

HOTSPOT DEVICE MANAGEMENT METHOD, COMMUNICATION APPARATUS, AND COMMUNICATION SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

5 **[0001]** This application claims priority to Chinese Patent Application No. 202210876527.5, filed with the China National Intellectual Property Administration on July 25, 2022 and entitled "HOTSPOT DEVICE MANAGEMENT METHOD, COMMUNICATION APPARATUS, AND COMMUNICATION SYSTEM", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

10 **[0002]** Embodiments of this application relate to the field of communication technologies, and in particular, to a hotspot device management method, a communication apparatus, and a communication system.

BACKGROUND

15 **[0003]** Currently, a terminal device, for example, a smartphone, has a hotspot sharing function. When the terminal device enables hotspot sharing, another device, for example, a laptop, may access the terminal device in a connection manner such as wireless fidelity (wireless fidelity, Wi-Fi), Bluetooth, or universal serial bus (Universal Serial Bus, USB) physical connection, to implement internet access.

20 **[0004]** However, how to effectively manage the terminal device having the hotspot sharing function needs to be resolved.

SUMMARY

18 **[0005]** Embodiments of this application provide a hotspot device management method, a communication apparatus, and a communication system, to effectively manage a terminal device having a hotspot sharing function.

25 **[0006]** According to a first aspect, an embodiment of this application provides a hotspot device management method. The method may be performed by a user plane network element or a module

(for example, a chip) used in a user plane network element. For example, the user plane network element performs the method. The method includes: The user plane network element receives indication information from a policy control network element. The indication information indicates to send a first event to the policy control network element when the first event occurs.

5 The first event is that a quantity of devices that access a terminal device by using a hotspot sharing technology is greater than or equal to a hotspot access threshold. When the first event occurs, the user plane network element sends the first event to the policy control network element.

[0007] In the foregoing solution, the policy control network element indicates the user plane network element to: detect the quantity of devices that access the terminal device by using the
10 hotspot sharing technology, and notify the policy control network element when detecting that the quantity of devices that access the terminal device by using the hotspot sharing technology is greater than or equal to the hotspot access threshold. Therefore, the policy control network element learns that the quantity of devices that access the terminal device by using the hotspot sharing technology is greater than or equal to the hotspot access threshold, so that the policy control
15 network element determines a charging manner or a control manner for the terminal device, to properly charge and precisely control the terminal device.

[0008] In a possible implementation method, the user plane network element receives the hotspot access threshold from the policy control network element, or the indication information includes the hotspot access threshold.

20 **[0009]** In the foregoing solution, the policy control network element configures the hotspot access threshold for the user plane network element, so that the hotspot access threshold can be accurately configured.

[0010] In a possible implementation method, the user plane network element determines the hotspot access threshold based on a service package of the terminal device, or the user plane
25 network element determines the hotspot access threshold based on configuration information in the user plane network element.

[0011] In the foregoing solution, the user plane network element determines the hotspot access threshold, and the policy control network element does not need to configure the hotspot access threshold for the user plane network element, so that signaling overheads can be reduced.

30 **[0012]** In a possible implementation method, the user plane network element receives a first charging rule from the policy control network element. The first charging rule is determined based on the first event. The user plane network element charges the terminal device according to the first charging rule.

[0013] In the foregoing solution, a charging rule can be effectively configured, to properly
35 charge the terminal device.

[0014] In a possible implementation method, the user plane network element receives a first control policy rule from the policy control network element. The first control policy rule is determined based on the first event. The user plane network element controls the terminal device according to the first control policy rule.

5 **[0015]** In the foregoing solution, a control policy rule can be effectively configured, to properly control the terminal device.

[0016] In a possible implementation method, when a second event occurs, the user plane network element sends the second event to the policy control network element. The second event indicates that the quantity of devices that access the terminal device by using the hotspot sharing
10 technology is less than or equal to the hotspot access threshold.

[0017] In a possible implementation method, the user plane network element receives a second charging rule from the policy control network element. The second charging rule is determined based on the second event. The user plane network element charges the terminal device according to the second charging rule.

15 **[0018]** In other words, when the quantity of devices that access the terminal device by using the hotspot sharing technology changes, the charging rule is adaptively modified. In the foregoing solution, the charging rule can be changed based on an actual situation, to properly charge the terminal device. The foregoing descriptions are applicable to descriptions in other aspects, and details are not described again.

20 **[0019]** In a possible implementation method, the user plane network element receives a second control policy rule from the policy control network element. The second control policy rule is determined based on the second event. The user plane network element controls the terminal device according to the second control policy rule.

[0020] In other words, when the quantity of devices that access the terminal device by using
25 the hotspot sharing technology changes, the control policy rule is adaptively modified. In the foregoing solution, the control policy rule can be changed based on an actual situation, to properly control the terminal device. The foregoing descriptions are applicable to descriptions in other aspects, and details are not described again.

[0021] In a possible implementation method, the user plane network element receives a
30 plurality of data packets from the terminal device. Each of the plurality of data packets includes a timestamp. The user plane network element determines, based on the timestamp in each of the plurality of data packets, reference values of clock sources corresponding to the plurality of data packets. The user plane network element determines, based on the reference values of the clock sources corresponding to the plurality of data packets, the quantity of devices that access the
35 terminal device by using the hotspot sharing technology.

[0022] In the foregoing solution, the quantity of devices that access the terminal device by using the hotspot sharing technology can be accurately determined.

[0023] In a possible implementation method, the user plane network element determines, based on a quantity and/or types of heartbeat messages detected in one or more periodicities, the quantity of devices that access the terminal device by using the hotspot sharing technology. The heartbeat message is from the terminal device or the device that accesses the terminal device by using the hotspot sharing technology.

[0024] In the foregoing solution, the quantity of devices that access the terminal device by using the hotspot sharing technology can be accurately determined.

[0025] In a possible implementation method, the user plane network element obtains a network traffic characteristic parameter corresponding to an internet protocol (internet protocol, IP) address in a network. The user plane network element determines, based on the network traffic characteristic parameter, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[0026] In the foregoing solution, the quantity of devices that access the terminal device by using the hotspot sharing technology can be accurately determined.

[0027] In a possible implementation method, the user plane network element obtains a plurality of hypertext transfer protocol (Hypertext Transfer Protocol, HTTP) request messages. The HTTP request message includes a device parameter. The user plane network element determines, based on device parameters in the plurality of HTTP request messages, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[0028] In the foregoing solution, the quantity of devices that access the terminal device by using the hotspot sharing technology can be accurately determined.

[0029] According to a second aspect, an embodiment of this application provides a hotspot device management method. The method may be performed by a policy control network element or a module (for example, a chip) used in a policy control network element. For example, the policy control network element performs the method. The method includes: The policy control network element sends indication information to a user plane network element. The indication information indicates to send a first event to the policy control network element when the first event occurs. The first event is that a quantity of devices that access a terminal device by using a hotspot sharing technology is greater than or equal to a hotspot access threshold. When the first event occurs, the policy control network element receives the first event from the user plane network element.

[0030] In the foregoing solution, the policy control network element indicates the user plane network element to: detect the quantity of devices that access the terminal device by using the

hotspot sharing technology, and notify the policy control network element when detecting that the quantity of devices that access the terminal device by using the hotspot sharing technology is greater than or equal to the hotspot access threshold. Therefore, the policy control network element learns that the quantity of devices that access the terminal device by using the hotspot sharing
5 technology is greater than or equal to the hotspot access threshold, so that the policy control network element determines a charging manner or a control manner for the terminal device, to properly charge and precisely control the terminal device.

[0031] In a possible implementation method, the policy control network element sends the hotspot access threshold to the user plane network element, or the indication information includes
10 the hotspot access threshold.

[0032] In the foregoing solution, the policy control network element configures the hotspot access threshold for the user plane network element, so that the hotspot access threshold can be accurately configured.

[0033] In a possible implementation method, the policy control network element determines a
15 first charging rule based on the first event. The first charging rule is used for charging the terminal device. The policy control network element sends the first charging rule to the user plane network element.

[0034] In the foregoing solution, a charging rule can be effectively configured, to properly charge the terminal device.

[0035] In a possible implementation method, the policy control network element determines a
20 first control policy rule based on the first event. The first control policy rule is used for controlling the terminal device. The policy control network element sends the first control policy rule to the user plane network element.

[0036] In the foregoing solution, a control policy rule can be effectively configured, to
25 properly control the terminal device.

[0037] In a possible implementation method, the policy control network element receives a second event from the user plane network element. The second event indicates that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than or equal to the hotspot access threshold.

[0038] In a possible implementation method, the policy control network element determines a
30 second charging rule based on the second event. The second charging rule is used for charging the terminal device. The policy control network element sends the second charging rule to the user plane network element.

[0039] In a possible implementation method, the policy control network element determines a
35 second control policy rule based on the second event. The second control policy rule is used for

controlling the terminal device. The policy control network element sends the second control policy rule to the user plane network element.

[0040] According to a third aspect, an embodiment of this application provides a hotspot device management method. The method may be performed by a user plane network element or a module (for example, a chip) used in a user plane network element. For example, the user plane network element performs the method. The method includes: The user plane network element receives indication information from a policy control network element. The indication information indicates to send a changed quantity of devices to the policy control network element when a quantity of devices that access a terminal device by using a hotspot sharing technology changes. When the quantity of devices that access the terminal device by using the hotspot sharing technology changes from a first quantity to a second quantity, the user plane network element sends the second quantity to the policy control network element.

[0041] In the foregoing solution, the policy control network element indicates the user plane network element to detect the quantity of devices that access the terminal device by using the hotspot sharing technology, and send the changed quantity of devices to the policy control network element after detecting that the quantity of devices that access the terminal device by using the hotspot sharing technology changes, so that the policy control network element determines a charging manner or a control manner for the terminal device based on the changed quantity of devices, to properly charge and precisely control the terminal device.

[0042] In a possible implementation method, the user plane network element receives a charging rule from the policy control network element. The charging rule is determined based on the second quantity. The user plane network element charges the terminal device according to the charging rule.

[0043] In the foregoing solution, the charging rule can be effectively configured, to properly charge the terminal device.

[0044] In a possible implementation method, the user plane network element receives a control policy rule from the policy control network element. The control policy rule is determined based on the second quantity. The user plane network element controls the terminal device according to the control policy rule.

[0045] In the foregoing solution, the control policy rule can be effectively configured, to properly control the terminal device.

[0046] In a possible implementation method, the user plane network element receives a plurality of data packets from the terminal device. Each of the plurality of data packets includes a timestamp. The user plane network element determines, based on the timestamp in each of the plurality of data packets, reference values of clock sources corresponding to the plurality of data

packets. The user plane network element determines, based on the reference values of the clock sources corresponding to the plurality of data packets, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[0047] In the foregoing solution, the quantity of devices that access the terminal device by using the hotspot sharing technology can be accurately determined.

[0048] In a possible implementation method, the user plane network element determines, based on a quantity and/or types of heartbeat messages detected in one or more periodicities, the quantity of devices that access the terminal device by using the hotspot sharing technology. The heartbeat message is from the terminal device or the device that accesses the terminal device by using the hotspot sharing technology.

[0049] In the foregoing solution, the quantity of devices that access the terminal device by using the hotspot sharing technology can be accurately determined.

[0050] In a possible implementation method, the user plane network element obtains network traffic characteristic parameters corresponding to a plurality of data packets. The user plane network element determines, based on the network traffic characteristic parameters, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[0051] In the foregoing solution, the quantity of devices that access the terminal device by using the hotspot sharing technology can be accurately determined.

[0052] In a possible implementation method, the user plane network element obtains a plurality of HTTP request messages. The HTTP request message includes a device parameter. The user plane network element determines, based on device parameters in the plurality of HTTP request messages, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[0053] In the foregoing solution, the quantity of devices that access the terminal device by using the hotspot sharing technology can be accurately determined.

[0054] According to a fourth aspect, an embodiment of this application provides a hotspot device management method. The method may be performed by a policy control network element or a module (for example, a chip) used in a policy control network element. For example, the policy control network element performs the method. The method includes: The policy control network element sends indication information to a user plane network element. The indication information indicates to send a changed quantity of devices to the policy control network element when a quantity of devices that access a terminal device by using a hotspot sharing technology changes. When the quantity of devices that access the terminal device by using the hotspot sharing technology changes from a first quantity to a second quantity, the policy control network element receives the second quantity from the user plane network element.

