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(54) Title: A METHOD FOR MANAGING DATA FLOWS IN A MOBILE TELECOMMUNICATIONS SYSTEM

FIG 1
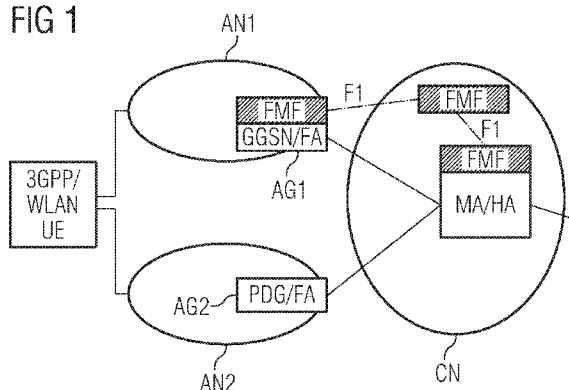
(57) Abstract: The invention relates to a method for managing data flows in a mobile telecommunications system having a plurality
of network nodes, wherein in dataflow from and/or to a user device (UE) can be transmitted between a core network (CN) and the user
device (UE) via different data links comprising links between the core network (CN) and one or more access networks (AN1, AN2,
AN3, AN4) and/or links within one or more access networks (AN1, AN2, AN3, AN4). A data flow information referring to rules (R)
concerning the data links to be used for specific data flows is provided in at least one flow management entity (FMF) assigned to a
network node through which data flows are transmitted. The data flow information is verified by a flow decision entity (FDF) based
on one or more policies (P) whereupon a verification result comprising confirmed and/or rejected rules (R) and/or confirmed and/or
rejected modifications of rules (R) is returned to the at least one flow management entity (FMF). Based on the verification result,
data flow filters are established by the at least one flow management entity (FMF), said data flow filters determining the data link to
be used for a data flow passing through the network node to which the at least one flow management entity (FMF) is assigned.

Description

A method for managing data flows in a mobile telecommunications system

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The invention relates to a method for managing data flows in a mobile telecommunications system as well as a method for data transmission in a mobile telecommunications system and a corresponding mobile telecommunications system.

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In newly developed mobile telecommunications system, especially in 3GPP (3rd Generation Partnership Project) mobile networks, an increasing number of heterogeneous access technologies are supported by those network structures. Those access technologies particularly comprise UMTS and/or GSM access networks (UTMS = Universal Mobile Telecommunications System; GSM = Global System for Mobile Communication) as well as new 3GPP access technologies like SAE/LTE radio access networks (SAE = System Architecture Evolution/LTE = Long Term Evolution). The user devices in mobile networks more and more support the possibility to access different radio access technologies, e.g. 3GPP technologies and also non 3GPP technologies like WLAN. Some user devices also enable a simultaneous access in parallel to different access networks to connect to the core network of the mobile telecommunications system. Hence, there is a need to efficiently use different access technologies and to provide seamless continuity of connectivity and services between those access technologies.

30   There are solutions in the prior art enabling the redirection of data flows transmitted via one access network to another access network, like Mobile IP. Nevertheless, the prior art solutions do not support a management of data flows on a flow-to-flow basis in dependence on certain criteria implemented in the network. Particularly, there is no solution for a scenario where a user of a user device maintaining a video data flow and a voice data flow via a UMTS access network can

only change the video data flow to a WLAN access network when moving into the range of a WLAN hot spot. In such a scenario, the video data stream would be changed to the WLAN network whereas the voice stream would not be affected at all. Fur-

5   thermore, when loosing the WLAN coverage, the network should be adapted to redirect the video data flow back to the UMTS access network.

According to the foregoing, it is an object of the invention

10   to provide a method for managing data flows in a mobile tele- communications system enabling a mechanism to automatically change the paths of data flows to and from and/or within one and more access networks in dependence on predefined criteria implemented in the network.

15

The method according to the invention manages data flows in a mobile telecommunications system having a plurality of net- work nodes, wherein a data flow from and/or to a user device can be transmitted between a core network and the user device

20   via different data links comprising links between the core network and one or more access networks and/or links within one and more access networks. Particularly, those access net- works are mobile access networks, and the user equipments are preferably, but not limited to, mobile devices like mobile

25   phones, laptops and the like.

According to the invention, data flow information referring to rules concerning the data links to be used for specific data flows is provided in at least one flow management entity

30   assigned to a network node through which data flows are transmitted. This data flow information is verified by a flow decision entity based on one or more policies whereupon a verification result comprising confirmed and/or rejected rules and/or confirmed and/or rejected modifications of rules

35   is returned to the at least one flow management entity. Based on the verification result, data flow filters are established by the at least one flow management entity, the data flow

filters determining the data to be used for a data flow pass-
ing through the network node to which the at least one flow
management entity is assigned.

5   According to the invention, two new entities are introduced
     in a mobile telecommunications system, namely a flow manage-
     ment entity and a flow decision entity. The flow management
     entity enables the implementation of rules on a flow-to-flow
     basis whereas the flow decision entity provides a mechanism
10   to confirm or reject rules based on policies. The invention
     thus enables an efficient mechanism to implement a change of
     data links to and from and within access networks by using
     rules and policies in the network. Therefore, a new flow-
     based management system is provided by the method according
15   to the invention.

