HempCheck: Grow, Track, Trust

Blockchain App for Reliable Tracking of Hemp Seed

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Abstract

The hemp industry is fast growing and ripe for an application of blockchain technology (BCT). This document outlines requirements and tasks for the design and implementation of a blockchain for hemp seed tracking which respects the needs and realities of all stakeholders, while providing a profitable opportunity for investors and early adopters. We describe the high level design of three primary system components and the specifics necessary to fully constrain the scope and purpose of each. We do not outline more granular implementation technologies, strategies, or guidelines.

I. Introduction

Since blockchain technology is still in its infancy, there are few established methodologies for making various intelligent design decisions in a standardized way. To this end, we propose a lightweight framework for making high-level, contextual design decisions, ultimately applying it to the issue of designing a blockchain for hemp seed tracking. After making these decisions we will discuss broad implementation strategies and necessary supporting components before subdividing into specific tasks.

II. Blockchain Overview

Blockchain is an emerging technology with strong growth potential and applications in a wide variety of fields. This success is because blockchain solves the core problem of trust between network actors. Blockchain solves the issue of trust by asking various actors within.

III. Blockchain Design

We identify seven essential questions about the core BCT of any system:

1. Who are the stakeholders in the chain?
2. Who can add data to the chain?
3. Who can view data in the chain?
4. Who controls nodes in the chain?
5. What is the nature of transactions between stakeholders?
6. What is an appropriate consensus algorithm?
7. What is the appropriate type of token[s]?

Stakeholders in HempCheck include: seed growers, regulatory agencies, certification facilities, processors, transporters, seed purchasers, and eventually the final consumers of the hemp product. The wide variety of stakeholders each with distinct desires and concerns about hemp seeds adds a complexity to HempCheck which is considered throughout the design.

Data is added to the HempCheck blockchain through many of these stakeholders. Seed growers add crop information, inputs, and harvest yields. Regulatory agencies must add field certification information, periodic testing data, and confirmation of 3rd party certification data. The chain can be viewed publicly. Confidential information can be encrypted, but most information is already publicly available or should be. Confidential information includes specific grower identifiers, field ids and locations. Public information includes all testing information, general provenance information, and all regulatory approval. Since the vast set of information is public, it makes sense to provide a public ledger for all data due to the benefits of public blockchain implementation.

Nodes on the chain should be controlled by stakeholders with a vested interest in preserving the accuracy of the data. The nodes will be setup as an invite-only consortium wherein all interested stakeholders can apply to host a node. HempCheck operators will also host the first nodes of the network and possibly extra nodes to maintain appropriate network performance. Hosting a node will entail benefits to the hosting party such as product discounts. We anticipate that stakeholders will express interest in hosting nodes themselves due to the investment opportunity and a desire to have a stake in the network. Due to the increasing prominence of cloud based blockchain hosting solutions it will be possible to greatly simplify the process of hosting a node to allow actors who may not traditionally be active participants in the blockchain hardware core to contribute computing resources and reap the benefits of processing transactions for the network.

Transactions between stakeholders look very different depending on the point in time they are added to the chain. Initial transactions involve no transfer of the product but rather serve to add various certifications or properties to a specific crop of hemp seed. These certifications involve trusting the testing facilities to produce and upload accurate data. However, once the certification is properly attached to the crop on HempCheck, it forms an immutable and secure record of testing which is auditable and viewable by buyers.

We propose a Proof of Stake (PoS) algorithm as the method of consensus for HempCheck network. PoS is a newer method for network consensus which maintains byzantine fault tolerance (BFT) while still giving nodes the ability to improve their odds of minting a new block. Instead of dedicating computing resources to “mining” blocks such as in the bitcoin proof of

work (PoW) structure, PoS consensus allows nodes to place a wager. The larger the wager, the larger the probability of that node being allowed to confirm a transaction. If the node confirms a valid transaction, then the wager plus some transaction fee is returned to the node, if the transaction is confirmed incorrectly though, the wager is forfeited. This makes PoS a very efficient and equitable consensus algorithm which is ideal for use with HempCheck.

Two primary tokens compose the value proposition of HempCheck: an asset backed security token directly representative of hemp crop at stake (HST = hemp security token) and a utility token responsible for settling trust transactions between stakeholders and nodes (HUT = hemp utility token). It is logical to separate these tokens since they represent entirely discrete functionalities. Furthermore, since the scope of HempCheck does not include a full product lifecycle, the HST economy may not form a natural equilibrium. On the other hand, price setting for HUT is not controlled by outside market forces, price fixing, etc and only varies on the network utilization, which stabilizes HUT value to a reasonable degree.

Additional System Components:

Beyond the distributed blockchain ledger, there is still the matter of outside interaction. Stakeholders need to interact with the HempCheck network in a convenient and useful manner. This means deciding common use cases and creating frontend design and platform specifications for the audience.

The specifications for the frontend system must consider that a number of entities will need to interact with the blockchain data layer. To this end, it will be necessary to develop well organized portals that expedite data input to busy users who want to have seamless interactions without dealing with blockchain directly. The frontend must abstract data input functionality for this audience while providing the security and reliability that can only be guaranteed by blockchain.

We anticipate two somewhat distinct user-facing apps one for data input and one viewing. They could be deployed as one depending on the identified use cases and testing. The data input app must allow stakeholders to input data according to their status on the blockchain and role within hemp production. Data input templates should be provided for common use cases. The data viewing app must support permissionless viewing for interested third parties and entities who wish to verify information using the HempCheck network. It should also provide confidential viewing for encrypted private data which is held on the network for stakeholders with the proper permissions.

IV. Tasks

- Proof of Concept (POC) test
- Create a test Sawtooth Blockchain network on Ubuntu
  - Develop a layout of the whitepaper
  - Divide tasks among team members
  - Write blockchain and background sections of whitepaper
  - Research and Write remaining whitepaper sections
  - Develop prototype alongside whitepaper for testing purposes
- Consultation with government officials
- Integration of data layer with hyperledger fabric
- Implementation of smart contracts
- Develop frontend for data input and viewing
- Conduct a field trial of the blockchain interface with customer-facing data
- Distribute survey on frontend experience to end users
- Analyze and integrate end user feedback
- Repeat feedback and testing as necessary
- Deploy final release

V. Gantt Chart