# POLICY DETERMINING METHOD AND APPARATUS

## TECHNICAL FIELD

**[0001]** The present invention relates to the field of communications technologies, and in particular, to a policy determining method and apparatus.

## BACKGROUND

**[0002]** To face a challenge brought by wireless broadband technologies and keep advantages of a 3rd Generation Partnership Project (3rd Generation Partnership Project, 3GPP) network, the Long Term Evolution (Long Term Evolution, LTE) project of a mobile communications network is formulated in the 3GPP. Under the direction of the Long Term Evolution project, a new mobile communications network architecture is defined, that is, an architecture of a System Architecture Evolution (System Architecture Evolution, SAE) network system.

**[0003]** FIG. 1 is a schematic architectural diagram of a SAE network system in the prior art. As shown in FIG. 1, when user equipment (User Equipment, UE) accesses the SAE network system by using a serving general packet radio system support node (Serving General Packet Radio System Support Node, SGSN), the UE may access a serving gateway (Serving Gateway, SGW) by using an S4 interface, and then access a packet data network gateway (Packet Data Network Gateway, PDN-GW or PGW) by using an S5 interface. Alternatively, the UE may directly access the PGW by using a Gn/Gp interface. Functions of main network elements in the SAE network system are described as follows:

**[0004]** Mobility management entity (Mobility Management Entity, MME): is mainly responsible for functions in an evolved universal mobile telecommunications system terrestrial radio access network (Evolved UMTS Terrestrial Radio Access Network, E-UTRAN), such as UE mobility management, session management, encryption and integrity protection of non-access stratum (Non-Access Stratum, NAS) signaling, temporary identifier allocation for UE, and PGW and SGW selection. The MME is corresponding to a control plane part of an SGSN in the Universal Mobile

Telecommunications System (Universal Mobile Telecommunications System, UMTS).

**[0005]** SGW: is mainly responsible for relaying a user service flow between the UE and the PGW, and is used as an anchor during handover between base stations.

**[0006]** PGW: is mainly responsible for user address allocation, execution of policy control, execution of a charging rule, and a function related to lawful interception.

**[0007]** Policy and charging rules function (Policy and Charging Rules Function, PCRF) entity: The function entity determines a corresponding policy according to limitation of a user access network, an operator policy, user subscription data, information about a service currently performed by a user, and the like, and provides the policy for a transmission gateway for execution, so as to implement policy charging control.

**[0008]** Home subscriber server (Home Subscriber Server, HSS): is responsible for storing user subscription information.

**[0009]** Operator's IP services (Operator's IP Services): The operator's IP (Internet Protocol, Internet Protocol) services are implemented in an LTE network by using an IP multimedia subsystem (IP Multimedia Subsystem, IMS) network. In addition, a packet switched streaming service (Packet Switched Streaming Service, PSS) technology is a technology that is defined in the 3GPP and that is used for providing a streaming media service for the user. A PSS network architecture mainly includes a mobile terminal and a PSS server that is on a network side.

**[0010]** On the basis of the architecture of the SAE network system shown in FIG. 1, to detect a congestion status of a cell in an access network, a radio access network congestion awareness function (Radio Access Network Congestion Awareness Function, RCAF) entity is introduced into the 3GPP. FIG. 2 is a schematic architectural diagram of a SAE network system with an RCAF entity. As shown in FIG. 2, the RCAF entity is connected to a radio access network (Radio Access Network, RAN) by using an operation, administration and maintenance (Operation, Administration and Maintenance, OAM) system of a RAN, obtains a congestion status of a cell, and requests UE information or access point name (Access Point Name, APN) information in the cell by using the MME or the SGSN. Then, the RCAF entity notifies the PCRF entity of a congestion status of a cell in which the UE is located. The architecture shown in FIG. 2 further includes a traffic detection function

(Traffic Detection Function, TDF) entity and a policy and charging enforcement function (Policy and Charging Enforcement Function, PCEF) entity. The TDF entity is mainly used to detect network traffic. The PCEF entity and the PGW may be integrated into a network device. The PCEF entity is mainly used to execute the policy determined by the PCRF entity.

