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(71) Applicant *(for all designated States except US)*: **TELEFONAKTIEBOLAGET LM ERICSSON (publ)** [SE/SE]; S-164 83 Stockholm (SE).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **MAHKONEN, Heikki** [FI/FI]; Toini Muonan Katu 8 B 26, FI-00560 Helsinki (FI). **JOKIKYYNY, Tony** [FI/FI]; Saniaistie 22 B 27, FI-00730 Helsinki (FI). **RINTA-AHO, Teemu** [FI/FI]; Yläkartanonkuja 3 B 18, FI-02360 Espoo (FI).

(74) Agent: **LIND, Robert**; Marks & Clerk LLP, 4220 Nash Court, Oxford Business Park South, Oxford Oxfordshire OX4 2RU (GB).

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(54) **Title**: FLOW MOBILITY FILTER RULE VERIFICATION

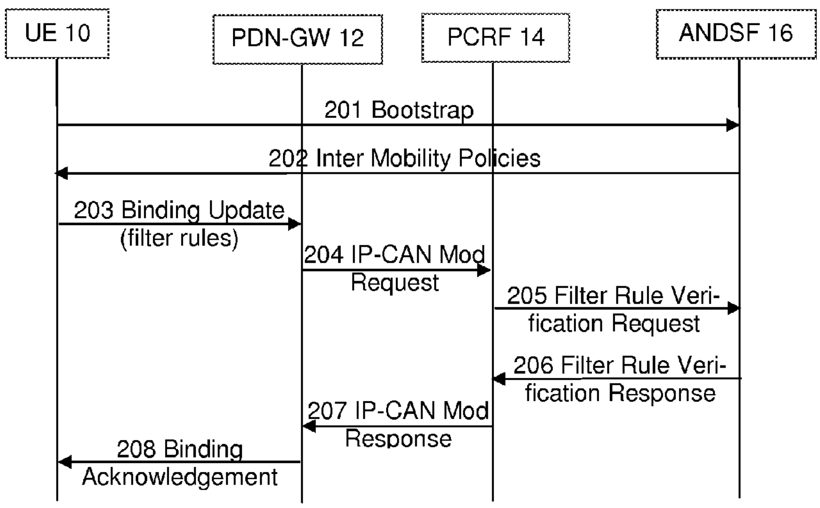

Figure 2b

(57) **Abstract**: In one aspect, a network node of a telecommunications packet network is configured to receive filter rules provided by a user entity, UE, relating to a requested IP-CAN session. The filter rules are applied by a Policy and Charging Control, PCC, network architecture for the session. The network node is also configured to compare the received filter rules with Inter Mobility Policies, IMPs, of the user so as to determine if the filter rules match with the user's IMPs, and to send a filter rule verification response indicating whether or not the filter rules match the user's IMPs. Other aspects include systems for and a method of verifying access filter rules relating to a requested IP-CAN session.

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FLOW MOBILITY FILTER RULE VERIFICATION

Field of the Invention

The present invention relates to a system and method for handling filter rules used to enable a user entity to initiate an IP Connectivity Access Network, IP-CAN session in a telecommunications packet network.

Background

With the increase in availability and use of services, such as IP multimedia services, that has occurred since third generation telecommunications networks were introduced, user entities (UEs) often require the use of multiple simultaneous accesses to such networks. This involves the UE requesting multiple simultaneous IP-CAN sessions. However, the networks and/or services often require, or make use of, different access technologies.

The Third Generation Project Partnership (3GPP) is standardizing an Evolved Packet Core (EPC) concept that will converge different access network technologies into a common core network. As part of this EPC architecture UEs can be provided with multiple Packet Data Network (PDN) connectivity capabilities so that the UE can use multiple access networks simultaneously. In addition, EPC will provide IP flow mobility, meaning that a UE can move active flows from one access network to another.

The most prominent global mobility protocol in the EPC network will be the Common Management Information Protocol, CMIP (Dual Stack Mobile IPv6, DSMIPv6) protocol. This will be used for non-3GPP accesses over the reference point S2c. 3GPP is also standardizing an Access Network Discovery and Selection Function (ANDSF), used to provide a UE with information about the access technologies that the UE is allowed to use, or should be using for particular applications, and access priorities. These are referred to as Inter Mobility Policies or IP Flow Policies, which can be accessed by the ANDSF, and include a list of accesses that the UE can use, which accesses the UE should be using for specific applications, and in which priority order. For example the Inter Mobility Policies may specify that all video application traffic should first use a Long Term Evolution, LTE, access and if LTE is not available then WLAN but never 2G or 3G accesses. These Inter Mobility Policies are high level policies that dictate what accesses the UE should use for particular application flows. To use the Inter Mobility

Policies, the UE needs to calculate filter rules from them and these filter rules are then installed into the network's Policy and Charging Control (PCC) architecture.

Current activities in 3GPP are ongoing to standardize the multi-PDN connectivity and IP flow mobility. As part of this activity, and as stated in 3GPP TS 23.261 ("IP flow mobility and seamless WLAN offload"), 3GPP will specify how filter rules, that are needed to route specific traffic flows via specified accesses, are installed into the EPC network by the UE. The UE will have the capability to send filter rules to its Home Agent (HA) that normally resides in the Packet Data Network Gateway (PDN-GW). These filter rules are either calculated by the UE from the Inter Mobility Policy set provided by the ANDSF, or by manual configuration. The HA will then forward these filter rules to the PCC architecture that will create an IP-CAN session based on the filter rule set.

According to the 3GPP Technical Specification, TS 23.261, the multi-PDN connectivity and IP flow mobility specified provides the UE with control as to what filter rules are installed for the UE in the core network at any given time. This means that, as currently specified, the UE is in charge of calculating the filter rules from the Inter Mobility Policies provided by the network operator, and the UE will send these rules inside CMIP signals to the network where they will be installed into the PCC architecture without any verification.

