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(54) **SYSTEMS AND METHODS FOR MAPPING RELEVANT PERSONAL CONNECTIONS**

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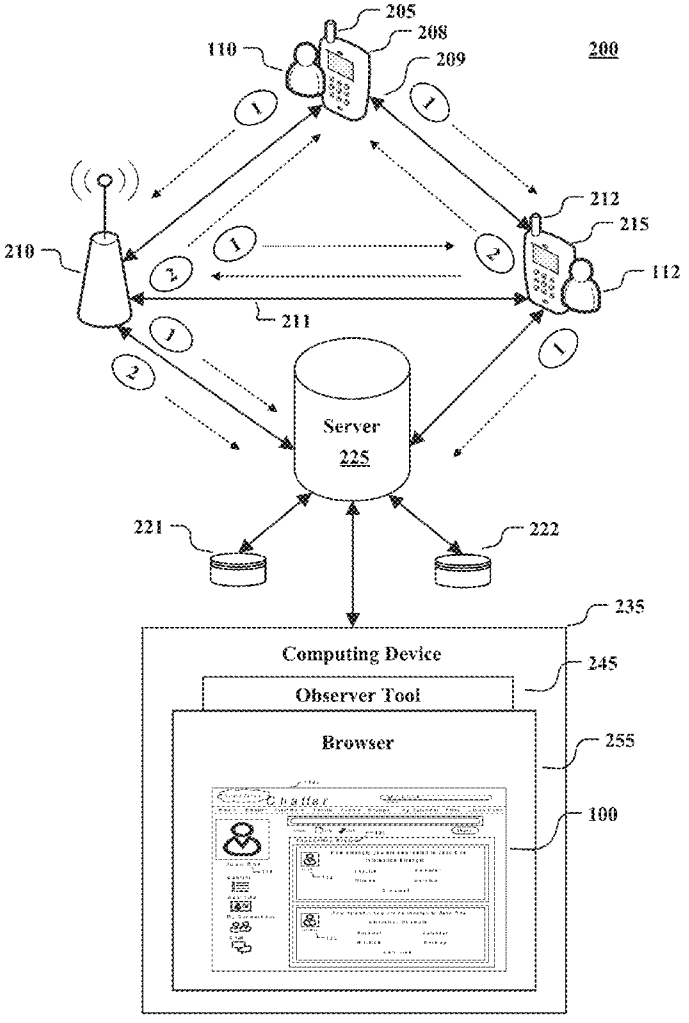
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(57) **ABSTRACT**

The technology disclosed relates to calculating interaction strengths for physical interactions, scheduled physical interactions and wireless interactions between users of online social networks. In particular, it relates to determining direct contact or likely contact between users of online social networks based in part on their mobile communication devices. This determination can be used to score interactions that take place outside the social network for interaction strengths.



