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(54) **Title:** METHOD, APPARATUS AND DEVICE FOR MANAGING AN IMS SESSION

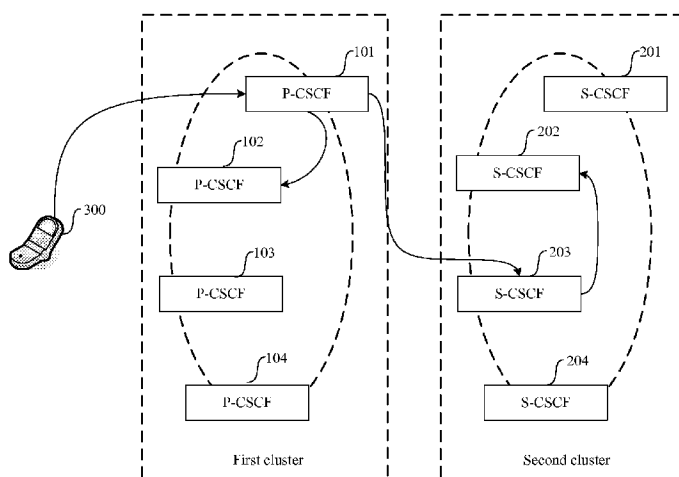


Fig. 1

(57) **Abstract:** An objective of the present invention is to provide methods, apparatuses, and devices for managing IMS sessions. According to one aspect of the present invention, wherein the P-CSCF device belongs to a first cluster including multiple P-CSCF devices, wherein the method comprises: when receiving an invitation information for inviting establishment of a session, extracting, from the invitation information, device identification information of a device relevant to said session; determining network address information of another P-CSCF device, which stores the device identification information, among said first cluster based on the extracted device identification information; obtaining first registry data corresponding to the device identification information from the determined another P-CSCF device. An advantage of the present invention lies in a good scalability and a good load balance.

Method, Apparatus and Device for Managing an IMS Session

Field of the Invention

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The present invention relates to the field of communication technology, and more specifically, to a method, apparatus and device for managing an IMS session.

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Background of the Invention

The prior art has proposed three approaches to determine the call session control function (CSCF) used by a session. However, each approach has its own limitation.

15 In the three approaches, the most common one is “once and forever” binding the IMS (IMS, IP Multimedia Subsystem) subscriber and CSCF entities.

This approach has the following problems: 1) it cannot support a wholesale user. For example, for a company subscriber “*@facebook.com.” which represents all users of
20 the Facebook Company. In the existing “once and forever” binding mechanism, all IMS sessions from the Facebook company at the same time are supported by the same CSCF entity containing registry data of this subscriber. It is hardly bearable for a single CSCF entity, which finally causes issues such as incapable of processing calls; 2) it cannot perform load balance. For a single user, a case might arise that a great
25 number of subscribers crowd to perform call sessions through few CSCF entities. The consequence is that these few CSCF entities are overloaded, while the remaining other CSCF entities are starving, which does not good for optimized load configuration.

The second approach is employing a central registry database. In this case, the registry
30 data of all subscribers is saved in a central registry database. When a subscriber initiates a session, the CSCF entity obtains registry data corresponding to the subscriber from the central registry database.

This approach has the following problems: 1) since in the whole system, a great
35 number of CSCF entities would read or write data from or into the central registry database simultaneously, the central registry database would become a performance bottleneck portion of the whole IMS system; 2) fault of a single node of the central registry database might cause all CSCF entities unable to work, which causes the system less secure; 3) when the performance of the central registry database per se
40 reaches its ultimate, regardless of how to add the CSCF entities, the system performance would not be extended. Therefore, the central registry database also becomes a bottleneck for extending the performance of the whole system.

The third approach is keeping registry data of all subscribers in each CSCF, such that

when a CSCF has new subscriber information, it would synchronize it to each of other CSCFs.

- 5 This approach has a problem that the throughput of the whole system merely relies on the performance of a single CSCF, such that the system performance cannot be effectively extended.

Summary of the Invention

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An objective of the present invention is to provide methods, apparatuses, and devices for managing IMS sessions.

- 15 According to one aspect of the present invention, there is provided a method for managing an IMS session in a proxy call session control function (P-CSCF) device, wherein the P-CSCF device belongs to a first cluster including multiple P-CSCF devices, wherein the method comprises:

- 20 a. when receiving an invitation information for inviting establishment of a session, extracting, from the invitation information, device identification information of a device relevant to said session;
- b. determining network address information of another P-CSCF device, which stores the device identification information, among said first cluster based on the extracted device identification information;
- 25 c. obtaining first registry data corresponding to the device identification information from the determined another P-CSCF device.

- According to one aspect of the present invention, there is provided a method for managing an IMS session in a service call session control function(S-CSCF) device, wherein said S-CSCF device belongs to a second cluster including multiple S-CSCF devices, wherein said method comprises:
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- A. when receiving an invitation information for inviting establishment of a session, extracting, from the invitation information, device identification information of a device relevant to said session;
- 35 B. determining network address information of another S-CSCF device, which stores the device identification information, among said second cluster based on the extracted device identification information;
- C. obtaining second registry data corresponding to the device identification information from the determined another S-CSCF device.

- 40 According to one aspect of the present invention, there is provided a proxy call session control function (P-CSCF) device for managing an IMS session, wherein said P-CSCF device belongs to a first cluster including multiple P-CSCF devices, wherein said P-CSCF device comprises:
- a first obtaining device configured to, when receiving an invitation information for

inviting establishment of a session, extract, from the invitation information, device identification information of a device relevant to said session;

a first determining device configured to determine network address information of another P-CSCF device, which stores the device identification information, among

5 said first cluster based on the extracted device identification information;

a second obtaining device configured to obtain first registry data corresponding to the device identification information from the determined another P-CSCF device.

According to one aspect of the present invention, there is provided a service call session control function(S-CSCF) device for managing an IMS session, said S-CSCF device belongs to a second cluster including multiple S-CSCF devices, wherein said S-CSCF device comprises:

a third obtaining device configured to, when receiving an invitation information for inviting establishment of a session, extract, from the invitation information, device

15 identification information of a device relevant to said session;

a second determining device configured to determine network address information of another S-CSCF device, which stores the device identification information, among said second cluster based on the extracted device identification information;

a fourth obtaining device configured to obtain second registry data corresponding to the device identification information from the determined another P-CSCF device.

According to one aspect of the present invention, there is provided an IMS session system, wherein the system comprises a first cluster and a second cluster, wherein said first cluster comprises multiple proxy call session control function(P-CSCF) devices and said second cluster comprises multiple service call session control function(S-CSCF) devices..

Comparing with the prior art, the present invention has the following advantages: each P-CSCF device or S-CSCF device may retrieve registration information stored in other P-CSCF devices or S-CSCF devices in the clusters they belong, such that each P-CSCF device or S-CSCF device may support a session originated by a subscriber that has not registered with the each P-CSCF device or S-CSCF device per se, and such that multiple P-CSCF devices or S-CSCF devices may support a session originated by the same subscriber account, i.e., supporting a wholesale mode.

Meanwhile, since DNS, when parsing domain names, may rank IPs according to actual load, a P-CSCF device or S-CSCF device, which has a lighter load is preferably selected to perform a session operation, thereby realizing load balance of each P-CSCF device or S-CSCF device. Moreover, the CSCF entities in the first cluster and second cluster according to the present invention may adopt a P2P protocol for connection, such that both of the first cluster and second cluster have a good scalability.

BRIEF DESCRIPTION OF THE DRAWINGS

Through reading the detailed depiction of the non-limiting embodiments with reference to the accompanying drawings, other features, objectives and advantages of the present invention will become more apparent:

Fig. 1 shows an originating network section of an IMS session system according to claim 1;

Fig. 2 shows a flowchart of a method in a call originating stage of managing an IMS session in a CSCF device according to the present invention;

Fig. 3 shows a called network section of an IMS session system;

Fig. 4 shows a flowchart of a method at a called stage of managing an IMS session in a CSCF device according to the present invention;

Fig. 5 shows a structural diagram of a P-CSCF device according to the present invention;

Fig. 6 shows a structural diagram of a S-CSCF device according to the present invention;

Same or similar reference signs in the drawings represent same or similar components.

Detailed Description of the Preferred Embodiments

Hereinafter, the present invention will be depicted further with reference to the accompanying drawings.

Fig. 1 schematically shows an originating network section of an IP multimedia subsystem(IMS) session system according to the present invention, wherein the IMS session system of the originating network section comprises a user equipment 300, a first cluster including multiple proxy call session control function(P-CSCF) devices, and a second cluster including a service call session control function(S-CSCF) devices, wherein the user equipment UE1 acts as a calling party, the first cluster corresponds to first domain name information, and the second cluster corresponds to second domain name information.

For the sake of simplicity, in the first cluster of Fig. 1, there only illustrates 4 P-CSCF devices 101 to 104, and in the second cluster, there only illustrates 4 S-CSCF devices 201 to 204.

Those skilled in the art may determine the numbers of devices in the two clusters respectively.

In this embodiment, each P-CSCF device in the first cluster may retrieve first registry data of subscribers from other P-CSCF devices in the cluster; each S-CSCF device in the second cluster may retrieve second registry data of subscribers from other S-CSCF devices in the cluster.

Preferably, the multiple P-CSCF devices, or the multiple S-CSCF devices, establishes a connection to form a cluster based on a P2P protocol, for example, Chord protocol, etc.

- 5 Fig. 2 shows a flowchart of a method in a call originating stage of managing an IMS session in a CSCF device according to the present invention.

In this embodiment, the method at the call originating stage comprises steps S11-S13 performed by the P-CSCF device, and steps S21-S23 performed by the S-CSCF
10 device.

In step S11, when the P-CSCF device receives invitation information for inviting establishment of a session, the P-CSCF device extracts, from the invitation information, device identification information of a device relevant to said session.
15

Herein, the device identification information includes information for uniquely identifying a user equipment. Preferably, the device identification information includes, but not limited to, any one of the following:

- 20 1) public user identity of the user equipment;
2) other information that may be used to uniquely identify a user, for example, a cellular phone's International Mobile Equipment Identity (IMEI) number, electronic serial number(ESN) and the like.

Preferably, when the invitation information comes from a user equipment, the step
25 S11 further comprises a step S111 (not shown).

In step S111, the P-CSCF device extracts device identification information of a user equipment as a calling party from the invitation information.

