A Connection Access Mechanism of Distributed Network based on Block Chain

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***Abstract*—Cross-border payment optimization technology based on block chain has become a hot spot in the industry. The traditional method mainly includes the block feature detection method, the fuzzy access method, the adaptive scheduling method, which perform related feature extraction and quantitative regression analysis on the collected distributed network connection access data, and combine the fuzzy clustering method to optimize the data access design, and realize the group detection and identification of data in the block chain. However, the traditional method has a large computational overhead for distributed network connection access, and the packet detection capability is not good. This paper constructs a statistical sequence model of adaptive connection access data to extract the descriptive statistical features of the distributed network block chain adaptive connection access data similarity. The performance of the strategy retrieval efficiency in the experiment is tested based on the strategy management method. The experiment performs matching query tests on the test sets of different query sizes. The different parameters for error rate and search delay test are set to evaluate the impact of different parameters on retrieval performance. The calculation method of single delay is the total delay or the total number of matches. The optimization effect is mainly measured by the retrieval delay of the strategy in the strategy management contract; the smaller the delay, the higher the execution efficiency, and the better the retrieval optimization effect.**

***Keywords*—block chain, big data, internet finance, distributed network, connection access**

I. INTRODUCTION

It is of great significance to study the optimization strategy of distributed network about connection access mechanism, which promotes the information management of the optimization of block chain structure [1]. The related strategy has received great attention. As a universal technical framework for solving trust problems, block chain will be extended to more new application areas, and it will certainly produce more fruitful research results in the future.

The block chain provides new ideas for solving industry problems. Its unique data security features provide new solutions for researchers to solve cross-border communications, ensure cross-border payment security, accuracy, efficiency, and reduce transaction costs. The approach has led to a high degree of attention from industry, academia and regulation. Cross-border payment optimization technology based on block chain has become a hot spot in the industry.

Combined with the quantitative regression analysis method, the optimized distributed network block chain is optimized and networked to improve the capability. In the traditional method, this method mainly includes the block feature detection method, the fuzzy access method, the adaptive scheduling method, etc. [3], which perform related feature extraction and quantitative regression analysis on the collected distributed network connection access data, and combine the fuzzy clustering method to optimize the data access design, and realize the group detection and identification of data in the block chain. However, the above method has a large computational overhead for distributed network connection access, and the packet detection capability is not good [4].

II. LOCK CHAIN ACCESS CONTROL ARCHITECTURE

A.Block Chain Architecture with Big Data Access Control

The block chain access control architecture involves the collection, aggregation, management, and control of big data resources. The big data access control architecture is mainly composed of the data layer, resource aggregation layer, infrastructure layer, transaction layer, consensus layer, and access control contract layer [5], as shown in Figure 1.

Each layer structure cooperates with each other and performs their own functions to form a complete big data access control architecture.

Data layer. Real big data resources are distributed and stored in different locations, and are logically managed by the resource aggregation layer[6].

Resource aggregation layer. Resource management of big data resources based on block chain technology is to achieve convergence of big data resources from different sources [7]. Although real big data resources are actually distributed by different data owners, the block chain technology logically forms a unified management of big data resources [8].The focus of the paper is on the access control mechanism, and the resource aggregation layer is not elaborated.

control policies, which include the issuance, update, and revocation of policies, and provide data support for PAP CONTRACT at the contract level. Attribute transactions are used to manage entity attributes, which include the release, update, and revocation of attributes, and provide data support for the contract layer AA CONTRACT. Contractual transactions are used to provide an operating environment for smart contracts, serving the contract layer [11-12].

