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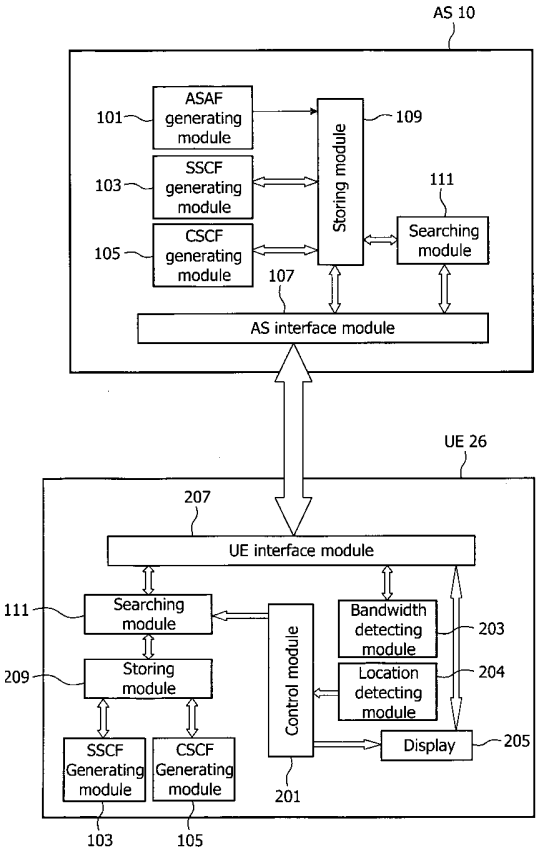
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(54) Title: METHOD AND APPARATUS FOR A USER EQUIPMENT TO OBTAIN LOCATION-BASED SERVICES



(57) Abstract: A method for a UE to obtain LBS, comprising: obtaining the location information of the UE; judging whether the UE is in the area where LBS are pre-customized, according to the location information and the predefined area relationship information; establishing a radio link with an application server capable of providing the LBS if the UE is in the area; receiving the LBS from the application server over the radio link.

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METHOD AND APPARATUS FOR A USER EQUIPMENT TO OBTAIN LOCATION-BASED SERVICES

FIELD OF THE INVENTION

The present invention relates generally to a wireless communication system, and more particularly, to a method and apparatus for a user equipment in the wireless communication system to obtain location-based services.

BACKGROUND ART OF THE INVENTION

Location-based services (LBS), or namely mobile positioning services, are value-added services, with which the wireless communication network operator obtains the location information (longitude and latitude coordinates) of a user equipment through the established wireless network such as GSM, CDMA and other cellular networks, and then provides information relating to the user's location with support of e-map platforms.

With LBS, living information, like local traffic updates, weather, hotel, restaurant and so on, can be provided for the user, and furthermore, emergency rescue can be provided when the user is in danger, thus LBS promises a bright future.

Currently, LBS offered by the LBS provider are delivered to the user equipment mainly via wireless communication networks. When a user needs to obtain LBS, the demand information from him/her is directed to SMSC (Short Message Service Center) via the wireless communication network. Then the SMSC forwards the current location of the user to the corresponding LBS application server along with the demand information. The LBS application server searches the LBS available according to the location of the user and the demand. When the corresponding LBS is found, the searching result is sent to the user via SMSC and the wireless communication network.

Acquisition of the location information of the user needs support from the wireless communication network, and LBS also need to be forwarded via SMSC of the wireless communication network, so current LBS providers have to rely heavily on the wireless communication network operators and the limited service modes of the wireless

communication, like voice service, SMS and MMS, to provide LBS for users. Accordingly, LBS providers can't introduce new LBS quickly, and can't adjust the LBS content provided in time according to the current usage of the network resource (wireless bandwidth). Furthermore, when acquiring LBS, the user can't control and select LBS, but only receive LBS from the LBS provider passively.

It is, therefore, necessary to propose a new method for a user equipment in the wireless communication network system to obtain LBS.

OBJECT AND SUMMARY OF THE INVENTION

An object of the present invention is to provide a method for a user equipment in the wireless communication network system to obtain LBS, with which LBS providers can easily introduce new LBS and adjust the available LBS in time, and thus it turns into a reality for users to dynamically control the LBS acquired.

A method is proposed for a user equipment to obtain LBS in accordance with the present invention, comprising steps: acquiring the location information of the user equipment; judging whether the user equipment is camping in the area where LBS are pre-customized, according to the location information and the predefined area relationship information; establishing a radio link with a LBS application server capable of providing the LBS if the user equipment is camping in the area; receiving the LBS from the application server via the radio link.

A method is proposed for a user equipment to obtain LBS in accordance with the present invention, comprising steps: acquiring the location information of the user equipment; establishing a radio link with a LBS application server capable of providing the LBS; sending the location information along with the LBS service request to the application server via the radio link; receiving the LBS from the application server; wherein the LBS are pre-customized, and the pre-customized LBS are sent to the user equipment when the application server determines that the user equipment is camping in the area where LBS are pre-customized according to the location information and the predefined area relationship information.

A method is proposed for an application server to provide LBS in accordance with the present invention, comprising steps: listing the areas where LBS are available and the

relevant LBS for a user to select from the listed areas and LBS; receiving a choosing instruction from the user's input; generating a customized LBS information, including the corresponding area where the LBS are available, for the user according to the selected instruction; storing the generated customized LBS information for the user.

A user equipment (UE) capable of obtaining LBS is proposed according to the present invention, comprising: a location detecting module, for obtaining the location information of the UE; a searching module, for determining whether the UE is camping in the area where LBS are pre-customized for the user, according to the location information and predefined relationship between customized LBS and area where the customized LBS are available; an interface module, for establishing a radio link with an application server capable of providing LBS; wherein the interface module establishes radio link with the application server and receives LBS from the application server via the radio link if the searching module determines the UE is camping in its customized LBS area.

An application server capable of providing LBS is proposed according to the present invention, comprising: a LBS providing module, for listing the areas where LBS are available and the relevant LBS, for a user to select from the listed areas and LBS; a LBS customizing module, for generating a customized LBS information, including the corresponding area where the LBS are available, for the user according to the selected instruction from the user input; a storing module, for storing the generated customized LBS information for the user; a CSCF (customer service configuration file) generating module, for generating an area relationship information according to the areas where the user has customized LBS and the predefined area demarcation criteria, the area relationship information at least comprising information about that the area where LBS are pre-customized is demarcated into several child-areas and the location of each child-area is identified by its characters; wherein the storing module stores the area relationship information.

Other objects and attainments together with a fuller understanding of the invention will become apparent and appreciated by referring to the following description and claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Detailed descriptions will be given below to the present invention in conjunction with specific embodiments and accompanying drawings, in which:

Fig.1 is a schematic diagram showing a network system from which users can obtain LBS in accordance with the present invention;

Fig.2 is a block diagram illustrating the application server and UE with which users can obtain LBS in accordance with an embodiment of the present invention;

Fig.3 is a schematic diagram showing the area demarcation in accordance with an embodiment of the present invention;

Fig.4 is a schematic diagram showing the data structure of an area described in accordance with an embodiment of the present invention;

Fig.5 is a schematic diagram showing the area relationship information described in accordance with an embodiment of the present invention;

Fig.6 is a schematic diagram for recording area shapes and the corresponding location calculation functions in accordance with an embodiment of the present invention;

Fig.7 is a flowchart showing the execution of area search in accordance with an embodiment of the present invention;

Fig.8 is a block diagram showing the application server with user configuration function, from which users can obtain LBS, and the UE, in accordance with an embodiment of the present invention;

Fig.9 is a block diagram showing the architecture of the application server from which users can obtain LBS and the UE in accordance with an embodiment of the present invention;

Fig.10 is a block diagram showing the architecture of the application server with user configuration function, from which users can obtain LBS, and the UE, in accordance with an embodiment of the present invention.

Throughout the drawing figures, like reference numerals will be understood to refer to like parts and components.

DETAILED DESCRIPTION OF THE INVENTION

According to the method for a UE in the wireless communication system to obtain

LBS as proposed in the present invention, a radio link can be established between the UE and an application server (AS) capable of providing LBS, and through the radio link, the UE can report its location information obtained through GPS to the AS. According to the current location of the UE and the LBS the user purchased beforehand, the AS judges whether the UE is in an area where LBS are pre-customized. If it's determined that the UE is currently in an area where LBS are pre-customized, the AS sends LBS directly to the UE via the radio link.

Fig.1 illustrates a network system with which users can obtain LBS. As shown in Fig.1, a UE 20 with GPS receiver capability and at least one radio interface such as cellular MODEM, establishes a radio link with an AS 10 in the LBS provider network, via Internet 40 and cellular network 30 consisting of accession station 301 and control center 302.

As shown in Fig.1, if UE 20 is in a WLAN and equipped with a WLAN MODEM, it can establish a radio link with AS 10 via Internet 40 or directly, using WAP for example.

UE 20 can report the location information obtained through GPS satellite 50 (UE 20 can calibrate the location information using the cellular network) to AS 10 via the established radio link. After determining that UE 20 has pre-customized LBS in the area, AS 10 sends the corresponding LBS to UE 20.

Detailed descriptions will be given below to the above procedure as how the user obtains LBS, in conjunction with Figs.2 to 7.

