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45 METHOD AND SYSTEM FOR DIFFERENTIATING SUBSCRIBER

The present invention is applicable to the field of communications, and provides a method and a system for differentiating between subscribers. The method includes: acquiring, by a control plane node, information of a mobile virtual network operator subscribed by a subscriber; and differentiating, by the control plane node, between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber. In embodiments of the present invention, by acquiring information of a mobile virtual network operator subscribed by the subscriber, the subscriber and a real subscriber subscribing a network can be differentiated according to the information of the mobile virtual network operator subscribed by the subscriber, thus, when the network is congested, the real subscriber subscribing the network and a wholesale subscriber can be differentiated according to information configured by a user equipment above, thereby implementing differentiated control and processing of the two types of subscribers.

Acquiring, by a control plane node, information of a mobile virtual network operator subscribed by a subscriber

Differentiating, by the control plane node, between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber

FIG. 1
Description

[0001] This application claims priority to Chinese Patent Application No. 201210427847.9, filed on October 31, 2012 and entitled "METHOD AND SYSTEM FOR DIFFERENTIATING BETWEEN SUBSCRIBERS", which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates to the field of wireless communications, and in particular, to a method and a system for differentiating between a mobile virtual network operator subscriber and a real subscriber subscribing a network.

BACKGROUND

[0003] In 3GPP communication criteria, a mobile network supports FLEX function, that is, in an intra-domain (Intra-domain), one radio access network (English full name: Radio Access Network, abbreviated as RAN) node can be connected to multiple core network (English full name: Core Network, abbreviated as CN) nodes, while the multiple core network nodes connected to the radio access network node form a pool (pool). When a specific core network connected to the radio access network has a breakdown or carries too much traffic, it can be switched to other core network within the pool, thus a problem of single point failure can be solved and load balancing can be achieved, additionally, when a user equipment (English full name: User Equipment, abbreviated as UE) moves in areas covered by different core networks within the pool, it does not need a handover of the core network to which the user equipment is attached, and signaling interactions between core networks can be reduced.

[0004] Furthermore, the core networks connected to the access network node may belong to public land mobile networks (English full name: Public Land Mobile Network, abbreviated as PLMN) of different operators, that is, a network sharing function. A current standard supports two types of network sharing scenarios: a multi-operator core network (English full name: Multi-Operator Core Network, abbreviated as MOCN) and a gateway core network (English full name: Gateway Core Network, abbreviated as GWCN). As for the MOCN, a base station connects core network nodes of different PLMNs, but the core network nodes belong to specific operators, and sharing cannot be performed among the core network nodes; as for the GWCN, not only the wireless access network nodes are shared, core network operators also share the core network nodes.

[0005] Currently, a newly-emerging network sharing mode rises gradually, that is, an operator may not have a basic network (for example, not have a base station and a core network, also not have its own spectrum resources and PLMN ID information), which rents a basic network of a certain PLMN to provide its subscribers with service instead. Such kind of mode is called as a wholesale mode, which may also be called as a mobile virtual network operator (English full name: Mobile Virtual Network Operator, abbreviated as MVNO), and a subscriber which the mobile virtual network operator provides with the service is called as a wholesale subscriber or an MVNO subscriber. In this mode, the PLMN ID information provided by the mobile virtual network operator can only be PLMN ID information of the rented network.

[0006] Additionally, in the network sharing (MOCN, GWCN), a user equipment (English full name: User Equipment, abbreviated as UE) selects a network according to broadcasted different PLMN IDs, and transmits the selected PLMN information to the network, a mobility management entity (English full name: Mobility Management Entity, abbreviated as MME) and an SGSN transfer the PLMN information selected by the UE (i.e. the PLMN information which provides services to the UE currently) to nodes such as an SGW and a PGW in subsequent processing. In this case, the nodes in the network perceive, under the network sharing configuration, the PLMN ID information which provides services to the UE currently. The network can differentiate between UEs according to a currently serving PLMN ID, for example, in a case of limited network resources, access and service quality of some PLMN subscribers are restricted.

[0007] However, as for a wholesale subscriber in the wholesale mode and a real subscriber subscribing a network, since they have the same PLMN ID information, thus a control plane node cannot differentiate between the real subscriber subscribing the network and the wholesale subscriber so as to control the accessing quantity of MVNO subscribers, and control and regulate the access and service quality of the MVNO subscribers.

SUMMARY

[0008] Embodiments of the present invention provide a method for differentiating between subscribers to differentiate between a real subscriber subscribing a network and a wholesale subscriber, thereby implementing differentiated control and processing of the two types of subscribers.

[0009] In a first aspect, a method for differentiating between subscribers is provided, the method includes the steps of:

- acquiring information of a mobile virtual network operator subscribed by a subscriber; and
- differentiating between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0010] In a second aspect, a method for differentiating between subscribers is provided, the method includes the steps of:
In a third aspect, a method for differentiating between subscribers is provided, the method includes the steps of:

transmitting, by a home subscriber server, information of a mobile virtual network operator subscribed by the subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0011] In a third aspect, a method for differentiating between subscribers is provided, the method includes the steps of:

transmitting, by a user plane node, information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0012] In a fourth aspect, a method for differentiating between subscribers is provided, the method includes the steps of:

reporting, by a user equipment which is used by the subscriber, information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0013] In a fifth aspect, a control plane node device for differentiating between subscribers is provided, the device includes:

an acquiring unit, configured to acquire information of a mobile virtual network operator subscribed by a subscriber; and

differentiating unit, configured to differentiate between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0014] In a sixth aspect, a device for differentiating between subscribers is provided, the device includes a second transmitting module which is configured to transmit information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0015] In a seventh aspect, a device for differentiating between subscribers is provided, the device includes a third transmitting module which is configured to report information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0016] In an eighth aspect, a system for differentiating between subscribers is provided, the system includes a control plane node device for differentiating between the subscribers and a user plane node device and/or a user equipment which is used by a subscriber and/or a home subscriber server, the user plane node device and/or the user equipment which is used by the subscriber and/or the home subscriber server transmits information of a mobile virtual network operator subscribed by the subscriber to the control plane node device, the control plane node device acquires the information of the mobile virtual network operator subscribed by the subscriber, and differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber acquired.