Access control contract layer. The layer includes PAP CONTRACT[13], PDP CONTRACT[14], AA CONTRACT three contracts [15].PAP CONTRACT is used for access control policy management. PDP CONTRACT is used for

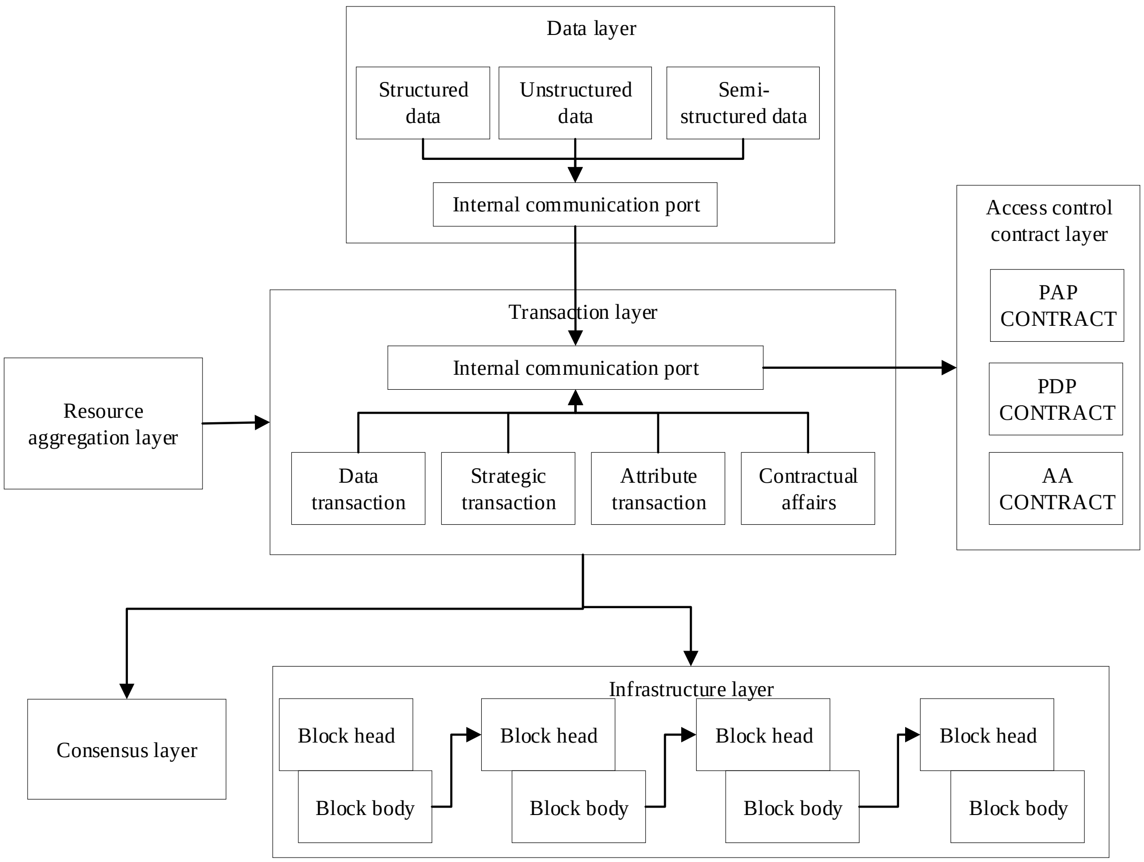


Fig. 1 Block chain access control architecture

Infrastructure layer. The block chain platform provides the infrastructure for big data access control, which is the basis of the entire architecture, and requires all network nodes and miners to maintain the normal operation of the system. Its infrastructure is also the carrier of big data access control platform transactions and smart contracts. The transaction layer, contract layer and resource aggregation layer are all upper-layer applications based on block chain [9].

Transaction layer. Its layers include data transaction, policy transaction, attribute transaction, contract transaction, four types of access control class transactions [10]. Data transactions are used to manage big data resources and serve the resource aggregation layer. Policy transactions are used to manage access

access control request decisions, AA CONTRACT is used for entity attribute management .

B.Distributed Network Access Mechanism

The block chain-based big data access control framework proposed in the paper is shown in Figure 2. The framework combines block chain technology with access control technology. The framework includes four core parts: Policy Enforcement Point (PEP), Attribute Authority (AA), Point Administration Point (PAP), and Policy Decision Point (PDP), which AA, PAP, and PDP are implemented by means of smart contracts. In order to ensure the correct execution of the access control policy in the block chain, the user needs to apply PEP as the access control client to perform access control interaction with the block chain; the access control work flow in the framework is an extension of the standard model work flow. The access control work flow can be divided into two phases: the preparation phase and the execution phase, as shown in Figure 2.

