

**COMMUNICATION TERMINAL FOR MULTI-PHONE-NUMBER SERVICE,
AND METHOD WHEREBY SAID COMMUNICATION TERMINAL PROVIDES
MULTI-PHONE-NUMBER SERVICE**

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TECHNICAL FIELD

The present application claims priority to Korean Patent Application No. 10-2015-0122829 filed on August 31, 2015, and Korean Patent Application No. 10-2016-0109964 filed on August 29, 2016 in the Republic of Korea, the disclosures of which are
10 incorporated herein by reference.

The present disclosure relates to a multi phone number service, and more particularly, to a multi phone number service which enables to use a plurality of phone numbers by endowing an additional phone number other than a default phone number in a single communication terminal.

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BACKGROUND ART

Recently, due to the rapid development of mobile communication technology, mobile communication terminals have been popularized fast and changed daily life of most persons so that they always carry a mobile communication terminal such as a hand-held
20 phone and PDA. The mobile communication terminal allows a user to more easily access the communication network and efficiently distributes system resources of a conventional communication system.

In addition, recently, the mobile communication service not only provides the

communication service for a voice call but also provides various additional services according to the preferences of the user. As one of these additional services, a 'multi phone number' is widely used in which two or more phone numbers are endowed to a single mobile communication terminal so that a subscriber may select a desired phone number and originate a call. As a representative example of the 'multi phone number service', a Korean mobile communication company, KT, provides Two Number Plus service.

If the service of a communication terminal is initiated, a basic phone number endowed to the user is stored in a subscriber identity module (USIM : Universal Subscriber Identity Module), and if the subscriber identity module is installed to the communication terminal, and the communication terminal originates or receives a call using the basic phone number stored in the subscriber identity module. However, in the multi phone number service described above, an additionally provided phone number is not stored in the subscriber identity module but is stored just in a communication network, different from the basic phone number. Since the additional phone number is not stored in the subscriber identity module, the user using the multi phone number service adds a special number such as ** in front of the called phone number in the communication terminal when originating a call. In addition, when an incoming call arrives at the additional phone number of the corresponding user, the communication network receives the incoming call by attaching identification information indicating that the incoming call is terminated to the additional phone number.

As described above, in the conventional multi phone number service, only the basic phone number is an actual phone number stored in the subscriber identity module,

and the additional phone number may be regarded not as an actual phone number but as a virtual phone number. Thus, there are many restrictions on providing additional services, which are provided to the basic phone number serving as the actual phone number, for the additional phone number. That is, in the case of Two Number Plus service of KT, only
5 three additional services, namely a caller identification service, a catch call service and a voice mail service, are provided for the additional phone number that is a virtual phone number.

DISCLOSURE

10 Technical Problem

The present disclosure is directed to providing a communication terminal capable of allowing a user to use a multi phone number service by providing a plurality of actual phone numbers, and a method for providing a multi phone number service for the communication terminal.

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Technical Solution

In one aspect of the present disclosure, there is provided a communication terminal for providing a multi phone number service with a single communication terminal, comprising: a subscriber identity module configured to store a plurality of phone numbers
20 and store mapping information of an operation mode for each phone number; a plurality of interface units configured to provide independent operation modes respectively corresponding to the plurality of phone numbers by using the plurality of phone numbers and the mapping information stored in the subscriber identity module; and a switching unit

configured to switch and activate the plurality of interface units to each other.

The plurality of interface units may check a plurality of application dedicated files (ADF) by analyzing an elementary file directory (EF DIR) of the subscriber identity module and search a phone number at each of the plurality of application dedicated files.

5 The mapping information may be stored as an elementary file (EF) in the subscriber identity module.

The ER storing the mapping information may be stored in a subdirectory of a master file (MF) of the subscriber identity module or be stored in a subdirectory of an application dedicated file (ADF).

10 The ER storing the mapping information may have a plurality of record regions, and each phone number may be stored in each record region.

A length of a phone number, the phone number, and a value of an operation mode corresponding to the phone number may be stored in each of the plurality of record regions.

15 When a phone number is recorded in each record region, a number representing a digit number of the phone number and numbers composing the phone number may be recorded, two numbers in one byte, so that in each byte, a first number is recorded in lower 4 bits and a second number is recorded in upper 4 bits.

20 The switching unit may activate an interface unit of an operation mode corresponding to a password input by a user when the communication terminal is in a locked state.

The plurality of interface units may store reception setting information of each operation mode, receive a call only in a time zone during which call reception is allowed according to the reception setting information of each operation mode, and give an auto-

answering guide in a time zone during which call reception is not allowed.

The switching unit may activate an interface unit of a default operation mode when the communication terminal comes into an idle state.

Each of the plurality of interface units may determine an operation mode
5 corresponding to the incoming call based on an international mobile subscriber identity (IMSI) included in the incoming call received from a communication network.

In another aspect, there is also provided a method for providing a multi phone number service with a single communication terminal, comprising: by the communication terminal, searching a plurality of phone numbers and mapping information of an operation
10 mode for each phone number from a subscriber identity module; and by the communication terminal, activating any one of a plurality of interface units, which give independent operation modes respectively corresponding to the plurality of phone numbers, by using the searched plurality of phone numbers and the searched mapping information.

In the step of searching, an elementary file directory (EF DIR) of the subscriber
15 identity module may be analyzed to check a plurality of application dedicated files (ADF), and a phone number may be searched at each of the plurality of application dedicated files.

The mapping information may be stored as an elementary file (EF) in the subscriber identity module.

