

Method for Automatically Spreading Resources and Equipment thereof

Technical field

The present invention relates to network communications technologies, and more particularly, to a method and device for spreading resources automatically.

Background of the Invention

With the development of network communications technologies, transmission of network resources becomes more and more frequent, and number of transmitted resources becomes more and more large, thus load of a network resource server becomes heavier. Since transmission capability of Peer-to-Peer (P2P) technology in a network depends on computation capability and bandwidth of all participators, which not depends on minor network resource servers. Thus, the problem of extra heavy load of network resource server may be solved. Subsequently, the P2P technology is widely applied in network transmission.

At present, during the process of transmitting network resources with the P2P technology, when a user downloads network resources, if number of P2P seeds (P2P clients capable of providing resources) is not adequate, it is necessary to obtain needed resources from the network resource server.

When implementing the present invention, at least the following disadvantages and deficiencies in the prior art are found by the inventor after analyzing and researching.

In existing P2P transmission technology, when number of P2P seeds is not adequate, bandwidth of network resource server needs to be consumed when a user

downloads network resources. Thus, consumed cost is too large, download speed is slow, and usage experience of a user is reduced.

Summary of the Invention

To guarantee not to consume resources of a network resource server, when obtaining network resources with P2P transmitting technology, so as to reduce cost of the network resource server, and to improve usage experience of a user, embodiments of the present invention provide a method and device for spreading resources automatically. The technical solution is as follows.

An embodiment of the present invention provides a method for spreading resources automatically, the method includes:

an original Peer to Peer (P2P) client obtaining information of one or more spreading P2P clients configured from a P2P seed server, wherein the original P2P client is a P2P client which downloads network resources from a network resource server;

the original P2P client automatically pushing the network resources to the one or more spreading P2P clients.

Wherein the one or more spreading P2P clients are determined by the P2P seed server, according to connection information of the original P2P client and other P2P clients, as well as resource occupancy states of the other P2P clients.

The method further comprising:

the P2P seed server determining one or more idle P2P clients directly connected with the original P2P client as the one or more spreading P2P clients of the original P2P client.

The method further comprising:

the P2P seed server firstly querying one or more P2P clients directly connected with the original P2P client, and querying one or more idle P2P clients from searched out one or more P2P clients directly connected with the original P2P client.

The method further comprising:

the P2P seed server firstly querying one or more idle P2P clients, and querying one or more P2P clients directly connected with the original P2P client from the one or more idle P2P clients searched out.

The method further comprising:

the P2P seed server determining one or more P2P clients directly connected with the original P2P client, and bandwidth occupancy rates of which is smaller than a threshold, as the one or more spreading P2P clients of the original P2P client.

The method further comprising:

the P2P seed server searching out one or more idle P2P clients directly connected with the original P2P clients, selecting one or more P2P clients from the one or more P2P clients searched out according to information transmission capabilities of the one or more P2P clients searched out, and configuring the selected one or more P2P clients as the one or more spreading P2P clients of the original P2P client.

The method further comprising:

each spreading P2P client obtaining information about one or more spreading P2P clients at the next lower lever of the spreading P2P client from the P2P seed server, and pushing the network resources to the one or more spreading P2P clients at the next lower lever.

A system for spreading resources automatically, which includes an original P2P client and one or more spreading P2P clients, wherein

the original P2P client is configured to download network resources from a network resource server, obtain information about the one or more spreading P2P clients configured from a P2P seed server, and automatically push the network resources to the one or more spreading P2P clients; and

each spreading P2P client is configured to receive the network resources pushed by the original P2P client.

Wherein the system further comprises the P2P seed server, which to configure

the one or more spreading P2P clients for the original P2P client, according to connection information of the original P2P client and other P2P clients, as well as resource occupancy states of the other P2P clients.

Wherein the P2P seed server to configure one or more idle P2P clients directly connected with the original P2P client as the one or more spreading P2P clients of the original P2P client.

Wherein the P2P seed server to configure one or more P2P clients directly connected with the original P2P client, and bandwidth occupancy rates of which are smaller than a threshold, as the one or more spreading P2P clients of the original P2P client.

Wherein the P2P seed server to query one or more idle P2P clients directly connected with the original P2P client, select one or more P2P clients from the one or more P2P clients searched out according to information transmission capabilities of the one or more P2P clients searched out, and configure the selected one or more P2P clients as the one or more spreading P2P clients of the original P2P client.

