(51) International Patent Classification:
H04L 12/28 (2006.01)  H04L 1/00 (2006.01)
H04M 1/66 (2006.01)

(21) International Application Number:
PCT/JP2007/056115

(22) International Filing Date: 16 March 2007 (16.03.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2006-077401  20 March 2006 (20.03.2006) JP


(72) Inventor: and

(75) Inventor/Applicant (for US only): FUJII, Kenichi [JP/JP]; c/o CANON KABUSHIKI KAISHA, 3-30-2, Shimomaruko, Ohta-ku, Tokyo, 1468501 (JP).

(74) Agent: OHTSUKA, Yasunori; 7th FL., Shuwa Kioicho Park Bldg., 3-6, Kioicho, Chiyoda-ku, Tokyo, 1020094 (JP).

(54) Title: COMMUNICATIONS APPARATUS AND CONTROL METHOD THEREFOR

(57) Abstract: When exchanging communication parameter setting information on a wireless network, a communications apparatus selects between a first operation mode in which communications parameter information is exchanged with a specific communications apparatus and a second operation mode in which communications parameter information is exchanged with an unspecified number of communications apparatus. Depending on the selected operation mode, the communications apparatus control security upon holding the communications parameter information exchanged with the specific communications apparatus and the communications parameter information exchanged with the unspecified number of communications apparatus.
DESCRIPTION
COMMUNICATIONS APPARATUS AND CONTROL METHOD THEREFOR

TECHNICAL FIELD

[0001] The present invention relates to a technique for setting communications parameter information.

BACKGROUND ART

[0002] Methods are proposed which automatically set wireless communications parameters such as the network identifier (SSID), encryption methods, encryption key, authentication methods, and authentication key, which are said to be troublesome for users to set. Regarding automatic wireless LAN settings, for example, a method for transferring wireless parameter settings for an access point (relay station) and station (terminal) safely and automatically from the access point to the station by simple operations has actually been implemented as a product.

[0003] Also, in carrying out wireless communication, products which assume various forms of usage have been implemented, including direct wireless communications (ad hoc communications) with specific or unspecified partners without an intervening access point.
Detailed methods for secure data communications have been proposed because wireless parameter settings include network security information. For example, whether or not data transmission is permitted is determined based on the attribute values attached to the data, as well as on access policies; Also when receiving data, whether or not the data can be stored is determined based on the attribute values and policies. If it is possible, the received data is stored. In this way, Patent Document 1 describes a secure data storage operation.

Also, proposals have been made in order to address the need to control the information to be distributed, either on a per-user basis or according to the place of use. Patent Document 2 describes a system in which a management apparatus which has setting information (profiles) compatible with a plurality of networks provides information to each terminal according to the user of the terminal or the place of use, so that the user can make a desired connection using the setting information without being conscious of the network.

Incidentally, Patent Documents 1 and 2 are as follows.


The above technique makes it possible to store safe data and to switch communications parameter setting information from one user to another on the network managed by the management apparatus described above. However, with future increases in the need for communications on unmanaged networks such as ad hoc networks, forms of communications will become complicated, and it will become necessary to exchange communications parameter setting information in multiple operation modes between specified wireless communications apparatus or between unspecified wireless communications apparatus. In that case, although from the viewpoint of security the user wants to control the way he/she stores the communications parameter setting information, such as permanently or temporarily, according to the operation mode, currently the switching of the communications parameter setting information is left to the user's manual control, which has involved complicated operation. Also, there have been problems in terms of security and operation. For example, the user may forget to erase temporary communications parameter setting information and continue to use it.

DISCLOSURE OF INVENTION

[0007] The present invention realizes to make it
possible to set the security of communications parameter setting information depending on whether communications are conducted by a specific communications apparatus or an unspecified number of communications apparatuses, without complicated operations.

[0008] According to one aspect of the present invention, there is provided a communications apparatus which sets communications parameter information, comprising: selection means for selecting one of a first operation mode in which communications parameter information is set in relation to a specific communications apparatus and a second operation mode in which communications parameter information is set in relation to an unspecified number of communications apparatus; and control means for controlling security of said communications parameter information which is set in relation to said specific communications-apparatus or said unspecified number of communications apparatus, according to an operation mode selected by said selection means.

[0009] According to another aspect of the present invention, there is provided a control method for a communications apparatus which sets communications parameter information comprising: a selection step of selecting one of a first operation mode in which communications parameter information is set in relation
to a specific communications apparatus and a second operation mode in which communications parameter information is set in relation to an unspecified number of communications apparatus; and a control step of controlling security of said communications parameter information which is set in relation to said specific communications apparatus or said unspecified number of communications apparatus, according to an operation mode selected by said selection step.

[0010] Further features of the present invention will become apparent from the following description of exemplary embodiments (with reference to the attached drawings).

