Specification

1. Title of the Invention:

Information Processing Method, Information Processing Apparatus, and Storage Medium for Storing an Information Processing Program

[Field of the Invention]

This invention relates to an information processing method and, more particularly, to a method for supporting information terminals connected to a server via a network in a centralized manner or to a method for controlling requests sent from the information terminals.

[0002]

[Background Art]

The Internet comprises multiple interconnected computer networks so that any computer on a given network can communicate with one or more computers on any other given network. A gateway computer is a computer that interconnects two networks and passes data from one network to the other(s).

[0003]

All the computers on the Internet communicate through certain communication protocols, i.e., Internet Protocol (IP). Most applications use Transmission Control Protocol (TCP) along with the Internet Protocol. Therefore, the Internet is also

9904469 - 5

13 SEP 1999

referred to as a TCP/IP Network. Any computer connected to the Internet is identified by a unique Internet address.

[0004]

The Internet uses a well known packet switching technique to route information. On the Internet, the data is transferred through packets (also called IP packets) with an address. Some common Internet applications include Electronic Mail, FTP, Telnet and Network news among others. Internet communication protocols and applications are well known.

[0005]

The World Wide Web (i.e., WWW or Web) is an information service system that is based on the Internet. The WWW uses Hypertext and client/server technology.

[0006]

Hypertext is a method of organizing and presenting information such that any data object in a hypertext file can have links to other hypertext files or data objects. For example, while viewing a hypertext page, a user can select a word that has links. This may bring the user to another hypertext file that contains more text and pictures explaining this word (The new file may also have more links to other hypertext files and so forth).

[0007]

Currently, the hypertext file is organized using a Hyper Text Markup Language (HTML). A hypertext data object can be almost

any information media such as text, image, sound, movie or even a piece of an executable computer program. Any hypertext file on the Web is uniquely identified by its Universal Resource Locator (URL).

[0008]

The Web client or a client (commonly a computer executing a program called a browser) is essentially a hypertext reader that communicates with a Web server through certain data transfer protocols, such as a Hyper Text Transfer Protocol (HTTP). The client can request a hypertext file with its URL and displays the file on a Graphical User Interface (GUI). This display is called a Web page. The client can also pass certain data back to the server and can invoke the Common Gateway Interface (CGI) programs on the server computer to conduct certain tasks. Currently, "Netscape Navigator" (trademark of Netscape Communications Corp.) and "Internet Explorer" (trademark of Microsoft Corp.) are known as popular browsers.

[0009]

Using the world wide connections of the Internet, the WWW allows a user, being anywhere on the Internet, to post any hypertext file on the WWW and fetch any hypertext file from all over the world as conveniently as using a local hard disk. This gives the user a tremendous power to acquire information and also turns the Internet into a hypermedia global database, i.e., the information superhighway.

[0010]

The Internet and the WWW have been growing explosively over the past few years. Businesses have also seen the great potential of using the Internet and WWW as the new generation of world-wide communication infrastructure to approach a massive consumer market.

[0011]

Given such Internet technology, there has been proposed a collaboration technique for allowing a plurality of users to simultaneously conduct a collaboration (browsing, moving and/or modifying) of an HTML page, as disclosed in Japanese Patent Publication 10-124461. Fig. 9 is a diagram showing an example where such a collaboration of an HTML page is applied to an interactive banking system. With this technique, while a customer is viewing a page, a bank agent is enabled to refer to the same page and manipulate it.

[0012]

However, since there exists certain HTML pages (e.g., stock information pages, other pages including movies and the like) the contents of which vary from time to time, it has been required to synchronize such HTML data that is acquired by a plurality of members participating in a collaboration session. To this end, it has been required to introduce a collaboration server for handling an HTML request sent from one member of the participants in such a way that content of its response is cached and then distributed to another member of the participants. However, since such a collaboration server is capable of supporting only one domain (Web server) alone, great investment costs have been required to introduce such a collaboration technique.

[0013]

On the other hand, it has been desired to change content of a response, which is associated with a request sent from a browser to a Web server, without applying any changes to the Web server's side.

[0014]

[Problems to be Solved by the Invention]

It is, therefore, an object of this invention to provide an information terminal supporting system of a lower cost in terms of a reduced number of resources required for use in supporting information terminals.

[0015]

It is another object of this invention to provide an information terminal supporting system that is capable of supporting or controlling information terminals in a centralized manner.

[0016]

It is another object of this invention to provide a computer system that does not depend on platforms of information terminals to be supported or controlled thereby.

[0017]

It is yet another object of this invention to control content

of service offered or provided to information terminals, without applying any changes to a server that responds to requests from the information terminals.

[0018]

[Means for Solving the Problems]

In one aspect of this invention, a plurality of virtual host names and their common IP address are managed in a domain name server. When a Web browser sends a request by specifying this virtual host name, a server having the common IP address is rendered to offer centralized service. For a request that does not require any service, this request is transferred to an actual Web server corresponding to the virtual host name. In this way, there is provided a server for offering centralized service with respect to a dialog between a plurality of browsers and a Web server, thereby to change content of service offered to the browsers without changing the server.

