ICE

ICT FOR CITY LOGISTICS
AND ENTERPRISES


# Blockchain in Industry – Why a marriage?

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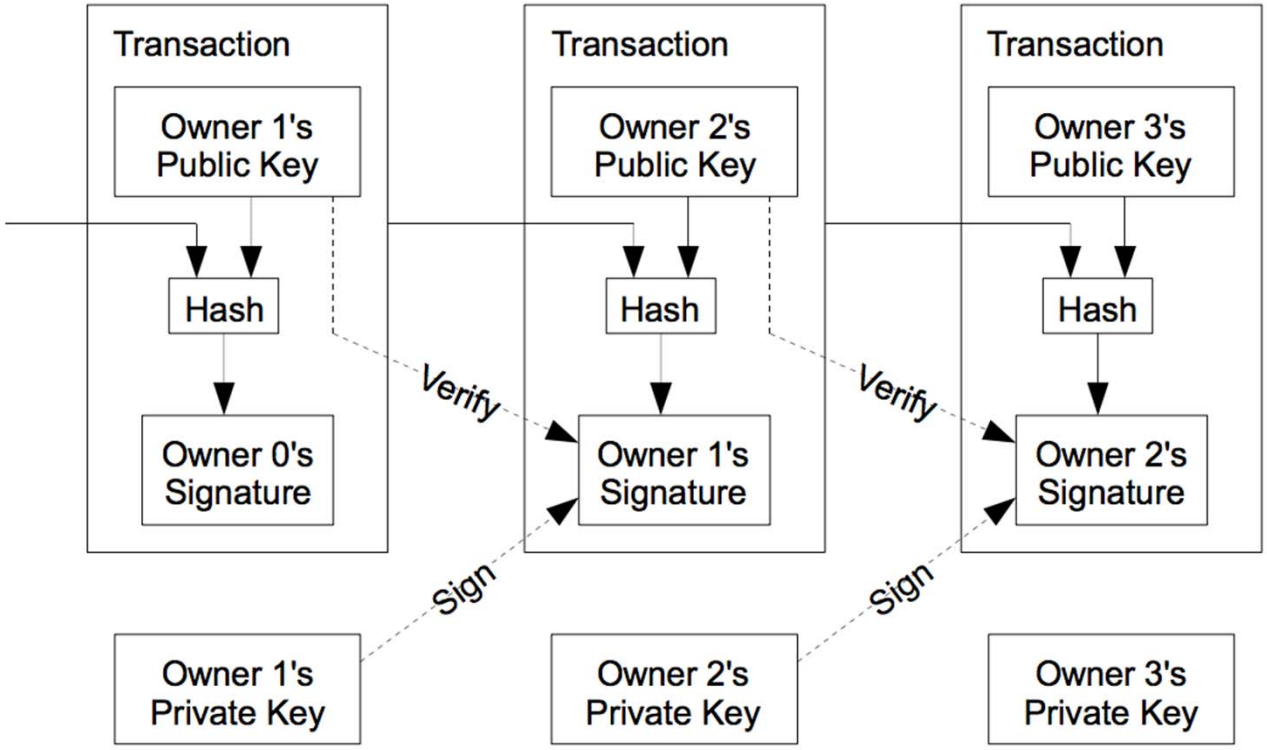
# AGENDA

