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## PROXIMITY BASED CONTACT SUGGESTION SYSTEM

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## **PROXIMITY BASED CONTACT SUGGESTION SYSTEM**

### ABSTRACT

A proximity based suggestion system can be used to deliver suggestions to social network users, to add one or more users to their friend list, based on users' proximity to each other. The system receives a first Internet Protocol (IP) address of a first user device connected to the Internet through a first access point. The system also receives IP address of a first client device connected to the Internet through the first access point. The system then receives a first MAC address of the first client device and a second MAC address of a second client device from the first client device. Similarly, the system also receives the second MAC address of the second client device and the first MAC address of the first client device from the second client device. Further, the system receives IP address of the second client device connected to the Internet through a second access point and a second IP address of a second user device connected to the Internet through the second access point. The system then determines that the first user connected to the Internet through the first access point and the second user connected to the Internet through the second access point are in physical proximity to each other.

### PROBLEM STATEMENT

Social networks often provide users with suggested contacts to add to their contact lists. These suggestions are typically based on the connections between the users and profile similarities, e.g., common interests, friends, and experiences. These suggestions can also be based on the geographical proximity of the users. User location can be determined from their

electronic devices, e.g., via GPS, through which the users access the social network. If the GPS coordinates between two users are in proximity to each other, the social network provides the nearby user as a suggested contact. However, this manner of generating suggested contacts could cause privacy concerns due to the high location accuracy of GPS. Users may be uncomfortable with their precise location being used to generate suggested contacts.

A proximity-based contact suggestion system that does not depend on the precise location of users is disclosed.

### PROXIMITY BASED SUGGESTION SYSTEM

The systems and techniques described here relate to a proximity based suggestion system associated with a social network that suggests users on the social network based on their proximity to each other. The system can be implemented as program instructions for use in an Internet, an Intranet, or another client and server environment. The device can be any electronic communication device, e.g., a smartphone, laptop, mobile phone, desktop computer, tablet, electronic wearable device, PDA etc.

FIG. 1 illustrates an example method for suggesting users as friends on a social network based on their proximity to each other. The system detects the proximity of the users based on the proximity of the user devices through which they access the social network. The method can be performed by a proximity based suggestion system.

The system receives a first Internet protocol (IP) address of a first user device connected to the Internet through a first access point (Block 102). IP addresses are a series of numbers assigned to each device connected in a computer network. Multiple devices can connect to the

Internet simultaneously via access points such as a router. These devices can connect to the Internet through the access point via access point port forwarding. The access point assigns different ports to different devices connected to the Internet through it. The access point routes the data packets for each device through its respective port, while still retaining a single IP address for all the connected devices. All the devices accessing the Internet through a common access point have the same IP address as that of the access point.

In an example, a first user may connect to the Internet on a first user device, e.g. , a smartphone. The first user's device connects to the Internet through a router, i.e., a first access point. The proximity based suggestion system receives a first IP address of the first user device. The system can receive this address from a data packet sent by the first user device when it accesses the Internet.

The system receives IP address of a first client device connected to the Internet through the first access point (104). The first client device can be any device capable of connecting to the Internet through an access point, for example, a WiFi/HDMI dongle connected to the Internet through the first access point. The proximity based suggestion system receives the IP address of the first client device from a data packet sent by the client device when it connects to the Internet through the router, i.e., the first access point. The client device and the first user device are both connected to the Internet through the same router, i.e., the first access point. The data packets for each of the respective devices are routed through different ports of the router. The IP address of the first client device is the same as that of the router and the first user device. Based on the received IP addresses, the system determines that both the first user device and the first client device are connected through the same router, i.e., first access point.

The system receives a first MAC address of the first client device and a second MAC address of a second client device from the first client device (106). Media access control (MAC) addresses are a unique identifiers associated with devices on a physical network segment. The first client device can discover MAC addresses of other devices in its nearby proximity. The discovery procedure is performed on the MAC network layer in a peer-to-peer manner. The first client device can perform the discovery procedure mutually exclusive from communications with the access point.