[0055] In the foregoing solution, the policy control network element indicates the user plane network element to detect the quantity of devices that access the terminal device by using the hotspot sharing technology, and send the changed quantity of devices to the policy control network element after detecting that the quantity of devices that access the terminal device by using the hotspot sharing technology changes, so that the policy control network element can determine a charging manner or a control manner for the terminal device based on the changed quantity of devices, to help properly charge and precisely control the terminal device.

[0056] In a possible implementation method, the policy control network element determines a charging rule based on the second quantity. The policy control network element sends the charging rule to the user plane network element.

[0057] In the foregoing solution, the charging rule can be effectively configured, to properly charge the terminal device.

[0058] In a possible implementation method, the policy control network element determines a control policy rule based on the second quantity. The policy control network element sends the control policy rule to the user plane network element.

[0059] In the foregoing solution, the control policy rule can be effectively configured, to properly control the terminal device.

[0060] According to a fifth aspect, an embodiment of this application provides a communication apparatus. The apparatus may be a user plane network element or a module (for example, a chip) used in a user plane network element. The apparatus has a function of implementing any implementation method of the first aspect. The function may be implemented by hardware, or may be implemented by hardware executing corresponding software. The hardware or the software includes one or more modules corresponding to the function.

[0061] According to a sixth aspect, an embodiment of this application provides a communication apparatus. The apparatus may be a policy control network element or a module (for example, a chip) used in a policy control network element. The apparatus has a function of implementing any implementation method of the second aspect. The function may be implemented by hardware, or may be implemented by hardware executing corresponding software. The hardware or the software includes one or more modules corresponding to the function.

[0062] According to a seventh aspect, an embodiment of this application provides a communication apparatus. The apparatus may be a user plane network element or a module (for example, a chip) used in a user plane network element. The apparatus has a function of implementing any implementation method of the third aspect. The function may be implemented by hardware, or may be implemented by hardware executing corresponding software. The hardware or the software includes one or more modules corresponding to the function.

[0063] According to an eighth aspect, an embodiment of this application provides a communication apparatus. The apparatus may be a policy control network element or a module (for example, a chip) used in a policy control network element. The apparatus has a function of implementing any implementation method of the fourth aspect. The function may be implemented
5 by hardware, or may be implemented by hardware executing corresponding software. The hardware or the software includes one or more modules corresponding to the function.

[0064] According to a ninth aspect, an embodiment of this application provides a communication apparatus, including a processor coupled to a memory. The processor is configured to invoke a program stored in the memory, to perform any implementation method of the first
10 aspect to the fourth aspect. The memory may be located inside or outside the apparatus. In addition, there may be one or more processors.

[0065] According to a tenth aspect, an embodiment of this application provides a communication apparatus, including a processor and a memory. The memory is configured to store computer instructions. When the apparatus runs, the processor executes the computer instructions
15 stored in the memory, to enable the apparatus to perform any implementation method of the first aspect to the fourth aspect.

[0066] According to an eleventh aspect, an embodiment of this application provides a communication apparatus, including units or means (means) configured to perform the steps of any implementation method of the first aspect to the fourth aspect.

[0067] According to a twelfth aspect, an embodiment of this application provides a communication apparatus, including a processor and an interface circuit. The processor is configured to communicate with another apparatus through the interface circuit, and perform any implementation method of the first aspect to the fourth aspect. There are one or more processors.

[0068] According to a thirteenth aspect, an embodiment of this application further provides a computer-readable storage medium. The computer-readable storage medium stores instructions. When the instructions are run on a communication apparatus, any implementation method of the
25 first aspect to the fourth aspect is performed.

[0069] According to a fourteenth aspect, an embodiment of this application further provides a computer program product. The computer program product includes a computer program or instructions. When the computer program or the instructions are run by a communication apparatus,
30 any implementation method of the first aspect to the fourth aspect is performed.

[0070] According to a fifteenth aspect, an embodiment of this application further provides a chip system, including a processor configured to perform any implementation method of the first aspect to the fourth aspect.

[0071] According to a sixteenth aspect, an embodiment of this application further provides a
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communication system, including a user plane network element configured to perform any implementation method of the first aspect, and a policy control network element configured to perform any implementation method of the second aspect.

[0072] According to a seventeenth aspect, an embodiment of this application further provides a communication system, including a user plane network element configured to perform any implementation method of the third aspect, and a policy control network element configured to perform any implementation method of the fourth aspect.

BRIEF DESCRIPTION OF DRAWINGS

[0073] FIG. 1 is a diagram of an architecture of a 5G network based on a service-oriented architecture;

[0074] FIG. 2(a) is a schematic flowchart of a hotspot device management method according to an embodiment of this application;

[0075] FIG. 2(b) is a schematic flowchart of a hotspot device management method according to an embodiment of this application;

[0076] FIG. 2(c) is an example diagram of determining a quantity of devices that access a terminal device by using a hotspot sharing technology;

[0077] FIG. 3(a) and FIG. 3(b) are a schematic flowchart of a hotspot device management method according to an embodiment of this application;

[0078] FIG. 4 is a schematic flowchart of a hotspot device management method according to an embodiment of this application;

[0079] FIG. 5(a) and FIG. 5(b) are a schematic flowchart of a hotspot device management method according to an embodiment of this application;

[0080] FIG. 6 is a diagram of a communication apparatus according to an embodiment of this application; and

[0081] FIG. 7 is a diagram of a communication apparatus according to an embodiment of this application.

DESCRIPTION OF EMBODIMENTS

[0082] FIG. 1 is a diagram of an architecture of a 5th generation (5th generation, 5G) network based on a service-oriented architecture. The 5G network architecture shown in FIG. 1 may include a terminal device, an access network, a core network, and a data network (data network, DN). The terminal device accesses the data network via the access network and the core network.

[0083] The terminal device may be user equipment (user equipment, UE), a mobile station, a

mobile terminal, or the like. FIG. 1 is described by using an example in which the terminal device is the UE. The terminal device may be widely used in various scenarios, for example, device-to-device (device-to-device, D2D), vehicle-to-everything (vehicle-to-everything, V2X) communication, machine-type communication (machine-type communication, MTC), internet of things (internet of things, IOT), virtual reality, augmented reality, industrial control, self-driving, telemedicine, a smart grid, a smart furniture, smart office, a smart wearable, smart transportation, and a smart city. The terminal device may be a mobile phone, a tablet computer, a computer with a wireless transceiver function, a wearable device, a vehicle, an urban air transportation vehicle (such as an uncrewed aerial vehicle or a helicopter), a ship, a robot, a robot arm, a smart home device, or the like.

[0084] The access network is used for implementing an access-related function, may provide a network access function for an authorized user in a specific area, and can determine transmission links of different quality based on user levels, service requirements, and the like, to transmit user data. The access network forwards a control signal and the user data between the terminal device and the core network. The access network may include an access network device. The access network device may be a device that provides access for the terminal device, and may include a radio access network (radio access network, RAN) device and a wireline access network device. FIG. 1 is described by using an example in which the access network device is a RAN. The RAN device is mainly responsible for functions such as radio resource management, quality of service (quality of service, QoS) management, and data compression and encryption on an air interface side. The RAN device may include base stations in various forms, for example, a macro base station, a micro base station (which may also be referred to as a small cell), a relay station, an access point, and a balloon station. In systems using different radio access technologies, names of devices having base station functions may be different. For example, in a 5G system, the device is referred to as a RAN or a next-generation node base station (next-generation Node base station, gNB). In a long term evolution (long term evolution, LTE) system, the device is referred to as an evolved NodeB (evolved NodeB, eNB or eNodeB).

[0085] The access network device and the terminal device may be at fixed positions, or may be movable. The access network device and the terminal device may be deployed terrestrially, including indoors or outdoors, or may be handheld or vehicle-mounted; or may be deployed on a water surface; or may be deployed on a plane, a balloon, or a man-made satellite in the sky. Application scenarios of the access network device and the terminal device are not limited in embodiments of this application.

[0086] The core network is responsible for maintaining subscription data of a mobile network, and provides functions such as session management, mobility management, policy management,

and security authentication for the terminal device. The core network includes but is not limited to one or more of the following network elements: an application function (application function, AF) network element, a unified data management (unified data management, UDM) network element, a policy control function (policy control function, PCF) network element, a session management function (session management function, SMF) network element, an access and mobility management function (access and mobility management function, AMF) network element, and a user plane function (user plane function, UPF) network element. For ease of description, for example, the unified data management network element is referred to as the UDM for short in the following, and other network elements are similar.

10 **[0087]** The AMF is mainly responsible for the mobility management in the mobile network, such as user position update, registration of a user with a network, and user switching.

[0088] The SMF is mainly responsible for the session management in the mobile network, such as session establishment, modification, and release. Specific functions include, for example, assigning an IP address for the user or selecting a UPF that provides a packet forwarding function.

15 **[0089]** The UPF is responsible for forwarding and receiving the user data, may receive the user data from the data network, and transmit the user data to the terminal device via the access network device. Alternatively, the UPF may receive the user data from the terminal device via the access network device, and forward the user data to the data network.

[0090] The UDM performs functions such as subscription data management and user access authorization.

20 **[0091]** The AF transfers a requirement of an application side on a network side, for example, a QoS requirement or user status event subscription. The AF may be a third-party functional entity, or may be an operator-deployed application service, for example, an IP multimedia subsystem (IP Multimedia Subsystem, IMS) voice call service.

25 **[0092]** The PCF mainly supports providing a unified policy framework to control network behavior, and providing a policy rule for a control layer network function, and is also responsible for obtaining policy-decision-related subscription information of the user. The PCF may provide policies such as a QoS policy and a slice selection policy for the AMF or the SMF.

[0093] A plurality of services may be deployed on the DN, and the DN may provide services such as a data service and/or a voice service for the terminal device. For example, the DN is a private network of a smart factory, a sensor installed in a workshop of the smart factory may be the terminal device, a control server of the sensor is deployed in the DN, and the control server may provide a service for the sensor. The sensor may communicate with the control server to obtain instructions of the control server, transmit collected sensor data to the control server based on the instructions, and the like. For another example, the DN is an internal office network of a

company, a mobile phone or a computer of an employee of the company may be the terminal device, and the mobile phone or the computer of the employee may access information, data resources, and the like on the internal office network of the company.

[0094] In FIG. 1, Namf, Npcf, Nsmf, Nudm, and Naf are service-oriented interfaces provided by the AMF, the PCF, the SMF, the UDM, and the AF respectively, and are configured to invoke corresponding service-oriented operations. N1, N2, N3, N4, and N6 are interface sequence numbers. The meanings of these interface sequence numbers are as follows:

[0095] (1) N1: represents an interface between the AMF and the terminal device, and may be configured to transfer non-access stratum (non-access stratum, NAS) signaling (for example, including a QoS rule from the AMF) to the terminal device, and the like.

[0096] (2) N2: represents an interface between the AMF and the RAN, and may be configured to transfer radio bearer control information from a core network side to the access network device, and the like.

[0097] (3) N3: represents an interface between the RAN and the UPF, and is mainly configured to transfer uplink and downlink user plane data between the access network device and the UPF.

[0098] (4) N4: represents an interface between the SMF and the UPF, and may be configured to transfer information between a control plane and a user plane, including delivery of a forwarding rule, a QoS rule, a traffic statistics rule, and the like from the control plane to the user plane, and reporting of user plane information.

[0099] (5) N6: represents an interface between the UPF and the DN, and is configured to transfer uplink and downlink user data flows between the UPF and the DN.

[00100] It may be understood that the network elements may be network elements in a hardware device, and the functions may be software functions running on dedicated hardware, or may be virtualized functions instantiated on a platform (for example, a cloud platform). In a possible implementation method, the network elements or the functions described above may be implemented by one device, may be implemented by a plurality of devices together, or may be implemented by one functional module in one device. This is not specifically limited in embodiments of this application.

[00101] A network sharing technology is also referred to as a hotspot sharing technology. Application of the technology may enable a device such as a laptop (Laptop), a desktop computer, a tablet (Tablet), or another intelligent terminal to access an intelligent terminal having an internet access function in connection manners such as a wired or wireless (for example, Wi-Fi, Bluetooth, or USB physical connection) connection manner, to provide a packet data service for a device other than the intelligent terminal having the internet access function. For example, the network sharing technology may be tethering (Tethering), and an intelligent terminal providing a tethering

function may be referred to as a tethering user.

[00102] With popularization of intelligent terminals with the network sharing technology, a large quantity of non-subscribed devices such as laptops and tablets may use network traffic by using the network sharing technology of the intelligent terminal. Because an operator cannot sense a terminal device that accesses a network by using the network sharing technology, the operator cannot analyze and determine an actual situation of the device that uses the network traffic, and therefore cannot provide a better service for the user.

