~~or in the prior art~~ more clearly, the following briefly introduces accompanying drawings required for describing the embodiments ~~or the prior art~~. Apparently, the accompanying drawings in the following description are merely some embodiments of the present invention, and a person of ordinary skill in the art may further obtain other drawings according to these accompanying drawings without creative efforts.

[0015] FIG. 1 is a schematic flowchart of a method for controlling quality of service according to an embodiment of the present invention;

[0016] FIG. 2 is a schematic flowchart of another method for controlling quality of service according to an embodiment of the present invention;

[0017] FIG. 3 is a schematic flowchart of still another method for controlling quality of service according to an embodiment of the present invention;

[0018] FIG. 4 is a schematic structural diagram of a policy and charging enforcement function entity according to an embodiment of the present invention;

[0019] FIG. 5 is a schematic structural diagram of an obtaining unit of the policy and charging enforcement function entity according to the embodiment of the present invention;

[0020] FIG. 6 is a schematic structural diagram of the obtaining unit of the policy and charging enforcement function entity according to the embodiment of the present invention;

[0021] FIG. 7 is a schematic structural diagram of a marking unit of the policy and charging enforcement function entity according to the embodiment of the present invention;

[0022] FIG. 8 is a schematic structural diagram of a policy and charging rules function entity according to an embodiment of the present invention;

[0023] FIG. 9 is a schematic structural diagram of a base station according to an embodiment of the present invention;

[0024] FIG. 10 is a schematic structural diagram of a sending unit of the base station according to the embodiment of the present invention;

[0025] FIG. 11 is a schematic structural diagram of a sending unit of another base station according to an embodiment of the present invention; and

[0026] FIG. 12 is a schematic structural diagram of a system for controlling quality of service according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0027] 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. Obviously, the embodiments to be described are merely part rather than 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.

[0028] In the embodiments of the present invention, a service refers to a data service based on a radio network bearer. Exemplarily, the service may be web page browsing, a video service, a voice service, an online game, file downloading, or the like.

[0029] In the embodiments of the present invention, a service flow refers to a data flow generated in a process of performing a service. In a same service, there may be different service flows for different subscribers, and there may also be different service flows when a same subscriber uses different services. The service flow is formed by data packets, and the data packets may be classified into an uplink data packet and a downlink data packet.

[0030] In the embodiments of the present invention, a service flow priority identifier (service Flow Priority Identifier, FPI) is a one-dimensional scalar for indicating a priority of a service flow.

[0031] In the embodiments of the present invention, a policy and charging enforcement function (Policy and Charging Enforcement Function, PCEF) entity may be a data gateway or an external processing device. The data gateway may be a packet data network gateway (Packet Data Network Gateway, PGW), and may also be a gateway GPRS support node (Gateway GPRS Support Node, GGSN); and the external processing device may generally be a device having capabilities of deep packet inspection (Deep packet inspection, DPI) and obtaining and executing a policy and charging control (Policy and Charging Control, PCC) policy.

[0032] In the embodiments of the present invention, a policy and charging rules function (Policy and Charging Rule Function, PCRF) entity has a capability of generating a PCC rule.

[0033] In the embodiments of the present invention, a base station is a broad concept. The base station may be a radio network controller (Radio Network Controller, RNC), a

CLAIMS

What is claimed is:

1. A method for controlling quality of service, comprising:

obtaining, by a policy and charging enforcement function PCEF entity, a service flow priority identifier FPI of a downlink data packet, wherein the FPI is used to indicate a priority of a service flow to which the downlink data packet belongs;

carrying, by the PCEF, the FPI in the downlink data packet; and

sending, by the PCEF, the downlink data packet to a base station, so that the base station sends the downlink data packet to a user equipment UE according to the FPI.

2. The method according to claim 1, wherein the obtaining, by the PCEF, the FPI of the downlink data packet comprises:

obtaining, by the PCEF, the FPI according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet; or

receiving, by the PCEF, an FPI sent by a policy and charging rules function PCRF entity, wherein the FPI is obtained by the PCRF according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet.

