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Na

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(54) **DISPLAY SERVICE METHOD, NETWORK DEVICE CAPABLE OF PERFORMING THE METHOD, AND STORAGE MEDIUM STORING THE METHOD**

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H04N 21/4402	(2011.01)
H04L 29/06	(2006.01)

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(58) **Field of Classification Search**

USPC 709/224

See application file for complete search history.

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(57) **ABSTRACT**

Provided are a display service method for automatically displaying the same screen image on a plurality of network devices at the same time based on pre-set schedule information in a network based on a plurality of network devices, a network device capable of performing the method, and a storage medium thereof. The method includes capturing a screen image of a first network device based on pre-set schedule information, and transmitting the captured screen image to at least one second network device. Accordingly, screen images displayed on a network device can be displayed on different network devices regardless of a format of the screen images.

16 Claims, 6 Drawing Sheets

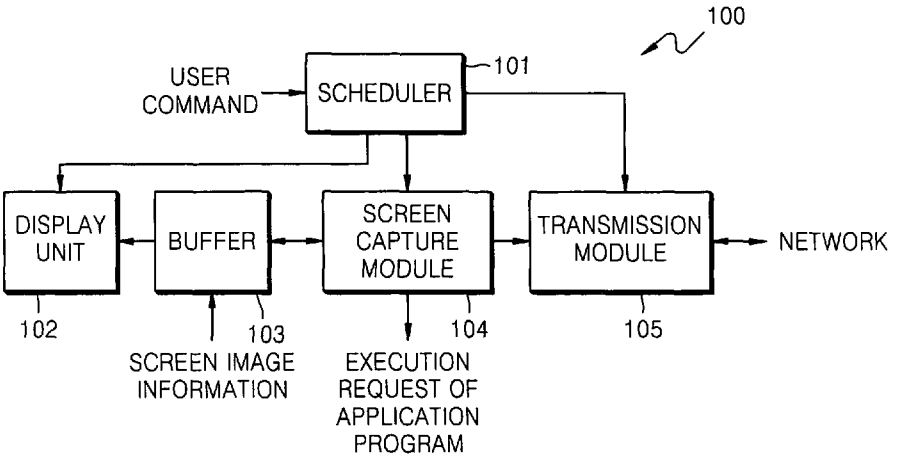

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FIG. 1

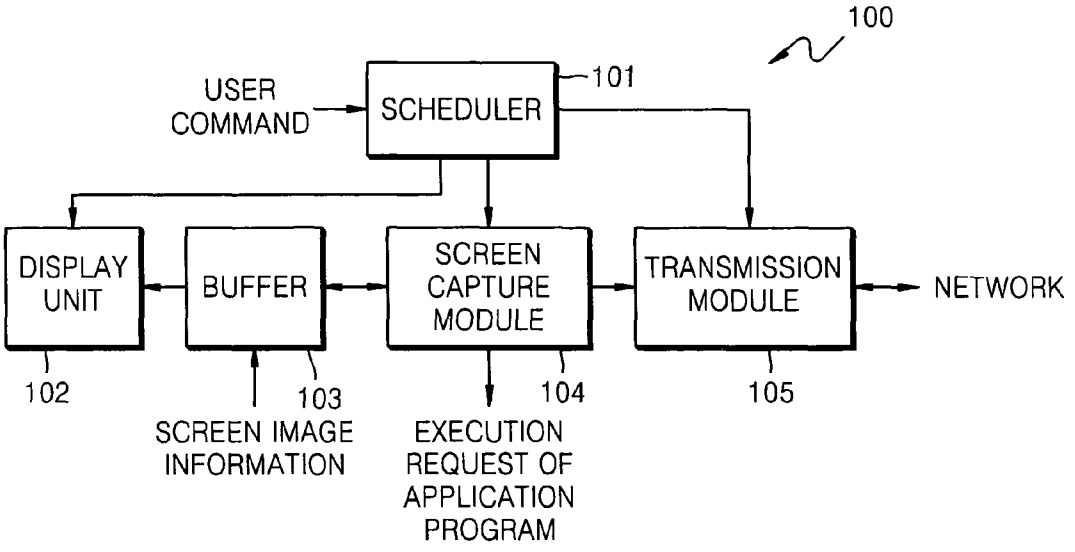

100
USER COMMAND
SCHEDULER
101
DISPLAY UNIT
BUFFER
SCREEN CAPTURE MODULE
TRANSMISSION MODULE
NETWORK
102
103
104
105
SCREEN IMAGE INFORMATION
EXECUTION REQUEST OF APPLICATION PROGRAM

FIG. 2

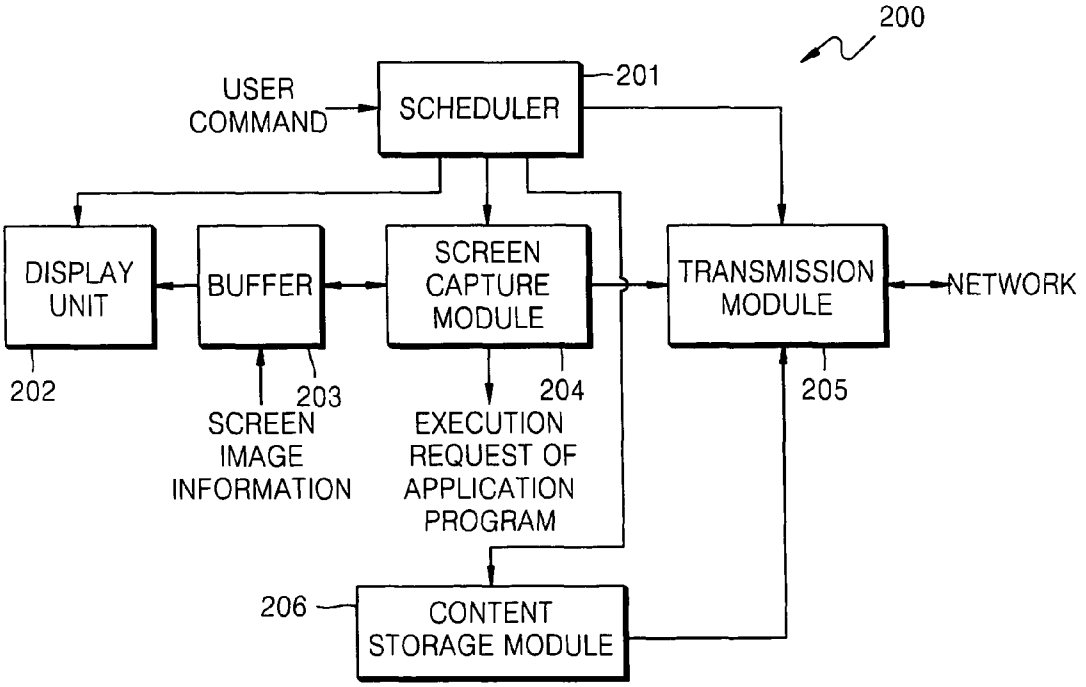

200
USER COMMAND
SCHEDULER
201
DISPLAY UNIT
BUFFER
SCREEN CAPTURE MODULE
TRANSMISSION MODULE
NETWORK
202
203
204
205
SCREEN IMAGE INFORMATION
EXECUTION REQUEST OF APPLICATION PROGRAM
206
CONTENT STORAGE MODULE

