December 2019

AN AUCTION-BASED MARKETPLACE FOR NOTIFICATIONS DELIVERY

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ABSTRACT

A notification delivery module is described that enables a computing system to selectively deliver notifications to a user. The notification delivery module may set a total budget (e.g., a total number of notifications a user may receive for a week) for the user based on prior notification delivery history. The notification delivery module may change (e.g., increase or decrease) the total budget for the user based on user history (e.g., volume and quality of the notifications that are delivered and interacted by the user). The notification delivery module may periodically (e.g., every 24-hour window) allocate a budget to every application provider, based on the application's active user-installed base or daily/monthly active users (DAU/MAU) metrics related to the application, and may replenish the budget periodically (e.g., reset the budget weekly). Each notification may be assigned a bid price, which may be calculated based on one or more criteria including: user feedback (e.g., whether the user merely views the notification or interacts with the notification), time (e.g., desired time for delivering the notification), target platform (e.g., mobile, web, desktop), notification delivery mechanism (e.g., device or email), content (e.g., related or unrelated to the user's interest), and overall quality (e.g., value to the application provider or to the user) of the notification. Notifications for a notification provider may be ranked based on the bid price. Higher-ranked notifications may be delivered to the user device prior to the lower-ranked notification until the budget for the particular notification provider runs out. When a delivered notification is dismissed before it is seen by the user, the notification delivery module may return the unused budget to the notification provider. The notification delivery module may also allow the user to set notifications to be delivered without any cost (e.g., free notifications). The notification delivery module may identify good opportunities to deliver notifications based on user

activity and learn to avoid delivery of notifications at bad delivery times (e.g., during meetings or while the user is asleep). The notification delivery module may also allow exchange (e.g., sale or purchase) of budget between application providers based on an application's current need.

DESCRIPTION

Notifications are inherently costly to the user; they distract the user from accomplishing a task by interrupting them with another piece of information. At the same time, from the notification provider's (e.g., a first-party application or a third-party application) perspective, a notification is cheap and easy to send, and highly effective. Current notification delivery options are set by the notification provider and managed by the end-user, which over-incentivizes the application to send multiple requests for enabling the notification and places the burden of managing notifications on the end-user. As such, it would be desirable to enable a computing system to automatically select the notifications to be delivered to a user and the time when the notifications are delivered based on the user's need.

Techniques are described that enable a computing system to selectively deliver notifications to one or more computing devices. Figure 1 below illustrates an example of a computing device that includes a notification delivery module configured to automatically select the notifications to be delivered to a user and the time when the notifications are delivered based on the user's need (e.g., total number of notification the user like to receive, interest of the user, user feedback, etc.).

