Block Chain for Public Distribution System in India

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Abstract: In the present era, BLOCK CHAIN is the trending technology which actually solves all security and auditing related problems in real-time applications. Public distribution System (Rationing) in India has faced many scam and fraud issues in various states. So in this paper we introduce the fraud insulated automated public food distribution system . To overcome problems arises in manual system, government has introduced E-POS Machine but in that also they discovered some fraud cases in UP. So, we propose a block chain based approach to solve the problem of duplicate entries or incorrect entries in the existing ePos systems and frauds or scams by the government authorities. In this approach of block chain we propose hash as digital signature of the beneficiary which uses Adhar card and ration card number as combination. Using block chain, auditing of records can be done easily so as to avoid sell of subsidized grain in private market by Fair Price Shops.

Keywords — Block chain, Public distribution system, Epos, Aadhar-card, Ration-card, Fare price shop

I. INTRODUCTION TO BLOCK CHAIN

Satashi nakamoto [1], is known for his work in fields of Digital currency, computer science and Cryptograph introduced the Block chain. has main idea and focus was to decentralize the transaction management in which there is a need of third party. it is basically a growing list of records called blocks where every block contains a secured hash/cryptographic hash of the previous block. It contains a group of blocks were each block is digitally signed by owner of the block by his public key and a hash. The hash is generated using a timestamp server. A block chain database is managed autonomously using a peer to peer network and a distributed timestamp server. They are authenticated by mass collaboration powered by collective self-interests.

The use of the blockchain removes the characteristic of infinite reproducibility from a digital asset. A blockchain can maintain title rights because, when properly set up to detail the exchange agreement, it provides a record that compels offer and acceptance. As per the premises, the more number of block less the probability of attacker. The transactions are stored the block as Merkel tree structure. In Merkel tree structure each of transactions are hashed and each forms another hash to form a single root hash and each transactions is digitally signed by the sender which makes it more and reliable for the end user. The signature is also appended in the transaction. For privacy purposes we can various algorithms in PKI, etc.

II. PUBLIC DISTRIBUTION SYSTEM IN INDIA

In India, the central and the state government is responsible for regulation public distribution system. A shop which distributes food to poor at subsidized rate is part of FDS. Refer fig. 1This is called FPS (Fair Price Shop). To purchase subsidized food in India, Ration cards are being issued by the government.

However, to reduce the problems in manual system, the central government has introduced ePOS system. An ePOS system is electronic point of sale it is linked with Aadhaar card of the consumer. Aadhaar card is issued to every citizen of India as a Unique Identification Number. The ePOS system was setup to eliminate the fake beneficiaries of public distribution system. Food is distributed after verifying the credentials of consumer. The ePOS system has further loop holes. The Aadhaar card numbers of the beneficiary can be changed while keeping the beneficiary name unchanged. In this way a Fraud transaction can be performed. We have proposed use of Block Chain Technology to avoid such fraud transactions.

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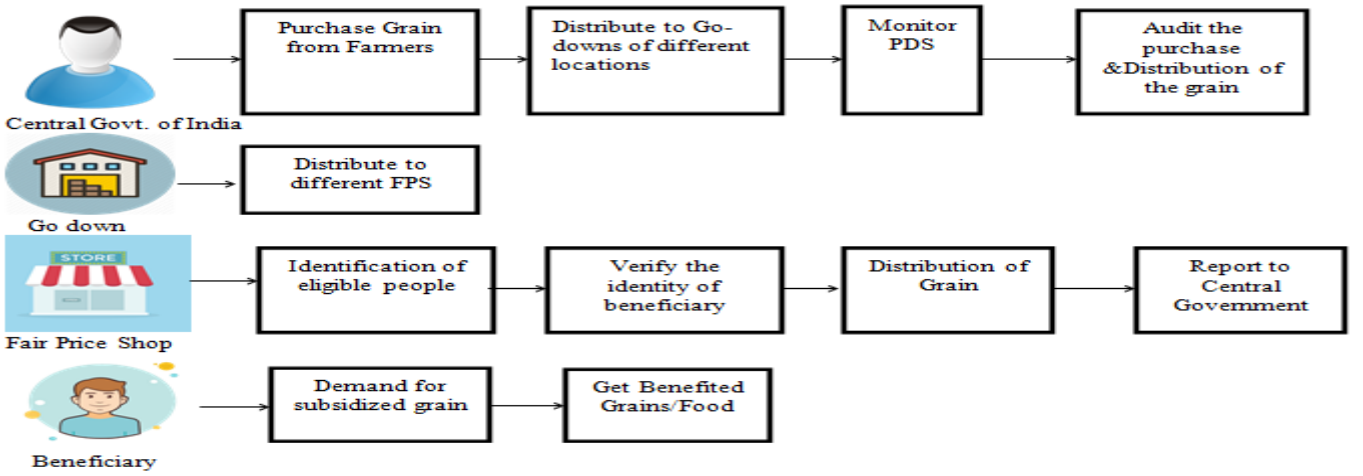

