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*[Continued on next page]*

(54) Title: REGIONAL ZONE BASED MOBILE CHARGING

**Fig 2**
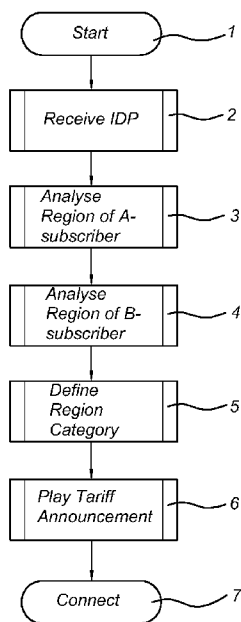
(57) Abstract: Network node (15; 24) and method in a telecommunication network (18), the network node (15; 24) receiving from a calling terminal (33) a request to set up a call with a called terminal (34). The network node (15; 24) retrieves call set up information from a stored connection table (45) and utilizes the retrieved data to set up the call. The connection table (45) comprises data relating to set up of a call between the calling terminal (33) and the called terminal (34). A first region class for the calling terminal (33) is determined, and a second region class for the called terminal (34), each being associated with locations of the calling terminal (33) and the called terminal (34), respectively. Furthermore, a rating category for the call to be set up is determined using the first region class and the second region class using the connection table (45).

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Regional Zone Based Mobile Charging

**Technical Field**

  The present invention relates to a method and a network node for setting up a call

5  between a calling terminal and a called terminal. In an aspect, the present invention

relates to regional zone based mobile charging.

**Background**

  International Patent application WO2008/054194 discloses a method for

10  conditionally routing a call made to a fixed telephone number. The call is possibly

routed to one or more mobile terminal via an IP network if a mobile terminal is within

reach of an access point in the IP network. Alternatively the call is routed to an

alternative terminating point, such as an answering machine, using a list stored in a

network node implementing the routing service.

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**Summary**

  The present invention seeks to provide an improved call establishment method

and a network node implementing such a method.

  According to the present invention, a method for setting up a call in a

20  telecommunication network between a calling terminal and a called terminal is

provided, comprising receiving from a calling terminal a request to set up a call to a

called terminal, retrieving call set up information from a stored connection table, the

connection table comprising data relating to set up of a call between the calling

terminal and the called terminal, and utilizing the retrieved data from the connection

25  table to set up the call. In a further aspect, a network node is provided in a

telecommunication network, the network node receiving from a calling terminal a

request to set up a call with a called terminal, the network node being further arranged

to retrieve call set up information from a stored connection table, the connection table

comprising data relating to set up of a call between the calling terminal and the called

30  terminal, utilizing the retrieved data from the connection table to set up the call. In the

connection table, a variety of parameters may be stored which play a role in the set up

process of a call between the calling terminal and the called terminal.

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**Brief description of the drawings**

     The present invention will be discussed in more detail below, using a number of exemplary embodiments, with reference to the attached drawings, in which

     Fig. 1 depicts a schematic view of a telecommunication network employing

5    embodiments of the present invention;

     Fig. 2 depicts a flow diagram of a method embodiment of the present invention;

     Fig. 3 depicts a schematic view of a part of a telecommunication network in which the present invention embodiments may be implemented;

     Fig. 4 depicts a further schematic view of telecommunication networks in

10   communication with each other, in which embodiment of the present invention may be implemented;

     Fig. 5 depicts a schematic views of an embodiment of the present invention relating to possible routes to a called terminal within reach of an access point; and

     Fig. 6 depicts a schematic view of an implementation of a route to mobile service

15   network node using a connection table according to an embodiment of the present invention.

**Detailed description**

     The present invention relates to the establishment of a call from a calling terminal

20   33 (a calling party A) to a called terminal 34 (a called party B) in a telecommunication network. This is schematically depicted in the simplified view of Fig. 1. The calling terminal 33 is e.g. a mobile terminal which is served by a (mobile) telecommunication network 18, such as a GSM or UMTS network. The called terminal 34 may also be a mobile terminal, which is served by a second (mobile) telecommunication network 18'

25   which is connected to the telecommunication network 18. In some circumstances, the calling or called terminal 33, 34 may also be arranged to use other types of (wireless) communication, e.g. using an internet protocol (IP) connection by using an Access Point (AP) 10 connected to an IP network 12 (e.g. Wifi, WLAN or WiMax networks), which are in turn interfacing with and in communication with the telecommunication

30   network 18 (See Fig. 3 and the associated description below). In the pending international patent application WO2008/054194 of applicant, which is incorporated herein by reference, embodiments are shown in which a connection between two terminals 33, 34 are set up optionally using an AP 10.

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As a further alternative, the calling party 33 or called party 34 may also be served
by a femto cell 21, which is like a regular cell in a cellular communication system, but
with a more limited range, e.g. inside a building. A femto cell 21 in a GSM network 18'
may be connected directly to an MSC 22'. This MSC 22' coupled to the femto cell 21

5      can be addressed directly by other services or applications being executed in the
telecommunication network 18' in a regular manner. In the schematic view of Fig. 1
this is indicated for the called party 34.

Using suitable equipment and arrangements, as known to the skilled person, a call
connection may be provided across one or more types of telecommunication networks

10     18, including but not limited to cellular communication networks (GSM, UMTS),
public land based networks (Plain Old Telephone System, POTS), and Voice over IP
(VoIP) networks.

In one embodiment of the present invention, a method is provided for setting up a
call in a telecommunication network 18 between a calling terminal 33 and a called

15     terminal 34, comprising receiving from a calling terminal 33 a request to set up a call to
a called terminal 34, retrieving call set up information from a stored connection table
45, the connection table 45 comprising data relating to set up of a call between the
calling terminal 33 and the called terminal 34, and utilizing the retrieved data from the
connection table 45 to set up the call. In a further aspect, a network node 15 in a

20     telecommunication network 18 is provided, the network node 15 receiving from a
calling terminal 33 a request to set up a call with a called terminal 34, the network node
15 being further arranged to retrieve call set up information from a stored connection
table 45, the connection table 45 comprising data relating to set up of a call between the
calling terminal 33 and the called terminal 34, and utilizing the retrieved data from the

25     connection table 45 to set up the call.

The calling party 33 and/or the called party 34 may be subscriber to a special
service, such as a Regional Zone based mobile charging application. In modern day
telecommunication networks 18 this service may be implemented as an Intelligent
Network (IN) service. This service may be an application being executed on a separate

30     network node 15 (see Fig. 3) in the telecommunication network 18, or in already
present network nodes such as a Service Control Point 24 (SCP) which is in
communication with a mobile switching centre 22 (MSC) in a GSM network 18 (which
is indicated in the schematic view of Fig. 1).