BRIEF DESCRIPTION OF DRAWINGS

[0011] Figure 1 is a diagram showing an exemplary configuration of a wireless communications system according to a first embodiment;

[0012] Figure 2 is a schematic block diagram showing an exemplary configuration of device A (digital camera 100);

[0013] Figure 3 is a schematic block diagram showing an exemplary configuration of device B (printer 101);

[0014] Figures 4A and 4B are diagrams showing an exemplary organization of operation modes and communications parameter setting information areas.
according to the first embodiment;

[0015] Figure 5 is a flowchart showing the process of receiving communications parameter setting information in AUTO operation mode;

[0016] Figure 6 is a flowchart showing the process of storing information in a temporary area when there is no empty AUTO-mode communications parameter setting information area;

[0017] Figure 7 is a flowchart showing the process of exchanging communications parameter settings in PARTY operation mode;

[0018] Figure 8 is a flowchart showing the process of achieving temporality in synchronization with power control;

[0019] Figure 9 is a flowchart showing the process of achieving temporality when a timer expires (at a preset time);

[0020] Figure 10 is a flowchart showing the process of achieving temporality when services have been performed by devices connected wirelessly using communications parameter setting information;

[0021] Figure 11 is a flowchart showing the process of achieving temporality by exchanging and holding communications parameter setting information again in PARTY mode;

[0022] Figure 12 is a flowchart showing the process of achieving temporality of communications
parameter setting information by changing the operation mode;

[0023] Figure 13 is a diagram showing security levels available for each device;
[0024] Figure 14 is a flowchart showing the process of determining a security level depending on whether the operation mode is AUTO or PARTY; and
[0025] Figure 15 is a flowchart showing the process of determining a security level depending on the presence or absence of billing information.

BEST MODE FOR CARRYING OUT THE INVENTION

[0026] The best mode for carrying out the invention will be described in detail below with reference to the drawings.

[0027] [First embodiment]

Figure 1 is a diagram showing an exemplary configuration of a wireless communications system according to a first embodiment. As shown in Figure 1, device A is a digital camera 100. It has wireless LAN capabilities as wireless communications capabilities 105, and it constructs a network in communications parameter setting mode when a communications parameter setting start button 103- is pressed. Device B is a printer 101. It has wireless LAN capabilities as wireless communications capabilities 106, and it constructs a network in communications parameter
setting mode when a communications parameter setting
start button 104 is pressed. Device C is a digital
camera 102. It has wireless LAN capabilities as
wireless communications capabilities 108, and it
constructs a network in communications parameter
setting mode when a communications parameter setting
start button 107 is pressed.

[0028] Operation modes in the communications
parameter setting mode and a method for setting them
will be described later.

[0029] Next, configurations of wireless
communications apparatus A and B will be described with
reference to Figures 2 and 3. Device C has the same
configuration as device A, and thus description thereof
will be omitted.

[0030] Figure 2 is a schematic block diagram
showing an exemplary configuration of device A (digital
camera 100). In Figure 2, reference numeral 201
denotes a controller which controls the digital camera
100, 202 denotes an image processor, 203 denotes a ROM
which stores control instructions (programs) and
control data, and 204 denotes a RAM. The RAM 204
prestores setup communications parameters used to form
a network for communications parameter setting.
Reference numeral 205 denotes a wireless communications
processor which controls communications for a wireless
LAN. Reference numeral 206 denotes an antenna and 207
denotes an antenna controller.

[0031] Reference numeral 208 denotes an image pickup section which captures a pixel signal from a CCD 209. Reference numeral 210 denotes a card interface which controls a recording media card used to store picked-up images and setting information and 211 denotes a display. Reference numeral 212 denotes a control panel which contains buttons used to give photo-taking, playback, setting, and other commands. Reference numeral 213 denotes a power supply including a secondary cell. Reference numeral 214 denotes a communications interface section used for communications other than wireless communications. It is, for example, a USB, IEEE 1394, or other wired interface. Reference numeral 215 denotes a communications parameter setting start button used to start communications parameter setting. Reference numeral 216 denotes an EEPROM used to store communications parameters. It should be noted that the communications parameters are stored in the EEPROM, however, may be stored in other memories such as a Flash ROM.

[0032] Figure 3 is a schematic block diagram showing an exemplary configuration of device B (printer 101). In Figure 3, reference numeral 301 denotes a controller which controls the printer 101, 302 denotes an image processor, 303 denotes a ROM which stores
control instructions (programs) and control data, 304 denotes a RAM, and 305 denotes a power supply. The RAM 304 prestores setup communications parameters used to form a network for communications parameter setting. Reference numeral 306 denotes a communications interface section used for communications other than wireless communications. It is, for example, a USB, IEEE 1394, or other wired interface.