Fig. 1 Public Distribution in India

III. CONTRIBUTION TO THE PAPER

The paper proposes an e-rationing scheme based on block chain technology. It meets the fundaments of PDS (Public Distribution System and at the same time it provides a degree of decentralization and places more control in hands of beneficiaries' as much as possible.

Auditing of the previous transactions done so far between the FPS shopkeeper and the beneficiary.

1. Reliable:Need to be checked or audited by government in order to ensure fair distribution. The records are stored on monthly basis or on beneficiary basis.

2. Fraud prevention: Using block chain misuse of the documents can be stopped. Also each transaction are recorded with a time stamp and verified by the consumer. If any other consumer tries to enter the system then he or she has to produce the required proof of work.

3. Transparent: All the transactions in the system should be visible to others in the system. A shopkeeper should be able to view or see the accountability of each beneficiary. Also records of the shop keeper should be visible to government at any given time.

Design of Block structure

Figure 2, shows structure of block for transaction.

The block structure is as shown below. As shown in the figure each block contains a hash function made up of Aadhar card number and ration card number. Each beneficiary digitally signs the next block. A consumer can verify the signatures to verify chain of ownership. For every transaction a time stamp is attached. This time stamp cannot be changed. If a beneficiary tries to enter the chain then he has to submit the proof of work i.e. the Aadhar card details and ration card number and time stamp of his transactions performed. Before adding the block in the chain, it is sent for consensus and election will be done. If the block is found to be suspicious no further blocks will be added to this block and it will be kept as dangling block. Such blocks can be easily identified and fraudulent consumers can be detected. To build a parallel chain more time is required. Similar chain can be built for shop keepers.