FIG. 3

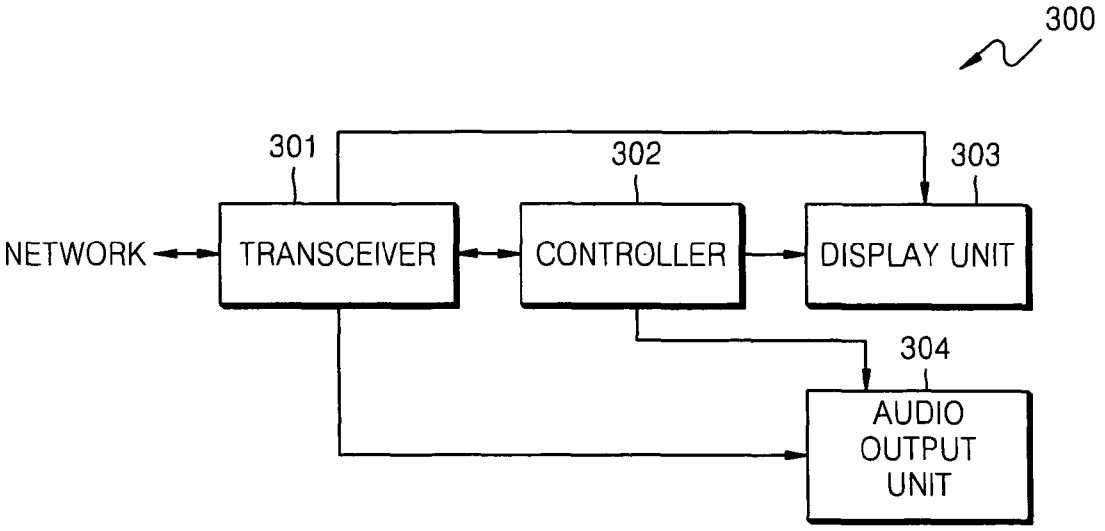

300
301
302
303
NETWORK
TRANSCEIVER
CONTROLLER
DISPLAY UNIT
304
AUDIO OUTPUT UNIT

FIG. 4

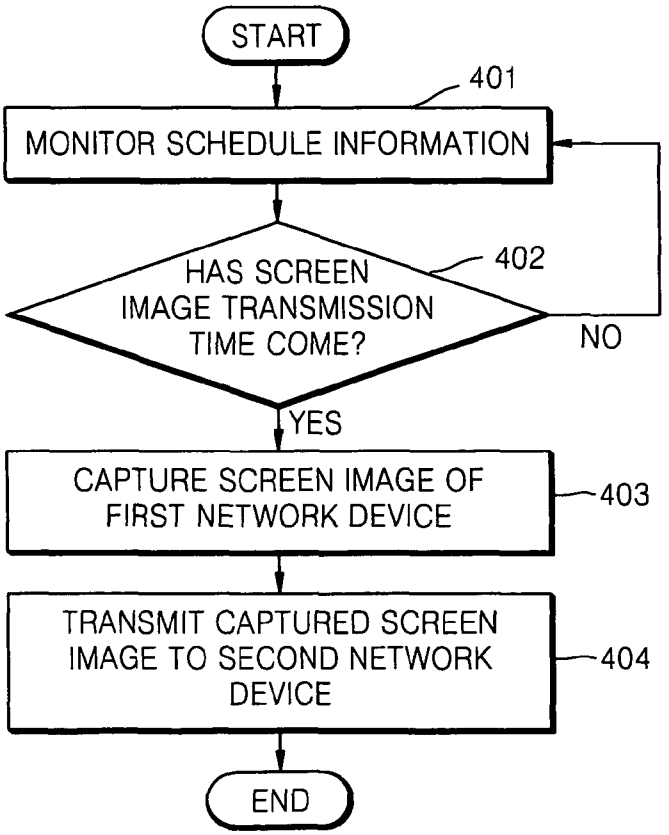

START
401
MONITOR SCHEDULE INFORMATION
HAS SCREEN IMAGE TRANSMISSION TIME COME?
402
NO
YES
CAPTURE SCREEN IMAGE OF FIRST NETWORK DEVICE
403
TRANSMIT CAPTURED SCREEN IMAGE TO SECOND NETWORK DEVICE
404
END

