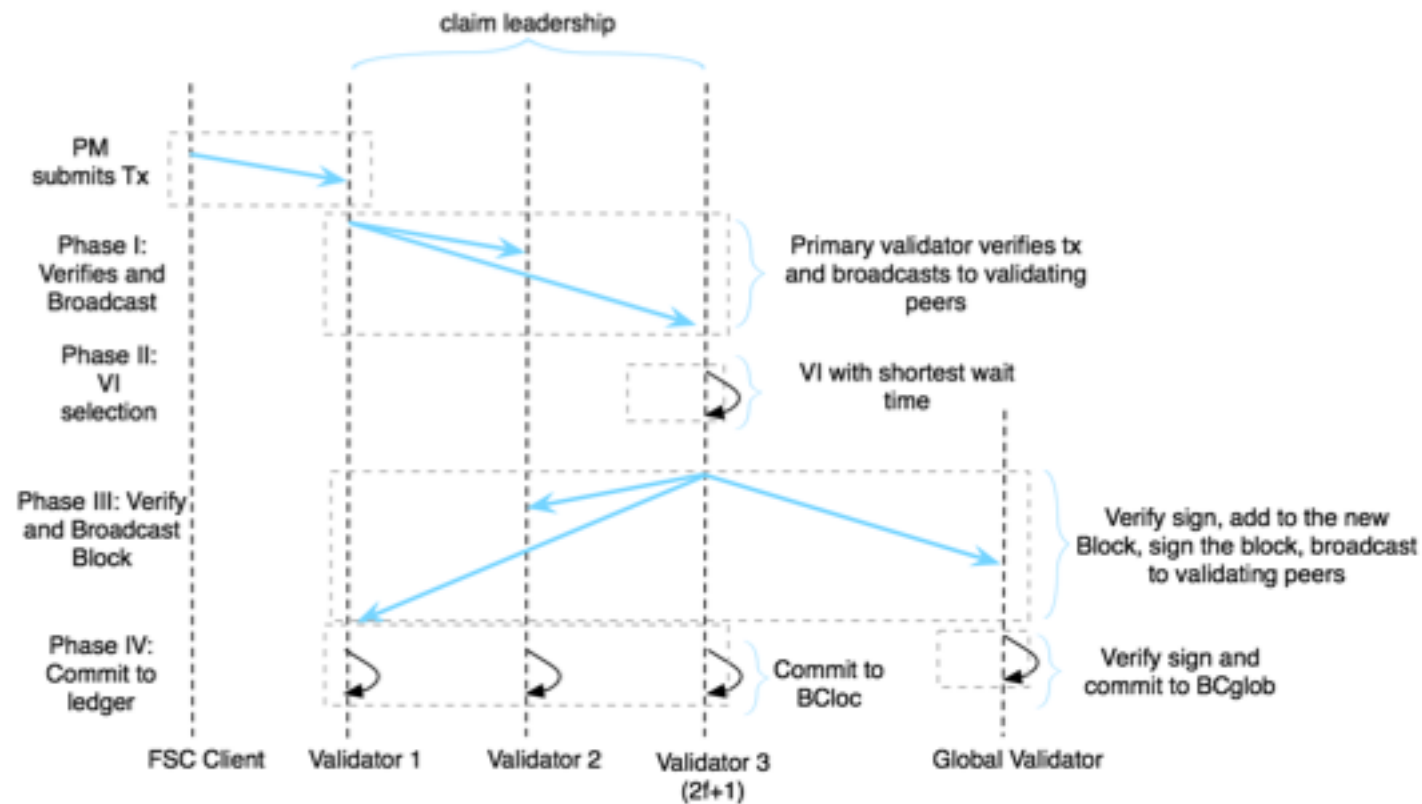


Create, Transfer, Produce



Blockchain for FSCs...

Tier 2: Block Validation



Blockchain for FSCs...

Tier 3: Customized Query Engine



- **Provenance information:**
 - location of origin of raw material, the name of primary
- **Certification/Quality Checks:**
 - Quality standards such as time/temperature measures in accordance with the food safety standards, for example in cold chain.
- **Approved by FRA:**
 - a consumer may only be interested if the production of food item met the standards and approved by food regulatory authority.

