# A CREDIT MODEL ON P2P NETWORK BASED ON COMMENTS GROUP

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**Abstract:**

**In order to solve a series of security problems such as mobility and uncertainty brought by frauds in the network, in this paper, we propose a new credit model on P2P network, and use a special dynamic mechanism named comments group to distinguish the reliability of P2P model. Compared with former models, our model can be better used in mobile and uncertain P2P network, which improve the serviceability of the P2P network.**

**Keywords:**

**P2P; Credit Model; Comments group**

## 1. Introduction

The core in P2P field is resources, of which the key is to search the resources of reliable substance. The issue that how to acquire the necessary resources of reliable substances assemblage with fast-speed and accuracy, and select the suitable substances from this assemblage as a server machine have become a heat topic. In literature [1], we use a credit model without particular feature, and via the client's computed storage end to guarantee both security and efficiency of the credit value. In literature [2], in order to emphasize on how to design and calculate the credit value, the paper put forward the concept of super node in the network. In our paper, we propose a new credit model via bringing forward a role of dynamic panel and corresponding system, which can provide the credit calculation, storage, and inquiry function with fast-speed, high-efficiency and security. Thus, the P2P network can operate efficiently.

The so-called dynamic panel refers to a type of dynamic varying substance's assemblage which can store and provide inquiry of credit value. According to the research from F.Le Fessant, S.Handurukande, A.M.Kermarrec and L.Massouli, etc, they put forward the "small world" phenomenon of position and interest existed in the network, which can be used to divide the P2P network based on region, and each region contains an amount of substances. When the substance transact with each other, whether it comes from the same or different region, this transaction needs to ensure the reliability of the two parities. This paper is to deal with the problem on how to gain the credit value.

## 2. Problem analysis

### 2.1. Inquiry efficiency of the credit value

There two common ways to inquiry at present: the broadcast inquiry and the single node inquiry. In the broadcast inquiry, client stores server's credit value. The inquiry end uses this way to request the server's credit value. In other words, when the substance (the former client) being queried, after having transacted with the server in the network, it will transmit the server's credit value to inquiry end. However, it needs more communicated expense than other means, with lower efficiency and inferior network utilization factor. While in the single node inquiry, the server stores its own credit value, so that the client can gain the credit value by querying its end. Despite its high-efficiency, the communication quantity is little, and simultaneously, there exists the security problems like fraud, retaliation, etc.

### 2.2. Timeliness

When the client selects the superior creditable server, the timeliness and representative faithfulness of credit value is vitally interrelated. If the credit value can not reflect the authentic server's reputation, the whole credit system will lose its worthiness.

### 2.3. Integrality

The credit value is offered by the client, while the server probably modifies or forges it deeply as to gain a preferable one. As a result, the integrality of the credit value will be destroyed.

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### 2.4. Robustness

It's obvious that we do not expect that there is a certain physics node in the P2P network, once it has been destroyed, the network can not operate as usual. This result is entirely contrary to the original intention of why we used the P2P network.

### 2.5. Retaliation

The server probably retaliate the client as their evaluations are too low, for instance, viciously reduce client's credit value or provide inferior service at next time.

## 3. Credit Model

### 3.1. Credit Model

The P2P credit model is shown in the figure 1. In this figure, ① shows that the client request the evaluate end for credit value, ② shows that the evaluate end transmit the credit value to the client, ③ shows that the client transmit data to the server, ④ shows that the client transmit the new credit value to the evaluate end, ⑤ shows that the server transmit relevant data to evaluate end, ⑥ shows that the group leader broadcast the new credit value to each member inner the panel.