3. The method according to claim 2, wherein before the obtaining, by the PCEF, the FPI according to the service type of the service to which the downlink data packet belongs and at least one of the following items: the service priority of the service to which the downlink data packet belongs, the subscriber accumulated usage level of the service to which the downlink data packet belongs, the subscriber level of the service to which the downlink data packet belongs, and the type of the UE receiving the downlink data packet, the method further comprises:

receiving, by the PCEF, a policy and charging control PCC rule delivered by the PCRF; and

obtaining, by the PCEF from the PPC rule, at least one of the following items: the service priority of the service to which the downlink data packet belongs, the subscriber accumulated usage level of the service to which the downlink data packet belongs, the subscriber level of the service to which the downlink data packet belongs, and the type of the UE receiving the downlink data packet.

4. The method according to claims 1 to 3, wherein the carrying, by the PCEF, the FPI in the downlink data packet comprises:

carrying, by the PCEF, the FPI in a tunnel encapsulation header of the downlink data packet; or

carrying, by the PCEF, the FPI in an IP packet header of the downlink data packet.

5. The method according to any one of claims 1 to 4, wherein the sending, by the PCEF, the downlink data packet to the base station, so that the base station sends the data packet to the UE according to the FPI comprises:

sending, by the PCEF, the downlink data packet to the base station through an intermediate node, so that the base station sends the downlink data packet to the UE according to the FPI, wherein the downlink data packet is sent by the intermediate node to the base station according to the FPI.

6. The method according to any one of claims 1 to 5, further comprising:

sending, by the base station, the downlink data packet to the UE according to the FPI.

7. The method according to claim 6, wherein the sending, by the base station, the downlink data packet to the UE according to the FPI comprises:

obtaining, by the base station, weight information corresponding to the FPI;

sending, by the base station, the downlink data packet to the UE according to the weight information corresponding to the FPI;

or

obtaining, by the base station, weight information corresponding to the FPI;

obtaining, by the base station, weight information corresponding to a bearer to which the downlink data packet belongs; and

sending, by the base station, the downlink data packet to the UE according to the

weight information corresponding to the FPI and the weight information corresponding to the bearer to which the downlink data packet belongs.

7. A method for controlling quality of service, comprising:

receiving, by a base station, a downlink data packet, wherein the downlink data packet comprises a service flow priority identifier FPI, and the FPI is used to indicate a priority of a service flow to which the downlink data packet belongs; and

sending, by the base station, the downlink data packet to a user equipment UE according to the FPI.

8. The method the according to claim 7, wherein the FPI is obtained according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet.

9. The method according to claim 7 or 8, wherein the sending, by the base station, the downlink data packet to the UE according to the FPI comprises:

obtaining, by the base station, weight information corresponding to the FPI;

sending, by the base station, the downlink data packet to the UE according to the weight information corresponding to the FPI;

or

obtaining, by the base station, weight information corresponding to the FPI;

obtaining, by the base station, weight information corresponding to a bearer to which the downlink data packet belongs; and

sending, by the base station, the downlink data packet to the UE according to the weight information corresponding to the FPI and the weight information corresponding to the bearer to which the downlink data packet belongs.

10. A policy and charging enforcement function entity, comprising: an obtaining unit, a marking unit, and a sending unit, wherein

the obtaining unit is configured to obtain a service flow priority identifier FPI of a downlink data packet, wherein the FPI is used to indicate a priority of a service flow to

which the downlink data packet belongs;

the marking unit is configured to carry the FPI in the downlink data packet; and

the sending unit is configured to send the downlink data packet to a base station, so that the base station sends the downlink data packet to a user equipment UE according to the FPI.

11. The policy and charging enforcement function entity according to claim 10, wherein

the obtaining unit comprises a matching unit or a receiving unit;

the matching unit is configured to obtain the FPI according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet; or

the receiving unit is configured to receive an FPI sent by a policy and charging rules function PCRF entity, wherein the FPI is obtained by the PCRF according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet.

12. The policy and charging enforcement function entity according to claim 11, wherein

the obtaining unit further comprises a rule receiving unit and an extracting unit;

the rule receiving unit is configured to receive a policy and charging control PCC rule delivered by the PCRF; and

the extracting unit is configured to obtain, from the PCC rule, at least one of the following items: the service priority of the service to which the downlink data packet belongs, the subscriber accumulated usage level of the service to which the downlink data packet belongs, the subscriber level of the service to which the downlink data packet belongs, and the type of the UE receiving the downlink data packet.

13. The policy and charging enforcement function entity according to any one of claims 10 to 12, wherein the marking unit comprises a first processing unit or a second processing unit;

the first processing unit is configured to carry the FPI in a tunnel encapsulation header of the downlink data packet; and

the second processing unit is configured to carry the FPI in an IP packet header of the downlink data packet.

