

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
11 December 2003 (11.12.2003)

PCT

(10) International Publication Number
WO 03/103198 A1

(51) International Patent Classification⁷: H04J 3/16, H04Q 7/20

(21) International Application Number: PCT/US03/16704

(22) International Filing Date: 28 May 2003 (28.05.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data: 60/384,183 29 May 2002 (29.05.2002) US

(71) Applicant: INTERDIGITAL TECHNOLOGY CORPORATION [US/US]; 300 Delaware Avenue, Suite 527, Wilmington, DE 19801 (US).

(72) Inventors: REDDY, Gautam, G.; 540 Steven Drive, Apt. 207, King of Prussia, PA 19406 (US). CHITRAPU, Prabhakar; 135 Brochant Drive, Blue Bell, PA 19422 (US).

(74) Agents: VOLPE, Anthony, S. et al.; Volpe and Koenig, P.C., United Plaza, Suite 1600, 30 South 17th Street, Philadelphia, PA 19103 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

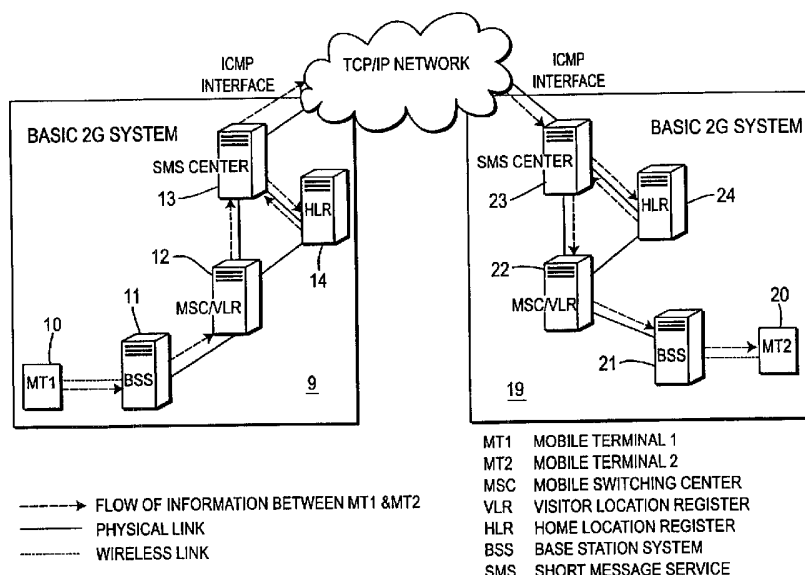
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, 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

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR TRANSMISSION OF INTERNET CONTROL MESSAGE PROTOCOL MESSAGES IN A COMMUNICATIONS NETWORK



(57) Abstract: In one aspect of the invention (Fig. 2) signal/control messages are embedded as packets in the payloads of SMS messages. The SMS messages are transmitted in a cellular network (9, 19) employing SMPP protocol. SMS messages intended to traverse a TCP/IP network are introduced to the TCP/IP network employing ICMP protocol. The protocol conversions are performed by a message center (MC), such as a SMS center (13, 23) or an SGSN in a cellular network (9, 19) or a WLAN Access Router when the SMS message is forwarded to a WLAN. The SMS messages are typically created by a mobile user (10, 20), which is also capable of receiving the SMS messages having a signal/control message in the SMS message payload.

WO 03/103198 A1

[0001] METHOD AND APPARATUS FOR TRANSMISSION OF
INTERNET CONTROL MESSAGE PROTOCOL MESSAGES
AS SHORT MESSAGE SERVICE (SMS) MESSAGES IN A
COMMUNICATIONS NETWORK COMPRISED OF MOBILE STATIONS

[0002] FIELD OF THE INVENTION

[0003] The present invention relates to transmission of SMS (Short Message Service) message through different wireless systems, such as Cellular Networks, Wireless Local Area Networks (WLANs) and any transmission control protocol/internet protocol (TCP/ IP) based network (e.g. internet), and more particularly the translation of these messages from Short Message Peer-to-Peer (SMPP) protocol to Internet Control Message Protocol (ICMP) and vice-versa

[0004] BACKGROUND

[0005] The Short Message Service (SMS) is a text message received by a Mobile Station (MS) in 2G cellular system or User Equipment (UE) in 3G Cellular system or any terminal in a network capable of receiving a text message as specified in the SMPP protocol. An MS or UE can also generate the text message, which is known as mobile originated SMS. SMS Messages in the Cellular network are processed in the core network by an SMS center. The SMS center is responsible for processing incoming messages from Non-mobile (Cellular) entities know as External Short Message Entities (ESMEs), validating the subscriber and delivering the message to the mobile in the cellular network. If the MS or UE is not in the home network but is roaming in another cellular network which is known to the home network, and the MS or UE receives an SMS message, the SMS message is delivered to the MS or UE in the roaming network via an SS7 signaling network.

