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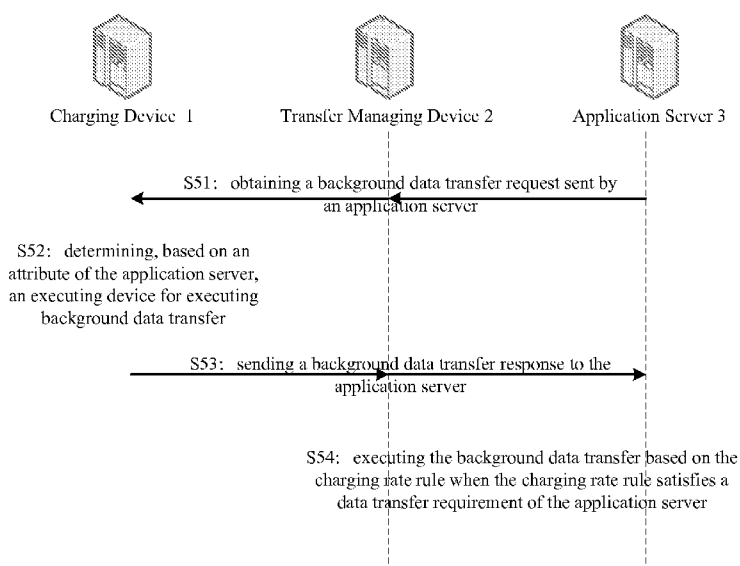
(54) Title: METHOD, APPARATUSES, AND SYSTEM FOR BACKGROUND DATA TRANSFER

Fig.5

(57) Abstract: An object of the invention is providing a method, apparatuses, and a system for background data transfer. A charging device obtains a background data transfer request sent by an application server, and then, determines, based on an attribute of the application server, an executing device for executing background data transfer, wherein the executing device includes the application server or a transfer managing device; the charging device sends a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule; when the charging rate rule satisfies a data transfer requirement of the application server, the executing device executes the background data transfer based on the charging rate rule. Compared with the prior art, the present invention could: 1. identify the optimal timing for the background data transfer; 2. provide a low-cost data transfer communication service based on the user's request, thereby satisfying the user's low-cost requirements; 3. fully utilize the network workload, and provide more revenues to service providers.

METHOD, APPARATUSES, AND SYSTEM FOR BACKGROUND DATA TRANSFER

FIELD OF THE INVENTION

[0001] The present invention relates to the field of telecommunication, and in particular to the technology of background data transfer.

BACKGROUND OF THE INVENTATION

[0002] The 3GPP system has unique core assets, denoted as 3GPP service capabilities, such as Communications, Context, Subscription and Control that may be valuable to application providers. 3GPP service capabilities can be exposed to external application providers, businesses and partners by 3GPP Mobile Network Operators (MNO). AESE can provide a service capability exposure framework to expose the 3GPP service capabilities. The exposure of services by the network creates a "toolbox" of capabilities that, with proper authorization, can be used, for example, to retrieve information, to request specific services, to receive notifications, to request the setting of specific parameters, etc.

[0003] Background data transfer is the key AESE data transmission mode and it's quite popular in current 3GPP study. Background data transfer means respective nodes (e.g., terminal, server, application server, etc.) in the 3GPP system request AESE for data transfer, such that AESE controls respective data transfer requests and determines when and at what rate to respond to respective data transfer requests, thereby guaranteeing load balance.

[0004] However, this is a method of fixed rate. Therefore, the key problem of existing Background data transfer solution is it cannot provide the best opportunity for MTC communication with less expensive expense for user and better use of the network resource to generate revenues as more as possible for operator. For example, MTC user (e.g. AS) may want to request a data delivery window with specific low charging rate, in another example, the operator may want to fully utilization of the network idle resources, particularly when the network load is relatively low and the expense is relatively low, to guide the AS to trigger MTC data delivery and achieve corresponding benefits. Obviously, these requirements can't be met with existing solution.

[0005] Besides, because the existing background data transfer mechanism is for collectively controlling background data transfer and then assigning an appropriate transfer window for each background data transfer so as to guarantee network load balance. Therefore, this solution only considers the situation of background data transfer in the time window assignment, without considering other factors of network congestion caused by data transfer; therefore, its capability of implementing network load balance is also limited.

[0006] In view of the above, the background data transfer method in the prior art does not have real-time nature, efficacy, or flexibility. Once the transfer window is

assigned, it will be impossible to adapt various dynamic changes.

[0007] For example, after the transfer window is assigned, if the network changes, the network load in this period becomes relatively congested, and the charging rate also correspondingly becomes higher, such that the user transfer charging rate will be expensive. This cannot satisfy the user's requirement of performing network transfer using the lowest charging rate.

SUMMARY OF THE INVENTION

[0008] An object of the invention is providing a method, apparatuses, and a system for background data transfer.

[0009] According to one aspect of the invention, a method for background data transfer is provided, wherein the method comprises:

[0010] obtaining, by a charging device, a background data transfer request sent by an application server;

[0011] determining, by the charging device, based on an attribute of the application server, an executing device for executing background data transfer, wherein the executing device includes the application server or a transfer managing device;

[0012] sending, by the charging device, a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule;

[0013] executing, by the executing device, the background data transfer based on the charging rate rule when the charging rate rule satisfies a data transfer requirement of the application server.

[0014] Preferably, the method further comprises:

[0015] - real-time monitoring, by the executing device, the charging rate rule, wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, the executing device notifies the application server to suspend execution of the background data transfer.

[0016] Preferably, when the executing device is the application server, the step of the executing background data transfer includes:

[0017] - determining in real time whether the charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server based on the charging rate rule;

[0018] - if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server, executing the background data transfer.

[0019] Preferably, when the executing device is the transfer managing device, the step of executing the background data transfer comprises:

[0020] - sending, by the application server, a best data transfer request to the transfer managing device, wherein the best data transfer request includes a charging request value;

[0021] - negotiating, by the transfer management device with the application server, to determine a charging criteria value based on the charging request value and the

charging rate rule;

[0022] - executing, by the transfer management device, the background data transfer based on the charging criteria value.

[0023] Preferably, the step of executing background data transfer comprises:

[0024] - executing, by the transfer management device, the background data transfer based on the charging criteria value in conjunction with network related information.

[0025] According to another aspect of the invention, a charging device for background data transfer is further provided, wherein, the charging device comprises:

[0026] a request obtaining module configured to obtain a background data transfer request sent by an application server;

[0027] a determining module configured to determine an executing device for executing background data transfer based on an attribute of the application server, wherein the executing device includes the application server or a transfer managing device;

[0028] a response sending module configured to send a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule.

[0029] According to another aspect of the invention, a transfer managing device for background data transfer is further provided, wherein, the transfer managing device comprises:

[0030] a request forwarding module configured to obtain a background data transfer request sent by an application server and forward the background data transfer request to a charging device;

[0031] a response forwarding module configured to obtain a background data transfer response sent by the charging device and forward the background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server or the transfer managing device.

[0032] Preferably, if the executing device is the transfer managing device, the transfer managing device further comprises:

[0033] a best obtaining module configured to obtain a best data transfer request sent by the application server, wherein the best data transfer request includes a charging request value;

[0034] a first negotiating module configured to negotiate with the application server to determine a charging criteria value based on the charging request value and the charging rate rule;

[0035] a first executing module configured to execute the background data transfer based on the charging criteria value.

[0036] Preferably, the first executing module is configured to:

[0037] - execute the background data transfer based on the charging criteria value in conjunction with network related information.

[0038] Preferably, the transfer managing device further comprises:

[0039] a first monitoring module configured to real-time monitor the charging rate

rule, wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, notifying the application server to suspend execution of the background data transfer.

[0040] According to another aspect of the invention, an application server for background data transfer is further provided, wherein, the application server comprises:

[0041] a request sending module configured to send a background data transfer request to a transfer managing device;

[0042] a response obtaining module configured to obtain a background data transfer response sent by the transfer managing device, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server or the transfer managing device.

[0043] Preferably, if the executing device is the application server, the application server further comprises:

[0044] a determining module configured to determine in real time whether a charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server based on the charging rate rule;

[0045] a second executing module configured to execute, if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server, the background data transfer.

[0046] Preferably, the application server further comprises:

[0047] a second monitoring module configured to real-time monitor the charging rate rule, and suspend execution of the background data transfer when the charging rate rule does not satisfy a data transfer requirement of the application server.

[0048] Preferably, if the executing device is the transfer managing device, the application server further comprises:

[0049] a best sending module configured to send a best data transfer request to the transfer managing device, wherein the best data transfer request includes a charging request value;

[0050] a second negotiating module configured to negotiate with the application server to determine a charging criteria value based on the charging request value and the charging rate rule;

[0051] a third executing module configured to execute the background data transfer based on a best device trigger request of the transfer managing device.

[0052] According to another aspect of the invention, a system for background data transfer is further provided, wherein the system comprises the charging device as aforesaid, the transfer managing device as aforesaid, and the application server as aforesaid.

[0053] Compared with the prior art, the present invention provides a method, apparatuses, and a system for background data transfer. A charging device obtains a background data transfer request sent by an application server, and then, determines, based on an attribute of the application server, an executing device for executing background data transfer, wherein the executing device includes the application server

or a transfer managing device; the charging device sends a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule; when the charging rate rule satisfies a data transfer requirement of the application server, the executing device executes the background data transfer based on the charging rate rule. Therefore, the present invention could:

[0054] 1. identify the optical timing for the background data transfer;

[0055] 2. provide a low-cost data transfer communication service based on the user's request, thereby satisfying the user's low-cost requirements;

[0056] 3. fully utilize the network workload, and provide more revenues to service providers.

[0057] Moreover, if the executing device is the application server, the application server may autonomously determine whether the current time is the best timing for background data transfer based on the charging rate rule sent by the charging device; if so, perform background data transfer. Therefore, it reduces interactions of executing the background data transfer, efficiently satisfies the user's low-cost requirements, and enables the providers to better utilize the network workload.

[0058] Moreover, if the executing device is the transfer managing device, the application server sends a best data transfer request to the transfer managing device, wherein the best data transfer request includes a charging request value, and then, the transfer management device and the application server negotiates to determine a charging criteria value based on the charging request value and the charging rate rule; at last, the transfer management device executes the background data transfer based on the charging criteria value. Therefore, the present invention can flexibly determine charging criteria based on the user's charging requirements, satisfy in real-time the user's various kinds of low-cost demands, changes the fixed-rate background data transfer mode, efficiently satisfies the user's low-cost demands, and enables the providers to better utilize the network workload.

[0059] Furthermore, the transfer management device of the present invention further can execute the background data transfer based on the charging criteria value in conjunction with network related information. Therefore, by weighing a plurality of factors, the present invention enhances the efficiency of background data transfer while lowering user costs, thereby satisfying the user's requirements.

[0060] Moreover, the executing device of the present invention further can real-time monitor the charging rate rule; when the charging rate rule does not satisfy a data transfer requirement of the application server, the executing device notifies the application server to suspend execution of the background data transfer. Therefore, through dynamically monitoring the change of the network charging rate, the present invention provides the best data transfer timing for the user, and meanwhile sufficiently utilizing network idle resources to bring benefits to the providers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0061] Other features, purposes and advantages of the invention will become more

explicit by means of reading the detailed statement of the non-restrictive embodiments made with reference to the accompanying drawings.

[0062] Fig. 1 shows a schematic diagram of system architecture for background data transfer according to one aspect of the present invention;

[0063] Fig. 2 shows a schematic diagram of a charging device, a transfer managing device and an application server for background data transfer according to one aspect of the present invention;

[0064] Fig. 3 shows a schematic diagram of a charging device, a transfer managing device and an application server for background data transfer according to one preferred embodiment of the present invention;

[0065] Fig. 4 shows a schematic diagram of a charging device, a transfer managing device and an application server for background data transfer according to another preferred embodiment of the present invention;

[0066] Fig. 5 shows a flow diagram of a method for background data transfer by cooperation of a charging device, a transfer managing device and an application server according to one aspect of the present invention;

[0067] Fig. 6 shows a flow diagram of a method for background data transfer by cooperation of a charging device, a transfer managing device and an application server according to one preferred embodiment of the present invention;

[0068] Fig. 7 shows a flow diagram of a method for background data transfer by cooperation of a charging device, a transfer managing device and an application server according to another preferred embodiment of the present invention;

[0069] Fig. 8 shows a flow diagram of a method for background data transfer with AS the executing device in a 3GPP system according to another preferred embodiment of the present invention;

[0070] Fig. 9 shows a flow diagram of a method for background data transfer with SCEF the executing device in a 3GPP system according to another preferred embodiment of the present invention.

[0071] The same or similar reference signs in the drawings represent the same or similar component parts.

DETAILED DESCRIPTION OF THE INVENTION

[0072] Before discussing example embodiments in more detail, it is noted that some example embodiments are described as processes or methods depicted as flowcharts. Although the flowcharts describe the operations as sequential processes, many of the operations may be performed in parallel, concurrently or simultaneously. In addition, the order of operations may be re-arranged. The processes may be terminated when their operations are completed, but may also have additional steps not included in the figures. The processes may correspond to methods, functions, procedures, subroutines, subprograms, etc.