**[0011]** The applicant finds that: in the prior art, the PCRF entity formulates a data flow transmission policy only according to information such as an operator policy or user subscription data, and therefore user experience is poor.

## SUMMARY

**[0012]** Embodiments of the present invention provide a policy determining method and apparatus, to resolve a problem of poor user experience caused when a PCRF entity formulates a data flow transmission policy only according to information such as an operator policy or user subscription data.

**[0013]** According to a first aspect, a policy determining method is provided, and the method includes:

obtaining transmission quality of a downlink data flow; and

determining a quality of service policy for the downlink data flow according to the transmission quality of the downlink data flow, where the quality of service policy is used to adjust the transmission quality of the downlink data flow.

**[0014]** According to a first implementation of the first aspect, the transmission quality of the downlink data flow includes a transmission bit rate of the downlink data flow, and the obtaining transmission quality of a downlink data flow includes: receiving the transmission bit rate that is of the downlink data flow and that is sent by a packet data network gateway PGW, a policy and charging enforcement function PCEF entity, or a traffic detection function TDF entity.

**[0015]** In this implementation, the transmission bit rate of the downlink data flow is detected by the PGW, the PCEF entity, or the TDF entity. Therefore, only a core network device needs to participate in determining of the quality of service policy for the downlink data flow, so that the transmission quality of the downlink data flow can be improved by using the quality of service policy while relatively small impact is exerted on an entire system, thereby improving user experience.

**[0046]** FIG. 7 is a schematic diagram of information of channel quality obtaining according to a fifth embodiment of the present invention;

**[0047]** FIG. 8 is a schematic structural diagram of a policy determining apparatus according to a sixth embodiment of the present invention; and

**[0048]** FIG. 9 is a schematic structural diagram of a policy determining apparatus according to a seventh embodiment of the present invention.

## DESCRIPTION OF EMBODIMENTS

**[0049]** To make the objectives, technical solutions, and advantages of the embodiments of the present invention clearer, the following clearly and completely describes the technical solutions in the embodiments of the present invention with reference to the accompanying drawings in the embodiments of the present invention. Apparently, the described embodiments are some but not all of the embodiments of the present invention. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of the present invention without creative efforts shall fall within the protection scope of the present invention.

**[0050]** A terminal mentioned in the embodiments of the present invention may be a wireless terminal. The wireless terminal may be a device that provides a voice or data connectivity for a user, a handheld device with a radio connection function, or another processing device connected to a radio modem. The wireless terminal may communicate with one or more core networks by using a RAN. The wireless terminal may be a mobile terminal such as a mobile phone (or referred to as a "cellular" phone), or a computer with a mobile terminal, for example, a portable, pocket-sized, handheld, computer built-in, or in-vehicle mobile apparatus, which exchanges a voice or data with the RAN. For example, the wireless terminal may be a device such as a personal communication service (Personal Communication Service, PCS) phone, a cordless telephone set, a Session Initiation Protocol (Session Initiation Protocol, SIP) phone, a wireless local loop (Wireless Local Loop, WLL) station, or a personal digital assistant (Personal Digital Assistant, PDA). The wireless terminal may also be referred to as a system, a subscriber unit (Subscriber Unit), a subscriber station (Subscriber Station), a mobile station (Mobile Station), a mobile terminal (Mobile), a remote station (Remote Station), an access point (Access Point), a remote terminal (Remote Terminal), an access terminal

TDF entity.

**[0059]** Optionally, before receiving the transmission bit rate that is of the downlink data flow and that is sent by the access network device, the PCRF entity further sends third instruction information to the PCEF entity or the TDF entity. The third instruction information is used to instruct the PCEF entity or the TDF entity to identify the downlink data flow, and the identified downlink data flow carries the specified identifier.

