

DESCRIPTION

Title of Invention

RELAY DEVICE

Technical Field

[0001] The present invention relates to a technique of supporting the provision of various services through communication networks.

Background Art

[0002] In recent years, the use of various services such as e-mail services and file sharing services which are implemented by data communication through a communication network has become possible. Further, it is also common to provide this type of service to employees in a company or the like so as to improve the work efficiency.

Citation List

Patent Literature

[0003] Patent Literature 1: JP-A-2006-254430

Summary of Invention

Technical Problem

[0004] In order to provide this type of service, it is necessary to connect a computer (hereinafter, a server device) which executes an application program for implementing the service (that is, a program causing a computer to execute data communication for implementing the service) to a communication network through a relay device such as a router. Further, it is necessary to sufficiently take note of ensuring security, such as paying sufficient attention to wiretapping in a communication network depending on the contents of the service to be provided. It is therefore difficult for an entity that is poor in resources such as an individual or a medium and small-sized business to prepare a separate server device that executes the application program, or hire a professional engineer in order to pay sufficient attention to ensuring security in many cases, and there is a

problem that it is not possible to easily implement various services through the communication network.

[0005] Although the invention of a communication device into which an application program is embedded in advance is disclosed in Patent Literature 1, the user is not able to freely add, delete, or change the application program in the communication device disclosed in Patent Literature 1. Accordingly, even if the user uses the communication device disclosed in Patent Literature 1, the user is not able to freely provide the desired service.

[0006] The present invention has been made in view of the problems described above, and an object thereof is to provide a technique by which the user can provide freely and easily the various services through a communication network.

Solution to Problem

[0007] In order to solve the problems, the present invention provides a relay device including relay means for relaying data communication between first and second communication networks; storage means for storing data in a rewritable manner, and storing an application program for implementing a predetermined communication service by data communication through at least one of the first and second communication networks, and a subprogram library which is a collection of subprograms called in an execution process of the application program; and program execution means for executing the application program.

[0008] According to such a relay device, there is no need to separately prepare a server device that executes an application program. Further, in the present invention, since the application program is executed in the relay device, there is no fear of wiretapping, and it is not necessary to pay particular attention to ensuring security. In addition, according to the present invention, it is not necessary to secure a communication address to be assigned to the server device, and there is an effect of being capable of saving the communication address. In particular, when the communication address is an Internet Protocol (IP) address of Internet Protocol version 4 (IPv4), the lack thereof has been a big problem, such that there is a great advantage of being capable of being able to save the IP address to be assigned to the server device. Further, according to the present invention, the data communication performed between the relay device and the

server through a communication network in a communication system in the related art is replaced with communication through the internal bus of the relay device, such that there is an effect capable of reducing traffic in the communication network. Then, in the relay device of the present invention, unlike the communication device disclosed in Patent Literature 1, the application program to be stored in the storage means can be rewritten freely according to the desire of the user. Further, as the subprogram library, if a collection of subprograms causing the program execution means to execute a process to be executed commonly in various types of application programs is prepared in advance, and the call specification is published as an application program interface (API), it is possible to save the effort and time required for the user to generate the sub-programs one by one. Thus, according to the present invention, the user can easily implement the provision of various services through the communication network.

[0009] As a more preferable aspect, in a case where a subprogram called in the execution process of the application program is a program including a specific process causing trouble in the relay of the data communication performed by the relay means, the program execution means determines whether or not the data communication is being currently relayed by the relay means, and in a case during the relay, the program execution means postpones the execution of the specific process until the data communication is completed. According to such an aspect, even if the specific process causing trouble in the relay of data communication performed by the relay means is included in the application program executed by the program execution means, if the data communication is being currently relayed by the relay means, the execution of the specific process is postponed until the data communication is completed. Here, a process of rewriting parameters (for example, communication address of the relay device, and the like) used during the relay of the data communication and a process of restarting the relay device are examples of the specific process causing trouble in the relay of data communication by the relay means. Therefore, according to the present invention, even if the user does not pay close attention, it is possible to avoid the occurrence of a problem caused by the execution of the specific process (disruption of data communication which is being currently relayed, or the like).