The ER storing the mapping information may be stored in a subdirectory of a
20 master file (MF) of the subscriber identity module or be stored in a subdirectory of an application dedicated file (ADF).

The ER storing the mapping information may have a plurality of record regions, and each phone number may be stored in each record region.

A length of a phone number, the phone number, and a value of an operation mode corresponding to the phone number may be stored in each of the plurality of record regions.

When a phone number is recorded in each record region, a number representing a digit number of the phone number and numbers composing the phone number may be
5 recorded, two numbers in one byte, so that in each byte, a first number is recorded in lower 4 bits and a second number is recorded in upper 4 bits.

The step of activating may include receiving a password from a user when the communication terminal is in a locked state; and activating an interface unit of an operation mode corresponding to the input password.

10 The method may further comprise: by the communication terminal, storing reception setting information of each operation mode; and by the communication terminal, receiving a call only in a time zone during which call reception is allowed according to the reception setting information of each operation mode and giving an auto-answering guide in a time zone during which call reception is not allowed.

15 The method may further comprise: by the communication terminal, coming into an idle state; and by the communication terminal, activating an interface unit of a default operation mode.

The method may further comprise: determining an operation mode corresponding to the incoming call based on an international mobile subscriber identity (IMSI) included
20 in the incoming call received from a communication network.

In another aspect, there is also provided a communication terminal for providing a multi phone number service with a single communication terminal, comprising: a subscriber identity module configured to store a plurality of phone numbers; a memory

configured to store mapping information of an operation mode for each phone number; a plurality of interface units configured to provide independent operation modes respectively corresponding to the plurality of phone numbers by using the plurality of phone numbers stored in the subscriber identity module and the mapping information stored in the memory; and a switching unit configured to switch and activate the plurality of interface units to each other.

Advantageous Effects

According to an embodiment, when providing a multi phone number service in a single communication terminal, a virtual phone number is not additionally endowed but an actual phone number is additionally endowed. Thus, a user having one communication terminal may feel as if he/she has a plurality of communication terminals, and the user may also use all of various additional services with an additional phone number.

DESCRIPTION OF DRAWINGS

FIG. 1 is a diagram showing the concept of a multi phone number service with a communication terminal according to an embodiment.

FIG. 2 is a diagram showing a communication terminal for a multi phone number service according to an embodiment.

FIG. 3 is a diagram showing a file structure of a subscriber identity module according to an embodiment.

FIG. 4 is a diagram showing a structure of an elementary file (EF) including mapping information of an actual phone number and an operation mode according to an

embodiment.

FIG. 5 is a diagram showing components for providing the multi phone number service at a communication terminal according to an embodiment.

FIG. 6 is a diagram for illustrating a process of switching from a locked state to a specific operation mode according to an embodiment.

FIG. 7 is a diagram showing a screen in which reception setting information of each operation mode is stored according to an embodiment.

FIG. 8 is a flowchart for illustrating a method for providing a multi phone number service with a communication terminal according to an embodiment.

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BEST MODE

The foregoing objects, features, and advantages will become apparent from the following detailed description with reference to the accompanying drawings, and accordingly, those skilled in the art will be able to easily practice the technical aspects of the present disclosure. Furthermore, in the description of the present disclosure, when it is deemed that certain detailed description of known technology related to the present disclosure may unnecessarily make the essence of the disclosure vague, its detailed description is omitted herein. Hereinafter, a preferred embodiment of the present disclosure is described in detail with reference to the accompanying drawings.

FIG. 1 is a diagram showing the concept of a multi phone number service with a communication terminal according to an embodiment.

As shown in FIG. 1, a subscriber identity module such as a universal subscriber identity module (USIM) stores a plurality of actual phone numbers 101-1, 101-2, ..., 101-N.

The examples where the subscriber identity module stores a plurality of actual phone numbers 101-1, 101-2 ... 101-N will be explained later in detail. In addition, a communication terminal operates in operation modes 102-1, 102-2 ... 102-N respectively corresponding to the plurality of actual phone numbers 101-1, 101-2 ... 101-N. In other words, each actual phone number stored in the subscriber identity module and each operation mode of the communication terminal are matched in one-to-one relationship. For each of the operation modes 102-1, 102-2 ... 102-N, an address book, incoming/outgoing call logs, a message box, an application installation environment and the like are applied independently.

FIG. 2 is a diagram showing a communication terminal for multi phone number service according to an embodiment.

As shown in FIG. 2, the communication terminal 200 includes a memory 210, a memory controller 221, at least one processor (CPU) 222, a peripheral interface 223, an input/output (I/O) sub-system 230, a display device 241, an input device 242, a communication circuit 252 and a subscriber identity module 260. These components communicate through at least one communication bus or signal line. Various components depicted in FIG. 2 may be implemented in hardware, software, or a combination of hardware and software, including at least one signal processing and/or application specific integrated circuit.

The memory 210 may include a high-speed random access memory, and may also include at least one magnetic disk storage device, a non-volatile memory such as a flash memory device, or another non-volatile semiconductor memory device. In some embodiments, the memory 210 may include a storage device located far from at least one

processor 222, for example a network attached storage device accessing the communication circuit 252 through a communication network (not shown) such as the Internet, an intranet, a local area network (LAN), a wide area network (WLAN), a storage area network (SAN), or any suitable combination thereof. The access to the memory 210
5 by other components of communication terminal 200, such as the processor 222 and the peripheral interface 223, may be controlled by the memory controller 221.