FIG. 5

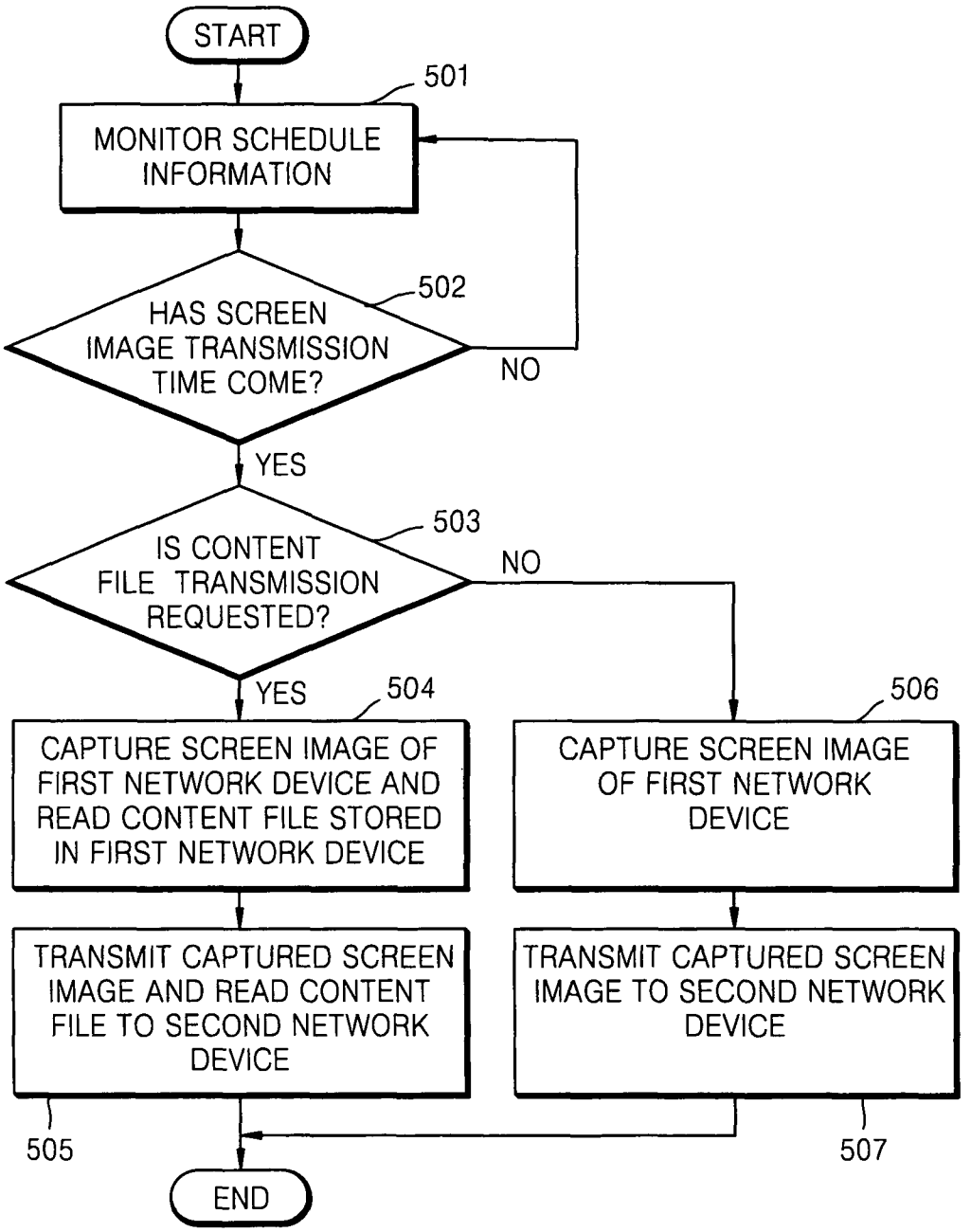

START
501
MONITOR SCHEDULE INFORMATION
502
HAS SCREEN IMAGE TRANSMISSION TIME COME?
NO
YES
503
IS CONTENT FILE TRANSMISSION REQUESTED?
NO
YES
504
CAPTURE SCREEN IMAGE OF FIRST NETWORK DEVICE AND READ CONTENT FILE STORED IN FIRST NETWORK DEVICE
506
CAPTURE SCREEN IMAGE OF FIRST NETWORK DEVICE
TRANSMIT CAPTURED SCREEN IMAGE AND READ CONTENT FILE TO SECOND NETWORK DEVICE
TRANSMIT CAPTURED SCREEN IMAGE TO SECOND NETWORK DEVICE
505
507
END

FIG. 6

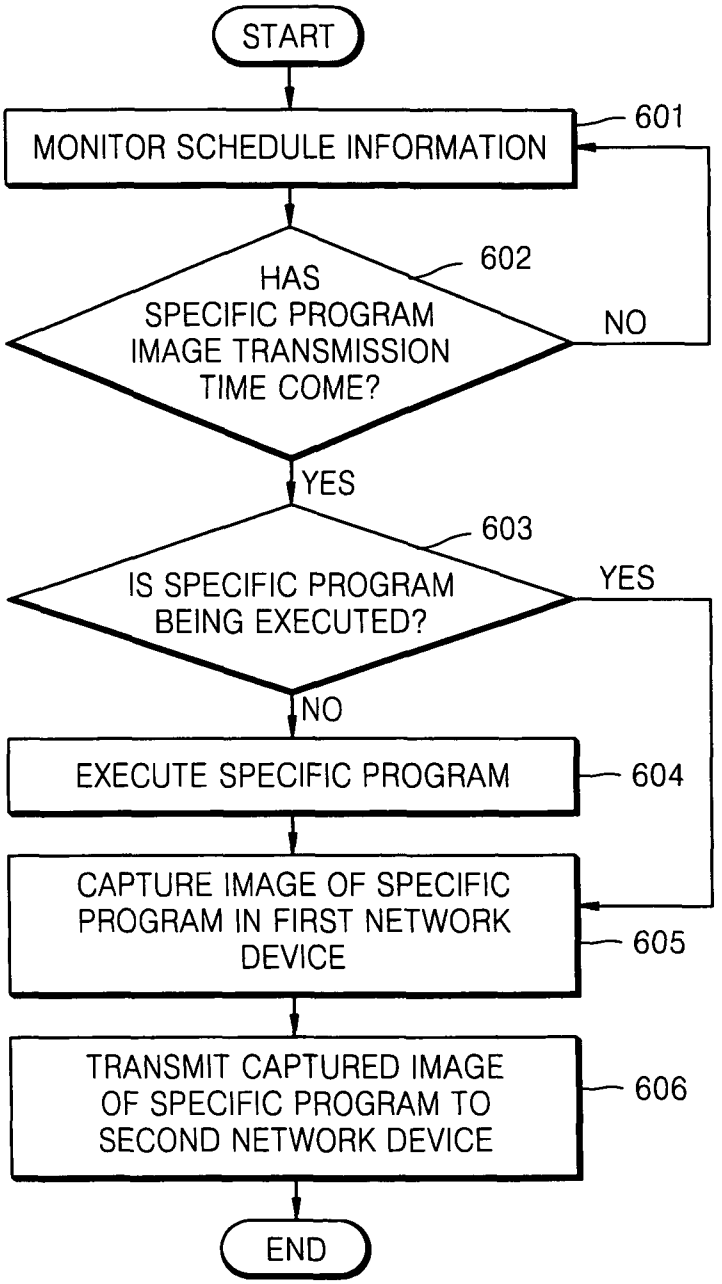

START
MONITOR SCHEDULE INFORMATION
601
HAS SPECIFIC PROGRAM IMAGE TRANSMISSION TIME COME?
602
NO
YES
IS SPECIFIC PROGRAM BEING EXECUTED?
603
YES
NO
EXECUTE SPECIFIC PROGRAM
604
CAPTURE IMAGE OF SPECIFIC PROGRAM IN FIRST NETWORK DEVICE
605
TRANSMIT CAPTURED IMAGE OF SPECIFIC PROGRAM TO SECOND NETWORK DEVICE
606
END

