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Blockchain based Smart Agri-Food Supply Chain Management

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***Abstract*: Blockchains the distributed ledger technology underpinning cryptocurrencies such as Bitcoin represent a new and innovative technological approach to realizing decentralized trustless systems. Indeed, the inherent properties of this Digital technology provide fault-tolerance, immutability, transparency and full traceability of the stored transaction records as well as coherent digital representations of physical assets and autonomous transaction executions. This paper presents Agri Block IoT, a fully decentralized, blockchain-based traceability solution for Agri-Food supply chain management, able to seamless integrate IoT devices producing and consuming digital data along the chain. The orders, updates, changes, tracking details, and the details of customers, sellers, manufacturers of raw material, assemblers, and others have to be decentralized, that's the purpose of introducing traditional supply chain to the block chain. The decentralization of this data across different levels ranging from raw material manufacturer to the retailer will lead to a more flexible and transparent system. These traits would in turn result into a system where data flows faster than traditional centralized approach to supply chain management. Use of IOT ensures that there are no inconsistencies in the processes that are in transit, automating the updating process that would other require human intervention.**

***Keywords*: Data provenance, Blockchain, Security, Reliability Smart Contract, IoT.**

1. Introduction

In our proposed system, we have a tendency to gift Agri Block IoT, a totally suburbanised traceability system for the Agri-Food provide chain management. In proposed system we provide the Agri food supply chain management between merchant, supplier and customer. The agri-food industry is a sector of key economic and political importance. It is one of the most regulated and protected sectors, with major implications for sustainability such as the fulfilment of human needs, the support of employment and economic growth, and its impact on the natural environment. Supply chains are complex entities which provides many functions. They are institutional arrangements that link producers, processors, marketers and distributors. Supply chains is an industrial organization which allow buyers and seller for separated by time and space to progressively add and accumulate value as products pass form one member of the chain to the next.

- Agree foods move from merchant to customer;
- Technology and advanced techniques are disseminated among merchant, supplier and customer;
- Ownership rights pass from merchant to customer and ultimately to supplier;

A distributed database is also a decentralized data structure which features quick query processing and well-designed data formatting but suffers from data reliability. Integrated agri-food supply chains are one of the most powerful competitive tools in today's globalizing business economy. They are institutional arrangements that link Merchant, Suppliers and Customers. For agricultural products, successful supply chain development projects reduce not only the transaction costs but also the institutional barriers that divide individual links in traditional distribution channels. They allow participants to achieve higher levels of service and to capture substantial added value thereby serving as leverage points for economic growth.

2. Literature survey

Paper name: Do you need Blockchain? Author: Karl wust, artthur garvaise

Blockchain is a technological innovation which allows to revolutionize how society trades and interacts. This reputation for particular attributable to its properties of allowing mutually mistrusting entity for exchanging financial value and interact without relying on a trusted third party. A blockchain provides an integrity for protected data storage and allows to provide process transparency. In this paper we analyze whether a blockchain is propriate technical solution for a particular application scenario. We can compare between permission less (e.g., Bitcoin/ Ethereum) and permissioned (e.g. Hyperledger/Corda) blockchain and contrast their properties to those of a centrally managed database. We provide a structured methodology to determine the appropriate technical solution to solve a particular application problem. Given our methodology, we analyze in depth three use cases — Supply Chain Management, Interbank and International Payments, and Decentralized Autonomous Organizations and conclude the article with an outlook for further opportunities.

Paper name: Performance Characterization of Hyperledger Fabric, Author: Arati Baliga, Nitesh Solanki, Shubham Verekar .

Hyperledger Fabric is used for a permissioned ledger platform designed which highly modular and extensible, delivering confidentiality, privacy and scalability for Enterprise blockchains. With Fabric's production grade availability in mid-2017, enterprises are experimenting for building real-world blockchain applications. In this paper, we can divide the performance and scalability features of the current production release of Fabric. In this paper we take an experimental approach, we study the throughput and latency characteristics of Fabric by subjecting it to when different sets of workloads. a suite of micro benchmarks, custom-built for Fabric, we can tune different transaction and chain code parameters and study how they affect transaction latencies. Finally, we also conduct experiments to study Fabric's performance characteristics while increasing the number of chain codes, channels and peers.
Paper name: An Agri-food Supply Chain Traceability System for China Based on RFID & Blockchain Technology. Author: Feng Tian