[0017] In the technical solutions above, by acquiring information of a mobile virtual network operator MVNO/Partner subscribed by the subscriber, the subscriber and a real subscriber subscribing a network can be differentiated according to the information of the mobile virtual network operator MVNO/Partner subscribed by the subscriber, thus, when the network is congested, the real subscriber subscribing the network and a wholesale subscriber can be differentiated according to information configured by user equipments above, thereby implementing differentiated control and processing of the two types of subscribers.

BRIEF DESCRIPTION OF DRAWINGS

[0018] FIG. 1 is a schematic flow chart of a method for differentiating between subscribers according to a first embodiment of the present invention;

FIG. 2 is a schematic flow chart of a method for differentiating between subscribers according to a second embodiment of the present invention;

FIG. 3 is a block diagram of a device for differentiating between subscribers according to a third embodiment of the present invention;

FIG. 4 is a block diagram of another device for differentiating between subscribers according to a third embodiment of the present invention;

FIG. 5 is a schematic flow chart of an attachment of a UE to an EUTRAN according to a fourth embodiment of the present invention;

FIG. 6 is a schematic flow chart of an attachment of a UE to an UTRAN according to a fifth embodiment of the present invention;

FIG. 7 is a flow chart of mobility management and session management according to a sixth embodiment of the present invention;

FIG. 8 is a flow chart of a handover of a source ENB according to a sixth embodiment of the present invention;
FIG. 9 is a schematic flow chart of an access of a UE to a network in an EUTRAN according to a ninth embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0019] In order to make objectives, technical solutions, and advantages of the present invention more clearly, the present invention will be described hereunder in details with reference to accompanying drawings and embodiments. It should be understood that the specific embodiments described herein are only intended for interpreting the present invention, rather than limiting the present invention.

[0020] In embodiments of the present invention, after acquiring information of a mobile virtual network operator MVNO/Partner subscribed by a subscriber, a control plane node can differentiate between the subscriber and a real subscriber subscribing a network according to the network and a wholesale subscriber can be differentiated according to information configured by user equipments above, thereby implementing differentiated control and processing for the two types of subscribers.

First Embodiment

[0021] FIG. 1 is a schematic flow chart of implementing a method for differentiating between subscribers from a perspective of a control plane node device according to a first embodiment of the present invention, and details are as follows:

1. receiving, by the control plane node, information of a mobile virtual network operator MVNO/Partner subscribed by a subscriber.

2. acquiring, by the control plane node, information of the mobile virtual network operator subscribed by the subscriber from a home subscriber server, a mobile switching center, and a serving gateway (English full name: Mobile Switching Center, abbreviated as MSC), the user plane node includes one or more of a gateway GPRS support node (English full name: Gateway GPRS Support Node, abbreviated as GGSN), a serving gateway (English full name: Serving Gateway, abbreviated as S-GW) and a packet data network gateway (English full name: PDN Gateway, abbreviated as P-GW).

[0022] Specifically, the acquiring of the information of the mobile virtual network operator subscribed by the subscriber may be in a manner of:

1. receiving, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber is transmitted to the user plane node by the policy and charging rules function. The control plane node can acquire the information of the mobile virtual network operator subscribed by the subscriber from the user plane node via a create session response message or a create PDP context response message. Or,

3. receiving, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by a user equipment which is used by the subscriber, and implementa
tions thereof include: receiving, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by the user equipment via an access layer message transmitted by a base station, wherein, the access layer message is reported to the base station by the user equipment which is used by the subscriber.

[0023] In embodiments of the present invention, the control plane node includes one or more of a serving GPRS support node (English full name: Serving GPRS Support Node, abbreviated as SGSN), a mobility management entity (English full name: Mobility Management Entity, abbreviated as MME) and a mobile switching center (English full name: Mobile Switching Center, abbreviated as MSC), the user plane node includes one or more of a gateway GPRS support node (English full name: Gateway GPRS Support Node, abbreviated as GGSN), a serving gateway (English full name: Serving Gateway, abbreviated as S-GW) and a packet data network gateway (English full name: PDN Gateway, abbreviated as P-GW).

[0024] Herein, before acquiring the information, a step of configuring the information of the virtual network operator subscribed by the subscriber for the user equipment in advance may be included, which may be implemented by configuring the information of the mobile virtual network operator subscribed by the subscriber in a manner of object management architecture device manage (English full name: Object Management Architecture Device Manage, abbreviated as OMA DM) or subscriber identity module over-the-air technology (English full name: Subscriber Identity Module Over-the-Air Technology, abbreviated as SIM OTA), or, configuring the information of the mobile virtual network operator subscribed by the subscriber in a SIM card of the user equipment. After acquiring the information of the mobile virtual network operator subscribed by the subscriber, by carrying the information of the mobile virtual network operator...
subscribed by the subscriber in an access layer message and/or a non-access layer message, the user equipment transmits the information to the base station.

[0025] When acquiring the information of the mobile virtual network operator subscribed by the subscriber according to embodiments of the present invention, a step of selecting to acquire the information of the mobile virtual network operator subscribed by the subscriber from other control plane nodes may also be included, which is specifically: judging whether the control plane node is stored with the information of the mobile virtual network operator subscribed by the subscriber, if not, then acquiring, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber from other control plane nodes.

[0026] In step S102, differentiating, by the control plane node, between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0027] According to embodiments of the present invention, the information of the mobile virtual network operator subscribed by the subscriber is a specific mobile virtual network operator name or can be mapped into an index of the specific mobile virtual network operator name. The control plane node carries the information of the mobile virtual network operator subscribed by the subscriber via a context response message or a forward relocation request message.

[0028] In embodiments of the present invention, after acquiring information of the mobile virtual network operator MVNO/Partner subscribed by the subscriber, the subscriber and a real subscriber subscribing a network can be differentiated according to the information of the mobile virtual network operator MVNO/Partner subscribed by the subscriber, thus, when the network is congested, a control plane node can differentiate between the real subscriber subscribing the network and the wholesale subscriber according to information configured by user equipments above, thereby implementing differentiated control and processing of the two types of subscribers. As in optional embodiments of the present invention, a reliable operation of network can be better protected by releasing a part of MVNO/Partner subscribers or rejecting joining of a new MVNO/Partner subscriber.