[0073] The “charging device” “transfer managing device” or “application server” herein comprises any computer device that can perform information processing. Here, the “computer device” (or called “computer”) refers to an intelligent electronic device

that performs predetermined processing processes such as numerical value calculations and/or logical calculations by running predetermined programs or instructions, which may comprise a processor and a memory. The predetermined processing process is executed by the processor through executing program instructions pre-stored in a memory, or the predetermined processing process is executed by hardware such as ASIC, FPGA, DSP, etc., or the predetermined processing process is executed by a combination of both.

[0074] The computer device includes, but not limited to, network device or a device integrated by network device(s) and user device(s) through a network. The network device includes, but not limited to, personal computer(s), network host(s), single network server, a set of multiple network servers or a cloud network formed by multiple servers; herein, the cloud network is formed by a large number of computers or network servers based on Cloud Computing, wherein, the cloud computing is a kind of distributed computing, which is a virtual supercomputer consisting of a group of loosely coupled computers set. Wherein, the computer device may run separately to implement the present invention, or implement the present invention through interaction operations with other computer devices in the network by accessing the network. The network of the computer device includes, but not limited to, the Internet, the Internet of Things, Wide Area Network, Metropolitan Area Network, LAN, VPN, wireless self-organizing network (Ad Hoc network), etc.

[0075] Besides, the user device in the context includes, but not limited to, any electronic product could process man-machine interactions with the user through keyboard, remote-control unit, touch panel, or acoustic equipment, such as personal computers, smart phones, PDAs, game consoles, or IPTV and so on.

[0076] It should be noted that the user device, network device, and network are only examples, and other existing or future possibly emerging computer device or network, if applicable to the present invention, should also be included within the protection scope of the present invention and is incorporated here by reference.

[0077] In the 3GPP system, the charging device includes, but not limited to, e.g., a PCRF device, or a device formed jointly by the SPR, PCRF, PCEF, and the like. The transfer managing device may be an independent device or module, or a device in combination with other device; the transfer management device is at the middle layer, which may be deployed on a certain service, or in the MTC-IWF.

[0078] Specific structural and functional details disclosed herein are merely representative for purposes of describing example embodiments of the present invention. This invention may, however, be embodied in many alternate forms and should not be construed as limited to only the embodiments set forth herein.

[0079] It should also be noted that in some alternative implementations, the functions/acts noted may occur out of the order noted in the figures. For example, two figures shown in succession may in fact be executed concurrently or may sometimes be executed in the reverse order, depending upon the functionality/acts involved.

[0080] Below, details of the invention will be further provided in combination with the accompanying drawings.

[0081] Fig. 1 shows a schematic diagram of system architecture for background data

transfer according to one aspect of the present invention.

[0082] In Fig. 1, the “background data transfer management” function in the present invention is introduced or deployed in the service exposure layer of the provider main network so as to enhance the service exposure layer. Here, the “background data transfer management” corresponds to the “method and corresponding apparatuses for background data transfer” in the context.

[0083] Through one or more APIs negotiated with various applications, the service exposure layer performs interactions with the various applications so as to perform collective control of the background data transfer requests from the various applications. The service exposure layer performs intelligent control to the background data transfer based on the “background data transfer management” function so as to realize Smart Data Delivery Management (SDDM). Hereinafter, the manner of “background data transfer” will be illustrated through a plurality of embodiments.

[0084] At the ease of description, Fig. 1 takes the 3GPP architecture as an example. Those skilled in the art should understand, under other architectures, the service exposure frame has a background data transfer function is similar to Fig. 1, which is not detailed here and likewise included within the protection scope of the present invention.

[0085] Fig. 2 shows a schematic diagram of a charging device, a transfer managing device and an application server for background data transfer according to one aspect of the present invention. Herein, the charging device 1 comprises a request obtaining module 11, a determining module 12, a response sending module 13; the transfer managing device 2 comprises a request forwarding module 21, a response forwarding module 22; the application server 3 comprises a request sending module 31, a response obtaining module 32.

[0086] Specifically, the request sending module 31 of the application server 3 sends a background data transfer request to the transfer managing device 2; correspondingly, the request forwarding module 21 of the transfer managing device 2 obtains the background data transfer request sent by the application server 3 and forwards the background data transfer request to the charging device 1; correspondingly, the request obtaining module 11 of the charging device 1 obtains the background data transfer request sent by the application server 3; and then, the determining module 12 of the charging device 1 determines an executing device for executing background data transfer based on an attribute of the application server 3, wherein the executing device includes the application server 3 or the transfer managing device 2; the response sending module 13 of the charging device 1 sends a background data transfer response to the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule; correspondingly, the response forwarding module 22 of the transfer managing device 2 obtains the background data transfer response sent by the charging device 1 and forwards the background data transfer response to the application server 3, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device

identifier includes the application server 3 or the transfer managing device 2; correspondingly, the response obtaining module 32 of the application server 3 obtains the background data transfer response sent by the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server 3 or the transfer managing device 2.

[0087] The request sending module 31 of the application server 3 sends a background data transfer request to the transfer managing device 2.

[0088] Specifically, the application server 3 sends a background data transfer request to the transfer management device 2 through corresponding communication protocols based on preset APIs, wherein the background data transfer request may include, for example, an identifier of the application server (AS identifier), a reference ID of the application server (AS Reference ID), a number of UEs corresponding to the application server (Number of UEs), a requested data volume of each UE (Volume per UE), the desired time window, etc.

[0089] Correspondingly, the request forwarding module 21 of the transfer managing device 2 obtains the background data transfer request sent by the application server 3 and forwards the background data transfer request to the charging device 1; correspondingly, the request obtaining module 11 of the charging device 1 obtains the background data transfer request sent by the application server 3.

[0090] Specifically, after obtaining the background data transfer request, the request forwarding module 21 may directly forward it to the charging device 1; or, after authenticating the request, forward it to the charging device 1. Here, the forwarded background data transfer request may include, e.g., ASP identifier, volume of data to be transferred by each UE, an expected amount of the UEs, the desired time window; preferably, there may also include network area information.

[0091] Then, the determining module 12 of the charging device 1 determines an executing device for executing background data transfer based on an attribute of the application server 3, wherein the executing device includes the application server 3 or the transfer managing device 2.

[0092] Specifically, the charging device 1 determines, based on an attribute of the application server 3, whether the application server 3 can perform the following smart data delivery procedure, wherein the attribute includes whether the application server is a third-party device. In the case of the third-party device, the application server 3 cannot know relevant information for smart data delivery and cannot perform the smart data delivery process; therefore, the transfer managing device 2 acts as the executing device. If the application server 3 is not a third-party device, it indicates that the application server 3 can know relevant information for smart data delivery to perform the following smart data delivery procedure; therefore, the application server 3 acts as the executing device. Besides, even if the application server 3 is not a third party device, the determining module 12 can still take the transfer managing device 2 as the executing device.

[0093] Here, the manner of determining the attribute of the application server 3 may be based on the identifier of the application server and/or the reference ID of the

application server. Those skilled in the art should understand that the above determining manner is only an example, not a limitation to the present invention. Other manners of determining the attribute of the application server is also suitable for the present invention, and included within the protection scope of the present invention.

[0094] Here, the smart data delivery procedure may refer to the embodiments corresponding to Figs. 3 and 4.

[0095] The response sending module 13 of the charging device 1 sends a background data transfer response to the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule.

[0096] Specifically, the executing device identifier is just the identifier of the executing device determined by the determining module 12. The charging rate rule may be directly obtained from the charging device 1 or obtained through interactions with other relevant devices, e.g., SPR. Then, the executing device identifier and the charging rate rule are added to a background data transfer response; the background data transfer response is sent to the transfer managing device 2. The charging rate rule may correspond to an individual UE corresponding to the application server 3 or correspond to a group UE.

[0097] Herein, an exemplary format of the executing device identifier is shown as below:

[0098]

Application Server ID	Transfer Management Device ID	Identifier (YES, indicating that the application server is the executing device; NO, indicating that the transfer management device is the executing device.)
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[0099] Here, those skilled in the art should understand that when the application server is a third-party device, the transfer management device is the executing device, then the aforementioned “identifier” is “NO”; when the application server is a non-third-party server and used as the executing device, the aforementioned “identifier” is “YES”; when the application server is a non-third-party device and the transfer management device is the executing device, the aforementioned “identifier” is “NO”.

[00100] The charging rate rule may include different charging rates under a plurality of different conditions, wherein the conditions may include work load, transmission time, etc. An exemplary format of the charging rate rule is shown as below:

[00101]

Condition Value 1	Corresponding Charging Rate 1
Condition Value 2	Corresponding Charging Rate 2
...	...
...	...
Condition Value n	Corresponding Charging Rate n

[00102] Here, the exemplary formats above are only exemplary, not a limitation to the

present invention; other formats are likewise applicable to the present invention and included within the protection scope of the present invention.

[00103] The response forwarding module 22 of the transfer managing device 2 obtains, based on the preset API and through corresponding protocols, the background data transfer response sent by the charging device 1 and forwards the background data transfer response to the application server 3. Correspondingly, the response obtaining module 32 of the application server 3 obtains the background data transfer response sent by the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server 3 or the transfer managing device 2.

[00104] Fig. 3 shows a schematic diagram of a charging device, a transfer managing device and an application server for background data transfer according to one preferred embodiment of the present invention. In the embodiment, the transfer managing device is used as an executing device.

[00105] Herein, the charging device 1 comprises a request obtaining module 11', a determining module 12', a response sending module 13'; the transfer managing device 2 comprises a request forwarding module 21', a response forwarding module 22', a best obtaining module 23', a first negotiating module 24', a first executing module 25'; the application server 3 comprises a request sending module 31', a response obtaining module 32', a best sending module 33', a second negotiating module 34', a third executing module 35'.

[00106] Specifically, the request sending module 31' of the application server 3 sends a background data transfer request to the transfer managing device 2; correspondingly, the request forwarding module 21' of the transfer managing device 2 obtains the background data transfer request sent by the application server 3 and forwards the background data transfer request to the charging device 1; correspondingly, the request obtaining module 11' of the charging device 1 obtains the background data transfer request sent by the application server 3; and then, the determining module 12' of the charging device 1 determines an executing device for executing background data transfer based on an attribute of the application server 3, wherein the executing device is the transfer managing device 2; the response sending module 13' of the charging device 1 sends a background data transfer response to the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule; correspondingly, the response forwarding module 22' of the transfer managing device 2 obtains the background data transfer response sent by the charging device 1 and forwards the background data transfer response to the application server 3, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier is the transfer managing device 2; correspondingly, the response obtaining module 32' of the application server 3 obtains the background data transfer response sent by the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device

identifier is the transfer managing device 2; the best sending module 33' of the application server 3 sends a best data transfer request to the transfer managing device 2, wherein the best data transfer request includes a charging request value; correspondingly, the best obtaining module 23' of the transfer managing device 2 obtains the best data transfer request sent by the application server 3, wherein the best data transfer request includes a charging request value; and then, based on the charging request value and the charging rate rule, the first negotiating module 24' of the transfer managing device 2 negotiates with the second negotiating module 34' of the application server 3 to determine a charging criteria value; at last, the first executing module 25' of the transfer managing device 2 executes the background data transfer based on the charging criteria value; the third executing module 35' of the application server 3 executes the background data transfer based on a best device trigger request of the transfer managing device 2.

[00107] Herein, the request obtaining module 11', the determining module 12' and the response sending module 13' of the charging device 1, the request forwarding module 21' and the response forwarding module 22' of the transfer managing device 2, the request sending module 31' and the response obtaining module 32' of the application server 3 are identical or substantially identical to corresponding modules shown in Fig. 2, which are thus not detailed here, but incorporated here by reference.

[00108] The best sending module 33' of the application server 3 sends a best data transfer request to the transfer managing device 2; correspondingly, the best obtaining module 23' of the transfer managing device 2 obtains the best data transfer request sent by the application server 3, wherein the best data transfer request includes a charging request value.

[00109] Specifically, the application server 3 obtains a charging request value desired by the user based on interactions with the user, or determines a charging request value based on the default setting; wherein, the charging request value is the data transfer rate desired to be adopted by the application server 3. Then, the best sending module 33' sends the best data transfer request including the charging request value to the transfer management device 2. The charging request value may include charging rate, time, occurrence probability, etc.; the values corresponding to the charging rate, time or occurrence probability may be a fixed value or a range value.

[00110] An exemplary format of the best data transfer request is shown as below:

[00111]

Application Server ID	Transfer Management Device ID	Charging Request Value
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[00112] Then, based on the charging request value and the charging rate rule, the first negotiating module 24' of the transfer managing device 2 negotiates with the second negotiating module 34' of the application server 3 to determine a charging criteria value.

[00113] Specifically, the first negotiating module 24' determines whether the charging request value can be satisfied based on the charging rate rule obtained from the charging device 1; wherein the charging rate rule may be a latest charging rate rule in the charging device 1 obtained by the transfer managing device 2 through real-time

interactions with the charging device 1, or a charging rate rule obtained by the transfer managing device 2 through previous interactions with the charging device 1. For example, if the charging request value is lower than any one of charging rate in the charging rate rule, it may be regarded that the charging request value cannot be satisfied; otherwise, it may be satisfied under certain conditions.

