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Examination Requested Requested

(54) Dynamic IP address modification apparatus and method

Abstract

The present invention relates to a dynamic IP address modification processing apparatus and method.

The present invention comprises a management server that is connected to an embedded system via the Internet, registers and manages dynamic IP address information assigned to an embedded terminal of the embedded system, and when a change event occurs for the dynamic IP address of an embedded terminal, the IP address information of the terminal is modified and stored. At this time, the embedded terminal is given a dynamic IP address by DHCP and transmits an IP address change event for setting and updating the IP address to the management server.

According to the present invention, when the embedded terminal has a dynamic IP address, by adding a management server that manages the IP address of the embedded terminal, a user terminal can receive the address of the modified embedded terminal, increasing convenience of use, and the load on the embedded system can be reduced by avoiding management of the dynamic address of the embedded terminal directly in the embedded system.

Representative Drawing

FIG. 3

Index Words

FreeWheel, Ex. 1162

DHCP, embedded systems, dynamic IP

Specification

Brief Description of the Drawings

FIG. 1 is a block diagram showing a network structure applying DHCP to an embedded system according to an embodiment of the present invention.

FIG. 2 is an operational flowchart of a dynamic Internet address change event processing process according to an embodiment of the present invention.

FIG. 3 is an operational flowchart of the event processing process of the management server in the dynamic Internet address change event processing process of FIG. 2.

Detailed Description of the Invention

Purpose of the Invention

Technical Field of the Invention and Prior Art

The present invention relates to an apparatus and method for processing dynamic Internet address modifications, and particularly to an apparatus and method for processing dynamic Internet address modifications when a dynamic address allocation protocol is used in an embedded system.

A Dynamic Host Configuration Protocol (hereinafter referred to as DHCP) is useful when a terminal connects to a server and receives various services; after use, the used Internet address is returned so that other users can use it, thereby providing Internet service to many subscribers.

However, when using DHCP, a new Internet address is used each time one connects, and it is not easy to configure it as a server, so DHCP is generally used for download services.

Meanwhile, an “embedded system” refers to an electronic control system that combines computer hardware and software to perform specific, predetermined functions; to a system that may comprise some equipment as needed. Such an embedded system often requires access from general users and must be easily accessible to a plurality of users. Rather than using a dynamic domain system, there are many cases where additional dynamic domain name clients and dynamic domain name servers are operated.

However, in the case of embedded systems consisting of very small sensors, and the like, there is a problem in that a lot of resources must be consumed to operate a dynamic domain name client.

Additionally, when applying DHCP to an embedded system, if the power is interrupted or the Internet connection is interrupted, a new host address is assigned, but remote users cannot be apprised of this, which causes problems in use.

Problem to be Solved by the Invention

In order to solve the above problem, the object of the present invention is to provide a dynamic IP address modification apparatus and method that makes it possible to maintain the Internet address when using the dynamic host configuration protocol for the terminal of an embedded system.

Structure and Operation of the Invention

To achieve the above object, the dynamic IP address modification apparatus according to one feature of the present invention is a dynamic IP (Internet Protocol address) address modification processing apparatus of an embedded system that provides services by applying a Dynamic Host Configuration Protocol (hereinafter referred to as DHCP),

that is connected via the Internet to an embedded terminal of the embedded system that is assigned a dynamic IP address by DHCP, that registers and manages dynamic IP address information provided to the embedded terminal, and modifies and stores the IP address information of the terminal when a change event occurs for the dynamic IP address of the embedded terminal.

The dynamic IP address modification apparatus comprises:

a subscriber module that provides IP address information of the embedded terminal to a terminal of a service subscriber who wishes to access the terminal of the embedded system through an Internet network;

an embedded system management module that manages embedded terminals added to or deleted from the embedded system;

a database storing a terminal mapping table containing IP address information assigned to the terminal of the embedded system; and

a log module that stores event information comprising modifies in the IP address assigned to the terminal of the embedded system, or addition or registration of the embedded terminal.

Further, the dynamic IP address modification method according to a feature of the present invention is

a method of processing dynamic IP address modifications in a management server that processes dynamic IP address change events of embedded systems that provide services by applying a DHCP, comprising:

a step of receiving corresponding IP address change event information when an event occurs in which the IP address of an embedded terminal of the embedded system is modified; and

a step of using the embedded terminal information comprised in the received IP address change event to modify the previously stored IP address of the embedded terminal to a new IP address comprised in the IP address change event and storing it.

