Chain2Sustain

Sustainable Supply Chains based on Blockchain

Technische Universität München

Department of Informatics

Blockchain technology for public sector innovation

14th of July 2023

This is Greg

Main Stakeholder - Issues

OEM

- Protect company's reputation
- Legal compliance
- Customer satisfaction

Customer

- Often not able to buy products with a clean conscience.

Supplier

- Worried about retaining their business secrets

How Blockchain can help

OEM

Customer

Supplier

Issues:

- Protect company's reputation
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- Often not able to buy products with a clean conscience.

- Worried about retaining their business secrets

Solution:

- Blockchains can be traceable, provide immutability, store relevant data and automate processes

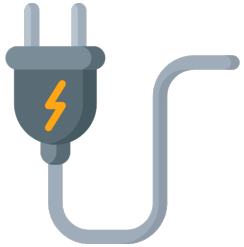
- Blockchain can proof a sustainable supply chain

- Blockchain can provide partial anonymity and data confidentiality

Emissions and Standardization

Emission Scopes according to GHG Protocol:

Scope 1:
Direct Emissions
from operation & production



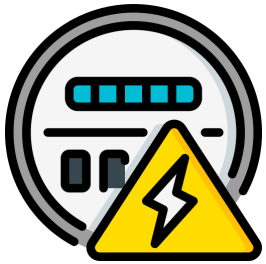
Scope 2:
Indirect Emissions
from purchased Energy

Scope 3:
All other Emissions
associated with the company

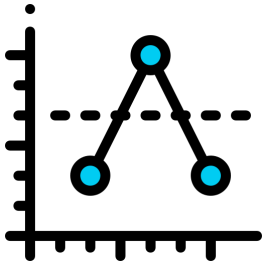
➔ Focus on Scope 1 + 2 Emissions

Emissions and Standardization

Accounting of Emissions



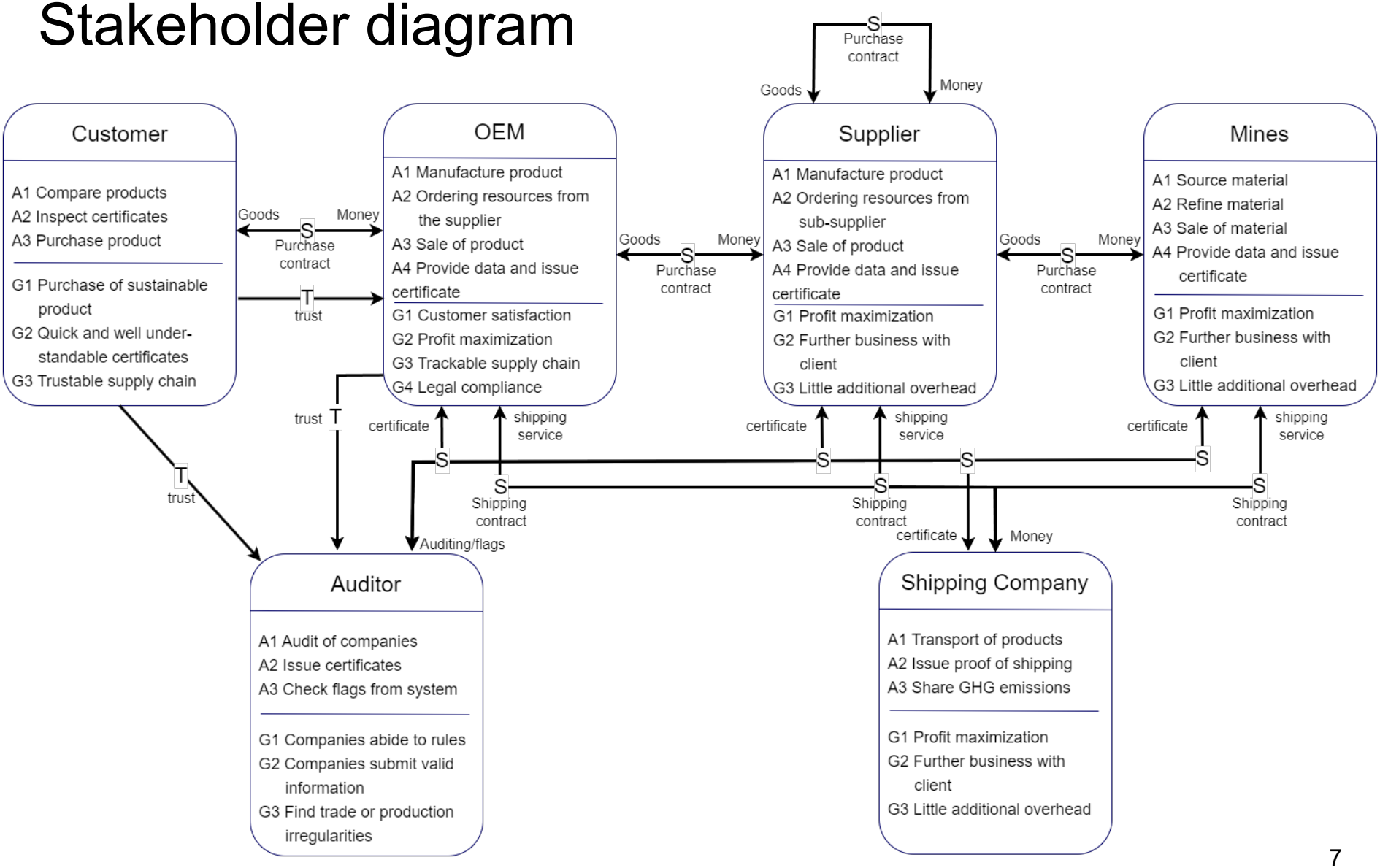
Primary Data:
Individual data &
direct measurements