Second Embodiment

[0029] FIG. 2 is a schematic flow chart of a method for differentiating between subscribers according to a second embodiment of the present invention, and details are as follows:

[0030] In step S201, acquiring, by a control plane node, information of a mobile virtual network operator subscribed by a subscriber.

[0031] In step S202, differentiating, by the control plane node, between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0032] Step S201 and step S202 are the same as the first embodiment, thus details will not be repeated herein.

[0033] Optionally, embodiments of the present invention can also include step S303, in which the control plane node transmits the information of the mobile virtual network operator subscribed by the subscriber to a user equipment, a base station or a user plane node.

[0034] Specifically, the control plane node transmits a create session request message or a create PDP context request message which includes the information of the mobile virtual network operator subscribed by the subscriber to the user plane node; and/or the control plane node transmits a message which includes the information of the mobile virtual network operator subscribed by the subscriber to the base station.

[0035] Furthermore, embodiments of the present invention can also include step S304, in which the control plane node controls access of the subscribers according to the differentiated subscribers, and which is specifically:

controlling, by the control plane node, the accessed quantity of mobile virtual network operator subscribers, or controlling accessed service quality of mobile virtual network operator subscribers; or in a case of network congestion, preferentially rejecting, by the control plane node, an access request of the mobile virtual network operator subscribers or, by the control plane node, releasing connections of the mobile virtual network operator subscribers; or making a distinction at the time of charging according to the mobile virtual network operator subscriber by the subscriber.

[0036] In embodiments of the present invention, after transmitting information of a mobile virtual network operator MVNO/Partner subscribed by a subscriber, a control plane node is enabled to differentiate subscribers according to the information of the mobile virtual network operator subscribed by the subscriber, so that the subscriber can be differentiated from a real subscriber subscribing a network. The present invention is further optimized by the control plane node transmitting the information of the mobile virtual network operator subscribed by the subscriber to a user equipment, a base station or a user plane node, thereby making it more efficiently and quickly when acquiring the information of the mobile virtual network operator subscribed by the subscriber later. Furthermore, by controlling the access of mobile virtual network subscribers, thus, when the network is congested, the control plane node can differentiate the mobile virtual network operator MVNO subscribers according to information configured by user equipments above, release a part of MVNO/Partner subscribers, and reject
Third Embodiment

[0037] FIG. 3 is a schematic structural diagram of a server device for differentiating between subscribers according to embodiments of the present invention, and details are as follows:

[0038] The server device for differentiating between subscribers according to embodiments of the present invention includes an acquiring unit 301 and a differentiating unit 302.

[0039] The acquiring unit 301 is configured to acquire information of a mobile virtual network operator subscribed by a subscriber.

[0040] The differentiating unit 302 is configured to differentiate between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

[0041] The acquiring unit 301 may include:

- a first acquiring sub-unit 3011, configured to receive the information of the mobile virtual network operator subscribed by the subscriber from a home subscriber server; or
- a second acquiring sub-unit 3012, configured to acquire the information of the mobile virtual network operator subscribed by the subscriber from a user plane node, wherein, the information of the mobile virtual network operator subscribed by the subscriber is transmitted to the user plane node by a policy and charging rules function after the policy and charging rules function acquires the information of the mobile virtual network operator subscribed by the subscriber from an SPR or a user data record (UDR); or
- a reporting sub-unit 3013, configured to receive the information of the mobile virtual network operator subscribed by the subscriber reported by a user equipment which is used by the subscriber.

[0042] The first acquiring sub-unit 3011 may be configured to receive the information of the mobile virtual network operator subscribed by the subscriber from the home subscriber server via a location update acknowledgement message or an insert subscriber data message.

[0043] The second acquiring sub-unit 3012 may be configured to acquire the information of the mobile virtual network operator subscribed by the subscriber from the user plane node via a access layer message transmitted by a base station, wherein, the access layer message is reported to the base station by the user equipment which is used by the subscriber.

[0044] The reporting sub-unit 3013 may be specifically configured to:

- receive, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by the user equipment which is used by the subscriber via an attachment request message or a routing area update request message or a tracking area update request message; or
- receive, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by the user equipment via an access layer message transmitted by a base station, wherein, the access layer message is reported to the base station by the user equipment which is used by the subscriber.

[0045] The acquiring unit 301 may include a judging and acquiring unit 3014 and a judging and acquiring sub-unit 3015.

[0046] The judging and acquiring unit 3014 is configured to judge whether the control plane node is stored with the information of the mobile virtual network operator subscribed by the subscriber, if not, then the control plane node acquires the information of the mobile virtual network operator subscribed by the subscriber from other control plane nodes.

[0047] The judging sub-unit 3015 is configured to judge whether the control plane node is stored with the information of the mobile virtual network operator subscribed by the subscriber, if not, then the control plane node acquires the information of the mobile virtual network operator subscribed by the subscriber from other control plane nodes.

[0048] Furthermore, the device may also include:

- a first transmitting unit 303, configured to transmit a create session request message or a create PDP context request message which includes the information of the mobile virtual network operator subscribed by the subscriber to a user plane node; and/or
- a second transmitting unit 304, configured to transmit a message which includes the information of the mobile virtual network operator subscribed by the subscriber to a user equipment; and/or
- a third transmitting unit 305, configured to transmit a message which includes the information of the mobile virtual network operator subscribed by the subscriber to a base station.

[0049] The control plane node carries the information of the mobile virtual network operator subscribed by the subscriber via a context response message or a forward relocation request message. The information of the mobile virtual network operator subscribed by the subscriber is a specific mobile virtual network operator name or can be mapped into an index of the specific mobile virtual network operator name.

[0050] Correspondingly, devices for differentiating between subscribers corresponding to a user plane node, a home subscriber server and a user equipment are described respectively as follows:
1. the home subscriber server: the device for differentiating between subscribers includes a first transmitting module which is configured to transmit information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber. The first transmitting module is specifically configured to transmit the information of the mobile virtual network operator subscribed by the subscriber to the control plane node via a location update acknowledgement message or an insert subscriber data message.

