

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
18 September 2008 (18.09.2008)

PCT

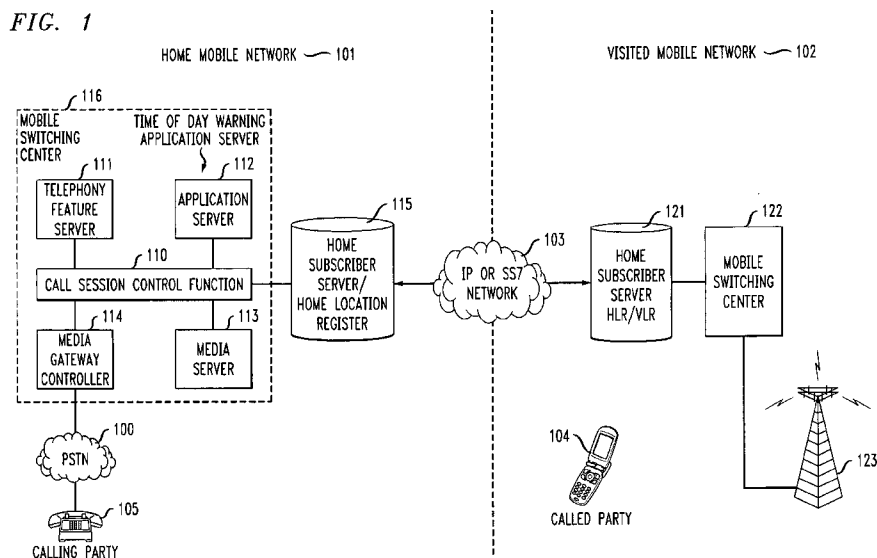
(10) International Publication Number
WO 2008/112095 A1

- (51) International Patent Classification:
H04Q 7/38 (2006.01)
- (21) International Application Number:
PCT/US2008/002807
- (22) International Filing Date: 3 March 2008 (03.03.2008)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
11/715,626 8 March 2007 (08.03.2007) US
- (71) Applicant (for all designated States except US): LUCENT TECHNOLOGIES INC. [US/US]; 600-700 Mountain Avenue, Murray Hill, NJ 07974-0636 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): BUSHNELL, William, Jackson [US/US]; 1220 South 6th Street, Saint Charles, IL 60174 (US). JI, George, Y. [US/US]; 2507 Palazzo Drive, Buffalo Grove, IL 60089 (US).
- (74) Agent: GRAZIANO, James, M.; Lucent Technologies Inc., Docket Administrator - Room 2F-192, 600-700 Mountain Avenue, Murray Hill, NJ 07974-0636 (US).

- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

- Published:**
- with international search report
 - before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(54) Title: TIME OF DAY WARNING FOR CALLS TO ROAMING MOBILE PHONES



(57) Abstract: The present time of day warning system provides the subscriber with the ability to designate at least one time interval during the course of the day when the subscriber prefers not to receive calls on their mobile phone unless these incoming calls are of an urgent nature. In this system, if the subscriber has enrolled in the Time Of Day Warning Service and their mobile phone is turned on, when someone attempts to call the subscriber, the mobile phone system determines the present time of day at the subscriber's present location. If the incoming call is attempted during one of the subscriber-designated blackout time intervals, the incoming call is intercepted. The calling party receives a recorded message which indicates the present time at the subscriber's present location and an indication that the subscriber is not taking calls at this time.

WO 2008/112095 A1

TIME OF DAY WARNING FOR CALLS TO ROAMING MOBILE PHONES

FIELD OF THE INVENTION

This invention relates to mobile phone networks and to a time of day
5 warning system which provides the roaming mobile subscriber with the ability to
designate times of day when the subscriber elects to have the calling party notified of the
subscriber's local time and to provide the calling party with the option of completing the
call, terminating the call or leaving a voice message.

BACKGROUND OF THE INVENTION

10 Today, mobile telephone companies around the world have interconnected
their mobile phone networks to provide ubiquitous service to subscribers. This includes
the ability for the subscriber to roam between carriers where incoming calls are delivered
to a subscriber's mobile phone even when the subscriber has roamed to another carrier's
network.