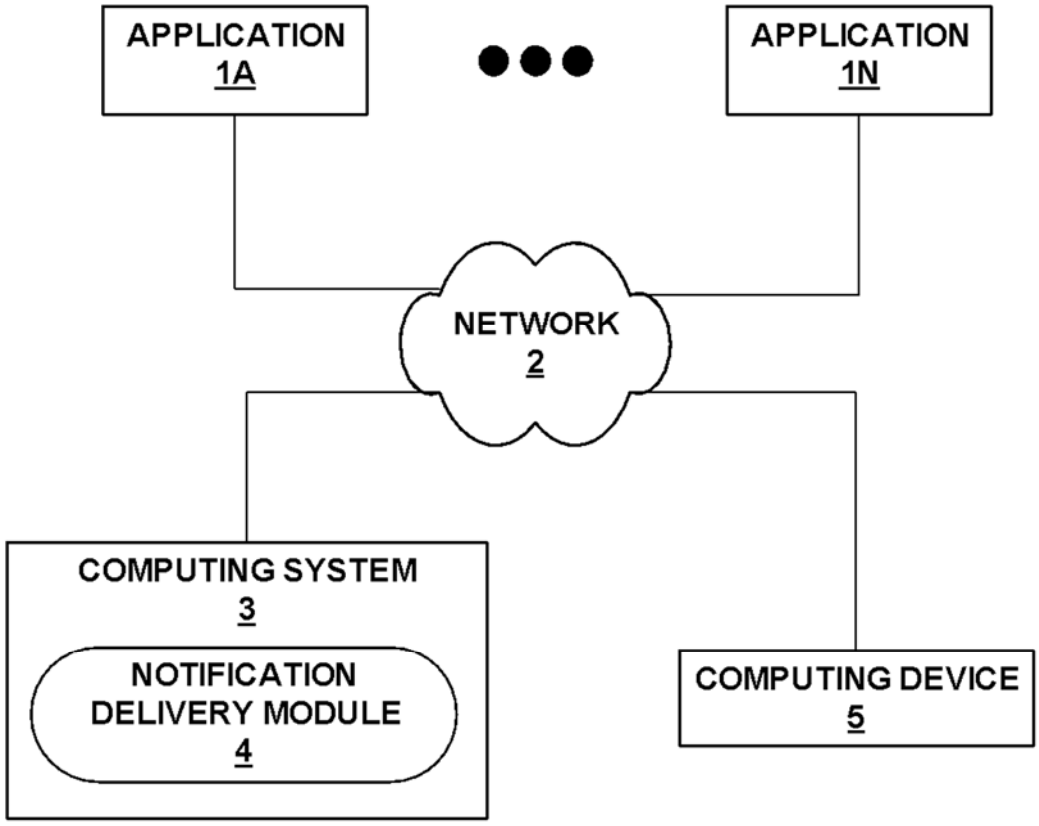

FIG. 1

Computing system 3 of Figure 1 may represent a computer, supercomputer, or other suitable equipment. Computing system 3 may be communicatively connected with one or more applications to receive notifications for delivery via a network. Each of applications 1A-1N may be a first-party application or a third-party application. Network 2 of Figure 1 represents a combination of any one or more public or private communication networks, for instance, television broadcast networks, cable or satellite networks, cellular networks, Wi-Fi networks, broadband networks, and/or other type of network for transmitting data (e.g., telecommunications and/or media data) between various computing devices, systems, and other communications and media

equipment. Computing system 3 may also be communicatively connected with one or more computing devices to selectively deliver notifications to one or more users.

Notification delivery module 4, such as shown in Figure 1 below, may be included in computing system 3 to select notifications to be delivered to one or more target platforms (e.g., mobile, web, desktop) on one or more of computing device 5. Examples of computing device 5 include, but are not limited to, smartphone, tablet computer, laptop computer, personal computer, or other suitable devices for receiving notifications. Notification delivery module 4 may be a software application. In such examples, notification delivery module 4 may be a native application or a web-based application. Native applications may be provided by a first-party developer or by a third-party developer and may be pre-installed or downloaded from an application market.

As shown in Figure 2 below at step 21, the notification delivery module may set a total budget (e.g., a total number of notifications a user may receive for a period of time (e.g., an hour, a day, a week, etc.)) to be allocated to all applications based on a default value. The notification delivery module, at step 21, may also set or adjust the total budget based in part on notification delivery history. For example, the notification delivery module may change (e.g., increase or decrease) the total budget for a user based on the number of notifications that the user has viewed, the number of notifications that the user has interacted with, and/or the feedback that the user has provided. In some examples, the total budget may be reset periodically (e.g., daily, weekly, or monthly).