As shown in Fig.2, first, the LBS provider inputs information about the several areas and the corresponding LBS available in these areas, into AS 10. According to the input information about the relevant areas and the corresponding LBS available in these areas, an ASAF module 101 generates an ASAF (Available Service and Area File) and stores it in storing module 109.

When the user logs into AS 10 to customize relevant LBS in the areas where LBS are expected to be available, SSCF generating module 103 reads out the ASAF from storing module 109 and lists the areas where LBS are available and the relevant LBS for the user to select. The user can select from the listed areas and the corresponding LBS: (i) customize a certain LBS service in all areas where LBS are available (the service content is what the user cares); (ii) customize, in some areas where LBS are available, all the LBS services available in these areas (the service area is what the user concerns about); (iii)

customize the corresponding LBS in different areas where LBS are available. Among the above three cases, (iii) is the most common one, so SSCF generating module 103 takes area as the main category and the corresponding LBS available as the sub-category, or LBS as the main category and the area where LBS are available as the sub-category, so that the user can customize according to actual requirement. Based on the instruction the user inputs, SSCF generating module 103 generates an information SSCF about the LBS the user customizes in the areas where LBS are available, and the information SSCF is also stored in storing module 109.

Since the UE originating the LBS service request is likely to be moving, AS 10 should instantly judge whether the UE has customized LBS in the area to which the location belongs according to the UE's location after receiving the LBS service request from the UE. If LBS have been customized, the customized LBS will be sent to the UE in time.

To speed up the judgment of AS 10, an area demarcation method and a search method in particular are proposed in the embodiment of the present invention, which are implemented by CSCF (Client Service Configuration File) generating module 105 and searching module 111 respectively.

First, let's describe the operations of CSCF module 105 in conjunction with Figs.3 to 5.

Fig.3 is a schematic diagram showing that CSCF generating module 105 demarcates the area where the user has customized LBS. As shown in Fig.3, CSCF generating module 105 demarcates the area where the user has customized LBS into several child-areas with different shapes, such as circular child-area A1, rectangular child-area A2 and circular child-area A3, according to the predefined area demarcation criteria set by the LBS provider. Each child-area can be further demarcated into several smaller child-areas with different shapes, or namely micro-areas. For instance, circular child-area A3 is demarcated into rectangular micro-area A31, circular micro-area A32, circular micro-area A33 and ellipsoidal micro-area A34, and circular micro-area A33 can be further demarcated into even smaller child-areas with different shapes, such as circular child-area A331. With the area being demarcated hierarchically, searching module 111 can find quickly the area where the UE is camping and LBS are available, which will be elaborated in the following

section.

After the area where the user has customized LBS is demarcated hierarchically into several child-areas according to the above method, CSCF generating module 105 defines each demarcated area as a specific data structure. Referring to Fig.4, the data structure of each area includes parent area, area shape, area characteristic value, first child-area and peer area in the same demarcation hierarchy, wherein the area characteristic value are composed of geometry parameters and location parameters corresponding to the area shape, for example, the characteristic value of circular child-area A3 include the radius of the circle as the geometry parameter and the coordinates of the circle center as the location parameter.

Fig. 5 is a schematic diagram showing an area relationship information CSCF formed by CSCF generating module 105 with the data structure shown in Fig.4 after the area where the user has customized LBS is demarcated hierarchically. The area relationship information not only reflects the areas in which the user has customized LBS, but also records the relationship between the areas. The CSCF information is also stored in storing module 109.

According to the embodiment of the present invention, after the user of the UE has customized the corresponding LBS in the areas where LBS are available and has formed the SSCF information and CSCF information of the user on AS 10 using SSCF generating module 103 and CSCF generating module 105 according to the areas provided in the ASAF file and the relevant LBS, the user basically completes configuration of the server side.

When the user expects to get the LBS pre-customized in the area which he/she locates in the wireless network, searching module 111 in AS 10 will perform a fast judgment according to the above generated CSCF information, to decide whether to provide the user information about the LBS the user has customized in the area recorded in the SSCF information. Description will be given below to the judgment procedure in conjunction with Fig. 6 and 7.

Fig. 6 shows a table about area shapes and the corresponding location calculation functions stored in storing module 109. Referring to Fig.6, circular child-area A3 shown in Fig. 3 is still taken as an example. If it's necessary to determine whether the UE is in A3,

the area shape of A3 is obtained first according to the data structure of A3. After the shape of A3 is determined to be circular, the characteristic value of A3 (the radius of the circle and the coordinates of the center of the circle) and the location information of the UE are substituted into the location calculation function corresponding to a circle in Fig.6, and it can be very easy to determine whether the UE is in A3, for example, with the method of calculating the distance between the UE and the coordinates of the center of A3 according to the location information of the UE and then judging whether the distance is less than the radius of the circle.

Detailed description will go below to the procedure as how UE 20 acquires LBS provided from AS 10, referring to the flowchart as shown in Fig.7.

First, after obtaining the location information of UE 20 by using GPS, UE 20 sends a request for establishing radio link to AS 10 via interface module 207. After establishing radio link with AS 10, UE 20 sends the location information and LBS service request to AS 10 over the radio link.

Upon receipt of the LBS service request from UE 20, searching module 111 in AS 10 judges whether the LMA (Last Matched Area) or namely the area where UE 20 camps in the last calculation stored in storing module 109 is the root area (step S10). The indication of the root area is that the field "parent area" in the data structure of the area is Null.

If area LMA is not the root area, judgment goes to whether the UE is still in area LMA (step S12). In the judgment method used in step S12, calculation is done with the location calculation function corresponding to the shape of area LMA to determine whether the UE is still in area LMA through substituting the characteristic value corresponding to the shape and the location information of the UE according to the shape of area LMA into the location calculation function..

If the UE is still in area LMA, judgment goes to whether area LMA is further demarcated into several child-areas according to the area relationship information CSCF as shown in Fig.5 (step S20). If area LMA is not further demarcated into several child-areas, that is, the field "first child-area" in the data structure of area LMA is Null, it's determined that UE 20 is still in area LMA (step S32). Otherwise, if area LMA is further demarcated into several child-areas, step S26 will be executed, which will be described hereafter.

If the UE has left area LMA, judgment goes to whether UE 20 is in the parent area of

area LMA according to the CSCF information shown in Fig.5, that is, judging whether UE 20 is in the area represented by the field "parent area" in the data structure of area LMA (step S14).

If UE 20 is in the parent area of area LMA, judgment goes to whether UE 20 is in one of the peer child-areas constituting the parent-area (step S22), that is, the area represented by the field "first child-area" in the data structure of the parent area and the area represented by the field "peer area in the same demarcation hierarchy" in the data structure of area LMA. If UE 20 is not in any of the peer child-areas of the parent area, it indicates that UE 20 is not in the areas included in the CSCF information, that is, UE 20 is not in the area where it has pre-customized LBS (step S34); if UE 20 is in one of the peer child-areas of the parent area, step 28 will be executed, which will be described later.

If UE 20 is not in the parent area of area LMA, judgment goes to whether the parent area of area LMA is the root area (step S16). If the parent area of area LMA is the root area, it indicates that UE 20 currently is not in the area where it has pre-customized LBS (step S34); if the parent area of area LMA is not the root area, judgment goes to whether UE 20 is in a peer child-area in the same demarcation hierarchy as the parent area of area LMA (step S18). If UE 20 is not in any peer child-area in the same demarcation hierarchy as the parent area of the area LMA, it indicates that UE 20 currently is not in the area where it has pre-customized LBS (step S34); if UE 20 is in a peer child-area in the same demarcation hierarchy as the parent area of the area LMA, step 28 will be executed, which will be described later.

If it's determined in the above step S10 that area LMA is the root area (area LMA is initialized as the root area when searching module 111 executes search operation the first time), judgment goes to whether area LMA is further demarcated into several child-areas (step S24). If area LMA is not further demarcated into several child-areas, that is, the field "first child-area" in the data structure of area LMA is Null, then area LMA is the root area and has no child-area, which indicates that UE 20 currently is not in the area where it has pre-customized LBS (step S34).

If area LMA is demarcated into several child-areas, judgment goes to whether UE 20 is in a child-area of area LMA (step S26). If UE 20 is not in any child-area of area LMA, it indicates that UE 20 currently is not in the area where it has pre-customized LBS (step

S34); if UE 20 is in a child-area of area LMA, judgment goes to whether the child-area is demarcated into several even smaller child-areas (micro-areas) (step S28). If the child-area is not demarcated into several even smaller child-areas, it's determined that UE 20 is in the child-area (step S32); if the child-area is demarcated into several even smaller child-areas, judgment goes to whether UE 20 is in one of the even smaller child-areas (step S30). If UE 20 is not in any of the even smaller child-areas, it indicates that UE 20 currently is not in the area where it has pre-customized LBS (step S34). If UE 20 is in one of the even smaller child-areas, execution goes on with step S28, to find the smallest child-area where UE 20 is.

That a UE in A331 sends a LBS service request to a application server will be taken as an example below, to describe the procedure as how searching module 111 determines that the UE is in area A331 according to the CSCF information shown in Fig.5 using the location calculation function as shown in Fig.6, in conjunction with the flowchart tin Fig.7.