FIG. 7

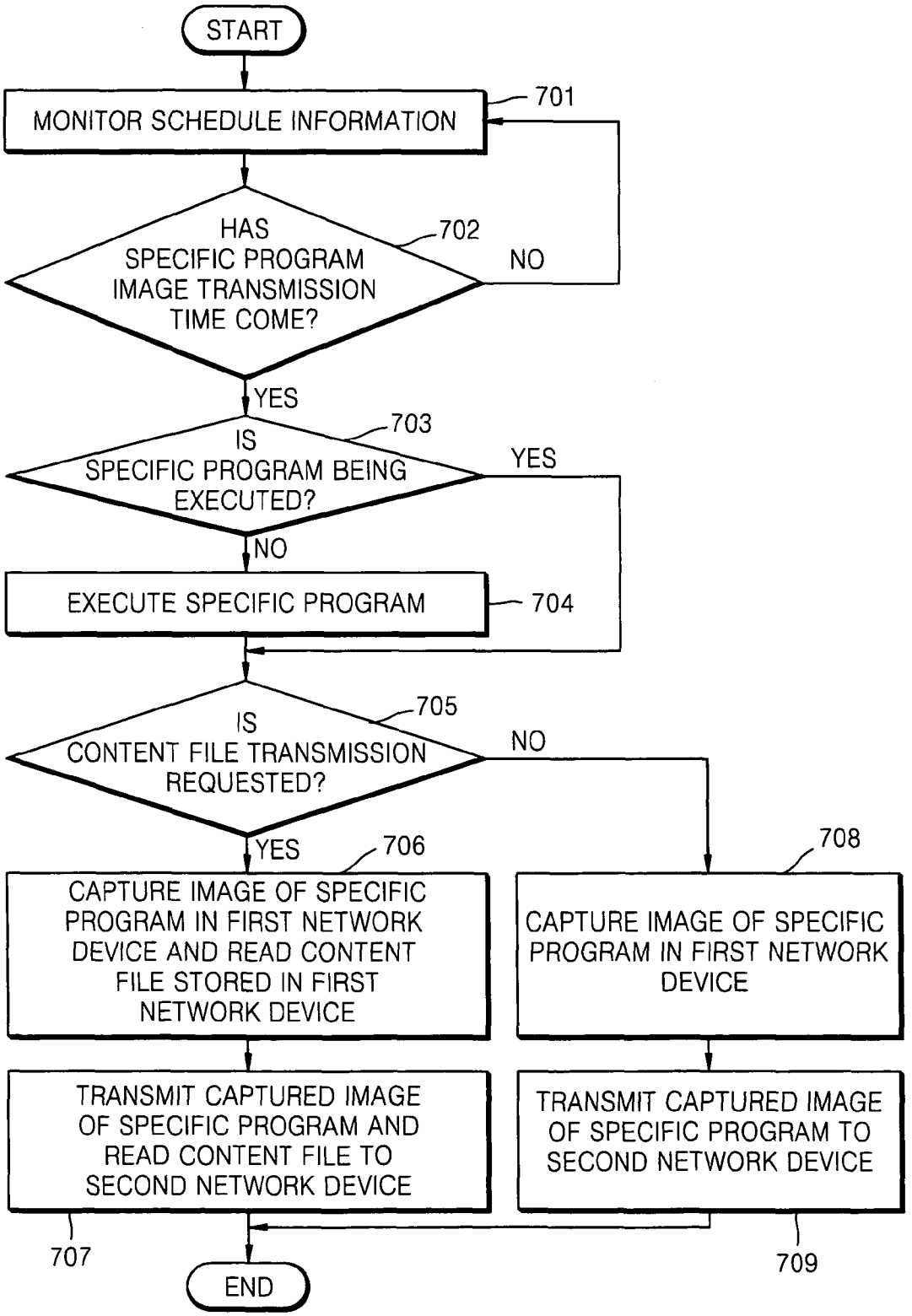
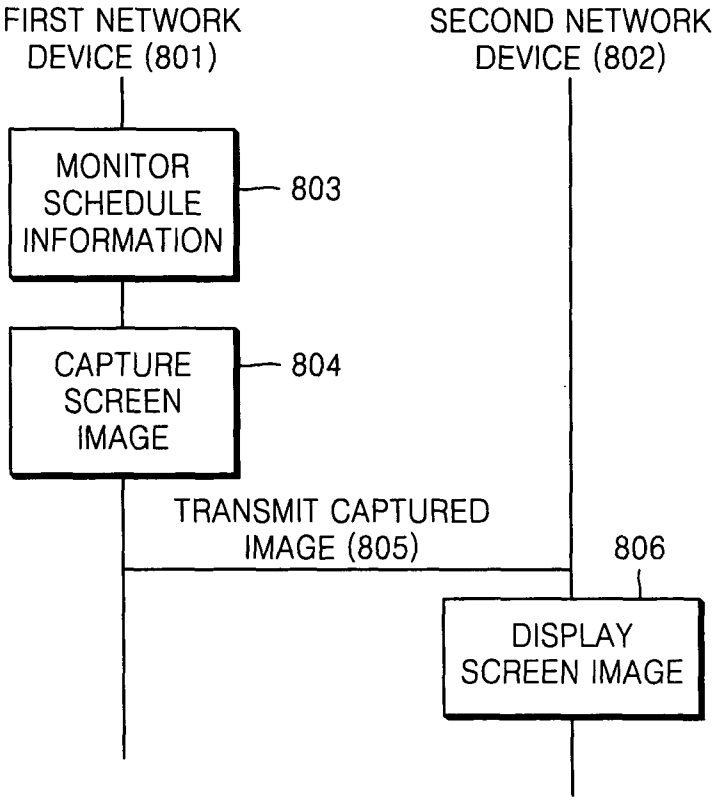

START
MONITOR SCHEDULE INFORMATION
701
HAS SPECIFIC PROGRAM IMAGE TRANSMISSION TIME COME?
702
NO
YES
IS SPECIFIC PROGRAM BEING EXECUTED?
703
YES
NO
EXECUTE SPECIFIC PROGRAM
704
IS CONTENT FILE TRANSMISSION REQUESTED?
705
NO
YES
706
CAPTURE IMAGE OF SPECIFIC PROGRAM IN FIRST NETWORK DEVICE AND READ CONTENT FILE STORED IN FIRST NETWORK DEVICE
708
CAPTURE IMAGE OF SPECIFIC PROGRAM IN FIRST NETWORK DEVICE
TRANSMIT CAPTURED IMAGE OF SPECIFIC PROGRAM AND READ CONTENT FILE TO SECOND NETWORK DEVICE
TRANSMIT CAPTURED IMAGE OF SPECIFIC PROGRAM TO SECOND NETWORK DEVICE
707
709
END

FIG. 8


FIRST NETWORK DEVICE (801)
SECOND NETWORK DEVICE (802)
MONITOR SCHEDULE INFORMATION
803
CAPTURE SCREEN IMAGE
804
TRANSMIT CAPTURED IMAGE (805)
806
DISPLAY SCREEN IMAGE

DISPLAY SERVICE METHOD, NETWORK DEVICE CAPABLE OF PERFORMING THE METHOD, AND STORAGE MEDIUM STORING THE METHOD

CROSS-REFERENCE TO RELATED PATENT APPLICATION

This application claims the benefit of priority from Korean Patent Application No. 10-2006-0065901, filed on Jul. 13, 2006, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a display service in a network based on a plurality of network devices, and more particularly, to a display service method for displaying a screen image of a network device on another network device, a network device capable of performing the method, and a storage medium storing the method.

2. Description of the Related Art

Network devices are devices having at least a display function and may include consumer electronic (CE) devices such as camcorders, digital televisions (DTVs), desktop computers, and display devices. Thus, a network device can be defined as a network display device. In addition, a network device can be a device having an additional function capable of storing and reproducing at least one of music content files, still image content files, moving picture content files, and composite content files in which music content and image content are mixed.

According to the prior art, in order to perform a display service for displaying a screen image of a network device on at least one different network device in a network including at least two network devices (or a plurality of network devices), an application program for displaying the screen image must be installed in the different network device.

For example, if it is assumed that one network device is a personal computer (PC) and another network device is a display device placed in a meeting room, in order to view a document edited on the PC using PowerPoint on the display device, an application program for displaying the document edited using PowerPoint must be installed in the display device.

