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(71) Applicant *(for all designated States except US)*: **OPENWAVE SYSTEM INC.** [US/US]; 2100 Seaport Blvd., Redwood City, CA 94063 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **CHANDRASEKARAN, Anand** [IN/US]; 1, E. Julian St., #218, San Jose, CA 95112 (US).

(74) Agent: **WILSON, Mark, A.**; Wilson Ham & Holman, 1811 Santa Rita Road, Suite 130, Pleasanton, CA 94566 (US).

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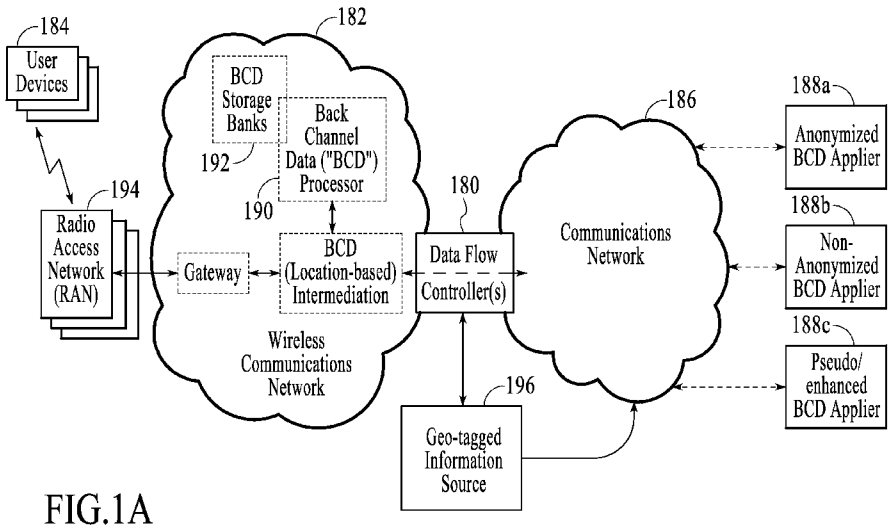


FIG.1A

(57) Abstract: Consistent with one aspect, location-based mobile-terminal data is processed within or involving the wireless portion of such communication networks, and methods and apparatuses process the location-based mobile-terminal data based on information provided from outside the relationship of the network operator and the user. The location- based mobile-terminal data is extracted and processed by a node in the wireless portion of the communication network based on a specified set of rules. Other sources of location- based information originate from within the communication network itself including, but not limited to, location information regarding the nodes themselves.

WO 2011/053808 A1

BACK-CHANNELED PACKETED DATA

Related Patent Documents

This patent document claims the benefit, under 35 U.S.C. § 119(e), of U.S. Provisional Patent Application Serial No. 61/256,565 filed on October 30, 2009, and entitled "Back-Channeled Packeted Data;" this patent document is fully incorporated herein by reference.

Field of the Disclosure

The present disclosure is related to computers, communication networks and the use of traffic data in a communication network having network elements that are implemented with wireless technology. Aspects of the disclosure relate to location-indicative information provided on behalf of terminals and used in such a communication network.

Background

Communication networks continue to improve in their abilities to efficiently and practically assist terminal-equipment users and society in general in communicating information, such as voice signals, images, electronic files or data, and video signals, to and from a mobile communication device using radio waves. For example, a wireless communication network may include a communication system using one or more of various radio-communication schemes such as represented in recent implementations and proposals of digital (*e.g.*, 3G/4G) cellular, wireless peer-peer, PCS and satellite communication systems.

Wireless communication networks generally include a network of base stations that communicate with various wireless communication devices. Examples of wireless communication devices include telephony devices, wireless readers, radios, personal digital assistants (PDAs), palmtops, notebook computers, and other devices that have wireless communication capability. Each base station provides communication services within its respective network zone, such that the network of base stations provides a number of network zones that can cover a large geographic area. The network zones and

their respective coverage areas occasionally change as base stations are improved and added within the wireless communication network. Nearly all of the United States is covered by cellular communication networks, with many of the base stations now providing various forms of the above-mentioned communication systems.

More recently, a number of location-based service applications have been implemented or proposed for wireless communication networks. Examples of such existing or proposed location-based service applications include: emergency service, location-dependent call routing, location-dependent billing, location tracking, and the like. In emergency applications the call and the exact location of the wireless communication device may be routed to the closest provider of emergency services, thus reducing emergency response time and possibly saving lives. In location-dependent billing applications, different billing rates may be charged to a customer for operating the wireless communication device in different geographical areas. Each location-based service application utilizes the location of the wireless communication device.

Location systems sometimes utilize conventional system reference location methods for determining or characterizing the location of the wireless communication device. Such reference location methods operate by relating the location of the wireless communication device to a network zone, e.g., cell or cell sector of the wireless communication network. However, mobile operators face specific and real problems with network resources that may hinder widespread deployment of commercial location-based services. For example, consider a situation where a mobile operator is offering a mix of location-based services to its subscribers. The application mix includes services like fleet tracking, child finder, push advertising, and traffic alerts. These applications generally would like to be notified with location updates when the subscriber is moving, and perhaps with greater frequency when the subscriber is moving more rapidly.

Aspects of the present disclosure can be useful for addressing these various needs and for providing various advantages and uses of location-based information in networks involving mobile terminals. While the present disclosure is not necessarily limited to such aspects, the instant disclosure may be appreciated through a discussion of examples using these and other contexts.

Summary

Without limitation, aspects of the present disclosure are directed to various embodiments involving back-channel location-based data available to an operator of the wireless network. Some of these aspects are: 1) architectural aspects of wireless communication networks for routing and processing location-based mobile-terminal data within the network; 2) routing and processing location-based mobile-terminal data by a wireless communication network in cooperation with a local or hot-spot network; 3) processing location-based mobile-terminal data by a wireless communication network for controlling aspects of mobile terminals; 4) Mobile terminal operation based on input from a wireless communication network processing location-based mobile-terminal data; 5) a wireless communication network adapted for routing and processing location-based mobile-terminal data to monitor (suspicious) calls; 6) providing telephony terminals network access (*e.g.*, call-screening) on behalf of 3rd parties; 7) a wireless communication network adapted for using and processing location-based mobile-terminal data as (geo-tagged) information sources for third parties and adaptively reprocessing such location-based data within the network with third party applications; and 8) software-based (business) methodology involving income-producing business models.

Consistent with one aspect, location-based mobile-terminal data is processed within or involving the wireless portion of such communication networks, and methods and apparatuses process the location-based mobile-terminal data based on information provided from outside the relationship of the network operator and the user. The location-based mobile-terminal data is extracted and processed by a node in the wireless portion of the communication network based on a specified set of rules. Other sources of location-based information originate from within the communication network itself including, but not limited to, location information regarding the nodes themselves.

For use in connection with a communication network having wireless-technology equipment, embodiments are directed to and involving a processor node configured within the wireless-technology equipment for assimilating current location data regarding the user terminals with the user profiles, and using the assimilated current location data for specifically-defined analysis operations, various ones of which are discussed below. In certain of these embodiments, a memory circuit is used by the processor node to store,

on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to user terminals associated with the subscriber data.

As an example of a communication network for which architectural aspects of this disclosure are directed, reference may be made to core wireless-based communications networks such as the General Packet Radio Service (GPRS) core network. Such networks provide a variety of communication services including mobility management, session management, and transport for Internet Protocol packet services such as in GSM and WCDMA networks. Whether for these or other types of wireless-based communications networks, aspects of the present invention are directed to routing and processing location-based information. The venue of transmitting mobile terminals from the wireless-based network channels is routed to a processor node that is programmed to analyze and translate the location-based information for specific objectives. The objectives stem from, and respect, user-sensitive information such as data in the user's business profile as a subscriber to the operator wireless carrier and the user's current status or location.

In certain implementations, specific objectives are largely contained within the controls expected by the wireless carrier of the communications network. Such objectives are related to confirmation, auditing and/or location-point refinement relative to information previously or otherwise available to the communications network. In these and other contexts, the processor node implements such objectives by providing a second source of location information for corroborating important location updates for the mobile terminal. Such location-information corroboration can become important for a variety of operations, including the various mobile registrations with base-station equipment, and other requested or forced location pushes from a mobile device.

In other specific implementations, the processor node receives the location-based data and processes the data for operations that are largely contained within the confines and controls expected by the wireless carrier of the communications network. Such objectives relate to confirmation, auditing and/or location-point refinement relative to information previously or otherwise available to the communications network. In these contexts, the processor node implements such objectives by providing a second or corroborating source of location information for location updates including the various

mobile registrations with base-station equipment and other common requested or forced location pushes from a mobile.

According to other aspects of the disclosure, the wireless communications network routes the location-based data to a processor node that is configured and programmed to process the data for one or more of the following operations: providing current and/or last-known location information for increasing accuracy/reliability of location-enabled technology as a source of location information in instances when the mobile terminal cannot accurately communicate its current location in the RAN (radio access network) equipment. The processor node stores and retains the last known location for recalling it for an applicable event; examples of such events include the mobile terminal being out of service or power, being in areas where there is substantial interference or limited access to the RAN, and being in blocked areas where GPS visibility is ineffective such as indoors and covered areas including tunnels and subways.

In connection with other aspects, the disclosure concerns a communication network having a local-area service network and having a wireless network including wireless-technology equipment that provides access to data through subscriber-based agreements via a memory circuit that stores, on behalf of an operator for the communication network, user profiles. The user profiles include wireless network subscriber data useful for providing network access to user terminals associated with the subscriber data, and terms pursuant to a third-party agreement involving an entity outside the network. A processor node configured within the wireless network is programmed for assimilating current location data regarding the user terminals with the user profiles, the current location data including a location within a region for which the local-area service network provides access between the user terminals and the communication network. For facilitating communication involving the user terminals in the communication network, the assimilated current location data is used according to a process or algorithm that is based on a parameter specific to the geographic region and to certain terms of the third-party agreement. As an example, the local-area service network provides local communication access to the network using a WiFi or a WiMax communication scheme per an industry standardization (*e.g.*, as defined by the WiFi Alliance or WiMAX

Forum). Specific implementations use one or more peer-to-peer communication schemes to transfer data between devices.

In more specific embodiments, the wireless network cooperates in communication with the local-area service network(s) to provide predictive data for communications between the local-area service network and a mobile terminal. In this context, as one or more of these networks assess a direction of a mobile terminal based on changes of the location-based back channel (or other such) data, the overall system predicts that the mobile terminal will be in a specific region (of one of the local-area service networks) and communications such as tracking, advertising, information services can be sent for (the user of) the mobile terminal. As nonlimiting examples, these communications can be used to offload network loading, *e.g.*, by sending such targeted data more slowly in advance of the expected time of arrival, and/or to provide more detailed location/advertising information to the user as the mobile terminal progresses (and is tracked) through a known region such as off a highway ramp toward the entrance of a retail strip mall and to the front of a store in the retail strip mall where directions and advertisements regarding the store (store hours and coupons) are more timely provided. Still using the examples of directions and advertisements, other aspects concern the use of a third-party resource that provides information which is parameter specific to the region/mobile terminal subscriber; this parameter might be any of a number of demographics or a follow-up response to a query on a specific type of store in the nearby vicinity. In certain instances, the wireless network and the subscriber enter into a monthly agreement in which access to the wireless network is discounted if the subscriber were to permit third-parties to send such user-related or user-prompted advertisements. Although beneficial in many mentioned and unmentioned contexts, many of these applications do not require use of more localized networks cooperating as such with the wireless network.

Another aspect and related embodiments configure wireless-technology equipment, including a processor node, to store and access back channel data for the purpose of controlling aspects of mobile terminals. Within a wireless communication network, a memory circuit stores: on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing

network access to user terminals associated with the subscriber data; and on behalf of a third party, communication rules relevant to a geographic region of service provided by the communication network (optionally, the third party communication rules are implemented pursuant to three-way agreements between the subscriber, the operator of the wireless network and the third party). The processor node is configured within the wireless-technology equipment for assimilating current location data regarding the user terminals with the user profiles, and using the assimilated current location data to facilitate communication for the mobile terminals, via the communication rules relevant to the geographic region, over the communication network. The communication rules can be used to dictate how certain of the mobile terminals can operate, *e.g.*, in terms of operable features, applications and access to the network.

In certain specific embodiments, the communication rules indicate terms for prioritizing the communication of data for the mobile terminals based on the assimilated current location data indicating that the mobile terminals have a venue relative to the geographic region of service. The terms for prioritizing the communication of data for the mobile terminals can be based on, for example, at least one of the following: time of day, day of the week, specific calendar date, user-profile identity data; user-profile data indicating subscription-paid feature; and a type or length of data involved in the communication with a user terminal.

The communication rules can also indicate other terms such as for limiting or blocking the communication of data for the mobile terminals based on the assimilated current location data indicating that the mobile terminals have a venue relative to the geographic region of service. Students at a learning center, for example, may have communication of certain or all data to/from the mobile terminals blocked, limited or filtered as a function of school hours while in the vicinity of the campus. The other terms may be specified in third-party agreements with the operator of the venue (school administrator or employer) and the big-brother issuer of the mobile terminal (parent or employer).

In other instances, the third party represents that it has an established relationship with (or under the authority of) the mobile terminals and this representation is communicated with the wireless carrier, or the local network communicating therewith,

when the mobile terminals are operating in the geographic region of service; in these configurations, the wireless carrier can block or limit calls to and/or from designated mobile terminals, when they are operating under the apparent authority, as a function of a confirmation protocol by the processor node to confirm the same. Such confirmation can be provided, *e.g.*, by the processor node retrieving the user profile for the mobile terminal and comparing the third party to a list of third parties which the user profile had designated as having such overriding authority.

In yet another related embodiment, the above-discussed communication rules are used by the processor node in the wireless network to prompt a communication to the mobile terminals, when they are operating in the geographic region of service, to indicate that they are to implement an application that alters their communication or operation with the network in a manner consistent with the communication rules. An example is implementation of a vibrate-only alert in place of a ring whenever quiet rules apply (*e.g.*, during times and/or places of education, worship, lecture, sermon, in the library, exiting congested events where accidents are known to occur such as in autos after large public events).

In other embodiments, such control-based communication is used to provide control over access and mobile terminals which operate based on downloaded applications or expected/standardized functionality; an example concerns coordinating operations between and using a processor node in the mobile terminal and a processor node in the wireless network. When the processor node in the wireless network identifies a targeted mobile terminal as being in a designated region of special operation, it messages the processor node in the mobile terminal to perform a special operation such as activating a communication protocol with a third party (*e.g.,* via another network) such as for time-clock entry of a trucker, attendance at school, RFID-tagging/imaging and otherwise registering services or products as being in a certain status of processing or handling. In certain of these embodiments, the processor node in the wireless network can also be configured to send a location-based, identity-based report for the purpose of corroborating the activity insofar as it is a trustworthy source of information or data concerning the user, the location and reported/recorded aspects of the activity.

In related aspects, the disclosure is directed to mobile terminals, their circuits, components, CPU-programming instructions and methods of implementing the mobile terminals so that they behave in accordance with one or more of the above-characterized manners. For example, the mobile terminal used in such a wireless network includes a memory circuit that stores: on behalf of an operator for the communication network, user identity information relating to wireless network subscriber data useful for providing network access; and on behalf of a third party, an executable set of communication rules relevant to a geographic region of service provided by the communication network. The mobile terminal also includes a mobile-terminal processor node which is configured in response to a communication from the wireless-technology equipment, indicating that the current location data for the mobile terminal permits the mobile terminal to alter normal rights for communicating with the user over the network while the mobile terminal is in the geographic region.

In other embodiments, the processor node in the wireless network coordinates communication between the mobile terminal and the wireless network to use location information of the mobile device for navigation on behalf of the mobile device. In one specific embodiment, the user is provided with content specific versions of webpages based on the location determination, for example, the store finder option automatically displays the closest locations without the user having to enter any information and/or maps and public-transportation schedules. In different configurations, these web pages are pushed from a geographically-convenient cache within the wireless network, and pushed from a local network, *e.g.*, WiFi or WiMax - in response to an instructional message from the processor node. In another specific embodiment, the processor node accesses its memory for a user's specified personal profile that includes preferred information wanted by the user when the user's mobile terminal is in certain regions or when engaging in a type of call (*e.g.*, name of a person, business entity).

In other specific embodiments, the processor node accesses its memory for a user's specified personal profile that includes information regarding other users participating on the network within a certain region of proximity. The system includes a matching process that compares the information provided to the processor node to determine whether any matches exist. When any matches are within the proximity of a user, the system sends an

alert message to the user to allow the user to initiate communication with matches within the area. The system can but does not need to provide actual identifier information for the matched users; instead the user can simply provide "tokenized" (keeping user-identifying and/or user-location data anonymous) channel connectivity to facilitate communication between the user and the matched users. If both users agree, they can enable the display of their location information on the device display of the other user.

According to other aspects, the processor node provides one or more of the above-noted controls on access to communications channels according to government-related standards which are similarly stored and used as mobile-terminal profiles. Where government employees are prohibited from keyboarding/texting on a mobile terminal while driving (as recently enacted in one federal level), the processor node controls the communications to block/monitor such keyboarding/texting while the mobile terminal is being tracked using the user's mobile-identification information with the location-access point as part of a mandatory government-based authorization subscriber protocol and/or another authorized procedure. In other government-related control instances, when automobile accidents are expected to escalate, government-related controls can similarly discriminate access of some or all types of communications (as discussed above) based on one or more of the following: the location-data indicating movement in a vehicle moving at all, on specific highways, or at specific speeds; alone or in combination with: the user's age as extracted and assumed from the subscriber data for the mobile equipment, the time (*e.g.*, after curfew), or the day (*e.g.*, New Year's Eve).