Below, embodiments of the present invention will be described in detail with reference to the attached drawings so that those skilled in the art can easily implement the present invention. However, the present invention may be implemented in many different forms and is not limited to the embodiments described herein. In the attached drawings, in order to clearly explain the present invention, parts that are not related to the description of the present invention are omitted, and identical or similar parts are given the same reference numerals.

FIG. 1 is a block diagram showing a network structure applying DHCP to an embedded system according to an embodiment of the present invention.

Referring to FIG. 1, the network according to an embodiment of the present invention comprises an embedded system 100, a DHCP (Dynamic Host Configuration Protocol) server 200, a user terminal 300, and a management server 400, each connected to the Internet network.

The embedded system 100 comprises embedded terminals 110 each providing specialized services; each embedded terminal 110 is assigned a dynamic IP address from the DHCP server 200 through the Internet network and connects to the Internet to provide various services to a plurality of user terminals 300.

The DHCP server 200 assigns a dynamic IP address to each of the embedded terminals 110 of the embedded system 100 so that they can connect to the Internet network and provide services.

The management server 400 manages IP address information assigned to the embedded terminal 110 by the DHCP 200. In the case where the power or Internet of the embedded terminal 110 is disconnected and then reconnected, when the embedded terminal 110 receives a new IP address from the DHCP server 200, the management server 400 according to an embodiment of the present invention is notified of this as an event and stores and manages the new IP address.

The management server 400 according to an embodiment of the present invention comprises a web server module 410, a subscriber module 420, an embedded system management module 430, a DB 440, and a log module 450.

The web server module 410 is a web service-related module that connects to the Internet to control and manage the management server 400; the subscriber module 420 manages subscriber information for using the embedded system 100. That is, when the subscriber module 420 receives a request from the user terminal 300 that wants to connect to the embedded terminal 110 and provide service, it determines whether the user is a service subscriber, and provides the IP address of the embedded terminal 110 to the user terminal 300.

The embedded system management module 430 enables management of the embedded system 100 from a remote location and processes events resulting from the addition or removal of the embedded terminal 110.

DB 440 comprises a terminal mapping table that stores subscriber information and IP address information assigned to the embedded terminal 110.

FIG. 2 is an operational flowchart of a dynamic Internet address change event processing process according to an embodiment of the present invention.

Referring to FIG. 2, when the embedded terminal 110 reconnects to the Internet network due to a power failure or other operation, the embedded terminal 110 first initializes the environment (S201) and loads the environment configuration defined in advance for the management server 400 (S202).

At this time, the initialization environment of the embedded terminal 110 and the configuration environment information of the management server 400 are basically stored in the embedded terminal 110; however, they can also be received from the embedded system 100, or the configuration environment information can also be provided from the management server 400 through the Internet network.

Next, the embedded terminal 110, which has completed the initialization process, connects to the Internet network and obtains an IP address from the DHCP server 200 to provide services (S203).

The embedded terminal 110, which has acquired a new IP address, determines whether the previously used IP address and the newly acquired IP address are the same (S204), and if they are the same, operates a standby timer (S208). At this time, because the standby timer must acquire a new IP address after a certain period of time due to the nature of DHCP, a new IP address is acquired according to the standby timer time. At this time, if the currently used IP address can continue to be used, the DHCP server 200 re-assigns the current IP address without changing the IP address.

However, if the IP address used is assigned to another embedded terminal 110 during the new IP address acquisition time, the DHCP server 200 grants a new IP address to the embedded terminal 110.

The technology for periodic IP address renewal described above follows the conventional DHCP standard, so a detailed description thereof is omitted.

Meanwhile, as a result of the determination in step S204, if the embedded terminal 110 acquires a new IP address that is different from the previous IP address, the embedded terminal 110 notifies the management server 400 that an event that modifies the IP address has occurred (S205); the management server 400 uses the received IP address change event to update and store the terminal mapping table with the new IP address as the IP address of the embedded terminal 110, and stores the new log information in the log file (S207). .

Then, the embedded terminal 110 operates a standby timer while using the new IP address (S208) to perform periodic IP address update.

The operation of the management server 400 in steps S206 and S207 when it receives an IP address change event from the embedded terminal 110 is described in more detail as follows.

FIG. 3 is an operational flowchart of the event processing process of the management server in the dynamic Internet address change event processing process of FIG. 2.

Referring to FIG. 3, the management server 400 performs initialization of the environment set by default during initial operation (S301) and enters a standby state while waiting for an event to be received from the embedded terminal 110 of the embedded system 100 (S302).