Wherein each spreading P2P client to obtain information about one or more spreading P2P clients at the next lower lever for the spreading P2P client from the P2P seed server, and pushes the network resources to the one or more spreading P2P clients at the next lower lever.

The advantages achieved by the technical solution provided by embodiments of the present invention are as follows.

In the solution provided by the embodiments of the present invention, after network resources are firstly obtained from a network resource server via an original P2P client, the network resources are automatically spread to P2P clients in the P2P system, to enable multiple P2P clients to download network resources. Thus, when other P2P clients obtain network resources with the P2P transmission technology, it may be guaranteed that the resources are provided by multiple P2P clients. Subsequently, resources of network resource server are not consumed, cost of the

network resource server is reduced, download speed is improved, and user's usage experience is enhanced.

Brief Descriptions of the Drawings

To describe the technical solution in the embodiments of the present invention or in the prior art clearer, accompanying drawings for describing the embodiments or the prior art will be described in brief hereinafter. Obviously, the following accompanying drawings are merely some examples of the present invention. Other drawings may be obtained according to these accompanying drawings without creative work by those skilled in the art.

Figure 1 is a flowchart illustrating a method in accordance with the first embodiment of the present invention.

Figure2 is a schematic diagram illustrating a spread structure in accordance with the second embodiment of the present invention.

Figure 3 is a flowchart illustrating a method in accordance with the second embodiment of the present invention.

Figure 4 is a schematic diagram illustrating a structure of a device in accordance with the third embodiment of the present invention.

Embodiments of the present invention

To make objectives, technical solutions and advantages of the present invention clearer, embodiments of the present invention will be further described in detail hereinafter with reference to accompanying drawings.

The first embodiment

To ensure not to consume resources of a network resource server when network resources are obtained with P2P transmission technology, so as to reduce cost of the network resource server and improve user's usage experience, an embodiment of the present invention provides a method for spreading resources automatically. With reference to Figure 1, the method includes the follows.

101: an original P2P client downloads network resources from a network

resource server.

102: the original P2P client obtains information about one or more spreading P2P clients configured from a P2P seed server, and automatically pushes the network resources to the one or more spreading P2P clients.

The spreading P2P client in the embodiment of the present invention refers to as follows. The seed server configures each P2P client in the spreading network according to actual connection conditions and idle state, to enable each P2P client to have one or more corresponding spreading P2P clients. The idle state therein reflects the resource occupancy state of a P2P client.

The original P2P client obtains information about one or more spreading P2P clients configured from the P2P seed server, and automatically pushes the network resources to the one or more spreading P2P clients, specifically includes the follows.

The original P2P client sends a query request to the P2P seed server.

After receiving the query request, the P2P seed server queries one or more P2P clients directly connected with the original P2P client, queries one or more idle P2P clients from the one or more P2P clients directly connected with the original P2P client, takes the one or more idle P2P clients found as one or more spreading P2P clients of the original P2P client, and sends information about the one or more spreading P2P clients to the original P2P client.

The original P2P client receives the information about the one or more spreading P2P clients sent by the P2P seed server, and pushes the network resources downloaded from the network resource server to the one or more spreading P2P clients.

Alternatively, the original P2P client obtains information about one or more spreading P2P clients configured from the P2P seed server, and automatically pushes the network resources to the one or more spreading P2P clients, specifically includes the follows.

The original P2P client sends a query request to the P2P seed server.

The P2P seed server firstly queries one or more idle P2P clients from a P2P system, and then queries one or more P2P clients directly connected with the original

P2P client from the one or more idle P2P clients searched out, takes the searched out one or more P2P clients directly connected with the original P2P client as one or more spreading P2P clients of the original P2P client, and sends information about the one or more spreading P2P clients to the original P2P client.

The original P2P client receives the information about the one or more spreading P2P clients sent by the P2P seed server, and pushes the network resources downloaded from the network resource server to the one or more spreading P2P clients.

The P2P seed server queries one or more idle P2P clients further includes the follows.

The P2P seed server queries one or more non-idle P2P clients with small bandwidth occupation; or, the P2P seed server selects one or more P2P clients from the one or more idle P2P clients searched out.

After obtaining by the original P2P client the information about the one or more spreading P2P clients configured from the P2P seed server, and pushing the network resources automatically to the one or more spreading P2P clients, the method further includes the follows.