A problem with this arrangement is that because the UE has control over the filter rules, it can therefore control the behaviour of the core network by simply updating filter rules with CMIP signalling. Even though CMIP signalling is protected with the IPsec security protocol, there remains the possibility that attackers could set filter rules in the PCC architecture that consume resources from other users. Even bigger problems can arise with wrongly-configured and active UEs in the network. For example, a large number of poorly behaving UEs accessing the network could end up deteriorating the capabilities of the whole network by installing filter rules that are clearly wrong or totally contrary to the policies of the network operator. As the architecture is currently defined, no verification is required that the filter rules generated by the UE comply with the Inter Mobility Policies provided by the operator or the EPC network. There is no operator control over filter rules what so ever!

The present invention has been conceived with the foregoing in mind.

Summary of the Invention

According to a first aspect of the invention there is provided a network node of a telecommunications packet network. The network node is configured to receive filter rules provided by a user entity, UE, relating to a requested IP-CAN session. The filter rules are applied by a Policy and Charging Control, PCC, network architecture for the session. The network node is also configured to compare the received filter rules with Inter Mobility Policies, IMPs, of the user so as to determine if the filter rules match with the user's IMPs, and to send a filter rule verification response indicating whether or not the filter rules match the user's IMPs.

In embodiments, the user's IMPs may be stored in a database in the network, the node being configured to retrieve the user's IMPs from the database. The network node may be a Policy and Charging Rules Function, PCRF.

Alternatively, the filter rules may be provided in a verification request received from a PCRF over an interface between the network node and the PCRF. The network node may be a high level policy server, such as an Access Network Discovery and Selection Function, ANDSF. The network node may be configured to send the filter rule verification response to the PCRF over the interface.

According to a second aspect of the invention there is provided a system for verifying access filter rules relating to an IP-CAN session requested by a user entity, UE, of a telecommunications packet network. The filter rules are provided for application by a Policy and Charging Control, PCC, network architecture for the session. The system comprises: a Policy and Charging Rules Function, PCRF; a high level policy server; and a network interface between the PCRF and the high level policy server. The PCRF is configured, on receiving the access filter rules of the requested IP-CAN session, to send a filter rule verification request over the interface to the high level policy server. The high level policy server has access to the user's Inter Mobility Policies, IMPs, and is configured to compare the filter rules of the requested session with the user's IMPs, and to return to the PCRF a filter rule verification response indicating if the filter rules match the user's IMPs.

The high level policy server is an Access Network Discovery and Selection Function, ANDSF.

According to a third aspect of the invention there is provided a system for verifying access filter rules relating to an IP-CAN session requested by a user entity, UE, of a telecommunications packet network. The filter rules are provided for application by a Policy and Charging Control, PCC, network architecture for the session. The system comprises: a Policy and Charging Rules Function, PCRF; and a database storing the user's Inter Mobility Policies, IMPs. The PCRF is configured, on receiving the access filter rules of the requested IP-CAN session, to retrieve the user's IMPs from the database, to compare the filter rules of the requested session with the user's IMPs and to make a determination as to whether the filter rules match the user's IMPs.

In embodiments of the second or third aspect, the PCRF may be further configured, on determining that the filter rules match the user's IMPs, to forward the filter rules so that these can be installed in the PCC architecture and the requested session can proceed. The PCRF may be further configured, on determining that the filter rules do not match the user's IMPs, to provide an error indication for sending to the UE. The system may also comprise a network node having a reference point for exchanging messages with the UE, which is configured to provide an error code to the UE indicating that the filter rules do not match the user's IMPs.

According to a fourth aspect of the invention there is provided a method of verifying access filter rules relating to an IP-CAN session requested by a user of a telecommunications packet network. The filter rules are provided for application by a Policy and Charging Control, PCC, network architecture for the session. The method comprises: receiving the filter rules provided by the user; accessing Inter Mobility Policies, IMPs, of the user; comparing the received filter rules with the user's IMPs to determine if there is a match; and providing a filter rule verification response indicating whether or not the filter rules match the IMPs.

In embodiments the filter rules may be received at a Policy and Charging Rules Function, PCRF. The PCRF accesses the user's IMPs from a database in the network, makes the comparison to determine if there is match and provides the filter rule verification response.

Alternatively, the filter rules may be received at a Policy and Charging Rules Function, PCRF, which sends a filter rule verification request to a high-level policy server over an interface between the PCRF and the server. The high level policy server accesses the user's IMPs, makes the comparison to determine if there is a match, and provides the filter rule verification response to the PCRF over the interface.

In embodiments, if it is determined that the filter rules match the user's IMPs, the PCRF provides the filter rules for installation in the PCC architecture so that the requested session can proceed, and if it is determined that the filter rules do not match the user's IMPs, the PCRF provides an error indication for returning to the UE.

In embodiments, a network node having a reference point for exchanging messages with the UE, provides an error code to the UE when the filter rules do not match the user's IMPs.

It is an advantage that embodiments of these aspects allow control of multi-access mobility to be given back to the operator of the core network, and ensure that UEs follow the Inter Mobility Policies. This enables operators to optimise network resources. Implementation provides a significant improvement in the ability of the operator to control the resource usage at a small cost in terms of the changes that are required to existing network components.

Brief Description of the Drawings

Figures 1a and 1b are, respectively, a schematic illustration and associated signal flow diagram of a system as currently envisaged.

Figures 2a and 2b are, respectively, a schematic illustration and associated signal flow diagram of a system according to a first embodiment.

Figures 3a and 3b are, respectively, a schematic illustration and associated signal flow diagram of a system according to a second embodiment.

Figure 4 is a flow diagram illustrating methodology in operation of the first embodiment of Figures 2a and 2b.

Figure 5 is a flow diagram illustrating methodology in operation of the second embodiment of Figures 3a and 3b.

Detailed Description

Figures 1a and 1b show the filter rule setup process as currently specified in the 3GPP standard (see Mobile IPv6 Support for Dual Stack Hosts and Routers, Internet Engineering Task Force Request for Comments, IETF RFC 5555). A UE 10 attaches to the network by first sending a bootstrap message 101 to the EPC network entity, ANDSF 16, which provides, in a return message 102, a set of Inter Mobility Policies (or IP Flow Policies). These policies are a high level set of instructions as to how the UE 10 should access the network for certain types of applications and in given conditions (e.g. time of day, roaming scenarios, at certain cost etc.). Based on these policies, the UE 10 then determines its low level filter rules when it requests an IP-CAN session for a particular application flow at any given time.