**[0060]** Optionally, the transmission quality of the downlink data flow further includes information of channel quality fed back to an access network device by a terminal that receives the downlink data flow. Step 301 may include: A PCRF entity receives the information of channel quality sent by the access network device. For example, the PCRF entity may receive the information of channel quality that is sent by the access network device by using an RCAF entity, or the PCRF entity may receive the information of channel quality that is sent by the access network device by using an MME.

**[0061]** Optionally, before receiving the information of channel quality sent by the access network device, the PCRF entity further sends second instruction information to the access network device. The second instruction information is used to instruct the access network device to report the information of channel quality.

**[0062]** Optionally, the information of channel quality includes a channel quality indicator (Channel Quality Indicator, CQI).

**[0063]** Optionally, the downlink data flow may be a downlink data flow of a specified service type. For example, the service type may be a video service.

**[0064]** Optionally, the service type of the downlink data flow is specified by an operator, or the service type of the downlink data flow is specified by the terminal. For example, the PCRF entity may receive an acceleration request sent by the terminal. The acceleration request includes the service type of the downlink data flow.

**[0065]** 302. Determine a quality of service policy for the downlink data flow according to the transmission quality of the downlink data flow, where the quality of service policy is used to adjust the transmission quality of the downlink data flow.

**[0066]** Optionally, the PCRF entity determines the quality of service policy for the downlink data flow when the transmission bit rate of the downlink data flow is less than a preset transmission bit rate.

**[0067]** Optionally, the PCRF entity determines the quality of service policy for the

downlink data flow when the transmission bit rate of the downlink data flow is less than a preset transmission bit rate and channel quality is better than preset channel quality.

**[0068]** Optionally, the quality of service policy may be used to adjust the transmission bit rate of the downlink data flow. For example, the quality of service policy may be to increase or decrease the transmission bit rate according to a specific variation, or adjust the transmission bit rate to a target value.

**[0069]** Optionally, the quality of service policy may be used to adjust a transmission parameter of the downlink data flow. Optionally, a quality of service class identifier (Quality of Service Class Identifier, QCI) may be used to indicate the transmission parameter of the downlink data flow. The QCI may include at least one of a transmission priority, a transmission delay, or a transmission packet loss rate, or the QCI may include another transmission parameter. This is not limited in this embodiment. Optionally, the quality of service policy is to adjust the QCI to a target value, so as to optimize the transmission quality. For example, the QCI before the adjustment is corresponding to a relatively poor transmission parameter such as a relatively low transmission priority, a relatively long transmission delay, or a relatively high packet loss rate. The target value obtained after the adjustment is corresponding to a relatively good transmission parameter such as a relatively high transmission priority, a relatively short transmission delay, or a relatively low packet loss rate.

**[0070]** Optionally, the PCRF entity further sends the quality of service policy to the PCEF entity. For example, the PCRF entity may initiate an Internet Protocol-connectivity access network (Internet Protocol-Connectivity Access Network, IP-CAN) modification session, so that the PCEF entity obtains the quality of service policy and adjusts at least one of the transmission bit rate of the downlink data flow or the transmission parameter of the downlink data flow according to the quality of service policy.

**[0071]** The method in this embodiment is described below by using an example of an application scenario. It is assumed that an operator specifies a transmission bit rate range of a downlink data flow of a service type and the range includes a minimum bit rate and a maximum bit rate. The PCRF entity may obtain transmission quality such as a transmission bit rate of the downlink data flow of the service type in real time. When the transmission bit rate of the downlink data flow of the service type is less

experience.

**[0085]** FIG. 5 is a schematic diagram of a policy determining method according to a third embodiment of the present invention. In this embodiment, for content that is the same as or similar to the first embodiment, refer to detailed descriptions in the first embodiment. Details are not described herein again. As shown in FIG. 5, the method in this embodiment includes the following steps.