After receiving the network resources pushed by the original P2P client, the one or more spreading P2P clients obtains information about one or more spreading P2P clients at the next lower level from the P2P seed server.

The one or more spreading P2P clients at the next lower level in the embodiment of the present invention are mentioned with reference to the one or more spreading P2P clients. For example, the original P2P client corresponds to the one or more spreading P2P clients, one or more spreading P2P clients corresponding to each spreading P2P client may be called one or more spreading P2P clients at the next lower level, and the like, when there is multiple levels of spreading, to make differentiation, the first, second, third levels of spreading P2P clients may be set, and so on. The specific dividing method is not limited by the embodiment of the present invention.

Each spreading P2P client pushes the network resources to one of more

spreading P2P clients at the next lower level.

Each spreading P2P client at the next lower level continuously spreads downwards, until all the P2P clients in the spreading network of the P2P system have received the network resources.

In the method provided by the embodiment of the present invention, after network resources are firstly obtained by the original P2P client from the network resource server, the network resources are automatically spread to P2P clients in the P2P system, to enable multiple P2P clients to download the network resources. Thus, it may be ensured that, when other P2P clients obtain network resources with the P2P transmission technology, multiple P2P clients may provide the resources. Subsequently, no resources of network resource server will be consumed, cost of the network resource server may be reduced, download speed may be improved, and user's usage experience may be enhanced.

The second embodiment

To ensure not to consume resources of a network resource server, to reduce cost thereof, to improve user's usage experience, when obtaining network resources with the P2P transmission technology, an embodiment of the present invention provides a method for automatically spreading resources. The specific implementing process of spreading is as follows.

The embodiment of the present invention will be described with reference to the spreading architecture diagram of the P2P system shown in figure 2. In figure 2, the spreading network of the P2P system includes two servers, a P2P seed server and a network resource server, N P2P clients, that is, the first P2P client, the second P2P client, the third P2P client, ..., the Nth P2P client. Each P2P client as a seed registers in the P2P seed server, and the P2P seed server performs uniform management on the P2P clients. The first P2P client firstly downloads network resources from the network resource server. The specific implementation process may refer to figure 3.

201: the first P2P client firstly downloads network resources from the network resource server.

In the embodiment of the present invention, the first P2P client is the original

P2P client in the P2P system, which is also referred to as an original node. The original node here is a client node, which downloads needed network resources from the network resource server. As the original node, the first P2P client firstly consumes bandwidth of the network resource server to download network resources from the network resource server, that is, the bandwidth is consumed for the first time.

202: the first P2P client obtains information about one or more spreading P2P clients configured from the P2P seed server, and pushes the network resources downloaded from the network resource server to the second spreading P2P client. After downloading resources from the network resource server, the first P2P client firstly sends a query request to the P2P seed server, to query one or more spreadable P2P clients. After receiving the query request from the first P2P client, the P2P seed server queries according to a pre-configured rule, and sends information about one or more P2P clients meeting the condition to the first P2P client. For example, in the embodiment of the present invention, a client meeting the condition is the second P2P client. After receiving information about the second P2P client meeting the condition from the P2P seed server, the first P2P client sends the downloaded resources to the second P2P client.

The P2P seed server queries one or more spreading P2P clients of the first P2P client according to the pre-configured rule. The P2P seed server may firstly query which P2P clients are directly connected with the first P2P client, and then query which P2P clients are idle from the P2P clients directly connected with the first P2P clients, so as to fully utilize the bandwidth. Definitely, the P2P seed server may also firstly query which P2P clients are idle in the P2P system, and then query which idle P2P clients are directly connected with the first P2P client. For example, in the embodiment of the present invention, the searched out P2P clients directly connected with the first P2P client are the second and Nth P2P clients. The idle P2P client of the second and Nth P2P clients is the second P2P client.

Besides, the P2P seed server may also query one or more non-idle P2P clients with small bandwidth occupation; alternatively, the P2P seed server may select one or more P2P clients from one or more idle P2P clients searched out as one or more

spreading P2P clients of the first P2P client according to the pre-configured rule. The pre-configured rule may be to determine a spreading P2P client according to information transmission capabilities, such as bandwidth, compute capabilities. For example, in the embodiment of the present invention, the second P2P client with small bandwidth occupation may be not idle, for example, the occupied bandwidth is smaller than a pre-configured threshold. Alternatively, although there are multiple idle P2P clients, the bandwidth and compute capability of the second P2P client are the best of the multiple P2P clients.