30 According to a first example of the present invention, when the user equipment 300 originates a call based on first domain name information corresponding to a first cluster, multiple pieces of network address information, P_IP1, P_IP2, P_IP3 and P_IP4 are obtained from parsing the first domain name information by a DNS, which respectively correspond to P-CSCF devices 101, 102, 103, and 104 in the first cluster.

35 Then, the user equipment 300 selects the network address information P_IP1 and sends invitation information for originating a session to the P-CSCF device 101 corresponding to the network address information P_IP1.

40 After the P-CSCF device 101 receives the invitation information from a user equipment 300, the P-CSCF device 101 extracts device identification information PUID_1 of the user equipment 300 as the calling party from the "From" field of a header of this invitation information.

It should be noted that the above example is only for better illustrating the technical

solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementations of extracting device identification information from a user equipment as the calling party from the invitation information should be included within the scope of the present invention.

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In step S12, the P-CSCF device determines network address information of another P-CSCF device, which stores the device identification information, among said first cluster based on the extracted device identification information.

10 Herein, each P-CSCF device of the first cluster stores index information for the device identification information stored in each other P-CSCF devices in the first cluster per se, wherein the index information comprises a correspondence relationships between the device identification information and each P-CSCF device; preferably, the index information comprises key values resulting from pre-processing the device
15 identification information, for example, the correspondence relationship between a hash value resulting from processing the device identification information using a predetermined hash function and each P-CSCF device.

Specifically, the P-CSCF device determines the network address information of
20 another P-CSCF device, which corresponds to the device identification information obtained in step S11, based on the correspondence relationship between the device identification information and each P-CSCF device.

Continue illustration of the above first example with reference to Figs. 1 and 2, the
25 P-CSCF device 101 performs hash processing to the obtained device identification information PUID_1 of the user equipment 300 using a predetermined hash function, so as to obtain the hash value Hash_2, wherein the index table in the P-CSCF device 101 is shown in following table 1:

30

Table 1

Hash Value	Network Address Information
Hash_11	P_IP1
Hash_12	P_IP2
Hash_13	P_IP3
Hash_14	P_IP4

The P-CSCF device 101 performs query in its own index table 1 so as to obtain network address information P_IP2 of another P-CSCF device storing the PUID_1.

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It should be noted that in the above step, the another P-CSCF device determined by the P-CSCF device may be other P-CSCF device or the P-CSCF device per se.

5 It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of determining network address information of another P-CSCF device, which stores the device identification information, among said first cluster based on the extracted device identification information, should be included within the scope of the present invention.

Next, in step S13, the P-CSCF device obtains first registry data corresponding to the device identification information from the determined another P-CSCF device.

15 Continue illustration of the above first example with reference to Figs. 1 and 2, based on the network address information P_IP2 determined in step S12, the P-CSCF device 101 obtains first registry data Reg_1 corresponding to the device identification information PUID_1 of the user equipment 300 from the P-CSCF device 102 corresponding to the network address information P_IP2.

20 It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of obtaining first registry data corresponding to the device identification information from the determined another P-CSCF device should be included within the scope of the present invention.

It should be noted that when the another P-CSCF device determined by the P-CSCF device in step S12 is other P-CSCF device, the P-CSCF device obtains, through an interactive communication with this another P-CSCF device, the first registry data corresponding to the device identification information sent by the latter; while when the another P-CSCF device is the P-CSCF device per se, the P-CSCF device directly obtains the first registry data corresponding to the device identification information from the multiple pieces of first registration information as stored in itself.

35 Preferably, when the invitation information comes from the user equipment, the first registry data as obtained by the P-CSCF device in step S13 includes second domain name information of the second cluster, and the method further comprises a step S14 (not shown) and a step S15 (not shown), which are performed by the P-CSCF device.

40 In step S14, the P-CSCF device obtains multiple pieces of network address information corresponding to the second domain name information.

Specifically, the P-CSCF device requests the DNS for parsing the second domain

name information and receives network address information of multiple S-CSCF devices in the second cluster, which is parsed by the DNS and is corresponding to the second domain name information.

- 5 Continue illustration of the above first example with reference to Figs. 1 and 2. The P-CSCF device 101 extracts second domain name information corresponding to the second cluster from the first registry data obtained at the another P-CSCF device 102; then, the P-CSCF device 101 requests the DNS for parsing the second domain name information, and receives that the network address information of multiple S-CSCF
10 devices in the second cluster parsed by the DNS are S_IP1, S_IP2, S_IP3, and S_IP4 respectively, which correspond respectively to the S-CSCF devices 201, 202, 203, and 204 in the second cluster.

- 15 In step S15, the P-CSCF device selects one piece of network address information from the multiple network addresses, and sends the invitation information to a S-CSCF device, corresponding to the network address information, in said second cluster.

- 20 Continue illustration of the above first example with reference to Figs. 1 and 2. The P-CSCF device 101 selects network address information S_IP3 from the 4 pieces of network address information, and sends a piece of invitation information for originating a session to the S-CSCF device 203, corresponding to the network address information S_IP3, in the second cluster.

- 25 Next, in step S21, when the S-CSCF device receives the invitation information for inviting establishment of a session, the S-CSCF device extracts device identification information of a device relevant to the session from the invitation information.

- 30 Preferably, when the invitation information comes from the P-CSCF device, the step S21 further comprises a step S211.

- In the step S211, when the invitation information comes from the P-CSCF device, the S-CSCF device obtains device information of a user equipment as a calling party from the invitation information.

- 35 Continue illustration of the first example with reference to Figs. 1 and 2. The S-CSCF device 203 receives a piece of invitation information from the P-CSCF device 101 and extracts device identification information PUID_1 of the user equipment 300 as the calling party from the "P-Asserted-Identity" or "From" field of a header of the
40 invitation information.

Next, in step S22, the S-CSCF device determines network address information of another S-CSCF device, which stores the device identification information, among said second cluster based on the extracted device identification information.

Herein, each S-CSCF device of the second cluster stores index information for the device identification information stored in each other P-CSCF devices in the second cluster per se, wherein the index information comprises a correspondence relationship between the device identification information and each S-CSCF device; preferably, the index information comprises key values resulting from pre-processing the device identification information, for example, the correspondence relationship between a hash value resulting from processing the device identification information using a predetermined hash function and each S-CSCF device.

Specifically, the S-CSCF device determines network address information of another S-CSCF device corresponding to the device identification information obtained in step S211, based on the correspondence relationship between the device identification information and each S-CSCF device.

Continue illustration of the above first example with reference to Figs. 1 and 2. The S-CSCF device 203 performs hash processing to the obtained PUID_1 of the user equipment 300 using a predetermined hash function, so as to obtain a hash value Hash_22, wherein the index table in the S-CSCF device 203 is shown in Table 2 as follows:

Table 2

Hash Value	Network Address Information
Hash_21	S_IP1
Hash_22	S_IP2
Hash_23	S_IP3
Hash_24	S_IP4

Then, the S-CSCF device 203 performs query in its own index table 1 so as to obtain the network address information S_IP2 of another S-CSCF device storing PUID_1.

It should be noted that said another S-CSCF device as determined by the S-CSCF device may be the S-CSCF device per se.

It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of determining network address information of another S-CSCF device, which stores the device identification information, among said second cluster based on the extracted device identification information, should be included within the scope of the present

invention.

Next, in step S23, the S-CSCF device obtains second registry data corresponding to the device identification information from the determined another S-CSCF device.

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Continue illustration of the above first example with reference to Figs. 1 and 2. The S-CSCF device 203, based on the network address information S_IP2 determined in the step S22, obtains the second registration information Reg_2 corresponding to the device identification information PUID_1 of the user equipment 300 from the S-CSCF device 202 corresponding to the network address information S_IP2.

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It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of obtaining second registry data corresponding to the device identification information from the determined another S-CSCF device should be included within the scope of the present invention.

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It should be noted that when said another S-CSCF device as determined by the S-CSCF device in step S22 is other S-CSCF device, the S-CSCF device receives, through interactive communication with said another S-CSCF device, second registry data corresponding to the device identification information sent by the latter; when said another S-CSCF device is the S-CSCF device per se, the S-CSCF device directly obtains the second registry data corresponding to the device identification information from the multiple pieces of second registration information stored in itself.

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According to one of the preferred embodiments of the present invention, the S-CSCF device further performs step S26 (not shown).

In step S26, upon the S-CSCF device obtains the second registry data, it performs a call originating operation and sends the invitation information to the called network.

30

Specifically, the S-CSCF device sends the invitation information to an Interrogating Call Session Control Function (I_CSCF) device so as to send the invitation information to a called network corresponding to the called party.

35

According to the method of the present invention, each P-CSCF device or S-CSCF device may obtains registry data stored on other P-CSCF device or S-CSCF device in the cluster to which said each P-CSCF device or S-CSCF device belongs, so that each P-CSCF device or S-CSCF device may support a session originated by a subscriber which does not register therewith, therefore a session originated by the same subscriber account could be supported by multiple P-CSCF devices or S-CSCF devices, i.e., a wholesale mode could be supported. Meanwhile, since the DNS could rank IPs according to the actual load of each IP when parsing domain names, so a

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P-CSCF device or a S-CSCF device with less load may be preferably selected to perform a session operation, thereby achieving load balance of each P-CSCF device or each S-CSCF device. Moreover, the CSCF devices in the first cluster and second cluster according to the present invention may be connected with a P2P protocol,
 5 thereby granting a good scalability to the first and second clusters.

As one of preferred embodiments of the present invention, the method according to the present invention may further comprise steps of registering a subscriber with a P-CSCF device and a S-CSCF device, wherein the method further comprises a step
 10 S17 (not shown) and a step S18 (not shown) performed by the P-CSCF device, and a step S27 (not shown) and a step S28 (not shown) performed by the S-CSCF device.

A user equipment to-be-registered originates a registration request based on first domain name information of the first cluster, wherein the user equipment requests a
 15 domain name parser (DNS) for parsing the first domain name information, and selects one piece of network address information from parsed multiple pieces of network address information corresponding to the first domain name information, and sends a registration request to P-CSCF device corresponding to the network address information.

20 In step S17, when the P-CSCF device receives a registration request relevant to the user equipment to-be-registered, based on device identification information of the user equipment to-be-registered included in the registration request, determines network address information of one P-CSCF device, which should store the device
 25 identification information, among the first cluster.

Herein, the P-CSCF device determines a P-CSCF device which is corresponding to the user equipment to-be-registered and is used for storing the first registry data of the former P-CSCF device based on a predetermined rule.
 30

Preferably, the predetermined rule comprises that storing first registry data of the user equipments within a predetermined range on each P-CSCF device.