2. the user plane node: the device includes a second transmitting module which is configured to transmit information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber. The second transmitting module is specifically configured to acquire the information of the mobile virtual network operator subscribed by the subscriber from the user plane node via a create session response message or a create PDP context response message.

3. the user equipment: as shown in FIG. 4, the device includes a third transmitting module 401 which is configured to report information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber. The third transmitting module is specifically configured to:

- report the information of the mobile virtual network operator subscribed by the subscriber to the control plane node via an attachment request message or a routing area update request message or a tracking area update request message; or
- report the information of the mobile virtual network operator subscribed by the subscriber to the control plane node according to an access layer message transmitted by a base station, wherein, the access layer message is reported to the base station by the user equipment which is used by the subscriber.

[0051] The device also includes: a configuration information receiving module 402, configured to receive configuration information of the information of the virtual network operator subscribed by the subscriber. The configuration information receiving module is specifically configured to: receive the information of the mobile virtual network operator subscribed by the subscriber which is configured in a manner of open mobile architecture (OMA)-defined device manage or SIM card over-the-air, or, receive, by the user equipment which is used by the subscriber, the information of the mobile virtual network operator subscribed by the subscriber which is configured in an SIM card.

[0052] This embodiment is a product embodiment corresponding to the method for differentiating between subscribers according to the first embodiment and the second embodiment.

Fourth Embodiment

[0053] FIG. 5 is a schematic flow chart of an attachment of a UE to an EUTRAN according to the present invention, and details are as follows:

[0054] In step 501, selecting, by a UE, a proper PLMN according to information broadcast by a base station, and initiating an attachment process. The UE transmits an RRC message to an ENB, and the selected PLMN ID information and the attachment request NAS message are included therein. Under a configuration of the MVNO, since PLMN ID information of a virtual operator cannot be broadcast or the virtual operator does not have its own PLMN ID information, at this time the PLMN information selected by the UE is not information of a real virtual operator.

[0055] In step 502, transmitting, by the ENB, an S1AP message to an MME, wherein the selected PLMN ID and the attachment request NAS message are included.

[0056] In step 503, if it is a new MME, obtaining, by the MME, UE context information from an original MME.

[0057] In step 504, the MME may initiate a process of re-authentication.

[0058] In step 505, if the MME has original bearer context information, then initiating a bearer deletion to an S-GW and a PGW.

[0059] In step 506, transmitting, by the new MME, location update request information to an HSS.

[0060] In step 507, if the HSS has registration information of an original serving node, then initiating a location deletion to the original serving node.

[0061] In step 508, if the original serving node has bearing context information, then initiating a bearer deletion to the S-GW and the PGW.

[0062] In step 509, transmitting, by the HSS, a location update acknowledgement message to the new MME, wherein subscriber data information of the UE is included.

[0063] In step 510, initiating, by the MME, a bearer session establishment to the SGW and the PGW. The message includes the PLMN information selected by the UE, and the PLMN information selected by the UE is transferred to the SGW and the PGW. The information of
the mobile virtual network operator MVNO/Partner subscribed by the UE is also included in a create session request message which is transmitted by the MME to the S-GW and is transmitted by the S-GW to the PGW. After receiving this information, the S-GW and the PGW record it. During this process, in interactions between the PGW and the PCRF, the PGW may also transfer the information of the served mobile virtual network operator MVNO/Partner to the PCRF. The PGW may also transfer the information of the served MVNO/Partner to a charging system for charging.

In step 511, transmitting, by the MME, the S1AP message to the ENB, wherein an attachment accept NAS message and PLMN information selected by the UE (i.e. the PLMN information providing the UE with services currently) are included. Besides the information above, the MME also transfers the acquired information of the served mobile virtual network operator MVNO/Partner to the eNB. The attachment accept NAS message transmitted by the MME may also include the information of the served mobile virtual network operator MVNO/partner. After receiving the information, the ENB and the UE records it.

In step 512, transmitting, by the ENB, the RRC message to the UE, wherein an attachment accept message is included. The UE responds the RRC message to the eNB.

In step 513, transmitting, by the ENB, an S1AP response message to the MME.

In step 514, transmitting, by the UE, a direct transfer message to the ENB, wherein an attachment complete NAS message is included.

In step 515, transmitting, by the ENB, the attachment complete message to the MME.

In step 516, initiating, by the MME, a bearing session update to the S-GW and the PGW.

In this embodiment, UE subscriber data information includes information of a mobile virtual network operator MVNO/Partner subscribed by a subscriber, during an attachment process, the UE subscriber data information including such information is transmitted to an MME, and then transmitted to all network nodes by the MME, so that all control plane nodes can differentiate between an MVNO subscriber and a real home subscriber, and in a case of network congestion, corresponding adjustment and control work can be done to the MVNO subscriber timely and effectively.

Fifth Embodiment

FIG. 6 shows a schematic flow chart of an attachment of a UE to a GERAN and an UTRAN, and details are as follows:

Different from the first embodiment, this embodiment is not accompanied with a bearing establishment during the attachment process. Steps 601-606 in this embodiment and steps 501-S506 in the first embodiment are the same basically; the bearing context information in the first embodiment corresponds to packet data protocol context herein, and all the control plane nodes in the first embodiment are adjusted appropriately in this embodiment.

The difference lies in, in step 607, in a manner of issuing subscriber data from an HLR (home location register: Home Location Register) to an SGSN (serving GPRS support node), or "insert subscriber data (insert subscriber data)". If it is a joint attach process, the SGSN transmits a "location update request (location update Request)" to an MSC, and in a manner in which the MSC acquires the subscriber data is "insert subscriber data (insert subscriber data)".

After acquiring information of the served mobile virtual network operator MVNO/Partner from the subscriber data, the SGSN transfers this message to an MS (Mobile Station/Subscriber) via an NAS message "attach accept (attach accept)" message in step 611, and an lu/Gb message from the SGSN to an RNC/BSC may also carry the information of the served mobile virtual network operator MVNO/Partner.

During the process of subsequent bearing establishment, similar to Embodiment 1, a bearing establishment message which is transmitted to the GGSN by the SGSN, or which is transmitted to the S-GW by the SGSN, or which is transmitted to the PGW by the S-GW also carries the information of the served mobile virtual network operator MVNO/Partner acquired from the subscriber data.