     In a preferred embodiment, the at least one flow management
     entity and the flow decision entity communicate via a prede-
     fined interface which is called the F1 reference point in the
20   detailed description.

     In another embodiment of the invention, the interworking be-
     tween the at least one flow management entity and the flow
     decision entity is such that the flow management entity
25   transmits requests for adding and/or modifying and/or delet-
     ing rules based on the data flow information to the flow de-
     cision entity. The flow decision entity verifies those re-
     quests and returns confirmations and/or refusals with respect
     to those requests to the at least one flow management entity,
30   preferably via the above mentioned predefined interface.

     In another embodiment of the invention, default rules are
     used for establishing a data flow filter for a data flow to
     be transmitted in case that no other rule applies for the
35   data flow.

The rules used according to the invention may depend on various quantities. Particularly, the rules may depend on the availability and/or load of the access networks and/or on the data transmission fees or speeds of the access networks. Furthermore, the rules may depend on the content of the data flow to be transmitted, particularly whether voice data and/or video data and/or multimedia data are transmitted in the data flow. This enables a fine adjustment of the data flow with respect to its content. In a preferred embodiment, the rules include instructions to redirect a data flow via another access network when predetermined conditions are met.

The policies provided for verifying the rules may be input by various entities. Preferably, those policies are provided in the flow decision entity by at least one service provider, particularly a mobile access network provider, and/or at least one mobile network provider and/or at least one user of a user device. Hence, different requirements from different entities may be taken into account when establishing appropriate data flow filters.

In another preferred embodiment, the data flow information is provided in the at least one flow management entity by at least one service provider, particularly a mobile access network provider and/or at least one network entity and/or at least one mobile network operator and/or at least one user of a user device. Hence, rules from different units in the network may be provided in the flow management entity.

Preferably, at least one flow decision entity located in the core network is used in the method of the invention. This entity communicates with one or more flow management entities.

Preferred locations for the flow management entity in the network is a gateway of an access network providing access to the core network and/or a mobility anchor providing mobility functionality to enable a user device to seamlessly change

the access network. A preferred location for the flow deci-
sion entity is a mobility anchor. However, the flow decision
entity may also be a separate entity in the core network not
belonging to another entity.

5

The access networks in the mobile telecommunications system
in which the method of the invention is implemented are par-
ticularly one or more 3GPP access networks, e.g. at least one
UMTS access network and/or at least one GSM access network

10   and/or at least one SAE/LTE access network. However, also non
3GPP access networks may be used, particularly at least one
WLAN access network.

The aforementioned method for managing data flows is prefera-

15   bly implemented in a method for transmitting data flows in a
mobile telecommunications system. In such a transmission
method, data flows which are transmitted via at least one
network node to which a flow management entity is assigned
are forwarded according to the data flow filters established

20   by the flow management entity.

Besides the above method, the invention also relates to a mo-
bile telecommunications system having a plurality of network
nodes, wherein a data flow from and/or to a user device can

25   be transmitted between a core network and the user device via
different data links comprising links between the core net-
work and one or more access networks and/or links within one
or more access networks, wherein the access networks are
preferably mobile access networks. This mobile telecommunica-

30   tions system comprises the following components:
-     at least one flow management entity assigned to a net-
      work node through which data flows are transmitted, the
      at least one flow management entity storing data flow
      information referring to rules concerning the data links

35   to be used for specific data flows;
-     a flow decision entity for verifying the data flow in-
      formation stored in the at least one flow management en-

tity based on one or more policies and for returning a
verification result comprising confirmed and/or rejected
rules and/or confirmed and/or rejected modifications of
rules to the at least one flow management entity.

5   In such a telecommunications system, the at least one flow
management entity has means to establish data flow filters
based on the verification result, said data flow filters de-
termining the data link to be used for a data flow passing
through the network node to which the at least one flow man-
10   agement entity is assigned.

Preferably, the above mobile telecommunications system is
adapted to perform any of the above described variants of the
method according to the invention.
15
Embodiments of the invention will now be described in detail
with respect to the accompanying drawings, wherein:

Fig. 1   is a schematic view of a first embodiment of a mo-
20   bile telecommunications system implementing the
           method according to the invention;

Fig. 2   is a schematic illustration of the interaction be-
           tween a flow management entity and a flow decision
25   entity according to the invention; and

Fig. 3   is a schematic view of another embodiment of a mo-
           bile telecommunications system implementing the
           method according to the invention.
30
Fig. 1 shows a mobile telecommunications system comprising a
common core domain network CN which can be accessed by dif-
ferent heterogeneous mobile access networks. In Fig. 1, a
first mobile access network AN1 and a second mobile access
35   network AN2 are shown. The mobile access network AN1 is a
3GPP network in the form of a GPRS packet domain network
(GPRS = General Packet Radio Service). This network has an

access gateway in the form of a GGSN (GGSN = Gateway GPRS
Support Node). The second mobile access network AN2 is a non
3GPP WLAN access network (WLAN = Wireless Local Area Network)
having an access gateway AG2 in the form of a packet data

5   gateway PDG. Both gateways AG1 and AG2 enable a data trans-
mission between the respective access networks and the common
core network CN. Fig. 1 further shows a user device in the
form of an user equipment UE, e.g. a mobile phone, having
3GPP and WLAN functionality, i.e. the user equipment UE has

10 two interfaces so that it can attach simultaneously to both
access networks AN1 and AN2. The network of Fig. 1 includes a
mobility mechanism based on Mobile IP version 4 with corre-
sponding locations of home agents HA and foreign agents FA
for the user equipment UE. In Fig. 1, the function of the

15 home agent HA is implemented in a so-called mobility anchor
MA in the core network CN. The user equipment UE is attached
to both foreign networks AN1 and AN2 wherein the GGSN of the
3GPP network AN1 forms one foreign agent FA and the packet
data gateway of the WLAN network AN2 forms another foreign

20 agent FA. The mobility mechanism of Mobile IPv4 is well known
in the art and will not be described here in detail.