[00103] FIG. 2(a) is a schematic flowchart of a hotspot device management method according to an embodiment of this application. The method includes the following steps.

[00104] Step 201a: A policy control network element sends indication information to a user plane network element.

[00105] Correspondingly, the user plane network element receives the indication information.

[00106] The policy control network element sends the indication information to the user plane network element. Specifically, the policy control network element may send the indication information to the user plane network element via a session management network element.

[00107] When this embodiment of this application is applied to a 5G scenario, the policy control network element is a PCF network element, the session management network element is an SMF network element, and the user plane network element is a UPF network element.

[00108] When this embodiment of this application is applied to a 4G scenario, the policy control network element is a policy and charging rules function (Policy and Charging Rules Function, PCRF) network element, the session management network element is a packet data network gateway-control plane (Packet Data Network Gateway-Control Plane, PGW-C) network element, and the user plane network element is a packet data network gateway-user plane (Packet Data Network Gateway-User Plane, PGW-U) network element.

[00109] Certainly, this embodiment of this application may be further applied to a future communication scenario, for example, a 6th generation (6th generation, 6G) communication scenario. This is not limited in this application. Implementations of the policy control network element, the session management network element, and the user plane network element are uniformly described herein, and details are not described subsequently.

[00110] The indication information indicates to send a first event to the policy control network element when the first event occurs. The first event is that a quantity of devices that access a terminal device by using a hotspot sharing technology is greater than or equal to a hotspot access threshold, or the first event is that a quantity of devices that access a terminal device by using a hotspot sharing technology is greater than a hotspot access threshold.

[00111] Step 202a: When the first event occurs, the user plane network element sends the first

event to the policy control network element.

[00112] Correspondingly, the policy control network element receives the first event.

[00113] After receiving the indication information, the user plane network element detects the quantity of devices that access the terminal device by using the hotspot sharing technology. When
5 the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology is greater than the hotspot access threshold, it indicates that the first event occurs. Therefore, the user plane network element sends the first event to the policy control network element, so that the policy control network element can learn that the quantity of devices that access the terminal device by using the hotspot sharing technology is
10 greater than or equal to the hotspot access threshold.

[00114] For example, it is assumed that the hotspot access threshold is 5, and the indication information indicates to report to the policy control network element when a quantity of devices that access a terminal device 1 by using the hotspot sharing technology is greater than or equal to 5. Therefore, the user plane network element detects the devices that access the terminal device 1
15 by using the hotspot sharing technology. When detecting that the quantity of devices that access the terminal device 1 by using the hotspot sharing technology is greater than or equal to 5, the user plane network element reports to the policy control network element that the quantity of devices that access the terminal device 1 by using the hotspot sharing technology is greater than or equal to 5.

[00115] In an implementation method, before step 202a, the user plane network element receives the hotspot access threshold from the policy control network element, in other words, the policy control network element provides the hotspot access threshold for the user plane network element. The hotspot access threshold and the indication information may be sent in a same message, or may be sent in different messages.
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[00116] In another implementation method, the indication information includes the hotspot access threshold.
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[00117] In another implementation method, the user plane network element determines the hotspot access threshold based on a service package of the terminal device. In other words, hotspot access thresholds corresponding to different service packages may be the same, or may be different.

[00118] In another implementation method, the user plane network element determines the hotspot access threshold based on configuration information in the user plane network element.
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[00119] In the foregoing solution, the policy control network element indicates the user plane network element to: detect the quantity of devices that access the terminal device by using the hotspot sharing technology, and notify the policy control network element when detecting that the
35 quantity of devices that access the terminal device by using the hotspot sharing technology is

greater than or equal to the hotspot access threshold. Therefore, the policy control network element learns that the quantity of devices that access the terminal device by using the hotspot sharing technology is greater than or equal to the hotspot access threshold, so that the policy control network element determines a charging manner or a control manner for the terminal device, to help properly charge and precisely control the terminal device.

[00120] In an implementation method, after step 202a, the following step 203a and/or step 204a may be further performed.

[00121] Step 203a: The policy control network element sends a first charging rule to the user plane network element.

[00122] Correspondingly, the user plane network element receives the first charging rule.

[00123] After receiving the first event, the policy control network element learns that the quantity of devices that access the terminal device by using the hotspot sharing technology is greater than or equal to the hotspot access threshold, and the policy control network element updates a charging rule to obtain the first charging rule. Then, the policy control network element sends the first charging rule to the user plane network element, and the user plane network element charges the terminal device according to the first charging rule.

[00124] For example, in comparison with the charging rule before the update, the first charging rule increases a traffic unit price (or a traffic charging rate), or updates previous non-charging to starting charging. A specific implementation method of the charging rule is not limited in this embodiment of this application. Therefore, in the method, the charging rule can be effectively configured, to properly charge the terminal device.

[00125] Step 204a: The policy control network element sends a first control policy rule to the user plane network element.

[00126] Correspondingly, the user plane network element receives the first control policy rule.

[00127] After receiving the first event, the policy control network element learns that the quantity of devices that access the terminal device by using the hotspot sharing technology is greater than or equal to the hotspot access threshold, and the policy control network element updates a control policy rule to obtain the first control policy rule. Then, the policy control network element sends the first control policy rule to the user plane network element, and the user plane network element controls the terminal device according to the first control policy rule.

[00128] For example, in comparison with the control policy rule before the update, the first control policy rule limits a traffic bandwidth of the device, reduces a traffic network speed of the device, or the like. A specific implementation method of the control policy rule is not limited in this embodiment of this application. In the method, the control policy rule can be effectively configured, to properly control the terminal device.

[00129] In an implementation method, after step 202a, the following step 205a may be further performed.

[00130] Step 205a: When a second event occurs, the user plane network element sends the second event to the policy control network element.

5 **[00131]** Correspondingly, the policy control network element receives the second event.

[00132] The second event indicates that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than or equal to the hotspot access threshold.

[00133] It may be understood that the second event is an event different from the first event. To be specific, when the quantity of devices that access the terminal device by using the hotspot sharing technology changes, for example, the quantity changes from being greater than the hotspot access threshold to being less than or equal to the hotspot access threshold, the user plane network element notifies the policy control network element of the change of the quantity. In other words, the user plane network element may dynamically sense the change of the quantity, and notify the policy control network element of the change of the quantity in real time, to implement dynamic management on the terminal device.

10 **[00134]** In an implementation method, after step 205a, the following step 206a and/or step 207a may be further performed.

[00135] Step 206a: The policy control network element sends a second charging rule to the user plane network element.

20 **[00136]** Correspondingly, the user plane network element receives the second charging rule.

[00137] After receiving the second event, the policy control network element learns that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than or equal to the hotspot access threshold, and the policy control network element updates a charging rule to obtain the second charging rule. Then, the policy control network element sends the second charging rule to the user plane network element, and the user plane network element charges the terminal device according to the second charging rule.

25 **[00138]** For example, in comparison with the charging rule before the update, the second charging rule reduces a traffic unit price (or a traffic charging rate), or updates previous charging to non-charging. A specific implementation method of the charging rule is not limited in this embodiment of this application. In the method, the charging rule can be effectively configured, to properly charge the terminal device.

30 **[00139]** Step 207a: The policy control network element sends a second control policy rule to the user plane network element.

[00140] Correspondingly, the user plane network element receives the second control policy rule.

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[00141] After receiving the second event, the policy control network element learns that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than or equal to the hotspot access threshold, and the policy control network element updates a control policy rule to obtain the second control policy rule. Then, the policy control network element sends the second control policy rule to the user plane network element, and the user plane network element controls the terminal device according to the second control policy rule.

[00142] For example, in comparison with the control policy rule before the update, the first control policy rule increases bandwidth traffic of the device, increases a traffic network speed of the device, or the like. A specific implementation method of the control policy rule is not limited in this embodiment of this application. In the method, the control policy rule can be effectively configured, to properly control the terminal device.

[00143] The following describes implementation methods in which the user plane network element detects the quantity of devices that access the terminal device by using the hotspot sharing technology. The following method 1 to method 4 are merely used as examples. The implementation methods in which the user plane network element detects the quantity of devices that access the terminal device by using the hotspot sharing technology are not limited in this application.

[00144] Method 1: The user plane network element receives a plurality of data packets from the terminal device. Each of the plurality of data packets includes a timestamp. The user plane network element determines, based on the timestamp in each of the plurality of data packets, reference values of clock sources corresponding to the plurality of data packets. The user plane network element determines, based on the reference values of the clock sources corresponding to the plurality of data packets, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00145] If the terminal device enables hotspot sharing, and another device accesses the terminal device by using the hotspot sharing technology, the another device sends a data packet via the terminal device. Therefore, the plurality of data packets received by the user plane network element from the terminal device include both the data packet sent by the terminal device and the data packet sent by the another device.

[00146] Both the terminal device and the another device that accesses the terminal device by using the hotspot sharing technology include a timestamp in the data packet when sending the data packet, and the timestamp is related to a clock source of the device that generates the data packet. Therefore, the user plane network element may determine, based on the timestamp in the obtained data packet, a reference value of the clock source corresponding to the data packet. Because reference values of a same clock source are the same, the user plane may determine, based on quantities of reference values of different types of clock sources, the quantity of devices that access

the terminal device by using the hotspot sharing technology. The reference value of the clock source may be understood as a value of the clock source at a reference moment. Clock sources of different devices have different values at a same moment, in other words, reference values of the clock sources of the different devices are different.

5 **[00147]** For example, the user plane network element determines, based on the timestamps in the plurality of received data packets, that there are five reference values. In the five reference values, one reference value is a reference value of a clock source of the terminal device that enables the hotspot sharing, and the other four reference values are reference values of clock sources of other devices that access the terminal device by using the hotspot sharing technology. Therefore,
10 the user plane network element determines that the quantity of devices that access the terminal device by using the hotspot sharing technology is 4.

[00148] The following uses an example to describe the method. For example, UE 1 is a device that enables hotspot sharing, and then a device 1, a device 2, and a device 3 access the UE 1 by using a hotspot enabled by the UE 1. The following describes a method in which the user plane
15 network element identifies that a quantity of devices that access the UE 1 by using the hotspot sharing technology is 3.

[00149] When the UE 1 is powered on, a clock source of the UE 1 generates an initial value (which is represented by initialTimestamp1), for example, 1000. Then, as time moves on, a value of the clock source increases by a fixed value (which is represented by numinbysec) every second.
20 A value of the numinbysec is 1000. For example, the clock source is updated to 2000 one second after the UE 1 is powered on, the clock source is updated to 3000 two seconds after the UE 1 is powered on, and so on. When generating a data packet, the UE 1 obtains a current value of the clock source of the UE 1, and then uses the value as a timestamp (timestamp) carried in the data packet. For example, at a moment t1, the value of the clock source of the UE 1 is timestamp1, and
25 the UE 1 includes the timestamp1 in the data packet. Similarly, at a moment t2, the value of the clock source of the UE 1 is timestamp2, and the UE 1 includes the timestamp2 in the data packet, and so on.

[00150] Similarly, when the device 1 is powered on, a clock source of the device 1 generates an initial value (which is represented by initialTimestamp2), for example, 2000. Then, as time moves
30 on, a value of the clock source increases by a fixed value (which is represented by numinbysec) every second. A value of the numinbysec is 1000. For example, the clock source is updated to 3000 one second after the device 1 is powered on, the clock source is updated to 4000 two seconds after the device 1 is powered on, and so on. When generating a data packet, the device 1 obtains a current value of the clock source of the device 1, and then uses the value as a timestamp carried in
35 the data packet. For example, at a moment t3, the value of the clock source of the device 1 is

timestamp3, and the device 1 includes the timestamp3 in the data packet. Similarly, at a moment t4, the value of the clock source of the device 1 is timestamp4, and the device 1 includes the timestamp4 in the data packet, and so on.

[00151] Similarly, the device 2 and the device 3 also include corresponding timestamps in data packets.

[00152] Therefore, the data packet received by the user plane network element from the UE 1, the device 1, the device 2, or the device 3 includes a timestamp. The user plane network element may obtain the timestamps in the plurality of data packets through sampling at different moments, and perform function fitting on the plurality of timestamps obtained through sampling at the plurality of moments, to obtain a plurality of straight lines with a same slope. A quantity of the straight lines represents a total quantity of devices from which the plurality of data packets come. It may also be understood that different devices represented by the plurality of straight lines obtained through fitting have different initial values. Because the initial values of the different devices when the devices are powered on are random values, a quantity of the initial values may be considered as a quantity of the devices. FIG. 2(c) is used as an example. The user plane network element separately obtains the plurality of data packets through sampling at a moment tx and a moment ty, obtains the timestamps in the data packets, and then performs fitting on the plurality of timestamps obtained through sampling, to obtain four straight lines. Data packets corresponding to a same straight line are from a same device. Therefore, the four straight lines indicate that the plurality of used data packets are from four devices, and the four devices are the UE 1, the device 1, the device 2, and the device 3. Therefore, the user plane network element determines that the quantity of devices that access the UE 1 by using the hotspot sharing technology is $4-1=3$.