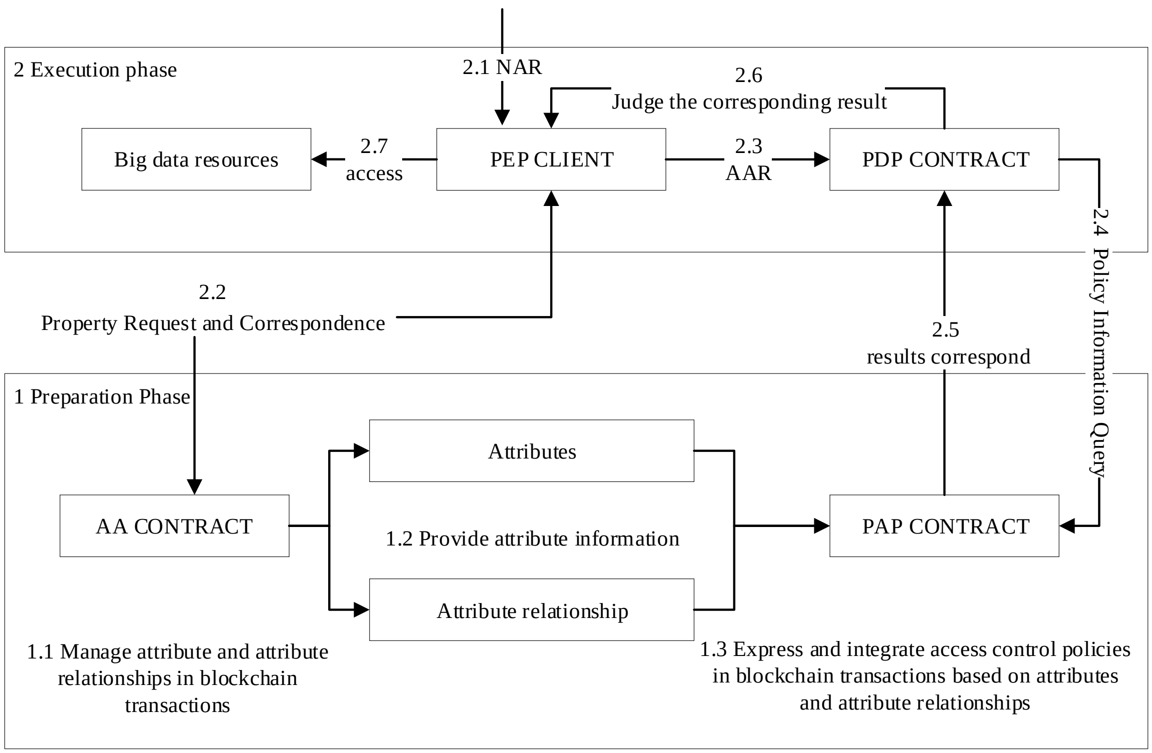


Fig. 2 Block chain access control work flow

The preparation phase mainly manages access control policies and attributes, which include the release, update, and revocation of policies and attributes, and responses to policy and attribute query results. The execution phase mainly performs the decision, response and execution of the access request, and is combined with the access control technology.

III. Distributed Network Based on Block Chain

A. Energy Distribution Characteristics of Distributed Network Nodes

In the block chain, the distribution characteristics of the distributed network are analyzed. Combined with the quantitative regression analysis method, the optimal statistical feature quantity is calculated. The best statistical feature quantity of the network connection access data in the gradient direction is

$$g_{(m,n)}(u) = I_{(k)g}[2(m-1)+u] \qquad u \in \{1,2\} \tag{1}$$

where the u is the sharpening value of the $I_{(k)g}$ for the network connection access data in the information fusion area. According to the network security service level, the eigenvalue calculation of the network node is performed, and the state feature status of the target node accessed by the distributed network block chain is

$$\hat{x}(k/k) = \sum_{j}^{m} u_j(k) \tag{2}$$

Where $u_j(k)$ represents the network node activity. In the underlying physical network, according to the replica correlation detection result, the sparse feature distribution set of the distributed network block chain adaptive connection is obtained

