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(54) REMOTE MONITORING APPARATUS OF AIR CONDITIONER AND AIR CONDITIONING SYSTEM

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(57) **ABSTRACT**

A remote monitoring apparatus includes a processor and a flash memory. By executing an FW at a time of activation, processor connects to a server via a network and determines whether FW coincides with or does not coincide with a latest program stored in the server based on a version information, and continues executing FW when FW coincides with the latest program, and acquires the latest program from server and executes a program update process of replacing FW with the latest program when FW does not coincide with the latest program.

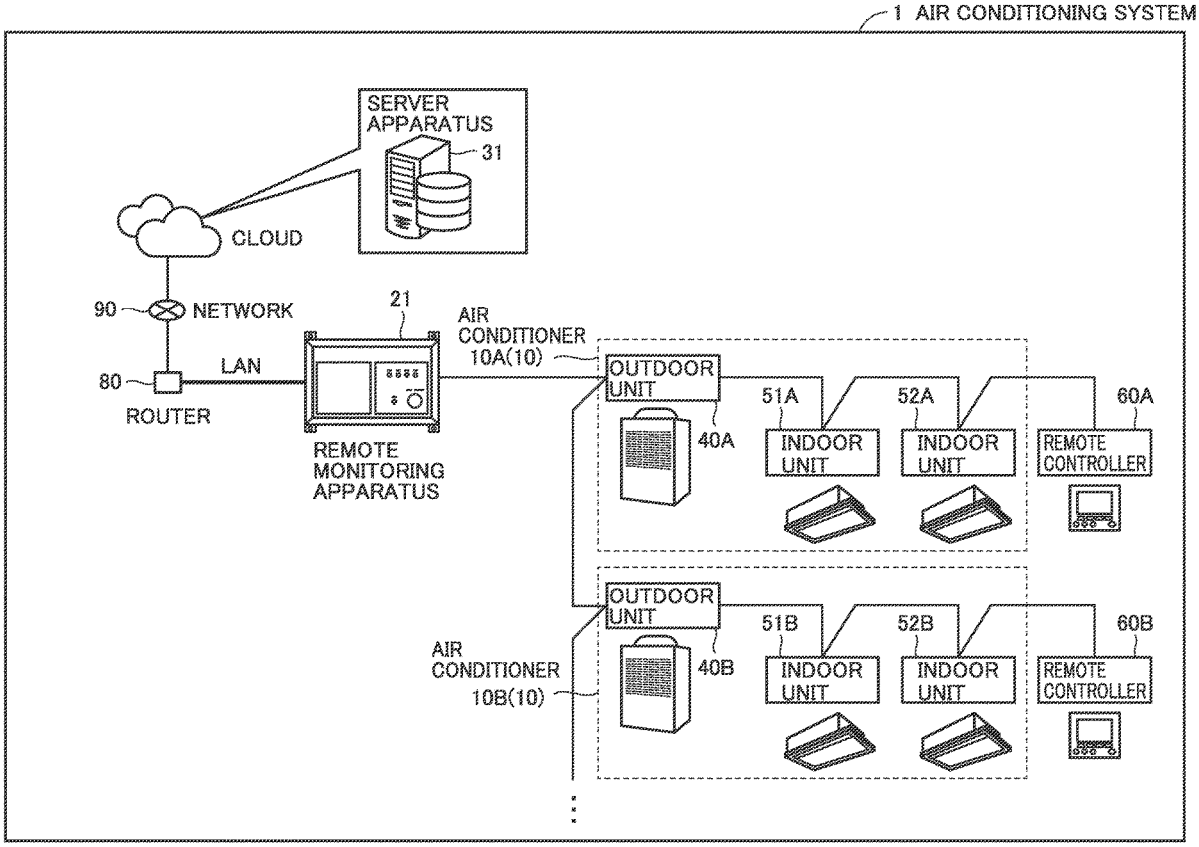


FIG.1

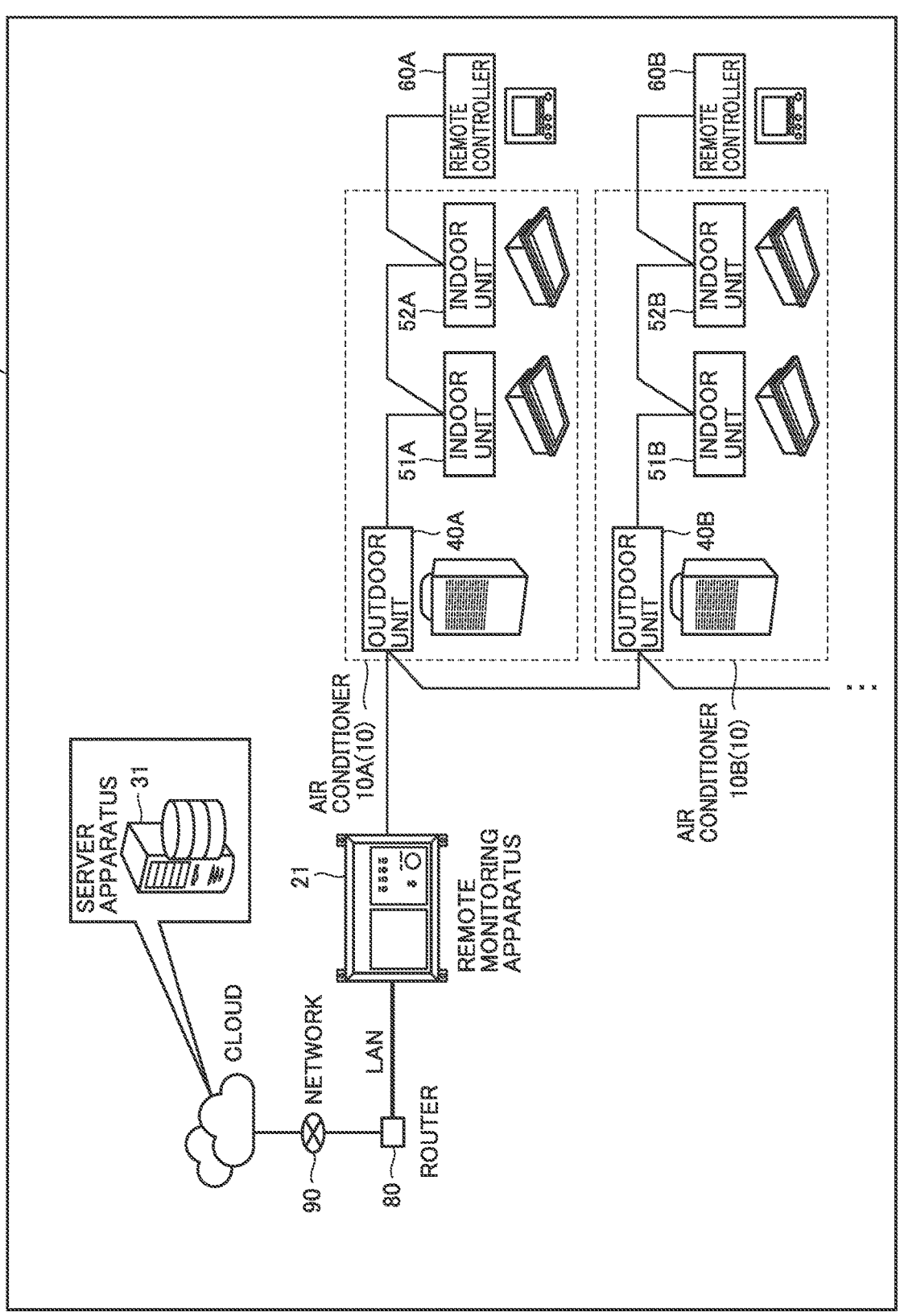

1 AIR CONDITIONING SYSTEM
SERVER APPARATUS
31
CLOUD
NETWORK
90
LAN
ROUTER
80
21
REMOTE MONITORING APPARATUS
AIR CONDITIONER 10A(10)
AIR CONDITIONER 10B(10)
OUTDOOR UNIT
40A
40B
51A
51B
INDOOR UNIT
52A
52B
60A
60B
REMOTE CONTROLLER

FIG.2

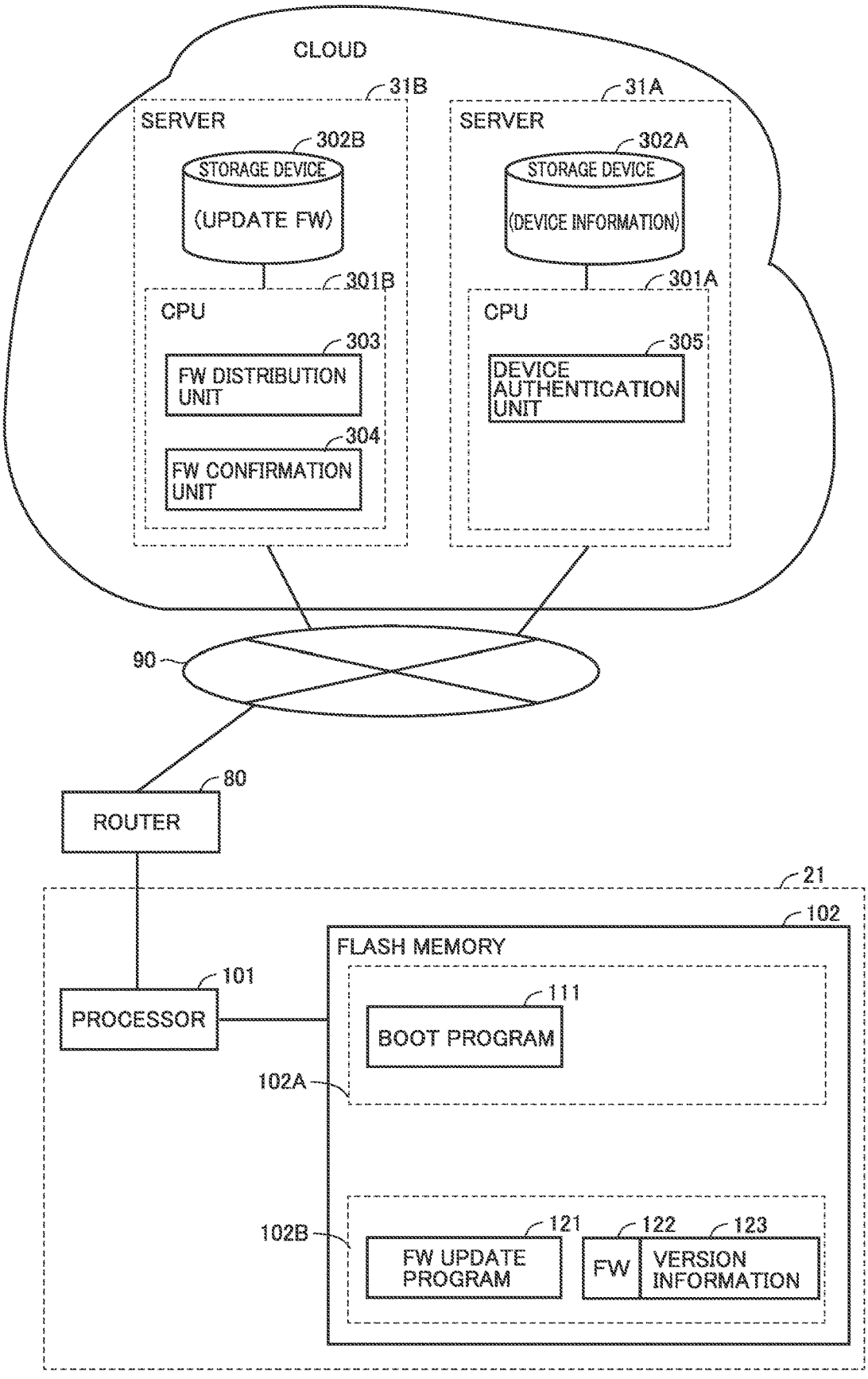

CLOUD
31B
SERVER
302B
STORAGE DEVICE
(UPDATE FW)
301B
CPU
303
FW DISTRIBUTION UNIT
304
FW CONFIRMATION UNIT
31A
SERVER
302A
STORAGE DEVICE
(DEVICE INFORMATION)
301A
CPU
305
DEVICE AUTHENTICATION UNIT
90
80
ROUTER
21
102
FLASH MEMORY
101
PROCESSOR
111
BOOT PROGRAM
102A
102B
121
FW UPDATE PROGRAM
122
FW
123
VERSION INFORMATION

