(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
12 August 2004 (12.08.2004)

PCT

(10) International Publication Number
WO 2004/068877 A1

(51) International Patent Classification[7]: H04Q 7/20, H04J 3/16

(21) International Application Number: PCT/US2003/041631

(22) International Filing Date: 30 December 2003 (30.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/348,927 22 January 2003 (22.01.2003) US

(71) Applicant *(for all designated States except US)*: **THOMSON LICENSING S.A.** [FR/FR]; 46, Quai A. Le Gallo, F-92648 Boulogne Cedex (FR).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **LI, Jun** [CN/US]; 26 Orchid Drive, Plainsboro, NJ 08536 (US). **ZHANG, Junbiao** [CN/US]; 20 Jenna Drive, Bridgewater, NJ 08807 (US). **RAMASWAMY, Kumar** [IN/US]; 71 Sayre Drive, Princeton, NJ 08540 (US).

(74) Agents: **TRIPOLI, Joseph, S.** et al.; Thomson Licensing Inc., 2 Independence Way, Suite 200, P. O. Box 5312, Princeton, NJ 08543-5312 (US).

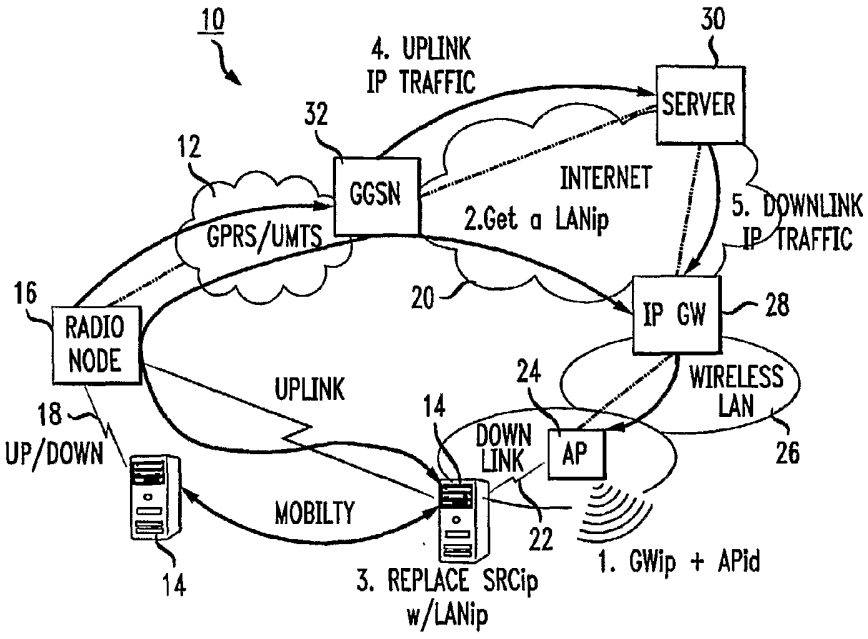
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM,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

(84) Designated States *(regional)*: ARIPO patent (BW, 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*
— *with amended claims*

[Continued on next page]

(54) Title: HIGH BANDWIDTH COMMUNICATIONS TECHNIQUE FOR MOBILE COMMUNICATIONS DEVICES



(57) Abstract: A mobile communications device (14) can advantageously provide information at a low cost by establishing a connection with its downlink through a unidirectional wireless broadband channel (22) to a network, such as a wireless Local Area Network (LAN) 26. The device establishes its uplink through a low bandwidth bi-directional channel (18) to a wireless telephony network (12). In this manner, the mobile communications device can experience seamlessly high throughput when large files are accessed from the Internet (20).

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HIGH BANDWIDTH COMMUNICATIONS TECHNIQUE FOR MOBILE COMMUNICATIONS DEVICES

TECHNICAL FIELD

This invention relates to a technique for providing high bandwidth information to a mobile communications device, such as a wireless telephone or the like.