**[0086]** 501. A PCRF entity sends instruction information to a PCEF entity or a TDF entity, where the instruction information is used to instruct the PCEF entity or the TDF entity to identify a downlink data flow of a specified service type.

**[0087]** Optionally, the instruction information includes the specified service type.

**[0088]** 502. After the PCEF entity or the TDF entity receives the instruction information sent by the PCRF entity, the PCEF entity or the TDF entity identifies the downlink data flow of the specified service type.

**[0089]** Optionally, before identifying the downlink data flow of the specified service type, the PCEF entity or the TDF entity further recognizes, from all downlink data flows, the downlink data flow of the specified service type included in the instruction information.

**[0090]** Optionally, the PCEF entity or the TDF entity further generates a specified identifier. The identified downlink data flow carries the specified identifier generated by the PCEF entity or the TDF entity. The specified identifier is used to instruct an eNodeB to detect a transmission bit rate of the downlink data flow.

**[0091]** Optionally, the PCEF entity or the TDF entity may identify the downlink data flow of the specified service type in one of the following two manners. A first manner is applicable to a case in which the PCEF entity is separated from the TDF entity. A second manner is applicable to a case in which the PCEF entity is separated from the TDF entity and a case in which the PCEF entity is integrated with the TDF entity.

**[0092]** In the first manner, the TDF entity determines a value corresponding to the service type of the downlink data flow from a preset correspondence between a service type and a value; then recognizes the downlink data flow (for example, a downlink IP packet) of the specified service type; updates, to the value corresponding to the service type of the downlink data flow, a value of an inner differentiated services code point (Differentiated Services Code Point, DSCP) field of the recognized downlink IP packet of the specified service type; and finally sends the

updated downlink IP packet to the PCEF entity. After receiving the downlink IP packet, the PCEF entity first recognizes the downlink IP packet of the specified service type from the downlink IP packet according to the value of the DSCP field, and then re-identifies the downlink IP packet in a GPRS Tunneling Protocol-user plane (GPRS Tunneling Protocol-User Plane, GTP-U) encapsulation manner. The specified identifier may be carried in a GTP-U header.

**[0093]** In the second manner, the PCEF entity or the TDF entity determines a value corresponding to the service type of the downlink data flow from a preset correspondence between a service type and a value; then recognizes the downlink data flow (for example, a downlink IP packet); and updates a value of an inner DSCP field of the downlink IP packet to the value corresponding to the service type of the downlink data flow. The specified identifier may be indicated by the value of the DSCP field.

**[0094]** 503. The PCEF entity or the TDF entity sends the identified downlink data flow to an eNodeB.

**[0095]** 504. After the eNodeB receives the identified downlink data flow sent by the PCEF entity or the TDF entity, the eNodeB detects a transmission bit rate of the identified downlink data flow.

**[0096]** Optionally, before detecting the transmission bit rate of the identified downlink data flow, the eNodeB further recognizes the identified downlink data flow from all downlink data flows.

**[0097]** Optionally, the eNodeB recognizes the identified downlink IP packet according to a GTP-U header in the downlink IP packet or the DSCP field of the downlink IP packet.

**[0098]** 505. The eNodeB sends the transmission bit rate of the downlink data flow to an RCAF entity.

**[0099]** 506. After the RCAF entity receives the transmission bit rate that is of the downlink data flow and that is sent by the eNodeB, the RCAF entity sends the transmission bit rate of the downlink data flow to the PCRF entity.

**[0100]** 507. After the PCRF entity receives the transmission bit rate that is of the downlink data flow and that is sent by the RCAF entity, the PCRF entity determines a quality of service policy for the downlink data flow according to the transmission bit rate of the downlink data flow, where the quality of service policy is used to adjust transmission quality of the downlink data flow.

descriptions in the first embodiment. Details are not described herein again. As shown in FIG. 7, a method in this embodiment includes the following steps.