FIG.3

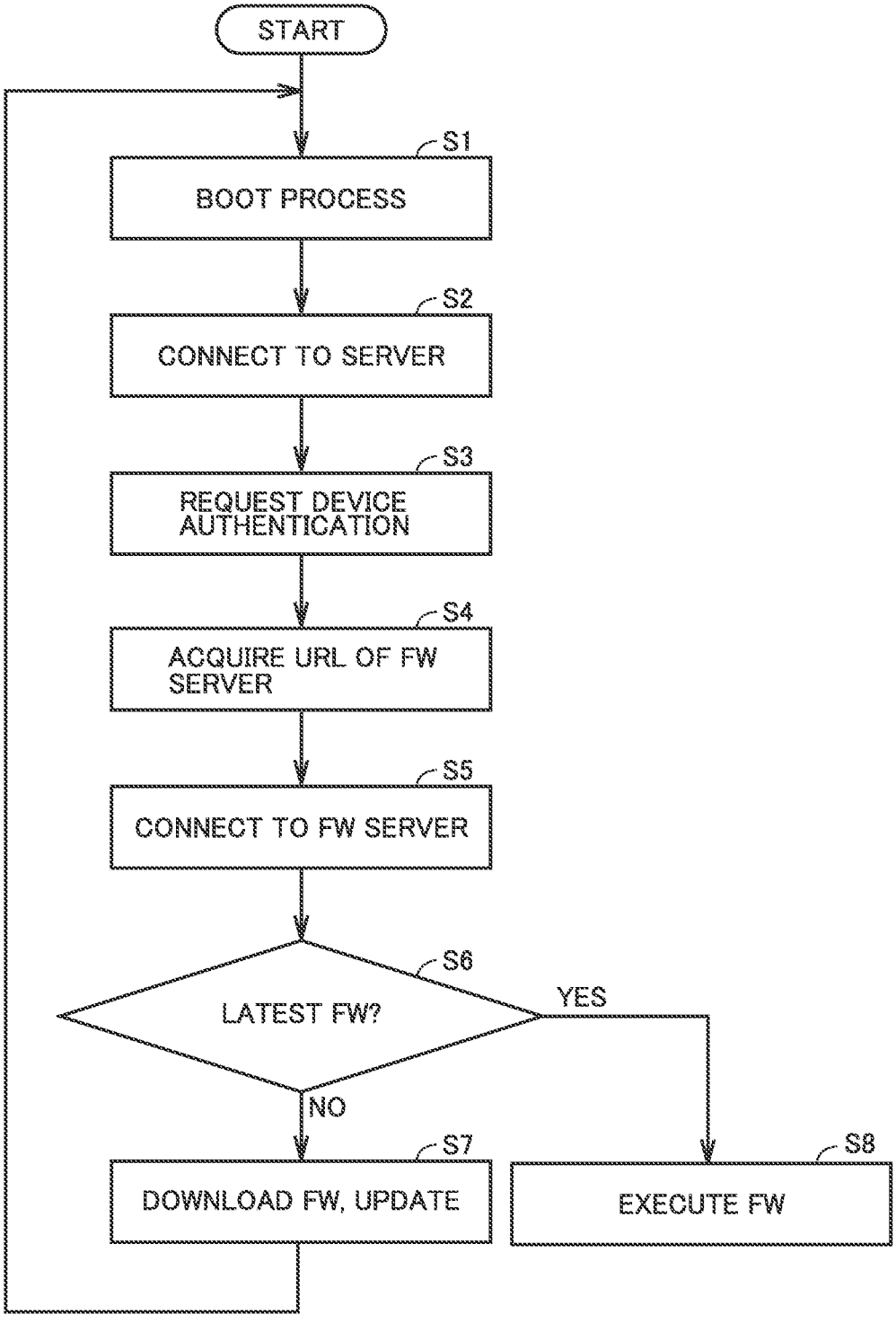

START
S1
BOOT PROCESS
S2
CONNECT TO SERVER
S3
REQUEST DEVICE AUTHENTICATION
S4
ACQUIRE URL OF FW SERVER
S5
CONNECT TO FW SERVER
S6
LATEST FW?
YES
NO
S7
DOWNLOAD FW, UPDATE
S8
EXECUTE FW

