

Research on integrated traffic-sharing platforms based on blockchain

Abstract: [Research purpose] Starting from the catering industry, using the decentralized characteristics of blockchain technology, to research the integrated traffic sharing platform, to provide a guarantee for the actions of improving customer loyalty, preserving and obtaining customer traffic. [Research content] Build a self-driving shared traffic distribution system with the help of blockchain technology, reduce the risk of credit over-issuance, and establish an efficient and safe benefit protection mechanism through smart contracts. [Research conclusion] The introduction of blockchain technology into the construction of the integrated traffic-sharing platform can provide merchants with traffic opportunities and satisfy consumers' personalized consumption motivation. The complete system, science and technology integrated travel chain has become a brand barrier and has been the escort for the catering consumption industry.

Keywords: blockchain, smart contract, integral flow

Introduction

With the advent of the digital economy era, the big data market is growing vigorously, and blockchain technology has emerged at the right moment. The decentralized nature of blockchain provides a new way to solve the trust problem and makes it quickly become the current research hotspot. In recent years, China's blockchain projects are accelerating their implementation, such as the blockchain implementation cases of Tencent, Alibaba, Xunlei, Baidu and JD.com, the five largest blockchain companies in China. Technological innovation is the key for blockchain projects to make such great progress. Blockchain technology removes the traditional centralized control and directly connects the beginning and end of related transactions. In addition, blockchain is a chain storage structure based on time series and a time-stamped set of data. In a transaction, after an individual passes the authentication, the blockchain will completely record the whole process information of each link of the transaction. At present, the point flow sharing platform in the catering industry is still in the early stage of development, there are certain risks, and there are still deficiencies in the research results. Blockchain technology has the advantages of decentralization, tamper-resistance, high credibility and distributed storage.^[1] Based on blockchain technology, this paper builds an integral traffic-sharing platform to solve the trust and traffic problems in cooperation and help the development of the catering consumption industry.

1. Concept of blockchain

Decentralized distributed database Blockchain technology removes the traditional centralized control and directly connects the beginning and end of related transactions. Distributed data recording and storage facility for the verification and management of information of each block node. The database supported by blockchain technology has formed a decentralized distributed ledger with orderly linked data that is difficult to tamper with, forge and encrypt based on mathematical algorithms.

Timestamp Blockchain is a set of data sequences based on time series chain storage structure and stamped with time stamps. In the transaction, after the individual passes the authentication, the blockchain will completely record the whole process information of each link of the whole transaction. The authentication of any specific node will be time-stamped by the cryptographic technology based on the mathematical algorithm. The timestamp can be traced and verified at any time.

Hard to tamper with Blockchain as a data storage carrier. Asymmetric encryption based on a mathematical algorithm is adopted. Although the transaction information in the blockchain is open and public, the account information is encrypted by the private key. Blocks are advanced in strict accordance with the formal order of time stamps, which are difficult to tamper with, and are distributed and synchronized to all nodes. Each node and participant has its data sovereignty. The security of the blockchain system is also strengthened with the increase in its number of nodes.

High credibility In the blockchain system, in addition to the private information of both parties, anyone can query or develop other open basic data. Therefore, the whole information is highly transparent. The entire blockchain system does not rely on a third-party organization, and all nodes can be automatically and safely verified in the system. Improve the credit system of transactions based on services such as blockchain decentralization, data sharing and consensus mechanism.

Smart contract^[2] Smart contract refers to the execution of transactions by machine precise algorithms and intelligent automatic execution protocol. It is based on the preset, tamper-proof and trusted distributed database in the blockchain, and automatically executes the preset rules and terms by reading the consensus agreement. After the system meets certain preset

conditions, the smart contract composed of computer code will automatically trigger operation, eliminate manual intervention, and provide system operation efficiency. Write the smart contract into the blockchain in the form of code, and use the blockchain technology to realize the traceability, transparency and tamper-proof process of data storage, reading and execution. The application of smart contracts can greatly reduce the losses caused by contract fraud and reduce the costs of litigation and arbitration. The flow chart of smart contract application is shown in Figure 1.