BACKGROUND ART

Presently, users desirous of obtaining wireless telephony service typically subscribe to one of the many providers of such service. Many of today's wireless telephony service providers not only offer voice-calling capability, but also offer data services, such as General Packet Radio Service (GPRS), thereby affording subscribers the capability of exchanging data packets via a mobile terminal. While mobile data service exists in many areas, data transmission rates typically do not exceed 128 Kbs and the costs incurred by wireless network service providers to support this service remain high, making mobile data service expensive. The relatively high cost and relatively low throughput of present-day public mobile data networks makes the data service offered through such networks impractical for providing "high bandwidth" information. For purposes of discussion, high bandwidth information comprises large files of text, data, audio and/or video that require high bandwidth for transmission in a timely manner. For example, transmission of a large video file, say 100 Mbytes, at a rate of 128 Kbs rate will typically take hours, whereas transmitting the same file at a rate of 11 Mb/s or higher will take but a few minutes.

The ability of many new wireless telephones to access the Internet is of somewhat limited value given the low data transmission rate available through present day public mobile data networks. Despite the availability of useful information, such as maps, and tour guides for example, available from the Internet, most wireless telephone subscribes avoid accessing the Internet because of the time and cost involved to obtain such information. Consequently, the relatively low data rate offered by present-day public mobile networks has impeded the development of various information services that require high bandwidth.

A prior mobile communication system for overcoming this problem comprises a direct link for communicating information between a network and a selected mobile communications

device, and a broadcast link for simultaneously broadcasting information from the network for intended receipt by all of the communications devices. The broadcast link takes the form of a satellite or terrestrial television transmission. While both satellite and television transmission afford high bandwidth, obtaining such spectrum for the purpose of providing a second channel to mobile communications devices could prove problematic, given the relatively high cost of such spectrum.

Thus, there is a need a technique for providing a relatively low cost, high bandwidth channel for providing information to mobile communications devices.

BRIEF SUMMARY OF THE INVENTION

Briefly, in accordance with present principles, a method is provided for establishing a high bandwidth, unidirectional communications channel to a mobile communications device already in communication with a first network via a low bandwidth bi-directional communications channel. The method commences upon receipt in a second network of a request by the mobile communications device to establish the high bandwidth, unidirectional communications channel. In practice, the second network comprises a Wireless Local Area Network (LAN) or the like linked to the first network. Upon receipt of the request, the second network (e.g., the wireless LAN) then undertakes to verify the requesting mobile communications device, typically by verifying identification information utilized by the mobile communications device to access the first network. Following verification, the second network establishes the high bandwidth, unidirectional communications channel, which in the case of the wireless LAN, takes the form of an IP channel. After establishing the channel, the second network will provide information to the mobile communications device. Such information could include information selected by commands entered by the mobile communications device to the first network and forwarded to the second network.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 depicts a block schematic diagram of a communications system for practicing the method of the present principles for establishing a high bandwidth, unidirectional communications channel; and

FIGURE 2 depicts a timing chart depicting the sequence of events associated with establishing the high bandwidth, unidirectional communications channel in the communications system of FIG. 1.

DETAILED DESCRIPTION

FIGURE 1 illustrates a block schematic diagram of a communications system 10 that includes a mobile telephone network 12. In practice, the network 12 provides data communications in accordance with the 2.5G GPRS standard or the 3G Universal Mobile Telephone Standard (UMTS). For that reason, the network 12 thus bears the designation GPRS/UMTS network in FIG. 1. Other wireless telephony standards exist and could easily be employed in place of the GPRS or UMTS standards without departing from the present principles. A mobile communications device 14, such as a wireless telephone, wireless PDA or wireless modem associated with a personal computer, accesses the GPRS/UMTS network 12 via a radio node 14 connected to the network. Communications between the radio node 14 and the mobile communications device 12 occurs over a radio channel 18 that typically has a relatively low bandwidth, which in practice, typically supports no more than 128 Kbs data service. While the bandwidth of the channel 18 supports bi-directional communications of both voice and data between the mobile communications device 14 and the radio node 16, the relatively low bandwidth of the channel does not support efficient accessing of large audio, video and/or data files, such as could be requested from a data network 20 like the Internet.