The peripheral interface 223 connects input/output peripheral devices of the communication terminal 200 to the processor 222 and the memory 210. At least one processor 222 executes various software programs and/or instruction sets stored in the
10 memory 210 to perform various functions for the communication terminal 200 and process data. In some embodiments, the peripheral interface 223, the processor 222 and the memory controller 221 may be implemented on a single chip, such as a chip 220. In other embodiments, they may be implemented as separate chips.

The I/O sub-system 230 provides an interface between the input/output peripheral
15 devices of the communication terminal 200, such as the display device 241 and the input device 242, and the peripheral interface 223.

The display device 241 may use liquid crystal display (LCD) technology or light emitting polymer display (LPD) technology. The display device 241 may be a touch display in a capacitive type, a resistive type, an infrared type, or the like. The touch
20 display provides an output interface and an input interface between a terminal and a user. The touch display displays a visual output to the user. The visual output may include text, graphics, video, or combinations thereof. All or some of the visual outputs may correspond to a user interface object. The touch display forms a touch sensitive surface

that receives a user input.

The subscriber identity module (USIM) 260 is a card-shaped module that is usable in a mobile communication terminal and stores personal information including a phone number so as to provide a variety of services such as authentication, charging, and security functions to a subscriber. In 1982, at the Conference of European Postal and Telecommunications administrations (CEPT), a single standard called the Global System for Mobile Communications (GSM) was introduced and the SIM(Subscriber Identity Module) was introduced for the purpose of user authentication. The USIM is advanced from the SIM and is a fingernail-sized chip that is essentially inserted into a terminal of asynchronous third generation mobile communication (WCDMA). The USIM also functions as a general purpose IC card (UICC), which may contain the role of the SIM for subscriber authentication and the functions of a transportation card and a credit card. The general purpose IC card guarantees the integrity and security of all personal information data by supporting the security of various multi applications. The USIM includes a small CPU and a memory. The CPU identifies a user with encryption/decryption functions, and the memory is used as a storage space for additional services. The memory may contain functions of a credit card, a transportation card or a membership card. In particular, by means of the Over the Air (OTA) technology, a service may be loaded wirelessly without issuing of a separate chip, if banking service or card service is approval. In this embodiment, the USIM is described as an example of the subscriber identity module 260, but without being limited thereto, and other types of subscriber identity modules (e.g., a subscriber identity module (SIM)) may also be applied for mobile communication services.

The subscriber identity module 260 stores a plurality of actual phone numbers

101-1, 101-2 ... 101-N for the multi phone number service. The subscriber identity module 260 may store mapping information of each of the actual phone numbers 101-1, 101-2, ..., 101-N and each of the operation modes 102-1, 102-2, ..., 102-N. As an alternative, the mapping information may also be stored in the memory 210 of the communication terminal 200.

The processor 222 is configured to perform operations associated with the communication terminal 200 and to perform instructions. For example, the processor 222 may control to receive and manipulate input and output data among components of the communication terminal 200 by using instructions searched from, for example, the memory 210.

In some embodiments, software components such as an operating system 211, a graphic module (an instruction set) 212 and a multi phone number service application (an instruction set) 213 is loaded (installed) in the memory 210.

The operating system 211 may be an embedded operating system such as, for example, Darwin, RTXC, LINUX, UNIX, OS X, WINDOWS, VxWorks, Android, or the like. The operating system 211 includes various software components and/or devices for controlling and managing general system tasks (for example, memory management, storage control, power management or the like) and may promote communication among various hardware and software components.

The graphics module 212 includes various software components well known in the art in order to provide and display graphics on the display device 241. The term “graphics” includes texts, web pages, icons (for example, user interface objects including soft keys), digital images, video, animations, or the like, without limitations, and may

include all objects which can be displayed to the user.

The communication circuit 252 transmits or receives signals in a wired way or transmits or receives electromagnetic waves in a wireless way. The communication circuit 252 converts electrical signals to electromagnetic waves, or vice versa, and communicates with the communication network, or other mobile gateways or communication devices, by means of the electromagnetic waves. The communication circuit 252 includes, for example, an antenna system, an RF transceiver, at least one amplifier, a tuner, at least one oscillator, a digital signal processor, a CODEC chipset, a subscriber identity module (SIM) card, a memory and so on, but may include a well-known circuit for performing such functions, without being limited thereto. The communication circuit 252 may communicate with other devices by means of a network such as the Internet called a world wide web (WWW), an intranet and a network and/or a cellular telephone network, a wireless network such as a wireless LAN, and a local wireless communication network. The wireless communication may use any one selected from a plurality of communication standards, protocols and techniques, which include Global System for Mobile Communications (GSM), Enhanced Data GSM Environment (EDGE), wideband code division multiple access (WCDMA), code division multiple access (CDMA), time division multiple access (TDMA) voice over Internet Protocol (VoIP), Wi-MAX, Bluetooth, ZigBee, Near Field Communication (NFC), or any other suitable communication protocols including communication protocols not yet developed at the time of filing of this application, without any limitations.

As described above with reference to FIGS. 1 and 2, in order to use the multi phone number service with a single communication terminal 200 by using the plurality of

actual phone numbers 101-1, 101-2, ..., 101-N stored in the subscriber identity module 260, the plurality of actual phone numbers 101-1, 101-2 ... 101-N for the multi phone number service should be stored in the subscriber identity module 260. In addition, the mapping information of each of the actual phone numbers 101-1, 101-2 ... 101-N and each of the operation modes 102-1, 102-2 ... 102-N should be stored in the subscriber identity module 260 or the memory 210 of the communication terminal 200.