In the embodiment of the present invention, the P2P client meeting the condition is the second P2P client. There may be more than one P2P clients directly connected with the first P2P client. However, there may be only the second P2P client at the idle state. Or, there may be multiple P2P clients meeting the condition. However, the second P2P client is the P2P client with the largest bandwidth.

Since the first P2P client needs to query one or more P2P clients connected with itself from the P2P seed server, and query resource occupancy state of each P2P client via the P2P seed server. Each P2P client in the P2P system needs to log on to or register in the P2P seed server, to facilitate the P2P seed server to perform uniform query and management.

The first P2P client may push downloaded network resources to the second P2P client as the first P2P client consumes server bandwidth of the network resource server to download network resources. Or, the first P2P client may spread and push the network resources to the second P2P client after the first P2P client finishes the downloading of the needed network resources from the network resource. The first P2P client may store the downloaded resources locally, for example, to store in fixed storage medium, such as hard-disk, or temporary storage medium, such as memory, cache. Or, the first P2P client may store the downloaded resources in network storage medium, such as network hard disk, and the downloaded resources may be directly obtained from the network when being used. The concrete implementation measures are not limited by the embodiment of the present invention,

203: the second P2P client receives the network resources pushed by the first

P2P client, obtains information about the third spreading P2P client and the Nth spreading P2P client configured from the P2P seed server, and pushes the network resources received from the first P2P client to the third and Nth P2P clients. The third P2P client pushes the network resources received from the second P2P client to the Nth P2P client.

The second P2P client obtains information about the third P2P client and the Nth P2P client configured from the P2P seed server, and pushes the downloaded network resources to the third and Nth P2P client. Specifically speaking, after receiving the resources pushed by the first P2P client, the second P2P client firstly sends a query request to the P2P seed server, to query one or more spreadable P2P clients. After receiving the query request, the P2P seed server queries according to a pre-configured rule, and sends information about one or more P2P clients meeting the condition to the second P2P client. In the embodiment of the present invention, the clients meeting the condition are the third and Nth P2P clients. After receiving information about the third and Nth P2P clients sent by the P2P seed server, the second P2P client sends received resources to the third and Nth P2P clients.

After receiving the network resources pushed by the second P2P client, with similar query of the seed server, the third P2P client may learn to push network resources to the Nth P2P client. At this time, the second P2P client has already pushed the network resources to the Nth P2P client. However, when querying one or more P2P clients meeting the condition for the third P2P client, the seed server finds the Nth P2P client in the searched out P2P clients directly connected with the third P2P client. At this time, the Nth P2P client is receiving the network resources pushed by the second P2P client. However, since bandwidth of the Nth P2P client hasn't been fully utilized, the Nth P2P client may still receive the network resources pushed by the second P2P client via the third P2P client. Speed of pushing the network resources by the second P2P client to the third P2P client should be larger than the speed of pushing the network resources, initiated by the second P2P client, to the Nth P2P client. Thus, it may be guaranteed that the network resources pushed to the Nth P2P client are not repeated. Therefore, the Nth P2P client possesses a function of

determining whether received network resources are repeated.

The P2P seed server queries one or more spreadable P2P clients for the second P2P client according to a pre-configured rule. The P2P seed server may firstly query which P2P clients directly connected with the second P2P client, and then query one or more idle P2P clients from one or more P2P clients directly connected with the second P2P client, so as to fully utilize the bandwidth. Definitely, the network resources may also be pushed to one or more non-idle P2P clients, which transmit other resources with small bandwidth. Of course, the P2P seed server may also firstly query one or more idle P2P clients in the P2P system, and then query which idle P2P clients are directly connected with the second P2P client. In the embodiment of the present invention, the P2P clients meeting the condition are the third and Nth P2P clients. The process for querying the P2P clients meeting the spreading condition for the third P2P client is similar with the above method, which is not repeated here.

The second P2P client may receive network resources from the first P2P client on one hand, and pushes the downloaded network resources to the third and Nth P2P clients on the other hand. The second P2P client stores the downloaded resources locally, for example, stores in fixed storage medium, such as hard disk, or in temporary storage medium, such as memory, cache. The second P2P client may also store the downloaded resources in a network storage medium, such as network hard disk, thus the resources may be directly obtained from the network when being used.