[0010] In another preferred aspect, respective priorities are set for communication services that are implemented by the relay means executing the relay of data communication and the program execution means executing the application program, and in a case where the relay of data communication and the communication service compete, until one of them having the higher priority is completed, the execution of the other may be postponed. According to such an aspect, it is possible to prevent one having the higher priority of the services that are implemented by the relay means executing the relay of data communication and by executing the application program from being inhibited by the other. In addition, in another preferred aspect, the respective priorities of the communication services that are implemented by the relay means executing the relay of data communication and the program execution means executing the application program are set for each time, and time acquisition means (for example, a real-time clock or a GPS receiver) for acquiring the current time is provided in the relay device, and the conflict avoidance may be implemented by using the priority corresponding to the time acquired by the time acquisition means.

[0011] Further, as another aspect for solving the problem, a method causing a control unit of a relay device connected to the first and second communication networks to execute in parallel a relay step of relaying data communication between first and second communication networks; and a program execution step of reading and executing an application program from storage means for storing the application program for implementing a predetermined communication service by data communication through at least one of the first and second communication networks, and a subprogram library which is a collection of subprograms called in an execution process of the application program, in advance.

[0012] Further, the relay device may be a wireless local area network (LAN) router.

Brief Description of Drawings

[0013] Fig. 1 is a block diagram illustrating a configuration example of a communication system including a relay device 10 according to an embodiment of the present invention.

Fig. 2 is a block diagram illustrating a configuration example of the relay

device 10.

Fig. 3 is a functional block diagram illustrating a function implemented by a control unit 110 of the relay device 10.

Fig. 4 is a diagram illustrating an operation example of the relay device 10.

Fig. 5 is a diagram illustrating another operation example of the relay device 10.

Fig. 6 is a flowchart illustrating an execution process of an API including a process causing trouble in relay of data communication.

Description of Embodiments

[0014] Hereinafter, embodiments of the present invention will be described with reference to the drawings.

(A: Configuration)

Fig. 1 is a diagram illustrating a configuration example of a communication system including a relay device 10 according to an embodiment of the present invention. The communication system includes an in-store wireless local area network (LAN) that is laid out in a store such as a retail store. The in-store wireless LAN is connected to the Internet 20 through the relay device 10. The relay device 10 is a wireless LAN router, and accommodates a wireless terminal 30. The wireless terminal 30 is a tablet terminal used by employees of the store. Although Fig. 1 illustrates only one wireless terminal 30, a plurality of the wireless terminals 30 may be included in the in-store wireless LAN. Although not illustrated in detail in Fig. 1, a dynamic host configuration protocol (DHCP) server that assigns IP addresses to the wireless terminals 30 is included in the in-store wireless LAN. This DHCP server stores the IP addresses assigned to the wireless terminals 30 in association with the media access control (MAC) addresses of the wireless terminals 30 to which the IP addresses are assigned.

[0015] The relay device 10 functions as a general wireless LAN router, and functions as a so-called database server. In more detail, the memory unit of the relay device 10 in Fig. 1 stores a database (hereinafter, a product database; not illustrated in Fig. 1) that stores information on each of various products that are sold in the store (a product identifier that uniquely indicates a product (for example, a string or the like that represents the name or the model number of the

product), a string of a descriptive text that describes the specification of a product, a price, or the like: hereinafter, product information). A manufacturer and distributor database 40, which is operated by the manufacturer and distributor of the product, or the like is connected to the Internet 20. The manufacturer and distributor database 40 stores the latest product information about the product which is manufactured and distributed by the operator. The relay device 10 has access to the manufacturer and distributor database 40, updates the contents stored in the product database to the latest state (in other words, such as adding new product information), and transmits the contents stored in the updated product database to the wireless terminal 30 such that the contents are stored as a local product database. The user (in other words, the employee of the store) of the wireless terminal 30 refers to the contents stored in the local product database, and can explain quickly and easily the specifications of various products to customers. In other words, the in-store wireless LAN illustrated in Fig. 1 is intended to implement an information sharing service to share the latest product information between respective employees.