According to the invention, it is possible to implement flow-
based rules enabling the forwarding of data flows to the ac-

25 cess network AN1 or AN2 according to a certain criteria. To
do so, a flow decision entity in the form of a flow-based ac-
cess management decision function FDF and two flow management
entities in the form of flow management functions FMF are im-
plemented in the network of Fig. 1. The flow-based access

30 management decision function is located in the common core
network CN and is shown as a separate entity in Fig. 1. How-
ever, this entity needs not be separated from the mobility
anchor MA but may form a part of this anchor. In the flow-
based access management decision function FDF several poli-

35 cies are stored, said policies being used in order to verify
corresponding rules for forwarding data flows. The decision
function FDF communicates via two interfaces in the form of

reference points F1 with an FMF integrated in the access
gateway AG1 of the GPRS access network AN1 and with an FMF
integrated in the mobility anchor MA. In those FMFs, the cor-
responding rules for forwarding data flows are provided and
5   corresponding requests for verifying those rules are trans-
mitted to the common FDF. The FDF verifies those rules based
on the stored policies and confirms or refuses the rules by
sending messages back to the FMFs. A detailed description of
the interworking between the FMFs and the FDF will be given
10 with respect to Fig. 2.

Due to the use of the new components FDF, FMF and the refer-
ence point F1, a flow-based mechanism for forwarding data
packets via different links from and to the access networks
15 and/or within the access networks is established. For for-
warding data packets arriving at the mobility anchor MA and
destined to the user equipment UE, well-known filters defined
for Mobile IP may be used. Those filters may be based on IP
source/destination addresses and port numbers. This mechanism
20 is sufficient when using e.g. a streaming protocol like RTP
(RTP = Real Time Protocol) which separates individual flows
by means of different port numbers.

In the GPRS access network AN1, flows may be separated by us-
25 ing the well-known mechanism of TFTs (TFT = Traffic Flow Tem-
plate). This mechanism is used to direct packets addressed to
the same PDP address (PDP = Packet Data Protocol) to differ-
ent secondary PDF contexts. E.g., when a user having a user
equipment being attached to the access network AN1 starts a
30 multimedia communication, the multimedia application may ac-
tivate a secondary PDP context suitable for video streaming.
When the voice and video packets arrive at the GGSN of the
access network AN1, all packets have the same destination IP
address. The TFT-mechanism allows other aspects, particularly
35 the source address, the port number, the flow label and so
on, to be used to assign the arriving packets to the correct
PDP contexts and hence to the correct QoS (QoS = Quality of

Service). Particularly, the source address and the source
port number may be used in the described scenario to differ-
entiate between different flows. Of course, appropriate soft-
ware has to be available at the user equipment UE to perform
5   the above described flow management actions in the opposite
direction.

In case that the necessity arises for an operation and main-
tenance centre of the telecommunications system to redirect a
10 flow via the WLAN network AN2 to the GPRS network AN1, the
operation and maintenance centre has to configure the corre-
sponding rules in the flow management function FMF of the mo-
bility anchor MA which needs an authorization for those rules
at the decision function FDF via the reference point F1 be-
15 fore forwarding all incoming packets of the flow via the GPRS
network AN1.

Fig. 2 is a schematic illustration showing the interaction
between a flow management function FMF and a flow-based ac-
20 cess management decision function FDF. Flow-based access man-
agement rules designated as R are input in the flow manage-
ment function FMF. Those rules can be provided by different
entities, e.g. by users (if allowed to do so) of user equip-
ments, other network functions, access network service pro-
25 viders, mobile network operators, particularly operation and
maintenance centres. The rules input are verified by the
flow-based access management decision function FDF. To do so,
corresponding requests are transmitted from the FMF to the
FDF via the F1 interface. Those requests comprise a request
30 for adding a new rule Add_FBAM_rule_req, a request for modi-
fying existing rules Modify_FBAM_rule_req and requests for
deleting existing rules Delete_FBAM_rule_req. Those requests
are handled in the FDF which decides whether those requests
are allowed or not by using corresponding policies P. Those
35 policies may be provided by users (if allowed to do so) of
user equipments, access network service providers, mobile

network operators, particularly operation and maintenance
centres.

After verifying the rules, a corresponding accept or reject
5   message to the respective request is transmitted via the ref-
erence point F1 to the FMF. As a consequence, based on con-
firmed new rules or modifications or deletions of rules, ap-
propriate flow filters are configured in the flow management
function. Thereafter, those filters are executed during the
10   data transmission of data packets DP arriving in the FMF.
Particularly, it is checked whether information in the data
packets matches with criteria in the flow filters. As a con-
sequence, data packets may be delivered via different inter-
faces I1 or I2 to access networks or within an access net-
15   work. Hence, based on the outcome of the matching executed in
the FMF, the corresponding forwarding action of the applica-
ble flow-based access management rule is performed and the
appropriate interface is selected.