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Nowadays mobile phone calls are charged based on a certain tariff tree, where the calling party 33 will be charged for a certain fee and the called party 34 will be charged for a further fee in case this subscriber 34 is roaming. The tariff of a call is defined in the rating tree and based on a dialled number and a subscription type (pre-paid, post-

5      paid). In known mobile communication systems it is not possible to differentiate the tariff of a mobile phone call based on a region where the calling party 33 and called party 34 are actually located. Roaming subscribers have to pay for receiving a call and in case of a prepaid subscriber as called party 34 the prepaid subscriber is not able to receive phone calls when the prepaid account becomes empty.

10     Thus, in a further embodiment of the present invention, a method is provided further comprising determining a first region class for the calling terminal, and a second region class for the called terminal, the first and second region class being associated with locations of the calling terminal and the called terminal, respectively, and determining a rating category for the call to be set up using the first region class

15     and the second region class using the connection table. In a further aspect, a network node is provided, the network node being further arranged to determine a first region class for the calling terminal (based on the actual location, e.g. a cell ID), and a second region class for the called terminal, the first and second region class being associated with locations of the calling terminal and the called terminal, respectively, and to

20     determine a rating category for the call to be set up using the first region class and the second region class using the connection table. A region class is e.g. one of a plurality of (geographic) regions, or a roaming location. The rating category may be one of: a free tariff, a local tariff, an inter local tariff, an international tariff. In a further embodiment, the connection table comprises possible rating categories for different

25     combinations of a first region class and a second region class.

According to the present invention, rating information is used in the call set up process, wherein the rating information is based on the location or region of the calling party 33 and called party 34. In this context, region (or zone) relates to a geographical area, e.g. a geographical area covered by a set of cells in a cellular mobile network 18.

30     This also offers the possibility to charge the calling party 33 for the roaming costs of the B-subscriber (called party 34).

In one embodiment of the present invention, a connection table 45 is used by an Intelligent Network (IN) service implementing the regional zone based mobile charging

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application (RZ service 11), wherein the application is being executed in an SCP 24 of the mobile communication network 18 and the connection table is stored in the SCP 24. In Fig. 2 a flow chart is shown of this embodiment.

Based on Originating Subscription Information as received by the MSC 22 serving the calling party 33, an IN service will be triggered and started in the SCP 24 (step 1 in Fig. 2). After invocation of the service, the location (cell ID) of the calling party 33 (received by the SCP 24 as part of the Initial Detection Point (IDP), step 2) is analyzed and mapped towards a region class (step 3).

Then the region information (i.e. location) of the called party 34 is defined using e.g. an Anytime Interrogation (ATI) message towards a home location register (HLR) 17 associated with the specific communication network 18 serving the called party 34. The Cell ID of the B-number (i.e. which cell of the communication network 18 is currently serving the called party 34) will be returned and this cell ID will be mapped to a region class (step 4). Then the IN SCP 24 will analyze the two region classes and map this combination to a rating category (step 5). Optionally, the calling party 33 will be informed about the tariff of the call (step 6) and the calling party 33 will get the option to pay for the call in case e.g. the called party 34 is roaming. After receiving a reply from the calling party 33, the call is set up in a regular manner (step 7: indicated in Fig. 3 as a functional block 25 'call set-up' connected from the MSC 22).

The rating category as determined may be transmitted to a billing service in the telecommunication network 18. Such a billing service is a regular service in a telecommunication network 18 which functions to bill the correct cost to the users of the telecommunication network 18. The network node 15 implementing the present regional zone service may interface with the billing service in the telecommunication network 18.

It is possible to define the following rating categories as part of the connection table stored in the SCP 24, depending on the region classes as determined for the calling party 33 and called party 34:

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| Region Class A-party | Region Class B-party | Rating in case A pays for roaming costs B | Rating in case A doesn't pay for Roaming B |
|---|---|---|---|
| Region 1 | Region 1 | Free | Free |
| Region 1 | Region 2 | Local Tariff | Local Tariff |
| Region 1 | Region 3 | Interlocal tariff | Interlocal tariff |
| Region 1 | Roaming location | International tariff 1 | Interlocal tariff |
| Roaming location | Region 3 | International tariff 1 | International tariff 1 |
| Roaming location | Roaming location | International tariff 2 | International tariff 1 |

In a further embodiment of the present invention, the called terminal 34 is associated with a prepaid account, and the network node 15 is further arranged to send a message to the calling terminal 33 requesting a payment option for the call to be set up to the called terminal 34. This enables the user of the calling terminal 33 to pay for the cost of the call to called terminal 34. The choice of the calling terminal 33 may be stored in the connection table 45. Furthermore, it is possible that the message has the form of a tariff announcement communicated to the calling terminal 33.

The network node interfaces with a prepaid service 19 in the telecommunication network 18 in an even further embodiment, and the network node 15 is further arranged to invoke the prepaid service 19 after determining a rating category, and to include the rating category (and possibly a terminating tariff deduction parameter) in a message transmitted to the prepaid service 19.

The prepaid service (PPS) 19 will be invoked after invocation of the RZ service 11, i.e. as part of the connect step 7 in the flow chart of Fig. 2. The PPS 19 is e.g. a software module being executed in a network node 15, possibly the same network node 15 in which the RZ service 11 is being executed as depicted schematically in Fig. 3. The Regional Zone service 11 sends a Connect message with a PPS invocation prefix added to the called party number as destination routing address. The payment service (an application being executed in a (further) network unit of the communication network 18) would then be triggered based on that PPS Invocation prefix. As an option, the prepaid service 19 might be invoked using route based triggering, which as such is known to the skilled person.

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The parameter 'Region Class' as defined above will be transferred to the PPS service 19. Also a 'Terminating Tariff Deduction' parameter may be added in a further embodiment indicating that the calling party 33 will be charged for the call and the terminating party or called party 34 receives this call for free (in case of roaming). Note

5      that a third party prepaid system can be part of the solution.

For manufacturers of network equipment (including software modules) it is possible to offer mobile operators advanced region based charging services using the above described embodiments. For operators a service may be provided to the end user that extends the usage of mobile phones and a higher call success rate. For the customer

10     a simple routing service is provided that extends the mobility of the end-user. Clear and up-to date tariff information is provided, as well as a possibility to reach a roaming subscriber that has no credit on the associated prepaid account.

In a further aspect, the present invention relates to a method wherein the connection table comprises routing information for a called terminal, the routing

15     information comprising an indication whether or not a called terminal is reachable via a second network (e.g. an internet protocol (IP) network) in communication with the telecommunication network, and the method further comprises retrieving routing information from the connection table, and when the called terminal is reachable via the second network, setting up the call via the second network. Similarly, the present

20     invention may relate to a network node wherein the connection table comprises routing information for a called terminal, the routing information comprising an indication whether or not a called terminal is reachable via a second network in communication with the telecommunication network, the network node being arranged to retrieve routing information from the connection table and when the called terminal is reachable

25     via the second network, to set up the call via the second network.