$$g(x,y) = \frac{\varepsilon(x,y)}{\hat{x}(k/k)} \tag{3}$$

Where $\varepsilon(x,y)$ represents the difference function in the process of network connection. The feature parameter $I_{(y)}$ is obtained by using the fuzzy feature detection method in the sparse feature distribution set, and the spatial distribution attribute value of the network connection access data is calculated according to the feature parameter. The expression formula is

$$I(i,j)=\sum_{k=1}^{P} I_{(y)}\times 2^{k-1} \tag{4}$$

Where k is a constant. The motion function $f(g_i)$ of the network node i at the time of obtaining the t is obtained as follows

$$f(g_i)=c_i\tilde{\lambda}_i I(i,j) \tag{5}$$

Where c_i represents the network data dimension, and $\tilde{\lambda}_i$ represents the node motion length. the energy distribution characteristics of the network nodes are analyzed according to the motion function. The process is shown in Figure 3.

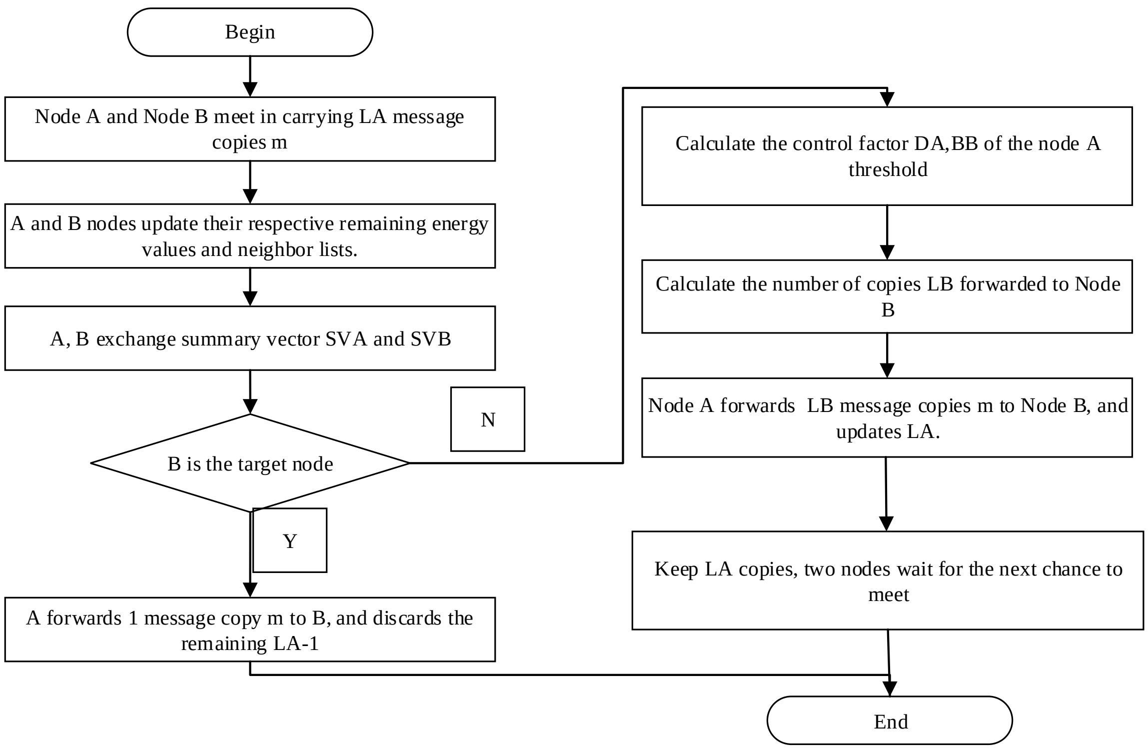


Fig 3 Flow chart for analysis of energy distribution characteristics of network nodes

The optimal positioning of distributed network nodes is realized by analyzing the energy distribution characteristics of network nodes.

B. Optimized Positioning of Distributed Network Nodes

In order to realize the distributed network connection access based on block chain and big data, the positioning of the network node needs to be completed. First, the node forwarding energy cost is obtained by calculating the node level separation result. Finally, the network node's change rate is calculated to realize the optimal positioning of network nodes.