FIG.4

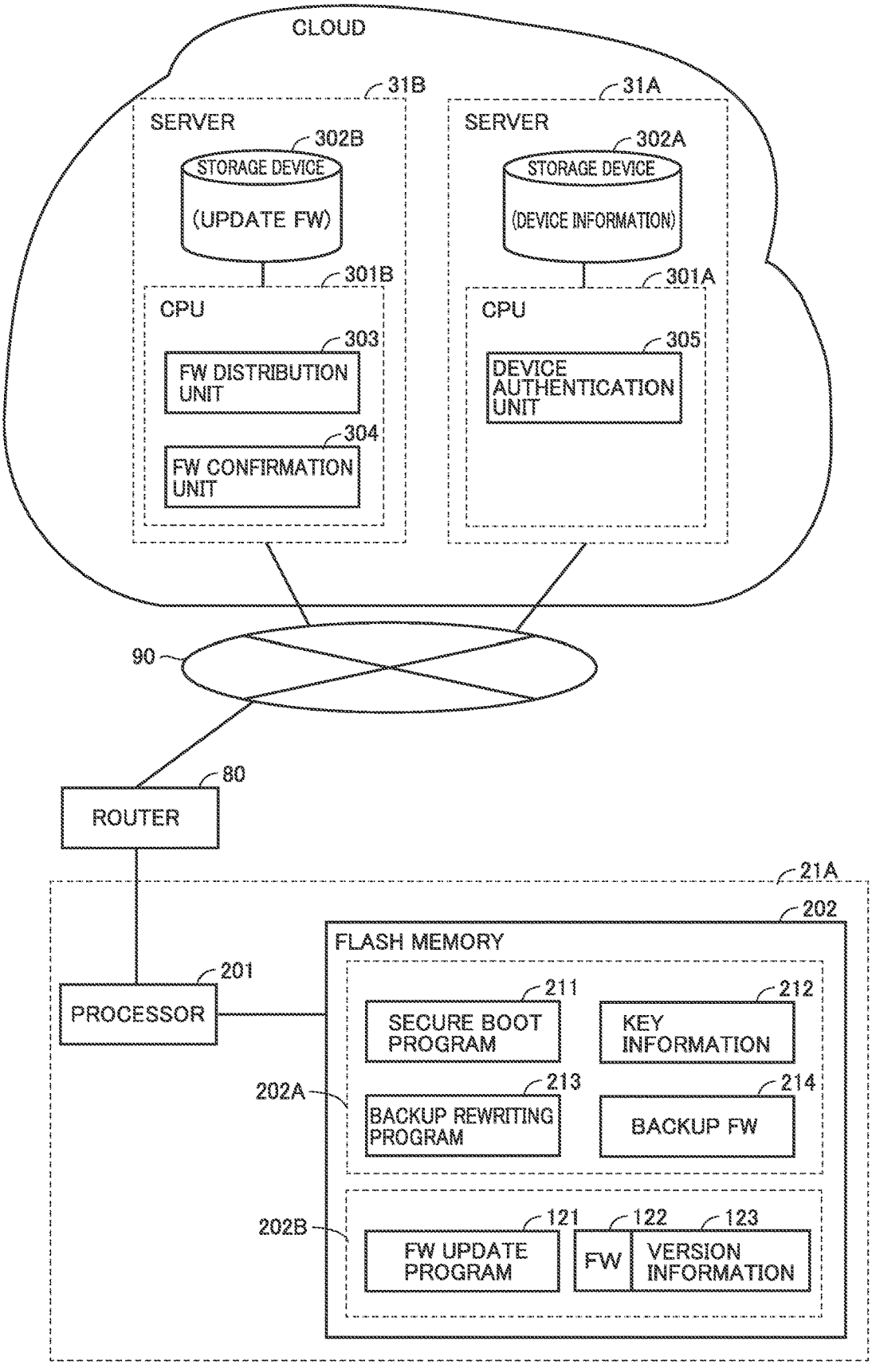
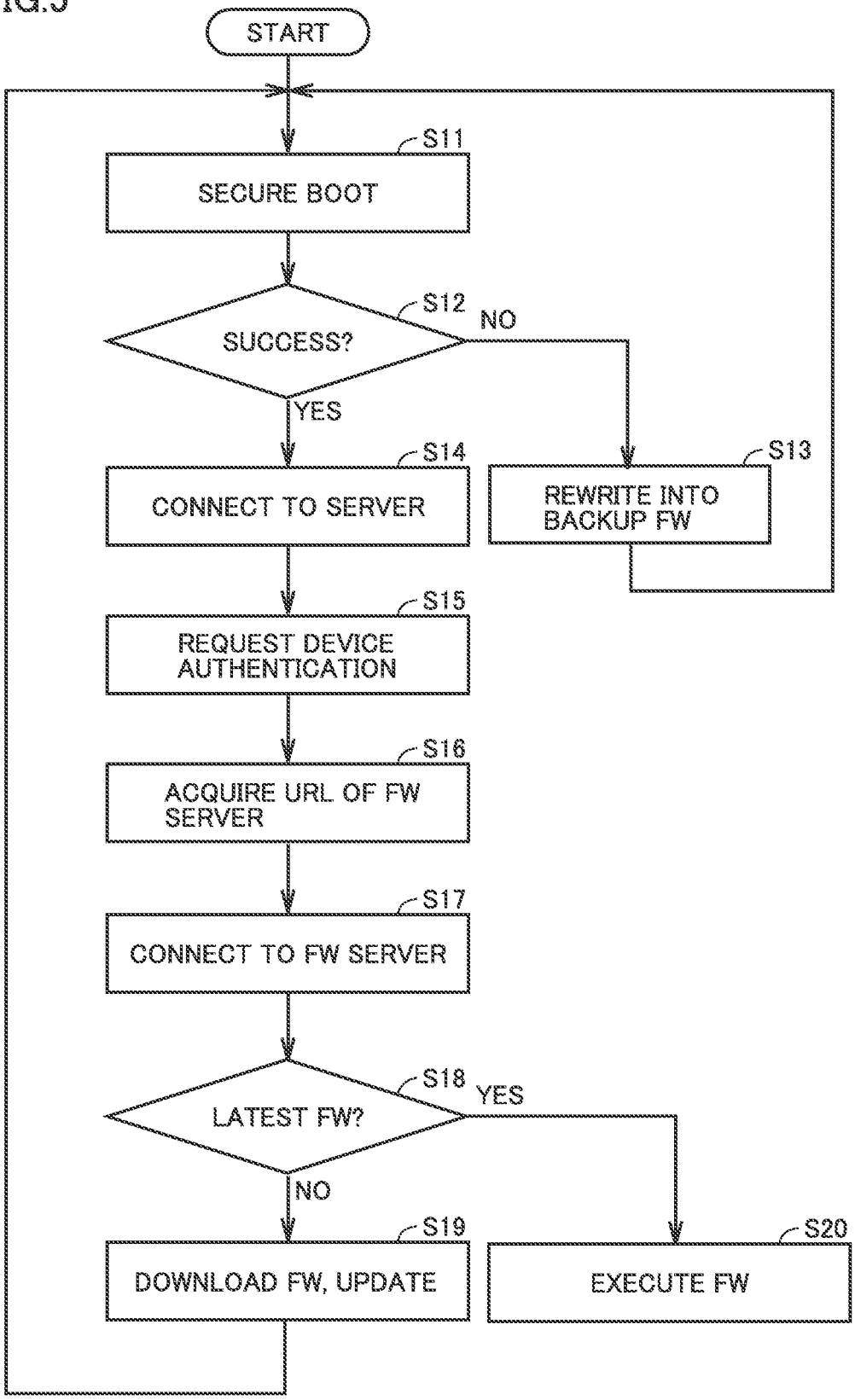