In Fig. 4, a network diagram is shown which depicts a telecommunication network in which embodiments of the present invention may be implemented. The telecommunication network comprises a wireless access point 10, such as a WiFi enabled modem installed at a subscriber's premises, which is connected to an Internet

30     Protocol (IP) network 12. A number of further elements allow the IP network 12 to interface with a fixed telephony network 20 and/or a mobile telephony network 18, i.e. a Security Gateway (SeGW) 14 and a Media Gateway (MGW) 26. The MGW 26 and SeGW 14 (which can also be seen as a single entity or network node) provide the

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interface between IP network 12 and general elements of a telecommunication network, i.e. a telephony switch 22, a Service Control Point (SCP) 24 and a Home Base Station Controller (HBSC) 16. These general elements may be formed by units which are part of or associated with the mobile telephony network 18 and/or fixed telephony network

5    20. E.g. when being part of the mobile telephony network 18, the switch may be formed by an MSC 22. Furthermore, as part of the mobile telephony network 18, a Base Station Controller (BSC) 28 and a Base Transmission Service (BTS) 30 are provided, which form the air interface with a mobile terminal 33.

In the embodiment shown in Fig. 4, a Service Switching Point (SSP) 21 is

10    arranged in the telephony switch 22 (or MSC). A database, not shown, is arranged for comprising information needed by the SCP 24 for routing purposes. The database may be arranged in the SCP 24, as a separate database like a Service Data Point (SDP), or arranged in another node or processing unit which is able to communicate with the SCP 24.

15        In Fig. 4, mobile terminals 33, 34 are depicted which are arranged to communicate either via said wireless access point 10 or said BTS 30. An example of such a mobile terminal 33, 34 is a UMA/GAN capable handset which is presently available on the market.

The Security Gateway 14 is arranged to setup a secure tunnel through the IP

20    network 12 via the access point 10 to the mobile terminal 34 (IP-SEC).

The HBSC 16 is arranged to register alternative access possibilities of UMA/GAN subscribers, and e.g. also to register when a mobile terminal 34 is connected via the access point 10. This may be stored in a connection table 45 which is accessible to the SCP 24 (or another network node executing a service related to the set

25    up of a call). The HBSC 16 communicates with the mobile telephone network 18 using the Mobile Application Protocol (MAP), and at the other end it communicates with the SeGW 14. The mobile telephone network 18 is arranged for providing telecommunication services for GSM and/or UMTS subscribers. It should be noted that in Fig. 3 the telephony switch 22 is depicted separate from the fixed telephone network

30    20 and mobile telephony network 18, while in fact it can be seen as being part of the fixed or mobile telephone network 18, 20. The SCP 24 is an IN node that is capable of executing IN services. This IN node in one embodiment provides an implementation of an application allowing the subscribers to be called to their fixed telephone number

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while receiving the calls on a mobile phone (Route to Mobile service (RTMS)), as described in more detail in pending international application WO2008/054194 mentioned above.

The SSP 21 in the telephony switch 22 triggers the SCP 24 whenever a connection needs to be set up to the fixed number. To set up a connection, at the signalling level, a phone number is transmitted via the network. There are three basic ways the SSP 21 can select which called numbers to forward to the SCP 24. First is known as "all B or all query" In this case the SSP 21 will forward every called number to the SCP 24. Alternatively the SSP 21 comprises a list of phone numbers for which the SSP 21 does not directly connect the call to the destination, but first accesses the SCP 24 to check whether the final destination is correct. Instead of the called number also the range in which the called number is or the subscription class of the called number may be used. If for example, a called party 34 has forwarded all the calls to another number, the SSP 21 will ask the SCP 24 for every call to which number the call needs to be connected.

The SSP 21 will receive the correct number from the SCP 24 and will establish a connection to the correct number. Please note that the term 'number' is not necessary the same as telephone number. A voice mail box 32 associated with a telephone number (e.g. a mobile number associated with the mobile telephony network 18) will have in the network a different 'number' than the telephone number.

The SSP 21 will receive the request for setting up a connection from the network, and then the SSP 21 gives the request as a "Initial DP" message to the SCP 24.

The telephony switch 22 communicates with the MGW 26, the fixed telephone network 20, and with the mobile telephone network 18 using the ISDN User Part for controlling the routing of the call and time division multiplexing (TDM) for the actual voice path. The SSP 21 in the telephony switch 22 communicates with the SCP 24 using the INAP (Intelligent Network Application Part) protocol. The MGW 26 is arranged to convert VoIP traffic received from the IP network 12 to TDM traffic for the telephony switch 22. The MGW 26 communicates with the IP network 12 using the well known Session Initiation Protocol. The BSC 28 communicates to the mobile telephone network 18 (i.e. a Mobile Switching centre in said mobile telephone network 18) using the so-called Base Station System Application Part (BSSAP) protocol. The

SeGW 14 communicates with the IP network using IP packets. It is noted that other protocols may be used as will be clear to the skilled person.

As described earlier a B party's mobile 34 registers to a HBSC 16 when getting in contact with a WLAN/WIFI transmitter (access point 10). The HBSC 16 contacts the

5    HLR 17 associated with the mobile telephony network 18 to get full details of the called party (B) 34. At the same time the HLR 17 is informed that the called party (B) 34 can now also be reached via the HBSC 16. This is comparable to a V-MSC (visited MSC) operation when the called party (B) 34 roams into the coverage area of the V-MSC. The HLR 17 holds now two alternatives for reaching the called party (B) 34, i.e.

10   the HBSC 16 and the V-MSC. When the route to mobile service (RTMS) want to establish the connection to the called party (B) 34 it requires doing an ATI (Anytime Inquiry) of the HLR 17 to obtain the HBSC 16 of the called party (B) 34 as an indication that the called party (B) 34 is WLAN/WIFI connected. Then it has three basic options to route the call to called party (B) 34, as indicated in the schematic

15   diagram of Fig. 5.

Forward the call to the G-MSC 22 associated with called party (B) 34. In this case a special prefix needs to be added to the MSISDN of called party B to cause the G-MSC 22 to route to the HBSC 16 instead of the V-MSC. As an alternative the G-MSC 22 is configured to select always the HBSC 16 route when available. This may

20   e.g. be stored in the connection table 45 as stored in the SCP 24.

Second possibility is direct routing to the HBSC 16. In this case no prefix is required. Again the needed information may be obtained from the connection table 45 as stored in the SCP 24.

Third possibility is to route to the media gateway MGW 14. In this case RTMS

25   requires interrogating the HBSC 16 for further details on the MGW 14 to use (or a fixed MGW 14 is used and this step can be omitted). Then RTMS requires to use the lawful intercept interface of the MGW 14 to obtain further details for the connection with called party (B) 34, before forwarding the call to the MGW 14.

The Route To Mobile Service (RTMS) may be implemented in a communication

30   network 18 (e.g. implemented in an SCP 24) in a further embodiment, in which a connection table is used as source of information on how to connect various calling parties 33 to called parties 34.