In accordance with the present principles, a mobile communication device can advantageously access high bandwidth information via a high-bandwidth unidirectional radio channel 22 established between the mobile communications device and an Access Point (AP) 24 associated with, for example, a Wireless Local Area Network (LAN) 26. In many geographic areas, there exists publicly accessible Wireless LANs, such as wireless LAN 26, that afford relatively high bandwidth (usually in excess of 10 Megabits/second) at a reasonable cost, thus offering a relatively cheap mechanism for providing information to the mobile communications device 14. An Internet Protocol Gateway (IP GW) 28 provides an interface between the wireless LAN 26 and the Internet 20 to permit accessing of information, and in particular, high bandwidth information, from at least one application server 30 connected to the Internet.

Control of the information provided by the server 30 occurs in response to instructions received through the GPRS/UMTS network 12 from the mobile communications device 14.

Within the GPRS/UMTS network 12, a Gateway GPRS Support Node (GGSN) 32 provides an interface between the network and the Internet 20. Thus, the GGSN 32 enables information selections received in GPRS/UMTS network 12 from the mobile communications device 14 to ultimately pass to the server 30, which in response provides such selected information for transmission through the wireless LAN 26 and the channel 22 for receipt by the mobile communications device.

FIGURE 2 depicts the sequence of events associated with establishing the high bandwidth unidirectional radio channel 22 between the mobile communications device 14 and the AP 24 associated with the wireless LAN 26, all of FIG. 1. Initially, the mobile communications device 14 establishes a communications session with the GPRS/UMTS network 12 through the radio node 16 in a well-known manner. In the process of establishing a communications session with the GPRS/UMTS network 12, the mobile communications device 14 will verify its identity typically using a Public Key (PBKu) and a Private Key (PVKu) assigned to the device. Once in communication with the GPRS/UMTS network 12 through the radio node 16, the mobile communications device 14 will send and receive traffic to and from the Internet 20 through the GGSN 32 during event 100 of FIG. 1. Such uploaded (uplinked) traffic can include information requests made to the server 30 of FIG. 1.

As discussed above, the radio channel 18 through which the communications device 14 sends and receives traffic to and from the GPRS/UMTS network 12 typically has a low bandwidth; making accessing of large files impractical. To open the high bandwidth channel 22 in accordance with the present principles, the mobile communications device 14, upon entering the coverage area of the wireless LAN 26, will "listen" for an identification signal (designated as "APid") from an access point, such as the AP 24. In addition to broadcasting the APid, the AP 24 will also broadcast the identification (i.e., the IP address) of the IP GW 28. The broadcast of the identification signal APid and the addresses (hereinafter referred to as GWip) of the IP GW 28 occur during event 102 of FIG. 2.

Upon receipt of the APid and GWip, the mobile communications device 14 then verifies itself to the IP GW 28 by transmitting the PBKu and PVKu of the device along with its Manufacturer's Identification Number (MNid), as well as the APid and GWip, to radio node 16 for receipt at the GGSN 32. In turn, the GGSN 32 communicates this information to the IP-GW 28. The transmission of such verification information occurs during event 104 in FIG. 2. After verifying the mobile communications device 14, the IP GW 28 will assign the device an IP address (IPa) and a Media Access Control (MAC) layer address (MACa) based on the APid and

shared key (Ks) provided by the device. The IPa address obtained from the IP GW 28 must enjoy visibility outside the wireless LAN 26. Should a Network Address Translator (NAT) (not shown) exist in the IP GW 28, then there needs to be a pool of addresses and port number pairs available for assignment to the mobile communication device 14. The IP GW 28 encrypts the addresses using the public key (PBKu) of the mobile communications device 14 prior to transmission to the device during event 106 of FIG. 2.

