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ABSTRACT

This paper describes techniques for intelligently selecting and utilizing components of one or more provider plans, such as one or more mobile service provider (e.g., mobile carrier) plans, which are configured for use on a mobile computing device. Various modern mobile computing devices are equipped with two or more subscriber identity modules, or SIMs. The techniques of the present paper enable a mobile computing device (e.g., smartphone) that is equipped with multiple SIMs to intelligently select and utilize a particular mobile service provider plan, or components (e.g., voice, text, data components) of multiple different service provider plans that are associated with corresponding SIMs. For example, based on factors such as user preferences, location information associated with a mobile computing device, and/or pricing information associated with each service provider plan, the mobile computing device may be configured to select various components of one or more service provider plans to use at any given time, such as while a user of the device is travelling.

DESCRIPTION

As outlined above, this paper describes techniques for automatically and intelligently selecting and utilizing portions of one or more mobile service provider plans that are configured for use on a mobile computing device (e.g., smartphone), which may be equipped with multiple SIMs. Certain SIMs, or SIM cards, may be inserted into or otherwise coupled to one or more external ports of a mobile computing device. Other types of SIMs, such as embedded SIMs, are programmable modules that are embedded directly into or within a mobile computing device.

Each individual SIM may comprise a component (e.g., integrated circuit) that securely stores subscriber identification and/or other network-specific information that is used to identify and authenticate subscribers (e.g., smartphone users) with corresponding mobile service providers (e.g., cellular carriers). As mobile computing devices begin to support multiple SIMs and multiple different service provider plans associated with these SIMs, users of these mobile devices may wish to choose which service provider that the mobile device should use for voice calls, exchanging text messages, and/or sending and receiving data at any point in time. However, users may not often know the cheapest or most efficient service provider plan or plan configuration at different points in time, such as when they are travelling.

For instance, in one particular example, a mobile device may have two SIMs, and the device user may subscribe to a different service provider plan for each SIM. As one example, a first SIM may be associated with a first service provider plan of a first service provider for voice, text, and/or data services at a first monthly fee. The first SIM may store subscriber identification information and/or other network-specific information that the first service provider may use to identify and authenticate the subscriber of the mobile device, as well as to identify the first service provider plan associated with this subscriber. Similarly, a second SIM of the mobile device may be associated with a second service provider plan of a second service provider for voice, text, and/or data services at a second monthly fee. The second SIM may store subscriber identification information and/or other network-specific information that the second service provider may use to identify and authenticate the subscriber of the mobile device, as well as to identify the second service provider plan associated with this subscriber.

Each service provider plan provided by the corresponding service provider may include different features. For example, the first service provider plan may include a first voice plan that

provides unlimited monthly voice calls within a first region, a first text plan that provides unlimited monthly text messaging within the first region, and a first data plan that provides a predefined amount of monthly data transfer within the first region. If the user of the mobile device travels outside of the first region, additional roaming charges may apply (e.g., charges based on the number of minutes of a voice call, the number of text messages, or the amount of data transfer outside of the first region). The second service provider plan may include a second voice plan that provides voice calls at a specified cost-per-minute within a second region, a second text plan that provides a specified cost-per-text with the second region, and a second data plan that provides an unlimited amount of monthly data transfer within the second region. If the user of the mobile device travels outside of the second region, additional roaming charges may apply for voice calls, text messages, and/or data transfer. The second region may or may not overlap with the first region.

In some cases, the user may be able to manually change one or more settings associated with the first and/or second SIMs to select individual features from the first and/or second service provider plans as the user travels. For instance, if the user travels to an area that is outside of the first region but still inside the second region, the user may wish to use one or more features of the second service provider plan associated with the second SIM, such as the second data plan that provides unlimited data transfer within the second region. However, depending on the roaming costs associated with the first voice plan and first text plan compared to the cost-per-minute of the second voice plan and the cost-per-text of the second text plan, the user may wish to selectively use the first or second voice plan along with either the first or second text plan. The user may then need to manually change the settings associated with the first and/or second SIMs, and may also need to repeatedly adjust these settings as the user travels from area to area

over time. In many cases, it may be quite burdensome for the user to perform such adjustments and continually assess cost comparisons between plans, particularly when the user may not in all instances be aware of the specific costs of each plan.