[00114] If the first negotiating module 24' believes that the charging request value is unreasonable (i.e., cannot be satisfied), it will send a best data transfer response including a recommended charging value to the second negotiating module 34'; if the second negotiating module 34' accepts the recommended value, the best data transfer request will be re-sent to the first negotiating module 24', wherein the best data transfer request includes the recommended charging request value.

[00115] If the first negotiating module 24' believes that the charging request value is reasonable (i.e., can be satisfied), the first negotiating module 24' sends a best data transfer response including an acknowledgement of the charging request value to the second negotiating module 34'. Here, those skilled in the art should understand that the first negotiating module 24' may acknowledge the charging request value when receiving the best data transfer request for the first time, or may acknowledge the updated charging request value through twice or multiple times of negotiation processes with the second negotiating module 34'.

[00116] An exemplary format of the best data transfer response is shown as below:

[00117]

Application Server ID	Transfer Management Device ID	Acknowledged or Recommended Charging Request Value (which may be a specific value or a value range)
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[00118] At last, the first executing module 25' of the transfer managing device 2 executes the background data transfer based on the charging criteria value; the third executing module 35' of the application server 3 executes the background data transfer based on a best device trigger request of the transfer managing device 2.

[00119] Specifically, after acknowledging the charging request value, the first executing module 25' may send a best device trigger request to the third executing module 35' based on the time, network condition, and/or charging rate corresponding to the charging request value so as to perform background data transfer. Correspondingly, the third executing module 35' may perform data transfer with the transfer managing device 2 based on the best device trigger request.

[00120] An exemplary format of the best device trigger request is shown as below:

[00121]

Application Server ID	Transfer Management Device ID	Current charging condition or identifier ("YES" indicates best transfer timing; "NO" indicates not)
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[00122] The message, i.e., the best device trigger request, may be transferred from the transfer management device 2 to the application server 3 for multiple times; for example, if the current charging condition is lower than the charging request, the transfer management device 2 sends the message so as to notify the application server 3 that this is the best timing. If the current charging condition is higher than the

charging request, the transfer management device 2 believes that this is not a best timing, and sends the message to notify the application server 3 that the best time is closed. Therefore, the application server 3 will stop or suspend the operation.

[00123] Preferably, the first executing module 25' could execute the background data transfer based on the charging criteria value in conjunction with network related information.

[00124] Specifically, the network related information includes, but not limited to, network traffic, work load, etc. The first executing module 25', based on the charging criteria value in conjunction with network related information, determines whether the current time is the timing for performing background data transfer. If the current time meets the charging criteria value but the network condition is not good, the background data transfer is not performed; if the current time meets the charging criteria value and the network condition is good or suitable, the background data transfer is performed.

[00125] Preferably, the transfer managing device 2 further comprises a first monitoring module (not shown), wherein, the first monitoring module real-time monitors the charging rate rule, wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, notifying the application server 3 to suspend execution of the background data transfer.

[00126] Specifically, the first monitoring module monitors in real time the charging rate rule, e.g., monitoring, with change of time, whether the current charging rate satisfies data transfer demands; or, the first monitoring device interacts with the charging device in real time so as to obtain the charging rate rule corresponding to the current time. Once the charging rate rule does not satisfy the data transfer demands of the application server, e.g., the current charging rate rule is higher than the charging request value of the application server, the first monitoring module notifies the application server to suspend execution of the background data transfer.

[00127] More preferably, the first monitoring module may also reserve a corresponding data volume based on an expected data transfer volume included in the background data transfer request and the already transferred data amount when notifying the application server to suspend execution of background data transfer, so as to reserve communication for the background data transfer request before completion of data transfer.

[00128] Fig. 4 shows a schematic diagram of a charging device, a transfer managing device and an application server for background data transfer according to another preferred embodiment of the present invention. In the embodiment, the application server is used as an executing device.

[00129] Herein, the charging device 1 comprises a request obtaining module 11'', a determining module 12'', a response sending module 13''; the transfer managing device 2 comprises a request forwarding module 21'', a response forwarding module 22''; the application server 3 comprises a request sending module 31'', a response obtaining module 32'', a determining module 36'', a second executing module 37''.

[00130] Specifically, the request sending module 31'' of the application server 3 sends a background data transfer request to the transfer managing device 2; correspondingly,

the request forwarding module 21" of the transfer managing device 2 obtains the background data transfer request sent by the application server 3 and forwards the background data transfer request to the charging device 1; correspondingly, the request obtaining module 11" of the charging device 1 obtains the background data transfer request sent by the application server 3; and then, the determining module 12" of the charging device 1 determines an executing device for executing background data transfer based on an attribute of the application server 3, wherein the executing device is the application server 3; the response sending module 13" of the charging device 1 sends a background data transfer response to the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule; correspondingly, the response forwarding module 22" of the transfer managing device 2 obtains the background data transfer response sent by the charging device 1 and forwards the background data transfer response to the application server 3, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier is the application server 3; correspondingly, the response obtaining module 32" of the application server 3 obtains the background data transfer response sent by the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier is the application server 3; the determining module 36" determines in real time whether a charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server 3 based on the charging rate rule; if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server 3, the second executing module 37" executes the background data transfer.

[00131] Herein, the request obtaining module 11", the determining module 12" and the response sending module 13" of the charging device 1, the request forwarding module 21" and the response forwarding module 22" of the transfer managing device 2, the request sending module 31" and the response obtaining module 32" of the application server 3 are identical or substantially identical to corresponding modules shown in Fig. 2, which are thus not detailed here, but incorporated here by reference.

[00132] The determining module 36" determines in real time whether a charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server 3 based on the charging rate rule.

[00133] Specifically, the determining module 36" determines in real-time, based on the obtained charging rate rule in conjunction with the data transfer requirements of the application server itself, whether the charging rate rule corresponding to the current situation satisfies the requirement, wherein the current situation includes time, network condition, etc.

[00134] If the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server 3, i.e., the current is the best timing for background data transfer, the second executing module 37" executes the background data transfer.

[00135] Therefore, if the executing device is the application server, the application server can determine the best data transfer timing and execute the background data transfer.

[00136] Preferably, the application server 3 further comprises a second monitoring module (not shown), wherein, the second monitoring module real-time monitors the charging rate rule, and suspends execution of the background data transfer when the charging rate rule does not satisfy a data transfer requirement of the application server 3.

[00137] Specifically, the second monitoring module monitors in real-time the charging rate rule, e.g., monitoring whether the current charging rate satisfies data transfer requirements with change of time; or, the second monitoring module interacts with the charging device in real-time directly or via the transfer management device so as to obtain the charging rate rule corresponding to the current time. Once the charging rate rule cannot satisfy the data transfer requirements of the application server, e.g., the current charging rate rule is higher than the charging request value of the application server, the second monitoring module notifies the application server to suspend execution of the background data transfer.

[00138] Fig. 5 shows a flow diagram of a method for background data transfer by cooperation of a charging device, a transfer managing device and an application server according to one aspect of the present invention.

[00139] Specifically, in the step S51, the application server 3 sends a background data transfer request to the transfer managing device 2; correspondingly, in the step S51, the transfer managing device 2 obtains the background data transfer request sent by the application server 3 and forwards the background data transfer request to the charging device 1; correspondingly, in the step S51, the charging device 1 obtains the background data transfer request sent by the application server 3; and then, in the step S52, the charging device 1 determines an executing device for executing background data transfer based on an attribute of the application server 3, wherein the executing device includes the application server 3 or the transfer managing device 2; in the step S53, the charging device 1 sends a background data transfer response to the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule; correspondingly, in the step S53, the transfer managing device 2 obtains the background data transfer response sent by the charging device 1 and forwards the background data transfer response to the application server 3, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server 3 or the transfer managing device 2; correspondingly, in the step S53, the application server 3 obtains the background data transfer response sent by the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server 3 or the transfer managing device 2; in the step S54, when the charging rate rule satisfies a data transfer requirement of the application server, the executing device executes the background data transfer based

on the charging rate rule.

[00140] In the step S51, the application server 3 sends a background data transfer request to the charging device 1.

[00141] Specifically, in the step S51, the application server 3 sends a background data transfer request to the transfer management device 2 through corresponding communication protocols based on preset APIs, wherein the background data transfer request may include, for example, an identifier of the application server (AS identifier), a reference ID of the application server (AS Reference ID), a number of UEs corresponding to the application server (Number of UEs), a requested data volume of each UE (Volume per UE), the desired time window, etc.

[00142] Correspondingly, in the step S51, the transfer managing device 2 obtains the background data transfer request sent by the application server 3 and forwards the background data transfer request to the charging device 1; correspondingly, the charging device 1 obtains the background data transfer request sent by the application server 3.

[00143] Specifically, in the step S51, after obtaining the background data transfer request, the transfer managing device 2 may directly forward it to the charging device 1; or, after authenticating the request, forward it to the charging device 1. Here, the forwarded background data transfer request may include, e.g., ASP identifier, volume of data to be transferred by each UE, an expected amount of the UEs, the desired time window; preferably, there may also include network area information.

[00144] Besides, those skilled in the art should understand that in the step S51, the application server 3 could send the background data transfer request directly to the charging device 1.

[00145] Then, in the step S51, the charging device 1 determines an executing device for executing background data transfer based on an attribute of the application server 3, wherein the executing device includes the application server 3 or the transfer managing device 2.

[00146] Specifically, in the step S51, the charging device 1 determines, based on an attribute of the application server 3, whether the application server 3 can perform the following smart data delivery procedure, wherein the attribute includes whether the application server is a third-party device. In the case of the third-party device, the application server 3 cannot know relevant information for smart data delivery and cannot perform the smart data delivery process; therefore, the transfer managing device 2 acts as the executing device. If the application server 3 is not a third-party device, it indicates that the application server 3 can know relevant information for smart data delivery to perform the following smart data delivery procedure; therefore, the application server 3 acts as the executing device. Besides, even if the application server 3 is not a third party device, the charging device 1 can still take the transfer managing device 2 as the executing device.

[00147] Here, the manner of determining the attribute of the application server 3 may be based on the identifier of the application server and/or the reference ID of the application server. Those skilled in the art should understand that the above determining manner is only an example, not a limitation to the present invention.

Other manners of determining the attribute of the application server is also suitable for the present invention, and included within the protection scope of the present invention.

[00148] Here, the smart data delivery procedure may refer to the embodiments corresponding to Figs. 6 and 7.

[00149] In the step S53, the charging device 1 sends a background data transfer response to the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule.

[00150] Specifically, the executing device identifier is just the identifier of the executing device determined by the charging device 1. The charging rate rule may be directly obtained from the charging device 1 or obtained through interactions with other relevant devices, e.g., SPR. Then, the executing device identifier and the charging rate rule are added to a background data transfer response; the background data transfer response is sent to the transfer managing device 2. The charging rate rule may correspond to an individual UE corresponding to the application server 3 or correspond to a group UE.

[00151] Herein, an exemplary format of the executing device identifier is shown as below:

[00152]

Application Server ID	Transfer Management Device ID	Identifier (YES, indicating that the application server is the executing device; NO, indicating that the transfer management device is the executing device.)
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[00153] Here, those skilled in the art should understand that when the application server is a third-party device, the transfer management device is the executing device, then the aforementioned “identifier” is “NO”; when the application server is a non-third-party server and used as the executing device, the aforementioned “identifier” is “YES”; when the application server is a non-third-party device and the transfer management device is the executing device, the aforementioned “identifier” is “NO”.

[00154] The charging rate rule may include different charging rates under a plurality of different conditions, wherein the conditions may include work load, transmission time, etc. An exemplary format of the charging rate rule is shown as below:

[00155]

Condition Value 1	Corresponding Charging Rate 1
Condition Value 2	Corresponding Charging Rate 2
...	...
...	...
Condition Value n	Corresponding Charging Rate n

[00156] Here, the exemplary formats above are only exemplary, not a limitation to the present invention; other formats are likewise applicable to the present invention and included within the protection scope of the present invention.

[00157] In the step S53, the transfer managing device 2 obtains, based on the preset API and through corresponding protocols, the background data transfer response sent

by the charging device 1 and forwards the background data transfer response to the application server 3. Correspondingly, the application server 3 obtains the background data transfer response sent by the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server 3 or the transfer managing device 2.

[00158] Besides, those skilled in the art should understand that in the step S53, the charging device 1 could send the background data transfer response directly to the application server 3.

[00159] In the step S54, when the charging rate rule satisfies a data transfer requirement of the application server, the executing device executes the background data transfer based on the charging rate rule. If the executing device is the application server, then the application server executes it; if the executing device is the transfer management device, then the transfer management device cooperates with the application server to execute it. The Fig. 6 and Fig. 7 shows the executing steps of the transfer management device used as the executing device and the application device used as the executing device respectively.

[00160] Fig. 6 shows a flow diagram of a method for background data transfer by cooperation of a charging device, a transfer managing device and an application server according to one preferred embodiment of the present invention. In the embodiment, the transfer managing device is used as an executing device.

