METHOD AND SYSTEM FOR AUTHORIZING TRANSACTIONS BASED ON RELATIVE LOCATION OF DEVICES

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ABSTRACT

Aspects of a method and system for authorizing transactions based on relative location of devices are provided. In this regard, data relating to a location of a first communication device and data relating to a location of a second communication device may be received, a distance between the first communication device and the second communication device may be determined based on the received data, and whether to approve a transaction may be determined based on the determined distance. The transaction may have been initiated from one of the first communication device and the second communication device, and may comprise a need to access an account. The transaction may be approved in instances that the first communication device and the second communication device are within a predetermined distance of each other. The received data may comprise distance information determined via communications between the first communication device and the second communication device.
FIG. 3

Reference Database 142
Processor 302
Memory 304

Interfacing Subsystem 310
Satellite Reference Network (SRN)
Mobile devices and/or Mobile core network
Transaction initiated

Transaction hosting server seeks authorization from location server

Transaction automatically approved?

Location server determines location of communication devices

distance approved?

Location server authorizes transaction

Out-of-band approval

Transaction approved?

Transaction completed

Transaction denied

FIG. 4
METHOD AND SYSTEM FOR AUTHORIZING TRANSACTIONS BASED ON RELATIVE LOCATION OF DEVICES

CROSS-REFERENCE TO RELATED APPLICATIONS/INCORPORATION BY REFERENCE

[0001] This patent application makes reference to, claims priority to and claims benefit from:
U.S. Provisional Patent Application Ser. No. 61/303,794 (Attorney Docket No. 21009US01) filed on Feb. 12, 2010; and

[0002] This Application also makes reference to:
U.S. patent application Ser. No. _____ (Attorney Docket No. 20997US02) filed on even date herewith;
U.S. patent application Ser. No. _____ (Attorney Docket No. 21007US02) filed on even date herewith;
U.S. patent application Ser. No. _____ (Attorney Docket No. 21009US02) filed on even date herewith; and
U.S. patent application Ser. No. _____ (Attorney Docket No. 21024US02) filed on even date herewith.

[0003] Each of the above stated applications is hereby incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0004] Certain embodiments of the invention relate to networking. More specifically, certain embodiments of the invention relate to a method and system for authorizing transactions based on relative location of devices.

BACKGROUND OF THE INVENTION

[0005] The security of electronic networks continues to grow in importance as more and more sensitive information is stored electronically and communicated via electronic networks. Businesses seeking to protect trade secrets and individuals seeking to protect their credit and identity are two primary forces driving the need for stronger network security. In this regard, the fact that such problems are prevalent today illustrates may be an indication that traditional security techniques such as username/password requirements and various encryption techniques are insufficient in many instances.

[0006] Further limitations and disadvantages of conventional and traditional approaches will become apparent to one of skill in the art, through comparison of such systems with some aspects of the present invention as set forth in the remainder of the present application with reference to the drawings.

BRIEF SUMMARY OF THE INVENTION

[0007] A system and/or method is provided for authorizing transactions based on relative location of devices, substantially as illustrated by and/or described in connection with at least one of the figures, as set forth more completely in the claims.

[0008] These and other advantages, aspects and novel features of the present invention, as well as details of an illustrated embodiment thereof, will be more fully understood from the following description and drawings.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

[0009] FIG. 1 is a block diagram illustrating an exemplary communication system that enables authorization of transactions based on relative location of devices, in accordance with an embodiment of the invention.

[0010] FIG. 2 is a block diagram illustrating an exemplary communication device that may enable and/or utilize location based services, in accordance with an embodiment of the invention.

[0011] FIG. 3 is a block diagram illustrating an exemplary location server, in accordance with an embodiment of the invention.

[0012] FIG. 4 is a flow chart illustrating exemplary steps for authorizing transactions based on relative location of devices, in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Certain embodiments of the invention may be found in a method and system authorizing transactions based on relative location of devices. In various embodiments of the invention, data relating to a location of a first communication device and data relating to a location of a second communication device may be received, a distance between the first communication device and the second communication device may be determined based on the received data, and whether to approve a transaction may be determined based on the determined distance. The transaction may have been initiated from one of the first communication device and the second communication device, and may comprise a need to access an account. The transaction may be approved in instances that the first communication device and the second communication device are within a predetermined distance of each other. The received data may comprise global navigation satellite system (GNSS) coordinates. The received data may comprise distance information determined via communications between the first communication device and the second communication device. The communications between the first communication device and the second communication device may be in accordance with Bluetooth and/or IEEE 802.11 standards, for example. The first communication device and the second communication device may be associated, in a database, with the account. Whether to approve the transaction may be determined based on preferences associated, in the database, with one or both of the first communication device and the second communication device. The transaction may comprise an electronic payment or funds transfer. Determining whether to approve the transaction may occur in response to a request from a network device. A result of the determination of whether to approve the transaction may be communicated to the network device.