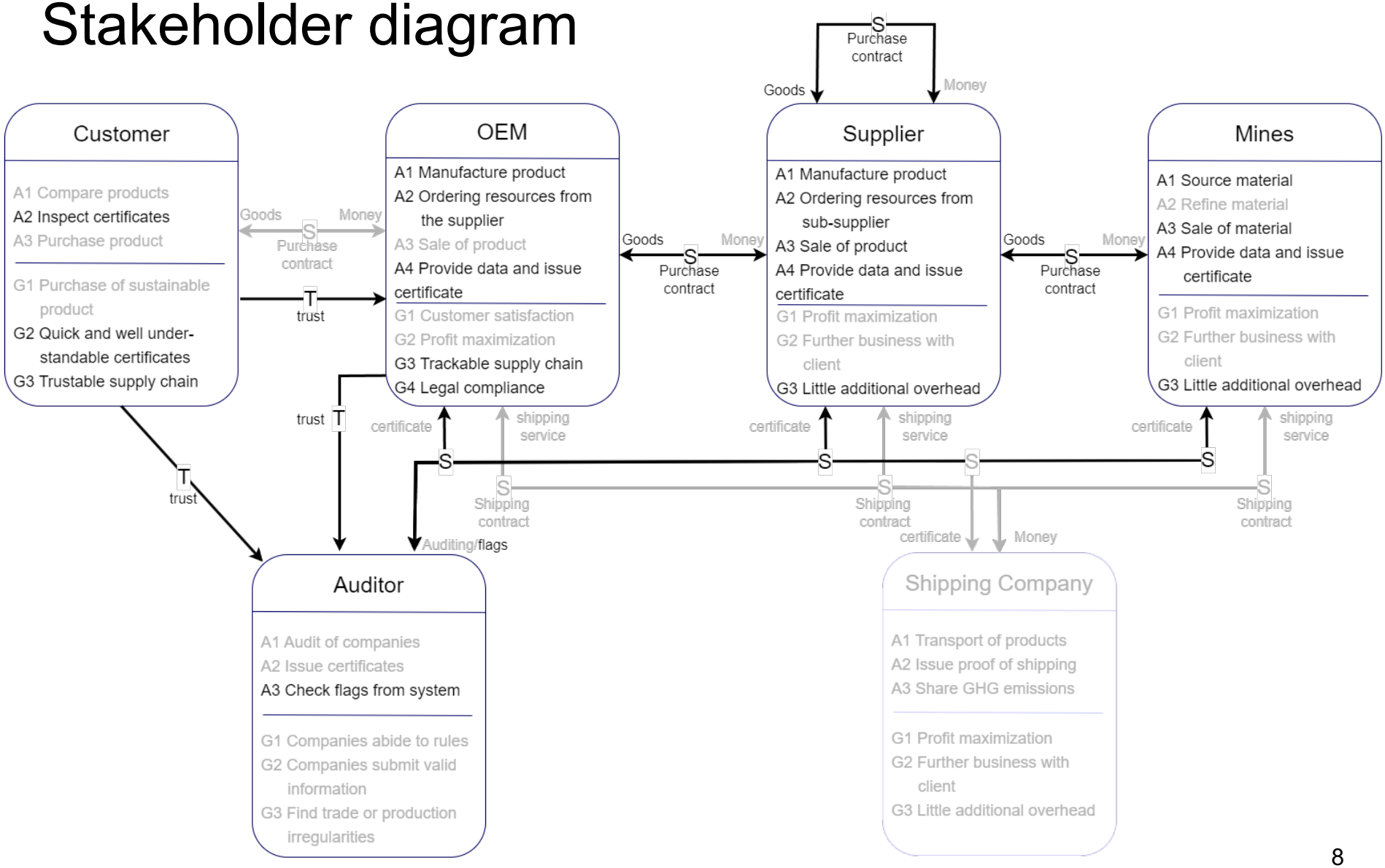
Secondary Data:
Industry Emission Average

Most audits are based on industry averages ➔ No mechanism to transfer lower emissions