15 For example, a subscriber who is served by a mobile carrier in the United
States can take their mobile phone to China and have their incoming calls forwarded
from the US carrier to the serving mobile phone carrier in China. The calling party,
therefore, can reach the subscriber when they are in the US or when they are in China by
simply dialing the subscriber's US phone number.

20 However, there is a 12- to 14-hour time zone difference between China and
the US, which can present inconveniences to subscribers as they travel. For people who
frequently travel, the calling party is typically not aware of the present location of the
subscriber or the time zone in which the subscriber is presently located. A calling party
in the US may call the subscriber during normal US working hours, but this call is
25 delivered to the subscriber in the middle of the night, local time, where the subscriber is
located. To avoid this situation, the subscriber typically turns off their mobile phone,
which makes them unavailable to all incoming calls, including emergency calls, in order
to avoid being disturbed at inappropriate times. Thus, all incoming calls fail to reach the
subscriber and typically are redirected to the subscriber's voicemail service, where they
30 must be retrieved by the subscriber at a later time.

Figure 2 illustrates, in flow diagram form, the operation of the present time of day warning system to enable a subscriber to enroll in the time of day warning service and set their time preferences; and

5 Figure 3 illustrates, in flow diagram form, the operation of the present time of day warning system in response to receipt of an incoming call that is directed to the subscriber.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 illustrates, in block diagram form, the overall architecture of a mobile phone network that spans multiple time zones. The called party 104 has a mobile service subscription with Home Mobile Network 101, which is the mobile phone system that serves the subscriber's home location. Figure 1 also illustrates the Public Switched Telephone Network 100 which serves wire-line telephones and mobile phones which are served by Mobile Networks (not shown) located remotely from the subscriber's Home Mobile Network 101. The Home Mobile Network 101 is connected to other mobile phone networks, such as Visited Mobile Network 102 via an IP or SS7 Network 103 for the exchange of control data in conjunction with the processing of communication connections for mobile phones which are located in the service area of the respective mobile networks, as is well known in the art.

The Visited Mobile Network 102 includes Mobile Switching Center 122 which operates cell site 123 to establish wireless communication connections with cell phones 104 that are operational in the coverage area of the cell site 123. The Visited Mobile Network 102 also includes a Home Subscriber Server 121 which provides the Home Location Register (HLR) and Visited Location Register (VLR) functions. The Home Location Register (HLR) serves mobile phones which have subscriptions with Visited Mobile Network 102, while the Visited Location Register (VLR) serves roaming mobile phones. A Home Subscriber Server 121 is part of a third generation IP multimedia subsystem (3G IMS). The IMS Home Subscriber Server 121 is the central subscriber database for next-generation IMS networks. The Home Subscriber Server design usually follows a distributed database model serving IMS applications. Home Subscriber Servers are generally designed to support multiple subscriber types including VoIP, Wi-Fi and 3G mobile subscribers. Managing one profile per subscriber dramatically reduces network complexity and operational expenditures, allows a single source for a subscriber's provisioning, and enables new, intelligent call routing. The Home Subscriber Server provides mobile phone location, IP, authentication, service, and presence data.

The Home Mobile IMS Network 101 includes various feature control systems, located in the Mobile Switching Center 116, that are used by the Home Mobile

Network 101 to provide subscribers with various communication services, such as the Time Of Day Warning Service described herein. The Call Session Control Function 110 is connected to various feature subsystems, including the Telephony Feature Server 111 which provides basic telephone services, an Application Server 112 which provides the
5 Time Of Day Warning Service, a Media Server 113 which provides various media-centric applications (such as recorded announcements), and Media Gateway Controller 114 which interconnects the Call Session Control Function 110 of the Mobile Switching Center 116 to the Public Switched Telephone Network 100. The Call Session Control Function provides session control for subscribers accessing services within the IP
10 Multimedia Core Network. In essence, the Call Session Control Function is an SIP Server. It has responsibility for interacting with network databases such as the Home Subscriber Server for mobility and AAA (Access, Authorization, and Accounting) Servers for security. The Home Mobile Network 101 also includes a Home Subscriber Server 115 which provides the Home Location Register (HLR) function for mobile
15 phones which have a subscription with Home Mobile Network 101.