When the service of the communication terminal 200 is initiated, it may be considered to store the mapping information in the communication terminal 200, instead of the subscriber identity module 260. However, in this case, if the communication terminal 200 is changed while the subscriber identity module 260 is used again, the mapping information is not stored in the changed communication terminal 200, and thus it is impossible to figure out the mapping information of the plurality of actual phone numbers stored in the subscriber identity module 260 and the operation modes of the communication terminal 200. Accordingly, in this embodiment, the mapping information of each of the actual phone numbers 101-1, 101-2 ... 101-N and each of the operation modes 102-1, 102-2 ... 102-N may be stored in the subscriber identity module 260. However, without being limited thereto, the mapping information may be stored in the memory 210 of the communication terminal 200, instead of the subscriber identity module 260. In this case, if the communication terminal 200 is changed while the subscriber identity module 260 is kept, the user may subscribe to the multi phone number service again through the communication terminal 200, receive the additional phone number again, and store the additional phone number in the mapping information of the memory 210 of the communication terminal 200. At this time, the mapping information may be stored as

an elementary file (EF) in a subdirectory of a master file (MF) or in a subdirectory of an ADF_USIM of the subscriber identity module 260, or may be stored as a separate file in the memory 210 of the communication terminal 200. This will be described in more detail with reference to FIG. 3.

5 FIG. 3 is a diagram showing a file structure of the subscriber identity module according to an embodiment and depicts an example where two actual phone numbers are stored in the subscriber identity module 260.

As shown in FIG. 3, a logic file structure of the subscriber identity module 260 should include one master file (MF) 310 and essential elementary files for basic operations
10 of the communication terminal 200. Here, the essential elementary files include an EF PL (not shown), an EF ICCID (not shown) and an EF DIR (Elementary File Directory) 350. Among them, the EF DIR 350 manages information about a list of various application dedicated file (ADF) that may be provided at the subscriber identity module 260. In this embodiment, the EF DIR 350 includes information about two phone numbers, namely two
15 USIM application dedicated files. In this embodiment, two USIM application dedicated files (ADF) included in the EF DIR 350 will be called 'ADF_USIM1 351' and 'ADF_USIM2 352', respectively. Here, the ADF_USIM1 351 and the ADF_USIM2 352 may be selected using information and an application identifier that is inherently allocated to each application file included in the EF DIR 350. In other words, in the
20 communication terminal 200, two phone numbers endowed to the user to use the multi phone number service may be checked based on the information about two USIM application dedicated files included in the EF DIR 350.

Generally, the USIM application dedicated file includes an EF (hereinafter,

referred to as EF_IMSI) for storing an International Mobile Subscriber Identity (IMSI) and an EF (hereinafter, referred to as EF_MSISDN) for storing a Mobile Subscriber ISDN Number (corresponding to the phone number of the present disclosure). The EF_IMSI and the EF_MSISDN respectively configuring the ADF USIM1 351 and the ADF USIM2 5 352 of this embodiment are set to different values. In other words, two USIM application dedicated files having different IMSI values and different MSISDN values are loaded. Accordingly, two actual phone numbers are stored in the subscriber identity module 260. If the service of the communication terminal 200 is initiated and the communication terminal 200 is powered on after mounting the USIM 260, authentication is performed 10 through a mobile communication network and location is registered. At this time, during the authentication process, the communication terminal 200 may transmit two different IMSI values stored in two USIM application dedicated files of the USIM 260 to the mobile communication network and receive different phone numbers (MSISDN) corresponding to two different IMSI values from the mobile communication network to write the different 15 phone numbers in the two USIM application dedicated files. As an alternative, a basic phone number (MSISDN) may be recorded in advance in a USIM application dedicated file stored in the USIM 260 as a default when the service of the communication terminal 200 is initiated, and later the user may subscribe to the multi phone number service at the communication terminal 200 by using an application. At this time, the communication 20 terminal 200 may extract IMSI from the second USIM application dedicated file among a plurality of USIM application dedicated files stored in the USIM 260, transmits the extracted IMSI to the mobile communication network, receive an additional phone number (MSISDN) corresponding thereto from the mobile communication network, and write the

additional phone number in the second USIM application dedicated file. The plurality of USIM application dedicated files in which the phone numbers (MSISDN) are written are entirely activated when the communication terminal 200 is powered on, and the information stored in the USIM application dedicated file is registered with location in the mobile communication network.

Meanwhile, as described above, the subscriber identity module 260 may store the mapping information of each actual phone number and each operation mode. The mapping information may be stored as an elementary file (EF) in a subdirectory of the master file (MF) of the subscriber identity module 260 or in a subdirectory of the ADF_USIM. In this embodiment, the mapping information may be stored in the EF_KT_TWOPHONE 360 which is a subdirectory of the master file (MF). The communication terminal 200 may check the two phone numbers endowed to the user to use the multi phone number service based on the information of the two USIM application dedicated files included in the EF DIR 350 and check which operation mode is mapped to each phone number on the basis of the information recorded in the EF_KT_TWOPHONE 360. Alternatively, the mapping information may be stored as a separate file in the memory 210 of the communication terminal 200, instead of the subscriber identity module 260.

The order of the plurality of operation modes may be set in advance in the communication terminal 200. The communication terminal 200 sets a default operation mode for the basic phone number (MSISDN) stored in the default USIM application dedicated file among the plurality of USIM application dedicated files stored in the USIM 260 and writes it in the mapping information. Also, the communication terminal 200 sets

a second operation mode among the plurality of operation modes for the additional phone number (MSISDN) stored in the USIM application dedicated file set in the second USIM application dedicated file among the plurality of USIM application dedicated files stored in the USIM 260 and writes it in the mapping information. As described above, whenever a
5 phone number is added, an operation mode is selected according to the order of the plurality of operation modes, and the information of the phone number and the operation mode is recorded in the mapping information. The communication terminal 200 may transmit the IMSI to the mobile communication network to perform authentication and may update the mapping information whenever a phone number corresponding to the IMSI
10 is received from the mobile communication network.

