Chain2Sustain

Sustainable Supply Chains based on Blockchain

Technische Universität München

Department of Informatics

Blockchain technology for public sector innovation

22nd of June, 2023

This is Greg

Main Stakeholder - Issues

Customer

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

OEM

- To satisfy customers, need of proof of a sustainable supply chain.
- Cannot provide proof

Suppliers

- Worried about retaining their business secrets

How Blockchain can help

Customer

OEM

Suppliers

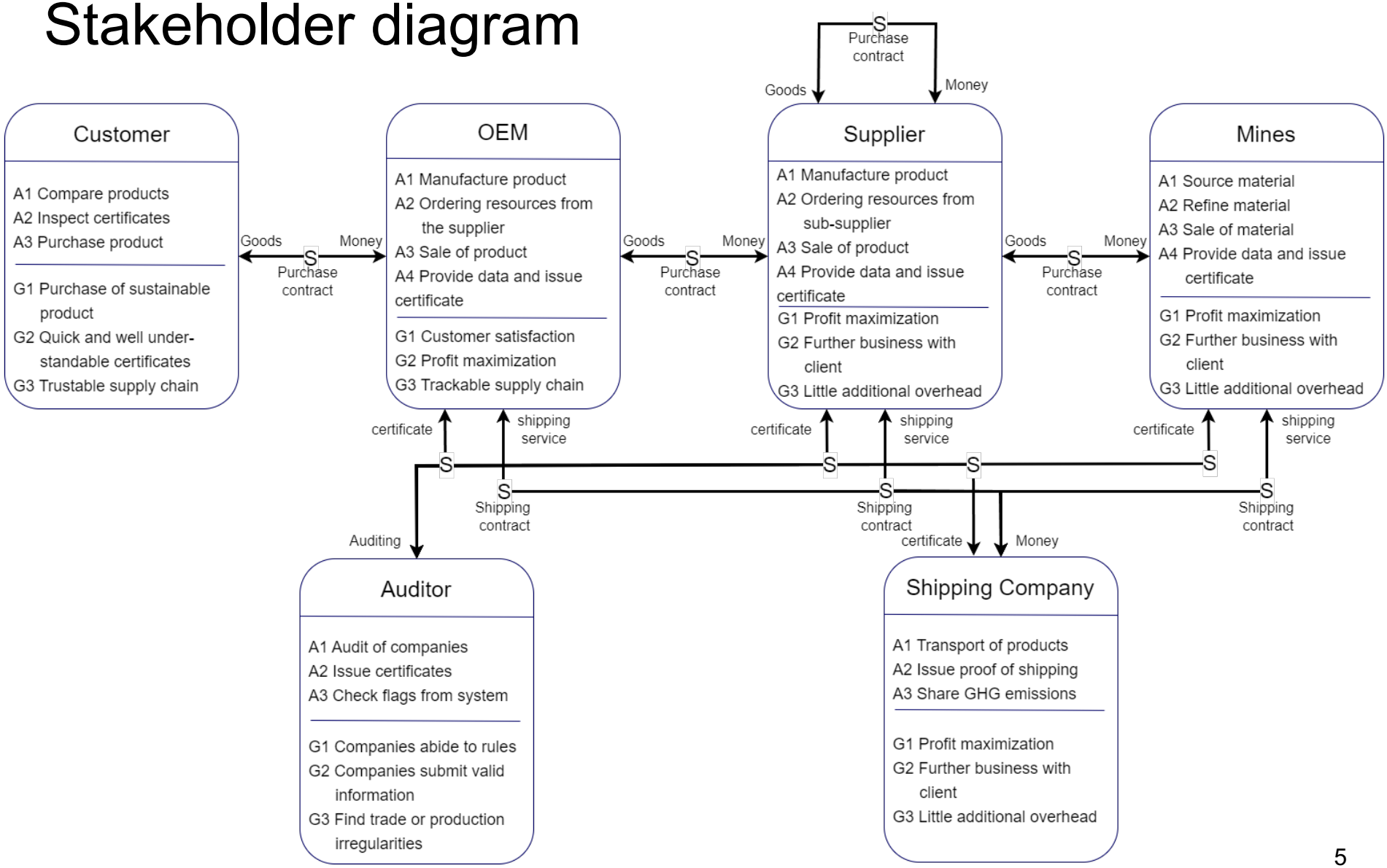
Issues:

- Often not able to buy products with a clean conscience.
- To satisfy customers, need of proof of a sustainable supply chain.
- Cannot provide proof
- Worried about retaining their business secrets

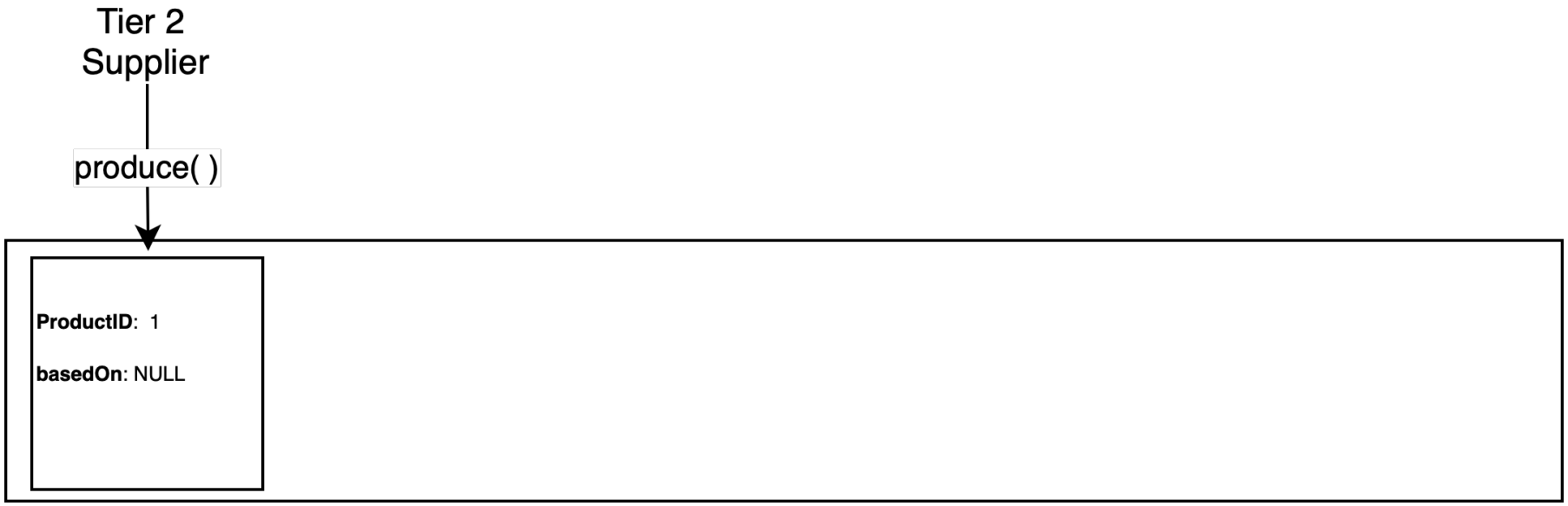
Solution:

- Blockchain can proof a sustainable supply chain
- Blockchains can be trace-able, provide immutability, store relevant data and automate processes
- Blockchain can provide partial anonymity and data secrecy

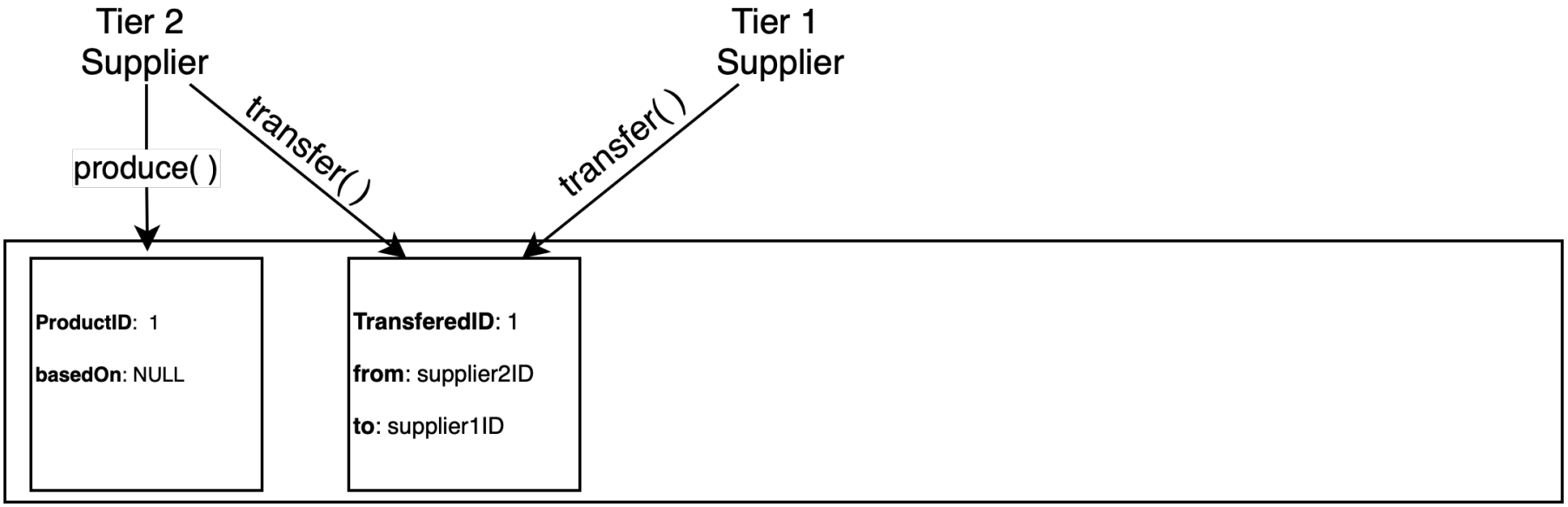