For example, the first cluster of the current IMS session system comprises 3 P-CSCF
 35 devices P1, P2, P3, wherein the predetermined rule is shown in Table 3 below:

Table 3

P-CSCF device	Range of UE hash values
P1	0~100
P2	101~200

P3	≥ 201
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And, when a new P-CSCF device P4 joins in the first cluster, the hash value range corresponding to the P-CSCF device P3 is adjusted to 201~300, and the hash value range corresponding to the newly joined P-CSCF device P4 is adjusted to ≥ 301 . When other P-CSCF devices join in the cluster, their corresponding hash value range is determined likewise.

More preferably, respective P-CSCF devices in the current first cluster are connected based on a Chord protocol, and the hash value ranges corresponding to the respective P-CSCF devices are determined based on the hash values of IP addresses of respective P-CSCF devices. Moreover, network address information of each other P-CSCF device is included on respective P-CSCF devices whose connection is established based on the Chord protocol.

Continue illustration of the above first example with reference to Fig. 1, 4 P-CSCF devices in the first cluster determine the ranges of hash values corresponding to respective P-CSCF devices based on the hash values of their network address information, which are shown in table 4 (wherein, Hash_IP1 < Hash_IP2 < Hash_IP3 < Hash_IP4):

Table 4

P-CSCF device	Hash value of IP	Hash value range section of device identification information
101	Hash_IP1	[0, Hash_IP1)
102	Hash_IP2	[Hash_IP1, Hash_IP2)
103	Hash_IP3	[Hash_IP2, Hash_IP3)
104	Hash_IP4	[Hash_IP3, $+\infty$)

When a new P-CSCF device joins in the cluster, each P-CSCF device re-determines the hash value range section of device identification information of the user equipment stored on the each P-CSCF device, based on the hash value of the network address information of each P-CSCF device.

When a user equipment to-be-registered UE_1 (not shown) selects a P-CSCF device 102 in a first cluster and sends a registration request thereto, the P-CSCF device 102 extracts device identification information PUID_2 of the user equipment to-be-registered UE_1 from the obtained registration request, and processes the device identification information PUID_2 using a predetermined hash function, and determines that the hash value corresponding to the device identification information

PUID_2 is Hash_2. Besides, the P-CSCF device 102 determines that $\text{Hash_IP2} < \text{Hash_2} < \text{Hash_IP3}$. So the P-CSCF device 102 determines that the device identification information PUID_2 should be stored in the P-CSCF device 103.

- 5 It should be noted that in step S17, the another P-CSCF device for storing the device identification information as determined by the P-CSCF device may be either other P-CSCF device or the P-CSCF device per se.

10 It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of determining, based on based on device identification information of the user equipment to-be-registered included in the registration request, network address information of one P-CSCF device, which should store the device identification information, among
15 the first cluster, should be included within the scope of the present invention.

Next, in step S18, the P-CSCF device performs a corresponding operation so that the determined P-CSCF device receives said registration request.

- 20 Specifically, the manner of performing a corresponding operation so that the determined P-CSCF device receives said registration request includes, but not limited to, any one of the following:

- 25 1) the P-CSCF device feeds back the network address information of the P-CSCF device determined in step S17 to the user equipment to-be-registered, and the user equipment to-be-registered sends a registration request to the P-CSCF device determined in step S27.

30 Continue illustration of the above first example with reference to Fig. 1. The P-CSCF device 102 determines in step S17 that the current device identification information PUID_2 should be stored in the P-CSCF device 103, and sends the network address information P_IP3 of the P-CSCF device 103 to the user equipment to-be-registered UE_1, then the user equipment UE_1 sends a registration request to the P-CSCF device 103 based on the network address information P_IP3.

- 35 2) the P-CSCF device directly sends the registration request to the P-CSCF device determined in step S17.

40 It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of performing a corresponding operation so that the determined P-CSCF device receives said registration request should be included within the scope of the present invention.

Next, when the P-CSCF device which should store the device identification information of the device to-be-registered determined in step S17 receives the registration request of the device to-be-registered, the P-CSCF device sends the registration request to the I-CSCF device and includes the first domain name information of the first cluster to which the P-CSCF device belongs into a header domain of the registration request.

Next, the I-CSCF device receiving the registration request sends a User-Authorization-Request (URA) to a Home Subscriber Server (HSS) to determine which S-CSCF device should serve the user equipment to-be-registered, and receives second domain name information corresponding to the second cluster as fed back from the HSS, then the I-CSCF requests the DNS to parse the second domain name information, and selects one piece of network address information from among multiple pieces of network address information as parsed, and sends the registration request to the S-CSCF device corresponding to the selected network address information.

Next, in step S27, when receiving the registration request relevant to the user equipment to-be-registered, based on the device identification information of the user equipment to-be-registered included in the registration request, the S-CSCF device determines network address information of one S-CSCF device, which should store the device identification information, among the second cluster.

Herein, the manner of building the second cluster is similar to the manner of building the first cluster.

Herein, the manner in which the S-CSCF device determines, based on the device identification information of the user equipment to-be-registered included in the registration request, network address information of one S-CSCF device, which should store the device identification information, among the second cluster is identical or similar to the manner in step S17 in which the P-CSCF device determines, based on device identification information of the user equipment to-be-registered included in the registration request, network address information of one P-CSCF device, which should store the device identification information, among the first cluster, which will not be detailed here.

Next, in step S28, the S-CSCF device performs a corresponding operation so that the determined S-CSCF device receives said registration request.

Herein, the manner in which the S-CSCF device performs a corresponding operation so that the determined S-CSCF device receives the registration request is identical or similar to the method of step S18 in which the P-CSCF device performs a corresponding operation so that the determined P-CSCF device receives the registration request, which will not be detailed here.

Next, the S-CSCF device for storing the device identification information of the device to-be-registered as determined in step S28 sends to the Home Subscriber Server (HSS) a Multimedia-Auth-Request(MAR), which includes the second domain name information of the second cluster and a Server-Assignment-Request(SAR). Next, after receiving the feedback information of HSS, the S-CSCF device creates in itself corresponding second registry data for the device identification information, includes the first domain information into the second registry data, and sends a confirmation message including the second domain name information to the I-CSCF.

An I-CSCF device, after receiving the confirmation message from the S-CSCF device, sends the confirmation message to the S-CSCF device, which is used for storing the device identification information of device the to-be-registered and is determined in step S17. The P-CSCF device creates in itself first registry data corresponding to the user equipment to-be-registered, and includes the second domain name information of the confirmation message into the first registry data.

According to the method of the present embodiment, the device storing the registration information is determined based on the device identification information of the user equipment, such that each P-CSCF device or S-CSCF device may determine in a similar manner which P-CSCF device or S-CSCF device specifically stores the registry data of the user equipment originating the session, so that each P-CSCF device or S-CSCF device may process a session originated by a subscriber that does not register therewith. Therefore, a whole mode may be supported. Besides, a P-CSCF device or S-CSCF device with a less load may be selected so as to achieve load balance.

Fig. 3 schematically shows a called network section of an IMS session system according to the present invention, wherein the IMS session system of the called network section comprises a user equipment 300, a first cluster including multiple P-CSCF devices P_CSCF, and a second cluster including multiple S-CSCF devices. Herein, the user equipment 300 acts as a called party, the first cluster corresponds to first domain name information; and the second cluster corresponds to second domain name information.

For the sake of simplicity, the first cluster in Fig. 3 merely illustrates 4 P-CSCF devices 101-104, and the second cluster merely illustrates 4 S-CSCF devices 201-204.

Those skilled in the art may determine respective number of devices in the two clusters according to actual applications and needs.

Herein, each P-CSCF device in the first cluster can obtain first registry data of a subscriber from other P-CSCF devices in the cluster; each S-CSCF device in the second cluster can obtain second registry data of a subscriber from other S-CSCF

devices in the cluster.

Preferably, the multiple P-CSCF devices, or the multiple S-CSCF devices, establish a connection based on a P2P protocol, for example, a Chord protocol and the like, to form a cluster.

Fig. 4 shows a flowchart of a method at a called stage of managing an IMS session in a CSCF device according to the present invention.

In this embodiment, the method at the called stage comprises steps S11-S13 performed by a P-CSCF device, and steps S21-S23 performed by a S-CSCF device. Herein, at the called stage, the step S11 further comprises a step S112 (not shown), the step S21 further comprises a step S212 (not shown), wherein the P-CSCF device further performs step S16 (not shown), and the S-CSCF device further performs a step S24 (not shown) and a step S25 (not shown).

In this embodiment, steps S11-S13 performed by a P-CSCF device and steps S21-23 performed by a S-CSCF device have been depicted in detail in the embodiments with reference to Figs. 1 and 2, which are incorporated here by reference and thus not detailed here.

At the called stage, the invitation information from the call originating network is sent by the S-CSCF device to an I-CSCF device, and the I-CSCF device sends a Location-Info-Request (LIR) to the HSS so as to determine which S-CSCF device is serving the called party. Next, the I-CSCF receives second domain name information fed back from the home subscriber server. Then, the I-CSCF selects one piece of network address information among multiple pieces of network address information corresponding to the second domain name information, and sends a piece of invitation information to the S-CSCF device corresponding to the selected network address information.

Next, in step S212, when the invitation information comes from the I-CSCF device, the S-CSCF device obtains device identification information of a user equipment as a called party from said invitation information.

Herein, the device identification information includes information for uniquely identifying a user equipment. Preferably, the device identification information includes, but not limited to, any one of the following:

- 1) public user identity (PUID) of the user equipment;
- 2) other information that may be used to uniquely identify a user equipment, for example, a cellular phone's IMEI number, ESN number, etc.

Specifically, the S-CSCF device obtains device identification information of the called party from a predetermined field of a header of the invitation information.

According to a second embodiment of the present invention, the I-CSCF requests a DNS for parsing the second domain name information corresponding to the second cluster and obtains the following multiple pieces of network address information:
5 S_IP1, S_IP2, S_IP3, and S_IP4, which correspond respectively to the S-CSCF devices 201-204 in the second cluster. Then, the I-CSCF selects the network address information S_IP1 and sends the invitation information for originating the session to one S-CSCF device 201 corresponding to the network address information S_IP1.

10 Next, the S-CSCF device 201, after receiving the invitation information from the I-CSCF, obtains the device identification information PUID_1 of the user equipment as the called party from the "Request URI" field of the invitation information.