Time Of Day Warning Sign-Up Service

Figure 2 illustrates, in flow diagram form, the operation of the present Time Of Day Warning System to enable a subscriber to enroll in the Time Of Day Warning Service and to set their time preferences. Obviously, there are many alternative processes
20 that can be used to enable a subscriber to set their time preferences, and this description is intended to teach the functions described therein, not to limit the scope of this process.

At step 201, the subscriber uses their personal computer system (not shown) to access the Internet and log into a WEB site, operated by the common carrier that
25 operates the subscriber's Home Mobile Network 101 and that provides the Time Of Day Warning Sign-Up Service. The WEB site provides the subscriber with a set of user interface screens which enables the subscriber to log into the Time Of Day Warning Sign-Up Service in conventional fashion. At step 202, the subscriber activates the Time Of Day Warning Service pursuant to the sign-up process established by the common
30 carrier which operates the Home Mobile Network 101.

At step 203, the subscriber specifies at least one time interval during which they do not wish to receive incoming calls. This time interval is also termed a Time Of Day Warning Period to indicate that the subscriber can keep their mobile phone on during this time interval, and the mobile phone network screens the incoming calls by
5 intercepting incoming calls directed to the subscriber during the Time Of Day Warning Period(s), and provides the calling party with a recorded message to alert the calling party of the unavailability of the subscriber. The subscriber can select one or more time intervals during which incoming calls are blocked. These times can be, for example, a sleep interval, a dinner interval, or even for the duration of important meetings. In
10 addition, the subscriber can elect various call processing options as described below. At step 204, the subscriber logs off the WEB site and the Time Of Day Warning System is activated.

Operation Of The Time Of Day Warning System

Figure 3 illustrates, in flow diagram form, the operation of the present Time
15 Of Day Warning System in response to receipt of an incoming call that is directed to the subscriber. As an illustration of the operation of the Time Of Day Warning System, the flow chart of Figure 3 presents a typical scenario, but obviously there are alternative implementations of this process that are possible and which would fall within the scope of the appended claims.

20 As part of the standard operation of mobile phone networks, when the subscriber roams from their Home Mobile Network 101 to a Visited Mobile Network 102, the Visited Mobile Network 102 registers the roaming mobile phone 104 on the Visited Mobile Network 102 once the subscriber activates their mobile phone 104 and is in wireless communication with cell site 123 and the associated Mobile Switching Center
25 122. As part of this process, the Visited Location Register (VLR) in the Home Subscriber Server 121 of the Visited Mobile Network 102 notifies the Home Subscriber Server 115 in the Home Mobile Network 101 that the subscriber is registered on the Visited Mobile Network 102, and this data is stored in the Home Location Register (HLR) of the subscriber's Home Subscriber Server 115. In the following example, the
30 subscriber is also subscribed to the Time Of Day Warning Service, and the subscriber has specified the time interval(s) during which they do not want to be disturbed.

The calling party at phone 105 initiates a call at step 300 to the subscriber's mobile phone 104. The incoming call is extended over the Public Switched Telephone Network 100 to the IMS Media Gateway 114 in the Home Mobile Switching Center 116. The called party identification information is received by the Call Session Control

5 Function 110, which processes the incoming call and forwards this information to the Telephony Feature Server 111 assigned to the called subscriber's mobile phone 104. Based on the Initial Filter Criteria data that is stored in the Home Subscriber Server 115 for the called subscriber's mobile phone 104, the Call Session Control Function 110 routes the call from the Telephony Feature Server 111 to the Application Server 112

10 which provides the Time Of Day Warning Feature logic. The Application Server 112, at step 301, queries the Home Subscriber Server 115 to determine if the subscriber's mobile phone 104 is registered anywhere in the Mobile Network, since the Home Location Register (HLR) stores the present location and service status for the subscriber's mobile phone 104. If the subscriber' mobile phone 104 is not registered, this is an indication

15 that the subscriber has turned off the mobile phone 104, or the mobile phone 104 is located in an area where mobile phone service is unavailable. In this case, the incoming call receives normal call completion service from the Application Server 112 at step 308 where the calling party is routed to the voicemail server for the called subscriber's mobile phone 104.