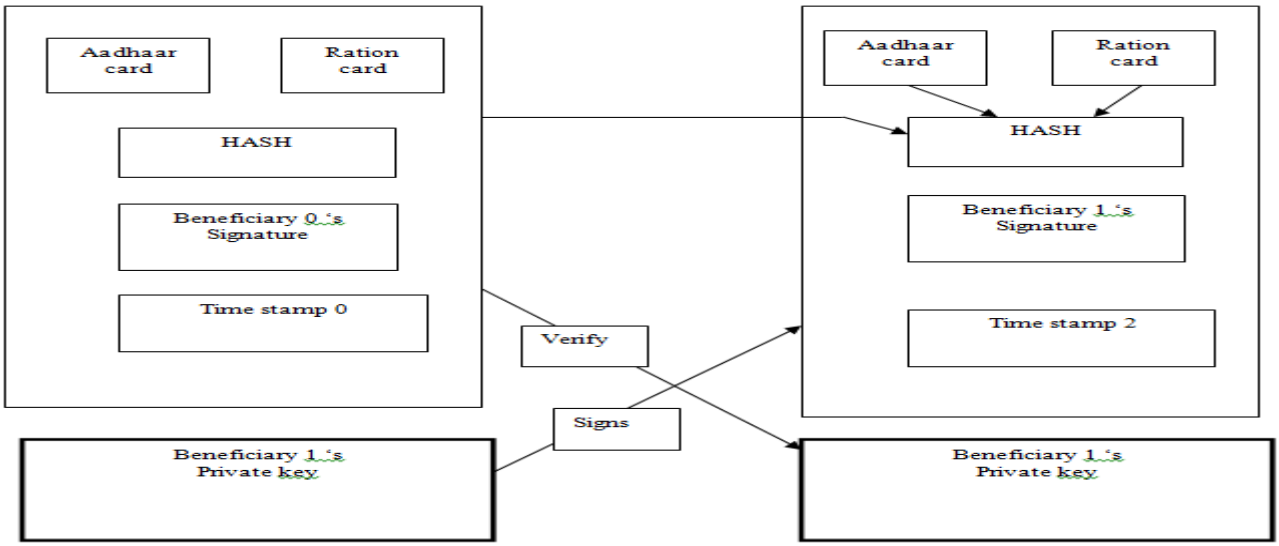

Fig 2. Proposed Block Structure

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IV. FORMATION OF BLOCK CHAIN FOR PDS.

PDS Node Creation steps

The Central Government of India distributes food grains or other items to all the Public distribution system (i.e. Go downs or other storage units). We introduce block for each district. As shown in the fig 3.

It Contains list of all the nodes of all the FPS shops under its control. Each FPS has block chain of its beneficiary.

In PDS we create a node with a hash. A node will be create using a hash function of district id, the number of nodes for this block chain will be constant as the number of districts under a state cannot be changed. During the creation of node, a central government authority digitally signs the node. The signature contains the time stamp. Once node is created for a district it cannot be deleted.\

Each node is linked to node of next district.

Once all the nodes of all the districts are added no question

.arises of adding a node in chain of the same district name.

Also, possibility of parallel chain can be eliminated.

Each block is linked with all the Fare distribution shops under its jurisdiction. This chain can be altered or changed with permission of its parent block, by using the consensus algorithm. This block stores all the transactions performed with consumers. It contains a block chain of the consumers or the beneficiaries. The nodes of the chain can be added by using the consensus algorithm.