[00161] Specifically, in the step S61, the application server 3 sends a background data transfer request to the transfer managing device 2; correspondingly, in the step S61, the transfer managing device 2 obtains the background data transfer request sent by the application server 3 and forwards the background data transfer request to the charging device 1; correspondingly, in the step S61, the charging device 1 obtains the background data transfer request sent by the application server 3; and then, in the step S62, the charging device 1 determines an executing device for executing background data transfer based on an attribute of the application server 3, wherein the executing device is the transfer managing device 2; in the step S63, the charging device 1 sends a background data transfer response to the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule; correspondingly, in the step S63, the transfer managing device 2 obtains the background data transfer response sent by the charging device 1 and forwards the background data transfer response to the application server 3, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier is the transfer managing device 2; correspondingly, in the step S63, the application server 3 obtains the background data transfer response sent by the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier is the transfer managing device 2; in the step S64, the application server 3 sends a best data transfer request to the transfer managing device 2, wherein the best data transfer request includes a charging request

value; correspondingly, in the step S641, the transfer managing device 2 obtains the best data transfer request sent by the application server 3, wherein the best data transfer request includes a charging request value; and then, based on the charging request value and the charging rate rule, in the step S642, the transfer managing device 2 negotiates with the application server 3 to determine a charging criteria value; at last, in the step S643, the transfer managing device 2 executes the background data transfer based on the charging criteria value; in the step S643, the application server 3 executes the background data transfer based on a best device trigger request of the transfer managing device 2.

[00162] Herein, the steps S61, S62, S63 are identical or substantially identical to corresponding steps S51, S52, S53 shown in Fig. 5, which are thus not detailed here, but incorporated here by reference.

[00163] In the step S641, the application server 3 sends a best data transfer request to the transfer managing device 2; correspondingly, in the step S641, the transfer managing device 2 obtains the best data transfer request sent by the application server 3, wherein the best data transfer request includes a charging request value.

[00164] Specifically, the application server 3 obtains a charging request value desired by the user based on interactions with the user, or determines a charging request value based on the default setting; wherein, the charging request value is the data transfer rate desired to be adopted by the application server 3. Then, in the step S641, the application server 3 sends the best data transfer request including the charging request value to the transfer management device 2. The charging request value may include charging rate, time, occurrence probability, etc.; the values corresponding to the charging rate, time or occurrence probability may be a fixed value or a range value.

[00165] An exemplary format of the best data transfer request is shown as below:

[00166]

Application Server ID	Transfer Management Device ID	Charging Request Value
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[00167] Then, based on the charging request value and the charging rate rule, in the step S642, the transfer managing device 2 negotiates with the application server 3 to determine a charging criteria value.

[00168] Specifically, the transfer management device 2 determines whether the charging request value can be satisfied based on the charging rate rule obtained from the charging device 1; wherein the charging rate rule may be a latest charging rate rule in the charging device 1 obtained by the transfer managing device 2 through real-time interactions with the charging device 1, or a charging rate rule obtained by the transfer managing device 2 through previous interactions with the charging device 1. For example, if the charging request value is lower than any one of charging rate in the charging rate rule, it may be regarded that the charging request value cannot be satisfied; otherwise, it may be satisfied under certain conditions.

[00169] If the transfer management device 2 believes that the charging request value is unreasonable (i.e., cannot be satisfied), it will send a best data transfer response including a recommended charging value to the application server 3; if the application server 3 accepts the recommended value, the best data transfer request will be re-sent

to the transfer management device 2, wherein the best data transfer request includes the recommended charging request value.

[00170] If the transfer management device 2 believes that the charging request value is reasonable (i.e., can be satisfied), the transfer management device 2 sends a best data transfer response including an acknowledgement of the charging request value to the application server 3. Here, those skilled in the art should understand that the transfer management device 2 may acknowledge the charging request value when receiving the best data transfer request for the first time, or may acknowledge the updated charging request value through twice or multiple times of negotiation processes with the application server 3.

[00171] An exemplary format of the best data transfer response is shown as below:

[00172]

Application Server ID	Transfer Management Device ID	Acknowledged or Recommended Charging Request Value (which may be a specific value or a value range)
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[00173] At last, in the step S643, the transfer managing device 2 executes the background data transfer based on the charging criteria value; the application server 3 executes the background data transfer based on a best device trigger request of the transfer managing device 2.

[00174] Specifically, after acknowledging the charging request value, the transfer management device 2 may send a best device trigger request to the application server 3 based on the time, network condition, and/or charging rate corresponding to the charging request value so as to perform background data transfer. Correspondingly, the application server 3 may perform data transfer with the transfer managing device 2 based on the best device trigger request.

[00175] An exemplary format of the best device trigger request is shown as below:

[00176]

Application Server ID	Transfer Management Device ID	Current charging condition or identifier ("YES" indicates best transfer timing; "NO" indicates not)
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[00177] The message, i.e., the best device trigger request, may be transferred from the transfer management device 2 to the application server 3 for multiple times; for example, if the current charging condition is lower than the charging request, the transfer management device 2 sends the message so as to notify the application server 3 that this is the best timing. If the current charging condition is higher than the charging request, the transfer management device 2 believes that this is not a best timing, and sends the message to notify the application server 3 that the best time is closed. Therefore, the application server 3 will stop or suspend the operation.

[00178] Preferably, in the step S643, the transfer management device 2 could execute the background data transfer based on the charging criteria value in conjunction with network related information.

[00179] Specifically, the network related information includes, but not limited to, network traffic, work load, etc. In the step S643, the transfer management device 2, based on the charging criteria value in conjunction with network related information,

determines whether the current time is the timing for performing background data transfer. If the current time meets the charging criteria value but the network condition is not good, the background data transfer is not performed; if the current time meets the charging criteria value and the network condition is good or suitable, the background data transfer is performed.

[00180] Preferably, the method further comprises a step S65 (not shown), wherein, in the step S65, the transfer management device 2 real-time monitors the charging rate rule, wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, notifying the application server 3 to suspend execution of the background data transfer.

[00181] Specifically, in the step S65, the transfer management device 2 monitors in real time the charging rate rule, e.g., monitoring, with change of time, whether the current charging rate satisfies data transfer demands; or, in the step S65, the transfer management device 2 interacts with the charging device in real time so as to obtain the charging rate rule corresponding to the current time. Once the charging rate rule does not satisfy the data transfer demands of the application server, e.g., the current charging rate rule is higher than the charging request value of the application server, the transfer management device 2 notifies the application server to suspend execution of the background data transfer.

[00182] More preferably, the transfer management device 2 may also reserve a corresponding data volume based on an expected data transfer volume included in the background data transfer request and the already transferred data amount when notifying the application server to suspend execution of background data transfer, so as to reserve communication for the background data transfer request before completion of data transfer.

[00183] Fig. 7 shows a flow diagram of a method for background data transfer by cooperation of a charging device, a transfer managing device and an application server according to another preferred embodiment of the present invention. In the embodiment, the application server is used as an executing device.

[00184] Specifically, in the step S71, the application server 3 sends a background data transfer request to the transfer managing device 2; correspondingly, in the step S71, the transfer managing device 2 obtains the background data transfer request sent by the application server 3 and forwards the background data transfer request to the charging device 1; correspondingly, in the step S71, the charging device 1 obtains the background data transfer request sent by the application server 3; and then, in the step S72, the charging device 1 determines an executing device for executing background data transfer based on an attribute of the application server 3, wherein the executing device is the application server 3; in the step S73, the charging device 1 sends a background data transfer response to the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule; correspondingly, in the step S73, the transfer managing device 2 obtains the background data transfer response sent by the charging device 1 and forwards the background data transfer response to the application server 3, wherein the background data transfer response includes an executing device identifier and a

charging rate rule, an executing device corresponding to the executing device identifier is the application server 3; correspondingly, in the step S73, the application server 3 obtains the background data transfer response sent by the transfer managing device 2, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier is the application server 3; in the step S741, the application server 3 determines in real time whether a charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server 3 based on the charging rate rule; if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server 3, in the step S742, the application server 3 executes the background data transfer.

[00185] Herein, the steps S71, S72, S73 are identical or substantially identical to corresponding steps S51, S52, S53 shown in Fig. 5, which are thus not detailed here, but incorporated here by reference.

[00186] In the step S741, the application server 3 determines in real time whether a charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server 3 based on the charging rate rule.

[00187] Specifically, in the step S741, the application server determines in real-time, based on the obtained charging rate rule in conjunction with the data transfer requirements of the application server itself, whether the charging rate rule corresponding to the current situation satisfies the requirement, wherein the current situation includes time, network condition, etc.

[00188] If the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server 3, i.e., the current is the best timing for background data transfer, in the step S742, the application server 3 executes the background data transfer.

[00189] Therefore, if the executing device is the application server, the application server can determine the best data transfer timing and execute the background data transfer.

[00190] Preferably, the method further comprises a step S75 (not shown), wherein, in the step S75, the application server 3 real-time monitors the charging rate rule, and suspends execution of the background data transfer when the charging rate rule does not satisfy a data transfer requirement of the application server 3.

[00191] Specifically, in the step S75, the application server 3 monitors in real-time the charging rate rule, e.g., monitoring whether the current charging rate satisfies data transfer requirements with change of time; or, in the step S75, the application server 3 interacts with the charging device in real-time directly or via the transfer management device so as to obtain the charging rate rule corresponding to the current time. Once the charging rate rule cannot satisfy the data transfer requirements of the application server, e.g., the current charging rate rule is higher than the charging request value of the application server, the application server suspends execution of the background data transfer.

[00192] Fig. 8 shows a flow diagram of a method for background data transfer with AS the executing device in a 3GPP system according to another preferred

embodiment of the present invention.

[00193] In the system, the AS is the application server; PCRF may be used as the charging device; the transfer managing device is deployed on the SCEF and replaced by the SCEF so as to be consistent with the 3GPP standard. Those skilled in the art should understand that first, it is most appropriate for the transfer managing device to be deployed at the SCEF, but which may also be deployed at other network elements, e.g., on the MTC-IWF; second, the following AS, PCRF, and SCEF are all enhanced corresponding devices.

[00194] Here, explanations of respective steps of Fig. 8 will be illustrated in the following, wherein the procedure of background data transfer in steps S81-86 and S811 to S813 may refer to TS23.203.

[00195] Step S81: A third party AS sends a background data transfer request (including AS Identifier, AS Reference ID, a requested data Volume of each UE, Number of UEs, and Desired time window) message to the SCEF. This message is based on the existing resource management for background data transfer. Refer to TS 23.682.

[00196] Step S82: The SCEF authorizes the AS request.

[00197] Step S83: Based on an AS request, the SCEF sends a background data transfer request to the PCRF. The background data transfer request contains ASP identifier, the volume of data to be transferred per UE, the expected amount of UEs, the desired time window and optionally, network area information.

[00198] Step S84: The PCRF requests from the SPR all existing transfer policies (optionally PCRF seeks additional charging account policy from OCS).

[00199] Step S85: The SPR provides all existing transfer policies and corresponding network area information to the PCRF (optionally OCS responds with additional charging account policy to PCRF).

[00200] Step S86: The PCRF determines, based on information provided by the AS and other available information one or more transfer policies. A transfer policy consists of a recommended time window for the background data transfer, a reference to a charging rate for this time window and optionally a maximum aggregated bitrate (i.e., a maximum download speed).

[00201] Step S87: PCRF is enhanced with the above functions of the charging device. PCRF determines whether AS can do the smart data delivery. If AS can, PCRF responds to SCEF with different charging rates which include criteria and charging rate. The different charging rates are included in the background data transfer response message sent to AS. If AS can't, SCEF will do the smart data delivery procedures. The logic tree is like that:

[00202] If (AS can do smart data delivery)

[00203] {

[00204] PCRF responds different charging rates to AS via SCEF.

[00205] AS will do PCC and monitor procedure.

[00206] }

[00207] else

[00208] {

[00209] PCRF responds to SCEF and SCEF will do smart data delivery.

[00210] }

[00211] There are two new parameters carried in the background data transfer response from PCRF to SCEF. The first new parameter is Smart Data Delivery Indicator (SDDI) which includes three parts. The format is as follows:

[00212]

Application Server ID	Transfer Management Device ID	Identifier (YES, indicating that the application server is the executing device; NO, indicating that the transfer management device is the executing device.)
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[00213] This new parameter indicates who do the smart data delivery, AS or SCEF.

[00214] The second parameter is Different Charging Rate Rule (DCRR) includes the condition value and related charging rate sent from PCRF to AS via SCEF. This message will be sent to AS when AS do smart data delivery. PCRF provides different charging rate to AS. The format is showing here:

[00215]

Condition Value 1	Corresponding Charging Rate 1
Condition Value 2	Corresponding Charging Rate 2
...	...
...	...
Condition Value n	Corresponding Charging Rate n

[00216] Note: Condition Value including work load, time etc....

[00217] Step S88-S89: PCRF responds AS with different charging rates via SCEF. The new two parameters SDDI and DCRR are included in background data transfer from PCRF to AS.

[00218] Step S810: AS is enhanced with functions of AS acting as the executing device to handle the different charging rates to select the best opportunity to do background data transfer.