[0016] In the related art, a server device functioning as a database server is generally provided in the in-store wireless LAN, separately from the relay device 10 in order to implement the information sharing service. In contrast, the present embodiment is characterized in that the relay device 10 also functions as the database server. Hereinafter, the relay device 10, significantly representing the characteristics of the present embodiment, will be mainly described.

[0017] Fig. 2 is a block diagram illustrating a configuration example of the relay device 10.

As illustrated in Fig. 2, the relay device 10 includes a control unit 110, a first communication interface (hereinafter, abbreviated as "I/F") unit 120, a second communication I/F unit 130, a memory unit 140, and a bus 150 that relays data exchange between these components.

[0018] The control unit 110 is, for example, a central processing unit (CPU). The control unit 110 functions as a control center of the relay device 10 by executing various programs stored in the memory unit 140. The first communication I/F unit 120 is a wireless communication I/F, and is configured to establish a wireless communication link to the wireless terminal 30, and accommodate a wireless

terminal to which the wireless communication link is to be established. The first communication I/F unit 120 receives and delivers packets transmitted from the wireless terminal 30 through a radio section, to the control unit 110, and transmits packets sent from the control unit 110 to the radio section. The second communication I/F unit 130 is, for example, a network interface card (NIC), and is connected to the Internet 20. The second communication I/F unit 130 receives and delivers packets transmitted from the Internet 20, to the control unit 110, and transmits the packets delivered from the control unit 110 to the Internet 20.

[0019] As illustrated in Fig. 2, the memory unit 140 includes a volatile memory unit 142, and a non-volatile memory unit 144. The volatile memory unit 142 is, for example, a random access memory (RAM). The volatile memory unit 142 is used as a work area when various programs are executed, by the control unit 110. In contrast, the non-volatile memory unit 144 is a non-volatile memory into which rewriting of data is available. In the present embodiment, a flash memory is used as the non-volatile memory unit 144.

[0020] The product database described above is stored in the non-volatile memory unit 144. Further, various programs for implementing the function of the relay device 10 (in other words, a wireless LAN router function and a database server function in the information sharing service) is stored in the non-volatile memory unit 144. Specific examples of the program stored in the non-volatile memory unit 144 include an operating system (OS) program, a relay control program, a database server program and an API library.

[0021] The OS program is a program causing the control unit 110 to implement a so-called multi-task OS. Although Linux (registered trademark) is used as the OS program in this embodiment, insofar as the control unit 110 implements a multi-task OS, the OS program is not limited to Linux (registered trademark). If the power (not illustrated) of the relay device 10 is turned on, the control unit 110 reads the OS program from the non-volatile memory unit 144 into the volatile memory unit 142, and starts execution. The control unit 110 that operates according to the OS program and is in a state of implementing the OS functions as program execution means (see Fig. 3) for executing other programs stored in storage means (in this embodiment, the non-volatile memory unit 144), according to a predetermined schedule or in response to an instruction given from the

outside. The control unit 110 which is in a state of implementing the OS can execute a plurality of programs in parallel. In this embodiment, it is scheduled in advance to read and execute the relay control program and the database server program from the non-volatile memory unit 144 into the volatile memory unit 142, immediately after implementing the OS.

[0022] The relay control program is a program causing the control unit 110 to execute a relay control process of transferring packets received through one of the first communication I/F unit 120 and the second communication I/F unit 130 to the other. The control unit 110 that operates according to the relay control program functions as relay means (see Fig. 3) for relaying data communication between a first communication network (in the present embodiment, the in-store wireless LAN) and a second communication network (in the present embodiment, the Internet 20). Since there is no particular change between the relay process that the control unit 110 executes according to the relay control program and that executed by a general wireless LAN router, a detailed description thereof will be omitted. The database server program is an application program causing the control unit 110 to execute a process of updating the contents stored in the product database to the latest state by referring to the contents stored in the manufacturer and distributor database 40, and updating the contents stored in the local product database of each wireless terminal 30 to the latest state. The details of the process that is executed by the control unit 110 according to the database server program will be described in the operation in order to avoid duplication. In the present embodiment, the relay of data communication by the relay means (see Fig. 3) and the execution of the application program (in the present embodiment, the database server program) by the program execution means (see Fig. 3) are executed in parallel.

