BLOCK CHAINING FOR TRANSACTIONS WITH DEMAND FORECASTING-APPLICATION IN LARGE SCALE RETAIL CHAINS

Ms. S.Sakshi[1], Ms. Srividhya.S.Subramanian[2], Ms.Ramya Ramdoss[3], Ms.Sri Gokulam.R[4]

Abstract- This paper is aimed at creating a block chain network for demand forecasting using the distributed ledger network. A blockchain essentially consists of a chain of blocks in which the information is stored. The history of the data is preserved securely and can be viewed at any point of time in the network, which makes the network reliable. Smart contracts are deployed on these nodes to provide a framework of conditions for transactions to occur in the network. The process of profiling an unstructured or semi-structured data for the products is defined as Data Analysis. This is carried out through demand forecasting which provides quality data and statistical results on the data provided from the blockchain network. The historical data that is used to train the model in the training phase. Then the model is implemented on the test data to determine quality and accuracy. Demand forecasting is used to predict the future demand of the grains for the retail chain. The transactions are stored chronologically in the blockchain and payments are processed in the form of ethers (Rinkeby Test ethers). The distributed ledgers are used for this prediction purpose and this network ensures security and liability of the data used for the analysis. Immutability is an important characteristic of the blockchain network is being used to ensure integrity and security of data. This paper delves into the creation of a blockchain to maintain the records in Large Scale Retail Chains*.
Keywords- Blockchain, Demand Forecasting, Ethers, Distributed Ledger, Smart Contract

1. INTRODUCTION

Since time immemorial, a record of transactions of an organization in the form of an organized collection of ledgers has been practiced. The act of amending the ledgers by appending records of the current transactions is of prime importance. Functionally, a distributed ledger based peer-to-peer network that enables the system to record all transactions is coined the term blockchain. This paper aims to discuss the implementation of a blockchain for financial transactions in a public distribution system along with demand forecasting of the future requirement of grains based on historical data an efficient, secure functioning. Large scale retail chains consist of a large array of shops located around the country that procure and sell commodities to the citizens of a country. The aim of this paper is to implement block chaining in large scale retail chains to ensure accountability of merchants in the system. Assets usually denote tangible /intangible entities that can be possessed or declared to belong to a *This paper implements the concept of Demand Forecasting in Blockchain for Large Scale Retail Chains, only for one commodity, Rice Grains. person or a group of people. Fundamentally, cash is an asset that provides anonymity during the process of deploying of transactions which is not suitable as transaction cannot be traced to its roots. Thus the problem of non-repudiation and lack of accountability arises in the public distribution system. This network is usually used for maintaining distributed synchronized ledgers which record transactions that involve the transfer of assets from one party to another. Implementation of blockchaining in large scale retail chains will ensure immutability and redundancy which directly increases the reliability of the system. Transaction refers to the transfer of assets from the owner of the declared asset to another client in the network of the blockchain. Smart Contracts are the basic set of conditions that should be satisfied for the transaction to occur in the system. Ether is a kind crypto currency that is transferred through this blockchain network.

2. RELATED WORK

Ever since mankind had emerged with the need for goods, which are needed for much more than just survival, distribution and selling of such goods are done by retailers. The field of retail store operations concerns all of the activities that keep a

---

[1] Associate Professor, Department of Computer Science & Engineering Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India
[2] Associate Professor, Department of Computer Science & Engineering Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India
[3] Associate Professor, Department of Computer Science & Engineering Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India
[4] Associate Professor, Department of Computer Science & Engineering Meenakshi Sundararajan Engineering College, Chennai, Tamil Nadu, India

store functioning well each day. Operations of a well-run store either online or not, includes many aspects, such as store design, display placement, And these could be done using Historic data which is not fully implemented in the existing shops.

Basically, in a system where cash is the mode of transaction, a lack of transparency arises. Once a person or a group of people physically acquire a sum of money legally or illegally, it belongs to them. The concept of ownership of money as an asset is that the asset holder becomes the asset owner. This leads to lack of traceability of assets .In other words the previous owners of the currency and the transaction for which the ethers was used cannot be retrieved.

It is to be noted that these transactions are not instantaneous in nature. The time required to carry out the money transfer may take vary anywhere between several hours to several days. Thus once the balance is credited to the receiver's account, the transaction is complete.

Furthermore, these existing systems are centralized in nature. This means that an increase in the network traffic could lead to congestion in the network. All the data is present on a central system. In case of failure of the central system, the whole network might come to a stand-still. The responsibilities of the local nodes are reduced, but the responsibility of the central node is increased greatly.