20 If the subscriber's mobile phone 104 is registered on the mobile network, call processing advances to step 302 where the Application Server 112 determines whether the subscriber is enrolled in the Time Of Day Warning Service. If the subscriber is not enrolled in the Time Of Day Warning Service, the incoming call is routed to the Call Session Control Function 110 and receives normal call completion service at step 308,

25 where the incoming call is completed to the called subscriber's mobile phone 104.

If the subscriber's mobile phone 104 is registered on the mobile network and the subscriber is enrolled in the Time Of Day Warning Service, call processing advances to step 303 where the Application Server 112 queries the Home Subscriber Server based Home Location Register (HLR) to determine where the subscriber's mobile phone 104 is

30 registered (i.e. Home Mobile Network 101 or one of many possible Visited Mobile Networks, such as 102).

At step 304, the Application Server 112 determines the present time (also termed "local time" herein) at the switching system at which the subscriber's mobile phone 104 is registered. While the present time of day warning service is not limited to roaming subscribers, the following description uses a roaming subscriber as an example for the purpose of illustrating the operation of this system, and this example is not intended as a limitation. The local time determination is typically done by taking the present time at the Home Mobile Network 101 and adjusting it by the time difference between the Home Mobile Network 101 and the Visited Mobile Network 102. The time difference can be determined by accessing a data table that shows the time difference between the Home Mobile Network 101 and the Visited Mobile Network 102. This process is consistent with the present exchange of messages between the Visited Location Register (VLR) and the Home Location Register (HLR) to update the present location information for the subscriber. Alternatively, if the Home Location Register (HLR) does not maintain a table of Visited Location Register (VLR) time zone differences, the Home Location Register (HLR) can query each Visited Location Register (VLR) to which the subscriber roams for the present time. However this would require modification of all the possible Visited Location Registers to accept a "Local Time" query and to respond. A third approach is for the Visited Mobile Network 102 to support mobile phone location queries, where the Home Location Register (HLR) queries the Visited Mobile Network 102 for the present physical location of the subscriber's mobile phone 104 in terms of latitude and longitude (from the Global Positioning System in the subscriber's mobile phone 104 or signal strength triangulation from several cell towers). The Home Location Register (HLR) uses the physical location information to determine the present time zone and the time of day for the subscriber's mobile phone 104. Another approach is to directly query the subscriber's mobile phone 104, since many mobile phones update the time of day display based on the data provided by the serving mobile phone network.

The Application Server 112 then compares the present time in the Visited Mobile Network 102 with the time interval which the subscriber has specified for accepting calls at step 305. If the present time of day of the call does not fall within the designated Time Of Day Warning Interval, the incoming call is routed to the Call Session

Control Function 110 and receives normal call completion service at step 308, where the incoming call is completed to the called subscriber's mobile phone 104.

If the present time of day of the call falls within the designated Time Of Day Warning Interval, the incoming call is routed at step 306 to an alternate destination, such as a Media Server 113, with instructions to play the warning message. The calling party at phone 105 receives an announcement that typically notes:

The party you are attempting to reach has roamed to a time zone in which the local time is XXX. If you want to leave a voice message, press 1. If this call is an emergency and you want to complete the call, press 2.

If the calling party signals the Media Server 113 that they want to leave a message, the call is forwarded to a voicemail server (not shown) or an operator/call coverage service (not shown) for the called subscriber at step 309.