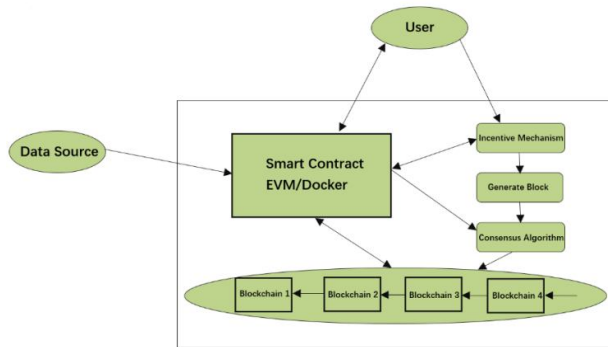


Fig.1. Application flow chart of smart contract

2. Overview of the development of blockchain

The development of blockchain can be divided into three stages: blockchain 1.0 - digital currency stage, blockchain 2.0 - financial stage, and blockchain 3.0 - social wide application stage. The keyword of the first phase is a digital currency, and the most typical representative of digital currency is Bitcoin. Blockchain originated in November 2008, and Bitcoin was officially born in January 2009. Blockchain appeared before Bitcoin. From the perspective of the combination of the two, it can be said that Bitcoin^[3] was born based on the blockchain and is a manifestation of the blockchain. Taking advantage of various features of blockchain to provide convenience for the barrier-free circulation of Bitcoin is the feature of Phase 1.0, and Bitcoin is even more popular than blockchain itself. The 2.0 stage can be simply summarized as "blockchain+programmable contract", in which the keyword of the programmable contract is "smart contract", which means that the contract can be guaranteed to be accurate and difficult to tamper with under the execution of a computer. The era of blockchain 3.0 is an era that we are gradually entering, an era in which new blockchain technologies and traditional technologies complement each other, and an era in which blockchain is combined with the real economy and real industry.

3. Problems in the development of blockchain

3.1 Catering industry it difficult to survive

Of all the industries in the country, the catering industry has the largest number. Many people think that the threshold of the catering industry is low. At the same time, the catering industry is also an industry with a high mortality rate. The closing rate is 80%, of which 83% is for takeout and the remaining 20% is not all profitable. Among these profitable storefronts, only a small half of them are struggling to make ends meet. Among these profitable storefronts, the profitability is very good and rare. According to the data in the "2023 White Paper on Chinese Catering in China" recently released jointly by Nestle and Amtrak, the total revenue of China's catering industry in the first half of 2022 was RMB2 trillion, representing a year-on-year decrease of 7.7%, and its share in the total retail sales of social consumer goods decreased to 9.5%. Since 2022, the repeated and multi-point spread of the epidemic has brought a great impact on the catering industry. In addition, factors such as employment pressure, rising costs of raw materials and logistics, and inflationary pressure have made it even more difficult for the catering industry to survive in 2022 than in 2021.

3.2 Lagging marketing concept

At present, we are in the era of big data. Although most of the catering industry has the convenience of the internet, some small and medium-sized catering industries still adhere to traditional marketing methods^[4] and struggle to survive in the cracks in the background of the big data age. In the market, most enterprises are brave to innovate marketing methods in the era of big data, among which Kentucky is a good example. It uses a "quality, service, cleanliness, value" service system in China. The use of the web to analyze consumers' big data information and promote it in various major media software has also made Kentucky the first to reach 137,000 online transactions.

3.3 Difficult data sharing and high trust crisis

Each participant in the upstream and downstream of the catering industry can only maintain their business data, and each other becomes a "data island". Credible sharing of data becomes a difficult problem, which is not conducive to maximizing the value of data. The Economist Intelligence Unit recently released its 2022 Global Food Safety Index, which uses 68 measures to assess 113 countries on affordability, availability, quality and safety, as well as a country's natural resource sustainability and resilience. Among the 113 countries assessed, Finland came first with a high score of 83.7, the United States ranked 13th, and

China ranked 25th with a comprehensive score of 74.2. In addition, frequent major food incidents have affected the public's trust in food safety and greatly affected the healthy development of China's catering industry. Each participant in the upstream and downstream of the catering industry can only maintain their business data, and each other becomes a "data island". Credible sharing of data becomes a difficult problem, which is not conducive to maximizing the value of data. The Economist Intelligence Unit recently released its 2022 Global Food Safety Index, which uses 68 measures to assess 113 countries on affordability, availability, quality and safety, as well as a country's natural resource sustainability and resilience. Among the 113 countries assessed, Finland came first with a high score of 83.7, the United States ranked 13th, and China ranked 25th with a comprehensive score of 74.2. In addition, frequent major food incidents have affected the public's trust in food safety and greatly affected the healthy development of China's catering industry.