[00153] Method 2: The user plane network element determines, based on a quantity and/or types of heartbeat messages detected in one or more periodicities, the quantity of devices that access the terminal device by using the hotspot sharing technology. The heartbeat message is from the terminal device or the device that accesses the terminal device by using the hotspot sharing technology.

[00154] An operating system (such as iOS, Android, or Windows) of the terminal device periodically sends a heartbeat message to an application server. The terminal device sends the heartbeat message to the user plane network element, and then the user plane network element forwards the heartbeat message to the application server. Therefore, the user plane network element may detect the heartbeat message of the terminal device.

[00155] For another device that accesses the terminal device by using the hotspot sharing technology, an operating system of the device also periodically sends a heartbeat message to the application server. When the device sends the heartbeat message, the heartbeat message reaches

the user plane network element via the terminal device, and then the user plane network element forwards the heartbeat message to the application server. Therefore, the user plane network element may detect the heartbeat message of the device.

[00156] In an implementation method, if types of heartbeat messages sent by different devices are different, the user plane network element may determine, based on the types of the heartbeat messages detected in the one or more periodicities, the quantity of devices that access the terminal device by using the hotspot sharing technology. For example, a terminal device 1 shares a hotspot, and then three devices, namely, a device 1, a device 2, and a device 3, all access the terminal device 1 by using the hotspot sharing technology. If the user plane network element can detect four types of heartbeat messages from the terminal device 1 in the one or more periodicities, the user plane network element determines that a quantity of devices that access the terminal device 1 by using the hotspot sharing technology is $4-1=3$.

[00157] In another implementation method, because heartbeat message sending periodicities of devices installed with a same type of operating system are the same, a quantity of heartbeat messages in one periodicity may be detected to determine the quantity of devices that access the terminal device 1 by using the hotspot sharing technology. For example, a device installed with an Android operating system sends a heartbeat message according to a periodicity T1, and a device installed with an Apple operating system sends a heartbeat message according to a periodicity T2. In this case, the user plane network element may detect, in one periodicity T1, a quantity of heartbeat messages sent by the Android device, for example, K1, and detect, in one periodicity T2, a quantity of heartbeat messages sent by the Apple device, for example, K2. In this way, the user plane network element determines that the quantity of devices that access the terminal device 1 by using the hotspot sharing technology is $(K1+K2)-1$.

[00158] It may be understood that the method 2 and the method 1 may be used at the same time. For example, when a characteristic of the heartbeat message is detected, a plurality of data packets with a same characteristic are determined by using the method 1. In this way, the quantity of devices that access the terminal device 1 by using the hotspot sharing technology can be more precisely determined.

[00159] Method 3: The user plane network element obtains network traffic characteristic parameters corresponding to a plurality of data packets. The user plane network element determines, based on the network traffic characteristic parameters, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00160] Hotspot access is essentially network address translation (network address translation, NAT) behavior. Traffic identification is essentially to classify IP addresses in a network into IP addresses of NAT devices and IP addresses of common hosts, which is similar to identification of

hotspot sharing behavior. The terminal device that enables a hotspot sharing function may be considered as the NAT device, and another device that does not enable a hotspot sharing function is considered as the common host. A general idea of the method is to obtain the IP addresses in the network, and then use each IP address as an example in data mining, to connect the NAT device with the common host in the network through the data mining.

[00161] Then, the user plane network element further determines the quantity of devices that access the NAT device by using the hotspot sharing technology. A specific method is as follows: The user plane network element collects a data packet, and then the user plane network element analyzes, based on a machine learning/depth model, a network traffic characteristic parameter corresponding to the collected data packet, to determine the quantity of devices that access the terminal device by using the hotspot sharing technology. The network traffic characteristic parameter corresponding to the data packet includes one or more of arrival time of the data packet, IP layer information in the data packet, and transmission control protocol (Transmission Control protocol, TCP) layer information in the data packet. The machine learning/depth model is obtained through training in advance based on the network traffic characteristic parameters of the plurality of collected data packets and label information of the NAT device.

[00162] Method 4: The user plane network element obtains a plurality of HTTP request messages. The HTTP request message includes a device parameter. The user plane network element determines, based on device parameters in the plurality of HTTP request messages, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00163] When accessing an HTTP service, a device sends an HTTP request message. A UserAgent field in a message header of the HTTP request message carries one or more of parameters such as an operating system type of the device, a browser type of the device, or a device type. Therefore, the user plane network element may determine, based on the parameter carried in the message header of the HTTP request message, whether the device is a device that accesses the terminal device by using the hotspot sharing technology, to determine the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00164] Similarly, the foregoing plurality of methods may be used in combination with each other to determine the quantity of devices that access the terminal device by using the hotspot sharing technology. Details are not described again.

[00165] FIG. 2(b) is a schematic flowchart of a hotspot device management method according to an embodiment of this application. The method includes the following steps.

[00166] Step 201b: A policy control network element sends indication information to a user plane network element.

[00167] Correspondingly, the user plane network element receives the indication information.

[00168] For the sending action, refer to the descriptions of step 201a.

[00169] The indication information indicates to send a changed quantity of devices to the policy control network element when a quantity of devices that access a terminal device by using a hotspot sharing technology changes.

5 [00170] Step 202b: When the quantity of devices that access the terminal device by using the hotspot sharing technology changes from a first quantity to a second quantity, the user plane network element sends the second quantity to the policy control network element.

[00171] In other words, when determining that the quantity of devices that access the terminal device by using the hotspot sharing technology changes, the user plane network element sends the

10 changed quantity of devices to the policy control network element.

[00172] In the foregoing solution, the policy control network element indicates the user plane network element to detect the quantity of devices that access the terminal device by using the hotspot sharing technology, and send the changed quantity of devices to the policy control network element after detecting that the quantity of devices that access the terminal device by using the

15 hotspot sharing technology changes, so that the policy control network element determines a charging manner or a control manner for the terminal device based on the changed quantity of devices, to help properly charge and precisely control the terminal device.

[00173] In an implementation method, after step 202b, the following step 203b, or step 204b, or step 203b and step 204b may be further performed.

20 [00174] Step 203b: The policy control network element sends a charging rule to the user plane network element.

[00175] Correspondingly, the user plane network element receives the charging rule.

[00176] After receiving the second quantity, the policy control network element determines the charging rule based on the second quantity. Then, the policy control network element sends the

25 charging rule to the user plane network element, and the user plane network element charges the terminal device according to the charging rule.

[00177] In an implementation method, in this embodiment of this application, intervals are specified for the quantity of devices that access the terminal device by using the hotspot sharing technology, and a charging rule is configured for each interval. For example, when the quantity of

30 devices is within an interval from 0 to 2, a charging rule 1 is configured. When the quantity of devices is within an interval from 3 to 5, a charging rule 2 is configured, and so on. A specific implementation method of the charging rule is not limited in this embodiment of this application. In the method, the charging rule can be effectively configured, to properly charge the terminal device.

35 [00178] Step 204b: The policy control network element sends a control policy rule to the user

plane network element.

[00179] Correspondingly, the user plane network element receives the control policy rule.

[00180] After receiving the second quantity, the policy control network element determines the control policy rule based on the second quantity. Then, the policy control network element sends
5 the control policy rule to the user plane network element, and the user plane network element controls the terminal device according to the control policy rule.

[00181] In an implementation method, in this embodiment of this application, intervals are specified for the quantity of devices that access the terminal device by using the hotspot sharing technology, and a control policy rule is configured for each interval. For example, when the
10 quantity of devices is within an interval from 0 to 2, a control policy rule 1 is configured. When the quantity of devices is within an interval from 3 to 5, a control policy rule 2 is configured, and so on. A specific implementation method of the control policy rule is not limited in this embodiment of this application. In the method, the control policy rule can be effectively configured, to properly control the terminal device.

[00182] It should be noted that, in the embodiment of FIG. 2(b), for an implementation method in which the user plane network element detects the quantity of devices that access the terminal device by using the hotspot sharing technology, refer to the related descriptions in the embodiment of FIG. 2(a). Details in the embodiment of FIG. 2(b) are not described again.

[00183] The following describes the embodiments of FIG. 2(a) and FIG. 2(b) with reference to
20 specific embodiments. The following embodiments of FIG. 3(a) and FIG. 3(b), and FIG. 5(a) and FIG. 5(b) are specific examples of the embodiment of FIG. 2(a), and the following embodiment of FIG. 4 is a specific example of the embodiment of FIG. 2(b).

[00184] FIG. 3(a) and FIG. 3(b) are a schematic flowchart of a hotspot device management method according to an embodiment of this application. The method includes the following steps.

[00185] Step 301: A terminal device sends a session establishment request message to a session
25 management network element.

[00186] The terminal device is a device that has an internet access capability and a hotspot sharing function. For example, the terminal device is a smartphone.

[00187] In 4G, the session management network element is a PGW-C. In 5G, the session
30 management network element is an SMF.

[00188] In 5G, the session establishment request message may be an Nsmf_PDUSession_CreateSMContext_Request message.

[00189] Step 302: The session management network element sends a policy establishment request message to a policy control network element.

[00190] In 4G, the policy control network element is a PCRF, and the session management
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network element (namely, the PGW-C) sends the policy establishment request message to the PCRF through a Gx interface between the PGW-C and the PCRF.

[00191] In 5G, the policy control network element is a PCF, and the session management network element (namely, the SMF) sends the policy establishment request message to the PCF through an N7 interface between the SMF and the PCF.

[00192] In 5G, the policy establishment request message may be an Npcf_SMPolicyControl_Create_Request message.

[00193] The policy establishment request message is used for requesting a user policy.

[00194] Step 303: The policy control network element sends a policy establishment response message to the session management network element.

[00195] In 5G, the policy establishment response message may be an Npcf_SMPolicyControl_Create_Request message.

[00196] The policy establishment response message includes a hotspot access exceeding threshold report event and a hotspot access threshold. The hotspot access exceeding threshold report event indicates to report an event when the event that a quantity of devices that access the terminal device by using a hotspot sharing technology exceeds the hotspot access threshold occurs. The policy control network element may locally obtain subscription data of the terminal device, and obtain, from the subscription data, the hotspot access threshold corresponding to the terminal device.

[00197] In an implementation method, in 4G, the policy establishment response message includes a credit control answer (credit control answer, CCA) message or a Re-Auth-Request (Re-Auth-Request, RAR) message, and the CCA message or the RAR message includes the hotspot access exceeding threshold report event and the hotspot access threshold.

[00198] The hotspot access exceeding threshold report event is a specific example of the indication information in the embodiment of FIG. 2(a).

[00199] The CCA message is used as an example. The CCA message currently includes an Event-Trigger field.

[00200] In a 4G application scenario, in this application, the Event-Trigger field may be extended, and a value range of the Event-Trigger is increased. For example, a value TETHERING_EXCEED_NUM_REPORT of the Event-Trigger is newly added. The TETHERING_EXCEED_NUM_REPORT is an example of the hotspot access exceeding threshold report event. Correspondingly, Tethering-Num-Threshold corresponding to the TETHERING_EXCEED_NUM_REPORT is further added. The Tethering-Num-Threshold is an example of the hotspot access threshold. When the value of the Event-Trigger in the CCA message is the TETHERING_EXCEED_NUM_REPORT, the CCA message further includes the Tethering-

Num-Threshold. The TETHERING_EXCEED_NUM_REPORT and the Tethering-Num-Threshold are referred to as an attribute-value pair (attribute-value pair, AVP).

[00201] In another implementation method, in a 5G application scenario, the policy establishment response message includes SmPolicyDecision. Some content included in the SmPolicyDecision is shown in Table 1.

Table 1

Attribute name	Data type	Description
policyCtrlReqTriggers	array(PolicyControlRequestTrigger)	Defines a policy control request trigger event subscribed to by the PCF.
Tethering_num_Threshold	integer	When the quantity of devices that access the device through hotspot sharing exceeds the Tethering_num_Threshold, triggers reporting of the quantity of devices that access the terminal device.