Next, in steps S22 and S23, the S-CSCF device obtains the second registration
15 information corresponding to the device identification information, wherein the second registry data includes the first domain name information of the first cluster.

Next, in step S24, the S-CSCF device obtains multiple pieces of network address
20 information corresponding to the first domain name information.

Specifically, the S-CSCF device requests the DNS for parsing the first domain name
information and receives network address information, as parsed from the DNS, of
multiple S-CSCF devices in the first cluster corresponding to the first domain name
information.

25 Continue illustration of the above second example. In step S22, the S-CSCF device 201 determines the network address information S_IP2 of another S-CSCF device storing the device identification PUID_1, and in step S23, the S-CSCF device 201 obtains second registry data Reg_2 corresponding to the device identification
30 information PUID_1 from the S-CSCF device 202 corresponding to the network address information S_IP2, and obtains the first domain name information corresponding to the first cluster from the second registry data Reg_2.

Next, the S-CSCF device 201 requests the DNS for parsing the first domain name
35 information, and receives that the network address information of the four P-CSCF devices in the first cluster parsed by the DNS are P_IP1, P_IP2, P_IP3, and P_IP4 respectively, which correspond respectively to the P-CSCF devices 101-104 in the first cluster.

40 In step S25, the S-CSCF device selects one piece of network address information from the multiple network addresses and sends the invitation information to a P-CSCF device, corresponding to the network address information, in said first cluster.

Continue illustration of the above second example with reference to Figs. 3 and 4. The

S-CSCF device 201 selects the network address information P_IP3 from the obtained 4 pieces of network address information, and sends a invitation information for originating a session to the P-CSCF device 103 corresponding to the network address information P_IP3, in the first cluster.

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Next, in step S112, when the invitation information comes from the S-CSCF device, the P-CSCF device extracts the device identification information of the user equipment as the called party from the invitation information.

10 Continue illustration of the above second example with reference to Figs. 3 and 4. The P-CSCF device 103 receives the invitation information from the S-CSCF device 201 and obtains the device identification information PUID_1 of the user equipment as the called party from the field, for example, "Request URI" field of the invitation information.

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Next, the P-CSCF device obtains first registry data corresponding to the device identification information as depicted in step S112 through steps S12 and S13.

20 Next, upon obtaining the first registry data, in step S16, the P-CSCF device performs a call originating operation and sends the invitation information to a user equipment corresponding to the device identification information.

Continue illustration of the above second example with reference to Figs. 3 and 4. In step S12, the P-CSCF device 103 determines the network address information P_IP2 of another S-CSCF device storing the device identification information PUID_1, and in step S13, the P-CSCF device 103 obtains first registry data Reg_1 corresponding to the device identification information PUID_1 from the P-CSCF device 102 corresponding to the network address information P_IP2.

30 Next, the P-CSCF device 103 sends invitation information to the user equipment 300 as the called party corresponding to the device identification information PUID_1.

According to the method of the present invention, each P-CSCF device or S-CSCF device may obtains registry data stored on other P-CSCF device or S-CSCF device in the cluster to which said each P-CSCF device or S-CSCF device belongs, so that each P-CSCF device or S-CSCF device may support a session originated by a subscriber which does not register therewith, therefore a session originated by the same subscriber account could be supported by multiple P-CSCF devices or S-CSCF devices, i.e., a wholesale mode could be supported. Meanwhile, since the DNS could rank IPs according to the actual load of each IP when parsing domain names, so a P-CSCF device or a S-CSCF device with less load may be preferably selected to perform a session operation, thereby achieving load balance of each P-CSCF device or each S-CSCF device. Moreover, the CSCF devices in the first cluster and second cluster according to the present invention may be connected with a P2P protocol,

thereby granting a good scalability to the first and second clusters.

Fig. 5 schematically shows a structural diagram of a P-CSCF device for managing an IMS session according to the present invention. The P-CSCF device according to the present invention comprises a first obtaining device 11, a first determining device 12, and a second obtaining device 13.

Illustration is made with reference to Figs. 1 and 5, wherein Fig. 1 schematically shows when the P-CSCF device receives invitation information for inviting establishment of a session, the first obtaining device 11 extracts, from the invitation information, device identification information of a device relevant to said session.

Herein, the device identification information includes information for uniquely identifying a user equipment. Preferably, the device identification information includes, but not limited to, any one of the following:

- 1) public user identity of the user equipment;
- 2) other information that may be used to uniquely identify a user equipment, for example, a cellular phone's International Mobile Equipment Identity (IMEI) number, electronic serial number (ESN) and the like.

Preferably, when the invitation information comes from a user equipment, said first obtaining device 11 further comprises a first sub-obtaining device (not shown).

The first sub-obtaining device extracts device identification information of a user equipment as a calling party from the invitation information.

According to a first example of the present invention with reference to Figs. 1 and 5, when the user equipment 300 originates a call based on first domain name information corresponding to a first cluster, multiple pieces of network address information, P_IP1, P_IP2, P_IP3 and P_IP4 are obtained from parsing the first domain name information by a DNS, which respectively correspond to P-CSCF devices 101, 102, 103, and 104 in the first cluster. Then, the user equipment 300 selects the network address information P_IP1 and sends invitation information for originating a session to the P-CSCF device 101 corresponding to the network address information P_IP1.

After the P-CSCF device 101 receives the invitation information from a user equipment 300, a first sub-obtaining device of the P-CSCF device 101 extracts device identification information PUID_1 of the user equipment 300 as the calling party from the "From" field of a header of this invitation information.

It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementations of extracting device

identification information from a user equipment as the calling party from the invitation information should be included within the scope of the present invention.

5 A first determining device 12 of the P-CSCF device determines network address information of another P-CSCF device, which stores the device identification information, among said first cluster based on the extracted device identification information.

10 Herein, each P-CSCF device of the first cluster stores index information for the device identification information stored in each other P-CSCF devices in the first cluster per se, wherein the index information comprises a correspondence relationships between the device identification information and each P-CSCF device; preferably, the index information comprises key values resulting from pre-processing the device identification information, for example, the correspondence relationship between a
15 hash value resulting from processing the device identification information using a predetermined hash function and each P-CSCF device.

Specifically, the first determining device 12 determines the network address information of another P-CSCF device, which corresponds to the device identification
20 information obtained by the first obtaining device 11, based on the correspondence relationship between the device identification information and each P-CSCF device.

Continue illustration of the above first example with reference to Figs. 1 and 5, the first determining device 12 of the P-CSCF device 101 performs hash processing to the
25 obtained device identification information PUID_1 of the user equipment 300 using a predetermined hash function, so as to obtain the hash value Hash_2, wherein the index table in the P-CSCF device 101 is shown in following table 5:

Table 5

Hash Value	Network Address Information
Hash_11	P_IP1
Hash_12	P_IP2
Hash_13	P_IP3
Hash_14	P_IP4

30 The first determining device 12 of the P-CSCF device 101 performs query in its own index table 5 so as to obtain network address information P_IP2 of another P-CSCF device storing the PUID_1.

It should be noted that in the above step, the another P-CSCF device determined by the first determining device of the P-CSCF device may be other P-CSCF device or the P-CSCF device to which the first determining device per se belongs.

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It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of determining network address information of another P-CSCF device, which stores the device identification information, among said first cluster based on the extracted device identification information, should be included within the scope of the present invention.

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Next, a second obtaining device 13 of the P-CSCF device obtains first registry data corresponding to the device identification information from the determined another P-CSCF device.

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Continue illustration of the above first example with reference to Figs. 1 and 5, based on the network address information P_IP2 determined by the first determining device 12, the second obtaining device 13 of the P-CSCF device 101 obtains first registry data Reg_1 corresponding to the device identification information PUID_1 of the user equipment 300 from the P-CSCF device 102 corresponding to the network address information P_IP2.

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It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of obtaining first registry data corresponding to the device identification information from the determined another P-CSCF device should be included within the scope of the present invention.

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It should be noted that when the another P-CSCF device determined by the first determining device 12 of the P-CSCF device is not the one to which the first determining device 12 belongs, the second obtaining device 13 of the latter P-CSCF device obtains, through an interactive communication with the determined another P-CSCF device, the first registry data corresponding to the device identification information sent by the latter; while when the another P-CSCF device determined by the first determining device 12 is the P-CSCF device to which the first determining device 12 per se belongs, the second obtaining device 13 of the P-CSCF device directly obtains the first registry data corresponding to the device identification information from the multiple pieces of first registration information as stored in

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itself.

Preferably, when the invitation information comes from the user equipment, the first registry data as obtained by the second obtaining device 13 of the P-CSCF device includes second domain name information of the second cluster, and the P-CSCF device further comprises a first address obtaining device (not shown) and a first sending device (not shown).

The first address obtaining device of the P-CSCF device obtains multiple pieces of network address information corresponding to the second domain name information.

Specifically, the first address obtaining device of the P-CSCF device requests the DNS for parsing the second domain name information and receives network address information of multiple S-CSCF devices in the second cluster, which is parsed by the DNS and is corresponding to the second domain name information.

Continue illustration of the above first example with reference to Figs. 1 and 5. The first address obtaining device of the P-CSCF device 101 extracts second domain name information corresponding to the second cluster from the first registry data obtained at the another P-CSCF device 102; then, the first address obtaining device of the P-CSCF device 101 requests the DNS for parsing the second domain name information, and receives that the network address information of multiple S-CSCF devices in the second cluster parsed by the DNS are S_IP1, S_IP2, S_IP3, and S_IP4 respectively, which correspond respectively to the S-CSCF devices 201, 202, 203, and 204 in the second cluster.

The first sending device selects one piece of network address information from the multiple network addresses, and sends the invitation information to a S-CSCF device, corresponding to the network address information, in said second cluster.

Continue illustration of the above first example with reference to Figs. 1 and 5. The first sending device of the P-CSCF device 101 selects network address information S_IP3 from the 4 pieces of network address information, and sends a piece of invitation information for originating a session to the S-CSCF 203 device, corresponding to the network address information S_IP3, in the second cluster.

Illustration is made with further reference to Fig.6. Fig.6 schematically shows a structural diagram of a S-CSCF device for managing an IMS session according to the present invention. The S-CSCF device according to the present invention comprises a third obtaining device 21, a second determining device 22, and a fourth obtaining device 23.

Next, when the S-CSCF device receives the invitation information for inviting establishment of a session, the third obtaining device 21 of the S-CSCF device extracts device identification information of a device relevant to the session from the invitation information.