Then, when an event is input to the management server 400 (S303), the log module 450 stores log information indicating that an event has been entered in the DB 440 (S304), and it is determined whether the event is in regarding to a modification in the IP address of the embedded terminal 110 (S304), whether it is a user connection event transmitted from the user for the embedded service (S307), or an initialization event of the server table (S310).

If the event received as a result of the determination in step S305 is an IP address change event of the embedded terminal 110, the terminal mapping table is modified by storing the IP address of the embedded terminal 110 as a new IP address in the DB 440 (S306), and after saving the log for the modification (S313), it switches to standby mode to wait for a new event input (S302).

Additionally, if the received event is a user connection event, this means that the user terminal 300 is to connect to a specific embedded terminal 110 in the embedded system 100 to use the service, so the user connection event comprises information on the embedded terminal 110 to which the user terminal 300 wishes to connect.

Accordingly, the subscriber module 420 of the management server 400 searches the terminal mapping table stored in the DB 440 (S308) to confirm the IP address for the corresponding embedded terminal 110, transmits the confirmed IP address information to the user terminal 300 (S309) and provides notification thereof. And after saving the log information (S313), it switches to standby mode to wait for a new event input (S302).

Then, the user terminal 300 that has received the IP address information can use the IP address to connect to the desired embedded terminal 110 and use the service.

Further, if the received event is an event for initialization of the server table, after initializing the terminal mapping table of the DB 440 (S311), log information for this is stored (S313), and then a switch is made to standby mode to wait for a new event input (S302).

On the other hand, if the received event is not an event like that in steps S305, S307 and S310, after processing it as another event (S312) and storing log information about it (S313), a switch is made to standby mode to wait for a new event input (S302).

At this time, the other event processing can be modified depending on the function of the management server 400; since it is not related to the present invention, a description thereof will be omitted.

As described above, according to an embodiment of the present invention, an embedded terminal whose Internet address modifications dynamically transmits an event about the address modification to the management server, and when the user terminal 300 wants to access a specific embedded terminal 110, the management server provides the IP address of the embedded terminal 110, so that the user terminal 300 can use the service regardless of the modification in the IP address of the embedded terminal 110.

Although the embodiments of the present invention have been described above, the present invention is not limited to the above-described embodiments and various other modifies and modifies are possible.

Effects of the Invention

As described above, the dynamic IP address modification apparatus and method according to the present invention has effects wherein, if the embedded terminal of an embedded system has a dynamic IP address, a management server that manages the IP address of the embedded terminal is added, which enhances convenience of use by allowing the user terminal to receive the modified address of the embedded terminal, so as to reduce the load on the embedded system by not having to manage the dynamic address of the embedded terminal directly in the embedded system.

(57) Claims

Claim 1.

A dynamic IP (Internet Protocol address) address modification processing apparatus of an embedded system that provides services by applying a Dynamic Host Configuration Protocol (hereinafter referred to as DHCP),
that is connected via the Internet to an embedded terminal of the embedded system that is assigned a dynamic IP address by DHCP, that registers and manages dynamic IP address information provided to the embedded terminal, and modifies and stores the IP address information of the terminal when a change event occurs for the dynamic IP address of the embedded terminal.

Claim 2.
The dynamic IP address modification apparatus according to claim 1,
wherein the dynamic IP address modification apparatus comprises:
a subscriber module that provides IP address information of the embedded terminal to a terminal of a service subscriber who wishes to access the terminal of the embedded system through an Internet network;
an embedded system management module that manages embedded terminals added to or deleted from the embedded system;
a database storing a terminal mapping table containing IP address information assigned to the terminal of the embedded system; and
a log module that stores event information comprising modifies in the IP address assigned to the terminal of the embedded system, or addition or registration of the embedded terminal.

Claim 3.
The dynamic IP address modification apparatus according to claim 2,
wherein the database stores information on users who wish to use the service by subscribing to the embedded system.

Claim 4.
The dynamic IP address modification apparatus according to claim 1,
Wherein the dynamic IP address modification apparatus further comprises a web server module for web environment management that enables management and control through the Internet network.

Claim 5.
A dynamic IP address modification apparatus, comprising an embedded terminal that is assigned a dynamic IP address by applying a Dynamic Host Configuration Protocol (hereinafter referred to as DHCP), and has a dynamic IP address that provides embedded services through the Internet

network; and a management server that is connected to the embedded terminal through the Internet, registers and manages dynamic IP address information assigned to the embedded terminal, and modifies and stores the IP address information of the terminal when a change event occurs for the dynamic IP address of the embedded terminal.