Another important aspect of the disclosure is directed to terrorism and government surveillance of suspicious-origination calls. A processor node in the communications network provides one or more of the above-noted controls access to communications channels where the communication is initiated from or involves certain types of mobile terminal or uses of mobile terminals in certain suspicious situations. These mobile terminal types, uses and suspicious situations are defined by government entities and also recorded/updated as one or more profiles in memory for access by the processor node. Examples of such situations might include a high or severe threat alert by the Homeland Security Advisory System in combination with mobile terminal calls issued to suspicious classes of individuals from specific venues of concern. Where the

location-access point for requested communication is being video recorded, the processor node can add such pin-pointing information by drawing from government-published databases and recording and/or real-time reporting of the added information as required in the government-defined profiles. Where the video equipment is linked, another communication channel in the network can be activated to provide a real-time connection to enable the processor node with the video-based biometrics (*e.g.*, facial recognition) as another data parameter for monitoring and/or comparing with the aforesaid parameters for assessing whether or not to provide additional operations such as alerting or further controlling aspects via the communications channels.

In more specific embodiments, other databases and analysis/reporting centers are used cooperatively to provide inputs and to analyze results of the processor node(s) configured to monitor or control such suspicious/flagged calls. For example, under certain governmental regulations, national banks are required to report known or suspected criminal offenses, at specified thresholds, or transactions over $5,000 that they suspect involve money laundering or violate the Bank Secrecy Act. These reports, known as Suspicious Activity Reports (SAR) are compiled in databases and then made available electronically to appropriate law enforcement agencies. Similar regulations by other regulators apply to other financial institutions. According to one embodiment, and consistent with the present invention, these types of databases are used to provide parameters for use by a wireless communication system configured to monitor channels involving certain mobile terminals in certain locations. In this context, the wireless communication system manages a memory circuit that stores: on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data; and on behalf of a third party, communication rules relevant to geographic regions of service provided by the communication network and relevant to designated telephony terminals called by the mobile terminals. A processor node, optionally configured within the wireless-technology equipment, is configured and software-programmed for assimilating current location data regarding the mobile terminals with the user profiles, and using the assimilated current location data and the communication rules to control

access or effect communication with the designated telephony terminals through the network communication.

Another aspect of the disclosure is directed to various embodiments in which a processor node in the wireless network uses a caller's location-based data, alone or in combination with portions of the user profile, to provide information to the telephony terminal (an agent thereof) being called. In one embodiment, the wireless-technology equipment includes a processor node (*e.g.*, processor module, circuit, and/or stored set of executable processor instructions) that is configured to access a memory circuit that stores on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to user mobile terminals associated with the subscriber data, and that also stores, on behalf of a third party, communication rules relevant to geographic regions of service provided by the communication network and relevant to designated telephony terminals called by the user mobile terminals. The processor node is configured within the wireless-technology equipment for assimilating current location data regarding the user terminals with the user profiles, and using the assimilated current location data and the communication rules to control access or effect communication with the designated telephony terminals through the network communication.

In a more specific embodiment, the memory circuit stores in and retrieves from a database of designated telephony terminals for which such service is to be provided. These designated telephony terminals can be designated and paid for, on a per-call, monthly or other basis, by a third party or as individual subscribers. By using such location-based/user-profile back channel data, the processor nodes can be configured and equipped to serve groups or individuals and to treat incoming calls in a special manner as set forth in a special-processing directory per the memory circuit such as in the third party's stored communication rules. For example, the processor nodes detect such calls and, in response, direct that the calls be routed differently or redundantly by the wireless network as a function of the location-based back channel data, and prioritize to higher or lower levels of importance, calls from certain mobile terminals to certain designated telephony terminals. In accordance with an example business model, the third party's

stored communication rules are accessed and the incoming calls are routed and billed accordingly.

In connection with yet further aspects, the disclosure concerns a communication network having a wireless network that provides access to back channel data to third parties. A processor node in the wireless network uses and processes location-based mobile-terminal data as geographically-tagged information sources for processing and analysis by third parties. In some configurations, the processor node receives feedback from the third parties, and/or input from other resources and databases, for adaptively re-processing the data previously provided to the third parties.

As a function of subscriber-based agreements or other authorized protocols (examples being provided herein), a memory circuit stores the above-discussed user profiles (including subscriber data such as identity, age, and other particulars and demographics) on behalf of an operator for the wireless communication network for access to the network. On behalf of a third party, the memory circuit also stores communication rules relevant to a geographic region of service provided by the communication network. The processor node is configured within the wireless-technology equipment for assimilating back channel data, such as current location data regarding the mobile terminals with the user profiles, for generating assimilated current location-based and user-characterizing data. The generated data is provided to another processor node (such as at a third party). In one configuration, in response thereto, a modified set of data and a set of rules are received from the third party for generating another set of assimilated current location-based and user-characterizing data.

Using one or more of the above-described architectures or network arrangements, the processor node stores and processes the last known location for certain mobile terminals to provide intermediate back-channel data in a form that is a function of whether the intermediate back-channel data is to be used in a situation that would encroach on information that might be sensitive to the subscriber or user of the mobile terminal, as viewed contractually, ethically or otherwise. If, for example, the subscriber or user of the mobile terminal has no such concerns (rights have been waived voluntarily by agreement with the wireless network operator or a third party, or involuntarily such as by a government mandate), the processor node generates location-identity-based back-

channel data in a form that does not attempt to hide or code the user's identity and/or specific location. This form of (nonanonymized) data can be freely used internally by processor nodes internal to the wireless carrier as well as produced for review and analysis, such as demographic analytics, for use by a third party. Further, it is possible that this information can include other information from the user profile and/or the contract information used to permit the mobile terminal access to the network.

If the subscriber or user of the mobile terminal has or is presumed to have such concerns, the processor node generates location-identity-based back-channel data in a form that hides (coding or encryption) or removes the user's identity and/or specific location. Based on subsequent uses of the data, its form is anonymized relative to the user's identity, *e.g.*, by use of a token (# 954) which categorizes the user's identity in demographic terms. The anonymized data is then relatively freely used internally and/or produced for external review and analysis as discussed herein and above.

In yet another related embodiment involving subscribers or users of the mobile terminals with at least presumptive identity concerns, the operator of the wireless network establishes its agreements for access to the network by way of the generalized or hidden identity of the mobile users. A pay-as-you-use mobile terminal is one example. In this example, the issuer of the mobile terminal effectively leases the terminal based on an agreement between the issuer and the operator of the wireless carrier; in this manner the ultimate user of the mobile terminal is removed or hidden from the operator of the wireless carrier, thereby permitting the latter relative freedom to use the intermediate back channel data. An encrypted-identity subscription agreement is another related example, in which the user's identity is expressly hidden by agreement between the subscriber-user of the mobile terminal and the operator the wireless network.

Other related applications for use of the intermediate back channel data include emergency service, location-dependent call routing, location-dependent billing, location tracking, fleet tracking, push advertising, traffic alerts, driving directions, child finder, and friend finder.

In a more specific embodiment, another aspect is directed to a communication network having wireless-technology equipment that includes a memory circuit for storing on behalf of an operator for the communication network, user profiles that include

wireless network subscriber data useful for providing network access to user terminals associated with the subscriber data, and also algorithms defining executable processes. A processor node is configured within the wireless-technology equipment for accessing the stored data, for assimilating current location data regarding the user terminals with the user profiles, for retrieving data from the assimilated current location data, and for selecting and executing one of the algorithms. In response thereto, the processor node produces data sets for analysis by a third party, for sending the produced data sets to a third party, and as a function of the algorithm(s), generates a set of invoice data for payment on behalf of the third party.

In another more specific embodiment, the wireless network is used as part of an anonymous bidding system that allows bidders to participate in a live auction by placing bids for items, but that does not disclose the identity of the bidding parties. Bidding participants use mobile terminals as bidding devices and they receive auction-related information such as item description, asking price, current high bid and time left, through their mobile terminals. The processor, internal to the wireless network, tracks messages for the participants using the intermediate back channel data, and processes bid requests via tokens which anonymize the participant's identity. As the mobile terminal provides an authenticable source, particularly with the related location-access point for the bid being part of intermediate back channel data, this embodiment provides an advantageous tool for controlling and auditing such bidding/auction processes.

In related embodiments, the processor node stores and retains the last known location for recall in an authorized situation such as providing a more secure authentication for accessing a communication channel. In such contexts, the processor node authenticates in real time, or stores data for later reporting, user identity by recording the user's mobile-identification information with the location-access point as part of an authorization subscriber protocol and/or another authorized procedure. As an example, such secure authentication involves a secure logon to a site via a wireless network channel where the logon requires access from a pin-pointed location, *e.g.*, in front of a video camera, at a bank or designated type of machine such as ATM or an RFID-enabled device that provides further protocols. Look-up tables (internally or externally provided) can be used to present the processor node convenient cache-like

access to the authorized location-access points on a user-profile basis, as well as convenient billing codes for generating invoicing data should the subscriber profile indicate that payment is to be provided for also operating the processor node to block/monitor/report unauthorized access attempts.

Certain protocols and/or authorized procedures are carried out based upon an entity or individual that is issuing such a mobile terminal to a particular user, such as when a parent or business owner issues a mobile terminal to a child or employee. The processor node restricts access, and provides communications limitations such as controlling (screening, blocking, recording, and/or summarizing) communications with particular endpoint devices, or involving any emails, email attachments, certain social sites, video streaming and other forms of messages, during times when the user is expected to be at specified locations or at unspecified locations other than those specified in the network's protocol-procedure documentation, or where such communications are deemed by the network's protocol-procedure documentation to be inappropriate (while school is in session, business hours, during safety training or other important events, while couriers are delivering goods, *etc.*).

According to other embodiments, back channel data is processed by a processor node internal to the wireless network as geo-based information sources accessible by third parties. With reference to the user profiles and anonymization rules stored in a memory accessible to the processor node, the processor node anonymizes the user's identity before publishing for third parties. The anonymization rules are established and paid for use thereof by third parties on a party-by-party basis in certain specific embodiments.

In other certain specific embodiments, the anonymization rules are pre-established using a set of rules that is generically usable by different third parties. In more specific embodiments thereof, the processor node uses different algorithms and queries the third parties for parameters that feed or drive the algorithms. As examples, one set of algorithms is directed to analytics pertaining to certain demographics, *e.g.*, growth of video-based messages over wireless networks by mobile terminals registered for those born after 1990 and before the year "X", and in cities having populations over "Y"; third parties would select the appropriate algorithm in such a set of related algorithms and

input the data for "X" and "Y" (along with other limited parameters such as time frames). Another set of algorithms pertains to a retail sales approach in which retailers are attempting to track trends in regions (rural and suburban areas) for smart-phone e-commerce hits through (e.g., the top few) social websites, with URLs for the social websites and zip codes or city names for the targeted regions being input parameters. As above, a third party can request that the same or other algorithms reprocess the initially-processed information.

Brief Description of the Figures

FIG. 1A depicts a block diagram of a system and various configurations optionally involving external data-processing /data-access nodes, consistent with embodiments of the present disclosure.

FIG. 1B depicts a block diagram of a system and various specialized processor-node configurations, consistent with embodiments of the present disclosure.

FIG. 2A shows a block diagram for data flow relative to certain network accesses by mobile devices, and including an expanded block diagram of a specialized processing node, consistent with embodiments of the present disclosure.

FIG. 2B shows a block diagram for a publisher API relative to certain network accesses by mobile devices, and for use with one or more of the internal or external nodes shown in the block diagrams of one or more of the above figures, also consistent with embodiments of the present disclosure.

FIG. 3 depicts an example wireless network consistent with various cellular systems and embodiments of the present disclosure.

FIG. 4 depicts an example network, including a wireless network, consistent with various cellular systems and embodiments of the present disclosure and further including

expanded example block diagrams to illustrate aspects of the user devices and processor-node circuitry useful for many of the embodiments discussed and illustrated herein.

FIG. 5 depicts an example network, including a wireless network, consistent with various cellular systems and embodiments of the present disclosure including many discussed and illustrated herein.

Detailed Description

In accordance with various example embodiments, a wireless data/communication network includes access networks in multiple geographies interconnected by a core network, where the wireless data network includes one or more specially-configured processor modules (herein referred to as processor nodes) that operate on location-based data and user profile data as this type of data is developed and/or passed along the channels of the network. While not necessarily limited thereto, aspects of the present disclosure are directed to uses of this type of data, referred to herein as back channel data.

The location-based data can be developed upon registration of the mobile terminals which occurs through the radio-access equipment, such as base stations and, in certain configurations and in addition to or in lieu of, the location of the mobile terminal is refined or provided by another device such as by the mobile terminal pushing its GPS location to the wireless network or by the above-mentioned processor node assimilating the mobile terminal's communication history (*e.g.*, last-known GPS coordinates and/or last linked-to WiFi server).

The user profile data is largely pre-stored in the wireless network based on contractual rights implemented before the user gains access the wireless network. These contractual rights specify the identity of the mobile terminal and other miscellaneous information which is useful for the user of the mobile terminal, for the operator of the wireless network as well as for certain third parties. For example, a SIM-type card can contain one or more unique serial numbers for the mobile user, security authentication and ciphering information, temporary information related to the local network such as a temporary local identification number that has been issued to the user, certain passwords and a list of the user-accessible services made available by the wireless network to the

user. This information, referred to as user-profile data, is retrieved and processed by the above-mentioned processor nodes, in channels of wireless network channels for the user to communicate.

Aspects of the present disclosure are useful in a variety of communications networks. As an example, such communications networks may include a wireless network and another local or periphery-region network, where the wireless network has such a processor node operating on back channel data and where the local or periphery-region network includes a wireless link (*e.g.*, in the last mile of the network) connecting user client devices to a radio transceiver with additional core network elements connecting the access network to the Internet backbone. The core network may employ wired or wireless technologies or a combination thereof. In a particular implementation, the access network includes a femtocell that acts as the access network's transceiver with a user's broadband connection acting as the backhaul link to the core network and the Internet backbone. In another implementation, the access network is terminated by a wireless WAN router that has one or more client devices connected to it over a wired connection (*e.g.*, 3G router) or a wireless connection (*e.g.,* 3G WiFi router). The access and core networks together can be operated by a wireless service provider that manages the network and charges users for the service.

Aspects of the present disclosure relate to use of processor nodes within the wireless network that are configured to provide specialized information, drawing from the back channel data, to the user of the mobile terminal, to the operator of the wireless network and to certain third parties which may be charged for the services relying on the special information. For example, these specialized services can be provided to an operator of the wireless network to provide location-based, user-profile based detailed analytics for performing optimizations of the data traffic in a wireless network by (re)routing in a proactive/predictive manner or reactively based on dynamics learned while users are accessing the network. As the wireless network is aware of its own capabilities for handling data flow, such as where a cache memory might be available at a periphery region of the network about to be congested by a myriad of users (*e.g.*, a breaking event drawing crowds to a region and to news-related web pages characterizing the event), communication between its specialized processor nodes can exploit this back

channel data by delivering redundantly-requested content from the cache rather than from a resource on the other side of the network. Similarly, another set of related back channel data, *e.g.,* pertaining to the number and age groups of people suddenly appearing at the event, can be processed by the processor node(s) and published as geographically-tagged information for third parties.

Turning now to the figures, Fig. 1A depicts a block diagram for a data control module within a communication system, consistent with embodiments of the present disclosure. A data flow controller 180 controls the flow of data between user devices 184 and content providers (or databases) 188a-188c. User devices 184 (also referred to as user terminals, user equipment, user devices, mobile stations, mobile devices, mobile terminals, mobile equipment) can be wirelessly connected to the data flow controller through a communications network 182 (examples of suitable networks are provided herein). Content providers can be connected to the data flow controller through a communications network 186 (*e.g.*, a wired/wireless, public/private packet-enabled network). Communication involving user devices 184 includes wireless communication via radio access network (RAN) equipment 194 which partly defines the wireless network part of the communication system.

Using the RAN equipment 194, user devices 184 can request content from a variety of sources including for example, website providers, servers, and other user devices which can be individual endpoint devices, such as smart phones which can also be content providers for another smart phone. One of more specialized processor nodes 190 (with designated memory circuits 192) are selectively incorporated into the network at one or many locations and are communicatively coupled to the access channels provided via the RAN equipment 194. From these access channels, the processor nodes 190 are programmed to look for and intercept location-based data and related user profile data for specialized operations.

In other embodiments, the processor nodes are programmed to access (receive from and/or write to) databases internal to the wireless network such as a 3G/4G cellular network. As permitted and enabled by way of other specialized resources such as those paid for by third parties, databases external to the wireless network are also available. FIG. 1A illustrates a database 196 which is depicted labeled as a "geo-tagged"

information source because, in the example, the processor node 190 has stored therein location-based back channel data regarding the locations of certain user devices. In certain example applications, the database 196 can be implemented external to the wireless network for review and processing by third parties, and can be implemented internal to the wireless network for review and processing by an operator of the wireless network.

Using the specific application where the database 196 is implemented external to the wireless network, management of the data accesses by a third party can be controlled by the same or different processor nodes processing the data to protect the user's identity and other confidential information which is at least initially present in the form of back channel data. This privacy is maintained through the use of "tokens" in place of such confidential user information, sometimes referred to as "anonymizing" certain back channel data.

FIG. 1A illustrates databases 188a-188c as providing or using a form of the back channel data. Database 188a contains certain anonymized back channel data. Database 188b contains certain back channel data that is not anonymized, *e.g.*, for applications internal to the wireless network. Database 188c contains pseudo-anonymized back channel data which is demographically enhanced to hide highly-sensitive information such as the user's identity while providing significant other information to characterize the user and/or the user's behavior insofar as such appropriate information is procured, in various ways, by the processor node(s) via the wireless network.

Related embodiments and applications involve different aspects and applications certain back channel data, as discussed in more detail herein.

As one aspect of the disclosure relates to the specialized use of back channel data for managing the flow of data in the network (or data traffic control), use of the specialized processor nodes can become integral with other network processing elements used in the wireless network. For instance, based on expectations of increased or decreased types of users in a certain region, data that is being uploaded through the network to a website or service may be blocked, expedited, delayed or throttled. Blocking traffic disrupts the user activity driving the network usage and forces the responsibility of handling the network connectivity interruption on the user or the user's

application/service. Blocking may be accomplished by terminating a request for TCP connection. Delaying traffic postpones data traffic to a future time. This may be motivated by congestion in the network at a given time or by operator defined policies. Delaying may be accomplished by blocking initial requests for communication followed by allowing the communication to proceed at a later time based on pre-defined policies or observed increase in network availability. Throttling slows down traffic in a network allowing the user to continue use of the network but at a reduced throughput. Throttling may be accomplished by delaying the transmission of TCP SYN packets in the case of a TCP/IP network effectively simulating a lower available bandwidth. Blocking, delaying and throttling may be implemented using a combination of client device and network element functionality. The client device component of the functionality may be implemented with a native client resident on the client device or an embedded client delivered as part of the data stream for execution in a browser environment. As users often become network frustrated in congested times (limited access when the user leaves work in an urban area at the end of the day or leaving a large public event in a frequented area), the user profiles can include a paid-for expedited-communication service which the specialized processor nodes can access and utilize for the user when the back channel data indicates that the user is in that region and, optionally, at such times.