Following receipt of the addresses IPa and MACa from the IP GW 28, the mobile communications device 14 can initiate a communications session with the wireless LAN 26 to provide information from the server 30 via the communications channel 22 of FIG. 1 during event 108 of FIG. 2. To initiate a communications session with the wireless LAN 26 to access information from the server 30, the mobile communications device 14 replaces its source address (SCRip) by which it is known in the GPRS/UMTS network 12 with a source address (dstlIP) by which the device will be known in the wireless LAN 26. To upload (uplink) information to the GPRS/UMTS network 12, the mobile communications device 14 will utilize its original source address (SCRip) by which it was previously known in the GPRS/UMTS network 12. The wireless LAN 26 accounts for the information accessed on the channel 22 for billing the mobile terminal device, either directly, or as part of the billing performed by the GPRS/UMTS network 12.

Establishing the unidirectional communications channel 22 in the manner discussed above advantageously provides a low cost, high-speed solution to the problem of enabling a mobile communications device to access high bandwidth information. As compared to terrestrial television and satellite transmission schemes, utilizing the wireless LAN 26 to access high bandwidth information incurs far less cost. Moreover, the growing number of wireless LANs currently available makes the present solution far more practical than seeking terrestrial television and/or satellite spectrum. Since the mobile communications device 14 does not upload information to the wireless LAN 26 (such uploading being confined only to the GPRS/UMTS network 12), a typical access point, such as the AP 24 can offer a much wider coverage area than if the AP had to unload traffic from the mobile communications device. Further, since the mobile communications device 14 uploads no information to the wireless LAN 26, the security of the wireless LAN remains relatively unaffected since the likelihood of hackers causing any disruption is extremely small. In addition, the present approach of establishing an unidirectional IP link, such as the channel 22 through the wireless LAN 26 provides for seamless throughput.

The foregoing describes a technique for providing a mobile communications device with separate downlink and uplink channels to enable the device to readily downlink high bandwidth information.

CLAIMS

1. A method for providing high bandwidth information to a mobile communications device in communications with a first network across a bi-directional channel, comprising the steps of:

receiving in a second network a request from the mobile communications device to establish a unidirectional wireless channel capable of carrying high bandwidth information to the device;

verifying in the second network the request from the mobile communications device; and

responsive to the verification, establishing the unidirectional wireless channel to the mobile communications device to enable providing of the high bandwidth information.

2. The method according to claim 1 wherein the verifying step further comprises the step of utilizing in the second network verification information from the mobile communication device used by the device for verification in the first network.

3. The method according to claim 2 wherein the verifying step further comprises the step of receiving in the second network the verification information forwarded by the first network from the mobile communications device.

4. The method according to claim 1 further including the step of providing to the mobile communications device the high bandwidth information across the unidirectional wireless channel in an IP format.

5. The method according to claim 4 wherein the providing step further comprises the step of selecting the high bandwidth information responsive to a selection command received in the first network from the mobile communications device.

6. The method according to claim 4 further comprising the step of accounting within the second network for the information provided to the mobile communications device.

7. A method for providing high bandwidth information to a mobile communications device, comprising the steps of:

establishing in a first communications network a communications session with the mobile communications device

receiving in a second network, through the first network, a request from the mobile communications device to establish a unidirectional wireless channel communications device capable of carrying high bandwidth information in an IP format through the second network to the mobile communications device;

verifying in the second network the request from the mobile communications device; and

responsive to the verification, establishing the unidirectional wireless channel to the second network to enable providing of the high bandwidth information.

8. The method according to claim 7 wherein the verifying step further comprises the step of utilizing in the second network verification information from the mobile communication device used in the first network for verification of the device.

9. The method according to claim 8 wherein the verifying step further comprises:

receiving in the second network the verification information forwarded by the first network from the mobile communications device.

10. The method according to claim 7 further including the step of providing to the mobile communications device the high bandwidth information across unidirectional wireless channel.

11. The method according to claim 10 wherein the providing step further comprises the step of selecting the high bandwidth information for providing responsive to a selection command received in the first network from the mobile communications device.