[00202] The policyCtrlReqTriggers is an existing attribute, and a value of the policyCtrlReqTriggers is represented by the PolicyControlRequestTrigger. In this embodiment of this application, a value range of the policyCtrlReqTriggers is newly added. For example, a value TETHERING_EXCEED_NUM_REPORT of the policyCtrlReqTriggers is newly added. The TETHERING_EXCEED_NUM_REPORT is an example of the hotspot access exceeding threshold report event.

[00203] The Tethering_num_Threshold is a newly added attribute. The Tethering_num_Threshold is an example of the hotspot access threshold.

[00204] Step 304: The session management network element sends the session establishment request message to the user plane network element.

[00205] In 4G, the user plane network element is a PGW-U, and the session management network element (namely, the PGW-C) sends the session establishment request message to the PGW-U through an Sx interface between the PGW-C and the PGW-U.

[00206] In 5G, the user plane network element is a UPF, and the session management network

element (namely, the SMF) sends the session establishment request message to the UPF through an N4 interface between the SMF and the UPF.

[00207] In 5G, the session establishment request message may be an N4 Session Establish Request message.

5 **[00208]** The session establishment request message includes the hotspot access exceeding threshold report event and the hotspot access threshold.

[00209] In an implementation method, the session establishment request message includes a usage reporting rule (Usage Reporting Rule, URR), and the URR includes Extended Reporting Triggers and the Tethering_num_Threshold. The Extended Reporting Triggers includes the hotspot
10 access exceeding threshold report event. The Tethering_num_Threshold is an example of the hotspot access threshold.

[00210] Step 305: The user plane network element starts hotspot access detection based on the hotspot access exceeding threshold report event.

[00211] For an implementation method in which the user plane network element detects the
15 quantity of devices that access the terminal device by using the hotspot sharing technology, refer to the related descriptions in the embodiment of FIG. 2(a). Details are not described again.

[00212] Step 306: The user plane network element sends a session establishment response message to the session management network element.

[00213] In 5G, the session establishment response message may be an N4 Session Establish
20 Response message.

[00214] Step 307: The user plane network element sends a session report request message to the session management network element.

[00215] In 5G, the session report request message may be an N4 Session Reporting Request message.

25 **[00216]** Specifically, when the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology exceeds the hotspot access threshold, the user plane network element sends the session report request message to the session management network element. The session report request message includes a hotspot access exceeding threshold event, and the hotspot access exceeding threshold event indicates that the
30 quantity of devices that access the terminal device by using the hotspot sharing technology exceeds the hotspot access threshold.

[00217] The hotspot access exceeding threshold event is a specific example of the first event in the embodiment of FIG. 2(a).

[00218] For example, the session report request message includes ExtendedUsage Report
35 Triggers, and the ExtendedUsage Report Triggers may include the hotspot access exceeding

threshold event. Step 308: The session management network element sends a policy update request message to the policy control network element.

[00219] In 5G, the policy update request message may be an Npcf_SMPolicyControl_Update_Request message.

5 **[00220]** The policy update request message includes the hotspot access exceeding threshold event.

[00221] Step 309: The policy control network element determines a charging rule 1 and/or a control policy rule 1 for the terminal device.

10 **[00222]** The hotspot access exceeding threshold event received by the policy control network element triggers the policy control network element to determine the charging rule 1 and/or the control policy rule 1 for the terminal device according to a preconfigured policy or a subscription policy.

[00223] Step 310: The policy control network element sends a policy update response message to the session management network element.

15 **[00224]** In 5G, the policy update response message may be an Npcf_SMPolicyControl_Update_Response message.

[00225] The policy update response message includes the charging rule 1 for the terminal device and/or the control policy rule 1 for the terminal device.

20 **[00226]** Step 311: The session management network element sends a session modification request message to the user plane network element.

[00227] In 5G, the session modification request message may be an N4 Session Modification Request message.

25 **[00228]** The session modification request message includes the charging rule 1 and/or the control policy rule 1 for the terminal device. In an implementation method, the session modification request message includes a packet detection rule (Packet Detection Rule, PDR), and the PDR includes the charging rule 1 and/or the control policy rule 1 for the terminal device.

[00229] Step 312: The user plane network element charges the terminal device according to the charging rule 1 for the terminal device, and/or controls the terminal device according to the control policy rule 1 for the terminal device.

30 **[00230]** Optionally, when the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology changes from exceeding the hotspot access threshold to being less than the hotspot access threshold, the following step 313 to step 318 may be further performed after step 312.

35 **[00231]** Step 313: The user plane network element sends the session report request message to the session management network element.

[00232] In 5G, the session report request message may be the N4 Session Reporting Request message.

[00233] Specifically, when the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology changes from exceeding the hotspot access threshold to being less than the hotspot access threshold, the user plane network element sends the session report request message to the session management network element. The session report request message includes a hotspot access less than threshold event, and the hotspot access less than threshold event indicates that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than the hotspot access threshold.

[00234] The hotspot access less than threshold event is a specific example of the second event in the embodiment of FIG. 2(a).

[00235] For example, the session report request message includes the ExtendedUsage Report Triggers, and the ExtendedUsage Report Triggers may include the hotspot access less than threshold event.

[00236] Step 314: The session management network element sends the policy update request message to the policy control network element.

[00237] In 5G, the policy update request message may be the Npcf_SMPolicyControl_Update_Request message.

[00238] The policy update request message includes the hotspot access less than threshold event.

[00239] Step 315: The policy control network element determines a charging rule 2 and/or a control policy rule 2 for the terminal device.

[00240] The hotspot access less than threshold event received by the policy control network element triggers the policy control network element to determine the charging rule 2 and/or the control policy rule 2 for the terminal device according to a preconfigured policy or a subscription policy.

[00241] Step 316: The policy control network element sends a policy update response message to the session management network element.

[00242] In 5G, the policy update response message may be an Npcf_SMPolicyControl_Update_Response message.

[00243] The policy update response message includes the charging rule 2 for the terminal device and/or the control policy rule 2 for the terminal device.

[00244] Step 317: The session management network element sends a session modification request message to the user plane network element.

[00245] In 5G, the session modification request message may be an N4 Session Modification Request message.

[00246] The session modification request message includes the charging rule 2 for the terminal device and/or the control policy rule 2 for the terminal device. In an implementation method, the session modification request message includes a PDR, and the PDR includes the charging rule 2 for the terminal device and/or the control policy rule 2 for the terminal device.

5 **[00247]** Step 318: The user plane network element charges the terminal device according to the charging rule 2 for the terminal device, and/or controls the terminal device according to the control policy rule 2 for the terminal device.

[00248] In the foregoing solution, the user plane network element can detect the quantity of devices that access the terminal device by using the hotspot sharing technology, and report the hotspot access exceeding threshold event when detecting that the quantity of devices that access the terminal device by using the hotspot sharing technology exceeds the hotspot access threshold, to trigger the policy control network element to determine a corresponding charging rule and/or control policy rule. In addition, when detecting that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than the hotspot access threshold, the user plane network element may further report the hotspot access less than threshold event, to trigger the policy control network element to determine a corresponding charging rule and/or control policy rule. Therefore, this solution can precisely charge and effectively control the terminal device.

15 **[00249]** It should be noted that step 303 and step 304 may be understood as a specific implementation of step 201a in the embodiment of FIG. 2(a), step 307 and step 308 may be understood as a specific implementation of step 202a in the embodiment of FIG. 2(a), step 310 and step 311 may be understood as a specific implementation of step 203a and step 204a in the embodiment of FIG. 2(a), step 313 and step 314 may be understood as a specific implementation of step 205a in the embodiment of FIG. 2(a), and step 316 and step 317 may be understood as a specific implementation of step 206a and step 207a in the embodiment of FIG. 2(a). For specific implementation, refer to the related descriptions in the embodiment of FIG. 2(a). Details are not described again.

[00250] FIG. 4 is a schematic flowchart of a hotspot device management method according to an embodiment of this application. The method includes the following steps.

30 **[00251]** Step 401: A terminal device sends a session establishment request message to a session management network element.

[00252] The terminal device is a device that has an internet access capability and a hotspot sharing function. For example, the terminal device is a smartphone.

[00253] In 4G, the session management network element is a PGW-C. In 5G, the session management network element is an SMF.

35 **[00254]** In 5G, the session establishment request message may be an

Nsmf_PDUSession_CreateSMContext Request message.

[00255] Step 402: The session management network element sends a policy establishment request message to a policy control network element.

[00256] In 4G, the policy control network element is a PCRF, and the session management network element (namely, the PGW-C) sends the policy establishment request message to the PCRF through a Gx interface between the PGW-C and the PCRF.

[00257] In 5G, the policy control network element is a PCF, and the session management network element (namely, the SMF) sends the policy establishment request message to the PCF through an N7 interface between the SMF and the PCF.

[00258] In 5G, the policy establishment request message may be an Npcf_SMPolicyControl_Create_Request message.

[00259] The policy establishment request message is used for requesting a user policy.

[00260] Step 403: The policy control network element sends a policy establishment response message to the session management network element.

[00261] In 5G, the policy establishment response message may be an Npcf_SMPolicyControl_Create_Request message.

[00262] The policy establishment response message includes a hotspot access device quantity report event. The hotspot access device quantity report event indicates to report a changed quantity of devices when an event that a quantity of devices that access the terminal device by using a hotspot sharing technology changes occurs.

[00263] In an implementation method, in 4G, the policy establishment response message includes a CCA message or an RAR message, and the CCA message or the RAR message includes the hotspot access device quantity report event.

[00264] The hotspot access device quantity report event is a specific example of the indication information in the embodiment of FIG. 2(b).

[00265] The CCA message is used as an example. The CCA message currently includes an Event-Trigger field.

[00266] In a 4G application scenario, in this application, the Event-Trigger may be extended, and a value range of the Event-Trigger is increased. For example, a value TETHERING_NUM_REPORT of the Event-Trigger is newly added. The TETHERING_NUM_REPORT is an example of the hotspot access device quantity report event.

[00267] In another implementation method, in a 5G application scenario, the policy establishment response message includes SmPolicyDecision. Some content included in the SmPolicyDecision is shown in Table 2.

Table 2

Attribute name	Data type	Description
policyCtrlReqTriggers	array(PolicyControlRequestTrigger)	Defines a policy control request trigger event subscribed to by the PCF.

[00268] The policyCtrlReqTriggers is an existing attribute, and a value of the policyCtrlReqTriggers is represented by the PolicyControlRequestTrigger. In this embodiment of this application, a value range of the policyCtrlReqTriggers is newly added. For example, a value TETHERING_NUM_REPORT of the policyCtrlReqTriggers is newly added. The TETHERING_NUM_REPORT is an example of the hotspot access device quantity report event.

[00269] Step 404: The session management network element sends the session establishment request message to the user plane network element.

[00270] In 4G, the user plane network element is a PGW-U, and the session management network element (namely, the PGW-C) sends the session establishment request message to the PGW-U through an Sx interface between the PGW-C and the PGW-U.

[00271] In 5G, the user plane network element is a UPF, and the session management network element (namely, the SMF) sends the session establishment request message to the UPF through an N4 interface between the SMF and the UPF.

[00272] In 5G, the session establishment request message may be an N4 Session Establish Request message.

[00273] The session establishment request message includes the hotspot access device quantity report event.

[00274] In an implementation method, the session establishment request message includes a URR, and the URR includes Extended Reporting Triggers. The Extended Reporting Triggers includes the hotspot access device quantity report event.

[00275] Step 405: The user plane network element starts hotspot access detection based on the hotspot access device quantity report event.

[00276] For an implementation method in which the user plane network element detects the quantity of devices that access the terminal device by using the hotspot sharing technology, refer to the related descriptions in the embodiment of FIG. 2(a). Details are not described again.

[00277] Step 406: The user plane network element sends a session establishment response message to the session management network element.

[00278] In 5G, the session establishment response message may be an N4 Session Establish Response message.

[00279] Step 407: The user plane network element sends a session report request message to the session management network element.

5 **[00280]** In 5G, the session report request message may be an N4 Session Reporting Request message.

[00281] Specifically, when the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology changes, the user plane network element sends the session report request message to the session management network
10 element. The session report request message includes the quantity of devices that access the terminal device by using the hotspot sharing technology, and the quantity is the changed quantity of devices.

[00282] In an implementation method, the session report request message may include ExtendedUsage Report Triggers, and the ExtendedUsage Report Triggers may include the quantity
15 of devices that access the terminal device by using the hotspot sharing technology. Step 408: The session management network element sends a policy update request message to the policy control network element.

[00283] In 5G, the policy update request message may be an Npcf_SMPolicyControl_Update_Request message.