3.4 High technical barriers and few talents

The blockchain currently lacks criteria. Secondly, although the structure of the traditional economic system has been improved under the technical optimization of decentralization, it also makes it more difficult for the regulatory authorities to control the catering subject, which may easily lead to confusion in the catering market. The combination of catering and blockchain makes the catering market more open and shared, and at the same time, it also increases the possibility of "drilling loopholes" for lawless elements. Therefore, the technology of blockchain still needs continuous improvement and optimization. For the demand-side blockchain enterprises, the gap in professional talents is still huge, and the current stock of blockchain talents still cannot meet the demand of the incremental market. At present when the blockchain is booming, it is also facing a major challenge, which is the shortage of talent. Due to the short development time of blockchain technology, colleges and universities, which are the core of personnel training, do not have many courses on blockchain. Many people rely more on self-study for their understanding and cognition of the blockchain. As a result, it is difficult for the talent supply side to meet the huge demand of the blockchain industry.

3.5 Lack of relevant laws and regulations

Blockchain technology forms a new subject structure in the industrial chain. The sharing mechanism of its construction is not very clear in the existing laws and regulations. The intelligent contract in the blockchain has the attribute of an electronic contract and cannot be tampered with. It can take the initiative to complete some set rules and terms, but the degree of automation is not high. As a result, the ability of the intelligent contract to deal with business cannot meet the demand well. If the purpose of the participant and the execution context of the intelligent contract are inconsistent, the termination or modification of the contract cannot be completed and the rights and interests of the participant cannot be guaranteed.^[5] In addition, blockchain technology can be used to hide the participants' private information anonymously or by encryption. If a person without civil capacity enters into an intelligent contract, the legal rights of the injured parties in the participants cannot be legally protected.

4. Application analysis of the blockchain in the catering industry

4.1 Coupling analysis of blockchain technology and the catering industry

Blockchain technology forms data into a chained data structure connected end to end in chronological order so that the internal data of the system cannot be tampered with or forged. Its integration with the catering industry can innovate the value chain of the catering industry and enhance the value of the catering industry. Under the empowerment of blockchain technology, it can greatly promote the development of the catering industry at a deeper level, break the barriers of information ratio between upstream and downstream enterprises, improve the openness, authenticity and sharing of information, and speed up the transmission of resources and related information in the industrial chain. And precision, so that the industrial resources have an agglomeration effect, greatly avoiding the waste of resources, realizing the maximum utilization of resources, and creating more profit margins.

4.2 Optimizing the supply chain and creating a new economic model

Blockchain technology has high transparency. In terms of product supply, it can truly and completely record all the information of the whole process from food to table. In the event of a food safety incident, the blockchain system can be used to locate the link where the problem occurred. Find the source of the problem in time to curb the spread of the problem. In addition, its decentralized nature enables the information to be fully disclosed to every consumer, so that consumers can obtain more open and transparent information and a better dining experience. Digital supply chain finance has differentiated service functions and will not mechanically provide homogeneous financing services. That is to say, digital supply chain finance not only provides financial services, but also provides lower-cost financing solutions for enterprises in the supply chain through the process of providing services, which is more flexible; digital supply chain financial participants are more diversified, Ecological inclusiveness is conducive to the innovation of supply chain models, the development of new businesses, and the enhancement of added value.

4.3 Assist in marketing operations and promote investment promotion

In the era of big data, to provide users with accurate and considerate personalized services, the platform divides users with the same data performance into one category in the huge user database, designs targeted services based on user performance, and maintains members in real time Service data, real-time updates on the implementation and implementation of marketing plans and follow-up services. Accurate delivery can be achieved by analyzing and tracking users' resources, which can reduce the marketing costs of merchants. For consumers, it is possible to track their demand for products, that is, to push similar products that have been browsed promptly, to achieve marketing benefits. For merchants, the platform only acts as an information intermediary, using simple algorithms to make Consumers and merchants conduct peer-to-peer matching transactions.

Blockchain technology tracks the data of all links of the product. If the franchisee stores the assets in the blockchain, the system will automatically transfer the assets to the brand every time the brand side completes certain support. In this way, the franchise will become smooth and secure, which will promote the orderly and rhythmic expansion of the brand and play a role in promoting the overall development of the catering industry.^[6]

4.4 Continuously improve relevant supporting technologies

Improve the quality of data collection and strengthen the training of data collection norms. Ensure the authenticity of the data. In addition, rationalize the storage of the collected data, integrate the data according to different levels and different scopes, formulate different standards, and build an open, transparent and real monitoring and management platform for data. And through the improvement of data processing and effective supervision, the deep integration of blockchain technology and the catering sales industry will be realized.

