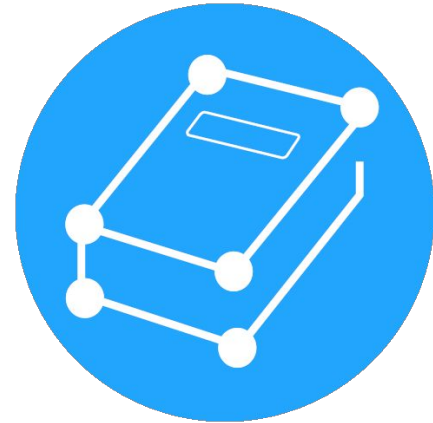# Leveraging Hyperledger Fabric for Biomethane Certification

GoLedger

Samuel Venzi

- Blockchain experience since 2018
  - Hyperledger Fabric since 2018
  - Hyperledger Besu since 2021
- CTO at **GoLedger** since 2020
  - Leading Brazilian vendor
  - Public and Private sectors
- Contributor on Hyperledger projects
- Core maintainer of Hyperledger Labs CC-Tools

Petrobras

- One of largest oil and gas companies in the world
- Petrobras produces, refines and transports oil and natural gas
  - (and much more)
- To reduce its carbon footprint, Petrobras deems important to use biofuels in its energy matrix

Biogas and Biomethane

- **Biomethane** is a combustible gas obtained from **Biogas**
- **Biogas** is produced by the **decomposition of organic matter** (biomass)
- **Biomethane** contributes to **reduce greenhouse gas emissions**, since it captures methane that would be released into the atmosphere
- Biomethane is used in
  - Fuel for vehicles (common in some regions in Brazil)
  - Electrical and Thermal energy generation
  - Injection into natural gas pipelines
- The **Biomethane market** in Brazil is **scattered**
  - Small producers in a large country
  - Petrobras has a hard time buying in this conditions

Regulation in Brazil

- **RenovaBio** promotes the use of biofuel in Brazil's energy matrix
  - Aims to reduce greenhouse gas emissions
  - Fuel distributors have to meet decarbonization targets
  - This regulates the market for **CBIO** credits
- Biomethane
  - Our project **anticipates** regulation regarding biomethane
  - Biomethane **plants are certified** and biomethane batches produced generate a **GASREC certification** that can be commercialized
  - In Brazil, the GASREC certifier is **Totum Institute** who is a partner of both **GoLedger** and **Petrobras**

Connections for Innovation

- A program to **promote innovation** within Petrobras

- Our project was part of the Start-ups Module

  - Partnership between Petrobras and Sebrae to foster the development of solutions for given challenges

- 2022 Edition: **Challenge 26** - Carbon Reduction

  - *Develop a system with **an agile and user-friendly platform** for **purchasing biomethane** from **various certified producers**, using **Blockchain technology as a reliable and auditable tool**. This solution will enable market development by facilitating the **integration of Petrobras with agents**, [...]"*

What's GoBiomethane?

- **GoBiomethane** is a marketplace platform for trading biomethane gas and its certification.
- It is developed with
    - **Hyperledger Fabric** for the network
    - **Hyperledger Labs CC-Tools** for the chaincode
    - Plus Hyperledger artifacts like SDK