[00219] Step S811-S813: Please refer to TS 23.203 [27] clause 7.11.1 and TS 23.682. The AS can also trigger monitor procedure.

[00220] Fig. 9 shows a flow diagram of a method for background data transfer with SCEF the executing device in a 3GPP system according to another preferred embodiment of the present invention.

[00221] In the system, the AS is the application server; PCRF may be used as the charging device; the transfer managing device is deployed on the SCEF and replaced by the SCEF so as to be consistent with the 3GPP standard. Those skilled in the art should understand that first, it is most appropriate for the transfer managing device to be deployed at the SCEF, but which may also be deployed at other network elements, e.g., on the MTC-IWF; second, the following AS, PCRF, and SCEF are all enhanced corresponding devices.

[00222] Step S91-S99: Refer to the steps S81-S89 in the Fig.8.

[00223] Step S910-S915: AS generates the Smart Data Delivery Parameter base on the demand of the critical value of charging condition value and inserts it into the "Best MTC Request". The "Best MTC Request" is sent to SCEF through the

enhanced Service Exposure Layer. The Smart Data Delivery Parameter received from AS is saved in the SCEF for further handling. SCEF will check the value of the charging criteria value. If the criteria is unreasonable (e.g. the criteria is lower than any charging rate in historical list), “Best MTC response” including the recommended criteria based on the historical list for charging rate is sent to AS. If the criteria is reasonable, “Best MTC response” including the confirm parameter is sent to AS. In this example, the first criteria value is unreasonable, SCEF gives a recommended criteria value to AS.

[00224] Step S916: Upon reception of AS Device trigger, SCEF begins to query the charging related network equipments. SCEF can also request and respond charging info/policy with PCRF by using the new or existing interfaces with new enhanced AVPs (Attribute Value Pair). (Note: this can also be monitored by enhanced Service Exposure Layer depend on the implementation). PCRF may interface with OCS to get charging rate info from OCS.

[00225] SCEF sends request message to PCRF by the new interface Rxs between SCEF and PCRF. In the messages, the format is including three parts: Application Server ID, Transfer Management Device ID and Criteria Value of charging condition threshold.

[00226]

Application Server ID	Transfer Management Device ID	Criteria Value of charging condition threshold
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[00227] For response messages, there are possibly two response messages. The format is showing here: The first one is PCRF responds the indicator to SCEF.

[00228]

Application Server ID	Transfer Management Device ID	Yes means the current charging rate rate is lower or equal to Criteria Value, No means it is higher to Criteria Value
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[00229] SCEF gets this response and determines whether it is the best MTC time.

[00230] The second one is PCRF responds the criteria value and related charging rate to SCEF (refer to the step S8 of Figure 8 for the definition of DCRR).

[00231] SCEF gets this response and analyzes whether the current charging condition rate meets the criteria Value of charging condition threshold. If meets, SCEF responds to AS.

[00232] Step S917: After SCEF gets the result from the charging related network equipments, SCEF analyzes the result and perform smart control to determine whether it is the best MTC opportunity. If SCEF consider it is not the best MTC opportunity, SCEF can also hold the MTC traffic to AS until the best MTC opportunity for the scenario that the traffic is paid by AS.

[00233] Step S918: When the charging condition meets the criteria, SCEF sends the “Best MTC Trigger” message to AS. In this example, the charging condition is lower than the critical value so SCEF sends the best MTC opportunity to AS.

[00234] Step S919: The MTC communication between AS and UE begin. The procedure can refer to 3GPP TS 23.682.

[00235] Step S920-S922: During the MTC communication between AS and UE,

SCEF also updates the charging policy change all the time and counts the amount the data transferred. In this example, the current tariff charging condition is higher than the critical value and the data transfer has not finished. So SCEF judge it is not the best time for MTC and sends “Best MTC Trigger” message to notify AS the best MTC opportunity is finished.

[00236] Step S923: AS hold the MTC communication and wait the SCEF reports the best time for MTC communication again.

[00237] Based on the procedures in Figs. 8 and 9, downloading a TV program will be taken as an example:

[00238] Smart home device such as smart TV updates the TV program by using Smart Data Delivery Management. Because it is not an emergency work and can be updated at midnight for both using less expensive expense for MTC data delivering and get the high traffic rate. So if the AS can do the smart data delivery notified by PCRF via SCEF, the “Best MTC Request” message is sent with a low critical value than daytime to SCEF. SCEF queries the charging policy to PCRF and gets the current charging policy. SCEF analyzes the current charging policy with the criteria value to determine whether the current charging policy meets the criteria. The “Best MTC Trigger” is sent to AS to notify AS whether it is the best time for MTC. If it is the best time, AS will updates the TV program to UE. If the best time is finished, AS will hold the action and wait the best time is appear again. If AS can't do the smart data delivery notified by PCRF via SCEF, AS can get the different charging rate and use it to determine the best time for MTC data delivering.

[00239] Those skilled in the art should understand that the examples of Figs. 8, Figs 9 and downloading a TV program are only exemplary, not limiting the present invention. Other application scenarios of background data transfer are likewise applicable to the present invention and are likewise included within the protection scope of the present invention.

[00240] It should be noted that the present invention may be implemented in software and/or a combination of software and hardware, for example, it may be implemented by an application-specific integrated circuit (ASIC), a general purpose computer or any other similar hardware device. In one embodiment, the software program of the present invention may be executed through a processor to implement the steps or functions as mentioned above. Likewise, the software program of the present invention (including relevant data structure) may be stored in the computer-readable recording medium, for example, RAM memory, magnetic or optic driver or floppy disk or similar devices. Besides, some steps or functions of the present invention may be implemented by hardware, for example, as a circuit cooperating with the processor to execute various steps or functions.

[00241] Besides, a part of the present invention may be applied as a computer program product, e.g., computer program instructions, which, when being executed by the computer, may invoke or provide the method and/or technical solution according to the present invention through operations of the computer, while the program instructions for invoking the method of the present invention may be stored in a fixed or mobile recording medium, and/or transmitted through broadcast or a data stream in

other signal carrier medium, and/or stored in a work memory of a computer device running based on the program instructions. Here, one embodiment according to the present invention comprises an apparatus, which comprising a memory for storing the computer program instructions and a processor for executing the program instructions, wherein when the computer program instructions are executed by the processor, the apparatus is triggered to run the above mentioned methods and/or technical solutions according to multiple embodiments of the present invention.

[00242] To those skilled in the art, it is apparent that the present invention is not limited to the details of above exemplary embodiments, and the present invention can be implemented with other specific embodiments without departing the spirit or basic features of the present invention. Thus, from any perspective, the embodiments should be regarded as illustrative and non-limiting. The scope of the present invention is limited by the appended claims, instead of the above description. Thus, meanings of equivalent elements falling within the claims and all variations within the scope are intended to be included within the present invention. Any reference numerals in the claims should not be regarded as limiting the involved claims. Besides, it is apparent that such terms as “comprise” and “include” do not exclude other units or steps, and a single form does not exclude a plural form. The multiple units or modules as stated in apparatus claims can also be implemented by a single unit or module through software or hardware. Terms such as first and second are used to represent names, not representing any specific sequence.

[00243] Although exemplary embodiments have been particularly shown and described above, those skilled in the art will understand that without departing from the spirit and scope of the claims, their forms and details may vary. The protection as sought here are illustrated in the appended claims. In the following numbered clauses, these and other aspects of various embodiments have been described:

[00244] 1. A method for background data transfer, wherein, the method comprises:

[00245] obtaining, by a charging device, a background data transfer request sent by an application server;

[00246] determining, by the charging device, based on an attribute of the application server, an executing device for executing background data transfer, wherein the executing device includes the application server or a transfer managing device;

[00247] sending, by the charging device, a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule;

[00248] executing, by the executing device, the background data transfer based on the charging rate rule when the charging rate rule satisfies a data transfer requirement of the application server.

[00249] 2. The method according to clause 1, wherein, the method further comprises:

[00250] - real-time monitoring, by the executing device, the charging rate rule, wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, the executing device notifies the application server to suspend execution of the background data transfer.

[00251] 3. The method according to clause 1, wherein when the executing device is

the application server, the step of the executing background data transfer includes:

[00252] - determining in real time whether the charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server based on the charging rate rule;

[00253] - if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server, executing the background data transfer.

[00254] 4. The method according to clause 1, wherein when the executing device is the transfer managing device, the step of executing the background data transfer comprises:

[00255] - sending, by the application server, a best data transfer request to the transfer managing device, wherein the best data transfer request includes a charging request value;

[00256] - negotiating, by the transfer management device with the application server, to determine a charging criteria value based on the charging request value and the charging rate rule;

[00257] - executing, by the transfer management device, the background data transfer based on the charging criteria value.

[00258] 5. The method according to clause 4, wherein the step of executing background data transfer comprises:

[00259] - executing, by the transfer management device, the background data transfer based on the charging criteria value in conjunction with network related information.

[00260] 6. A method for background data transfer in a charging device, wherein, the method comprises:

[00261] - obtaining a background data transfer request sent by an application server;

[00262] - determining an executing device for executing background data transfer based on an attribute of the application server, wherein the executing device includes the application server or a transfer managing device;

[00263] - sending a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule.

[00264] 7. A method for background data transfer in a transfer managing device, wherein, the method comprises:

[00265] - obtaining a background data transfer request sent by an application server and forwarding the background data transfer request to a charging device;

[00266] - obtaining a background data transfer response sent by the charging device and forwarding the background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server or the transfer managing device.

[00267] 8. The method according to clause 7, wherein, if the executing device is the transfer managing device, the method further comprises:

[00268] - obtaining a best data transfer request sent by the application server, wherein the best data transfer request includes a charging request value;

[00269] - negotiating with the application server to determine a charging criteria value based on the charging request value and the charging rate rule;

[00270] - executing the background data transfer based on the charging criteria value.

[00271] 9. The method according to clause 8, wherein, the step of executing the background data transfer comprises:

[00272] - executing the background data transfer based on the charging criteria value in conjunction with network related information.

[00273] 10. The method according to clause 8 or 9, wherein, the method further comprises:

[00274] - real-time monitoring the charging rate rule, wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, notifying the application server to suspend execution of the background data transfer.

[00275] 11. A method for background data transfer in an application server, wherein, the method comprises:

[00276] - sending a background data transfer request to a transfer managing device;

[00277] - obtaining a background data transfer response sent by the transfer managing device, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server or the transfer managing device.

[00278] 12. The application server according to clause 11, wherein, if the executing device is the application server, the method further comprises:

[00279] - determining in real time whether a charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server based on the charging rate rule;

[00280] - executing, if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server, the background data transfer.

[00281] 13. The method according to clause 12, wherein, the method further comprises:

[00282] - real-time monitoring the charging rate rule, and suspending execution of the background data transfer when the charging rate rule does not satisfy a data transfer requirement of the application server.

[00283] 14. The method according to clause 11, wherein, if the executing device is the transfer managing device, the method further comprises:

[00284] - sending a best data transfer request to the transfer managing device, wherein the best data transfer request includes a charging request value;

[00285] - negotiating with the application server to determine a charging criteria value based on the charging request value and the charging rate rule;

[00286] - executing the background data transfer based on a best device trigger request of the transfer managing device.

[00287] 15. A charging device for background data transfer, wherein, the charging device comprises:

[00288] a request obtaining module configured to obtain a background data transfer request sent by an application server;

[00289] a determining module configured to determine an executing device for executing background data transfer based on an attribute of the application server, wherein the executing device includes the application server or a transfer managing device;

[00290] a response sending module configured to send a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule.

[00291] 16. A transfer managing device for background data transfer, wherein, the transfer managing device comprises:

[00292] a request forwarding module configured to obtain a background data transfer request sent by an application server and forward the background data transfer request to a charging device;

[00293] a response forwarding module configured to obtain a background data transfer response sent by the charging device and forward the background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server or the transfer managing device.

[00294] 17. The transfer managing device according to clause 16, wherein, if the executing device is the transfer managing device, the transfer managing device further comprises:

[00295] a best obtaining module configured to obtain a best data transfer request sent by the application server, wherein the best data transfer request includes a charging request value;

[00296] a first negotiating module configured to negotiate with the application server to determine a charging criteria value based on the charging request value and the charging rate rule;

[00297] a first executing module configured to execute the background data transfer based on the charging criteria value.

[00298] 18. The transfer managing device according to clause 18, wherein, the first executing module is configured to:

[00299] - execute the background data transfer based on the charging criteria value in conjunction with network related information.

[00300] 19. The transfer managing device according to clause 17 or 18, wherein, the transfer managing device further comprises:

[00301] a first monitoring module configured to real-time monitor the charging rate rule, wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, notifying the application server to suspend execution of the background data transfer.

[00302] 20. An application server for background data transfer, wherein, the application server comprises:

[00303] a request sending module configured to send a background data transfer request to a transfer managing device;

[00304] a response obtaining module configured to obtain a background data transfer

response sent by the transfer managing device, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server or the transfer managing device.

[00305] 21. The application server according to clause 20, wherein, if the executing device is the application server, the application server further comprises:

[00306] a determining module configured to determine in real time whether a charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server based on the charging rate rule;

[00307] a second executing module configured to execute, if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server, the background data transfer.