These filter rules are sent inside a CMIP (DSMIPv6) Binding Update message 103 to the user's Home Agent (HA) in the PDN-GW 12. If CMIP is in use, as in the present illustration, the HA and the UE communicate with each other using Binding Update and Binding Acknowledgement messages. The filter rules are then forwarded in an IP-CAN Modification Request 104 to the Policy and Charging Rules Function (PCRF) 14, which ensures that session traffic coming downstream to the UE 10 is also routed through the correct access. The PCRF 14 returns an IP-CAN Modification Response 105. The HA in the PDN-GW 12 then initiates an IP-CAN session modification procedure in the PCC architecture to reserve the needed bandwidth (Quality of Service, QoS) for the new flow. If the IP-CAN session modification succeeds, the HA will inform the UE 10 in a Binding Acknowledgement message 106, with a status indication of “0”, indicating that it can start sending and receiving data through the access interface.

As discussed above, problems arise because the network operator has no control over the filter rules that are applied by the UE 10. One way to mitigate these problems is shown in Figures 2a and 2b, while an alternative is shown in Figures 3a and 3b.

To enable the operator to have control over the access selection and IP flow mobility in the EPC network, the network must have functionality to check that the filter rules conform to the Inter Mobility policies configured for the UE 10. This can be done by the ANDSF 16 if the policies are only stored in it, or by the PCRF if it can access the policies from, for example, a global database. Figure 2a shows schematically the entities and signals exchanged between them, while Figure 2b is the corresponding signal flow diagram. Equivalent entities carry the same reference numerals as used in Figures 1a and 1b. As shown in Figure 2a, when compared with Figure 1a a new interface reference point 18 is defined between the PCRF 14 and the ANDSF 16. This reference point allows the PCRF 14 to request verification by the ANDSF 16 of the filter rules sent by the UE 10 when it requests a new access.

As in the currently-specified procedure of Figures 1a and 1b, the UE 10 attaches to the network by sending a bootstrap message 201 to the ANDSF 16, which provides the Inter Mobility Policies in a return message 202. The UE sends a Binding Update message 203 to the PDN-GW 12, which includes the filter rules. The filter rules are then forwarded in an IP-CAN Modification Request 204 to the PCRF 14. Now, the PCRF sends a Filter Rule Verification Request 205 to the ANDSF over the new reference point 18. This includes an identification of the user and the received filter rules. The ANDSF 16, on receiving the Filter Rule Verification Request 205 is then configured to compare the filter rules with the user's Inter Mobility Policies to determine if there is a match. The ANDSF 16 sends a Filter Rule Verification Response 206, the content of which will depend on the results of its determination. Based on the Filter Rule Verification Response 206 received from the ANDSF 16, the PCRF 14 will then either deny the filter rules or put them into use. As shown in Figures 2a and 2b, this is done by way of the IP-CAN Modification Response 207 sent from the PCRF 14 to the PDN-GW 12, and a Binding Acknowledgement message 208 sent to the UE 10.

If the ANDSF 16 has determined that the filter rules match the Inter Mobility Policies, then, as in the current procedure shown in Figures 1a and 1b, the HA in the PDN-GW 12 initiates an IP-CAN session modification procedure in the PCC architecture to reserve the QoS for the new flow. If the IP-CAN session modification succeeds, the HA then informs the UE 10 in a Binding Acknowledgement message 208 with a “0” status indicating that it can start sending and receiving data through the access interface.

Alternatively, if the ANDSF has determined that the filter rules do not match the Inter Mobility Policies, then the IP-CAN Modification Response 207 sent from the PCRF 14 to the PDN-GW 12 will include an indication that the request is to be denied. In that case, the HA in the PDN-GW 12 will not initiate an IP-CAN modification procedure, but instead will notify the UE 10 that its request is being denied. This means that an EPC node, for example the PDN-GW 12, that has a reference point with the UE 10 (e.g. CMIP, Proxy Mobile IP - PMIP, GPRS Tunnelling Protocol -GTP, or other appropriate protocol) can signal the error to the UE 10. This might, for example, be included in the functionality of the HA, set up to provide appropriate error codes for this purpose in the Binding Acknowledgement message 208 sent to the UE 10.

In CMIP, a Binding Acknowledgement message includes a status indicator, which can contain error codes - in fact if the status of the Binding Acknowledgement is not zero, it is an error. Thus, a new error code value would be assigned to inform the UE 10 that the access has been denied due to filter rules that do not match the Inter Mobility Policies. Similarly, the Proxy Mobile IP PMIPv6 protocol uses Proxy Binding Update and Proxy Binding Acknowledgement (PBU and PBA) messages between a Mobile Access Gateway (MAG) and Local Mobility Anchor (LMA). PBA has a similar status field which is zero if everything is normal and non-zero if an error occurs.

Figures 3a and 3b illustrate an alternative system and method. Again equivalent entities carry the same reference numerals as in Figures 1a, 1b, 2a and 2b. Instead of providing a new reference point between the PCRF 14 and the ANDSF 16, the Inter Mobility Policies are stored in a global database, DB 20, which is accessible by both the PCRF 14 and the ANDSF 16. In this case the Inter Mobility Policies are not stored at the ANDSF 16, so instead, after the UE 10 has attached by sending a bootstrap message 301, the ANDSF 16 fetches, at steps 302 and 303, the Inter Mobility Policies from the DB 20, and provides these at step 304 to the UE 10. the UE 10, sends the filter rules in a Binding Update message 305 (as before), and these are forwarded in an IP-CAN Modification Request from the PDN-GW 12 to the PCRF 14 (as before). However, in this case the PCRF 14 is configured to carry out the verification procedure itself. To do this it fetches, at steps 307 and 308, the user's Inter Mobility Policies from the DB 20 and performs a comparison to see if there is a match with the filter rules sent by the UE 10. If there is a match, then, as in the current procedure shown in Figures 1a and 1b and in the previous embodiment shown in Figures 2a and 2b, an IP-CAN Modification Response 309 is sent from the PCRF 14 to the PDN-GW 12. The HA in the PDN-GW 12 then initiates an IP-CAN session modification procedure in the PCC architecture to reserve the QoS for the new flow, and provided the IP-CAN session modification succeeds, then informs the UE 10 by sending a Binding Acknowledgement message 310, with a "0" status indication. Alternatively, if the PCRF 14 determines that the filter rules do not match the Inter Mobility Policies, then the IP-CAN Modification Response 207 sent from the PCRF 14 to the PDN-GW 12 will include an indication that the request is to be denied. In that case, the HA in the PDN-GW 12 will not initiate an IP-CAN modification procedure, but instead will notify the UE 10 that its request is being denied by sending a status indicator with the appropriate error code in the Binding Acknowledgement message 310, as above.