- BlockChain for non IT Experts
- Why the marriage?
- Use Case

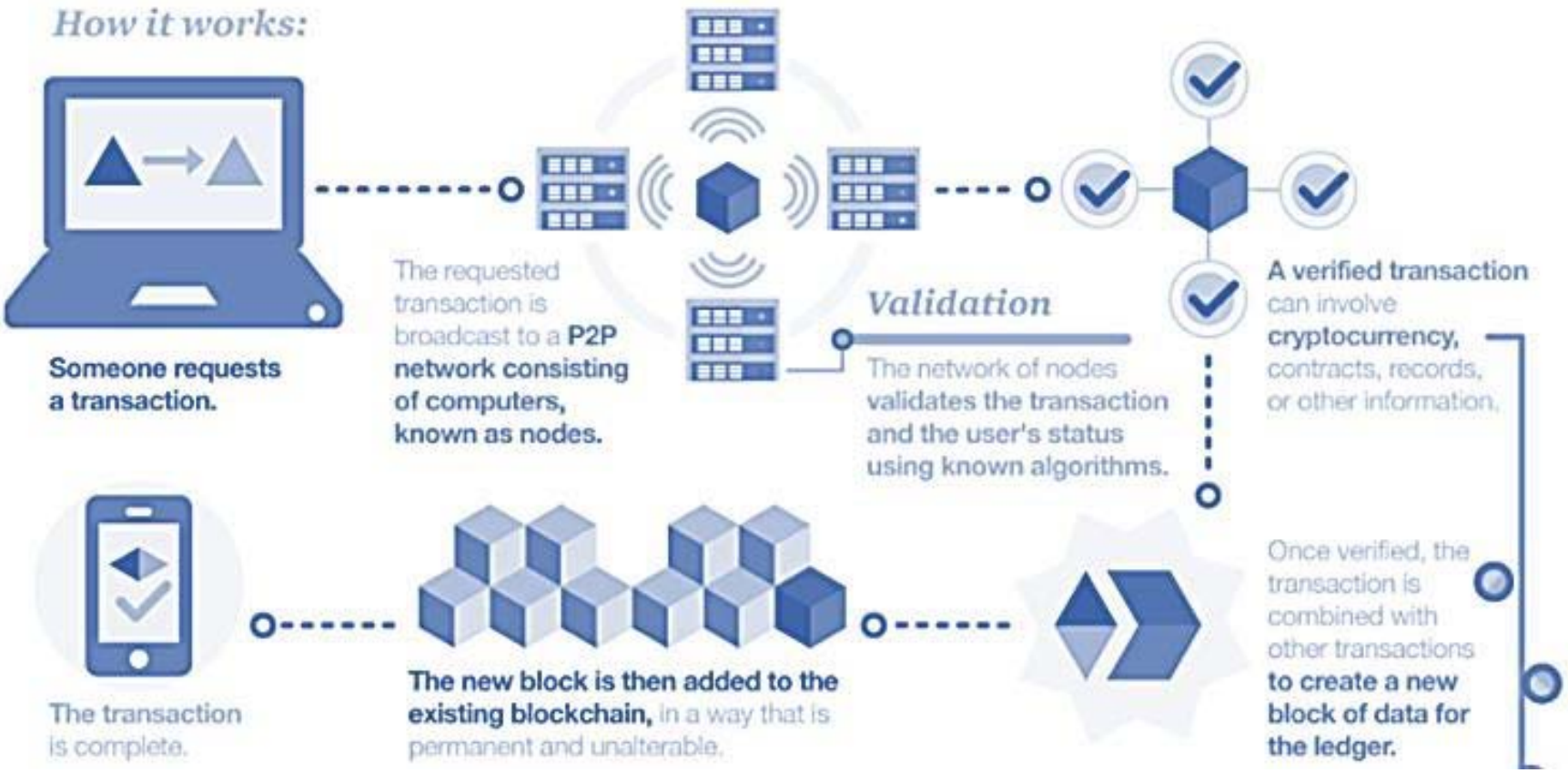
- Blockchain is a **P2P ledger**, firstly used in the **Bitcoin** cryptocurrency for economic transactions. (Conoscenti et al., 2016)



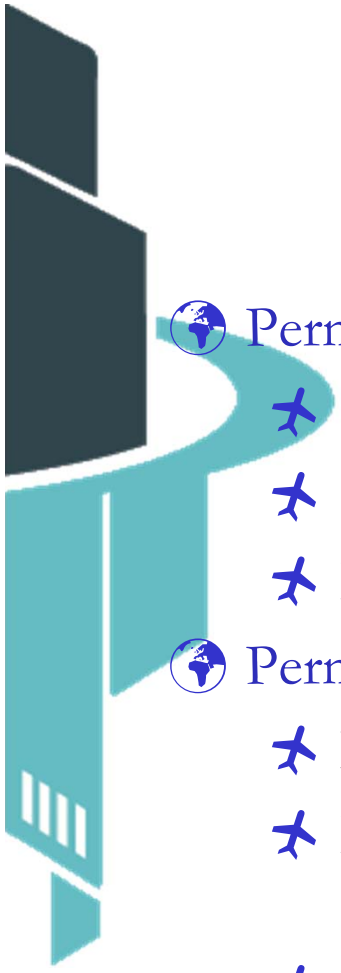
# BlockChain for non-IT

- Distributed
  - It is designed to be distributed and synchronized across networks
  - Hard to attack by hackers
- Trustness
  - If you want to sale your dog, the dog must belong to you
  - All the parties must agree that they want to buy/sell a dog
- Rules to share your data
  - Transactions agreed between participants in advance
  - Stored in the blockchain as “smart contracts”
- Immutability of the data
  - When all the parties agree and the transaction is stored in the BlockChain, it cannot be changed
  - Possibility to rebuild the story of the information