It's assumed that area LMA is area A22, that is, UE 20 is in area A22 the last time the location of UE 20 is calculated. First, step S10 is executed, to judge whether area LMA (or namely area A22) is the root area. According to the data structure of area A22 as shown in Fig.5, the field "parent area" is "A2", so the judgment result in step S10 is that area LMA (area A22) is not the root area, then the process goes to step S12 to judge whether UE 20 is in area LMA (area A22). According to the "circular" as represented by the field "area shape" in the data structure of area A22, the location calculation function corresponding to the circular area in Fig.5 is found, and the "area characteristic value" (i.e. geometry parameters "circle radius" and location parameters "coordinates of the circle center") in the data structure of area A22 and the location information of UE 20 are substituted into the corresponding location calculation function, to calculate the distance between UE 20 and the coordinates of the center of area A22. By comparing the distance with the radius of area A22, it's determined in step S12 that UE 20 is not in area LMA (area A22), and thus step S14 is executed, to judge whether UE 20 is in the parent area of area LMA (area A22).

The field "parent area" in the data structure of area A22 is "A2", so judgment goes to whether UE 20 is in the parent area A2 of area A22. According to the "rectangle" as represented by the field "area shape" in the data structure of area A2, the location calculation function corresponding to the rectangular area in Fig.5 is found and the "area

characteristic value" in the data structure of area A2 are substituted into the corresponding location calculation function along with the location information of UE 20, to determine that UE 20 is not in the parent area A2 of area A22. According to the flowchart shown in Fig.7, step S16 will be executed, to judge whether the parent area A2 of area A22 is the root area.

Since the field "parent area" in the data structure of area A2 is "root area" rather than "Null", step S18 will be executed, to judge whether UE 20 is in a peer child-area in the same demarcation hierarchy as area A2, that is, in area "A3" or area "A1" as represented by the field "peer area in the same demarcation hierarchy" in the data structure of area A2. Wherein, area "A1" can be found according to area "root area" as represented by the field "parent area" in the data structure of area A2 and then through area "A1" as represented by the field "first child-area" in the data structure of the root area.

According to the "circle" as represented by the field "area shape" in the data structure of area A1 or A3, the location calculation functions corresponding to the circular areas in Fig. 5 is found respectively, and the "area characteristic value" in the data structure of area A1 or A3 and the location information of UE 20 are substituted into the corresponding location calculation function for calculation, to determine that UE 20 is in area A3. Therefore, step S28 can be executed then, to judge whether area A3 is demarcated into even smaller child-areas.

The field "first child-area" in the data structure of area A3 is not "Null", which indicates that area A3 is demarcated into several even smaller areas, so step S30 will be executed. In step S30, judgment goes to whether UE 20 is in a child-area of area A3. According to area "A31" represented by field "first child-area" in the data structure of area A3, area "A32" represented by the field "peer area in the same demarcation hierarchy" in the data structure of area A31, area "A33" represented by the field "peer area in the same demarcation hierarchy" in the data structure of area A32 and area "A34" represented by the field "peer area in the same demarcation hierarchy" in the data structure of area A33, judgment goes respectively to whether UE 20 is camping in child-area A31, A32, A33 or A34 of area A3. From calculation it can be determined that UE 20 is in child-area A33 of area A3. Then, referring to the flowchart shown in Fig.7, judgment goes to whether area A33 is further demarcated into several child-areas, i.e. step S28.

The field "first child-area" in the data structure of area A33 is "A331", so judgment goes on with whether UE 20 is in area A331 and thus finds that UE 20 is in the smallest child-area A331.

Using the CSCF information shown in Fig.5, searching module 111 can determine whether UE 20 currently is in the area where it has pre-customized LBS, through performing the search procedure shown in Fig.7.

If UE 20 is not in the area where it has pre-customized LBS, AS 10 won't provide LBS to UE 20; if UE 20 is in the area such as the above area A331 where it has pre-customized LBS, AS 10 reads out the SSCF information of the user stored in storing module 109 and sends the LBS corresponding to area A331 in the SSCF information to UE 20 via interface module 107 of the AS.

UE 20 can access the customized LBS directly via protocols like HTTP. Its bottom-layer link may be WLAN or GPRS, depending on the profile of its wireless interface device. UE 20 can also access LBS using instant message or cellular short message mechanism. For example, if UE 20 and LBS AS 10 are in the same WLAN, AS 10 can send the stored LBS information to UE 20 over the direct link established between AS 10 and the WLAN interface of UE 20; if UE 20 and LBS AS 10 are not in the same WLAN, AS 10 can send the stored LBS information to UE 20 over the direct link established between the Internet and the WLAN interface of UE 20, with instant message transfer mechanism like MS MSN or Yahoo message as provided by the network operator; if UE 20 is in wireless WAN, AS 10 can send the stored LBS information to UE 20 over the radio link established between the SMS or MMS service center and the cellular MODEM of UE 20 through the SMS or MMS service center of the cellular network. But at this time, it's likely that the cellular network may not transfer SMS or MMS message in time, thus it's better to add time flag in the SMS or MMS message to be transferred so that the user can determine whether the transferred LBS are still valid for the current location. All these can be done by the LBS client software downloaded via the UE. The LBS provider can customize the LBS acquisition manner when the UE connects its server to download the LBS client software, or users can change the LBS acquisition configuration of the LBS client software according to the configuration of the UE.

Furthermore, when sending the customized LBS to UE 10, AS 10 can provide text or

multimedia LBS to UE 20 according to the current bandwidth usage of the wireless network. The specific procedure is as follows: adding a bandwidth detecting module 203 in UE 20, for detecting the current bandwidth usage of the wireless network when UE 20 requests to establish radio link with AS 10, and sending the detection result to AS 10 via interface module 207 of the UE; AS 10 provides the relevant LBS to UE 20 according to the detection result received via interface module 107 of the AS.

Additionally, when AS 10 sends the customized LBS to UE 20, UE 20 can display the received LBS on display 205 automatically or display it on display 205 when the user requires according to the user instruction, through adding a control module 201.

In order to enable the user to dynamically control the expected LBS, SSCF generating module 103, CSCF generating module 105 and the ASAF information stored in storing module 109 in AS 10, are downloaded to UE 22 (as shown in Fig.8) so that the user can modify its customized LBS in UE 22 without logging into the AS. Specifically, when the user needs to cancel or add LBS in a certain area based on the downloaded ASAF information, or when the LBS provider adds LBS and sends the updated ASAF information to UE 22 and thus the user needs to cancel or add LBS in a certain area according to the updated ASAF information, the SSCF generating module in UE 22 lists the areas where LBS are available and the LBS included in the ASAF information for the user to select, and generates an updated SSCF information according to the user selection; the CSCF generating module generates an updated CSCF information according to the area where the user has customized LBS in the updated SSCF information. The operations of the SSCF generating module and CSCF generating module are the same as those in AS 10.

After the updated SSCF information and CSCF information are generated, UE 22 sends the updated SSCF information and CSCF information to AS 10 through establishing a radio link with AS 10 immediately, to update the SSCF information and CSCF information previously stored in AS 10. Or UE 22 first stores the updated SSCF information and CSCF information in storing module 209, and then sends the updated SSCF information and CSCF information to AS 10 along with the radio link establishment request or LBS service request later when UE 22 requests AS 10 for establishing radio link or sends LBS service request to AS 10, to update the SSCF information and CSCF information previously stored in AS 10.

In the embodiments described in conjunction with Fig.2 and Fig.8, the UE to get LBS first sends request for establishing radio link to AS 10, and sends LBS service request later to AS 10 over the radio link after the radio link is established; then, after the searching module in AS 10 searches according to the CSCF information and determines the UE is in the area where it has pre-customized LBS, AS 10 provides LBS corresponding to the area to the UE according to the SSCF information, so that the UE can receive LBS from the AS over the radio link.

In another embodiment of the present invention as shown in Fig.9, UE 24 includes searching module 111 which is downloaded from AS 10, so that the searching module 111 can perform a fast judgment as whether UE 24 is in the area where it has pre-customized LBS according to the location information obtained by UE 24 using GPS and the stored CSCF information of the user downloaded from the AS beforehand when UE 24 expects to obtain LBS. Only after searching module 111 in UE 24 determines that UE 24 is in the area where it has pre-customized LBS, can UE 24 send a radio link establishment request to AS 10 to establish a radio link with AS 10 and sends a LBS service request to AS 10 over the radio link. Upon receipt of the LBS service request from UE 24, AS 10 sends the LBS corresponding to the location information in the SSCF information to UE 24 over the radio link, according to the location information of UE 24 included in the LBS service request.

The operation procedure executed by searching module 111 in UE 24 is the same as that in AS 10, wherein searching module 111 in UE 24 performs the above search operations to determine whether UE 24 is in the area where it has pre-customized LBS according to the user instruction, for instance when the user requires to obtain LBS, or performs the above search operations regularly to determine whether UE 24 is in the area where it has pre-customized LBS according to the time interval the user presets, or generates a control information when location detecting module 203 in UE 24 detects that UE 24 has left area LMA, to perform the above search operations to determine whether UE 24 is in the area where it has pre-customized LBS.