As discussed above

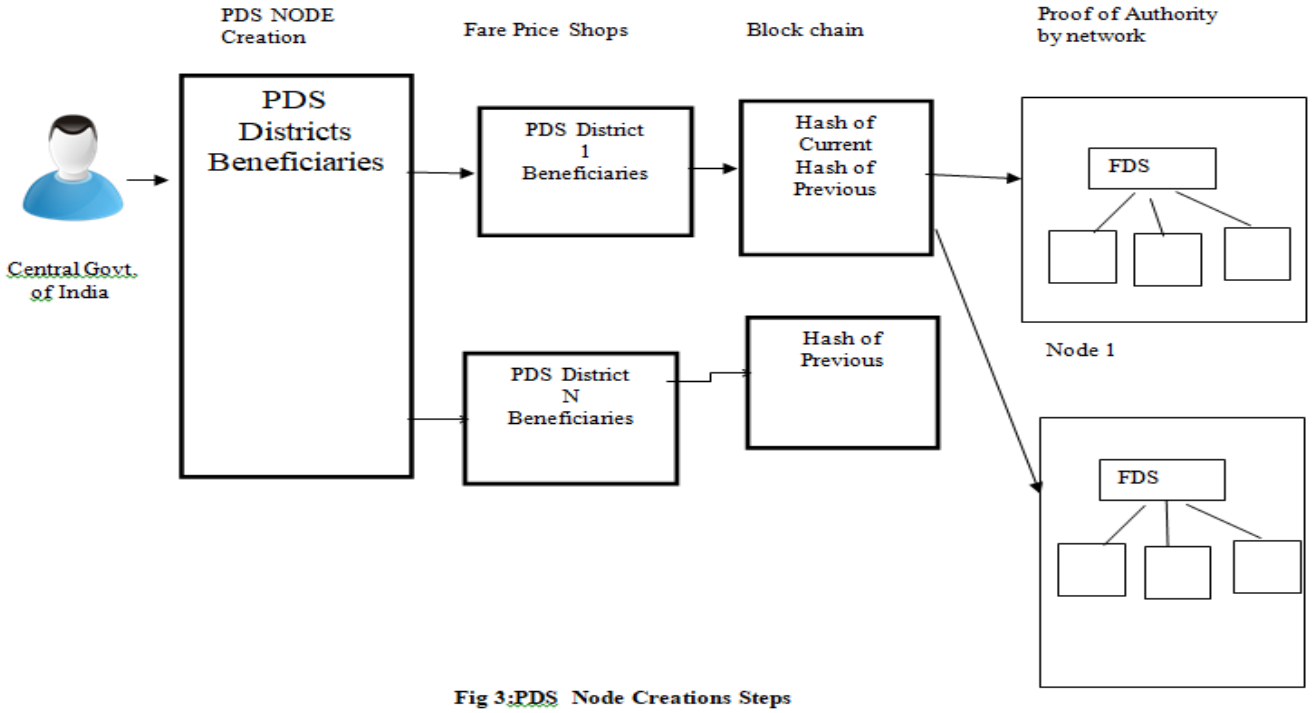

Fig 3:PDS Node Creations Steps

V. INTEGRATING THE BLOCK CHAIN IN EPOS.

In this section we integrate our block chain in the existing ePOS. Initially the ePOS calls for Authentication of the beneficiaries it will then retrieve the block from the PDS node (fig 4). This PDS node will restive the credentials digitally signed by the beneficiaries. It then returns permission of its parent block, by using the consensus algorithm. This block stores all the back to corresponding block chain of the PDS System. The Block chain node contains list of Authorities, district id, and list of beneficiaries.

Here we are decentralizing the beneficiary from the centralized public centralized system. Each node maintains demand of food grains or other items. Whenever a beneficiary receives food grain its transaction is saved in the block with a time stamp. When a authority tries to create a record or a block in the system he needs to add a Aadhar card and ration card in the system. When a same Aadhar

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card no is entered the ration card no should also be the same. If this happens the hash function will be the same hence there will be duplication. If Aadhar card number and ration card are different a different block will be generated which will indicate presence of new beneficiary. Also, each beneficiary has to digitally sign when a block is created. Hence a fraud or scam can be avoided.