Figure 4 shows the filter rule verification procedure for the embodiment of Figures 2a and 2b. The procedure is performed in the ANDSF 16. At step 401 the ANDSF 16 receives a Filter Rule Verification Request for a UE, which includes the UE's Filter Rules for the requested session (sent from the PCRF 14 over the new reference point 18). At step 402, the ANDSF 16 searches for the UE's Inter Mobility Policies. If the UE's policies are not found, the ANDSF 16 will send (step 405) a Filter Rule Verification Reply indicating an error, with a status of "Policy Not Found". If the Inter Mobility Policies are found, then at step 403 the ANDSF 16 compares these with the Filter Rules. At step 404, if the Filter Rules are found not to match (conform to) the Inter Mobility Policies, then the ANDSF 16 proceeds (step 406) to send a Filter Rule Verification Reply indicating an error, with a status of "Filter Rule Mismatch". If at step 404 the ANDSF 16 finds that the Filter Rules match the Inter Mobility Policies, then at step 407 it sends a Filter Rule Verification Reply indicating a status of "0", which acts as an instruction to the PCRF 14 to use these Filter Rules to set up the session. The process of how these rules are matched to the policies depends on the syntax of both the high level policies and the low level filter rules, but is a detail that is not important for an understanding of the principles. One possibility would be for the ANDSF 16 to produce a set of filter rules based on the Inter Mobility Policies of the UE and see if the received filter rules match with these.

Figure 5 shows the filter rule verification procedure for the embodiment of Figures 3a and 3b. Here, the filter rule verification procedure is performed by the PCRF 14. The procedure is similar to the flow diagram shown in Figure 4 and described above. The main differences are that the PCRF 14 acquires the policy information from the database DB 20, and it sends the verification reply status inside the IP-CAN Session Modification Response message to directly to the PDN-GW 12.

Thus, at step 501 the PCRF 14 receives a Filter Rule Verification Request for a UE, which includes the UE's Filter Rules for the requested session (sent from the PDN-GW 12). At step 502, the PCRF 14 fetches the UE's Inter Mobility Policies from the DB 20. At step 503, if the UE's policies are not found (i.e. not able to be provided by the DB 20), the PCRF 14 will send (step 506) an IP-CAN Session Modification Reply indicating an error, with a status of "Policy Not Found". If the Inter Mobility Policies are found, then at step 504 the PCRF 14 compares these with the Filter Rules. At step 505, if the Filter Rules are found not to match the Inter Mobility Policies, then the PCRF 14 proceeds (step 507) to send a IP-CAN Session Modification Reply indicating an error, with a status of "Filter Rule Mismatch". If at step 505 the PCRF 14 finds that the Filter Rules match the Inter Mobility Policies, then at step 508 it sends an IP-CAN Session Modification Reply indicating a status of "0" and proceeds to use these Filter Rules to set up the session.

It is clear that this embodiment requires processing resources in the PCRF node to perform the comparison between the filter rules and policies.

It will be readily apparent from the above, that the control of multi-access mobility is given back to the operator of the core network, as it will ensure that UEs follow the Inter Mobility Policies. This enables operators to optimise network resources, because, if UEs are able to set filter rules that are in contradiction to their Inter Mobility Policies, resource usage optimization of the network becomes impossible. Implementation brings a significant improvement in the ability of the operator to control the resource usage at a small cost in terms of the changes that are required to existing components.

CLAIMS:

1. A network node of a telecommunications packet network configured to:

receive filter rules provided by a user entity, UE, relating to a requested IP-CAN session, wherein the filter rules are applied by a Policy and Charging Control, PCC, network architecture for the session;

compare the received filter rules with Inter Mobility Policies, IMPs, of the user so as to determine if the filter rules match with the user's IMPs; and

send a filter rule verification response indicating whether or not the filter rules match the user's IMPs.

2. The network node of claim 1 wherein the user's IMPs are stored in a database in the network, the node being configured to retrieve the user's IMPs from the database.

3. The network node of claim 2 wherein the node is a Policy and Charging Rules Function.

4. The network node of claim 1 or claim 2 wherein the filter rules are provided in a verification request received from a PCRF over an interface between the network node and the PCRF.

5. The network node of claim 4 wherein the node is a high level policy server, such as an Access Network Discovery and Selection Function, ANDSF.

6. The network node of claim 4 or claim 5, configured to send the filter rule verification response to the PCRF over the interface.

7. A system for verifying access filter rules relating to an IP-CAN session requested by a user entity, UE, of a telecommunications packet network, wherein the filter rules are provided for application by a Policy and Charging Control, PCC, network architecture for the session, the system comprising:

a Policy and Charging Rules Function, PCRF;

a high level policy server; and

a network interface between the PCRF and the high level policy server, wherein the PCRF is configured, on receiving the access filter rules of the requested IP-CAN session, to send a filter rule verification request over the interface to the high level policy server, and

wherein the high level policy server has access to the user's Inter Mobility Policies, IMPs, and is configured to compare the filter rules of the requested session with the user's IMPs, and to return to the PCRF a filter rule verification response indicating if the filter rules match the user's IMPs.

8. The system of claim 7 wherein the high level policy server is an Access Network Discovery and Selection Function, ANDSF.