[0023] The API library is a collection (that is, a subprogram library) of various sub-programs that are likely to be utilized in common regardless of the types of the application programs. The API originally means a format when these sub-programs are called, but these sub-programs are also referred to as API in this specification according to customs. Examples of APIs included in the API library of the present embodiment include an API for acquiring device information of hardware (in the present embodiment, the relay device 10) and environment

information about the surrounding of the hardware, and an API for changing the operation setting of the hardware. Specifically, the examples include an API for acquiring the use rate of the control unit 110 (that is, the CPU) or the use rate of the volatile memory unit 142 (that is, the memory), an API for measuring the temperature of the inside of the housing of the relay device 10, an API for reading update and saving of running-config, an API for reading an operation log, an API for restarting the relay device 10, and the like.

[0024] In addition, the API library includes an API which is unique to the hardware to be installed. In other words, the API library of the present embodiment includes an API unique to a communication device. Specific examples of the API unique to a communication device include an API for acquiring a list of MAC addresses of the wireless terminals 30 that are connected to the relay device 10 (hereinafter, a MAC address list acquisition API), and an API for acquiring or changing the IP address of the first communication I/F unit 120 or the second communication I/F unit 130. In the present embodiment, these various APIs are prepared in advance as the API library, and the call specification of each API is published. Therefore, when creating an application program, codes for calling each API may be coded according to the specification, and there is no need to code procedures of processes implemented by these APIs one by one. This reduces time and effort required for creating the application program.

The above is the configuration of the relay device 10.

[0025] (B: Operation)

Next, the operation that the control unit 110 executes according to the database server program will be described with reference to Fig. 4. The control unit 110 that operates according to the database server program, first, communicates with the manufacturer and distributor database 40 through the Internet 20, downloads the latest data, and updates the contents stored in the product database (Fig. 4 : step SA100). Here, a determination as to whether or not data is the latest data may be configured to store each piece of data in association with version information indicating a version (version number) of the data in the manufacturer and distributor database 40, and determine data that is associated with version information indicating a newer version than that stored in the product database as the latest data. Further, in the case where the latest data is

not stored in the manufacturer and distributor database 40, step SA100 and subsequent processes may be skipped.

[0026] Subsequently, the control unit 110 acquires the IP addresses of the wireless terminals 30 that are connected to the relay device 10 (Fig 4: Step SA110). More specifically, the control unit 110 acquires a list of MAC addresses of the wireless terminals 30 connected to the relay device 10 by using the MAC address list acquisition API described above. Then, the control unit 110 acquires the IP address corresponding to each MAC address acquired in this way from the DHCP server (not illustrated) of the in-store wireless LAN. In the case where there is a wireless terminal 30 of which an IP address cannot be acquired, the control unit 110 transmits a wake signal with the MAC address of the wireless terminal 30 as the destination, and makes an inquiry to the DHCP server again waiting for the acquisition of the IP address by the wireless terminal 30.

[0027] Subsequently, the control unit 110 transmits the contents stored in the product database through the in-store wireless LAN, with each IP address that is acquired in step SA110 as the destination, and instructs the wireless terminal 30 indicated by the IP address to update the local product database (step SA120). In addition, the control unit 110 makes an inquiry of the version of the data stored in the local product database to each wireless terminal 30 prior to transmission of the contents stored in the product database, and the transmission of the contents stored in the product database to the wireless terminal 30 having the local product database of the latest version may of course be omitted. As a result of the operation described above, the contents stored in the product database of the relay device 10 and the contents stored in the local product database of each wireless terminal 30 are collectively updated to the latest state.

[0028] According to the present embodiment, if the power of the relay device 10 is turned on at a predetermined time before the opening time of the store and the power of the relay device 10 is turned off after the closing time, the latest product information can always be shared between the employees of the store during business hours. Incidentally, if the database server program is scheduled to be executed at a predetermined time, the same effect can be achieved even if the relay device 10 is always in a turn-on state.