Stakeholder diagram



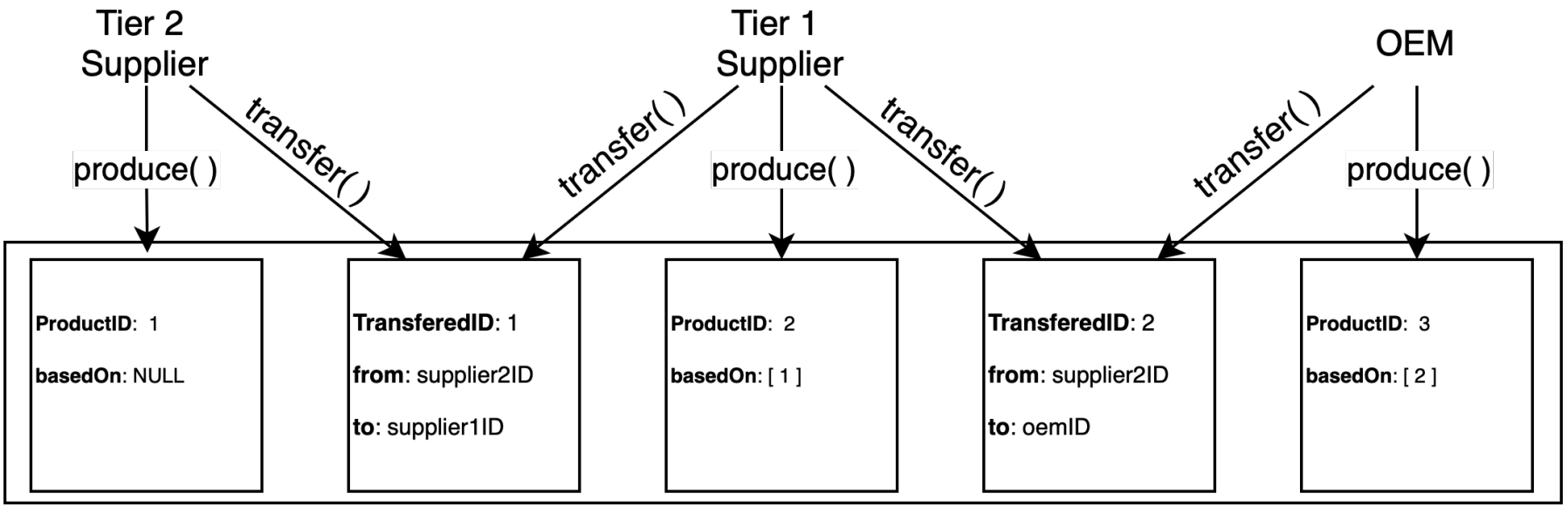
System Design



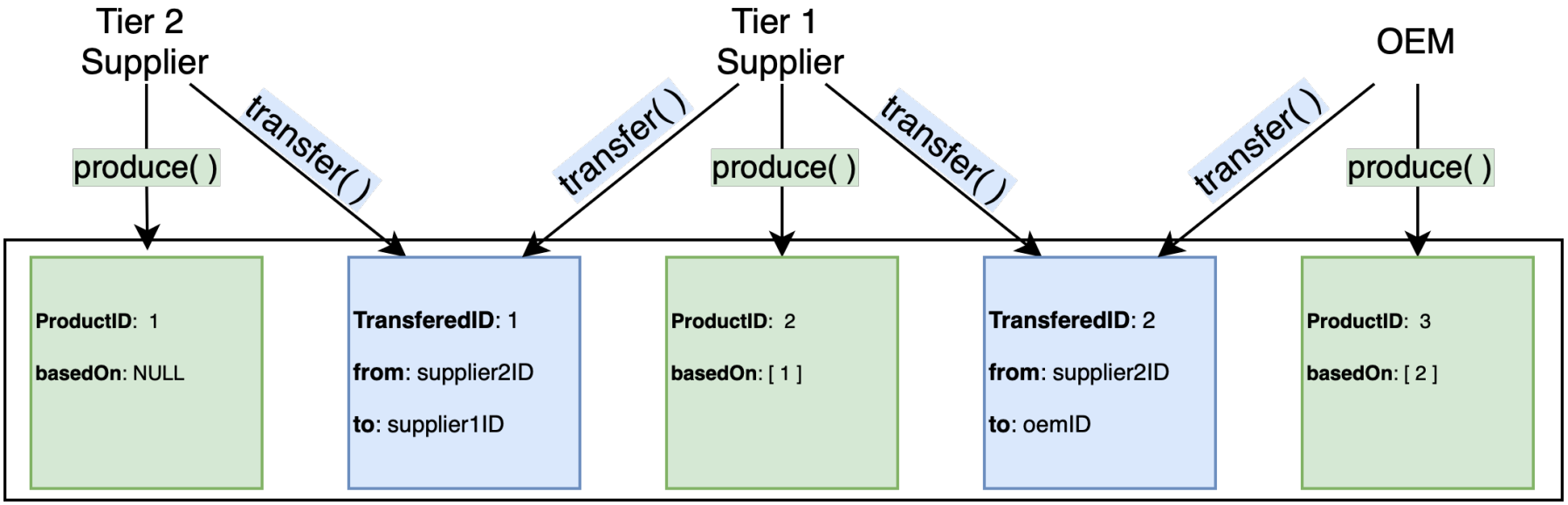
System Design



System Design



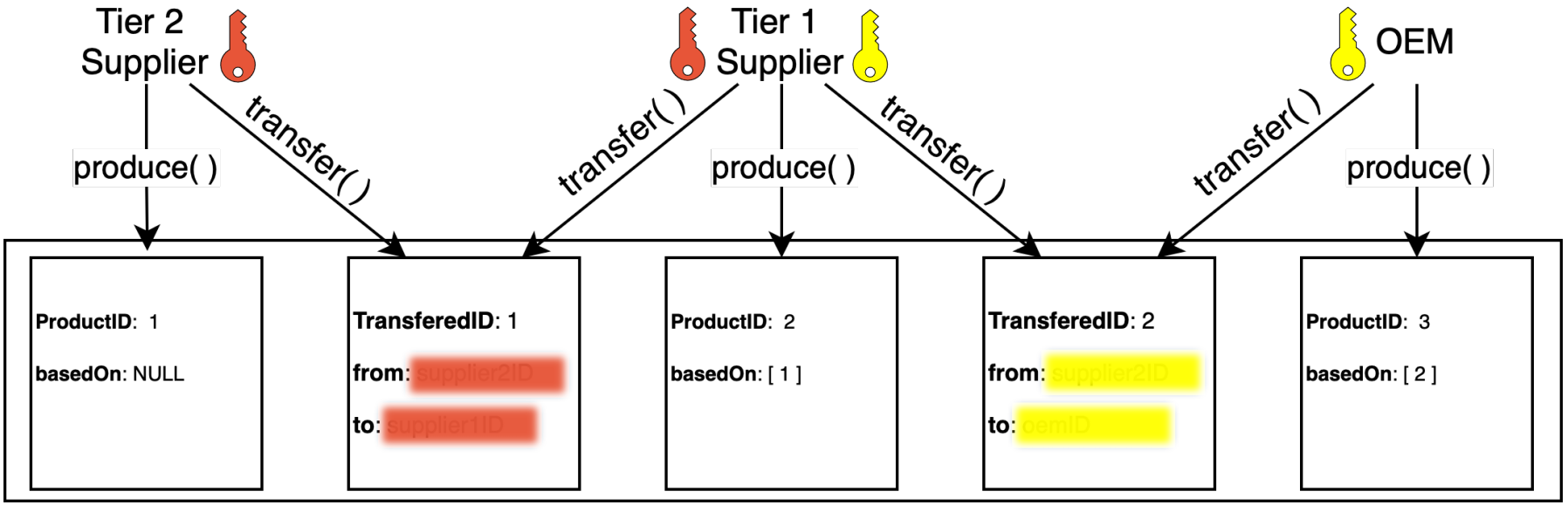
System Design



Chaincodes:

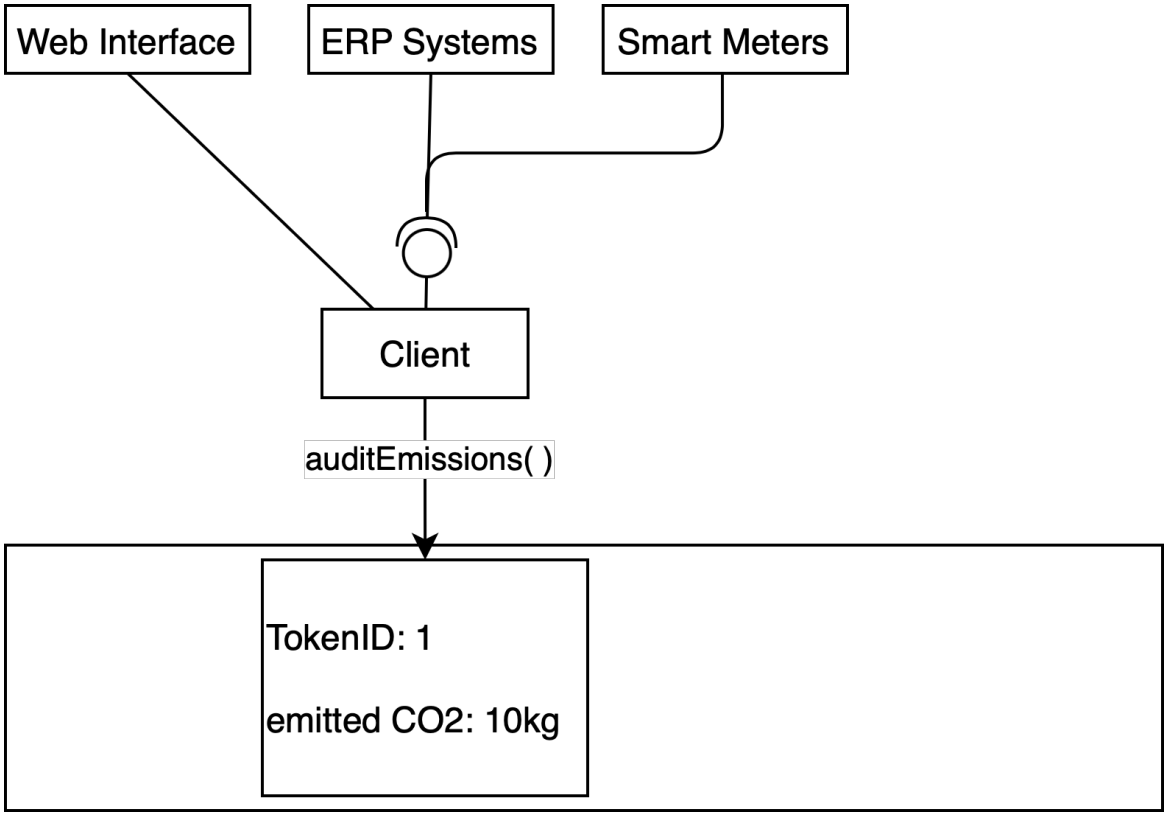
- Produce Products
- Transfer Products

System Design - Privacy



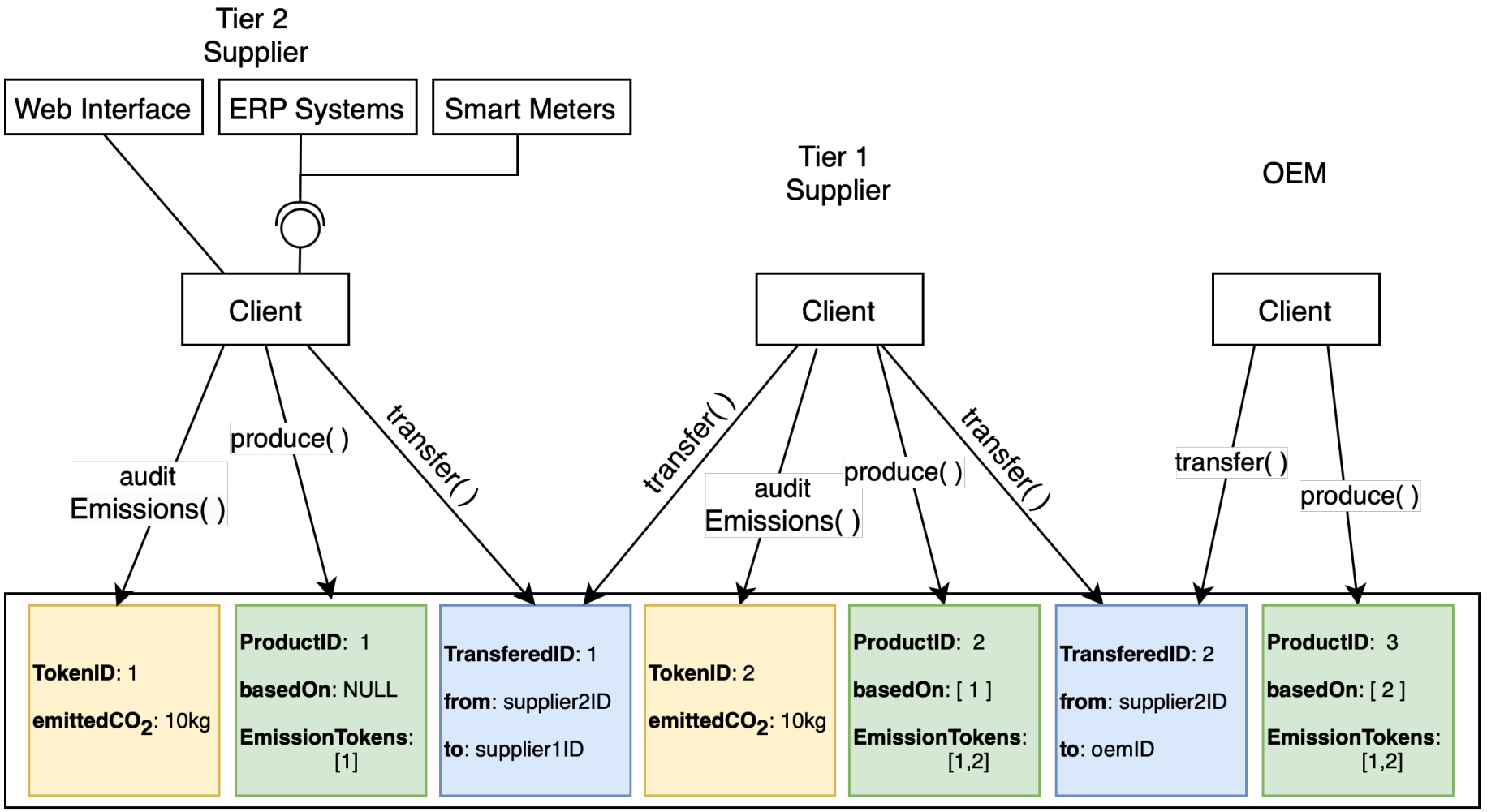
- Private Data Collections
- Identity Mixing

System Design – Emissions Input



- Automated emissions auditing through chaincode
- Transferable emissions tokens

System Design



Technologies/Implementation

Why Hyperledger Fabric?

- Scalability
- Flexible design options
- Consortium blockchain
- Identity mixer and private data
- Some previous experience
- Good documentation

Why Fablo?

- Easy to setup organizations and channels
- Automatically creates credentials
- Simplifies the setup of the design and management

Why NodeJS?

- Go-to web interface creation tool
- Prior experience

Technologies & Tools - Fablo

Creation of organization:

```
"orgs": [
    {
      "organization": {
        "name": "Org1",
        "domain": "org1.example.com"
      },
      "peer": {
        "instances": 1,
        "db": "LevelDb"
      },
      "tools": {}
    }
],
```