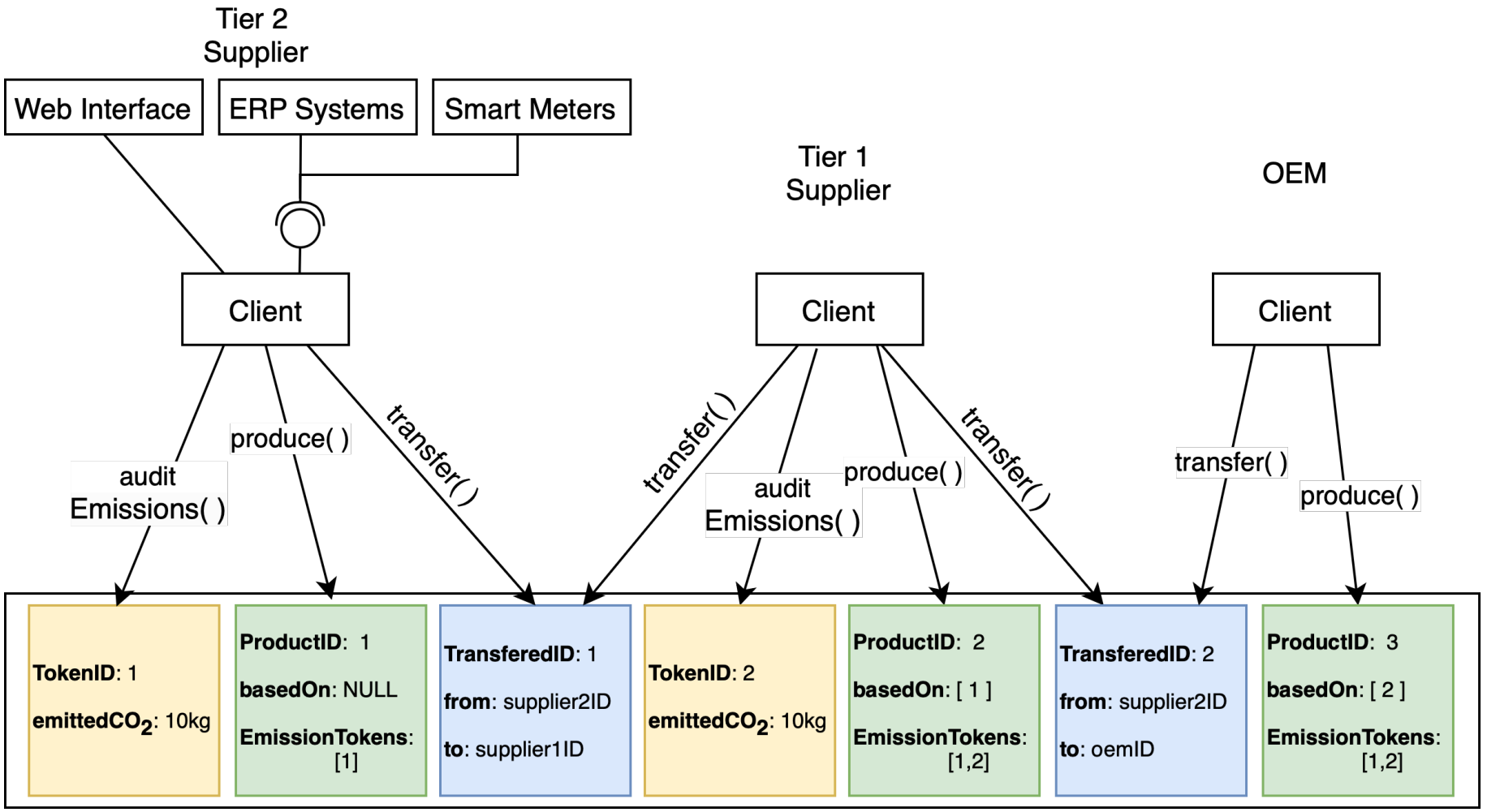
Stakeholder diagram



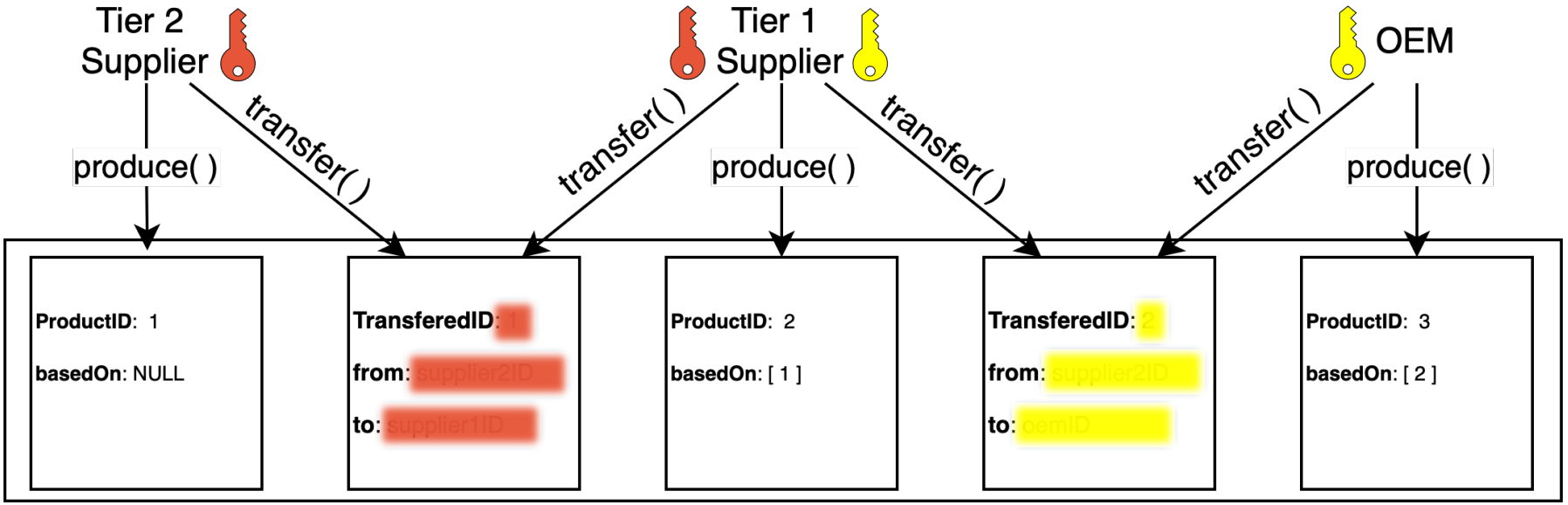
Stakeholder diagram