[0019]

According to another aspect of this invention, there is provided an information processing method to be carried out in a system including a collaboration server for supporting a collaboration between a customer browser and an agent browser, comprising the steps of:

(a) generating, at said collaboration server, a first UAI to be granted to a first agent browser in response to a first HTTP request from the said first agent browser;

(b) sending a first HTTP response containing said first UAI to said first agent browser;

(c) storing said first UAI into an agent management table:

(d) generating, at said collaboration server, a second UAI to be granted to a first customer browser in response to a second HTTP request from the said first customer browser;

(e) sending a second HTTP response containing said second UAI to said first customer browser;

(f) storing said second UAI into said agent management table in association with said first UAI;

(g) receiving a third HTTP request sent from said first customer browser, the said third HTTP request containing first host specifying information;

(h) transferring said third HTTP request to a first Web server corresponding to said first host specifying information;

(i) generating, at said collaboration server, a third UAI to be granted to a second agent browser in response to a fourth HTTP request from the said second agent browser;

(j) sending a third HTTP response containing said third UAI to said second agent browser;

(k) storing said third UAI into said agent management table;

(l) generating, at said collaboration server, a fourth UAI to be granted to a second customer browser in response to a fifth HTTP request from the said second customer browser;

(m) sending a fourth HTTP response containing said fourth UAI to said second customer browser;

(n) storing said fourth UAI into said agent management table in association with said third UAI;

(o) receiving a sixth HTTP request sent from said second customer browser, the said sixth HTTP request containing second host specifying information; and

(p) transferring said sixth HTTP request to a second Web server corresponding to said second host specifying information.

[0020]

According to another aspect of this invention, there is provided an information processing method to be carried out in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, comprising the steps of:

(a) receiving, at a first server, a first request from a first information terminal;

(b) executing, at said first server, a first application to grant first information terminal identifying information to said first information terminal;

(c) receiving a second request from said first information terminal, the said second request containing first host specifying information;

(d) transferring said second request to a second server corresponding to said first host specifying information;

(e) receiving, at said first server, a third request from a second information terminal;

(f) executing, at said first server, said first application to grant second information terminal identifying information to said second information terminal;

(g) receiving a fourth request from said second information terminal, the said fourth request containing second host specifying information; and

(h) transferring said fourth request to a third server corresponding to said second host specifying information.

Note here that, in the claims of the present specification, the expression "information terminal identifying information" represents a concept covering information, such as UAI to be described below in connection with an embodiment, which is required for specifying an information terminal or software loaded thereto.

[0021]

According to another aspect of this invention, there is provided an information processing method to be carried out in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, comprising the steps of:

(a) sending, from the information terminal, a request containing first host specifying information and application specifying information to a first server corresponding to the said first host specifying information;

(b) checking, at said first server, whether or not said request contains the application specifying information;

(c) if it is determined that said request contains the application specifying information, then executing an application corresponding to the application specifying information; and

(d) if it is determined that said request does not contain the application specifying information, then transferring said request to a second server corresponding to said first host specifying information.

Note here that, in the claims of the present specification, the expression "application specifying information" represents a concept covering information, such as a URL or information of a local directory to be described below in connection with an embodiment, which is required for specifying an application to be executed.

[0022]

According to another aspect of this invention, there is provided an information processing method to be carried out in a system including a server for receiving a request from an

information terminal and for providing service corresponding to the request, comprising the steps of:

(a) sending, from the information terminal, a request containing first host specifying information to a first server corresponding to the said first host specifying information;

(b) checking whether or not communication method specifying information corresponding to said first host specifying information contained in said request is stored at said first server; and

(c) if the communication method specifying information corresponding to said first host specifying information contained in said request is stored at said first server, then transferring said request to a second server corresponding to said first host specifying information in a manner based on said communication method specifying information.

[0023]

According to another aspect of this invention, there is provided an information processing apparatus for supporting a collaboration between a customer browser and an agent browser, comprising:

(a) a UAI generator for determining whether or not UAI information is contained in a first HTTP request from a browser and, if not, for generating a UAI to be granted to the said browser;

(b) an application for generating an HTTP response containing said UAI and for sending the said HTTP response to said browser;

(c) an agent management table for managing said UAI and another UAI that has a collaboration relation with said UAI; and

(d) a destination Web servers' management table being referred

to for transferring a second HTTP request to another Web server corresponding to a host name contained in said second HTTP request sent from said browser.

[0024]

According to another aspect of this invention, there is provided an information processing apparatus for receiving a request from an information terminal and for generating a response corresponding to the request, comprising:
(a) an information terminal identifying information generator, being responsive to a request from the information terminal, for generating information terminal identifying information; and
(b) a destination Web servers' management table being referred to for transferring said request to another Web server corresponding to host specifying information contained in said request sent from said information terminal.

[0025]

According to another aspect of this invention, there is provided an information processing apparatus for receiving a request from an information terminal and for generating a response corresponding to the request, comprising:
(a) an information terminal identifying information generator, being responsive to a request from the information terminal, for generating information terminal identifying information; and
(b) a handler for determining whether or not said request sent from said information terminal contains application specifying information;
(c) an application to be executed if said request contains the

application specifying information; and

(d) a destination Web servers' management table being referred to, if said request does not contain the application specifying information, for transferring said request to another Web server corresponding to host specifying information contained in said request sent from said information terminal.

[0026]

According to another aspect of this invention, there is provided an information processing apparatus for receiving a request from an information terminal and for generating a response corresponding to the request, comprising:

(a) an information terminal identifying information generator, being responsive to a request from the information terminal, for generating information terminal identifying information; and

(b) a destination Web servers' management table being referred to for transferring said request to another Web server corresponding to host specifying information contained in said request sent from said information terminal, and for determining a communication method to be used in transferring said request to the said another Web server.