Moreover, in case of arrival of several concurrent request from the local nodes to the bank, the efficiency of the transaction decreases. Thereby, another problem arises which is the execution of safe financial transactions. In case of vulnerabilities of the central server (which happens very rarely) all the account details, transactions of the account holders will be disclosed.

*This paper implements the concept of Demand Forecasting in Blockchain for Large Scale Retail Chains, only for one commodity, Rice Grains.

3. PROPOSED SYSTEM

3.1. Blockchain

The proposed system consists of a distributed blockchain network with several nodes. Every node maintains a copy of the data in the ledgers. Thus, data redundancies are maintained within the system. Moreover, the property of immutability is preserved in this network. This denotes that every transaction stored in the network is permanent in nature. It can never be tampered under any circumstance. It is a distributed system that has several nodes in which copies of the transactions are stored. It is a peer to peer network where every transaction is mined by every node in the network. When a message is to be sent for authentication it has to be mined by the nodes between the current node and authenticator.
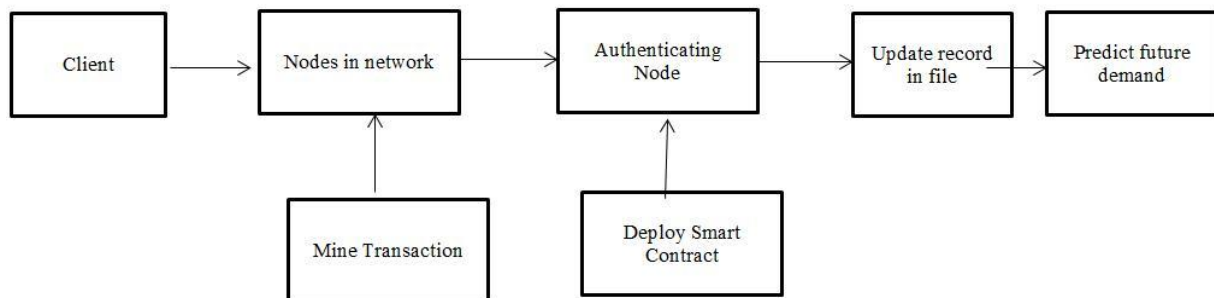

Fig 1.2: Block Diagram

It consists of a basic UI which can provide the details of a user given their ethereum account number. This is a one way operation as the account number cannot be obtained with the knowledge of any of the fields in the information of the user.
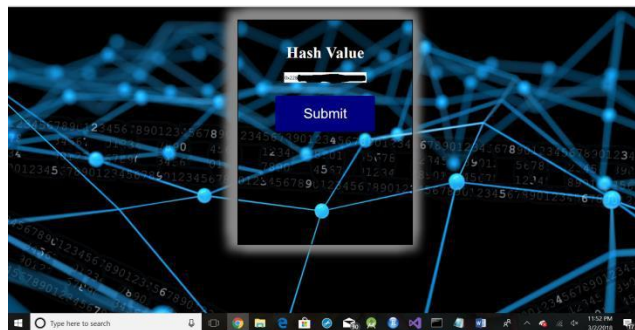

Fig 1.3 GUI-1

Once the hash value is provided, all the details of the user will be displayed. These values include the hash value, SSN number, first name and last name. It also allows the user to navigate to the transaction page to perform the required transfer of ethers.
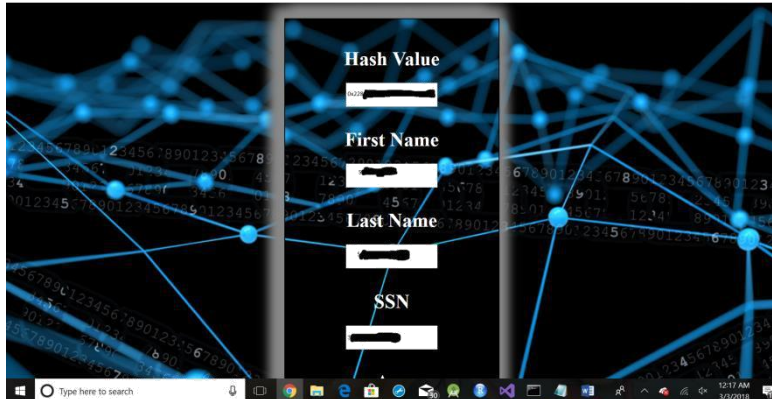