Online Social Network Environment

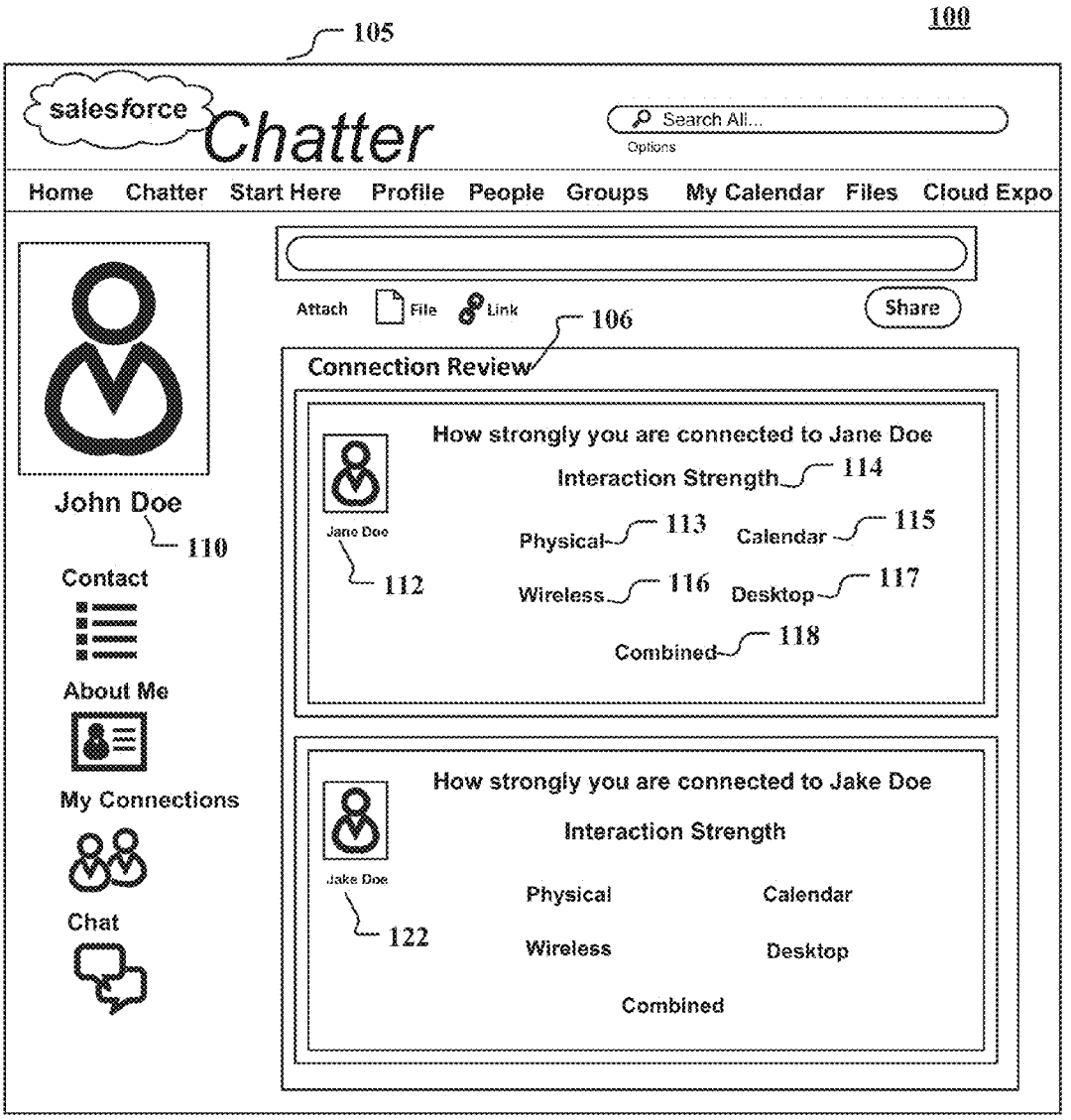


Fig. 1 – Social Profile of a User

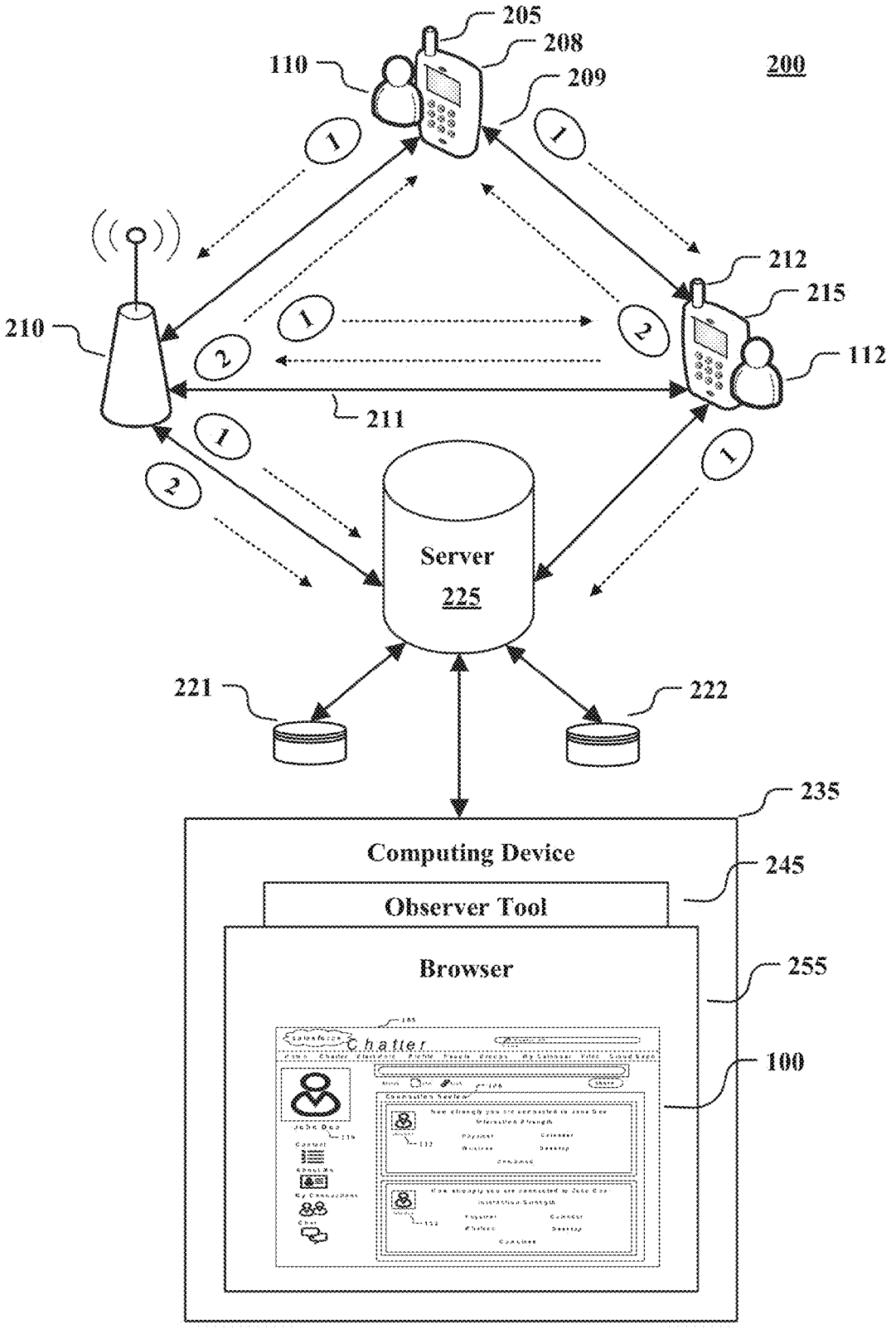


Fig. 2 – Online Social Network Environment

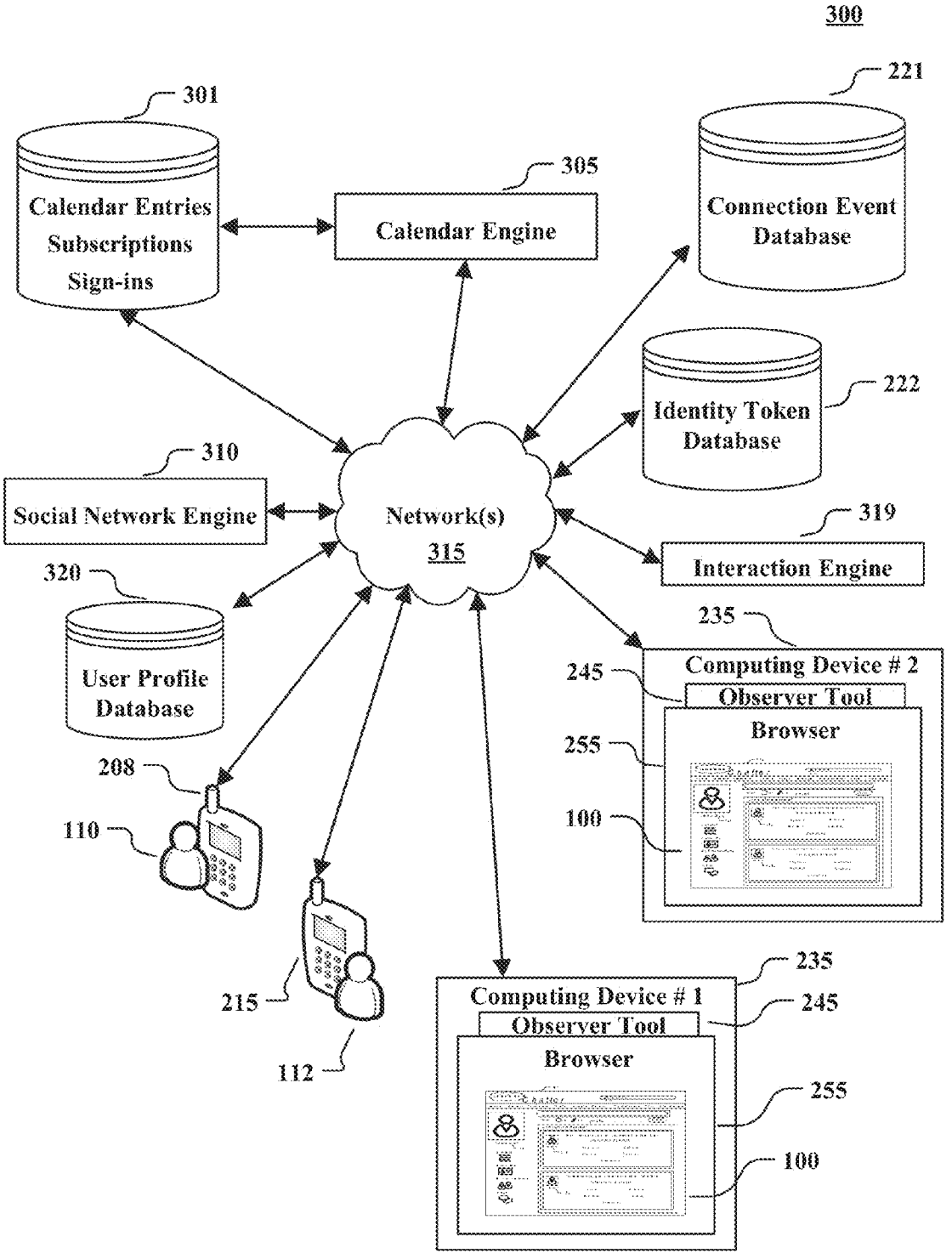


Fig. 3 – Representative System for Mapping Relevant Personal Connections

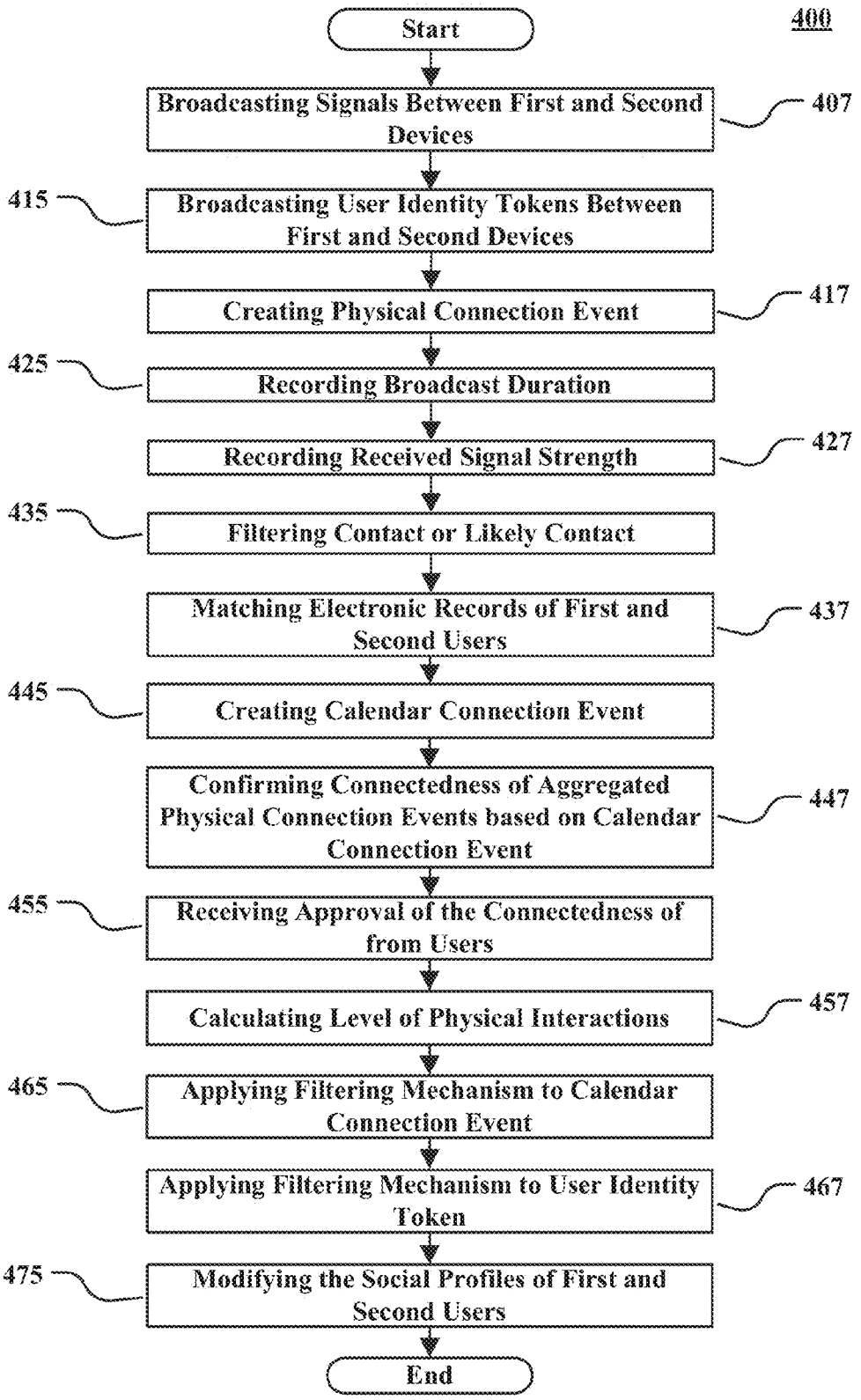


Fig. 4 – Flow Chart of Calculating Level of Physical Interactions in Peer-to-Peer Connection