[0006] An (MS) or a UE in a 2.5G (such as GPRS network) or 3G such as a 3rd generation partnership project (3GPP) cellular system, which is running Internet Protocol-level (IP-level) applications, such as MobileIP, etc., has a need to send and/or receive IP-level signaling/control packets. Examples are Internet Control Message Protocol (ICMP) messages related to MobileIP protocol which,

for example, are typically used to report a problem in the communication environment. These signaling/control IP packets are presently sent to, and received by, the MS over the air interface using transport/physical channels such as a dedicated channel (DCH), etc.

[0007] Hereinafter a UE, MS or a wireless transmit and/or receive unit (WTRU) shall be used interchangeably and includes but is not limited to a user equipment, mobile station, fixed or mobile subscriber unit, pager, or any other type of device capable of operating in a wireless environment. When referred to hereafter, a base station includes but is not limited to a base station, Node-B, site controller, access point or other interfacing device in a wireless environment.

[0008] SUMMARY

[0009] The present invention is utilized to great advantage in two different applications, namely:

[0010] 1. SMS messages traveling between cellular and TCP/IP networks employ SMPP Protocol in the Cellular Network and ICMP in the TCP/IP network. Therefore an SMS center is used to convert SMPP protocol employed in the cell to ICMP in the TCP/IP network and converting ICMP received from the TCP/IP network to SMPP protocol employed in the cell.

[0011] 2. WTRUs in 2.5G and 3G and which are capable of operating in a TCP/IP environment need to send and/or receive IP-level signaling/control packets (such as ICMP messages) which are transmitted through prevailing Transport/Physical Channels and these message take a different path than the SMS messages. The ICMP message is converted to an SMS message and sent as SMS message and the WTRU converts them as SMS message and vice versa.

[0012] BRIEF DESCRIPTION OF THE DRAWING(S)

[0013] The invention will be understood from a consideration of the accompanying detailed description and drawings, wherein like elements are designated by like numerals and wherein:

[0014] Fig. 1 is a block diagram of the SMS message flow in accordance with the prior art and is useful in understanding the present invention.

[0015] Fig. 2 is a block diagram of a first embodiment of the present invention described in application (1) above, wherein SMS messages are sent over an IP network.

[0016] Fig. 3 is a block diagram of an alternative embodiment which is based on the first embodiment and which sends SMS pages from a cellular system to a wireless local area network (WLAN) system.

[0017] Fig. 4 is a block diagram of a second embodiment described in application (2) above and showing a system which transmits TCP/IP-packets as SMS messages in accordance with a first embodiment of the present invention.

[0018] Fig. 5 is a block diagram of a system of the second embodiment which transmits IP-packets as SMS messages in accordance with a first alternative of the second embodiment of the present invention.

[0019] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0020] A first embodiment of the present invention is shown in Fig. 2. In this embodiment MS 10 sends SMS messages over a TCP/IP network using ICMP messages. It should be understood that any mobile unit, in all embodiments of the invention as well as Figure 2, receiving an SMS message with ICMP information and any mobile unit sending an ICMP message as an SMS message, inherently has IP functionality. The example shown in Fig. 2 depicts two (2) cellular systems 9 and 19. As shown, the SMS Center 13 has an ICMP interface. This permits SMS center 13 to connect to the TCP/IP network. The SMS center converts an SMS message into an ICMP message and inserts into the ICMP header an indication that this is an SMS message. This operation is performed by all SMS centers in all other embodiments of the invention, as well as Figure 2. The routing of the SMS message is performed through a TCP/IP network. MT1 (10) creates an SMS message which reaches SMS Center 13 through the base station system (BSS) 11 and mobile switching center/visitor location register (MSS/VLR) 12. The home location register (HLR) 14 is a standard network

element which contains transient and permanent subscriber information such as subscriber location, subscription data and feature activation status of a wireless subscriber.

[0021] The SMS center sends an ICMP message through the TCP/IP network to an SMS center 23 in cellular network 19. The ICMP message is converted to an SMS message and sent to MT2 (20) via MCS/VLR 22 and BSS 21.