To solve this problem, a technique of displaying a screen image that is being displayed on a PC on another display device by introducing a thin-client concept has been disclosed. However, according to this technique, a desired screen image can be displayed on the display device only if a user directly performs real-time control using a keyboard or mouse connected to the PC.

In addition, according to the conventional display service, it is impossible to transmit the same screen image to a plurality of display devices at the same time, and it is impossible to transmit a currently displayed screen image for a desired duration by specifying a predetermined time or only a screen image of a specific program.

SUMMARY OF EXEMPLARY EMBODIMENTS OF THE INVENTION

Exemplary embodiments of the present invention provide a display service method for automatically displaying the same screen image on a plurality of network devices at the same time based on pre-set schedule information in a network based on a plurality of network devices, a network device capable of performing the method, and a storage medium thereof.

Exemplary embodiments of the present invention also provide a display service method for automatically splitting a screen image that is being displayed on a network device, and displaying the split screen images on at least two network devices based on pre-set schedule information in a network based on a plurality of network devices, a network device capable of performing the method, and a storage medium thereof.

Exemplary embodiments of the present invention also provide a display service method for outputting a screen image that is being displayed on a network device, and at least one content file that is stored in the network device, to at least one different network device based on pre-set schedule information in a network based on a plurality of network devices, a network device capable of performing the method, and a storage medium thereof.

The present invention also provides a display service method for simultaneously displaying the entire or a portion of a screen image that is being displayed on a network device, or a screen image of a specific program that is being executed in the network device, on at least one different network device based on pre-set schedule information in a network based on a plurality of network devices, a network device capable of performing the method, and a storage medium thereof.

According to an aspect of the present invention, there is provided a display service method in a network based on a plurality of network devices, the method comprising: capturing a screen image of a first network device based on pre-set schedule information; and transmitting the captured screen image to at least one second network device.

The method may further comprise transmitting at least one content file stored in the first network device based on the schedule information.

If the number of second network devices is N, the capturing of the screen image may comprise capturing N screen images, and the transmitting of the captured screen image may comprise respectively transmitting the captured N screen images to the N second network devices.

According to another aspect of the present invention, there is provided a network device capable of providing a display service between network devices, the network device comprising: a display unit displaying a screen image; a scheduler managing a schedule for the display service based on pre-set schedule information; a screen capture module capturing a screen image displayed on the display unit under the control of the scheduler; and a transmission module transmitting the captured screen image to at least one different network device under the control of the scheduler.

According to another aspect of the present invention, there is provided a computer readable recording medium storing a computer readable program for executing a display service method in a network based on a plurality of network devices, the method comprising: capturing a screen image of a first network device based on pre-set schedule information; and transmitting the captured screen image to at least one second network device.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

FIG. **1** is a functional block diagram of a network device according to an exemplary embodiment of the present invention;

FIG. **2** is a functional block diagram of a network device according to another exemplary embodiment of the present invention;

FIG. **3** is a functional block diagram of a network device, which outputs a screen image or the screen image and a content file received from the network device illustrated in FIG. **1** or **2**, according to an exemplary embodiment of the present invention;

FIG. **4** is a flowchart illustrating a display service method in a display service provider according to an exemplary embodiment of the present invention;

FIG. **5** is a flowchart illustrating a display service method in a display service provider according to another exemplary embodiment of the present invention;

FIG. **6** is a flowchart illustrating a display service method in a display service provider according to another exemplary embodiment of the present invention;

FIG. **7** is a flowchart illustrating a display service method in a display service provider according to another exemplary embodiment of the present invention; and

FIG. **8** is a signaling diagram for explaining a display service method according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS OF THE INVENTION

The present invention will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown.

FIG. **1** is a functional block diagram of a network device **100** according to an exemplary embodiment of the present invention. The network device **100** according to an exemplary embodiment of the present invention is connected to a network based on a plurality of network devices. The network device **100** has at least a display function. The network device **100** may further have a function of storing and reproducing a content file. The content file may be at least one of a music content file, a still image content file, a moving picture content file, and a composite content file in which music content and image content are mixed. If the network based on the plurality of network devices is a server-client based network, the network device **100** corresponds to a server.

Referring to FIG. **1**, the network device **100** includes a scheduler **101**, a display unit **102**, a buffer **103**; a screen capture module **104**, and a transmission module **105**.

The scheduler **101** manages a schedule for a display service according to an exemplary embodiment of the present invention based on pre-set schedule information. The schedule information can be previously set using a user command input by a user and/or using stored schedule information. The schedule information may contain information on a screen image to be captured, information on a network device to which a captured screen image is transmitted, and information on a screen image transmission time. Thus, the user command may contain selection information of the screen image to be captured, selection information of the network device to which the captured screen image is transmitted, and selection information of the screen image transmission time. The user command may be defined as a screen image transmission control command.

If a user command contains the selection information of the screen image to be captured, the selection information of the network device to which the captured screen image is transmitted, and the selection information of the screen image transmission time, the scheduler **101** edits a schedule list based on the input user command. The edited schedule list may be defined as illustrated in Table 1.

TABLE 1

Screen image transmission time	Network device to which screen image is transmitted	Screen image to be captured
2006/7/10/10:00AM	Second network device	Entire screen image
2006/7/10/10:30AM	Third network device	Portion of screen image (coordinates (0, 0)-(300, 300))
2006/7/10/11:00AM	Second network device	PowerPoint Image
2006/7/10/11:30AM	Second network device	Entire screen image + repeated play of music content file (xx.mp3)
2006/7/10/12:00AM	Second and third network devices	MS-Word Image

The schedule list illustrated in Table 1 is an example of schedule information from 10:00 AM Jul. 10, 2006 to 12:00 AM Jul. 10, 2006. Based on Table 1, the network device **100** captures the entire screen image being displayed on the display unit **102** at 10:00 AM Jul. 10, 2006, and transmits the captured screen image to a second network device connected to the network.

The scheduler **101** can manage the edited schedule list by directly setting (or registering) the edited schedule list as schedule information. Alternatively, the scheduler **101** can allow the user to confirm the edited schedule list by displaying the edited schedule list on the display unit **102** in order to set and manage the edited schedule list as schedule information.

If the user wants to use existing schedule information, the scheduler **101** outputs a schedule list edited based on previously set schedule information to the display unit **102**. If the user modifies (or edits) the output schedule list, the scheduler **101** can set and manage the modified schedule list as schedule information. Alternatively, the scheduler **101** can allow the user to confirm the modified schedule list by displaying the modified schedule list on the display unit **102** in order to set and manage the modified schedule list as schedule information. During the modification, a portion of the previously set schedule information may be deleted.

The scheduler **101** operates based on a timer to manage the schedule for the display service. Thus, if a time for transmitting a screen image comes based on the pre-set schedule information, the scheduler **101** activates the screen capture module **104** and the transmission module **105**.

The display unit **102** displays an image. In particular, the display unit **102** can display a plurality of screen images based on a virtual display environment. The plurality of screen images may include a screen image of a specific program.