**[0111]** 701. A PCRF entity sends instruction information to a PCEF entity or a TDF entity, where the instruction information is used to instruct an eNodeB to report information of channel quality fed back by a terminal that receives a downlink data flow.

**[0112]** Optionally, the instruction information includes an identifier of the terminal that receives the downlink data flow.

**[0113]** 702. After the PCEF entity or the TDF entity receives the instruction information sent by the PCRF entity, the PCEF entity or the TDF entity sends the instruction information to an MME.

**[0114]** 703. After the MME receives the instruction information sent by the PCRF entity or the TDF entity, the MME sends the instruction information to the eNodeB.

**[0115]** It should be noted that the PCRF entity, the PCEF entity, the TDF entity, and the MME may send the instruction information by using an event subscription mechanism.

**[0116]** 704. After the eNodeB receives the instruction information sent by the MME, the eNodeB obtains the information of channel quality fed back by the terminal that receives the downlink data flow.

**[0117]** Optionally, the eNodeB obtains a CQI fed back by the terminal that receives the downlink data flow. The terminal that receives the downlink data flow is a terminal identified by the identifier of the terminal that is included in the instruction information.

**[0118]** 705. The eNodeB sends the information of channel quality to the MME.

**[0119]** 706. After the MME receives the information of channel quality sent by the eNodeB, the MME sends the information of channel quality to the PCRF entity or the TDF entity.

**[0120]** 707. After the PCEF entity or the TDF entity receives the information of channel quality sent by the MME, the PCEF entity or the TDF entity sends the information of channel quality to the PCRF entity, and the PCRF entity receives the information of channel quality sent by the PCEF entity or the TDF entity.

**[0121]** In this embodiment, the PCRF entity sends the instruction information to the eNodeB. After receiving the instruction information, the eNodeB sends the information of channel quality to the PCRF entity. Therefore, the PCRF entity can determine,

## CLAIMS

1. A policy determining method, wherein the method comprises:

obtaining, by a policy and charging rules function (PCRF) entity, transmission quality of a downlink data flow, wherein obtaining the transmission quality comprises receiving:

a transmission bit rate of the downlink data flow from: a packet data network gateway (PGW), a policy and charging enforcement function (PCEF) entity, or a traffic detection function (TDF) entity; and

information of channel quality fed back to an access network device by a terminal that receives the downlink data flow, and

wherein before receiving the information of channel quality from the access network device, the method further comprises sending, by the PCRF entity to the access network device, instruction information used to instruct the access network device to report the information of channel quality;

determining, by the PCRF entity, a quality of service policy for the downlink data flow according to the transmission quality of the downlink data flow; and

sending, by the PCRF entity to the PCEF entity, the quality of service policy that instructs the PCEF entity to adjust the transmission quality of the downlink data flow according to the determined quality of service policy.

2. The method according to claim 1, wherein before the receiving the transmission bit rate of the downlink data, the method further comprises:

sending, by the PCRF entity to the PGW, the PCEF entity, or the TDF entity, instruction information used to instruct the PGW, the PCEF entity, or the TDF entity to detect the transmission bit rate of the downlink data flow.

3. The method according to claim 1, wherein the obtaining transmission quality of a downlink data flow comprises:

receiving the transmission bit rate of the downlink data flow from the access network device.

4. The method according to claim 3, wherein the downlink data flow carries a specified identifier used to instruct the access network device to detect the transmission bit rate of the downlink data flow.

5. The method according to claim 4, wherein before the receiving the transmission bit rate that is of the downlink data flow and that is sent by an access network device, the method further comprises:

sending, by the PCRF entity, instruction information used to instruct the PCEF entity or the TDF entity to identify the downlink data flow, and the identified downlink data flow carries the specified identifier.