Data flow controller(s) 180 of FIG. 1A can provide various location-related functions useful for controlling and providing delivery of content to user devices 184. An example of such functions is limiting access to the content based on where one or more user devices 184 are located. Access can be limited in a number of different manners including, for example, denial of content, denial of a form of content (*e.g.,* voice, email, mms or short message), and delay in providing the content, and/or throttling of the speed at which the content is provided. The selection and implementation of these functions can be effected by monitoring, for certain user devices in certain locations, a number of context parameters including, for instance, parameters that define the current state of the network. This allows for data flow controller 180 to actively respond to changing network conditions and facilitate control over and allow for fair use of bandwidth between content providers and/or for critical content or services to remain available.

The implementation of data flow controller 180 can take several forms and may involve using two or more such controllers 180. In this context, the network items 182 and 194 are merely two aspects generally characterizing a potential larger network system, perhaps with other data flow controllers distributed near the periphery of the network system, *e.g.,* near the initial connection point of user devices 184. Each data flow controller 180 can monitor and assess network loading, content overuse and similar parameters (discussed in more detail herein). This can be particularly useful for providing data flow control that is tailored toward a particular data path. For instance, content can be device specific, geographically specific, language specific or otherwise tend to be unevenly accessed between different users. Thus, one data flow controller may see a very high rate of content access whereas another data flow controller sees very low rate of content access.

In such contexts, monitoring and controlling data flow as a function of location-based data regarding user devices 184 can be advantageous. Certain implementations use one or more centralized analysis devices to provide location-based content control indicators to data flow controllers 180 for assessing and predicting content accesses across different data paths. In certain embodiments discussed in this disclosure, cache storage devices can be implemented for caching content as a function of location-based back channel data, an example of which is use of a cache for a category of communications to and from a designated group of mobile terminals heading to a large sporting event. As discussed in connection with the data flow controllers 180, the location, control and usage of the cache storage devices can be implemented largely based on predictive analysis of location-based data regarding user devices 184.

In a related example, news professionals, safety/medical personnel, government officials and certain businesses may require priority access to the wireless network in times involving special public situations where large crowds gather, whether a newsworthy event, a business convention or a potential public catastrophe. In such instances, the user profiles can include different paid-for business-levels for expediting communication services. For these services, the specialized processor nodes dynamically identify the regions of such public situations, by tracking samples of mobile terminals converging in such regions or via an external news feed, and access the business-level

user profiles when the back channel data indicates that such users are in the region at such times. The application and/or user profile may call for opening a voice channel or for permitting a real-time live data stream to be transported through the network. In a high-priority emergency application, a video stream may be required on the downlink for consumption by a number of users simultaneously, and the network may need to react by employing multicasting or other relatively rare channel routing at least for a time until the congestion in the region's radio equipment (the base stations) clears.

In some embodiments and as a function of such location-based situations, traffic management ensuing from the processor node operations may lead to and directly involve operations by other portions of the network. As examples, the downstream traffic may be converted for transport over radio broadcast/multicast technologies such as MediaFlo or DVB-H, information can be sent to designated devices using other than the requested forms, *e.g.*, using a WAP push, SMS, MMS or the like. Some of these redirections can be particularly useful for sending emergency information and less time-critical data such as targeted advertising.

Other aspects of the disclosure allow for the use of a peer-to-peer (P2P) network and a sharing scheme. In such an implementation, back channel data can be shared between user devices directly (*e.g.*, direct point-to-point connection via Bluetooth), through a local area network (LAN) or otherwise. This can be accomplished, for instance, by replacing user identity information with a token, which can range from an entirely un-informing piece of data, to a mid-level demographic (male or female) or a much more detailed demographic (gender, age, zip code, favorite hobby and music, political party, *etc.*). Third parties can use such networks to gather and exchange such "tokenized" back channel data provided from the wireless network and optionally request that the wireless network provide geo-tagged notifications when similarly tokenized users approach the regions covered by these third-party networks. For instance, two retailers in the same mall might be separately tracking purchases of certain goods and services around a holiday and discover from "tokenized" back channel data, exchanged and otherwise, important demographics to assist in further sales for the next holiday.

Fig. 1B depicts a block diagram of a system and various possible specialized processor node configurations, consistent with an embodiment of the present disclosure.

User devices, or user equipment, 152 connect to content providers, to each other, or to other data sources through a variety of data paths. Non-limiting examples of user devices include cellular phones, smart phones, personal digital assistants (PDA), handheld gaming devices, laptops, home computers, vehicle computers and other devices that connect through wireless networks. For simplicity many components within the data path have been excluded from the diagram.

One example data path involves radio access networks (RANs) 194. The user device(s) 152 could be, for example, a smart phone connecting through a cellular communication scheme, such as Global System for Mobile communications (GSM), Universal Mobile Telecommunications System (UMTS), Code Division Multiple Access (CDMA) and communications protocols as defined by the 3rd Generation Partnership Project (3GPP) or the 3rd Generation Partnership Project 2 (3GPP2), 4G Long Term Evolution (LTE) and IEEE 802.16 standards bodies. These examples, however, are not limiting and aspects of the disclosure lend themselves to any number of connection protocols and mechanisms.

Gateways 162 can be used to connect between the RAN interface and devices using another protocol, such as Internet-based protocols. For example, the gateway could translate data between the Wireless Application Protocol (WAP) protocol and the world-wide web protocols e.g., from various Internet protocols to Wireless Markup Language (WML). The data gateways can be configured to use GPRS Tunneling Protocol (GTP) to communicate with the radio access network. Other embodiments may use other communications protocols. Other conventional operations of the data gateways are known. For example, the data gateways enable users of mobile stations to roam between cells, for example, to move between different locations within the radio access network, by tracking the mobile station's identity across the network. The data gateway may also provide authentication and data formatting functions.

As shown in FIG. 1B, multiple RAN connection points (or cells) can use a common gateway. Also shown in the figure are various memory circuits 192 for storing and retrieving banks of data used by the processor nodes 190. In one embodiment, the memory circuits 192 include one or more cache storage devices 170 located at certain of the gateways 162. This allows for sharing of cache storage between multiple RANs as a

function of and directed by algorithms executed by the processor nodes 190. At the same time, there can be many gateways that are geographically (and logically) distributed around the cellular network and therefore the cache locations can be implemented with a relatively broad distribution.

Another example data path involves the use of femtocells 154. Femtocells are often implemented as a low power cellular base station that is connected to a cellular provider's network, often through a broadband connection (*e.g.*, DSL or T1) link. Femtocells can be particularly useful for providing local cellular coverage to areas that otherwise have inadequate coverage, *e.g.*, indoors.

For simplicity, many details of the data path are omitted as they can be implemented in a variety of manners. Often a gateway 162 provides an interface between user devices and another protocol, such as the Internet. This gateway 162 is a possible location for such a specialized processor node 190. The gateway 162 can be located within a cellular provider's network and thereby shared (or similar to the gateway) with RAN-based data paths from larger/traditional cellular base stations. As another possibility, the cache storage device can be situated between the gateway and the user device. For example, a processor node and storage device can be located at the femtocell base station location. This can be particularly useful for controlling data bandwidth between the femtocell and the remainder of the network as this can be limited by the capacity of the broadband data link (sometimes shared with a variety of other devices).

A third data path uses wireless network interface 158 to connect and request data. This interface can be, for example, Worldwide Interoperability for Microwave Access (WiMax), 802.11x or the like. Thus, user devices can connect using wireless hotspots or other local networks. As before, the data path may include a gateway 162 and other device 170 and/or 190. The gateway can sometimes be located at a cellular provider's location, but need not be so located. In another implementation, cache storage device 170 is located between the gateway and the user device. In this manner, such devices are located as part of and within control of the wireless network.

A user device (or mobile terminal) can sometimes be simultaneously capable of connecting to multiple data paths. For instance, a user device 152 may be in range of a wireless hotspot while also having a connection to a 3G-type data interface. The decision

on how to retrieve the necessary data can be made based upon a number of criteria, one of which can be whether or not a specialized processor node has assessed from location-based back channel data that there is available data likely residing in a memory (or cache) of a particular data path.

Other embodiments of the present disclosure relate to access-analyzing-control functions 166. These functions can be used to accurately and effectively control what and where content is to be routed and/or cached based on back-channel location information provided by the processor nodes 190.

A number of examples are useful in illustrating such methodology. As one example, network communications are routed and/or cached reactively and/or predictively, based on such back-channel location information. In a relatively simple implementation, a cache located in a region is deemed "highly-populated by mobile users interested in airline arrival times, football scores, bus schedules" by assessing the presence of an excessive volume of types (ages of users) having user devices: currently registering on in the region so as to reactively process; and having locations converging on the region so as to predictively process. In either situation, the network nodes cooperate to store data in a FIFO fashion for serving this high population of mobile users before their requests would otherwise be overtaking the network's available bandwidth (*e.g.*, as limited by the RAN equipment) by providing the same largely-redundant information across the network to the same region. If particular content is accessed multiple times before leaving the FIFO cache, it is provided from the cache and then moved back to the front of the cache.

As another example of a reactive implementation, a network data analyzer identifies content that is being accessed in high-volume and that is consuming considerable bandwidth. The data can then be cached according to the network impact of storing in a particular cache storage device. The system can thereby prioritize what data is stored according to network impact. This can be particularly useful for maintaining high priority content in the cache.

Yet another reactive implementation involves receiving region-specific indications of media content's popularity from 3rd parties, such as the content providers.

This can be implemented using an indication of the number of requested downloads within a predefined time period or using more complex parameters and algorithms.

In a predictive example, the analyzer uses data to predict future network demands for content. This can include predicting downloads related to breaking news stories or detecting access patterns that indicate that particular content is likely to increase in usage. For instance, as many video clips are accessed via a network, more users see the data and the demand increases rapidly as the users forward or otherwise send the video clip to other users. Another example relates to sporting events in which a large group of people attempt to access content at approximately the same time, such as near the end of a game. Large news events, such as natural disasters, can also result in a spike in content requests for related information.

Another aspect relates to determining how content is distributed between various storage elements. In conjunction with the assessment of a region deemed "highly populated," the processor nodes can make determinations on where to store data based upon numerous parameters. For instance, for a particular data path, the network analyzer can identify the most likely bottleneck for the data and chose to store the content accordingly. As another example, the analyzer might determine that certain content is related to another geographical region and thereby send the content to correspondingly located cache storage devices. Another example involves content that is associated with a particular type of device, *e.g.*, smart phone application for a particular type of phone. This can also provide valuable information about where the content is best stored.

Accordingly, these important decisions can be based upon any number of other parameters or factors. A few examples may include user data, device characteristics, network characteristics, environmental factors and socio-cultural factors. Examples of user data include the data service price plan a user is subscribed to (*e.g.*, premium vs. standard). Examples of device characteristics include screen size and supported audio and video codecs. Examples of network characteristics include network technology (*e.g.*, HSPA, LTE), network topology (e.g., microwave vs. metro Ethernet backhaul) and available network capacity. Examples of environmental factors include time of day, location of sender and recipient and weather conditions. Examples of socio-cultural factors include holidays, sporting event schedules, etc. One or more of the context

parameters may be combined to form a context which in turn is used to determine the management of the content in the cache storage elements. For instance, a video clip of breaking news may be automatically moved to cache storage elements nearer the edge of networks from the cloud cache or core network cache storage elements as the day breaks around the globe anticipating user requests for playback of the video clip.

Other aspects of the present disclosure allow for the use of multicasting in connection with a delay mechanism discussed herein. When a user device requests content that is highly-demanded and/or that consumes large amounts of bandwidth, access to the content can be delayed. Access by other user devices requesting the data is also delayed. As part of the delay mechanism, the user devices are presented with information for connection to a multicast session. The user devices then connect to the same multicast session and receive the content therefrom. The multicast session can be initiated for the group by presenting a synchronization time for the session to each of the user devices or can simply be periodically repeated (*e.g.*, in the case of very-highly demanded content) thereby allowing devices to connect as necessary. Synchronization/multicast information can be sent as part of the delay mechanism through a variety of suitable mechanisms.

Yet another implementation is directed to using multicasting for pushing data to large number of devices. Multicast information (*e.g.*, session initiation information) can be sent to groups of devices, e.g., using a WAP push, SMS, MMS or the like, and the devices can respond by connecting to the multicast stream/radio channel. This can be particularly useful for sending emergency information, targeted advertising or even software updates to a large group of user devices. The content can be cached and sent to groups of devices until all desired devices receive the content. This can allow for updates to be sent and received over time and to devices that may subsequently connect to the network.

Multicasting can be particularly useful for efficient use of radio signal bandwidth. For instance in a UMTS context, a group of mobile stations can be configured to listen to the packet notification channel (PNCH) on which a point to multipoint-multicast (PTM-M) notification is sent. Data can then be sent to the group of mobile stations using a shared packet data traffic channel (PDTCH). These operations can be important for many

contexts including, for example, emergency situations where specifically-equipped or configured groups of mobile stations need to monitor the situations on a priority basis. This type of multipoint-multicast mode can be initiated in response to certain of the processor nodes executing processes to track externally-reported events (from other databases and networks) and/or converging populations of user devices to predict and/or react to location-based back channel data.

Consistent with another embodiment, a user application can be installed/downloaded to a mobile station in response to a user or third-party profile accessed by the processor node. The processor node uses the profile information as a reference for identifying that the mobile station should be tracked as it approaches a favorite region, such as "home." In response, the user application can facilitate the intelligent control and delivery of content to the device by cooperation with and in response to the device location being monitored by the processor node. For instance, the application provides configuration options for accessing/downloading content. In one embodiment, the application controls delivery options based upon content type and/or content source as determined by the user. Such delivery options might include expedited delivery for rich media (recently published e-books of videos). This allows the user to specify which, if any, content is provided using aspects of the present disclosure (e.g., available caching locations or access limitations). Other aspects of the application allow a user to modify delivery settings dynamically. The user can use the application to route content delivery to e-mail, to delay delivery, to use bandwidth throttled, or to access a preferred/premium service which allows access to cache locations and similar functionality. This can be particularly useful for changing deliver options as may be desirable when a user is travelling and has limited access to other network resources (e.g., home computer access or email).

To implement such modifications, the application can modify content requests to denote user preferences (*e.g.*, by modifying routing data for access request or adding preference indications thereby instructing how a remote device should control content delivery). Alternatively, user profile data can be stored by a service provider. The application then updates the user profile data according to user preferences. Access to user profile data can also be provided via other interfaces, such as via a website.

As a particular example, the user may indicate that a first website contains content that is to be afforded a relatively low priority and for which delivery can be delayed or otherwise slowed. The user may indicate that another website is to be afforded high priority, and delivery should be prioritized. The cache/data control device(s) process access requests for each website accordingly. For billing purposes, the user may be charged a premium fee for the high priority accesses. As another example, when a mobile device requests access to content, the mobile device presents the user with content delivery options. These options can be a priority indication and/or more detailed options, such as accepting delayed delivery for a reduced price and/or paying extra for access to a cached version. Other options include transcoding options, such as indicating the acceptability of different video resolutions or coding schemes.

These and other applications can be implemented on mobile stations consistent with the present disclosure. The application includes programmed instructions that, when executed by a computer/processor, perform one or more of the methods and/or steps of the disclosure. The instructions can be programmed on a computer readable medium including non-volatile or volatile memory circuitry.

Various aspects of the present disclosure relate to particular types of data flow in response to the location-based operations performed by processor nodes 190. FIG. 2A illustrates a block diagram useful for discussing examples of such data flow relative to content access by mobile devices, consistent with embodiments of the present disclosure. The system depicted in FIG. 2A includes mobile stations 202, radio access networks 204, data gateways 206, an Internet gateway 208, and data intermediation modules 220 which are used to illustrate an example structure for providing specialized back channel operations by the processor nodes. Although the system is depicted and described with certain components and functionality, other embodiments of the system may include fewer or more components to implement less or more functionality.

For description purposes, one of the mobile stations 202 requests multimedia, or other, content and one of the data intermediation modules 220 receives the requests. The mobile stations 202 can include handheld wireless devices, such as cell phones, mobile phones, smartphones, personal digital assistants (PDA), handheld gaming devices etc, that can wirelessly communicate using radio frequency (RF) communications signals.

In certain embodiments, the radio access networks 204 facilitate radio communications between the mobile stations 202 and a core network that includes the data gateways 206, the Internet gateways 208, and the data intermediation modules 220. In an embodiment, the radio access networks include one or more base stations to facilitate communications among the mobile stations that are within a communication range of the base stations. Each base station has at least one RF transceiver and the base stations communicate with the mobile stations using RF communication signals. The radio access network facilitates network communications among multiple mobile stations within the same radio access network and between mobile stations in other radio access networks and provides interfaces to facilitate communications with other entities, such as a Public Switched Telephone Network (PSTN), a Wide Area Network (WAN), the Internet, Internet servers, hosts, etc., which are outside of the radio access network. In an embodiment, the network elements depicted in FIGs. 1A and 1B are part of a wireless network that is operated by a single wireless service provider.

Data signals communicated between the mobile stations 202 and the radio access networks 204 include, but are not limited to, analog and/or digital RF signals (*i.e.*, radio waves) for any type of communication mode, including text messaging, multimedia messaging, voice calling, and Internet browsing. The radio access network can support various different RF communications protocols, including without limitation, GSM, UMTS, CDMA, WiMax and communications protocols as defined by 3GPP, 3GPP2, or IEEE 802.16. Although some wireless communications protocols are identified herein, it should be understood that present disclosure is not limited to the cited wireless communications protocols.