The buffer **103** stores information on a screen image displayed on the display unit **102**. That is, if a single image is displayed on the display unit **102**, the buffer **103** stores information on the single image. If a plurality of screen images are displayed on the display unit **102** based on the virtual display environment, the buffer **103** stores information on the plurality of screen images. The buffer **103** can be realized using a frame buffer. Screen information input to the buffer **103** has a digital format, which can be displayed on the display unit **102**. The screen information input to the buffer **103** is information on a screen image reproduced by the network device **100**.

The screen capture module **104** captures a screen image displayed on the display unit **102** based on information on the screen image, which is stored in the buffer **103**, under the control of the scheduler **101**.

For example, if the schedule information is set to transmit a screen image that is displayed prior to a currently displayed screen image, the screen capture module **104** reads screen information corresponding to the screen image that is displayed prior to the screen image currently displayed on the display unit **102** from the buffer **103** and then captures the entire screen image being displayed on the display unit **102**.

If the schedule information is set to transmit an image corresponding to coordinates (x, y) from coordinates (0, 0) to coordinates (300, 300) out of a currently displayed screen image, the screen capture module **104** reads screen information of an image corresponding to coordinates (x, y) from coordinates (0, 0) to coordinates (300, 300) out of a screen image currently displayed on the display unit **102** from the buffer **103** and then captures the image within a range of coordinates (x, y) from coordinates (0, 0) to coordinates (300, 300) out of the screen image being displayed on the display unit **102**.

If the schedule information is set to transmit a PowerPoint Image, the screen capture module **104** determines whether PowerPoint is being executed in the network device **100**. If it is determined that PowerPoint is not being executed in the network device **100**, the screen capture module **104** outputs a PowerPoint execution request signal in order to execute PowerPoint in the network device **100**. The PowerPoint execution request signal may be input to a control module (not shown) controlling the general function of the network device **100**.

As a result, if PowerPoint is executed in the network device **100** and thus a PowerPoint image is displayed on the display unit **102**, the screen capture module **104** reads information on the PowerPoint image from the buffer **103** and then captures the PowerPoint image displayed on the display unit **102**.

If it is determined that PowerPoint is being executed in the network device **100**, the screen capture module **104** can read information on a PowerPoint image from the buffer **103** even though the PowerPoint image is displayed in the virtual display environment. Then, the screen capture module **104** captures the PowerPoint image read from the buffer **103**.

The transmission module **105** transmits a screen image captured by the screen capture module **104** to at least one different network device via the network under the control of the scheduler **101**. That is, if the schedule information is set to transmit the captured screen image to a specific network device out of network devices connected to the network, the transmission module **105** transmits the captured screen image to a network device registered in the schedule information. If a plurality of network devices are registered in the schedule information, the transmission module **105** transmits the captured screen image to the plurality of network devices. In this case, the transmission module **105** can transmit message information indicating the display service along with information on the captured screen image.

If the schedule information is set to split and transmit a screen image to N network devices, the screen capture module **104** reads screen information from the buffer **103** as if a screen image to be captured is split into N images and respectively captured. The transmission module **105** respectively transmits the N-split and captured images to the N network devices. Thus, an image obtained by uniting the images displayed on the N network devices may be the same as an entire image, a portion of the entire image, or a screen image of a specific program displayed on the display unit **102** of the network device **100**.

If the schedule information is set to transmit a screen image to N network devices, the screen capture module **104** captures N screen images, and the transmission module **105** respectively transmits the captured N screen images to the N network devices. The N screen images may be the same images, different images, or images obtained by splitting a screen image into N images. If the N screen images are images obtained by splitting a screen image into N images, each of the N-split images can have an image area overlapping with an adjacent split image.

If the network based on the plurality of network devices is a server-client based network, the different network device corresponds to a client.

FIG. **2** is a functional block diagram of a network device **200** according to another embodiment of the present invention. The network device **200** according to another embodiment of the present invention performs the same role as the network device **100** illustrated in FIG. **1** in order to provide the display service in the network based on the plurality of network devices. Thus, if the network based on the plurality of network devices is a server-client based network, the network device **200** corresponds to a server.

Referring to FIG. **2**, the network device **200** includes a scheduler **201**, a display unit **202**, a buffer **203**, a screen capture module **204**, a transmission module **205**, and a content storage module **206**.

The scheduler **201**, the display unit **202**, the buffer **203**, the screen capture module **204**, and the transmission module **205**, which are illustrated in FIG. **2**, are similar to the scheduler **101**, the display unit **102**, the buffer **103**, the screen capture module **104**, and the transmission module **105**, which are illustrated in FIG. **1**.

The content storage module **206** outputs at least one content file to the transmission module **205** under the control of the scheduler **201**. The content storage module **206** can store at least one of a music content file, a still image content file, a moving picture content file, and a composite content file in which music content and image content are mixed.

For example, if schedule information is set as the fourth entry of Table 1, the content storage module **206** transmits the stored music content file (xx.mp3) to the transmission module **205** under the control of the scheduler **201**. When the content file is received from the content storage module **206** and information on a captured screen image is received from the screen capture module **204**, the transmission module **205** transmits the received content file and the captured screen image to a different network device via the network.

The different network device of FIG. **2** corresponds to a client in a server-client based network.

The network device **100** or **200** illustrated in FIG. **1** or **2** can be modified so that the screen capture module **104** or **204** is included in a control module (not shown) controlling the general function of the network device **100** or **200**.

Also, the network device **100** or **200** illustrated in FIG. **1** or **2** can include the above components except the buffer **103** or **203**. For example, the network device **100** illustrated in FIG. **1** can include the scheduler **101**, the display unit **102**, the screen capture module **104**, and the transmission module **105** without the buffer **103**. In this case, the screen capture module **104** can perform the capturing operation based on a screen image being displayed on the display unit **102**, under the control of the scheduler **101**. Also, the network device **200** illustrated in FIG. **2** can include the scheduler **201**, the display unit **202**, the screen capture module **204**, and the transmission module **205** without the buffer **203**. In this case, the screen capture module **204** can perform the capturing operation

based on a screen image being displayed on the display unit **202**, under the control of the scheduler **201**.

FIG. **3** is a functional block diagram of a network device **300**, which outputs a screen image or a content file received from the network device **100** or **200** illustrated in FIG. **1** or **2**, according to an exemplary embodiment of the present invention. Thus, the network device **300** corresponds to a client in a server-client based network.

Referring to FIG. **3**, the network device **300** includes a transceiver **301**, a controller **302**, a display unit **303**, and an audio output unit **304**.

Through the network, the transceiver **301** can receive message information indicating that the currently received information is information for the display service and information on a captured screen image, or receive the message information, information on a captured screen image, and information on at least one content file.

The controller **302** analyzes the message received from the transceiver **301**. If it is determined that the information received along with the received message is information for the display service, the controller **302** displays the received information on the display unit **303**. Thus, an entire screen image or a portion of the entire screen image displayed on the display unit **303** matches an entire screen image, a portion of the entire screen image, or an image of a specific program displayed on the display unit **102** or **202** illustrated in FIG. **1** or **2**.

