

Blockchain Based Loyalty Platform

Manjunatha M S, S Usha, Chaya Bhat C, Manu R, Kavya S

Abstract: Attracting customers towards business has been a challenging area today and also it has been a tough task to have continuous engagement with customers towards their business using traditional marketing strategies. The main aim of our project is to provide a block chain based loyalty platform to have continuous engagement with the customer and a business to transact for the services offered by the brands and stores through smart ads. This concept is mainly drawing the attention of the customer, so they are attracted towards the products and will make them to buy from the stores or brands. Advertisements are the key attraction which includes Pop Ads, Store Ads and Brand Ads. So here we are providing loyalty points for the users who make purchases through these smart ads and these loyalty points can be used in other platforms which are registered under this network.

Index Terms: Block chain, Smart ads, Loyalty program

I. INTRODUCTION

The main motto of the project is to have continuous relationship with customers and keep them engage to the network. In the new era of very quickly growing industrial technological advances, block chain confirms to be another leading-edge invention.

By implementing this technology, market could heighten the customer action with secure and quick absolution from different merchants. Therefore, industries could attract the customers via this technology for continuous rewards from every purchase of items.

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Loyalty program contains many asset transactions between different participants like admin to brand, brand to store and store to consumers and consumers to stores. There are some drawbacks which make the loyalty program or points useless like the rewards gained in one platform cannot be used in other platforms and can't be shared to others. This paper provides a solution for these problems as block chain based loyalty platform is proposed.

Block chain is a decentralized, distributed database platform which is accessed digitally and publicly for the administration of huge transactional info[2]. Different fields of the economy, along with but are not defined to healthcare, manufacturing, consulting, technology, and accounting, could make use of block chain for a variety of commercial transactions and documentation purposes. Apart from the relatively new invention of

block chain technologies, its reorganizing capacity to modify the habits of industries and customers universally is extraordinary. Block chain provides a secured and private platform and also ensures data integrity for the users as well.

In this paper we propose block chain based loyalty platform. Regular rewards like punch cards, tiered, fee-based, cash backs are replaced by loyalty points. We focus to keep track of transactions in the block chain system to provide flexibility of the data. The rest of this paper is systematized as follows. Section II, we describes the details of the loyalty programs to the customers and block chain technology pertaining to it. In section III, we describe about the hyper ledger fabric framework and key words defined in it. In section IV, we define the technical flow of the system and the methodology. Section V, we wind up the paper with the future works of the project.

II. RELATED WORKS

A. Block chain

Block chain technology is a new technology that unifies decentralization, timestamp, asymmetric encryption, distributed computation, consensus algorithm[1]. The main intention is to establish block chain distributed consensus in the digital modern era. The concept of block chain is very much comparable to that of a linked list, where single

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entry is linked to the next one by means of a pointer. Although the two structures above are conceptually the same, their application differs in several major forms. Block chain subsists of blocks by including earlier block hash value. It provides unchangeable data in a persistent manner. Hence, transactions between substances can be stored regularly without faults. While keeping unchangeable and shared data on the network, members of the network which are called nodes do not need to believe each other. Consensus protocol can be defined as the rules for the validations of the transaction. In order to decide the validity of the transaction, nodes apply consensus protocol for the transaction. It serves a trustless environment so trust is achieved as a aspect that derives from the interaction of various members in the system [6]. When the system discovers the applicable block and attaches to the chain, it shares the last block with the network. Therefore, nodes can start to find the next appropriate block along with the new transactions. Block chain basically consists of blocks and transactions. The first block of the block chain is the 'Genesis block' which does not have parent block [7]. Every block includes a hash of the timestamp, previous block, transactions, and root hash in the header and nonce value in the body. The block header consists of the hash of the prior block to keep blocks in a linked form. Further, having the prior block's hash in the block header provides unchangeable of the data because, changing in one of the blocks in the chain will cause changes in all subsequent blocks. A digital record which controls the present time of occurrence of a appropriate event is called as Timestamp. Timestamps are essential for simultaneity of blocks because they are cited at the creation time of the blocks. Every transaction is processed only once, this is assured by the counter called Nonce[8].