20 **[00284]** The policy update request message includes the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00285] Step 409: The policy control network element determines a charging rule and/or a control policy rule for the terminal device.

[00286] The quantity that is of devices that access the terminal device by using the hotspot
25 sharing technology and that is received by the policy control network element triggers the policy control network element to determine the charging rule for the terminal device and/or the control policy rule for the terminal device according to a preconfigured policy or a subscription policy.

[00287] Step 410: The policy control network element sends a policy update response message to the session management network element.

30 **[00288]** In 5G, the policy update response message may be an Npcf_SMPolicyControl_Update_Response message.

[00289] The policy update response message includes the charging rule and/or the control policy rule for the terminal device.

[00290] Step 411: The session management network element sends a session modification
35 request message to the user plane network element.

[00291] In 5G, the session modification request message may be an N4 Session Modification Request message.

[00292] The session modification request message includes the charging rule and/or the control policy rule for the terminal device. In an implementation method, the session modification request message includes a PDR, and the PDR includes the charging rule and/or the control policy rule for the terminal device.

[00293] Step 412: The user plane network element charges the terminal device according to the charging rule for the terminal device, and/or controls the terminal device according to the control policy rule for the terminal device.

[00294] Subsequently, if the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology changes, the foregoing step 407 to step 412 are repeatedly performed.

[00295] In the foregoing solution, the user plane network element can detect the quantity of devices that access the terminal device by using the hotspot sharing technology, and report the detected quantity of devices that access the terminal device by using the hotspot sharing technology, to trigger the policy control network element to determine a corresponding charging rule and/or control policy rule. Therefore, this solution can precisely charge and effectively control the terminal device.

[00296] It should be noted that, step 403 and step 404 may be understood as a specific implementation of step 201b in the embodiment of FIG. 2(b), step 407 and step 408 may be understood as a specific implementation of step 202b in the embodiment of FIG. 2(b), and step 410 and step 411 may be understood as a specific implementation of step 203b and step 204b in the embodiment of FIG. 2(b). For specific implementation, refer to the related descriptions in the embodiment of FIG. 2(b). Details are not described again.

[00297] FIG. 5(a) and FIG. 5(b) are a schematic flowchart of a hotspot device management method according to an embodiment of this application. The method includes the following steps.

[00298] Step 501: A terminal device sends a session establishment request message to a session management network element.

[00299] The terminal device is a device that has an internet access capability and a hotspot sharing function. For example, the terminal device is a smartphone.

[00300] In 4G, the session management network element is a PGW-C. In 5G, the session management network element is an SMF.

[00301] In 5G, the session establishment request message may be an Nsmf_PDUSession_CreateSMContext Request message.

[00302] Step 502: The session management network element sends a policy establishment

request message to a policy control network element.

[00303] In 4G, the policy control network element is a PCRF, and the session management network element (namely, the PGW-C) sends the policy establishment request message to the PCRF through a Gx interface between the PGW-C and the PCRF.

5 **[00304]** In 5G, the policy control network element is a PCF, and the session management network element (namely, the SMF) sends the policy establishment request message to the PCF through an N7 interface between the SMF and the PCF.

[00305] In 5G, the policy establishment request message may be an Npcf_SMPolicyControl_Create_Request message.

10 **[00306]** The policy establishment request message is used for requesting a user policy.

[00307] Step 503: The policy control network element sends a policy establishment response message to the session management network element.

[00308] In 5G, the policy establishment response message may be an Npcf_SMPolicyControl_Create_Request message.

15 **[00309]** The policy establishment response message includes a hotspot access exceeding threshold report event. The hotspot access exceeding threshold report event indicates to report an event when the event that a quantity of devices that access the terminal device by using a hotspot sharing technology exceeds a hotspot access threshold occurs.

[00310] In an implementation method, in 4G, the policy establishment response message
20 includes a CCA message or an RAR message, and the CCA message or the RAR message includes the hotspot access exceeding threshold report event.

[00311] The hotspot access exceeding threshold report event is a specific example of the indication information in the embodiment of FIG. 2(a).

[00312] The CCA message is used as an example. The CCA message currently includes an
25 Event-Trigger field.

[00313] In a 4G application scenario, in this application, the Event-Trigger may be extended, and a value range of the Event-Trigger is increased. For example, a value TETHERING_EXCEED_NUM_REPORT of the Event-Trigger is newly added. The TETHERING_EXCEED_NUM_REPORT is an example of the hotspot access exceeding
30 threshold report event.

[00314] In another implementation method, in a 5G application scenario, the policy establishment response message includes SmPolicyDecision. Some content included in the SmPolicyDecision is shown in Table 3.

Table 3

Attribute name	Data type	Description
policyCtrlReqTriggers	array(PolicyControlRequestTrigger)	Defines a policy control request trigger event subscribed to by the PCF.

[00315] The policyCtrlReqTriggers is an existing attribute, and a value of the policyCtrlReqTriggers is represented by the PolicyControlRequestTrigger. In this embodiment of this application, a value range of the policyCtrlReqTriggers is newly added. For example, a value TETHERING_EXCEED_NUM_REPORT of the policyCtrlReqTriggers is newly added. The TETHERING_EXCEED_NUM_REPORT is an example of the hotspot access exceeding threshold report event.

[00316] Step 504: The session management network element sends the session establishment request message to the user plane network element.

[00317] In 4G, the user plane network element is a PGW-U, and the session management network element (namely, the PGW-C) sends the session establishment request message to the PGW-U through an Sx interface between the PGW-C and the PGW-U.

[00318] In 5G, the user plane network element is a UPF, and the session management network element (namely, the SMF) sends the session establishment request message to the UPF through an N4 interface between the SMF and the UPF.

[00319] In 5G, the session establishment request message may be an N4 Session Establish Request message.

[00320] The session establishment request message includes the hotspot access exceeding threshold report event.

[00321] In an implementation method, the session establishment request message includes a URR, and the URR includes Extended Reporting Triggers. The Extended Reporting Triggers includes the hotspot access exceeding threshold report event.

[00322] Step 505: The user plane network element starts hotspot access detection based on the hotspot access exceeding threshold report event.

[00323] For an implementation method in which the user plane network element detects the quantity of devices that access the terminal device by using the hotspot sharing technology, refer to the related descriptions in the embodiment of FIG. 2(a). Details are not described again.

[00324] Step 506: The user plane network element sends a session establishment response message to the session management network element.

[00325] In 5G, the session establishment response message may be an N4 Session Establish

Response message.

[00326] Step 507: The user plane network element sends a session report request message to the session management network element.

[00327] In 5G, the session report request message may be an N4 Session Reporting Request message.

[00328] The hotspot access threshold is preconfigured on the user plane network element. Alternatively, the user plane network element determines the hotspot access threshold based on a service package of the terminal device.

[00329] Specifically, when the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology exceeds the hotspot access threshold, the user plane network element sends the session report request message to the session management network element. The session report request message includes a hotspot access exceeding threshold event, and the hotspot access exceeding threshold event indicates that the quantity of devices that access the terminal device by using the hotspot sharing technology exceeds the hotspot access threshold.

[00330] The hotspot access exceeding threshold event is a specific example of the first event in the embodiment of FIG. 2(a).

[00331] For example, the session report request message includes ExtendedUsage Report Triggers, and the ExtendedUsage Report Triggers may include the hotspot access exceeding threshold event.

[00332] Step 508: The session management network element sends a policy update request message to the policy control network element.

[00333] In 5G, the policy update request message may be an Npcf_SMPolicyControl_Update_Request message.

[00334] The policy update request message includes the hotspot access exceeding threshold event.

[00335] Step 509: The policy control network element determines a charging rule 1 and/or a control policy rule 1 for the terminal device.

[00336] The hotspot access exceeding threshold event received by the policy control network element triggers the policy control network element to determine the charging rule 1 and/or the control policy rule 1 for the terminal device according to a preconfigured policy or a subscription policy.

[00337] Step 510: The policy control network element sends a policy update response message to the session management network element.

[00338] In 5G, the policy update response message may be an

Npcf_SMPolicyControl_Update_Response message.

[00339] The policy update response message includes the charging rule 1 and/or the control policy rule 1 for the terminal device.

[00340] Step 511: The session management network element sends a session modification request message to the user plane network element.

[00341] In 5G, the session modification request message may be an N4 Session Modification Request message.

[00342] The session modification request message includes the charging rule 1 and/or the control policy rule 1 for the terminal device. In an implementation method, the session modification request message includes a PDR, and the PDR includes the charging rule 1 and/or the control policy rule 1 for the terminal device.

[00343] Step 512: The user plane network element charges the terminal device according to the charging rule 1 for the terminal device, and/or controls the terminal device according to the control policy rule 1 for the terminal device.

[00344] Optionally, when the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology changes from exceeding the hotspot access threshold to being less than the hotspot access threshold, the following step 513 to step 518 may be further performed.

[00345] Step 513: The user plane network element sends the session report request message to the session management network element.

[00346] In 5G, the session report request message may be the N4 Session Reporting Request message.

[00347] Specifically, when the user plane network element detects that the quantity of devices that access the terminal device by using the hotspot sharing technology changes from exceeding the hotspot access threshold to being less than the hotspot access threshold, the user plane network element sends the session report request message to the session management network element. The session report request message includes a hotspot access less than threshold event, and the hotspot access less than threshold event indicates that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than the hotspot access threshold.

[00348] The hotspot access less than threshold event is a specific example of the second event in the embodiment of FIG. 2(a).

[00349] For example, the session report request message includes the ExtendedUsage Report Triggers, and the ExtendedUsage Report Triggers may include the hotspot access less than threshold event.

[00350] Step 514: The session management network element sends the policy update request

message to the policy control network element.

[00351] In 5G, the policy update request message may be the Npcf_SMPolicyControl_Update_Request message.

[00352] The policy update request message includes the hotspot access less than threshold event.

5 **[00353]** Step 515: The policy control network element determines a charging rule 2 and/or a control policy rule 2 for the terminal device.

[00354] The hotspot access less than threshold event received by the policy control network element triggers the policy control network element to determine the charging rule 2 and/or the control policy rule 2 for the terminal device according to a preconfigured policy or a subscription
10 policy.

[00355] Step 516: The policy control network element sends a policy update response message to the session management network element.

[00356] In 5G, the policy update response message may be an Npcf_SMPolicyControl_Update_Response message.

15 **[00357]** The policy update response message includes the charging rule 2 and/or the control policy rule 2 for the terminal device.

[00358] Step 517: The session management network element sends a session modification request message to the user plane network element.

[00359] In 5G, the session modification request message may be an N4 Session Modification
20 Request message.

[00360] The session modification request message includes the charging rule 2 and/or the control policy rule 2 for the terminal device. In an implementation method, the session modification request message includes a PDR, and the PDR includes the charging rule 2 and/or the control policy rule 2 for the terminal device.

25 **[00361]** Step 518: The user plane network element charges the terminal device according to the charging rule 2 for the terminal device, and/or controls the terminal device according to the control policy rule 2 for the terminal device.

[00362] In the foregoing solution, the user plane network element can detect the quantity of devices that access the terminal device by using the hotspot sharing technology, and report the
30 hotspot access exceeding threshold event when detecting that the quantity of devices that access the terminal device by using the hotspot sharing technology exceeds the hotspot access threshold, to trigger the policy control network element to determine a corresponding charging rule and/or control policy rule. In addition, when detecting that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than the hotspot access threshold, the user
35 plane network element may further report the hotspot access less than threshold event, to trigger

the policy control network element to determine a corresponding charging rule and/or control policy rule. Therefore, this solution can precisely charge and effectively control the terminal device.

[00363] It should be noted that step 503 and step 504 may be understood as a specific implementation of step 201a in the embodiment of FIG. 2(a), step 507 and step 508 may be understood as a specific implementation of step 202a in the embodiment of FIG. 2(a), step 510 and step 511 may be understood as a specific implementation of step 203a and step 204a in the embodiment of FIG. 2(a), step 513 and step 514 may be understood as a specific implementation of step 205a in the embodiment of FIG. 2(a), and step 516 and step 517 may be understood as a specific implementation of step 206a and step 207a in the embodiment of FIG. 2(a). For specific implementation, refer to the related descriptions in the embodiment of FIG. 2(a). Details are not described again.

[00364] It may be understood that, to implement the functions in the foregoing embodiments, the user plane network element or the policy control network element includes a corresponding hardware structure and/or software module for performing each function. A person skilled in the art should be easily aware that, in this application, the units and method steps in the examples described with reference to embodiments disclosed in this application can be implemented by hardware or a combination of hardware and computer software. Whether a function is performed by hardware or hardware driven by computer software depends on particular application scenarios and design constraints of the technical solutions.