CLOUD
31B
SERVER
302B
STORAGE DEVICE
(UPDATE FW)
301B
CPU
303
FW DISTRIBUTION UNIT
304
FW CONFIRMATION UNIT
31A
SERVER
302A
STORAGE DEVICE
(DEVICE INFORMATION)
301A
CPU
305
DEVICE AUTHENTICATION UNIT
90
80
ROUTER
21A
202
FLASH MEMORY
201
PROCESSOR
211
SECURE BOOT PROGRAM
212
KEY INFORMATION
202A
213
BACKUP REWRITING PROGRAM
214
BACKUP FW
202B
121
FW UPDATE PROGRAM
122
FW
123
VERSION INFORMATION

FIG.5


START
S11
SECURE BOOT
S12
SUCCESS?
NO
YES
S13
REWRITE INTO BACKUP FW
S14
CONNECT TO SERVER
S15
REQUEST DEVICE AUTHENTICATION
S16
ACQUIRE URL OF FW SERVER
S17
CONNECT TO FW SERVER
S18
LATEST FW?
YES
NO
S19
DOWNLOAD FW, UPDATE
S20
EXECUTE FW

REMOTE MONITORING APPARATUS OF AIR CONDITIONER AND AIR CONDITIONING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a U.S. National Stage Application of PCT/JP2021/029348 filed on Aug. 6, 2021, the contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to a remote monitoring apparatus of air conditioner and an air conditioning system.

BACKGROUND

[0003] In a large-scale air conditioner, a control program may be distributed from a network server. For example, Japanese Patent No. 6141242 (PTL 1) discloses a control program distribution system that distributes a control program from a server to an indoor unit and an outdoor unit of an air conditioner via a network and a relay device (edge device).

PATENT LITERATURE

[0004] PTL 1: Japanese Patent No. 6141242

[0005] The control program distribution system disclosed in Japanese Patent No. 6141242 (PTL 1) distributes a control program from a server via a relay device immediately after installation work of an air conditioner is completed in order to conceal the control program and reduce a risk of unauthorized use of the control program.

[0006] On the other hand, in addition to the distribution of the control program of the air conditioner, the network may be used to remotely monitor or remotely control the air conditioner. In this case, the relay device also acts as a remote monitoring apparatus. A control program (hereinafter also referred to as firmware or FW) of a remote monitoring apparatus and an air conditioner may be subjected to a version upgrade for the purpose of improvement in multifunctionality, controllability, or the like. In order to reliably apply the version upgrade of the control program after the remote monitoring apparatus and the air conditioner start to operate, there is room for improvement in the relay device used in the control program distribution system.

SUMMARY

[0007] The present disclosure has been made to solve the above-described problem, and an object of the present disclosure is to provide a remote monitoring apparatus of an air conditioner capable of maintaining a version of a control program to be a latest regular program.

[0008] The present disclosure relates to a remote monitoring apparatus of an air conditioning system for remotely monitoring or remotely operating the air conditioning system. The remote monitoring apparatus includes: a processor; and a nonvolatile memory to store a first program for remotely monitoring or remotely operating the air conditioning system and a version information of the first program. By executing the first program at the time of activation, the processor: (a) connects to a server via a network and determines whether the first program coincides with or does not coincide with a latest program stored in the server based on the version information; and (b) continues executing the first program when the first program coincides with the latest program, and acquires the latest program from the server and executes a program update process of replacing the first program with the latest program when the first program does not coincide with the latest program.

[0009] According to the remote monitoring apparatus of the present disclosure, it is possible to maintain the control program to be in the regular latest version without the user or the administrator being aware of the matter.

BRIEF DESCRIPTION OF DRAWINGS

[0010] FIG. **1** is a diagram showing an overall configuration of an air conditioning system **1** according to Embodiment 1.

[0011] FIG. **2** is a block diagram showing a configuration of a remote monitoring apparatus and a server according to Embodiment 1.

[0012] FIG. **3** is a flowchart for illustrating a process executed in a remote monitoring apparatus **21**.

[0013] FIG. **4** is a block diagram showing a configuration of a remote monitoring apparatus and a server according to Embodiment 2.

[0014] FIG. **5** is a flowchart for illustrating a process executed in a remote monitoring apparatus **21**A.

DETAILED DESCRIPTION

[0015] Hereinafter, embodiments of the present disclosure will be described in detail with reference to the drawings. Although a plurality of embodiments will be described below, it is planned from the beginning of the application that the configurations described in the embodiments are appropriately combined. Note that the same or corresponding parts in the drawings are denoted by the same reference signs, and description thereof will not be repeated.

Embodiment 1

[0016] FIG. **1** is a diagram showing an overall configuration of an air conditioning system **1** according to Embodiment 1. As shown in FIG. **1**, air conditioning system **1** includes an air conditioner **10**, a remote monitoring apparatus **21**, and a server apparatus **31**.

[0017] Remote monitoring apparatus **21** is communicably connected to at least one air conditioner **10**. For example, air conditioner **10** includes an air conditioner **10**A and an air conditioner **10**B, and remote monitoring apparatus **21** is communicably connected to each of air conditioner **10**A and air conditioner **10**B. Air conditioner **10**A includes an outdoor unit **40**A, an indoor unit **51**A, and an indoor unit **52**A, and is communicably connected to a remote controller **60**A. Air conditioner **10**A configured as described above adjusts temperature, humidity, or the like of air sucked from an indoor space based on an operation of remote controller **60**A, and supplies adjusted air to the indoor space. Air conditioner **10**B includes an outdoor unit **40**B, an indoor unit **51**B, and an indoor unit **52**B, and is communicably connected to a remote controller **60**B. Air conditioner **10**B configured as described above adjusts temperature, humidity, or the like of air sucked from the indoor space based on an operation of remote controller **60**B, and supplies adjusted air to the indoor space.

[0018] Remote monitoring apparatus **21**, monitors air conditioner **10**, and for example, collects air-conditioning data related to air-conditioning of air conditioner **10**, and controls air conditioner **10**. That is, remote monitoring apparatus **21** performs remote monitoring and remote operation. As the remote monitoring, remote monitoring apparatus **21** collects the air-conditioning data and uploads the data to a cloud server in a wireless or wired manner. Further, as the remote operation, remote monitoring apparatus **21** receives an instruction from the cloud server to change settings such as an operation mode, a temperature, and a wind direction of the air conditioner.