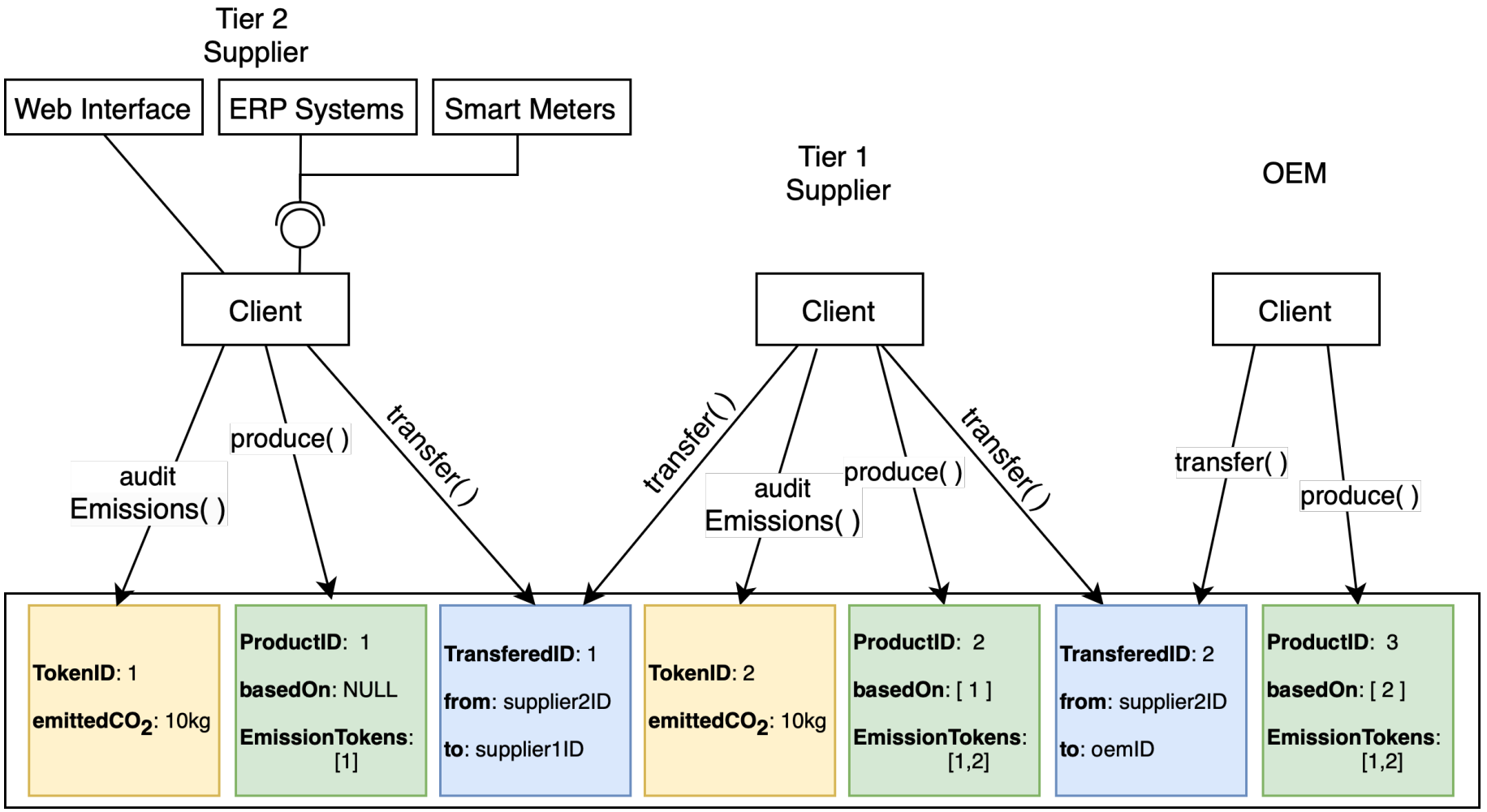
System Design



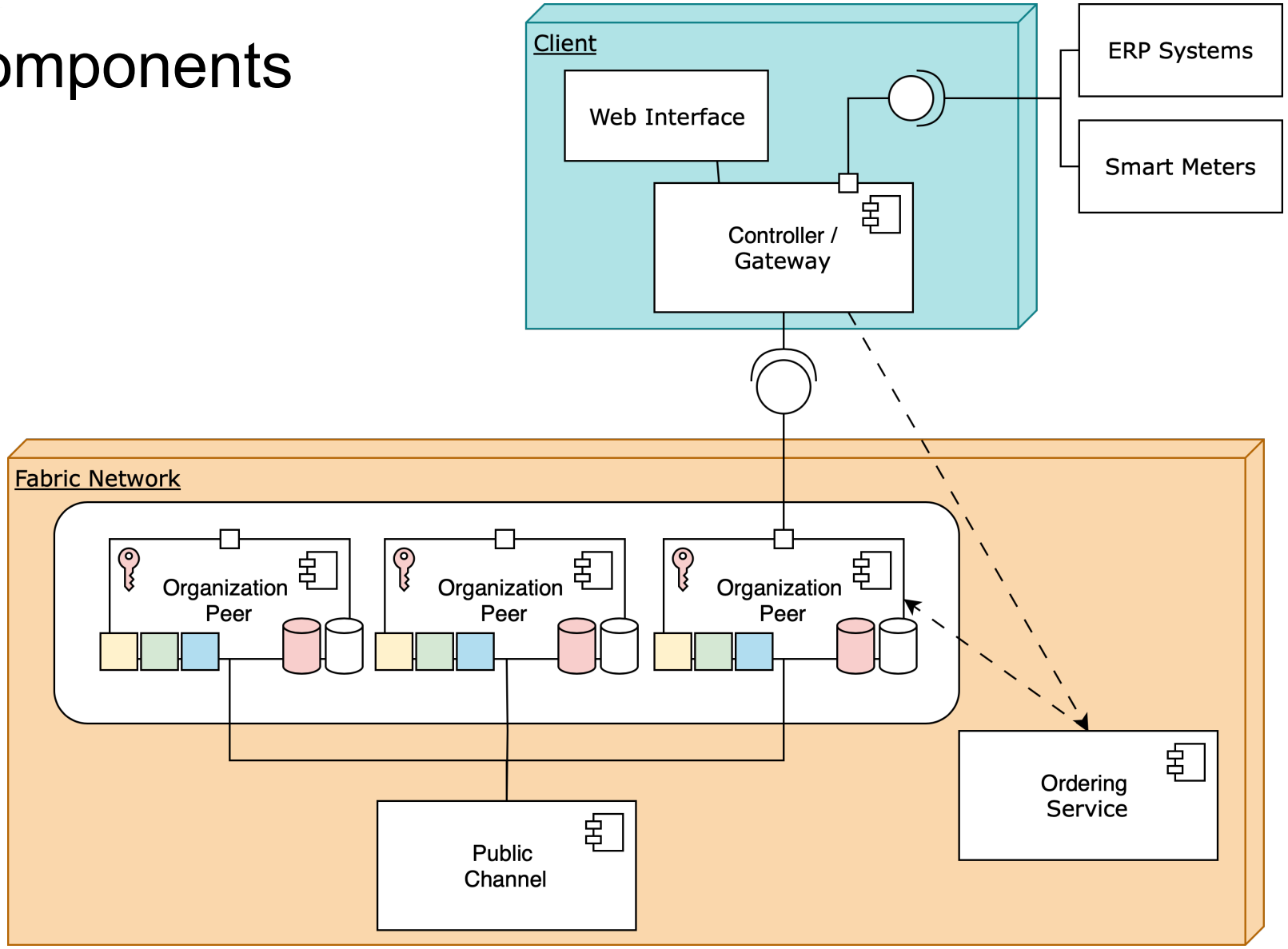
System Design – Private Data Collections