# How it works




Blockchain explained (source: PWC Global)



## BlockChain types

- Permissionless Blockchains
  - Any peer can join and leave the network
  - Cryptographic primitives for writing the data
  - Examples – Bitcoin, Ethereum
- Permissioned Blockchains
  - Readers and writers must be granted
  - Eventual separated and parallel blockchains for encapsulation and privacy
  - Example – Hyperledger

# The land of blood and honey

- We can secure our data
- We can rebuild how the information was generated

- The infrastructure can be expensive
- Different technologies, different applications
  - Hyperledger – IBM
  - IOTA – IoT specific
- Specific expertise

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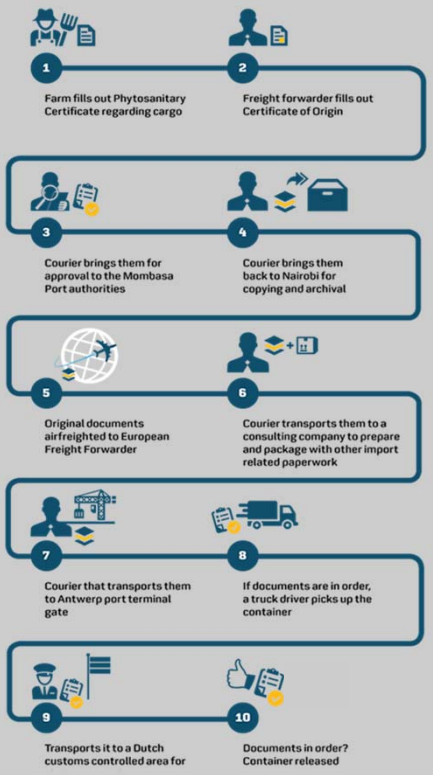
# Limited information visibility across supply chain incur significant cost in handling information

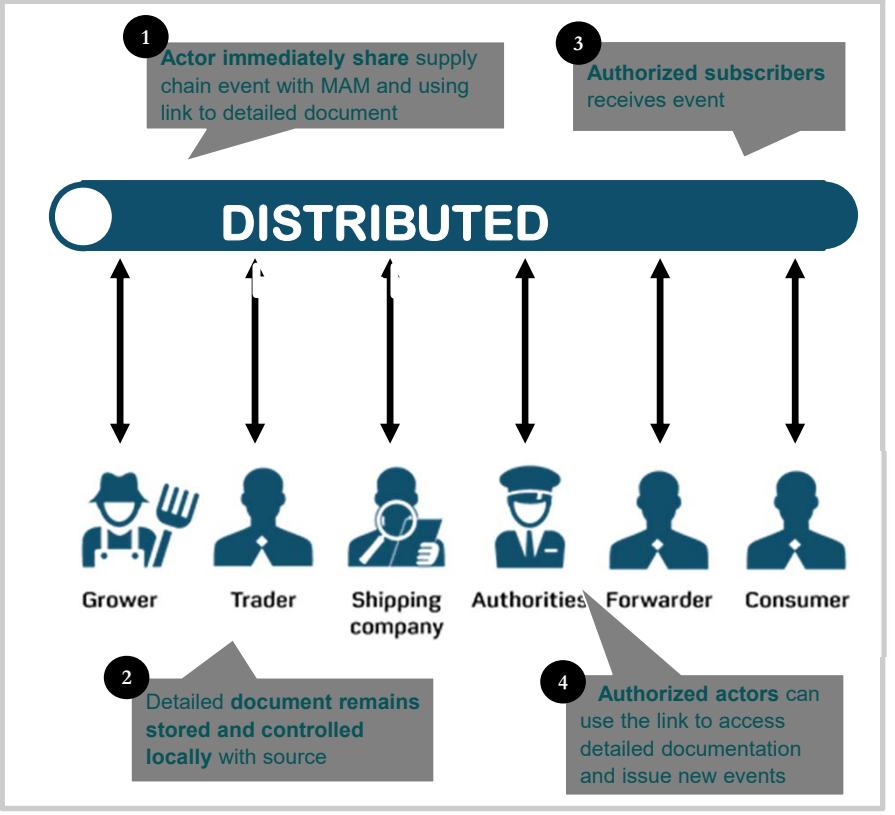
## From Kenya to Europe, the travel of documents looks like this