20   In the following, a more detailed description of the new com-
ponents FDF, FMF and F1 introduced by the invention is given.
The flow-based access management decision function FDF is
usually part of the core network and communicates with the
flow management function FMF via an interface called F1 ref-
25   erence point. The FDF accepts or rejects at the F1 reference
point requests for flow-based access management rules R
originated by the FMF. A decision engine implemented in the
FDF incorporates in the decision making process corresponding
policies P from other entities, e.g. users, service providers
30   or mobile network operators. What kind of policies and how
they are provided is out of the scope of this invention. One
possible realization of policies being applicable to a user
is described in the prior art for WLAN access authorization
wherein processes are defined for 3GPP AAA server defining
35   what access rules/policy should be applied to a user. This
mechanism could be extended for providing flow-based access
management policies.

Examples of flow-based access management policies are:
-      rules input in the FMF from an operation and maintenance
       centre always have highest priority;
5 -   do not accept any rule input by a so-called silver-class
       user having lower priority than other users;
-      a user is allowed to input rules if the rules do not
       violate rules or policies input by other entities, e.g.
       a user is allowed to use a WLAN access for those flow
10   management actions which do not violate rules originat-
       ing from a network operator or an operation and mainte-
       nance centre.

The flow management function FMF communicates with the flow-
15 based access management decision function FDF via F1 refer-
ence points. The FMF receives flow-based access management
rules R provided by users, other network functions, service
providers, mobile network operators or operation and mainte-
nance centre. New rules can be added to a database hosted by
20 the FMF and existing rules can be modified or deleted. In a
preferred embodiment, so-called default rules are applied if
no other rule is applicable. The mechanism and the format of
how the rules are provided as well as the mapping to distinct
flow filters are out of the scope of this invention. Several
25 realizations for enabling such a filtering are defined in the
prior art. In those realizations, explicit flow filters (ad-
dressing e.g. distinct IP header fields like addresses and
port numbers or the flow label) are piggybacked on Mobile IP
signalling. Other realizations are possible to be used in the
30 invention, e.g. providing flow-based access management rules
during WLAN access authorization or by using an independent
signalling protocol or by using a more abstract notation for
flow-based access management rules.

35 Examples of flow-based access management rules are as fol-
lows:

-       a rule input by an operation and maintenance centre may
        be to redirect all data flows to another access network,
        e.g. because the former access network has to be com-
        pletely maintained;

5 -   a rule input by a user may be to redirect a specific
        flow from an expensive UMTS interface to a WLAN inter-
        face which is cheaper and has become available due to
        the movement of the user equipment;

-       a rule input by another network function (e.g. located

10   in the core network) may be to redirect some flows to
        another, in parallel available radio access network,
        e.g. because of overload conditions;

-       another rule which may be input by a network function
        may be to force a redirection of a video data flow to a

15   WLAN access after the network function has detected the
        attachment of the user equipment to the WLAN access.

As described above, the FMF applies flow-based access manage-
ment rules by evaluating received data packets (e.g. IP pack-

20 ets) against flow filters. When a packet matches a filter,
the packet matching process for this packet is completed, and
the corresponding forwarding action of this flow-based access
management rule is applied, e.g. with the consequence that an
appropriate interface to an access network is selected or

25 that a secondary PDP context is used.

The flow management function FMF may be incorporated in dif-
ferent physical components and known network functions. In a
Mobile IP oriented environment, the FMF may be implemented in

30 the home agent or a mobility anchor when using Mobile IPv4.
When using Mobile IPv6, the FMF may be implemented in the
home agent or a common mobility anchor or a mobility anchor
point mobility anchor point. Examples of a common mobility
anchor and mobility anchor points are shown in Fig. 3 de-

35 scribed later on. In a 3GPP oriented environment, a FMF may
be implemented in the GGSN wherein each individual PDP con-
text (i.e. each primary and all secondary PDP contexts) could

be seen in the context of the invention as parallel, simultaneously used GPRS access links having individual characteristics, like QoS specifications, and being managed by means of TFTs.

The F1 reference point is located between the flow management functions FMF and the flow-based management decision function FDF. The F1 reference point enables the authorization of flow-based access management rules requested by users or other network functions or service providers or mobile network operators or operation and maintenance centres based on policies from users or access network service providers or mobile network operators or operation and maintenance centres.

The F1 reference point supports the following functions between the FDF and FMF:
-       initialization and maintenance of F1 connection;
-       request for adding a new flow-based management rule by using the above described message Add_FMBA_rule_req;
-       request for modifying an already existing flow-based access management rule by using the above defined F1 messages Modify_FBAM_rule_req;
-       request for deleting an existing flow-based access management rule by using the above defined F1 messages Delete_FBAM_rule_req;
-       transmit acceptance and refusal messages for the above requests.