FIG. 4 is a diagram showing a structure of an elementary file (EF) including mapping information of an actual phone number and an operation mode according to an embodiment and depicts the EF_KT_TWOPHONE 360 described with reference to FIG. 3.

Referring to FIG. 4, the EF_KT_TWOPHONE 360 includes a file identifier field
15 410, a file structure field 420, a record number field 430, an access right field 440 and a record region 450.

In the file identifier field 410, a value identifying the corresponding EF_KT_TWOPHONE 360 is stored. In the file structure field 420, a value indicating that the EF_KT_TWOPHONE 360 has a linear fixed structure is stored. In the record number
20 field 430, a value corresponding to the number of phone numbers endowed to the user is stored. In this embodiment, the user is endowed with two phone numbers and a value of 2 is stored. The access right field 440 is a field for controlling an access right to the corresponding EF_KT_TWOPHONE 360, and the access right field 440 is used to set an

access right to control commands such as READ, UPDATE, DEACTIVATE and ACTIVATE. In the record region 450, information about the operation mode for each phone number is stored. Since each phone number has one record and the user is endowed with two phone numbers in this embodiment, two records 451, 452 are provided.

5 As shown in FIG. 4, the first record 451 stores a length of a first phone number (or, a first number), the first phone number and a value of the operation mode corresponding to the first phone number (or, a value of a first mode). Also, the second record 452 stores a length of a second phone number (or, a second number), the second phone number and a value of the operation mode corresponding to the second phone number (or, a value of a
10 second mode).

The phone numbers are stored in the records 451, 452 as follows. 1 byte is composed of 8 bits, namely two digits. 1 digit is composed of 4 bits. 1 digit may represent one Arabic numeric (0 to 9), so 1 byte may represent two Arabic numerals. Also, a phone number is composed of 10 or 11 digits in Korea. Thus, the phone number
15 may be represented by 6 bytes. Accordingly, the number '6', which means 6 bytes, is recorded in the length field of the phone number of each of the records 451, 452.

When a phone number is represented with 6 bytes, it should be indicated whether the corresponding phone number is 10 digits or 11 digits so that a correct phone number may be extracted from the communication terminal 200. An even number is indicated for
20 10 digits, and an odd number is indicated for 11 digits. When a phone number is indicated with 6 bytes, the phone number is indicated in order from the first byte to the sixth byte. However, as described above, two numbers can be indicated in 1 byte. That is, since one number can be indicated with 4 bits, two numbers are recorded in 1 byte. At

this time, when a number is recorded in 1 byte, its bits are filled from lower 4 bits. For example, in order to indicate '01', the number '0' is indicated in the lower 4 bits of 1 byte, and the number of '1' is indicated in the upper 4 bits thereof.

Meanwhile, it is needed to indicate a digit number of the phone number, namely whether the digit number is an odd number or an even number. Thus, information about the digit number of the corresponding phone number is recorded in the lower 4 bits of the first byte. For example, if the phone number has an even digit number, the number of '0' is recorded, and if the phone number has an odd digit number, the number of '8' is recorded.

This feature will be explained based on a specific phone number as an example. Assuming that the phone number is 01098761234, the phone number has a digit number of 11 that is an odd number. Thus, the number of 8 is recorded in the lower 4 bits of the first byte, and the number of 0, which the first number of the phone number, is recorded in the upper 4 bits thereof. In addition, the number of 1, which is the second number of the phone number, is recorded in the lower 4 bits of the second byte, and the number of 0, which is the third number of the phone number, is recorded in the upper 4 bits thereof. The number of 9, the fourth number of the phone number, is recorded in the lower 4 bits of the third byte, and the number of 8, which is the fifth number of the phone number, is recorded in the upper 4 bits thereof. The number 7, which is the sixth number of the phone number, is recorded in the lower 4 bits of the fourth byte, and the number of 6, which is the seventh number of the phone number, is recorded in the upper 4 bits thereof. The number of 1, which is the eighth number of the phone number, is recorded in the lower 4 bits of the fifth byte, and the number of 2, which is the ninth number of the phone

number, is recorded in the upper 4 bits thereof. The number of 3, which is the tenth number of the phone number 3, is recorded in the lower 4 bits of the sixth byte, and the number of 4, which is the eleventh number of the phone number, is written in the upper 4 bits thereof.

5 If the phone number is composed of 10 digits, the number of 0 is recorded in the lower 4 bits of the first byte. Also, the phone number is recorded in order as described above, and since there is no number filling the upper 4 bits of the last sixth byte, a predefined padding value, for example '0xFF', is filled therein.

10 Even though it is described that the information about the digit number of the phone number, namely an odd digit number or an even digit number, is recorded first, the information may also be recorded last.

 The communication terminal 200 checks the two phone numbers endowed to the user to use the multi phone number service in the elementary files (EF_MSISDN, EF_IMSI) based on the information of the two USIM application dedicated files included
15 in the EF DIR 350, and checks which operation mode is mapped to each phone number, based on the information recorded in the EF_KT_TWOPHONE 360, specifically the information recorded in the record region 450, and then performs operations.