Sixth Embodiment

FIG. 7 and FIG. 8 are flow charts of mobility management and session management after the attachment is completed according to a sixth embodiment of the present invention.

In step 701, initiating, by the user equipment UE, a TAU process, initiating, by the user equipment UE, a TAU request to the ENB, and transmitting, by the ENB, the TAU request to the mobility management entity MME.

In step 702, if the mobility management entity MME is a new MME, then it needs to request a context from an original MME node, and information of the mobile virtual network operator MVNO/partner subscribed by the user equipment UE is included in a context response message fed back by the original MME node.

In step 703, if the SGW changes, transmitting, by the MME, a create session request (create session request) message to the S-GW, wherein the create session request message includes the information of the mobile virtual network operator MVNO/partner subscribed by the UE.

In step 704, after acquiring the information of the MVNO/partner subscribed by the UE, transmitting, by the new MME, a TAU accept message to the UE, wherein the TAU accept message may include the information of the MVNO/partner subscribed by the UE.

Through the above steps, control plane nodes...
such as the new MME, the newly-changed S-GW and the UE are allowed to perceive the information of the MVNO/partner subscribed by the user equipment included, so that they can differentiate between an MVNO subscriber and a real subscriber subscribing a network.

[0082] A process of initiating an RAU in 2G/3G by the UE is similar to the above process, which will not be repeated herein.

[0083] Additionally, FIG. 8 is a flow chart of a handover according to a sixth embodiment of the present invention, and details are as follows:

[0084] In step 801, initiating, by a source eNB, a handover, and transmitting a handover request message to a source MME.

[0085] In step 802, transmitting, by the source MME, a forward relocation request (forward relocation request) to a target MME, wherein information of a mobile virtual network operator MVNO/partner subscribed by a UE needs to be included.

[0086] In step 803, after obtaining this information, issuing, by the target MME, a handover request message to a target eNB, wherein the handover request message includes the information of the mobile virtual network operator MVNO/partner subscribed by the UE.

[0087] In step 804, transmitting, by the target eNB, a handover request acknowledgement to the target MME.

[0088] In step 804, transmitting, by the target MME, a forward relocation response to the source MME.

[0089] In step 805, returning, by the source MME, a handover command to the source eNB.

[0090] The above steps can be completed after the network attachment process ends, and the information of the mobile virtual network operator MVNO/partner subscribed by the UE is acquired timely in subsequent mobility management and session management processes.

Seventh Embodiment

[0091] In this embodiment, the information of the MVNO/partner subscribed by the subscriber is issued to network entities such as PGW/GGSN/SGSN/MME/SGSN via PCRF during bearer establishment, rather than issued to MME/SGSN/MSC in a manner of subscriber data, then MME/SGSN network control entities issue the information to the UE via an NAS message, and issue to BSC/RNC/ENB via Gb (an interface between SGSN and BSC), Lu (an interface between SGSN and RNC) and S1AP (MME and eNB) interface messages, controlling control plane nodes record the received information of the mobile virtual network operator MVNO/partner subscribed by the subscriber.

[0092] During the handover establishment, the PCRF acquires the information of the MVNO/partner subscribed by the subscriber via an SPR and a UDR, and issues it to the PGW, the message may be IP-CAN session create or modify, the PGW transfers the information to the SGW via a create session response message, and the S-GW transfers the information to the MME via the create session response message. Processes of transferring to the UE and the ENB by the MME are similar to the first embodiment, which will not be repeated herein.

[0093] As for accesses to a GERAN and a UTRAN, during bearer establishment, PCRF may also issue information of an MVNO/partner subscribed by a subscriber, which will not be repeated herein.

Eighth Embodiment

[0094] This embodiment is a subsequent process after the user equipment UE receives the information of the MVNO/Partner subscribed by the subscriber as described in the embodiments above.

[0095] After the UE receives the information of the MVNO/Partner subscribed by the subscriber, in subsequent access processes, the RRC message may also carry the information of the mobile virtual network operator MVNO/Partner subscribed by the subscriber besides carrying a serving PLMN selected by the subscriber, in this case, BSC/Enb/RNC can perceive the information of the MVNO/Partner subscribed by the subscriber, when the network is congested, BSC/Enb/RNC may perform connection establishment reject or RRC connection establishment release according to the information of the MVNO/Partner subscribed by the subscriber.

Ninth Embodiment

[0096] FIG. 9 is a schematic flow chart of an access of a UE to a network in an EUTRAN according to a ninth embodiment of the present invention, and details are as follows:

[0097] Information of a mobile virtual network operator subscribed by a subscriber is configured for a user equipment in advance, which may be implemented by configuring the information of the mobile virtual network operator subscribed by the subscriber in a manner of OMA DM or SIM OTA, or configuring the information of the mobile virtual network operator subscribed by the subscriber in a SIM card of the user equipment. In subsequent access processes, the user equipment provides the network with the information of the mobile virtual network operator configured above.

[0098] In step 901, selecting, by a UE, a proper PLMN according to information broadcast by a base station, and initiating an attachment process. The UE transmits an RRC message to an ENB, and the selected PLMN ID information and an attachment request NAS message are included therein. The information of the mobile virtual network operator MVNO/partner subscribed by the subscriber is also included.

[0099] In step 902, transmitting, by the ENB, an S1AP message to an MME, wherein the selected PLMN ID and the attachment request NAS message are included. The information of the mobile virtual network operator MVNO/partner subscribed by the subscriber may also be included. A manner of acquiring the information of the
MVNO/Partner subscribed by the subscriber by the MME may also be the information being carried in the attachment request NAS message transmitted by the UE.

[0100] In step 903, if it is a new MME, obtaining, by the MME, UE context information from an original MME.

[0101] In step 904, the MME may initiate a process of re-authentication.

[0102] In step 905, if the MME has original bearing context information, then initiating a bearing deletion to an S-GW and a PGW.

[0103] In step 906, transmitting, by the new MME, location update request information to an HSS.

[0104] In step 907, if the HSS has original registration information, then initiating a location deletion to the original subscribed by node.

[0105] In step 908, if the original subscribed by node has bearing context information, then initiating a bearing deletion to the S-GW and the PGW.