[00308] 22. The application server according to clause 21, wherein, the application server further comprises:

[00309] a second monitoring module configured to real-time monitor the charging rate rule, and suspend execution of the background data transfer when the charging rate rule does not satisfy a data transfer requirement of the application server.

[00310] 23. The application server according to clause 20, wherein, if the executing device is the transfer managing device, the application server further comprises:

[00311] a best sending module configured to send a best data transfer request to the transfer managing device, wherein the best data transfer request includes a charging request value;

[00312] a second negotiating module configured to negotiate with the application server to determine a charging criteria value based on the charging request value and the charging rate rule;

[00313] a third executing module configured to execute the background data transfer based on a best device trigger request of the transfer managing device.

[00314] 24. A system for background data transfer, wherein the system comprises the charging device according to clause 15, the transfer managing device according to any one of clauses 16-19, and the application server according to any one of clauses 20-23.

List of abbreviations in the description and drawings:

3GPP	3rd Generation Partnership Project
AESE	Architecture Enhancements for Service capability Exposure
AS	Application Server
ASP	Application Service Provider
API	Application Programming Interface
BMTM	Best MTC transfer Management
DCRR	Different Charging Rate Rule
GSMA	Global System for Mobile Communications assembly
MNO	Mobile Network Operators
MTC	Machine-Type Communications
OMA	Open Mobile Architecture
OCS	Online Charging System
PCC	Policy and Charging Control
PCEF	Policy and Charging Enforcement Function
PCRF	Policy and Charging Rules Function
SCEF	Service Capability Exposure Function
SDDI	Smart Data Delivery Indicator
SDDM	Smart Data Delivery Management
SPR	Subscription Profile Repository
UE	User Equipment

We claim:

1. A method for background data transfer, wherein, the method comprises:
obtaining, by a charging device, a background data transfer request sent by an application server;
determining, by the charging device, based on an attribute of the application server, an executing device for executing background data transfer, wherein the executing device includes the application server or a transfer managing device;
sending, by the charging device, a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule;
executing, by the executing device, the background data transfer based on the charging rate rule when the charging rate rule satisfies a data transfer requirement of the application server.

2. The method according to claim 1, wherein, the method further comprises:
- real-time monitoring, by the executing device, the charging rate rule, wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, the executing device notifies the application server to suspend execution of the background data transfer.

3. The method according to claim 1, wherein when the executing device is the application server, the step of the executing background data transfer includes:
- determining in real time whether the charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server based on the charging rate rule;
- if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server, executing the background data transfer.

4. The method according to claim 1, wherein when the executing device is the transfer managing device, the step of executing the background data transfer comprises:
- sending, by the application server, a best data transfer request to the transfer managing device, wherein the best data transfer request includes a charging request value;
- negotiating, by the transfer management device with the application server, to determine a charging criteria value based on the charging request value and the charging rate rule;
- executing, by the transfer management device, the background data transfer based on the charging criteria value.

5. The method according to claim 4, wherein the step of executing background data transfer comprises:
- executing, by the transfer management device, the background data transfer based on the charging criteria value in conjunction with network related information.

6. A charging device for background data transfer, wherein, the charging device comprises:

a request obtaining module configured to obtain a background data transfer request sent by an application server;

a determining module configured to determine an executing device for executing background data transfer based on an attribute of the application server, wherein the executing device includes the application server or a transfer managing device;

a response sending module configured to send a background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule.

7. A transfer managing device for background data transfer, wherein, the transfer managing device comprises:

a request forwarding module configured to obtain a background data transfer request sent by an application server and forward the background data transfer request to a charging device;

a response forwarding module configured to obtain a background data transfer response sent by the charging device and forward the background data transfer response to the application server, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server or the transfer managing device.

8. The transfer managing device according to claim 7, wherein, if the executing device is the transfer managing device, the transfer managing device further comprises:

a best obtaining module configured to obtain a best data transfer request sent by the application server, wherein the best data transfer request includes a charging request value;

a first negotiating module configured to negotiate with the application server to determine a charging criteria value based on the charging request value and the charging rate rule;

a first executing module configured to execute the background data transfer based on the charging criteria value.

9. The transfer managing device according to claim 8, wherein, the first executing module is configured to:

- execute the background data transfer based on the charging criteria value in conjunction with network related information.

10. The transfer managing device according to claim 8 or 9, wherein, the transfer managing device further comprises:

a first monitoring module configured to real-time monitor the charging rate rule,

wherein when the charging rate rule does not satisfy a data transfer requirement of the application server, notifying the application server to suspend execution of the background data transfer.

11. An application server for background data transfer, wherein, the application server comprises:

a request sending module configured to send a background data transfer request to a transfer managing device;

a response obtaining module configured to obtain a background data transfer response sent by the transfer managing device, wherein the background data transfer response includes an executing device identifier and a charging rate rule, an executing device corresponding to the executing device identifier includes the application server or the transfer managing device.

12. The application server according to claim 11, wherein, if the executing device is the application server, the application server further comprises:

a determining module configured to determine in real time whether a charging rate rule corresponding to the current situation satisfies a data transfer requirement of the application server based on the charging rate rule;

a second executing module configured to execute, if the charging rate rule corresponding to the current situation satisfies the data transfer requirement of the application server, the background data transfer.

13. The application server according to claim 12, wherein, the application server further comprises:

a second monitoring module configured to real-time monitor the charging rate rule, and suspend execution of the background data transfer when the charging rate rule does not satisfy a data transfer requirement of the application server.

14. The application server according to claim 11, wherein, if the executing device is the transfer managing device, the application server further comprises:

a best sending module configured to send a best data transfer request to the transfer managing device, wherein the best data transfer request includes a charging request value;

a second negotiating module configured to negotiate with the application server to determine a charging criteria value based on the charging request value and the charging rate rule;

a third executing module configured to execute the background data transfer based on a best device trigger request of the transfer managing device.

15. A system for background data transfer, wherein the system comprises the charging device according to claim 6, the transfer managing device according to any one of claims 7-10, and the application server according to any one of claims 11-14.