The distributed Sink networking method is used to design the network node distribution model. The hierarchical separation is performed according to the ID number of the node, and the result of the hierarchical separation $D_{i,j}$ is

$$D_{i,j}=\frac{\left|N_i(t)\cap N_j(t)\right|}{\left|N_i(t)\cup N_j(t)\right|} \tag{6}$$

Where $N_i(t)$ and $N_j(t)$ respectively represent the similarity feature quantity of network node i and node j at the current time t.

The energy cost of the node relay is calculated according to the separation result. The energy cost of the network connection node i forwarding the message to the node j is

$$u_E=D_{i,j}\frac{E_i}{E_i+E_j} \tag{7}$$

Where E_i and E_j represent the effective access rates of node i and node j, respectively. In the large-scale physical network structure model, the ontology mapping model AVG_{X} for constructing network connection access data is

$$AVG_{\mathrm{X}}=\frac{1}{m\times n}u_E\sum_{x=1}^{n}\sum_{y=1}^{m}\left|G_{\mathrm{X}}(x,y)\right| \tag{8}$$

Where $G_{\mathrm{X}}(x,y)$ is the distributed directivity function of the network connection access data, m and n respectively represent the correlation dimension and the embedding dimension between the routing switching nodes. Taking into account the length of the interval, the network neighbor change rate is expressed on node i as

$$N_i = \frac{|N_i(t) \cup N_i(t_{old})| - |N_i(t) \cap N_i(t_{old})|}{AVG_X} \tag{9}$$

Where $N_i(t_{old})$ is a set of edge distribution features of the network nodes. According to the distribution feature set, the distribution characteristics of the network nodes are obtained, and the calculation of the optimization of the network node is completed. The calculation expression is as follows

$$u_N = \frac{N_i}{N_i + N_j} \tag{10}$$

Where N_j is the neighbor change rate of the distributed network encounter node *j*.

Based on the above steps, the fuzzy connection rule scheduling mechanism is established by performing fuzzy association rule scheduling on the network connection access.

IV. Distributed Network Connection Access Mechanism

A.Network Connection Access Fuzzy Association Rule Scheduling

In the above-mentioned construction of the distributed network connection access to the big data sampling model. The number of packets of the distributed network connecting node A to forwarding node B is

$$L_j = P_i \times L_i \tag{11}$$

Where P_B represents the probability of successful forwarding of the node. It is assumed that NN distributed network connections access the sample set $X = \{x_1, x_2, \ldots, x_n\}$ of big data points construct a decision tree classification model. According to the second-order regression analysis of the data management process for accessing big data by distributed network connection, the number of nodes i itself is

$$L_i' = L_i \times L_j \tag{12}$$

The associated weight of the distributed network block chain adaptive connection access data is

$$\omega = (\omega_1, a_1'),\ (\omega_2, a_2'), \ldots,\ (\omega_n, a_n'),\quad \omega_j \in [0,1] \tag{13}$$

The weighted statistical analysis method is used to analyze the sample robustness. The mapping relationship between the association rule sets of the network block chain adaptive connection access is

$$f_1(SC_1^j, SC_2^j, \ldots SC_n^j) = SS_j, SC_n^j \in C_{SC} \tag{14}$$

$$f_2(SS_1^k, SS_2^k, \ldots SS_m^k) = SA_k, SS_m^k \in C_{SS} \tag{15}$$

Where C_{SC} and C_{SS} respectively represent the security components and statistical features of the distributed network block chain. In the ontology integration system, the carrying capacity of the distributed network block chain adaptive connection access data is

$$S_{CA} = \{a_{Co}, a_{In}, a_{Nr}, a_{Ac}, a_{Aa}\}, a \in \{1,2,3,4,5\} \tag{16}$$

According to the above analysis, the network connection access fuzzy association rule scheduling is implemented.