The discovery procedure mentioned above includes an announcement mechanism which utilizes multiple wireless channels of the client device. In an example process, a second client device selects to wait for a random period of time, e.g. 30 seconds. The second client device resumes regular communication after the selected amount of time period. The client device then goes into an announcement mode during which it transmits announcement packets with premeditated content on its wireless channels in a round robin schema. The content in these announcement packets is redundant and is just required to identify the packets as second client device's announcement packets. Each packet has MAC address of the second client device embedded in it. Other client devices present in the vicinity of the second client device, e.g. first client device, keeps track of the announcement packets (thus the MAC addresses on the packets) it overheard. The first client device transmits the list of the MAC addresses it overheard, i.e. second MAC address together with its own MAC address, to the system. The process is then repeated after a set period of time.

Similarly, the system receives the second MAC address of the second client device and the first MAC address of the first client device from the second client device (108), as described above.

The system receives IP address of the second client device connected to the Internet through a second access point (110), as described above.

The system receives a second IP address of a second user device connected to the Internet through the second access point (112), as described above. A second user may connect to the Internet on the second user device. The IP address of the second client device is the same as the second IP address of the second user device and the second access point.

The system determines that the first user connected to the Internet through the first access point and the second user connected to the Internet through the second access point are in physical proximity to each other (Block 114). First, the system determines that the first user is associated with the first access point because the first user's first user device has the same IP address as the first access point. Second, the system determines that the first access point is associated with the first client device because the first access point has the same IP address as the first client device. Third, the system determines that the first client device is associated with the second client device because both client devices detected the other client device's MAC address broadcast. Fourth, the system determines that the second client device is associated with the second access point because the second access point has the same IP address as the second client device. Fifth, the system determines that the second access point is associated with the second user because the user's second user device has the same IP address as the second access point.

As a result of determining these associations, the system determines that the first user and second user are in physical proximity to each other.

The system causes a recommendation to the first user to add the second user as a contact to be generated. Alternatively, or additionally, the system causes a recommendation to the second user to add the first user as a contact to be generated. For example, the system can cause a social network to present the second user's social network profile to the first user. The social network can recommend that the first user add the second user's profile to his social network contacts.

FIG. 2 illustrates an example network that a proximity based suggestion system can analyze to determine physical proximity of users. The figure depicts a first user device 208 belonging to a User A. The user device 208 is connected to the Internet through a first access point AP 1 204. User A accesses the social network through the first user device 208. The system receives a first IP address of the user device 208 when it accesses the social network. Similarly, when a User B accesses the social network using a second user device 212 through a second access point AP 2 206, the system receives a second IP address of the device 212.

The access point AP 1 is also associated with a first client device 210 (HDMI dongle). The client device 210 also connects to the Internet through the first access point 204. The system receives IP address of the first client device 210 by accessing a data packet sent by the client device. The first user device 208 and the first client device 210 are connected through AP 1 204 via port forward mechanism. As a result, the IP address received by the system for both of them is same, i.e., the first IP address.

Similarly, the system receives IP address of the second client device 214, which is same as the second IP address of the second user device 212.

Using the received information, the system determines that the first client device 210 and the User A device 208 are connected to the Internet through the same access point AP 1 204, as they have both identified themselves with the same first IP address. The same determination is made with respect to User B device 212, second client device 214 and AP 2 206.

The system then receives a first MAC address of the client device 210 and a second MAC address of the second client device 214 from the first client device 210 through the access point AP 1. The client device 210 discovers a similar second client device, an HDMI dongle 214, in its proximity. The client device detects the MAC address broadcast of the second client device 214 and send it to the system along with its own MAC address. Similarly, second client device 214 also sends its own second MAC address and the first MAC address of the detected dongle device 210 to the system through access point AP 2.

The system also keeps a track of all the MAC addresses detected by the client devices 210 and 214 in their proximity. The system detects that the first client device 210 has sent the MAC address of second client device 214 as its nearby discovered client device. Similarly, the second client device 214 has sent the MAC address of the first client device 210 as its nearby discovered client device. As a result, the system determines that the first and second client devices have discovered each other and as such are present in physical proximity to each other.