The data gateways 206 configure outgoing data access requests for use with one or more networks and configure incoming data for use by or display on a mobile station 202. As shown, each data gateway interfaces directly with a radio access network 204 and a data intermediation module 220, although other embodiments may include other intermediate functional elements.

The Internet gateway 208 provides a gateway for receiving data from content providers 262 (or optionally between mobile stations 202). The content providers 262 can be Internet-connected hosts and/or servers. For example, the Internet gateway can be a

Wireless Application Protocol (WAP) gateway that converts the WAP protocol used by the radio access network to the Hypertext Transfer Protocol (HTTP) protocol used by the Internet. In an embodiment, the Internet gateway enables mobile stations to access multimedia content, such as Hyper Text Markup Language (HTML), compact HTML (cHTML), and extensible HTML (xHTML), which is stored on Internet-connected hosts and/or servers.

The disclosure is not limited to Internet communications and can be used in connection with various other networks and content sources as shown by alternative gateway/service 210. For instance, alternative gateway/service 210 can be a custom interface provided by a wireless service provider. The wireless service provider can use the custom interface to provide content to mobile devices. As an example, the content could be movies, applications, music, games or other downloadable data. The wireless service provider can store the content at one or more centralized locations and then distribute the content to cache locations as desired and discussed herein. Mobile device users can be charged for access to the content and at the same time realize an improved quality of experience due to intelligent caching and/or delivery of the content.

In a particular implementation of the disclosure, the wireless service provider can provide data content originating from other content providers. The other content providers purchase access to the caching/data control aspects of the present disclosure, thereby providing improved quality of experience for mobile users attempting to access their content.

The FCC may impose ("net neutrality") rules that would prohibit Internet service providers from slowing or blocking of information and certain applications over their networks. In this context, it should be noted that even for content that is allowed equal access to network bandwidth; however, subscribers to the intelligent data control of the instance disclosure can provide a higher quality of experience for their respective content.

With reference to FIG. 2A, in a data acquisition process, a mobile station 202 generates a data request message (e.g., HTTP, SIP, RTP) that identifies a content provider and desired content (e.g., by entering a URL or other identifier). The data intermediation modules 220 can be located between gateways 206 on one side and the Internet gateway on the other side. In particular, each data intermediation module is

functionally located in a data path that is between the respective data gateway on one side and the Internet gateway on the other side. In accordance with an embodiment of the disclosure, the data/caching module 220 manages the flow of content between content providers and mobile stations. The modules can include, or have access to, a cache storage device for storing content.

In an embodiment, the data intermediation module 220 intercepts content requests that are sent from a mobile station and processes the requests to determine how to handle the content requests. This can include determining whether the requested data is present in the cache and/or performing various other functions that help to improve the performance of the system. For example, the data intermediation module may perform any of the following functions:

1) limit access to content by a requesting mobile station;

2) cache content for delayed delivery;

3) optimize the content by transcoding thereof;

4) provide content directly from the cache without retrieving the content through the Internet gateway; and

5) forward content between data intermediation modules to preemptively populate caches with content.

In alternative embodiments, other techniques for media streaming such as HTTP-Progressive Download (PD) and HTTP adaptive bit rate streaming may be utilized. In a particular embodiment, the content is part of streaming data that is accessible within the 3GPP end-to-end PS streaming service specification. Within this specification the content is transported using Real time Transport Protocol (RTP) over User Data Protocol (UDP). Session control/setup is implemented using Real Time Streaming Protocol (RTSP). For cached data, the streaming session can be effectively intercepted by streaming from the cached location instead of the indicated URL. The cache device can identify requests for streaming sessions for cached URL locations and thereby intercept the connection. This can be accomplished in a number of manners. For instance, connection information is sent to a requesting device using a session description protocol (SDP) file. In one instance, the SDP file can be adjusted based upon the existence of cache data. The

adjustment can include changes due to transcoding and or connection information due to cache location.

In alternative embodiments, other techniques for media streaming such as HTTP-Progressive Download (PD) and HTTP adaptive bit rate streaming may be utilized. In another embodiment, the content can include content (media or otherwise) that is accessible via OMA generic content download over-the-air specification. This access can include either download with separate delivery of download descriptor and media object or download with co-delivery of descriptor and media object. The download descriptor contains information about a media object and instructions on how to download the content. The data flow control can thereby be effected by modifications to the download descriptor.

As a specific example a data network can involve multiple/disparate entities managing nodes/gateways or other content delivery elements. A content control device can initiate content delivery (streaming or otherwise) via a setup request. In a more particular embodiment, the content control device modifies the setup request as a function of the current cache state or other network parameters (such as subscriber relationship, content provider agreement or analytics applicable to network environment). In some instances, the modified request includes options for content delivery that can be acted upon by a downstream node or entity.

The data intermediation modules 220 can be particularly useful for improving the performance of live data content delivery by intelligent caching and data flow control. Caching and flow control decisions can be made based upon the status of cache storage devices at various locations. For instance, the data intermediation modules 220 can determine whether or not all or part of a particular requested content is already stored in a cache storage device near the recipient device. In this manner, the cached content can be retrieved from the data cache device and thereby not sent over the core network.

To facilitate this cache-based communication between data intermediation modules 220, a variety of messaging protocols can be used. For instance, the existence of multiple cache locations allows for content retrieval to occur between caches thereby alleviating the need to access the content provider directly. While not limiting, in one example a central cache managing server maintains a list of cached content for the

various cache storage devices. A data intermediation module 220 checks with this managing server to determine whether the entire content needs to be transmitted as a function of the status of cache storage devices. In another example implementation, the data intermediation modules 220 communicate directly with one another.

These and other various communications can be implemented over the control protocols for telephonic devices. For instance, the cache checks can be sent within the signaling system 7 (SS7) protocol, thereby facilitating transmission across a number of different network platforms including, for instance, the PSTN. Other communication protocols are also possible. An example embodiment using such communication flow is discussed more detail in regards to FIG. 3.

Additional improvements in performance can be achieved by processing the content to, for example, optimize the content and to provide value added services.

Each one of the data intermediation modules 220 (and/or associated processor nodes and storage devices) can be a standalone network element, such a distinct network node (*e.g.*, a different "box") that is connected to the network by wired and/or fiber-optic network connections using network communications protocols such as Internet Protocol and Ethernet. Alternatively, each one of the data intermediation modules 220 may be integrated with one of the other network elements. For example, a data intermediation module may be located in the same "box" as one of the data gateways 206, the Internet gateway 208, or other components. Whether the data intermediation module 220 is physically located in a distinct physical network node or in the same network node as another network element, the functionality of the data intermediation module can be similar.

Use of a data intermediation module as described herein is applicable to different kinds of radio access networks, including, for example, 3GPP, 3GPP2, IEEE 802.16, and 4G radio access networks. For instance, radio access networks as defined by the 3GPP include a NodeB, a Radio Network Controller (RNC), a Serving General Packet Radio Service (GPRS) Support Node (SGSN), and a Gateway GPRS Support Node (GGSN). These nodes are discussed briefly as an example system, but the disclosure is not limited thereto.

A NodeB is a network element that performs base station functionality. A NodeB can use various communication protocols, such as Wideband Code Division Multiple Access (WCDMA)/Time Division Synchronous Code Division Multiple Access (TD-SCDMA), to communicate with the mobile stations. In an embodiment, each NodeB includes an RF transceiver that communicates with the mobile stations that are within a service area of the NodeB. In one embodiment, the NodeBs have a minimum amount of functionality and are controlled by an RNC. In another embodiment in which High Speed Downlink Packet Access (HSDPA) is used, some logic (*e.g.*, retransmission) is handled by the NodeB to achieve shorter response times.

Each RNC is a network element that controls the connected NodeBs. In particular, the RNC is responsible for radio resource management and mobility management. The RNC is also the element that performs encryption before user data is sent to and from a mobile station. In an embodiment, radio resource management operations include outer loop power control, load control, admission control, packet scheduling, handover control, security functions, and mobility management. The Radio Network Controller may also various radio resource optimization operations.

Each SGSN is a network element that delivers packets to and from the mobile stations within a corresponding geographical service area. Functionality of the SGSN includes packet routing and transfer, mobility management (*e.g.*, attach/detach and location management), logical link management, and authentication and billing. In an embodiment, the SGSN maintains a location register that stores location information, such as the current cell of a mobile station, and user profiles, such as International Mobile Subscriber Identity (IMSI) address used in the packet data network, of all GPRS mobile stations that are registered within the corresponding geographical service area of the SGSN.

Each GGSN is a network element that provides interworking between the GPRS network and external packet switched networks, such as the Internet and X.25 networks. In particular, the GGSN hides the GPRS infrastructure from the external networks. Functionality of the GGSN includes checking to see if specific mobile stations are active in the radio access network and forwarding data packets to the SGSN that is currently supporting a mobile station. The GGSN also converts GPRS packets coming from an

SGSN into the needed packet data protocol format (*e.g.*, Internet Protocol or X.25) and forwards packets to the appropriate external network. The GGSN is also responsible for IP address management/assignment and is the default router for the mobile stations. The GGSN may also implement Authentication, Authorization, and Accounting (AAA) and billing functions.

FIG. 2A also depicts a detailed example of a data intermediation module 220 in accordance with an embodiment of the disclosure. The data intermediation module 220 includes a sender-side interface 240, a recipient-side interface 242, a Value Added Service Provider (VASP) interface 244, a billing interface 246, an AAA interface 248, a cache storage module 250, a context parameter and analytics database 252, a media processor 254 for handling 3rd party requests and reports, recommendation processor 255, a traffic manager 256, and a workflow engine 258. Without loss of generality, some of the content flow is discussed herein in terms of content received over the Internet; however, the data content could be provided via other suitable mechanisms and from other sources.

The sender-side interface 240 is an element of the data intermediation module 220 that provides an interface to the sender-side functional elements of the system and is the incoming interface for data content sent to the recipient-side mobile station. The recipient-side interface 242 is an element of the data intermediation module 220 that provides an interface to the recipient-side functional elements of the system and is the outgoing interface for data content destined for a recipient-side mobile station. In the embodiment of Fig. 2A, the recipient-side interface is functionally adjacent to the (Internet) gateway or other network components (*e.g.*, a MSF server), and the receiving data intermediation module.

The VASP interface 244 is an interface for value added service providers (*e.g.,* service providers that are distinct from the content provider or the operator of the system and wireless communications network). In an embodiment the value added service providers are third-party service providers that provide some additional service, functionality, or data to the system. In an embodiment, the VASP interface enables value added service providers to provide direct inputs to the data intermediation module related to, for example, sender parameters, recipient parameters, and optimization parameters.

The billing interface 246 of the data intermediation module provides an interface to a billing system or billing systems. In an embodiment, the billing interface enables the system to implement a billing program for data services. The billing system can also be used to bill content providers for access to the caching or for preferred content delivery features (*e.g.*, enabling of RAN-based multicasting or reduced throttling). Content providers could request that certain content be stored and easily accessible, thereby improving the user experience for the cached content. The billing program could record such requests and charge content providers as a function of the number of cache requests, the number of accesses to the content, the bandwidth used by accesses to the content and the like.

Another implementation involving a billing function is directed to a centralized controller (or a hierarchy of important data and/or multiple storage/cache locations at various points within the network) for distributing content to multiple locations based on mobile-terminal population changes in the regions of the locations. Content providers can request distribution of content for improved access based upon defined parameters. These parameters can include, for instance, geographical location, type of wireless service available (*e.g.*, 3G, WiMax), wireless service provider (*e.g.*, AT&T, Verizon) or state/country boundaries. The billing can be accomplished using a centralized model, such as based upon the number of cache locations the content is to be loaded to, and/or a decentralized model where each location tracks usage and generates billing data therefrom. In yet another embodiment, a semi-centralized model involves two or more business entities coordinating and negotiating billing models and content delivery control/caching, bandwidth and quality factors. These and other aspects can thereby be used with various other parameters and content control functions.

Another implementation relating to billing methods involves a method of controlling delivery of source data content through a communication network including a wireless-technology network and another network. The wireless-technology network is controlled by a first business entity (*e.g.*, data caching/flow control provider) and the other network being controlled by a second business entity (*e.g.*, Internet Service Provider/content provider). In response to notification that source data content is to be routed through the communication network, control data is accessed, representing data-

delivery conditions agreed to between the first and second business entities. In response to and as a function of the control data, substantially redundant representations of the source data are directed to cache memories located at nodes in the wireless-technology network. The system delivers redundant representations of the source data from the cache memories to comply with the notification while effecting an improved quality of experience or improved system bandwidth allocation in the communication network. In a specific example of such a data network involving multiple/disparate entities managing nodes/gateways or other content delivery elements, a (streaming or otherwise) setup request is modified by one of the business entities to effect delivery as a function of the current cache state or other network parameters (such as subscriber relationship, content provider agreement or analytics applicable to network environment).

The AAA interface 248 of the data intermediation module provides an interface to authentication, access control, and accounting information and services.

The cache storage module 250 of the data intermediation module 220 provides storage for content (*e.g.*, video, audio, website, messages). In an embodiment, the cache storage module enables the data intermediation module 220 to delay communication of content to other network elements when desired. Additionally, the processor nodes and associated storage modules can communicate with one another to allow for the data intermediation modules to implement an accelerated delivery mechanism by sending content directly between data intermediation modules without passing through an Internet gateway.

The context parameter database 252 of the data intermediation module provides a repository for context parameters that can be used to control content caching and/or delivery. In an embodiment, context parameters may include user data, device characteristics, network characteristics, environmental factors, and socio-cultural factors. Examples of user data include the messaging price plan a user is subscribed to (*e.g.*, premium vs. standard), the age of the user, or the billing location of the user. Examples of device characteristics include the screen size and supported audio and video codecs of a mobile station. Examples of network characteristics include network technology (*e.g.*, High Speed Packet Access (HSPA), LTE), network topology (*e.g.*, microwave vs. metro Ethernet backhaul), and available network capacity. Examples of environmental factors

include time of day, location of sender and recipient, and weather conditions. Examples of socio-cultural factors include holidays, sporting event schedules, *etc*. One or more of the context parameters may be combined to form context information that is used to determine how the data intermediation module processes content. For instance, content provided to a user having a standard rate price plan may not get priority treatment relative when the system is congested due to a wild fire raging in the area.

The media processor 254 of the data intermediation module supports the processing of content to modify one or more aspects of the multimedia (and other) content. In one embodiment, the media processor transcodes the content. For instance, video content may be modified by changing the spatial and temporal resolution, changing the encoding bit rate, and/or changing the codec and/or codec parameters. In another embodiment, audio content may be changed by changing the sampling rate, changing the number of channels, changing the encoding bit rate, and/or changing the codec and/or the codec parameters. In another embodiment, image content may be changed by changing the spatial resolution, changing the bit depth, changing the encoding bit rate, and/or changing the codec and/or the codec parameters.

In another embodiment, the media processor 254 processes the content to enhance it. For example, the media processor may insert an advertisement in audio, video, image, or textual format into the content. In another embodiment, the media processor may convert textual symbols, such as emoticons, to an equivalent image representation.

The recommendation processor 255 of the data intermediation module is configured to proactively push real-time recommendations to mobile users. Using location-based and user-profile back channel data, the recommendation processor 255 can proactively push out location-based recommendations regarding a variety of user preferences and parameters. As indicated further in connection with FIG. 2B, these might include video sources for rich-media downloads, preferred music sources and blog forums, social network friends whose mobile terminals are relatively geographically nearby, and interesting local opportunities to users on the go. As users travel, they can thereby receive reports from the recommendation processor 255 and communicate therewith on a convenient and region-specific basis. In certain systems, these region-

specific recommendations and alerts utilize region-specific data sharing and distribution via a region-specific cache, as previously discussed.

The traffic manager 256 of the data intermediation module is configured to provide traffic management in the network. In an embodiment, the traffic manager regulates the flow of content traffic between the functional elements of the system. For example, when a mobile station requests content from a content provider, the traffic manager regulates the data transfer rate by delaying or throttling back the transmission of the content. In an embodiment, the traffic manager delays the transfer of content by terminating the Transmission Control Protocol (TCP) connection when a mobile station initiates the transfer process. In an embodiment, the traffic manager throttles back the transfer of content by delaying the sending of TCP SYN packets from the data intermediation module to the mobile station while the content is being transferred. Other types of traffic management can be implemented by the traffic manager.

The workflow engine 258 of the data intermediation module is configured to process the content and, in response to the processing, to determine where/whether to cache the content based on the aforementioned discussion. In an embodiment, the workflow engine determines where/whether the content currently resides relative to one or more cache locations. This determination can be used to decide how best to retrieve the content, such as whether to access the content provider through the Internet gateway or from another data intermediation module.

In one implementation, the workflow engine can access resources from any of the traffic manager, the VASP interface, the billing interface, the AAA interface, the cache storage module, the context parameter database, and the media processor in order to help make routing/caching/control decisions and any of the criteria described above with respect to the traffic manager, the VASP interface, the billing interface, the AAA interface, cache storage module, the context parameter database, and the media processor can be considered by the workflow engine. Additionally, the workflow engine may dictate how content is processed within the data intermediation node. For example, the workflow engine may specify a particular type of transcoding for the content based on the capabilities of the intended recipient-mobile station.

In a particular embodiment, a billing node may be located between the GGSN and the data intermediation module.

FIG. 3 depicts an example wireless network consistent with various cellular systems and an embodiment of the present disclosure. Data paths are indicated by solid connection lines and control paths are indicated by broken lines. As discussed herein, embodiments of the present disclosure allow for location-based cache control to be implemented using existing control paths. If desired, the control data can be sent consistent with the SS7 and related control protocols. This allows for additional flexibility including backward compatibility across disparate systems. Moreover, since the existence of stored data may eliminate and/or reduce the necessity for an end-to-end data path between source and destination devices, the use of the control protocols can be particularly useful in determining this necessity before setting up data path(s).

For instance, connection to content might be established using HTTP or session-initiation-protocol (SIP). An intervening control server/device can check the status of various storage devices relative to the desired content indicated by the connection request for a given population of mobile terminals in a particular location. If the desired content is indeed readily available and/or cached, the intervening control can intercept the connection request and establish a link with the storage device instead of the destination indicated by the requesting user/mobile device.