Rather than having to perform such manual adjustments and to address the problem of efficient use of a mobile device across multiple service providers, the user may instead rely on an automated system provided by the mobile device that obtains or discovers information about all service provider plans that are associated with installed SIMs of the device. Based on such information, which may be stored on or external to the mobile device, the techniques of the present paper enable a mobile device that is equipped with multiple SIMs to intelligently select and utilize a particular mobile service provider plan, or portions (e.g., voice, text, data portions) of multiple different service provider plans that are associated with corresponding SIMs of the device. For example, based on factors such as user preferences, location information, and/or pricing information associated with each service provider plan, the device may be configured to select portions of one or more service provider plans to use at any given time (e.g., while the user is travelling or roaming). These techniques may support the dual SIM dual standby mode and/or the dual SIM dual active mode, where multiple SIMs may be active at the same time. In general, the techniques enable the intelligent selection of individual voice, text, and data plans associated with any number of two or more SIMs that are installed on a mobile device, where any one or more of these SIMs may be active at a given time.

Figure 1 shown below illustrates an example mobile computing device 100 that may be configured to perform the techniques described herein. Mobile computing device 100 includes a display device 102 (e.g., a presence-sensitive display device), one or more processors 120, one or more input components 122, one or more output components 126, one or more communication

units 124, one or more SIMs 128, and one or more storage devices 150. FIG. 1 illustrates only one particular example of mobile computing device 100.
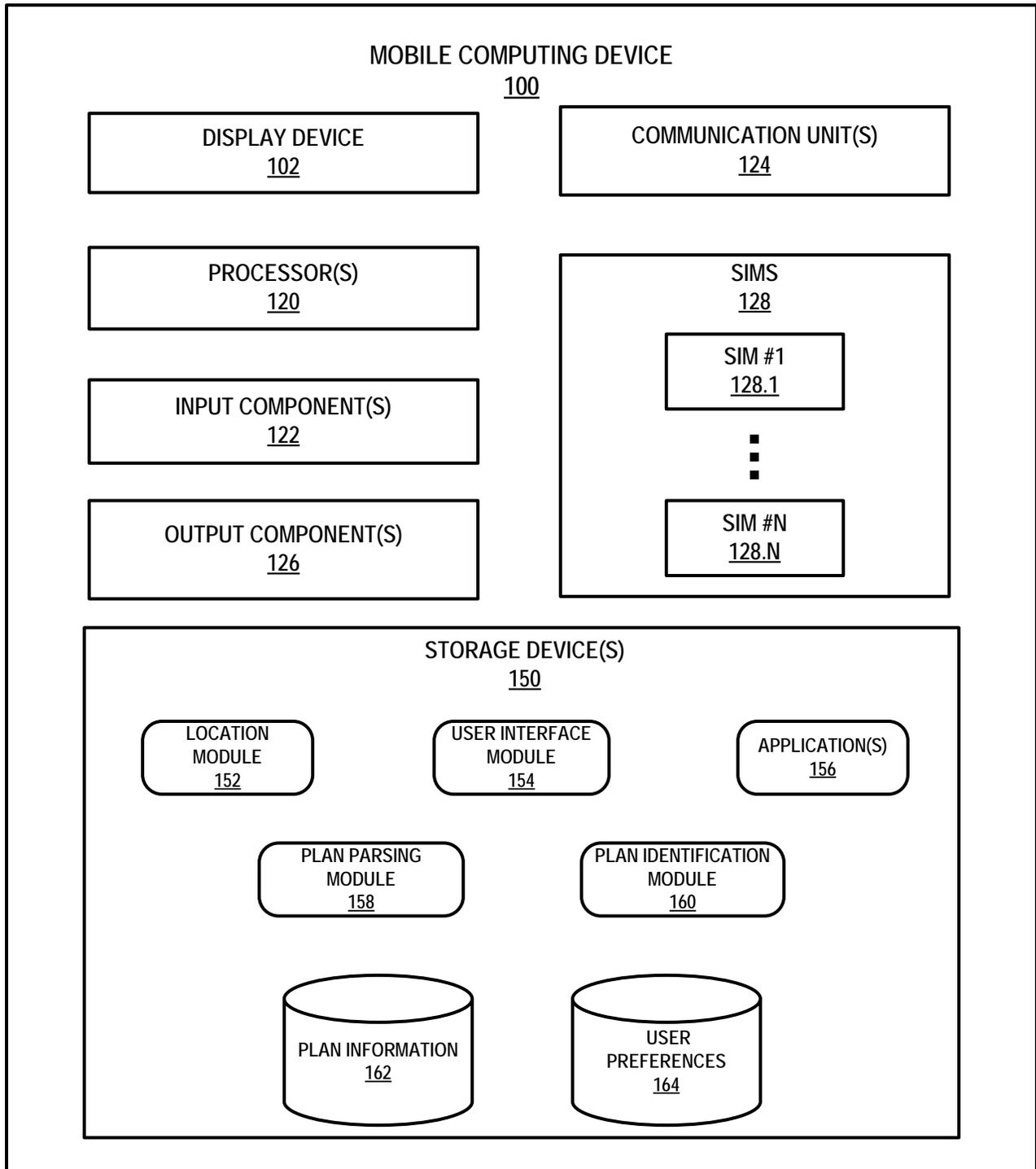