After the client devices 210 and 214 are determined to be in close proximity, the system determines that any other devices registered with the same IP addresses as that of first client device 210 and second client device 214 should also be proximate to each other. The system then



looks for all user devices accessing the social network with the same IP addresses as that of the identified client devices. As depicted, User A device 208 and User B device 212 have already identified themselves to the system with their respective IP address. The system detects that the IP address of User A device 208 is same as that of client device 210 and the IP address of a User B device 212 is same as that of client device 214. As the system is already aware that the client devices are in proximity to each other, the system concludes that the users accessing the social network via devices 208 and 212 should also be in close proximity to each other. As a result, the system suggests User A as a friend to User B on the social network and vice versa.

FIG. 3 is a block diagram of an exemplary environment that shows components of a system for implementing the techniques described in this disclosure. The environment includes client devices 310, servers 330, and network 340. Network 340 connects client devices 310 to servers 330. Client device 310 is an electronic device. Client device 310 may be capable of requesting and receiving data/communications over network 340. Example client devices 310 are personal computers (e.g., laptops), mobile communication devices, (e.g. smartphones, tablet computing devices), set-top boxes, game-consoles, embedded systems, and other devices 310' that can send and receive data/communications over network 340. Client device 310 may execute an application, such as a web browser 312 or 314 or a native application 316. Web applications 313 and 315 may be displayed via a web browser 312 or 314. Server 330 may be a web server capable of sending, receiving and storing web pages 332. Web page(s) 332 may be stored on or accessible via server 330. Web page(s) 332 may be associated with web application 313 or 315 and accessed using a web browser, e.g., 312. When accessed, webpage(s) 332 may be transmitted and displayed on a client device, e.g., 310 or 310'. Resources 318 and 318' are

resources available to the client device 310 and/or applications thereon, or server(s) 330 and/or web pages(s) accessible therefrom, respectively. Resources 318' may be, for example, memory or storage resources; a text, image, video, audio, JavaScript, CSS, or other file or object; or other relevant resources. Network 340 may be any network or combination of networks that can carry data communication.

The subject matter described in this disclosure can be implemented in software and/or hardware (for example, computers, circuits, or processors). The subject matter can be implemented on a single device or across multiple devices (for example, a client device and a server device). Devices implementing the subject matter can be connected through a wired and/or wireless network. Such devices can receive inputs from a user (for example, from a mouse, keyboard, or touchscreen) and produce an output to a user (for example, through a display). Specific examples disclosed are provided for illustrative purposes and do not limit the scope of the disclosure.