[0022] The MSC function of MSC/VLRs, 12 and 22 is the receipt of incoming calls from mobiles. The VLR function of each of the MSC/VLRs 12 and 22 is to act as a temporary repository for profile information and also functions as pointer to the service MSC.

[0023] The conventional technique, employed in Figure 1, conveys SMS messages from the SMS center 12 in cellular network 9 to the SMS center 23 in cellular network 19 through an SS7 network. There is no capability of providing signal/control messages in the manner of the present invention.

[0024] A similar capability is extended to sending SMS pages from cellular systems to Wireless Local Area Network systems (WLANs) and vice-versa as shown in Fig. 3. However, the WLAN access router 31 sends the ICMP message using ICMP protocol to the wireless device 32 since the WLAN system does not support SMS protocol. The MT 10 and wireless device 32 may have send and receive capabilities as is described below with regard to the embodiments shown in Figures 4 and 5. For example, the mobile users in the networks 9 and 19 are interchangeable.

[0025] The benefit of the first embodiment is that the limitations of sending an SMS message from one SMS center to another is not an inter-connected cellular system, but a ubiquitous IP network. Additionally, the ICMP messages are fast and, as control signals, they take priority over data signals. The SMS message can be sent to any other network that has an ICMP interface, which is the basic protocol for a TCP/IP based network. Although the preferred embodiment employs an SMS center for the protocol conversion capability, it should be understood that any unit having similar capabilities may be utilized.

[0026] A second embodiment of the present invention is directed to the transmission of the signaling/control TCP/IP-packets, such as ICMP messages, as SMS messages. The SMS messages are created (known as mobile-originated SMS) at a WTRU, MS or UE 10 (having IP functionality) by embedding the signaling/control TCP/IP packets as the SMS payload. Sending Mobile Originated SMS is prior art but sending ICMP messages in the SMS payload is part of the invention. This approach reduces the amount of overhead over the air interface. It may also benefit from the built-in robustness features of SMS delivery, such as automatic retransmission in case of transmission errors.

[0027] The translation from the SMS message to the ICMP message and vice versa is performed at the SMS center 12 forming part of the cellular network 9, as shown in Fig. 4. Alternatively, the translation from SMS to ICMP message is performed at the serving GPRS support node (SGSN) 33 provided within a cellular network, as shown in Fig. 5.

[0028] Also for the embodiments of Figures 4 and 5, the mobile (WTRU) 10 has the capability of receiving an ICMP message embedded in the SMS message (in the SMS pay load) as well as having the ability to send such an SMS message. This capability is indicated in the embodiments of Figures 4 and 5 by the arrows indicating the ability to send and receive an ICMP message in the SMS message.

[0029] The alternative second embodiments shown in Figures 4 and 5 permit a potentially reduced overhead and robust mechanism to send IP-level signaling/control messages over the air interface. This innovation also allows for an independent path for ICMP messages to reach the IP based network through the SMS message. For a mobile in the TCP/IP environment, the ICMP messages are sent as part of the regular signals, be it in 2.5G or 3G, but sending the ICMP messages as part of the SMS message adds another independent path of sending and receiving ICMP signals and adds to the robustness.

* * *

CLAIMS

1. A method for the handling of messages of a given format moving between wireless cellular and transmission control protocol/internet protocol (TCP/IP) networks, comprising:
 - a) converting said messages in said given format in the cellular network to an internet control message protocol (ICMP); and
 - b) conveying the ICMP messages to the TCP/IP network.
2. The method of claim 1 wherein step (a) further comprises:
inserting in a header of the ICMP message that it is an SMS message.
3. The method of claim 1 further comprising:
 - (c) conveying the ICMP message traversing the TCP/IP network to a second cellular network; and
 - (d) converting the ICMP message received in the second cellular network to said given format message.
4. The method of claim 3 further comprising:
conveying said given format message at step (d) to a mobile user in the second cellular network.
5. The method of claim 1 wherein the given format message is obtained initially created by a mobile user in said cellular network.
6. The method of claim 1 wherein the given format message is created in said cellular network as a short message service (SMS) message.
7. The method of claim 6 wherein the SMS message is created by:
generating a ICMP message; and
inserting the ICMP message in a payload of the SMS message.

8. The method of claim 1 wherein the ICMP message is conveyed from the TCP/IP network to a wireless local area network (WLAN) system and the ICMP message received in the WLAN system is conveyed to a user employing the ICMP protocol.

9. The method of claim 8 wherein said given format message received in the WLAN system is conveyed to a wireless user.

10. The method of claim 9 wherein said given format message is initially created as an SMS message.

11. The method of claim 9 wherein said converted given format message is conveyed to a mobile user in another cellular network.