In various embodiments of the present disclosure, the storage devices operate to maintain synchronicity with content providers. In particular, content providers may change the content and thereby render the versions of the content out-of-date. The synchronicity can be maintained in a number of different manners. One mechanism involves periodically, or in response to user device requests, checking the version/status of the content at the content provider. If the content has changed, the version stored in the storage devices can be updated. Another mechanism is to allow for content providers to push new updates directly to the storage devices. This allows content providers to have more control over the content delivery, but may require more interaction with the content providers, *e.g.,* establishment of preexisting protocols and other agreements.

Consistent with embodiments of the present disclosure, various processes (algorithms) can be implemented in connection with location-based back channel data

features. According to one such process, a control processor(s) is configured to access a database of context parameters. The particular parameters and their respective weight in the analysis can be selected according to a number of criteria. According to one such criterion, a lookup table of desired context parameters is indexed according to the content type. The content type can include such characterizations as media type (*e.g.*, video, audio or text), content source, real-time requirements (*e.g.*, streaming/live data) and/or data size. The lookup table then provides a list of context parameters along with instructions on how to use the context parameters. The control processor uses these parameters to determine whether, to which types of mobile devices, and/or where to send messages, recommendations and/or content. The control processor, using the user profile of prospective recipients of such data, can also determine whether or not to limit access thereto based on user preferences and the location-based back channel data.

In a particular implementation, the control processor node assesses the propriety of proceeding with such user-directed communications by first rating the message or content and then comparing the content rating to previously stored content as indicated in a user profile. If the new/current content has a higher rating, then the control processor instructs the relevant nodes for delivery of the content and/or its storage for later access.

The above-mentioned processes (algorithms) show the diversity and wide ranging application of embodiments of the present disclosures and therefore are not meant to be limiting. Variations of the above-discussed embodiments, for example, are based on combinations of the disclosed aspects as set forth above and/or in the claims that follow. Variations of the embodiments may be employed for wireless communication networks based on 3G (e.g. CDMA, UMTS, HSPA, HSPA+) or 4G (e.g. WiMax, LTE, LTE-Advanced) standards.

FIG. 4 depicts an example network, including a wireless network, consistent with various cellular systems and embodiments of the present disclosure and further including expanded example block diagrams of relevant hardware-software circuits of both a user device and processor-node circuitry applicable to many of the embodiments discussed and illustrated herein. The mobile or user device 184 includes an Adaptive Autonomous Location Push (AALP) mobile agent 410 to interface with an AALP adapter provided in the mobile positioning center (MPC – internal to the wireless communications network

182 and RAN 194. The mobile or user device 184 also includes other hardware-software circuits such as client application program interfaces (APIs) 420, a Secure User Plane for Location (SUPL) interface 422, and a GPS interface 426. Such applications are further described in US Patent Application Publication No. 2007/0026871, assigned to the instant assignee.

The mobile device 184 further includes specialized-privileged application program interfaces 424 and 428 which are configured to permit the mobile device 184 to implement a variety of network-specific and network-cooperative location-based operations. For instance, the specialized-privileged application program interface 428 provides feature control for the mobile device, in response to a communication from the wireless-technology equipment that a user-alert indicator should be changed in the mobile terminal when the mobile terminal is in a geographic region. The user-alert indicator can change between modes of an audible alert and a vibrating alert, *e.g.*, when the region designates a worship service, quiet hours such as during classroom time.

As another example, the specialized-privileged application program interface 424 can provide the wireless communication network 182 user-profile updates such as personal travel calendar information useful for assisting in preparing location-specific processors and (cache) memory devices within the wireless communication network 182 in advance of the anticipated travel.

The processor node 190 and its related memory device 192 is also expanded, thereby illustrating the intermediation interface for acquiring and processing the location-based back channel data. The intermediation interface has a front end processor 450 which acts as a gateway for accessing selected user profiles as a function of receipt of regional region-relevant alerts of user devices from the RAN equipment 194. The intermediation interface has a BCD (back channel data) processor 452 which performs the translations and matching between the back channel data received from the front end processor 450 and other stored data. For sets of programmed operations that specialize the processor nodes to provide certain features (benefitting the mobile users, the wireless network and/or third parties), the BCD processor 452 carries out immediate local access and (cache-like) processing of the relevant user profiles in processor module 454, third party profiles and related instructions in processor module 456 and network-specific

BCD-related operating and access rules in processor module 458. Another processor module 460 is generally configured for other functionality such as that discussed above in connection with the lower portion of block 220 of FIG. 2A.

FIG. 5 depicts an example network, including a wireless network, consistent with various cellular systems and embodiments of the present disclosure including many discussed herein involving third party requests and BCD-related accesses. An example application involves a communication network with a wireless network 182 that provides access to back channel data to nodes 510 managed by third parties. A processor node 190 in the wireless network uses and processes location-based mobile-terminal data as geographically-tagged information sources for review and possibly further processing and analysis by the third parties. Processor 514, acting as an agent of the network 182, anonymizes the sensitive BCD data before publishing these geographically-tagged information sources. In some configurations, the processor node 190 receives from third parties' requests and feedback via processor interface, and/or input from other resources such as a server over the Web 520 and privately-held databases 522 which might include adaptively re-processed versions of the data previously provided to the third parties. Database 522 and results analysis processor 530, feed and/or are controlled by a third party, are depicted as receiving instructions and rules from third parties for demographically refining work product received from the processor node 190 with at least one iteration for refining the work product such as by including additional parameters latently obtained regarding the set of demographic information. In some configurations, the processor 514 receives such refined work product from the third party node 510 and reverses the "tokenization" of the sensitive user data; in this manner the processor node 190 is able to re-process in the ensuing iterative steps with more complete information than would otherwise be accessible to the third party. A BCD combiner 540 is a processor node adapted to reconstruct useable data for the processor node 190 based on the (the reverse "tokenization" of the sensitive user data) output from the processor 514 and the refined rules and/or parameters received from the third party node 510.

This methodology can be extremely useful in a variety of situations including, for example, use of the processor node as an independent auditor for a transaction between two parties (bidding auction, business-business dispute settlement, *etc.*). In one such

independent auditing transaction, the processor node 190 acts on behalf of a government entity to monitor suspicious communication activity with reports being issued to a judge in respect of the privacy rights of those being monitored. An example of such suspicious communication activity might entail the government entity providing demographic user-based and location-based rules for monitoring calls where certain terms are used (see related processing in blocks 220 of FIG. 2A and 190 of FIG. 4). Sensitive user data provided by way of the back channel data can be encrypted and delivered in various forms with a key provided to (or accessible by) the judge for decrypting before analyzing the data (*e.g.*, in deciding whether to issue a subpoena for desensitizing the data), or by another entity for reprocessing and further monitoring within the network.

As a function of subscriber-based agreements or other authorized protocols (examples being provided herein), a memory circuit stores the above-discussed user profiles (including subscriber data such as identity, age, and other particulars and demographics) on behalf of an operator for the wireless communication network for access to the network. On behalf of a third party, the memory circuit also stores communication rules relevant to a geographic region of service provided by the communication network. The processor node is configured within the wireless-technology equipment for assimilating back channel data, such as current location data regarding the user terminals and with the user profiles, for generating assimilated current location-based and user-characterizing data. The generated data is provided to another processor node (such as at a third party). In one configuration, in response thereto, a modified set of data and a set of rules are received from the third party for generating another set of assimilated current location-based and user-characterizing data.

Various embodiments described above, in the claims that follow, in the figures and related discussion may be implemented alone, in one or more combinations with other aspects and/or in other manners. One or more of the elements depicted in the figures can also be implemented in a more separated or integrated manner, or removed, as is useful in accordance with particular applications. It is also within the spirit and scope to implement a program or code that can be stored in a machine-readable medium to permit a computer to perform one or more aspects of the approaches described above, such as those involving the storage and retrieval of data. In view of the description

herein, those skilled in the art will recognize that many changes may be made thereto without departing from the spirit and scope of the present disclosure.

What is claimed is:

1. For use in connection with a communication network having wireless-technology equipment, a system comprising:

a memory circuit that stores on behalf of an operator of the communication network, user profiles that include wireless network subscriber data useful for providing network access to user terminals associated with the subscriber data; and

a processor node configured within the wireless-technology equipment for assimilating current location data regarding locations of the user terminals with the user profiles, and using the assimilated current location data for generating reports outside of the communication network and in a manner consistent with authorization data for the user profiles.

2. The invention set forth in claim 1, wherein the user profiles are established based on an underlying network-service agreement having terms that include limitations on use of the subscriber data, and the processor node is further configured within the wireless-technology equipment for providing aspects of the assimilated current location data for use beyond the limitations on use.

3. The invention set forth in claim 2, wherein providing aspects of the assimilated current location data for use beyond the limitations on use includes anonymizing subscriber-identification data.

4. The invention set forth in claim 3, wherein anonymizing subscriber-identification data includes at least one of: removing the subscriber-identification data altogether; coding the subscriber-identification data to characterize demographics of the associated user profile; and encrypting the subscriber-identification data; and further including the step of providing the anonymized subscriber-identification data to a third-party entity based on a third-party processing profile.

5. The invention set forth in claim 2, wherein the processor node is further configured for processing the aspects of the assimilated current location data within the network, for a use related to a third-party processing profile.

6. The invention set forth in claim 5, wherein the processor node is further configured for anonymizing subscriber-identification data and providing the anonymized subscriber-identification data, along with the processed aspects of the assimilated current location data, to a third-party entity according to a processing profile.

7. The invention set forth in claim 1, further including a plurality of location-based processor nodes at various geographic regions with the network, each processor node configured within the wireless-technology equipment for assimilating current location data regarding the location of the user terminals with the user profiles, and processing the assimilated current location data from the plurality of location-based processor nodes for use related to a third-party processing profile.

8. The invention set forth in claim 1, wherein the processor node is further configured for analyzing the assimilated current location data for a user terminal and providing revised current location data for the user terminal in a situation that includes at least one of: the user terminal being inactive to the network; and anticipation of the user terminal being involved in a handoff within or outside the network.

9. The invention set forth in claim 1, wherein the assimilated current location data is based partly on location-coordinates received from the user terminal.

10. The invention set forth in claim 1, wherein the assimilated current location data is independent of any location-coordinates received from the user terminal.

11. For use in connection with a communication network having wireless-technology equipment, a method comprising:

in a memory circuit, storing on behalf of an operator of the communication network, user profiles that include wireless network subscriber data useful for providing network access to user terminals associated with the subscriber data;

using a processor node configured within the wireless-technology equipment, assimilating current location data regarding locations of the user terminals with the user profiles; and

using the assimilated current location data for generating reports outside of the communication network and in a manner consistent with authorization data for the user profiles.

12. The invention set forth in claim 1, wherein the user profiles are established based on an underlying network-service agreement having terms that include limitations on use of the subscriber data, and the processor node is further configured within the wireless-technology equipment for providing aspects of the assimilated current location data for use beyond the limitations on use.

13. The invention set forth in claim 12, wherein providing aspects of the assimilated current location data for use beyond the limitations on use includes anonymizing subscriber-identification data.

14. The invention set forth in claim 13, wherein anonymizing subscriber-identification data includes at least one of: removing the subscriber-identification data altogether; coding the subscriber-identification data to characterize demographics of the associated user profile; and encrypting the subscriber-identification data; and further including the step of providing the anonymized subscriber-identification data to a third-party entity based on a third-party processing profile.

15. The invention set forth in claim 12, wherein the processor node is further configured for processing the aspects of the assimilated current location data within the network, for a use related to a third-party processing profile.

16. The invention set forth in claim 15, wherein the processor node is further configured for anonymizing subscriber-identification data and providing the anonymized subscriber-identification data, along with the processed aspects of the assimilated current location data, to a third-party entity according to a processing profile.

17. The invention set forth in claim 11, further including using a plurality of location-based processor nodes at various geographic regions with the network, wherein each processor node is configured within the wireless-technology equipment for assimilating current location data regarding the location of the user terminals with the user profiles, and processing the assimilated current location data from the plurality of location-based processor nodes for use related to a third-party processing profile.

18. The invention set forth in claim 11, further including using the processor node for analyzing the assimilated current location data for a user terminal and providing revised current location data for the user terminal in a situation that includes at least one of: the user terminal being inactive to the network; and anticipation of the user terminal being involved in a handoff within or outside the network.

19. The invention set forth in claim 11, wherein the assimilated current location data is based partly on location-coordinates received from the user terminal.

20. The invention set forth in claim 11, wherein the assimilated current location data is independent of any location-coordinates received from the user terminal.

21. For use in connection with a communication network having a local-area service network and having a wireless network including wireless-technology equipment that provides access through subscriber-based agreements, a method comprising:

providing a memory circuit that stores on behalf of an operator of the communication network, user profiles that include wireless network subscriber data useful for providing network access to user terminals associated with the subscriber data, and terms pursuant to a third-party agreement involving an entity outside the network;

using a processor node configured within the wireless network, assimilating current location data regarding the location of the user terminals with the user profiles, the current location data including a location within a region for which the local-area service network provides access between the user terminals and the communication network; and

facilitating communication involving the user terminals in the communication network by using the assimilated current location data according to a process that is based on a parameter specific to the region and the third-party agreement.

22. The invention set forth in claim 21, wherein the local-area service network provides local communication access to the network using a Wi-Fi scheme.

23. The invention set forth in claim 21, wherein the local-area service network provides local communication access to the network using a WiMAX scheme.

24. The invention set forth in claim 21, wherein facilitating communication further involves providing communications between the local-area service network and a mobile terminal based on a prediction that the mobile terminal will be in region of the local-area service network.

25. The invention set forth in claim 21, further including tracking a mobile terminal, based on the current location data, relative to a region of the local-area service network.

26. The invention set forth in claim 21, further including tracking a mobile terminal, based on the current location data, relative to a region of the local-area service network, wherein facilitating communication further involves providing communications between the local-area service network and a mobile terminal based on the processor node

providing a prediction, based on data processed by tracking the mobile terminal, that the mobile terminal will be in region of the local-area service network.

27. The invention set forth in claim 21, wherein facilitating communication further involves using the assimilated data to predict that the mobile terminals will be in the region, and providing data designated for the mobile terminals from the wireless network to the local-area service network in advance of the mobile terminals being within the region.

28. The invention set forth in claim 21, wherein the parameter specific to the region is based on demographics.

29. The invention set forth in claim 21, wherein the terms pursuant to the third-party agreement relate to advertisements.

30. The invention set forth in claim 21, wherein the communication network includes another local-area service network that provides service for another region, and further including facilitating communication between the mobile terminals and the other local-area service network by using the assimilated data to predict that the mobile terminals will be in one of the regions, and providing data to one of the regions to facilitate communication between the local-area service networks for communication of data designated for the mobile terminals, the data designated for the mobile terminals being gated through each of the local-area service networks in advance of being received by the mobile terminals.

31. For use in connection with a communication network having a local-area service network and having a wireless network including wireless-technology equipment that provides access through subscriber-based agreements, a circuit comprising:

a memory circuit that stores on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing

network access to user terminals associated with the subscriber data, and terms pursuant to a third-party agreement involving an entity outside the network;

a processor node configured within the wireless network for assimilating current location data regarding the location of the user terminals with the user profiles, the current location data including a location within a region for which the local-area service network provides access between the user terminals and the communication network; and

another processor node configured for facilitating communication involving the user terminals in the communication network by using the assimilated current location data according to a process that is based on a parameter specific to the region and the third-party agreement.

32. The invention set forth in claim 31, wherein the local-area service network provides local communication access to the network using a Wi-Fi scheme.

33. The invention set forth in claim 31, wherein the local-area service network provides local communication access to the network using a WiMAX scheme.

34. The invention set forth in claim 31, wherein facilitating communication further involves providing communications between the local-area service network and a mobile terminal based on a prediction that the mobile terminal will be in region of the local-area service network.

35. The invention set forth in claim 31, wherein at least one of the processor nodes is further configured for tracking a mobile terminal, based on the current location data, relative to a region of the local-area service network.

36. The invention set forth in claim 31, wherein at least one of the processor nodes is further tracking a mobile terminal, based on the current location data, relative to a region of the local-area service network, wherein facilitating communication further involves providing communications between the local-area service network and a mobile terminal based on the processor node providing a prediction, based on data processed by tracking

the mobile terminal, that the mobile terminal will be in region of the local-area service network.

37. The invention set forth in claim 31, wherein at least one of the processor nodes is configured for facilitating communication further involves using the assimilated data to predict that the mobile terminals will be in the region, and providing data designated for the mobile terminals from the wireless network to the local-area service network in advance of the mobile terminals being within the region.

38. The invention set forth in claim 31, wherein the parameter specific to the region is based on demographics.

39. The invention set forth in claim 31, wherein the terms pursuant to the third-party agreement relate to advertisements.

40. The invention set forth in claim 31, wherein the communication network includes another local-area service network that provides service for another region, and wherein at least one of the processor nodes is further configured for facilitating communication between the mobile terminals and the other local-area service network by using the assimilated data to predict that the mobile terminals will be in one of the regions, and providing data to one of the regions to facilitate communication between the local-area service networks for communication of data designated for the mobile terminals, the data designated for the mobile terminals being gated through each of the local-area service networks in advance of being received by the mobile terminals.

41. The invention set forth in claim 31, wherein the network includes a 4G system.

42. For use in connection with a communication network having wireless-technology equipment, a system comprising:

a memory circuit that stores

on behalf of an operator of the communication network, user profiles that include wireless network subscriber data useful for providing network access to user terminals associated with the subscriber data,

on behalf of a third party, communication rules relevant to a geographic region of service provided by the communication network; and

a processor node configured within the wireless-technology equipment for assimilating current location data regarding the user terminals with the user profiles, and using the assimilated current location data to facilitate communication for the mobile terminals, via the communication rules relevant to the geographic region, over the communication network.

43. The invention set forth in claim 42, wherein the communication rules indicate terms for prioritizing the communication of data for the mobile terminals based on the assimilated current location data indicating a common venue for the mobile terminals relative to the geographic region of service.

44. The invention set forth in claim 42, wherein the communication rules indicate terms for prioritizing the communication of data for the mobile terminals based on at least one of the following: time of day, day of the week, specific calendar date, user-profile identity data; user-profile data indicating subscription-paid feature; and a type or length of data involving in the communication with a user terminal.