Claim 6.
The dynamic IP address modification apparatus according to claim 5,
wherein the embedded terminal transmits an IP address change event for IP address renewal according to power on/off and Internet connection on/off to the management server.

Claim 7.
A method of processing dynamic IP address modifications in a management server that processes dynamic IP address change events of embedded systems that provide services by applying a Dynamic Host Configuration Protocol (hereinafter referred to as DHCP), comprising:
a step of receiving corresponding IP address change event information when an event occurs in which the IP address of an embedded terminal of the embedded system is modified; and
a step of using the embedded terminal information comprised in the received IP address change event to modify the previously stored IP address of the embedded terminal to a new IP address comprised in the IP address change event and storing it.

Claim 8.
The dynamic IP address change event processing method according to claim 7,
wherein the IP address of the embedded terminal is modified when a new IP address is assigned due to periodic IP address renewal, or when a new IP address is assigned due to the embedded terminal being powered on/off or Internet access turned on/off.

Claim 9.
The dynamic IP address change event processing method according to claim 7,
comprising a step of the management server receiving a user access event from a user terminal for accessing the embedded terminal, and

a step of searching for the IP address of the embedded terminal according to the embedded terminal information comprised in the user connection event and transmitting the searched IP address information to the user terminal.

Claim 10.

The dynamic IP address change event processing method according to claim 7,
comprising a step of the management server receiving an initialization event from the embedded terminal, and

a step of initializing the terminal mapping table according to the initialization event.

Claim 11.

The dynamic IP address change event processing method according to claim 7,
further comprising a step of the management server storing log information according to the input and processing results of the received event.