For the problem of technical incompleteness, we must first tackle key problems of its core technology, including data integration, data processing, storage scale, system communication, construction of agricultural Internet of Things, information security, application of big data technology, main body Improve key core technologies such as privacy protection. In addition, it is necessary to explore the development and change laws of blockchain technology, grasp the key points of independent innovation, and promote the advancement of core technologies. Construct the Internet of Things and big data platform to completely collect catering data and information, and provide comprehensive data information support for the sustainable development of the catering industry chain.

5. Blockchain integral flow platform construction

This product is based on blockchain technology to solve the trust problem in cooperation and can be a diverted points exchange system platform^[7]. In the process of consumption, the system of points and coupons is more to solve the problem of customer loyalty. The product uses blockchain technology to build a point storage and diversion system. The purpose is to speed up the traffic speed and realize the sharing and exchange of traffic.

The shopping centre issues diversion points to Merchant A and Merchant B, in which the corresponding number of points can be exchanged for coupons, and the coupons can be used to offset part or all of the merchandise amount in the purchased merchandise. The platform acts as a medium to exchange the points in Merchant A and Merchant B to achieve traffic drainage. Assuming that customer A gets points for consumption in merchant A when the customer goes to merchant B to consume, the points obtained in merchant A can be used to exchange coupons for corresponding products in merchant B to offset part of the consumption amount.^[8] The panorama of the core business of the platform is shown in Figure 2 .

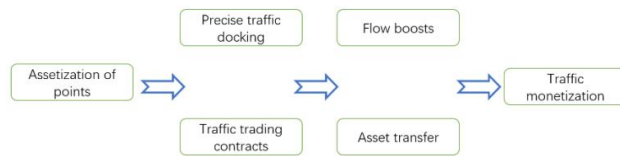


Fig.2. A panoramic view of the platform's core business

5.1 Platform Services

5.1.1 Basic business services

We take high-quality, systematic, comprehensive and convenient business services as the foundation of product development, and "customer-centric" as the business service concept to provide high-quality basic services for service providers and consumers.

Basic business services include pre-sales (understanding the entry process, points usage rules, customized planning of service packages), sales (providing service packages according to customer needs, feedback on sales status), after-sales service (points processing after returns and exchanges during transactions, insurance business Wait for follow-up).

5.1.2 Basic technical services

We aim to create a first-class service enterprise with advanced technology, standardize management, strictly control the process, ensure service quality, improve customer satisfaction as the policy, adhere to the principle of customer first, build a good sales service system, In case of any technical problems, we will provide professional services.

5.1.3 Big Data Personalized Services

In the era of big data, to provide users with accurate and considerate personalized services, the platform divides users with the same data performance into one category in the huge user database, designs targeted services based on user performance, and maintains members in real time Service data, real-time updates on the implementation and implementation of marketing plans and follow-up services. To maintain a good platform experience for platform users, users can independently choose whether to enjoy big data personalized services according to their own needs.

5.1.4 24-hour manual service

We provide 24-hour manual service for consumers and service providers to provide questions and answers and solutions. For the sales process and points, and for the special needs of service providers, we will send special technical consultants to visit and provide professional answers.

5.1.5 Token Coordination Service

To realize the complementarity of business ecology and the connection between traffic pools, the platform acts as a medium to coordinate with different companies, and exchange points between the two parties through free transfer, transaction, use or exchange at a certain rate so that The traffic is moving to achieve a win-win effect for both parties.

5.1.6 Privacy and Confidentiality Services

To provide consumers with more complete and high-quality products and services, we may share some of your personal information with partners to provide better customer service and user experience. We will only share consumers' personal information for legal, legitimate, necessary, specific, and clear purposes, and will only share personal information necessary to provide services. We will conduct security assessment and processing on the output form, circulation and use of information data to protect data security. At the same time, we will strictly supervise and manage our partners. Once we find that they have violated the rules of handling personal information, we will immediately stop cooperation and pursue their legal responsibilities.