Fig 1.4 GUI-2

The simple ethereum web browser Mist is used to deploy the smart contract which is used to transfer ethers from the sender to receiver. The sender can choose the number of ethers they wish to transfer along with the gas limit. The gas limit is used to represent the maximum amount of ethers that can be used to mine a transaction.
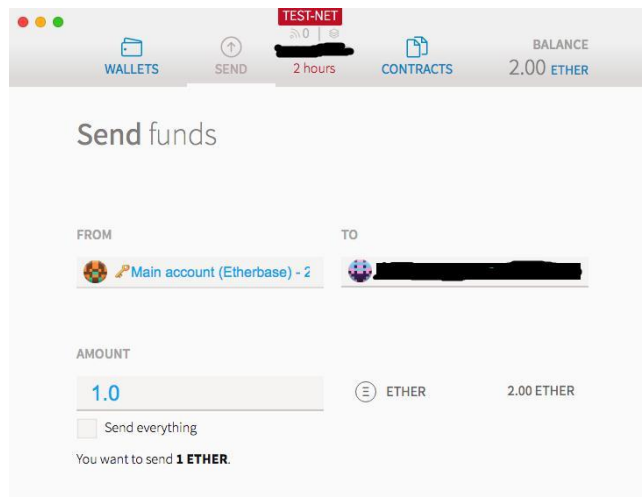

Fig 1.5 Mist Interface

Smart contracts are usually deployed on to this network to transfer assets between two parties on the network without the involvement of intermediaries. The money is transferred only if the conditions mentioned in the smart contract are met. Effectively, a blockchain is used to establish trust or consensus between two parties that do not trust each other.

The data transfer is not immediate in nature in this system. Every transaction has to be authenticated or mined. Hence, this cannot be performed instantaneously. This might take anywhere between a few seconds to a few minutes depending on the gas limit. The gas limit specifies the maximum amount of ethers that may be paid for the transactions to be mined. If the complexity of the problem increases, the gas limit also increases.

Blockchain System was first implemented in bitcoin mining by Satoshi Nakamoto. The basis of bitcoin is a public block chain with anonymous participants. All transactions performed by the system are stored in the system can never be deleted.

Consensus: Money transfer occurs only after both parties agree to permit the transaction.

Provenance: The roots of a currency can be traced by using provenance property of blockchain. The history of transfer of the currency could be tracked too. Immutability: Records of the transaction stored in this network are permanent in nature and can never be altered during the existence of the blockchain.

3.2. Demand Forecasting

The blockchain is fundamentally a peer to peer network which operates by forwarding transactions to the authenticating node. The transactions are carried out by the deployment of smart contracts which record the transactions in a chronological order. Every transaction involves two parameters:-price and the quantity of rice*(in kg).The details of transactions among all nodes are collected at the authentication node and organized. Forecasting is carried out for the available historical data for the quantity of rice. This paper involves a proof of work concept by the use of ARIMA model (Auto Regressive Integrated Moving Average).This model can be used to predict seasonality and trends. However, it works only for time series data.
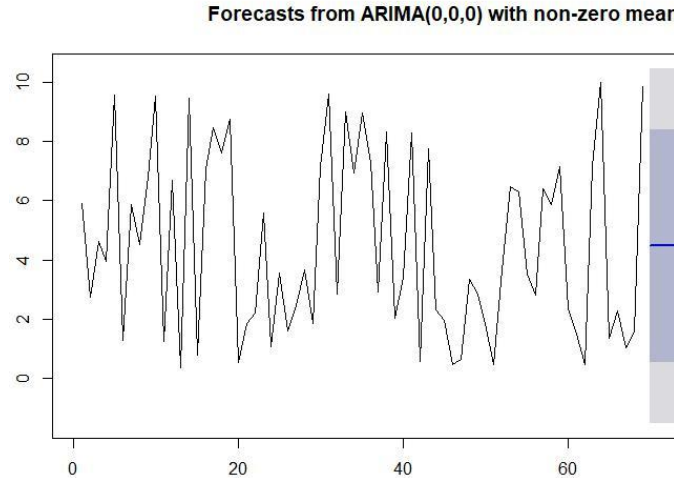