9. A system for verifying access filter rules relating to an IP-CAN session requested by a user entity, UE, of a telecommunications packet network, wherein the filter rules are provided for application by a Policy and Charging Control, PCC, network architecture for the session, the system comprising:

a Policy and Charging Rules Function, PCRF; and

a database storing the user's Inter Mobility Policies, IMPs;

wherein the PCRF is configured, on receiving the access filter rules of the requested IP-CAN session, to retrieve the user's IMPs from the database, to compare the filter rules of the requested session with the user's IMPs and to make a determination as to whether the filter rules match the user's IMPs.

10. The system of any of claims 7 to 9, wherein the PCRF is further configured, on determining that the filter rules match the user's IMPs, to forward the filter rules so that these can be installed in the PCC architecture and the requested session can proceed.

11. The system of any of claim 7 to 10, wherein the PCRF is further configured, on determining that the filter rules do not match the user's IMPs to provide an error indication for sending to the UE.

12. The system of any of claims 7 to 11, comprising a network node having a reference point for exchanging messages with the UE, which is configured to provide an error code to the UE indicating that the filter rules do not match the user's IMPs.

13. A method of verifying access filter rules relating to an IP-CAN session requested by a user of a telecommunications packet network, wherein the filter rules are provided for application by a Policy and Charging Control, PCC, network architecture for the session, the method comprising:

receiving the filter rules provided by the user;

accessing Inter Mobility Policies, IMPs, of the user;

comparing the received filter rules with the user's IMPs to determine if there is a match; and

providing a filter rule verification response indicating whether or not the filter rules match the IMPs.

14. The method of claim 13 wherein the filter rules are received at a Policy and Charging Rules Function, PCRF, the PCRF accesses the user's IMPs from a database in the network, makes the comparison to determine if there is match and provides the filter rule verification response.

15. The method of claim 13 wherein the filter rules are received at a Policy and Charging Rules Function, PCRF, which sends a filter rule verification request to a high-level policy server over an interface between the PCRF and the server, and wherein the high level policy server accesses the user's IMPs, makes the comparison to determine if there is a match, and provides the filter rule verification response to the PCRF over the interface.

16. The method of claim 14 or claim 15, wherein if it is determined that the filter rules match the user's IMPs, the PCRF provides the filter rules for installation in the PCC architecture so that the requested session can proceed, and wherein if it is determined that the filter rules do not match the user's IMPs, the PCRF provides an error indication for returning to the UE.

17. The method of any of claims 13 to 16, wherein an network node having a reference point for exchanging messages with the UE, provides an error code to the UE when the filter rules do not match the user's IMPs.

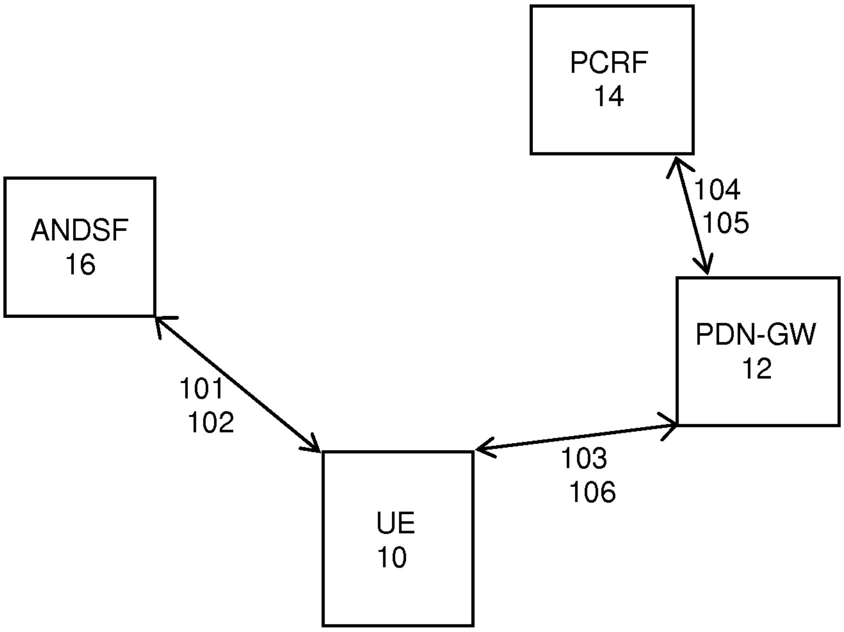

Figure 1a
(Prior Art)

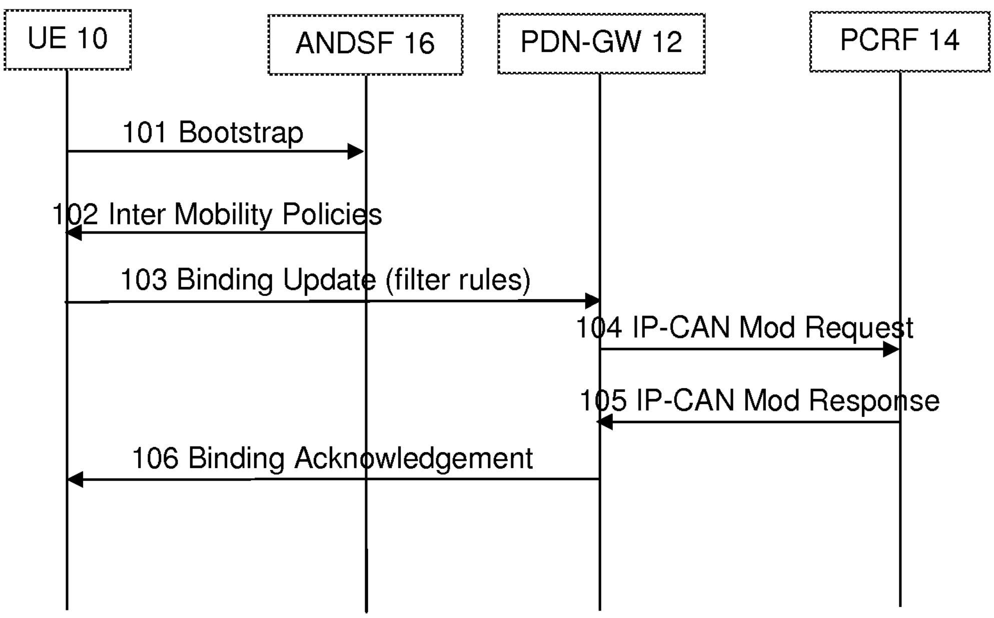

Figure 1b
(Prior Art)