If the calling party at phone 105 signals that they wish to proceed with the call, the Application Server 112 signals the Call Session Control Function 110 to complete the call at step 310. In order to prevent the subscriber from receiving an unwanted call from a calling party who disregards the intent of the recorded announcement – blocking all but emergency calls – the Time Of Day Warning System optionally can include a feature where the calling party must input a pass code to have the incoming call completed to the called subscriber, or the Application Server 112 can use the calling party identification to match to a list of parties permitted to complete calls to the subscriber during the Time Of Day Warning Interval.

The above description illustrates the use of the Media Server 113 as the alternate destination to which the incoming call is redirected for delivery of the time of day warning, although other options can be used. These options include an operator, call coverage service and a voice mail system, which may be used not only to provide the time of day warning message but also to take a message from the calling party, especially if the subscriber has elected not to receive calls at all during the designated time intervals. The operator and call coverage options can also provide human-based incoming call screening to enable call completion to the subscriber's mobile phone 104 based on a rule set provided to the operator or call coverage staff.

Although the illustration above of the Time Of Day Warning System is using a Mobile IMS network for Home Mobile Network 101, the system also works for 2G networks with similar drawings and call flows.

Summary

5 The present time of day warning system provides the subscriber with the ability to designate times of day when the subscriber prefers to receive calls on their mobile phone only if these incoming calls are of an urgent nature. When someone attempts to call the subscriber, the mobile phone system determines the present time of day at the subscriber's present location. If the incoming call is attempted during one of
10 these subscriber-designated times, the incoming call is intercepted.

What Is Claimed:

1. A time of day warning system, operational in a mobile phone network, for redirecting incoming calls, initiated to a mobile subscriber's mobile phone at mobile subscriber designated times of day when the subscriber elects not to receive calls on their mobile phone, comprising:

5 time interval indication means for storing data received from a subscriber indicative of at least one time interval during which the mobile subscriber does not wish to receive incoming calls;

 present time determining means, responsive to receipt of an incoming call directed to said mobile subscriber, for determining a present time at the mobile
10 subscriber's present location; and

 incoming call redirection means, responsive to said present time at the mobile subscriber's present location corresponding to one of said at least one time interval, for redirecting said incoming call to an alternate destination.

15 2. The time of day warning system of claim 1 wherein said alternate destination comprises:

 warning delivery means, responsive to receipt of said redirected incoming call, for providing an announcement to said calling party which indicates the present time at the subscriber's present location and a message that the subscriber is not taking calls at
20 this time.

3. The time of day warning system of claim 2 further comprising:

 call completion means, responsive to said calling party generating an indication that they wish to complete said incoming call to said subscriber's mobile
25 phone, for enable said incoming call to be completed to said subscriber's mobile phone when said present time at the mobile subscriber's present location corresponds to one of said at least one time interval.

4. The time of day warning system of claim 1 wherein said present time determining means comprises:

query means for transmitting a query to one of a Home Location Register and a Visited Location Register presently serving said mobile phone to determine a present location of said mobile subscriber's mobile phone; and

present time computation means for combining a present time at said mobile subscriber's home location with a time difference, indicative of the time difference between said mobile subscriber's present location and the subscriber's home location, to determine a present time at said mobile subscriber's present location.

10

5. The time of day warning system of claim 1 wherein said present time determining means comprises:

location determining means for determining a present physical location of said mobile subscriber's mobile phone;

time zone determining means, responsive to said determined present physical location of said subscriber's mobile phone, for identifying a time zone in which said subscriber's mobile phone is operational; and

present time computation means for combining a present time at said mobile subscriber's home location with a time zone difference, indicative of the time difference between said identified time zone and the subscriber's home location, to determine a present time at said mobile subscriber's present location.

20

6. A method of operating a time of day warning system, operational in a mobile phone network, for redirecting incoming calls, initiated to a mobile subscriber's mobile phone at mobile subscriber designated times of day when the subscriber elects not to receive calls on their mobile phone, comprising:

25

storing data received from a subscriber indicative of at least one time interval during which the mobile subscriber does not wish to receive incoming calls;

determining, in response to receipt of an incoming call directed to said mobile subscriber, a present time at the mobile subscriber's present location; and

30

redirecting, in response to said present time at the mobile subscriber's present location corresponding to one of said at least one time interval, said incoming call to an alternate destination.