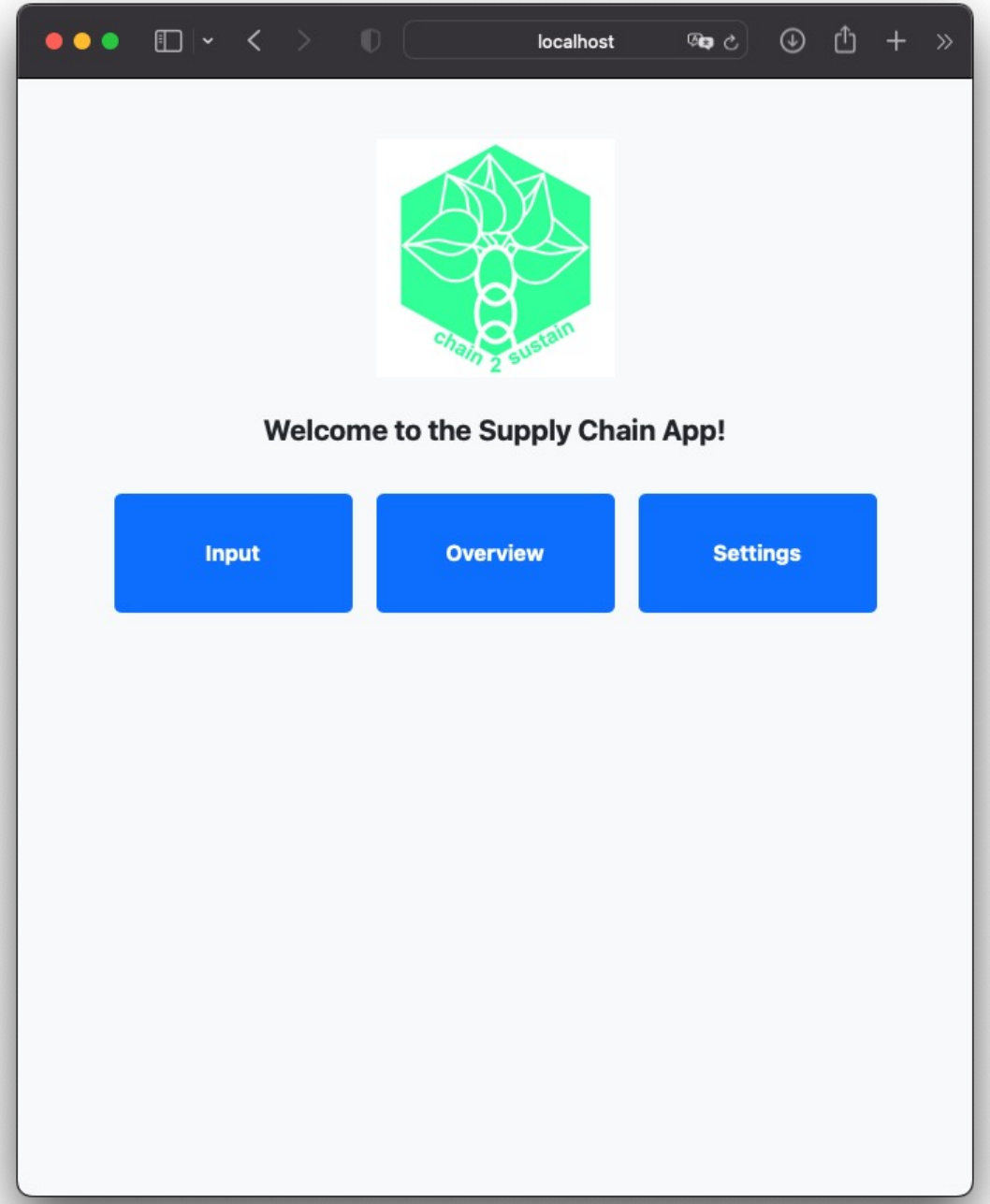
Creation of channel:

```
"channels": [
    {
      "name": "my-channel1",
      "orgs": [
        {
          "name": "Org1",
          "peers": [
            "peer0",
            "peer1",
            "peer2"
          ]
        }
      ]
    }
],
```

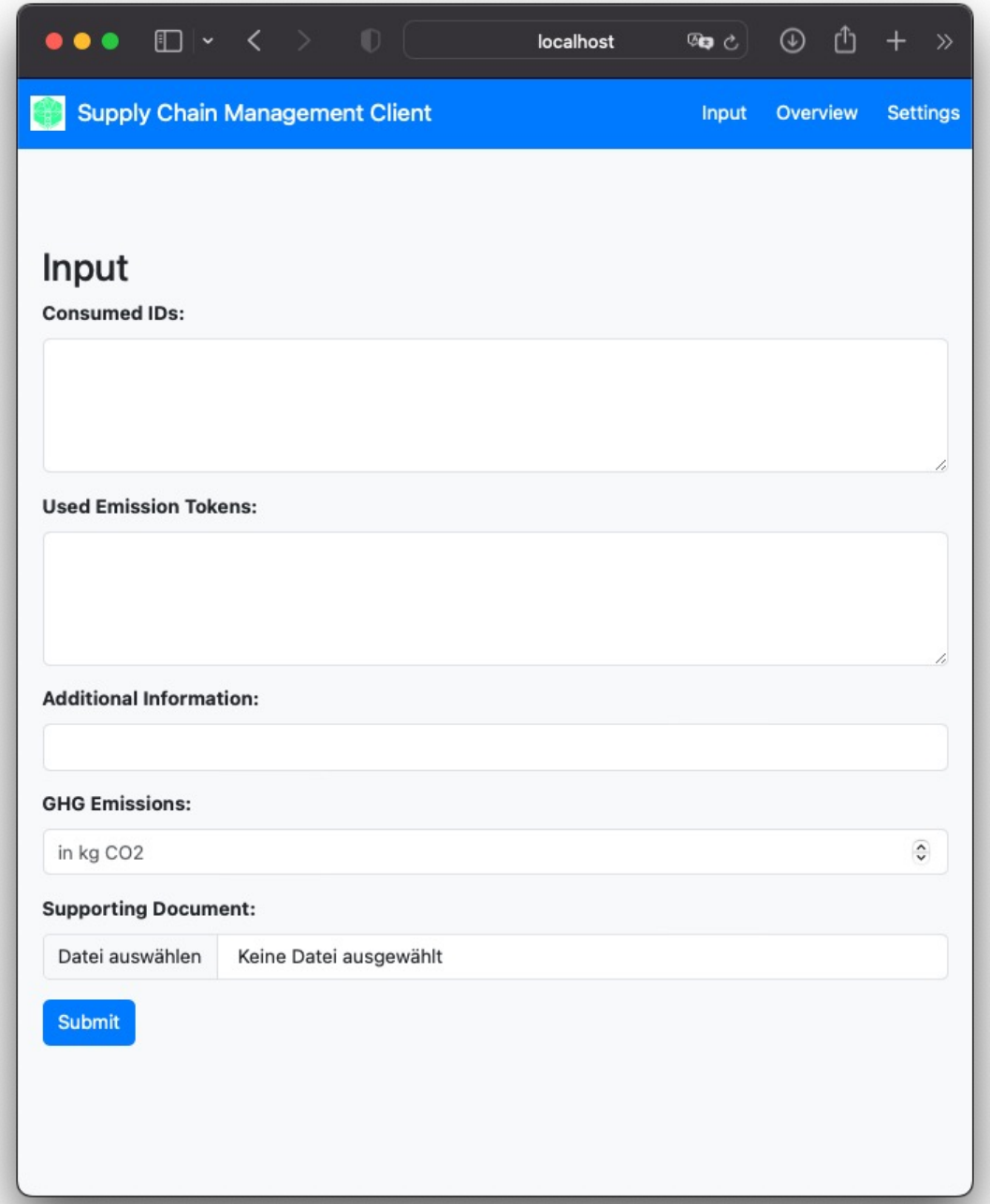
Creation of chaincode:

```
"chaincodes": [
    {
      "name": "chaincode1",
      "version": "0.0.1",
      "lang": "node",
      "channel": "my-channel1",
      "directory":
"./chaincodes/chaincode-kv-
node"
    }
  ]
```