[00365] FIG. 6 and FIG. 7 are diagrams of structures of possible communication apparatuses according to embodiments of this application. These communication apparatuses may be configured to implement functions of the user plane network element or the policy control network element in the foregoing method embodiments, and therefore can also implement beneficial effects of the foregoing method embodiments. In this embodiment of this application, the communication apparatus may be a user plane network element or a policy control network element, or may be a module (for example, a chip) used in a policy control network element or a module (for example, a chip) used in a user plane network element.

[00366] As shown in FIG. 6, the communication apparatus 600 includes a processing unit 610 and a transceiver unit 620. The communication apparatus 600 is configured to implement the functions of the user plane network element or the policy control network element in the foregoing method embodiments.

[00367] When the communication apparatus 600 is configured to implement the functions of the user plane network element in the embodiment of FIG. 2(a), FIG. 3(a) and FIG. 3(b), or FIG. 5(a) and FIG. 5(b), the transceiver unit 620 is configured to receive indication information from the policy control network element. The indication information indicates to send a first event to

the policy control network element when the first event occurs. The first event is that a quantity of devices that access a terminal device by using a hotspot sharing technology is greater than or equal to a hotspot access threshold. When the first event occurs, the first event is sent to the policy control network element.

5 **[00368]** In a possible implementation method, the transceiver unit 620 is configured to receive the hotspot access threshold from the policy control network element, or the indication information includes the hotspot access threshold.

10 **[00369]** In a possible implementation method, the processing unit 610 is configured to determine the hotspot access threshold based on a service package of the terminal device, or the processing unit 610 is configured to determine the hotspot access threshold based on configuration information in the user plane network element.

15 **[00370]** In a possible implementation method, the transceiver unit 620 is configured to receive a first charging rule from the policy control network element. The first charging rule is determined based on the first event. The processing unit 610 is configured to charge the terminal device according to the first charging rule.

20 **[00371]** In a possible implementation method, the transceiver unit 620 is configured to receive a first control policy rule from the policy control network element. The first control policy rule is determined based on the first event. The processing unit 610 is configured to control the terminal device according to the first control policy rule.

20 **[00372]** In a possible implementation method, the transceiver unit 620 is configured to: when a second event occurs, send the second event to the policy control network element, where the second event indicates that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than or equal to the hotspot access threshold.

25 **[00373]** In a possible implementation method, the transceiver unit 620 is configured to receive a second charging rule from the policy control network element. The second charging rule is determined based on the second event. The processing unit 610 is configured to charge the terminal device according to the second charging rule.

30 **[00374]** In a possible implementation method, the transceiver unit 620 is configured to receive a second control policy rule from the policy control network element. The second control policy rule is determined based on the second event. The processing unit 610 is configured to control the terminal device according to the second control policy rule.

35 **[00375]** In a possible implementation method, the transceiver unit 620 is configured to receive a plurality of data packets from the terminal device. Each of the plurality of data packets includes a timestamp. The processing unit 610 is configured to: determine, based on the timestamp in each of the plurality of data packets, reference values of clock sources corresponding to the plurality of

data packets; and determine, based on the reference values of the clock sources corresponding to the plurality of data packets, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00376] In a possible implementation method, the processing unit 610 is configured to determine, based on a quantity and/or types of heartbeat messages detected in one or more periodicities, the quantity of devices that access the terminal device by using the hotspot sharing technology. The heartbeat message is from the terminal device or the device that accesses the terminal device by using the hotspot sharing technology.

[00377] In a possible implementation method, the processing unit 610 is configured to: obtain network traffic characteristic parameters corresponding to a plurality of data packets; and determine, based on the network traffic characteristic parameters, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00378] In a possible implementation method, the processing unit 610 is configured to: obtain a plurality of HTTP request messages, where the HTTP request message includes a device parameter; and determine, based on device parameters in the plurality of HTTP request messages, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00379] When the communication apparatus 600 is configured to implement the functions of the policy control network element in the embodiment of FIG. 2(a), FIG. 3(a) and FIG. 3(b), or FIG. 5(a) and FIG. 5(b), the transceiver unit 620 is configured to send indication information to the user plane network element. The indication information indicates to send a first event to the policy control network element when the first event occurs. The first event is that a quantity of devices that access a terminal device by using a hotspot sharing technology is greater than or equal to a hotspot access threshold. When the first event occurs, the first event is received from the user plane network element.

[00380] In a possible implementation method, the transceiver unit 620 is configured to send the hotspot access threshold to the user plane network element, or the indication information includes the hotspot access threshold.

[00381] In a possible implementation method, the processing unit 610 is configured to determine a first charging rule based on the first event. The transceiver unit 620 is configured to send the first charging rule to the user plane network element.

[00382] In a possible implementation method, the processing unit 610 is configured to determine a first control policy rule based on the first event. The transceiver unit 620 is configured to send the first control policy rule to the user plane network element.

[00383] In a possible implementation method, the transceiver unit 620 is configured to receive a second event from the user plane network element. The second event indicates that the quantity

of devices that access the terminal device by using the hotspot sharing technology is less than or equal to the hotspot access threshold.

[00384] In a possible implementation method, the processing unit 610 is configured to determine a second charging rule based on the second event. The transceiver unit 620 is configured to send the second charging rule to the user plane network element.

[00385] In a possible implementation method, the processing unit 610 is configured to determine a second control policy rule based on the second event. The transceiver unit 620 is configured to send the second control policy rule to the user plane network element.

[00386] When the communication apparatus 600 is configured to implement the functions of the user plane network element in the embodiment of FIG. 2(b) or FIG. 4, the transceiver unit 620 is configured to receive indication information from the policy control network element. The indication information indicates to send a changed quantity of devices to the policy control network element when a quantity of devices that access a terminal device by using a hotspot sharing technology changes. When the quantity of devices that access the terminal device by using the hotspot sharing technology changes from a first quantity to a second quantity, the second quantity is sent to the policy control network element.

[00387] In a possible implementation method, the transceiver unit 620 is configured to receive a charging rule from the policy control network element. The charging rule is determined based on the second quantity. The processing unit 610 is configured to charge the terminal device according to the charging rule.

[00388] In a possible implementation method, the transceiver unit 620 is configured to receive a control policy rule from the policy control network element. The control policy rule is determined based on the second quantity. The processing unit 610 is configured to control the terminal device according to the control policy rule.

[00389] In a possible implementation method, the transceiver unit 620 is configured to receive a plurality of data packets from the terminal device. Each of the plurality of data packets includes a timestamp. The processing unit 610 is configured to: determine, based on the timestamp in each of the plurality of data packets, reference values of clock sources corresponding to the plurality of data packets; and determine, based on the reference values of the clock sources corresponding to the plurality of data packets, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00390] In a possible implementation method, the processing unit 610 is configured to determine, based on a quantity and/or types of heartbeat messages detected in one or more periodicities, the quantity of devices that access the terminal device by using the hotspot sharing technology. The heartbeat message is from the terminal device or the device that accesses the

terminal device by using the hotspot sharing technology.

[00391] In a possible implementation method, the processing unit 610 is configured to: obtain network traffic characteristic parameters corresponding to a plurality of data packets; and determine, based on the network traffic characteristic parameters, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00392] In a possible implementation method, the processing unit 610 is configured to: obtain a plurality of HTTP request messages, where the HTTP request message includes a device parameter; and determine, based on device parameters in the plurality of HTTP request messages, the quantity of devices that access the terminal device by using the hotspot sharing technology.

[00393] When the communication apparatus 600 is configured to implement the functions of the policy control network element in the embodiment of FIG. 2(b) or FIG. 4, the transceiver unit 620 is configured to send indication information to the user plane network element. The indication information indicates to send a changed quantity of devices to the policy control network element when a quantity of devices that access a terminal device by using a hotspot sharing technology changes. When the quantity of devices that access the terminal device by using the hotspot sharing technology changes from a first quantity to a second quantity, the second quantity is received from the user plane network element.

[00394] In a possible implementation method, the processing unit 610 is configured to determine a charging rule based on the second quantity. The transceiver unit 620 is configured to send the charging rule to the user plane network element.

[00395] In a possible implementation method, the processing unit 610 is configured to determine a control policy rule based on the second quantity. The transceiver unit 620 is configured to send the control policy rule to the user plane network element.

[00396] For more detailed descriptions about the processing unit 610 and the transceiver unit 620, directly refer to the related descriptions in the foregoing method embodiments. Details are not described herein again.

[00397] As shown in FIG. 7, the communication apparatus 700 includes a processor 710 and an interface circuit 720. The processor 710 and the interface circuit 720 are coupled to each other. It may be understood that the interface circuit 720 may be a transceiver or an input/output interface. Optionally, the communication apparatus 700 may further include a memory 730, configured to store instructions executed by the processor 710, input data required by the processor 710 to run the instructions, or data generated after the processor 710 runs the instructions.

[00398] When the communication apparatus 700 is configured to implement the foregoing method embodiments, the processor 710 is configured to implement the function of the processing unit 610, and the interface circuit 720 is configured to implement the function of the transceiver

unit 620.

[00399] It may be understood that, the processor in embodiments of this application may be a central processing unit (central processing unit, CPU), or may be another general-purpose processor, a digital signal processor (digital signal processor, DSP), an application-specific integrated circuit (application-specific integrated circuit, ASIC), a field programmable gate array (field programmable gate array, FPGA) or another programmable logic device, a transistor logic device, a hardware component, or any combination thereof. The general-purpose processor may be a microprocessor or any regular processor or the like.

[00400] A person of ordinary skill in the art may understand that various numbers such as first and second in this application are merely used for differentiation for ease of description, and are not intended to limit the scope of embodiments of this application or represent a sequence. The term "and/or" describes an association relationship for describing associated objects and represents that three relationships may exist. For example, A and/or B may represent the following three cases: Only A exists, both A and B exist, and only B exists. The character "/" generally indicates an "or" relationship between the associated objects. "At least one" means one or more. "At least two" means two or more. "At least one" or a similar expression thereof means any combination of the items, including any combination of one item (piece) or a plurality of items (pieces). For example, at least one item (piece) of a, b, or c may indicate: a, b, c, a and b, a and c, b and c, or a, b, and c, where a, b, and c may be singular or plural. "A plurality of" means two or more, and another quantifier is similar to this.

[00401] It should be understood that sequence numbers of the foregoing processes do not mean execution sequences in various embodiments of this application. The execution sequences of the processes should be determined based on functions and internal logic of the processes, and should not be construed as any limitation on the implementation processes of embodiments of this application.

[00402] It may be clearly understood by a person skilled in the art that, for the purpose of convenient and brief description, for a detailed working process of the foregoing system, apparatus, and unit, refer to a corresponding process in the foregoing method embodiments. Details are not described herein again.

[00403] A part or all of the foregoing embodiments may be implemented by using software, hardware, firmware, or any combination thereof. When the software is used for implementation, the part or all of the embodiments may be implemented in a form of a computer program product. The computer program product includes one or more computer instructions. When the computer program instructions are loaded and executed on the computer, the procedure or functions according to embodiments of this application are all or partially generated. The computer may be

a general-purpose computer, a dedicated computer, a computer network, or another programmable apparatus. The computer instructions may be stored in a computer-readable storage medium or may be transmitted from one computer-readable storage medium to another computer-readable storage medium. For example, the computer instructions may be transmitted from one website,
5 computer, server, or data center to another website, computer, server, or data center in a wired (for example, a coaxial cable, an optical fiber, or a digital subscriber line (digital subscriber line, DSL)) or wireless (for example, infrared, radio, or microwave) manner. The computer-readable storage medium may be any usable medium accessible by a computer, or a data storage device, such as a server or a data center, integrating one or more usable media. The usable medium may be a
10 magnetic medium (for example, a floppy disk, a hard disk drive, or a magnetic tape), an optical medium (for example, a digital versatile disc), a semiconductor medium (for example, a solid-state drive (solid-state drive, SSD)), or the like.

[00404] The various illustrative logical units and circuits described in embodiments of this application may implement or operate the described functions by using a general-purpose
15 processor, a digital signal processor, an application-specific integrated circuit, a field programmable gate array, another programmable logical apparatus, a discrete gate, transistor logic, a discrete hardware component, or a design of any combination thereof. The general-purpose processor may be a microprocessor. Optionally, the general-purpose processor may alternatively be any conventional processor, controller, microcontroller, or state machine. The processor may
20 also be implemented by a combination of computing apparatuses, such as a digital signal processor and a microprocessor, a plurality of microprocessors, one or more microprocessors with a digital signal processor core, or any other similar configuration.

