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PACING DATA CONSUMPTION FOR COMPUTING DEVICES USING DAILY DATA ALLOCATIONS

ABSTRACT

Network providers (e.g., a cellular data provider, cable internet provider, or other network provider) allocate a finite or fixed amount of cellular data or mobile data to a computing device for use during a time period (e.g., one month). A computing device may partition or divide the total amount of data into a general data pool and a reserve data pool. The computing device may divide the general data pool for the time period into smaller amounts of data for a portion of the time period (e.g., daily). For example, the computing device may determine a daily data allocation, allotment, or limit by dividing the general data pool for the month by the number of days in a month. In some examples, the computing device prevents the user from utilizing more than the allocated amount of data from the general data pool in any one day or other portion of the time period. In this way, the computing device may assist the user in pacing his/her data usage throughout the time period. The computing device may permit certain exempt applications to utilize data from the reserve data pool even if the computing device has utilized the daily allocation of data from the general data pool. In this way, the computing device may enable the important applications to utilize data when the daily allocation of data from the general data pool has been used.

DESCRIPTION

Techniques are described that enable a computing device to pace data usage by allocating the total amount of data available to a user of a computing device in a time period into subportions of the time period, with subportions of the total data allocation accessible during each time subportion.

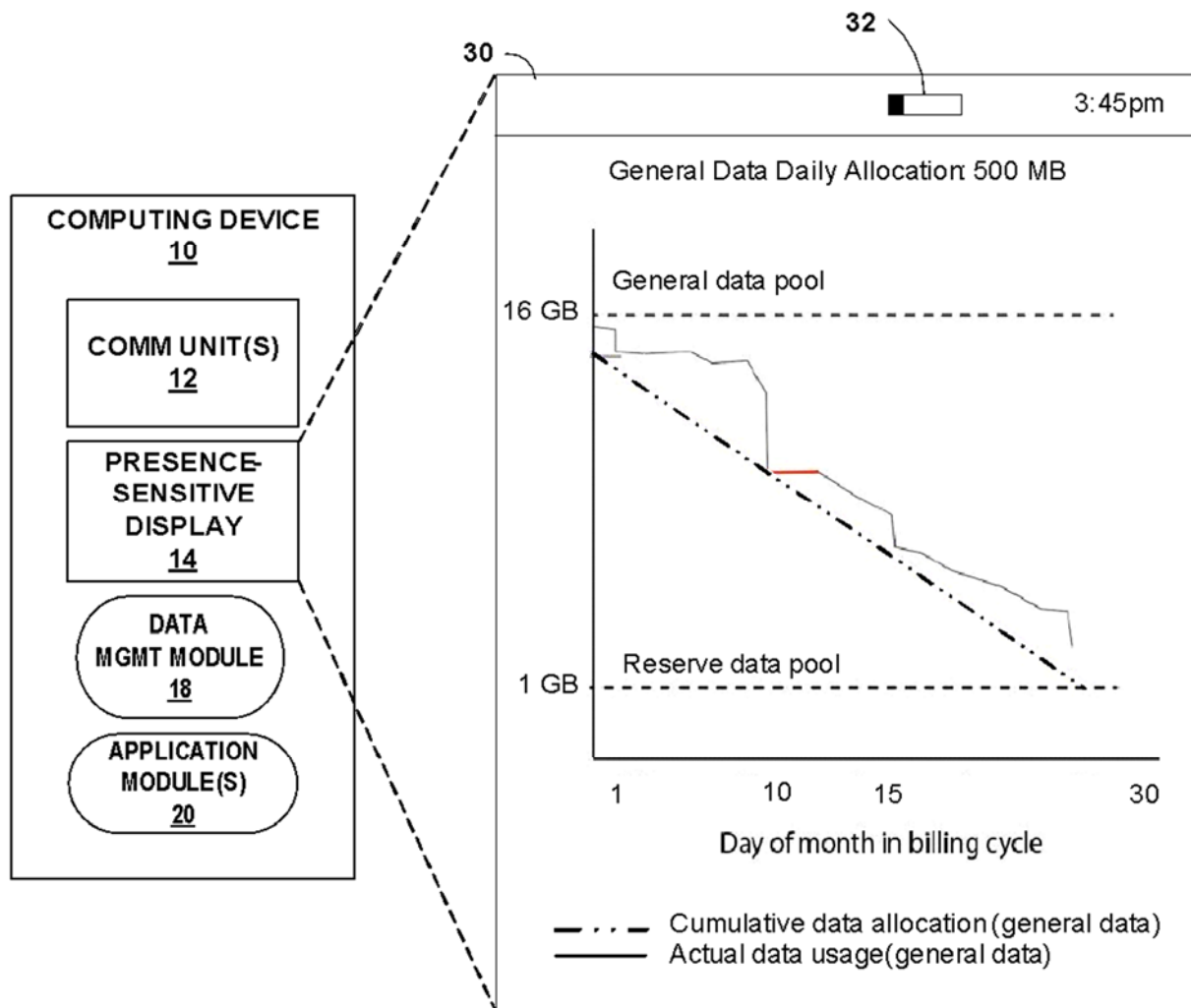


FIG. 1

Computing device 10 may include any type of computing device capable of exchanging data with another computing device over a network, such as a smart phone, a desktop computer, a laptop computer, a tablet computer, a smart watch, a smart camera, a smart speaker (with or without a display), smart glasses, a smart thermostat, a smart television (including an add-on device to enable smart television experiences), a server, a vehicle infotainment system, or any other type of computing device or system. Computing device 10 includes one or more processors. Examples of processors include, but are not limited to, digital signal processors

