Blockchain and Software Engineering

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BLOCKNET

Cryptocurrencies

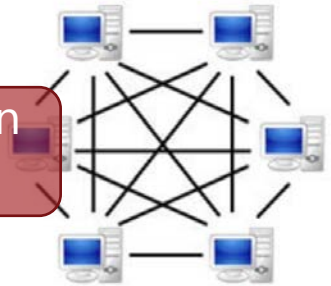
Blockchain: generalized distributed ledger view (CS perspective)

A dynamic **peer-to-peer computer network** characterized by

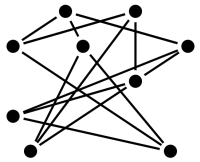
- behaving like a **single reliable virtual computer,** but with **decentralized governance,**
- performing **tamper-proof recording** of digitally signed (real-world) events and their **evidence**;
- **securely** managing **economic resources**:
  - digital *storage*, *transfer*, transportation and transformation of economic resources (money, assets, goods, rights, etc.)

It provides

- **consistent, nonrepudiable history** across all principals (suppliers, partners, customers, regulators, etc.)
- **economic resource preservation** (duplication *impossible*)
- (possibly) **authentication**, **privacy** and **confidentiality**



What do you do
if you have to
construct a system
that is…?



Decentralized

Tamper-proof information

Store & transfer assets

- physical evidence framework

Blockchain/DLT = distributed cryptographic data-structure for managing linear resources [Haber & Stornetta 1990, Bayer et al. 1993]

Lecture content

Blockchain-specific competencies and skills for software engineers

Didactical model and curriculum

Lecture contents:

- Theory of information systems (databases)
- Distributed systems
- Cryptography
- Programming models, architecture and platforms (including smart contracts)
- Tokens, cryptocurrencies and tokenization
- Token exchanges

12 Lectures, 271 slides, 353 min videos

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Blockchain for coffee

Resources: Parchment coffee, green coffee, roasted coffee, money

Events:

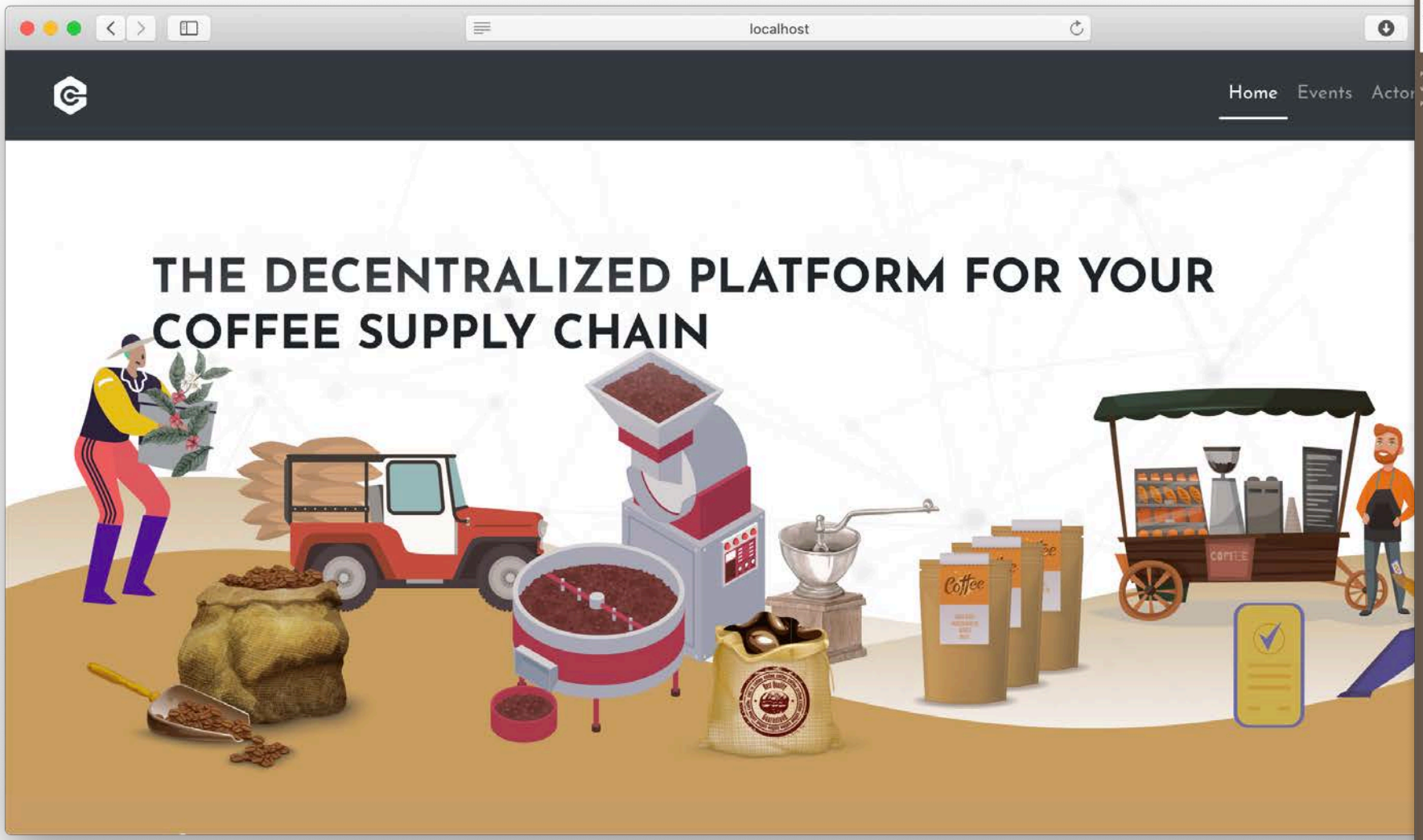
- Transfers (of ownership [money and coffee] and possession [coffee])
- Transportation (of coffee from/to different locations)
- Transformations
  - Production (coffee in parchment > green coffee > roasted coffee)
  - Packing and unpacking (bags -> truckloads [of bags] -> bags -> repacked bags)
- Observations (e.g. scan of coffee bag in a certain location)
- Tests (coffee quality tests)
- Actor certification (farmer and cooperative certifications)

