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Yan Liu

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Detection of Message Read Status

ABSTRACT

In some communication systems, notifications or other indications can be displayed to indicate whether received messages have been read by a user. In some cases, a read / unread status of a message, and display of this status, is inaccurate when that message has been received out of order, due to use of conversation timestamps by the system. This document describes techniques to accurately detect read and unread status for messages and to provide displayed indications of the status on all of a user's devices. This is achieved by storing an observed flag associated with each message that indicates the read/unread status of the associated message. Once it is detected that the user has read a message, the observed flag of that message is changed accordingly. Further, the state of the observed flag is sent to other client devices of the user to indicate that the user has read the message. The other client devices update the status of the message in local storage, and automatically update the display of indications or notifications that indicate the status of the message.

KEYWORDS

- Message status
- Chat application
- Instant messaging
- Notifications
- Status display
BACKGROUND

Email applications, messaging applications, and other communication applications executing on a client device can be used to communicate messages to and from other users' devices. The client device can be a desktop computer, laptop computer, mobile device (e.g., smartphone, smartwatch, VR or AR headset, wearable device), etc. The client device can display (or otherwise indicate) that a received message has not been read by the user of the client device, e.g., the message has not been opened and the message contents have not been displayed on the client device. For example, the client device can display a notification or other indication, e.g., a message subject displayed in bold or other distinguishing manner, that a message has been received and has not been read.

A problem can arise when a device mistakenly determines that a message has been read when it has not been read. For example, this occurs if a single last-seen timestamp is used for all the messages received in a message conversation (e.g., message thread), where the last-seen timestamp indicates when the latest message was received. All messages in the thread that have a message timestamp that is before the last-seen timestamp are considered to have been read, where the message timestamp indicates when the message was sent. The use of the last-seen timestamp does not cause this problem when messages are received in the order they are sent.

However, if a newer message is sent after an older message, but the newer message is received by the client device before the older message, the last-seen timestamp will be set to the timestamp of the newer message. In this example, the older message will be considered read even though it has not been read because its timestamp is before the last-seen timestamp. In other cases causing a mistaken read status, in a local time system on the particular user device that has a time ahead of a server time, the last-seen timestamp is updated to the local time. In this...
case, a new received message is considered read even though it has not been read since the timestamp is based on the server time that is before the last-seen timestamp.

Some problems occur where a user has multiple client devices used for messaging. Each client device must be updated with the read status of a message that is read on one of the client devices. However, such updates do not occur in some systems. Thus, displayed indications of unread messages are missed, or indications are displayed for messages that have already been read by the user.

DESCRIPTION

Figure 1 illustrates a diagram of an example environment 100 in which techniques of the present disclosure can be implemented. In Figure 1, four client devices (102a, 102b, 102c, 102d) can include desktop computers, laptop computers, tablets, phones, wearable devices, etc. The client devices are coupled to a server 106 via a network 108. Each client device has a communication application that can communicate with other devices over the network 108. The communication application executes on respective devices 102, e.g., an email application, a chat application, etc. Each client device stores messages sent and received by that client device, e.g., emails, instant messages, etc. The communication application can display messages in threads or conversations, e.g., where a thread is a group of messages that are linked based on the messages being replies to earlier messages and have the same subject line.

The server enables the client devices to communicate with each other over the network using the communication application. The server routes messages to client devices. The server maintains a datastore 110 that stores copies of messages communicated using the communication application. It stores identifications of such messages, e.g., message subjects or identification
codes. In this example, a single user, User 1, uses multiple client devices 102a, 102b, and 102c that may access a single user account provided by the server. A different user, User 2, uses client device 102d that accesses a different user account for User 2.

The server and client devices store an observed flag associated with each message received by a user account. The observed flag indicates the read status of the associated message, e.g., whether the associated message has been read or not by the user. A read message is a message that has been opened and its content displayed for viewing or reading. An unread message is a message that has been received but not yet opened.

In this example, a client device stores, on local storage of the client device a list of messages 120 that have been received by the user account from other users, and a conversation identification for each conversation (thread) of such messages. In this example, since each of the client devices 102a, 102b, and 102c access the same user account, the list of received messages is the same on each of these client devices. Each message is associated with a stored observed flag 122 that indicates the observed status of that message as currently stored by that client device. For example, client device 102a ("User 1 Device 1") stores an observed flag associated with each message. Similarly, client device 102b ("User 1 Device 2") and client device 102c ("User 1 Device 3") each store the messages and associated observed flags.

A client device can also store a list of all the client devices that access the user account. Thus, client device 102a can store a list that identifies client devices 102a, 102b and 102c.

Client device 102d ("User 2 Device 1") is used by User 2, and as such stores a different list of received messages 126 and their associated observed flags 128.

The server stores a record associated with the messages received by each user account in the datastore. This record includes the message identifications, conversation identifications, and
observed flags for all the received messages received by the user accounts. For example, the
server stores the received messages 120, conversation identifications, and the observed flags 122
that are stored by the client devices 120a, 120b, and 120c of User 1. The server also stores the
received messages 126 and the observed flags 128 of the client device 102d of User 2.