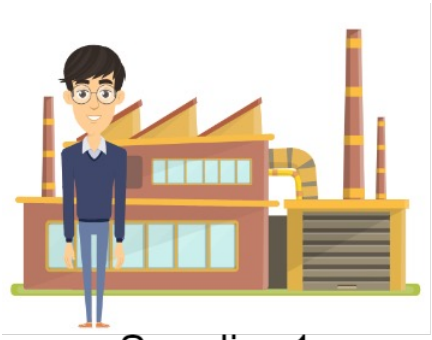
System Design



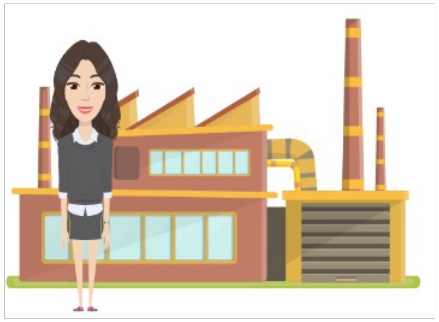
Components


Client
Web Interface
Controller / Gateway
ERP Systems
Smart Meters
Fabric Network
Organization Peer
Organization Peer
Organization Peer
Public Channel
Ordering Service

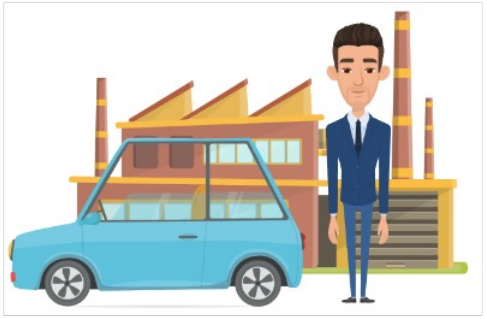
Trust dependencies



Supplier 1

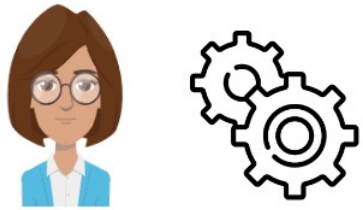


Supplier 2



OEM

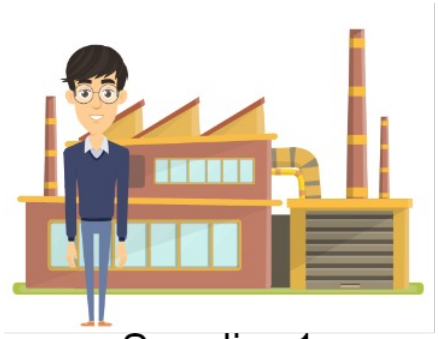