12. The method of claim 11 wherein said given format message is created by:

creating a ICMP message; and

inserting the ICMP as a payload in a short message service (SMS) message.

13. A method for conveying messages of a given format in a wireless system, comprising:

a mobile user located in a given cellular network:

a) creating an ICMP message;

b) inserting the ICMP message in payload of an SMS message;

and

c) communicating the SMS message as a message intended to

travel into an TCP/IP network;

a first unit in said given cellular network:

d) receiving said SMS message from said mobile user;

e) converting the SMS message to an ICMP message protocol;
and
f) conveying the message obtained at step (e) as a ICMP message.

14. The method of claim 13 wherein step (a) comprises:

g) creating a signal/control ICMP message.

15. The method of claim 13 wherein step (c) further comprises:

g) sending the ICMP message employing SMPP protocol.

16. The method of claim 15 wherein step (e) converts the SMS message sent using SMPP protocol to ICMP protocol.

17. A method for conveying signal/control packets intended to pass through a TCP/IP network, comprising:

a mobile user in a given cellular network:

a) creating an SMS message;

b) inserting the control and data information in the SMS payload; and

c) sending the SMS message intended to traverse the TCP/IP network employing SMPP protocol;

a message center in said given cellular network;

d) receiving the SMS message in SMPP protocol; and

e) introducing the SMS message into the TCP/IP network employing ICMP protocol.

18. The method of claim 17 wherein step (e) further comprises:

inserting in a header of the ICMP message that it is an SMS message.

19. The method of claim 17 further comprising a base station in said given cellular network:

forwarding the message obtained at step (c) to the message center.

20. The method of claim 17 further comprising another message center in another cellular network:

f) receiving the SMS message employing ICMP protocol obtained at step (e); and

g) converting the SMS message intended for a user in said another cellular network employing SMPP protocol.

21. The method of claim 20 further comprising another base station in said another cellular network:

sending the message obtained at step (g) to said user.

22. A method for conveying an SMS message having an ICMP message as a payload to a mobile user in a cellular network from a TCP/IP network, comprising:

a message center in said cellular network:

a) receiving said SMS message employing ICMP protocol; and

b) sending said SMS message employing SMPP protocol to said

mobile user.

said mobile user in said cellular network:

c) receiving the message obtained at step (b) in SMPP protocol.

23. The method of claim 22 further comprising:

a base station in said cellular network:

d) receiving said SMS message from said message center; and

e) conveying the SMS message to said mobile user.

24. A method for conveying an SMS message through a TCP/IP network to a wireless device in a WLAN and having an ICMP message as a payload, comprising:

an access router:

- a) receiving said SMS message employing ICMP protocol; and
- b) sending said SMS message employing ICMP protocol to said wireless device;

said wireless device:

- c) receiving the message obtained in step (b) using ICMP protocol.

25. The method of claim 24 further comprising:

a mobile user in a cellular network:

- d) creating said SMS message and conveying the SMS message said base station to a base station in said cellular network;
- e) receiving said SMS message from said mobile user; and
- f) conveying the SMS message to a message center in said cellular network; and
- g) said message center transmitting the SMS message to said TCP/IP network employing ICMP protocol.

26. Apparatus for handling messages of a given format moving between wireless cellular and transmission control protocol/internet protocol (TCP/IP) networks, comprising:

means for converting said messages in said given format in the cellular network to an internet control message protocol (ICMP); and

means for conveying the ICMP messages to the TCP/IP network.

27. The apparatus of claim 26 further comprising:

means for conveying the ICMP message traversing the TCP/IP network to a second cellular network; and

means for converting the ICMP message received in the second cellular network to said given format message.

28. The apparatus of claim 27 further comprising:

means for conveying said given format message from said converting means to a mobile user in the second cellular network.

29. The apparatus of claim 26 wherein the given format message is initially created by a mobile user in the first-mentioned cellular network.

30. The apparatus of claim 29 wherein the given format message is an SMS message created by:

means for generating an ICMP message; and

means for inserting the ICMP message in a payload of the SMS message.

31. The apparatus of claim 26 further comprising:

means for conveying from the TCP/IP network to a wireless local area network (WLAN) system; and

means for forwarding the ICMP message received in the WLAN system to a wireless device.

32. The apparatus of claim 28 further comprising:

a mobile user having means for receiving the given format message using SMPP protocol.