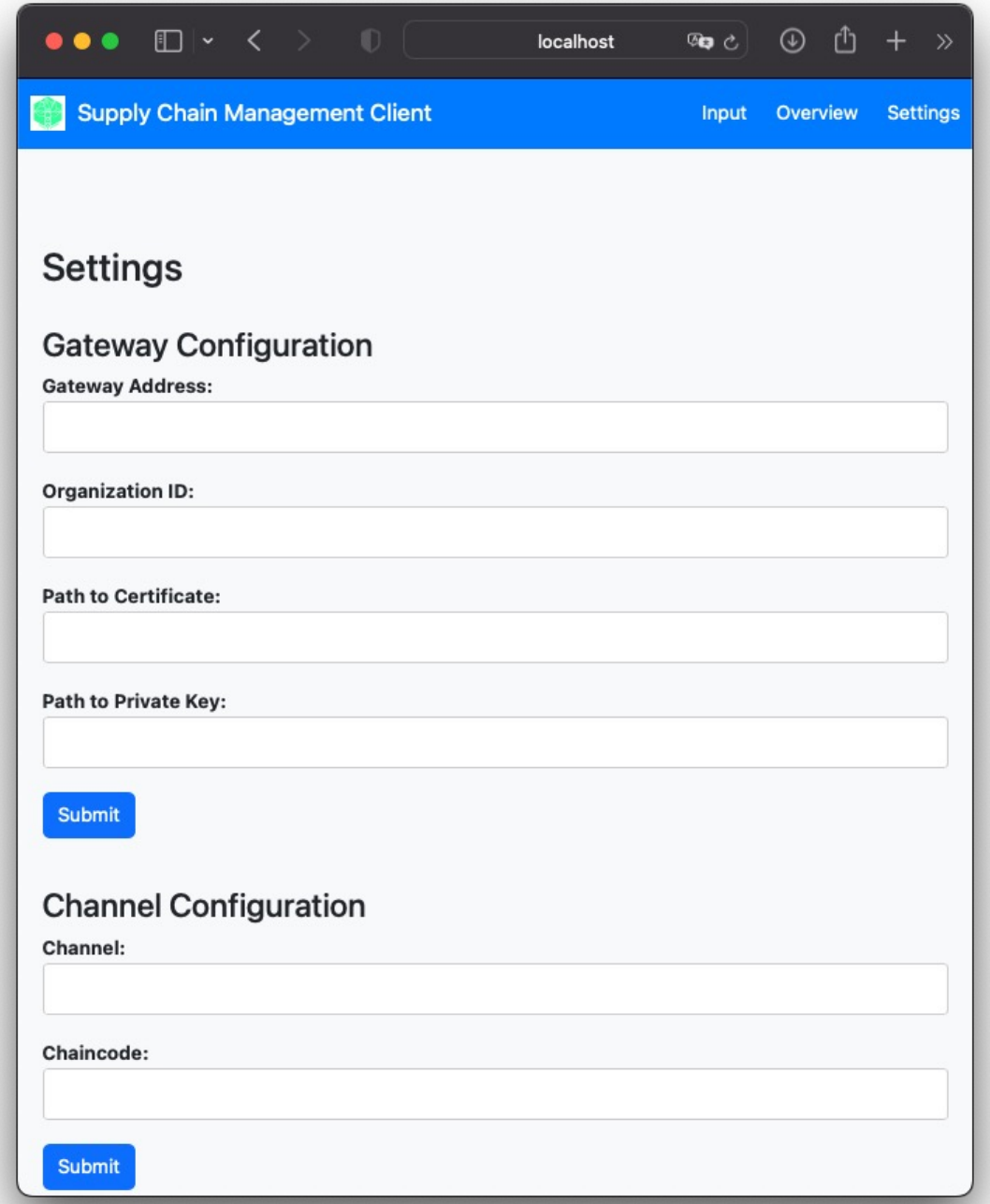
Client


localhost
chain 2 sustain
Welcome to the Supply Chain App!
Input
Overview
Settings

Client

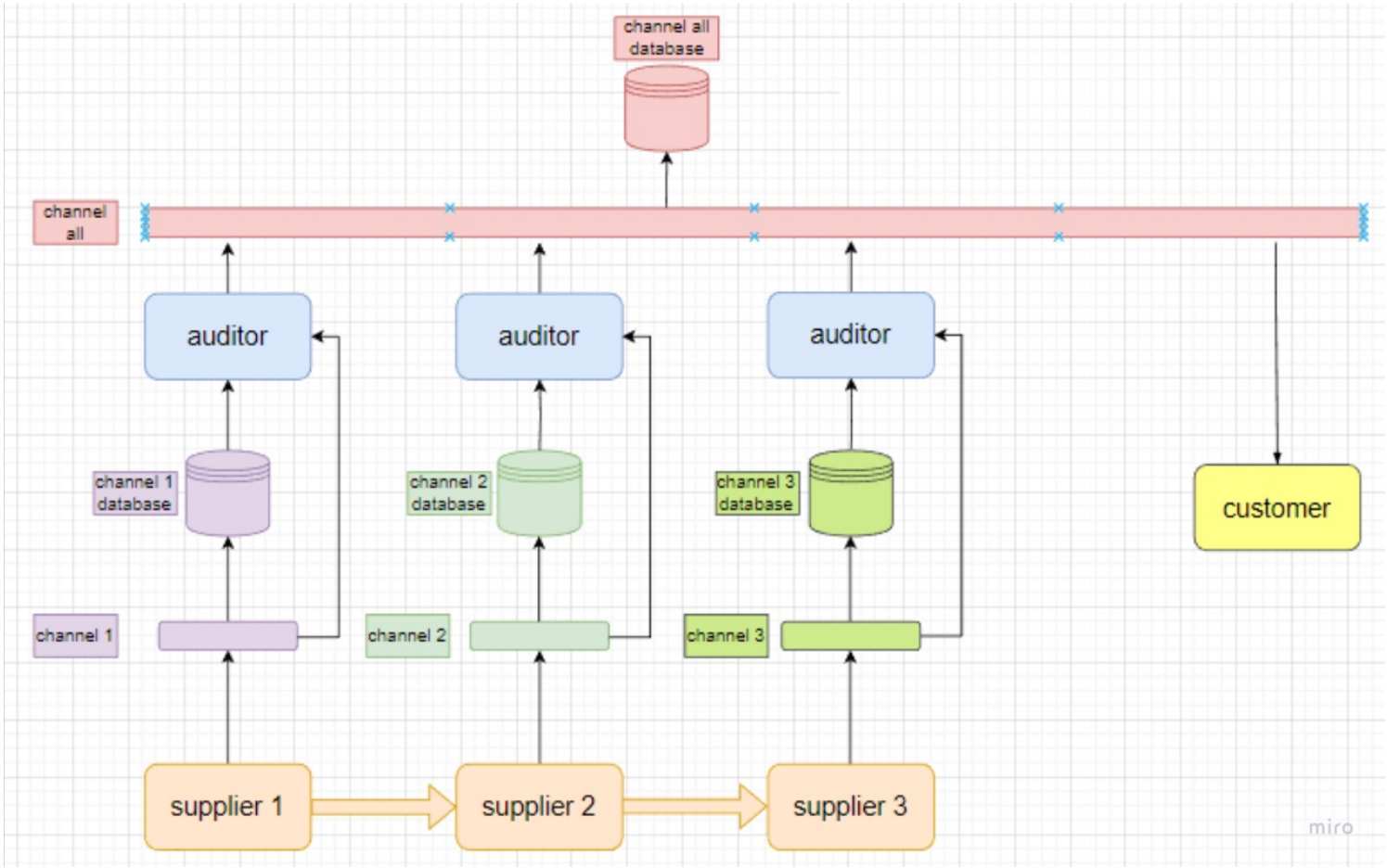

localhost
Supply Chain Management Client
Input
Overview
Settings
Input
Consumed IDs:
Used Emission Tokens:
Additional Information:
GHG Emissions:
in kg CO2
Supporting Document:
Datei auswählen
Keine Datei ausgewählt
Submit