[0033] Reference numeral 307 denotes a paper feeder/ejector which feeds/ejects printer paper. Reference numeral 308 denotes a printer engine which controls electrophotographic or inkjet printing. Reference numeral 309 denotes a card interface which controls a recording media card used to store images and 310 denotes a display. Reference numeral 311 denotes a control panel which contains menu, setting, and other buttons. Reference numeral 312 denotes a wireless communications processor which controls communications for a wireless LAN. Reference numeral 313 denotes an antenna and 314 denotes an antenna controller. Reference numeral 315 denotes a communications parameter setting start button used to start communications parameter setting. Reference numeral 316 denotes an EEPROM used to store communications parameters. It should be noted that the communications parameters are stored in the EEPROM, however, may be stored in other memories such as a
Flash ROM.

[0034] Next, communications parameters which are set in communications parameter setting processes in operation modes of each device will be described with reference to Figures 4A and 4B. Available operation modes include an AUTO mode in which communications parameter setting information is set automatically between two devices and a PARTY mode in which communications parameter setting information is set automatically among three or more devices.

[0035] Figures 4A and 4B are diagrams showing an exemplary organization of operation modes and communications parameter setting information areas according to the first embodiment. Incidentally, the communications parameters are stored in the EEPROM 216 of the digital cameras 100 and 102 and in the EEPROM 316 of the printer 101.

[0036] As shown in Figures 4A and 4B, in AUTO operation mode, the communications parameters are stored as permanent communications parameters in AUTO-mode communications parameter setting information areas. In this example, permanent communications parameters 1 and 2 are already stored in AUTO-mode communications parameter setting information areas 401 and 402.

[0037] In PARTY operation mode, the communications parameters are stored as temporary communications parameters in PARTY-mode communications parameter
setting information areas. In this example temporary communications parameters are already stored in a PARTY-mode communications parameter setting information area 404. The communications parameters stored in the AUTO-mode communications parameter setting information areas can be erased by user action. Otherwise, they are not erased.

[0038] Incidentally, the information held in the areas described above include, SSID, Mode, Authentication, Cryptograph, Encryption key, Index, Channel, Device type, IP address setting, Management terminal MAC address, and Pointer. SSID is a network identifier needed for wireless LAN connection. Mode is information which indicates either an infrastructure mode or ad hoc mode. Authentication is information which represents an authentication type. Cryptograph is information which represents the type of encryption key. Index is an index of the key. Channel is information which represents a communications frequency. Device type is information which represents the type of remote device. IP address setting is information which represents the class of IPv address. Management terminal MAC address is the MAC address of a remote terminal. Pointer is a link to the next area. The last field of the link contains a null code 403.

[0039] Now description will be given of a process in which the digital camera 100 receives communications
parameter setting information from the digital camera 102 with the above configuration when the operation mode of the digital cameras 100 and 102 is AUTO.

[0040] Figure 5 is a flowchart showing the process of receiving communications parameter setting information in AUTO operation mode. The user first sets the operation mode of the digital camera 100 to AUTO (S501) by pressing its communications parameter setting start button 103. At the same time, exchange of communications parameter settings is started (S502) . The digital camera 100 waits for communications parameter setting information to be received from the digital camera 102 (S503) . When communications parameter setting information is received, since the digital camera 100 is operating in AUTO operation mode, the digital camera 100 checks whether an AUTO-mode communications parameter setting information area is available to store the communications parameter-setting information (S504).

[0041] If the AUTO-mode communications parameter setting information area 403 in Figure 4A is empty, the received communications parameter setting information is stored in it as permanent communications parameters 3 (S505) . The digital camera 100 displays a message on the display 211 stating that the exchange of communications parameter setting information has been successful (S506), and finishes processing.
If there is no empty AUTO-mode Communications parameter setting information area, the digital camera 100 displays a message on the display 211 stating that the exchange of communications parameter settings has failed because no empty area is available (S507), and finishes processing. When no area is available, the communications parameter setting information may be stored in a temporary area.

Figure 6 is a flowchart showing the process of storing information in a temporary area when there is no empty AUTO-mode communications parameter setting information area. Steps S601 to 606 in Figure 6 are the same as Steps S501 to 506 in Figure 5, and thus only processes in Step S607 and later will be described here.

If it is found in Step S604 that there is no empty AUTO-mode communications parameter setting information area, the digital camera 100 informs the remote device that communications parameters will be stored in a temporary area (S607), stores the communications parameters in the temporary area (S608), and finishes processing.

In this way, by using a temporary area even in AUTO operation mode, it is possible to continue communications without causing an error even if no AUTO-mode communications parameter setting information area is available.
Next, description will be given of a process in which communications parameter settings are exchanged among the digital camera 100, printer 101, and digital camera 102 in PARTY operation mode. Here, a process in which the digital camera 100 receives communications parameter setting information from the printer 101 will be described with reference to Figure 7.

Figure 7 is a flowchart showing the process of exchanging communications parameter settings in PARTY operation mode. The user first sets the operation mode of the digital camera 100 to PARTY mode (S701) by pressing its communications parameter setting start button 103. At the same time, exchange of communications parameter settings is started (S702). The digital camera 100 then waits for communications parameter setting information to be received from the printer 101 (S703). When communications parameter setting information is received, since the digital camera 100 is operating in PARTY mode, the digital camera 100 checks whether a PARTY-mode communications parameter setting information area is available for use to store the communications parameters (S704).