7. The method of operating a time of day warning system of claim 6 further comprising:

5 delivering, in response to receipt of said redirected incoming call at said alternate destination, an announcement to said calling party which indicates the present time at the subscriber's present location and a message that the subscriber is not taking calls at this time.

10 8. The method of operating a time of day warning system of claim 6 further comprising:

enabling, in response to said calling party generating an indication that they wish to complete said incoming call to said subscriber's mobile phone, said incoming call to be completed to said subscriber's mobile phone when said present time at the mobile subscriber's present location corresponds to one of said at least one time interval.

15 9. The method of operating a time of day warning system of claim 6 wherein said step of determining comprises:

20 transmitting a query to one of a Home Location Register and a Visited Location Register presently serving said mobile phone to determine a present location of said mobile subscriber's mobile phone; and

25 combining a present time at said mobile subscriber's home location with a time difference, indicative of the time difference between said mobile subscriber's present location and the subscriber's home location, to determine a present time at said mobile subscriber's present location.

10. The method of operating a time of day warning system of claim 6 wherein said step of determining comprises:

30 determining a present physical location of said mobile subscriber's mobile phone;

identifying, in response to said determined present physical location of said subscriber's mobile phone, a time zone in which said subscriber's mobile phone is operational; and

combining a present time at said mobile subscriber's home location with a time zone difference, indicative of the time difference between said identified time zone and the subscriber's home location, to determine a present time at said mobile subscriber's present location.