14. The policy and charging enforcement function entity according to any one of claims 10 to 13, wherein

the sending unit is specifically configured to send the downlink data packet to the base station through an intermediate node, so that the base station sends the downlink data packet to the UE according to the FPI, wherein the downlink data packet is sent by the intermediate node to the base station according to the FPI.

15. A policy and charging rules function entity, comprising:

an obtaining unit, configured to obtain a service flow priority identifier FPI according to a service type of a service to which a downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of a UE receiving the downlink data packet, wherein the FPI is used to indicate a priority of a service flow to which the downlink data packet belongs; and

a sending unit, configured to send the FPI to a policy and charging enforcement function entity.

16. A base station, comprising: a receiving unit and a sending unit, wherein

the receiving unit is configured to receive a downlink data packet, wherein the downlink data packet comprises a service flow priority identifier FPI, and the FPI is used to indicate a priority of a service flow to which the downlink data packet belongs; and

the sending unit is configured to send the downlink data packet to a user equipment UE according to the FPI.

17. The base station according to claim 16, wherein

the sending unit comprises a first obtaining unit and a first sending unit;

the first obtaining unit is configured to obtain weight information corresponding to the FPI; and

the first sending unit is configured to send the downlink data packet to the UE according to the weight information corresponding to the FPI.

18. The base station according to claim 16, wherein

the sending unit comprises a second obtaining unit, a third obtaining unit, and a second sending unit;

the second obtaining unit is configured to obtain weight information corresponding to the FPI;

the third obtaining unit is configured to obtain weight information corresponding to a bearer to which the downlink data packet belongs; and

the second sending unit is configured to send the downlink data packet to the UE according to the weight information corresponding to the FPI and the weight information corresponding to the bearer to which the downlink data packet belongs.

19. A system for controlling quality of service, comprising the policy and charging enforcement function entity according to any one of claims 10 to 14 and the base station according to any one of claims 16 to 18.

CLAIMS:

1. A method for controlling quality of service, comprising:

obtaining, by a policy and charging enforcement function (PCEF) entity, a service flow priority identifier (FPI) of a downlink data packet, wherein the FPI is used to indicate a priority of a service flow to which the downlink data packet belongs;

carrying, by the PCEF entity, the FPI in the downlink data packet; and

sending, by the PCEF entity, the downlink data packet to a base station, so that the base station sends the downlink data packet to a user equipment (UE) according to the FPI:

wherein the FPI corresponds to each of a plurality of queues within a same bearer.

2. The method according to claim 1, wherein the obtaining, by the PCEF entity, the FPI of the downlink data packet comprises:

obtaining, by the PCEF entity, the FPI according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet; or

receiving, by the PCEF entity, an FPI sent by a policy and charging rules function (PCRF) entity, wherein the FPI is obtained by the PCRF entity according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet.

3. The method according to claim 2, wherein before the obtaining, by the PCEF entity, the FPI according to the service type of the service to which the downlink data packet belongs and at least one of the following items: the service priority of the service to which the downlink data packet belongs, the subscriber accumulated usage level of the service to which the downlink data packet belongs, the subscriber level of the service to which the downlink data packet belongs, and the type of the UE receiving the downlink data packet, the method further comprises:

receiving, by the PCEF entity, a policy and charging control (PCC) rule delivered by the PCRF entity; and

obtaining, by the PCEF entity from the PPC rule, at least one of the following items: the service priority of the service to which the downlink data packet belongs, the subscriber accumulated usage level of the service to which the downlink data packet belongs, the subscriber level of the service to which the downlink data packet belongs, and the type of the UE receiving the downlink data packet.

4. The method according to any one of claims 1 to 3, wherein the carrying, by the PCEF entity, the FPI in the downlink data packet comprises:

carrying, by the PCEF entity, the FPI in a tunnel encapsulation header of the downlink data packet; or

carrying, by the PCEF entity, the FPI in an IP packet header of the downlink data packet.

5. A method for controlling quality of service, comprising:

receiving, by a base station, a downlink data packet, wherein the downlink data packet comprises a service flow priority identifier (FPI), and the FPI is used to indicate a priority of a service flow to which the downlink data packet belongs; and

sending, by the base station, the downlink data packet to a user equipment (UE) according to the FPI;

wherein the FPI corresponds to each of a plurality of queues within a same bearer.