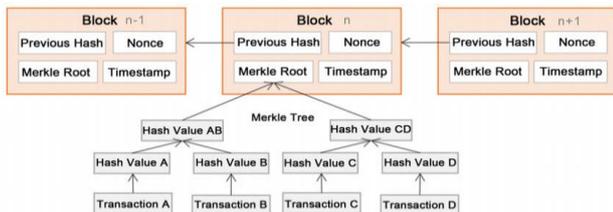


Fig 1: Structure of Block Chain

1. Consensus

There are various consensus protocols few of them are, proof-of-work, proof-of-stake, Practical Byzantine Fault Tolerance, Delegated Byzantine Fault Tolerance, Unique Node Lists, Tangaroa [6]. But, we will only explain the most commonly used two among listed.

a) Proof-Of-Work:

This is the first consensus protocol taken up here, the user will be rewarded in block chain system if the user finds the next block of the chain. Hence, the computational calculations are required in order to find the next block; these are carried out by users who are called miners. This provides a community which supports block chain system continuously. The block which has found will be shared among all the nodes in the network; they have to verify the correctness by examining the calculations of hash. The nodes will append the block into the block chain only if

they found block is determined as a valid block. In order to overcome the faults, attacks on the network, bit coin system relay on the proof-of-work protocol[10]. Energy consumption is the biggest disadvantage of the proof-of-work. As it needs extreme computational estimations to find the appropriate block, electricity usage is a critical problem.

b) Proof-Of-Stake:

Block chain structure that uses proof-of-stake; make a randomized selection for the leader who will be responsible for the next block which will be appended to the chain of blocks. The miner gets rewarded, as comparative to the proof-of-work if the miner finds the next block. The users are been selected who have an amount of crypto currency of the system. If a particular user has more amount of crypto currency, that user is preferred the most. Even though proof-of-stake partly resolves the energy consumption problem of the proof-of-work, new problems occur which are not exist in the proof-of-work protocol. For example, the electoral process can be affected by the malicious parties in their selection process. The rewards earned and spending of their money becomes easier for them due to this [11].

2. Transactions

The history of records in block chain is termed as Transaction. Initially, the sender creates the record and it will be shared in the network. Once the record has been added to the block chain it cannot be modified. The transactions in the block chain has made easier for asset transactions. Every transaction has an id, sent asset's id, sender's address, and receiver's address

3. Security Aspects

In general, consensus algorithms assures the trustworthiness of a block chain. However, there are chances where malicious users can drag the block chain structure to modify or corrupt the blocks. An attacker can hack the network if he posses more than 50% of the nodes in the network. This attack is called as the 51% attack, this aims to check consensus mechanism to manipulate a block chain. These attacks have been shown to be productive against many negligible crypto-currencies such as Verge, Bit coin Gold and Zen cash – however, they have as well threatened even widespread crypto-currencies such as Bit coin. Double-spending, which consists in the copy of one or more transactions, is the main intention of 51% attacks.

However, it has been shown that double-spending can be accomplished even without imminent to 50% threshold. To reduce 51% attacks, more block chain-based systems are adopting better security strategies. The real-time validators can increase the attack threshold to 99 % or the attacker have the control on block chain if has access to all nodes in network. The other way to achieve this is to use PoS consensus mechanisms where the importance given to the ownership of coins (rather than of computational power) makes the 51% attack unsuccessful for the attacker.

B .Loyalty Program

Loyalty program or points or rewards program. They are offered by airlines, grocery, stores, gas station ,hotels, car rental agencies, restaurant, coffee shops, book stores and so on[3].The success of the program lies in providing customers with specific rewards. The main motto of this program is to have continuous engagement with the customer. Loyalty program has gained popularity among various organizations; the problem appears that supermarket chain loyalty programs are not successfully creating

loyalty.Customer's loyalty is a customer's attachment to a brand, store, manufacturer, service provider or other entity based on favorable attitudes and behavioral responses such as repeat purchase [4]. Customer loyalty is very essential to the organization in order to retain its current customers. It is because customer's loyalty can serve several benefits to the organization.