Drawings

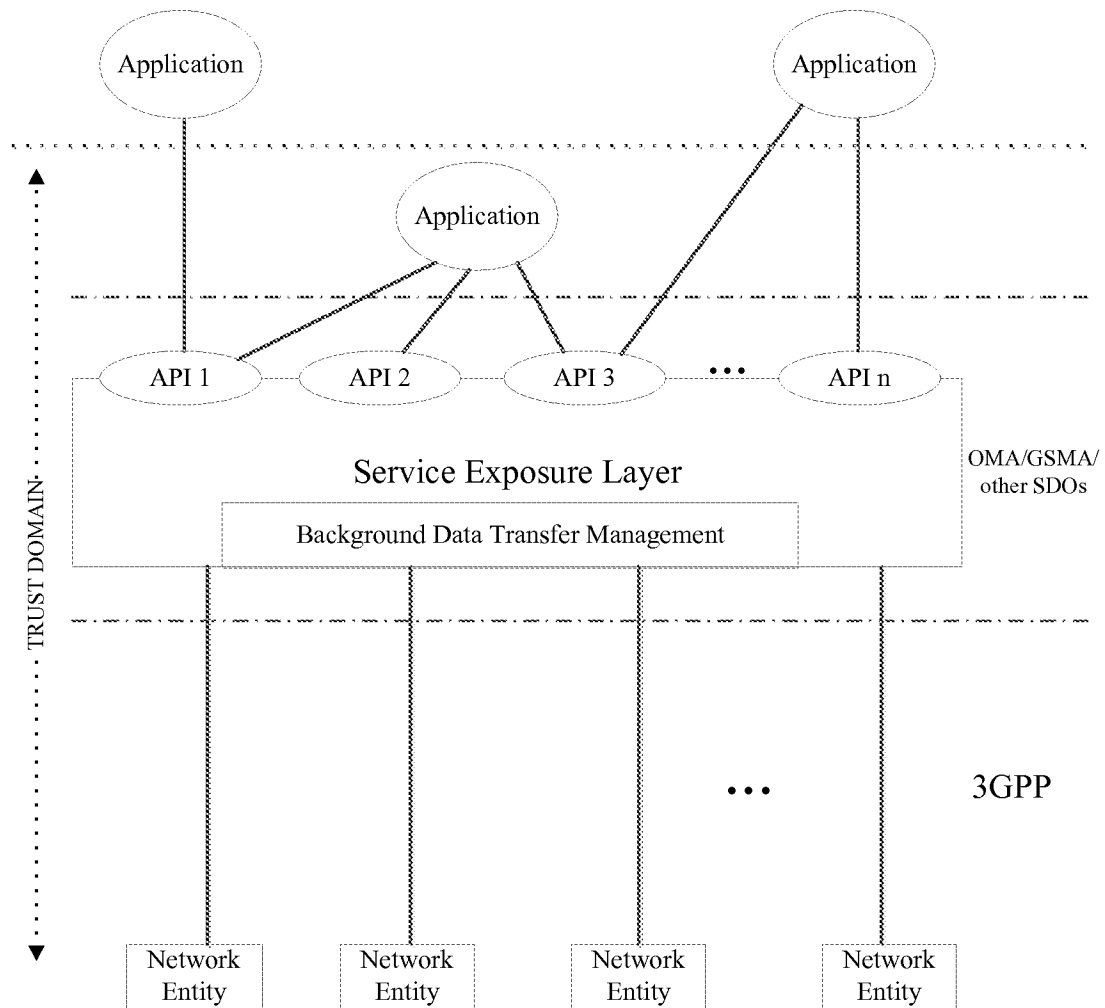


Fig.1

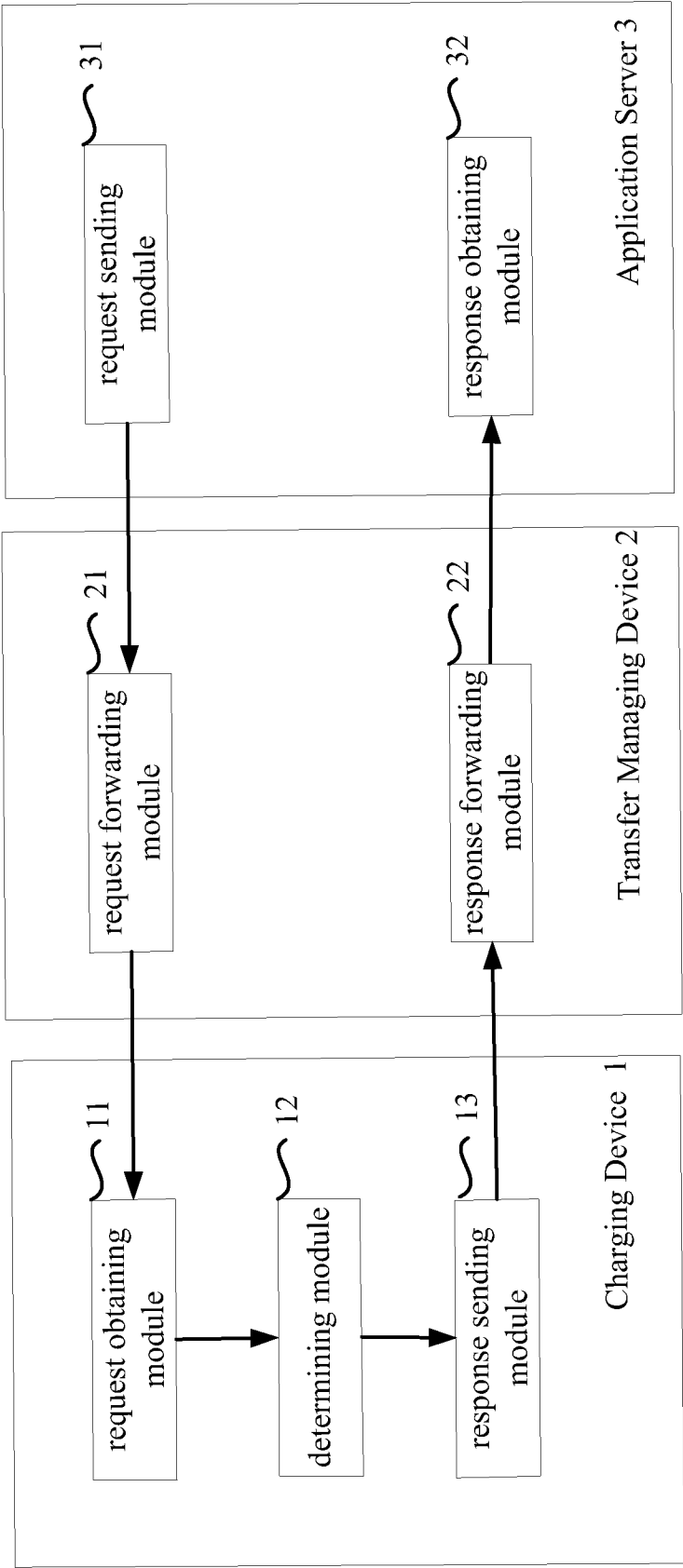


Fig.2

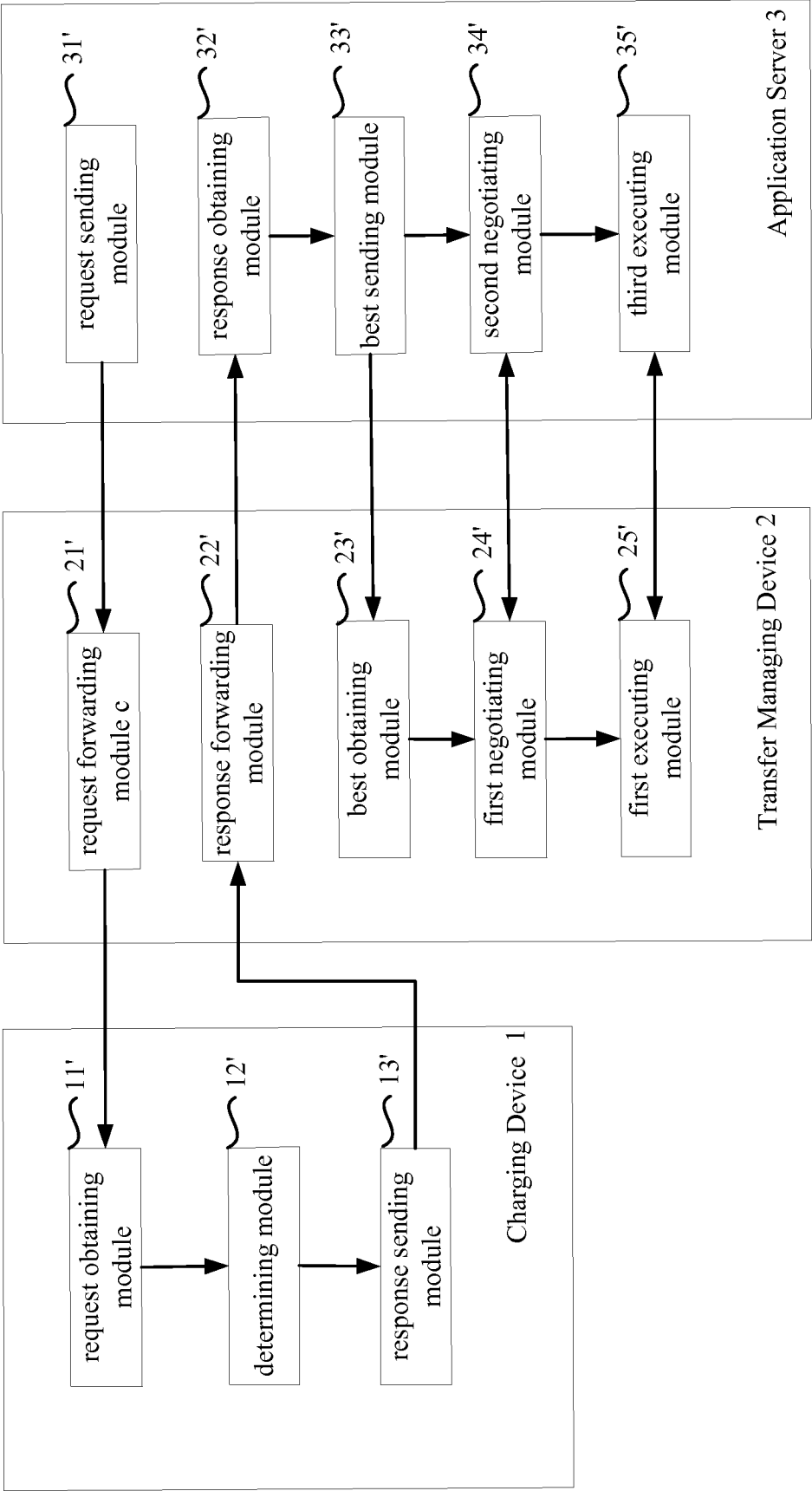


Fig.3

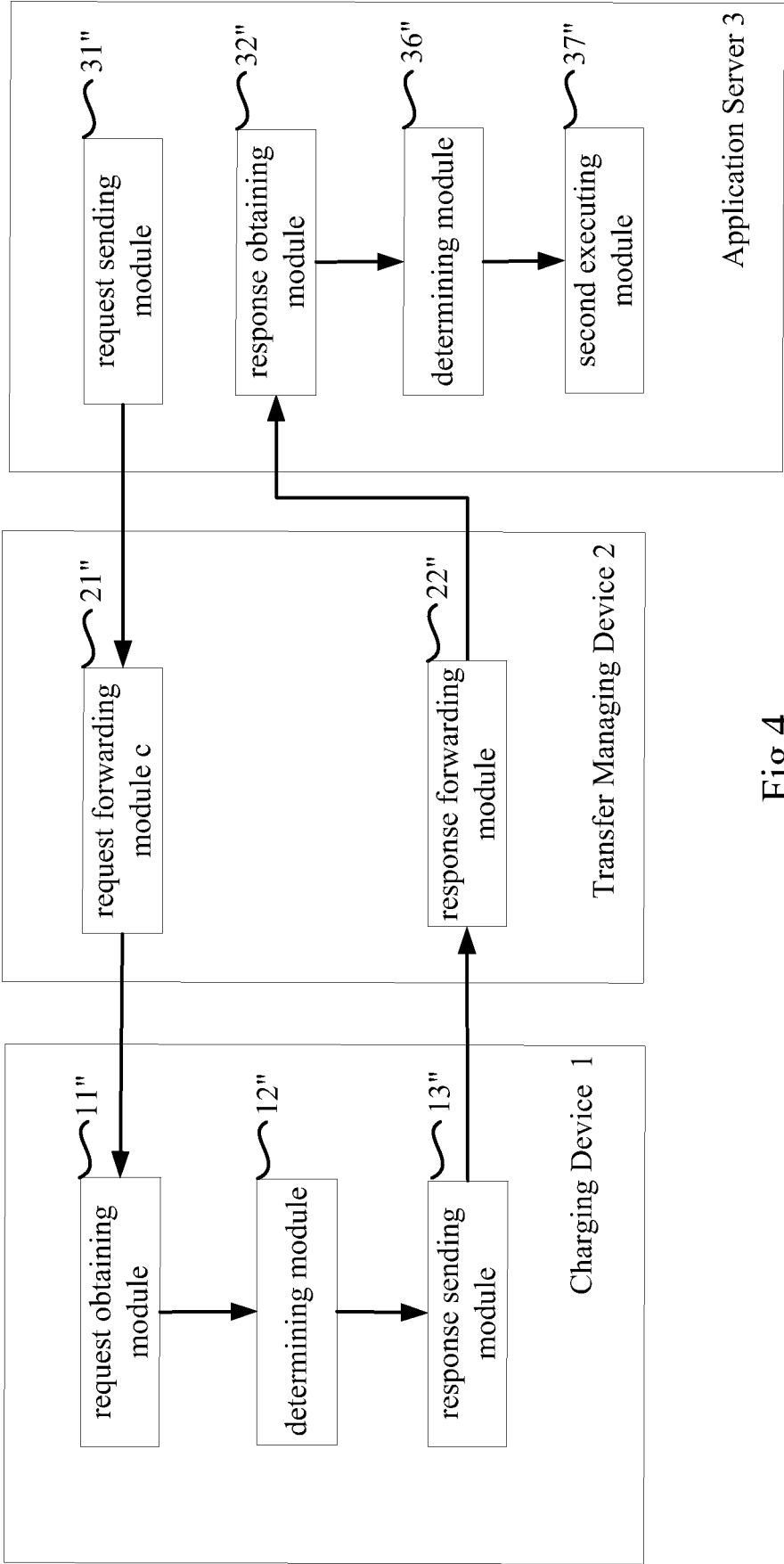


Fig.4

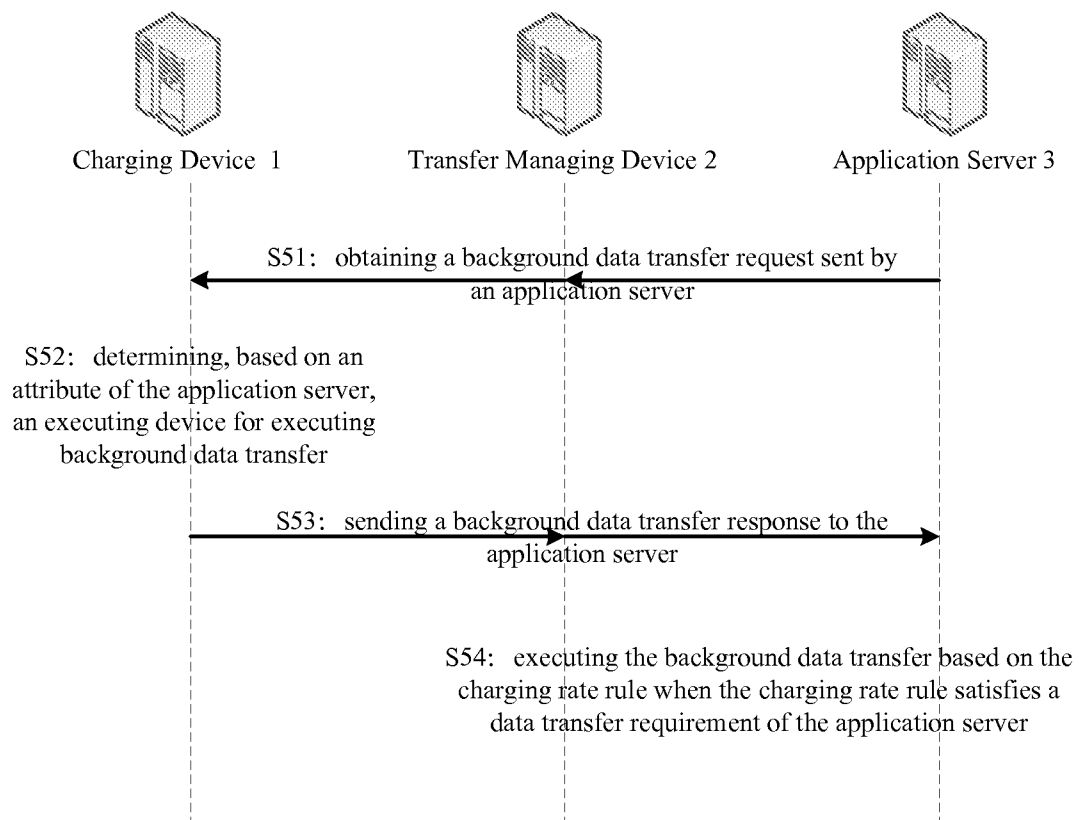


Fig.5

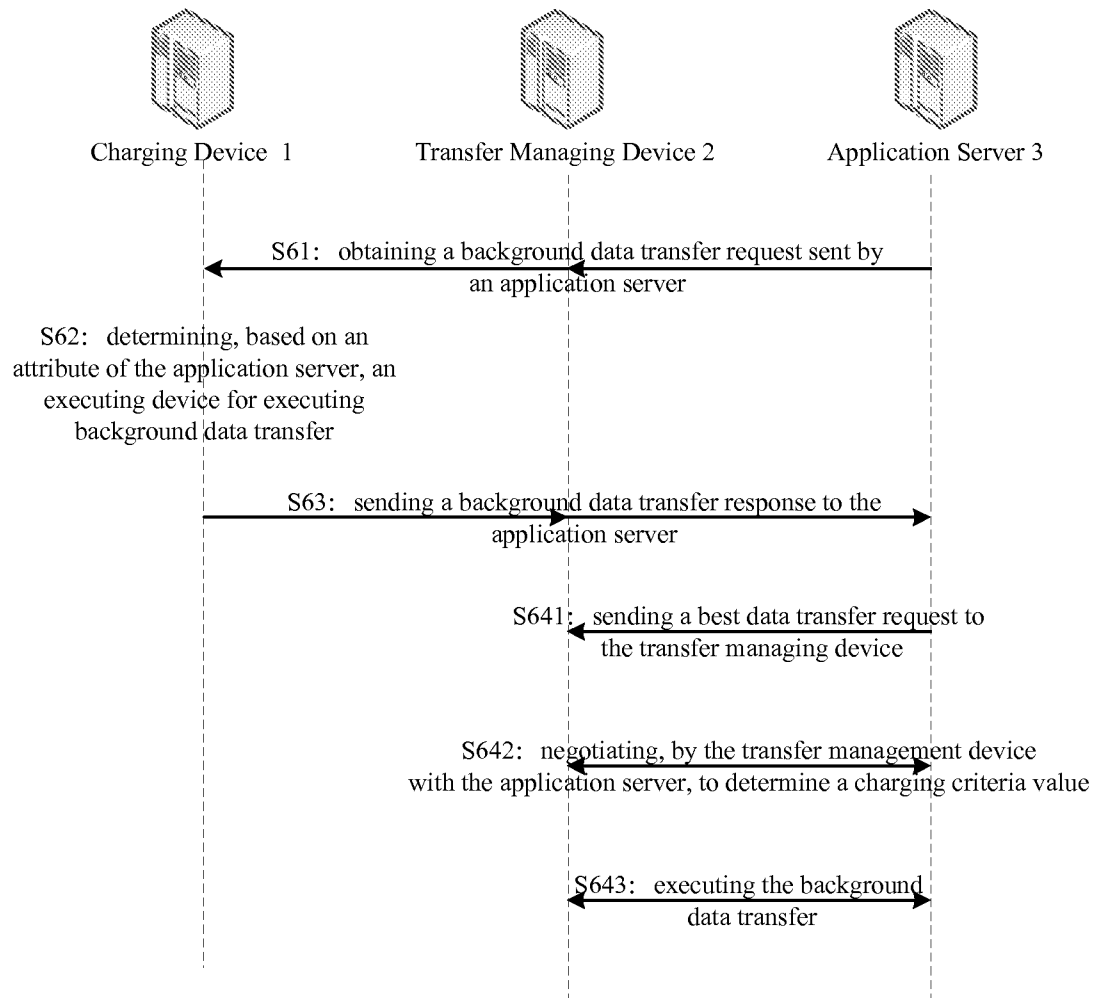


Fig.6

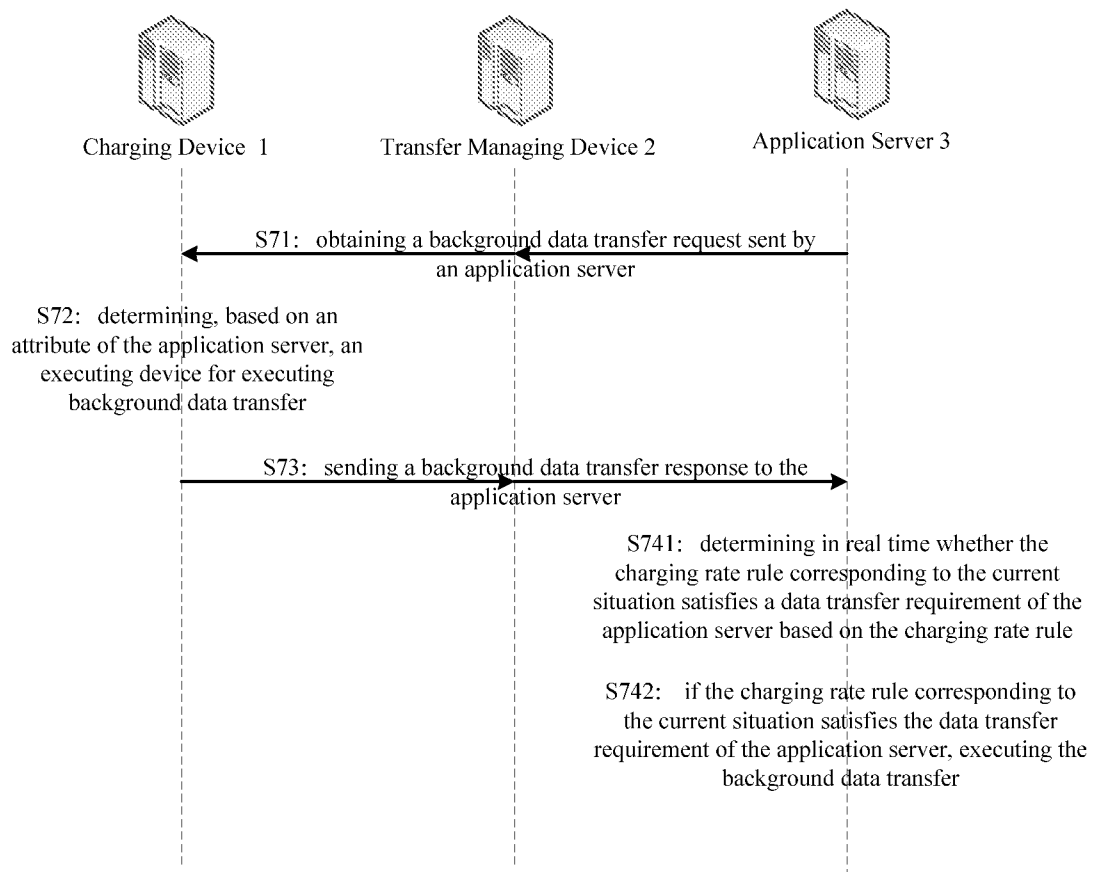


Fig.7

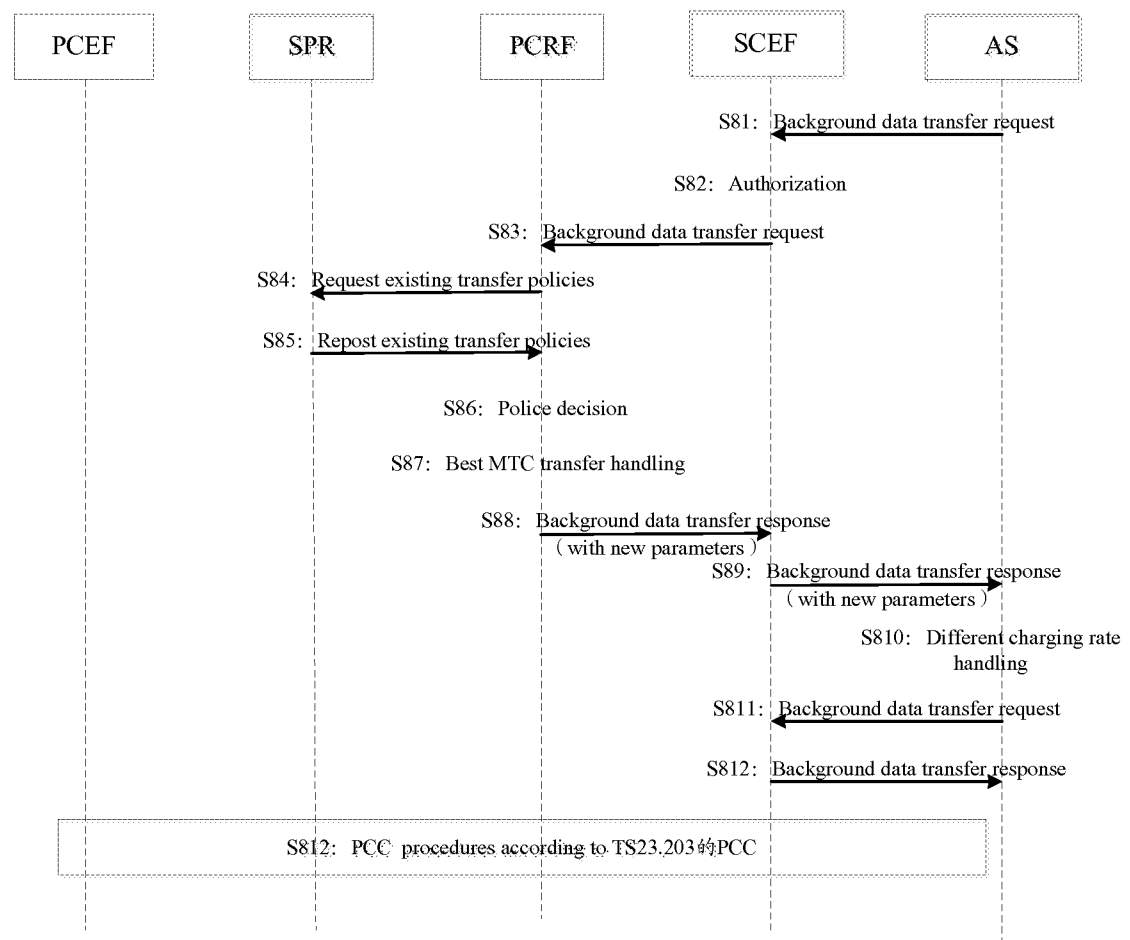


Fig.8

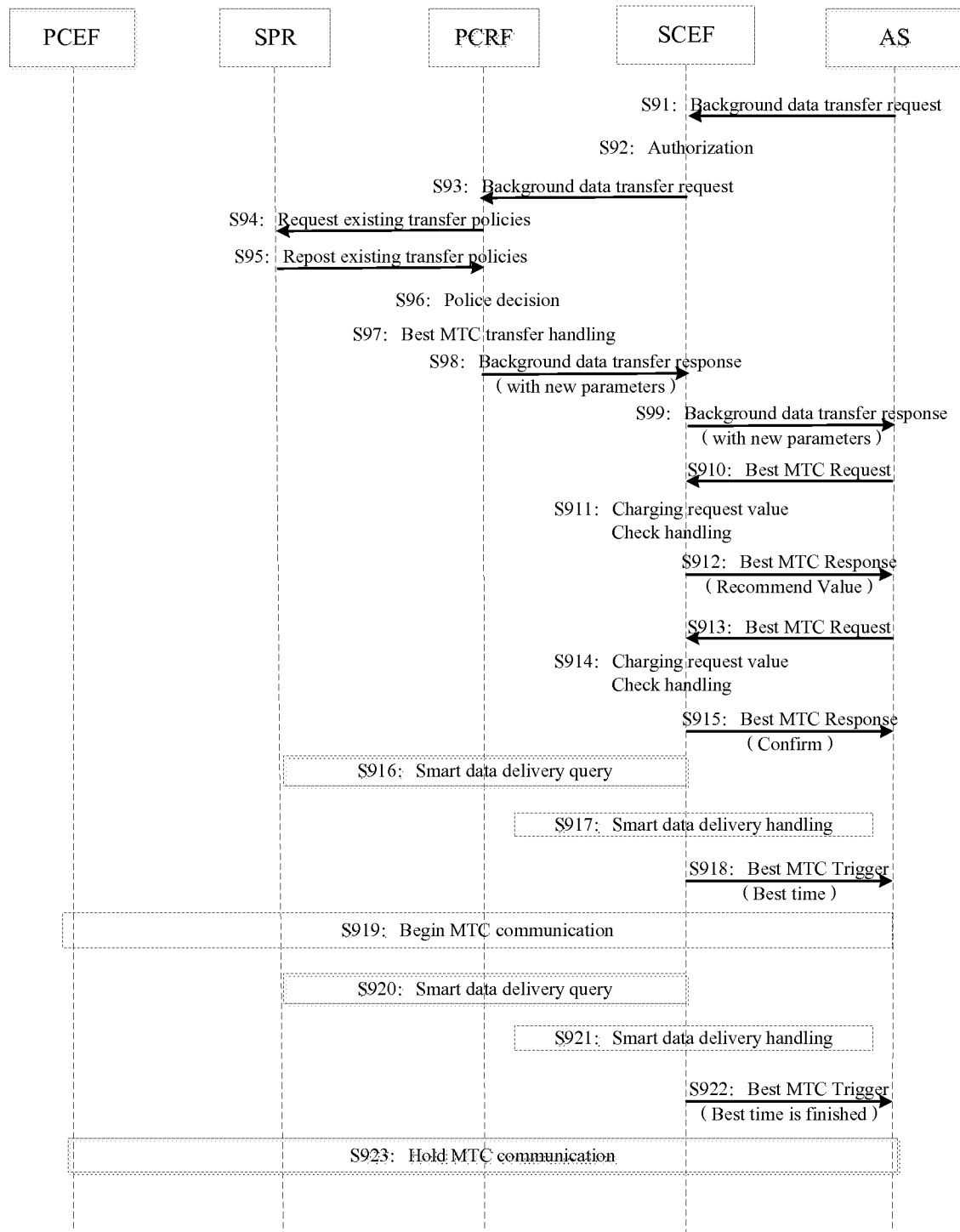


Fig.9

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2017/000496

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H04L12/24 H04W4/00
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04L H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Architecture Enhancements for Service Capability Exposure (Release 13)", 3GPP DRAFT; 23708-D00, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , 22 June 2015 (2015-06-22), XP050985900, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_sa/WG2_Arch/Latest_SA2_Specs/Rel-13/ [retrieved on 2015-06-22] * chapter 5.7 * * chapters 6.8-6.8.3 * * figures 6.8.1.1-1 and 6.8.1.2-1 * -/--	1,6,7, 11,15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

3 July 2017

Date of mailing of the international search report

10/07/2017

Name and mailing address of the ISA/

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Bertsch, Andreas

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2017/000496