[0027]

According to another aspect of this invention, there is provided a storage medium for storing an information processing program to be executed in a system including a collaboration server for supporting a collaboration between a customer browser and an agent browser, the program comprising:

(a) program code for directing said collaboration server to

generate, at said collaboration server, a first UAI to be granted to a first agent browser in response to a first HTTP request from the said first agent browser;

(b) program code for directing said collaboration server to send a first HTTP response containing said first UAI to said first agent browser;

(c) program code for directing said collaboration server to store said first UAI into an agent management table:

(d) program code for directing said collaboration server to respond, at said collaboration server, to a second HTTP request from a first customer browser for generating a second UAI to be granted to the said first customer browser;

(e) program code for directing said collaboration server to send a second HTTP response containing said second UAI to said first customer browser;

(f) program code for directing said collaboration server to store said second UAI into said agent management table in association with said first UAI;

(g) program code for directing said collaboration server to receive a third HTTP request sent from said first customer browser, the said third HTTP request containing first host specifying information;

(h) program code for directing said collaboration server to transfer said third HTTP request to a first Web server corresponding to said first host specifying information;

(i) program code for directing said collaboration server to respond, at said collaboration server, to a fourth HTTP request from a second agent browser for generating a third UAI to be granted to the said second agent browser;

(j) program code for directing said collaboration server to send a third HTTP response containing said third UAI to said second agent browser;

(k) program code for directing said collaboration server to

store said third UAI into said agent management table;

(l) program code for directing said collaboration server to respond, at said collaboration server, to a fifth HTTP request from a second customer browser for generating a fourth UAI to be granted to the said second customer browser;

(m) program code for directing said collaboration server to send a fourth HTTP response containing said fourth UAI to said second customer browser;

(n) program code for directing said collaboration server to store said fourth UAI into said agent management table in association with said third UAI;

(o) program code for directing said collaboration server to receive a sixth HTTP request sent from said second customer browser, the said sixth HTTP request containing second host specifying information; and

(p) program code for directing said collaboration server to transfer said sixth HTTP request to a second Web server corresponding to said second host specifying information.

[0028]

According to another aspect of this invention, there is provided a storage medium for storing an information processing program to be executed in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, the program comprising:

(a) program code for directing a first server to receive a first request from a first information terminal;

(b) program code for directing said first server to execute a first application to grant first information terminal identifying information to said first information terminal;

(c) program code for directing said first server to receive a

second request from said first information terminal, the said second request containing first host specifying information;
(d) program code for directing said first server to transfer said request to a second server corresponding to said first host specifying information;
(e) program code for directing said first server to receive a third request from a second information terminal;
(f) program code for directing said first server to execute said first application to grant second information terminal identifying information to said second information terminal;
(g) program code for directing said first server to receive a fourth request from said second information terminal, the said fourth request containing second host specifying information; and
(h) program code for directing said first server to transfer said request to a third server corresponding to said second host specifying information.

[0029]

According to another aspect of this invention, there is provided a storage medium for storing an information processing program to be executed in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, the program comprising:
(a) program code for directing said server to check whether or not a request received from the information terminal contains application specifying information;
(c) program code, being responsive to a determination that said request contains the application specifying information, for directing said server to execute an application corresponding to the application specifying information; and

(d) program code, being responsive to a determination that said request does not contain the application specifying information, for directing said server to transfer said request to a second server corresponding to said first host specifying information.

[0030]

According to another aspect of this invention, there is provided a storage medium for storing an information processing program to be executed in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, the program comprising:

(a) program code for directing a first server to check whether or not communication method specifying information is stored at said server, the communication method specifying information being corresponding to host specifying information contained in a request sent from the information terminal to the said first server; and

(b) program code, being responsive to a determination that the communication method specifying information corresponding to said first host specifying information contained in said request is stored at said server, for directing said first server to transfer said request to a second server corresponding to said host specifying information in a manner based on said communication method specifying information.

[0031]

[Description of Embodiment of the Invention]

A. Summary

Now, with reference to the drawings, an embodiment of this invention will be described. Fig. 1 is a conceptual diagram of a computer system in a preferred embodiment of this invention. In an information terminal 110, a Web browser such as "Netscape Navigator" (trademark of Netscape Communications Corp.) and/or "Internet Explorer" (trademark of Microsoft Corp.) is installed. The information terminal 110 is able to access Web servers 151 to 155 via a network 140 for acquiring a variety of information. In a preferred embodiment, an information terminal supporting server 100 is provided as a "collaboration server". This collaboration server 100 associates the information terminal 110 on a customer's side with an information terminal 120 on an agent's side, and controls both of the associated information terminals such that the same data is sent to their browsers respectively.

[0032]

B. Hardware Configuration

With reference to Fig. 2, there is schematically shown a hardware configuration for implementing the collaboration server 100 used in this invention. The collaboration server 100 includes a central processing unit (CPU) 1 and a memory 4. CPU 1 and memory 4 are connected to a hard disk drive 13 as an auxiliary storage device via a bus 2. A floppy disk drive (or another storage medium drive such as an MO drive 28, CD-ROM drives 26, 29) 20 is connected to bus 2 via a floppy disk controller 19 (or another controller such as an IDE controller 25, a SCSI controller 27).

[0033]

A floppy disk (or another storage medium such as an MO disk, a CD-ROM) inserted into the floppy disk drive (or another storage medium drive such as the MO drive, CD-ROM drive) 20, the hard disk drive 13 and/or a ROM 14 is capable of storing a computer program code for practicing this invention. At the time of execution, this computer program code is loaded into the memory 4 such that it cooperates with an operating system to provide instructions to the CPU or the like. This computer program code may be compressed or divided into a plurality of segments for storing across a plurality of media.

[0034]

Also, the collaboration server 100 may be provided with user interface hardware, including a pointing device (such as a mouse, a joystick or the like) 7 or a keyboard 6 for inputting, as well as a display 12 for presenting visual data to a user. In addition, a touch panel may be used as an input means. Also, a printer and a modem may be connected via a parallel port 16 and a serial port 15 respectively. The present server 100 may be connected to a network via the serial port 15 and the modem or a communication adapter 18 (Ethernet or token ring card) for communicating with other computers and the like.