Form previous many years, food safety is a main problem in China. traditional agri-food is not match the demands of the market anymore, building an agri-food supply chain traceability system is becoming more and more urgent. In this paper efforts, development situation of RFID and blockchain technology first, is studied and then we analyze the advantages and disadvantages of using RFID and blockchain technology is the building the agri-food supply chain traceability system; finally, we demonstrate the building process of this system. understand the traceability for trusted information in the whole agri-food supply chain, which give guarantee the food safety, by gathering, transferring and sharing the authentic data of agri-food in production, processing, distribution and selling links.
Paper name: Blockchain Access Privacy: Challenges and Directions. Author: Ryan Henry, Amir Herzberg, Aniket Kate

Many researchers prefer using anonymous communications networks, such as Tor, to ensure access privacy. We challenge this approach, showing the need for mechanisms through which non-anonymous users can publish and fetch transactions without enabling others to link those transactions to their network addresses or their transactions.
Paper name: A Model for Smart Agriculture Using IoT. Author: Prof. K. A. Patil, Prof. N. R. Kale.

Climate changes and rainfall has been erratic over the past decade. Because of this in the recent era, climate-smart methods called as smart agriculture is accepted by many Indian farmers. Smart agriculture is a self-moving. and directed information technology implemented by the IoT. IoT is very fast developing and widely applied in all wireless environments. A combined approach with internet and wireless communications, Remote Monitoring System (RMS) are proposed. The main goal is to collect real-time data of agriculture product that provides easily access for agricultural face plates alerts through Short Massaging Service (SMS).

3. Existing system

In this system, its intrinsic capability of providing immutable and tamper-proof records, along with its potential of facultative trust and responsibility among untrusted peers represent too enticing options, preventing this technology to remain relegated into one vertical sector.

4. Proposed system

In our proposed system, to implement block chain as a layer of our system, implementing Agri food supply chain management between merchant, supplier and customer. In proposed system we providing direct traceability between merchant to customer using private blockchain technology. for providing traceability between merchant and customer we are using weight sensor to generate the weight of product to both side and by using BAR code we generate the bill of the product.

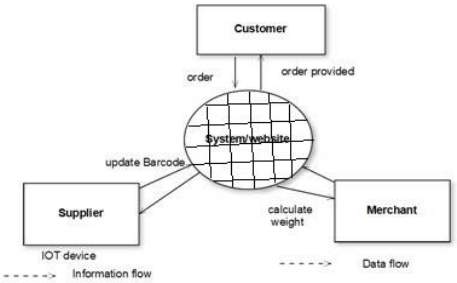


Fig. 1. System architecture

Figure 1 depicts a simplified version of such process whose involved actors are briefly introduced in the following:

1. *Merchant:* Calculate weight of product using weight sensor and Generate OR code of the product.
2. *Supplier:* Using OR code show the traceability between the merchant and customer.
3. *Customer:* This is final element of chain who can order the product and replace the product if product not correct

5. Algorithms

Ethash which is used for the planned for PoW algorithm for Ethereum 1.0. I. Ethash the new of version of Dagger-Hashimoto, although it can no longer appropriately be called that since many of the original features of both algorithms have been drastically changed in the last month of research and development. The algorithm takes is as follows:

1. A seed which can be used computed for each block by scanning through the block headers up until that point.
2. From the seed, one can compute a 16 MB pseudorandom cache. Light clients store the cache.
3. From cache, we generate a 1 GB dataset, with the property of each item in the dataset depends on only a small number of items from the cache. Full clients and miners store the dataset. The dataset grows linearly with time.

4. Mining involves grabbing of random slices of the dataset and hashing with each other. Verification can be performed with low memory by using the cache to regenerate the specific pieces of the dataset that you need, so you only need to store the cache.
5. The Big dataset is updated every 30000 blocks, majority of a miner's effort will be reading the dataset, not making changes to it.

Syntax:

For j=1:r

c=c+s (j,j)*u(:,j)*v(:,j).';

end

The R-value in the m-file represents the number of iterations taken on each layer used in the resulting decomposition. This is the rank of the SVD matrix. When we increase the rank we can increase clarity until an optimal image is reached.