45. The invention set forth in claim 44, wherein the communication rules indicate terms for prioritizing the communication of data for a set of plural ones of the mobile terminals based on a time-related parameter, or user-profile data.

46. The invention set forth in claim 42, wherein the communication rules indicate terms for limiting or blocking the communication of data for the mobile terminals based on the assimilated current location data indicating a common venue for the mobile terminals relative to the geographic region of service.

47. The invention set forth in claim 45, wherein the communication rules indicate terms for at least limiting the communication of data for a set of plural ones of the mobile terminals also based on a time-related parameter, or user-profile data, and authorization data provided by a third party.

48. The invention set forth in claim 42, wherein the memory circuit stores data reflecting that the third party operates a network in at least a portion of the geographic region of service.

49. The invention set forth in claim 42, wherein the memory circuit stores data reflecting that the third party operates another node for accessing the network in the geographic region of service.

50. The invention set forth in claim 42, wherein the memory circuit stores data reflecting that the third party has an established relationship with the mobile terminals when operating in the geographic region of service.

51. The invention set forth in claim 50, wherein the communication rules are used to prompt a communication to the mobile terminals, when operating in the geographic region of service, to indicate that the mobile terminals are to implement an application that alters their communication with the network in a manner consistent with the communication rules.

52. For use in connection with a communication network having wireless-technology equipment, a method comprising:

in a memory circuit, storing

on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to user terminals associated with the subscriber data,

on behalf of a third party, communication rules relevant to a geographic region of service provided by the communication network; and

using a processor configured within the wireless-technology equipment, assimilating current location data regarding the user terminals with the user profiles, and using the assimilated current location data to facilitate communication for the mobile terminals, via the communication rules relevant to the geographic region, over the communication network.

53. The invention set forth in claim 52, wherein the communication rules indicate terms for prioritizing the communication of data for the mobile terminals based on the assimilated current location data indicating a common venue for the mobile terminals relative to the geographic region of service.

54. The invention set forth in claim 52, wherein the communication rules indicate terms for prioritizing the communication of data for the mobile terminals based on at least one of the following: time of day, day of the week, specific calendar date, user-profile identity data; user-profile data indicating subscription-paid feature; and a type or length of data involving in the communication with a user terminal.

55. The invention set forth in claim 54, wherein the communication rules indicate terms for prioritizing the communication of data for a set of plural ones of the mobile terminals based on a time-related parameter, or user-profile data.

56. The invention set forth in claim 52, wherein the communication rules indicate terms for limiting or blocking the communication of data for the mobile terminals based on the assimilated current location data indicating a common venue for the mobile terminals relative to the geographic region of service.

57. The invention set forth in claim 55, wherein the communication rules indicate terms for at least limiting the communication of data for a set of plural ones of the mobile terminals also based on a time-related parameter, or user-profile data, and authorization data provided by a third party.

58. The invention set forth in claim 52, wherein the memory circuit stores data reflecting that the third party operates a network in at least a portion of the geographic region of service.

59. The invention set forth in claim 52, wherein the memory circuit stores data reflecting that the third party operates another node for accessing the network in the geographic region of service.

60. The invention set forth in claim 52, wherein the memory circuit stores data reflecting that the third party has an established relationship with the mobile terminals when operating in the geographic region of service.

61. The invention set forth in claim 60, wherein the communication rules are used to prompt a communication to the mobile terminals, when operating in the geographic region of service, to indicate that the mobile terminals are to implement an application that alters their communication with the network in a manner consistent with the communication rules.

62. For use in connection with a communication network having wireless-technology equipment, a system comprising:

a memory circuit that stores

on behalf of an operator for the communication network, user identity information relating to wireless network subscriber data useful for providing network access,

on behalf of a third party, an executable set of communication/operating rules relevant to a geographic region of service provided by the communication network; and

a mobile-terminal processor node configured, in response to a communication from the wireless-technology equipment regarding the current location data for the mobile terminal being appropriate relative to the geographic region of service, to alter

normal rights, communication, and operation for the mobile terminal while the mobile terminal is in the geographic region.

63. The invention set forth in claim 62, wherein the mobile-terminal processor node is further configured, in response to the communication from the wireless-technology equipment to change a user-alert indicator in the mobile terminal when the mobile terminal is in the geographic region.

64. The invention set forth in claim 63, wherein the user-alert indicator is changed between modes of an audible alert and a vibrating alert.

65. The invention set forth in claim 62, wherein the mobile-terminal processor node is further configured, in response to the communication from the wireless-technology equipment to block certain forms of communication to the mobile terminal when the mobile terminal is in the geographic region.

66. The invention set forth in claim 62, wherein the mobile-terminal processor node is further configured, in response to the communication from the wireless-technology equipment to block certain forms of communication from the mobile terminal when the mobile terminal is in the geographic region.

67. The invention set forth in claim 62, wherein the mobile-terminal processor node is further configured to store and operate an application program interface only in response to an activation uniquely defined by the communication from the wireless-technology equipment.

68. The invention set forth in claim 62, wherein the mobile-terminal processor node is further configured, in response to the communication from the wireless-technology equipment, to change to a different mode for communicating over the wireless network.

69. The invention set forth in claim 68, wherein the different mode for communicating is operative only when the mobile terminal is in the geographic region.

70. The invention set forth in claim 62, wherein the mobile-terminal processor node is further configured, in response to the communication from the wireless-technology equipment, to temporarily disable its ability to communicate over the wireless network.

71. The invention set forth in claim 62, wherein the mobile-terminal processor node is further configured to respond to the communication from the wireless-technology equipment by accessing a different network for further communications when the mobile terminal is in the geographic region.

72. For use in connection with a communication network having wireless-technology equipment, a method comprising:

in a memory circuit, storing

on behalf of an operator for the communication network, user identity information relating to wireless network subscriber data useful for providing network access,

on behalf of a third party, an executable set of communication/operating rules relevant to a geographic region of service provided by the communication network; and

using a mobile-terminal processor node acting, in response to a communication from the wireless-technology equipment regarding the current location data for the mobile terminal being appropriate relative to the geographic region of service, altering normal rights, communication, and operation for the mobile terminal while the mobile terminal is in the geographic region.

73. The invention set forth in claim 72, wherein the mobile-terminal processor node acts, in response to the communication from the wireless-technology equipment to change a user-alert indicator in the mobile terminal when the mobile terminal is in the geographic region.

74. The invention set forth in claim 73, wherein the user-alert indicator is changed between modes of an audible alert and a vibrating alert.

75. The invention set forth in claim 72, wherein the mobile-terminal processor node acts, in response to the communication from the wireless-technology equipment to block certain forms of communication to the mobile terminal when the mobile terminal is in the geographic region.

76. The invention set forth in claim 72, wherein the mobile-terminal processor node acts, in response to the communication from the wireless-technology equipment to block certain forms of communication from the mobile terminal when the mobile terminal is in the geographic region.

77. The invention set forth in claim 72, wherein the mobile-terminal processor node stores and operates an application program interface only in response to an activation uniquely defined by the communication from the wireless-technology equipment.

78. The invention set forth in claim 72, wherein the mobile-terminal processor node acts, in response to the communication from the wireless-technology equipment, to change to a different mode for communicating over the wireless network.

79. The invention set forth in claim 78, wherein the different mode for communicating is operative only when the mobile terminal is in the geographic region.

80. The invention set forth in claim 72, wherein the mobile-terminal processor node acts, in response to the communication from the wireless-technology equipment, to temporarily disable its ability to communicate over the wireless network.

81. The invention set forth in claim 72, wherein the mobile-terminal processor node responds to the communication from the wireless-technology equipment by accessing a

different network for further communications when the mobile terminal is in the geographic region.

82. For use in connection with a communication network having wireless-technology equipment, a system, comprising:

a memory circuit that stores

on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data,

on behalf of a third party, communication authorization rules relevant to a limited set of conditions including a geographic region of service provided by the communication network, and including data in at least one of the user profiles;

a first processor node configured within the wireless-technology equipment for assimilating current location data regarding the mobile terminals with the user profiles, and using the assimilated current location data to monitor and/or control communication for the mobile terminals, via the communication rules relevant to the geographic region, over the communication network; and

a second processor node configured within the wireless-technology equipment for implementing the communication authorization rules in response to the first processor node assimilating the current location data and to the limited set of conditions being satisfied.

83. The invention set forth in claim 82, wherein the system is configured for monitoring communications over the network, and storing and reviewing communications over the network for text searches or biometric-based searches such as based on voice or facial image.

84. The invention set forth in claim 82, wherein one of the processor nodes is further configured to implement algorithms to search for suspicious communications.

85. The invention set forth in claim 82, wherein the processor node is configured to implement an algorithm to search for suspicious communications and reporting/storing/ flagging suspicious communications for review by an external entity.

86. The invention set forth in claim 85, wherein the processor node is configured to encrypt user profile data pertaining to the suspicious communications for reporting to the external entity.

87. The invention set forth in claim 85, wherein the processor node is configured to encrypt user profile data pertaining to the suspicious communications for reporting to an external party for decrypted review of the encrypted user profile data.

88. The invention set forth in claim 82, wherein the second processor node is configured to search databases (internal or external) and uses data therefrom for reporting suspicious communications.

89. The invention set forth in claim 82, wherein the first processor node and the second processor node are co-located, each with access to common databases.

90. The invention set forth in claim 82, wherein the communication authorization rules are defined by a government entity and include rules for searching for specific types of mobile terminals.

91. The invention set forth in claim 82, wherein the communication authorization rules are defined by a government entity, include rules for searching for specific types of mobile terminals, and the rules change automatically in response to a change in a threat alert from Homeland Security Advisory System.

92. For use in connection with a communication network having wireless-technology equipment, a method, comprising:

in a memory circuit, storing

on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data,

on behalf of a third party, communication authorization rules relevant to a limited set of conditions including a geographic region of service provided by the communication network, and including data in at least one of the user profiles;

using a first processor node configured within the wireless-technology equipment, assimilating current location data regarding the mobile terminals with the user profiles, and using the assimilated current location data to monitor and/or control communication for the mobile terminals, via the communication rules relevant to the geographic region, over the communication network; and

using a second processor node configured within the wireless-technology equipment, implementing the communication authorization rules in response to the first processor node assimilating the current location data and to the limited set of conditions being satisfied.

93. The invention set forth in claim 92, further including monitoring communications over the network, and storing and reviewing communications over the network for text searches or biometric-based searches such as based on voice or facial image.

94. The invention set forth in claim 92, further including using one of the processor nodes to implement algorithms to search for suspicious communications.

95. The invention set forth in claim 92, further including using the processor node to implement an algorithm to search for suspicious communications and reporting/storing/flagging suspicious communications for review by an external entity.

96. The invention set forth in claim 95, wherein the processor node encrypts user profile data pertaining to the suspicious communications for reporting to the external entity.

97. The invention set forth in claim 95, wherein the processor node encrypts user profile data pertaining to the suspicious communications for reporting to an external party for decrypted review of the encrypted user profile data.

98. The invention set forth in claim 92, wherein the second processor node searches databases (internal or external) and uses data therefrom for reporting suspicious communications.

99. The invention set forth in claim 92, wherein the first processor node and the second processor node are co-located, each with access to common databases.

100. The invention set forth in claim 92, wherein the communication authorization rules are defined by a government entity and include rules for searching for specific types of mobile terminals.

101. The invention set forth in claim 92, wherein the communication authorization rules are defined by a government entity, include rules for searching for specific types of mobile terminals, and the rules change automatically in response to a change in a threat alert from Homeland Security Advisory System.

102. For use in connection with a communication network having wireless-technology equipment, a system comprising:

a memory circuit that stores

on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data,

on behalf of a third party, communication rules relevant to geographic regions of service provided by the communication network and relevant to designated telephony terminals called by the mobile terminals; and

a processor node configured within the wireless-technology equipment for assimilating current location data regarding locations of the mobile terminals with the

user profiles, and using the assimilated current location data and the communication rules to control access or effect communication with the designated telephony terminals through the communication network.

103. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes using geographic information to reroute calls from certain mobile terminals to certain designated telephony terminals

104. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes using geographic information to prioritize calls from certain mobile terminals to certain designated telephony terminals

105. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes assessing whether network communications from the user terminals are to be communicatively linked with the designated telephony terminals

106. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes limiting access through the communication network

107. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes providing an indication to the third party useful for the third party to indicate whether or how to effect communication with the designated telephony terminals through the communication network.

108. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes providing a location-based indication to the designated telephony terminal, wherein the location-based indication is used as part of communication rule set.

109. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes providing a location-based indication to the designated telephony terminal, wherein the location-based indication is displayed for viewing at the designated telephony terminal.

110. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes providing a location-based indication to the designated telephony terminal, wherein the location-based indication is used to route the call to another terminal as indicated by a response from the designated telephony terminal.

111. The invention set forth in claim 102, wherein using the assimilated current location data and the communication rules includes providing a location-based indication to the designated telephony terminal, wherein the location-based indication is used to route the call to another terminal as indicated by a response from the third party.

112. For use in connection with a communication network having wireless-technology equipment, a method comprising:

in a memory circuit, storing

on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data,

on behalf of a third party, communication rules relevant to geographic regions of service provided by the communication network and relevant to designated telephony terminals called by the mobile terminals; and

using a processor node configured within the wireless-technology equipment, assimilating current location data regarding locations of the mobile terminals with the user profiles, and using the assimilated current location data and the communication rules to control access or effect communication with the designated telephony terminals through the communication network.

113. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes using geographic information to reroute calls from certain mobile terminals to certain designated telephony terminals

114. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes using geographic information to prioritize calls from certain mobile terminals to certain designated telephony terminals

115. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes assessing whether network communications from the user terminals are to be communicatively linked with the designated telephony terminals

116. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes limiting access through the communication network

117. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes providing an indication to the third party useful for the third party to indicate whether or how to effect communication with the designated telephony terminals through the communication network.

118. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes providing a location-based indication to the designated telephony terminal, wherein the location-based indication is used as part of communication rule set.

119. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes providing a location-based indication to the designated telephony terminal, wherein the location-based indication is displayed for viewing at the designated telephony terminal.

120. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes providing a location-based indication to the designated telephony terminal, wherein the location-based indication is used to route the call to another terminal as indicated by a response from the designated telephony terminal.

121. The invention set forth in claim 112, wherein using the assimilated current location data and the communication rules includes providing a location-based indication to the designated telephony terminal, wherein the location-based indication is used to route the call to another terminal as indicated by a response from the third party.

122. For use in connection with a communication network having wireless-technology equipment, a system comprising:

a memory circuit that stores

on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data,

on behalf of a third party, communication rules relevant to a geographic region of service provided by the communication network; and

a processor node configured within the wireless-technology equipment for

assimilating current location data regarding locations of the mobile terminals with the user profiles, and generating assimilated current location-based and user-characterizing data, and

providing the generated data to another processor node and, in response thereto, receiving a modified set of data and a set of rules for generating another set of assimilated current location-based and user-characterizing data.

123. The invention set forth in claim 122, wherein the processor node is further configured for receiving modified sets of data for iterative processing according to at least one set of rules.

124. The invention set forth in claim 123, wherein the modified sets of data refine sets of data for one of: advertising, fleet tracking, child finder, and traffic alerts.

125. The invention set forth in claim 123, wherein the modified sets of data provide different types of information for different analytics, the different analytics relating to at least one of: advertising-directed demographics, fleet tracking, people finding, traffic, types, times and volumes of network communications.

126. The invention set forth in claim 122, further including an invoicing module that generates an invoice, to the third party, for operations by the processor node configured within the wireless-technology equipment.

127. The invention set forth in claim 122, further including a processing module for receiving and processing sets of data that relate to: advertising, fleet tracking, child finder, and/or traffic alerts.

128. The invention set forth in claim 122, further including a processing module for receiving sets of data and related sets of new rules that pertain to advertising-directed demographics.

129. The invention set forth in claim 122, wherein the other processor node is primarily dedicated to analytics processing configured to operate in part by rules provided from a third party.

130. The invention set forth in claim 122, wherein the other processor node is configured to perform operations at least partly provided by rules received from third parties.

131. The invention set forth in claim 122, wherein assimilating current location data and generating assimilated current location-based and user-characterizing data are iterative operations.

132. For use in connection with a communication network having wireless-technology equipment, a method comprising:

in a memory circuit, storing

on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data,

on behalf of a third party, communication rules relevant to a geographic region of service provided by the communication network; and

using a processor node configured within the wireless-technology equipment,

assimilating current location data regarding locations of the mobile terminals with the user profiles, and generating assimilated current location-based and user-characterizing data, and

providing the generated data to another processor node and, in response thereto, receiving a modified set of data and a set of rules for generating another set of assimilated current location-based and user-characterizing data.

133. The invention set forth in claim 132, wherein the processor node is further configured for receiving modified sets of data for iterative processing according to at least one set of rules.

134. The invention set forth in claim 133, wherein the modified sets of data refine sets of data for one of: advertising, fleet tracking, child finder, and traffic alerts.

135. The invention set forth in claim 133, wherein the modified sets of data provide different types of information for different analytics, the different analytics relating to at least one of: advertising-directed demographics, fleet tracking, people finding, traffic, types, times and volumes of network communications.

136. The invention set forth in claim 132, further including using an invoicing module to generate an invoice, to the third party, for operations by the processor node configured within the wireless-technology equipment.

137. The invention set forth in claim 132, further including receiving and processing sets of data that relate to: advertising, fleet tracking, child finder, and/or traffic alerts.

138. The invention set forth in claim 132, further including receiving sets of data and related sets of new rules that pertain to advertising-directed demographics.

139. The invention set forth in claim 132, wherein the other processor node is primarily dedicated to analytics processing configured to operate in part by rules provided from a third party.

140. The invention set forth in claim 132, wherein the other processor node is configured to perform operations at least partly provided by rules received from third parties.

141. The invention set forth in claim 132, wherein the steps of assimilating current location data and generating assimilated current location-based and user-characterizing data are iterative operations.