Hyperledger
FABRIC
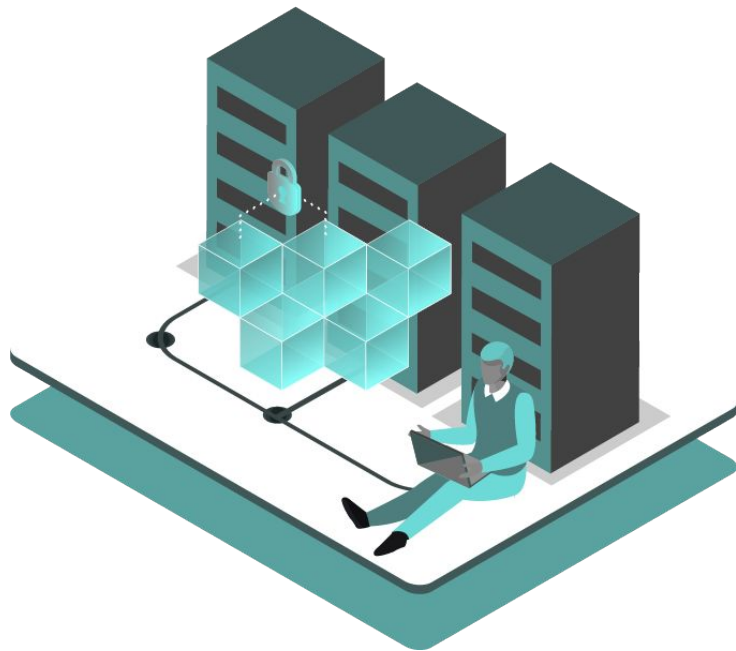
Features

- Management of participants of the process
  - Agents participating in the negotiation flow
  - Products, delivery points and delivery methods
  - Buy and sell proposals.

- Detailed accounting dashboards.