In the embodiment as shown in Fig.9, searching module 111 in UE 24 won't originate the request for establishing radio link with the application server when determining that UE 24 is not in the area where it has pre-customized LBS, with which limited radio resource can be saved, and the battery power of UE 24 can be preserved as well. The

embodiment shown in Fig.9 is, therefore, a preferred embodiment.

Admittedly, UE 24 in Fig.9 can also download the SSCF generating module and CSCF generating module in AS 10, as best shown in Fig.10. According to the newest ASAF information downloaded from AS 10 at any moment or the stored ASAF information downloaded previously from AS 10, the user can modify the customized LBS and generates new SSCF information and CSCF information at UE 26. Through replacing the CSCF information previously stored in the UE with the newly generated CSCF information and uploading the new SSCF information along with the new CSCF information to AS 10 to replace the previous SSCF information and CSCF information of the user in the AS, the user can dynamically control the LBS expected.

ADVANTAGEOUS EFFECTS OF THE INVENTION

Detailed descriptions are given above to the method for a UE in the wireless communication system to obtain LBS in accordance with the present invention. In this method, the UE can connect the provider network directly via WLAN or GPRS to obtain service, so tight couple with operators is not required for the LBS provider and various services can be deployed flexibly, which is beneficial for the LBS provider to introduce new LBS quickly.

Furthermore, the user can determine its location at the UE side and initiate service request, thus he/she can control acquisition of services rather than just wait passively, which is of great help for saving the limited radio resource and the battery power of the UE. Meanwhile, the user can also modify and add LBS in some areas at the UE in time according to the downloaded ASAF information, so he/she can dynamically control the LBS expected to some extent.

Moreover, the UE can report the current usage of the network resource (wireless bandwidth) detected to the AS, so the AS can adjust the LBS content to be sent in time, and thus the UE can obtain the optimum LBS.

It is to be understood by those skilled in the art that the method as disclosed in this invention can be made of various modifications without departing from the spirit and scope of the invention as defined by the appended claims.

CLAIMS:

1. A method for a UE(user equipment) to obtain location-based services (LBS), comprising steps of:

(a) obtaining location information of the UE;

(b) judging whether the UE is in a area where LBS are pre-customized, according to the location information and predefined area relationship information;

(c) establishing a radio link with an application server capable of providing the LBS if the UE is in the area;

(d) receiving the LBS from the application server over the radio link.

2. The method according to claim 1, wherein:

said predefined area relationship information, at least includes information about that area where the user has customized LBS is demarcated into several child-areas and location of each child-area is identified by its characteristic values;

said step (b) further comprises: judging whether the UE is in one of the several child-areas according to the characteristic values of the several child-areas and the location information of said UE.

3. The method according to claim 2, wherein:

said predefined area relationship information, further includes information about that said child-area is demarcated into several micro-areas and location of each micro-area is identified by its characteristic values;

said step (b) further comprises: judging whether the UE is in one of the several micro-areas according to the characteristic values of the several micro-areas and the location information of said UE.

4. The method according to claim 2, further comprising steps of:

receiving information about areas and available LBS from said application server;

choosing an area where said user expects to customize LBS according to the received information;

generating an area relationship information according to the chosen area and predefined area demarcation criteria, the area relationship information at least comprising information about that the chosen area is demarcated into several child-areas and location of each child-area is identified by its characteristic values;

updating said predefined area relationship information using the generated area relationship information.

5. The method according to claim 4, wherein said area relationship information further includes information about that said child-area is demarcated into several micro-areas and location of each micro-area is identified by its characteristic values.

6. The method according to any one of claims 2, 3, 4 and 5, wherein, said characteristic values include area shape, geometry parameters corresponding to the area shape and location parameters corresponding to the area shape.

7. The method according to claim 6, further comprising steps of:

configuring LBS said user expects to obtain in said chosen area according to the received information;

sending said chosen area and the corresponding customized LBS to said application server.

8. The method according to claim 6, further comprising steps of:

configuring LBS said user expects to obtain in said chosen area according to the received information;

in said step (c), sending said chosen area and the corresponding customized LBS to said application server.

9. The method according to claim 1, further comprising steps of:

detecting wireless bandwidth occupied by said radio link;

sending the detection result to said application server.

10. The method according to claim 3, wherein, said UE starts the operation of said step (b) according to a predefined time interval or control instructions from the user input.

11. The method according to claim 3, further comprising steps of:

recording the area where said UE currently locates and said user has pre-customized LBS according to the judgment result in step (b);

detecting whether said UE is still in a area where said user has pre-customized LBS;

restarting the operation of said step (b) if said UE moves out of said area.

12. The method according to claim 1, wherein said application server provides said LBS to said UE with any one message transfer mechanism of instant messaging of the network operator, SMS (Short Message Service) and MMS (Multimedia Message Service) of the cellular network.

13. A method for a UE to obtain LBS, comprising steps of:

(a) obtaining location information of the UE;

(b) establishing a radio link with a application server capable of providing LBS;

(c) sending the location information along with a LBS service request to the application server over the radio link;

(d) receiving LBS from the application server;

wherein, the LBS is pre-customized, and will be sent to the UE when the application server determines that the UE is in a area where it has pre-customized the LBS according to the location information and predefined area relationship information.

14. The method according to claim 13, further comprising steps of:

receiving information about areas and LBS provided from said application server;

choosing a area where said user expects to customize LBS according to the received information;

generating an area relationship information according to the chosen area and predefined area demarcation criteria, the area relationship information at least including information about that the chosen area is demarcated into several child-areas and location of each child-area is identified by its characteristic values;

sending the area relationship information to said application server.

15. The method according to claim 14, wherein said area relationship information further includes information about that said child-area is demarcated into several micro-areas and location of each micro-area is identified by its characteristic values.

16. The method according to claim 14 or 15, wherein said characteristic values include area shape, geometry parameters corresponding to the area shape and location parameters corresponding to the area shape.

17. The method according to claim 16, further comprising steps of:

configuring LBS said user expects to obtain in the chosen area according to the received information;

establishing a radio link with said application server;

sending the chosen area and the corresponding customized LBS to said application server over the radio link.

18. The method according to claim 16, further comprising steps of:

configuring LBS said user expects to obtain in the chosen area according to the received information;

sending the chosen area and the corresponding customized LBS to said application server in said step (b) or (c).

19. The method according to claim 18, further comprising steps of:

detecting wireless bandwidth occupied by said radio link;

sending the detection result to said application server.

20. The method according to claim 19, wherein, said UE starts the operation of said step (b) according to a predefined time interval or control instructions inputted by the user.

21. A method for an application server to provide LBS, comprising steps of:

(a) listing areas where LBS are available and the relevant LBS, for user of a UE(user equipment) to choose from the listed areas and LBS;

(b) receiving a choosing instruction from the user input;

(c) generating an information about LBS the user has customized in the areas where LBS are available, according to the choosing instruction;

(d) storing the generated information about the LBS the user has customized in the areas where LBS are available.

22. The method according to claim 21, wherein step (a) includes:

listing the areas where LBS are available, for the user to choose a area where LBS need to be provided;

listing the corresponding LBS the area can provide according to the area chosen by the user, for said user to customize the corresponding LBS in said chosen area.

23. The method according to claim 21, wherein step (a) includes:

listing LBS available, for said user to choose LBS that need to be provided;

listing the corresponding areas where the LBS are available according to the LBS chosen by the user, for said user to choose the corresponding area where the LBS are

available.

24. The method according to claim 21, further comprising steps of:

generating an area relationship information according to the areas where LBS are customized and predefined area demarcation criteria, the area relationship information at least including information about that the areas where LBS are customized is demarcated into several child-areas and location of each child-area is identified by its characteristic values;

storing the area relationship information.

25. The method according to claim 24, wherein said area relationship information further includes information about that said child-areas is demarcated into several micro-areas and location of each micro-area is identified by its characteristic values.

26. The method according to claim 25, wherein said characteristic values include area shape, geometry parameters corresponding to the area shape and location parameters corresponding to the area shape.

27. The method according to claim 21, further comprising steps of:

recording a newly added information about at least one area and LBS available in the area;

sending the information about the updated area and the LBS provided, to said UE;

receiving a information about the LBS customized by said user in the updated area from said UE;

updating the information about the LBS customized by said user in the areas where LBS can be provided stored in step (d), using the received information.

28. The method according to claim 26 or 27, further comprising step of:

sending said area relationship information to said UE.

29. The method according to claim 28, further comprising steps of:

(i) receiving a request for establishing a radio link with said application server from said UE, wherein, the radio link request is sent to said application server by said UE when said UE judges that it is in a area where said user has pre-customized LBS according to said area relationship information;

(ii) establishing the radio link with said UE;

(iii) receiving a LBS request from said UE over the radio link;

(iv) responding the LBS request by sending the corresponding LBS said user has pre-customized to said UE.

30. The method according to claim 29, wherein said LBS request at least includes location information of said UE and said step (iv) comprises:

sending LBS corresponding to the location information to the UE according to the location information.

31. The method according to claim 30, further comprising steps of:

receiving a report message from said UE, the report message being detection result obtained by said UE through detecting wireless bandwidth occupied by said radio link;

sending LBS in text or multimedia form to said UE in said step (iv) according to the report message.