12. The method according to claim 7 further comprising the step of accounting within the second network for the information provided to the mobile communications device.

13. A communications system for providing information to a mobile communications device, comprising:

a data network containing at least one information source for providing information for providing to the mobile communications device;

a wireless telephony network coupled to the data network;

a radio node coupled to the wireless telephony network and accessible by the mobile communications device via a low bandwidth bi-directional wireless channel so that the wireless network can upload information from and provide information to the device through the radio node;

an access Point for providing a unidirectional high bandwidth wireless channel to the mobile communications device; and

a wireless LAN coupled to the access point for (1) verifying the mobile communications device in accordance with verification information used by the mobile communications device for the purpose of establishing a communications session with the wireless telephony network, and (2) transmitting the information stored in the information source to the mobile communications device through the unidirectional high bandwidth wireless IP channel upon establishment of a communications session with the mobile communications device.

14. The system according to claim 13 wherein the information source provides information through the wireless LAN to the mobile communications device across the unidirectional channel responsive to an information selection command received in the wireless telephony network from the mobile communications device.

AMENDED CLAIMS

[received by the International Bureau on 2 June 2004 (02.06.04);
original claims 1-14 replaced by amended claims 1-12 (3 pages)]

1. A method for providing high bandwidth information to a mobile communications device in communications with a first network across a bi-directional channel, comprising the steps of:

receiving in a second network a request from the mobile communications device to establish a unidirectional wireless channel capable of carrying high bandwidth information to the device;

verifying in the second network the request from the mobile communications device by utilizing network verification information from the mobile communication device used by the device for verification in the first network; and

responsive to the verification, establishing the unidirectional wireless channel to the mobile communications device to enable providing of the high bandwidth information.

2. The method according to claim 1 wherein the verifying step further comprises the step of receiving in the second network the verification information forwarded by the first network from the mobile communications device.

3. The method according to claim 1 further including the step of providing to the mobile communications device the high bandwidth information across the unidirectional wireless channel in an IP format.

4. The method according to claim 3 wherein the providing step further comprises the step of selecting the high bandwidth information responsive to a selection command received in the first network from the mobile communications device.

5. The method according to claim 1 further comprising the step of accounting within the second network for the information provided to the mobile communications device.

6. A method for providing high bandwidth information to a mobile communications device, comprising the steps of:

establishing in a first communications network a communications session with the mobile communications device

receiving in a second network, through the first network, a request from the mobile communications device to establish a unidirectional wireless channel communications device capable of carrying high bandwidth information in an IP format through the second network to the mobile communications device;

verifying in the second network the request from the mobile communications device by utilizing network verification information from the mobile communication device used by the device for verification in the first network; and

responsive to the verification, establishing the unidirectional wireless channel to the second network to enable providing of the high bandwidth information.

7. The method according to claim 6 wherein the verifying step further comprises:

receiving in the second network the verification information forwarded by the first network from the mobile communications device.

8. The method according to claim 6 further including the step of providing to the mobile communications device the high bandwidth information across unidirectional wireless channel.

9. The method according to claim 8 wherein the providing step further comprises the step of selecting the high bandwidth information for providing responsive to a selection command received in the first network from the mobile communications device.

10. The method according to claim 6 further comprising the step of accounting within the second network for the information provided to the mobile communications device.

11. A communications system for providing information to a mobile communications device, comprising:

a data network containing at least one information source for providing information for providing to the mobile communications device;

a wireless telephony network coupled to the data network;

a radio node coupled to the wireless telephony network and accessible by the mobile communications device via a low bandwidth bi-directional wireless channel so that the wireless network can upload information from and provide information to the device through the radio node;

an access Point for providing a unidirectional high bandwidth wireless channel to the mobile communications device; and

a wireless LAN coupled to the access point for (1) verifying the mobile communications device in accordance with verification information used by the mobile communications device for the purpose of establishing a communications session with the wireless telephony network, and (2) transmitting the information stored in the information source to the mobile communications device through the unidirectional high bandwidth wireless IP channel upon establishment of a communications session with the mobile communications device.