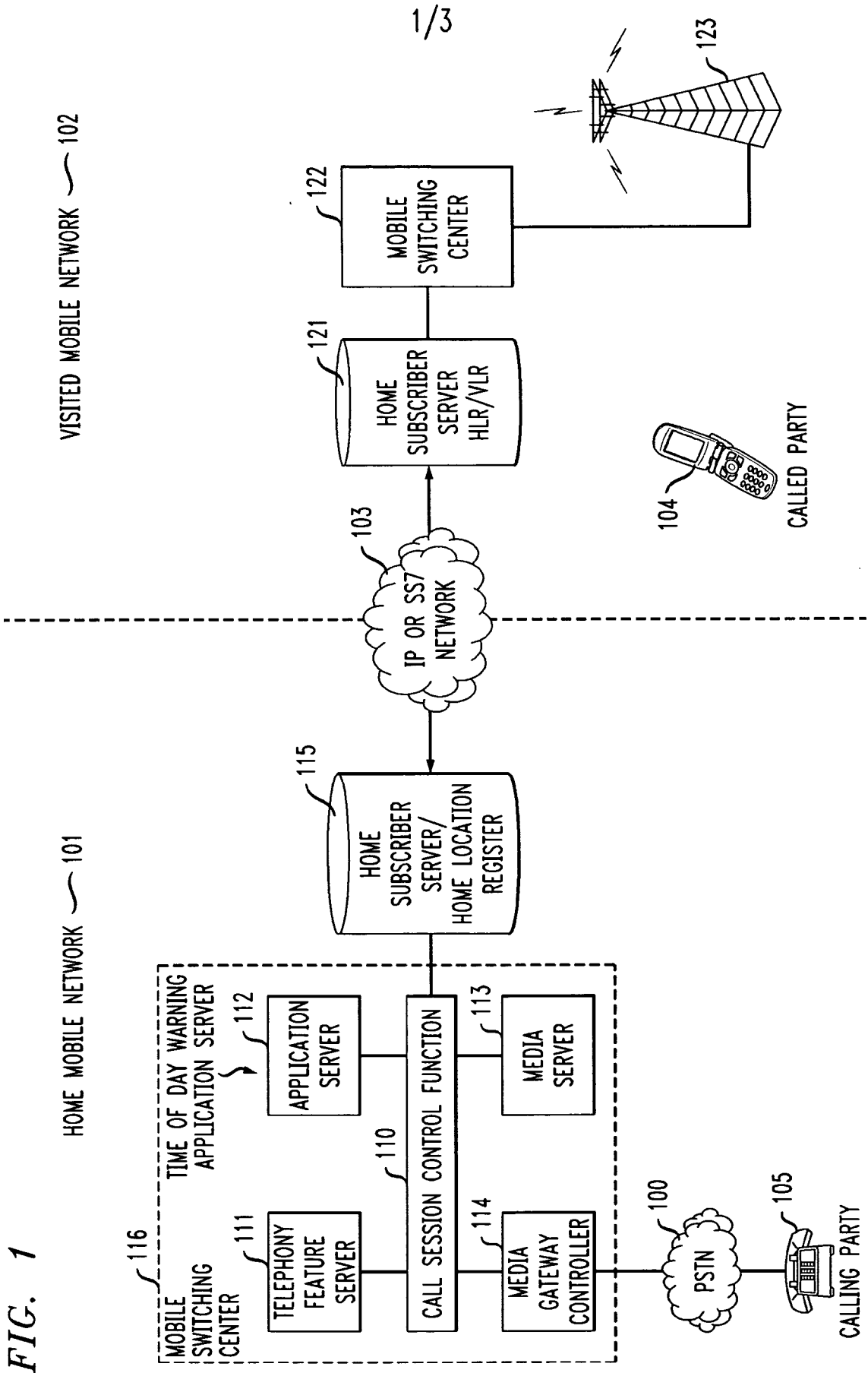


FIG. 1

FIG. 2

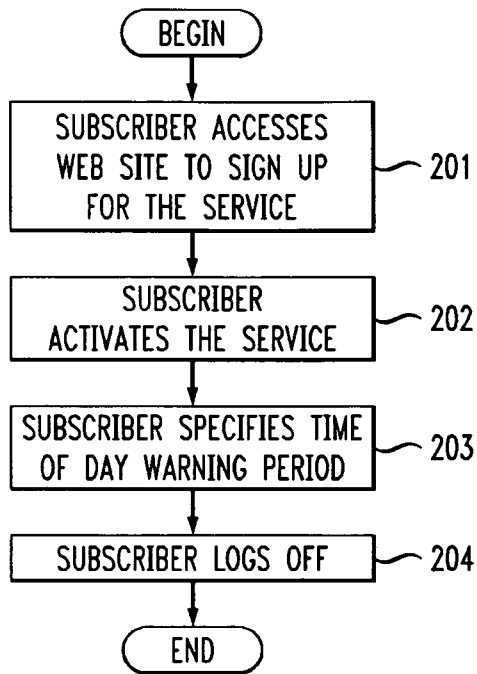
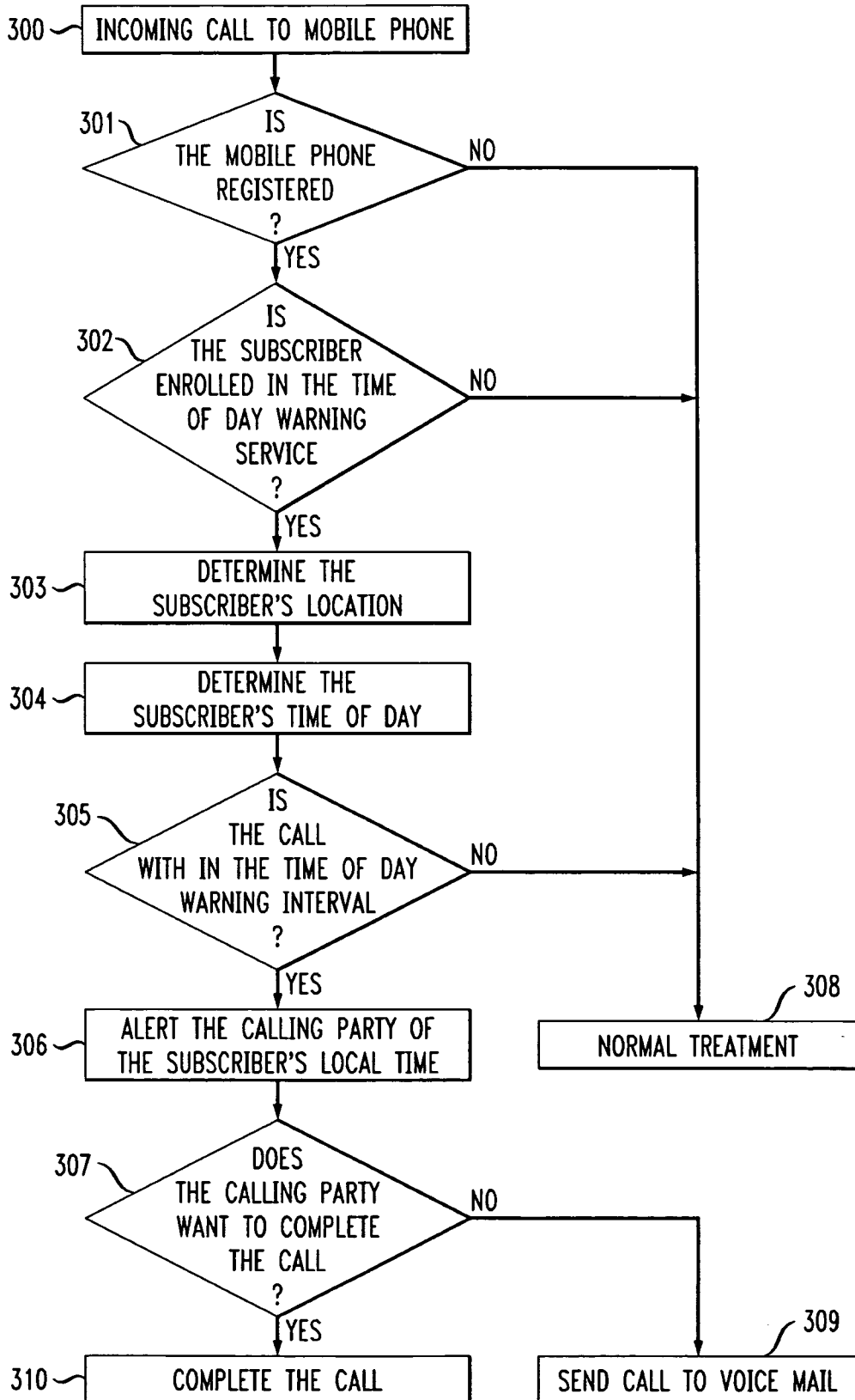


FIG. 3



INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2008/002807

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04Q7/38

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 H04M

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 1 551 158 A (GENESYS TELECOMM LAB INC [US]) 6 July 2005 (2005-07-06) abstract paragraphs [0023] - [0034]	1-10
X	GB 2 395 092 A (VODAFONE PLC [GB]) 12 May 2004 (2004-05-12) abstract page 6, line 3 - page 10, line 15 page 11, lines 8-14	1-10
A	US 2005/201362 A1 (KLEIN MARK D [US] ET AL) 15 September 2005 (2005-09-15) abstract paragraphs [0086] - [0097]	1-10
-/--		

Further documents are listed in the continuation of Box C.

See patent family annex.

- * Special categories of cited documents :
- *A* document defining the general state of the art which is not considered to be of particular relevance
 - *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 2 July 2008	Date of mailing of the international search report 25/07/2008
---	---

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Falò, Luca
---	---

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/002807

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2004/235461 A1 (JACKSON LISA E [US] ET AL) 25 November 2004 (2004-11-25) abstract paragraph [0016]	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/002807

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1551158	A	06-07-2005	CN 1649438 A	03-08-2005
			US 2005148343 A1	07-07-2005
GB 2395092	A	12-05-2004	NONE	
US 2005201362	A1	15-09-2005	NONE	
US 2004235461	A1	25-11-2004	NONE	