32. The method according to claim 26 or 27, further comprising steps of:

(I) receiving a request for establishing a radio link with said application server from said UE;

(II) establishing the radio link with said UE;

(III) receiving a LBS request from said UE and location information of said UE over the radio link;

(IV) judging whether said UE is in a area where said user has pre-customized LBS, according to the location information and said area relationship information;

(V) responding the LBS request by sending the corresponding LBS said user pre-customized to said UE if said UE is in the area.

33. The method according to claim 32, wherein step (IV) includes:

judging whether said UE is in a child-area according to the characteristic values of said several child-areas and the location information of said UE in the predefined area relationship information.

34. The method according to claim 33, wherein step (IV) further includes:

judging whether said UE is in a micro-area according to the characteristic values of said several micro-areas and the location information of said UE in the predefined area relationship information.

35. The method according to claim 32, further comprising steps of:

receiving an updated area relationship information from said UE, the updated area relationship information being generated by said UE according to information about said updated area and the LBS provided sent from said application server;

updating the stored area relationship information, using the updated area relationship information.

36. The method according to claim 32, further comprising steps of:

receiving a report message from said UE, the report message being detection result obtained by said UE through detecting wireless bandwidth occupied by said radio link;

sending the LBS in text or multimedia form to said UE in said step (V) according to the report message.

37. A UE(user equipment) capable of obtaining LBS, comprising:

a location detecting module, for obtaining location information of the UE;

a searching module, for judging whether the UE is in a area where LBS are pre-customized, according to the location information and predefined area relationship information;

an interface module, for establishing a radio link with an application server capable of providing the LBS;

wherein the interface module establishes the radio link with the application server and receives the LBS from the application server over the radio link if the searching module determine that the UE is in the area.

38. The UE according to claim 37, wherein:

said predefined area relationship information, at least includes information about that area where the user has pre-customized LBS is demarcated into several child-areas and location of each child-area is identified by its characteristic values.

39. The UE according to claim 38, wherein:

said predefined area relationship information, further includes information about that said child-area is demarcated into several micro-areas and location of each micro-area is identified by its characteristic values.

40. The UE according to claim 39, wherein:

said interface module receives information about areas and LBS provided from said application server;

the UE further comprising:

a CSCF (Custom Service Configuration File) generating module, for choosing a area where said user expects to customize LBS according to the received information; generating an area relationship information according to the chosen area and predefined area demarcation rule, the area relationship information at least comprising information about that the chosen area is demarcated into several child-areas and location of each child-area is identified by its characteristic values;

a storing module, for storing the generated area relationship information.

41. The UE according to claim 40, wherein, said characteristic values include area shape, geometry parameters corresponding to the area shape and location parameters corresponding to the area shape.

42. The UE according to claim 41, further comprising:

a LBS configuring module, for configuring LBS said user expects to obtain in the chosen area according to the received information;

wherein said interface module sends the chosen area and the corresponding customized LBS to said application server.

43. An application server capable of providing LBS, comprising:

a LBS providing module, for listing areas where LBS are available and the relevant LBS, for a user to make choice from the listed areas and LBS;

a LBS configuring module, for generating an information about LBS the user customized in the areas where LBS are available, according to the choosing instruction form the user;

a storing module, for storing the generated information about the LBS the user customized in the areas where LBS are available;

a CSCF (Custom Service Configuration File) generating module, for generating an area relationship information according to area where the user has customized LBS and predefined area demarcation rule, the area relationship information at least comprising information about that the area where the user has customized LBS is demarcated into several child-areas and location of each child-area is identified by its characteristic values;

wherein, the storing module stores the area relationship information.

44. The application server according to claim 43, wherein said characteristic values include area shape, geometry parameters corresponding to the area shape and

location parameters corresponding to the area shape.

45. The application server according to claim 44, further comprising:

an interface module, for receiving a request for establishing a radio link with said application server from said UE, wherein the radio link request is sent to said application server by said UE when said UE judges that it is in a area where said user has pre-customized LBS according to said area relationship information;

said application server sends the corresponding LBS said user has pre-customized via the interface module over the radio link established with said UE.

46. The application server according to claim 44, further comprising:

an interface module, for receiving a request for establishing a radio link with said application server from said UE and receiving a LBS request and the location information of said UE from said application server over the radio link after establishing the radio link with said UE;

a searching module, for judging whether said UE is in a area where said user has pre-customized LBS, according to the location information and the predefined area relationship information;

wherein the corresponding LBS the user has pre-customized will be sent to said UE via the interface module if said UE is in the area.

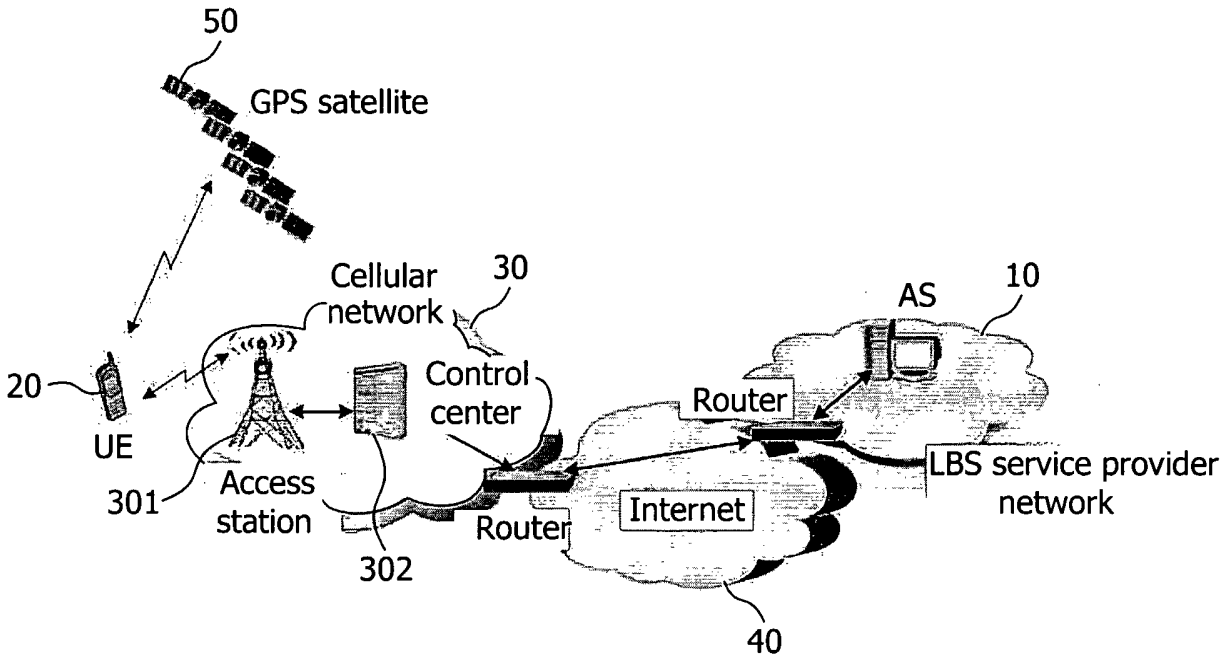

50
GPS satellite
Cellular network
30
AS
10
20
Control center
Router
UE
LBS service provider network
301
Access station
Internet
Router
302
40