(DSPs), general purpose microprocessors, application specific integrated circuits (ASICs), field programmable logic arrays (FPGAs), or other equivalent integrated or discrete logic circuitry.

Computing device 10 may include communication (comm) unit 12. Examples of communication unit 12 include a cellular radio, a wireless network radio (e.g., WIFI™, BLUETOOTH®, etc.), a network interface card (e.g. such as an Ethernet card), a cable modem, or any other type of device that can send and/or receive information. For example, communication unit 12 may communicate with other computing devices via a network provider, such as a cellular provider, cable internet provider, or other network provider.

Computing device 10 may include a presence-sensitive display (PSD) 14. PSD 14 may function as a respective input and/or output device for computing device 10. PSD 14 may be implemented using various technologies. For instance, PSD 14 may function as an input device using a presence-sensitive input screen, such as a resistive touchscreen, a surface acoustic wave touchscreen, a capacitive touchscreen, a projective capacitance touchscreen, a pressure sensitive screen, an acoustic pulse recognition touchscreen, or another presence-sensitive display technology. PSD 14 may also function as an output (e.g., display) device using a display device, such as a liquid crystal display (LCD), a dot matrix display, a light emitting diode (LED) display, an organic light-emitting diode (OLED) display, e-ink, or similar monochrome or color display capable of outputting visible information to a user of computing device 10.

Computing device 10 may also include data management (mgmt) module 18 and one or more application modules 20. Data management module 18 and application modules 20 may perform operations described using hardware, hardware and software, hardware and firmware, or a mixture of hardware, software, and firmware residing in and/or executing at computing device 10. Computing device 10 may execute modules 18 and 20 with multiple processors or multiple

devices. Computing device 10 may execute modules 18 and 20 as one or more services of an operating system or computing platform, or as one or more executable programs at an application layer of an operating system or computing platform.

Data management module 18 may receive data indicating a total amount of data allocated to computing device 10 by a network provider for a time period. The total amount of data allocated to computing device 10 may be a network provider data limit, such as a limit specified by a cellular network or cellular carrier contract. In some examples, the time period is a day, week, month, or a year, although in other examples different time periods may be used. For example, data management module 18 may receive a user input indicating that computing device 10 is allocated 16 GB for a one-month time period.

In one example, data management module 18 may enable any of application modules 20 to utilize the total amount of data allocated to computing device 10 during a given time period. In another example, data management module 18 partitions the total amount of data into a general data pool and a reserve data pool.

In one example, data management module 18 enables certain exempt application modules of application modules 20 (e.g., applications that perform critical services) to utilize the reserve data pool while prohibiting other application modules of application modules 20 from utilizing data allocated to the reserve data pool. Examples of exempt application modules that may utilize data in the reserve data pool include an email application, calendar application, navigation application, or other applications that typically consume relatively low bandwidth or data. In some examples, data management module 18 allows the user to select the exempt applications. In one example, data management module 18 may receive a user input indicating amount of data

to include in the reserve data pool. In the example of FIG. 1, data management module 18 sets the reserve data pool for the time period equal to 1 GB based on the user input.

Data management module 18 may receive a user input enabling data management to allocate data to portions of the time period. For example, data management module 18 may output a graphical user interface with settings that allow the user to enable or disable data management module 18 to pace data usage by allocating data to portions of the time period.

Data management module 18 may allocate data in the general data pool (and in some examples, data in the reserve data pool) to portions of the time period. A portion of a time period may be an hour, day, several days, or any other division of the time period. In one example, the time period may be a month and computing device 10 may allocate the data (e.g., general data and/or reserve data) into daily data allocations. In some instances, data management module 18 allocates data for each portion of a time period equally. For instance, data management module 18 may allocate the same amount of data for each day of the month. In the example illustrated in FIG. 1, data management module 18 may determine the daily data allocation of data from the general data pool is 500 MB (one-thirtieth of 15 GBs of the general data pool for the month).

In some examples, data management module 18 allocates the data for each portion of the time period unequally. For example, data management module 18 may allocate more data from the general data pool to days of the weekend (e.g., Saturday and Sunday) compared to days of the work week (e.g., Monday through Friday). In one example, data management module 18 may allocate the data based on historical data usage. For example, data management module 18 may determine that the user has historically used more data in morning and evening (e.g., while streaming music while commuting) and may allocate more data to those portions of time.