[0019] Server apparatus **31** exists between remote monitoring apparatus **21** and a user device **70** in a cloud computing mode. Remote monitoring apparatus **21** is connected to a router **80** via a LAN (Local Area Network). Server apparatus **31** is communicably connected to router **80** via a network **90**.

[0020] Server apparatus **31** accumulates and stores the air-conditioning data of air conditioner **10** collected by remote monitoring apparatus **21**. The air-conditioning data includes, for example, data such as an operation state corresponding to operation or stop, an operation start time, an operation end time, a set temperature, a set humidity, an operation mode of cooling/heating, an indoor temperature, and an indoor humidity. The air-conditioning data may include data such as a refrigerant temperature and a refrigerant pressure measured by a sensor installed in a refrigerant pipe or the like.

[0021] Further, server apparatus **31** outputs data corresponding to various setting values input using the user device to remote monitoring apparatus **21**. Remote monitoring apparatus **21** controls air conditioner **10** based on the data acquired from server apparatus **31**.

[0022] Communication between server apparatus **31** and remote monitoring apparatus **21** is performed in accordance with a communication standard A. As communication standard A, for example, on the Internet, connection by TCP/IP (Transmission Control Protocol/Internet Protocol) which is a general communication method is assumed. TCP/IP is a standard set of communication protocols used in many computer networks, including the Internet.

[0023] Communication between remote monitoring apparatus **21** and air conditioner **10** is performed in accordance with a communication standard B. Communication standard B is, for example, bus communication unique to a manufacturer. Although not particularly limited, the communication speed of communication standard B is often lower than that of communication standard A.

[0024] A storage device for storing an update program of air conditioner **10** such as a firmware to be updated is disposed in remote monitoring apparatus **21**, and the storage device may be provided in an outdoor unit, an indoor unit, a remote controller, or the like of air conditioner **10**. However, since the communication network among the outdoor unit, the indoor unit, and the remote controller has a low communication speed, when data is requested, it takes time for the data to arrive from server apparatus **31**. For this reason, it is desirable that a storage device for downloading an FW from server apparatus **31** is provided inside remote monitoring apparatus **21** capable of communicating with server apparatus **31** via a wired LAN, a wireless LAN, or the like.

[0025] FIG. **2** is a block diagram showing a configuration of the remote monitoring apparatus and the server according to Embodiment 1. Server apparatus **31** represented as a cloud shown in FIG. **2** includes a server **31**A and a server **31**B.

[0026] Server **31**A includes a CPU (Central Processing Unit) **301**A and a storage device **302**A. Storage device **302**A stores device information of remote monitoring apparatus **21**. CPU **301**A operates as a device authentication unit **305** by executing a program. Device authentication unit **305** determines a connectable device, and permits connection to server **31**B when the connectable device is determined.

[0027] Server **31**B includes a CPU **301**B and a storage device **302**B. Storage device **302**B stores the FW for update. CPU **301**B operates as an FW confirmation unit **304** and an FW distribution unit **303** by executing a program. FW confirmation unit **304** determines whether or not the FW to be updated exists in a storage device **302**B. When the FW to be updated is confirmed, the FW distribution unit distributes an update FW to remote monitoring apparatus **21**. After confirming the update FW by FW confirmation unit **304**, server **31**B distributes the update FW to remote monitoring apparatus **21** by FW distribution unit **303**.

[0028] Each of storage devices **302**A and **302**B includes various semi-conductor memory devices, hard disks, and the like.

[0029] Remote monitoring apparatus **21** includes a processor **101** and a flash memory **102**. Processor **101** operates as various processing units by executing various programs stored in flash memory **102**.

[0030] Processor **101** loads programs stored in flash memory **102** into a RAM (Random Access Memory) or the like and executes the programs. The programs stored in flash memory **102** are programs that describe the processing procedure for operating as remote monitoring apparatus **21**. Processor **101** executes a boot process, an FW update process, and the like in accordance with these programs. Processor **101** that executes these processes may be a single CPU or may be a plurality of different CPUs.

[0031] Flash memory **102** includes a protected area **102**A which is prohibited from being rewritten and a rewritable area **102**B which is set to be rewritable.

[0032] A boot program **111** is stored in protected area **102**A. An FW update program **121**, an FW **122**, and a version information **123** are stored in rewritable area **102**B.

[0033] FW **122** and version information **123** are data of the FW currently being executed by remote monitoring apparatus **21** and data showing the FW version.

[0034] FW update program **121** inquires server **31**B in the cloud and checks version information **123** to confirm whether or not there is an update FW newer than FW **122** currently stored in rewritable area **102**B at the time of activation of remote monitoring apparatus **21**. When there is an update FW of a newer version than the currently held FW, FW update program **121** downloads the update FW from server **31**B and rewrites FW **122** and version information **123**.

[0035] At the time of activation of remote monitoring apparatus **21**, boot program **111** is executed to load FW **122** into the RAM or the like and execute FW **122**.

[0036] FIG. **3** is a flowchart for illustrating a process executed by remote monitoring apparatus **21**. When remote monitoring apparatus **21** is powered on, processor **101** executes the boot process by boot program **111** in step S1.

Thus, FW **122** stored in flash memory **102** becomes executable, and the processes from step S**2** are executed according to FW **122**.

[0037] First, in step S**2**, remote monitoring apparatus **21** is connected to server **31**A via router **80**. Then, in step S**3**, remote monitoring apparatus **21** requests server **31**A to perform device authentication. Server **31**A determines whether or not the device information registered in storage device **302**A coincides with the device information of remote monitoring apparatus **21**. When the device authentication is normally performed in step S**3**, remote monitoring apparatus **21** is permitted to connect to server **31**B. Then, in step S**4**, remote monitoring apparatus **21** can acquire a URL of server **31**B storing the update FW from server **31**A.

[0038] In step S**5**, remote monitoring apparatus **21** connects to server **31**B by using the acquired URL. Subsequently, in step S**6**, processor **101** refers to version information **123** of FW **122** stored in flash memory **102** to determine whether or not the latest FW held by server **31**B coincides with FW **122**.