Figure 1: Example Mobile Device Configured to Intelligently Select Service Plan(s)

Many other examples of mobile computing device 100 may be used in other instances and may include a subset of the components shown, or additional components not shown, in FIG. 1. In some examples, one or more components shown in FIG. 1 (e.g., processors 120, storage devices 150) may be provided by one or more devices that are remote from or external to mobile computing device 100.

Input components 122 may receive input, such as touch/tactile, presence-sensitive, and/or audio input. Output components 126 may generate output, such as haptic, audio, and/or visual output. Communication units 124 may communicate with external devices via one or more networks (e.g., one or more wired and/or wireless networks) by transmitting and/or receiving network signals via the one or more networks. For example, mobile computing device 100 may use communication units 124 to transmit and/or receive radio signals on a radio network such as a cellular radio network, or to transmit and/or receive satellite signals on a satellite network such as a global positioning system (GPS) network.

SIMs 128 include two or more individual SIMs, which are labelled SIM #1 (SIM 128.1) through SIM #N (128.N), where N is greater than or equal to two. Each of SIMs 128 may comprise any form of SIM, such as an external SIM (e.g., SIM card inserted into a SIM port) or an embedded SIM.

Storage devices 150 may store information for processing during operation of mobile computing device 100 (e.g., during execution of one or more applications 156, a location module 152, a user interface module 154, a plan parsing module 158, and/or a plan identification module 160 by processors 120). Storage devices 150, in some examples, include one or more computer-readable storage media. As illustrated in FIG. 1, storage devices 150 may also store plan information 162 and user preferences 164, as described in further detail below.

Applications 156 may include one or more applications that are executed by processors 120 during operation. An e-mail application, a map or navigation application, a calendar application, a voice or phone application, a messaging application, a social media application, a travel application, an interactive assistant application, a game application, a stock application, and/or a weather application are all examples of applications 156. One or more of these applications 156 may make use of the voice plan, text plan, and/or data plan included in one or more service provider plans associated with SIMs 128.

During execution, plan identification module 160 may detect that the user of mobile computing device 100 has multiple different service provider plans that are associated with SIMs 128, such as by activation of multiple ones of SIMs 128. Each one of SIMs 128 may be associated with a different respective service provider plan. In some cases, the user may provide input defining the features of each individual plan. For example, user interface module 154 may output a graphical user interface for display at display device 102. The user may interact with this graphical user interface to input the features of the different plans.