Preferably, when the invitation information comes from the P-CSCF device, the fourth sub-obtaining device included in the third obtaining device 21 obtains device identification information of a user equipment as a calling party from said invitation information.

Continue illustration of the first example with reference to Figs. 1 and 6. The S-CSCF device 203 receives a piece of invitation information from the P-CSCF device 101, and the fourth sub-obtaining device included in the third obtaining device 21 of the S-CSCF device 203 extracts device identification information PUID_1 of the user equipment 300 as the calling party from the “P-Asserted-Identity” or “From” field of a header of the invitation information.

Next, the second determining device 22 of the S-CSCF device determines network address information of another S-CSCF device, which stores the device identification information, among said second cluster based on the extracted device identification information.

Herein, each S-CSCF device of the second cluster stores index information for the device identification information stored in each other P-CSCF devices in the second cluster per se, wherein the index information comprises a correspondence relationship between the device identification information and each S-CSCF device; preferably, the index information comprises key values resulting from pre-processing the device identification information, for example, the correspondence relationship between a hash value resulting from processing the device identification information using a predetermined hash function and each S-CSCF device.

Specifically, the second determining device 22 of the S-CSCF device determines network address information of another S-CSCF device corresponding to the device identification information obtained by the fourth sub-obtaining device, based on the correspondence relationship between the device identification information and each S-CSCF device.

Continue illustration of the above first example with reference to Figs. 1 and 6. The second determining device 22 of the S-CSCF device 203 performs hash processing to the obtained PUID_1 of the user equipment 300 using a predetermined hash function, so as to obtain a hash value Hash_22, wherein the index table in the S-CSCF device

203 is shown in Table 6 as follows:

Table 6

Hash Value	Network Address Information
Hash_21	S_IP1
Hash_22	S_IP2
Hash_23	S_IP3
Hash_24	S_IP4

- 5 Then, the S-CSCF device 203 performs query in its own index table 6 so as to obtain the network address information S_IP2 of another S-CSCF device storing PUID_1.

It should be noted that said another S-CSCF device as determined by the second determining device 22 of the S-CSCF device may be other S-CSCF device or the
10 S-CSCF device to which the second determining device 22 per se belongs.

It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of determining
15 network address information of another S-CSCF device, which stores the device identification information, among said second cluster based on the extracted device identification information, should be included within the scope of the present invention.

20 Next, the fourth obtaining device 23 of the S-CSCF device obtains second registry data corresponding to the device identification information from the determined another S-CSCF device.

Continue illustration of the above first example with reference to Figs. 1 and 6. The
25 fourth obtaining device 23 of the S-CSCF device 203, based on the network address information S_IP2 determined by the second determining device 22, obtains the second registration information Reg_2 corresponding to the device identification information PUID_1 of the user equipment 300 from the S-CSCF device 202 corresponding to the network address information S_IP2.

30 It should be noted that the above example is only for better illustrating the technical

solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of obtaining second registry data corresponding to the device identification information from the determined another S-CSCF device should be included within the scope of the present invention.

It should be noted that when said another S-CSCF device as determined by the second determining device 22 of the S-CSCF device is other S-CSCF device, the fourth obtaining device 23 of the S-CSCF device receives, through interactive communication with said another S-CSCF device, second registry data corresponding to the device identification information sent by the latter; when the another S-CSCF device determined by the second determining device 22 is the S-CSCF device to which the second determining device 22 belongs to, the fourth obtaining device 23 of the S-CSCF device directly obtains the second registry data corresponding to the device identification information from the multiple pieces of second registration information stored in itself.

According to one of the preferred embodiments of the present invention, the S-CSCF device further comprises a fourth sending device (not shown).

Upon the S-CSCF device obtains the second registry data, the fourth sending device of the S-CSCF device performs a call originating operation and sends the invitation information to the called network.

Specifically, the fourth sending device sends the invitation information to an Interrogating Call Session Control Function (I_CSCF) device so as to send the invitation information to a called network corresponding to the called party.

According to the scheme of the present invention, each P-CSCF device or S-CSCF device may obtains registry data stored on other P-CSCF device or S-CSCF device in the cluster to which said each P-CSCF device or S-CSCF device belongs, so that each P-CSCF device or S-CSCF device may support a session originated by a subscriber which does not register therewith, therefore a session originated by the same subscriber account could be supported by multiple P-CSCF devices or S-CSCF devices, i.e., a wholesale mode could be supported. Meanwhile, since the DNS could rank IPs according to the actual load of each IP when parsing domain names, so a P-CSCF device or a S-CSCF device with less load may be preferably selected to perform a session operation, thereby achieving load balance of each P-CSCF device or each S-CSCF device. Moreover, the CSCF devices in the first cluster and second cluster according to the present invention may be connected with a P2P protocol, thereby granting a good scalability to the first and second clusters.

As one of preferred embodiments of the present invention, the P-CSCF device according to the present invention may further comprise a third determining device (not shown) and a first operating device (not shown), the S-CSCF device according to the present invention may further comprise a fourth determining device(not shown) and a second operating device(not shown).

A user equipment to-be-registered originates a registration request based on first domain name information of the first cluster, wherein the user equipment requests a domain name parser (DNS) for parsing the first domain name information, and selects one piece of network address information from parsed multiple pieces of network address information corresponding to the first domain name information, and sends a registration request to P-CSCF device corresponding to the network address information.

When the P-CSCF device receives a registration request relevant to the user equipment to-be-registered, based on device identification information of the user equipment to-be-registered included in the registration request, the third determining device of the P-CSCF device determines network address information of one P-CSCF device, which should store the device identification information, among the first cluster.

Herein, the third determining device of the P-CSCF device determines a P-CSCF device which is corresponding to the user equipment to-be-registered and is used for storing the first registry data of the former P-CSCF device based on a predetermined rule.

Preferably, the predetermined rule comprises that storing first registry data of the user equipments within a predetermined range on each P-CSCF device.

For example, the first cluster of the current IMS session system comprises 3 P-CSCF devices P1, P2, P3, wherein the predetermined rule is shown in Table 7 below:

Table 7

P-CSCF device	Range of UE hash values
P1	0~100
P2	101~200

P3	≥ 201
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And, when a new P-CSCF device P4 joins in the first cluster, the hash value range corresponding to the P-CSCF device P3 is adjusted to 201~300, and the hash value range corresponding to the newly joined P-CSCF device P4 is adjusted to ≥ 301 . When other P-CSCF devices join in the cluster, their corresponding hash value range is determined likewise.

More preferably, respective P-CSCF devices in the current first cluster are connected based on a Chord protocol, and the hash value ranges corresponding to the respective P-CSCF devices are determined based on the hash values of IP addresses of respective P-CSCF devices. Moreover, network address information of each other P-CSCF device is included on respective P-CSCF devices whose connection is established based on the Chord protocol.

Continue illustration of the above first example with reference to Fig. 1, 4 P-CSCF devices in the first cluster determine the ranges of hash values corresponding to respective P-CSCF devices based on the hash values of their network address information, which are shown in table 8 (wherein, Hash_IP1 < Hash_IP2 < Hash_IP3 < Hash_IP4):

Table 8

P-CSCF device	Hash value of IP	Hash value range section of device identification information
101	Hash_IP1	[0, Hash_IP1)
102	Hash_IP2	[Hash_IP1, Hash_IP2)
103	Hash_IP3	[Hash_IP2, Hash_IP3)
104	Hash_IP4	[Hash_IP3, $+\infty$)

When a new P-CSCF device joins in the cluster, each P-CSCF device re-determines the hash value range section of device identification information of the user equipment stored on the each P-CSCF device, based on the hash value of the network address information of each P-CSCF device.

When a user equipment to-be-registered UE_1 (not shown) selects a P-CSCF device 102 in a first cluster and sends a registration request thereto, the third determining device of the P-CSCF device 102 extracts device identification information PUID_2 of the user equipment to-be-registered UE_1 from the obtained registration request, and processes the device identification information PUID_2 using a predetermined

hash function, and determines that the hash value corresponding to the device identification information PUID_2 is Hash_2. Besides, the third determining device of the P-CSCF device 102 determines that $\text{Hash_IP2} < \text{Hash_2} < \text{Hash_IP3}$. So the third determining device of the P-CSCF device 102 determines that the device identification information PUID_2 should be stored in the P-CSCF device 103.

It should be noted that, the another P-CSCF device, which is used for storing the device identification information and is determined by the third determining device of the P-CSCF device, may be either other P-CSCF device or the P-CSCF device to which the third determining device belongs to.

It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of determining, based on based on device identification information of the user equipment to-be-registered included in the registration request, network address information of one P-CSCF device, which should store the device identification information, among the first cluster, should be included within the scope of the present invention.

Next, the first operating device of the P-CSCF device performs a corresponding operation so that the determined P-CSCF device receives said registration request.

Specifically, the manner of that the first operating device performs a corresponding operation so that the determined P-CSCF device receives said registration request includes, but not limited to, any one of the following:

1) the first operating device of the P-CSCF device feeds back the network address information of the P-CSCF device determined by the third determining device to the user equipment to-be-registered, and the user equipment to-be-registered sends a registration request to the P-CSCF device determined by the third determining device.

Continue illustration of the above first example with reference to Fig. 1. The third determining device of the P-CSCF device 102 determines that the current device identification information PUID_2 should be stored in the P-CSCF device 103, and the first operating device of the P-CSCF device sends the network address information P_IP3 of the P-CSCF device 103 to the user equipment to-be-registered UE_1, then the user equipment UE_1 sends a registration request to the P-CSCF device 103 based on the network address information P_IP3.

2) the first operating device of the P-CSCF device directly sends the registration request to the P-CSCF device determined by the third determining device of the

former P-CSCF.

It should be noted that the above example is only for better illustrating the technical solution of the present invention, not intended to limit the present invention. Those skilled in the art should understand that any implementation manner of performing a corresponding operation so that the determined P-CSCF device receives said registration request should be included within the scope of the present invention.

Next, when the P-CSCF device which should store the device identification information of the device to-be-registered determined by the third determining device receives the registration request of the device to-be-registered, the P-CSCF device sends the registration request to the I-CSCF device and includes the first domain name information of the first cluster to which the P-CSCF device belongs into a header domain of the registration request.