If the information received along with the received message contains information on a content file, if the received content file is a still image content file or a moving picture content file, and if the received screen image information is information on a portion of an entire screen image, the controller **302** controls the display unit **303** to display the received portion of an entire screen image together with the received still image content or moving picture content. That is, the display unit **303** can display the received still image content or moving picture content as a background image of the received portion of an entire screen image.

If the information received along with the received message contains information on a music content file, the controller **302** displays the received screen information on the display unit **303** and simultaneously outputs the received music content file to the audio output unit **304**. Thus, a user of the network device **300** can hear and view a separate content file and a screen image displayed on the network device **100** or **200** illustrated in FIG. **1** or **2**. In this case, the network device **100** or **200** illustrated in FIG. **1** or **2** can be modified to simultaneously reproduce and transmit a content file to another network device. Thus, an image and audio output from the network device **100** or **200** illustrated in FIG. **1** or **2** can be the same as an image and audio output from the network device **300** illustrated in FIG. **3**.

FIG. **4** is a flowchart illustrating a display service method in a display service provider according to an exemplary embodiment of the present invention. Hereinafter, for convenience of description, a network device in terms of a display service provider is defined as a first network device, and a network device in terms of a display service receiver is defined as a second network device. Thus, the first network device can be formed as illustrated in FIG. **1** or **2**, and the second network device can be formed as illustrated in FIG. **3**.

Referring to FIG. **4**, a first network device monitors pre-set schedule information in operation **401**. The schedule information can be previously set as described with the scheduler **101** of FIG. **1**. The schedule information is timer-based schedule information, containing information on a screen image to be captured, information on a screen image transmission time, and information on a network device to which a captured screen image is transmitted.

Then, based on the monitoring in operation **401**, if it is determined that the screen image transmission time has come in operation **402**, the first network device captures a screen image based on the pre-set schedule information in operation **403**. That is, if the schedule information is set to transmit an entire screen image that is being currently displayed on the first network device, the first network device captures a currently displayed entire screen image. If the schedule information is set to transmit a portion of an entire screen image that is being currently displayed on the first network device, the first network device captures a portion of a currently displayed entire screen image based on coordinate information contained in the schedule information.

The first network device transmits the captured screen image to at least one second network device in operation **404**.

FIG. **5** is a flowchart illustrating a display service method in a display service provider according to another exemplary embodiment of the present invention.

Referring to FIG. **5**, a first network device monitors pre-set schedule information in operation **501**. Then, based on the monitoring in operation **501**, if it is determined that a screen image transmission time has come in operation **502**, the first network device determines in operation **503** whether the schedule information contains information for requesting content file transmission.

If it is determined in operation **503** that the schedule information contains the information for requesting content file transmission, the first network device captures a currently displayed screen image and simultaneously reads a transmission-requested content file in operation **504**. The transmission-requested content file is stored in the first network device as described with the content storage module **206** of FIG. **2**. The captured screen image may be an entire screen image that is being currently displayed on the first network device, or a portion of the entire screen image.

The first network device transmits the captured screen image and the read content file to at least one second network device in operation **505**.

If it is determined in operation **503** that the schedule information does not contain information for requesting content file transmission, the first network device captures a currently displayed screen image in operation **506**, and transmits the captured screen image to at least one second network device in operation **507**.

FIG. **6** is a flowchart illustrating a display service method in a display service provider according to another exemplary embodiment of the present invention.

Referring to FIG. **6**, a first network device monitors pre-set schedule information in operation **601**. Then, based on the monitoring in operation **601**, if it is determined that a screen image transmission time has come in operation **602**, the first network device determines in operation **603** whether a specific program is being executed. The specific program may be, for example, PowerPoint or MS-Word. If it is determined in operation **603** that the specific program is not being executed, the first network device executes the specific program in operation **604** and captures an image of the specific program in operation **605**. If it is determined in operation **603** that the specific program is being executed, the first network device captures an image of the specific program in operation **605**.

The first network device transmits the captured image of the specific program to at least one second network device in operation **606**. FIG. **7** is a flowchart illustrating a display

service method in a display service provider according to another embodiment of the present invention.

Referring to FIG. **7**, a first network device monitors pre-set schedule information in operation **701**. Then, based on the monitoring in operation **701**, if it is determined that a screen image transmission time has come in operation **702**, the first network device determines in operation **703** whether a specific program is being executed. The specific program may be; for example, PowerPoint or MS-Word. If it is determined in operation **703** that the specific program is not being executed, the first network device executes the specific program in operation **704** and determines in operation **705** whether the schedule information contains information for requesting content file transmission.

If it is determined in operation **705** that the schedule information contains the information for requesting content file transmission, the first network device captures an image of the specific program and simultaneously reads a transmission-requested content file in operation **706**. The transmission-requested content file is stored in the first network device as described with the content storage module **206** of FIG. **2**.

The first network device transmits the captured image of the specific program and the read content file to at least one second network device in operation **707**.

If it is determined in operation **703** that the specific program is being executed, the first network device determines in operation **705** whether the schedule information contains information for requesting content file transmission. If it is determined in operation **705** that the schedule information does not contain information for requesting content file transmission, the first network device captures an image of the specific program in operation **708** and transmits the captured image of the specific program to at least one second network device in operation **709**.

FIG. **8** is a signaling diagram for explaining a display service method according to an exemplary embodiment of the present invention. Referring to FIG. **8**, a first network device **801** monitors schedule information in operation **803** as described in FIGS. **4** through **7**.

Then, based on the monitoring in operation **803**, if it is determined that a screen image transmission time has come, the first network device **801** captures a screen image in operation **804**. The captured screen image may be an entire screen image that is being currently displayed on the first network device, or a portion of the entire screen image or an image of a specific program executed by the first network device **801**.

The first network device **801** transmits the captured screen image to a second network device **802** in operation **805**. The second network device **802** displays the received screen image in operation **806**.

In the exemplary embodiments of FIGS. **4** through **8**, if the schedule information is set to split a screen image that is being displayed on a first network device into N split images and respectively transmit the N split images to N second network devices, in the capturing of the screen image, a screen image to be captured is split into N split images and captured, and in the transmitting of the captured screen image, the captured N split images are respectively transmitted to the N second network devices. In this case, each of the N split images can have an image area overlapping with an adjacent split image.

In the exemplary embodiments of FIGS. **4** through **8**, if the schedule information is set to transmit a screen image that is being displayed on a first network device to N second network devices, in the capturing of the screen image, N screen images are captured, and in the transmitting of the captured screen image, the captured N screen images are respectively transmitted to the N second network devices. In this case, the captured N screen images may be the same images, different images, or images obtained by splitting a screen image into N split images.

If the network based on the plurality of network devices is a server-client based network, the first network device **801** corresponds to a server, and the second network device **802** corresponds to a client.

The invention can also be embodied as computer readable codes on a computer readable recording medium. The computer readable recording medium is any data storage device that can store data which can be thereafter read by a computer system. Examples of the computer readable recording medium include read-only memory (ROM), random-access memory (RAM), CD-ROMs, magnetic tapes, floppy disks, optical data storage devices, and carrier waves (such as data transmission through the Internet). The computer readable recording medium can also be distributed over network coupled computer systems so that the computer readable code is stored and executed in a distributed fashion.