[0035]

A speaker 43 receives audio signals that are D/A (digital/analog) converted by an audio controller 21 via an amplifier 22, and outputs the audio signals as sounds. Also, the audio controller 21 may perform an A/D (analog/digital) conversion of audio information received from a microphone 24,

thereby to capture the external audio information into the system.

[0036]

Thus, it will be readily understood from the foregoing that the collaboration server 100 of this invention may be implemented by a conventional personal computer (PC), a workstation, a notebook PC, a palm top PC, a communication terminal having communication functions including a network computer or the like, and any combinations thereof. Note, however, that these elements are listed for exemplification purpose only, and all of these elements are not necessarily equated with essential elements of this invention.

[0037]

In particular, since the hardware configuration explained here includes those non-essential elements that are not required for supporting an information terminal, there may be no need to maintain these elements. They are: audio controller 21, amplifier 22, speaker 23 and microphone 24 used for audio processing; keyboard 6, mouse 7 and keyboard/mouse controller 5 used for direct input entry; CRT 12, a display device 11, VRAM 9 and VGA 8 used for presenting visual data to a user; and a variety of storage medium controllers 19, 25, 27 and the like.

[0038]

It will be readily understood by those skilled in the art that various modifications to respective elements of this collaboration server 100, including but not limited to

combining a plurality of machines and distributing implemented functions among these machines, may be made without departing the spirit and scope of the concept of this invention.

[0039]

The information terminal 110 for use in this invention may be implemented by the hardware configuration as shown in Fig. 2 in the same manner as the collaboration server 100. That is, since the information terminal 110 requires limited functions for entering information acquisition requests and originating the same, it will be readily understood by those skilled in the art that the information terminal 110 may be implemented by a conventional personal computer (PC), a workstation, a notebook PC, a palm top PC, a variety of household electric appliances such as TV sets incorporating computers, a game machine having communication functions, an information terminal having communication functions including a telephone, a FAX machine, a mobile telephone, a PHS (personal handyphone system), an electronic memorandum book or the like, and any combinations thereof. Note, however, that these elements are listed for exemplification purpose only, and all of these elements are not necessarily equated with essential elements of this invention.

[0040]

An operating system on the collaboration server 100 is not limited to a particular operating system environment and it may be implemented by: those supporting a GUI multiwindow environment such as "WindowsNT" (trademark of Microsoft Corp.), "Windows95" (trademark of Microsoft Corp.), "Windows3.X" (trademark of Microsoft Corp.), "OS/2" (trademark

of IBM Corp.), "MacOS" (trademark of Apple Computer, Inc.), "X-WINDOWS system" (trademark of MIT) on "AIX" (trademark of IBM Corp.) or the like; those supporting a character base environment such as "PC-DOS" (trademark of IBM Corp.), "MS-DOS" (trademark of Microsoft Corp.) or the like; those categorized as real-time OS such as "OS/Open" (trademark of IBM Corp.), "VxWorks" (trademark of Wind River Systems, Inc.) or the like; and those embedded into a network computer such as "JavaOS" or the like.

[0041]

Similarly, an operating system on the information terminal 110 is not limited to a particular operating system environment and it may be implemented by: those supporting a GUI multiwindow environment such as "WindowsNT" (trademark of Microsoft Corp.), "Windows95" (trademark of Microsoft Corp.), "Windows3.X" (trademark of Microsoft Corp.), "OS/2" (trademark of IBM Corp.), "MacOS" (trademark of Apple Computer, Inc.), "X-WINDOWS system" (trademark of MIT) on "AIX" (trademark of IBM Corp.) or the like; those supporting a character base environment such as "PC-DOS" (trademark of IBM Corp.), "MS-DOS" (trademark of Microsoft Corp.) or the like; those categorized as real-time OS such as "OS/Open" (trademark of IBM Corp.), "VxWorks" (trademark of Wind River Systems, Inc.) or the like; those embedded into a network computer such as "JavaOS" or the like; and "Zaurus OS" being used in the "Zaurus" (trademark of Sharp Corp.) or the like.

[0042]

C. System Configuration

Fig. 3 is a functional block diagram, which shows a system configuration of a collaboration system including the collaboration server 100 in a preferred embodiment.

[0043]

The collaboration system in a preferred embodiment includes the information terminals 110, 120, a domain name server 130, the collaboration server 100, as well as Web servers 151, 153 and 157.

[0044]

In a preferred embodiment, the information terminals 110, 120 are provided with Web browsers. Each of the Web browsers specifies a URL and sends a request toward a given Web server. It also receives responses sent from the Web servers 210, 151 to 155 and displays them on a display screen.

[0045]

The domain name server 130 manages an association (correspondence) table of host names in a domain and IP addresses. Each of the Web servers 151 to 155 responds to a request sent by one of the Web browsers for sending an HTML content of the specified URL back to the Web browser's side.

[0046]

The collaboration server 100 in a preferred embodiment is provided with the Web server 210, an HTTP handler 230, an HTTP request dispatcher 240, a multidomain manager 250, a cache manager 270 and a session manager 290.

[0047]

The Web server on the collaboration server's side (collaboration Web server) 210 responds to a request sent by a Web browser for sending an HTML file of the specified URL back to the said Web browser. It also has an API for passing the received request to the HTTP handler 230. In this collaboration Web server 210, an application 211 is installed. This application 211 indicates checking of authority to access this collaboration Web server 210, generation of a UAI, allocation of an agent and the like. A UAI generator 213 responds to an indication of the application 211 for allocating a UAI that is uniquely identifiable by the Web browser on the customer's side. An agent assignment 215 uses an agent management table 220 to manage status of the information terminal on the agent's side, and to manage information of the Web browser on the customer's side that participates in a collaboration.