In some examples, the exempt application modules of application modules 20 utilize data from the daily data allocation of the general data pool until the daily data allocation is exhausted and utilize data from the reserve data pool after the daily data allocation of the general data pool is exhausted. In another example, the exempt application modules utilize data from the reserve data pool first and utilize data from the general data pool if the reserve data pool is exhausted.

According to one scenario, computing device 10 may utilize less than the allocated amount of data for a given portion of a time period. In the example illustrated in FIG. 1, computing device 10 may utilize 300 MB of data on the first day of the month. In some examples, data management module 18 re-divides the remaining data for remaining portion of the time period. For example, data management module 18 may determine there are 29 days left in the month and 14.7 GBs of data remaining from the general data pool, and may divide the remaining data from the general data pool by the remaining number of days to calculate an updated allocation of data for each subsequent portion (e.g., day) of the time period (e.g., month).

In one example, data management module 18 determines a cumulative data allocation (also referred to as an aggregate data allocation) for a plurality of portions of time. For example, data management module 18 may determine the cumulative data allocation by multiplying the daily data allocation by the number of portions that have elapsed. As one example, on the second day of the month, data management module 18 may determine that cumulative data allocation for the first two days of the month includes 1.0 GB of data. In the example of FIG. 1, data management module 18 may determine that computing device 10 utilized 300 MB of data on the first day of the month, such that computing device 10 may utilize up to 700 MBs of data during the second day of the month. That is, data management module 18 allows computing

device 10 to consume data as long as there is data from the general data pool available at the proscribed pace.

In some examples, data management module 18 may determine whether computing device 10 has utilized the cumulative data allocation. For example, as illustrated in FIG. 1, computing device 10 may utilize a large amount of data from the general data pool on the 10th day of the time period. In such examples, data management module 18 determines that computing device 10 has utilized the cumulative data allocation through ten days. Responsive to determining that computing device 10 has utilized the cumulative data allocation through the first ten days of the time period, data management module 18 may restrict data usage from the general data pool. In some examples, data management module 18 permits exempt application modules from application modules 20 to utilize data from the reserve data pool when the cumulative data allocation from the general data pool has been used or exhausted. In this way, data management module 18 may assist the user of computing device 10 in pacing data utilization, thereby reducing the likelihood that computing device 10 utilizes all of the general data pool prior to the end of the time period.

Data management module 18 may output an alert or notification indicating the user has utilized all of the cumulative data allocation through that portion of the time period. In some examples, the notification indicates that cumulative available data has been exhausted and that additional data usage will be restricted or capped for the remainder of the current portion (e.g., current day). In one example, the notification indicates that the exempt application modules of application modules 20 are still permitted to utilize data from the reserve data pool.

Data management module 18 may output a notification enabling the user to borrow data from the general data pool that is allocated to future portions of the time period. For example,

the notification may include data indicating the daily data allocation from the general data pool and may enable the user to select an amount of data to borrow. In some instances, data management module 18 adjusts or re-calculates the daily data allocation and/or cumulative data allocation for the remainder of the time period in response to receiving a user input to borrow data. For instance, data management module 18 may determine that computing device 10 utilized 7.5 GBs of the general data pool (e.g., 15 GBs) through the first 15 days of the 30 month and that the user borrowed 500 MB from the general data pool. In such instances, data management module 18 may re-calculate the daily data allocation (e.g., 7 GB remaining divided by 15 days). In such examples, data management module 18 may also re-calculate the cumulative data allocation for each subsequent portion of the time period. In some examples, the user may repeatedly borrow data from the remaining portion of the time period, which may lead to fully depleting data from the general data pool prior to the end of the time period.

In some examples, data management module 18 outputs a notification prompting the user to update the total amount of data for the time period in response to determining that computing device 10 has utilized the cumulative data allocation for a portion of the time period. For example, the network provider may enable the user to purchase additional amounts of data in certain increments (also referred to as a carrier overage increment) if the user exceeds the total amount of data allocated by the network provider. In one example, the notification may enable the user to specify the amount of additional data that the user is allowed to exceed the original total amount of data. In such examples, data management module 18 may increase the general data pool by the additional data amount and re-calculate the daily data allocation and/or cumulative data allocation.

In some examples, computing device 10 may output a graphical user interface (GUI) 30 that includes data indicating the daily data allocation (also referred to as a daily quota), the cumulative data allocation, the amount of data remaining from the daily data allocation, and/or the amount of data remaining from the cumulative data allocation. For example, as illustrated in FIG. 1, GUI 30 includes a status bar indicator 32 indicating the amount of data remaining from the daily data allocation and/or cumulative data allocation.

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 U.S. Patent Publication No. 2015/0099483 entitled “System and method for data usage management in an electronic device” by Vetaal et al.