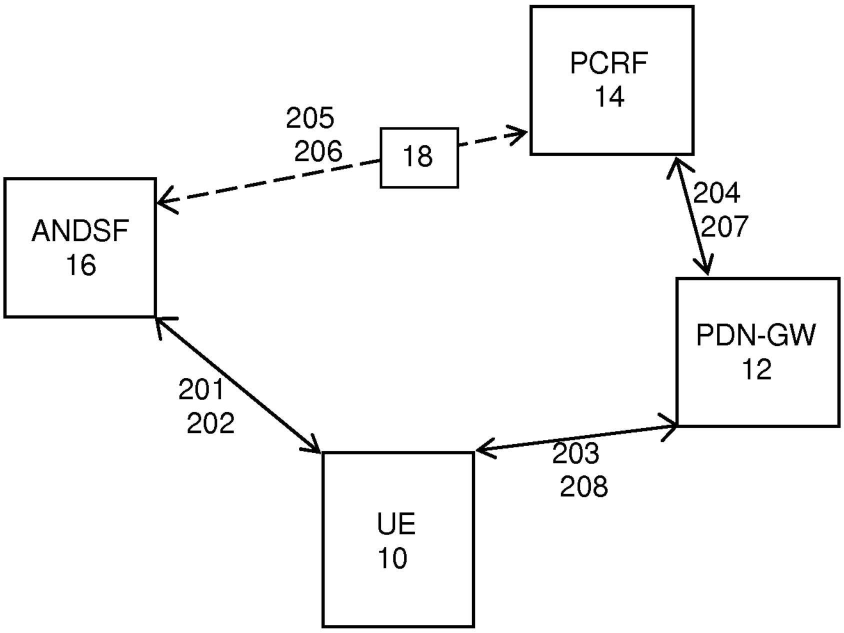

Figure 2a

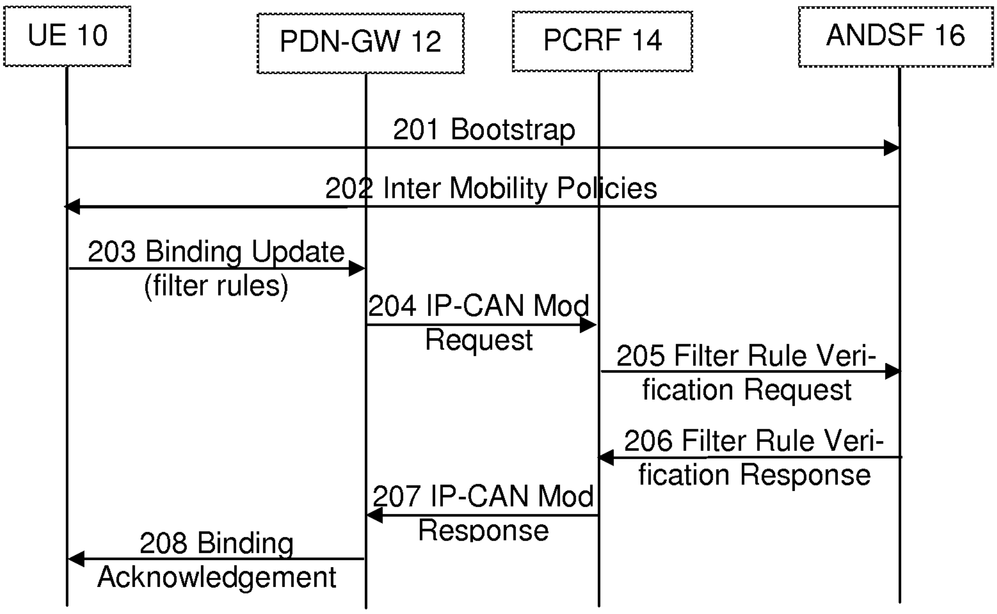

Figure 2b

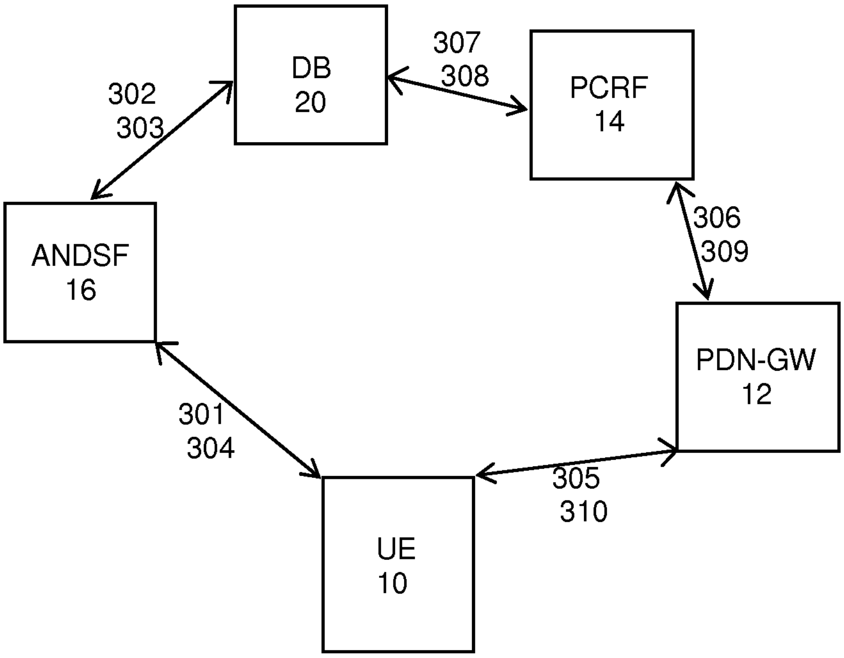

Figure 3a

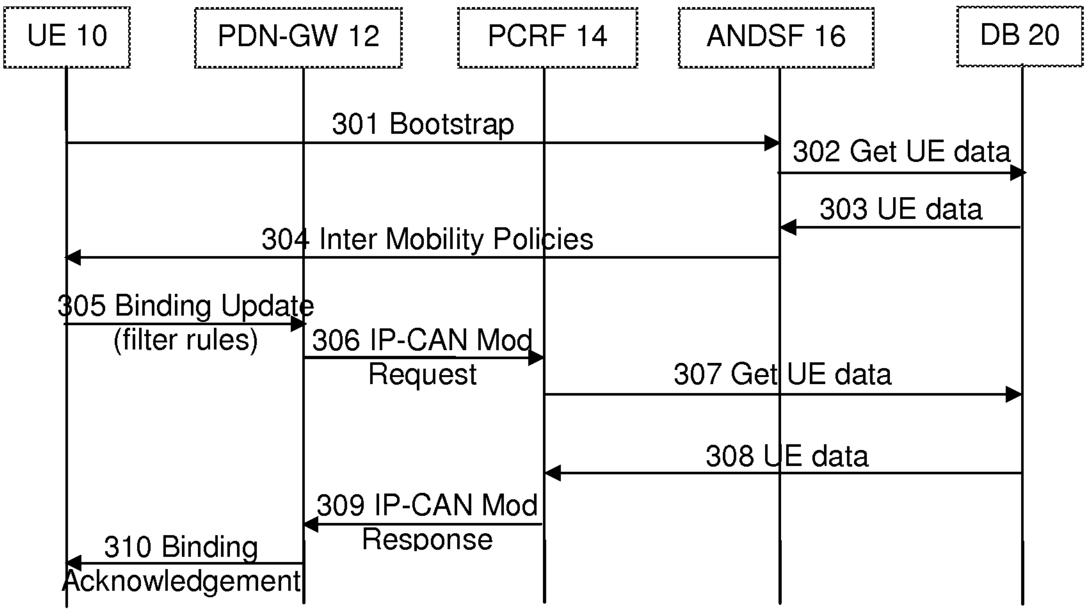

Figure 3b

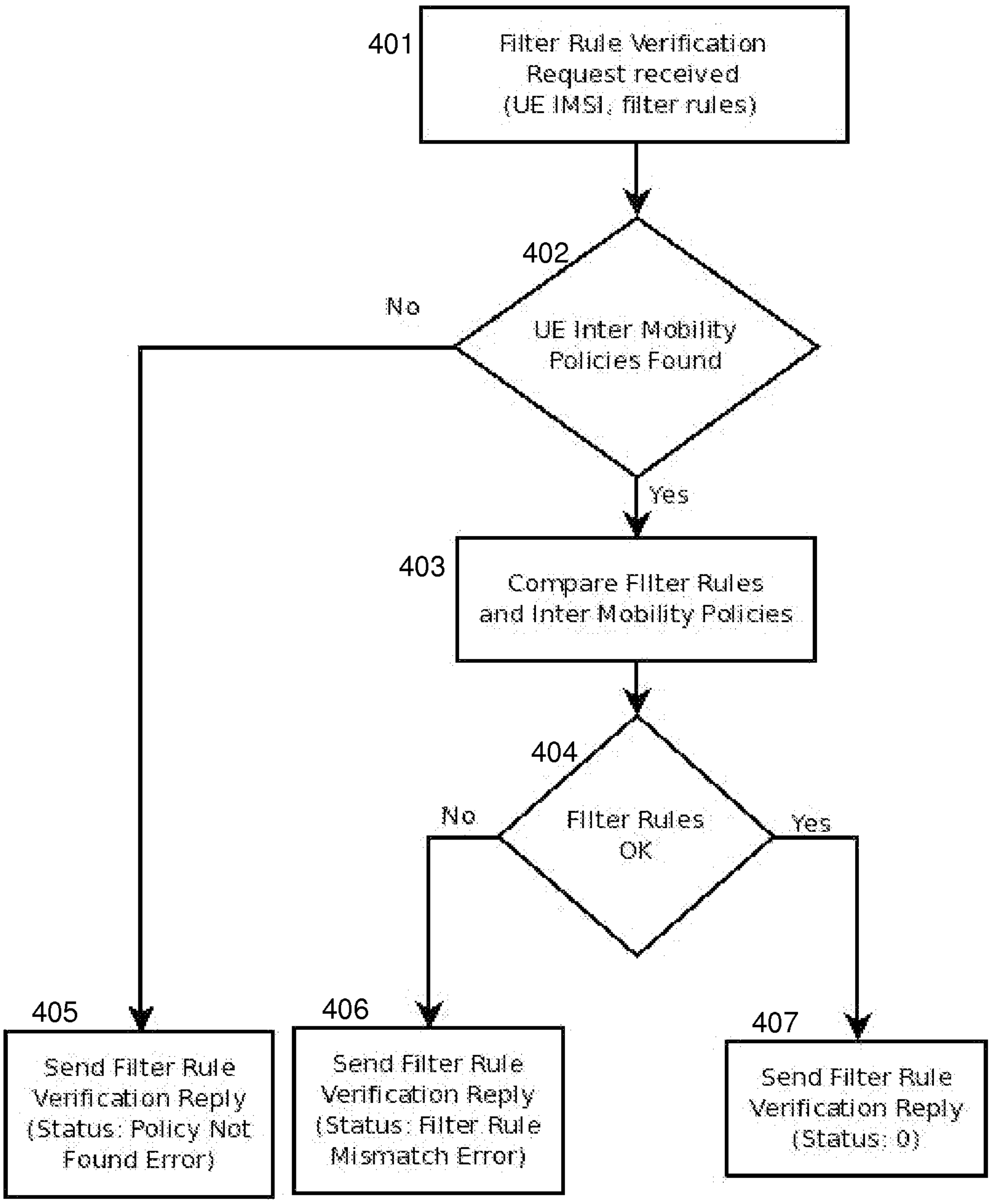
401
Filter Rule Verification
Request received
(UE IMSI, filter rules)
402
UE Inter Mobility
Policies Found
No
Yes
403
Compare Filter Rules
and Inter Mobility Policies
404
Filter Rules
OK
No
Yes
405
Send Filter Rule
Verification Reply
(Status: Policy Not
Found Error)
406
Send Filter Rule
Verification Reply
(Status: Filter Rule
Mismatch Error)
407
Send Filter Rule
Verification Reply
(Status: 0)

