Using Blockchain Technology to Enhance the Trustworthiness of the Organic Foodchain

Group 9

Team:

1: Integration, Documentation
2: Documentation and Graphics
3: Project Manager
4: Smart Contract Development, Integration
5: Front-end Development, Integration
6: PhD Student, Author of Food Provenance Blockchain
7: The Fellows Group, Project Sponsor

Presentation contents

Intro

What is blockchain?

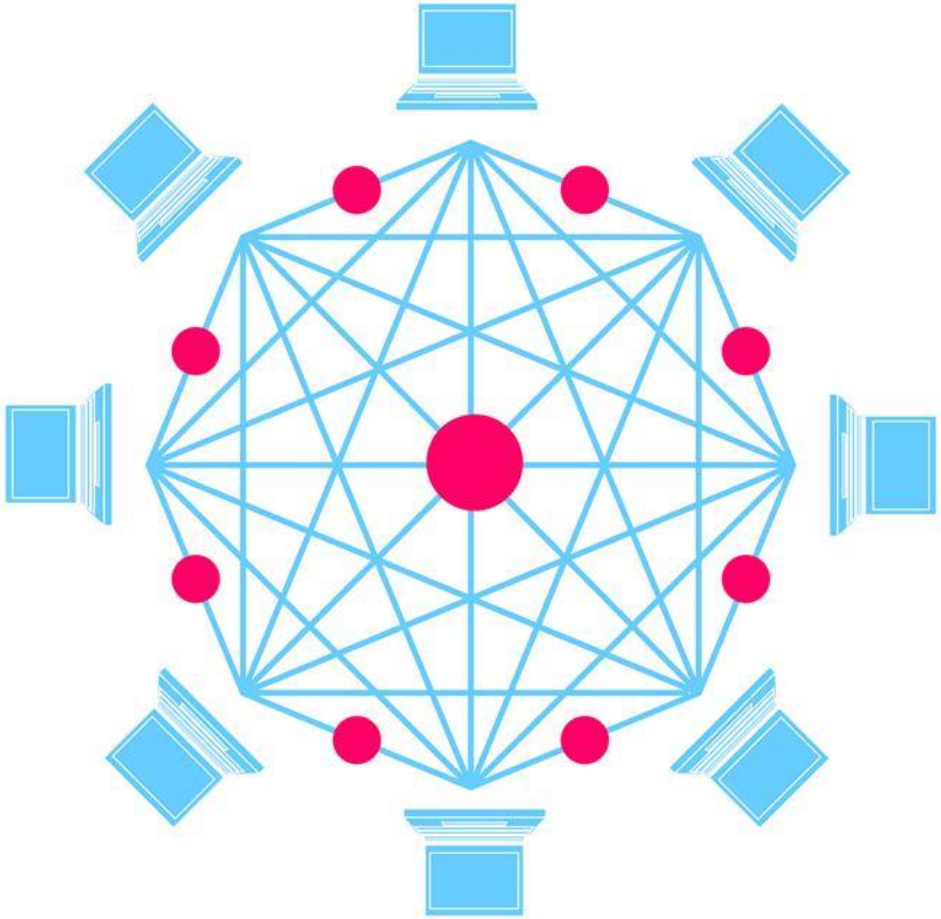
Food problem

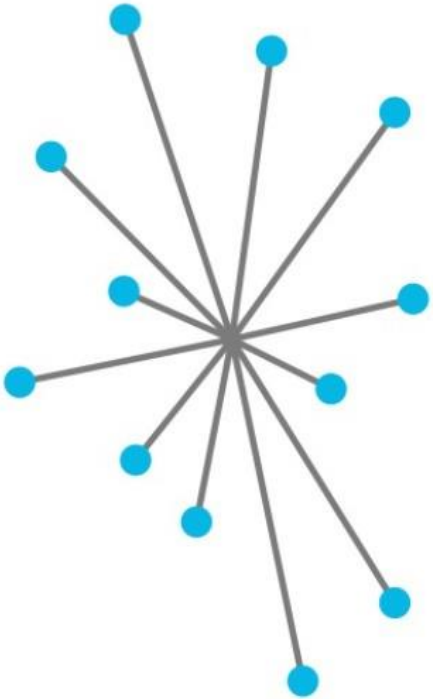
Our solution.