Costumer



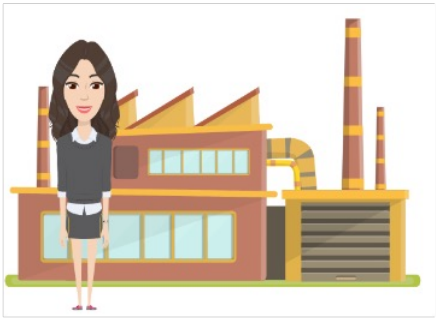
Auditor

System

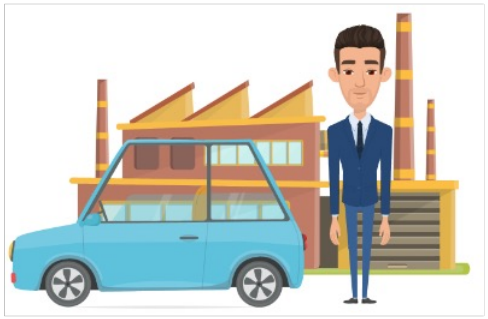
Trust dependencies



Supplier 1

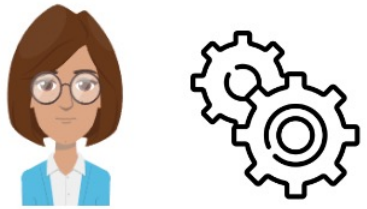


Supplier 2



OEM

Audit
Manufacturing
Process

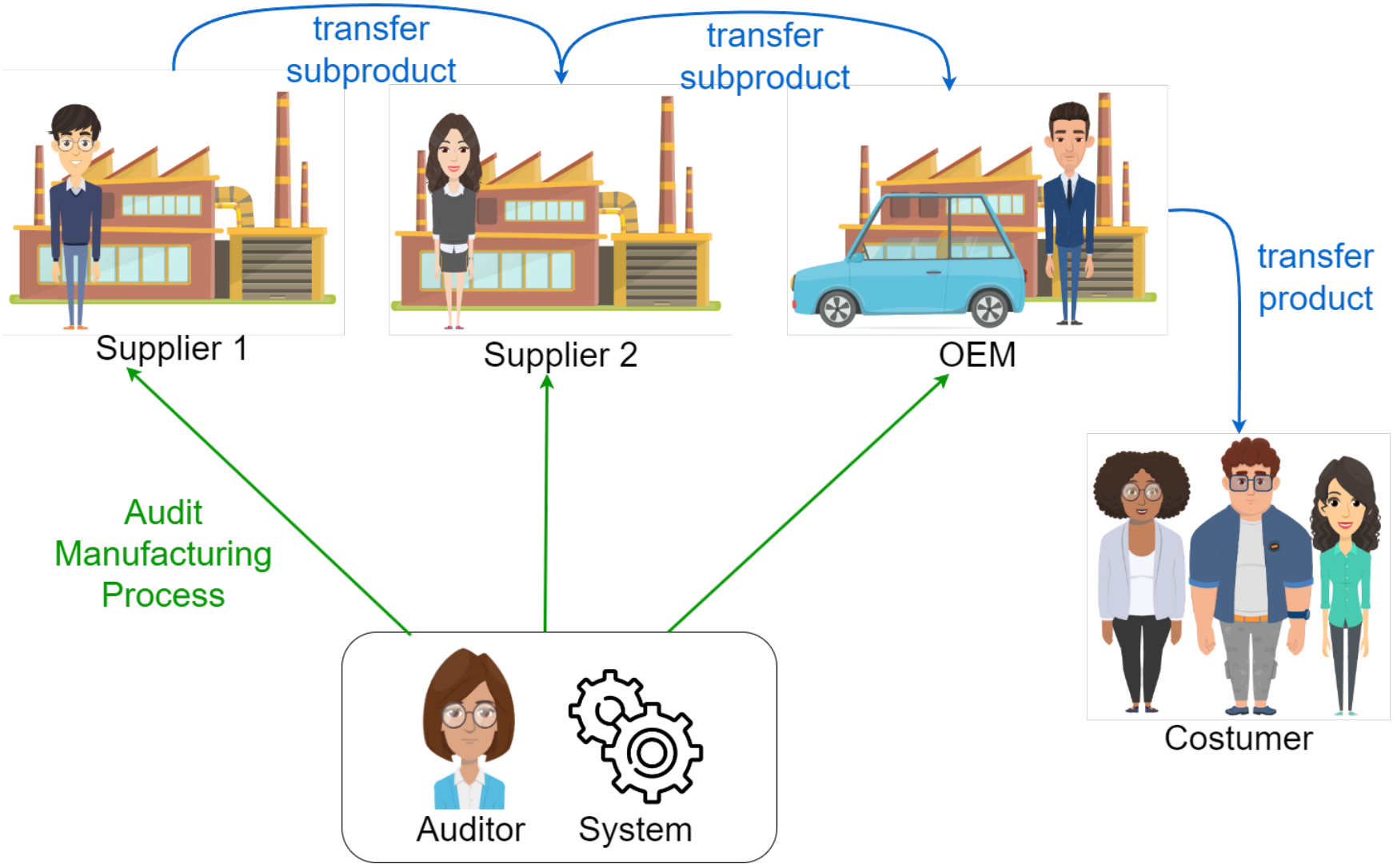


Auditor

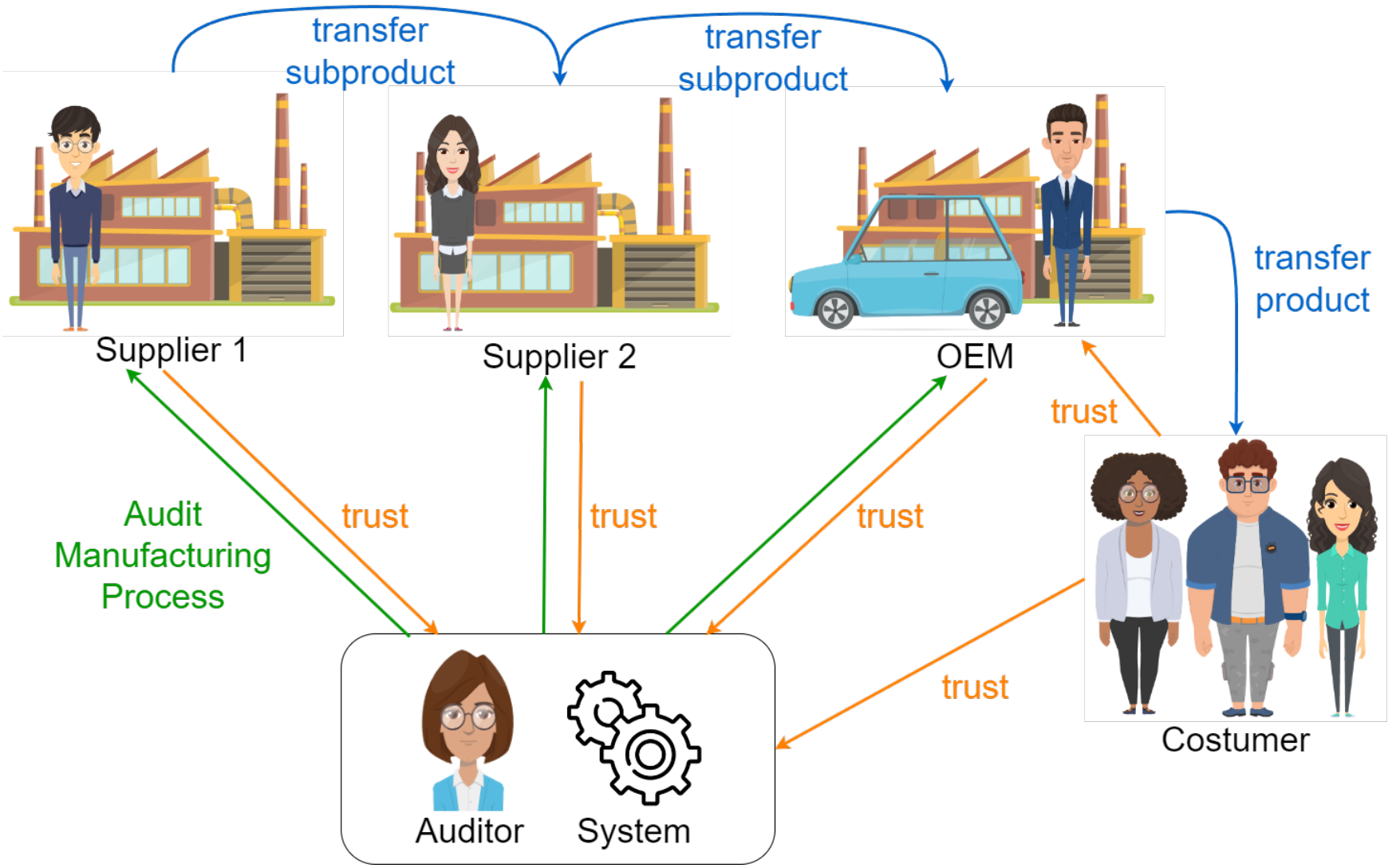
System

Costumer

Trust dependencies



Trust dependencies



Technologies

Why Hyperledger Fabric?