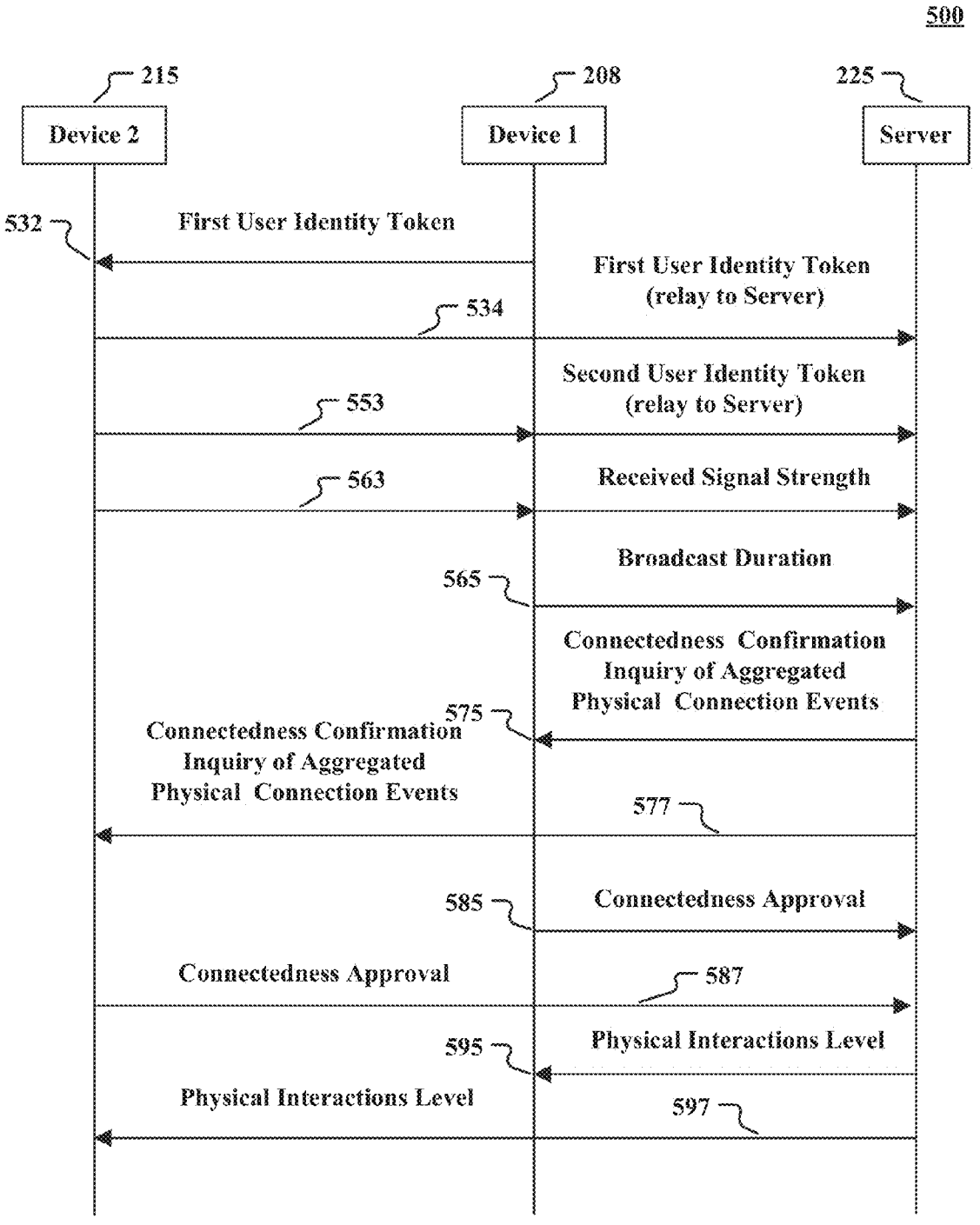


Fig. 5 – Message Sequence Chart of Calculating Physical Interactions Level in Peer-to-Peer Conneciton

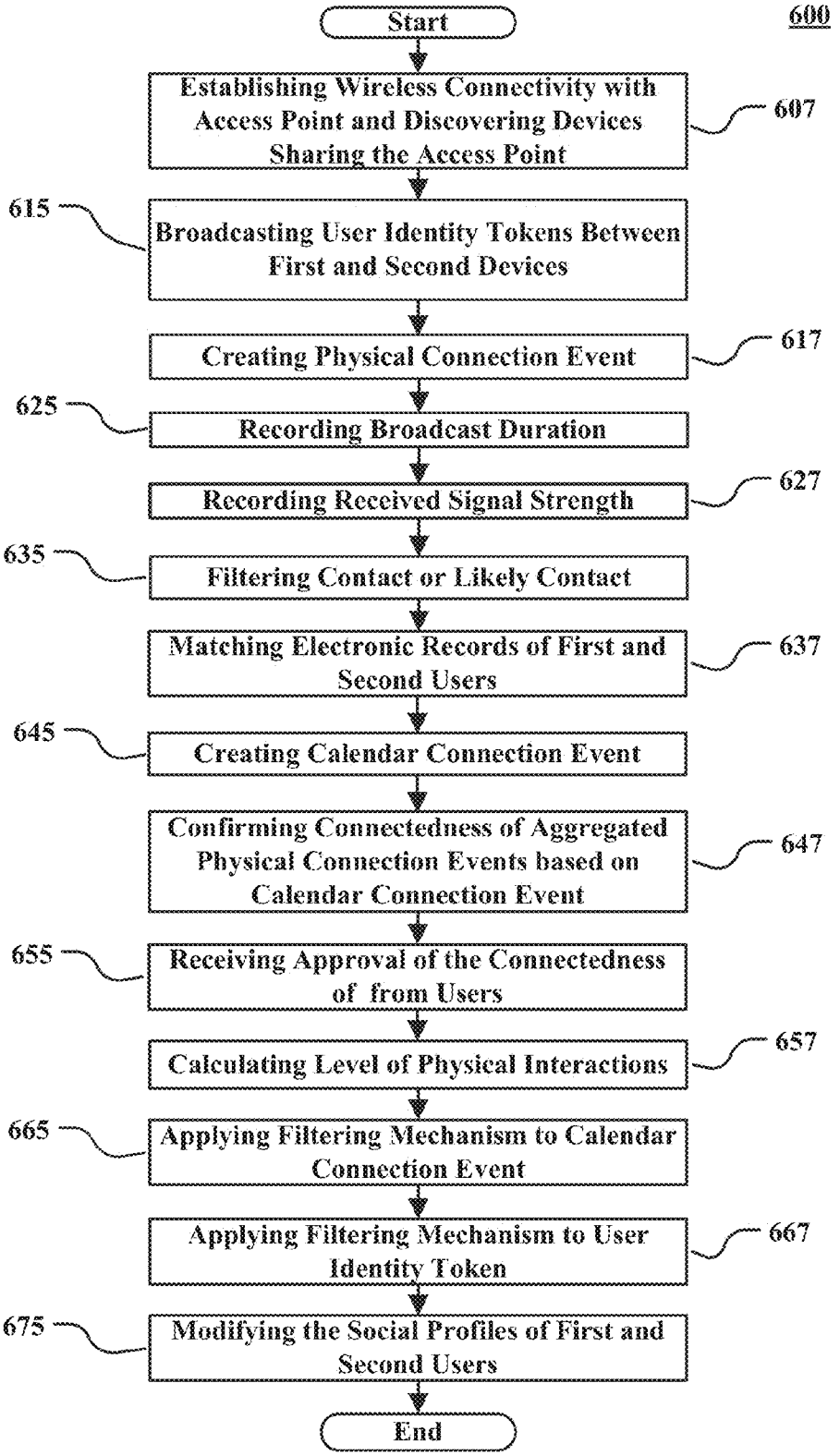


Fig.6 – Flow Chart of Calculating Level of Physical Interactions in WLAN Connection

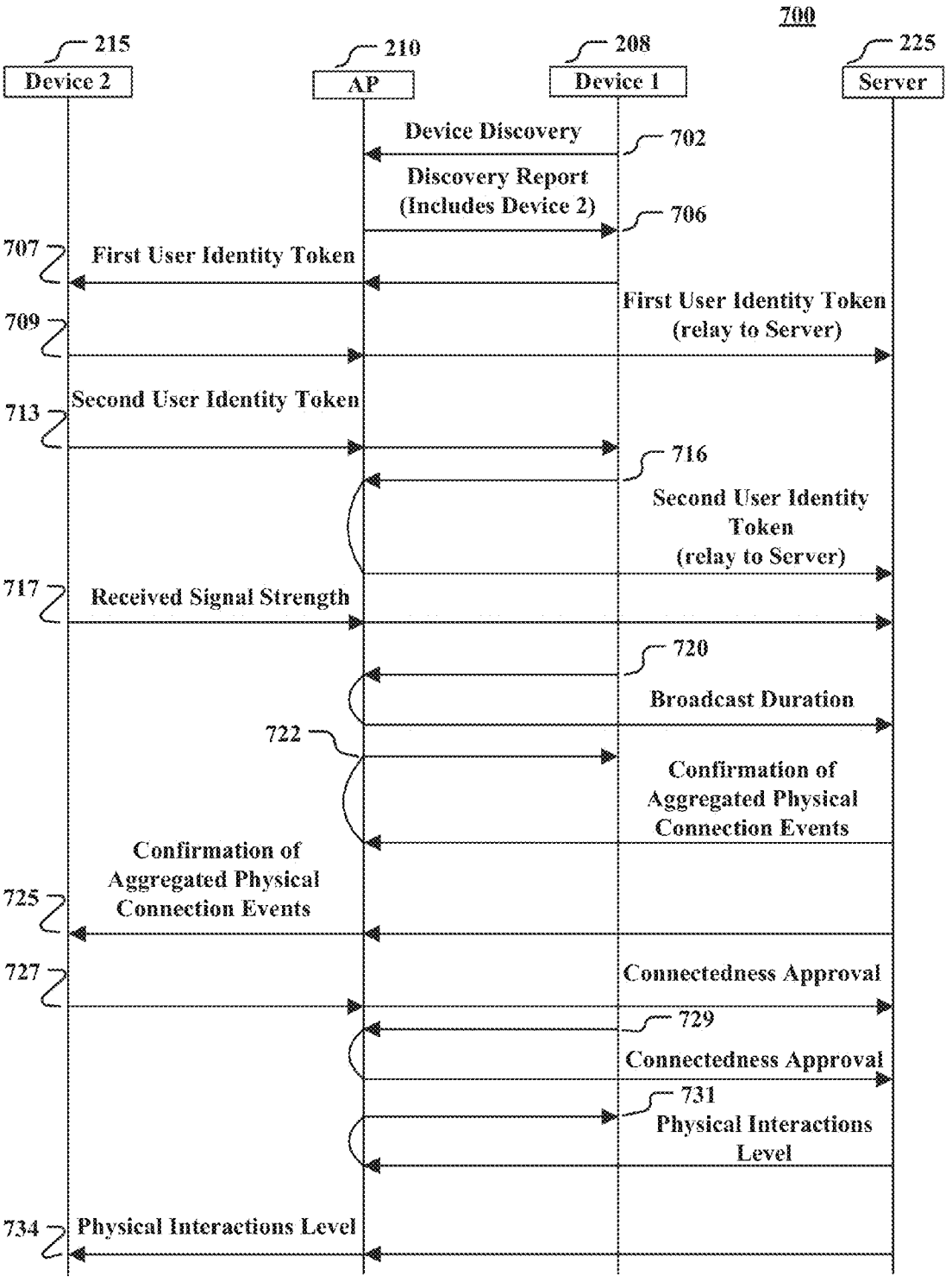


Fig. 7 – Message Sequence Chart of Calculating Physical Interactions Level in WLAN Connection