- Flexible negotiation process.
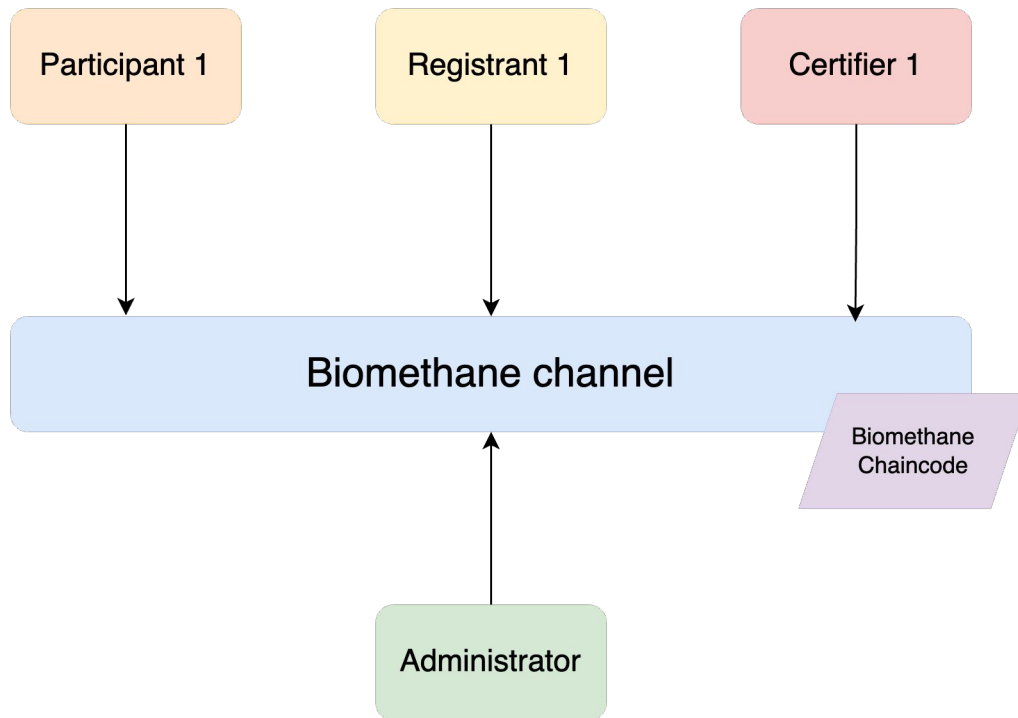
System Agents
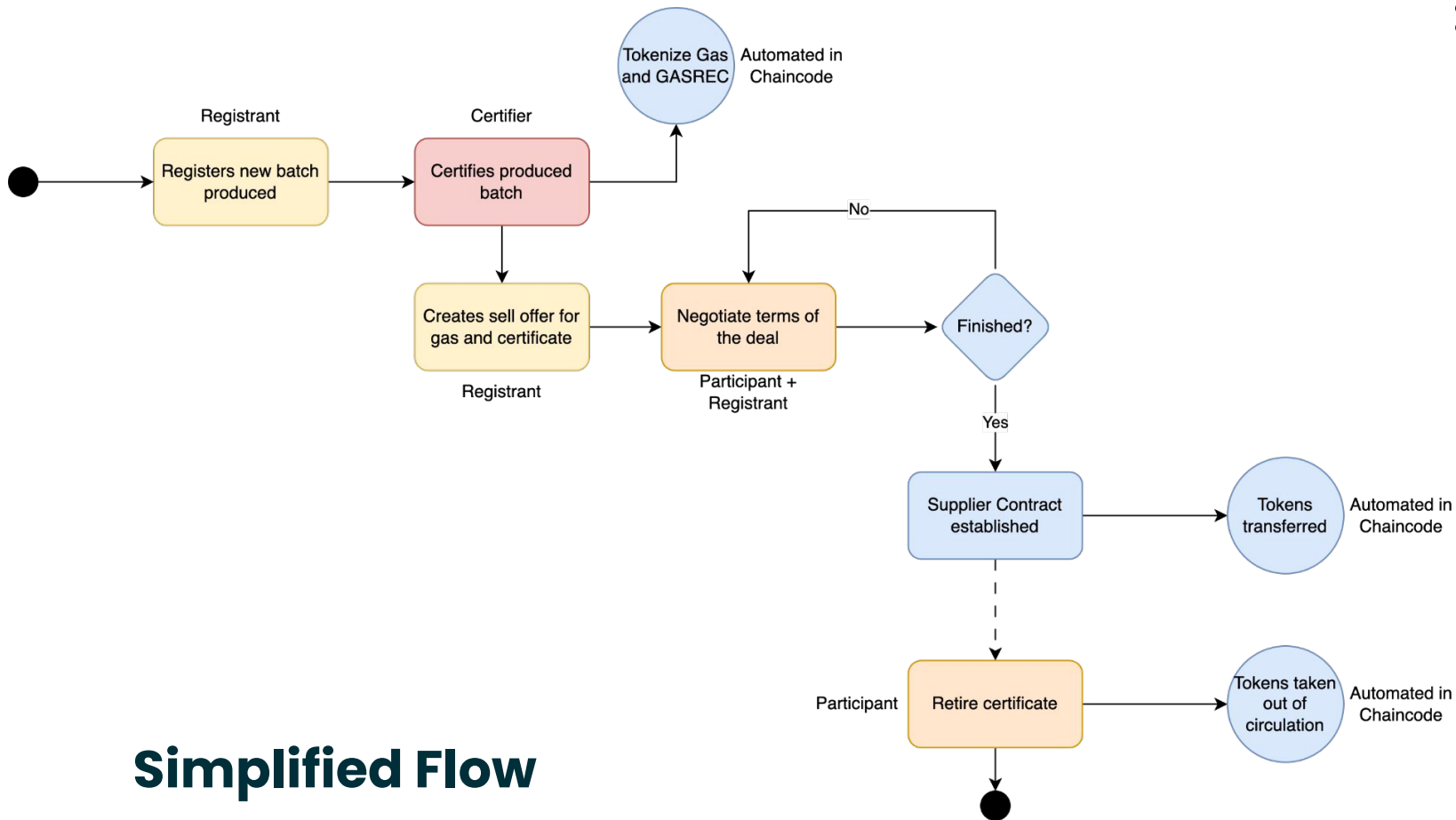