6. The method the according to claim 5, wherein the FPI is obtained according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet.

7. The method according to claim 5 or 6, wherein the sending, by the base station, the downlink data packet to the UE according to the FPI comprises:

obtaining, by the base station, weight information corresponding to the FPI;

sending, by the base station, the downlink data packet to the UE according to the

weight information corresponding to the FPI;

or

obtaining, by the base station, weight information corresponding to the FPI;

obtaining, by the base station, weight information corresponding to a bearer to which the downlink data packet belongs; and

sending, by the base station, the downlink data packet to the UE according to the weight information corresponding to the FPI and the weight information corresponding to the bearer to which the downlink data packet belongs.

8. A policy and charging enforcement function entity, comprising: an obtaining unit, a marking unit, and a sending unit, wherein

the obtaining unit is configured to obtain a service flow priority identifier (FPI) of a downlink data packet, wherein the FPI is used to indicate a priority of a service flow to which the downlink data packet belongs;

the marking unit is configured to carry the FPI in the downlink data packet;

the sending unit is configured to send the downlink data packet to a base station, so that the base station sends the downlink data packet to a user equipment (UE) according to the FPI; and

the FPI corresponds to each of a plurality of queues within a same bearer.

9. The policy and charging enforcement function entity according to claim 8, wherein

the obtaining unit comprises a matching unit or a receiving unit;

the matching unit is configured to obtain the FPI according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the UE receiving the downlink data packet; or

the receiving unit is configured to receive an FPI sent by a policy and charging rules function (PCRF) entity, wherein the FPI is obtained by the PCRF entity according to a service type of a service to which the downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of the

UE receiving the downlink data packet.

10. The policy and charging enforcement function entity according to claim 9, wherein

the obtaining unit further comprises a rule receiving unit and an extracting unit;

the rule receiving unit is configured to receive a policy and charging control (PCC) rule delivered by the PCRF entity; and

the extracting unit is configured to obtain, from the PCC rule, at least one of the following items: the service priority of the service to which the downlink data packet belongs, the subscriber accumulated usage level of the service to which the downlink data packet belongs, the subscriber level of the service to which the downlink data packet belongs, and the type of the UE receiving the downlink data packet.

11. The policy and charging enforcement function entity according to any one of claims 8 to 10, wherein the marking unit comprises a first processing unit or a second processing unit;

the first processing unit is configured to carry the FPI in a tunnel encapsulation header of the downlink data packet; and

the second processing unit is configured to carry the FPI in an IP packet header of the downlink data packet.

12. A policy and charging rules function entity, comprising:

an obtaining unit, configured to obtain a service flow priority identifier (FPI) according to a service type of a service to which a downlink data packet belongs and at least one of the following items: a service priority of the service to which the downlink data packet belongs, a subscriber accumulated usage level of the service to which the downlink data packet belongs, a subscriber level of the service to which the downlink data packet belongs, and a type of a UE receiving the downlink data packet, wherein the FPI is used to indicate a priority of a service flow to which the downlink data packet belongs; and

a sending unit, configured to send the FPI to a policy and charging enforcement function entity;

wherein the FPI corresponds to each of a plurality of queues within a same bearer.

13. A base station, comprising: a receiving unit and a sending unit, wherein

the receiving unit is configured to receive a downlink data packet, wherein the downlink data packet comprises a service flow priority identifier (FPI), and the FPI is used to

indicate a priority of a service flow to which the downlink data packet belongs;

the sending unit is configured to send the downlink data packet to a user equipment (UE) according to the FPI; and

the FPI corresponds to each of a plurality of queues within a same bearer.

14. The base station according to claim 13, wherein

the sending unit comprises a first obtaining unit and a first sending unit;

the first obtaining unit is configured to obtain weight information corresponding to the FPI; and

the first sending unit is configured to send the downlink data packet to the UE according to the weight information corresponding to the FPI.

15. The base station according to claim 13, wherein

the sending unit comprises a second obtaining unit, a third obtaining unit, and a second sending unit;

the second obtaining unit is configured to obtain weight information corresponding to the FPI;

the third obtaining unit is configured to obtain weight information corresponding to a bearer to which the downlink data packet belongs; and

the second sending unit is configured to send the downlink data packet to the UE according to the weight information corresponding to the FPI and the weight information corresponding to the bearer to which the downlink data packet belongs.