12. The system according to claim 11 wherein the information source provides information through the wireless LAN to the mobile communications device across the unidirectional channel responsive to an information selection command received in the wireless telephony network from the mobile communications device.

FIG. 1

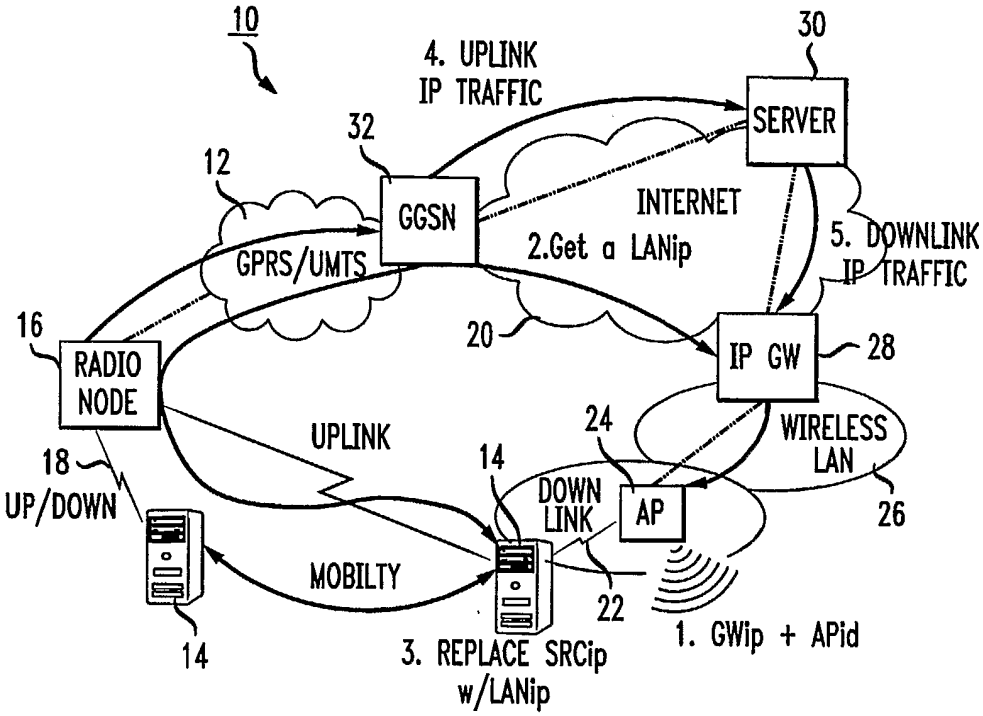
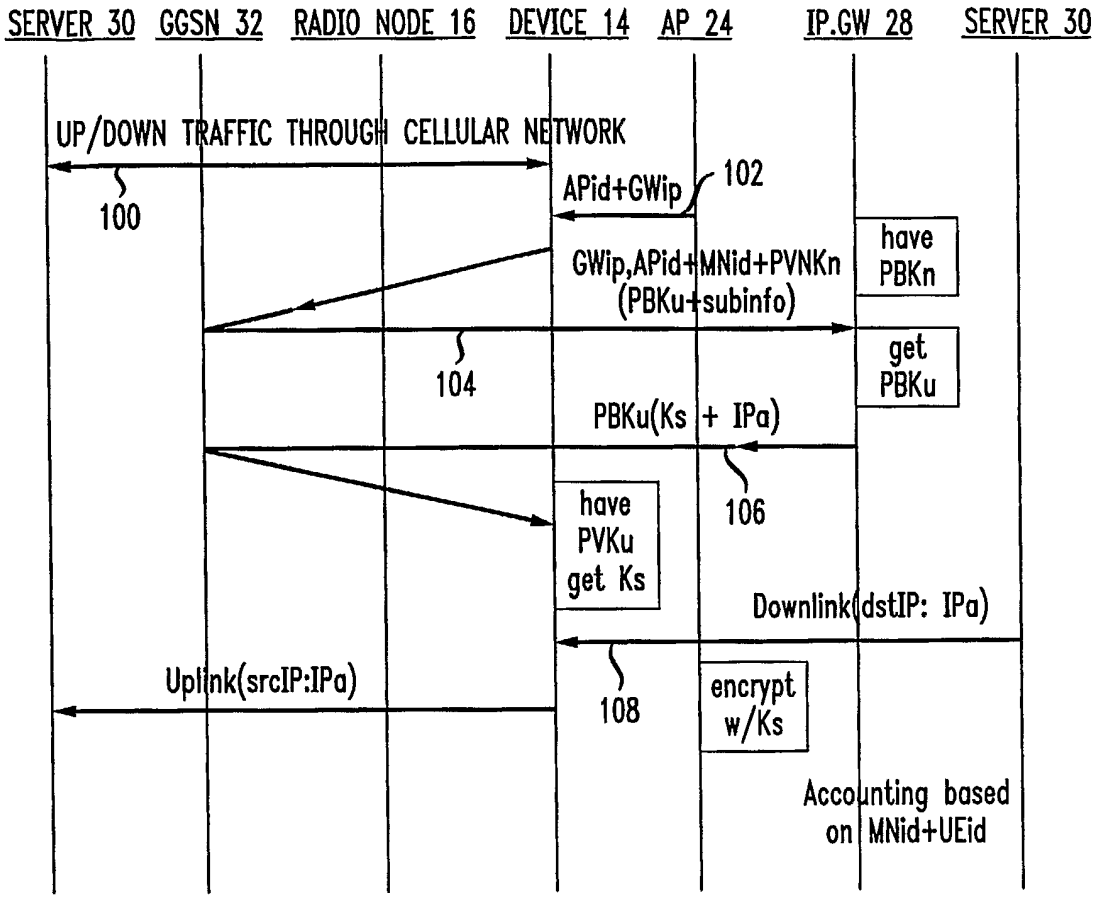