B. Network Connection Access Mechanism Establishment

The associated feature set of the extracted distributed network block chain adaptive connection access data are classified and integrated. The fuzzy membership function of distributed network block chain adaptive connection access data modeling is

$$P_F = \sum_{j=k}^{N} \sum_{\sum u_i = j} \prod_{i=1}^{N} (P_{fi})^{u_i} (1 - P_{fi})^{1-u_i} \tag{17}$$

$$P_D = \sum_{j=k}^{N} \sum_{\sum u_i = j} \prod_{i=1}^{N} (P_{di})^{u_i} (1 - P_{di})^{1-u_i} \tag{18}$$

Where P_{fi} represents the ontology feature quantity of the adaptive connection access of the distributed network block chain, and P_{di} is the fuzzy association rule set of the adaptive connection access of the distributed network block chain. The weighted statistical analysis method is used to analyze the sample robustness, and the similarity distribution coefficient of the distributed network block chain connection access data is obtained as follows

$$\bar{x} = \frac{1}{N} \sum_{i=1}^{N} |x_i| \tag{19}$$

The parameters of the output layer connection weight are learned, and the process of distributed network block chain connection access is optimized. The statistical feature of the Internet financial distributed network block chain adaptive connection access is

$$\sigma^2 = \frac{1}{N} \sum_{i=1}^{N} \left| x_i - \bar{x} \right|^2 \tag{20}$$

The update rule for network data access is

$$n_{pq} = \frac{\bar{x}}{\sigma^2} \tag{21}$$

The network connection access mechanism obtained by regional segmentation is

$$F_d - \frac{d}{dx} F_{d_x} - \frac{d}{dy} = 0 \tag{22}$$

Where F_d is the local variance of the adaptive connection access data of the distributed network block chain, and F_{d_x} is the feature segmentation coefficient of the adaptive connection access of the distributed network block chain. The gradient descent method is used to optimize the adaptive connection access of the distributed network block chain. The optimization process is shown in Figure 4.