Fig 1.6 Demand Forecast Graph from ARIMA

3.3. Implementation In Large Scale Retail Chains:

The most important characteristic of a blockchain network is immutability, which is the base for implementing this concept in a large scale retail chain. Ethereum is a platform for applying this concept of a distributed network for executing transactions through ethers. A transaction occurs only if it is authenticated by the network and this is done using hashing techniques like the SHA256 algorithm. This authorized user can now make transactions to any other node present in the network. Every time this cryptocurrency is used in a transaction, it is recorded in the network's distributed ledgers and every authenticated user in the network can view the history of transactions taking place between any two nodes. Here, we have considered the rice market where we can implement this network concept for the transactions taking place between the consumer and the large scale retail chain (collectively known as the parties). Any transaction that has to occur between the parties is done by the transfer of ethers between them. The data that is being stored in the distributed ledgers through smart contracts that establish functionalities which write the data into the .csv files for demand forecasting. The price of the rice can increase when the demand drops and decrease when the demand raises. This can be done by using the ARIMA (Auto Regressive Integrated Moving Average) time series model to forecast the demand in the future and this can be done only for stationary series. Stationary series are those that have constant mean, variance, and covariance for the data that is to be plotted against time. Plot the ARIMA graph using 3 major factors namely, p,q,d. p- No. of Autoregressive terms q- No. of non-seasonal differences for a stationary series d- No. of lagged forecast errors in the prediction equation Once the amount of rice that is required is seen through the forecasted data displayed in the graphs, we can use it for controlling the price of rice in the market. We can assure that the data being used from the blockchain network is liable which makes the prediction more accurate and reliable for the retailers.
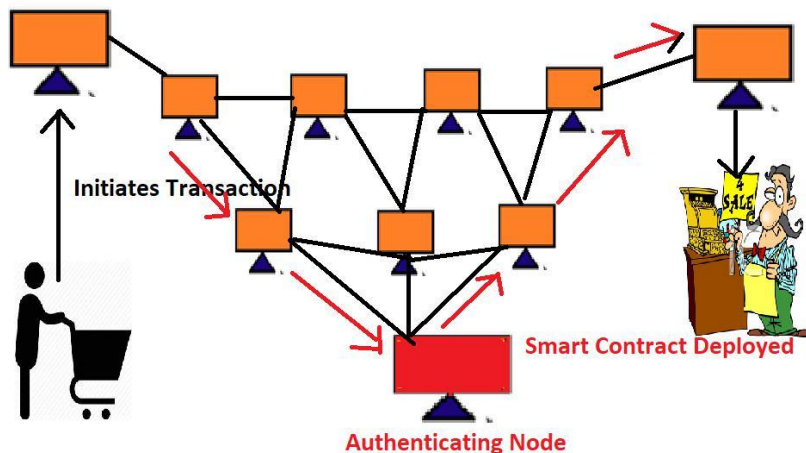
3.4. Architecture

Fig1.7Architecture of a blockchain based System

3.5. Algorithm

Input: CSV file with the list of transactions
Output: Trends in the data
For each transaction
If(transaction==null)/*First Instance of Deployment. No previous transactions*/ Return null
Else if(transaction==ts)/*Transactions exist in the system. Apply ARIMA model*/
Apply ARIMA model
Return result
Else if(transaction!=ts)
Return null;
The processes involved are
1)   Initiation of transaction by the client
2)   Mining of transaction to the authenticating node
3)   Deployment of Smart Contract
4)   Updating Of records
5)   Transfer Of Records
6)   Periodic Demand Forecasting

4. RESULTS AND DISCUSSION

Thus, the blockchain has been implemented along with demand forecasting to provide an efficient system for the large scale retailers who use ethers for implementing their transactions from one party to another. The use of blockchaining can improve the transparency, redundancy, security and improve efficiency of the transactions. This network can be used in various fields due to its reliability and secure transactions. This network stores the input data from the end user in its distributed ledgers, which can be viewed with authentication from any node in this network. The smart contracts deployed are used to facilitate the reading of the input data form the network into the files which are the used for forecasting the demand of rice in the market. Till now we have been using only one variable to forecast the demand and we can extend it to more variable by considering factors such as the geographical area need, supply constraints, population constraint, economic condition of the area, occurrences of disasters constraints, etc. can be used in this prediction purpose.

To take this network one step forward, we can apply this to multiple use cases at a time, i.e. for a large scale retailer with multiple products that can be on demand, we will have to analyze the demand accurately for these many products at a particular instant so as to improve the overall profit margin for all its franchises. Here, we can apply complex data models to the data set to achieve the required result. This requires scaling of the network and a large amount of ethers to work on the transactions in the network.

5. CONCLUSION

Blockchaining for transactions with demand forecasting can be applied to various fields to forecast the demand for commodities in the large scale retail chains where there is a threat of missed transactions, and hence the immutability data characteristic of the blockchain network provides secure and reliable data through the transactions that have already occurred for us to apply various time series models to control the prices of the commodities based on their demand in the future.

6. REFERENCES

[1]   The Evolution of Fintech: A New Post-Crisis Paradigm? By Douglas Arner; Jànos Barberis; Ross Buckley, University of New South Wales Law Research Series, 2015
[2]   The Future Of Banking: The Role Of Information Technology by Marko Jakšič and Matej Marinč, September, 2015
[3]   Developing Blockchain Real-Time Clearing and Settlement in the EU, U.S., and Globally by Joanna Diane Caytas from Columbia Law School
[4]   Where Is Current Research on Blockchain Technology?—A Systematic Review . Jesse Yli-Huumo1 , Deokyoon Ko2 , Sujin Choi4 *, Sooyong Park2 , Kari Smolander3