6. The method according to claim 1, wherein the determining a quality of service policy for the downlink data flow according to the transmission quality of the downlink data flow comprises:

determining the quality of service policy when: the transmission bit rate of the downlink data flow is less than a preset transmission bit rate, or the channel quality is better than a preset channel quality.

7. The method according to claim 1, wherein the determining a quality of service policy for the downlink data flow according to the transmission quality of the downlink data flow comprises:

determining the quality of service policy when: the transmission bit rate of the downlink data flow is less than a preset transmission bit rate, and the channel quality is better than preset channel quality.

8. A policy determining apparatus, comprising: processor and a network interface, wherein

a memory storing instructions; and

a processor coupled to the memory to execute the instructions, the instructions comprising:

instructions for obtaining transmission quality of a downlink data flow by receiving

a transmission bit rate of the downlink data flow from: a packet data network gateway (PGW), a policy and charging enforcement function (PCEF) entity, or a traffic detection function (TDF) entity; and

information of channel quality from the access network device fed back to an access network device by a terminal that receives the downlink data flow;

instructions for determining a quality of service policy for the downlink data flow according to a transmission quality of the downlink data flow when: the transmission bit rate of the downlink data flow is less than a preset transmission bit rate, or the channel quality is better than a preset channel quality, wherein the transmission quality includes: the transmission bit rate, and the information of channel quality; and

instructions for sending the quality of service policy to the PCEF entity that instructs the PCEF entity to adjust the transmission quality of the downlink data flow according to the determined quality of service policy.

9. The apparatus according to claim 8, wherein the instructions further comprise:

instructions for sending ~~first~~ instruction information to the PGW, the PCEF entity, or the TDF entity before receiving the transmission bit rate of the downlink data, wherein the instruction information is used to instruct the PGW, the PCEF entity or the TDF entity to detect the transmission bit rate of the downlink data flow.

10. The apparatus according to claim 8, wherein the instructions further comprise:

instructions for sending instruction information to the access network device, wherein the instruction information is used to instruct the access network device to report the information of channel quality.

11. The apparatus according to claim 8, wherein the instructions for obtaining transmission quality of a downlink data comprise:

instructions for receiving a transmission bit rate of the downlink data flow from the access network device.

12. The apparatus according to claim 11, wherein the downlink data flow carries a

specified identifier used to instruct the access network device to detect the transmission bit rate of the downlink data flow.

13. The apparatus according to claim 12, wherein the instructions further comprise:

instructions for sending instruction information to the PCEF entity or the TDF entity before receiving the transmission bit rate of the downlink data flow from the access network device, wherein the instruction information is used to instruct the PCEF entity or the TDF entity to identify the downlink data flow, and the identified downlink data flow carries the specified identifier.

14. The apparatus according to claim 8, wherein the instructions for determining a quality of service policy for the downlink data flow comprise:

instructions for determining the quality of service policy when: the transmission bit rate of the downlink data flow is less than a preset transmission bit rate, and the channel quality is better than a preset channel quality.

15. A policy determining method, wherein the method comprises:

obtaining, by a policy and charging rules function (PCRF) entity, transmission quality of a downlink data flow, wherein obtaining the transmission quality comprises receiving a transmission bit rate of the downlink data flow from an access network device, and wherein:

the downlink data flow carries a specified identifier used to instruct the access network device to detect the transmission bit rate of the downlink data flow; and

before receiving the transmission bit rate of the downlink data flow from the access network device, the method further comprises sending, by the PCRF entity to a policy and charging enforcement function (PCEF) entity or to a traffic detection function (TDF) entity, instruction information used to instruct the PCEF entity or the TDF entity to identify the downlink data flow, wherein the identified downlink data flow carries the specified identifier;

determining, by the PCRF entity, a quality of service policy for the downlink data flow according to the transmission quality of the downlink data flow; and

sending, by the PCRF entity to the PCEF entity, the quality of service policy that

instructs the PCEF entity to adjust the transmission quality of the downlink data flow according to the determined quality of service policy.