Step-5:

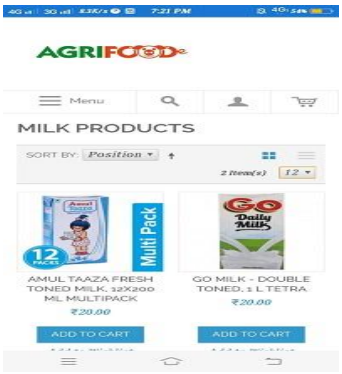
Display the compressed image.

WORD_BYTES = 4
DATASET_BYTES_INIT = 2**30
DATASET_BYTES_GROWTH = 2**23
CACHE_BYTES_INIT = 2**24
CACHE_BYTES_GROWTH = 2**17
CACHE_MULTIPLIER=1024
EPOCH_LENGTH = 30000
MIX_BYTES = 128
HASH_BYTES = 64
DATASET_PARENTS = 256
CACHE_ROUNDS = 3
ACCESSES = 64

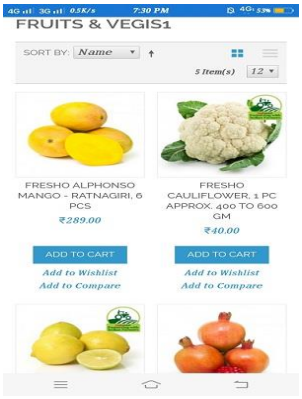
Ethereum's development is related with the development of the SHA3 standard, and the standards process made a late change in the padding of the finalized hash algorithm, so the Ethereum "sha3_256" and "sha3_512" hashes is not standard sha3 hashes, but a variant often referred to as "Keccak-256" and "Keccak-512" in other contexts.

6. Result

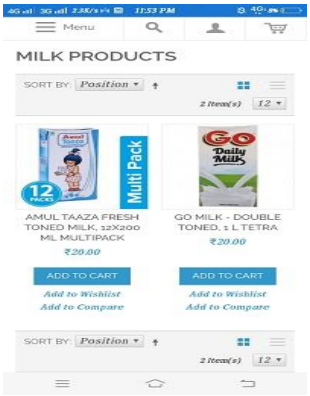
A. Homepage



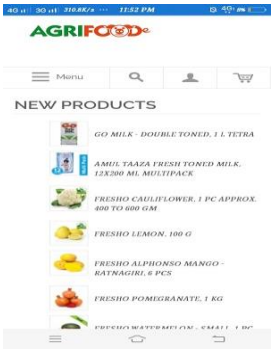
B. Category of vegetables



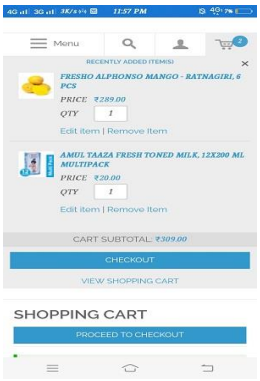
C. Category of milk



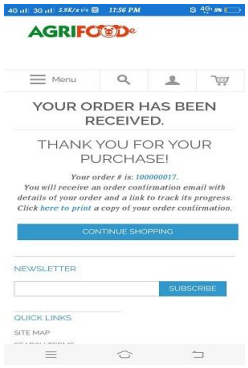
D. All product



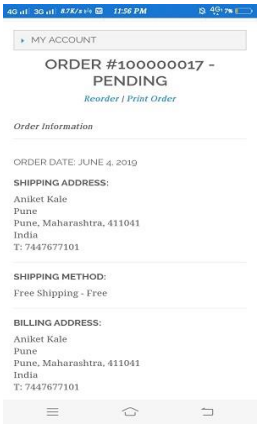
E. Shopping cart



F. Order placed



G. Costumer account after order place



H. Printing bill

7. Conclusion

Thus, we have presented an efficient solution to automate and decentralize the supply chain management process with. Using this system would help decrease the error rates that occur indifferent stages of the supply-chain and would improve the customer support by a great magnitude, allowing a complete retrace and traversal of the supply chain tree, to help spot inconsistencies across various levels of the tree. The proposed system would be an efficient and advantageous replacement to the existing supply chain management systems.

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