[0014] FIG. 1 is a block diagram illustrating an exemplary communication system that enables authorizing transactions based on device location, in accordance with an embodiment of the invention. Referring to FIG. 1, there is shown a communication system 100 comprising communication devices 102 and 104, a mobile core network 110, a cellular basestation (BS) 114, a Worldwide Interoperability for Microwave Access (WiMAX) BS 116, a broadcast tower 118, a Global Naviga-
tion Satellite Systems (GNSS) network 120, a plurality of GNSS satellites 122a-122n, the Internet 130, a location server 140, and a satellite reference network (SRN) 150. The communication devices 102 and 104 may be at locations 106 and 108, respectively.

[0015] The GNSS network 120 may comprise suitable logic, circuitry, interfaces, and/or code that may provide navigation information to land-based devices via satellite links. The GNSS network 120 may provide positioning information via downlink satellite links transmitted to land-based devices, such as the mobile communication devices 102 and 104, to enable determining their locations. In this regard, the GNSS network 120 may comprise, for example, the plurality of GNSS satellites 122a-122n, each of which is operable to provide satellite transmissions based on a global navigation satellite system (GNSS). Exemplary GNSS systems may comprise, for example, the Global Positioning System (GPS), GLONASS and/or Galileo based satellite system. The plurality of GNSS satellites 122a-122n may directly provide positioning information and/or a land-based device may utilize satellite transmissions from different satellite to determine its location using, for example, triangulation based techniques.

[0016] The Internet 130 may comprise a system of interconnected networks and/or devices that enable exchange of information and/or data among a plurality of nodes, based on one or more networking standards, including, for example, Internet Protocols (IP). The Internet 130 may enable, for example, connectivity among a plurality of private and public, academic, business, and/or government nodes and/or networks, wherein the physical connectivity may be provided via the Public Switched Telephone Network (PSTN), utilizing copper wires, fiber-optic cables, wireless interfaces, and/or other standards-based interfaces.

[0017] The mobile core network 110 may comprise suitable logic, circuitry, interfaces, and/or code that are operable to provide interfacing and/or connectivity servicing among one or more access networks, which may be operable to provide network accessibility to mobile communication devices, and external data networks such as packet data networks (PDNs) and/or the Internet 130. The mobile communication devices 102 and 104 may access the mobile core network 110, for example, via the wireless AP 112a, the cellular BS 114, and/or the WiMAX BS 116. The mobile core network 110 may be configured to provide data services, which are provided by external data networks, to associated users.

[0018] The wireless APs 112a and 112b may each comprise suitable logic, circuitry, interfaces, and/or code that are operable to provide data services to communication devices, such as one or more of the mobile communication devices 102 and 104, in adherence with one or more wireless LAN (WLAN) standards such as, for example, IEEE 802.11, 802.11a, 802.11b, 802.11d, 802.11e, 802.11n, 802.11v, and/or 802.11u. The wireless AP 112a may communicate with the mobile core network 110, via one or more links and/or associated devices, for example. The wireless AP 112b may communicate with the Internet 130, via one or more links and/or associated devices, for example. In this manner, the wireless APs 112a and 112b may provide network access to the mobile communication devices 102 and 104.

[0019] The cellular BS 114 may comprise suitable logic, circuitry, interfaces, and/or code that are operable to provide voice and/or data services to communication devices, such as one or more of the mobile communication devices 102 and 104, in adherence with one or more cellular communication standards. Exemplary cellular communication standards may comprise Global System for Mobile communications (GSM), General Packet Radio Services (GPRS), Universal Mobile Telecommunications System (UMTS), Enhanced Data rates for GSM Evolution (EDGE), Enhanced GPRS (EGPRS), and/or 3GPP Long Term Evolution (LTE). The cellular BS 114 may communicate with the mobile core network 110 and/or the Internet 130, via one or more backhaul links and/or associated devices for example. In this manner, the cellular BS 114 may provide network access to the mobile communication devices 102 and 104.

[0020] The WiMAX BS 116 may comprise suitable logic, circuitry, interfaces, and/or code that are operable to provide WiMAX based data services to communication devices, such as one or more of the mobile communication devices 102 and 104. The WiMAX BS 116 may communicate with the mobile core network 110 and/or the Internet 130, via one or more backhaul links and/or associated devices for example. In this manner, the WiMAX BS 116 may provide network access to the mobile communication devices 102 and 104.

[0021] The broadcast tower 118 may comprise, for example, a terrestrial radio and/or terrestrial television transmitter. In this regard, the broadcast tower 118 may transmit television and/or radio in accordance with one or more broadcast standards such as, for example, AM radio, FM radio, Radio Data Services (RDS or RBDS), the Digital Video Broadcasting (DVB) family of standards, the Advanced Television Systems Committee (ATSC) family of standards, the Integrated Services Digital Broadcasting (ISDB) family of standards, the Digital Terrestrial Multimedia Broadcast (DTMB) family of standards, and the Digital Multimedia Broadcast (DMB) family of standards.