[0048]

The HTTP handler 230 accepts an HTTP request received by the collaboration Web server 210 to determine whether a local process or an acquisition process of a Web server (the acquisition process requires to delegate its processing to the cache manager 270) is to be carried out. If it is determined that processing of the request is delegated to the cache manager 270, the request is passed to the HTTP request dispatcher 240. Otherwise, the request is returned to the collaboration Web server 210. Also, the HTTP handler 230 sends an HTML content, which is returned via the cache manager 270, back to the Web browsers 110, 120 by way of the Web server

[0049]

The HTTP request dispatcher 240 responds to the HTTP request from the Web browser 110 for determining whether or not its corresponding HTML content resides in a cache 275 within the cache manager 270. If not, the HTTP request dispatcher 240 sends the HTTP request to the actual Web servers 151, 153, 155 and receives the HTML content therefrom. The received HTML content is stored into the cache 275 under the control of cache manager 270 and, at the same time, the HTML content is returned to the HTTP handler 230 by way of the cache manager 270. On the other hand, if the HTML content resides in the cache 275 within the cache manager 270, the HTTP request dispatcher 240 indicate to send its corresponding data back to the Web browsers 110, 120.

[0050]

The multidomain manager 250 manages relations between virtual Web servers that are owned by the collaboration Web server 210 and the actual Web servers 151, 153, 155. Also, the multidomain manager 250 manages methods for establishing HTTP sessions with respect to the actual Web servers 151, 153, 155.

[0051]

The cache manager 270 is used for caching an HTML content (HTTP response), which corresponds to an HTTP request sent from each Web browser 110, 120. Also, in a situation where the two Web browsers are being shared, the cache manager 270 responds to HTTP requests sent by both of the Web browsers for

controlling to send the same HTML content back to them. The session manager 290 establishes sessions on the agent's side and the customer's side, and allocates session IDs.

[0052]

While respective functional blocks shown in Fig. 3 have been described above, it is noted that these functional blocks are logical functional blocks. Thus, each of the functional blocks is not necessarily implemented by bulky hardware/software respectively, but it may be implemented by combined or common hardware/software. Note also that all of the functional blocks shown in Fig. 3 are not necessarily regarded as essential elements of this invention.

[0053]

D. Setting/Registration Procedure of System

Now, as a preparatory work for describing a preferred embodiment, setting/registration procedures of the system will be described below.

[0054]

D-1. Setting of Domain Name Server

For each of the Web servers 151 to 155 that are serviced by the collaboration server 100, a different host name will be defined respectively. Note, however, that an IP address of the collaboration server 100 is to be set up/registered as the respective IP address. For example, as shown in Fig. 3, assuming that the actual Web servers (their host names are:

www. a. com (151); www. b. com (153); www. c. com (155); www. d. com (157)) are to be serviced by the collaboration server 100 (its host name is: www. isp. com; and its IP address is: 9. 100. 100. 100), the same IP address (9. 100. 100. 100) as that of the host name (www. isp. com) will be commonly set up with respect to host names (wwwc. a. isp. com; wwwc. b. isp. com; wwwc. c. isp. com; wwwc. d. isp. com) respectively.

[0055]

D-2. Setting of Web Server

For each of said host names (wwwc. a. isp. com; wwwc. b. isp. com; wwwc. c. isp. com; wwwc. d. isp. com), a virtual Web server will be created respectively. While, viewing from the Web browsers, they appear to be independent Web servers respectively, they are actually a single Web server.

[0056]

On the other hand, the information terminal 120 on the agent's side uses its Web browser to send a request of a specific URL to the Web server (wwwc. a. isp. com) on the collaboration server 100, thereby to activate an application A for performing the following functions. Namely, a unique UAI generated by the UAI generator 213 is set into an HTTP response header as a Cookie. Also, by notifying the agent assignment 215 of its own UAI, it is registered at the agent management table 220 and enters into a customer wait state.

[0057]

Fig. 6 shows an example of an HTTP response header 330 to be

sent by the application A at this point of time. As shown, the HTTP response header 330 contains a "set-cookie" command 331 for registering the UAI at the Web browser on the customer's side. Thereafter, as shown in Fig. 7, an HTTP request header 320 will contain a "Cookie" command 321 for acquiring UAI information that enables to uniquely identify the Web browser on the customer's side.

[0058]

The application 211 on the Web server 210 is such an application that is specified at a local directory 263 within a destination Web servers' management table 260 (Fig. 5). When this application 211 responds to an HTTP request without a Cookie called "IBMCF_UAI" for creating an HTTP response, it generates a unique ID (UAI), uses the "Set-cookie:" response header to set the previously generated UAI into the key called "IBMCF_UAI" as a Cookie, and sends the HTTP response back to the Web browser.

[0059]

Thereafter, an HTTP request to be sent from this Web browser to the Web server (wwwc. a. isp. com) will contain this UAI or ID at HTTP Cookies in its HTTP request header. With this ID, the collaboration server 100 will be able to identify each Web browser on the Internet.

[0060]

Fig. 4 is a conceptual diagram of the agent management table 220 in a preferred embodiment. As shown, in a first column 221, UAIs of those agents logged-on the system are registered.

In a second column 223, status (B: busy; F: free; and the like) of such agents are registered, whereas in a third column 225, UAIs of their accompanying collaborators (Web browsers on the customer's side) are registered.

[0061]

D-3. Setting of Collaboration Server

In the destination Web servers' management table 260, the following items are set up.

1. Associations between the virtual Web servers and the actual Web servers 151 to 157;
2. Settings of the local directory 263 entries corresponding to the virtual Web servers; and
3. Settings of methods for establishing HTTP sessions with respect to the actual Web servers 151 to 157 (non-secure and secure port numbers, as well as cipher information)

[0062]

Fig. 5 is a conceptual diagram of the destination Web servers' management table 260 in a preferred embodiment. As shown, the destination Web servers' management table 260 manages a variety of information in its columns, which are labeled as collaboration server's host name 261, Web server's host name 262, local directory 263, non-secure port number 264, secure port number 265 and cipher information 267 respectively.