Trade-offs, architecture, considerations for upcoming groups.

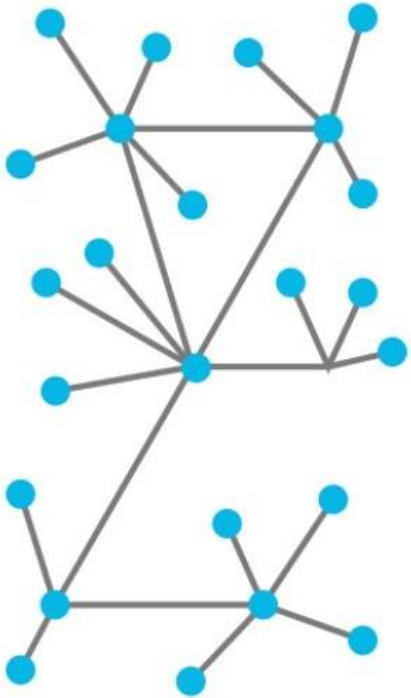
What is blockchain?

Blockchain is a decentralized, distributed, digital ledger used for exchanging digital assets. These exchanges get recorded in blocks that are secured by cryptography, and kept by everyone in the network. Any changes to the records are propagated to all nodes, and consequentially verified by all participants in the network to establish validity through consensus.

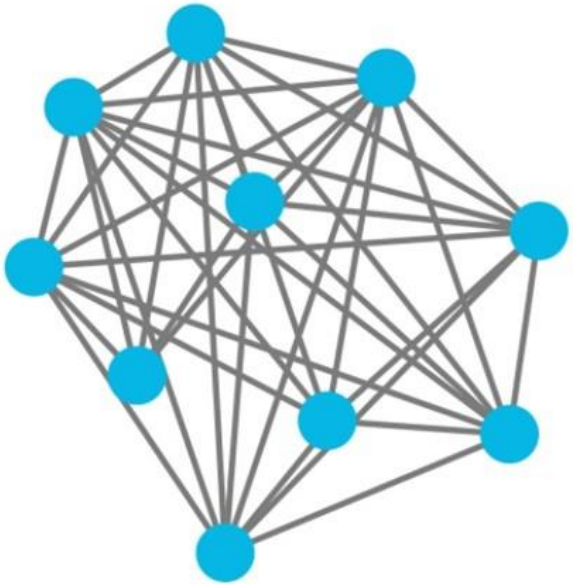




Centralized



Decentralized



Distributed

What if the nodes in this network could also run code?