[0022] The server 132 may store private and/or secure information, such as financial information, which may be accessed during a transaction such as an electronic funds transfer or online purchase. For example, the server 132 may store information for credit card holders and may process debits and/or credits to card-holders accounts. Accordingly, for purposes of this application, the server 132 may be referred to as a “transaction hosting server.”

[0023] The SRN 150 may comprise suitable logic, circuitry, interfaces, and/or code that are operable to collect and/or distribute data from GNSS satellites, on a continuous basis. In this regard, the SRN 150 may comprise a plurality of GNSS reference tracking stations located around the world to provide A-GNSS coverage all the time in both a home network and/or any visited network. The SRN 150 may utilize satellite signal received from various GNSS constellations, such as, for example, the plurality of GNSS satellites 122a-122n of the GNSS network 120. The location server 140 may provide location related data when requested to do so.

[0024] The location server 140 may comprise suitable logic, circuitry, interfaces, and/or code that are operable to provide and/or support location based services (LBS). In this regard, the location server 140 may store and/or process location related data associated with communication devices and/or users thereof. The location server 140 may be operable to maintain, for example, the reference database 142, which may comprise profile elements corresponding to each of the mobile communication devices 102 and 104, and/or users thereof, for example. In this regard, users may register or otherwise establish a location based services (LBS) account (also referred to as a profile) with the owner and/or operator of the location server 140 and the location server 140 may store
location related data associated with the accounts. LBS accounts or profiles may, for example, be associated with one or more users, one or more communications devices, or a combination thereof.

[0025] The location related data may be stored in a reference database 142 in the location server 140. The location related data may be communicated securely to and from the location server 140 utilizing authentication and/or encryption mechanisms that may prevent spoofing or otherwise tampering with the requests and/or responses. In various embodiments of the invention, location related data stored in the communication server 140 may comprise GNSS coordinates. In this regard, the location server 140 may also be operable to access and/or communicate with the SRN 150, for example, to collect and/or update location related data independently and/or autonomously. The location server 140 may be operable to access the SRN 150 to collect GNSS satellite data, and may utilize the collected GNSS satellite data to generate GNSS assistance data (A-GNSS data) pertaining to, and/or associated with the mobile communication devices 102 and 104. In various embodiments of the invention, location related data stored in the location server 140 may be collected and/or retrieve location related data from the mobile communication devices 102 and 104. In this regard, the location related data may be uploaded to the location server 140 via any suitable means such as the APs 112a and/or 112b, cellular BS 114, WiMAX BS 116, the Internet 130, and/or other devices such as Femtocells. In some instances, location related data may be determined via ranging and/or triangulation based on communications to and/or from one or more of the APs 112a and/or 112b, cellular BS 114, WiMAX BS 116, and broadcast tower 118. Similarly, in some instances, location related data may be determined via ranging based on communications between the communication devices 102 and 104.

[0026] The location server 140 may be operable to communicate the stored location related data when requested to do so. In addition, the reference database 142 maintained in the location server 140 may be modified, refined, and/or updated. The modification may be performed, for example, based on location related data received from the SRN 150 and/or from the mobile communication devices 102 and 104 and/or other communication devices in the system 100. The location related data may be uploaded, for example, by users logging in to the location server 140 and manually updating preferences, permissions, and/or other location related data. Additionally or alternatively, location related data may be updated, for example, automatically. Such automatic uploading and/or updating may, for example, be performed periodically, occasionally, and/or upon the occurrence of certain events, such as an attempted transaction, completed transaction, and/or data reaching a particular age.

[0027] Various security protocols and/or procedures may be used and/or implemented within the system 100 to ensure secure exchange of location related data among, for example, devices, such as the communication devices 102 and 104, associated with LBS accounts and/or devices, such as the transaction processing server 132, seeking to authenticate devices and/or users associated with an LBS account. In this regard, each of the communication devices 102 and 104 may comprise a security subsystem that may be operable to communicate reliable and secure location information to the location server 140. The security subsystem may comprise, for example, dedicated hardware and/or one or more secure applications running on the communication device 104.

[0028] The communication devices 102 and 104 may each comprise suitable logic, circuitry, interfaces and/or code to communicate via one or more wired and/or wireless connections. In this regard, the communication devices 102 and 104 may each be operable to transmit and/or receive signals to and/or from one or more of the APs 112a and 112b, the cellular BS 114, the WiMAX BS 116, the GNSS network 120, and the broadcast tower 118. The communication devices 102 and 104 may each comprise, for example, a phone, a laptop, or a personal media player.

[0029] In operation, a transaction, such as an online purchase utilizing a credit card, may be attempted from the communication device 102 and the purchase may be processed on to the transaction hosting server 132. In this regard, the server 132 may attempt to process the payment by checking the credit card’s balance and/or availability of funds. Upon accessing the credit card account, the server 132 may determine that a LBS account is associated with the credit card account and that the card owner has enrolled in location based authentication. Accordingly, the server 132 may send a request to the location server 140 to have the location server 140 approve the transaction. The request may include information identifying the device 102 and/or location 108 from which the transaction is being attempted.