5.2 Product Services

5.2.1 Points Pass

Many companies currently use points to bind customers, measure user contributions with points and return some of the economic benefits to customers through points, but there are several problems inherent in the current points mechanism. Firstly, these points can only be restricted for use within the enterprise platform and cannot be freely transferred, traded or used by users, which causes significant inconvenience to users. Secondly, companies can add and cancel points at will, and users do not have a high level of credit recognition for points. Thirdly, points can only be used for re-consumption and cannot be stored for value. Fourthly, with the development of the enterprise, the value of the enterprise will show exponential growth, and the user's points cannot add value because they cannot store value, and cannot share the value growth of the enterprise. Fifthly, points are a liability asset for the company and need to be accrued and written off, which can be a burden to the company's operations.

This product uses the passwords in blockchain technology to solve the problems faced by the current points system by designing a password circulation and trading model to create a new type of points model with fair distribution of benefits between customers and enterprises. A pass is a cryptographic digital proof of interest circulating on the blockchain that can generate greater value through circulation and exchange while having the consensus mechanisms of blockchain technology such as trustworthiness, traceability, tamper-proof and limited issuance.

5.2.2 Advertising platforms

The platform system has launched an advertising program, where advertisers provide high-quality ads. The platform's advertisements precisely display the advertiser's marketing plan in front of the precise users through their personalised tags, keywords and user profiles. The platform digs deep into the characteristics of consumer behaviour according to the main body of the advertising audience, reaching the target users with precision, and achieving targeted conversions while exposing to attract users' attention. It helps advertisers to achieve brand differentiation, quickly establish their brands and increase their visibility.

5.2.3 Product Service Advantages

The adoption of the new NDC standard promotion eliminates the disadvantages of centralisation of GDS in distribution, reduces unnecessary consumption caused by serious product homogenisation and over-reliance on price competition, optimises the excessively long industry chain and guarantees new vitality in the distribution in the post-epidemic era. As times change, consumers need to be offered a wider choice of freely combinable, personalised products with comparative advantages to meet special or potential service needs. The traditional food and beverage sales service offerings are no longer sufficient to meet current market needs.

Offering dynamically packaged "differentiated/personalised" products and services directly to the consumer, all products can be monitored and dynamically adjusted in real-time across all sales channels including GDS, OTAs, sales agents, websites and apps.

Using blockchain technology, all sales transactions can be traced, while safeguarding user privacy, eliminating middlemen and avoiding unnecessary loss of profit due to price competition, all transactions are settled with points and finally settled to different accounts according to user attributes, and based on the points settlement guide, a transaction leaderboard is displayed so that consumers can choose their suitable service package according to the transaction list in their region. This improves the service experience, increases revenue, enhances service provider brand loyalty and reshapes the restaurant sales system.

5.3 Blockchain technology application points

After the design task is started, the design procedures of each profession are opened and the object information starts to be entered in a phased manner, to ensure that the information entry of new projects can be carried out smoothly.

Step 1: Build the blockchain architecture, enter the target information data and establish the inflow storage structure, block storage structure and transaction storage structure.

Step 2: Use consensus algorithm to build automatic settlement architecture and data architecture, including transaction data structure in the block, merchant agreement data structure, transaction type data structure, settlement algorithm data structure,

data management and design application.

Step 3: Downstream applications such as results output and display; merchant and user information import testing, application optimisation design, and completion of infusion points system setting.^[9] The project information model workflow is shown in Figure 3.

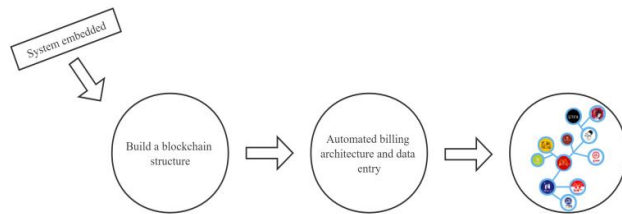


Fig.3. Project Information Model Workflow Diagram

5.3.1 Technical structure

The points flow sharing platform uses the latest generation of smart contracts to be able to reshape the sales system of the restaurant and food consumption industry. The protection and support of financial and transaction payment type data security is the primary consideration of the team. About the existing architectural design of more well-known blockchains such as Ether, EOS, Super Ledger, MOAC, etc., combined with the current actual scenario, a series of new features are incorporated to complete the construction of the travel chain platform.

5.3.2 Consensus algorithms

The consensus mechanism^[10] is a core issue of the travel chain platform technology, which determines the law of block generation in the blockchain and ensures the honesty of each node, the fault tolerance of the ledger and the robustness of the system.