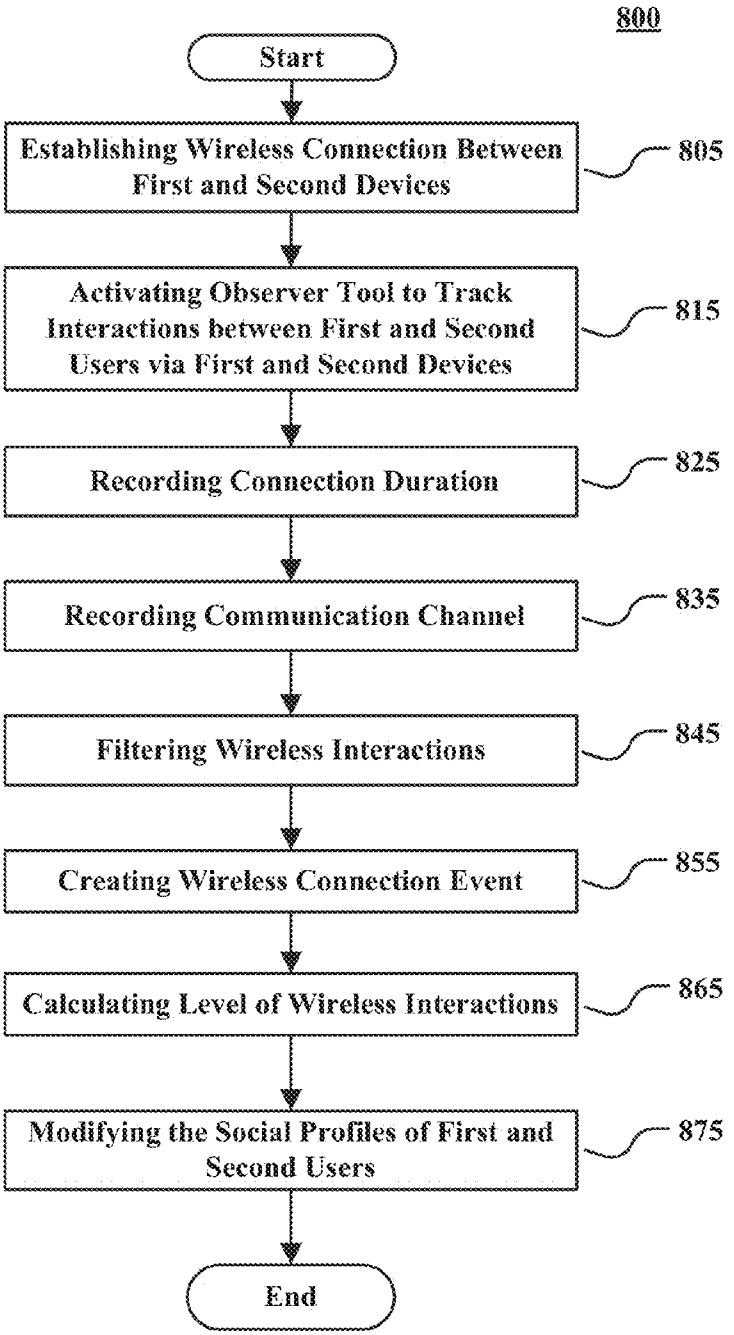


Fig. 8 – Flow Chart of Calculating Wireless Interactions Level

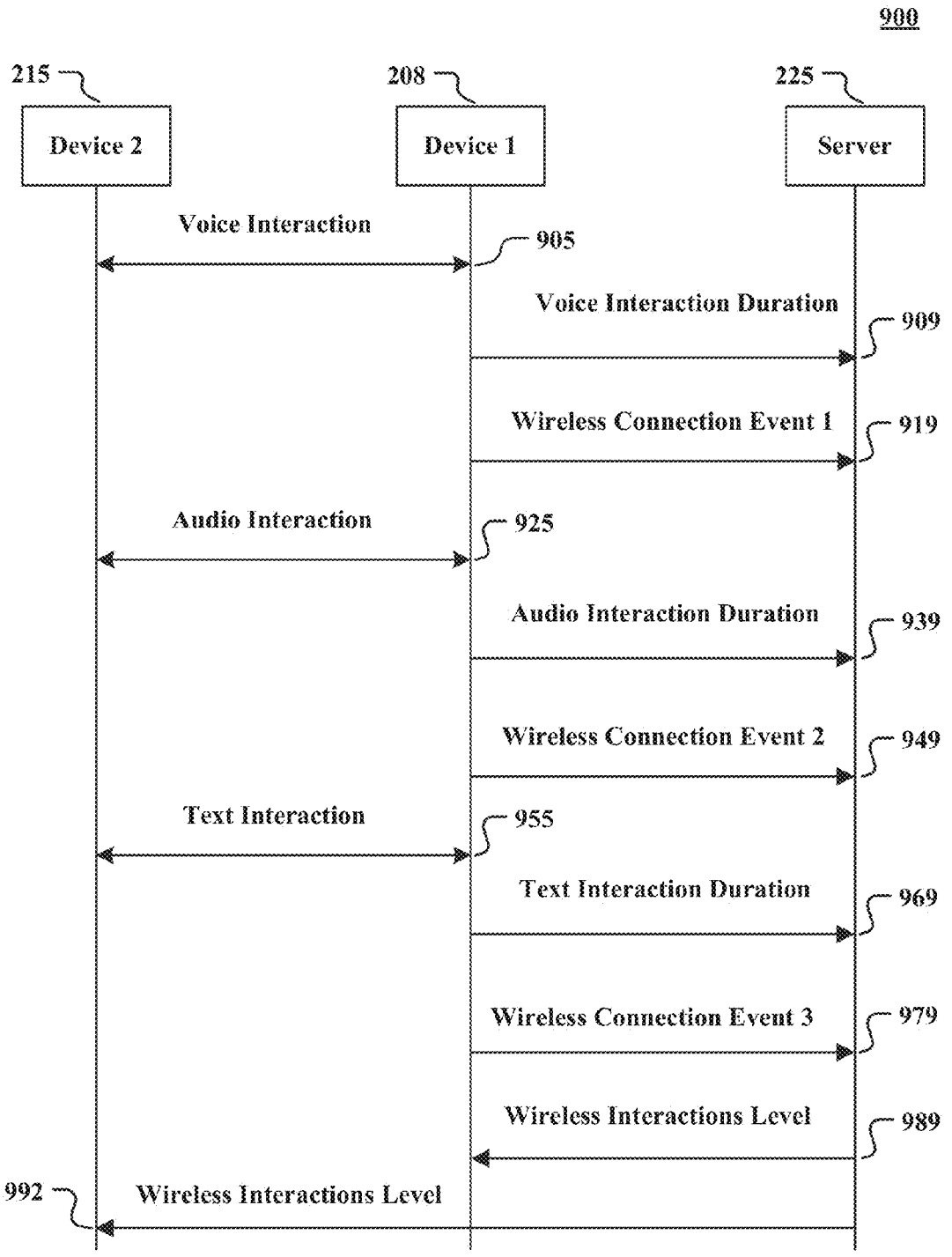


Fig. 9 – Message Sequence Chart of Calculating Wireless Interactions Level

SYSTEMS AND METHODS FOR MAPPING RELEVANT PERSONAL CONNECTIONS

RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 61/579,098, entitled, "Systems and Methods for Mapping Relevant Personal Connections," filed on 17 Jan. 2012. The provisional application is hereby incorporated by reference for all purposes.

BACKGROUND

[0002] The subject matter discussed in the background section should not be assumed to be prior art merely as a result of its mention in the background section. Similarly, a problem mentioned in the background section or associated with the subject matter of the background section should not be assumed to have been previously recognized in the prior art. The subject matter in the background section merely represents different approaches, which in and of themselves may also correspond to implementations of the claimed inventions.

[0003] The technology disclosed relates to calculating interaction strengths for physical interactions, scheduled physical interactions and wireless interactions between users of online social networks. In particular, it relates to determining direct contact or likely contact between users of online social networks based in part on their mobile communication devices. This determination can be used to score interactions that take place outside the social network for interaction strengths.

[0004] Online social networks have become common tools through which users interact and share information across various channels including as messages, e-mails, videos, chat rooms, blogs, etc. The inherent value of an online social network is rooted in the value of a users' connections to other users and objects. Typically, most of this value is derived from actions performed and captured on the social network websites. For example, a user may actively follow, like, or comment on another user or object in order to integrate that user or object with the user's social network. Currently, actions external to the online social network cannot be used to influence the relationship between users or between users and objects on an online social network.

[0005] User interactions outside of the context of an online social network are not captured or represented in a meaningful way by the social network. For instance, a physical interaction with another user such as attending a meeting and conversing, or collectively viewing a presentation, contributes to a social network. However, there may not be any explicit interaction through the social network, resulting in online social networks not being able to capture such real-world interactions.

[0006] An opportunity arises to provide users of an online social network with mechanisms and methods for mapping connections with other relevant users of the online social network. In particular, the technology disclosed allows users of an online social networks to capture real-world interactions with other users and represent them on the online social network. Improved representation and analysis of inter-user relationships may result.

SUMMARY

[0007] The technology disclosed relates to calculating interaction strengths for physical interactions, scheduled physical interactions and wireless interactions between users of online social networks. In particular, it relates to determining direct contact or likely contact between users of online social networks based in part on their mobile communication devices. This determination can be used to score interactions that take place outside the social network for interaction strengths.

[0008] Other aspects and advantages of the present invention can be seen on review of the drawings, the detailed description and the claims, which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The included drawings are for illustrative purposes and serve only to provide examples of possible structures and process operations for one or more implementations of this disclosure. These drawings in no way limit any changes in form and detail that may be made by one skilled in the art without departing from the spirit and scope of this disclosure. A more complete understanding of the subject matter may be derived by referring to the detailed description and claims when considered in conjunction with the following figures, wherein like reference numbers refer to similar elements throughout the figures.

[0010] FIG. **1** illustrates one implementation of a graphical user interface representing a social profile associated with a user.

[0011] FIG. **2** illustrates one implementation of an exemplary online social network environment.

[0012] FIG. **3** illustrates one implementation of an example system that allows mapping of relevant personal connections.

[0013] FIG. **4** is a flow chart of one implementation of calculating level of physical interactions between first and second users using first and second devices operating in peer-to-peer mode.

[0014] FIG. **5** is a message exchange chart of one implementation of some elements of FIG. **4**.

[0015] FIG. **6** is a flow chart of one implementation of calculating level of physical interactions between first and second users using first and second devices participating in a wireless local area network.