Client


localhost
Supply Chain Management Client
Input
Overview
Settings
Settings
Gateway Configuration
Gateway Address:
Organization ID:
Path to Certificate:
Path to Private Key:
Submit
Channel Configuration
Channel:
Chaincode:
Submit

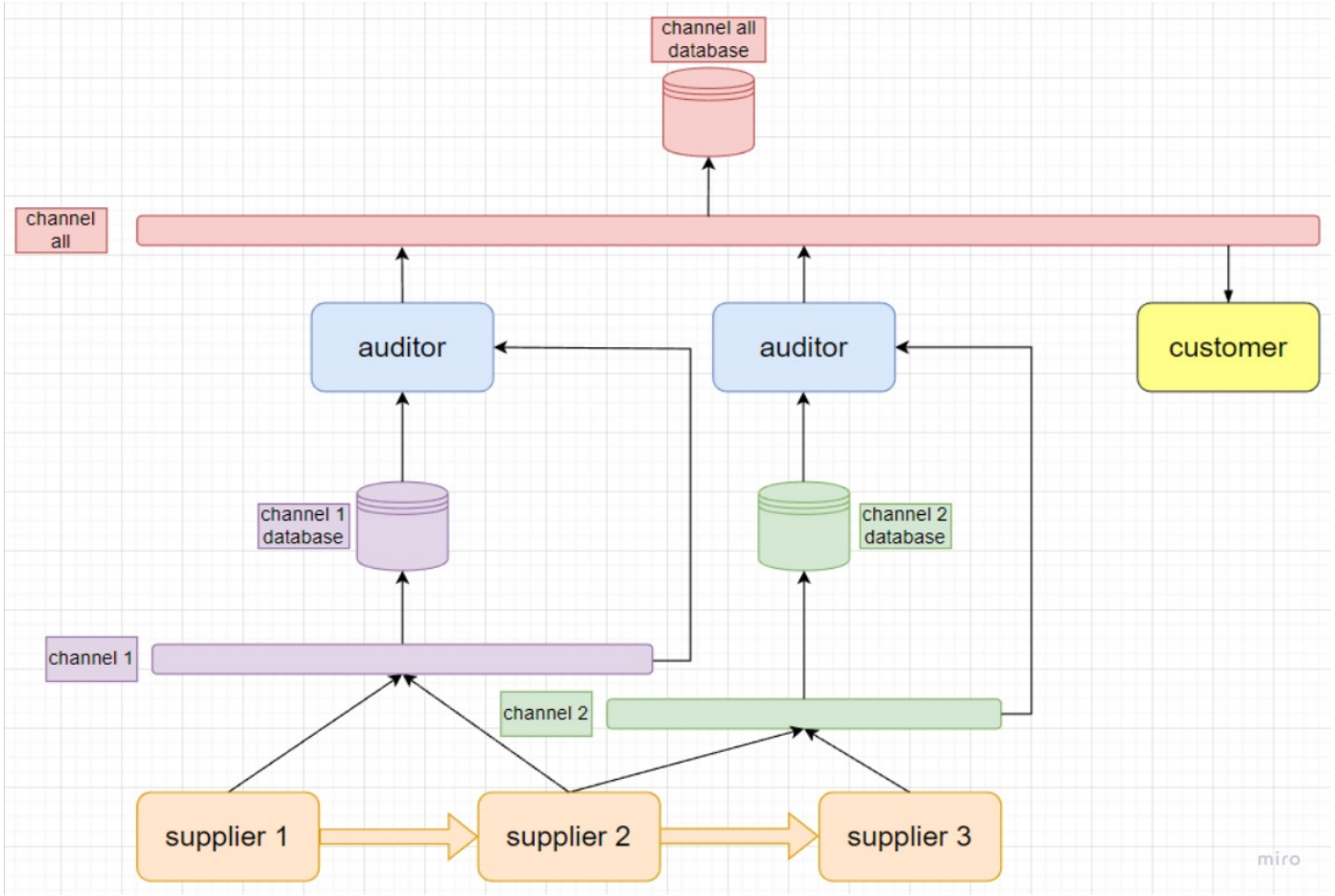
Past challenges

Privacy vs traceability

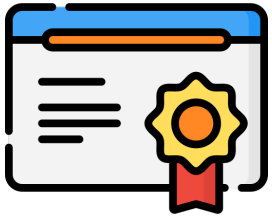


Past challenges

Information transfer between channels



Future challenges

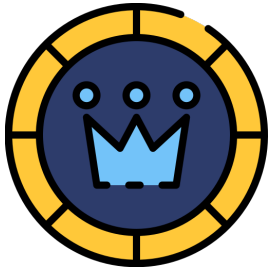


Further work on design of:

- Chaincode
- Certificates

Look further into:

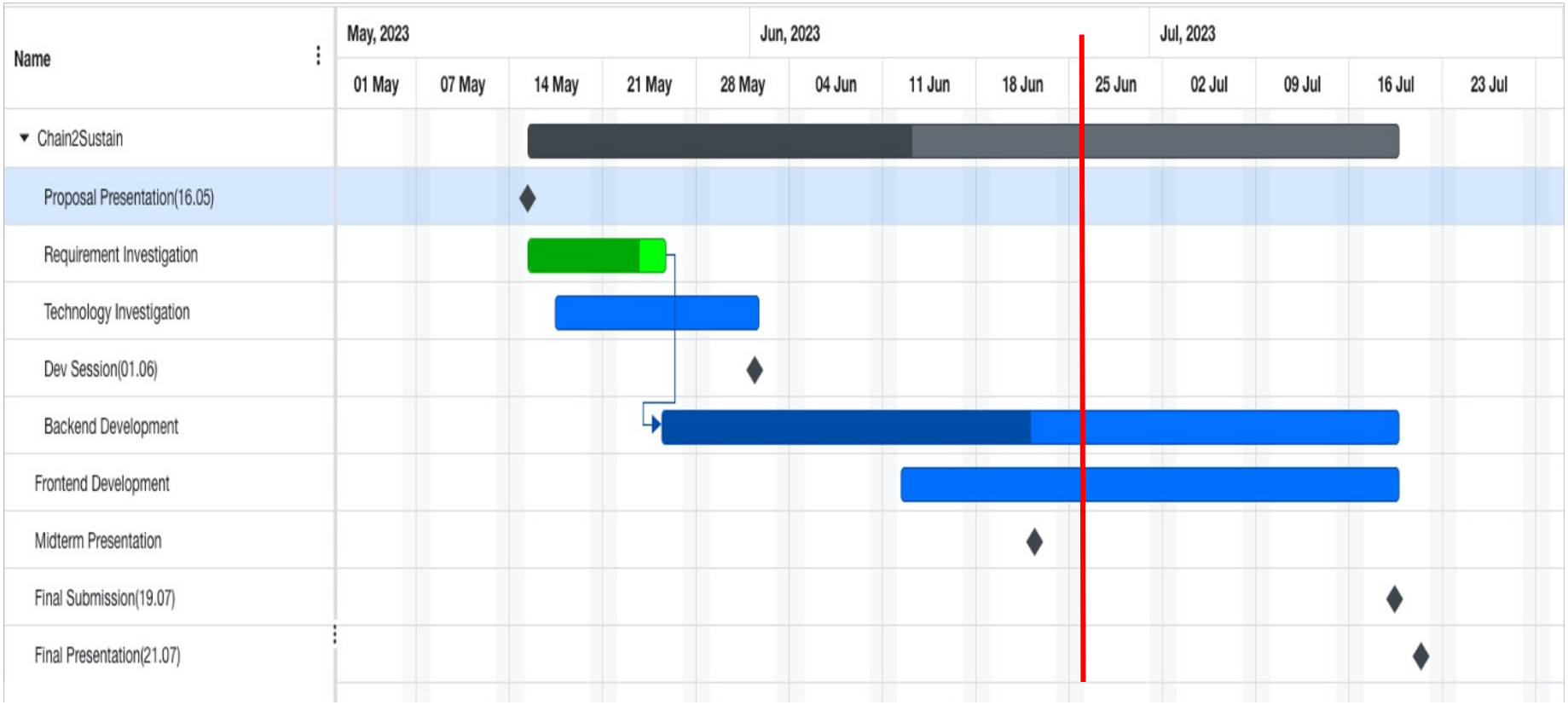
- Private Data Collection
- Identity Mixer



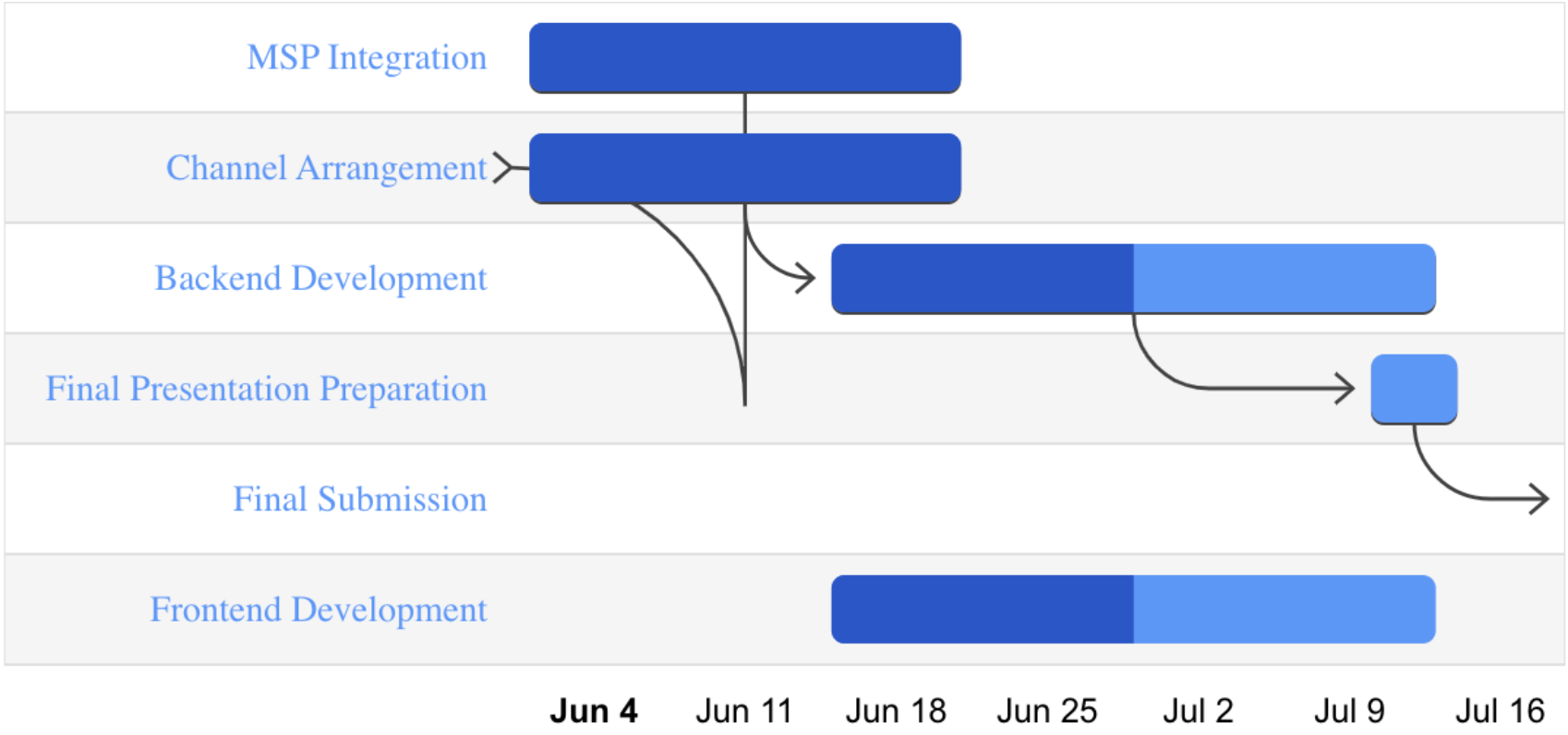
Token creation and integration into the system:

- Tracing tokens without revealing Identity of Issuer

Roadmap


Name
May, 2023
Jun, 2023
Jul, 2023
01 May
07 May
14 May
21 May
28 May
04 Jun
11 Jun
18 Jun
25 Jun
02 Jul
09 Jul
16 Jul
23 Jul
Chain2Sustain
Proposal Presentation(16.05)
Requirement Investigation
Technology Investigation
Dev Session(01.06)
Backend Development
Frontend Development
Midterm Presentation
Final Submission(19.07)
Final Presentation(21.07)

Roadmap – Slightly revised



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

Proposal - Technology

Public/Permissionless blockchain	Private/Permissioned blockchain	Consortium blockchain

• Anyone
  • join the network
  • read & write access
• Consensus
  • solve a complex cryptographic problem (e.g. PoW)
• Transparency - little to no privacy in transactions
• Examples
  • Bitcoin, Ethereum
	• join by invitation
	• one or more participants control the network
	  • based on a set of rules by the network admin
	• Requires identities of users
	• Example
	  • Multichain
		• semi-decentralized
		• a group of approved participants control the network
		• join by invitation
		• Consensus
		  • networks operators validate transactions
		• Examples
		  • Hyperledger Fabric, Corda

System Design Extension – Emission Records