[00405] Steps of the methods or algorithms described in embodiments of this application may be directly embedded into hardware, a software unit executed by a processor, or a combination
25 thereof. The software unit may be stored in a random access memory (Random Access Memory, RAM), a flash memory, a read-only memory (Read-Only Memory, ROM), an erasable programmable read-only memory (erasable programmable read-only memory, EPROM), a register, a hard disk drive, or a removable disk in any other form of storage medium in the art. For example, the storage medium may connect to a processor, so that the processor can read information from
30 the storage medium and write information into the storage medium. Optionally, the storage medium may alternatively be integrated into a processor. The processor and the storage medium may be disposed in an ASIC.

[00406] These computer program instructions may also be loaded onto a computer or another programmable data processing device, so that a series of operations and steps are performed on
35 the computer or the another programmable device, to generate computer-implemented processing.

Therefore, the instructions executed on the computer or the another programmable device provide steps for implementing a specific function in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[00407] For example, in one or more designs, the functions described in this application may be implemented by using hardware, software, firmware, or any combination thereof. If the software is used for implementation, these functions may be stored in a computer-readable medium or are transmitted to the computer-readable medium in a form of one or more instructions or pieces of code. The computer-readable medium includes a computer storage medium and a communication medium that enables a computer program to move from one place to another place. The storage media may be an available medium that may be accessed by any general or special computer. For example, the computer-readable medium may include but is not limited to a RAM, a ROM, another optical disc storage, a disk storage, another magnetic storage apparatus, or any other medium that may be used for bearing or storing program code, where the program code is in a form of instructions or a data structure or in a form that can be read by a general or special computer or a general-purpose or special processor. In addition, any connection may be appropriately defined as a computer-readable medium. For example, if software is transmitted from a website, a server, or another remote resource by using a coaxial cable, an optical fiber computer, a twisted pair, a digital subscriber line or in a wireless manner, such as infrared, radio, or microwave, the software is included in the defined computer-readable medium. The disk (disk) and the disc (disc) include a compact disk, a laser disk, an optical disc, a digital versatile disc, a floppy disk, and a Blu-ray disc. The disk generally copies data by a magnetic means, and the disc generally copies data optically by a laser means. The foregoing combination may also be included in the computer-readable medium.

[00408] A person skilled in the art should be aware that in the foregoing one or more examples, functions described in this application may be implemented by hardware, software, firmware, or any combination thereof. When the software is used for implementation, the foregoing functions may be stored in a computer-readable medium or are transmitted as one or more instructions or pieces of code in the computer-readable medium. The computer-readable medium includes a computer storage medium and a communication medium, where the communication medium includes any medium that enables a computer program to be transmitted from one place to another place. The storage medium may be any available medium accessible to a general-purpose or a dedicated computer.

[00409] In the foregoing specific implementations, the objectives, technical solutions, and beneficial effects of this application are further described in detail. It should be understood that the foregoing descriptions are merely specific implementations of this application, but are not intended

to limit the protection scope of this application. Any modification, equivalent replacement, improvement, or the like made based on the technical solutions of this application shall fall within the protection scope of this application. According to the foregoing descriptions of this specification in this application, technologies in the art may use or implement the content of this application. Any modification based on the disclosed content shall be considered definite in the art. The basic principles described in this application may be applied to other variations without departing from the essence and scope of this application. Therefore, the content disclosed in this application is not limited to the described embodiments and designs but may also be extended to a maximum scope that is consistent with the principles and disclosed new features of this application.

[00410] Although this application is described with reference to specific features and embodiments thereof, it is clear that various modifications and combinations may be made to them without departing from the spirit and scope of this application. Correspondingly, the specification and accompanying drawings are merely example description of this application defined by the accompanying claims, and are considered as any of or all modifications, variations, combinations or equivalents that cover the scope of this application. It is clear that a person skilled in the art can make various modifications and variations to this application without departing from the scope of this application. Therefore, this application is intended to cover these modifications and variations that are of this application provided that they fall within the scope of protection defined by the following claims and their equivalent technologies.

CLAIMS

What is claimed is:

1. A hotspot device management method, comprising:
receiving, by a user plane network element, indication information from a policy control
5 network element, wherein the indication information indicates to send a first event to the policy control network element when the first event occurs, and the first event is that a quantity of devices that access a terminal device by using a hotspot sharing technology is greater than or equal to a hotspot access threshold; and
when the first event occurs, sending, by the user plane network element, the first event to the
10 policy control network element.
2. The method according to claim 1, wherein the method further comprises:
receiving, by the user plane network element, the hotspot access threshold from the policy control network element; or
the indication information comprises the hotspot access threshold.
- 15 3. The method according to claim 1, wherein the method further comprises:
determining, by the user plane network element, the hotspot access threshold based on a service package of the terminal device; or
determining, by the user plane network element, the hotspot access threshold based on configuration information in the user plane network element.
- 20 4. The method according to any one of claims 1 to 3, wherein the method further comprises:
receiving, by the user plane network element, a first charging rule from the policy control network element, wherein the first charging rule is determined based on the first event; and
charging, by the user plane network element, the terminal device according to the first charging rule.
- 25 5. The method according to any one of claims 1 to 4, wherein the method further comprises:
receiving, by the user plane network element, a first control policy rule from the policy control network element, wherein the first control policy rule is determined based on the first event; and
controlling, by the user plane network element, the terminal device according to the first control policy rule.
- 30 6. The method according to any one of claims 1 to 5, wherein the method further comprises:
when a second event occurs, sending, by the user plane network element, the second event to the policy control network element, wherein the second event indicates that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than or equal to the hotspot access threshold.

7. The method according to claim 6, wherein the method further comprises:

receiving, by the user plane network element, a second charging rule from the policy control network element, wherein the second charging rule is determined based on the second event; and
charging, by the user plane network element, the terminal device according to the second
5 charging rule.

8. The method according to claim 6 or 7, wherein the method further comprises:

receiving, by the user plane network element, a second control policy rule from the policy control network element, wherein the second control policy rule is determined based on the second event; and

10 controlling, by the user plane network element, the terminal device according to the second control policy rule.

9. The method according to any one of claims 1 to 8, wherein the method further comprises:

receiving, by the user plane network element, a plurality of data packets from the terminal device, wherein each of the plurality of data packets comprises a timestamp;

15 determining, by the user plane network element based on the timestamp in each of the plurality of data packets, reference values of clock sources corresponding to the plurality of data packets; and

determining, by the user plane network element based on the reference values of the clock sources corresponding to the plurality of data packets, the quantity of devices that access the terminal device by using the hotspot sharing technology.
20

10. The method according to any one of claims 1 to 8, wherein the method further comprises:

determining, by the user plane network element based on a quantity and/or types of heartbeat messages detected in one or more periodicities, the quantity of devices that access the terminal device by using the hotspot sharing technology, wherein the heartbeat message is from the terminal device or the device that accesses the terminal device by using the hotspot sharing technology.
25

11. The method according to any one of claims 1 to 8, wherein the method further comprises:

obtaining, by the user plane network element, network traffic characteristic parameters corresponding to a plurality of data packets; and

determining, by the user plane network element based on the network traffic characteristic parameters, the quantity of devices that access the terminal device by using the hotspot sharing technology.
30

12. The method according to any one of claims 1 to 8, wherein the method further comprises:

obtaining, by the user plane network element, a plurality of hypertext transfer protocol HTTP request messages, wherein the HTTP request message comprises a device parameter; and

35 determining, by the user plane network element based on device parameters in the plurality

of HTTP request messages, the quantity of devices that access the terminal device by using the hotspot sharing technology.

13. A hotspot device management method, comprising:

5 sending, by a policy control network element, indication information to a user plane network element, wherein the indication information indicates to send a first event to the policy control network element when the first event occurs, and the first event is that a quantity of devices that access a terminal device by using a hotspot sharing technology is greater than or equal to a hotspot access threshold; and

10 when the first event occurs, receiving, by the policy control network element, the first event from the user plane network element.

14. The method according to claim 13, wherein the method further comprises:

sending, by the policy control network element, the hotspot access threshold to the user plane network element; or

the indication information comprises the hotspot access threshold.

15 15. The method according to claim 13 or 14, wherein the method further comprises:

determining, by the policy control network element, a first charging rule based on the first event, wherein the first charging rule is used for charging the terminal device; and

sending, by the policy control network element, the first charging rule to the user plane network element.

20 16. The method according to any one of claims 13 to 15, wherein the method further comprises:

determining, by the policy control network element, a first control policy rule based on the first event, wherein the first control policy rule is used for controlling the terminal device; and

25 sending, by the policy control network element, the first control policy rule to the user plane network element.

17. The method according to any one of claims 13 to 16, wherein the method further comprises:

30 receiving, by the policy control network element, a second event from the user plane network element, wherein the second event indicates that the quantity of devices that access the terminal device by using the hotspot sharing technology is less than or equal to the hotspot access threshold.

18. The method according to claim 17, wherein the method further comprises:

determining, by the policy control network element, a second charging rule based on the second event, wherein the second charging rule is used for charging the terminal device; and

35 sending, by the policy control network element, the second charging rule to the user plane network element.

19. The method according to claim 17 or 18, wherein the method further comprises:

determining, by the policy control network element, a second control policy rule based on the second event, wherein the second control policy rule is used for controlling the terminal device; and

5 sending, by the policy control network element, the second control policy rule to the user plane network element.

20. A hotspot device management method, comprising:

receiving, by a user plane network element, indication information from a policy control network element, wherein the indication information indicates to send a changed quantity of devices to the policy control network element when a quantity of devices that access a terminal device by using a hotspot sharing technology changes; and

when the quantity of devices that access the terminal device by using the hotspot sharing technology changes from a first quantity to a second quantity, sending, by the user plane network element, the second quantity to the policy control network element.

21. The method according to claim 20, wherein the method further comprises:

receiving, by the user plane network element, a charging rule from the policy control network element, wherein the charging rule is determined based on the second quantity; and

charging, by the user plane network element, the terminal device according to the charging rule.

22. The method according to claim 20 or 21, wherein the method further comprises:

receiving, by the user plane network element, a control policy rule from the policy control network element, wherein the control policy rule is determined based on the second quantity; and

controlling, by the user plane network element, the terminal device according to the control policy rule.

23. A hotspot device management method, comprising:

sending, by a policy control network element, indication information to a user plane network element, wherein the indication information indicates to send a changed quantity of devices to the policy control network element when a quantity of devices that access a terminal device by using a hotspot sharing technology changes; and

when the quantity of devices that access the terminal device by using the hotspot sharing technology changes from a first quantity to a second quantity, receiving, by the policy control network element, the second quantity from the user plane network element.

24. The method according to claim 23, wherein the method further comprises:

determining, by the policy control network element, a charging rule based on the second quantity, wherein the charging rule is used for charging the terminal device; and

sending, by the policy control network element, the charging rule to the user plane network element.

25. The method according to claim 23 or 24, wherein the method further comprises:

determining, by the policy control network element, a control policy rule based on the second
5 quantity, wherein the control policy rule is used for controlling the terminal device; and

sending, by the policy control network element, the control policy rule to the user plane network element.

26. A communication apparatus, comprising a processor and an interface circuit, wherein the interface circuit is configured to receive a signal from another communication apparatus other than
10 the communication apparatus and transmit the signal to the processor, or send a signal from the processor to another communication apparatus other than the communication apparatus, and the processor is configured to implement, by using a logical circuit or executing code instructions, the method according to any one of claims 1 to 12, the method according to any one of claims 13 to 19, the method according to any one of claims 20 to 22, or the method according to any one of
15 claims 23 to 25.

27. A computer program product, comprising a computer program, wherein when the computer program is executed by a communication apparatus, the method according to any one of claims 1 to 12, the method according to any one of claims 13 to 19, the method according to any one of claims 20 to 22, or the method according to any one of claims 23 to 25 is implemented.

28. A computer-readable storage medium, wherein the storage medium stores a computer program or instructions; and when the computer program or the instructions are executed by a communication apparatus, the method according to any one of claims 1 to 12, the method according to any one of claims 13 to 19, the method according to any one of claims 20 to 22, or the method according to any one of claims 23 to 25 is implemented.

29. A communication system, comprising a user plane network element configured to perform the method according to any one of claims 1 to 12, and a policy control network element configured to perform the method according to any one of claims 13 to 19.

30. A communication system, comprising a user plane network element configured to perform the method according to any one of claims 20 to 22, and a policy control network element
30 configured to perform the method according to any one of claims 23 to 25.