[0016] FIG. **7** is a message exchange chart of one implementation of some elements of FIG. **6**.

[0017] FIG. **8** is a flow chart of one implementation of calculating level of wireless interactions between first and second users using first and second devices.

[0018] FIG. **9** is a message exchange chart of one implementation of some elements of FIG. **8**.

DETAILED DESCRIPTION

[0019] The following detailed description is made with reference to the figures. Sample implementations are described to illustrate the technology disclosed, not to limit its scope, which is defined by the claims. Those of ordinary skill in the art will recognize a variety of equivalent variations on the description that follows.

[0020] Physical and wireless interactions between users or between users and objects can be used to calculate and/or build the users' social network. For example, the frequency of interaction between users can be used to measure the interaction strength of their relationship. In some implementa-

tions, actions external to the online social network can be used to affect the interaction strength of users in an online social network.

[0021] Interaction strength information can be shared to the extent allowed by settings. All social network users, or only those users who follow the first user, or only the first user can view the interaction strength on first user's profile page. Interaction strength can be based on metrics, such as the number of interactions within a defined time period (i.e., frequency), the length of interaction, and the like. This interaction strength calculation can consider interactions outside of the online social network, such as interactions observed with a CRM system. A first user's interactions with a second user recorded in the CRM system can be provided to the social network and used to determine interaction strength. In yet another implementation, interaction strength can also be based upon multiple social network interactions.

[0022] Physical interactions are captured based on wireless interactions between mobile communication devices of two users. Use cases for peer-to-peer communication between the respective mobile devices and simultaneous interaction with a shared access point are described. These use cases have in common physical proximity of users. The proximity of mobile communication devices is used as a proxy for user interaction or at least for shared user experiences due to physical proximity.

[0023] Scheduled physical interactions are captured from calendar entries, event subscriptions, sign-ins and the like that place two users at the same event. The scheduled physical interactions may be analyzed when the user's respective privacy settings allow. Analysis of schedule physical interactions may be triggered by another interaction event, thereby reducing the potential intrusiveness of analyzing calendars.

[0024] Wireless communication interactions outside the social network can be monitored using observer software residing on respective mobile communication devices.

[0025] The observer software can monitor video, audio and text communications channels that are out of band from the social network.

[0026] In each of these use cases, connection events such as physical connection event, calendar connection event or wireless connection event can be created and stored in a database. A physical connection event can be triggered by reception of a user identity token. The receiving device can record the duration and strength of the signal that broadcasted the user identity token. It also can record the number of token broadcasts received and optionally their timing or continuity. Similarly, a calendar connection event is a memory update caused by a find or match of calendar related electronic records of two users indicating their co-attendance at an event. Likewise, a wireless connection event is registered at a server when two users communicate with each other outside the social network using their respective wireless devices.

[0027] Moreover, the connection events can be processed to determine connectedness scores for pairs of users. Connectedness scores can be made available to users for their own connections and to permitted viewers

[0028] Actions performed by a user outside the social network can be analyzed from browser cookies or the user's browser history. A user can use permission levels to set the level of access to his browser history or to real-time browser actions. For purposes of this example, the actions of the user can be accessed or tracked by an "observer tool."

[0029] Once the observer tool is activated, either by the user or an administrator having sufficient privileges, the actions of the user can be analyzed. The observer tool can see that the user interacts with a number of other users or objects on the social network, regardless of whether the user is following those other users or objects on the social network. Interactions can include, but are not limited to, viewing a profile page of the user or object, commenting on a post mentioning the user or object, initiating a chat session with the user, sending a message to the user, and the like. If the first user is not following or is otherwise not connected to the user or object with which he or she is interacting, the observer tool can trigger an action to suggest that the first user follow the user or object, or the observer tool can trigger that the user or object be automatically followed by the first user based upon a configurable number of interactions.

[0030] In one example, a first user can meet a second user at a conference, where electronic interactions between users' respective communication devices can confirm proximity and interaction between the users. For instance, each device may broadcast identity tokens once per minute. Each device may receive ten tokens in ten minutes with a received signal strength indicator for peer-to-peer wireless channel that suggests close physical proximity. Such interactions can affect the interaction strength of the second user in the first user's social network, and vice-versa. Alternatively or additionally, calendar entries common to both the users can contribute to an interaction strength for the two users.

[0031] In another example, a second user can be excluded from interaction strength calculation. The first user may not want to measure the extent of his or her relationship with the second user. However, if the second user provides an incentive, such as a piece of contact information, access, or other object or portion of an object to the first user, the first user may include the second user in the interaction strength calculation.

[0032] The technology disclosed relates to online social networks for use in a computer-implemented system. The described subject matter can be implemented in the context of any computer-implemented system, such as a software-based system, a database system, a multi-tenant environment, or the like. Moreover, the described subject matter can be implemented in connection with two or more separate and distinct computer-implemented systems that cooperate and communicate with one another. One or more implementations may be implemented in numerous ways, including as a process, an apparatus, a system, a device, a method, a computer readable medium such as a computer readable storage medium containing computer readable instructions or computer program code, or as a computer program product comprising a computer usable medium having a computer readable program code embodied therein.

Social Profile

[0033] FIG. **1** illustrates one implementation of a graphical user interface **100** representing a social profile **105** associated with a user **110**. In particular, FIG. **1** illustrates the social profile **105** of user John Doe **110** on an online social network **200** such as Salesforce's Chatter. The social profile **105** can include the user's name, contact information, professional information, and/or picture. In addition, the social profile **105** can list other users connected with John Doe **110** including Jane Doe **112** and Jake Doe **122**.

[0034] In some implementations, the social profile **105** can include a connection review tab **106** that displays interaction

strength **114** of John Doe **110** with other users such as Jane Doe **112** and Jake Doe **122**. The interaction strength **114** can be based on physical interactions **113**, calendar events **115**, wireless interactions **116**, desktop history **117**, combined interactions **118**, and the like, which can be displayed as separate individual tabs. The interaction strength **114** can be indicated through scoring functions, point system, meters, highlighting or other graphical enhancements, ordering, mouseovers, or indicators. In other implementations, selecting one of these tabs can open a new view or browser window elaborating the selected tab. Another example can include a list created by John Doe **110** to view his interaction strength with specific users.

Online Social Network

[0035] FIG. **2** illustrates one implementation of an online social network environment **200**. The users **110** and **112** of online social network environment **200** can use wireless devices **208** and **215** communicating through peer-to-peer connection **209** or simultaneously interacting with a shared access point **210** (AP) configured on a wireless local area network **211** (WLAN).

[0036] The devices **208** and **215** can include a number of components, the controlling components being processors. Processors can include one or more digital signal processor (DSP), microprocessor, microcontroller, central procession unit (CPU) or graphics processing unit (GPU), application specific integrated circuit (ASIC), reduced instruction set computing (RISC) or field-programmable gate array (FPGA) or a combination of these processor types. Processors can control the overall operations of the devices **208** and **215**. In addition to their operating system functions, they can execute software applications on the devices **208** and **215**. The processors can interact with other components of the respective devices **208** and **215** such as radio frequency (RF) transceivers, device interfaces, memory units, etc.

[0037] The communication related functions of the devices **208** and **215** are performed by the RF transceivers. The RF transceivers can transmit/receive RF signals through antennas **205** and **212**. For transmission, the RF transceivers can perform data channel-coding and spreading. In case of reception, they can convert received RF signals into baseband signals and perform de-spreading and channel decoding on the baseband signals to recover the original data.

[0038] Additionally, RF transceivers can search for neighboring RF transceivers and perform a discovery or pairing process. The RF transceivers in conjunction with the processors can—function as a signal measurement unit for determining the strength of a received signal or received signal strength indication (RSSI), implement a timer for determining the duration of a connection or broadcast, and place timestamps on the transferred signals for recording the date and time of transmission or reception.

[0039] The input/output related functions of the devices **208** and **215** are executed by device interfaces. The device interfaces can comprise of various input/output sub-systems such as a display, keyboard, microphone, speaker, serial port, etc. In some implementations, the devices **208** and **215** can include one or more device interfaces for providing users access to various system components and receiving information.

[0040] The memory units such as Read Only Memory (ROM), Random Access Memory (RAM), flash memory and disk drive among others, can provide persistent or volatile storage. In some implementations, the memory units can store—micro-codes of a program for processing and controlling device operations, temporary data generated during program executions, reserved data, and data transmitted and received by the devices **208** and **215**.

User Identity Tokens

[0041] Snippets of data, referred to as "user identity tokens" **1** and **2** can be used for discovery of respective users **110** and **112** of the online social network **200**. In some implementations, user identity tokens **1** and **2** can include encrypted data unique to users **110** and **112**. In addition, the user identity tokens **1** and **2** can include the social identities of the users **110** and **112** setup on the online social network **200**. In other implementations, the server **225** can generate encrypted "user identifier keys" unique to the users of online social network **200**. Users **110** and **112** can anonymously broadcast their user identifier tokens **1** and **2** or user identifier keys to identify other users of the online social network **200**. Other authentication protocols can be implemented.

[0042] Short-range communication systems such as Bluetooth, Near Field Communication (NFC), RFID, Z-Wave, ZigBee, etc. can establish peer-to-peer (P2P) connection **209** between devices that are in close physical proximity of each other. During a P2P connection **209**, devices **208** and **215**, when within transmission range of each other, broadcast user identity tokens **1** and **2**. In P2P passive or connectionless mode, one of the devices can initiate the broadcast, and other can behave as a receiver without pairing. In P2P active mode, in which the devices are paired or have built a connection, both devices **208** and **215** can transmit and receive identity tokens **1** and **2**.