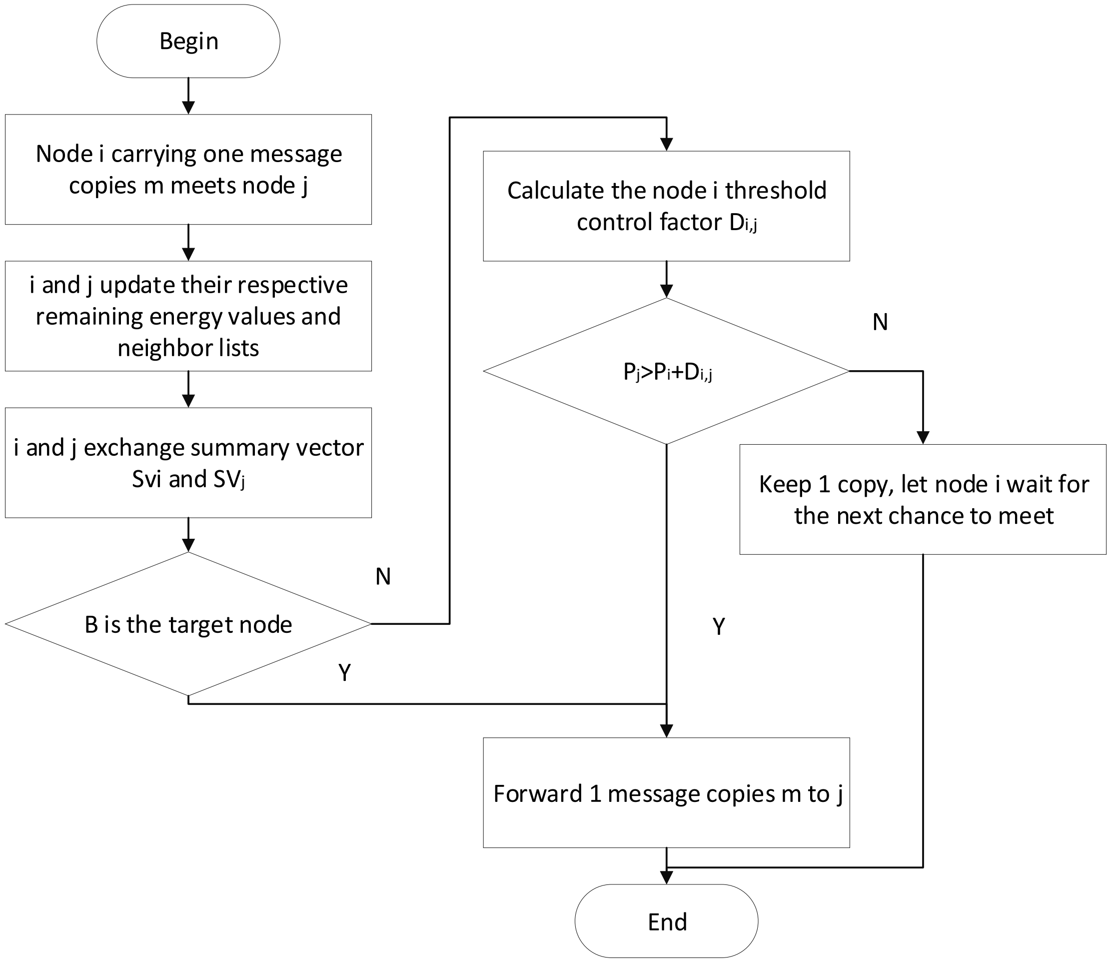


Fig 4 Access mechanism optimization implementation process

V. Simulation Analysis

The attribute sets and policy sets in the standard policy conformance test package provided by XACML in the paper is detected. The Policy Samples of groups 1-6 correspond to 5000, 10000, 15000, 20000, 25000, and 30000 single-strategy test set samples, respectively. The open source block chain platform EbCoin was extended and improved. the PoW mechanism is switch that the PAP CONTRACT, PDP CONTRACT, AA CONTRACT three-part contract code is integrated with EbCoin to build a three-node simulation experiment environment on a PC.

In order to test the effectiveness of the method in the distributed network block chain connection access, the Matlab is combined with for experimental test analysis, and the SPSS 19.0 statistical analysis software is used for empirical analysis, the sample size of distributed network connection access big data sampling is 2500Mbit, the training sample set is 30,000. The data sampling comes from the Internet financial big data published by the central bank, and the characteristic analysis is carried out by descriptive statistical analysis method. The descriptive statistical analysis results from 2020 Annual Network Sector Report.

The performance of the strategy retrieval efficiency in the experiment is tested based on the strategy management method. The experiment performs matching query tests on the test sets of different query sizes. The different parameters for error rate and search delay test are set to evaluate the impact of different parameters on retrieval performance. The calculation method of single delay is the total delay or the total number of matches. The optimization effect is mainly measured by the retrieval delay of the strategy in the strategy management contract; the smaller the delay, the higher the execution efficiency, and the better the retrieval optimization effect.

The larger the ratio, the lower the false positive rate, but it will also take up more space costs. At the same time, the true value of the false positive rate is generally smaller than the theoretical value of the false positive rate. Under the condition that the n value is optimal, the false positive rate that can be accepted by the intended use can be achieved, and the increase in false positive rate does not lead to a significant increase in revenue. Therefore, as far as conditions permit, maximizing the value of n/k can effectively improve query performance. It is mainly due to the fact that during the attribute keyword filtering process of policy detection, the retrieval time is less affected by the size of the policy collection. Policy retrieval can effectively save cache space, reduce the number of requests for caching, and improve policy query efficiency and policy management service isolation. According to the above descriptive statistical analysis results, the distributed network connection access big data mining is performed, and the big data mining result is obtained, as shown in Fig. 5.