[0063]

A collaboration server's host name 261 entry and a Web server's host name 262 entry contain such information for

specifying a virtual Web server and an actual Web server respectively. A local directory 263 entry contains such information for accessing information of a virtual Web server. Controlling this local directory 263 by means of the destination Web servers' management table 260, it becomes possible to provide an application for offering common service to a plurality of Web servers, without changing the Web servers' side. In a preferred embodiment, it is possible to execute such an application, which is unique to a collaboration (allocation of a UAI, log-in control of an agent and the like), and which is specified at a local directory 263 entry within this destination Web servers' management table 260. In a preferred embodiment, by requesting a specific URL (e.g., http://wwwc. a. isp. com/servlet/appl/), it is possible to activate the specified application.

[0064]

A non-secure port number 264 entry and a secure port number 265 entry contain such information for specifying those port numbers for use in non-secure and secure communications respectively. A cipher information 267 entry contains such information for specifying a communication procedure to be carried out by using a secure port number.

[0065]

E. Operational Procedures

By using the Web browser of the information terminal 110 on the customer's side to send a request of another URL (e.g., http://wwwc. a. isp. com/servlet/applB/), which is different from the aforesaid specific URL requested by an agent, to the

Web server (wwwc. a. isp. com) on the collaboration server 100, an application B will be activated. Similar to the aforesaid operation of the agent's side, this application B will set a unique UAI generated by the UAI generator 213 into an HTTP response header as a Cookie.

[0066]

Fig. 6 is a conceptual diagram showing an example of an HTTP response header 330 in a preferred embodiment. As shown, the HTTP response header 330 contains a "set cookie" command 331 for registering a UAI at the Web browser on the customer's side. Thereafter, as shown in Fig. 7, an HTTP request header 320 will contain a "Cookie" command 321 for acquiring UAI information that enables to uniquely identify the Web browser on the customer's side.

[0067]

More particularly, when the application 211 on the Web server 210 responds to an HTTP request without a Cookie called "IBMCF _UAI" for creating an HTTP response, it generates a unique ID (UAI), uses a "Set-cookie:" response header to set the previously generated UAI into the key called "IBMCF_UAI" as a Cookie, and sends it back to the Web browser.

[0068]

Thereafter, an HTTP request to be sent from this Web browser to the Web server (wwwc. a. isp. com) will contain this UAI or ID at HTTP Cookies in its HTTP request header. With this ID, the collaboration server 100 will be able to identify each Web browser on the Internet. If an agent is requested, an

application C for requesting such an agent will be activated by the Web server on the collaboration server 100. The application C sends a request for assignment of an agent to the agent assignment 215.

[0069]

The agent assignment 215 retrieves the agent management table 220 to find an agent that is in a customer wait state, passes its UAI and the customer's UAI to the session manager 290, thereby requesting to generate a new session. Then, the session manager 290 uses the passed agent's UAI and customer's UAI to generate a session ID and, thus, informs the cache manager 270 that the Web browsers with the two UAIs enter into a collaboration session using the generated session ID.

[0070]

The cache manager 270 starts to share a cache 275 section associated with the agent's UAI and another cache 275 section associated with the customer's UAI. With this process, the agent is able to share the cache section owned by the customer.

[0071]

Fig. 8 is a conceptual diagram of a cache management table 280 in a preferred embodiment. As shown, the cache management table 280 manages a variety of information in its columns, which are labeled as UAI 281, session ID 282, cache table pointer 283, URL 284, cache record pointer 285 and cache record 286 respectively.

[0072]

A UAI 281 entry contains a UAI of a Web browser on the customer's side. A session ID 282 entry contains information of a session ID that has been allocated by the session manager 290. A cache table pointer 283 entry manages pointer information for accessing a request group that has been sent in this session.

[0073]

A URL 284 entry contains URL information that has been included in an HTML request. A cache record pointer 285 entry contains address information of a stored HTML content. A cache record 286 entry contains information of the HTML content.

[0074]

When a Web browser on the customer's side issues an HTTP request (GET HTTP://wwwc. a. isp. com/index.html) toward the Web server (wwwc. a. isp. com), the Web browser confirms an IP address (9. 100. 100. 100) of the destination Web server (wwwc. a. isp. com) through the domain name server 130. Then, the Web browser issues the HTTP request (GET HTTP://wwwc. a. isp. com/index.html) to the Web server (its IP address is: 9. 100. 100. 100) on the collaboration server 100.

[0075]

The collaboration Web server 210 transfers the received HTTP request to the HTTP handler 230. This is done by an API of the Web server 210. At the HTTP handler 230, it is determined whether or not there exists a UAI in "HTTP Coolies" of the

HTTP request header. If there is no such a UAI, its processing is delegated to the collaboration Web server 210.

[0076]

On the other hand, if there exists such a UAI, the HTTP handler 230 refers to a local directory 261 entry of the destination Web servers' management table 260, and determines whether its processing is delegated to the Web server 210 or the HTTP request is transferred to an actual Web server (www. a. com) 151. By way of example, if the present HTTP request is "GET HTTP://wwwc. a. isp. com/index.html", its processing will be delegated to the collaboration Web server 210.

[0077]

In case of transferring the HTTP request to the actual Web server (www. a. com) 151, the HTTP handler 230 checks at the outset whether or not there exists a corresponding HTML file in the cache 275 within the collaboration server 100. If so, its content will be sent back to the Web server. In a preferred embodiment, this determination is made base on whether or not there exists a URL object. On the other hand, if there is no such corresponding HTML file, the HTTP handler 230 refers to the destination Web servers' management table 260 and, then, sends the HTTP request to the actual Web server (www. a. com) 151. Thereafter, it stores an HTTP response received from the actual Web server (www. a. com) 151 into the cache 275 and, at the same time, it sends the HTTP response back to the Web server 210.