[0030] Upon receiving the request for approval, the location server 140 may access the LBS account associated with the credit card account and determine that communication devices 102 and 104 are associated with the LBS account. The LBS server 140 may then determine the distance between the communication devices 102 and 104. In some instances, the distance may be determined utilizing location data previously stored in the database 142. However, in other instances, the location server 140 may request updated location related information from one or both of the communication devices 102 and 104 prior to calculating the distance.

[0031] In an exemplary embodiment of the invention, upon receiving a request to approve a transaction associated with an LBS account that is, in turn, associated with the communication devices 102 and 104, the location server 102 may send a request to communication device 104 for the communication device 104 to determine a distance to the communication device 102 and report the distance back to the location server 140. Accordingly, the communication device 104 may attempt to communicate with the communication device 102 utilizing, for example, Wi-Fi, ZigBee, or Bluetooth. In this regard, the communication device 104 may attempt to determine the distance utilizing the method and system described in U.S. patent application Ser. No. (Attorney Docket No. 21004US01). For example, location information may be communicated between secure or trusted subsystems of the communication devices 102 and 104 such that each of the communication devices 102 and 104 may be operable to authenticate, decrypt, and/or otherwise secure or verify the location information.

[0032] The formatting and/or type of distance determination may differ depending on the implementation and/or on the particular circumstances. For example, the distance determination may be quantitative, such as a numerical distance or range of distances, or may be more qualitative, such as “in range” or “out-of-range.” In some instances, upon determining that the transaction was initiated from communication device 102, the request to determine distance in accordance with this paragraph may be sent to the communication device 104. Similarly, upon determining that the transaction was
initiated from communication device 104, the request to determine distance in accordance with this paragraph may be sent to the communication device 102.

[0033] Upon determining the distance between the communication devices 102 and 104, the location server 140 may determine whether to approve the transaction based on the distance. Such a determination may be based on a variety of factors including, for example, preferences and/or rules associated with the LBS account. Such preferences and/or rules may be established, for example, by the LBS account holder and/or the credit card company.

[0034] The preferences and/or rules may, for example, be based on the type of transaction. For example, electronic funds transfers or other financial transactions may only be approved when the communication devices 102 and 104 are within X meters. As another example, access to an online account, such as a financial account, an email account, or a social networking account may be approved only when communication device 102 is within Bluetooth or Wi-Fi range of communication device 104.

[0035] For financial transactions, the preferences and/or rules may, for example, be based on the amount involved. For example, transactions involving amounts greater than $X.XX may be approved only when the communication devices 102 and 104 are less than X feet apart. Conversely, a rule or preference may be established that, for all transactions involving less than $X.XX, the transaction may be approved regardless of the distances between the communication devices 102 and 104.

[0036] The preferences and/or rules may, for example, be based on the time at which the transaction is being attempted. For example, a rule or preference may be established that all transactions being attempted between the hours of X:XX and Y:YY, and/or on certain days, may be automatically denied or may automatically trigger additional authentication measures when the communication devices 102 and 104 are not within X meters of each other.

[0037] The above rules, preferences, and transactions are just for illustration and the invention is not so limited.

[0038] Upon determining whether to approve or deny the transaction, the location server 140 may then communicate the approval or denial to the server 132 and the server 132 may proceed accordingly.

[0039] FIG. 2 is a block diagram illustrating an exemplary communication device 200 that may enable and/or utilize location based services, in accordance with an embodiment of the invention. Referring to FIG. 2 there is shown a communication device 200, a processor 202, a system memory 204, a system bus 206, a communication subsystem 210, a plurality of interface processing blocks 212r-212n, a security sub-system 220, and a transaction management processing block 230. The communication device 200 may be substantially similar to the communication devices 102 and 200 described with respect to FIG. 1.

[0040] The communication device 200 may comprise the host processor 202, the system memory 204, the system bus 206, the communication subsystem 210, the security sub-system 220, and the transaction management processing block 230. The communication device 200 may be as described in FIG. 1. In this regard, the communication device 200 may enable reception and/or transmission of signals during communication via one or more wired and/or wireless connections. The communication device 200 may also be operable to support and/or utilize location based services.

[0041] The processor 202 may comprise suitable logic, circuitry, interfaces, and/or code that may be operable to process data and/or control operations of the communication device 200. In this regard, the host processor 202 may be operable to configure and/or control operations of various components and/or systems of the communication device 200, by for example, providing control signals, controlling data transfers within the communication device 200, and enabling execution of applications, programs and/or code, which may be stored in the system memory 204. Such operations of the communication device 200 may comprise detection and/or identification of the location of the communication device 200. In this manner, the processor 202 may enable the communication device 200 to support and/or utilize location based services.