Next, the I-CSCF device receiving the registration request sends a User-Authorization-Request (URA) to a Home Subscriber Server (HSS) to determine which S-CSCF device should serve the user equipment to-be-registered, and receives second domain name information corresponding to the second cluster as fed back from the HSS, then the I-CSCF requests the DNS to parse the second domain name information, and selects one piece of network address information from among multiple pieces of network address information as parsed, and sends the registration request to the S-CSCF device corresponding to the selected network address information.

Next, when receiving the registration request relevant to the user equipment to-be-registered, based on the device identification information of the user equipment to-be-registered included in the registration request, the fourth determining device of the S-CSCF device determines network address information of one S-CSCF device, which should store the device identification information, among the second cluster.

Herein, the manner of building the second cluster is similar to the manner of building the first cluster.

Herein, the manner in which the fourth determining device of the S-CSCF device determines, based on the device identification information of the user equipment to-be-registered included in the registration request, network address information of one S-CSCF device, which should store the device identification information, among the second cluster is identical or similar to the manner in which the third determining device of the P-CSCF device determines, based on device identification information of the user equipment to-be-registered included in the registration request, network address information of one P-CSCF device, which should store the device

identification information, among the first cluster, which will not be detailed here.

Next, the second operating device of the S-CSCF device performs a corresponding operation so that the determined S-CSCF device receives said registration request.

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Herein, the manner in which the second operating device of the S-CSCF device performs a corresponding operation so that the determined S-CSCF device receives the registration request is identical or similar to the manner in which the first operating device of the P-CSCF device performs a corresponding operation so that the determined P-CSCF device receives the registration request, which will not be detailed here.

10

Next, the determined S-CSCF device, which is used for storing the device identification information of the device to-be-registered and is determined by the second operating device of the S-CSCF device, sends to the Home Subscriber Server (HSS) a Multimedia-Auth-Request(MAR), which includes the second domain name information of the second cluster and a Server-Assignment-Request(SAR). Next, after receiving the feedback information of HSS, the determined S-CSCF device creates in itself corresponding second registration information for the device identification information, includes the first domain information into the second registration information, and sends a confirmation message including the second domain name information to the I-CSCF.

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An I-CSCF device, after receiving the confirmation message from the S-CSCF device, sends the confirmation message to the S-CSCF device, which is used for storing the device identification information of device to-be-registered and is determined by the third determining device of the P-CSCF device. The P-CSCF device creates in itself first registration information corresponding to the user equipment to-be-registered, and includes the second domain name information of the confirmation message into the first registration information.

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According to the method of the present embodiment, the device storing the registration information is determined based on the device identification information of the user equipment, such that each P-CSCF device or S-CSCF device may determine in a similar manner which P-CSCF device or S-CSCF device specifically stores the registry data of the user equipment originating the session, so that each P-CSCF device or S-CSCF device may process a session originated by a subscriber that does not register therewith. Therefore, a whole mode may be supported. Besides, a P-CSCF device or S-CSCF device with a less load may be selected so as to achieve load balance.

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As another one of the preferred embodiments of the present invention, reference to Fig.3, the P-CSCF device and the S-CSCF device according to the present invention

are applied to a called network section of an IMS session system according to the present invention.

At a called stage, the P-CSCF device further comprises a second sending device (not shown), the first obtaining device 11 of said P-CSCF device further comprises a second sub-obtaining device(not shown); the S-CSCF device further comprises a second address obtaining device(not shown) and a third sending device(not shown), the third obtaining device 21 of said S-CSCF device further comprises a third sub-obtaining device(not shown).

10

At the called stage, the invitation information from the call originating network is sent by the S-CSCF device to an I-CSCF device, and the I-CSCF device sends a Location-Info-Request (LIR) to the HSS so as to determine which S-CSCF device is serving the called party. Next, the I-CSCF receives second domain name information fed back from the home subscriber server. Then, the I-CSCF selects one piece of network address information among multiple pieces of network address information corresponding to the second domain name information, and sends a piece of invitation information to the S-CSCF device corresponding to the selected network address information.

20

Next, when the invitation information comes from the I-CSCF device, the third sub-obtaining device of the S-CSCF device obtains device identification information of a user equipment as a called party from said invitation information.

Herein, the device identification information includes information for uniquely identifying a user equipment. Preferably, the device identification information includes, but not limited to, any one of the following:

- 1) public user identity (PUID) of the user equipment;
- 2) other information that may be used to uniquely identify a user equipment, for example, a cellular phone's IMEI number, ESN number, etc.

Specifically, the third sub-obtaining device obtains device identification information of the called party from a predetermined field of a header of the invitation information.

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According to a second embodiment of the present invention, the I-CSCF requests a DNS for parsing the second domain name information corresponding to the second cluster and obtains the following multiple pieces of network address information: S_IP1, S_IP2, S_IP3, and S_IP4, which correspond respectively to the S-CSCF devices 201-204 in the second cluster. Then, the I-CSCF selects the network address information S_IP1 and sends the invitation information for originating the session to one S-CSCF device 201 corresponding to the network address information S_IP1.

40

Next, the third sub-obtaining device of the S-CSCF device 201, after receiving the invitation information from the I-CSCF, obtains the device identification information PUID_1 of the user equipment as the called party from the "Request URI" field of the invitation information.

Next, the S-CSCF device obtains the second registration information corresponding to the device identification information through the second determining device 22 and the fourth obtaining device 23, wherein the second registry data includes the first domain name information of the first cluster.

Next, the second address obtaining device of the S-CSCF device obtains multiple pieces of network address information corresponding to the first domain name information.

Specifically, the second address obtaining device of the S-CSCF device requests the DNS for parsing the first domain name information and receives network address information, as parsed from the DNS, of multiple S-CSCF devices in the first cluster corresponding to the first domain name information.

Continue illustration of the above second example. The second determining device 22 of the S-CSCF device 201 determines the network address information S_IP2 of another S-CSCF device storing the device identification PUID_1, and the fourth obtaining device of the S-CSCF device 201 obtains second registry data Reg_2 corresponding to the device identification information PUID_1 from the S-CSCF device 202 corresponding to the network address information S_IP2, and the second address obtaining device obtains the first domain name information corresponding to the first cluster from the second registry data Reg_2.

Next, the second address obtaining device of the S-CSCF device 201 requests the DNS for parsing the first domain name information, and receives that the network address information of the four P-CSCF devices in the first cluster parsed by the DNS are P_IP1, P_IP2, P_IP3, and P_IP4 respectively, which correspond respectively to the P-CSCF devices 101-104 in the first cluster.

The third sending device of the S-CSCF device selects one piece of network address information from the multiple network addresses and sends the invitation information to a P-CSCF device, corresponding to the network address information, in said first cluster.

Continue illustration of the above second example with reference to Figs. 3 and 6. The third sending device of the S-CSCF device 201 selects the network address

information P_IP3 from the obtained 4 pieces of network address information, and sends a invitation information for originating a session to the P-CSCF device 103 corresponding to the network address information P_IP3, in the first cluster.

- 5 Next, when the invitation information comes from the S-CSCF device, the second sub-obtaining device of the P-CSCF device extracts the device identification information of the user equipment as the called party from the invitation information.

Continue illustration of the above second example with reference to Figs. 3 and 5. The
10 P-CSCF device 103 receives the invitation information from the S-CSCF device 201, and the second sub-obtaining device of the P-CSCF device 103 obtains the device identification information PUID_1 of the user equipment as the called party from the field, for example, "Request URI" field of the invitation information.

- 15 Next, the P-CSCF device obtains first registry data corresponding to the device identification information as obtained by the second sub-obtaining device through the first determining device 12 and the second obtaining device 13.

Next, upon obtaining the first registry data, the second sending device of the P-CSCF
20 device performs a call originating operation and sends the invitation information to a user equipment corresponding to the device identification information.

Continue illustration of the above second example with reference to Figs. 3 and 5. The
first determining device 12 of the P-CSCF device 103 determines the network address
25 information P_IP2 of another S-CSCF device storing the device identification information PUID_1, and the second obtaining device 13 of the P-CSCF device 103 obtains first registry data Reg_1 corresponding to the device identification information PUID_1 from the P-CSCF device 102 corresponding to the network address information P_IP2.

30 Next, the second sending device of the P-CSCF device 103 sends invitation information to the user equipment 300 as the called party corresponding to the device identification information PUID_1.

35 According to the manner of the present invention, each P-CSCF device or S-CSCF device may obtains registry data stored on other P-CSCF device or S-CSCF device in the cluster to which said each P-CSCF device or S-CSCF device belongs, so that each P-CSCF device or S-CSCF device may support a session originated by a subscriber which does not register therewith, therefore a session originated by the same
40 subscriber account could be supported by multiple P-CSCF devices or S-CSCF devices, i.e., a wholesale mode could be supported. Meanwhile, since the DNS could

rank IPs according to the actual load of each IP when parsing domain names, so a P-CSCF device or a S-CSCF device with less load may be preferably selected to perform a session operation, thereby achieving load balance of each P-CSCF device or each S-CSCF device. Moreover, the CSCF devices in the first cluster and second cluster according to the present invention may be connected with a P2P protocol, thereby granting a good scalability to the first and second clusters.

To those skilled in the art, it is apparent that the present invention is not limited to the details of the above illustrative embodiments. Without departing from the spirit or essential features of the present invention, the present invention may be implemented in other specific manners. Therefore, no matter from which perspective, the embodiments should be regarded as illustrative, not limitative. The scope of the present invention is limited by the appending claims, instead of the above illustration. Therefore, meanings intended to fall within the equivalent elements of the claims and all variations within the scope are covered within the present invention. Any reference numerals in the claims should not be deemed as limiting the involved claims. Besides, the word “comprise” does not exclude other element or step, and a singular form does not exclude the plural form. A plurality of units or modules as stated in the apparatus claims may also be implemented by one unit or apparatus through software or hardware. Expressions such as first and second are used to indicate names, instead of indicating any particular sequences.

What is claimed is:

1. A method for managing an IMS session in a proxy call session control function (P-CSCF) device, wherein the P-CSCF device belongs to a first cluster including multiple P-CSCF devices, wherein the method comprises:

- 5 a. when receiving an invitation information for inviting establishment of a session, extracting, from the invitation information, device identification information of a device relevant to said session;
- b. determining network address information of another P-CSCF device, which stores the device identification information, among said first cluster based on the
- 10 extracted device identification information;
- c. obtaining first registry data corresponding to the device identification information from the determined another P-CSCF device.