33. The apparatus of claim 26 further comprising:

a mobile user in said given cellular network having means for creating a ICMP message; and

means for inserting the ICMP message as a payload in a short message service (SMS) message.

34. The apparatus of claim 26 wherein said means for converting further comprises:

means for inserting into a header of the ICMP message an indication that it is an SMS message.

35. Apparatus for conveying messages of a given format in a wireless system, comprising:

a mobile user located in a given cellular network comprising:

means for creating an ICMP message;

means for inserting the ICMP message in payload of an SMS message; and

means for communicating the SMS message as a message intended to travel into an TCP/IP network;

a first unit in said given cellular network comprising:

means for receiving said SMS message from said mobile user;

means for converting the SMS message to an ICMP message protocol; and

means for conveying the message from said means for converting as an ICMP message.

36. Apparatus of claim 35 wherein said means for communicating further comprises:

means for sending the ICMP message employing SMPP protocol.

37. The apparatus of claim 35 wherein the means for converting translates the SMS message sent using SMPP protocol to ICMP protocol.

38. Apparatus for conveying signal/control packets intended to pass through a TCP/IP network, comprising:

a mobile user in a given cellular network, comprising:

means for creating an SMS message;

means for inserting the signal/control packets in the SMS payload; and
means for sending the SMS message intended to traverse the TCP/IP
network employing SMPP protocol;
a message center in said given cellular network comprising:

39. The apparatus of claim 38 further comprising a base station in said
given cellular network having means for forwarding the message obtained from
the mobile user to the message center.

40. The apparatus of claim 38 further comprising another message
center in another cellular network, comprising:
means for receiving the SMS message employing ICMP protocol; and
means for converting the SMS message intended for another mobile user
in said another cellular network employing SMPP protocol.

41. The apparatus of claim 40 further comprising:
another base station in said another cellular network having means for
sending the message obtained from said another message center to said another
mobile user.

42. Apparatus for conveying an SMS message having an ICMP message
as a payload to a mobile user in a given cellular network from a TCP/IP network,
comprising:

a message center; comprising:
means for receiving said SMS message employing ICMP protocol;
and
means for sending said SMS message employing SMPP protocol to
said mobile user;
said mobile user comprising:
means for receiving the message obtained from the message center
in SMPP protocol.

43. Apparatus conveying an SMS message having an ICMP message as a payload to a wireless device in a WLAN from a TCP/IP network, comprising:
an access router, comprising:
means for receiving said SMS message employing ICMP protocol;
and
means for sending said SMS message employing ICMP protocol to said wireless device;
said wireless device comprising:
means for receiving the message obtained from said access router employing ICMP protocol.

44. The apparatus of claim 43 further comprising:
a cellular network supporting SMPP protocol,
a mobile user having means for creating said SMS message and conveying the SMS message to a base station;
said base station having means for conveying the SMS message to a message center; and
said message center conveying said SMS message to said TCP/IP network employing ICMP protocol.

45. The apparatus of claim 43 wherein said means for converting further comprises:
means for inserting into a header of the ICMP message an indication that it is an SMS message.