[0106] In step 909, transmitting, by the HSS, a location update acknowledgement message to the new MME, wherein subscriber data information of the UE is included. Information including a subscribed mobile virtual network operator MVNO/Partner indicates a relationship between the subscriber and the MVNO/partner. This information may be a specific MVNO/Partner name, and may also be an index. This part of subscriber information may be included or may not be included. A purpose for including may be for verification, to verify whether the information of the mobile virtual network operator provided by the UE is correct.

[0107] In step 910, initiating, by the MME, a bearing session establishment to the SGW and the PGW. The message includes the PLMN information selected by the UE, and the PLMN information selected by the UE is transferred to the SGW and the PGW. The information of the mobile virtual network operator MVNO/Partner subscribed by the UE is also included in a create session request message which is transmitted by the MME to the S-GW and transmitted by the S-GW to the P-GW. After receiving this information, the S-GW and the P-GW record it. During this process, in interactions between the PGW and the PCRF, the PGW may also transfer the information of the subscribed mobile virtual network operator MVNO/Partner to the PCRF.

[0108] In step 911, transmitting, by the MME, the S1AP message to the ENB, wherein an attachment accept NAS message and PLMN information selected by the UE (i.e., PLMN information providing the UE with services currently) are included. Besides the information above, the MME may also transfer the acquired information of the subscribed mobile virtual network operator MVNO/Partner to the eNB.

[0109] In step 912, transmitting, by the ENB, the RRC message to the UE, wherein an attachment accept message is included. The UE responds the RRC message to the eNB.

[0110] In step 913, transmitting, by the ENB, an S1AP response message to the MME.

[0111] In step 914, transmitting, by the UE, a direct transfer message to the Enb, wherein an attachment complete NAS message is included.

[0112] In step 915, transmitting, by the ENB, the attachment complete message to the MME.

[0113] In step 916, initiating, by the MME, a bearer session update to the S-GW and the PGW.

[0114] A manner of an access of the UE to a GERAN/UTRAN is similar to the embodiments above, which will not be repeated herein.

[0115] After acquiring the information of the mobile virtual network operator MVNO subscribed by the subscriber, the user equipment transmits the information to a base station by carrying it in an access layer message and/or a non-access layer message.

[0116] After finishing differentiating between the subscribers, embodiments of the present invention may also include: controlling the accessed quantity of mobile virtual network operator subscribers according to the differentiated subscribers, or controlling access quality of mobile virtual network operator subscribers; or in a case of network congestion, preferentially rejecting an access request of the mobile virtual network operator subscribers or releasing connections of the mobile virtual network operator subscribers; or differentiating the mobile virtual network operator subscribers at the time of charging.

[0117] Additionally, embodiments of the present invention also provide a system for differentiating between subscribers, the system includes a control plane node device for differentiating between subscribers and a user plane node device and/or a user equipment which is used by the subscriber and/or a home subscriber server, the user plane node device and/or the user equipment which is used by the subscriber and/or the home subscriber server transmits information of a mobile virtual network operator subscribed by the subscriber to the control plane node device, the control plane node device acquires the information of the mobile virtual network operator subscribed by the subscriber, and differentiates between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber acquired.

[0118] In embodiments of the present invention, a manner of acquiring information of a mobile virtual network operator MVNO/Partner subscribed by a subscriber includes: including the information of the MVNO/Partner subscribed by the subscriber in subscriber data or including the information of the MVNO/Partner subscribed by the subscriber in an SPR or a UDR, or configuring the information of the MVNO/Partner subscribed by the subscriber on a user equipment in advance. A node in a network acquires the information of the MVNO/Partner subscribed by the subscriber by subscriber data issuing it or a subscriber reporting it so as to differentiate whether the subscriber is a real subscriber subscribing the network or an MVNO subscriber, and in a case of network congestion, preferentially rejecting an access request of
MVNO subscribers or release connections of MVNO subscribers, thereby controlling accessed quantity and service quality of the MVNO subscribers effectively.

[0119] The above are merely preferred embodiments of the present invention, and shall not be considered as a limitation to the present invention. Any amendment, equivalent replacement, and improvement within the spirit and the principle of the present invention shall fall within the protection scope of the present invention.

Claims

1. A method for differentiating between subscribers, comprising:

   acquiring, by a control plane node, information of a mobile virtual network operator subscribed by a subscriber; and
   differentiating, by the control plane node, between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

2. The method for differentiating between subscribers according to claim 1, wherein, the step of acquiring the information of the mobile virtual network operator subscribed by the subscriber comprises:

   receiving, by the control plane node, from a home subscriber server, the information of the mobile virtual network operator subscribed by the subscriber; or
   acquiring, by the control plane node, from a user plane node, the information of the mobile virtual network operator subscribed by the subscriber, wherein the information of the mobile virtual network operator subscribed by the subscriber is transmitted to the user plane node by a policy and charging rules function after the policy and charging rules function acquires the information of the mobile virtual network operator subscribed by the subscriber from a service processor (SPR) or a user data record (UDR); or
   receiving, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by a user equipment which is used by the subscriber.

3. The method for differentiating between subscribers according to claim 2, wherein, the receiving, by the control plane node, from the home subscriber server, the information of the mobile virtual network operator subscribed by the subscriber comprises:

   receiving, by the control plane node, from the home subscriber server, the information of the mobile virtual network operator subscribed by the subscriber via a location update acknowledgement message or an insert subscriber data message.

4. The method for differentiating between subscribers according to claim 2, wherein, the acquiring, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber comprises: acquiring, by the control plane node, from the user plane node, the information of the mobile virtual network operator subscribed by the subscriber via a create session response message or a create PDP context response message.

5. The method for differentiating between subscribers according to claim 2, wherein, the receiving, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by the user equipment which is used by the subscriber comprises:

   receiving, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by the user equipment via an attachment request message or a routing area update request message or a tracking area update request message; or
   receiving, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by the user equipment via an access layer message transmitted by a base station, wherein, the access layer message is reported to the base station by the user equipment which is used by the subscriber.