[0078]

The collaboration Web server 210 sends the HTTP response so received back to the Web browser as it is. Carrying out said processing for each of the Web servers that are defined by the destination Web servers' management table 260, it becomes possible to support a plurality of domains.

[0079]

H. Miscellaneous

While this invention has been described above with respect to an aspect of using Web browsers, it should be understood that this invention is applicable to a communication system that uses a protocol other than the Internet protocol as well. This is because this invention is primarily directed to an collaboration server that is capable of offering particular service in a centralized manner.

[0080]

[Advantages of the Invention]

As described above, in accordance with this invention, it is possible to provide an information terminal supporting system of a lower cost in terms of a reduced number of resources required for supporting information terminals and, yet, to support or control such information terminals in a centralized manner.

[0081]

Further, in accordance with one aspect of this invention, it is possible to control content of service offered to

information terminals without changing a server that responds to requests from the information terminals.

4. Brief Description of the Drawings:

Fig. 1 is a conceptual diagram showing a computer system in a preferred embodiment of this invention.

Fig. 2 is a block diagram showing an embodiment of a hardware configuration of a collaboration server (information terminal supporting server) or an information terminal of this invention.

Fig. 3 is a block diagram of processing elements in a preferred embodiment.

Fig. 4 is a conceptual diagram of an agent management table in a preferred embodiment.

Fig. 5 is a conceptual diagram of a destination Web servers' management table in a preferred embodiment.

Fig. 6 is a conceptual diagram of an HTTP response header in a preferred embodiment.

Fig. 7 is a conceptual diagram of an HTTP request header in a preferred embodiment.

Fig. 8 is a conceptual diagram of a cache management table in a preferred embodiment.

Fig. 9 is a conceptual diagram for explaining the conventional

collaboration technique.

[Description of Symbols]

100 Collaboration Server (Information Terminal Supporting Server)
110 Web Browser (Customer's Side)
120 Web Browser (Agent's Side)
130 Domain Name Server
140 Network
151 to 157 Web Servers
210 Web Server (internal to Collaboration Server)
220 Agent Management Table
230 HTTP Handler
240 HTTP Request Dispatcher
250 Multidomain Manager
260 Destination Web Servers' Management Table
270 Cache Manager
280 Cache Management Table
290 Session Manager
301 OS
303 CPU
305 Memory

Claims:

(1) An information processing method to be carried out in a system including a collaboration server for supporting a collaboration between a customer browser and an agent browser, comprising the steps of:
(a) generating, at said collaboration server, a first UAI to be granted to a first agent browser in response to a first HTTP request from the said first agent browser;
(b) sending a first HTTP response containing said first UAI to said first agent browser;
(c) storing said first UAI into an agent management table:
(d) generating, at said collaboration server, a second UAI to be granted to a first customer browser in response to a second HTTP request from the said first customer browser;
(e) sending a second HTTP response containing said second UAI to said first customer browser;
(f) storing said second UAI into said agent management table in association with said first UAI;
(g) receiving a third HTTP request sent from said first customer browser, the said third HTTP request containing first host specifying information;
(h) transferring said third HTTP request to a first Web server corresponding to said first host specifying information;

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(i) generating, at said collaboration server, a third UAI to be granted to a second agent browser in response to a fourth HTTP request from the said second agent browser;

(j) sending a third HTTP response containing said third UAI to said second agent browser;

(k) storing said third UAI into said agent management table;

(l) generating, at said collaboration server, a fourth UAI to be granted to a second customer browser in response to a fifth HTTP request from the said second customer browser;

(m) sending a fourth HTTP response containing said fourth UAI to said second customer browser;

(n) storing said fourth UAI into said agent management table in association with said third UAI;

(o) receiving a sixth HTTP request sent from said second customer browser, the said sixth HTTP request containing second host specifying information; and

(p) transferring said sixth HTTP request to a second Web server corresponding to said second host specifying information.

(2) An information processing method to be carried out in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, comprising the steps of:

(a) receiving, at a first server, a first request from a first information terminal;

(b) executing, at said first server, a first application to grant first information terminal identifying information to said first information terminal;

(c) receiving a second request from said first information terminal, the said second request containing first host specifying information;

(d) transferring said second request to a second server

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corresponding to said first host specifying information;
(e) receiving, at said first server, a third request from a second information terminal;
(f) executing, at said first server, said first application to grant second information terminal identifying information to said second information terminal;
(g) receiving a fourth request from said second information terminal, the said fourth request containing second host specifying information; and
(h) transferring said fourth request to a third server corresponding to said second host specifying information.

(3) An information processing method to be carried out in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, comprising the steps of:
(a) sending, from the information terminal, a request containing first host specifying information and application specifying information to a first server corresponding to the said first host specifying information;
(b) checking, at said first server, whether or not said request contains the application specifying information;
(c) if it is determined that said request contains the application specifying information, then executing an application corresponding to the application specifying information; and
(d) if it is determined that said request does not contain the application specifying information, then transferring said request to a second server corresponding to said first host specifying information.

(4) An information processing method to be carried out in a system including a server for receiving a request from an

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information terminal and for providing service corresponding to the request, comprising the steps of:

(a) sending, from the information terminal, a request containing first host specifying information to a first server corresponding to the said first host specifying information;

(b) checking whether or not communication method specifying information corresponding to said first host specifying information contained in said request is stored at said first server; and

(c) if the communication method specifying information corresponding to said first host specifying information contained in said request is stored at said first server, then transferring said request to a second server corresponding to said first host specifying information in a manner based on said communication method specifying information.