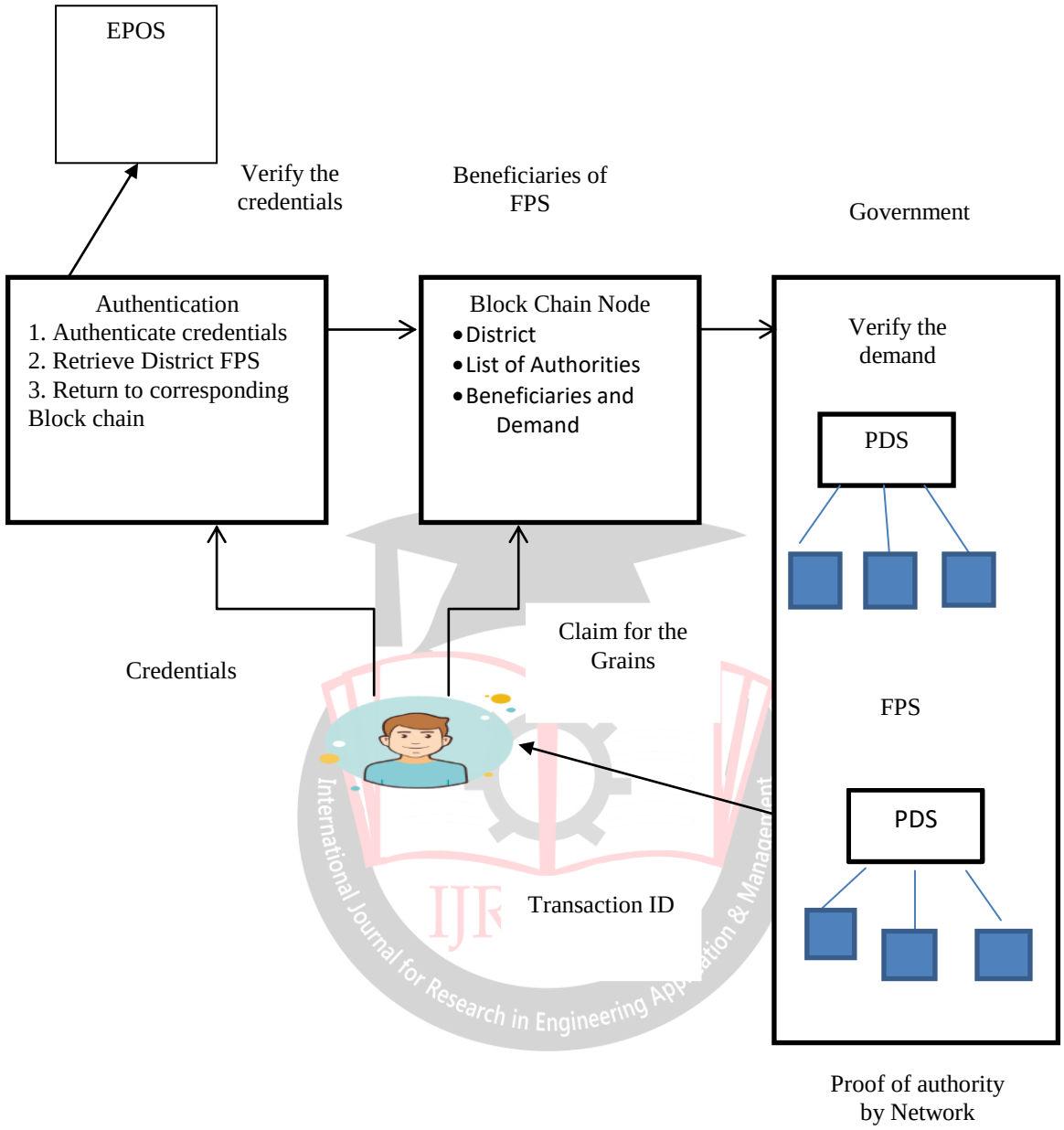

Fig 4: Integrating the block chain in ePOS.

The Central government Authorities has to full fill the demands raised by the beneficiaries. The block chain of FPS is responsible for forwarding the demands of Beneficiaries to the central government of India. The demand is raised by the beneficiaries at the FPS shop. This demand is verified by the authorities of Governmnet of India. If the food stock is available the demand is full filled by the central government. A transaction ID is maintained by the central government of India. A time stamp is maintained for this transaction and the transaction is saved in the system for further auditing.

VI. AUDITING

To ensure that all the beneficiaries get the required quantity of food grain or other items in PDS, an auditing has to be formed by the government authorities. It provides a way of accountability for all the FPS and other distribution centers.

When government supplies food or other items to the go down of all the district authorities we keep a copy of that transaction in the system along with its time stamp.

Similarly, a transaction is saved in each node of the PDS block. Once a transaction is committed it cannot be rolled back. A report can be generated by the authorities timely. The FPS is responsible for distributing the food grains to the beneficiaries depending on their entitlement. Here we maintain block chain of the beneficiaries. Again, a record of the transaction with all the beneficiaries is maintained at the

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FPS end. Here all the records food grain received by the government and distributed by the shopkeeper are maintained in the ePOS.

The Auditors can verify all the records FPS wise or district wise or item wise by logging in the system using single sign on. This will reduce the burden of account handling on the auditors.

VII. Conclusion

In this work we have proposed an approach to overcome the fraud or errors in public distribution system (PDS) using block chain. We have introduced two chains one at District level and another at FPS level. We try to integrate these two levels in exiting epos. Using a hash of ration card and Aadhar card duplication of blocks is eliminated hence a fraud can be avoided. Using this approach auditing of records becomes very easy.

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