FIGURES

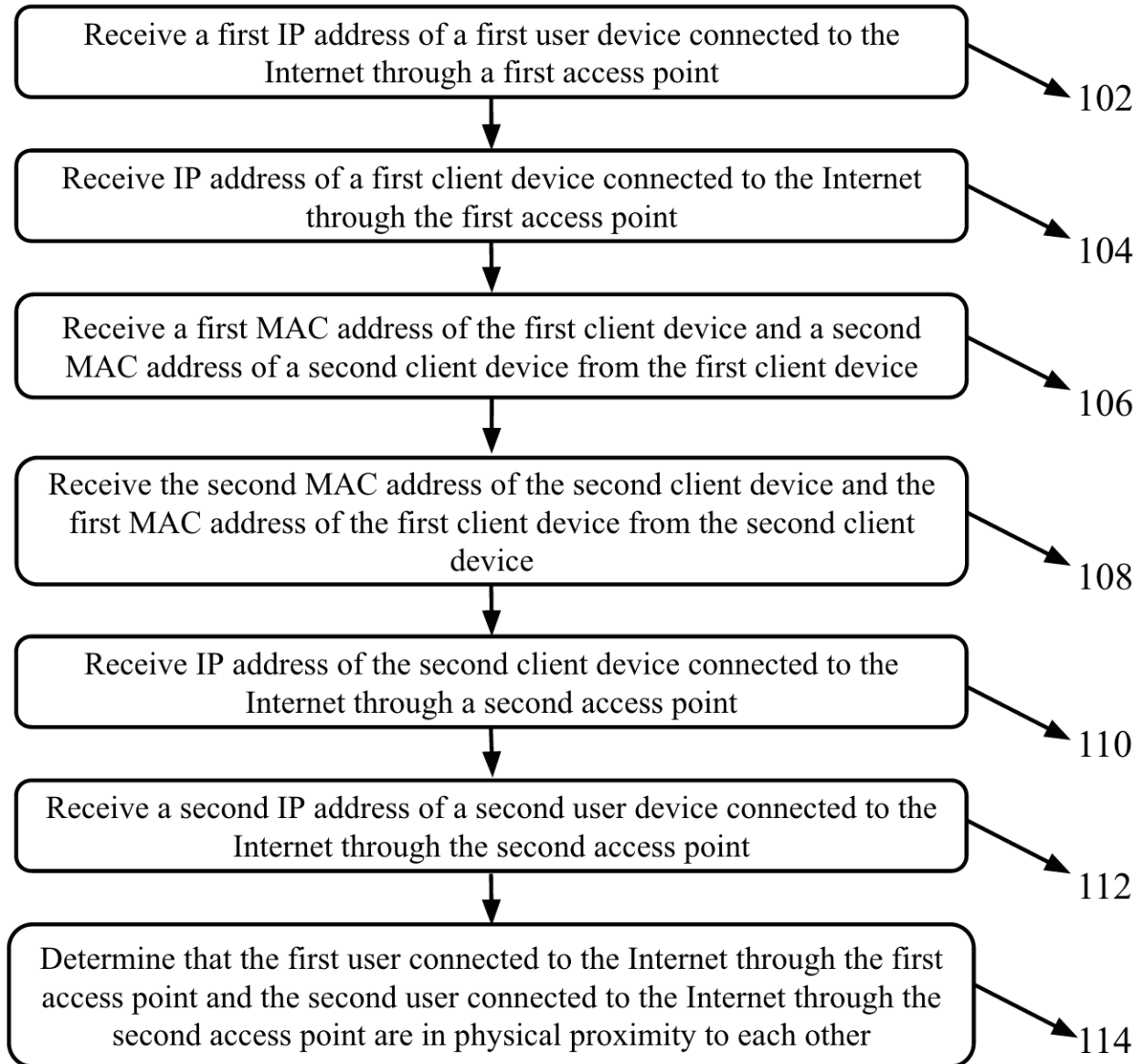


FIGURE 1

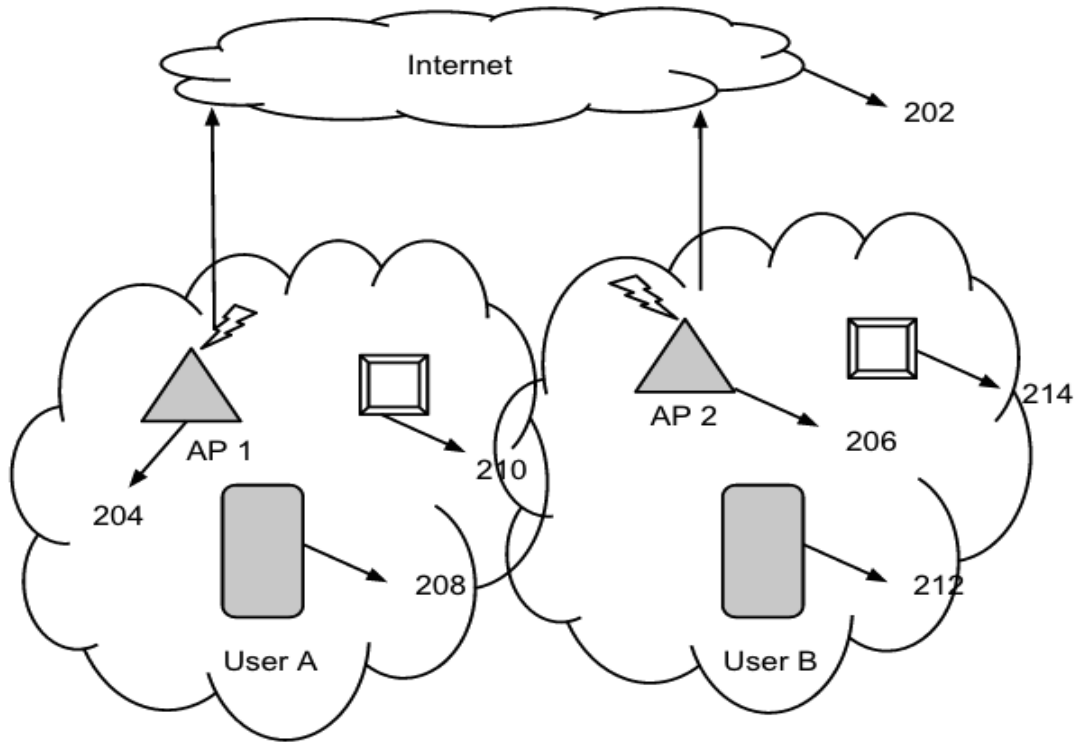