If the PARTY-mode communications parameter setting information area in Figure 4B is empty, the received communications parameter setting information is stored in the area 404 as temporary communications
parameters (S705). The digital camera 100 then displays a message on the display 211 stating that the exchange of communications parameter setting information has been successful (S706), and finishes processing.

[0048] On the other hand, if the PARTY-mode communications parameter setting information area is already in use, the digital camera 100 displays a message on the display 211 stating that the exchange of communications parameter settings has failed because no empty area is available (S101) to save the information, and finishes processing.

[0049] Next, description will be given of methods for achieving temporality of communications parameter setting information by automatically clearing the communications parameter setting information held in the area 404 in PARTY mode. It should be noted that the communications parameter setting information stored in the PARTY-mode communications parameter setting information area is cleared (erasing), and information stored in the AUTO-mode communications parameter setting information areas is not cleared.

[0050] As a first method, description will be given of a method for clearing the communications parameter setting information held as temporary communications parameters of the digital camera 100, in synchronization with power control.
Figure 8 is a flowchart showing the process of achieving temporality in synchronization with power control. First, it is checked whether the digital camera 100 is powered off (S800). If the digital camera 100 is powered off, it is checked whether communications parameter setting information is stored in the area 404 (S801). If it is stored, the information stored in the area 404 is cleared completely (S802).

In this way, temporality is achieved by turning off the power. Although only turn-off of power has been described here, the same effect can be obtained by clearing the area 404 at power-on.

Next, as a second method, description will be given of a method for clearing the communications parameter setting information held as temporary communications parameters of the digital camera 100 after a lapse of a certain period of time.

Figure 9 is a flowchart showing the process of achieving temporality when a timer expires (at a preset time). First, the digital camera 100 checks whether exchange of communications parameter setting information in PARTY mode has been completed (S900). After completion of the exchange, the communications parameter setting information is saved in the area 404 (S901). At the same time, a temporary area storage monitoring timer T1 is started (S902). The digital
camera 100 waits for the timer T1 to expire (S903). When the timer T1 expires, the communications parameter setting information stored in the area 404 is cleared (S904).

[0055] Next, as a third method, description will be given of a method for clearing the communications parameter setting information held as temporary communications parameters of the digital camera 100 after completion of a communications service.

[0056] Figure 10 is a flowchart showing the process of achieving temporality as triggering service execution completion between devices connected wirelessly using communications parameter setting information. First, the digital camera 100 checks whether exchange of communications parameter setting information in PARTY mode has been completed (S1000). After completion of the exchange, the communications parameter setting information is saved in the area 404 (S1001). Next, communications are started based on the communications parameters stored in the area 404 (S1002). Subsequently, the digital camera 100 starts a communications service in relation to the partner with which it has exchanged communications parameters (S1003) and performs the communications service (S1004). The digital camera 100 waits for the communications service to be completed (S1005). When the service is completed, the communications parameters stored in the
area 404 is cleared (S1006). This service includes various processing, which is executed via communication based on communication parameters stored in the area 404, such as processing that the printer 101 prints an image received from the digital camera 100, and exchange processing of image between the digital cameras 100 and 102.

[0057] Thus, in the case of communications parameter setting information which combines a one-time service ticket, once service is performed, the communications parameter setting information is erased, making it impossible to conduct a next communications session. Consequently the service no longer can be started. This makes it possible to implement a one-time service.

[0058] Next, as a fourth method, description will be given of a method for clearing the communications parameter setting information when new communications parameter setting information is stored, in a case where the communications parameter setting information has been held as temporary communications parameters of the digital camera 100.

[0059] Figure 11 is a flowchart showing the process of achieving temporality by exchanging and holding communications parameter setting information again in PARTY mode. First, the digital camera 100 checks whether exchange of communications parameter
setting information in PARTY mode has been completed (SHOO). After completion of the exchange, the communications parameter setting information is saved in the area 404 (S1101). Next, the digital camera 100 starts communications based on the communications parameters stored in the area 404 and performs a communications service in relation to the partner with which it has exchanged communications parameters (S1102). After the service is finished, if exchange of communications parameter setting information in PARTY mode is specified as the operation mode (S1103), the digital camera 100 exchanges communications parameter setting information again. When the exchange is completed (S1104), the area 404 is cleared (S1105). The accepted new communications parameter setting information is stored in the area 404 (S1106).

[0060] Consequently, the digital camera 100 can conduct communications any number of times easily with the communications partner with which it has exchanged parameters once in PARTY mode until it enters PARTY mode the next time.

[0061] Next, description will be given of a case in which the printer 101 exchanges communications parameter setting information in AUTO mode, and then exchanges communications parameter setting information in PARTY mode during communications.