FIG. 1

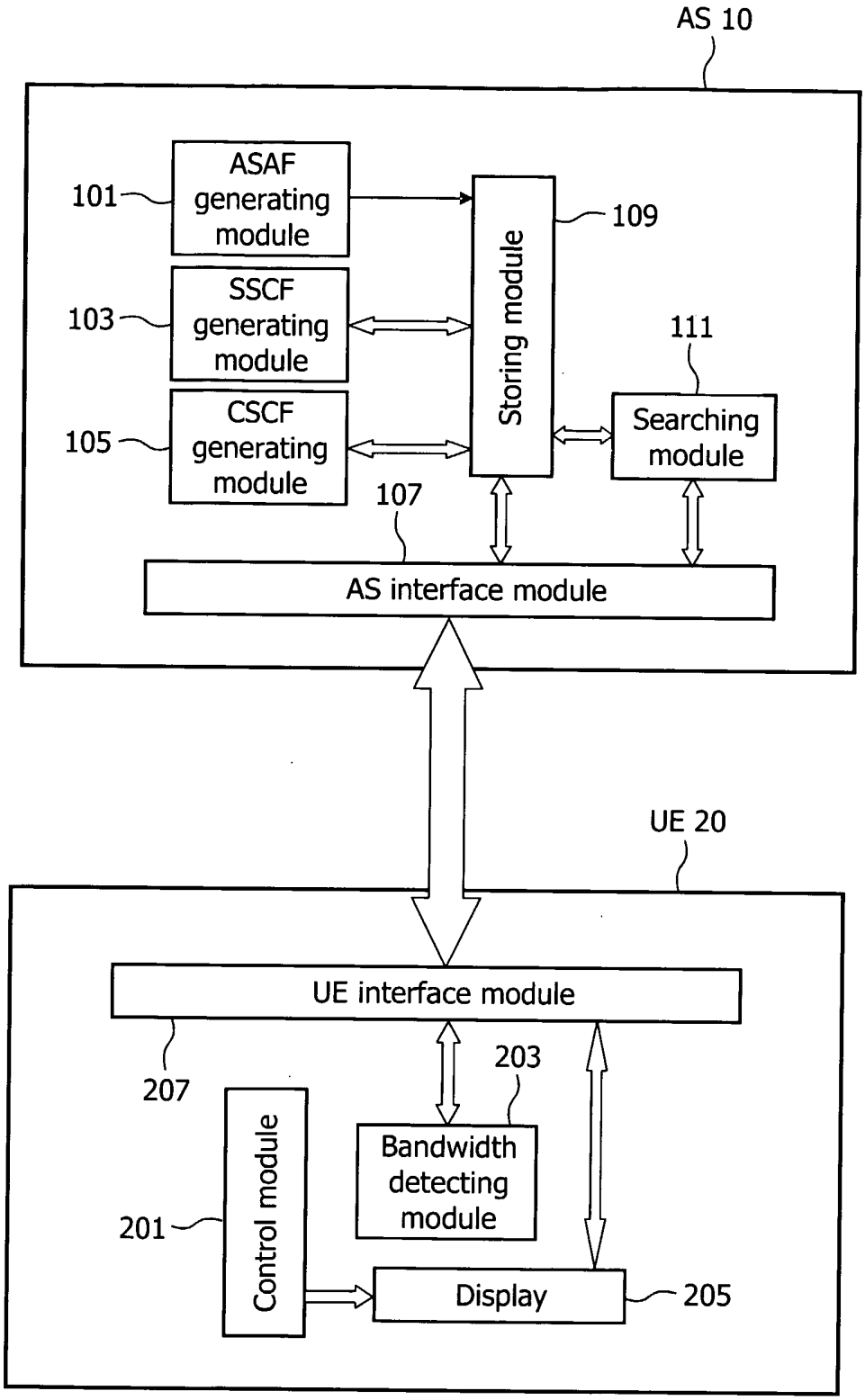

AS 10
ASAF generating module
101
SSCF generating module
103
CSCF generating module
105
Storing module
109
Searching module
111
107
AS interface module
UE 20
UE interface module
207
203
Bandwidth detecting module
Control module
201
Display
205

FIG. 2

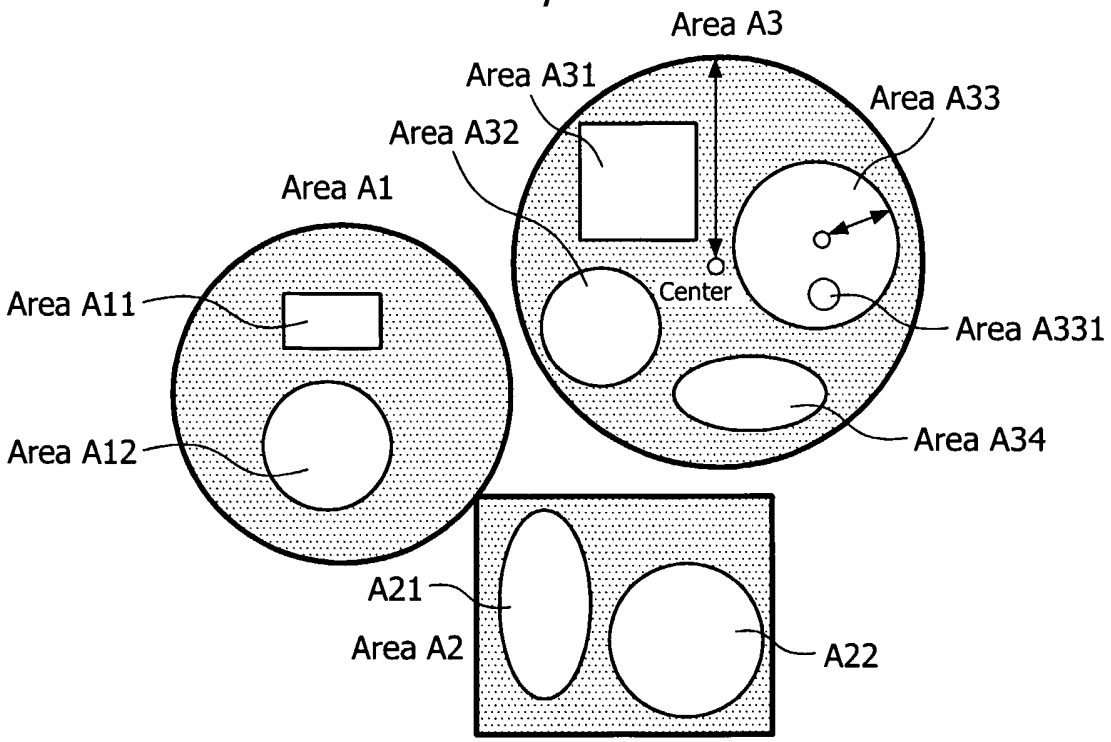


FIG. 3

Parent area	Area shape	Area characteristic values	First child-area	Peer area in the same demarcation hierarchy

FIG. 4

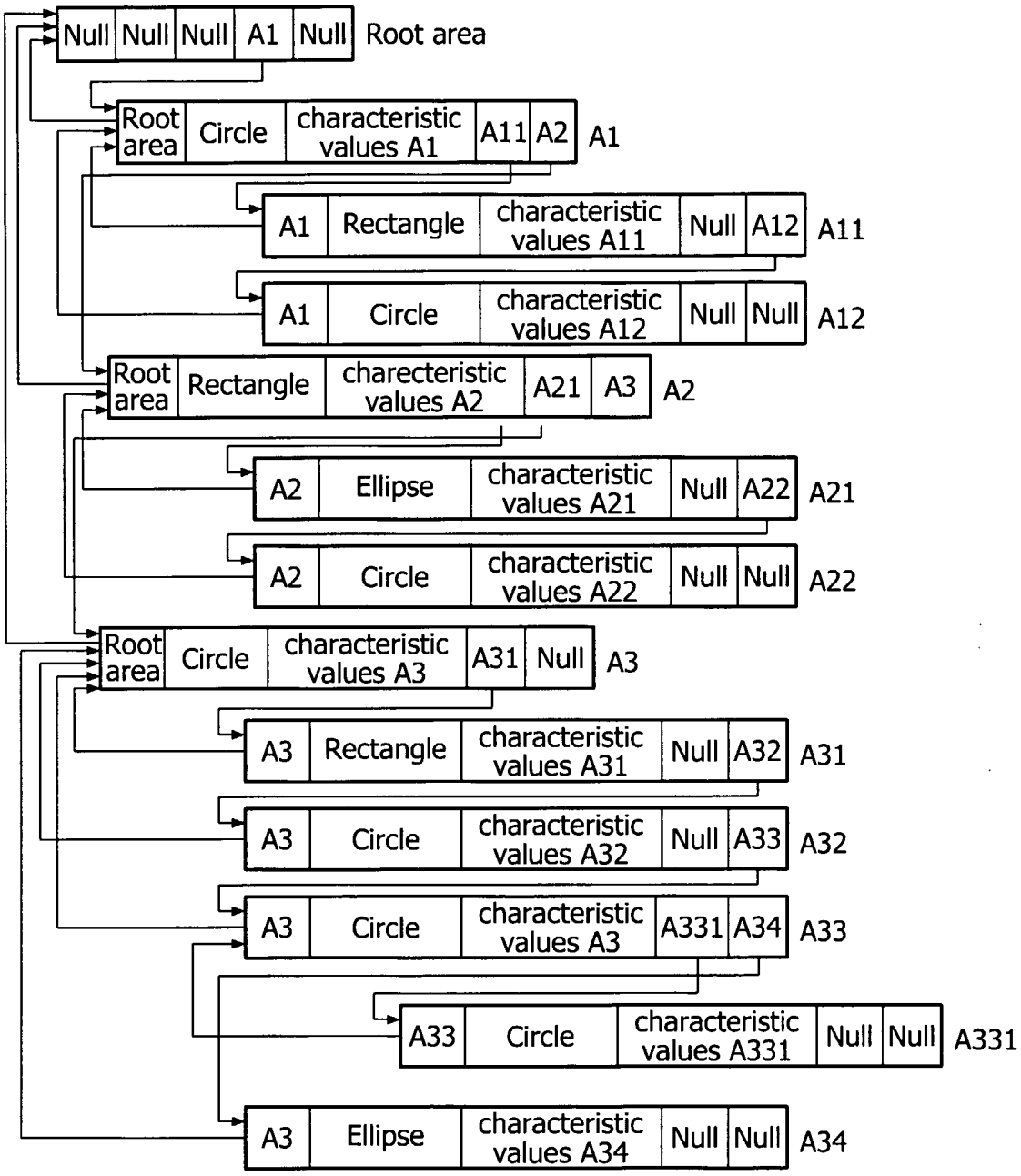

Null Null Null A1 Null
Root area
Root area Circle characteristic values A1 A11 A2
A1
A1 Rectangle characteristic values A11 Null A12
A11
A1 Circle characteristic values A12 Null Null
A12
Root area Rectangle charecteristic values A2 A21 A3
A2
A2 Ellipse characteristic values A21 Null A22
A21
A2 Circle characteristic values A22 Null Null
A22
Root area Circle characteristic values A3 A31 Null
A3
A3 Rectangle characteristic values A31 Null A32
A31
A3 Circle characteristic values A32 Null A33
A32
A3 Circle characteristic values A3 A331 A34
A33
A33 Circle characteristic values A331 Null Null
A331
A3 Ellipse characteristic values A34 Null Null
A34

FIG. 5

Shape	Location calculation function (shape charecteristic value, UE location info)
Circle	Circle calculation function (circle characteristic value, UE location info)
Rectangle	Rectangle calculation function (rectangle characteristic value, UE location info)
Ellipse	Ellipse calculation function (ellipse characteristic value, UE location info)
.....	.....