[0042] The memory 206 may comprise suitable logic, circuitry, and/or code that may be operable to store information such as executable instructions and data that may be utilized for operations of the communication device 200, including utilizing and/or supporting location based services. The memory 206 may comprise RAM, ROM, low latency non-volatile memory such as flash memory and/or other suitable electronic data storage. One or more portions of the memory 206 may be secured, e.g., via the security subsystem 220, and the security may be implanted and/or enforced in hardware. At least a portion of the memory may be a one-time-programmable and may comprise information that may be utilized in authenticating the device 200, its user, and/or its location. The system memory 204 may store, for example, information comprising configuration data used during LBS operations in the communication device 200. The configuration data may comprise parameters and/or code, which may comprise software and/or firmware, but the configuration data need not be limited in this regard.

[0043] The system bus 206 may comprise suitable logic, circuitry, interfaces, and/or code that may enable exchange of data and/or information between various components and/or systems in the communication device 200. In this regard, the system bus may comprise parallel or serial, and/or internal or external based bus technologies, and/or any combinations thereof. Exemplary system bus interfaces may comprise Inter-Integrated Circuit (I²C), Universal Serial Bus (USB), Advanced Technology Attachment (ATA), Small Computer System Interface (SCSI), Peripheral Component Interconnect (PCI), and/or Peripheral Interconnect Express (PCI-e) based interfaces.

[0044] The communication subsystem 210 may comprise suitable logic, circuitry, code, and/or interfaces that may enable communication of data, content, and/or messaging from and/or to the communication device 200, based on one or more wired and/or wireless protocols. The communication subsystem 210 may comprise, for example, the plurality of processing blocks 212r-212n that may be operable to perform communication based on wired or wireless standards supported in the communication device 200. In this regard, each of the plurality of processing blocks 212r-212n may comprise suitable logic, circuitry, interfaces, and/or code that are operable to detect, receive, and/or transmit signals based on specific frequency bands and/or modulation schemes. The processing blocks 212r-212n may also be operable to perform necessary processing operations, which may comprise, for example, buffering, filtering, modulation/demodulation, up-conversion/down-conversion, and/or digital-to-analog/ analog-to-digital conversion. The plurality of processing
blocks 212a-212n may be configured to support, for example, transmission and/or reception of RF signals during communication based on Ethernet, Bluetooth, WLAN, cellular, WiMAX, GNSS, FM interfaces and/or protocols.

The security subsystem 220 may comprise suitable logic, circuitry, interfaces, and/or code that may operable to perform security related operations in the communication device 200. In this regard, the security subsystem 220 may perform device and/or user authentication, certificate usage, and/or cryptographic operations in the communication device 200. Various security functions may be implemented in hardware to prevent security from being circumvented via software and/or firmware modifications. In various embodiments of the invention, the security subsystem 220 may comprise dedicated hardware and/or one or more applications.

In operation, the communication device 200 may be utilized to perform network access and/or communication via one or more wired or wireless interfaces. In this regard, the communication device 200 may, via the communication subsystem 210, receive signals from and/or transmit signals to the wireless AP 112a, wireless AP 112b, the cellular BS 114, the WiMAX BS 116, the broadcast tower 118, and/or the Internet 130 (e.g., via Ethernet, DSL, and/or cable infrastructure). During operations in the communication device 200, the host processor 202 may manage and/or control operations of, for example, communication subsystem 210 and/or security subsystem 220. In an exemplary aspect of the invention, the communication device 200 may be operable to support LBS application. In this regard, the communication device 200 may be associated with an LBS account managed via the location server 140. Accordingly, the communication device 200 may communicate, via the communication subsystem 210, with the location server 140.

Information communicated between the location server 140 and the communication device 200 may be stored in the database 142 indexed by, or otherwise associated with, the LBS account that is associated with the communication device 200 and/or an owner or user thereof. The communication device 200 may interact with the location server 140 via one or more of the wireless AP 112a, wireless AP 112b, the cellular BS 114, the WiMAX BS 116, and/or the Internet 130. During LBS related operations, the communication device 200 may provide, and/or enable the location server 140 to determine, the location of the communication device 200. During LBS related operations, the security subsystem 220 may support various authentication and/or confidentiality related operations performed via the communication device 200. For example, the security subsystem 220 may prevent a user, via software or firmware, from spoofing the location of the communication device 200. In this regard, the security subsystem 220 may be trusted by the location server 140 and/or other communication devices such as the devices 102 and 104 such that location information received from the communication device 200 may be trusted and/or relied upon for determining distance.

Additionally, location may be checked via a plurality of methods and if the checked methods report inconsistent locations, then the transaction may not be completed. In some embodiments of the invention, if a minority of the reported locations is inconsistent, then other valid identification means may be requested before the transaction is completed. Other identification means may comprise passwords, special keys, passphrases, and personal identifying information.