[0062] Figure 12 is a flowchart showing the
process of achieving temporality by changing the operation mode. First, the communications parameter setting start button 104 is pressed when the printer 101 is conducting communications using the communications parameter setting information stored in a permanent communications parameter area (S1200). When PARTY operation mode is set (S1201), the printer 101 temporarily saves the permanent communications parameters used for regular communications (S1202). At the same time, the printer 101 starts exchange of communications parameter setting information in PARTY mode (S1203) and waits for the exchange to be completed (S1204).

[0063] Subsequently, when the exchange is completed, the printer 101 saves the PARTY-mode communications parameter setting information in a temporary area (S1205) and starts communications using the communications parameters (S1206). Then, the printer 101 performs a communications service in relation to the partner with which it has exchanged communications parameters (S1207). After the service is finished (S1208), the printer 101 restores the permanent communications parameters saved temporarily (S1209). The printer 101 clears the communications parameter setting information stored in the temporary area (S1210) and resumes operation using the communications parameters in the permanent area (S1211).
Thus, when a user regularly uses a printer included in a network constructed in a fixed fashion at home, even if the printer is used temporarily by another user, the original user can subsequently restore the settings of the fixed network automatically. On the other hand, the user who wants to use the printer temporarily can perform services by exchanging communications parameter setting information in PARTY mode.

[0065] [Second embodiment]

Next, a second embodiment of the present invention will be described in detail below with reference to the drawings. In the second embodiment, description will be given of a case in which security levels contained in communications parameter setting information is controlled in operation mode.

[0066] Figure 13 is a diagram showing security levels available for each device. In Figure 13, the tightness of security decreases in the order: security 1 > security 2 > security 3 > security 4 > security 5. In the example of Figure 13, the security levels available for device A are securities 1, 2, 3, and 5. The security levels available for device B are securities 1, 3, and 5. The security levels available for device C are securities 1, 2, 4, and 5. The highest of the security levels common to all the devices is security 1, and the lowest security level is
security 5.

[0067] Now, detailed description will be given of how to ensure security and increase safety while maintaining interconnectability among multiple devices by changing the tightness of security depending on the operation mode.

[0068] First, description will be given of a case in which communications parameter setting information is exchanged by selecting a security level according to the operation mode and setting the selected security level on the communications parameter setting information.

[0069] Figure 14 is a flowchart showing the process of determining a security level depending on whether the operation mode is AUTO or PARTY. First, the digital camera 100 starts exchange of communications parameter setting information (S1401). It exchanges security levels with other devices (S1402), and checks whether it has collected security levels from all the devices currently located on the same network (S1403). If the digital camera 100 is in PARTY operation mode (S1404: YES), it compares the collected security levels (S1405). The digital camera 100 selects the lowest security level common to all the devices and sets it on the communications parameter setting information (S1406). In this case, security 5 in Figure 13 is selected. Then, the digital camera 100
exchanges the communications parameter setting information with all the other devices (S1409).

[0070] On the other hand, if the digital camera 100 is in AUTO operation mode, it compares the security levels (S1407), selects the highest security common to all the devices, and sets it on the communications parameter setting information (S1408). Then, the digital camera 100 exchanges the communications parameter setting information with the other devices (S1409).

[0071] That is, in AUTO mode, in which information has permanence, a high security level is selected while in PARTY mode, in which an unspecified number of people participate and parameters are temporary, a security level common to all people is selected to allow them to conduct communications. This makes it possible to balance interconnectability with security according to usage forms.

[0072] Next, description will be given of the process of determining a security level when it is desired to raise the security level even in PARTY operation mode because the communications parameter setting information includes billing information. Incidentally, although billing information is taken as an example, the description also applies to other highly confidential information.

[0073] Figure 15 is a flowchart showing the
process of determining a security level depending on the presence or absence of billing information. First, the digital camera 100 starts exchange of communications parameter setting information (S1501). It exchanges security levels with other devices (S1502), and checks whether it has collected security levels from all the devices currently located on the same network (S1503). Next, the digital camera 100 checks whether billing information is included in the communications parameter setting information (S1504). If billing information is included (S1504: YES), the digital camera 100 compares the collected security levels (S1505). The digital camera 100 selects the highest security level that will allow all users to conduct communications and sets it on the communications parameter setting information (S1506). Then, the digital camera 100 exchanges communications parameter setting information at a higher security level (S1509).

[0074] On the other hand, if no billing information is included, the digital camera 100 sets the security level according to the operation mode (S1507) as in the case of the process in Figure 14 and sets the security corresponding to the operation mode on the communications parameter setting information (S1508). Then, the digital camera 100 exchanges the communications parameter setting information with the
other devices (S1509).

[0075] This makes it possible to raise the security level even in PARTY mode when communicating highly confidential information.

[0076] A high security level is required in AUTO operation mode, and it is possible to further increase security by rejecting communications with devices which do not satisfy a certain level of security.

[0077] [Other embodiments]

As another embodiment, by allowing the user to select from a plurality of methods for temporarily holding parameters in PARTY mode, it is possible to achieving temporality according to circumstances.