[0029] In the present embodiment, without separately providing the server device

functioning as a database server in the in-store wireless LAN, it is possible to collectively update the contents stored in the product database of the relay device 10 and the contents stored in the local product database of each wireless terminal 30 to the latest state, and cause the latest product information to be shared between the respective employees. In this manner, since it is not necessary to separately prepare the server device functioning as a database server, even if the management entity of the store is poor in resources, such as an individual or a small-sized business, it becomes possible to easily implement the information sharing service about the product information. Further, in the present embodiment, a flash memory is used as a storage destination device of the product database in the relay device 10, and this is one of the features of the present embodiment. In the server device in the related art, although a hard disk drive is generally used as this type of storage device, there has been a disadvantage that sufficient attention is to be paid to the failure of a mechanism section such as a motor with respect to the hard disk drive (for example, recording the contents stored in the hard disk drive to other recording medium on a regular basis). In contrast, since the flash memory has no mechanism section such as a motor, it is not necessary to pay attention as described above. Even from this point, according to this embodiment, it is possible to easily implement the information sharing service for the product information. In addition, although the present embodiment describes a case of executing the information sharing service to the employees of the store in which the in-store wireless LAN is laid down, the information sharing service may be provided to people who enter the store. Further, although the present embodiment describes the case of implementing the sharing of the product information, it is needless to say that the present invention may be applied to sharing of other types of information.

[0030] As described above, the database server program which is an application program causing the relay device 10 to function as a database server is stored in the non-volatile memory unit 144, and the non-volatile memory unit 144 is a non-volatile memory into which rewriting of data is available. Therefore, in the present embodiment, it is possible to provide other communication services to the relay device 10 by replacing the application program stored in the non-volatile memory unit 144. For example, it is possible to cause the relay device 10 to

function as a file sharing server, by replacing the database server program stored in the non-volatile memory unit 144 with a file sharing server program causing the control unit 110 to execute a file sharing process illustrated in Fig. 5. In addition, various application programs installed in the relay device 10 may appropriately be distributed to a manufacturer of the relay device 10 or a third party that receives a license from the manufacturer, through the Internet 20.

[0031] Fig. 5 is a flowchart illustrating the flow of the file sharing process executed by the relay device 10. The control unit 110 that operates according to the file sharing server program, as illustrated in Fig. 5, waits for an access request to the file from the wireless terminal 30 (step SB100). When receiving an access request through the in-store wireless LAN (Yes at step SB100), the control unit 110 specifies a network address to which the wireless terminal 30 belongs (step SB110). For specification of the network address, an API may be prepared in advance. Incidentally, in a case where a communication network that accommodates a terminal which is the transmission source of the access request is a wireless LAN as those in the present embodiment, an SSID may be used instead of the network address. In the case of using the SSID instead of the network address, for example, staff SSIDs may be assigned to the employees of the store, and guest SSIDs different from the staff SSIDs may be assigned to the people who enter the store.

[0032] The control unit 110 determines whether or not the network address specified in step SB110 is a guest address (step SB120), and if the determination result is No, the control unit 110 receives the access request, and executes step SB130 and the subsequent process. On the contrary, if the network address is the guest address (Yes at step SB120), the control unit 110 discards the access request (step SB150), and repeats step SB100 and the subsequent process.

[0033] In step SB130 that is executed in a case where the determination result of step SB120 is No, the control unit 110 transmits the file which is the access destination of the access request to the wireless terminal 30 which is a transmission source of the access request, and displays the contents of the file. In the case where the file which is the access destination of the access request is not stored in its own public directories, the control unit 110 acquires the file through the Internet 20, stores the file in the public directory, and then transfers it to the

transmission source of the access request. With respect to such files that are stored in the public directory in this manner, if the communication session with the transmission source of the access request is disconnected, the control unit 110 deletes the files from the public directory. Later, the control unit 110 determines whether or not the end of the file sharing service is instructed (step SB140), and if the determination result is No, the control unit 110 repeats step SB100 and the subsequent processes. As a result, the file sharing service is implemented.