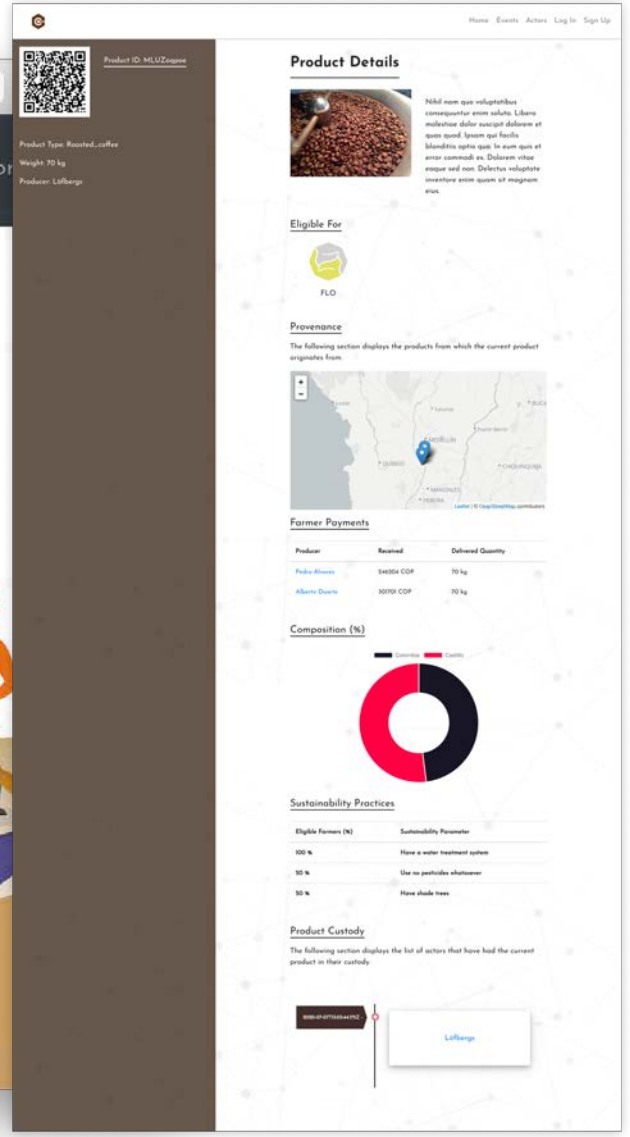
Actors: farmers, testers, certifiers, cooperatives, dry mills, transporters, roasters

Information: track & trace "from cherry to cup"

Evidence: digitally signed statements, pictures, measurements, etc

Implementation





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