[0078] Although digital cameras and a printer have been cited as devices, the present invention is not limited to them and may be applied to notebook personal computers having wireless communication capability, mobile terminals, and the like.

[0079] Incidentally, the present invention may be applied either to a system consisting of two or more devices (e.g., a host computer, interface devices, readers, printers, and the like) or to an apparatus (e.g., a copying machine, facsimile machine, or the like) consisting of a single device.

[0080] Needless to say, the object of the present invention can also be achieved by a recording medium containing software program code that implements the
functions of the above embodiments: it is supplied to a system or apparatus, whose computer (or CPU or MPU) then reads the program code out of the storage medium and executes it.

[0081] In that case, the program code itself read out of the recording medium will implement the functions of the above embodiments, and the recording medium which stores the program code will constitute the present invention.

[0082] Available recording media for use to supply the program code include, for example, a flexible disk, hard disk, optical disk, magneto-optical disk, CD-ROM, CD-R, magnetic tape, non-volatile memory card, ROM, or the like.

[0083] Needless to say, the functions of the above embodiments may be implemented not only by the program code read out and executed by the computer, but also by part or all of the actual processing executed, in accordance with instructions from the program code, by an OS (operating system) running on the computer.

[0084] Furthermore, needless to say, the functions of the above embodiments may also be implemented by-part or all of the actual processing executed by a CPU or the like contained in a function expansion card inserted into the computer or a function expansion unit connected to the computer if the processing is performed in accordance with instructions from the
program code that has been read out of the storage medium and written into memory on the function expansion card or unit.

[0085] While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

CLAIMS

1. A communications apparatus which sets communications parameter information, comprising:
   selection means for selecting one of a first operation mode in which communications parameter information is set in relation to a specific communications apparatus and a second operation mode in which communications parameter information is set in relation to an unspecified number of communications apparatus; and
   control means for controlling security of said communications parameter information which is set in relation to said specific communications apparatus or said unspecified number of communications apparatus, according to an operation mode selected by said selection means.

2. The communications apparatus according to claim 1, wherein said control means changes storage areas to store said communications parameter information, according to said selected operation mode.

3. The communications apparatus according to claim 1, wherein said control means manages said communications parameter information as either permanent stored information or temporary stored information, according to said selected operation mode.
4. The Communications apparatus according to claim 3, said control means erases communications parameter information managed as the temporary stored information when said communications apparatus is powered on or off.

5. The communications apparatus according to claim 3, said control means erases communications parameter information managed as the temporary stored information when a predetermined period lapses.

6. The communications apparatus according to claim 3, said control means erases communications parameter information managed as the temporary stored information when a service is performed on a network corresponding to said communications parameter information.

7. The communications apparatus according to claim 3, said control means continues to store communications parameter information managed as the temporary stored information until communications parameter information is newly set in the second operation mode.

8. The communications apparatus according to claim 3, said control means manages communications parameter information set by said first operation mode as the permanent stored information, and manages
communications parameter information set by said second operation mode as the temporary stored information.

9. The communications apparatus according to claim 3, wherein when setting second communications parameter information in said second operation mode after forming a network by first communications parameter information in said first operation mode, a network is formed by said second communications parameter information with said first communications parameter information saved temporarily, and then a wireless network is formed by said first communications parameter information again.

10. The communications apparatus according to claim 1, further comprising:
exchange means for exchanging security level information when setting said communications parameter information, wherein
said control means controls security of said communications parameter information according to said exchanged security level information and said selected operation mode.

11. The communications apparatus according to claim 10, wherein regarding said security, the highest common security level is set in said first operation mode and the lowest common security level is set in said second...
operation mode.

12. The communications apparatus according to claim 10, wherein the security of said communications parameter information in said first operation mode is controlled by setting the highest common security level when specific additional information is included in said communications parameter information and setting the lowest common security level when no additional information is included in said communications parameter information.

13. A control method for a communications apparatus which sets communications parameter information comprising:
   a selection step of selecting one of a first operation mode in which communications parameter information is set in relation to a specific communications apparatus and a second operation mode in which communications parameter information is set in relation to an unspecified number of communications apparatus; and
   a control step of controlling security of said communications parameter information which is set in relation to said specific communications apparatus or said unspecified number of communications apparatus, according to an operation mode selected by said
selection step.

14. A program which is recorded on a computer-readable recording medium and makes a computer perform the control method for the communications apparatus according to claim 13.