[0039] When FW **122** coincides with the latest FW (YES in S**6**), FW **122** is directly executed in step S**8**. On the other hand, when FW **122** does not coincide with the latest FW (NO in S**6**), in step S**7**, processor **101** downloads the latest FW from server **31**B and executes FW update program **121**. When the replacement of FW **122** with the latest FW is completed by the update, remote monitoring apparatus **21** is then restarted, and the processes from step S**1** are executed again.

[0040] As described above, in Embodiment 1, when there is no special update instruction from a user, if the updated FW is registered in server apparatus **31**, remote monitoring apparatus **21** can always execute the latest regular FW.

Embodiment 2

[0041] There is a possibility that an unauthorized FW is written in the remote monitoring apparatus or the server by a malicious third party. A technique called secure boot for preventing such unauthorized FW from being executed is known. In Embodiment 2, the secure boot is also applied to a remote monitoring apparatus of an air conditioner. The secure boot is a technique in which a software is verified using a key data and a digital signature given to the software in advance at the time of activation so that only regular software can be executed.

[0042] FIG. **4** is a block diagram showing a configuration of the remote monitoring apparatus and the server according to Embodiment 2.

[0043] Server apparatus **31** represented as a cloud shown in FIG. **4** includes server **31**A and server **31**B.

[0044] Since server **31**A and server **31**B have the same configurations as those in Embodiment 1, description thereof will not be repeated here.

[0045] A remote monitoring apparatus **21**A includes a processor **201** and a flash memory **202**. Processor **201** operates as various processing units by executing various programs stored in flash memory **202**.

[0046] Flash memory **202** includes a protected area **202**A which is prohibited from being rewritten and a rewritable area **202**B which is set to be rewritable.

[0047] A secure boot program **211**, a key information **212**, a backup rewriting program **213**, and a backup FW **214** are stored in protected area **202**A.

[0048] FW update program **121**, FW **122**, and version information **123** are stored in rewritable area **202**B.

[0049] FW **122** and version information **123** are data of the FW currently being executed by remote monitoring apparatus **21**A and data showing the FW version.

[0050] FW update program **121** inquires server **31**B in the cloud and checks version information **123** to confirm whether or not there is an update FW newer than FW **122** currently stored in rewritable area **202**B at the time of activation of remote monitoring apparatus **21**A. When there is an update FW of a newer version than the currently held FW, FW update program **121** downloads the update FW from server **31**B and rewrites FW **122** and version information **123** into the latest FW and the version information thereof.

[0051] Key information **212** is key data for verification used by secure boot program **211**. In Embodiment 2, a regular digital signature is attached to regular FW **122**, and secure boot program **211** verifies whether or not the digital signature is regular using key information **212**. In this way, secure boot program **211** verifies whether or not the FW has been tampered with using key information **212**.

[0052] Backup FW **214** is a FW data for backup used in place of FW **122** when secure boot program **211** fails in verification.

[0053] Backup rewriting program **213** is executed when secure boot program **211** fails in verification, and rewrites FW **122** and version information **123** into backup FW **214** and an initial version information, respectively.

[0054] FIG. **5** is a flowchart for illustrating a process executed in remote monitoring apparatus **21**A. When remote monitoring apparatus **21**A is powered on, processor **201** executes secure boot program **211** in step S**11**. Secure boot program **211** uses key information **212** to verify whether or not FW **122** currently stored in flash memory **202** has been tampered with.

[0055] In step S**12**, processor **201** determines whether or not the secure boot has succeeded. When it is determined that FW **122** has not been tampered with, the secure boot has succeeded, and when it is determined that FW **122** has been tampered with, the secure boot has failed.

[0056] When the secure boot has succeeded (YES in S**12**), the process of step S**14** is executed. On the other hand, when the secure boot has failed (NO in S**12**), the process of step S**13** is executed.

[0057] In step S**13**, processor **201** executes backup rewriting program **213**. Backup rewriting program **213** rewrites FW **122** into backup FW **214**. When the rewriting is completed, remote monitoring apparatus **21**A is restarted by itself, and the secure boot in step S**11** is executed again. Backup FW **214** is written in protected area **202**A in advance, and it is guaranteed that the secure boot succeeds. Therefore, in this case, the secure boot succeeds in step S**12**, and the process of step S**14** is executed.

[0058] From step S**14**, processor **201** executes FW **122**. First, in step S**14**, remote monitoring apparatus **21**A is connected to server **31**A via router **80**. Then, in step S**15**, remote monitoring apparatus **21**A requests server **31**A to perform device authentication. Server **31**A determines whether or not the device information registered in storage device **302**A coincides with the device information of remote monitoring apparatus **21**A. When the device authentication is normally performed in step S**15**, remote monitoring apparatus **21**A is permitted to connect to server **31**B.

Then, in step S16, remote monitoring apparatus 21A can acquire the URL of server 31B storing the update FW from server 31A.

[0059] In step S17, remote monitoring apparatus 21A connects to server 31B by using the acquired URL. Subsequently, in step S18, processor 201 refers to version information 123 of FW 122 stored in flash memory 202 to determine whether or not the latest FW held by server 31B coincides with FW 122.

[0060] When FW 122 coincides with the latest FW (YES in S18), FW 122 is directly executed in step S20. On the other hand, when FW 122 does not coincide with the latest FW (NO in S18), in step S19, processor 201 downloads the latest FW from server 31B and executes FW update program 121. When the update is completed, remote monitoring apparatus 21A is then restarted, and the processes from step S11 are executed again.

[0061] Since it is clear that the FW has become the latest after the restart, when there is a history of restart, the processes of steps S16 to S18 may be omitted.

[0062] As described above, in Embodiment 2, in addition to the effects obtained in Embodiment 1, when FW 122 has been tampered with for some reason, the FW which has been tampered with can be eliminated and the latest regular FW can be executed.

[0063] The protected area and the rewritable area are provided in flash memories 102, 202 in Embodiments 1, 2, and these areas can be easily realized by a flash memory capable of applying protection for each sector. It is possible to determine whether each sector is set to the protected area or the rewritable area by setting a lock bit for each sector when manufacturing the remote monitoring apparatus. In addition, an area requiring a password for rewriting may be set as the protected area. Alternatively, the protected area and the rewritable area may be formed as different chips, respectively.