Other P2P clients in the P2P system may download network resources with the P2P mode mutually. Other $N-4$ P2P clients adopt similar spreading steps to continuously perform the spreading process, until N P2P clients have downloaded the network resources. That is, N P2P clients store the network resources locally. At this time, bandwidth consumption has been amplified N times for the first time.

204: when the network resources have been downloaded by N P2P clients, there is a new download request from a P2P client in the P2P system, the network resources may be directly obtained from the N P2P clients.

When the network resources have been downloaded by N P2P clients in the P2P system, at this time, a P2P client in the P2P system without the network resources

initiates a download request, the N P2P clients in the P2P system may provide the network resources for the P2P client, and it is not necessary to occupy bandwidth of the network resource server. Thus, not only cost of the network resource server may be reduced, but also the download speed may be improved. Subsequently, a user's usage experience may be enhanced.

In the method provided by the embodiment of the present invention, after network resources are downloaded from a network resource server via the original P2P client, the network resources may be automatically spread to other P2P clients, to increase the number of P2P seeds dynamically real time. Thus, it may be ensured to provide network resources by adequate P2P seeds when other P2P clients download the network resources, and it is not necessary to occupy bandwidth of the network resource server. Thus, cost of the network resource server may be reduced, download speed may be improved, and a user's usage experience may be improved.

The third embodiment

An embodiment of the present invention further provides a system for automatically spreading resources. With reference to figure 4, the system includes an original P2P client and one or more spreading P2P clients 302.

The original P2P client 301 is configured to download network resources from a network resource server, obtain information about the deployed spreading P2P client 302 from a P2P seed server, and automatically push the network resources to the spreading P2P client 302.

Each spreading P2P client 302 is configured to receive the network resources pushed by the original P2P client 301.

Specifically, the original P2P client 301 is configured to send a query request to the P2P seed server, receive information about the one or more spreading P2P clients 302 sent by the P2P seed server, and push the network resources downloaded from the network resource server to the one or more spreading P2P clients 302.

The system further includes a P2P seed server, specifically configured to, after receiving the query request, query one or more P2P clients directly connected with the original P2P client 301, and query one or more idle P2P clients from the one or more

P2P clients directly connected with the original P2P client 301, takes the one or more idle P2P clients searched out as the one or more spreading P2P clients 302 of the original P2P client 301, and sends information about the one or more spreading P2P clients 302 to the original P2P client 301.

Specifically, the P2P seed server is configured to, after receiving the query request, firstly query one or more idle P2P clients in the P2P system, and then query one or more P2P clients directly connected with the original P2P client 301 from the one or more idle P2P clients searched out, takes the searched out one or more P2P clients, which are directly connected with the original P2P client 301 as the one or more spreading P2P clients 302 of the original P2P client 301, and sends information about the one or more spreading P2P clients 302 to the original P2P client 301.

The P2P seed server is further configured to query one or more non-idle P2P clients with small bandwidth occupation. Alternatively, the P2P seed server may select one or more P2P clients from the one or more idle P2P clients searched out.

Specifically, each spreading P2P client 302 is configured to obtain information about one or more spreading P2P clients at the next lower lever of the spreading P2P client 302 from the P2P seed server, after receiving the network resource pushed by the original P2P client 301, pushes the network resources to the one or more spreading P2P clients at the next lower lever, to enable the one or more spreading P2P clients at the next lower lever to continuously spread downwards, until all the P2P clients in the spreading network of the P2P system have received the network resources.

In the system provided by the embodiment of the present invention, after firstly obtaining network resources from a network resource server via the original P2P client, the network resources may be automatically spread to P2P clients in the P2P system, to enable multiple P2P clients to download the network resources. It may be guaranteed that multiple P2P clients provide the resources when other P2P clients obtaining the network resources with the P2P transmission technology. Thus, resources of the network resource server may be not consumed, cost of the network resource server may be reduced, download speed may be improved, and a user's usage experience may be enhanced.

The word “receiving” in the embodiment of the present invention may be understood as actively obtaining information from another module, or receiving information sent by another module.

Persons having ordinary skill in the art may easily learn that the accompanying drawings are only schematic diagrams of a preferred embodiment. The module or flow illustrated in the accompanying drawings is not definitely necessary to implement the present invention.