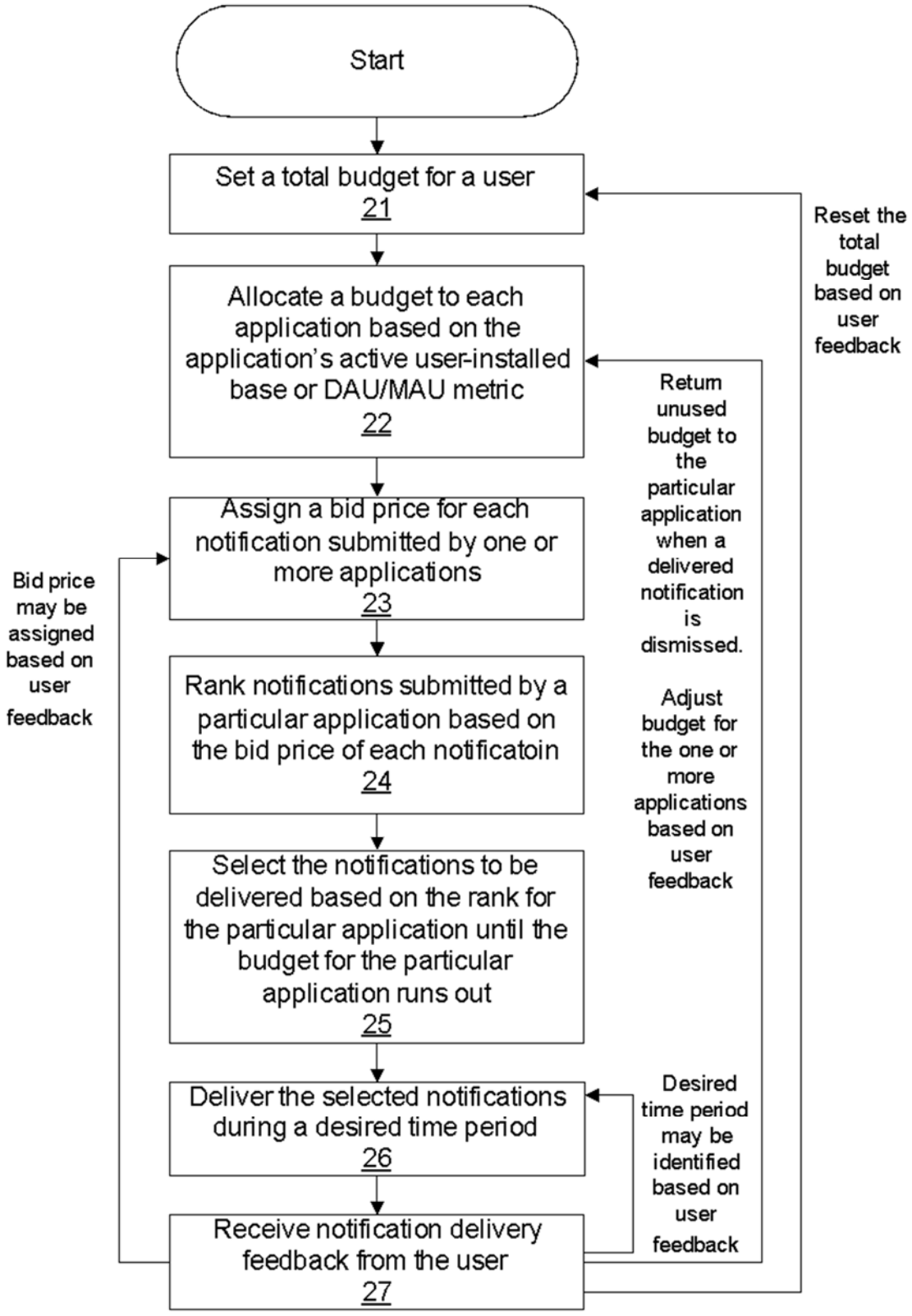
Start
Set a total budget for a user
21
Allocate a budget to each application based on the application's active user-installed base or DAU/MAU metric
22
Assign a bid price for each notification submitted by one or more applications
23
Rank notifications submitted by a particular application based on the bid price of each notificatoin
24
Select the notifications to be delivered based on the rank for the particular application until the budget for the particular application runs out
25
Deliver the selected notifications during a desired time period
26
Receive notification delivery feedback from the user
27
Reset the total budget based on user feedback
Return unused budget to the particular application when a delivered notification is dismissed.
Adjust budget for the one or more applications based on user feedback
Bid price may be assigned based on user feedback
Desired time period may be identified based on user feedback