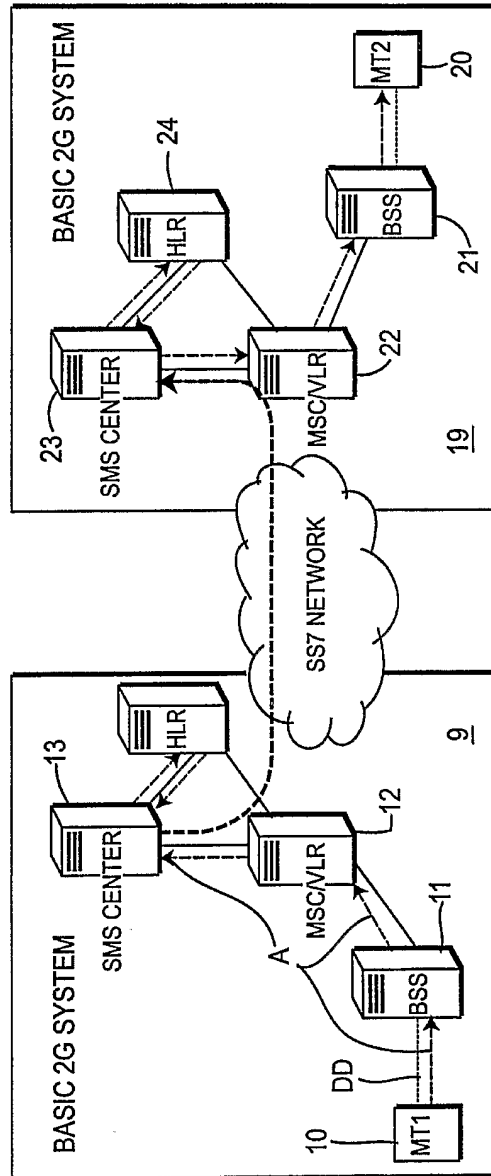


FIG. 1
RELATED ART

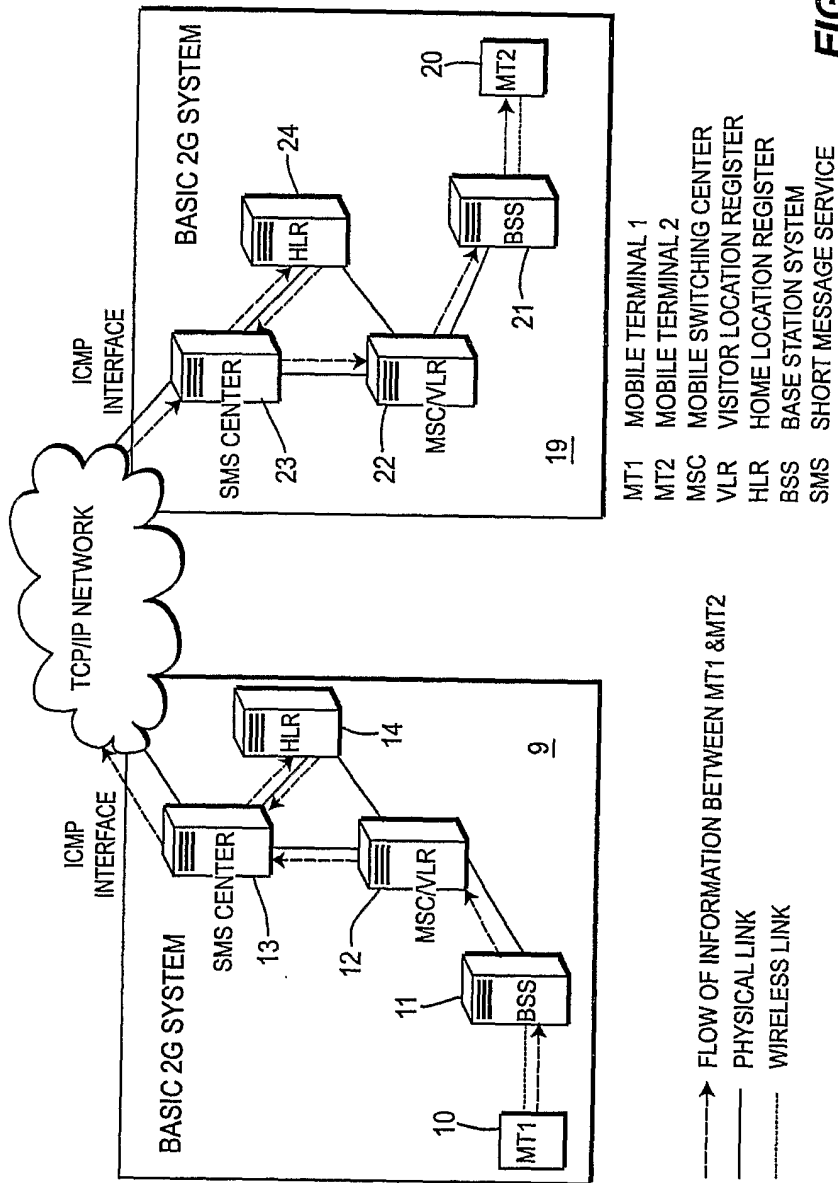


FIG. 2

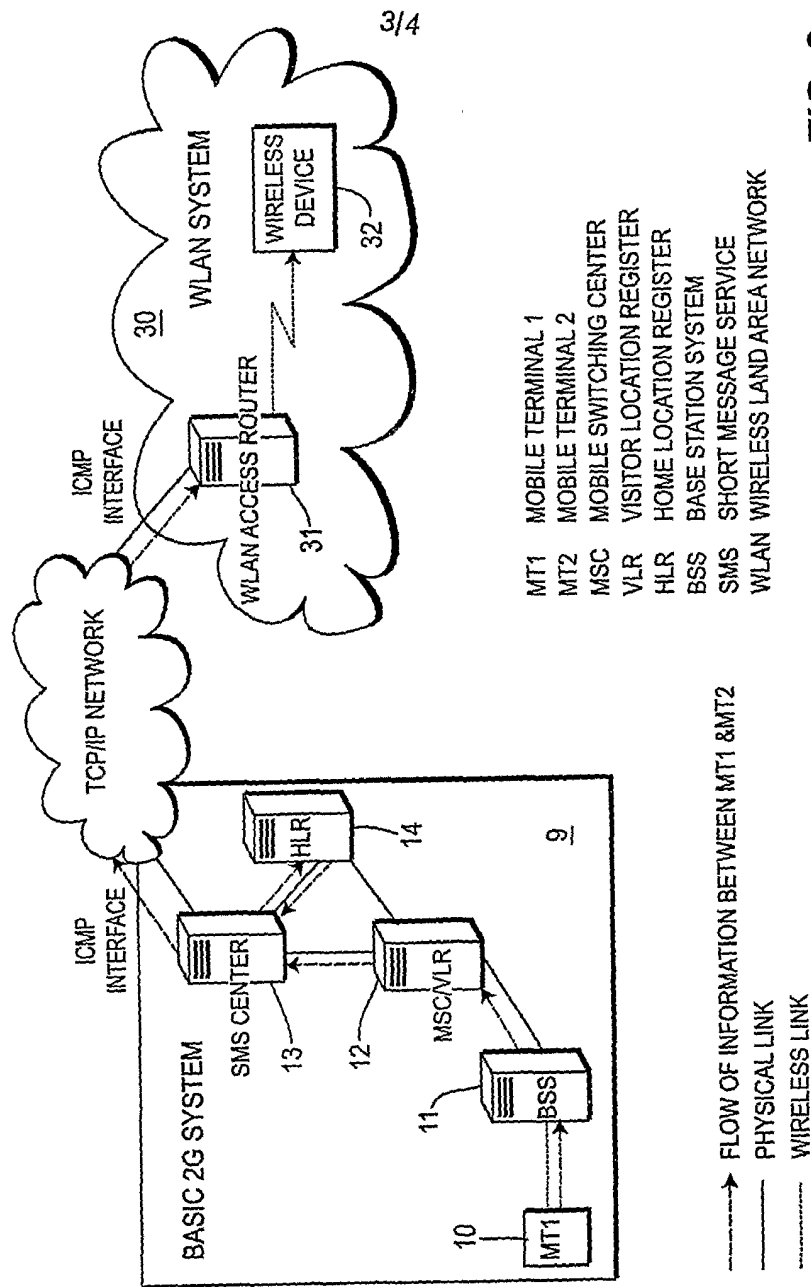


FIG. 3

- MT1 MOBILE TERMINAL 1
- MT2 MOBILE TERMINAL 2
- MSC MOBILE SWITCHING CENTER
- VLR VISITOR LOCATION REGISTER
- HLR HOME LOCATION REGISTER
- BSS BASE STATION SYSTEM
- SMS SHORT MESSAGE SERVICE
- WLAN WIRELESS LAND AREA NETWORK