Figure 4

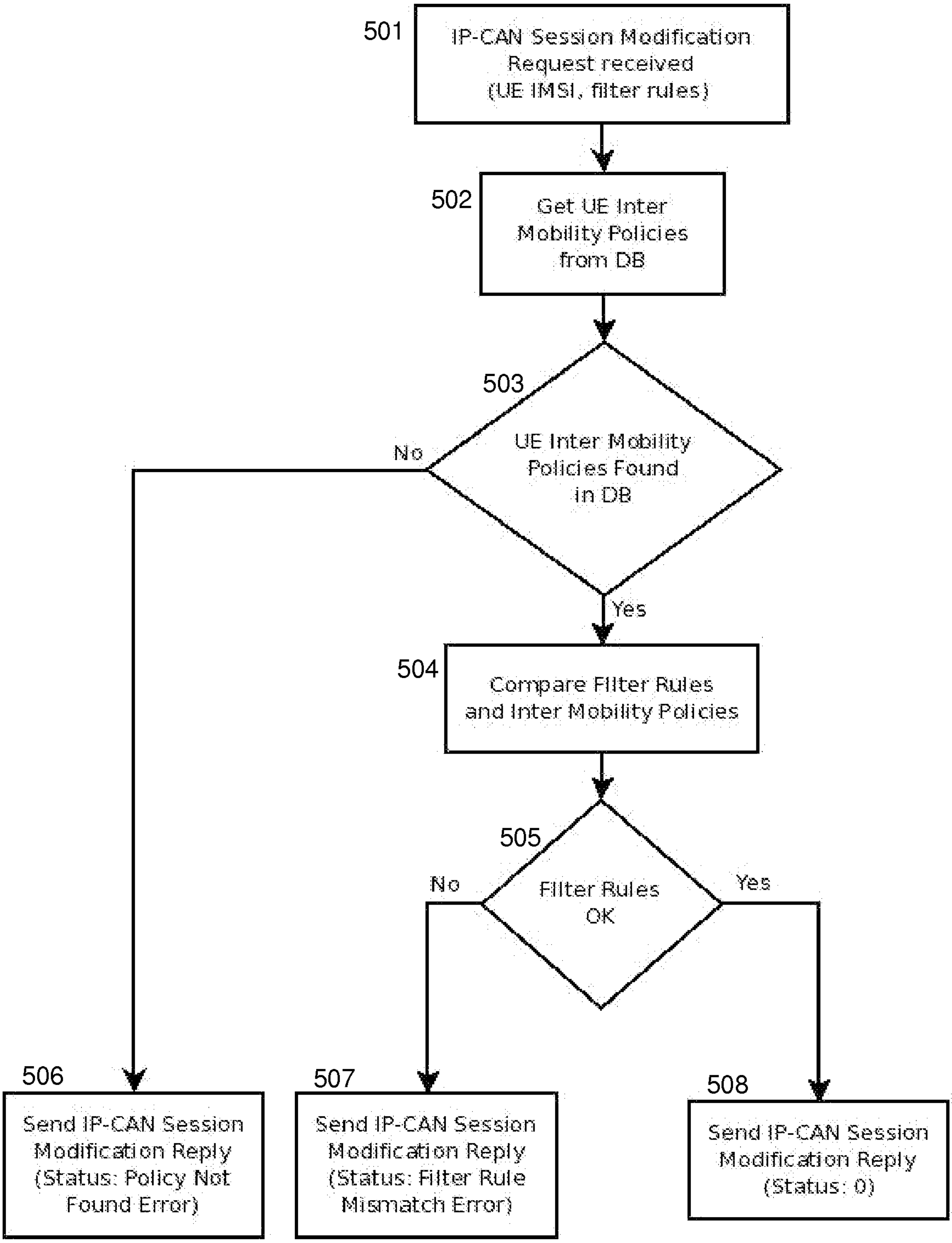
501
IP-CAN Session Modification Request received (UE IMSI, filter rules)
502
Get UE Inter Mobility Policies from DB
503
UE Inter Mobility Policies Found in DB
No
Yes
504
Compare Filter Rules and Inter Mobility Policies
505
Filter Rules OK
No
Yes
506
Send IP-CAN Session Modification Reply (Status: Policy Not Found Error)
507
Send IP-CAN Session Modification Reply (Status: Filter Rule Mismatch Error)
508
Send IP-CAN Session Modification Reply (Status: 0)

Figure 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/057441

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W12/12 H04L29/06
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W H04L

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; IP Flow Mobility and seamless WLAN offload; Stage 2 (Release 10)", 3GPP STANDARD; 3GPP TS 23.261, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, no. V1.1.0, 25 May 2010 (2010-05-25), pages 1-21, XP050441467, [retrieved on 2010-05-25] cited in the application paragraphs [04.3], [4.3.2], [5.4.3] figures 5.3.2-1, 5.4.3-1 -----	1-17

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[X] Further documents are listed in the continuation of Box C.

[X] 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

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 February 2011	14/02/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kesting, Christiane

2

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Policy and charging control architecture (Release 9)", 3GPP STANDARD; 3GPP TS 23.203, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, no. V9.4.0, 25 March 2010 (2010-03-25), pages 1-123, XP050402048, [retrieved on 2010-03-25] paragraphs [4.3.3], [6.1.1.3], [07.4] figures 5.1.1, 7.6 -----	1-17
A	US 2004/158618 A1 (SHAW VENSON M [US]) 12 August 2004 (2004-08-12) figures 8,9 paragraphs [0007], [0008], [0041], [0101], [0103] -----	1-17
A	ALCATEL-LUCENT: "Policy based terminal triggered, ANDSF decided access selection", 3GPP DRAFT; S2-081658_REVISION OF 1355_ANDSF DISCUSSION_V2, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. SA WG2, no. Athens; 20080216, 16 February 2008 (2008-02-16), XP050263998, [retrieved on 2008-02-16] pages 2,3,5; figures 2,3,5 -----	1-17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/057441

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004158618 A1	12-08-2004	US 2010323690 A1	23-12-2010