ethereum

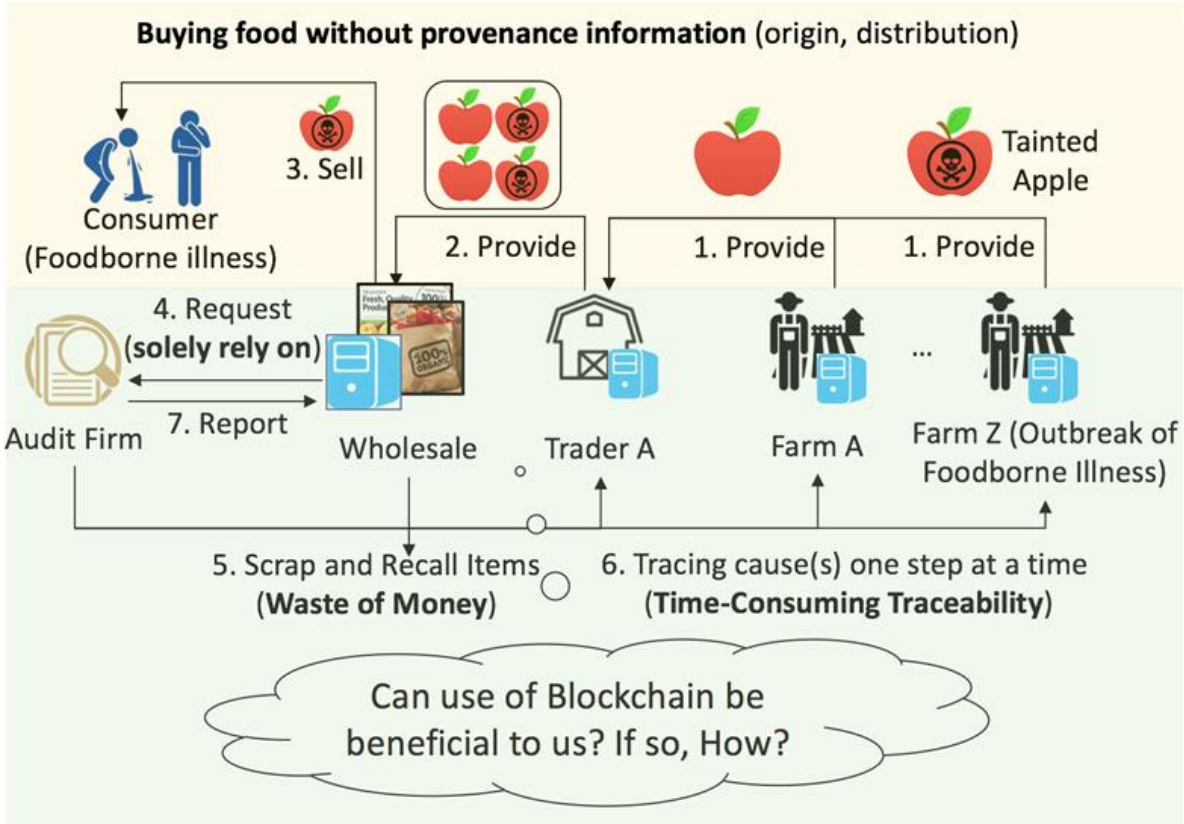
Ethereum and Smart Contracts

Ethereum is an open-source, public, blockchain platform that implements smart contracts. In this platform, transactions are intermediated by computer code. Whenever a code execution is requested for a transaction, all nodes in the network run the code. The production of the same output by the majority of the network defines the validity of the transaction.