15. A computer-readable recording medium containing a program which makes a computer perform the control method for the communications apparatus according to claim 13.
**FIG. 4B**

**PARTY-MODE COMMUNICATIONS PARAMETER SETTING INFORMATION AREA**

<table>
<thead>
<tr>
<th>TEMPORARY COMMUNICATIONS PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SSID</strong></td>
</tr>
<tr>
<td><strong>MODE</strong></td>
</tr>
<tr>
<td><strong>AUTHENTICATION</strong></td>
</tr>
<tr>
<td><strong>CRYPTOGRAPH</strong></td>
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<tr>
<td><strong>ENCRYPTION KEY</strong></td>
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<tr>
<td><strong>INDEX</strong></td>
</tr>
<tr>
<td><strong>CHANNEL</strong></td>
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<tr>
<td><strong>DEVICE TYPE</strong></td>
</tr>
<tr>
<td><strong>IP ADDRESS SETTING</strong></td>
</tr>
<tr>
<td><strong>MANAGEMENT TERMINAL MAC ADDRESS</strong></td>
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404
START

OPERATION MODE IS SET TO AUTO  \( S501 \)

START EXCHANGE OF COMMUNICATIONS PARAMETER SETTINGS  \( S502 \)

COMMUNICATIONS PARAMETER SETTING INFORMATION RECEIVED?  \( S503 \)

PERMANENT STORAGE AREA FOR COMMUNICATIONS PARAMETERS AVAILABLE?  \( S504 \)

DISPLAY MESSAGE ABOUT FAILURE TO EXCHANGE COMMUNICATIONS PARAMETER SETTING INFORMATION (NO STORAGE AREA AVAILABLE)  \( S507 \)

SAVE COMMUNICATIONS PARAMETER SETTING INFORMATION IN PERMANENT STORAGE AREA  \( S505 \)

DISPLAY MESSAGE ABOUT SUCCESSFUL EXCHANGE OF COMMUNICATIONS PARAMETER SETTING INFORMATION  \( S506 \)

END
START

OPERATION MODE IS SET TO AUTO

START EXCHANGE OF COMMUNICATIONS PARAMETER SETTINGS

COMMUNICATIONS PARAMETER SETTING INFORMATION RECEIVED?

NO

NO

PERMANENT STORAGE AREA FOR COMMUNICATIONS PARAMETERS AVAILABLE?

INFORM REMOTE DEVICE ABOUT STORAGE IN TEMPORARY AREA

STORE COMMUNICATIONS PARAMETERS IN TEMPORARY AREA

SAVE COMMUNICATIONS PARAMETER SETTING INFORMATION IN PERMANENT STORAGE AREA

DISPLAY MESSAGE ABOUT SUCCESSFUL EXCHANGE OF COMMUNICATIONS PARAMETER SETTING INFORMATION

END
START

S701
OPERATION MODE IS SET TO PARTY

S702
START EXCHANGE OF COMMUNICATIONS PARAMETER SETTINGS

S703
COMMUNICATIONS PARAMETER SETTING INFORMATION RECEIVED?

S704
TEMPORARY STORAGE AREA FOR COMMUNICATIONS PARAMETERS AVAILABLE?

S705
SAVE COMMUNICATIONS PARAMETER SETTING INFORMATION IN TEMPORARY STORAGE AREA

S706
DISPLAY MESSAGE ABOUT SUCCESSFUL EXCHANGE OF COMMUNICATIONS PARAMETER SETTING INFORMATION

S707
DISPLAY MESSAGE ABOUT FAILURE TO EXCHANGE COMMUNICATIONS PARAMETER SETTING INFORMATION (NO STORAGE AREA AVAILABLE)

END
**FIG. 8**

1. **START**
2. **S800**
   - **IS POWER OFF?**
     - NO
     - YES
3. **S801**
   - **COMMUNICATIONS PARAMETERS STORED IN TEMPORARY AREA?**
     - NO
     - YES
4. **S802**
   - **CLEAR COMMUNICATIONS PARAMETER SETTING INFORMATION IN TEMPORARY AREA**
5. **END**
FIG. 9

START

S900

EXCHANGE OF COMMUNICATIONS PARAMETER SETTING INFORMATION COMPLETED?

YES

NO

SAVE COMMUNICATIONS PARAMETER SETTING INFORMATION IN TEMPORARY AREA

S901

START TEMPORARY AREA STORAGE MONITORING TIMER T1

S902

S903

HAS TIMER T1 EXPIRED?

NO

YES

CLEAR COMMUNICATIONS PARAMETER SETTING INFORMATION IN TEMPORARY AREA

S904

END
FIG. 10

START

S1000

EXCHANGE OF
COMMUNICATIONS PARAMETER SETTING
INFORMATION COMPLETED?

NO

YES

SAVE COMMUNICATIONS PARAMETER SETTING
INFORMATION IN TEMPORARY AREA

S1001

S1002

COMMUNICATIONS
BASED ON COMMUNICATIONS
PARAMETERS IN TEMPORARY AREA
STARTED?

NO

YES

S1003

COMMUNICATIONS SERVICE
IN RELATION TO REMOTE TERMINAL
STARTED?

NO

YES

PERFORM COMMUNICATIONS SERVICE

S1004

S1005

COMMUNICATIONS SERVICE
COMPLETED?

NO

YES

CLEAR COMMUNICATIONS PARAMETER SETTING
INFORMATION IN TEMPORARY AREA

S1006

END
FIG. 11

START

S1100
EXCHANGE OF
PARTY-MODE COMMUNICATIONS
PARAMETER SETTING INFORMATION
COMPLETED?