6. The method for differentiating between subscribers according to claim 1, wherein, the method further comprises:

   transmitting, by the control plane node, a create session request message or a create PDP context request message which comprises the information of the mobile virtual network operator subscribed by the subscriber to a user plane node; and/or
   transmitting, by the control plane node, a message which comprises the information of the mobile virtual network operator subscribed by the subscriber to a user equipment; and/or
   transmitting, by the control plane node, a message which comprises the information of the mobile virtual network operator subscribed by the subscriber to a base station.

7. The method for differentiating between subscribers
according to claim 1, wherein, the step of acquiring the information of the mobile virtual network operator subscribed by the subscriber comprises:

judging whether the control plane node is stored with the information of the mobile virtual network operator subscribed by the subscriber, if not, then acquiring, by the control plane node, from other control plane nodes, the information of the mobile virtual network operator subscribed by the subscriber.

8. The method for differentiating between subscribers according to any one of claims 1–7, wherein, the acquiring, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber comprises: acquiring, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber from a context response message or a forward relocation request message.

9. The method for differentiating between subscribers according to any one of claims 1–8, wherein, the information of the mobile virtual network operator subscribed by the subscriber is a mobile virtual network operator name or can be mapped into an index of the mobile virtual network operator name.

10. The method for differentiating between subscribers according to any one of claims 1–9, wherein, after the step of differentiating, by the control plane node, between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber, the method further comprises:

controlling, by the control plane node, an accessed quantity of mobile virtual network operator subscribers according to the differentiated subscriber, or controlling accessed service quality of mobile virtual network operator subscribers; or

in a case of network congestion, preferentially rejecting, by the control plane node, an access request of the mobile virtual network operator subscribers or releasing, by the control plane node, connections of the mobile virtual network operator subscribers.

11. A method for differentiating between subscribers, it is characterized in that the method comprises the following steps:

transmitting, by a home subscriber server, information of a mobile virtual network operator subscribed by the subscriber.

12. The method according to claim 11, wherein, the transmitting, by the home subscriber server, the information of the mobile virtual network operator subscribed by the subscriber to the control plane node comprises:

transmitting, by the home subscriber server, the information of the mobile virtual network operator subscribed by the subscriber to the control plane node via a location update acknowledgement message or an insert subscriber data message.

13. A method for differentiating between subscribers, it is characterized in that the method comprises the following steps:

transmitting, by a user plane node, information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

14. The method according to claim 13, wherein, the transmitting, by the user plane node, the information of the mobile virtual network operator subscribed by the subscriber to the control plane node comprises:

acquiring, by the control plane node, from the user plane node, the information of the mobile virtual network operator subscribed by the subscriber via a create session response message or a create PDP context response message.

15. A method for differentiating between subscribers, it is characterized in that the method comprises the following steps:

reporting, by a user equipment which is used by the subscriber, information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

16. The method according to claim 15, wherein, the reporting, by the user equipment which is used by the subscriber, the information of the mobile virtual network operator subscribed by the subscriber to the control plane node comprises:

reporting, by the user equipment of the subscrib-
er, the information of the mobile virtual network operator subscribed by the subscriber to the control plane node via an attachment request message or a routing area update request message or a tracking area update request message; or reporting, by the user equipment of the subscriber, the information of the mobile virtual network operator subscribed by the subscriber to the control plane node according to an access layer message transmitted by a base station, wherein, the access layer message is reported to the base station by the user equipment which is used by the subscriber.

17. The method for differentiating between subscribers according to claim 15, wherein, before the step of reporting, by the user equipment which is used by the subscriber, the information of the mobile virtual network operator subscribed by the subscriber to the control plane node, the method further comprises:

receiving, by the user equipment which is used by the subscriber, configuration information of the information of the virtual network operator subscribed by the subscriber.

18. The method for differentiating between subscribers according to claim 17, wherein, the step of receiving, by the user equipment which is used by the subscriber, the configuration information of the information of the virtual network operator subscribed by the subscriber specifically comprises:

receiving, by the user equipment which is used by the subscriber, the information of the mobile virtual network operator subscribed by the subscriber which is configured in a manner of open mobile architecture OMA-defined device manage or SIM card over-the-air, or, receiving, by the user equipment which is used by the subscriber, the information of the mobile virtual network operator subscribed by the subscriber which is configured in an SIM card.

19. The method according to any one of claims 11–18, wherein, the information of the mobile virtual network operator subscribed by the subscriber is a mobile virtual network operator name or can be mapped into an index of the mobile virtual network operator name.

20. A control plane node device for differentiating between subscribers, it is characterized in that the device comprises:

an acquiring unit, configured to acquire information of a mobile virtual network operator subscribed by a subscriber; and a differentiating unit, configured to differentiate between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

21. The device according to claim 20, wherein, the acquiring unit comprises:

a first acquiring sub-unit, configured to receive, from a home subscriber server, the information of the mobile virtual network operator subscribed by the subscriber; or a second acquiring sub-unit, configured to acquire, from a user plane node, the information of the mobile virtual network operator subscribed by the subscriber from an SPR or a user data record UDR; or a reporting sub-unit, configured to receive the information of the mobile virtual network operator subscribed by the subscriber reported by a user equipment which is used by the subscriber.

22. The device according to claim 21, wherein, the first acquiring sub-unit is specifically configured to receive, from the home subscriber server, the information of the mobile virtual network operator subscribed by the subscriber via a location update acknowledgement message or an insert subscriber data message.

23. The device according to claim 21, wherein, the second acquiring sub-unit is specifically configured to acquire, from the user plane node, the information of the mobile virtual network operator subscribed by the subscriber via a create session response message or a create PDP context response message.

24. The device according to claim 21, wherein, the reporting sub-unit is specifically configured to:

receive, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by the user equipment which is used by the subscriber via an attachment request message or a routing area update request message or a tracking area update request message; or
receive, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber reported by the user equipment via an access layer message trans-
mitted by a base station, wherein, the access layer message is reported to the base station by the user equipment which is used by the subscriber.

25. The device according to claim 20, wherein, the device further comprises:

(a) a first transmitting unit, configured to transmit a create session request message or a create PDP context request message which comprises the information of the mobile virtual network operator subscribed by the subscriber to a user plane node; and/or
(b) a second transmitting unit, configured to transmit a message which comprises the information of the mobile virtual network operator subscribed by the subscriber to a user equipment; and/or
(c) a third transmitting unit, configured to transmit a message which comprises the information of the mobile virtual network operator subscribed by the subscriber to a base station.