Drawings

FIG. 1

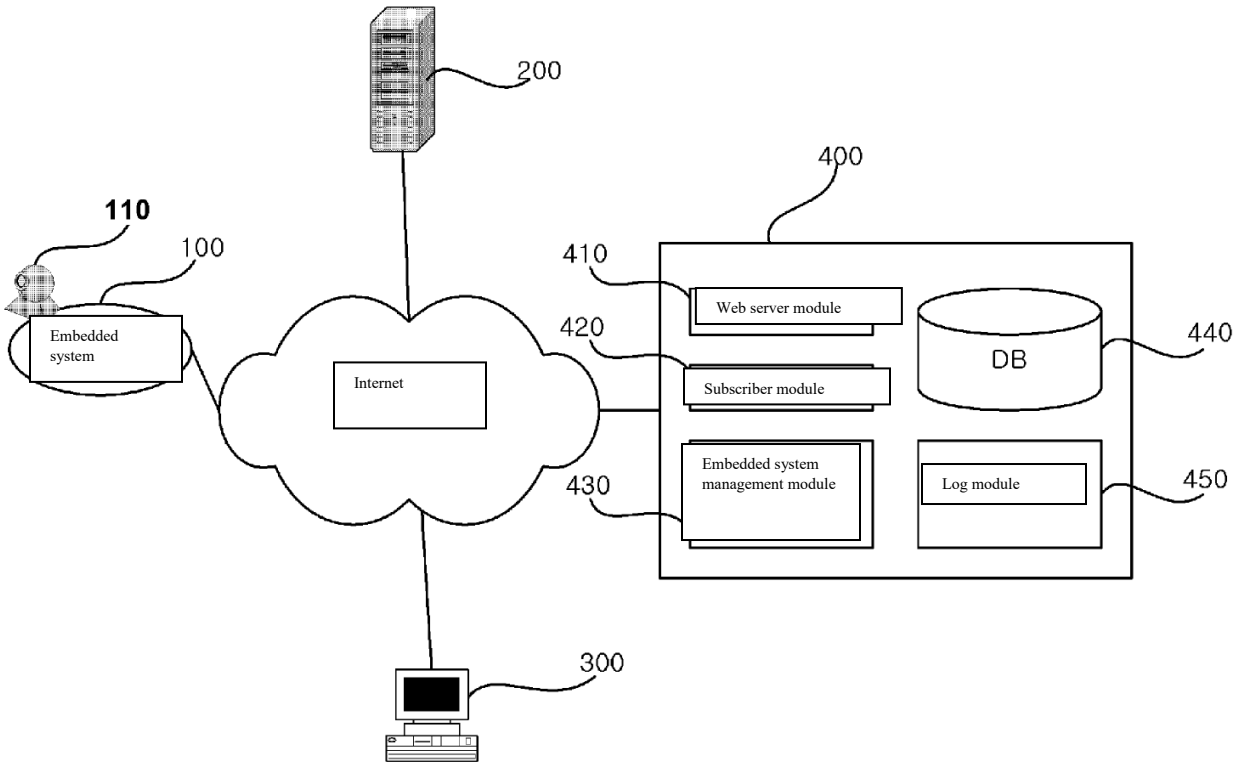


FIG. 2

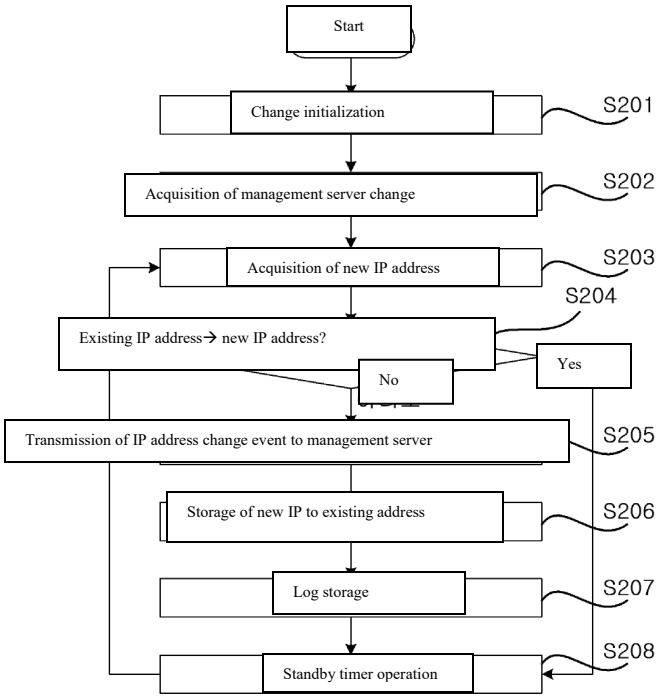
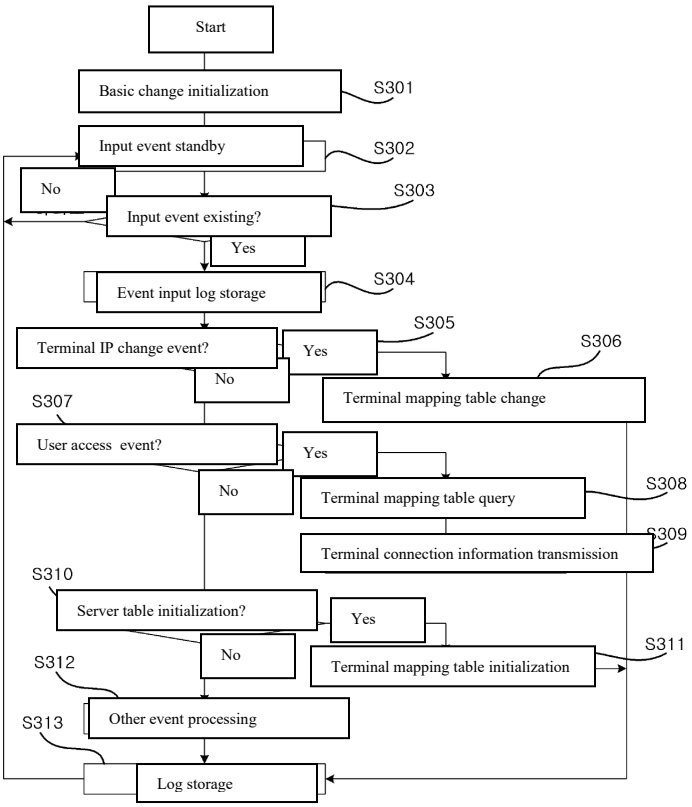

Start
Change initialization
S201
Acquisition of management server change
S202
Acquisition of new IP address
S203
S204
Existing IP address→ new IP address?
Yes
No
Transmission of IP address change event to management server
S205
Storage of new IP to existing address
S206
Log storage
S207
S208
Standby timer operation

FIG. 3


Start
Basic change initialization
S301
Input event standby
S302
No
S303
Input event existing?
Yes
Event input log storage
S304
S305
Terminal IP change event?
Yes
S306
No
Terminal mapping table change
S307
User access event?
Yes
No
Terminal mapping table query
S308
Terminal connection information transmission
S309
S310
Server table initialization?
Yes
No
S311
S312
Terminal mapping table initialization
Other event processing
S313
Log storage

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November 03, 2023

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Date