Based on the drawbacks and development bottlenecks of the current blockchain technology, the team combined the advantages of blockchain technology, based on POW proof of work, and drew on the consensus algorithm based on DPOS-POR (Proof of Requests), which was developed based on POW and POS to solve the high energy consumption of POW and to avoid the possible "scales of trust" bias under POS equity distribution. "The DPOS consensus algorithm is based on POW and POS. The addition of the DPOS consensus algorithm sacrifices a bit of decentralisation, but further strengthens the reliability of the consensus and in return improves the performance by several orders of magnitude.

Disputes may arise between service providers and consumers during transactions, and when this happens, in a centralised platform, the platform often acts as a coordinator and arbitrator, but both parties may feel that the arbitration is unfair. A dispute resolution system designed by the system based on the Proof of Entitlement mechanism (DPOS) is a good solution to such problems. For example, first, at the service registration stage, the service provider can specify the amount of margin it is willing to pay and the amount of margin it requires from the consumer. Once the transaction begins, the transaction funds, as well as the deposit and the included points, are locked in a designated blockchain wallet. And Travelchain has adopted the idea of the DPOS Proof of Entitlement mechanism to design its dispute resolution system because DPOS is the fastest, most efficient, distributed and most flexible consensus model available. All network parameters, from rate plans to block spacing and transaction sizes, can be adjusted by elected representatives. Most importantly, the consensus protocol protects all participants from unnecessary regulatory interference.

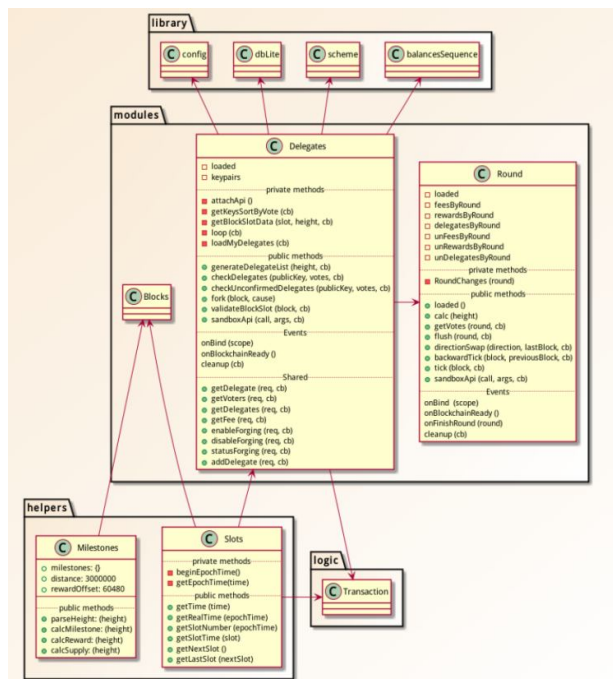


Fig.4. DPOS mechanism related class diagram and its relationship

5.3.3 Automated Settlement Architecture

How to settle accounts between cooperative merchants is an important problem to be solved in the decentralized transaction system between shopping centers and merchants. To solve this problem, this paper proposes an automatic settlement algorithm. On the premise of protecting merchant privacy data, homomorphic encryption mechanism is introduced. The platform first draws up a cooperation agreement with the merchant. For the transaction that completes the diversion, the system will settle the encrypted data according to the agreement and send it directly to the merchant account. As shown in the figure below, it is an automatic settlement algorithm model. The model is mainly divided into four parts, namely transaction storage, merchant agreement storage, transaction type and matching settlement algorithm.