[0043] WLAN **211** such as Wi-Fi, can connect the devices **208** and **215** to AP **210** using medium range signals. During WLAN connection **211**, devices **208** and **215** can operate in broadcast (connectionless) or connected modes. In a broadcast mode, broadcasting devices **208** and **215** connected to a shared AP **210** can be presumed to be in close proximity. Tokens can, for instance, be broadcast to MAC address or to another MAC or IP address of a defined network segment scope. Broadcasting to a MAC address is supported by IPv4 and IEEE 802.11. In IPv6, multicasting takes the place of broadcasting. Tokens can be embedded in recognized broadcast message types. One example of a broadcast protocol is Internet Control Message Protocol, which is implemented in both IPv4 and IPv6. ICMP messages of various types could be used or a new type chosen from the reserved range of type codes. Another example of a broadcast protocol supported by IPv4 is the address resolution protocol (ARP). Query messages can be used to scan a WLAN segment **211**. From responses to a query, a list of unique media access control (MAC) addresses of connected devices can be compiled. In IPv6, the neighborhood discovery protocol (NDP) specifies a variety of multicast message types that could be adapted for transmitting identity token information. When the devices **208** and **215** can broadcast ARP messages or user identity tokens **1** and **2**, the AP can forward the broadcasts to other connected devices. In some implementations, multiple APs covering a single location, such as a large meeting room, can be relay broadcasts as a group or can be treated as a single AP.

Connection Events

[0044] Upon receiving user identity tokens, the devices **208** and **215** can store the tokens in their local memory units and

automatically or manually upload them to server **225** connected to an identity token database **222**. The server **225** can use identity tokens individually or in aggregate to create a physical connection event in the connection event database **221**.

[0045] In some implementations, the system or users **110** and **112** can set a threshold or timeout limit to help the mobile devices aggregate physical connection events resulting from successive reception of the same user identity token. In aggregated physical connection events resulting from reception of multiple user identity tokens, user identity tokens with higher counts, lengthier timestamps readings, or greater received signal strengths indications (RSSI) can indicate sustained and close proximity of two devices.

[0046] Aggregation can be performed on the devices **208** and **215**, the server **225**, or both. For instance, the devices **208** and **215** may aggregate received user identity tokens to determine a timestamp duration. In some implementations, failure to receive a user identity token from a broadcasting device within a pre-set time window can cause the receiving device to close and summarize a connection event. After a timeout duration without receiving further user identity tokens, the devices **208** and **215** may forward the batch of collected user identity tokens and associated metadata including timestamp durations and RSSI values to the server **225**. The devices **208** and **215** can indicate the quality of a transmission as "strong" or "average" based on the number of collected user identity tokens and the associated metadata values. The quality of a broadcast can indicate close proximity of the broadcasting device and be used by the sever **255** for interaction strength calculation. In other implementations, aggregation of subsequent user identity tokens can be limited by the server.

[0047] The aggregated physical connection events and corresponding calendar connection events can be used to calculate a level of physical interactions (explained later). The calculated level of physical interactions can be depicted through an interaction strength metric on the social profile **105** of John Doe **110**. The social profile **105** can be accessed from a browser **255** running on the computing device **235** and being tracked by an observer tool **245**. The browser **255** can be Chrome, Internet Explorer, Firefox, Safari, etc. or the like that is capable of sending and receiving information to and from the server **225**. In some implementations, the server **225** can apply a filter to calendar connection events and received user identity tokens for identifying particular events or user properties desired by the users **110** and **112**.

[0048] In some implementations, the devices **208** and **215** can use Bluetooth technology, which can include an identification phase and a pairing phase. During the identification phase, the broadcasting device **208** can set a frequency-hopping pattern, to which the device **215** can synchronize its signals. In the pairing phase, the device **208** and **215** can transmit low power short-range RF signals and broadcast user identity tokens **1** and **2**. Alternatively, tokens can be received and processed without pairing in a connectionless mode.

[0049] In other implementations, the devices **208** and **215** can use NFC for ultra-short-range communication and replace the identification phase of the Bluetooth technology with a simple tap between the devices **208** and **215**. In case of NFC, antennas **205** and **212** can function as windings of a transformer to generate high power ultra-short-range RF signals for broadcasting user identity tokens **1** and **2**.

[0050] In other implementations, the devices **208** and **215** can participate in the WLAN **211** through Wi-Fi, via an AP **210** that broadcasts a Wi-Fi signal usable over a medium-range area. In response to a MAC address based ARP scan initiated by devices **208** and **215**, the AP **210** can generate a list of devices connected to it along with their MAC address, names, format, Internet Protocol (IP), etc. The devices **208** and **215** can then use the user identity tokens to filter those devices from the list whose users are in the same online social network environment as those of devices **208** and **215**.

[0051] FIG. **3** illustrates one implementation of an example system **300** that allows mapping of relevant personal connections. In FIG. **3**, the components are configured to operate within an execution environment hosted by a device and/or multiple devices, as in a distributed execution environment. Exemplary computing devices can include desktop computers, servers, networking devices, notebook, computers, PDAs, mobile phones, digital image capture devices and the like. The wireless devices **208** and **215** and computing devices **1** and **2** can be communicatively coupled to one another via network **315**. The network **315** may be any network or combination of networks of devices that communicate with one another. For example, network **315** can be any one or any combination of Local Area Network (LAN), Wide Area Network (WAN), telephone network, wireless network, point-to-point network, star network, token ring network, hub network, or other appropriate configuration including the Internet.

[0052] The calendar entries store **301** can store the calendar entries, event subscriptions, and sign-ins of the users **110** and **112**, which are matched in the calendar engine **305** to create or capture calendar connection events after locating a scheduled physical connection by finding a coincidence of scheduling, registration or check-in information in electronic records of the users **110** and **112**. The calendar connection event can correspond to information stored with the physical connection event in time or location. If the timestamp and location recordings related to a physical connection event matches the time and venue entries associated with a scheduled connection event, then the two connection events can be presumed to correspond to each other.

[0053] The connection events can be further stored in the calendar events store **309**. The social network engine **310** can provide online social applications that store the social profiles of the users **110** and **112**. The interaction engine **319** can calculate the level of physical interaction between the users **110** and **112** by matching the corresponding physical and calendar connection events. The user profile database **320** can include the user identity tokes **1**, **2**, and **3** of users **110** and **112**.

Physical Interactions Level

[0054] FIG. **4** is a flow chart **400** of one implementation of calculating a level of physical interactions between first user **110** using first device **208** and second user **112** using second device **215** communicating via P2P connection **209**. Other implementations may perform the steps in different orders and/or with different, fewer or additional steps than the ones illustrated in FIG. **4**. Multiple steps can be combined in some implementations. For convenience, this flowchart is described with reference to the system that carries out a method. The system is not necessarily part of the method.

[0055] As explained above, when in close proximity with each other, first and second devices **208** and **215** broadcast short-range RF signals at step **407**. The user identity tokens **1** and **2** of respective users **110** and **112** that include users' social identities are broadcasted through the broadcast signals

at step **415**. If the users are members of the online social network **200**, a physical connection event is registered in the connection event database **221** at step **417**. At step **425**, the timestamps of the first and last reception of user identity tokens **1** and **2** can be used to record the broadcast durations. The RSSI values of the broadcasts can be recorded at step **427**, quantifying the quality of broadcasts with each devices **208** and **215**. At step **435**, the presumption of contact or likely contact between the users **110** and **112** is narrowed based on the broadcast durations and RSSI values, with longer broadcasts and higher RSSI values suggesting greater proximity between users **110** and **112**. The electronic records of the users **110** and **112** pertaining to calendar entries, event subscriptions, sign-ins and the like that place two users at the same event are matched at step **437**. A find or a match creates a calendar connection event in the connection event database **221** at step **445**.

[0056] As explained above, the connectedness of aggregated physical connection events with calendar connection events is optionally confirmed at step **447** on the basis of their respective time and location fields. The connectedness confirmation is approved by the users **110** and **112** at step **455** to ensure that they actually attended the events whose calendar entries and the like created the calendar connection events. At step **457**, a level of physical interaction between the users **110** and **112** is calculated by the interaction engine **319** based on the aggregated physical connection events and the corresponding calendar connection events.

[0057] Following this, at steps **465** and **467**, filtering mechanisms are implemented to the calendar connection events and received user identity tokens **1** and **2** for identifying particular events or user properties. At step **475**, the social profiles of the users **110** and **112** are modified on the online social network **200** through an interaction strength metric using scoring functions, point systems, meters, graphical enhancements, etc.

[0058] FIG. **5** is a message exchange chart **500** of one implementation of some elements of FIG. **4**. At exchange **532**, first device **208** sends the user identity token **1** of the first user **110** to second device **215**. The second device **215** relays the received user identity token **1** to the server **225** at exchange **534**, which stores it in the identity token database **221** and identifies the user associated with it. At exchange **553**, second device **215** transmits the user identity token **2** of the second user **112** to first device **208**. The first device **208** relays it to the server **225** for the same "social identity analysis" as at exchange **534**. The RSSI values and broadcast durations are reported to the server **225** at exchanges at **563** and **565**. At exchanges **565** and **575**, the server **225** sends the connectedness confirmation inquiry to the users **110** and **112** via their respective devices **208** and **215**. The users **110** and **112** then approve the connectedness confirmation at exchanges **585** and **587**. Following this, the server **225** sends the level of physical interactions between the users **110** and **112** calculated by interaction engine **319** to the respective devices **208** and **215** at exchanges **595** and **597**.

[0059] FIG. **6** is a flow chart **600** of one implementation of calculating a level of physical interactions between first user **110** using first device **208** and second user **112** using second device **215** communicating via WLAN **211**. Other implementations may perform the steps in different orders and/or with different, fewer or additional steps than the ones illustrated in FIG. **6**. Multiple steps can be combined in some implementations. For convenience, this flowchart is described with reference to the system that carries out a method. The system is not necessarily part of the method.

[0060] As explained above, the first and second devices **208** and **215** wirelessly discover other proximate devices. This discovery can be connectionless or connected, as between wireless devices, each of which is connected to AP **210** at step **607**. In some implementations, a MAC-based ARP scan can be part of the discovery. To reduce potential intrusiveness, the devices **208** and **215** optionally can broadcast user identity tokens **1** and **2** to just those devices whose users are members of the online social network **200**. If first user identity token **1** being broadcasted by first device **208** confirms the membership of user **110** in the online social network **200**, then it is collected by first device **215** at step **615**. Also at step **615**, The second device **215** broadcasts a second user identity token **2**, which is filtered against the profiles stored in the user profile database **320** by the server **225** to confirm that the second user **112** is a member of the online social network **200**. With the reception of the user identity tokens, physical connection events are registered in the connection event database **221** at step **617**. At step **625**, the timestamps of the first and last reception of user identity tokens **1** and **2** are used to record the broadcast durations. The RSSI values of the broadcasts are recorded at step **627**, quantifying the quality of broadcasts with each devices **208** and **215**.