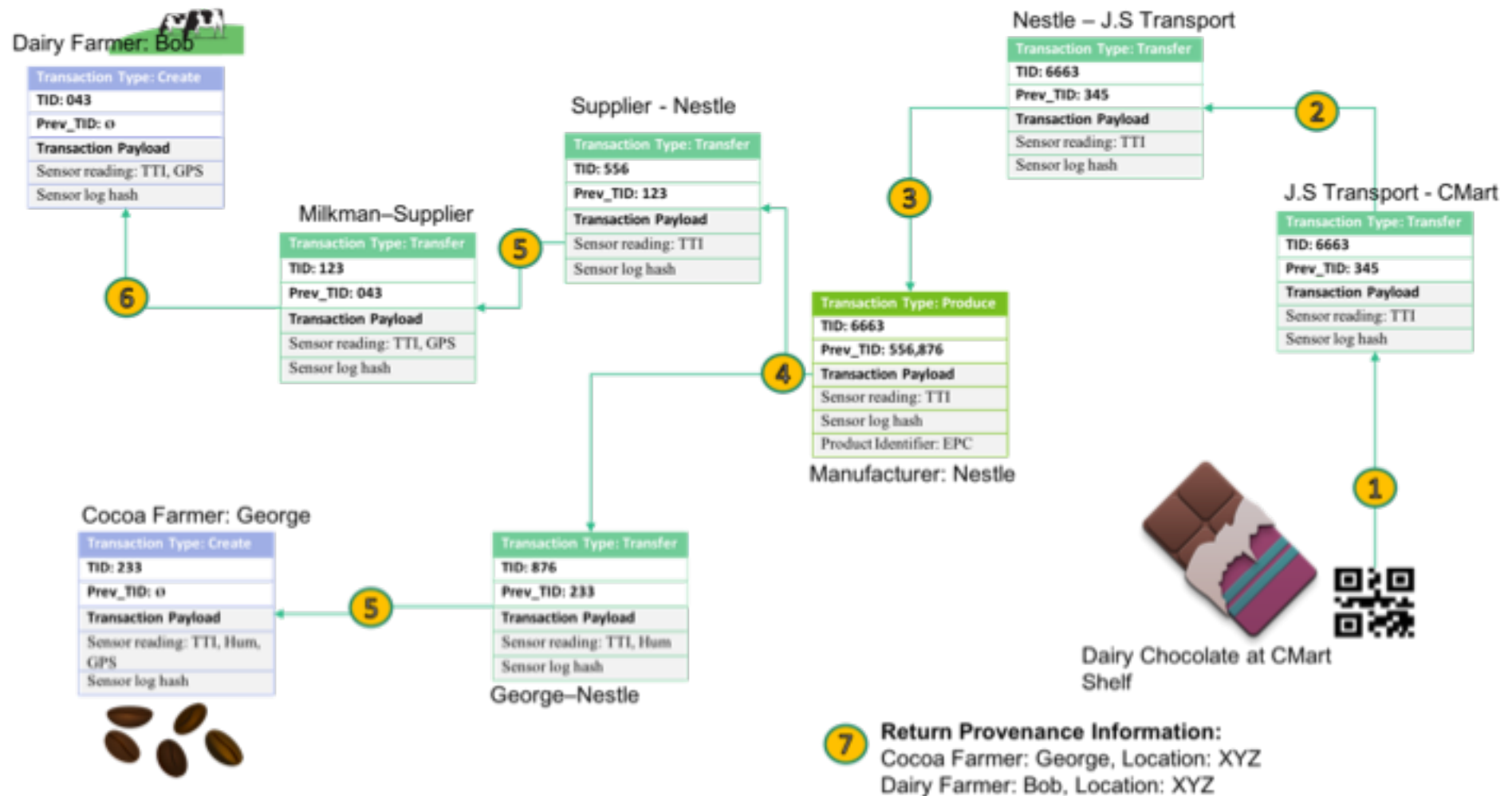
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FSC Blockchain

Results

Provenance Information

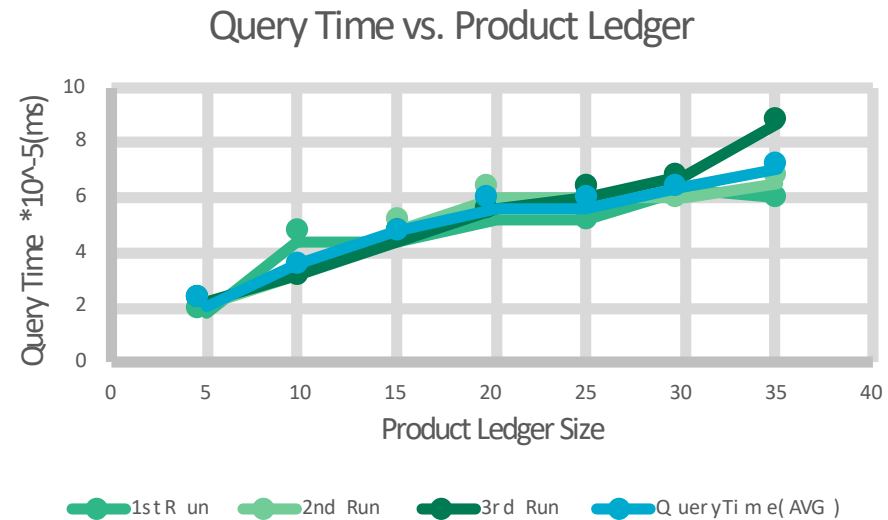


Results...



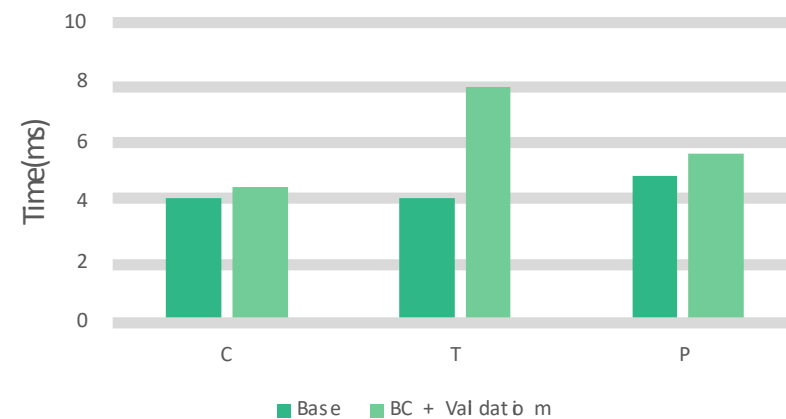
Blockchain Size Vs Query Time

- A blockchain with an increasing product ledger size
- The query time product traceability
- Less than a traditional trace back method



Validating Transactions

- Base Case: A traditional DB
- BC: permissioned BC Create,
- Transfer Tx validation < 5ms
- Produce < 50 ms



Some Challenges



- Proving the quality of food
 - Types of food
- Accountability
- Organic Produce
- Disconnected chain
- Incentive for a low scale producer
- Privacy of Trade Flows

Blockchain cannot solve everything!



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Thank you

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