FIG. 6

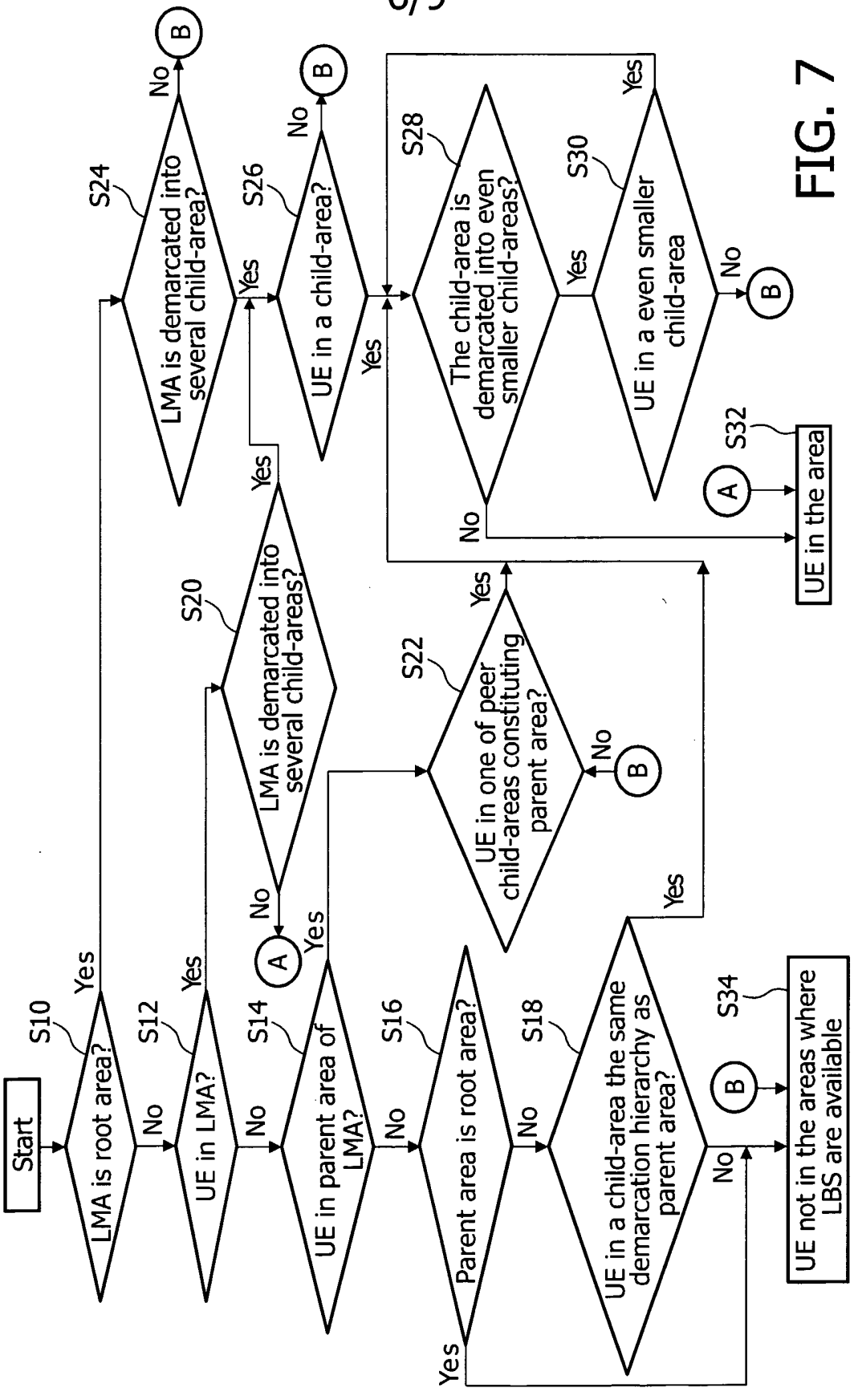

Start
S10
LMA is root area?
Yes
No
S12
UE in LMA?
Yes
No
S14
UE in parent area of LMA?
Yes
No
S16
Parent area is root area?
Yes
No
S18
UE in a child-area the same demarcation hierarchy as parent area?
Yes
No
S20
LMA is demarcated into several child-areas?
Yes
No
S22
UE in one of peer child-areas constituting parent area?
Yes
No
S24
LMA is demarcated into several child-area?
Yes
No
S26
UE in a child-area?
Yes
No
S28
The child-area is demarcated into even smaller child-areas?
Yes
No
S30
UE in a even smaller child-area
Yes
No
S32
UE in the area
S34
UE not in the areas where LBS are available
A
B

FIG. 7

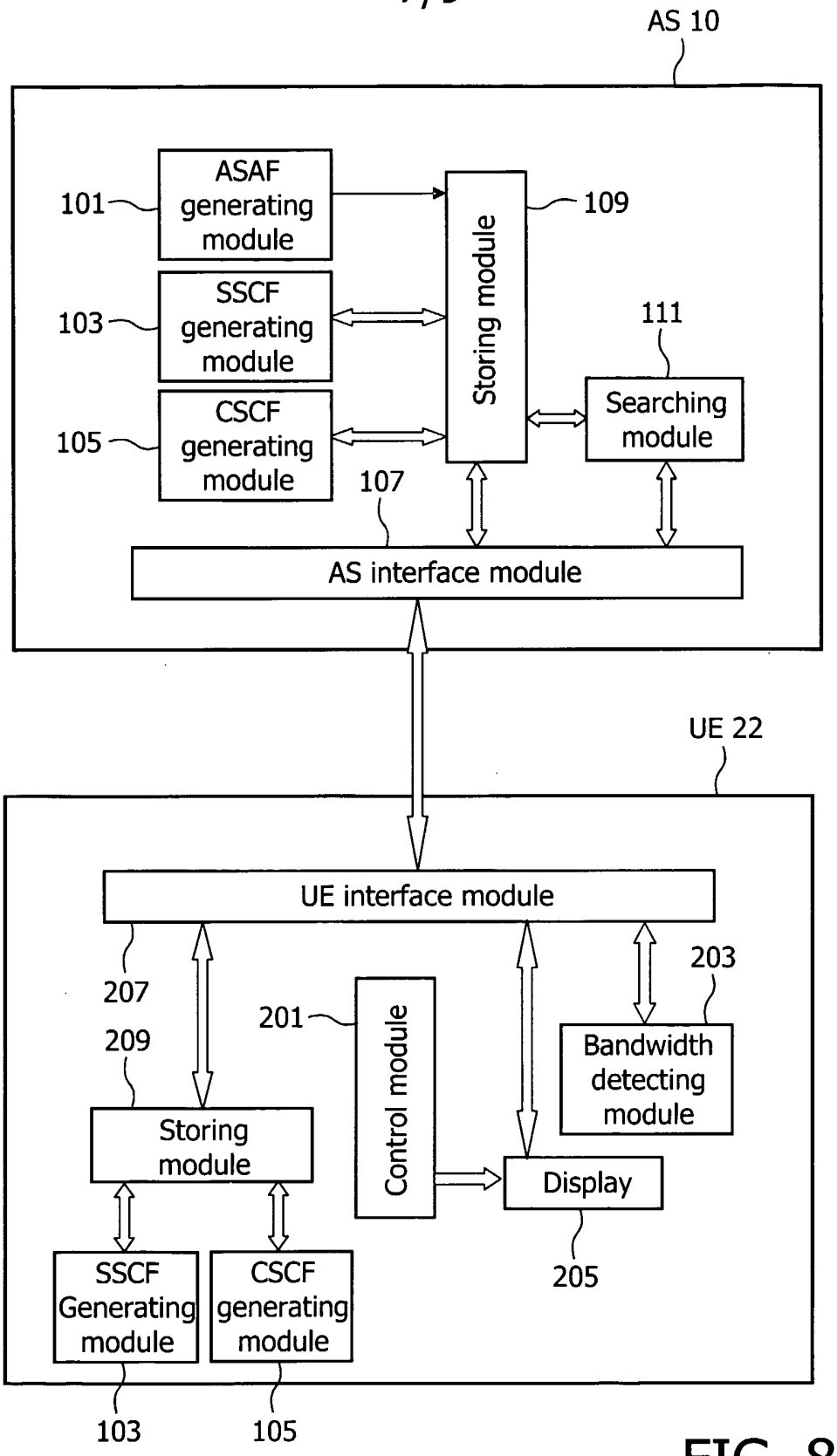

AS 10
ASAF generating module
101
SSCF generating module
103
CSCF generating module
105
Storing module
109
111
Searching module
107
AS interface module
UE 22
UE interface module
207
209
201
Control module
203
Bandwidth detecting module
Storing module
Display
205
SSCF Generating module
CSCF generating module
103
105