Fig. 3 is a schematic view of another embodiment of a mobile telecommunications system in which the method according to the invention may be implemented. Fig. 3 shows a scenario wherein, additionally to the GPRS packet domain network AN1 and the WLAN access network AN2, two further mobile access networks are used in order to connect to a core network CN. Those additional mobile access networks are networks AN3 and AN4. The network AN3 is a SAE/LTE radio access domain network

(SAE = System Architecture Evolution; LTE = Long Term Evolution) which are newly developed 3GPP access networks. The network AN4 is another WLAN access network implementing a Mobile IPv6 mechanism wherein the mobile access point MAP is

5   implemented in the packet data gateway PDG incorporated in the access gateway AG4. This packet data gateway also includes a flow management function FMF. Contrary to that, the access gateway AG2 of the WLAN network AN2 is a packet data gateway only having the function of an access router AR.

10

Similar to the user equipment shown in Fig. 1, the user equipment UE shown in Fig. 3 has two interfaces to enable a simultaneous connection through 3GPP networks, i.e. network AN1 or network AN3, and through non 3GPP networks, i.e. net-

15   work AN2 and/or AN4. In the scenario shown in Fig. 3, only access to one 3GPP network at a time but an additional simultaneous access to all other, in parallel available WLAN access networks is allowed to be performed by the UE.

20   Besides one flow-based management decision function FDF, the core network CN also includes mobility anchors MA1 and MA2 both implementing a corresponding flow management function FMF. The mobility anchor MA1 is a 3GPP mobility anchor having the functionality of a mobile access point MAP according to

25   Mobile IPv6 and providing seamless connectivity when a user equipment changes between the 3GPP networks AN1 and AN3. The other mobility anchor MA2 is a so-called common mobility anchor having the functionality of a home agent HA according to Mobile IPv6. This common mobility anchor provides mobility

30   between the WLAN networks AN2 and AN4. Due to the use of mobility anchors MA1 and MA2, mobility is provided between all access networks AN1 to AN4.

According to the invention, the new components FMF and FDF

35   are integrated in the network of Fig. 3. Particularly, each mobility anchor MA1 and MA2 includes a flow management function FMF defining appropriate flow filters. Furthermore, a

flow management function FMF is integrated in the access gateway AG1 of the 3GPP network AN1 and in the access gateway AG4 of the access WLAN network AN4. All those FMFs communicate with the common flow-based management decision function

5   FDF in the core network CN via the above defined F1 reference points. The flow-based management decision function FDF located in the common core network CN is not necessarily separated from the mobility anchors but may also form a part of one of those mobility anchors.

10

During operation of the network of Fig. 3, incoming IP packets at the common mobility anchor MA2 destined to the user equipment UE will be directed to the configured 3GPP and non 3GPP access networks as the filters for Mobile IP at the com-

15   mon mobility anchor MA2 define. Those filters may be based on IP source/destination addresses and port numbers when using a streaming protocol like RTP which separates individual flows by means of different port numbers. Also the parameter Flow Label may be used to distinguish data flows. In case that

20   several flows are directed to an active 3GPP access network AN1 or AN3, those flows could be separated by using the above described TFTs. Packets destined to non 3GPP access networks are directed to the configured WLAN access networks AN2 or AN4 as the filters for Mobile IP at the common mobility an-

25   chor MA2 define. The selection of the first WLAN network AN2 is finally done in the common mobility anchor MA2 whereas the mobile access point MAP in the access gateway AG4 of the second WLAN network AN4 includes some further structure within this network so that an additional configuration of filters

30   for Mobile IP in this gateway may result in the final selection of the access routers in this WLAN network. From the perspective of the user equipment UE, flows will be terminated at the UE arriving via the active 3GPP access network and via the WLAN access networks AN2 and AN4.

35

In an extension of the scenario shown in Fig. 3, an independent WLAN access service provider for the second WLAN access

network AN4 which has a service level agreement with the 3GPP
mobile network operator may have the ability to manage the
flows within its WLAN network by means of the FMF hosted by
the PDG/MAP in access gateway AG4. To do so, an interface to
5   this FMF is needed which is not within the scope of this in-
vention.

The invention as described above has several benefits and ad-
vantages. Particularly, the invention enables a network con-
10   trolled flow management spanning all (mobile) access networks
of an operator, thus providing a network service for effi-
cient usage of (mobile) access network resources. This effi-
ciency is particularly improved by using suitable policies
for implementing rules to configure flow filters. The method
15   according to the invention may support seamless continuity of
connectivity and services by using realizations like
GPRS/TFTs or filters for Mobile IP. According to the inven-
tion, innovative varieties of media services are possible be-
cause using the flow management of the invention supports
20   service provisioning via simultaneous, parallel network at-
tachments. Particularly, the service provisioning supported
by the policy based flow management can include user's pref-
erences, making these services attractive for new users. A
mobile network operator may increase its revenue per user by
25   providing seamless connectivity and service continuity over
all mobile access networks. A mobile network operator may de-
crease its operational expenditure by providing a flow-based
access management architecture as a solution applicable for
all mobile access networks.

Patent Claims

1. A method for managing data flows in a mobile telecommunications system having a plurality of network nodes, wherein a
5   dataflow from and/or to a user device (UE) can be transmitted
between a core network (CN) and the user device (UE) via different data links comprising links between the core network
(CN) and one or more access networks (AN1, AN2, AN3, AN4)
and/or links within one or more access networks (AN1, AN2,
10   AN3, AN4), the method comprising the following steps:
-    data flow information referring to rules (R) concerning
     the data links to be used for specific data flows is provided in at least one flow management entity (FMF) assigned to a network node through which data flows are
15   transmitted;
-    the data flow information is verified by a flow decision
     entity (FDF) based on one or more policies (P) whereupon
     a verification result comprising confirmed and/or rejected rules (R) and/or confirmed and/or rejected modifi-
20   cations of rules (R) is returned to the at least one flow
     management entity (FMF);
-    based on the verification result, data flow filters are
     established by the at least one flow management entity
     (FMF), said data flow filters determining the data link
25   to be used for a data flow passing through the network
     node to which the at least one flow management entity
     (FMF) is assigned.