The administrative cost is **comparable to the cost of the physical transport**

Transporting avocados from Nairobi to Rotterdam involves **30 actors** and **200 information** exchanges

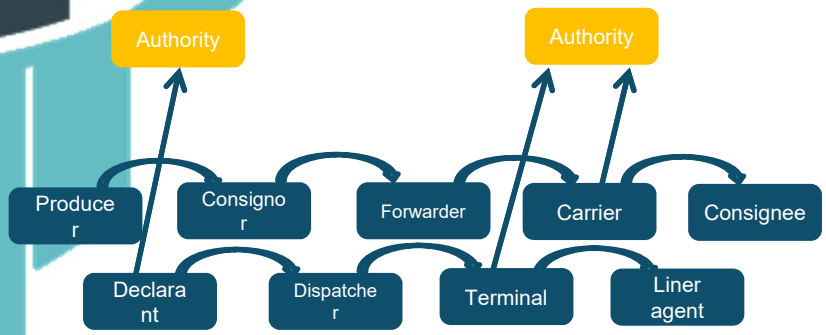



## With DLT solution it will look like this

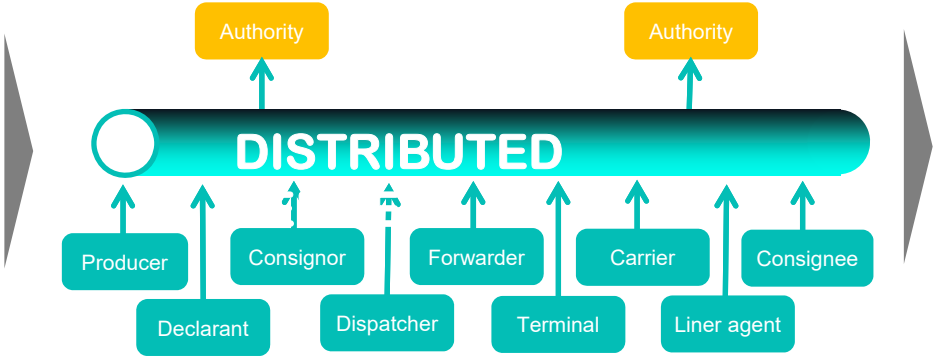


**Creating an infrastructure for digital exchange of events and related documents in global trade with benefits for all**