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A schematic diagram of an RTMS 40 implementation, with functional interfaces is shown schematically in Fig. 6. The MAP interface controller 42 allows the RTMS (i.e. the RTMS Controller function 41) to exchange MAP messages with other entities like the HLR 17. The CAP interface controller 43 allows the exchange of CAP messages with entities/network nodes like the MSC 22.

Furthermore, the RTMS controller 41 is arranged to interface with three types of tables 45-46-47. In one embodiment, the tables are combined into a single table, which in this and other embodiments may be referred to in general as connection table 45.

The connection table 45 holds records for each RTM subscription managed by the RTMS 40. For each RTM number a group of records exists identified as a RTM group. Each record in the group contains the RTM number as well as a connection number to connect to when the RTM number is called. All these connection numbers form a hunting list.

A connection number can be the MSISDN of a RTM subscriber (e.g. calling party 33), again a RTM number or a non RTM subscriber number. To identify if the stated connection number is subject to RTM control (is a RTM subscriber) a **Subscriber flag** is contained in each record.

The hierarchical set-up allows for example companies to have one general RTM number and several dedicated RTM numbers like for the sales department, service department, and purchase department. The dedicated RTM numbers are present as connection number in the general RTM number of the company. The general RTM group also contains records having the numbers of the central reception as connection numbers.

The subscriber flag is one of several RTM control flags present in each record. Several others will be discussed hereafter. Control flags may be related to the RTM group or to one record (connection number). In the first case each record of the RTM group has the same value in the flag, in the second case the value may differ per connection number.

The tariff & account table 46 contains the details on where and how to charge the call cost for the different call cases. For each RTM subscriber 33, 34 a table 46 is present. An example of such a tariff & account table 46 is given below;

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| | Calling A=RTM | A loc. | A account | leg 1+2 Tariff | Called B=RTM | Same client | B. loc | B account | Third leg Tariff |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Y | N | A1 | T1 | Y | Y | N | A1 | Tb1 |
| 2 | Y | N | A1 | T1 | Y | Y | H-P | A1 | Tb2 |
| 3 | Y | N | A1 | T1 | Y | Y | V-P | Ax | n.a.* |
| 4 | Y | N | A2 | T1 | Y | N | N | A2 | Tb1 |
| 5 | Y | N | A2 | T1 | Y | N | H-P | A2 | Tb2 |
| 6 | Y | N | A2 | T1 | Y | N | V-P | Ax | n.a.* |
| 7 | Y | N | A3 | T1 | N* | No action | | | |
| 8 | Y | H-P | A1 | T2 | Y | Y | N | A1 | Tb1 |
| 9 | Y | H-P | A1 | T2 | Y | Y | H-P | A1 | Tb2 |
| 10 | Y | H-P | A1 | T2 | Y | Y | V-P | Ax | n.a.* |
| 11 | Y | H-P | A2 | T2 | Y | N | N | A2 | Tb1 |
| 12 | Y | H-P | A2 | T2 | Y | N | H-P | A2 | Tb2 |
| 13 | Y | H-P | A2 | T2 | Y | N | V-P | Ax | n.a.* |
| 14 | Y | H-P | A3 | T2 | N* | No action | | | |
| 15 | Y | V-P | Ax | n.a.* | Y | Y | N | A1 | Tb1 |
| 16 | Y | V-P | Ax | n.a.* | Y | Y | H-P | A1 | Tb2 |
| 17 | Y | V-P | Ax | n.a.* | Y | Y | V-P | Ax | n.a.* |
| 18 | Y | V-P | Ax | n.a.* | Y | N | N | A2 | Tb1 |
| 19 | Y | V-P | Ax | n.a.* | Y | N | H-P | A2 | Tb2 |
| 20 | Y | V-P | Ax | n.a.* | Y | N | V-P | Ax | n.a.* |
| 21 | Y | V-P | Ax | n.a.* | N* | No action | | | |
| 22 | N | not relevant | | | Y | n.a. | N | A3 | Tb1 |
| 23 | N | not relevant | | | Y | n.a. | H-P | A3 | Tb2 |
| 24 | N | not relevant | | | Y | n.a. | V-P | Ax | n.a.* |
| 25 | N | not relevant | | | N* | No action | | | |

EXAMPLE TABLE TARIFF & ACCOUNT SELECTION

The tariff & account table 46 consists of rows, each row is defined by the RTM subscription (Yes/No) and location (e.g. connected via AP 10 to IP Network (IN), mobile connected in the H-PLMN (H-P) or mobile connected in a V-PLMN, i.e. roaming (V-P)) of the calling party (A) 33 and the called party (B) 34.

A further distinction is made by the same client field. When both calling party A 33 and called party B 34 are RTM subscribers and belong to the same RTM group charging can be different. This will allow companies to have different charging for inter-company calls. The account has to be seen as a number that is charged. This can be prepaid (is MSISDN of terminal + prefix), postpaid (MSISDN of terminal) or postpaid to a third party number. The later allows a company to accumulate all cost into one account and receive a single bill.

The RTMS 40 fetches the table based on the RTM subscription indicator in the connection record and the connection number. RTMS 40 can be invoked by the MSC 22 of the calling party 33 when the associated parameters are set in the HLR 17 for

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triggering RTMS 40. The service 40 will then fetch the table belonging to the calling RTM subscriber 33 and use account and tariff in the calling party 34 part of the table 46. Likewise it can be done by the G-MSC 22 when T-CSI (or TICK) is set in the HLR 17 in the subscription details of the mobile terminal 34 that is called directly. Then the

5    table 46 is fetched for the called MSISDN 34 and the tariff and account in the called part is used. Third possibility is when a RTM number is called then the RTM switch will invoke RTMS 40 on basis of number recognition. The table 46 will be fetched for a B MSISDN (called party 34 number) that is used for trying to get connection. Alternative here is that the tables for all connection numbers (being RTM subscribers)

10   in a RTM group have the same called part tariff and accounts in their tables. If parallel ringing is used this is mandatory.

A connection between a calling party 33 and a called party 34 consists of three basic parts. If the calling party 33 is a mobile party then the first part is the connection between the mobile terminal 33 and the MSC 22. The second part is the connection

15   between the MSC 22 and the final destination switch in the network 18 (or IP network 12). The third part is the connection between the final destination switch and the terminal 34 of the called party. If the called party terminal 34 is a fixed line telephone the final destination switch will be a local exchange 22. If a RTM number was called the final destination would be the RTM switch 22. If the called number is a MSISDN

20   then the final destination is a G-MSC 22. A standard approach is that the calling party 33 pays for the first two parts and the called party 34 pays for the third part. When both terminals 33, 34 are RTM subscribers also other arrangements on who pays which cost can be made.

Account and tariff information is returned after the invoking CAP-IDP message

25   by means of a Furnish Charging Information (FCI) message sent with the CAP-CON message. The Furnish Charging Information (FCI) message will be used by the receiving MSC 22 to modify charging records.