2. The method according to claim 1, wherein said invitation information comes from a user equipment, said first registry data includes second domain name information of the second cluster, said second cluster comprises multiple service call session control function (S-CSCF) devices, wherein said step a comprises the following steps:

- obtaining device identification information of the user equipment as a calling party from said invitation information;
- 20 wherein said method further comprises the following steps:
- obtaining multiple pieces of network address information corresponding to said second domain name information;
- selecting one piece of network address information from said multiple pieces of network address information, and sending the invitation information to a S-CSCF
- 25 device, corresponding to the network address information, in said second cluster.

3. The method according to claim 1, wherein said invitation information comes from a S-CSCF device, said step a comprises the following steps:

- extracting device identification information of a user equipment as the called
- 30 party from said invitation information;
- wherein said method further comprises the following step:
- upon obtaining said first registry data, performing a call originating operation, and sending the invitation information to a user equipment corresponding to the device identification information.

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4. The method according to any one of claims 1 to 3, wherein said method further comprises the following steps:

- when receiving a registration request relevant to a user equipment to-be-registered, based on device identification information of the user equipment to-be-registered included in the registration request, determining network address
- 40 information of one P-CSCF device, which should store the device identification information, among the first cluster;
- performing a corresponding operation so that the determined P-CSCF device receives said registration request.

5. A method for managing an IMS session in a service call session control function(S-CSCF) device, wherein said S-CSCF device belongs to a second cluster including multiple S-CSCF devices, wherein said method comprises:

- 5 A. when receiving an invitation information for inviting establishment of a session, extracting, from the invitation information, device identification information of a device relevant to said session;
B. determining network address information of another S-CSCF device, which stores the device identification information, among said second cluster based on
10 the extracted device identification information;
C. obtaining second registry data corresponding to the device identification information from the determined another S-CSCF device.

6. The method according to claim 5, wherein said invitation information comes from
15 an interrogating call session control function(I-CSCF) device, said second registry data includes first domain name information of the first cluster, said first cluster comprises multiple proxy call session control function (P-CSCF) devices; wherein said step A comprises the following steps:

- 20 - obtaining device identification information of a user equipment as a called party from said invitation information;
wherein said method further comprises the following steps:
- obtaining multiple pieces of network address information corresponding to said first domain name information;
- selecting one piece of network address information from said multiple pieces of
25 network address information, and sending the invitation information to a P-CSCF device, corresponding to the network address information, in said first cluster.

7. The method according to claim 5, wherein said invitation information comes from a P-CSCF device, said step A comprises the following steps:

- 30 - obtaining device identification information of a user equipment as a calling party from said invitation information;
wherein said method further comprises the following step:
- upon obtaining said second registry data, performing a call originating operation, and sending the invitation information to the called network.

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8. The method according to any one of claims 5 to 7, wherein said method further comprises the following steps:

- 40 - when receiving the registration request relevant to a user equipment to-be-registered, based on the device identification information of the user equipment to-be-registered included in the registration request, determining network address information of one S-CSCF device, which should store the device identification information, among the second cluster;
- performing a corresponding operation so that the determined S-CSCF device receives said registration request.

9. A proxy call session control function (P-CSCF) device for managing an IMS session, wherein said P-CSCF device belongs to a first cluster including multiple P-CSCF devices, wherein said P-CSCF device comprises:

- 5 a first obtaining device configured to, when receiving an invitation information for inviting establishment of a session, extract, from the invitation information, device identification information of a device relevant to said session;
- a first determining device configured to determine network address information of another P-CSCF device, which stores the device identification information,
- 10 among said first cluster based on the extracted device identification information;
- a second obtaining device configured to obtain first registry data corresponding to the device identification information from the determined another P-CSCF device.

- 15 10. The P-CSCF device according to claim 9, wherein said first registry data includes second domain name information of the second cluster, said second cluster comprises multiple service session control function(S-CSCF) devices, wherein said first obtaining device further comprises:

- a first sub-obtaining device configured to, when said invitation information
- 20 comes from a user equipment, obtain device identification information of the user equipment as a calling party from said invitation information;
- wherein said P-CSCF device further comprises:
- a first address obtaining device configured to obtain multiple pieces of network address information corresponding to said second domain name information;
- 25 a first sending device configured to select one piece of network address information from said multiple pieces of network address information, and send the invitation information to a S-CSCF device, corresponding to the network address information, in said second cluster.

- 30 11. The P-CSCF device according to claim 9, wherein said invitation information comes from a S-CSCF device, wherein said first obtaining device further comprises:

- a second sub-obtaining device configured to extract device identification information of a user equipment as the called party from said invitation information;
- 35 wherein said P-CSCF device further comprises:
- a second sending device configured to, upon obtaining said first registry data, perform a call originating operation, and send the invitation information to a user equipment corresponding to the device identification information.

- 40 12. A service call session control function(S-CSCF) device for managing an IMS session, said S-CSCF device belongs to a second cluster including multiple S-CSCF devices, wherein said S-CSCF device comprises:

- a third obtaining device configured to, when receiving an invitation information for inviting establishment of a session, extract, from the invitation information,

device identification information of a device relevant to said session;
a second determining device configured to determine network address information of another S-CSCF device, which stores the device identification information, among said second cluster based on the extracted device identification information;
5 a fourth obtaining device configured to obtain second registry data corresponding to the device identification information from the determined another P-CSCF device.

10 13. The S-CSCF device according to claim 12, wherein said invitation information comes from an interrogating call session control function (I-CSCF) device, said second registry data includes first domain name information of the first cluster, said first cluster comprises multiple P-CSCF devices; wherein said third obtaining device comprises:

15 a third sub-obtaining device configured to obtain device identification information of a user equipment as a called party from said invitation information;

wherein said S-CSCF device further comprises:

20 a second address obtaining device configured to obtain multiple pieces of network address information corresponding to said first domain name information;

a third sending device configured to select one piece of network address information from said multiple pieces of network address information, and send the invitation information to a P-CSCF device, corresponding to the network address information, in said first cluster.
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14. The S-CSCF device according to claim 12, wherein said invitation information comes from the P-CSCF device, wherein said third obtaining device comprises:

30 a fourth sub-obtaining device configured to obtain device identification information of a user equipment as a calling party from said invitation information;

a fourth sending device configured to, upon obtaining said second registry data, perform a call originating operation, and send the invitation information to the called network.

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15. An IMS session system, wherein the system comprises a first cluster and a second cluster, wherein said first cluster comprises multiple proxy call session control function(P-CSCF) devices according to any one of claims 9-11, and said second cluster comprises multiple service call session control function(S-CSCF) devices
40 according to any one of claims 12-14.