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	----- "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Policy and charging control architecture (Release 13)", 3GPP DRAFT; 23203-D70, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , 24 March 2016 (2016-03-24), XP051086100, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_sa/WG2_Arch/Latest_SA2_Specs/Rel-13/ [retrieved on 2016-03-24] cited in the application * chapter 6.1.8 * * chapter 6.1.16 * * chapter 7.11.1 *	1,6,7, 11,15
Y	----- HUAWEI ET AL: "Resource management for background data transfer via Rx", 3GPP DRAFT; S2-151678 AESE 23203, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. SA WG2, no. Fukuoka, Japan; 20150525 - 20150529 24 May 2015 (2015-05-24), XP050977081, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/SA2/Docs/ [retrieved on 2015-05-24] * chapters 5.2.1, 6.1.1.1, 6.1.x * * figure 6.8.1.2.1 * ----- -/--	1,6,7, 11,15

INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Architecture enhancements to facilitate communications with packet data networks and applications (Release 13)", 3GPP DRAFT; 23682-D50, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , 24 March 2016 (2016-03-24), XP051086107, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_sa/WG2_Arch/Latest_SA2_Specs/Rel-13/ [retrieved on 2016-03-24] cited in the application * chapter 5.9 * * figure 5.9-1 * -----	1-15