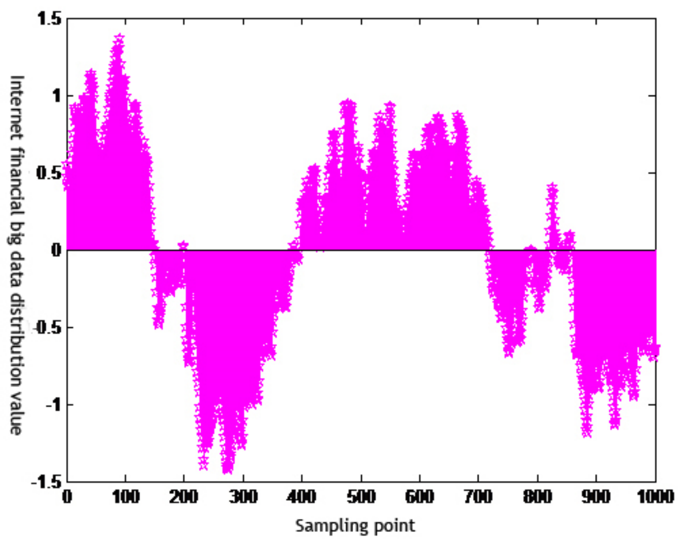
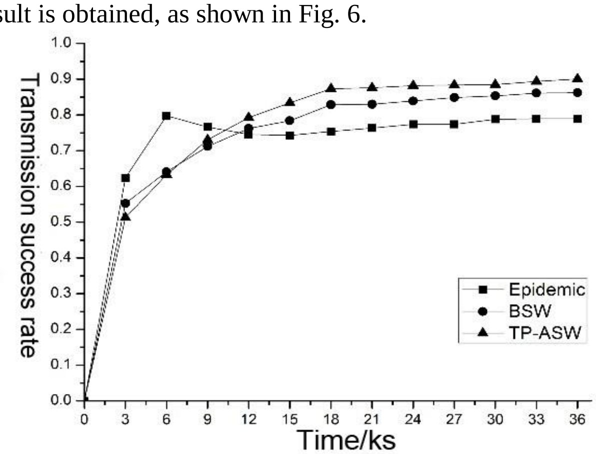
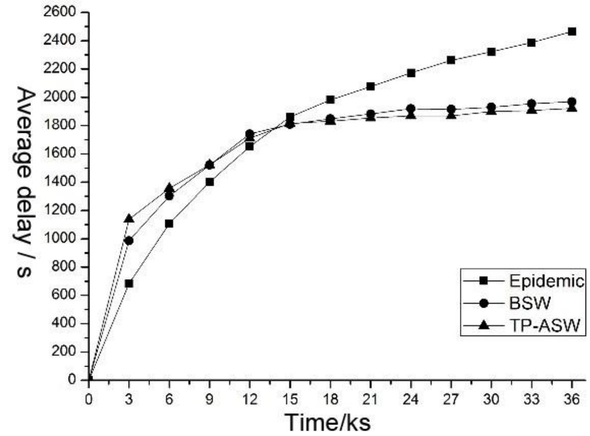


Fig 5 Internet finance distributed network connection access big data mining results

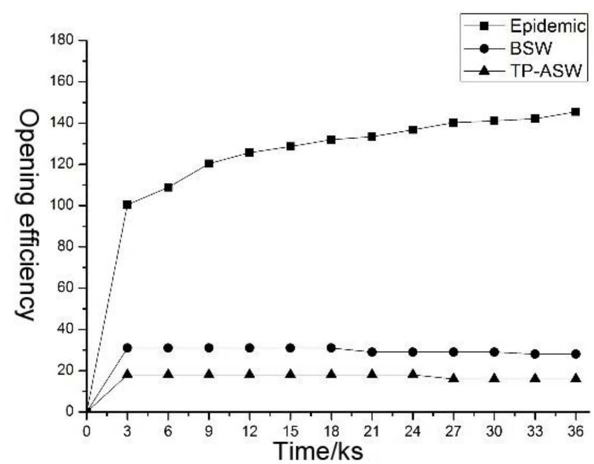
The method of the paper is compared with the block feature detection method and the fuzzy access method. TP-ASW is the method of the paper, Epidemic is the block feature detection method, and BSW is the fuzzy access method. The comparison result is obtained, as shown in Fig. 6.



(a) Transmission success rate



(b) Average delay



(c) Overhead rate

Fig. 6 The performance test comparison

VI. Conclusion

In this paper, the segmented sample regression analysis method is used to conduct fuzzy association rule scheduling for distributed network connection access, and the statistical feature of block chain of distributed network is extracted. Information fusion and fuzzy tomographic analysis are used to optimize the scheduling of distributed network connection access, which improve the accuracy of distributed network connection and the accuracy of big data access. The performance of the strategy retrieval efficiency in the experiment is tested based on the strategy management method. The experiment performs matching query tests on the test sets of different query sizes. The different parameters for error rate and search delay test are set to evaluate the impact of different parameters on retrieval performance. The calculation method of single delay is the total delay or the total number of matches. The optimization effect is mainly measured by the retrieval delay of the strategy in the strategy management contract; the smaller the delay, the higher the execution efficiency, and the better the retrieval optimization effect..

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