FIG. 8

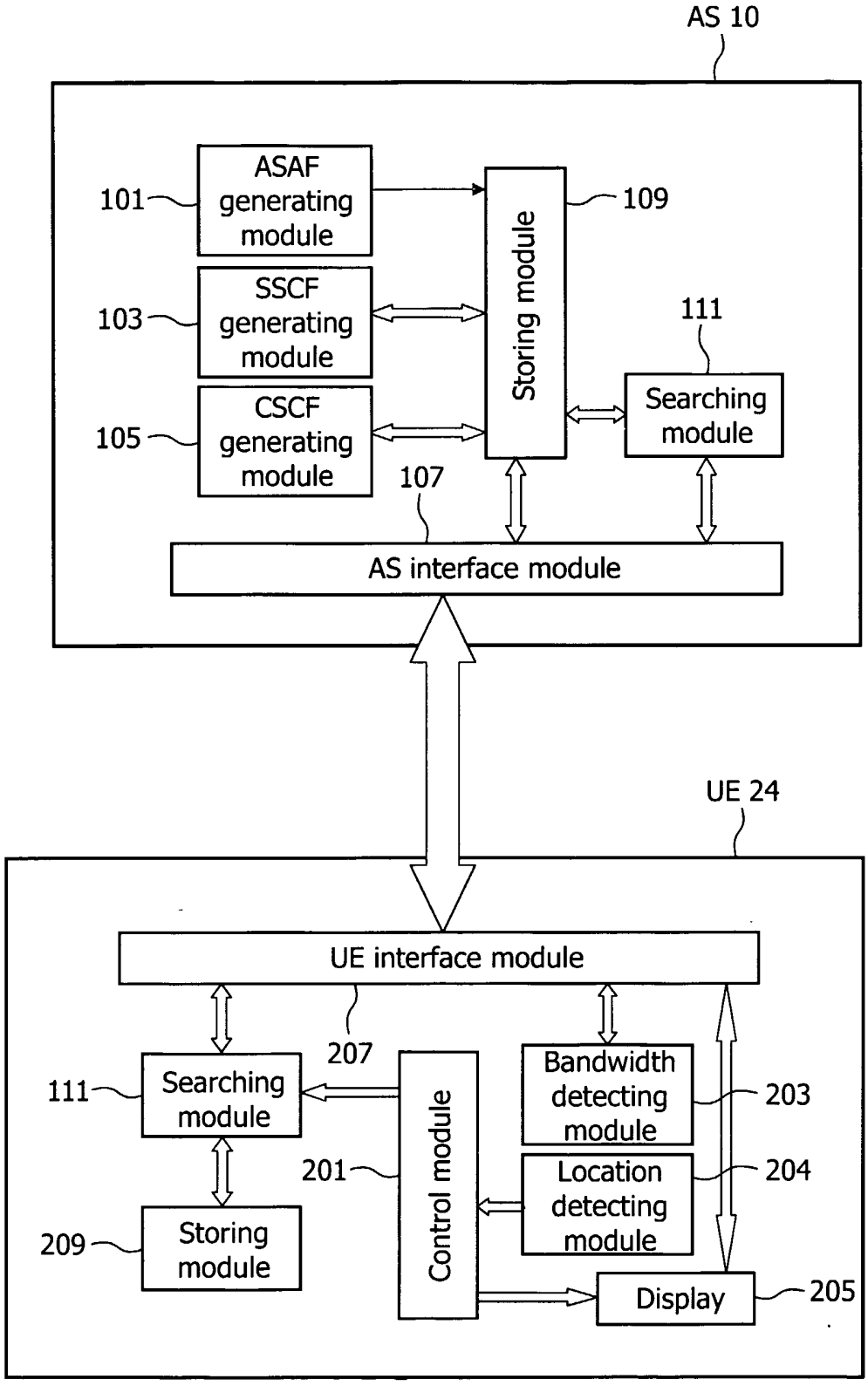

AS 10
ASAF generating module
101
SSCF generating module
103
CSCF generating module
105
Storing module
109
111
Searching module
107
AS interface module
UE 24
UE interface module
207
111
Searching module
209
Storing module
201
Control module
Bandwidth detecting module
203
Location detecting module
204
Display
205

FIG. 9

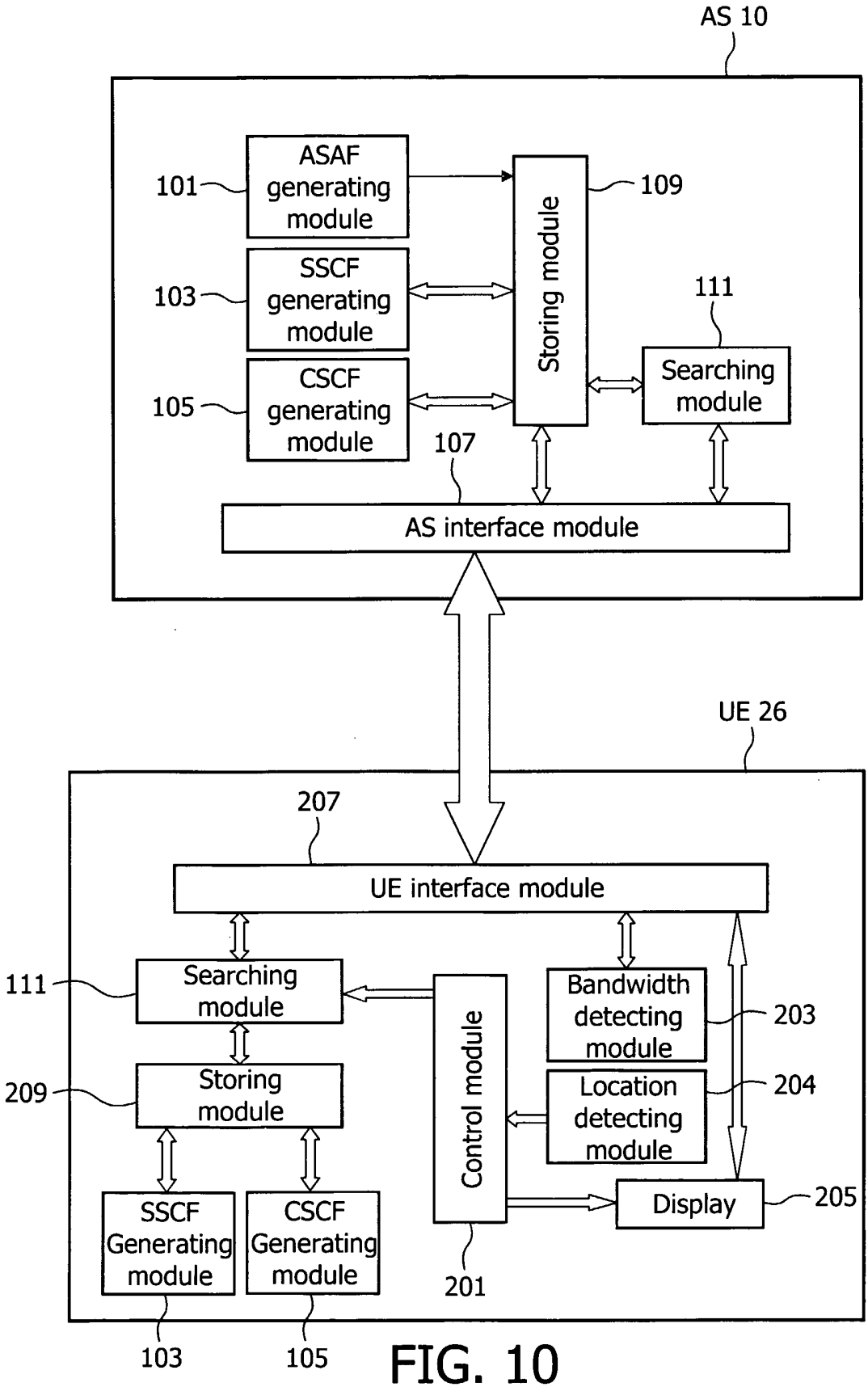

AS 10
ASAF generating module
101
SSCF generating module
103
CSCF generating module
105
Storing module
109
Searching module
111
107
AS interface module
UE 26
207
UE interface module
111
Searching module
209
Storing module
SSCF Generating module
CSCF Generating module
103
105
Control module
201
Bandwidth detecting module
203
Location detecting module
204
Display
205

FIG. 10

INTERNATIONAL SEARCH REPORT

Interr ıl Application No
PCT/IB2005/052648

A. CLASSIFICATION OF SUBJECT MATTER
H04Q7/22

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)
H04Q 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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 164 804 A (HEWLETT-PACKARD COMPANY) 19 December 2001 (2001-12-19) paragraph '0001! paragraphs '0008! - '0012! paragraphs '0031!, '0032! paragraphs '0034! - '0053! claim 1 figures 6-10	1-20, 37-42
X	EP 1 303 105 A (SUN MICROSYSTEMS, INC) 16 April 2003 (2003-04-16) paragraph '0002! paragraphs '0009! - '0011! paragraphs '0023! - '0032! paragraphs '0036! - '0040! claims 1-12 figures 1-4	1-20

-/--

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

[X] Patent family members are listed in 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
22 November 2005	30/11/2005

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

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