Loyal customers are less price-sensitive, reduce marketing expenditures for attracting new customers and improved organizational profitability [5]. In relation to that, 95 percent of profit came from the repurchasing behavior in between the loyal customers [6]. Besides that, loyal customer serves as a "fantastic marketing force" by providing recommendations and spreading positive word of mouth [7,8]. Moreover, a loyal customer cost less to serve, in part because they know the products and require less information [8]. Therefore, loyal customers not only require less information, the customers also serve as an data source for other customers [8]. Loyal customer told their friends and families about their positive experienced and in the future, they will help to create new businesses and continuously increase revenue for the organization [9]. However, loyal customers can also be very fatal and difficult to be maintained by the organization as soon as they were able to gain access to the information and compared the products and services offered by the organization with other competitors [10].

C. Hyperledger Fabric Framework

Hyper ledger Fabric is a software or it's a project under the Linux foundation such as Node Js,Drone code etc.It is software where one can use to create one's own personalized block chain services. It is a open sourced community where the ledger will be created between the providers and consumer. Only to the particular nodes the data will be transmitted hence highly secured.

Hyper ledger supports/promotes the business block chain technology, distributed ledger, client libraries, smart contract, and utility libraries. Prevention of a crypto currency reduces some significant risk/attack vectors, and absence of cryptographic mining operations means that the platform can be redistributed with roughly the similar operational cost as any other shared system. Few key concepts are described below:

1. Node

Device in a block chain network,i.e. the foundation of technology allowing it to function& services. node can be any active device i.e. computer, phone or even printer as long as it is connected to IP address.

2. Peer

These will host ledgers and smart contract as they are considered as the fundamental element.

3. Network:

Computers, mainframes, servers, devices connected to all allocation of data, peripherals and network devices are collectively called as Network.

4. Ledger

Ledger is the principal book or computer file for documenting and adding up economic transaction calculated in terms of financial unit of account by account type with debits and credits in separate columns and beginning monetary balance and ending monetary balance for each account. Ledger is a tamper-resistant, sequenced record of every state transition. State transition is product of chain code transaction.

5. State database

The latest value of the each and every key which are ever presented in the chain transactions log, in termed as a ledger's current state database.

6.Channel

Channels partition and isolate peers and ledger data to provide private and confidential transaction on the block chain network.

7. Consensus algorithm

It is an agreement on a single data value among distributed processor or system.

8. Smart-Contracts

Referred as a computer protocol designed to digitally promote, authenticate or accomplish agreement of the achievement of the contract.

9.Entry System

a) Single Entry: It records only one side of every transaction, this happens because there is only one entry to record every transaction. This do not use any nominal or real accounts.

b) Double Entry: In double entry book keeping system there are two sides to every transaction.

10.HyperLedger Composer

It is tool used to implement hyper ledger fabric. Enables smarting of business network including participants, assets & transactions. Generate the model and rest api allows the quick integration.

III.METHODOLOGY

The proposed system mainly consists of two modules:

A. Smart Ads

B. Loyalty Points

A. Smart Ads

This includes the advertisements which are provided to retailers so that they can attract the customers. The products are showcased well in front of customers to improve the business. This concept is mainly drawing the attention of the customer, so that they are attracted towards the product and will to buy from the stores. Advertisements are the key attraction which includes Pop Ads, Store Ads, and Brand Ads.

This includes sub modules:

▪ Brand

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- Store
- Customer
- Admin

The Users like Admin, Brand, Stores who have registered to the network (Loyalty Platform) will have a web application to post their Ads and to send the loyalty points.

Role of Admin: As an admin, one can add the brands and stores and can monitor all the brands and stores and the ads posted by them and can get the statistics of all the brands and stores. The main role of the admin is to generate the loyalty points and distribute over the network.

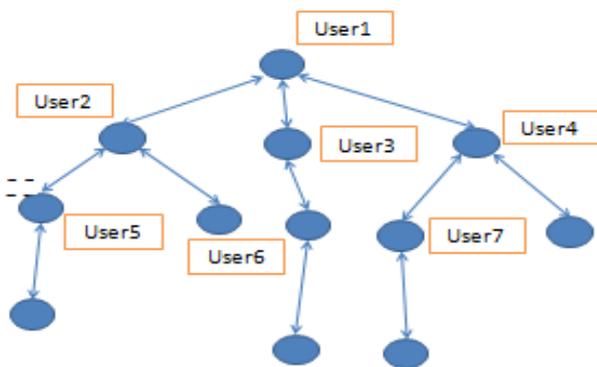
Role of Brand: A brand can register himself to the network and has power to add the stores where his brand is available. Also brand can post brand Ad which can be visible by all the stores and customers in the network. Also able to add campaigns in which the particular ad belong to. Brand can send the points to the stores and the customers who buys the product through the ads posted by the brands.