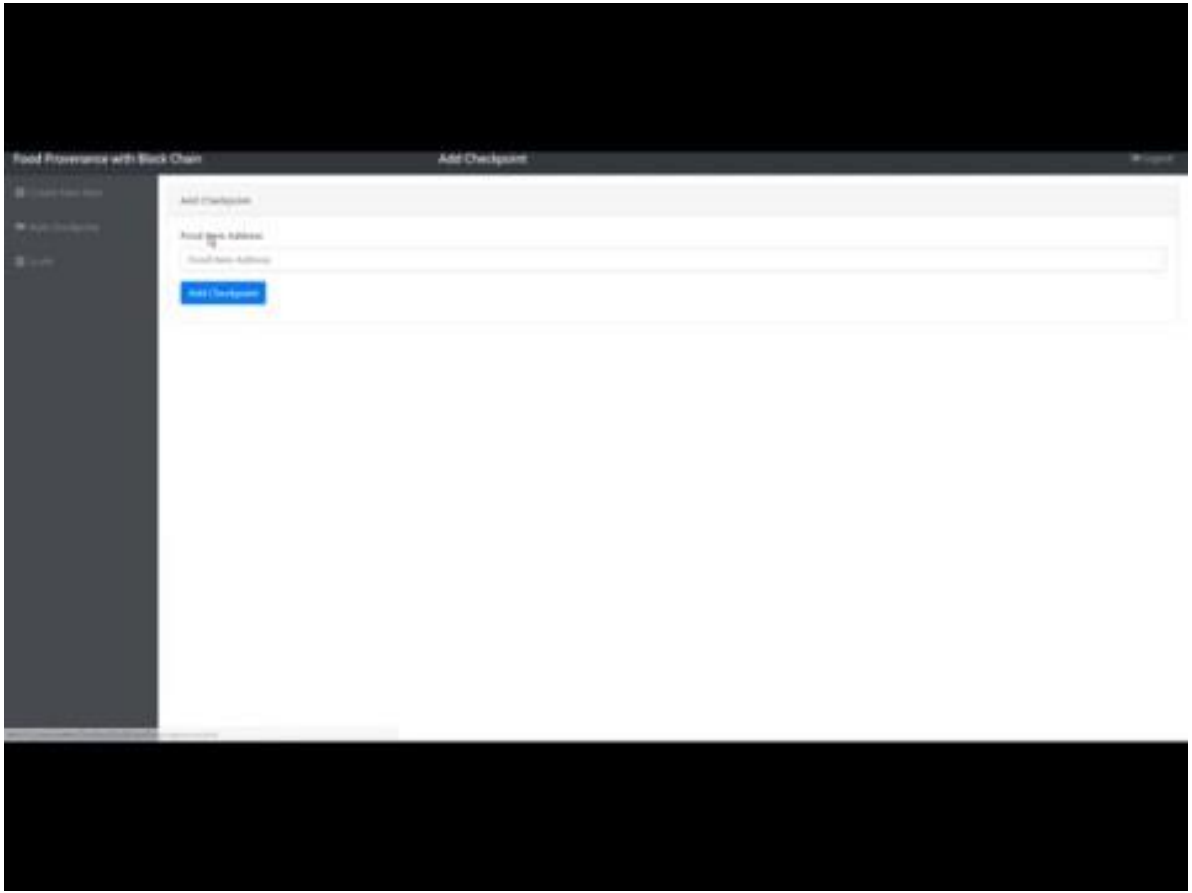
Our project and problem

Product Purpose

- We aim to provide users with confidence in the produce they are buying
- Users are able to select a piece of produce, scan it, and receive information
  - Includes the date/location of harvesting and the number of distributors it passed through before reaching store shelves
- Increase trustworthiness and safety of the modern food chain
  - Our product allows rapid tracking of produce back to its source which can be useful in stopping the spread of foodborne illnesses like E. coli
    - Infected items can be removed from store shelves faster and the source of contamination will be more easily identifiable
  - Our product could track food back to its source faster than current food auditing systems which may take a full day to track produce to each stop it made


Buying food without provenance information (origin, distribution)
Consumer
(Foodborne illness)
3. Sell
Tainted
Apple
2. Provide
1. Provide
1. Provide
4. Request
(solely rely on)
7. Report
Audit Firm
Wholesale
Trader A
Farm A
...
Farm Z (Outbreak of
Foodborne Illness)
5. Scrap and Recall Items
(Waste of Money)
6. Tracing cause(s) one step at a time
(Time-Consuming Traceability)
Can use of Blockchain be
beneficial to us? If so, How?

Demo


Food Provenance with Block Chain
Add Checkpoint

Advantages

Security: consensus verifies transactions did take place and are confirmed by at least the majority of the network. Mining also acts as a security feature.

Integrity: transaction traceability, mining, and hash generation.

Dependability: Ethereum’s deterministic nature enforces consensus by having all nodes generate the same output for the same code.

Reliability: on average, most transactions reach about 95% of the network in less than 15 seconds.

Testing: the truffle framework allows for easy testing and development of smart contracts.

Disadvantages

- Smart contract immutability requires engineers to write code that cannot be directly updated later.
- New multi-layered technology requires familiarity with multiple languages, and a new application architecture.
- Limited resources to integrate front and back end.

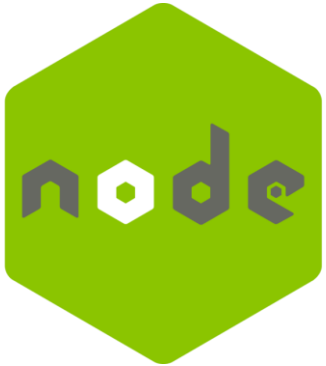
Architecture

Front End - HTML and CSS

Backend - Node.js

Integration - Web3 api (Javascript) to integrate the interface with the blockchain
Smart Contract Development - Solidity Language, and truffle framework

Technologies Used



Roadblocks

- Student Syndrome.
- Solidity Language Resources
- Mutual Integration
- Front End Database Management

For the Upcoming Group

- Divise public and private blockchain for different stakeholders.
- Work on integration.
- Refine smart contracts to reflect on the different entities that make up the system
- Create new components for certain smart contracts.
- Create comprehensible list of food items and their units.