26. The device according to claim 20, wherein, the acquiring unit comprises:

(a) a judging and acquiring sub-unit, configured to judge whether the control plane node is stored with the information of the mobile virtual network operator subscribed by the subscriber, if not, then the control plane node acquires, from other control plane nodes, the information of the mobile virtual network operator subscribed by the subscriber.

27. The device according to any one of claims 20-26, wherein, the acquiring unit is specifically configured to: acquire the information of the mobile virtual network operator subscribed by the subscriber from a context response message or a forward relocation request message.

28. The device according to any one of claims 20-27, wherein, the information of the mobile virtual network operator subscribed by the subscriber acquired by the acquiring unit is a mobile virtual network operator name or can be mapped into an index of the mobile virtual network operator name.

29. A device for differentiating between subscribers, it is characterized in that the device comprises a first transmitting module which is configured to transmit the information of the mobile virtual network operator subscribed by the subscriber.

30. The device according to claim 29, wherein, the first transmitting module is specifically configured to transmit the information of the mobile virtual network operator subscribed by the subscriber to the control plane node via a location update acknowledgement message or an insert subscriber data message.

31. A device for differentiating between subscribers, it is characterized in that the device comprises a second transmitting module which is configured to transmit information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

32. The device according to claim 31, wherein, the second transmitting module is specifically configured to acquire, from a user plane node, the information of the mobile virtual network operator subscribed by the subscriber via a create session response message or a create PDP context response message.

33. A device for differentiating between subscribers, it is characterized in that the device comprises a third transmitting module which is configured to report information of a mobile virtual network operator subscribed by a subscriber to a control plane node, so that the control plane node differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber.

34. The device according to claim 33, wherein, the third transmitting module is specifically configured to:

report the information of the mobile virtual network operator subscribed by the subscriber to the control plane node via an attachment request message or a routing area update request message or a tracking area update request message; or
report the information of the mobile virtual network operator subscribed by the subscriber to the control plane node according to an access layer message transmitted by a base station, wherein, the access layer message is reported to the base station by a user equipment which is used by the subscriber.

35. The device according to claim 33, wherein, the device further comprises:

(a) a configuration information receiving module,
configured to receive configuration information of the information of the virtual network operator subscribed by the subscriber.

36. The device according to claim 35, wherein, the configuration information receiving module is specifically configured to: receive the information of the mobile virtual network operator subscribed by the subscriber which is configured in a manner of open mobile architecture OMA-defined device manage or SIM card over-the-air, or, receive, by a user equipment which is used by the subscriber, the information of the mobile virtual network operator subscribed by the subscriber which is configured in an SIM card.

37. A system for differentiating between subscribers, it is characterized in that the system comprises a control plane node device for differentiating between the subscribers and a user plane node device and/or a user equipment which is used by a subscriber and/or a home subscriber server, the user plane node device and/or the user equipment which is used by the subscriber and/or the home subscriber server transmits information of a mobile virtual network operator subscribed by the subscriber to the control plane node device, the control plane node device acquires the information of the mobile virtual network operator subscribed by the subscriber, and differentiates between the subscribers according to the information of the mobile virtual network operator subscribed by the subscriber acquired.
S101

Acquiring, by a control plane node, information of a mobile virtual network operator subscribed by a subscriber

S102

Differentiating, by the control plane node, between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber

FIG. 1

S201

Acquiring, by a control plane node, information of a mobile virtual network operator subscribed by a subscriber

S202

Differentiating, by the control plane node, between subscribers according to the information of the mobile virtual network operator subscribed by the subscriber

S203

Transmitting, by the control plane node, the information of the mobile virtual network operator subscribed by the subscriber to a user equipment, a base station or a user plane node

S204

Controlling, by the control plane node, access of the subscribers according to the differentiated subscribers

FIG. 2
FIG. 5
FIG. 6
FIG. 9
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

H04W 8/08 (2009.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: H04L; H04B; H04W; H04Q; H04M; H04H; G06F

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

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

EPDOC, WPI, IEEE, 3GPP, CNPAT, CNKE: client, mobile virtual network, operator, mobile management entity, recognize, distinguish, identify, user, subscriber, terminal, MVNO, belong, home, HLR, message, information, control plane, user plane, server, MME, report, sign, attach, context

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category *</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>X</td>
<td>CN 1852304 A (HUAWEI TECHNOLOGIES CO., LTD.), 25 October 2006 (25.10.2006), description, page 9, paragraph 2 to page 13, paragraph 2, and figures 3 and 4</td>
<td>1-37</td>
</tr>
<tr>
<td>A</td>
<td>CN 102630081 A (HUAWEI DEVICE CO., LTD.), 08 August 2012 (08.08.2012), the whole document</td>
<td>1-37</td>
</tr>
<tr>
<td>A</td>
<td>WO 2008/103394 A2 (ROAMWARE, INC. et al.), 28 August 2008 (28.08.2008), the whole document</td>
<td>1-37</td>
</tr>
</tbody>
</table>

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
   “A” document defining the general state of the art which is not considered to be of particular relevance
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   “X” document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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   “&” document member of the same patent family

Date of the actual completion of the international search
15 October 2013 (15.10.2013)

Date of mailing of the international search report
07 November 2013 (07.11.2013)

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## INTERNATIONAL SEARCH REPORT
### Information on patent family members

<table>
<thead>
<tr>
<th>Patent Documents referred in the Report</th>
<th>Publication Date</th>
<th>Patent Family</th>
<th>Publication Date</th>
</tr>
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<tbody>
<tr>
<td>CN 1852304 A</td>
<td>25.10.2006</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>CN 102630081 A</td>
<td>08.08.2012</td>
<td>WO 2013139283 A1</td>
<td>26.09.2013</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 2008127512 A2</td>
<td>23.10.2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2010144344 A1</td>
<td>10.06.2010</td>
</tr>
</tbody>
</table>

Form PCT/ISA/210 (patent family annex) (July 2009)
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

• CN 201210427847 [0001]