[0061] At step **635**, the presumption of contact or likely contact between the users can be narrowed based on the broadcast durations and RSSI values, with longer broadcasts and higher RSSI values suggesting greater proximity between users. The electronic records of the users pertaining to calendar entries, event subscriptions, sign-ins and the like that place two users at the same event are matched at step **637**. A find or a match creates a calendar connection event in the connection event database **221** at step **645**.

[0062] As explained above, the connectedness of aggregated physical connection events with calendar connection events confirmed at step **647** on the basis of their respective time and location fields. The connectedness confirmation is approved by the users **110** and **112** at step **655** to ensure that they actually attended the events whose calendar entries and the like created the calendar connection events. At step **657**, a level of physical interaction between the users is calculated by the interaction engine **319** based on the aggregated physical connection events and the corresponding calendar connection events. Following this, at steps **665** and **667**, filtering mechanisms are implemented to the calendar connection events and received user identity tokens for identifying particular events or user properties. At step **675**, the social profiles of the users are modified on the online social network **200** through an interaction strength metric using scoring functions, point systems, meters, graphical enhancements and the like.

[0063] FIG. **7** is a message exchange chart **700** of one implementation of some elements of FIG. **6**. Optionally, the first device **208** sends a device discovery request to AP **210** at exchange **702**. The AP **210** reports a list of devices discovered on its network to the first device **208** at exchange **706**, including the second device **215**.

[0064] Using the AP MAC address of the second device **215** obtained from the discovery report, the first device **208** sends the first user identity token **1** to the second device **215** at exchange **707**. The second device **215** relays the first user identity token **1** to the server **225** at exchange **709**. Optionally, it can check if the user **110** associated with the first identity

token **1** is a member of the online social network **200**. If the server **225** confirms that user **110** is a member of the online social network **200**, then the second device **215** broadcasts the second user identity token **2** to the first device **208** at exchange **713**. The first device **208** forwards the second identity token to the server **225** at exchange **718** to make the same identity check done by second device **215** at exchange **710**. The RSSI values and broadcast durations are reported to the server **225** at exchanges at **719** and **721**. At exchanges **722** and **725**, the server **225** sends the connectedness confirmation inquiry to the users **110** and **112**. The users **110** and **112** then approve the connectedness confirmation at exchanges **728** and **730**. Following this, the server **225** sends the level of physical interactions calculated by interaction engine **319** to the devices **208** and **215** at exchanges **733** and **734**.

[0065] The concept of calculating a level of physical interactions between users can be further explained through an example scenario of a Dreamforce conference. The users **110** and **112** of the online social network **200** using devices **208** and **215** can enable Bluetooth, NFC, or Wi-Fi in their respective devices while attending Dreamforce conference. The users **110** and **112** can then broadcast their user identity tokens when their devices are within the transmission range of the enabled wireless network. The devices **208** and **215** can assign timestamps to the received user identity tokens and track the duration and RSSI values of the broadcast, which can be uploaded to the server **225** to create a physical connection event in the on-demand database **221**.

[0066] Further on, while attending another event like a training workshop, the users **110** and **112** can again exchange their user identity tokens when their devices are within the transmission range of the enabled wireless network and create another physical connection event. If the aggregation of physical connection events crosses the pre-defined threshold counter due to repeated reception of the same user identity token, the users **110** and **112** can exchange the electronic records stored in their respective devices **208** and **215** such as social profiles, social check-ins, calendar entries, event subscriptions, etc.

[0067] Following this, the calendar engine **305** can match the calendar related electronic records to find any events co-attended by the users **110** and **112** and create a calendar connection event. The aggregated physical connection events and corresponding calendar connection events can then be used to calculate a level of physical interactions between the users **110** and **112**, which can be depicted through an interaction strength metric on Chatter, Facebook, or Twitter profiles of the users **110** and **112**.

[0068] In some implementations, the server **225** can request the users **110** and **112** to confirm the connectedness between the aggregated physical connection events and corresponding calendar connection events. In some implementations, the server **225** can apply a filter to the calendar connection events and received user identity tokens for identifying particular events such as an important internal meetings or user properties like similar work backgrounds, professional titles, etc.

Observer Tool

[0069] The devices **208** and **215** can establish wireless communications across various channels including audio, video, and text. For example, the devices **208** and **215** can communicate with each other over cellular networks including code division multiple-access (CDMA), global system for mobile communications (GSM), Enhanced Data GSM Environment (EDGE), long-term evolution (LTE), etc. Similarly, the devices **208** and **215** can establish a wireless local area network (LAN) such as Wi-Fi, personal area network like Bluetooth or NFC, etc. Other communication protocols can also be implemented.

[0070] For example, the first user **110** can interact with a second user **112** on Chatter, but can interact more heavily with the second user **112** on Facebook or Twitter, or in a social gaming environment such as that provided by Zynga, or can physically or proximally interact with the second user **112** as evidenced by common check-ins on Foursquare or other location-based social networking systems. In other implementations, interaction strength can also be based upon one or more physical interactions that also implement features common to mobile communication devices, such as smartphones, tablet computers, etc.

[0071] The observer tool **245** can track wireless interactions between the users **110** and **112** via the devices **208** and **215**. It can extract user activity history from web browsers, call logs, applications cache, memory units, etc. to identify—the users in the interaction, the channel communication of the interaction, and the duration of the interaction. This information can then be sent to the server **225**, which is in communication with the devices **208** and **215** to create connection events. The server **225** can then calculate a level of wireless interactions based on one or more wireless connection events that can be used to modify the social profiles of users **110** and **112** through an interaction strength metric.

[0072] FIG. **8** is a flow chart **800** of one implementation of calculating a level of wireless interactions between first user **110** and second user **112** communicating via first device **208** and second device **215**. Other implementations may perform the steps in different orders and/or with different, fewer or additional steps than the ones illustrated in FIG. **8**. Multiple steps can be combined in some implementations. For convenience, this flowchart is described with reference to the system that carries out a method. The system is not necessarily part of the method.

[0073] At step **805**, a wireless connection is established between the devices **208** and **215** over audio, video, text communication channel. Following this, the observer tool **245** and a timer is activated to track and time wireless interactions between the users **110** and **112** via the devices **208** and **215** at step **815**. The duration of the connection is recorded at step **825** using the timer and the channel of communication is recorded at step **835**. The wireless interactions are filtered at step **845** based on the length and type of the interaction. In some implementations, a gradation is applied to audio, video, text interactions, with video interactions being "strongest", audio interactions "average" and text interactions "weakest." In other implementations, the length of the interactions and amount of data transferred during an interaction is considered during gradation. As a result, wireless connection event is created at step **855**, which is stored in the connection event database **221**. At step **865**, interaction engine **329** calculates a level of wireless interactions based on the number and gradation of wireless connection events. At step **875**, the social profiles of the users **110** and **112** are modified using an interaction strength metric based on the calculated level of wireless interactions.

[0074] FIG. **9** is a message exchange chart **900** of one implementation of some elements of FIG. **8**. At exchange **905**, users **110** and **112** interact across a voice communication channel and the duration of the interaction is reported to the

server **225** at exchange **909**. As a result, the first wireless connection event is created at exchange **919**. Similarly, an audio interaction and its duration are recorded at exchanges **925** and **939** to create the second wireless connection event at exchange **949**. Likewise, at exchange **955** a text interaction between the users **110** and **112** is recorded and its duration is reported to the server **225** at exchange **969**. Consequently, the third wireless connection event is created at exchange **929**. The server **225** calculates a wireless interactions level at exchange **989** on the basis of the count and gradation of received wireless connection events, which is reported to the devices **208** and **215** at exchange **992**.

[0075] In a non-limiting example, the observer tool **245** can track interactions between the users **110** and **112** made through voice calls, SMSs, and Skype video calls along with their durations. The observer tool **245** can then upload the tracked interactions to the remote server **225**, with each upload creating a wireless connection event in the server **225**. Using the number and gradation of wireless connection events, the interaction engine **319** can calculate a level of wireless interactions between the users **110** and **112**. As a result, the Chatter, Facebook, or Twitter profiles of the users **110** and **112** can be modified using a interaction strength metric based on the calculated level of wireless interactions.

Some Particular Implementations

[0076] In one implementation, a system is described for calculating real-world user interactions between first and second users connected in an online social environment that includes a processor and code stored in memory coupled to the processor, which when executed on a processor creates a physical connection event stored in memory that represents contact or likely contact between the first and second users when first and second wireless devices carried by the first and second users establish a peer-to-peer relationship using a direct wireless channel, calculates a level of physical interactions between the first and second users including at least aggregating the plurality of physical connection events, updates the level of physical interactions in memory, and modifies social profiles of the first and second users using an interaction strength metric based on the level of physical interactions.

[0077] This system and other implementations of the technology disclosed can each optionally include one or more of the following features and/or features described in connection with additional systems disclosed. In the interest of conciseness, the combinations of features disclosed in this application are not individually enumerated and are not repeated with each base set of features. The reader will understand how features identified in this section can readily be combined with sets of base features identified as implementations.

[0078] The system can further include physical connection event to record a duration of connection via the direct wireless channel and a pattern of received signal strength during the connection via the direct wireless channel. It can include the contact or likely contact being filtered by duration of connection and strength of received signal when multiple direct wireless channels are simultaneously active.

[0079] The system can further include code stored in memory coupled to the processor, which when executed on a processor further locates a scheduled physical connection by finding a coincidence of scheduling, registration or check-in information in electronic records of the first and second users, creating a calendar connection event, and including in the calculating of the level of physical interactions between the first and second users an aggregation of the plurality of physical connection events.

[0080] The system can further include code stored in memory coupled to the processor, which when executed on a processor further confirms interaction strength of the physical connection event based on the calendar connection event, wherein the calendar connection event corresponds in at least time or location to information stored with the physical connection event.

[0081] The system can further include code stored in memory coupled to the processor, which when executed on a processor further applies a filtering mechanism to the calendar connection event to identify scheduling, registration or check-in information in electronic records of the second user that meets criteria set by the first user.