This model acts the following roles in accordance with its analyzed function: client (or evaluate end), server, evaluate end, inquiry end. Theoretically, each substance in the P2P network can serve as one or certain roles as mentioned above. That is to say, one entity can inquiry other servers (serves as inquiry end), or use another entities server to offer service and evaluation (serves as client), which simultaneously offer service to other entities (serves as server). At the same time, it can collect the whole entity credit value of this region and offer the table for the inquiry end to use. However, considering that not only the entities have differences in actual performance, but also it's evaluate end burden heavy task and excessive data communication, the model uses certain algorithms to select the weight computer as the comments group member.

### 3.2. The principles abided by model

Apparently, it's of importance on how to select the comments group. As a rule, a panel includes 8 to 10 members. We should abide by the following principles while selecting members as to ensure their weight:

(1) Accuracy. Make sure this panel can provide each entity credit value of the inner region. Thus, we select those high credit value entities as our panel's member as possible as we can.

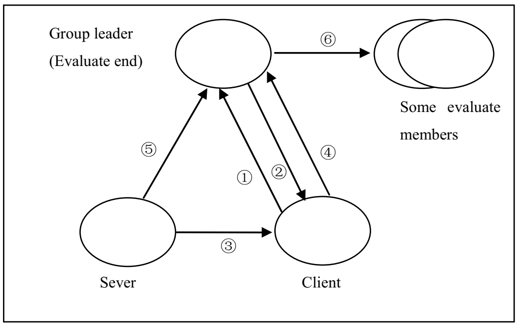


**Figure 1. Credit model**

(2) Speediness. Apparently, the faster the exchanging speeds of information between each region's entity and panels, the higher inquiry efficiency of the entire credit value. It this way, the substance with higher network's speed will be chosen.

(3) Representativeness. To make sure the network can operate as usual, we should consider the problem of regional relevance while selecting members, especially those of each subregion. Only through this way can we avoid all panels' members breaking off the network and dropping the regional credit value's data, which in turn can result in collapsing the entire network's credit value system.

(4) Stability. Obviously, it's inappropriate to evaluate panel's member list too fast. Therefore, those entities that online longer and more stable can be considered at first.

(5) Flexibility. Whatever substance of this region enters into the network, we need to ensure the weight of entity according to the standard mentioned above. If the weight reaches the threshold we have set, this entity will be added into the panel and gain the credit value table. Meanwhile, the last one in the group has to quit.

### 3.3. The framework of panel

After we make sure the members of comments group, its' members should follow the rule and coordinate with each other:

(1) We set the highest weight member as the panel's leader, and other members become candidates. The leader receives the entire regional member's credit value table and distributes it to these candidates by the multicast.

(2) The leader establishes new credit value table after each transaction has accomplished, and distribute it to other members for the sake of update.

(3) Only after the leader pushed out the network for some reasons (e.g. fall line), can a new principal with highest weight be selected, and start up its credit value.

### 3.4. The implementation procedure of model

First of all, when the regional network initializes itself, each autonomic region will transmit its credit value to panel, so that the leader can collect them into a table and preserve in all members' record.

When one of these regional entities requests the credit value of another one, the group leader will offer the corresponding credit value according to mastery tables.

The client will gain the corresponding credit value list and select the highest value to transact it.

The client ensures the new credit value base on former one and the relevant data after finishing the transaction. The record of this process will be sent to server's regional leader, and the server will transmit the relevant records to the group leader.

The leader, therefore, receives this regional server's new credit value and data, so as to ensure both parties' records and efficiency, which can updates its credit value chart by the form of panel's broadcast.