FIG. 2

Once a total budget is set for the user, at step 22, the notification delivery module may allocate a budget to each application (e.g., number of notifications an application may deliver to the user) based on the application's active user-installed base or daily/monthly active user (DAU/MAU) metrics related to the application. An application with a lower DAU/MAU metric may receive a lower budget than an application with a higher DAU/MAU metric. The allocated budget may also be adjusted based on user feedback. For example, if the user indicates receiving spam notifications from an application, a small fee may be incurred by the application, causing the allocated budget to be reduced. In addition, the notification delivery module may also return unused budget to an application when a delivered notification is dismissed.

For each notification submitted by one or more applications, a bid price may be set by the notification delivery module at step 23. The bid price may be set based on time (e.g., higher bid price on prime time), target platform (e.g., different bid price for notification deliver to mobile, web, and desktop), notification delivery mechanism (e.g., different bid price for notification delivery by device, email, or other suitable mechanism), priority value (e.g., a notification set by the user may have a higher priority than a notification submitted by an application), content of the notification (e.g., related to subject search by the user), and overall quality of the notification (e.g., feedback from user). In one example, a notification may be assigned a higher bid price if the user interacts with it (e.g., if the user clicks on a link within the notification) than a notification that is merely viewed by the user. In another example, a calendar notification may be given a higher priority value than others and may be assigned with a higher bid price based on the priority value. In another example, the priority value of a notification may be adjusted based on time. For example, the priority value for a communication notification may be set higher during rush hour resulting in a higher bid price for the communication notification.

At step 24, notifications submitted by a particular application may then be ranked based on the bid price of each notification. A notification with a higher bid price may be ranked higher than a notification with a lower bid price.

As shown in Figure 2, at step 25, the notification delivery module may select the notifications to be delivered based on the rank for the particular application until the budget for the particular application runs out. For example, suppose the budget for a particular application has been set to four, the four most expensive notifications may be selected to be delivered to the user.

A user may also set notifications to be delivered without any cost (e.g., free notifications). A priority value may be set for each notification. A notification request may further be allowed regardless of remaining notification limit of notifications if the priority is set above a predetermined threshold. As such, a notification set by the user may be given a high priority and the notification delivery module may always use the priority value to select the notifications set by the user to be delivered to the user.

The notification delivery module may then deliver the selected notifications during a desired time period at step 26. A run-time of 24 hours may be used by the notification delivery module. Alternatively, the notification delivery module may use a dynamic time window, which may be set based on the user's activity. For example, the notification delivery module may avoid delivery notifications during meetings or while the user is asleep based on user feedback. One or more machine learning algorithms may be used to train the notification delivery module to identify desired time periods for sending notifications.

The notification delivery module may allow an exchange of budget between applications based on an application's current needs. For example, a map service application may find it highly

important to send a notification at commute time, while a file storage application may value notifications delivered during work hours. Applications may sell budget to other applications and repurchase again based on needs.

The user may provide feedback to the notification delivery module at step 27. The notification delivery module may generate a request asking the user to give permission for sharing of computing device information. For example, the user of computing device 5 in Figure 1 may be provided with an opportunity to provide input to accept or reject the collection and/or use of the computing device information associated with computing device 5 (e.g., information about the user's calendar schedule, notification delivery history, the number of notifications that the user has interacted with, the web browsing history of the user, etc.) by the notification delivery module.

It is noted that the techniques of this disclosure may be combined with any other suitable technique or combination of techniques. As one example, the techniques of this disclosure may be combined with the techniques described in International Patent Application Publication 2019/030554A1. As another example, the techniques of this disclosure may be combined with the techniques described in US Patent Application Publication 2012/0166284A1.