The Hot list table 47 comprises records where each record contains a called party 33 MSISDN and a telephone number that is allowed to bypass the RTMS 40. When

30   entries for a MSISDN exist in the hot list table then a hot list indicator flag in the connection record in connection table 45 for that MSISDN is set. When a direct call to a RTM subscriber 34 is made the RTMS 40 checks when invoked if any of the records having the MSISDN if the phone number in those records match the calling phone

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number. If a match exists then all other limitations in the connection record are ignored and a connection is set-up. Likewise, when invoked for a calling RTM subscriber 33, a match of the called phone number and the phone numbers in the records having the MSISDN of the calling party will have the same effect that limitations for setting up the connection in the connection record of the calling RTM subscriber are ignored.

In case of an implementation of RTMS as application in a SCP 24, the tables may also be located in a SDP (Service Data Point).

As indicated a RTM group contains one or more records with connection numbers. When there is an incoming call for the RTM number of the RTM group then a hunting process is executed by the RTMS 40 to establish a connection using the hunting list as described above. The hunting process is, in a further embodiment, supported by a Priority Number in each record of the RTM group. Zero (0) is the highest priority and the first connection attempt will be made to that number. If no answer or busy the connection number with Priority number one (1) is taken, and so on. Records within a RTM group may contain the same priority number. In that case these will be subject to parallel ringing when such is supported by the CAP version used. The CAP version applicable is contained in a special field in CAP-IDP messages. If not supported then the connection number with equal priority are tried one by one in the order as received from the connection table 45.

Accordingly, in an embodiment of the present invention, the connection table comprises a hunting list for a called terminal, the hunting list comprising one or more destination addresses to which the call can be set up, and a priority indicator for each of the one or more destination addresses. The destination address may be an IP address, an alternative IP address, and alternative mobile address, or even addresses to reach alternative services, such as an answering service.

In further embodiments, the network node is arranged to apply a set of rules to data obtained from the connection table. These data may comprise one or more flags which can be set by the user (i.e. users of calling terminal 33 and/or called terminal 34), e.g. based on subscription to various services offered by the operator of the telecommunications network. Examples of such flags include, but are not limited to a subscriber flag, hot list indicator flag, CLI conversion flag, force to Route To Mobile flag, RTM locked flag, etc.

15

When a RTM subscriber A 33 makes a call his MSISDN will be used as calling line identity. In some circumstances this is not wanted. In case the called party B 34 uses a service like automatic call back when busy or on no answer, the reverse call will be setup directly to the mobile number instead of the RTM number. The same happens when the called party 34 stores the number and later on makes a call using the stored number. It is therefore important that the RTM number is given as calling line identity instead of the MSISDN.

The conversion should however not take place in all cases. If for example calling and called party belong to the same RTM group, the called party would like to see who of his group is calling him. This might be by the MSISDN or by a short number of the calling party.

In order for RTMS 40 to control the CLI in the subscription of calling party A 33 contained in the HLR 17, the Originating Subscription Information parameter field (O-CSI or OICK) should contain a trigger to invoke RTMS 40. When a call is made, first RTMS 40 is invoked before the call setup continues.

The conversion of CLI could be done by a fixed rules in RTMS 40 but as it might also differ per RTM group. CLI conversion is set as a flag in the connection table 45. When invoked, RTMS 40 retrieves the record from the connection table 45 for the group where calling party A 33 belongs to. If the flag is set then RTMS 40 places the RTM number of the group in the additional calling party number filed When changed RTMS 40 sends a CAP-CON message containing the modified fields to the MSC 22. The MSC 22 will use the value of these fields for the continuation of the set-up of the call. The called party 34 is presented the RTM number as CLI.

When the called party 34 is also a RTM subscriber (known from the connection table 45) then RTMS 40 will also be invoked due to the use of the RTM number. If this is the case and calling party A 33 and called party B 34 belong to the same group then the RTM group may contain a second flag in the connection table 45 that instead of the RTM number the original MSISDN of calling party A 33 or a short number representation of calling party A 33 is to be used. For the original MSISDN, RTMS 40 simply removes the contents of the additional calling party field. For short number representation, RTMS 40 replaces the RTM number in the additional calling party number by the short number representation.

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In the standard situation a party 33 can call the MSISDN of called party B 34 and so bypass the RTM system and get direct mobile connection with called party B 34. If called party B 34 is not connected to an AP 10 then the route via a V-MSC is used. Especially companies would require that calls are always subject to RTM control. This is achieved by placing a trigger to RTMS 40 in the T-CSI or as alternative TICK field in the subscription of called party B 34 in the HLR 17. When a call to the MSISDN of called party B 34 is made the call set-up reaches the G-MSC 22 for called party B 34. Here the G-MSC 22 fetches the details of called party B 34 from the HLR 17. Forced by the contents of the T-CSI or TICK field the G-MSC 22 invokes with a CAP-IDP message RTMS 40 in the SCP 24.

As forcing to RTM might only be applicable for some and not all RTMs a force to RTM flag is available in the connection table 45. When RTMS 40 is invoked it retrieves the record matching the MSISDN of called party B 34 that was called. If the flag for forcing to RTM is set, RTMS 40 replaces the MSISDN of called party B 34 in the called party field with the RTM number. The original MSISDN of called party B 34 is placed in the original called party ID field. Then RTMS 40 returns the modified fields in a CAP-CON message to the G-MSC 22.

The G-MSC 22 then forwards the call to the RTM number instead of the MSISDN of called party B 34. The call set-up arrives at the RTM switch, RTMS 40 is invoked and will perform the normal RTM functions. As an option RTMS 40 may check if the Original called party ID was containing an MSISDN. In that case it may use this MSISDN as first priority in hunting.

As an A party 33 can have a MSISDN that is coupled to more then one RTM group, the RTM group to apply can not be established. Example for such a case is a person using his mobile phone for his private RTM as well as the Company RTM. To be able to select the correct record in the connection table 45 in calling cases, a RTM locked flag is contained in the record. RTMS 40 checks in calling cases the presence of this flag. Only the one RTM record that has the flag not set shall be used.

The A party 33 has the possibility to change his default RTM by means of a service call or service SMS. Example of such; *666*"RTM number" send. The service call or SMS will arrive at RTMS 40, which will set the flag in all records of the connection table 45 matching the MSISDN of the A party 33. Then only one flag is reset in the record matching the A party 33 MSISDN and the RTM number.

Other examples of connection control flags which are settable by RTMS 40 in the connection table 45 include, but are not limited to: Blocking of calls to non RTM numbers, Blocking of calls outside the own RTM group, Blocking of calls when self not AP 10 connected, Blocking of calls when self not in H-PLMN,...