 FIG. 5 is a diagram showing components for providing the multi phone number service at a communication terminal according to an embodiment. Referring to FIG. 5, in
20 this embodiment, the communication terminal 200 includes a first interface unit 510, a second interface unit 520 and a switching unit 530. In this embodiment, it is assumed that the subscriber identity module 260 stores information about two phone numbers, and thus it is explained that two interface units 510, 520 are provided. The components of this

embodiment may be implemented as a program in the communication terminal 200 as described above with reference to FIG. 2 to be stored in the memory 210 and executed by the processor 222, or may be implemented as a combination of hardware and/or software components. Wallpapers, ringing tones, vibration/light emitting statuses, address books, outgoing/incoming call logs, message boxes, and application installation environments are independently applied to the first interface unit 510 and the second interface unit 520.

The first interface unit 510 and the second interface unit 520 checks the phone numbers respectively mapped thereto based on information about the two USIM application dedicated files included in the EF DIR 350 stored in the subscriber identity module 260 and the mapping information recorded in the EF_KT_TWOPHONE 360 or the memory 210 of the communication terminal 200.

The first interface unit 510 is an operation mode corresponding to the first phone number stored in the subscriber identity module 260. The first interface unit 510 sets an independent screen and allocates an independent storage area to the memory 210 to store terminal functions and additional functions related to the default phone number in the area and also access the storage area to manage data. A state in which the first interface unit 510 is activated is called a P (private) mode, and an icon (for example, P) about the state is displayed on a status bar so that the user may figure out a current operation mode.

If the user attempts to originate a call in a state where the first interface unit 510 is activated, the first interface unit 510 originates the call including the first phone number stored in the subscriber identity module 260 as a calling phone number. Here, the first phone number may be understood to include MSISDN and IMSI. In this case, the first interface unit 510 records originating information on an outgoing/incoming list. The

same operation is performed when sending a text message.

When a call is received to the first phone number, the first interface unit 510 records the incoming information in the outgoing/incoming call list. The same operation is performed when receiving a text message.

5 The second interface unit 520 is an operation mode corresponding to the second phone number stored in the subscriber identity module 260. The second interface unit 520 sets an independent screen, allocates an independent storage area to the memory 210 and, and stores a terminal function and an additional function related to the second phone number in the corresponding area to access and manage data. The state where the second
10 interface unit 520 is activated is called a B (Private) mode, and an icon (for example, B) about this state is displayed on the status bar so that the user may figure out a current operation mode.

IF the user attempts to originate a call in a state where the second interface unit 520 is activated, the second interface unit 520 originates a call including the second phone
15 number stored in the subscriber identity module 260 as a calling phone number. Here, the second phone number may be understood to include MSISDN and IMSI. In this case, the second interface unit 520 records originating information in the outgoing/incoming list. The same operation is performed when sending a text message.

When a call is received to the second phone number, the first interface unit 520
20 records the incoming information in the outgoing/incoming call list. The same operation is performed when receiving a text message.

If a call is received to a phone number of another operation mode, the first interface unit 510 and the second interface unit 520 display a label indicating to the user

that a call is being received to the phone number of another operation mode. For example, if a call is received to the second phone number in a state where the first interface unit 510 is activated, the first interface unit 510 displays a label such as 'B' in the caller information so that user may figure out that a call is received to the second phone number. The first
5 interface unit 510 and the second interface unit 520 may determine a phone number of the operation mode to which a call is received, based on the IMSI included in the incoming call.

The switching unit 530 switches the first interface unit 510 and the second interface unit 520 to each other and activates any one of them to apply the unit as an
10 operation mode to the communication terminal 200. The switching unit 530 receives a predetermined manipulation from a user and switches two interfaces to each other. The predetermined manipulation may include pressing a function key provided at the communication terminal 200, pressing a specific key of a keypad for a predetermined time or selecting an application installed in the communication terminal 200. In addition,
15 various manipulations not overlapping with manipulations for other functions of the communication terminal 200 may also be used.

In addition, when switching the operation mode, the switching unit 530 may allow the switching after the user enters a password and performs authentication. After the user sets a password in advance, when switching an interface, the user enters the set password
20 and performs authentication. The switching function using a password as described above may be set according to the selection of the user. Here, though it is described that two interfaces are used in this embodiment, in the multi phone number service, a plurality of additional phone numbers may be endowed and a plurality of interfaces corresponding

thereto are further added, so that the switching unit 530 selects and activates any one of the plurality of interfaces.

The switching unit 530 may set one of the plurality of operation modes to a default operation mode so that the switching unit 530 automatically switches to the default
5 operation mode when the communication terminal 200 comes into an idle state.

In addition, if a password corresponding to a specific operation mode is input from the user when the communication terminal 200 is in the locked state, the switching unit 530 may activate the corresponding operation mode instantly. For this, the switching unit 530 stores a password for each operation mode, compares a password input in the locked
10 state with the password for each operation mode, and switches to the corresponding operation mode.

FIG. 6 is a diagram for illustrating a process of switching from a locked state to a specific operation mode according to an embodiment. As shown in the portion (a) of FIG. 6, if a power button is input, the communication terminal 200 displays a password input
15 window in the locked state. If the user enters the password corresponding to a specific operation mode, as shown in the portion (b) of FIG. 6, the mode is automatically switched to an operation mode corresponding to the corresponding password.

Meanwhile, the first and second interface units 510, 520 store reception setting information for each operation mode, receive a call only in a time zone during which call
20 reception is allowed according to the reception setting information for each operation mode, and give an auto-answering guide or the like in a time zone during which call reception is not allowed.