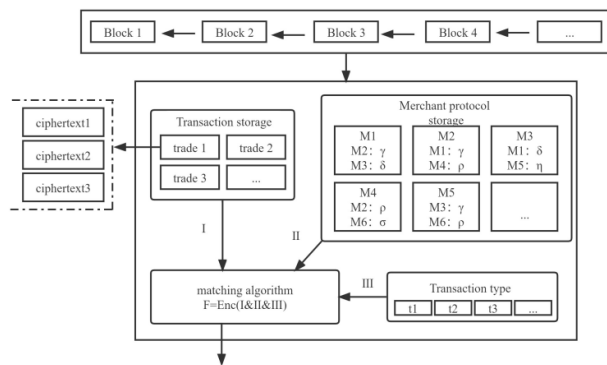


Fig.5. Automatic settlement process

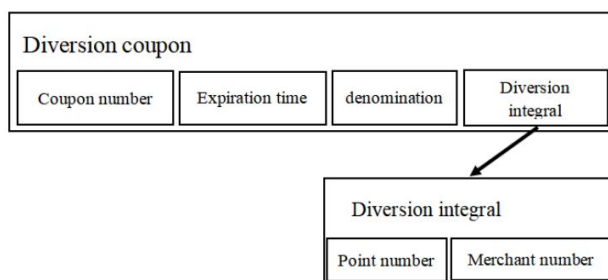


Fig.6. Coupon structure chart

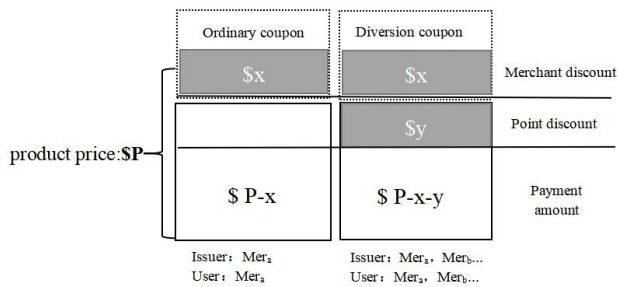


Fig.7. Coupon composition chart

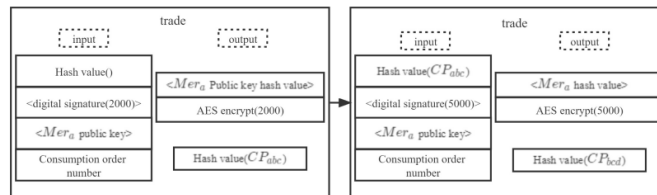


Fig.8. Coupon circulation process diagram

5.3.4 Encryption mechanisms

Cryptographic mechanisms are indispensable algorithms in decentralized systems to improve the privacy of information between the two parties of a transaction. Yuan Yong proposes cryptography for asymmetric encryption integrated into the blockchain to meet security requirements and ownership verification needs. Encryption algorithms can be divided into two types, one is a symmetric encryption algorithm and the other is an asymmetric encryption algorithm.

One part of the transaction content between the customer and the merchant is the transfer of points-coupons and the other part is the private information of the merchant itself, e.g. information about the customer, and information about the products traded. The former is the transfer of digital assets, using digital signatures and asymmetric encryption in the form of data maintained by both parties to the transaction to ensure the security of the data remains unchanged. The latter is the transfer of the merchant's private data, which will be encrypted using symmetric encryption, with the key held by the merchant itself to prevent data leakage due to the loss of the key.

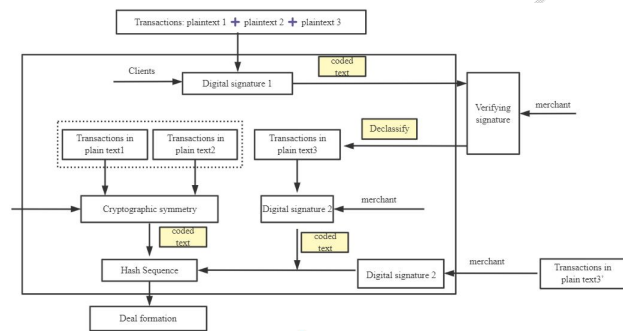


Fig.9. Cryptographic protocol

6. Conclusion and prospect

With the development of Internet information technology, blockchain technology is steadily moving towards the 3.0 era. As a promising technology, blockchain has emerged as a new digital economy model characterized by decentralization. At present, various platform models are constantly innovating. We should make full use of the value-added role of Internet information technology in the catering industry chain and apply blockchain technology to the catering industry. Blockchain technology promotes decentralization, builds trust mechanisms, realizes data value, and strengthens property rights protection. Relevant technical personnel should strive to improve the top-level design, and then help the innovative development of the catering industry, increase R&D investment to seize the opportunity of industrial innovation and development, innovate regulatory technology to ensure the safe development of the catering industry, strengthen talent training to solve the talent shortage in the catering industry, and use the traceability of the blockchain Features and functions such as tamper-resistance and smart contract, realize the traceability of the whole industrial chain of catering product production, and create an influential catering brand. Of course, overcoming the difficulties in the application of blockchain technology will probably accelerate the expansion and development of high-quality catering brands.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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