5          In an even further embodiment, the present invention relates to a method wherein the connection table further comprises a route to mobile (RTM) group identification and an announcement indicator associated with a called terminal, and the method further comprises sending a message (in the form of a ring tone or a textual announcement) to the called terminal prior to call establishment based on the

10        announcement indicator. Furthermore, a network node may be provided wherein the connection table further comprises a route to mobile (RTM) group identification and an announcement indicator associated with a called terminal, and the network node is further arranged to send a message to the called terminal prior to call establishment based on the announcement indicator.

15        A further addition in the connection table 45 is made in a further embodiment, in which an RTM group announcement is sent to the called party 34. The called party 34 can be informed if the incoming call is from a party that is also an RTM member. The called party 34 has two selection options in the connections table 45, one for a dedicated ring tone and one for prior announcement before connect. For the ring tone

20        the following selections can be made: no ring tone, only for members of the same RTM group or in the same main RTM group, or for all RTM parties calling. Like wise options for receiving a RTM group identification can be set in the connection table 45 prior to the actual connection of the call for all RTM parties calling, only for RTM parties outside his own (main) RTM group or no prior announcement. Where the ring

25        tone is determined by the called party 34, the announcement is determined by the calling party 33 like a personal greeting (e.g. the name of the company). The reference to the stored announcement is also saved in the RTM member record in the connection table 45 in a further embodiment. Optional this greeting can be locked, and is automatically inherited from a higher order RTM group to which this RTM member

30        belongs.

The announcement is possible from CAP V2 onwards. A dedicated ring tone is only possible in conjunction with call state handling under CAP V4. For a CAP V2 implementation the ring tone must be part of the announcement as discussed below.

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Note that the user will get the announcement after accepting an incoming call but it is possible to disconnect before the actual call connection is made.

For playing an announcement the SCP 24 will sent a CAP-PA message(play Announcement) with the indication of the prerecorded message, prerecorded tone, a combination of prerecorded tones and messages, a text string that is converted into speech, or a variable message containing several of the before described elements. When the announcement is completed the SSF in the MSC 22 informs the service in the SCP 24 thereof by a CAP-SSR (Specialized Resource Report). Then the SCP 24 sends CAP-CON for actual connecting the call. If a called party 34 disconnects before that the call will not be established or established in an alternative way as controlled by the service in the SCP 24.

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## CLAIMS

1.     Method for setting up a call in a telecommunication network between a calling
terminal (33) and a called terminal (34), comprising

5      receiving from a calling terminal (33) a request to set up a call to a called terminal (34),
retrieving call set up information from a stored connection table (45), the connection
table (45) comprising data relating to set up of a call between the calling terminal (33)
and the called terminal (34),
utilizing the retrieved data from the connection table (45) to set up the call.

10

2.     Network node in a telecommunication network, the network node (15; 24)
receiving from a calling terminal (33) a request to set up a call with a called terminal
(34), the network node (15; 24) being further arranged to retrieve call set up
information from a stored connection table (45), the connection table (45) comprising

15     data relating to set up of a call between the calling terminal (33) and the called terminal
(34), and to utilize the retrieved data from the connection table (45) to set up the call.

3.     Method according to claim 1, further comprising
determining a first region class for the calling terminal (33), and a second region class

20     for the called terminal (34), the first and second region class being associated with
locations of the calling terminal (33) and the called terminal (34), respectively, and
determining a rating category for the call to be set up using the first region class and the
second region class using the connection table (45).

25  4.     Network node according to claim 2,
the network node (15; 24) being further arranged to determine a first region class for
the calling terminal (33), and a second region class for the called terminal (34), the first
and second region class being associated with locations of the calling terminal (33) and
the called terminal (34), respectively, and to determine a rating category for the call to

30     be set up using the first region class and the second region class using the connection
table (45).

20

5.      Network node of claim 4, wherein the connection table (45) comprises possible rating categories for different combinations of first region class and second region class.

5    6.      Network node according to claim 4 or 5, wherein the network node (15; 24) interfaces with a billing service in the telecommunication network (18), and is further arranged to transmit the rating category to the billing service.

7.      Network node according to any one of claims 4-6, wherein the called terminal
10   (34) is associated with a prepaid account, and the network node (15; 24) is further arranged to send a message to the calling terminal (33) requesting a payment option for the call to be set up to the called terminal (34).

8.      Network node according to claim 7, wherein the network node (15; 24) interfaces
15   with a prepaid service (19) in the telecommunication network (18), and the network node (15; 24) is further arranged to invoke the prepaid service (19) after determining a rating category, and to include the rating category in a message transmitted to the prepaid service (19).

20   9.      Method according to claim 1, wherein the connection table (45) comprises routing information for a called terminal (34), the routing information comprising an indication whether or not a called terminal (34) is reachable via a second network (12) in communication with the telecommunication network (18), and the method further comprises retrieving routing information from the connection table (45), and when the
25   called terminal (34) is reachable via the second network (12), setting up the call via the second network (12).

10.     Network node according to claim 2, wherein the connection table (45) comprises routing information for a called terminal (34), the routing information comprising an
30   indication whether or not a called terminal (34) is reachable via a second network (12) in communication with the telecommunication network (18), the network node (15; 24) being arranged to retrieve routing information from the connection table (45) and when

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the called terminal (34) is reachable via the second network (12), to set up the call via the second network (12).

11.   Network node according to claim 10, in which the connection table (45)
5    comprises a hunting list for a called terminal (34), the hunting list comprising one or more destination addresses to which the call can be set up, and a priority indicator for each of the one or more destination addresses.

12.   Network node according to claim 10 or 11, in which the network node (15; 24) is
10   arranged to apply a set of rules to data obtained from the connection table (45).

13.   Method according to claim 9, wherein the connection table (45) further comprises a route to mobile (RTM) group identification and an announcement indicator associated with a called terminal (34), and the method further comprises sending a message to the
15   called terminal (34) prior to call establishment based on the announcement indicator.