Role of Store: Store is the module which directly deals with the customers who visits to buy the products to respective stores available. Store also provides the loyalty points to the customers and also receives points when customer redeems his points. Store can post pop Ads(Instant ads) to clear his stocks.

The main user also called as end user i.e. the customers will have a mobile application through which one can register to network and get the services. Once the customer gets registered successfully he/she will be able to see the ads posted by the brands and stores. Customer's current location is fetched using geo-fencing. Later, nearby stores are displayed based on the customers location.

Various options provided for customers:

1. Ripple Effect: Ripple effect is the effect which continues and spread results of an event and action. Here action refers to the percentage of points distributed all over the stream. The person who advertises will be benefited by the points throughout the network. When the user shares an Ad to his friend 1 later if the same Ad is shared to friend 2 by friend 1 all three will get the reward points. Similarly it continues until a certain level which depends on the Ads posted by the brand/store.



Ripple Effect

Fig 2:Flow of Ripple effect

2. Earn and Redeem loyalty points: One can earn points by purchasing product through the smart ads. She/he receives points from brand or store and can redeem points in any stores and can buy the products with more discounts and offers. Also will be able send or request points with his friends.

3. User Choice Ads: Customer can get the ads based on his interests, categories and campaigns. Can view pop ads added by the nearby stores.

4. Save Ads and Save Stores: Customer can save his favorite ads and stores to keep in reminder and buy later.

B. Loyalty Points

The points are not platform specific, the coins earned in one platform can be used in any platform within the network. The network will be created using block chain within which the transactions can be carried out, which includes the transfer of coins in any platform.

These loyalty points are handled by block chain using Hyper-Ledger Framework. The smart contract or the chain code contains many assets and participants and transaction between participants. Asset is the wallet for each users and participants are brands, stores, customers respectively.

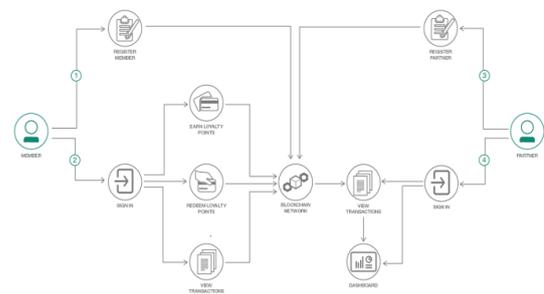


Fig:3 Architecture Flow of Loyalty Points in Block chain Network

The above figure is the architecture flow of loyalty points in block chain network where we have a wallet for customers who can earn points and redeem points which are saved in block chain network. Admin can view the transactions done by the customers and keep track on truncations made by the customers and users.

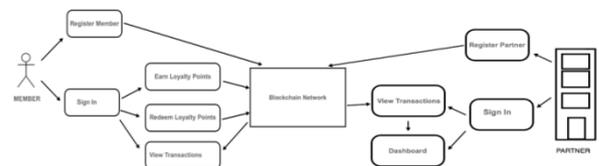


Fig: 4 Class Diagram of Loyalty Points in Block chain Network

Implementation of block chain can drive the customer experience to the next level in

- Reducing the cost
- Enabling a frictionless system
- Providing a secure environment

- Creating unique business opportunities

C.Consumer Benefits:

- Personalized real-time offers.
- Gamified engagement with retail stores.
- Discovery of products similar to user choices.
- Share offers and earn.
- Loyalty points.

D.Retailer Benefits:

- Know customer preferences and personalize offers.
- Real-time engagement with nearby customer with push of offers for instant gratification.
- Higher ROI and conversion rate.

IV.CONCLUSION

Here, in this paper we determined the drawbacks faced in traditional customer loyalty programs in marketing companies. We Proposed Block Chain Based Loyalty Platform which modernize the transaction process between various participants in the market like brands, stores and customers. It will change the tradition coupon and cash backs system with common mobile wallet where user can store their reward points. Hence it increases the usage of this application in the market.

We have planned the proposed system to implement it globally in the world and to increase the work of the application in detail of transaction process time.

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