Persons having ordinary skill in the art may understand that the modules in the device embodiment may be distributed in the device of the embodiment according to embodiment descriptions, or may be changed correspondingly to locate in one or more devices different from the embodiment. The modules in above embodiment may be combined into one module, or may be divided into multiple sub-modules furthermore.

Sequence number in above embodiments of the present invention is only used for descriptions, and doesn't demonstrate good or better embodiment.

Some steps in the embodiments of the present invention may be implemented with software. Corresponding software programs may be stored in readable storage medium, such as Optical Disk (CD), hard disk, or the like.

The foregoing is only preferred embodiments of the present invention, which is not used for limiting the present invention. Any modifications, equivalent substitutions and improvements within the spirit and principle of the present invention, should be covered within the protection scope of the present invention.

Claims

1, A method for automatically spreading resources, comprising:

an original Peer to Peer (P2P) client obtaining information of one or more spreading P2P clients configured from a P2P seed server, wherein the original P2P client is a P2P client which downloads network resources from a network resource server;

the original P2P client automatically pushing the network resources to the one or more spreading P2P clients.

2, The method of claim 1, wherein the one or more spreading P2P clients are determined by the P2P seed server, according to connection information of the original P2P client and other P2P clients, as well as resource occupancy states of the other P2P clients.

3, The method of claim 2, further comprising:

the P2P seed server determining one or more idle P2P clients directly connected with the original P2P client as the one or more spreading P2P clients of the original P2P client.

4, The method of claim 3, further comprising:

the P2P seed server firstly querying one or more P2P clients directly connected with the original P2P client, and querying one or more idle P2P clients from searched out one or more P2P clients directly connected with the original P2P client.

5, The method of claim 3, further comprising:

the P2P seed server firstly querying one or more idle P2P clients, and querying one or more P2P clients directly connected with the original P2P client from the one or more idle P2P clients searched out.

6, The method of claim 2, further comprising:

the P2P seed server determining one or more P2P clients directly connected with the original P2P client, and bandwidth occupancy rates of which is smaller than a threshold, as the one or more spreading P2P clients of the original P2P client.

7, The method of claim 2, further comprising:

the P2P seed server searching out one or more idle P2P clients directly connected with the original P2P clients, selecting one or more P2P clients from the one or more P2P clients searched out according to information transmission capabilities of the one or more P2P clients searched out, and configuring the selected one or more P2P clients as the one or more spreading P2P clients of the original P2P client.

8, The method of claim 1, further comprising:

each spreading P2P client obtaining information about one or more spreading P2P clients at the next lower lever of the spreading P2P client from the P2P seed server, and pushing the network resources to the one or more spreading P2P clients at the next lower lever.

9, A system for automatically spreading resources, wherein the system comprises an original Peer to Peer (P2P) client and one or more spreading P2P clients, wherein

the original P2P client is configured to download network resources from a network resource server, obtain information about the one or more spreading P2P clients configured from a P2P seed server, and automatically push the network resources to the one or more spreading P2P clients; and

each spreading P2P client is configured to receive the network resources pushed by the original P2P client.

10, The system of claim 9, wherein the system further comprises the P2P seed server, which to configure the one or more spreading P2P clients for the original P2P client, according to connection information of the original P2P client and other P2P clients, as well as resource occupancy states of the other P2P clients.

11, The system of claim 10, wherein the P2P seed server to configure one or more idle P2P clients directly connected with the original P2P client as the one or more spreading P2P clients of the original P2P client.

12, The system of claim 10, wherein the P2P seed server to configure one or more P2P clients directly connected with the original P2P client, and bandwidth occupancy rates of which are smaller than a threshold, as the one or more spreading

P2P clients of the original P2P client.

13, The system of claim 10, wherein the P2P seed server to query one or more idle P2P clients directly connected with the original P2P client, select one or more P2P clients from the one or more P2P clients searched out according to information transmission capabilities of the one or more P2P clients searched out, and configure the selected one or more P2P clients as the one or more spreading P2P clients of the original P2P client.

14, The system of claim 10, wherein each spreading P2P client to obtain information about one or more spreading P2P clients at the next lower lever for the spreading P2P client from the P2P seed server, and pushes the network resources to the one or more spreading P2P clients at the next lower lever.