FIG. 7 is a diagram showing a screen in which reception setting information of

each operation mode is stored according to an embodiment, and FIG. 7 depicts an example of the first interface unit 510, namely the P mode. As shown in FIG. 7, the P mode is set not to allow call reception from 9 am to 10 am in Monday, Wednesday and Friday, from 7 am to 9 am in Monday to Friday, from 1 pm to 3 pm in Monday to Friday, and from 7 pm to the following morning 7 am in Monday to Friday, and an automatic response message is sent during these periods.

The communication terminal 200 of an embodiment uses a multi-user mode provided by the Android operating system. Here, if the user subscribes to the multi phone number service, an additional account for the multi phone number may be generated at the communication terminal 200. After that, the communication terminal 200 adds the additional account for the multi phone number to mStartedUse of Activity Manager whenever booting. The interface units 510, 520 access the address book of another operational mode and search the information by the following definition. In this embodiment, a multi-user mode provided by the Android operating system provided to operate multiple accounts for the multi phone number service has been described. However, the present disclosure is not limited thereto, and there is no limit as long as a plurality of phone numbers may be classified so that independent interfaces, namely operation modes, are provided to the phone numbers, respectively.

```
20      final UserManager userManager=  
      (UserManager)context.getSystemService(Context.USER_SERVICE);  
      List<UserInfo>users=userManager.getUsers(true);//import information of users of  
      System.
```

```
final UserInfo user=users.get(i);//import a specific user  
ContentProvider.maybeAddUserId(CONTENT_URI, user.id);//query
```

When an incoming call is received, in order to search the address book, the first and second interface units 510, 520 give priority to the address book of an operation mode corresponding to the received incoming call may but display caller information searched from the address book on the screen, regardless of the current operation mode. However, after displaying the caller information on the screen, in order to leave a call log, the first and second interface units 510, 520 record the information of the incoming call only in a call log of the operation mode corresponding to the incoming call. For example, if a call is received to the second phone number in a state where the first interface unit 510 is activated, the first interface unit 510 searches caller information in the address book of the B mode and then displays the searched sender information on the screen. Then, after the call is terminated, the call log is not stored in the P mode but is stored only in the B mode.

In addition, when leaving the call log, the first and second interface units 510, 520 record the caller information together, and at this time, the first and second interface units 510, 520 record the caller information based on the address book of the operation mode corresponding to the incoming call. For example, if a call is received to the second phone number in a state where the first interface unit 510 is activated, the first interface unit 510 cannot search the caller information in the address book of the B mode because there is no relevant information in the address book of the B mode, and thus the first interface unit 510 may search and display the caller information in the address book of the P mode. Then, after the call is terminated, the call log is not stored in the P mode but is stored only

in the B mode, and at this time, the caller information (for example, the name) searched from the address book of the P mode is not recorded in the call list of the B mode, and only the caller phone number is left therein.

FIG. 8 is a flowchart for illustrating a method for providing a multi phone number service with a communication terminal according to an embodiment.

Referring to FIG. 8, the communication terminal 200 is booted as a user gives power thereto (S801). The communication terminal 200 accesses the subscriber identity module 260 and analyzes the records included in the EF DIR file (S803). The communication terminal 200 determines whether there exist a plurality of USIM application dedicated files in the EF DIR by analyzing the records. That is, it is determined whether a plurality of phone numbers is present (S805).

If a plurality of phone numbers exists as a result of the determination, the communication terminal 200 analyzes the mapping information stored in the subscriber identity module 260 (S807). The subscriber identity module 260 stores the mapping information as an elementary file (EF), and the communication terminal 200 analyzes a record region of the elementary file where the mapping information is recorded. Alternatively, the mapping information may be stored as a separate file in the memory 210 of the communication terminal 200, instead of the subscriber identity module 260, and the communication terminal 200 may analyze a record region of the file stored in the memory 210.

According to analysis result of the mapping information, the communication terminal 200 maps the corresponding phone number to each operation mode and activates the operation mode set as a default (S809). In addition, if it is determined in Step S805

that a plurality of phone numbers is not present, the communication terminal 200 activates the default operation mode (S809).

Meanwhile, in Step S809, instead of activating the default operation mode, the communication terminal 200 may receive a password from a user and activate an operation mode corresponding to the input password. The password may be input on a locked screen of the terminal.

In addition, the communication terminal 200 may switch to another operation mode according to the manipulation of the user in a state where a specific operation mode is activated. This manipulation can be performed when the user presses a physical button of the communication terminal 200 or selects an application related to the switching of the operation mode.

While this specification contains many features, the features should not be construed as limiting the scope of the disclosure or the appended claims. Certain features described in the context of separate exemplary embodiments can also be implemented in combination in a single exemplary embodiment. Conversely, various features described in the context of a single exemplary embodiment can also be implemented in multiple exemplary embodiments separately or in any suitable subcombination.

Although the drawings describe the operations in a specific order, one should not interpret that the operations are performed in a specific order as shown in the drawings or successively performed in a continuous order, or all the operations are performed to obtain a desired result. Multitasking or parallel processing may be advantageous under a particular environment. Also, it should be understood that all exemplary embodiments do not require the distinction of various system components made in the above mentioned

embodiment. The program components and systems may be generally implemented as a single software product or multiple software product packages.

The above mentioned method of the present disclosure may be implemented as program instructions and recorded in non-transitory computer-readable media (such as, for
5 example, a compact disk-read only memory (CD ROM), random access memory (RAM), read-only memory (ROM), floppy disks, hard disks, magneto-optical disks, and the like). This process may be easily performed by person having ordinary skill in the technical field to which the present disclosure belongs, and its detailed description is omitted herein.