- Scalability
- Flexible design options
- Consortium blockchain
- Identity mixer and private data
- Database: CouchDB
- GO Chaincode

Why Fablo?

- Simplifies network setup
- Automated credentials management
- Enables fast prototyping

Why NodeJS?

- Available libraries and APIs
- Rapid development
- Cross-Platform functionality

Live Demo

Stakeholder Issue Resolution

OEM

Issues:

- Protect company's reputation
- Legal compliance
- Customer satisfaction

Resolution:

- System provides traceability,
- Blockchains can be trace-
- and immutability for audits
- able, provide immutability,
- stores relevant data and
- store relevant data and
- automate processes
- automate processes
- More transparent and trustable

Customer

- Often not able to buy products with a clean conscience.

- Customers can proof
- System can proof a
- the exact GHG number of
- sustainable supply chain
- their product

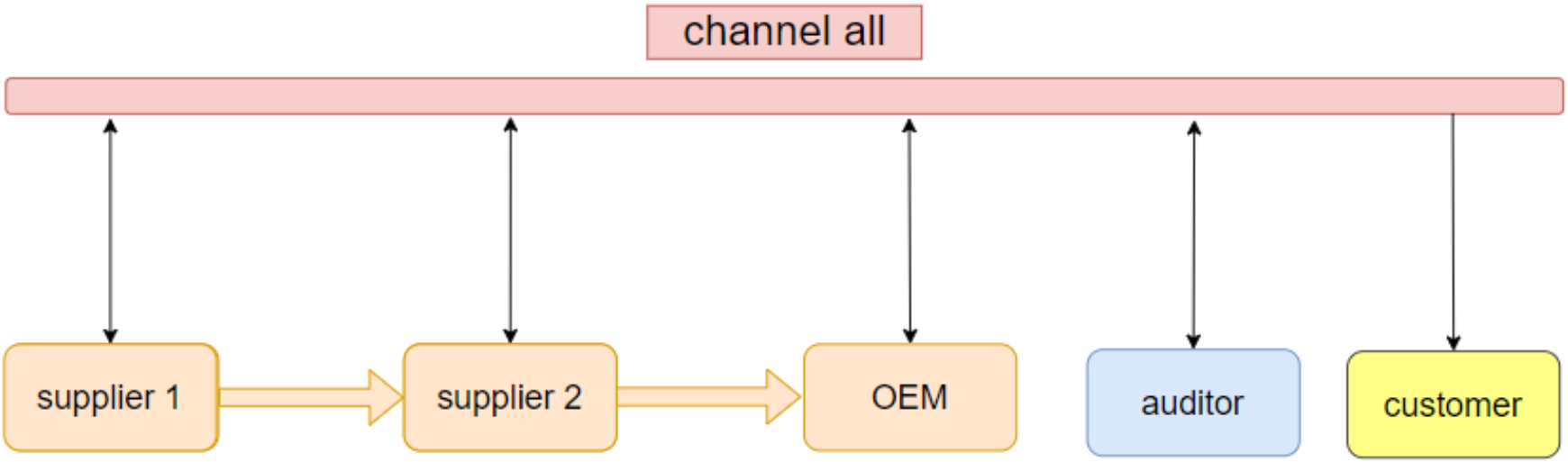
Supplier

- Worried about retaining their business secrets

- Confidentiality: information
- Blockchain can provide
- in system is need to know
- partial anonymity and data
- Partial Anonymity: suppliers
- confidentiality
- work under an alias