[0034] As described above, although various APIs are called in the execution processes of the application programs such as the database server program and the file sharing server program, some of the APIs contain specific processes causing trouble in the relay of the data communication, if the processes are executed during the relay of the data communication performed by the relay means. Specifically, an API for restarting the relay device 10, and an API for rewriting the parameters used during the relay of data communication are examples of the APIs. The present embodiment is configured such that even if the API executing the specific process causing trouble in data communication is called during the relay of data communication, the execution of the process is postponed until the completion of the data communication, and this is one of the features of the present embodiment.

[0035] For example, Fig. 6 is a flowchart illustrating a flow of the process that the control unit 110 executes according to the API for restarting the relay device 10. If the API is called from the application program, the control unit 110, first, determines whether or not data communication is being currently relayed (step SC100). Here, an existing technique may be used for the determination as to whether or not the data communication is being currently relayed, and an aspect is also conceivable in which the determination process in step SC100 is executed by another API different from the API executing the process of Fig. 6 and the determination result is received from another API. If the determination result of step SC100 is “Yes”, the control unit 110 executes again step SC100 and the subsequent process after being in a sleep state for a predetermined period of time (for example, one second or the like) (step SC110). On the contrary, if the determination result of step SC100 is “No”, the control unit 110 performs the restart of the relay device 10 (step SC120). Although the same flow (updating the

parameters in step SC120) is also possible for the API for rewriting the parameters used during the relay of data communication by the relay means, in this case, it is preferable to pause a relay control process once prior to the update of the parameters, and to restart it after the update of the parameters. This is because the relay of new data communication is prevented during the update of parameters.

[0036] In this way, since the present embodiment is configured such that even if the API executing the specific process causing trouble in data communication is called during the relay of data communication, the execution of the process is postponed until the completion of the data communication, the user of the relay device 10 does not need to consider whether or not an application program that is intended to be installed in the relay device 10 is a program that calls the API (that is, a program causing the restart of the relay device 10 in the execution process of the application program). Thus, according to the present embodiment, the user is able to easily implement various services through the communication network.

[0037] (C: Modifications)

One embodiment of the present invention has been described above, but of course the following modifications may be added to this embodiment.

(1) In the embodiment, the process of restarting the relay device 10 and the process of rewriting the communication parameters such as communication addresses are described as an example of the specific process causing trouble in the relay of data communication. In addition thereto, since similar problems may occur in the case of performing start/stop of the first communication I/F unit 120 or the second communication I/F unit 130, update of the routing information, update of the VoIP parameter, and update of an encryption algorithm, it is preferable to postpone the execution of these processes until the completion of data communication which is being currently relayed. In addition, in the case where the control unit 110 executes a plurality of types of application programs in parallel, similar problems may occur in the case of executing an application program for updating a system time during the execution of the application program for referring to the system time, the case of executing an application program of restarting the relay device 10 during the execution of the application program for writing data into the non-volatile memory unit 144, or the like.

Therefore, a similar adjustment (postponing the update of the system time if another application program is being executed, or the like) may be performed even between application programs.

[0038] (2) Priorities may be set in advance for respective communication services that are implemented by the relay means executing the relay of data communication and the program execution means executing the application program. In a case where the relay of data communication and the communication service compete, until one of them having the higher priority is completed, the execution of the other may be postponed. For example, if a real-time property is not required for the communication service that is implemented by the application program, the priority of the relay control is set to be higher, such that the application program can be executed centrally in off-season of data communication and it is possible to minimize the impact to the relay control by the execution of the application program. In addition, if the priority is set for each time, such as setting the priority of the communication service to be higher than the priority of the relay control during the business hours of the store, and setting the reverse outside of business hours, it is possible to implement more attentive priority control.

[0039] (3) Although the embodiment describes a case where the non-volatile memory unit 144 is formed of a flash memory, of course, it may be formed of a hard disk drive. Further, the non-volatile memory unit 144 may be formed of a nonvolatile memory (for example, a flash memory) into which rewriting of data is available and a nonvolatile memory (for example, a ROM) into which rewriting of data is unavailable, a program such as an application program that can preferably freely be updated by the user may be stored in the former, and a program such as an OS program and a relay control program having a low necessity of updating may be stored in the latter. In short, the application program may be stored in the memory unit into which rewriting of data is available.