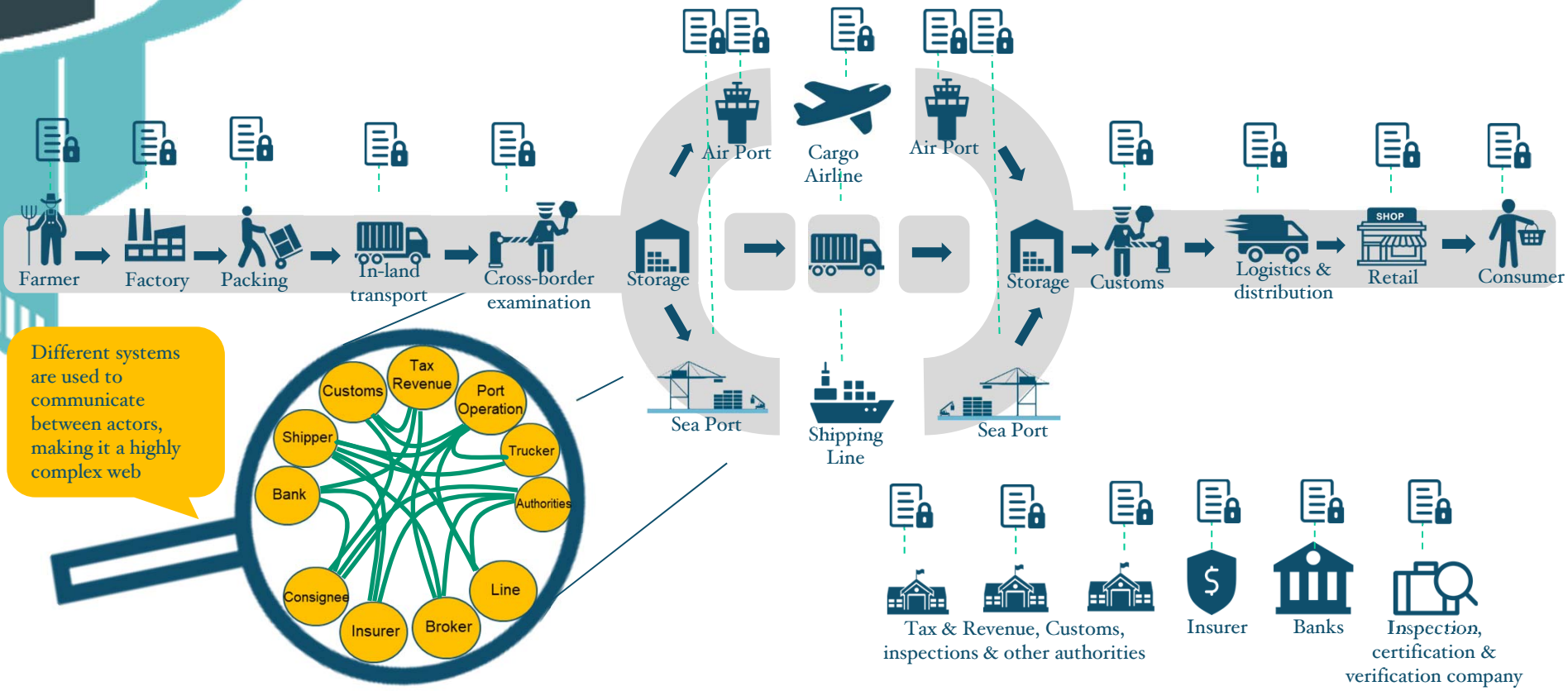
## Today: Peer-to-peer communications




## Tomorrow: DLT-enabled communication



**The generation, transmission, use and storage of information is highly segmented and not effectively shared among parties, resulting in inefficiencies, lose of data and sub-optimization**



# Different Domains

| DIGITAL TWIN | SENSOR DATA | IDENTITY MANAGEMENT | DOCUMENT STORAGE | PUBLISH EVENTS | ACTIONS |
|---|---|---|---|---|---|
| Tagging objects using RFID, QR, container numbers etc. | GPS, temperature, humidity, performance etc. | Define roles such as producer, transporter, customs, port operator, bank, etc | Ability to store relevant docs: purchase order, invoice, load list, phyto certificate, certificate of origin, transport booking, bill of lading, manifest, declarations, etc. | Ex: purchase of goods done, container stuffed, tax paid, good inspected, certificate approved, container loaded, etc. | Ex: push, receive, make a query for, discover different events/doc/data/users |

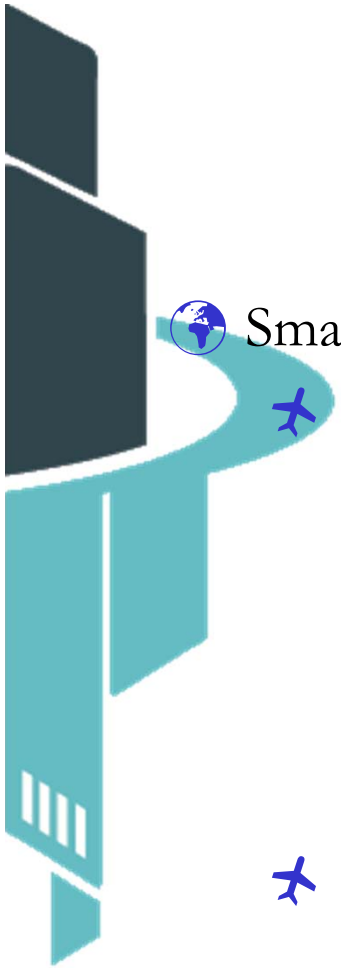
Single version of the truth, data integrity, immutable records, encryption, agnostic to internal processes/IT, permission-less innovation

# Some scenarios

- Automotive
  - Grey spare parts
- Sustainable transportation
  - ISO/TS 14067 requires that all the chain of a product/service is computed in its environmental impact
  - How to assess the subcontractors/parts?
  - Tokens as «green» money
- Synchromodal transportation
  - Need of a common network
    - Digital twins
    - Capacity
  - DL: certified capacity
  - Smart Contracts: negotiation of the real costs
    - Prevent large companies from gathering data of smaller ones