In various embodiments of the invention, the communication device 200 may determine its current location, which may be done using, for example, GNSS signals received via one or more of the plurality of processing blocks 212a-212n. LBS data and/or applications provided by the location server 140, the communication devices 102 and 104, and/or various entities, such as the wireless APs 112, the cellular BS 114, and the WiMAX BS 116, with which the communication devices 102 and 104 communicate. The security subsystem 220 may then perform, in conjunction with a location server such as the location server 140, user authentication based on, for example, LBS based data and/or applications. Once the location of the device 200 is determined, and/or device and/or user authentication is performed, transactions, such as described with respect to FIG. 1, may be initiated and/or completed.

FIG. 3 is a block diagram illustrating an exemplary location server, in accordance with an embodiment of the invention. Referring to FIG. 3 there is shown a server 140, a processor 302, a memory 304, a reference database 142, and an interfacing subsystem 310.

The server 140 may comprise the processor 302, the memory 304, the reference database 142, and the interfacing subsystem 310. In this regard, the server 140 may be operable to provide and/or support location based services (LBS). In an exemplary aspect of the invention, the server 140 may maintain location related data, via the reference database 142, for example. The location related data may be associated with communication devices that have an account with, or are otherwise associated with, the location based services provider that owns and/or operates the location server 140. Location related data may, for example, comprise information associated with location(s) that the communication devices 102 and 104 are at and/or locations to which the communication devices 102 and 104 have been.

The processor 302 may comprise suitable logic, circuitry, interfaces, and/or code that may be operable to manage and/or control operations of the server 140. In this regard, the processor 302 may be operable to configure and/or control operations of various components and/or systems of the location server 140, by providing, for example, control signals. The processor 302 may also control data transfers within the location server 140, including data storage and/or retrieval from memory 304 and/or generating, storing, and/or updating elements in the reference database 142. The processor 302 may enable execution of applications, programs and/or code, which may be stored in the memory 304 for example, to enable performing various services and/or application requested from the location server 140, including location based services (LBS) applications for example.

The memory 304 may comprise suitable logic, circuitry, interfaces, and/or code that enable permanent and/or non-permanent storage and/or fetch of data, code and/or other information used in the location server 140. In this regard, the memory 304 may comprise different memory technologies, including, for example, read-only memory (ROM), random access memory (RAM), and/or Flash memory. The memory 304 may be operable to store, for example, data and/or code used during LBS operations in the location server 140. The data and/or code may comprise configuration data or parameters, and the code may comprise operational code such as software and/or firmware, but the information need not be limited in this regard.
The reference database 142 may comprise suitable logic, circuitry, interfaces, and/or code that may be operable to store location related data for one or more LBS accounts, wherein each LBS account may be associated with one or more communication devices, such as the communication devices 102 and 104, and/or owners thereof and/or users thereof. The reference database 142 may be internally or externally coupled to the location server 140. The stored location related data may be collected from and/or provided to associated devices and/or users to support LBS applications. The reference database 142 may be operable to manage and update the stored location related data when requested, dynamically whenever any change is detected, and/or periodically. In an exemplary aspect of the invention, the reference database 142 may comprise data which may be utilized to approve or deny transactions. Furthermore, the reference database 142 may be updated and/or modified based on data communicated to the server 140 by the communication devices 102 and 104, the SRN 150, the wireless APs 112, the cellular BS 114, the WiMAX BS 116, and/or other devices.

The interfacing subsystem 310 may comprise suitable logic, circuitry, interfaces, and/or code that may enable communication of data, content, and/or messaging from and/or to the location server 140. The interfacing system 310 may support, for example, a plurality of physical and/or logical connections, based on one or more wired and/or wireless interfaces in the location server 140. In this regard, the interfacing system 310 may comprise, for example, one or more network interface cards (NIC) and/or wireless network interface cards (WNIC).

In operation, the location server 140 may be utilized to provide location based services (LBS). To facilitate LBS operations and/or servicing via the location server 140, the processor 302 may be operable to communicate, via the interfacing subsystem 310, with the SRN 150, the mobile core network 110, and/or the Internet 130 to collect location related data. The processor 302 may utilize the collected location related data to build and/or update the reference database 142, which may be coupled internally or externally to the location server 140. The processor 302 may retrieve or collect location related data from associated users, such as the communication device 104. The location server 140 may provide location related data by retrieving it from the reference database 142. In this regard, the location server 140 may store the location related data in the reference database 142 as elements that may be indexed using identifiers that are specific to serviced devices and/or users and/or owners thereof. Exemplary identifiers comprise LBS account numbers, LBS account usernames, phone number of a communication devices associated with LBS accounts, and MAC addresses of a communication devices associated with LBS accounts.

In an exemplary aspect of the invention, the reference database 142 may store and/or maintain, via the reference database 142 for example, data and/or information which may be utilized to approve or deny transactions, substantially as described with regard to FIG. 1. The transaction related data may be stored into, for example, LBS accounts (also referred to as profiles) maintained via the reference database 142. In this regard, when determining whether to approve a transaction, the server 140 may perform device and/or user authentication procedures with the serviced devices, such as the communication devices 102 and 104, and/or with devices requesting the approval, such as the server 132.

