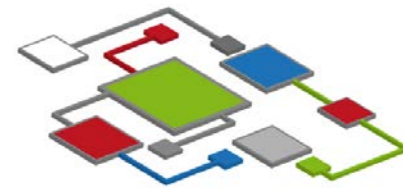


# Blockchain and Software Engineering

15th prof. Vladas Gronskas  
International Scientific Conference  
December 3, 2020

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UNIVERSITY OF COPENHAGEN



**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.)

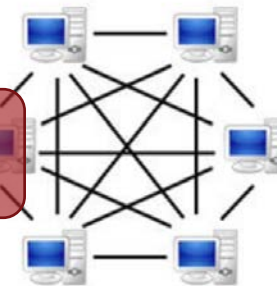
It provides

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

Democratic, egalitarian access and control

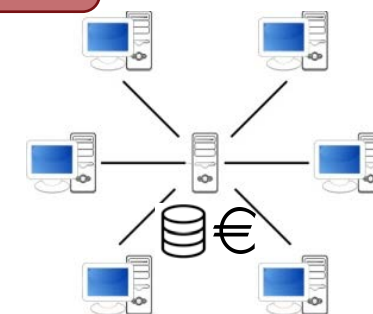
Secure tracking & tracing

No forging or double spending



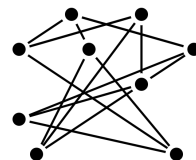
P2P-network

behaves like



server-based system

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)

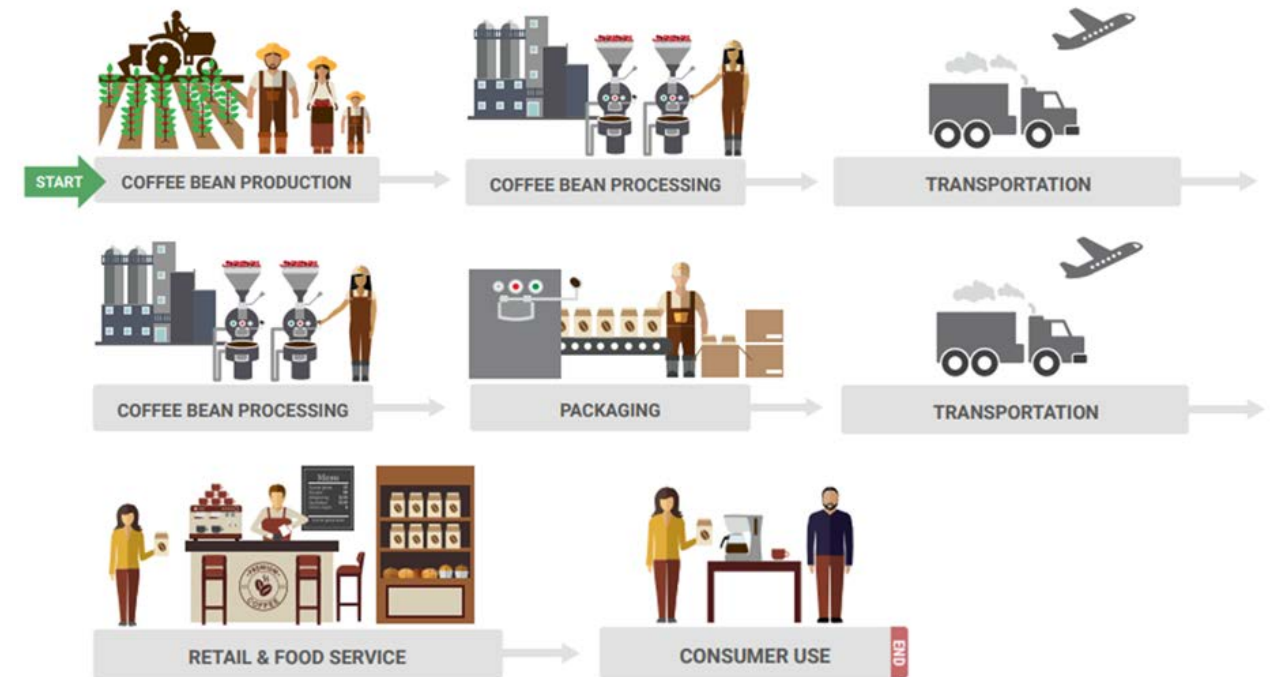
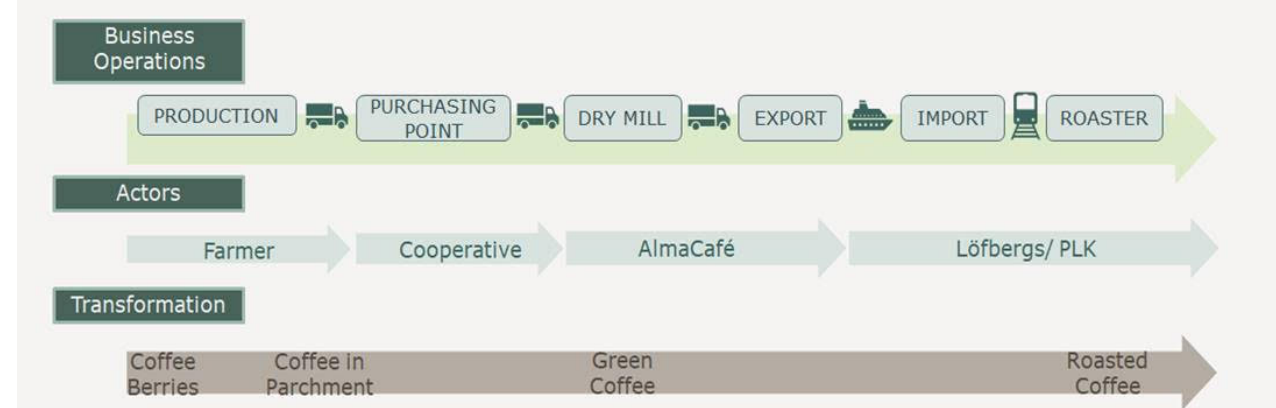
Tests (coffee quality tests)

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

The screenshot displays a web application interface for a decentralized coffee supply chain platform. The main content area features a large illustration depicting the coffee supply chain process, from a farmer harvesting coffee beans to a coffee cart at a market. The text reads: "THE DECENTRALIZED PLATFORM FOR YOUR COFFEE SUPPLY CHAIN".

The sidebar on the right provides detailed information for a selected product, "Roasted Coffee". It includes a QR code, product type, weight (70 kg), and producer (Lilberg). The "Product Details" section contains a description and an image of coffee beans. The "Eligible For" section shows the FLO logo. The "Provenance" section includes a map showing the origin of the coffee. The "Farmer Payments" section contains a table with the following data:

Producer	Received	Delivered Quantity
Proba Alliance	54500 COP	70 kg
Alberto Duarte	10700 COP	70 kg

The "Composition (%)" section shows a donut chart with a 50% split between two categories. The "Sustainability Practices" section lists eligible farmers and their practices, such as "Have a water treatment system" and "Have shade trees". The "Product Custody" section shows a list of actors, with "Lilberg" highlighted.

# Let us stay in touch

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