## Speed and scalability

- Bitcoin peaks out at around 7 TPS
- Ethereum is limited to around 15 TPS
- Quorum has stated a target of “dozens to hundreds of transactions per second depending on configuration” in their white paper.
- Hyperledger Fabric. They claim 3500 TPS. Independent test 170
- IOTA- 180 TPS, claiming to arrive at 1600 for the end of the year
- Speed decreasing with the network size
  - Tradeoff between speed and security



# Costs

- Small BC
  - Scenario 1 – private BC
    - Standard machine
      - 1 Vmachine 32 CPU 128 Gb Ram machine
      - 14000$/Year
    - Need of at least 6 machines
    - 84000$/Year to start your business
  - Scenario 2- shared BC
    - 1 Vmachine 32 CPU 128 Gb Ram machine
    - 14000 $/year
    - 9 machines
    - 126000$/Year to start your business

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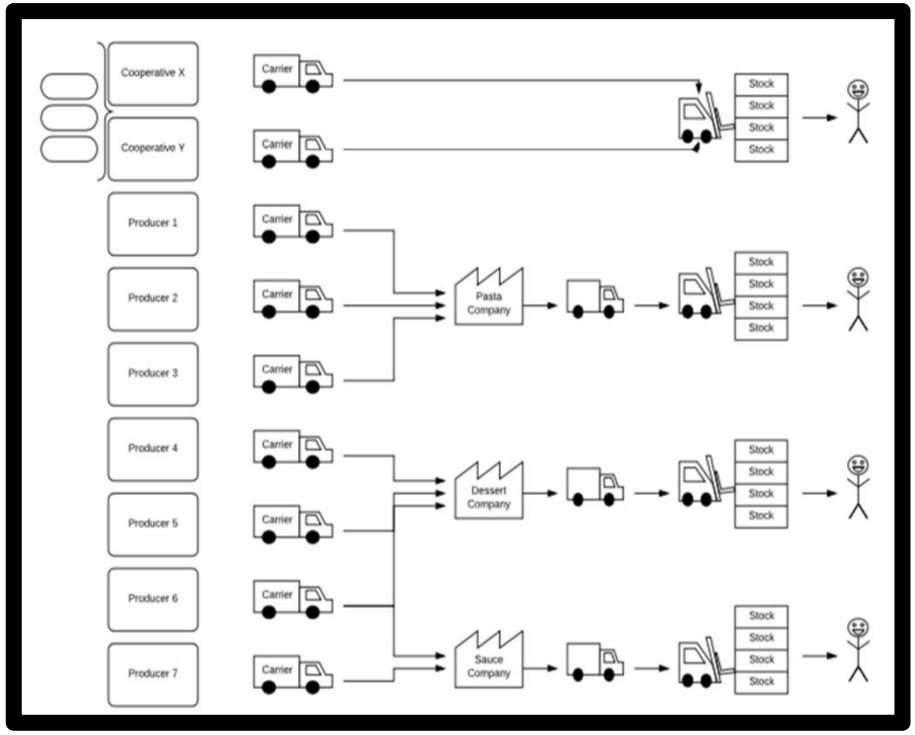
# Use Case – Fresh Food

- Fresh food retailer
- 10 warehouses and 3 distribution centers in Western Europe



# To Be scenario

- Hyperledger BC
  - Object: eggs
  - Value: 13000 K€
  - Actors: Retailer, suppliers, carriers
- Objectives
  - Cost reduction
    - Inboud operations efficiency
    - Waste
    - Recall (e.g., sanitary problems)
  - Value
    - Brand image
    - Increased revenues

# To Be scenario

- Costs
  - IT team: 130K
    - HP. Average salary: 2100 month
  - BC Platform: 240K
  - BC members (Retailer, suppliers, carriers): 21
  - Cost per actor: about 1000€/month
- Value
  - +10% revenues
  - Inboud efficiency: 45K
    - 875 man-working minutes per day and 2 operators could be moved to a different area
    - Accuracy of data
  - Reduced waste of food: 450K
    - Reduced expired items (exceeded sell-by date or use-by date) and waste caused by unsafe stow conditions
- Potential value
  - Recalls (possible contaminations): 1200K

# To Be scenario

- Limits
  - Need to put in the BC all the Supply Chain participants
  - Digital Twin
    - Some limits in linking the real and the digital
  - IoT
    - Additional costs for introducing the sensors network data

      E.g. Cold chain
    - Potentially high gains

## Contacts

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http://www.ice-lab.online/