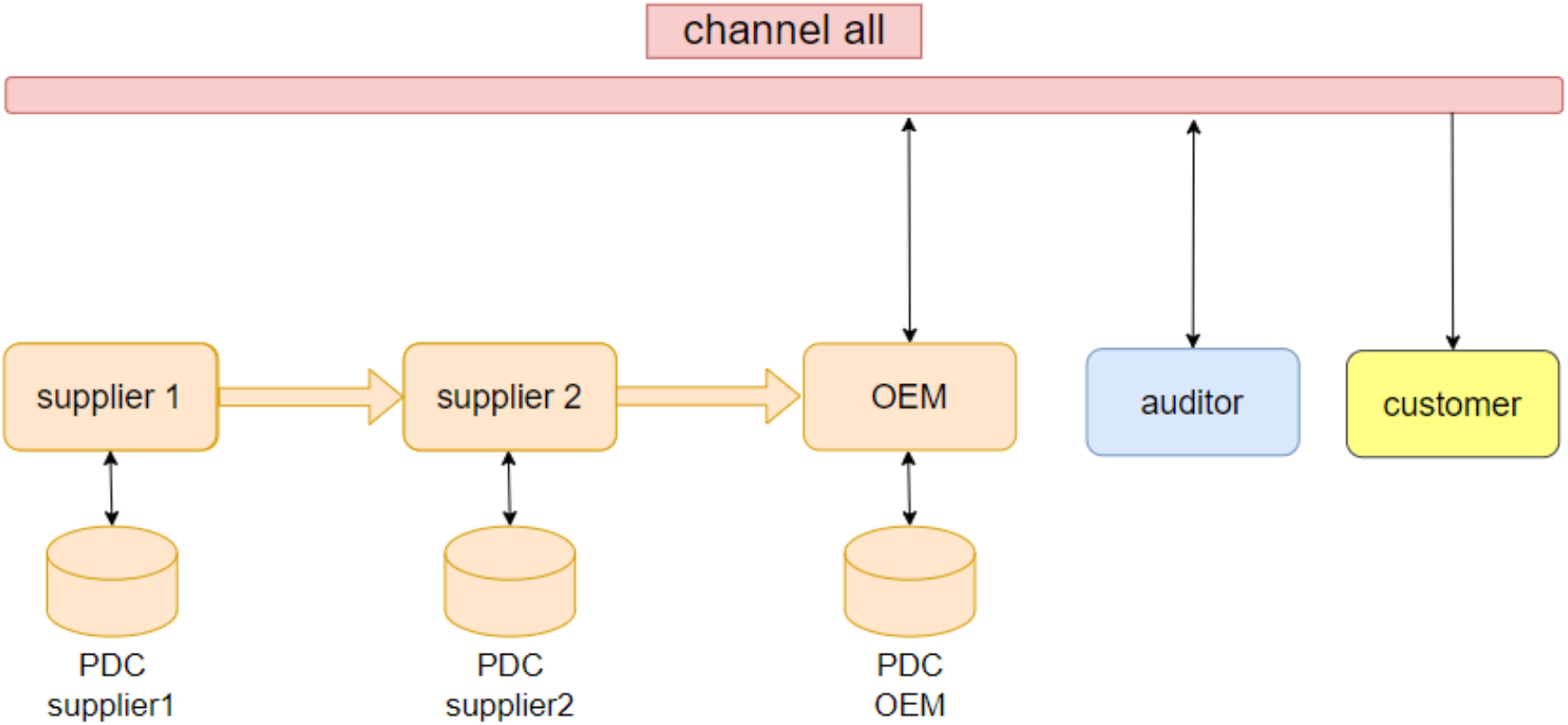
vs

Traceability ⟷ Confidentiality

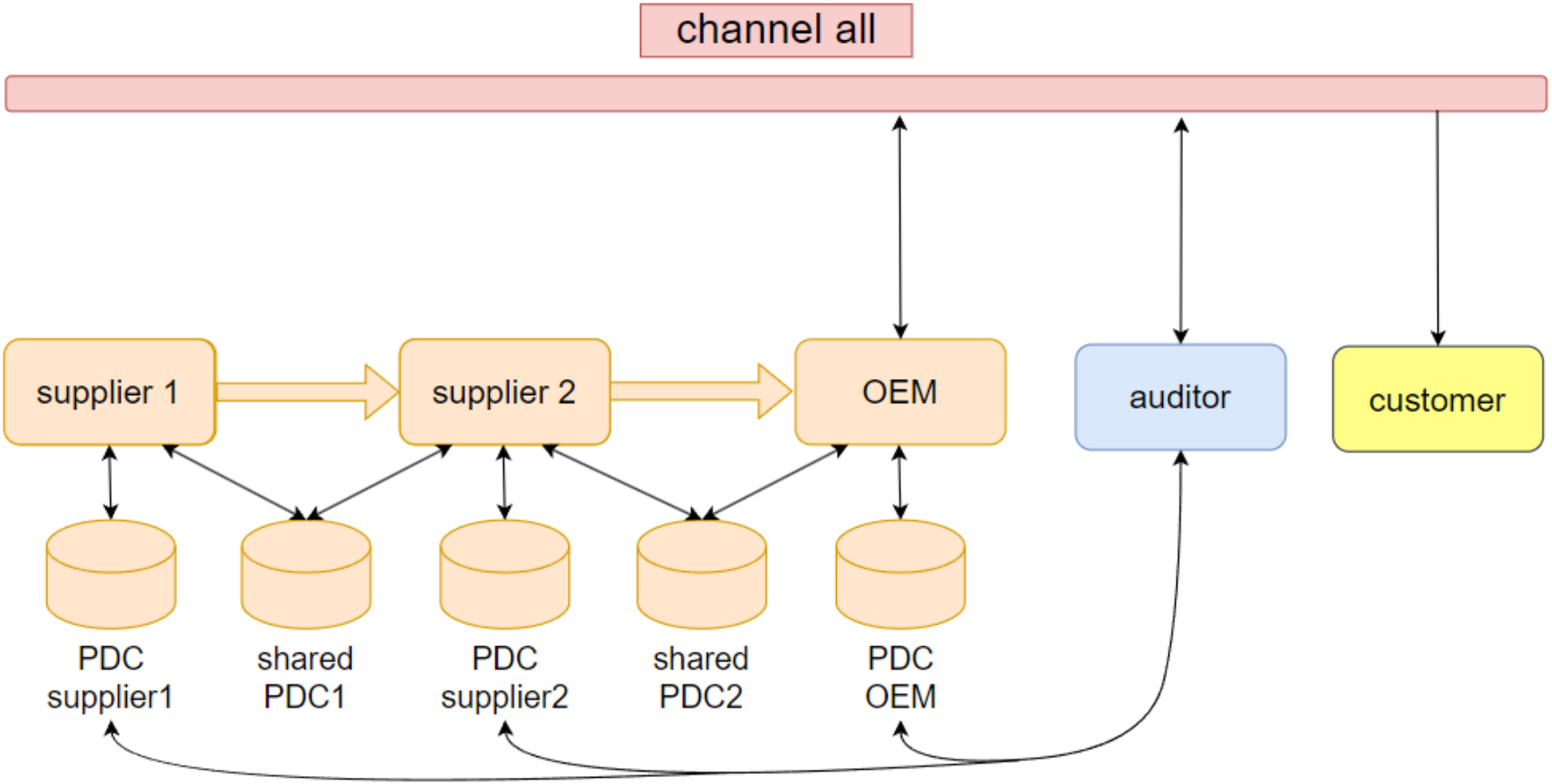


vs

Traceability ⟷ Confidentiality



Traceability vs Confidentiality



Challenges & Future Work

Adding Identity Mixing

- Redesign of Organisations & Endorsement Policies
- New Client Application in Java

Further tokenization of Emissions

- Tracking of scope 3 emissions
- Non-repudiation of emissions

Enhanced Emission Checks

- More profound emissions audits
- Increased inventory and availability tracking and checks

Thank you for your attention and we are looking forward to the discussion!