(5) An information processing apparatus for supporting a collaboration between a customer browser and an agent browser, comprising:

(a) a UAI generator for determining whether or not UAI information is contained in a first HTTP request from a browser and, if not, for generating a UAI to be granted to the said browser;

(b) an application for generating an HTTP response containing said UAI and for sending the said HTTP response to said browser;

(c) an agent management table for managing said UAI and another UAI that has a collaboration relation with said UAI; and

(d) a destination Web servers' management table being referred to for transferring a second HTTP request to another Web server corresponding to a host name contained in said second HTTP request sent from said browser.

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(6) An information processing apparatus for receiving a request from an information terminal and for generating a response corresponding to the request, comprising:
(a) an information terminal identifying information generator, being responsive to a request from the information terminal, for generating information terminal identifying information; and
(b) a destination Web servers' management table being referred to for transferring said request to another Web server corresponding to host specifying information contained in said request sent from said information terminal.

(7) An information processing apparatus for receiving a request from an information terminal and for generating a response corresponding to the request, comprising:
(a) an information terminal identifying information generator, being responsive to a request from the information terminal, for generating information terminal identifying information; and
(b) a handler for determining whether or not said request sent from said information terminal contains application specifying information;
(c) an application to be executed if said request contains the application specifying information; and
(d) a destination Web servers' management table being referred to, if said request does not contain the application specifying information, for transferring said request to another Web server corresponding to host specifying information contained in said request sent from said information terminal.

(8) An information processing apparatus for receiving a

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request from an information terminal and for generating a response corresponding to the request, comprising:

(a) an information terminal identifying information generator, being responsive to a request from the information terminal, for generating information terminal identifying information; and

(b) a destination Web servers' management table being referred to for transferring said request to another Web server corresponding to host specifying information contained in said request sent from said information terminal, and for determining a communication method to be used in transferring said request to the said another Web server.

(9) A storage medium for storing an information processing program to be executed in a system including a collaboration server for supporting a collaboration between a customer browser and an agent browser, the program comprising:

(a) program code for directing said collaboration server to generate, at said collaboration server, a first UAI to be granted to a first agent browser in response to a first HTTP request from the said first agent browser;

(b) program code for directing said collaboration server to send a first HTTP response containing said first UAI to said first agent browser;

(c) program code for directing said collaboration server to store said first UAI into an agent management table:

(d) program code for directing said collaboration server to respond, at said collaboration server, to a second HTTP request from a first customer browser for generating a second UAI to be granted to the said first customer browser;

(e) program code for directing said collaboration server to send a second HTTP response containing said second UAI to said first customer browser;

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(f) program code for directing said collaboration server to store said second UAI into said agent management table in association with said first UAI;

(g) program code for directing said collaboration server to receive a third HTTP request sent from said first customer browser, the said third HTTP request containing first host specifying information;

(h) program code for directing said collaboration server to transfer said third HTTP request to a first Web server corresponding to said first host specifying information;

(i) program code for directing said collaboration server to respond, at said collaboration server, to a fourth HTTP request from a second agent browser for generating a third UAI to be granted to the said second agent browser;

(j) program code for directing said collaboration server to send a third HTTP response containing said third UAI to said second agent browser;

(k) program code for directing said collaboration server to store said third UAI into said agent management table;

(l) program code for directing said collaboration server to respond, at said collaboration server, to a fifth HTTP request from a second customer browser for generating a fourth UAI to be granted to the said second customer browser;

(m) program code for directing said collaboration server to send a fourth HTTP response containing said fourth UAI to said second customer browser;

(n) program code for directing said collaboration server to store said fourth UAI into said agent management table in association with said third UAI;

(o) program code for directing said collaboration server to receive a sixth HTTP request sent from said second customer browser, the said sixth HTTP request containing second host specifying information; and

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(p) program code for directing said collaboration server to transfer said sixth HTTP request to a second Web server corresponding to said second host specifying information.

(10) A storage medium for storing an information processing program to be executed in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, the program comprising:

(a) program code for directing a first server to receive a first request from a first information terminal;

(b) program code for directing said first server to execute a first application to grant first information terminal identifying information to said first information terminal;

(c) program code for directing said first server to receive a second request from said first information terminal, the said second request containing first host specifying information;

(d) program code for directing said first server to transfer said request to a second server corresponding to said first host specifying information;

(e) program code for directing said first server to receive a third request from a second information terminal;

(f) program code for directing said first server to execute said first application to grant second information terminal identifying information to said second information terminal;

(g) program code for directing said first server to receive a fourth request from said second information terminal, the said fourth request containing second host specifying information; and

(h) program code for directing said first server to transfer said request to a third server corresponding to said second host specifying information.

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(11) A storage medium for storing an information processing program to be executed in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, the program comprising:

(a) program code for directing said server to check whether or not a request received from the information terminal contains application specifying information;

(b) program code, being responsive to a determination that said request contains the application specifying information, for directing said server to execute an application corresponding to the application specifying information; and

(c) program code, being responsive to a determination that said request does not contain the application specifying information, for directing said server to transfer said request to a second server corresponding to said first host specifying information.

(12) A storage medium for storing an information processing program to be executed in a system including a server for receiving a request from an information terminal and for providing service corresponding to the request, the program comprising:

(a) program code for directing a first server to check whether or not communication method specifying information is stored at said first server, the communication method specifying information being corresponding to host specifying information contained in a request sent from the information terminal to the said first server; and

(b) program code, being responsive to a determination that the communication method specifying information corresponding to said first host specifying information contained in said request is stored at said server, for directing said first

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server to transfer said request to a second server corresponding to said host specifying information in a manner based on said communication method specifying information.