2. The method according to claim 1, wherein the at least one
30   flow management entity (FMF) and the flow decision entity
(FDF) communicate via a predefined interface (F1).

3. The method according to claim 1 or 2, wherein the at least
one flow management entity (FMF) transmits requests for add-
35   ing and/or modifying and/or deleting rules (R) based on the
data flow information to the flow decision entity (FDF),
whereupon the flow decision entity (FDF) verifies those re-

quests and returns confirmations and/or refusals with respect
to those requests to the at least one flow management entity
(FMF).

5   4. The method according to one of the preceding claims,
wherein default rules are used for establishing a data flow
filter for a data flow to be transmitted in case that no
other rules apply for the data flow.

10   5. The method according to one of the preceding claims
wherein the rules (R) are dependent on the availability
and/or load of the access networks (AN1, AN2, AN3, AN4)
and/or on the data transmission fees or speeds of the access
networks (AN1, AN2, AN3, AN4).

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6. The method according to one of the preceding claims,
wherein the rules (R) are dependent on the content of the
data flow to be transmitted, particularly whether voice data
and/or video data and/or multimedia data are transmitted in

20   the data flow.

7. The method according to one of the preceding claims,
wherein the rules (R) include instructions to redirect a data
flow via another access network (AN1, AN2, AN3, AN4) when

25   predetermined conditions are met.

8. The method according to one of the preceding claims,
wherein the policies (P) are provided in the flow decision
entity (FDF) by at least one service provider, particularly a

30   mobile access network provider and/or at least one mobile
network operator and/or at least one user of a user device
(UE).

9. The method according to one of the preceding claims,

35   wherein the data flow information is provided in the at least
one flow management entity (FMF) by at least one service pro-
vider, particularly a mobile access network provider and/or

at least one network entity and/or at least one mobile net-
work operator and/or at least one user of a user device (UE).

10. The method according to one of the preceding claims,
wherein the method is performed by using at least one flow
decision entity (FDF) which is preferably located in the core
network (CN) and communicates with one or more flow manage-
ment entities (FMF).

11. The method according to one of the preceding claims
wherein the at least one flow management entity (FMF) is as-
signed to a mobility anchor (MA, MA1, MA2) providing mobility
functionality and/or to a gateway (AG1, AG2, AG3, AG4) of an
access network (AN1, AN2, AN3, AN4) providing access to the
core network (CN).

12. The method according to one of the preceding claims,
wherein the flow decision entity (FMF) is a separate entity
in the core network (CN) or assigned to a mobility anchor
(MA, MA1, MA2) providing mobility functionality.

13. The method according to one of the preceding claims,
wherein the access networks (AN1, AN2, AN3, AN4) comprise one
or more 3GPP access networks, particularly at least one UMTS
access network and/or at least one GSM access network and/or
at least one SAE/LTE access network.

14. The method according to one of the preceding claims,
wherein the access networks (AN1, AN2, AN3, AN4) comprise one
or more non 3GPP access networks, particularly at least one
WLAN access network.

15. A method for transmitting data flows in a mobile telecom-
munications system in which a method according to one of the
preceding claims is performed, wherein data flows which are
transmitted via at least one network node to which a flow
management entity (FMF) is assigned are forwarded according

to the data flow filters established by the flow management
entity (FMF).

16. A mobile telecommunications system having a plurality of
network nodes, wherein a dataflow from and/or to a user de-
vice (UE) can be transmitted between a core network (CN) and
the user device (UE) via different data links comprising
links between the core network (CN) and one or more access
networks (AN1, AN2, AN3, AN4) and/or links within one or more
access networks (AN1, AN2, AN3, AN4), the system comprising:
- at least one flow management entity (FMF) assigned to a
  network node through which data flows are transmitted,
  the at least one flow management entity storing data
  flow information referring to rules (R) concerning the
  data links to be used for specific data flows;
- a flow decision entity (FDF) for verifying the data flow
  information stored in the at least one flow management
  entity (FMF) based on one or more policies (P) and for
  returning a verification result comprising confirmed
  and/or rejected rules (R) and/or confirmed and/or re-
  jected modifications of rules (R) to the at least one
  flow management entity (FMF);
- wherein the at least one flow management entity (FMF)
  has means to establish data flow filters based on the
  verification result, said data flow filters determining
  the data link to be used for a data flow passing through
  the network node to which the at least one flow manage-
  ment entity (FMF) is assigned.