FIGURE 2

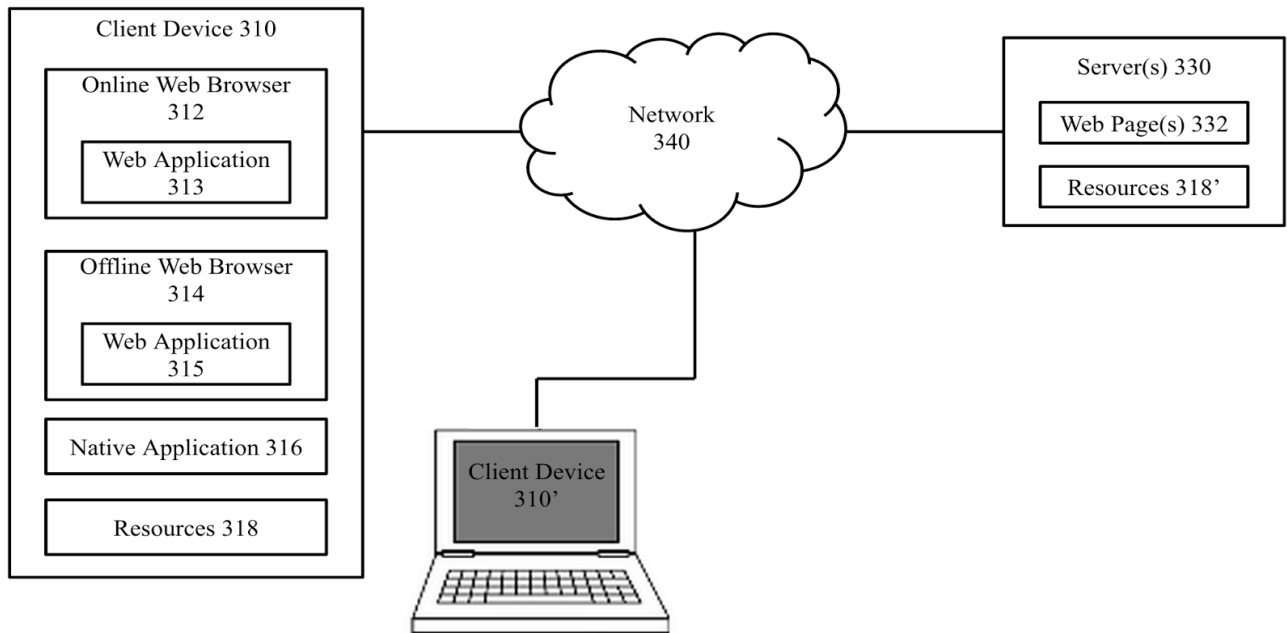


FIGURE 3