142. For use in connection with a communication network having wireless-technology equipment, a system comprising:

a memory circuit that stores on behalf of an operator for the communication network,

user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data, and

algorithms defining executable processes; and

a processor node configured within the wireless-technology equipment for assimilating current location data regarding the mobile terminals with the user profiles, for retrieving data from the assimilated current location data, for selecting and executing one of the algorithms and in response thereto, producing data sets for analysis by a third party, for sending the produced data sets to the third party, and as a function of said one of the algorithms, generating a set of invoice data for payment on behalf of the third party.

143. The invention set forth in claim 142 wherein selected ones of the algorithms are directed to searching a database specified by the third party.

144. The invention set forth in claim 142, wherein selected ones of the algorithms are directed to monitoring social network communications.

145. The invention set forth in claim 142, wherein selected ones of the algorithms are directed to monitoring communications to and from mobile terminals that are issued to a subordinate of the third party.

146. The invention set forth in claim 145, wherein the third party and the subordinate are in the same family or subscription plan provided by the communication network having wireless-technology equipment.

147. The invention set forth in claim 145, wherein the third party and the subordinate are in an employer-employee relationship as defined by a subscription plan provided by the communication network having wireless-technology equipment.

148. The invention set forth in claim 145, wherein the third party is a government entity and wherein the processor node is further configured to execute operations for identifying mobile terminals using/capable of a type of communication identified by the government entity.

149. The invention set forth in claim 148, wherein the type of communication includes one of: image-based messages, music, designated websites, encrypted or encoded messages, and communications lasting beyond time span.

150. The invention set forth in claim 148, wherein the data sets for the third party are geo-tagged information sources.

151. The invention set forth in claim 142, wherein the data sets for the third party are geo-tagged sources of information for at least one of: traffic, communication-network analytics, and advertising.

152. For use in connection with a communication network having wireless-technology equipment, a system comprising :

a memory circuit that stores on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data; and

a processor node configured within the wireless-technology equipment for assimilating current location data regarding the mobile terminals with the user profiles, and using the assimilated current location data to provide a set of data representing analytics on location-based network usage by the mobile terminals.

153. The invention set forth in claim 152, wherein the set of data, representing analytics on location-based network usage by the mobile terminals, includes confidential identity information from the subscriber data of the mobile terminals for management of system data traffic involving the wireless-technology equipment.

154. The invention set forth in claims 152, wherein the set of data representing analytics includes location-system data traffic involving the wireless-technology equipment.

155. The invention set forth in claim 154, wherein the set of data includes confidential identity information from the subscriber data of the mobile terminals for management of system data traffic involving the wireless-technology equipment.

156. The invention set forth in claim 154, wherein the set of data is used in the network to route communications via the wireless-technology equipment.

157. The invention set forth in claim 152, wherein the processor node is further configured to: use data tables to look up or cross link information providing designated mobile terminals, and/or tag suspicious mobile terminals, geographic areas, calls to be routed through the network differently.

158. The invention set forth in claim 152, wherein the processor node is further configured to tag calls to be processed with a different priority.

159. The invention set forth in claim 152, wherein the processor node is further configured for generating billing information for content providers.

160. The invention set forth in claim 152, wherein the processor node is further configured for providing content control as a function of location of mobile terminal and of user profile.

161. The invention set forth in claim 152, wherein the processor node is further configured to track usage of certain content of mobile terminals.

162. The invention set forth in claim 152, wherein the processor node is further configured to implement caching operations based on assessing a location common to mobile terminals in a particular region.

163. The invention set forth in claim 152, wherein the processor node is further configured to access control data representing data-delivery conditions agreed to between first and second business entities.

164. The invention set forth in claim 152, wherein the processor node is further configured to control, based on groups mobile terminals agreeing to limit access such as during attendance associated with a large paid-for event, at least one of the following: system bandwidth, system access, allocation of communication resources, and allocation of cache memory resources.

165. For use in connection with a communication network having wireless-technology equipment, a system, comprising:

a memory circuit that stores on behalf of an operator for the communication network, user profiles that include wireless network subscriber data useful for providing network access to mobile terminals associated with the subscriber data, and an algorithm for using back channel data that includes location information regarding the mobile terminals; and

a processor node configured within the wireless-technology equipment for

assimilating current location data regarding locations of the mobile terminals with the user profiles,

using the assimilated current location data to provide a set of data representing location-based network usage by the mobile terminals, and therefrom

executing the algorithm to produce a report indicative of a location common to a group of mobile terminals.

166. The invention set forth in claim 165, wherein the processor node is further configured to: use data tables to look up or cross link information providing designated mobile terminals; identify suspicious mobile terminals, geographic areas, or calls to be routed through the network differently; and process calls with a different priority.

167. The invention set forth in claim 165, wherein the processor node is further configured to: provide and use data for improving quality of experience in delivery of content; track usage of certain content or mobile terminals; generating billing information for content providers; and provide content control, as a function of location of mobile terminal and profile.

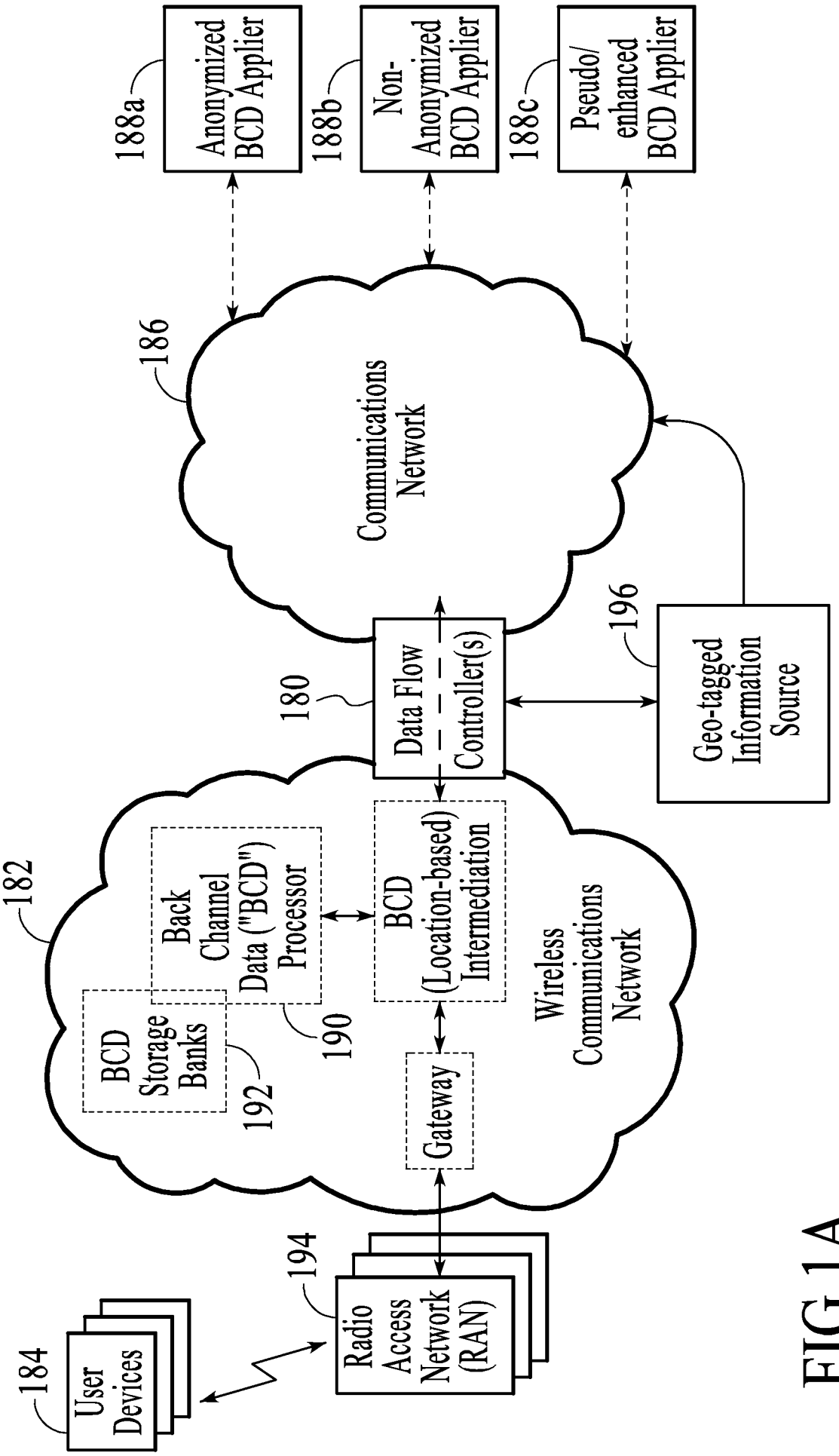

188a
Anonymized BCD Applier
188b
Non-Anonymized BCD Applier
188c
Pseudo/enhanced BCD Applier
186
Communications Network
180
Data Flow Controller(s)
196
Geo-tagged Information Source
182
Back Channel Data ("BCD") Processor
BCD (Location-based) Intermediation
BCD Storage Banks
192
190
Gateway
Wireless Communications Network
194
Radio Access Network (RAN)
184
User Devices

FIG.1A

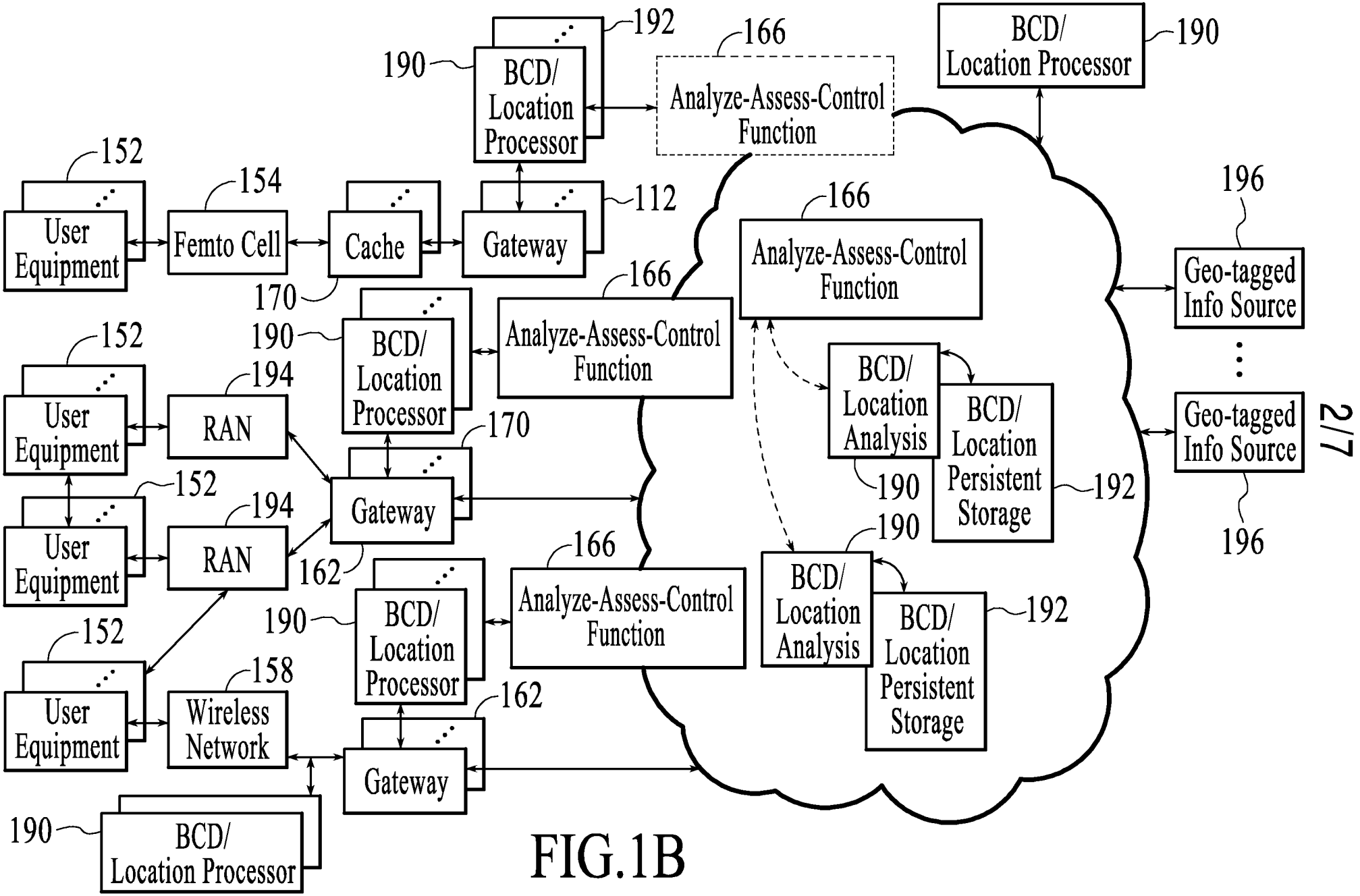

BCD/ Location Processor
190
192
166
Analyze-Assess-Control Function
BCD/ Location Processor
190
152
User Equipment
154
Femto Cell
Cache
Gateway
112
170
166
Analyze-Assess-Control Function
196
Geo-tagged Info Source
152
User Equipment
190
BCD/ Location Processor
194
RAN
170
Gateway
166
Analyze-Assess-Control Function
BCD/ Location Analysis
BCD/ Location Persistent Storage
190
192
Geo-tagged Info Source
196
152
User Equipment
194
RAN
162
190
BCD/ Location Processor
166
Analyze-Assess-Control Function
BCD/ Location Analysis
BCD/ Location Persistent Storage
190
192
152
User Equipment
158
Wireless Network
162
Gateway
190
BCD/ Location Processor

FIG.1B

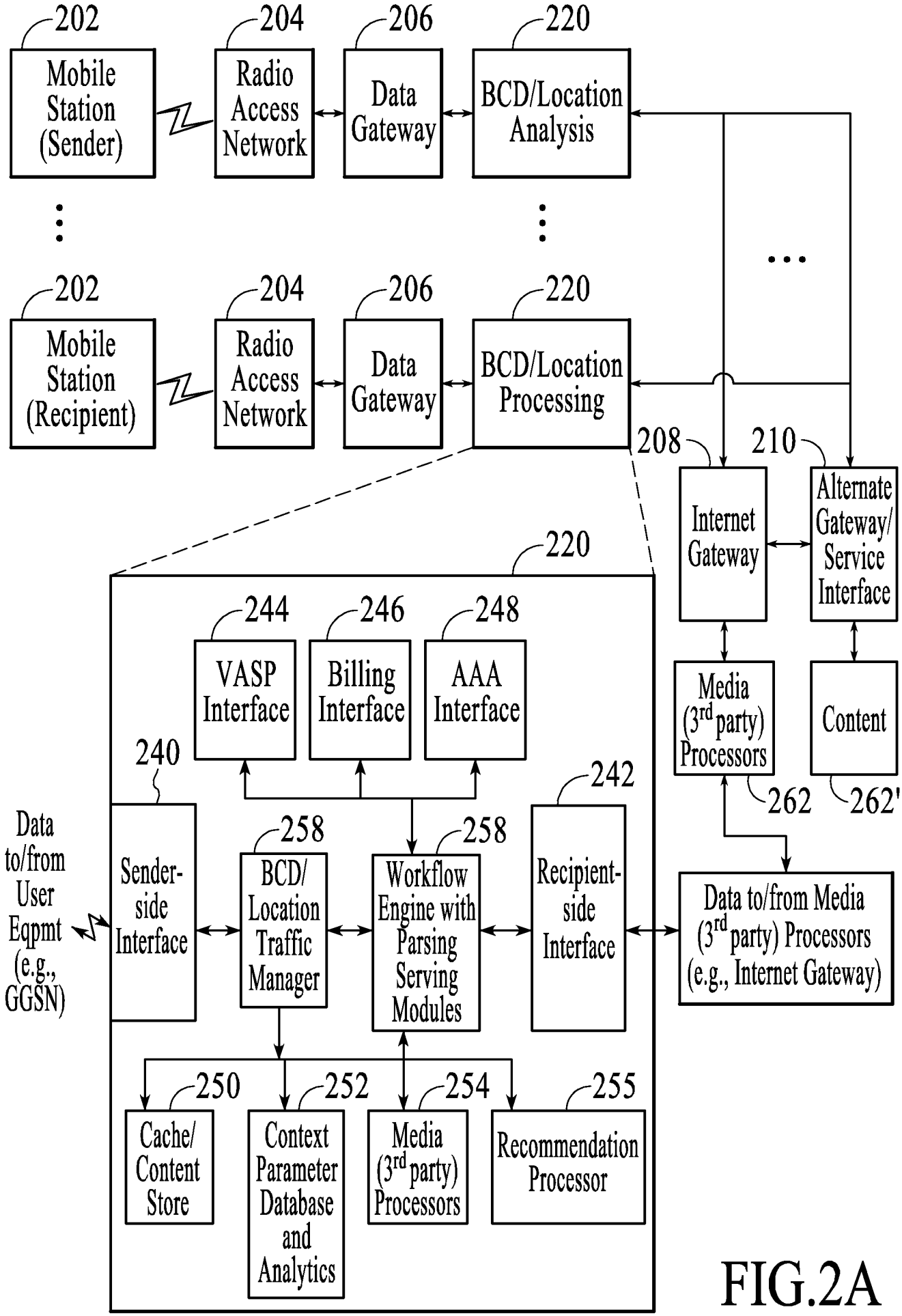

202
Mobile Station (Sender)
204
Radio Access Network
206
Data Gateway
220
BCD/Location Analysis
202
Mobile Station (Recipient)
204
Radio Access Network
206
Data Gateway
220
BCD/Location Processing
208
210
Internet Gateway
Alternate Gateway/ Service Interface
220
244
VASP Interface
246
Billing Interface
248
AAA Interface
240
242
Media (3rd party) Processors
Content
262
262'
Data to/from User Eqpmt (e.g., GGSN)
Sender-side Interface
258
BCD/ Location Traffic Manager
258
Workflow Engine with Parsing Serving Modules
Recipient-side Interface
Data to/from Media (3rd party) Processors (e.g., Internet Gateway)
250
Cache/ Content Store
252
Context Parameter Database and Analytics
254
Media (3rd party) Processors
255
Recommendation Processor