The location server 140 may enable, via the interfacing subsystem 310, access to LBS accounts such that information associated with an account, such as account rules and/or preferences, may be modified. In this regard, persons and/or entities which may access an LBS account may comprise an owner and/or user of a communication device associated with the LBS account, a credit card company, bank, or other financial institution associated with the LBS account, a wireless provider associated the LBS account, an Internet service provider associated with the LBS account, and/or any other person and/or entity which has been associated with the LBS account through secure and authenticated mechanisms.

FIG. 4 is a flow chart illustrating exemplary steps for authorizing transactions based on relative location of devices, in accordance with an embodiment of the invention. Referring to FIG. 4, the exemplary steps may begin with step 404 when a transaction, such as online purchase using a credit card, is initiated from the communication device 102, where the credit card and/or communication device 102 is associated with an LBS account that is also associated with the communication device 104. The attempted purchase may be submitted to the server 132. Subsequent to step 404, the exemplary steps may advance to step 406.

In step 406, the server 132 may send a request to the location server 140 for the location server 140 to determine whether to approve the transaction. Subsequent to step 406, the exemplary steps may advance to step 408.

In step 408, the location server 140 may access the LBS account associated with the communication devices 102 and 104. Based on rules and/or preference of the LBS account, the location server 140 may determine, based on rules, preferences, and/or other information in the LBS account, whether the transaction should be automatically approved. That is, whether the transaction should be approved or denied regardless of the distance between the communication devices 102 and 104. In instances that the transaction cannot be automatically approved or denied, the exemplary steps may advance to step 408. In instances that the transaction is to be automatically approved or denied, the exemplary steps may advance to step 412.

In step 412, the location server 140 may determine the distance between the communication devices 102 and 104. In this regard, the location server 140 may send a request to one or both of the communication devices 102 and 104 via one or more of the wireless AP 112a, wireless AP 112b, the cellular BS 114, the WiMAX BS 116, and/or the broadcast tower 118. The location information may be communicated via a security subsystem 220 in each of the communication devices 102 and 104 such that the location information may be trusted by the location server 140. Subsequent to step 408, the exemplary steps may advance to step 410.

In step 410, the location server 140 may determine whether to approve the transaction based on the distance between the communication devices 102 and 104. How the distance between the communication devices 102 and 104...
factors into the determination may depend on the rules and/or preferences of the LBS account. For example, the transaction may be approved in instances that the communication devices 102 and 104 are within X feet of each other. In instances that the transaction is approved based on the distance between the communication devices 102 and 104, the exemplary steps may advance to step 412. In step 412, the location server 140 may notify the server 132 that the transaction is approved. In step 414, the transaction may be completed.

[0065] Returning to step 410, in instances that the transaction is denied, the location server 140 may seek approval of the transaction via an out-of-band channel. For example, the location server 140 may call or send a message to the communication device 104 requesting manual approval from the user of the communication device 104. The user may reply to the message and send his or her approval or denial. For example, to approve the transaction, the user may have to provide a password. In instances that the user denies the transaction, the exemplary steps may advance to step 422. In step 422, the location server 140 may notify the server 132 of the denial and the server 132 may, in turn, deny the transaction.

[0066] Although various steps and/or functions described with respect to FIG. 4 are described as being performed in the location server 140, the invention need not be so limited. For example, the location server 140 may provide location related data to another server or device and such steps and/or functions may be performed in that server or device.

[0067] Although some devices are referred to as “communication devices” and some are referred to as “network devices” such terminology is for clarity of description only and is not meant to limit the types or capabilities of the devices.

[0068] Various aspects of a method and system for authorizing transactions based on relative location of devices are provided. In an exemplary embodiment of the invention, data relating to a location of a first communication device 102 and data relating to a location of a second communication device 104 may be received, a distance between the first communication device 102 and the second communication device 104 may be determined based on the received data, and whether to approve a transaction may be determined based on the determined distance. The transaction may have been initiated from one of the first communication device 102 and the second communication device 104, and may comprise a need to access an account, such as a financial or internet-accessible account. The transaction may be approved in instances that the first communication device 102 and the second communication device 104 are within a predetermined distance of each other. The received data may comprise global navigation satellite system (GNSS) coordinates. The received data may comprise distance information determined via communications between the first communication device 102 and the second communication device 104. The communications may be between or involve a security subsystem 220 in each of the communication devices 102 and 104. The communications between the first communication device 102 and the second communication device 104 may be in accordance with Bluetooth and/or IEEE 802.11 standards, for example. The first communication device 102 and the second communication device 104 may be associated, in a database 142, with the account. Whether to approve the transaction may be determined based on preferences associated, in the database 142, with one or both of the first communication device 102 and the second communication device 104. The transaction may comprise an electronic payment or funds transfer. Determining whether to approve the transaction may occur in response to a request from a network device 132. A result of the determination of whether to approve the transaction may be communicated to the network device 132.