As described above, according to exemplary embodiments of the present invention, in a network based on a plurality of network devices, a screen image displayed on a certain network device can be captured; automatically transmitted to at least one different network device, and displayed on the at least one different network device based on pre-set schedule information. Thus, even though the different network devices do not have a separate application program, the different network devices can display the captured screen image. That is, the different network devices can display the captured screen image regardless of a format of the captured screen image. Thus, an unmanned automatic display system based on a plurality of network devices can be constructed.

In addition, by transmitting an entire screen image that is being currently displayed on a network device, or a portion of the entire screen image or an image of a specific program executed by the network device to different network devices based on pre-set schedule information, the same screen images or various screen images can be displayed on a plurality of network devices.

In addition, by splitting a screen image displayed on a network device into N images, capturing the N split images and respectively transmitting the captured N split images to different network devices, a wall mount effect using a plurality of network devices can be provided.

In addition, by transmitting at least one content file along with an entire screen image that is being currently displayed on a network device, or a portion of the entire screen image or an image of a specific program executed by the network device to different network devices based on pre-set schedule information, various display services can be provided.

While this invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. The exemplary embodiments should be considered in descriptive sense only and not for purposes of limitation. Therefore, the scope of the invention is defined not by the detailed description of the invention but by the appended claims, and all differences within the scope will be construed as being included in the present invention.

What is claimed is:

1. A network device capable of providing a display service between the network device and a second network device, the network device comprising:

a display operational to display a screen image;

a processor providing the operational capabilities for;

a scheduler configured to store, in response to a command input at a first time, pre-set schedule information comprising screen information of a screen image to be captured that indicates a portion of the display on which the screen image is displayed to be captured, the screen information comprising coordinate positions identifying at least one of the portion on the display, an entire portion of the display, or an application displayed on the display, screen image time information comprising a second time occurring after the first time at which the portion of the display is to be captured, and destination information that identifies the second network device to which the captured portion of the display is to be transmitted and a program identifies that identifies a specific program executed by the first network device, the scheduler further monitoring the pre-set schedule information for occurrence of the second time, and determining upon the occurrence of the second time, based on the screen information of the stored pre-set schedule information, whether the specific program is executed on the first network device; and

a screen capture module configured to capture the portion of the screen image displayed on the display unit at the second time, based on the screen information and the screen image time information of stored pre-set schedule information, in response to determining that the specific program is executed by the first network device at the second time; and

a transmission module which is operational to transmit the captured portion of the screen image to the second network device based on the destination information of the pre-set schedule information, in response to the screen capture module capturing the portion of the display at the second time.

2. The network device of claim 1, wherein the coordinate positions indicate a portion that is less than an entire screen image and the application is displayed in an area in which a specific program is executed by the network device.

3. The network device of claim 2, wherein the area of the specific program is a virtual display environment.

4. The network device of claim 2, wherein the screen capture module is further configured to determine, upon the occurrence of the second time, that the specific program is not being executed by the network device, execute the specific program in response to determining that the specific program is not being executed, and capture the area in which the specific program is displayed on the display.

5. The network device of claim 1, further comprising a content storage module configured to output a content file to the transmission module,

wherein the transmission module is further configured to transmit the at least one content file and the captured screen image to the second network device.

6. The network device of claim 5, wherein the content file comprises at least one of a music content file, a still image content file, a moving picture content file, and a composite content file in which music content and image content are mixed.

7. The network device of claim 1, further comprising a buffer which stores information on the screen image displayed on the display.

8. The network device of claim 1, wherein the second network device comprises N different network devices,

wherein the screen capture module is further configured to capture N screen images, and

wherein the transmission module is further configured to transmit the portion of the captured N screen images to the N network devices, respectively.

9. A display service method in a network, the method comprising:

storing, in response to a command input at a first time, pre-set schedule information comprising screen information of a screen image to be captured that indicates a portion of a first display of a first network device on which a screen image is displayed to be captured, the screen information comprising coordinate positions identifying at least one of the portion on the first display, an entire portion of the first display, or an application displayed on the first display, screen image time information comprising a second time occurring after the first time at which the portion of the first display is to be captured, and destination information that identifies a second network device to which the captured portion of the first display is to be transmitted and a program identifier that identifies a specific program executed by the first network device;

monitoring the pre-set schedule information for occurrence of the second time;

determining upon the occurrence of the second time, based on the screen information of the stored pre-set schedule information, whether the specific program is executed on the first network device;

capturing the portion of the screen image displayed on the first display of the first network device at the second time based on screen information and the screen image time information of the stored pre-set schedule information, in response to determining that the specific program is executed by the first network device at the second time; and

in response to capturing the portion of the first display at the second time, transmitting the captured portion of the first display to the second network device based on the destination information of the pre-set schedule information.

10. The method of claim 9, wherein the coordinate positions indicate a portion that is less than an entire screen image and the application is displayed in an area in which a specific program is executed by the first network device.

11. The method of claim 10, further comprising:

determining, upon the occurrence of the second time, that the specific program is not executed by the first network device; and

executing the specific program in response to determining that the specific program is not being executed by the first network device,

wherein the capturing of the screen image comprises capturing the area in which the specific program is displayed on the first display.

12. The method of claim 9, wherein the transmitting comprises transmitting the captured portion of the screen image to the second device and transmitting a content file stored in the first network device to the second device.

13. The method of claim 12, wherein the content file comprises at least one of a music content file, a still image content

file, a moving picture content file, and a composite content file in which music content and image content are mixed.

14. The method of claim **9**, wherein the second network device comprises N number of second network devices,

wherein the capturing of the screen image comprises capturing N screen images, and

wherein the transmitting comprises transmitting the portion of the captured N screen images to the N second network devices, respectively.

15. The method of claim **9**, wherein the first network device is a server and the second network device is a client.

16. A non-transitory computer readable recording medium storing a computer readable program for executing a display service method, the method comprising:

storing, in response to a command input at a first time, pre-set schedule information comprising screen information of a screen image to be captured that indicates a portion of a first display of a first network device on which a screen image is displayed to be captured, the screen information comprising coordinate positions identifying at least one of the portion on the first display, an entire portion of the first display, or an application displayed on the first display, screen image time information comprising a second time occurring after the first time at which the portion of the first display is to be captured, and destination information that identifies a second network device to which the captured portion of the first display is to be transmitted and a program identifier that identifies a specific program executed by the first network device;

monitoring the pre-set schedule information for occurrence of the second time;

determining upon the occurrence of the second time, based on the screen information of the stored pre-set schedule information, whether the specific program is executed on the first network device;

capturing the portion of the screen image displayed on the first display of the first network device at the second time based on screen information and the screen image time information of the stored pre-set schedule information in response to determining that the specific program is executed by the first network device at the second time; and

in response to capturing the portion of the first display at the second time, transmitting the captured portion of the first display to the second network device based on the destination information of the pre-set schedule information.

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