Continuing with the example above, for instance, a first service provider plan may be associated with SIM #1 (SIM 128.1), while a second service provider plan may be associated with SIM #N (SIM 128.N). The user may provide the details of the voice, text, and data plans of the first service provider plan associated with SIM #1, and may also provide the details of the voice, text, and data plans of the second service provider plan associated with SIM #N. All such plan information may be stored in plan information 162.

In other examples, plan parsing module 158 may at least partially automate this functionality. In these examples, plan parsing module 158 may determine, based on certain documentation or information that is received or otherwise processed, e.g., from service

providers, the specific details of each respective service provider plan, and store such details within plan information 162. For instance, upon signing up for or activating the first service provider plan of the first service provider, the user of mobile computing device 100 may receive electronic documentation (e.g., email documentation, word processing documentation) from the first service provider that identifies the specific details regarding the voice, text, and data plans included in the first service provider plan. In some cases, plan parsing module 158 may receive or process other forms of electronic documentation, such as documentation from a service provider's website, or other publicly available documentation associated with a service provider and/or service provider plan. Plan parsing module 158 may be able to infer and/or confirm various plan details from such documentation.

Upon receiving the user's approval, plan parsing module 158 may parse and process this electronic documentation to automatically identify various details, such as details about the voice, text, and data plans, as well as any associated billing or cost parameters. Plan parsing module 158 may similarly parse electronic documentation received or processed from the second service provider to identify details about the second service provider plan. The details about the voice, text, and data plans may include information as to whether the plans are unlimited or metered, as well as the associated costs. An unlimited plan may include a fixed monthly cost, whereas a metered plan may include a certain defined cost plus an additional cost per minute/text/byte above specified thresholds in a given billing period. The plan details may also include details associated with additional roaming charges that may be occurred while mobile computing device 100 is outside of the first region. In general, plan parsing module 158 may identify the plan details, including any associated voice, text, and data costs for each region

mentioned in the corresponding service provider plan, and store these details in plan information 162.

At any point in time, plan identification module 160 may identify portions of one or more service provider plans, such as the first and second service provider plans described above, which mobile computing device 100 may use. For example, as the user of mobile computing device 100 travels to various locations in the first or second regions, plan identification module 160 may attempt to identify the features of the first and/or second service provider plans that provide the most economical (e.g., cheapest) and/or most efficient result for voice, text, or data usage. In order to identify the current location of mobile computing device 100, processors 120 may execute location module 152.

Location module 152 may use one or more input signals to determine the current location of mobile computing device 100. For example, if communication units 124 are configured to transmit and/or receive radio signals on a radio network such as a cellular radio network, location module 152 may determine the location of mobile computing device 100 based on received signals that indicate mobile cell tower location information. If communication units 124 are configured to transmit and/or receive satellite signals on a satellite network, such as a global positioning system (GPS) network, location module 152 may determine the location of mobile computing device 100 based on these satellite signals. In various other cases, location module 152 may use other input information (e.g., other short-range wireless information, social media information provided by applications 156) to identify the location of mobile computing device 100.

Location module 152 may provide the location of mobile computing device 100, as input, to plan identification module 160. Plan identification module 160 may then access plan

information 162 to identify the plan details of each active service provider plan that is associated with a corresponding one of SIMs 128 (e.g., details of the first and second service provider plans described above). Plan identification module 160 may then intelligently identify a particular mobile service provider plan, or components of multiple different service provider plans (e.g., voice, text, data components), for selection and use on mobile computing device 100. For example, based on factors such as user preferences, location information provided by location module 152, and/or pricing information associated with each service provider plan, mobile computing device 100 may be configured to select individual voice, text, and data plans associated with any number of SIMs 128 that are installed on mobile computing device 100. The details about the voice, text, and data plans may include information as to whether the plans are unlimited or metered, as well as the associated costs or billing parameters. In some cases, plan identification module 160 may also account for the current time period within the current billing cycle in identifying optimum service plan components.