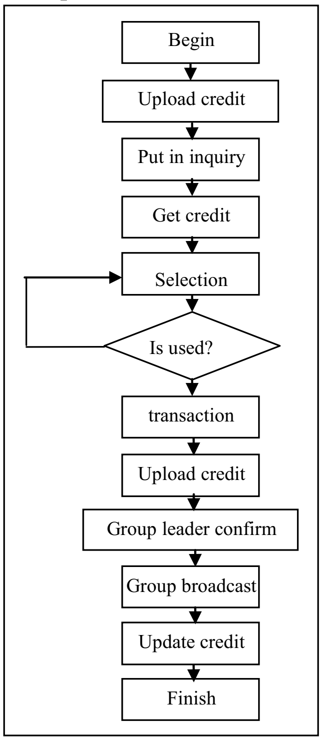


**Figure 2. The implementation procedure of model**

### 3.5. Efficiency analysis

Under an ideal circumstance, we can compare the new model with those of the literature [1]. The entire network has 1000 nodes (in ideal situation), which has been divided into 10 regions. Thus, each region has 100 nodes which can evaluate 10 members of a panel, and all the regional nodes form a connected graph. These regions in turn can connect with each other, and make up of completed graph.

In general, we assume that the spending time of each regional node connect with another one is , that is to say, the average spending time of cross-regional node is $\omega_{out}(>\omega_m)$ :

In the course of a credit value's inquiry, as the client maybe any nodes of the entire network, the new client have to acquire server's certificate as the literature [1] described, and gain the server's credit value from the former client, so as to complete two spending time:

$$(0.9\omega_{out}+0.1\omega_m)+(0.9\omega_{out}+0.1\omega_m)$$

In the model proposed by us, however, the new client just has to acquire the server's credit value from regional panel's leader, of which the spending time is:

$$\omega_{out}<(0.9\omega_{out}+0.1\omega_m)+(0.9\omega_{out}+0.1\omega_m)$$

The credit value updates itself after the service is finished. In the literature [1], the new client builds a server's credit value and stores it. It sends the certificate to inform the server, who will update the new client's certificate of former one, and the network expense is:

$$(0.9\omega_{out}+0.1\omega_m)+(0.9\omega_{out}+0.1\omega_m)$$

What's more, the new client just has to update the server's credit value to the leader, who will broadcast inner the panel. The spending time is:

$$(0.9\omega_{out}+0.1\omega_m)+\omega_m<(0.9\omega_{out}+0.1\omega_m)+(0.9\omega_{out}+0.1\omega_m)$$

We can conclude from the above formulas that this model is in favor of economizing the network resources and improve its availability and efficiency.

## 4. Performance analysis

We can analyze the model as follow:

(1) Efficiency of the credit's security. This model introduces the concept of comments group, and adopt the layer multicast technology, which can avoid the drawbacks of traditional broadcast inquiry and single node inquiry, reduce the communicated expense, and improve the efficiency to certain extent.

(2) Real time of the credit. Owing that the corresponding credit value can update in time after each transaction has accomplished, the model possess superior

real time.

(3) Integrality of the credit. In this model, the credit value's evaluation is finished by the client and store in the panel. Therefore, it avoids the server to falsify, forge or delete the credit value. Because of the higher reputation of each member in the panel, the model guarantees the credit table's authenticity and integrality.

(4) Robustness of the network. This model is superior in the robustness and efficiency in the network by overcoming the drawbacks of the excessive communication expense and lower response of the network that lack of organization. Besides, the model doesn't bear the traditional centralized server which is confronted to particular structure node, as it can lead to break down the whole network if it can not operate as usual.

(5) Prevention of fraud. On account of the client evaluate the credit value after the transaction have finished, the model cease the fraudulent phenomena.

## 5. Conclusions

This paper put forward a credit model aim at solving security and reliability problems exist in the present P2P network, and introduce a robust, secure and efficient P2P environment. This model divides the entire network into amounts of regions in accordance with the "small world" theory existed in the P2P network. Meanwhile, it solves the problems mentioned above to some extent by electing a comments group in all the regions to store and offer each member's credit value to clients.

Due to the particularity of the panel's members, how to ensure the weight and threshold of each member has been the key problem. Besides, as the model establishes the entire credit system based on the high credit value of panel's members, it can not completely guarantee the actual behaviors done by panel's members. Therefore, it's necessary to form an inner panel's mutual supervision system, which is supposed to ensure the integrate credit system. This task is up for us to make further efforts to accomplish.

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