17. The mobile telecommunications system according to claim
16, wherein the system is adapted to perform a method accord-
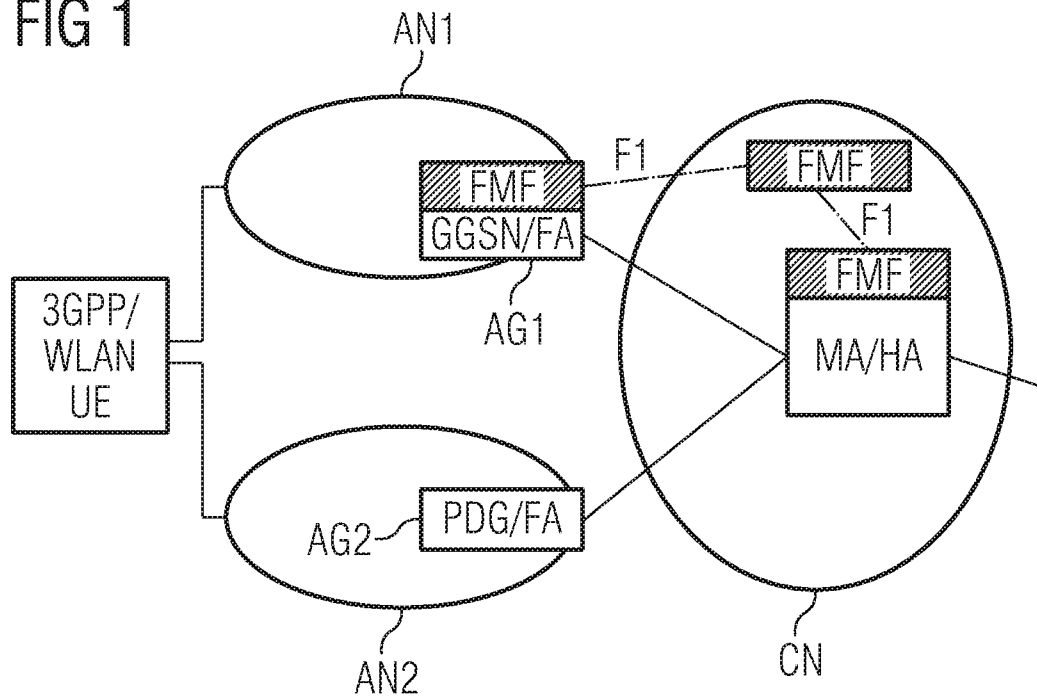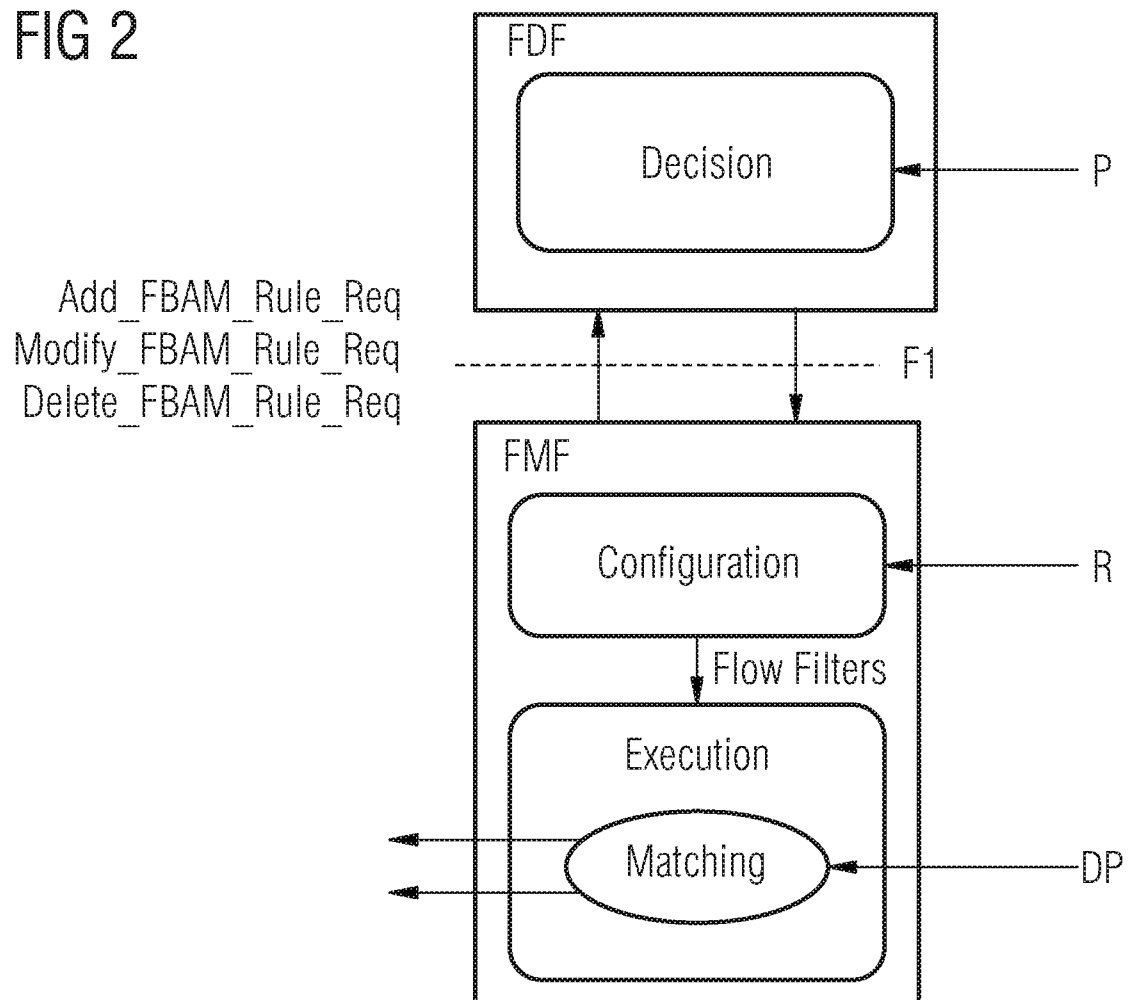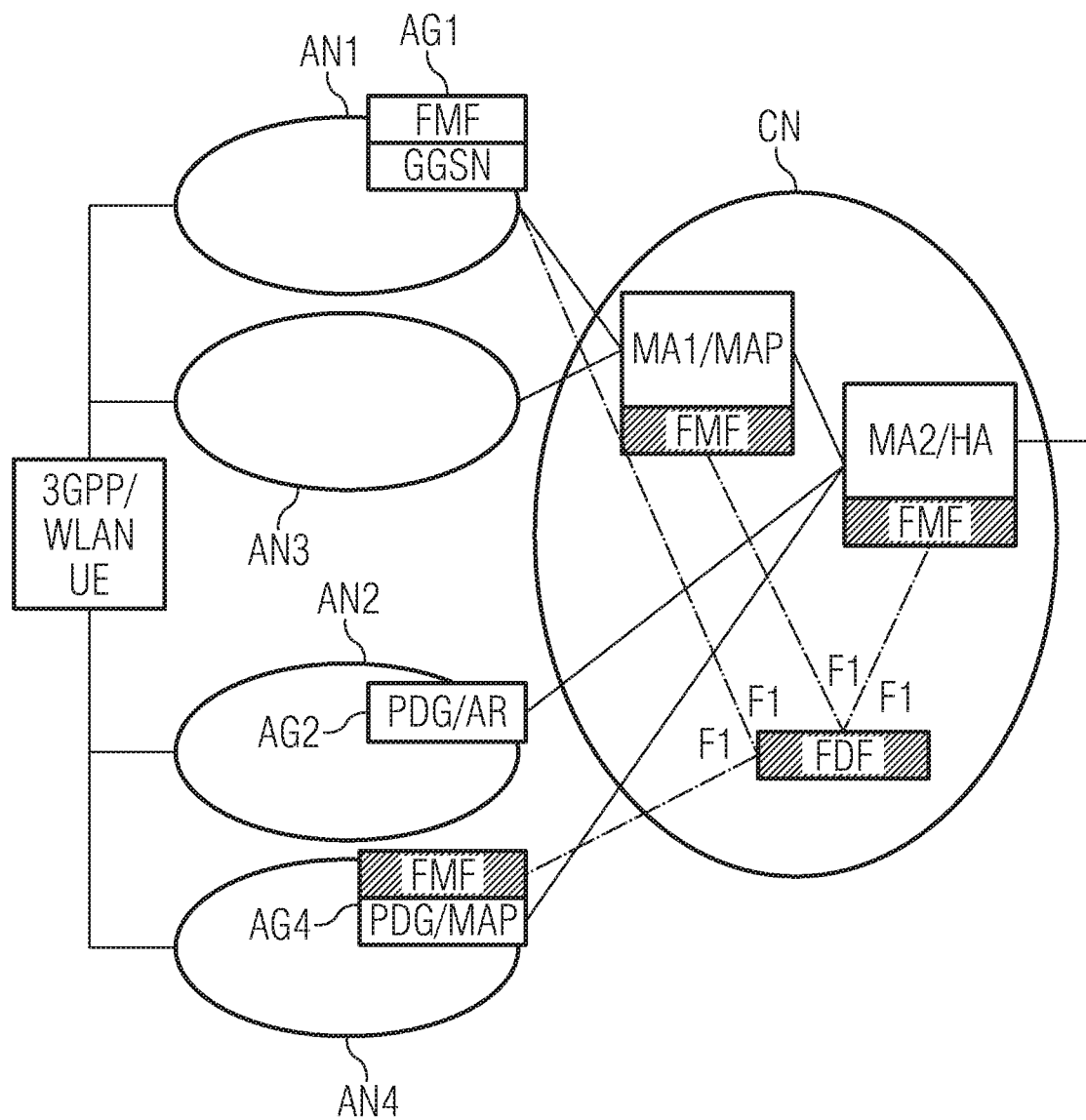ing to one of claims 1 to 15.

FIG 1

FIG 2

FIG 3

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L12/24   H04L12/56

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)

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

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A	US 2006/193295 A1 (WHITE PATRICK E [US] ET AL) 31 August 2006 (2006-08-31) figures 1,5,7 page 2, paragraph 8-10 page 5, paragraph 42 page 7, paragraph 51 page 8, paragraph 57 page 10, paragraph 66-68	1-17
A	US 2007/061433 A1 (REYNOLDS SCOTT [CA] ET AL) 15 March 2007 (2007-03-15) figures 1-3,5,10 page 2, paragraphs 14,15 page 3, paragraph 36 page 4, paragraph 38 page 5, paragraph 51 page 9, paragraphs 98,99	1-17

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| X | Further documents are listed in the continuation of Box C. | | X | See patent family annex. |

Date of the actual completion of the international search	Date of mailing of the international search report
8 December 2008	12/12/2008

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

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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