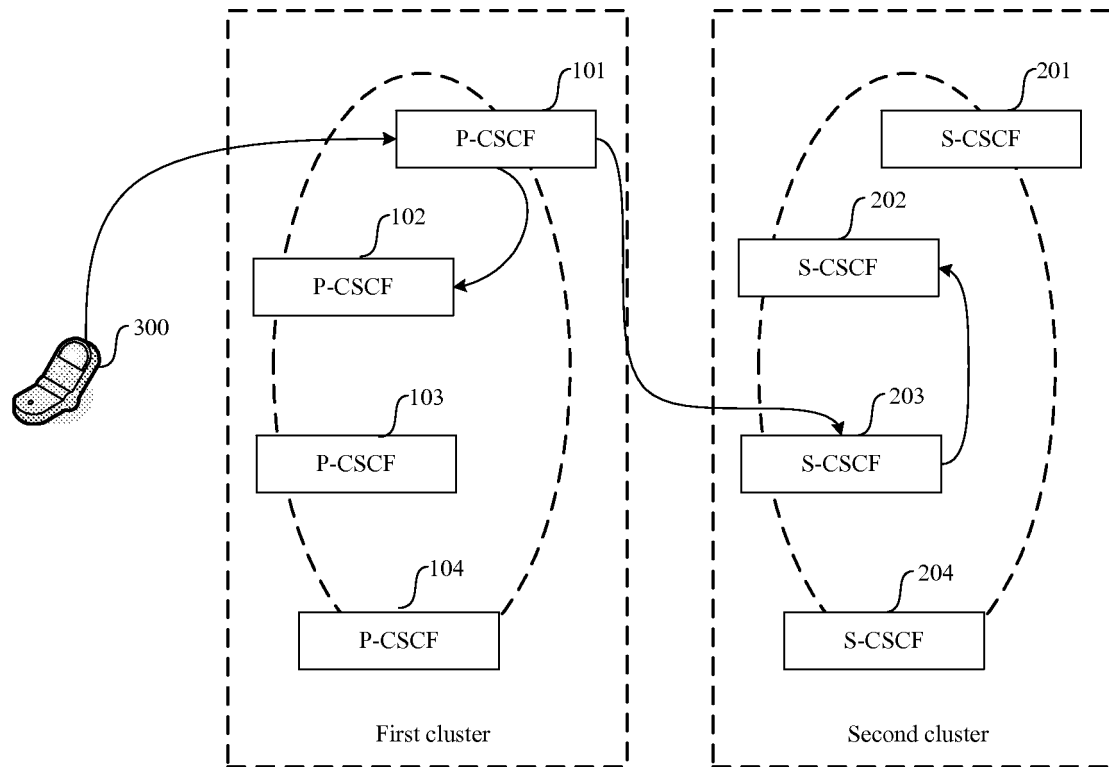


Fig. 1

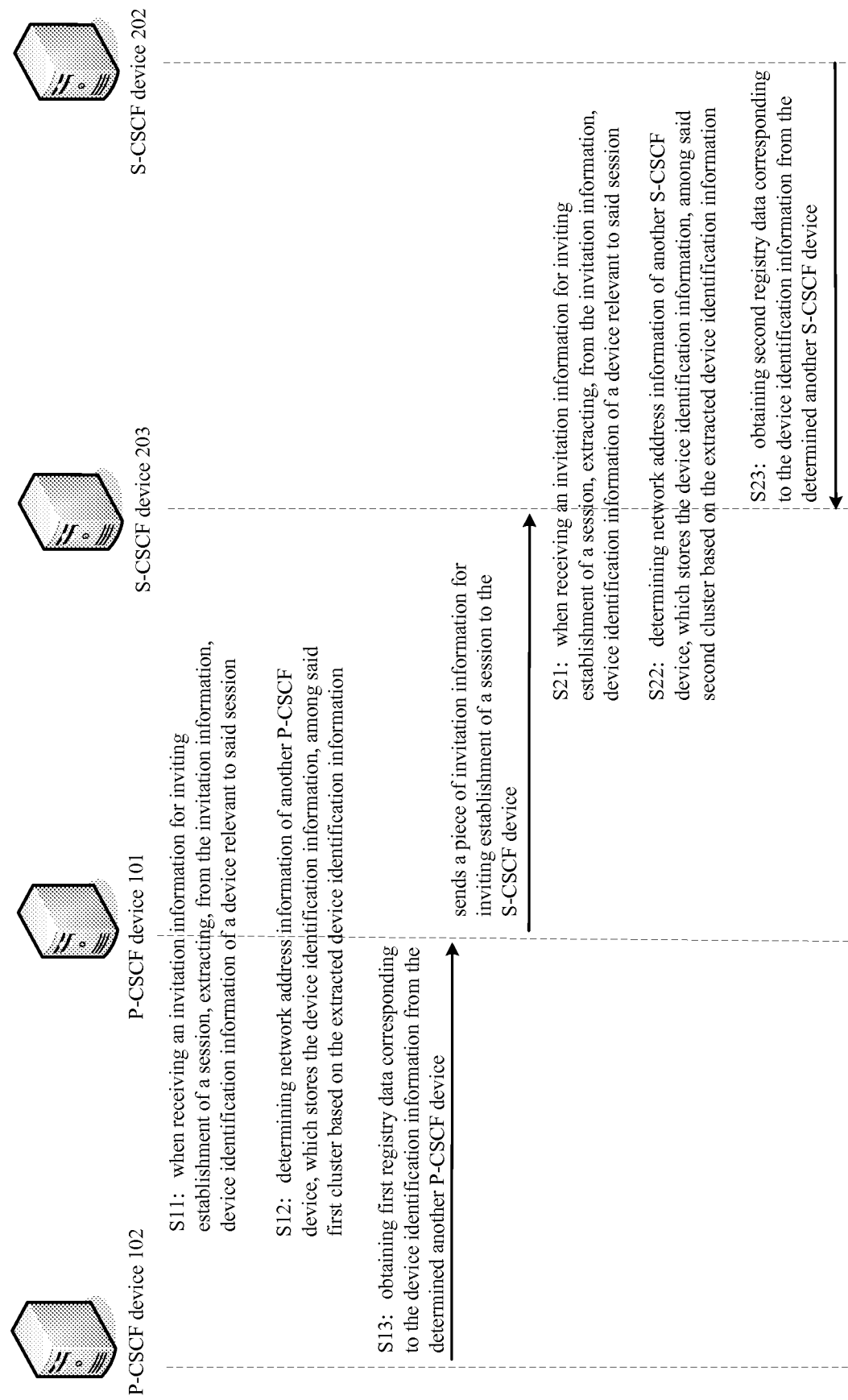


Fig. 2

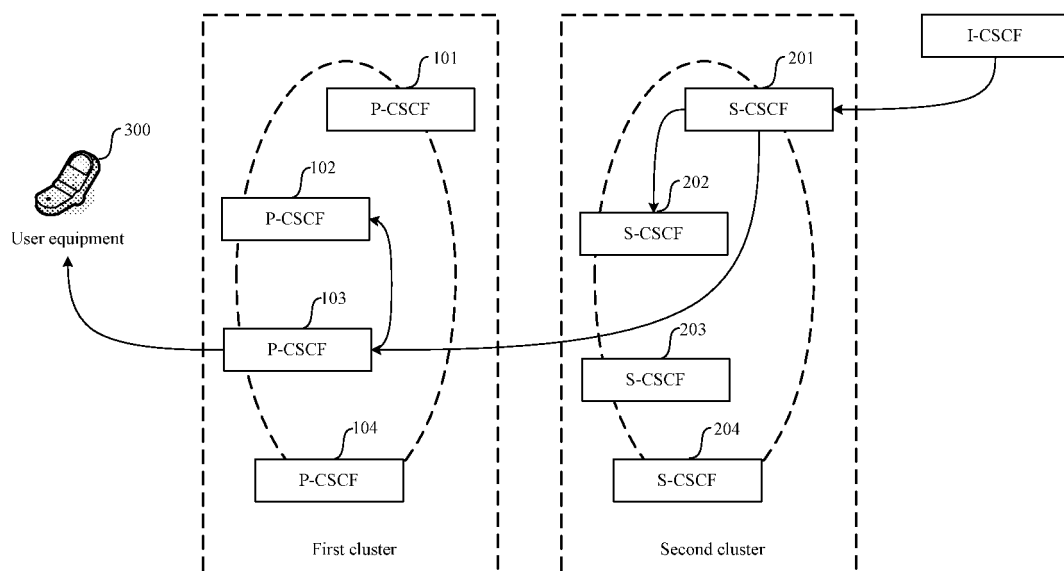


Fig. 3

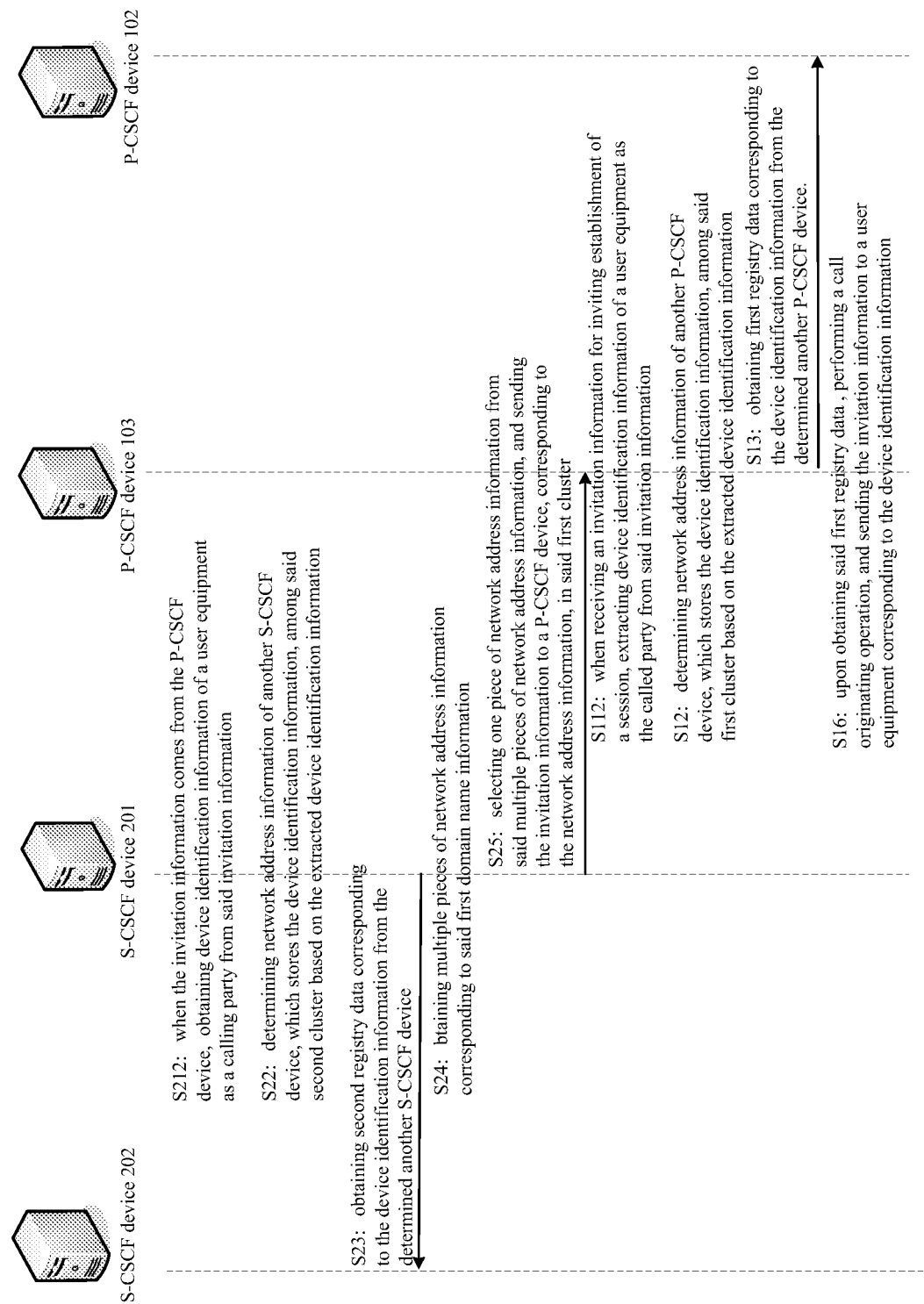


Fig. 4

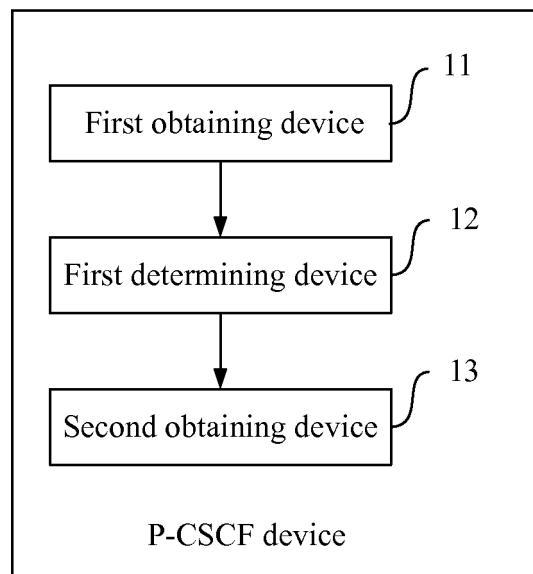


Fig. 5

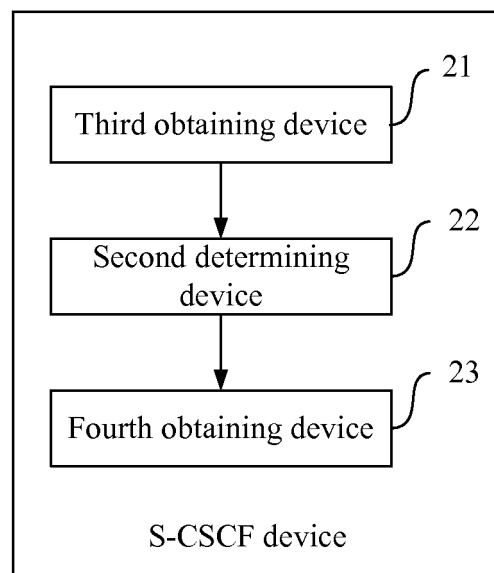


Fig. 6