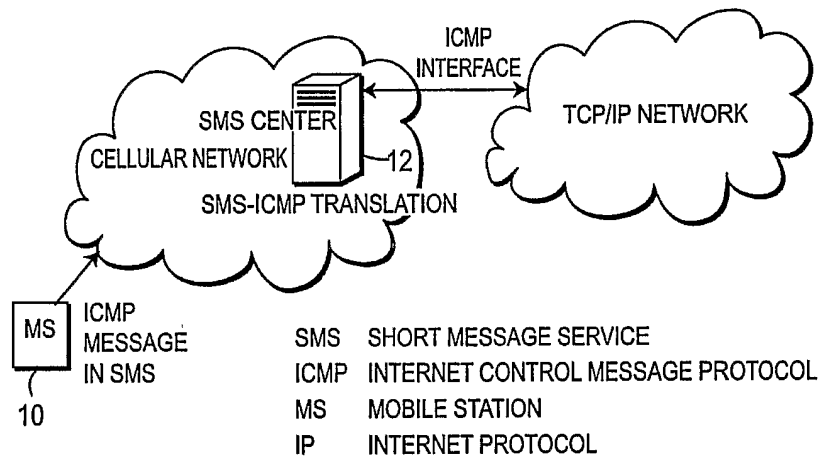


FIG. 4

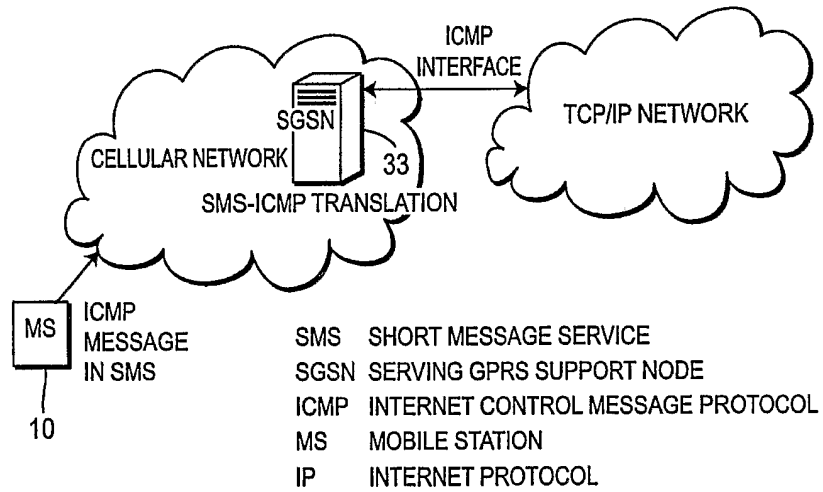


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/16704

A. CLASSIFICATION OF SUBJECT MATTER IPC(7) : H04J 3/16; H04Q 7/20 US CL : 370/466; 455/466 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) U.S. : 370/466, 467, 469, 395.5, 395.52, 351, 389, 522; 455/466, 511 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 practicable, search terms used) EAST																
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category *</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A, E</td> <td>US 6,321,257 B1 (KOTOLA et al.) 20 November 2001 (20.11.2001). See entire document.</td> <td style="text-align: center;">1-45</td> </tr> <tr> <td style="text-align: center;">A, P</td> <td>US 6,421,707 B1 (MILLER et al.) 16 July 2002 (16.07.2002). See entire document.</td> <td style="text-align: center;">1-45</td> </tr> <tr> <td style="text-align: center;">A, E</td> <td>US 5,950,123 A (SCHWELB et al.) 07 September 1999 (07.09.1999). See entire document.</td> <td style="text-align: center;">1-45</td> </tr> <tr> <td style="text-align: center;">A, T</td> <td>US 2003/0058827 A1 (CHOW et al.) 27 March 2003 (27.03.2003). See entire document.</td> <td style="text-align: center;">1-45</td> </tr> </tbody> </table>		Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A, E	US 6,321,257 B1 (KOTOLA et al.) 20 November 2001 (20.11.2001). See entire document.	1-45	A, P	US 6,421,707 B1 (MILLER et al.) 16 July 2002 (16.07.2002). See entire document.	1-45	A, E	US 5,950,123 A (SCHWELB et al.) 07 September 1999 (07.09.1999). See entire document.	1-45	A, T	US 2003/0058827 A1 (CHOW et al.) 27 March 2003 (27.03.2003). See entire document.	1-45
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.														
A, E	US 6,321,257 B1 (KOTOLA et al.) 20 November 2001 (20.11.2001). See entire document.	1-45														
A, P	US 6,421,707 B1 (MILLER et al.) 16 July 2002 (16.07.2002). See entire document.	1-45														
A, E	US 5,950,123 A (SCHWELB et al.) 07 September 1999 (07.09.1999). See entire document.	1-45														
A, T	US 2003/0058827 A1 (CHOW et al.) 27 March 2003 (27.03.2003). See entire document.	1-45														
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> 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 application or patent 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 07 October 2003 (07.10.2003)	Date of mailing of the international search report 07 OCT 2003															
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer Dang Ton <i>Ronald Ward</i> Telephone No. (703)305-4739															

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/16704

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

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

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

- 2. Claim Nos.: 38
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
- Recitation (Claim 38, Line 8): "... given cellular network comprising:" is vague and indefinite because the claim must end with a period. Therefore, the sentence is unclear completed or not.

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

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

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

- 1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
- 2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
- 3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

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

Remark on Protest The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.

Continuation of Item 4 of the first sheet:

METHOD AND APPARATUS FOR TRANSMISSION OF INTERNET CONTROL MESSAGE PROTOCOL MESSAGES AS SHORT MESSAGE SERVICE (SMS) MESSAGES IN A COMMUNICATIONS NETWORK COMPRISED OF MOBILE STATIONS

NEW TITLE

METHOD AND APPARATUS FOR TRANSMISSION OF INTERNET CONTROL MESSAGE PROTOCOL MESSAGES IN A COMMUNICATIONS NETWORK