Administrator

Certifier

Registrant

Participant

Sample Network

Simplified Flow

New Negotiation

New Buy Offer

Expiration 2023-11-30
Supply Start 2024-01-01
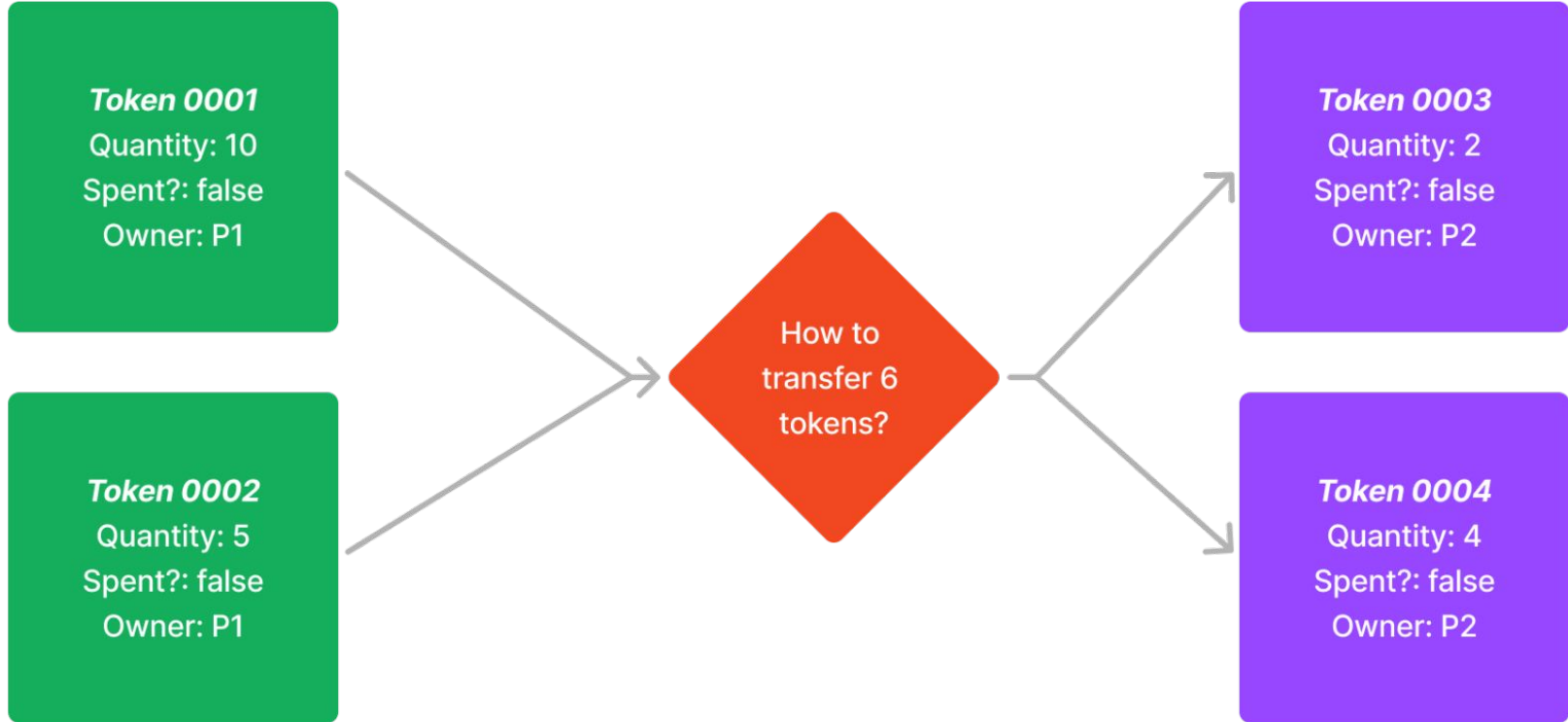**Supply End** 2024-01-31

Product: Biomethane.
Quantity: 1000.
Unit Price: 30.

Product: GASREC.
Quantity: 1000.
Unit Price: 10.

Batch: 10203.
Expiration: 2023-11-25.
Delivery Method:
Pipeline.
Delivery Location
Location.

Biomethane
Quantity: 1000.
Unit Price: 35.

GASREC
Quantity: 1000.
Unit Price: 12.