[0040] (4) Although the embodiment describes a case of reducing time and effort required for the development of an application program by preparing the API library in advance, the implementation of the API library may of course be omitted. However, in this case, with respect to the application program including a specific process causing trouble in data communication, prior to the execution of

the specific process, it is preferable to determine whether or not the data communication is being currently relayed by the relay means, and generate the application program so as to postpone the execution of the specific process until the data communication is completed, in a case during the relay.

[0041] (5) Although the embodiment describes the case where the relay means for relaying data communication and the program execution means for executing the application program are implemented by software modules, the relay means may of course be implemented by a hardware module (such as an ASIC) which is separate and independent from the program execution means. Further, although the embodiment describes the application example of the present invention to the wireless LAN router that is connected to a wired communication network and a wireless communication network, the present invention may be applied to a wireless router connected to two wireless communication networks, or a router that is connected to two wired communication networks in a wired manner.

Further, the relay device to which the present invention is applied is not limited to a router (that is, a relay device that relays data communication in the third layer of the OSI reference model), and the present invention may be applied to a bridge such as a switching hub (a relay device that relays data communication in the second layer of the OSI reference model), a gateway (a relay device that relays data communication in the fourth layer or more layers of the OSI reference model), and a wireless access point device.

[0042] (6) In the embodiment, the information sharing service and the file sharing service, performed by integrally updating the database, are described as an example of a service that is implemented by the control unit 110 executing the application program, but without being limited thereto, for example, an e-mail service (that is, a service of causing the relay device 10 to function as a mail server) may be possible. In short, a service that is implemented by data communication through at least one of the Internet 20 and the in-store wireless LAN may be possible. Incidentally, in addition to a program causing the control unit 110 to implement the service that is implemented by data communication through at least one of the Internet 20 and the in-store wireless LAN (or, instead of the program), a text editor for rewriting the setting information file of the relay device 10, and an address book management program may be stored in the non-

volatile memory unit 144 as an application program to be executed by the control unit 110.

[0043] This application is based upon Japanese Patent Application (No. 2014-001962) filed January 8, 2014, and the entire contents of which are incorporated herein by reference.

Reference Signs List

[0044] 10: RELAY DEVICE

110: CONTROL UNIT

120: FIRST COMMUNICATION I/F UNIT

130: SECOND COMMUNICATION I/F UNIT

140: MEMORY UNIT

142: VOLATILE MEMORY UNIT

144: NON-VOLATILE MEMORY UNIT

20: INTERNET

30: WIRELESS TERMINAL

40: MANUFACTURER AND DISTRIBUTOR DATABASE

CLAIMS

1. A relay device comprising:

relay means for relaying data communication between first and second communication networks;

storage means for storing data in a rewritable manner, and storing an application program for implementing a predetermined communication service by data communication through at least one of the first and second communication networks, and a subprogram library which is a collection of subprograms called in an execution process of the application program; and
program execution means for executing the application program.

2. The relay device according to claim 1, wherein in a case where a subprogram called in the execution process of the application program is a program including a specific process causing trouble in the relay of the data communication performed by the relay means, the program execution means determines whether or not the data communication is being currently relayed by the relay means, and in a case during the relay, the program execution means postpones the execution of the specific process until the data communication is completed.

3. The relay device according to claim 2, wherein the specific process is a process of restarting the relay device, or a process of rewriting parameters used at the time of the relay of data communication performed by the relay means.

4. The relay device according to any one of claims 1 to 3, wherein priorities are respectively set for the relay of the data communication performed by the relay means and the communication service, and

wherein, during execution of one out of the relay of the data communication performed by the relay means and the application program executed by the program execution means, in a case where the other is executed, the execution having a lower priority is postponed until the completion of the

execution having a higher priority.

5. The relay device according to any one of claims 1 to 4, wherein at least one of the first communication network and the second communication network is a wireless communication network.

6. The relay device according to any one of claims 1 to 5, wherein the relay device is a wireless LAN router.