YES NO

S1101
SAVE COMMUNICATIONS PARAMETER SETTING
INFORMATION IN TEMPORARY AREA

S1102
PERFORM COMMUNICATIONS SERVICE IN RELATION
TO CONNECTION TARGET SELECTED BY USER

S1103
IN PARTY MODE?

NO

YES

S1104
EXCHANGE OF
COMMUNICATIONS PARAMETER SETTING
INFORMATION COMPLETED?

NO

YES

S1105
CLEAR COMMUNICATIONS PARAMETER SETTING
INFORMATION IN TEMPORARY AREA

S1106
SAVE NEW COMMUNICATIONS PARAMETERS IN
TEMPORARY AREA FOR COMMUNICATIONS
PARAMETER SETTING INFORMATION

END
FIG. 12

START

S1200
COMMUNICATIONS BEING CONDUCTED
BASED ON COMMUNICATIONS
PARAMETERS 1 IN
PERMANENT
AREA?

NO

S1201
IN PARTY MODE?

NO

S1202
YES
SAVE PERMANENT
COMMUNICATIONS
PARAMETERS 1 TEMPORARILY

S1203
START EXCHANGE OF
PARAMETERS IN PARTY MODE

S1204
YES
EXCHANGE OF COMMUNICATIONS
PARAMETER SETTING
INFORMATION COMPLETED?

NO

S1205
STORE COMMUNICATIONS
PARAMETER SETTING
INFORMATION IN
TEMPORARY AREA

S1206
START COMMUNICATIONS
BASED ON COMMUNICATIONS
PARAMETERS IN
TEMPORARY AREA

S1207
START SERVICE IN RELATION
TO REMOTE TERMINAL

S1208
SERVICE COMPLETED?

NO

S1209
YES
RESTORE PERMANENT
COMMUNICATIONS PARAMETERS
SAVED TEMPORARILY

S1210
CLEAR COMMUNICATIONS
PARAMETER SETTING
INFORMATION IN
TEMPORARY AREA

S1211
RESUME OPERATION
USING COMMUNICATIONS
PARAMETERS 1 IN
PERMANENT AREA

END
FIG. 14

START

S1401
EXCHANGE OF COMMUNICATIONS PARAMETER SETTING INFORMATION STARTED?

YES

NO

S1402
EXCHANGE SECURITY LEVELS

S1403
SECURITY LEVELS RECEIVED FROM ALL DEVICES?

NO

S1404
IN PARTY MODE?

NO (= AUTO)

S1407

S1408
COMPARE SECURITY LEVELS

SELECT HIGHEST COMMON SECURITY AND SET IT ON COMMUNICATIONS PARAMETERS

S1409
EXCHANGE COMMUNICATIONS PARAMETERS

END
FIG. 15

START

S1501

EXCHANGE OF COMMUNICATIONS PARAMETER SETTING INFORMATION STARTED?

NO

YES

EXCHANGE SECURITY LEVELS S1502

S1503

SECURITY LEVELS RECEIVED FROM ALL DEVICES?

NO

YES

BILLING INFORMATION INCLUDED?

NO (= AUTO) S1507

SET SECURITY LEVEL ACCORDING TO OPERATION MODE

SET SECURITY CORRESPONDING TO OPERATION MODE ON COMMUNICATIONS PARAMETERS S1508

S1505

COMPARE SECURITY LEVELS

S1506

SELECT HIGHEST COMMON SECURITY AND SET IT ON COMMUNICATIONS PARAMETERS

EXCHANGE COMMUNICATIONS PARAMETERS S1509

END
### INTERNATIONAL SEARCH REPORT

**International application No.**

PCT/JP2007/056115

**A. CLASSIFICATION OF SUBJECT MATTER**

Int.Cl. H04L12/28 (2006.01)i, H04M1/66 (2006.01)i, H04M11/00 (2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. H04L12/28, H04M1/66, H04M11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

- Published examined utility model applications of Japan 1971-1994
- Published unexamined utility model applications of Japan 1994-2007
- Registered utility model specifications of Japan 1994-2007
- Published registered utility model applications of Japan 1994-2007

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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<td>JP 11-68786 A (Yamatake Corporation) 1999.03.09, [0019] - [0046] (family: none)</td>
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</table>

* Further documents are listed in the continuation of Box C.

* Special categories of cited documents:
  - "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier application or patent but published on or after the international filing date
  - "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  - "O" document referring to an oral disclosure, use, exhibition or other means
  - "P" document published prior to the international filing date but later than the priority date claimed

* See patent family annex.

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

**Date of the actual completion of the international search**

10.04.2007

**Date of mailing of the international search report**

24.04.2007

**Name and mailing address of the ISA/JP**

Japan Patent Office

3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan

**Authorized officer**

Akirahiko Iwata

Authorized officer

Telephone No. +81-3-3581-1 101 Ext. 3596

Form PCT/ISA/210 (second sheet) (April 2005)