10
4. UPLINK
IP TRAFFIC
30
SERVER
32
12
GGSN
INTERNET
2.Get a LANip
5. DOWNLINK
IP TRAFFIC
GPRS/UMTS
16
20
IP GW
28
RADIO
NODE
UPLINK
24
WIRELESS
LAN
18
14
DOWN
LINK
AP
26
UP/DOWN
MOBILTY
22
1. GWip + APid
14
3. REPLACE SRCip
w/LANip

FIG. 2


SERVER 30
GGSN 32
RADIO NODE 16
DEVICE 14
AP 24
IP.GW 28
SERVER 30
UP/DOWN TRAFFIC THROUGH CELLULAR NETWORK
100
APid+GWip
102
have PBKn
GWip,APid+MNid+PVNKn (PBKu+subinfo)
get PBKu
104
PBKu(Ks + IPa)
106
have PVKu get Ks
Downlink(dstIP: IPa)
Uplink(srcIP:IPa)
108
encrypt w/Ks
Accounting based on MNid+UEid

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/41631

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04Q 7/20; H04J 3/16

US CL : 455/450, 451, 452.1, 452.2; 713/171; 370/312, 346

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. : 455/450, 451, 452.1, 452.2; 713/171; 370/312, 346

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6,317,831 B1 (KING) 13 November 2001 (13.11.2001), column 4, lines 25-28. column 4, lines 1-16. column 5, lines 44-52. column 6 lines 28-31. column 8, lines 22-29, 50-56. column 15, lines 30-34. column 15 lines 48-50.	1-14
A	US 2002/0181415 A1 (WEST et al) 05 December 2002 (05.12.2002), paragraphs 0052, 0068, 0072, 0084.	1-14

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

* Special categories of cited documents:

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"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

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Date of the actual completion of the international search

22 April 2004 (22.04.2004)

Date of mailing of the international search report

17 MAY 2004

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

Marsha D. Banks-Harold

Telephone No. (703) 308-5576

Form PCT/ISA/210 (second sheet) (July 1998)