Operation

When a user selects a received message to display the content of that message on a
particular client device, where the message has an unread status, the observed flags of that
message are updated accordingly at the user's client devices. For example, if User 1 uses client
device 102a to select a received Message 1 that has an unread status, the client device 102a
updates the observed flag for that message in its local storage to a read status. For example, a
flag bit is set to a value that indicates a read state. The client device 102a also sends information
to the server to indicate that this user action and change in read status has occurred for Message
1. For example, the client device 102a sends an identification of the conversation in which
Message 1 is included (Conversation 1), an identification of Message 1, the observed flag (in its
read state), and an identification of the client device. The server updates the observed flag in the
datastore 110 to a read status for Message 1 of User 1's devices 102a, 102b, and 102c.

The server also sends information to the other client devices 102b and 102c of the user
(e.g., as indicated by the user account), to cause the other client devices to update the read status
for Message 1. For example, the server information includes an identification of the
conversation in which Message 1 is included, an identification of Message 1, the read status of
the observed flag, and an identification of client device 102a where the user action occurred to
view the message. Other client devices 102b and 102c receive the server information via the
network and change the observed flag to read status for Message 1 in their local storage. This causes all of a user's client devices to be synchronized with the latest read status of received messages, regardless of which client device was used to view the messages.

At particular times during client device operation such as upon startup, when the communication application is opened, when a new message is received by the user account or client device, etc., a client device can display a notification of the received messages that have not yet been viewed by the user. For example, the notification indicates that a new message has been received, and also lists other unread messages of the user account. After an observed flag has been changed from the unread status to the read status, the next notification output on a client device omits displaying the message associated with that read status.

Further, a client device displays a new notification that re-notifies the user of one or more unread messages, after earlier notification(s) have been provided, to notify the user of those unread messages. For example, the new notification is displayed on a different client device of the user than the client device previously used to display the previous notification. The observed flags described in this document allow accurate display of such new notifications indicating unread messages.

Further, an identification of an unread message, or an identification of a conversation that includes one or more unread messages, is displayed by a client device in a way that distinguishes it from messages that have been read and conversations that include no unread messages. For example, the subjects or titles of unread messages can be displayed in bold text and the subjects or titles of read messages can be displayed in regular text, or other highlighting of unread messages can be displayed (in a different color, etc.). The observed flags allow accurate display of read and unread messages and message threads.
In some cases, a new client device is added to the user account. The new client device uses the communication application and accesses messages received by the user account. When the new client device is added to the account, a synchronization update is triggered for the observed flags. For example, in the synchronization update, the server sends the observed flag states for all the messages of the user account to each client device, including the new client device. The server also sends a list of identifications of all the client devices accessing the user account.

Besides a selection or opening of a message to display its content, other types of user actions can be detected to indicate that a message has been read. For example, such user actions include entering a conversation mode on a client device to display messages as grouped into conversations (threads), exiting such a conversation mode, selecting a displayed user interface element in the communication application, running the communication application, switching to or selecting display focus on a chat conversation, inputting text using a hardware or software keyboard, selecting a displayed element in a notification to cause the communication application to open, etc. Any such user actions can cause the update to observed flags on the user's client devices.

Techniques of this disclosure enable displayed identifications of received messages to accurately indicate which of the messages have been read and which of the messages have not yet been read by a user, and this indication is accurate across all of a user's client devices.

In situations in which the systems and methods discussed herein may collect or use personal information about users (e.g., user presence status or information, information about a user's social network, location, biometric information, and/or activities and demographic information), users are provided with one or more opportunities to control whether information is
collected, whether the personal information is stored, whether the personal information is used, and how the information is collected about the user, stored and used. That is, the systems and methods discussed herein collect, store and/or use user personal information only upon receiving explicit authorization from the relevant users to do so. For example, a user is provided with control over whether programs or features collect user information about that particular user or other users relevant to the program or feature. Each user for which personal information is to be collected is presented with one or more options to allow control over the information collection relevant to that user, to provide permission or authorization as to whether the information is collected and as to which portions of the information are to be collected. For example, users can be provided with one or more such control options over a communication network. In addition, certain data may be treated in one or more ways before it is stored or used so that personally identifiable information is removed. In some examples, a user’s identity or geographic location may be treated so that no personally identifiable information can be determined.

CONCLUSION

Accurately indicating which received messages have been read and which are still unread by a user is a valuable function provided to users of communication applications. Some techniques that use a last-seen timestamp for a message conversation or thread include errors in these indications due to messages received out-of-order. The techniques of this disclosure provide a flag stored per message to indicate the read/unread status of the associated message. The techniques enable accurate indication of read and unread messages in communication applications.
In addition, multiple client devices of a user are synchronized to be updated with a new read/unread status of a message, e.g., after a user action changes that status. If a user reads the message on one client device, the server and other client devices automatically update the observed flag in their local storage. Notifications and indications of message read status on the other client devices can thus be automatically updated to correspond to the current status of messages.