[0082] The system can further include code stored in memory coupled to the processor, which when executed on a processor further receives from at least one of the first and second users a response to a query confirming connectedness of the physical connection event. It can include the first and second devices that are configured to automatically exchange user identity tokens that are meaningful to an interaction server cooperating with the online social environment.

[0083] The system can further include code stored in memory coupled to the processor, which when executed on a processor further receives from at least one of the first and second wireless devices at least one user identity token received in an automatic exchange. It can include the privacy of the user identity tokens to be limited by user selectable privacy criteria.

[0084] The system can further include code stored in memory coupled to the processor, which when executed on a processor further applies a filtering mechanism to the user identity tokens to identify user identity information of the second user that meets criteria set by the first user.

[0085] Other implementations may include a non-transitory computer readable storage medium storing instructions executable by a processor to constitute a system as described above. Yet another implementation may include a method performed by the system as described above.

[0086] In another implementation, a system is described for calculating real-world user interactions between first and second users connected in an online social environment that includes a processor and code stored in memory coupled to the processor, which when executed on a processor creates a physical connection event stored in memory that represents contact or likely contact between the first and second users using first and second wireless devices sharing a common wireless local area network access point, calculates a level of physical interactions between the first and second users including at least aggregating the plurality of physical connection events, updates the level of physical interactions in memory, and modifies social profiles of the first and second users using an interaction strength metric based on the level of physical interactions.

[0087] Other implementations may include a non-transitory computer readable storage medium storing instructions executable by a processor to constitute a system as described above. Yet another implementation may include a method performed by the system as described above.

[0088] In another implementation, a system is system for calculating wireless user interactions between first and second users using wireless devices that includes a processor and

code stored in memory coupled to the processor, which when executed on a processor activates an observer tool to track at least an interaction between the first and second users via the first and second wireless devices across at least a video, audio, or text communication channel, creates a wireless connection event stored in memory that represents wireless interactions between the first and second users via first and second wireless devices, calculates a level of wireless interactions between the first and second users including at least aggregating plurality of wireless connection events, updates the level of wireless interactions in memory, and, modifies social profiles of the first and second users using an interaction strength metric based on the level of wireless interactions

[0089] This system and other implementations of the technology disclosed can each optionally include one or more additional features described.

[0090] The system can further include wireless interactions that are filtered by a duration of interaction and the type of communication channel used for the interaction.

[0091] While the present invention is disclosed by reference to the preferred implementations and examples detailed above, it is to be understood that these examples are intended in an illustrative rather than in a limiting sense. It is contemplated that modifications and combinations will readily occur to those skilled in the art, which modifications and combinations will be within the spirit of the invention and the scope of the following claims.

[0092] What is claimed is:

1. A system for calculating real-world user interactions between first and second users connected in an online social environment, the system including:

a processor;

code stored in memory coupled to the processor, which when executed on a processor:

creates a physical connection event stored in memory that represents contact or likely contact between the first and second users when first and second wireless devices carried by the first and second users establish a peer-to-peer relationship using a direct wireless channel;

calculates a level of physical interactions between the first and second users including at least aggregating the plurality of physical connection events;

updates the level of physical interactions in memory; and

modifies social profiles of the first and second users using an interaction strength metric based on the level of physical interactions.

2. The system of claim **1**, wherein the physical connection event records a duration of connection via the direct wireless channel.

3. The system of claim **1**, wherein the physical connection event records a pattern of received signal strength during the connection via the direct wireless channel.

4. The system of claim **1**, wherein the contact or likely contact is filtered by duration of connection and strength of received signal when multiple direct wireless channels are simultaneously active.

5. The system of claim **1**, wherein the code stored in memory coupled to the processor, which when executed on a processor further locates a scheduled physical connection by finding a coincidence of scheduling, registration or check-in information in electronic records of the first and second users, creating a calendar connection event, and including in the calculating of the level of physical interactions between the first and second users an aggregation of the plurality of physical connection events.

6. The system of claim **5**, wherein the code stored in memory coupled to the processor, which when executed on a processor further confirms interaction strength of the physical connection event based on the calendar connection event, wherein the calendar connection event corresponds in at least time or location to information stored with the physical connection event.

7. The system of claim **5**, wherein the code stored in memory coupled to the processor, which when executed on a processor further applies a filtering mechanism to the calendar connection event to identify scheduling, registration or check-in information in electronic records of the second user that meets criteria set by the first user.

8. The system of claim **1**, wherein the code stored in memory coupled to the processor, which when executed on a processor further receives from at least one of the first and second users a response to a query confirming connectedness of the physical connection event.

9. The system of claim **1**, wherein the first and second devices are configured to automatically exchange user identity tokens that are meaningful to an interaction server cooperating with the online social environment.

10. The system of claim **9**, wherein the code stored in memory coupled to the processor, which when executed on a processor further receives from at least one of the first and second wireless devices at least one user identity token received in an automatic exchange.

11. The system of claim **9**, wherein privacy of the user identity tokens is limited by user selectable privacy criteria.

12. The system of claim **10** wherein the code stored in memory coupled to the processor, which when executed on a processor further applies a filtering mechanism to the user identity tokens to identify user identity information of the second user that meets criteria set by the first user.

13. A system for calculating real-world user interactions between first and second users connected in an online social environment, the system including:

a processor;

code stored in memory coupled to the processor, which when executed on a processor:

creates a physical connection event stored in memory that represents contact or likely contact between the first and second users using first and second wireless devices sharing a common wireless local area network access point;

calculates a level of physical interactions between the first and second users including at least aggregating the plurality of physical connection events;

updates the level of physical interactions in memory; and

modifies social profiles of the first and second users using an interaction strength metric based on the level of physical interactions.

14. A system for calculating wireless user interactions between first and second users using wireless devices, the system including:

a processor;

code stored in memory coupled to the processor, which when executed on a processor:

activates an observer tool to track at least an interaction between the first and second users via the first and

second wireless devices across at least a video, audio, or text communication channel;

creates a wireless connection event stored in memory that represents wireless interactions between the first and second users via first and second wireless devices;

calculates a level of wireless interactions between the first and second users including at least aggregating plurality of wireless connection events;

updates the level of wireless interactions in memory; and

modifies social profiles of the first and second users using an interaction strength metric based on the level of wireless interactions.

15. The system of claim **14**, wherein the wireless interactions are filtered by a duration of interaction and type of communication channel used for the interaction.

16. A method of calculating real-world user interactions between first and second users connected in an online social environment, the method including:

creating a physical connection event stored in memory that represents contact or likely contact between the first and second users when first and second wireless devices carried by the first and second users share information via a peer-to-peer direct wireless channel;

calculating a level of physical interactions between the first and second users including at least aggregating the plurality of physical connection events;

updating the level of physical interactions in memory; and

modifying social profiles of the first and second users using an interaction strength metric based on the level of physical interactions.

17. The method of claim **16**, further including locating a scheduled physical connection by finding a coincidence of scheduling, registration or check-in information in electronic records of the first and second users, creating a calendar connection event, and including in the calculating of the level of physical interactions between the first and second users an aggregation of the plurality of physical connection events.

18. The method of claim **17**, further including confirming interaction strength of the physical connection event based on the calendar connection event, wherein the calendar connection event corresponds in at least time or location to information stored with the physical connection event.

19. The method of claim **17**, further including applying a filtering mechanism to the calendar connection event to identify scheduling, registration or check-in information in electronic records of the second user that meets criteria set by the first user.

20. The method of claim **16**, wherein the first and second devices are configured to automatically exchange user identity tokens that are meaningful to an interaction server cooperating with the online social environment.

21. A method of calculating real-world user interactions between first and second users connected in an online social environment, the method including:

creating a physical connection event stored in memory that represents contact or likely contact between the first and second users using first and second wireless devices sharing a common wireless local area network access point;

calculating a level of physical interactions between the first and second users including at least aggregating the plurality of physical connection events;

updating the level of physical interactions in memory; and

modifying social profiles of the first and second users using an interaction strength metric based on the level of physical interactions.

22. A method of calculating wireless user interactions between first and second users using wireless devices, the method including:

activating an observer tool to track at least an interaction between the first and second users via the first and second wireless devices across at least a video, audio, or text communication channel;

creating a wireless connection event stored in memory that represents wireless interactions between the first and second users via first and second wireless devices;

calculating a level of wireless interactions between the first and second users including at least aggregating plurality of wireless connection events;

updating the level of wireless interactions in memory; and

modifying social profiles of the first and second users using an interaction strength metric based on the level of wireless interactions.

23. An article of manufacture that includes processor readable storage with processor executable code for calculating real-world user interactions between first and second users connected in an online social environment, including:

a logic, which when executed on a processor:

creates a physical connection event stored in memory that represents contact or likely contact between the first and second users when first and second wireless devices carried by the first and second users establish a peer-to-peer relationship using a direct wireless channel;

calculates a level of physical interactions between the first and second users including at least aggregating the plurality of physical connection events;

updates the level of physical interactions in memory; and

modifies social profiles of the first and second users using an interaction strength metric based on the level of physical interactions.

24. An article of manufacture that includes processor readable storage with processor executable code for calculating real-world user interactions between first and second users connected in an online social environment, including:

a logic, which when executed on a processor:

creates a physical connection event stored in memory that represents contact or likely contact between the first and second users using first and second wireless devices sharing a common wireless local area network access point;

calculates a level of physical interactions between the first and second users including at least aggregating the plurality of physical connection events;

updates the level of physical interactions in memory; and

modifies social profiles of the first and second users using an interaction strength metric based on the level of physical interactions.

25. An article of manufacture that includes processor readable storage with processor executable code for calculating wireless user interactions between first and second users using wireless devices, including:

a logic, which when executed on a processor:

activates an observer tool to track at least an interaction between the first and second users via the first and

second wireless devices across at least a video, audio, or text communication channel;

creates a wireless connection event stored in memory that represents wireless interactions between the first and second users via first and second wireless devices;

calculates a level of wireless interactions between the first and second users including at least aggregating plurality of wireless connection events;

updates the level of wireless interactions in memory; and

modifies social profiles of the first and second users using an interaction strength metric based on the level of wireless interactions.

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