14.   Network node according to any one of claims 10-12, wherein the connection table (45) further comprises a route to mobile (RTM) group identification and an announcement indicator associated with a called terminal (34), and the network node
20   (15; 24) is further arranged to send a message to the called terminal (34) prior to call establishment based on the announcement indicator.
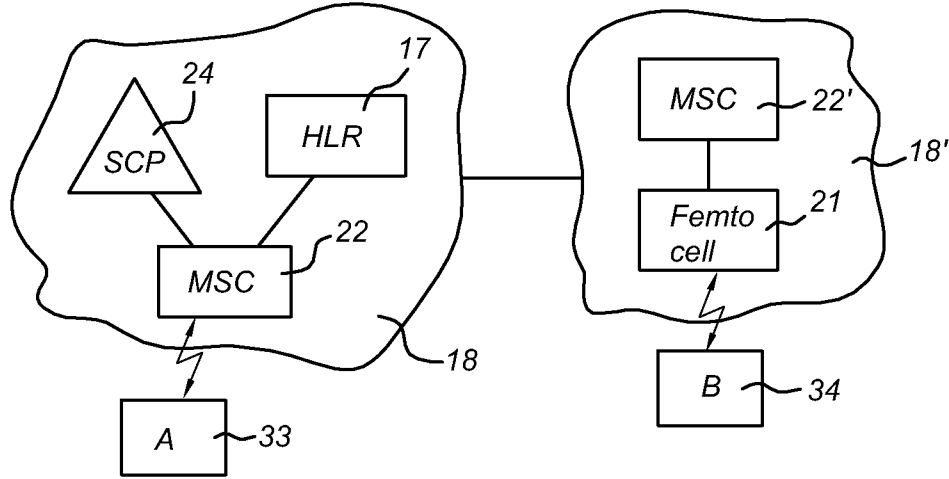
*************
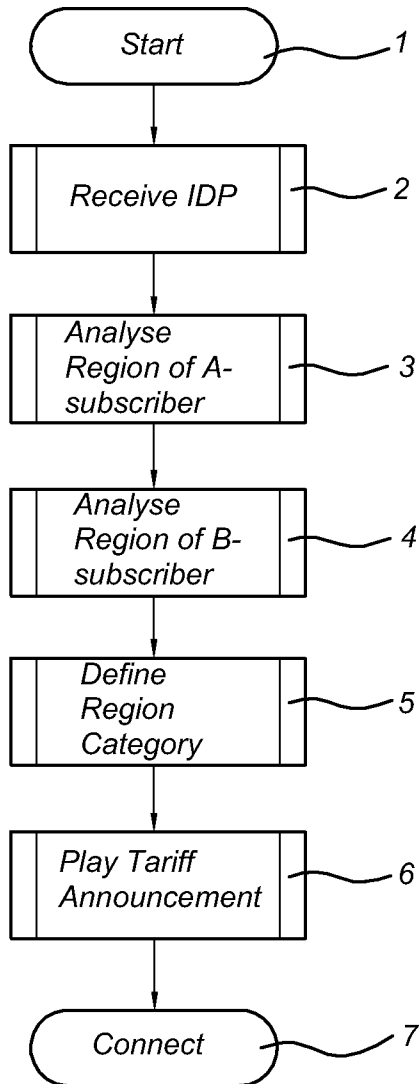
# Fig 1