FIG.2A

Publisher API Architecture

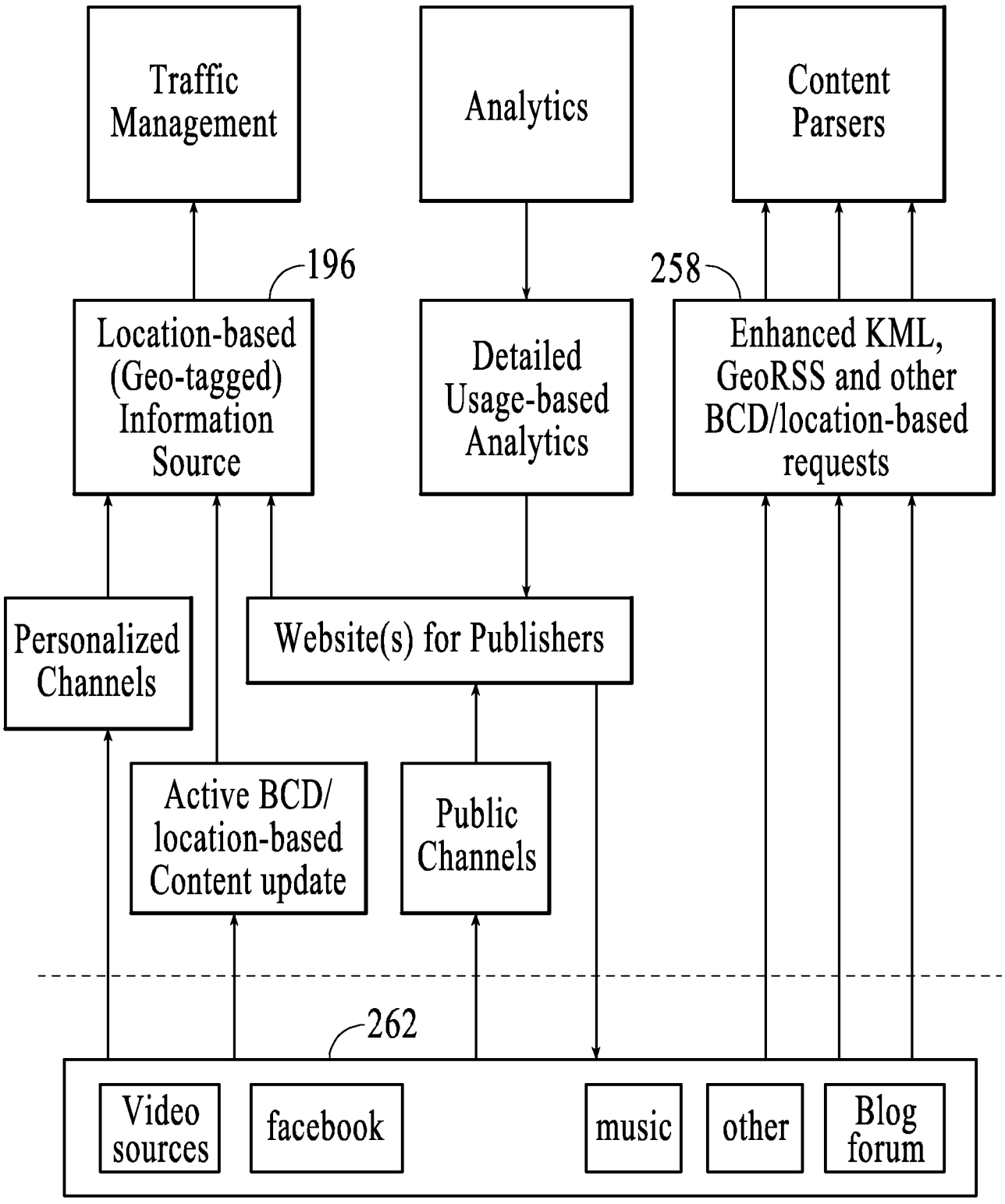
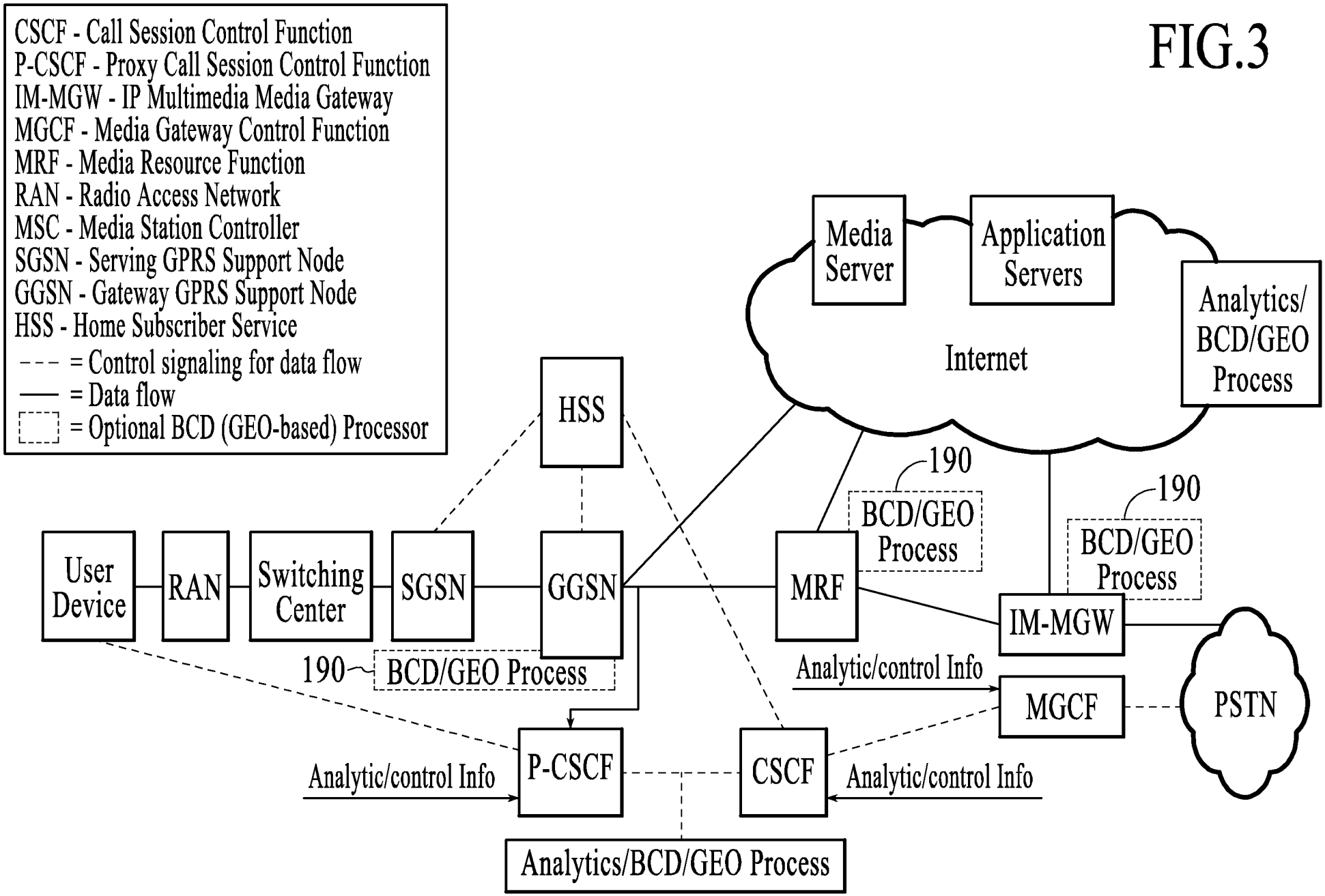


FIG.2B

FIG.3


CSCF - Call Session Control Function
P-CSCF - Proxy Call Session Control Function
IM-MGW - IP Multimedia Media Gateway
MGCF - Media Gateway Control Function
MRF - Media Resource Function
RAN - Radio Access Network
MSC - Media Station Controller
SGSN - Serving GPRS Support Node
GGSN - Gateway GPRS Support Node
HSS - Home Subscriber Service
--- = Control signaling for data flow
—— = Data flow
= Optional BCD (GEO-based) Processor
Media Server
Application Servers
Analytics/ BCD/GEO Process
Internet
HSS
190
BCD/GEO Process
190
BCD/GEO Process
User Device
RAN
Switching Center
SGSN
GGSN
MRF
IM-MGW
190
BCD/GEO Process
Analytic/control Info
MGCF
PSTN
Analytic/control Info
P-CSCF
CSCF
Analytic/control Info
Analytics/BCD/GEO Process

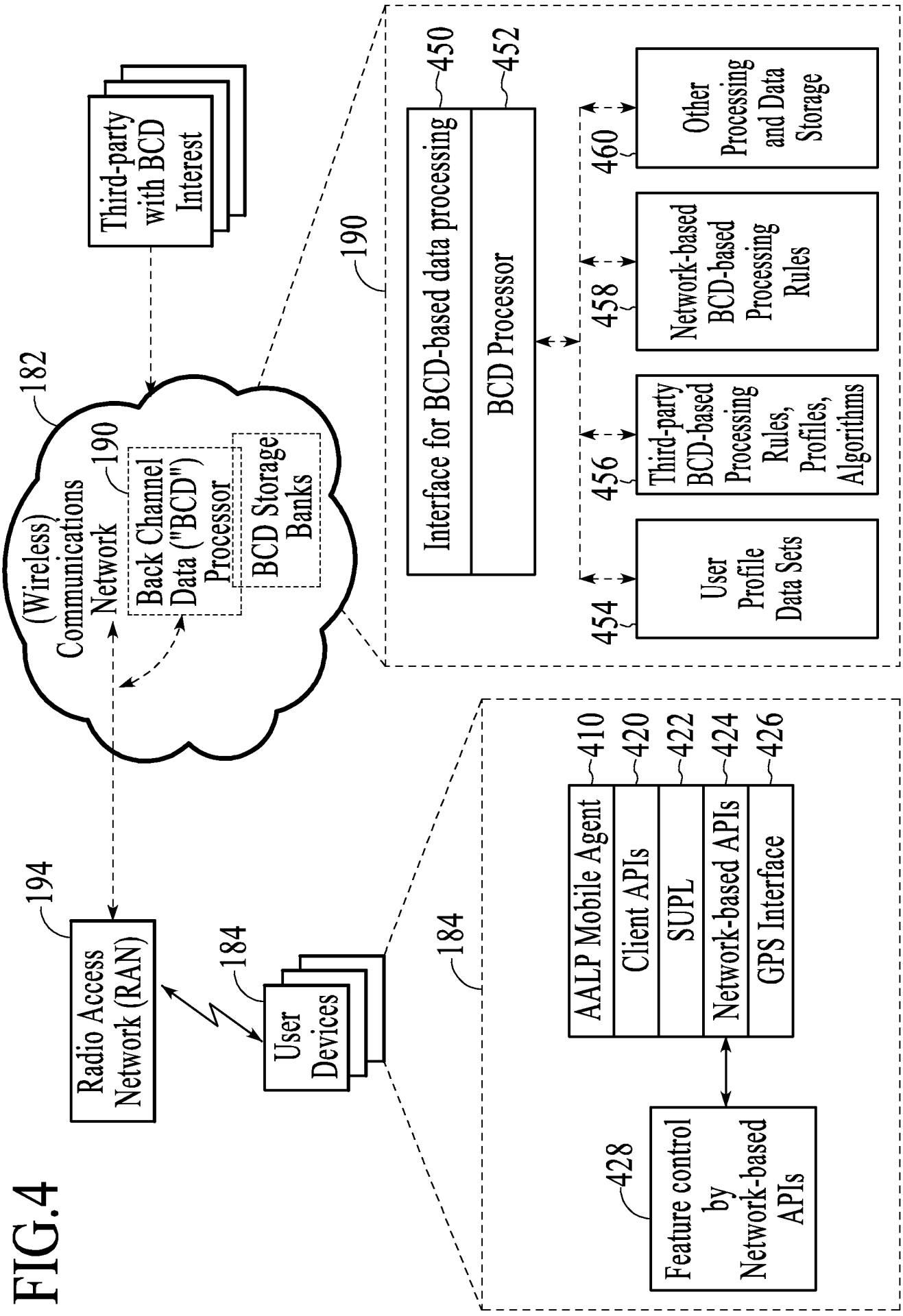

Third-party with BCD Interest
182
(Wireless) Communications Network
190
Back Channel Data ("BCD") Processor
BCD Storage Banks
190
Interface for BCD-based data processing
450
BCD Processor
452
User Profile Data Sets
454
Third-party BCD-based Processing Rules, Profiles, Algorithms
456
Network-based BCD-based Processing Rules
458
Other Processing and Data Storage
460
194
Radio Access Network (RAN)
184
User Devices
184
AALP Mobile Agent
410
Client APIs
420
SUPL
422
Network-based APIs
424
GPS Interface
426
Feature control by Network-based APIs
428

FIG.4

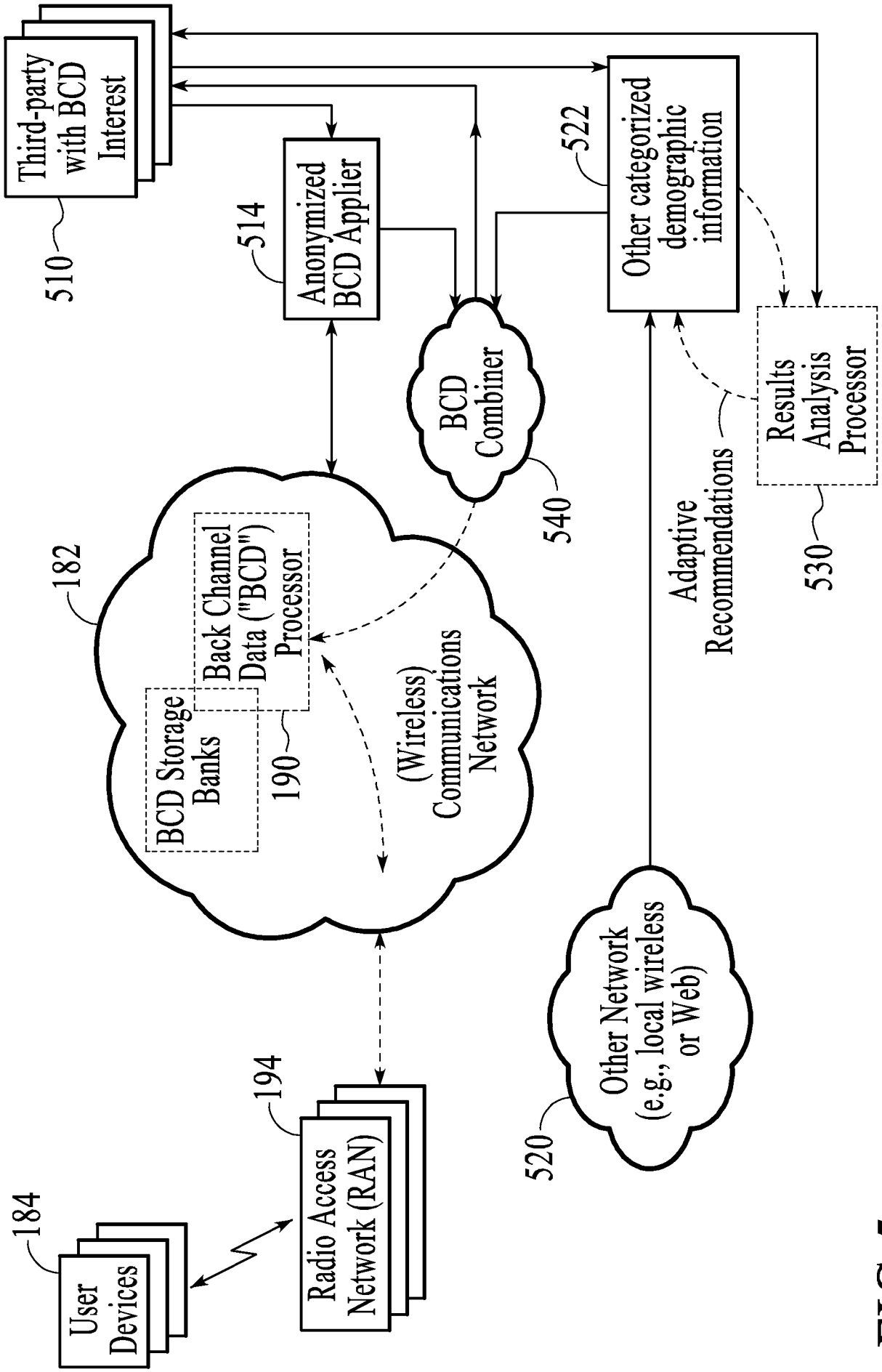

Third-party with BCD Interest
510
Anonymized BCD Applier
514
Other categorized demographic information
522
BCD Combiner
540
Results Analysis Processor
530
Adaptive Recommendations
182
BCD Storage Banks
Back Channel Data ("BCD") Processor
190
(Wireless) Communications Network
Other Network (e.g., local wireless or Web)
520
194
Radio Access Network (RAN)
184
User Devices

FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/054767

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06F 15/16 (2010.01)
USPC - 709/228
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)
IPC(8) - G06F 15/16; H04W 4/02; H04W 4/26; H04W 12/12 (2010.01)
USPC - 709/228; 705/14.64; 709/219; 709/217; 455/414.1; 455/456.1

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)
Patbase, Google Internet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/0097451 A1 (BJORKSTEN et al) 22 May 2003 (22.05.2003) entire document	1-167
Y	US 2002/0035605 A1 (MCDOWELL et al) 21 March 2002 (21.03.2002) entire document	1-167
Y	US 2005/0215238 A1 (MACALUSO) 29 September 2005 (29.09.2005) entire document	142-151, 159, 167
Y	US 2005/0166072 A1 (CONVERSE et al) 28 July 2005 (28.07.2005) entire document	84-88, 94-98, 144-150
Y	US 2003/0130893 A1 (FARMER) 10 July 2003 (10.07.2003) entire document	28, 38, 125, 135
Y	US 2007/0280462 A1 (NEECE) 06 December 2007 (06.12.2007) entire document	83, 90, 91, 93, 100, 101
A	WO 2007/048063 A2 (BANGA) 26 April 2007 (26.04.2007) entire document	1-167

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 December 2010	27 DEC 2010
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. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)