SUMMARY

[0064] The present disclosure relates to remote monitoring apparatus 21 of an air conditioner for remotely monitoring or remotely operating air conditioner 10. Remote monitoring apparatus 21 includes: processor 101; and flash memory 102 for storing a first program (FW 122) for remotely monitoring or remotely operating air conditioner 10 and version information 123 of the first program (FW 122). By executing the first program (FW 122) at the time of activation, processor 101: (a) connects to server 31B via network 90 and determines whether the first program (FW 122) coincides with or does not coincide with the latest program stored in the server based on the version information; and (b) continues executing the first program (FW 122) when the first program (FW 122) coincides with the latest program, and acquires the latest program from server 31B and executes a program update process of replacing the first program (FW 122) with the latest program when the first program (FW 122) does not coincide with the latest program.

[0065] With such a configuration, when there is no special update instruction from a user, if the updated FW is registered in server apparatus 31, remote monitoring apparatus 21 can always execute the latest regular FW.

[0066] Preferably, as shown in FIG. 4, in addition to the first program (FW 122), flash memory 202 stores a second program (secure boot program 211) for executing a verification process for verifying whether or not the first program (FW 122) is a regular program, and a backup program (backup FW 214) for executing at least the program update process. As a result of verification by the second program (secure boot program 211) at the time of activation, processor 201 executes the first program (FW 122) when the first program (FW 122) is a regular program, and executes the backup program (backup FW 214) in place of the first program (FW 122) when the first program (FW 122) is not a regular program.

[0067] With such a configuration, when FW 122 has been tampered with for some reason, the FW which has been tampered with can be eliminated and the latest regular FW can be executed.

[0068] More preferably, flash memory 202 stores key information 212 used by the second program (secure boot program 211). Flash memory 202 is configured such that a partial area thereof can be set to be protected area 202A where data cannot be rewritten. The second program (secure boot program 211), key information 212, and the backup program (backup FW 214) are stored in protected area 202A. The first program (FW 122) and version information 123 are stored in an area (rewritable area 202B) different from protected area 202A of flash memory 202.

[0069] Preferably, the first program (FW 122) is signed with the digital signature. By executing the second program (secure boot program 211), processor 201 verifies whether or not the digital signature is regular using key information 212 in the verification process.

[0070] With such a configuration, there is no possibility that secure boot program 211, backup FW 214, and backup rewriting program 213 are tampered with, and thus, even when FW 122 has been tampered with, by replacing FW 122 with backup FW 214, replacing version information 123 with the initial version, and acquiring the latest program from the server again to perform the program update process, it is possible to reliably eliminate the tampered FW and execute the latest regular FW.

[0071] Preferably, server apparatus 31 includes server 31A for authenticating the remote monitoring apparatus and server 31B for holding the latest program. As shown in FIG. 5, a processor 201 requests server 31A to perform authentication (S15), and acquires information (URL), which is for accessing server 31B, from server 31A when the device information of remote monitoring apparatus 21A coincides with the device information stored in server 31A (S16).

[0072] Preferably, as shown in step S7 of FIG. 3 or step S19 of FIG. 5, when processor 201 executes the program update process, processor 201 restarts and executes the first program (FW 122) which has been replaced with the latest program.

[0073] Although an example in which a storage device is provided in remote monitoring apparatus 21 has been described in the embodiment disclosed herein, a storage device that stores an update program of air conditioner 10 such as a firmware may be provided in an outdoor unit, an indoor unit, a remote controller, or the like of air conditioner 10, and the technique described in the present embodiment may be applied to the FW update of air conditioner 10.

[0074] It should be understood that the embodiments disclosed herein are illustrative in all respects and are not restrictive. The scope of the present disclosure is defined not by the above description of the embodiments but by the claims, and is intended to include all modifications within the meaning and scope equivalent to the claims.

1. A remote monitoring apparatus of an air conditioner for remotely monitoring or remotely operating an air conditioner, the remote monitoring apparatus comprising:
a processor; and
a nonvolatile memory to store a first program for remotely monitoring or remotely operating the air conditioner and a version information of the first program, wherein
the processor executes the first program at a time of activation to:
(a) connect to a server via a network and determine whether the first program coincides with or does not coincide with a latest program stored in the server based on the version information; and
(b) continue executing the first program when the first program coincides with the latest program, and acquire the latest program from the server and execute a program update process of replacing the first program with the latest program when the first program does not coincide with the latest program,
the nonvolatile memory stores, separately from the first program, a second program to execute a verification process for verifying whether or not the first program is a regular program, and a backup program to execute at least the program update process,
as a result of verification by the second program at the time of activation, the processor executes the first program when the first program is a regular program, and executes the backup program in place of the first program when the first program is not a regular program,
the nonvolatile memory is configured such that a partial area thereof can be set to be a protected area where a data cannot be rewritten, and
the backup program is stored in the protected area.

2. (canceled)

3. The remote monitoring apparatus according to claim 1, wherein
the nonvolatile memory further stores a key information used by the second program,
in addition to the backup program, the second program, and the key information are stored in the protected area, and
the first program and the version information are stored in an area different from the protected area of the nonvolatile memory.

4. The remote monitoring apparatus according to claim 3, wherein
the first program is signed with a digital signature, and
the processor verifies whether or not the digital signature is regular using the key information in the verification process by executing the second program.

5. The remote monitoring apparatus according to claim 1, wherein
the server includes:
a first server to authenticate the remote monitoring apparatus; and
a second server to hold the latest program, and
the processor requests the first server to perform authentication, and acquires from the first server an information for accessing the second server when a device information of the remote monitoring apparatus coincides with a device information stored in the first server.

6. The remote monitoring apparatus according to claim 1, wherein when the processor executes the program update process, the processor restarts and executes the first program which has been replaced with the latest program.

7. An air conditioning system comprising:
the remote monitoring apparatus according to claim 1,
the air conditioner; and
the server.

8. An air conditioning system comprising:
the remote monitoring apparatus according to claim 3,
the air conditioner; and
the server.

9. An air conditioning system comprising:
the remote monitoring apparatus according to claim 4,
the air conditioner; and
the server.

10. An air conditioning system comprising:
the remote monitoring apparatus according to claim 5,
the air conditioner; and
the server.

11. An air conditioning system comprising:
the remote monitoring apparatus according to claim 6,
the air conditioner; and
the server.

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