[0069] Other embodiments of the invention may provide a non-transitory computer readable medium and/or storage medium, and/or a non-transitory machine readable medium and/or storage medium, having stored thereon, a machine code and/or a computer program having at least one code section executable by a machine and/or a computer, thereby causing the machine and/or computer to perform the steps as described herein for authorizing transactions based on relative location of devices.

[0070] Accordingly, the present invention may be realized in hardware, software, or a combination of hardware and software. The present invention may be realized in a centralized fashion in at least one computer system, or in a distributed fashion where different elements are spread across several interconnected computer systems. Any kind of computer system or other apparatus adapted for carrying out the methods described herein is suited. A typical combination of hardware and software may be a general-purpose computer system with a computer program that, when being loaded and executed, controls the computer system such that it carries out the methods described herein.

[0071] The present invention may also be embedded in a computer program product, which comprises all the features enabling the implementation of the methods described herein, and which when loaded in a computer system is able to carry out these methods. Computer program in the present context means any expression, in any language, code or notation, of a set of instructions intended to cause a system having an information processing capability to perform a particular function either directly or after either or both of the following: a) conversion to another language, code or notation; b) reproduction in a different material form.

[0072] While the present invention has been described with reference to certain embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the scope of the present invention. In addition, any modifications may be made to adapt a particular situation or material to the teachings of the present invention without departing from its scope. Therefore, it is intended that the present invention not be limited to the particular embodiment disclosed, but that the present invention will include all embodiments falling within the scope of the appended claims.

What is claimed is:
1. A method for networking, the method comprising:
in a first network device:
receiving data relating to a location of a first communication device and data relating to a location of a second communication device;
determining a distance between said first communication device and said second communication device based on said received data relating to said location of said first communication device and said received data relating to said location of said second communication device;
determining, based on said determined distance, whether to approve a transaction, wherein said transaction was initiated from one of said first communication device and said second communication device, and said transaction comprises a need to access an account; and communicating a result of said determining whether to approve said transaction.

2. The method according to claim 1, wherein said transaction is approved in instances that said first communication device and said second communication device are within a predetermined distance of each other.

3. The method according to claim 1, wherein one or both of said received data relating to said location of said first communication device and said received data relating to said location of said second communication device comprises global navigation satellite system (GNSS) coordinates.

4. The method according to claim 1, wherein one or both of said received data relating to said location of said first communication device and said received data relating to said location of said second communication device comprises distance information determined via communications between said first communication device and said second communication device.

5. The method according to claim 4, wherein said communications are in accordance with one or both of Bluetooth standards and IEEE 802.11 standards.

6. The method according to claim 1, wherein said communications are between a secure subsystem within said first communication device and a secure subsystem within said second communication device.

7. The method according to claim 1, wherein said first communication device and said second communication device are associated, in an database accessible by said first network device, with said account.

8. The method according to claim 7, wherein whether to approve said transaction is determined based on preferences associated, in said database, with one or both of said first communication device and said second communication device.

9. The method according to claim 1, wherein said transaction comprises an electronic payment or funds transfer.

10. The method according to claim 1, wherein said determining whether to approve said transaction occurs in response to a request from a second network device.

11. The method according to claim 10, wherein a result of said determining whether to approve said transaction is communicated to said second network device.

12. A system comprising one or more circuits and/or processors for use in connection with a location server, said one or more circuits and/or processors being operable to: receive data relating to a location of a first communication device and data relating to a location of a second communication device; determine a distance between said first communication device and said second communication device based on said received data relating to said location of said first communication device and said received data relating to said location of said second communication device; determine, based on said determined distance, whether to approve a transaction, wherein said transaction was initiated from one of said first communication device and said second communication device, and said transaction comprises a need to access an account; and communicating a result of said determining whether to approve said transaction.

13. The system according to claim 12, wherein said transaction is approved in instances that said first communication device and said second communication device are within a predetermined distance of each other.

14. The system according to claim 12, wherein one or both of said received data relating to said location of said first communication device and said received data relating to said location of said second communication device comprises distance information determined via communications between said first communication device and said second communication device.

15. The system according to claim 12, wherein one or both of said received data relating to said location of said first communication device and said received data relating to said location of said second communication device comprises global navigation satellite system (GNSS) coordinates.

16. The system according to claim 15, wherein said communications are between a secure subsystem within said first communication device and a secure subsystem within said second communication device.

17. The system according to claim 15, wherein said communications are in accordance with one or both of Bluetooth standards and IEEE 802.11 standards.

18. The system according to claim 12, wherein said first communication device and said second communication device are associated, in a database accessible by said location server, with said account.

19. The system according to claim 18, wherein whether to approve said transaction is determined based on preferences associated, in said database, with one or both of said first communication device and said second communication device.

20. The system according to claim 12, wherein said transaction comprises an electronic payment or funds transfer.

21. The system according to claim 12, wherein said determining whether to approve said transaction occurs in response to a request from a network device.

22. The system according to claim 21, wherein a result of said determining whether to approve said transaction is communicated to said network device.