Continuing with the example above, wherein SIM #1 is associated with the first service provider plan, and SIM #N is associated with the second service provider plan, if the user of mobile computing device 100 travels to an area that is outside of the first region but still inside the second region, plan identification module 160 may determine that the most economical overall plan for data usage is the second data plan associated with SIM #N, which provides unlimited data transfer within the second region. Depending on the roaming costs associated with the first voice plan and first text plan associated with SIM #1, when compared to the cost-per-minute of the second voice plan and the cost-per-text of the second text plan associated with SIM #N, plan identification module 160 may identify either the first voice plan from SIM #1 or the second voice plan from SIM #N as the most economical choice for voice communication.

Plan identification module 160 may also identify either the first text plan from SIM #1 or the second text plan from SIM #N as the most economical choice for text messaging. In such fashion, plan identification module 160 may identify select portions or components of the plans associated with one or more of SIMs 128, at any given time, as part of the most preferred or cost-efficient options.

As noted above, in some cases, plan identification module 160 may utilize user preference information when identifying service provider plans. User preference information may be stored in user preferences 164. User preferences 164 may include certain preferences associated with the service plans or other parameters. For example, the user of mobile computing device 100 may prefer to always use the same phone number for any voice calls, which may be associated with SIM #1 for the first service provider plan. The user may also prefer to always use the second service provider plan for data usage in all instances. These types of preferences may be stored in user preferences 164 and used by plan identification module 160 when identifying optimum portions of the service provider plans for use at any given time based upon the current location of mobile computing device 100.

In some cases, plan identification module 160 may identify the preferred service plan components (e.g., voice, text, data components) of the various service plans associated with SIMs 128, and provide a suggestion or recommendation to select and utilize these plan components to a user via user interface module 154. For instance, plan identification module 160 and/or user interface module 154 may output a recommendation, via display device 102, for the user to utilize the voice and text plans included in the first service provider plan associated with SIM #1, but to utilize the data plan included in the second service provider plan associated with SIM #N. Upon viewing this recommendation, the user of mobile computing device 100

may provide a user input to cause plan identification module 160 to select and utilize these service plan components for voice, text, and/or data communication at a given time. As the location of mobile computing device 100 changes over time (e.g., as mobile computing device 100 moves between regions that are associated with the first and/or second service provider plans), plan identification module 160 can identify, as appropriate, different preferred service plan components. In certain examples, based upon a prior approval from the user, plan identification module 160 may automatically select and utilize service plan components as they are identified in real time.

In some examples, the functionality provided by location module 152, user interface module 154, plan parsing module 158, and/or plan identification module 160 may be provided by an interactive assistant application, which may be one of applications 156. The interactive assistant application may be configured to make recommendations or suggestions to the user based on the available service provider plans associated with SIMs 128. In some cases, the interactive assistant application may be configured to proactively provide recommendations and suggestions prior to the user traveling to one or more regions. For example, when applications 156 include a calendar application, plan identification module 160 may access the details provided by the calendar application to determine that the user of mobile computing device 100 is about to take a trip from an area inside the first region associated with the first service provider plan to an area outside the first region (e.g., to an area inside the second region but outside the first region). Based on this information, and before the user embarks on this trip, plan identification module 160 may proactively provide a suggestion or recommendation associated with preferred service plan components, similar to those described above.

In certain cases, SIMs 128 may include only a single activated SIM (e.g., SIM #1) that is associated with a service provider plan. In these cases, when the user of mobile computing device 100 hasn't yet activated a second SIM associated with a second service provider plan, plan identification module 160 may be configured to identify other, different favorable service plans associated with one or more service providers. In these cases, plan identification module 160 may have access to plan information associated with other service provider plans (e.g., information stored in plan information 162 or in an off-device server), and may compare plan details of these other plans with the currently activated service provider plan associated with SIM #1. Based upon the user preferences, location of mobile computing device 100, and the pricing information associated with the various plans, plan identification module 160 may identify other favorable service provider plans that the user may use and activate on one of the remaining SIMs 128 to reduce voice, text, and/or data costs while travelling.

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 United States Patent Application Publication Numbers US20180109676A1 and US20130237197A1, and World Intellectual Property Organization (WIPO) Publication Number WO2018004712A1.