It should be noted various substitutions, modifications, and changes may be made
10 to the present disclosure by person having ordinary skill in the technical field to which the present disclosure belongs without departing from the scope of the present disclosure, and the present disclosure is not limited by the above described embodiments and the accompanying drawings.

WHAT IS CLAIMED IS:

1. A communication terminal for providing a multi phone number service with a single communication terminal, comprising:

5 a subscriber identity module configured to store a plurality of phone numbers and store mapping information of an operation mode for each phone number;

a plurality of interface units configured to provide independent operation modes respectively corresponding to the plurality of phone numbers by using the plurality of phone numbers and the mapping information stored in the subscriber identity module; and

10 a switching unit configured to switch and activate the plurality of interface units to each other,

wherein the plurality of interface units store reception setting information of each operation mode, receive a call only in a time zone during which call reception is allowed according to the reception setting information of each operation mode, and give an auto-
15 answering guide in a time zone during which call reception is not allowed.

2. The communication terminal according to claim 1,

wherein the plurality of interface units check a plurality of application dedicated files (ADF) by analyzing an elementary file directory (EF DIR) of the subscriber identity
20 module and search a phone number at each of the plurality of application dedicated files.

3. The communication terminal according to claim 1,

wherein the mapping information is stored as an elementary file (EF) in the

subscriber identity module.

4. The communication terminal according to claim 3,
wherein the ER storing the mapping information is stored in a subdirectory of a
5 master file (MF) of the subscriber identity module or is stored in a subdirectory of an
application dedicated file (ADF).

5. The communication terminal according to claim 3,
wherein the ER storing the mapping information has a plurality of record regions,
10 and each phone number is stored in each record region.

6. The communication terminal according to claim 5,
wherein a length of a phone number, the phone number, and a value of an
operation mode corresponding to the phone number are stored in each of the plurality of
15 record regions.

7. The communication terminal according to claim 6,
wherein when a phone number is recorded in each record region, a number
representing a digit number of the phone number and numbers composing the phone
20 number are recorded, two numbers in one byte, so that in each byte, a first number is
recorded in lower 4 bits and a second number is recorded in upper 4 bits.

8. The communication terminal according to claim 1,

wherein the switching unit activates an interface unit of an operation mode corresponding to a password input by a user when the communication terminal is in a locked state.

5 9. The communication terminal according to claim 1,

wherein the switching unit activates an interface unit of a default operation mode when the communication terminal comes into an idle state.

10 10. The communication terminal according to claim 1,
10 wherein each of the plurality of interface units determines an operation mode corresponding to the incoming call based on an international mobile subscriber identity (IMSI) included in the incoming call received from a communication network.

15 11. A method for providing a multi phone number service with a single
15 communication terminal, comprising:

by the communication terminal, searching a plurality of phone numbers and mapping information of an operation mode for each phone number from a subscriber identity module;

20 by the communication terminal, activating any one of a plurality of interface units,
20 which give independent operation modes respectively corresponding to the plurality of phone numbers, by using the searched plurality of phone numbers and the searched mapping information;

by the communication terminal, storing reception setting information of each

operation mode; and

by the communication terminal, receiving a call only in a time zone during which call reception is allowed according to the reception setting information of each operation mode and giving an auto-answering guide in a time zone during which call reception is not
5 allowed.

12. The method according to claim 11,
wherein in the step of searching, an elementary file directory (EF DIR) of the subscriber identity module is analyzed to check a plurality of application dedicated files
10 (ADF), and a phone number is searched at each of the plurality of application dedicated files.

13. The method according to claim 11,
wherein the mapping information is stored as an elementary file (EF) in the
15 subscriber identity module.

14. The method according to claim 13,
wherein the ER storing the mapping information is stored in a subdirectory of a master file (MF) of the subscriber identity module or is stored in a subdirectory of an
20 application dedicated file (ADF).

15. The method according to claim 13,
wherein the ER storing the mapping information has a plurality of record regions,

and each phone number is stored in each record region.

16. The method according to claim 15,

wherein a length of a phone number, the phone number, and a value of an
5 operation mode corresponding to the phone number are stored in each of the plurality of
record regions.

17. The method according to claim 16,

wherein when a phone number is recorded in each record region, a number
10 representing a digit number of the phone number and numbers composing the phone
number are recorded, two numbers in one byte, so that in each byte, a first number is
recorded in lower 4 bits and a second number is recorded in upper 4 bits.

18. The method according to claim 11,

15 wherein the step of activating includes:

receiving a password from a user when the communication terminal is in a locked
state; and

activating an interface unit of an operation mode corresponding to the input
password.

20

19. The method according to claim 11, further comprising:

by the communication terminal, coming into an idle state; and

by the communication terminal, activating an interface unit of a default operation

mode.

20. The method according to claim 11, further comprising:

5 determining an operation mode corresponding to the incoming call based on an international mobile subscriber identity (IMSI) included in the incoming call received from a communication network.

21. A communication terminal for providing a multi phone number service with a single communication terminal, comprising:

10 a subscriber identity module configured to store a plurality of phone numbers;

a memory configured to store mapping information of an operation mode for each phone number;

a plurality of interface units configured to provide independent operation modes respectively corresponding to the plurality of phone numbers by using the plurality of
15 phone numbers stored in the subscriber identity module and the mapping information stored in the memory; and

a switching unit configured to switch and activate the plurality of interface units to each other,

wherein the plurality of interface units store reception setting information of each
20 operation mode, receive a call only in a time zone during which call reception is allowed according to the reception setting information of each operation mode, and give an auto-answering guide in a time zone during which call reception is not allowed.