# Fig 2

Fig 3
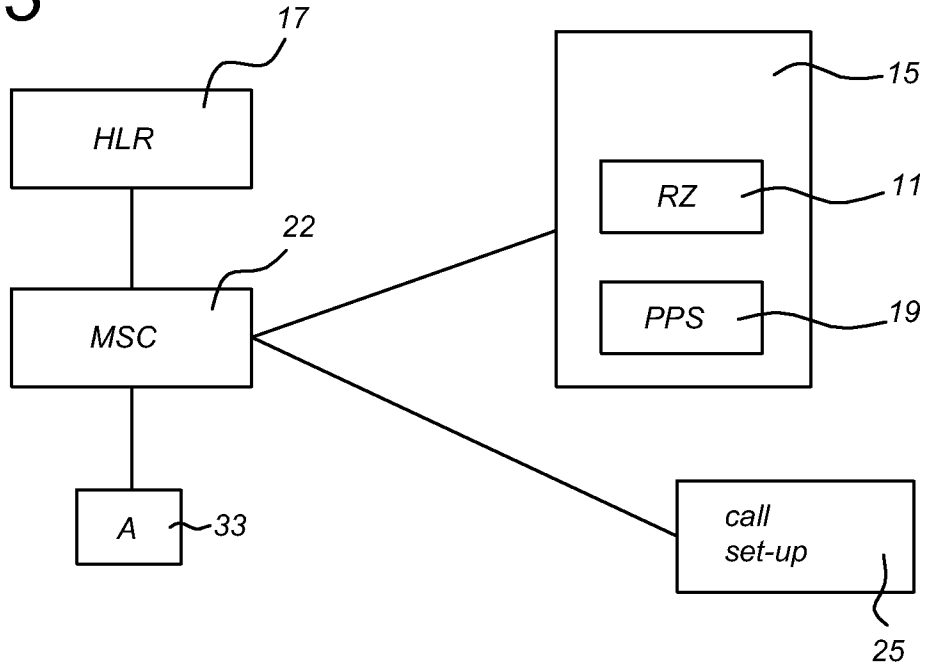


Fig 4
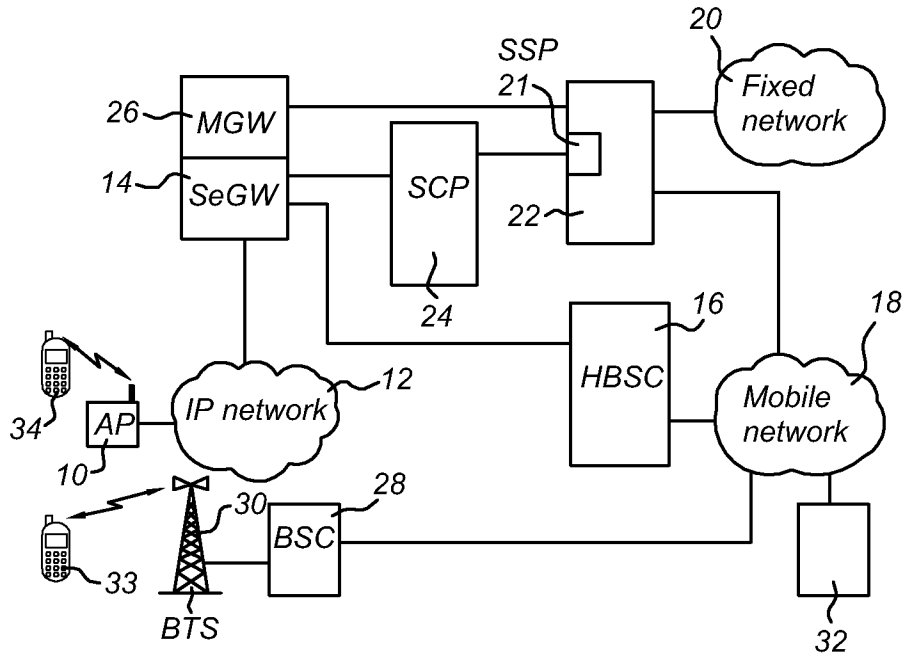
# Fig 5
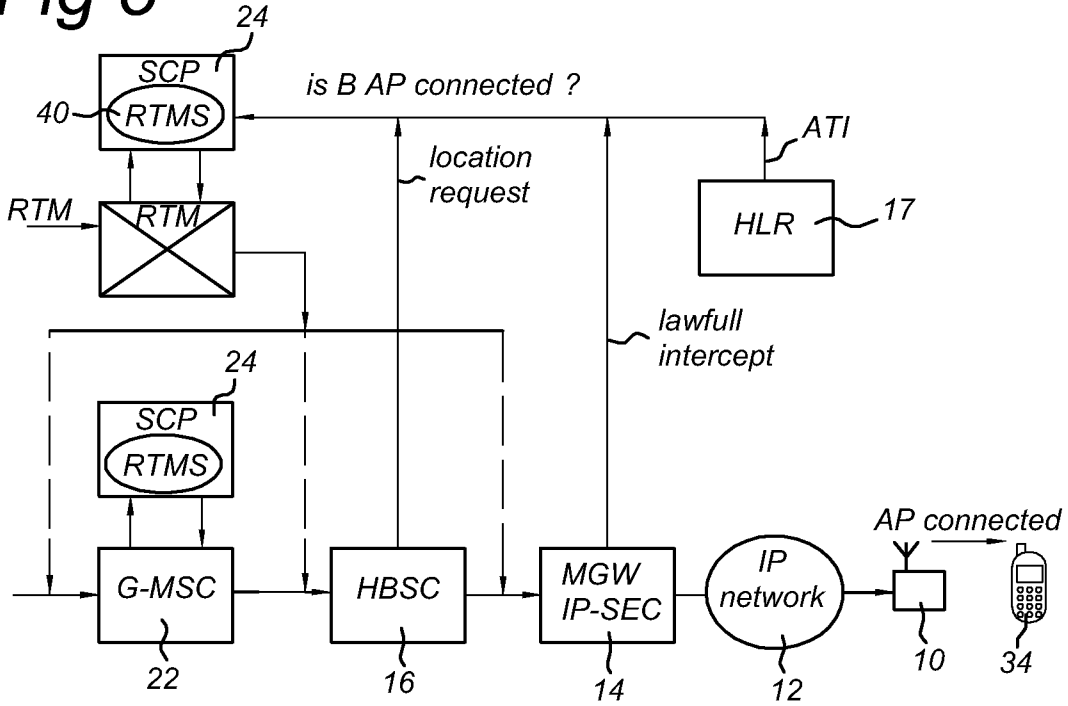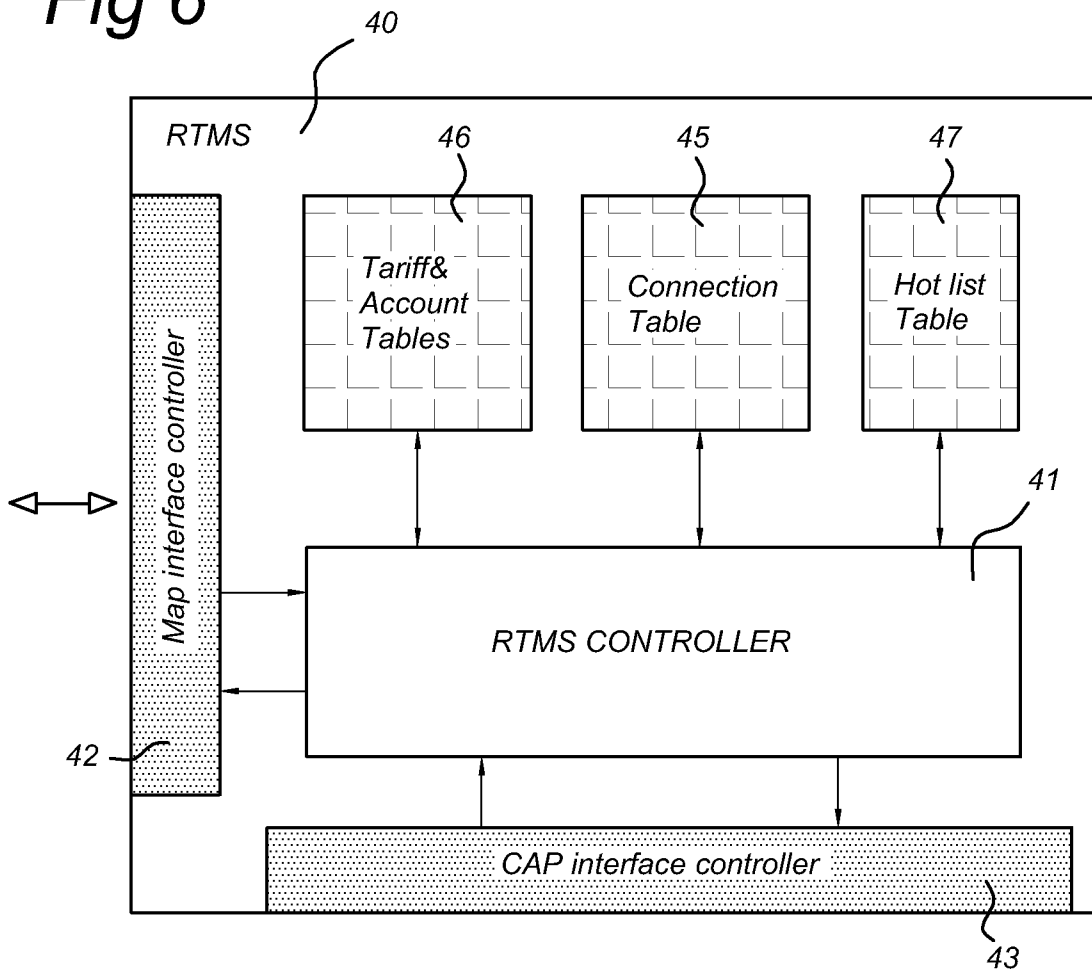
is B AP connected ?

location
request

lawfull
intercept

AP connected

ATI

SCP — 24
RTMS — 40

RTM — RTM

SCP — 24
RTMS

HLR — 17

G-MSC
22

HBSC
16

MGW
IP-SEC
14

IP
network
12

10        34

# Fig 6

40

RTMS

46                45                47

| Tariff&<br>Account<br>Tables | Connection<br>Table | Hot list<br>Table |

41

Map interface controller

RTMS CONTROLLER

42

CAP interface controller

43

# INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV.  H04W4/24      H04W4/16

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 .

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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-/--

[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 |
|---|---|
| 14 October 2009 | 22/10/2009 |

| 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 | Biyee, Nicole |

C(Continuation).   DOCUMENTS CONSIDERED TO BE RELEVANT

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Form PCT/ISA/210 (continuation of second sheet) (April 2005)

| Box No. II | Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet) |

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

| Box No. III | Observations where unity of invention is lacking (Continuation of item 3 of first sheet) |

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM    PCT/ISA/ 210**

This International Searching Authority found multiple (groups of)
inventions in this international application, as follows:

1. claim: 1 and 2 in combination with claims 3 to 8

   Method and network node for determining a rating category to
   be used for billing a call based on the region classes
   associated with the locations of the calling and called
   terminals, respectively, using information stored in a
   connection table

   ---

2. claim: 1 and 2 in combination with claims 9 to 14

   Method and network node for determining how to set up a call
   to a called terminal based on routing information for the
   called terminal retrieved from a stored connection table.

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