UTXO Tokenization

Token 0001
Quantity: 10
Spent?: false
Owner: P1

Token 0002
Quantity: 5
Spent?: false
Owner: P1

How to transfer 6 tokens?

Token 0003
Quantity: 2
Spent?: false
Owner: P2

Token 0004
Quantity: 4
Spent?: false
Owner: P2

UTXO Tokenization

Token 0001 ~~(struck through)~~
Quantity: 10
Spent?: true
Owner: P1

Token 0006
Quantity: 4
Spent?: false
Owner: P1

Token 0002 ~~(struck through)~~
Quantity: 5
Spent?: true
Owner: P1

Input and Output

Token 0003
Quantity: 2
Spent?: false
Owner: P2

Token 0005
Quantity: 6
Spent?: false
Owner: P2

Token 0004
Quantity: 4
Spent?: false
Owner: P2

Layers of the architecture

| Front-end | REST API | Blockchain |
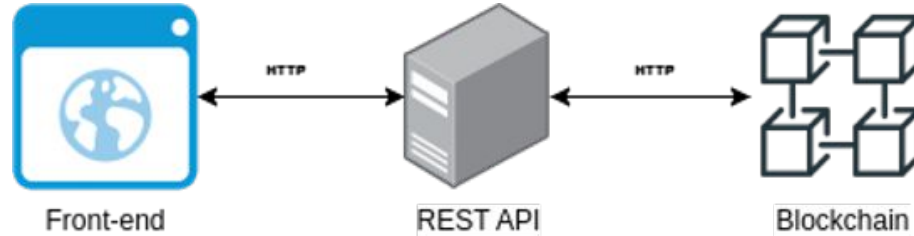
Software-as-a-Service

- Accessible via interface
- Individual users

Platform-as-a-Service

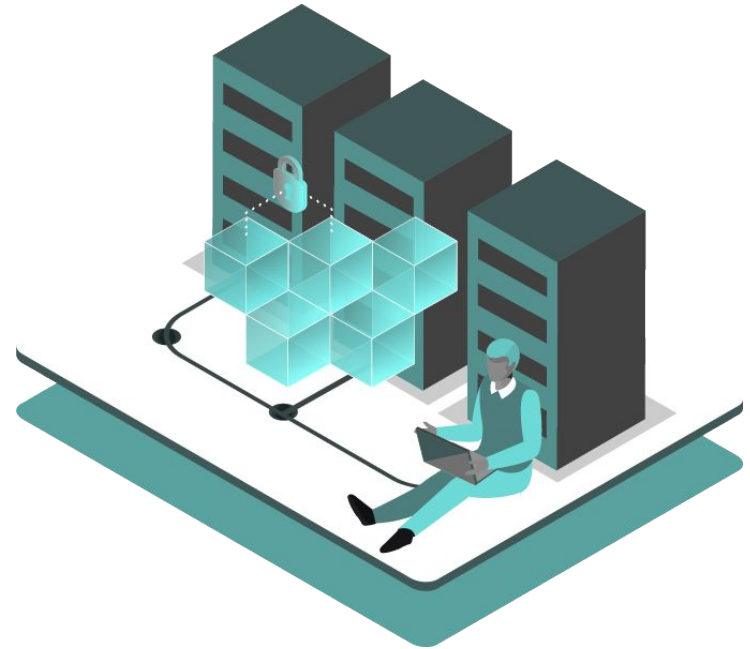- Accessible via REST API
- System level integration

Infra-as-a-Service

- Nodes connected to the blockchain
- Block replication
- Transaction execution

Deployment of the Network

- Network deployment is completely done through **GoFabric**

- **GoFabric** allows
  - **Organization creation** and management
  - **Collaborative** network management
  - **Scaling peers** and orderers
  - Deploying **Client APIs**
  - Deploying **chaincodes**
  - **Monitoring** resources
  - **Provisioning** infrastructure resources

Hyperledger FABRIC

Demo

Thank You!

GoLedger