DESCRIPTION

TITLE OF INVENTION Relay communication system and relay server

TECHNICAL FIELD

[0001]

The present invention relates to a relay communication system including a plurality of relay servers that can communicate with each other, a plurality of client terminals, and LANs connecting the client terminal to the relay server, and further to a relay server used in the relay communication system.

BACKGROUND ART

[0002]

In some systems, client terminals connected to remote local area networks (LANs) communicate with each other through a wide area network (WAN). A virtual private network (VPN) makes it possible to configure a virtual network in which the remote local area networks (LANs) are connected directly with each other. However, in the virtual private network (VPN), it is difficult to configure a network that is expandable and flexible.

[0003]

A relay communication system shown in Patent Document 1 can configure a virtual network in which the remote local area networks (LANs) are directly connected with each other, as in the virtual private network (VPN). Moreover, in the relay communication system, it is easy to

What is claimed is:

1. A relay communication system comprising:

a first network;

a second network;

a first relay server connected to the first network;

a second relay server connected to the second network, and configured to communicate with the first relay server via a third network;

one or more client terminals connected to the first relay server via the first network; and

one or more client terminals connected to the second relay server via the second network; wherein

each of the first relay server, the second relay server, the one or more client terminals connected to the first relay server, and the one or more client terminals connected to the second relay server includes:

a relay group information storage unit configured to store relay group information that indicates the first relay server, the second relay server, the one or more client terminals connected to the first relay server and one or more client terminals connected to the second relay server constitute a relay group;

a relay server information storage unit configured to store relay server information including activation information of the first relay server, activation information of the second relay server, activation/registration information of the one or more client terminals connected to the first relay server, and activation/registration information of the one or more client

terminals connected to the second relay server;

an information sharing unit configured to allow the first relay server, the second relay server, the one or more client terminals connected to the first relay server, and the one or more client terminals connected to the second relay server, to share the relay group information and the relay server information;

a VLAN group information control unit configured to allow VLAN client terminals constituting a VLAN group in the relay group to share VLAN group information, at least two of the one or more client terminals connected to the first relay server and the one or more client terminals connected to the second relay server being the VLAN client terminals, the VLAN group information including hub information having identification information of the first relay server and identification information of the second relay server, to which the VLAN client terminal is connected, session information that indicates a connecting-side and a connected-side of a session established between the first relay server and the second relay server, and identification information that identifies the VLAN client terminals;

each of the first relay server and the second relay server further includes:

an activation command control unit configured to transmit a response signal including address information of a VLAN device as an activatable VLAN client terminal in a case of receiving an activation instruction of the VLAN group;

a VLAN session control unit configured to establish a hub session as a VLAN session between the first relay server and the second relay server based on the session information, and establish a device session as a VLAN session with the VLAN device that is connected to the first relay server or the second relay server; and

a suspension processing unit configured to notify of suspension of the VLAN device;

each of the one or more client terminals connected to the first relay server and the one or more client terminals connected to the second relay server further including a virtual address control unit configured to create virtual address information related to the VLAN device based on the response signal, and transmit the virtual address information to the VLAN device, and

during a time when at least two VLAN devices are communicating with each other using the virtual address information and the VLAN session, if the suspension processing unit notifies of the suspension of the VLAN device, the virtual address control unit deletes the VLAN device about which the suspension has been notified from the virtual address information, and the VLAN session establishing unit is configured to close the VLAN session related to the VLAN device about which the suspension has been notified.

2. The relay communication system according to claim 1, wherein, if operation of the first relay server or the second relay server is suspended

during a time when at least two VLAN devices are communicating with each other using the virtual address information and the VLAN session, the suspension processing unit is configured to notify of suspension of the one or more VLAN devices connected to the suspended first relay server or the one or more VLAN devices connected to the suspended second relay server.

3. The relay communication system according to claim 1 or 2, wherein the suspension processing unit determines the number of the VLAN devices which are activated except the VLAN device about which the suspension has been notified, and if the number of the activated VLAN devices is one or less, the VLAN session establishing unit closes all of the VLAN sessions established in the VLAN group.

4. The relay communication system according to any of claims 1 through 3, wherein the virtual address information includes a virtual IP address and a virtual MAC address given to the VLAN device.

5. A relay server configured to serve as a second relay server connected to a second network, and communicate with a first relay server connected to a first network, the relay server comprising:

a relay group information storage unit configured to store relay group information that indicates the first relay server, the second relay server, one or more client terminals connected to the first relay serer via the first network, and one or more client terminals connected to the second

relay server via the second network constitute a relay group;

a relay server information storage unit configured to store relay server information including activation information of the first relay server, activation information of the second relay server, activation/registration information of the one or more client terminals connected to the first relay server, and activation/registration information of the one or more client terminals connected to the second relay server;

an information sharing unit configured to allow the first relay server, the second relay server, the one or more client terminals connected to the first relay server, and one or more client terminals connected to the second relay server, to share the relay group information and the relay server information,

a VLAN group information control unit configured to allow VLAN client terminals constituting a VLAN group in the relay group to share VLAN group information, at least two of the one or more client terminals connected to the first relay server and the one or more client terminals connected to the second relay server being the VLAN client terminals, and the VLAN group information including hub information having identification information of the first relay server and identification information of the second relay server, to which the VLAN client terminal is connected, session information that indicates a connecting-side and a connected-side of a session established between the first relay server and the second relay server, and identification information that identifies the VLAN client terminals, ;

an activation command control unit configured to transmit a response signal including address information of a VLAN device as an activatable VLAN client terminal in a case of receiving an activation instruction of the VLAN group;

a VLAN session control unit configured to establish a hub session as a VLAN session between the first relay server and the second relay server based on the session information, and establish a device session as a VLAN session with the VLAN device connected to the second relay server;

a relay server communication control unit configured to control communication between the VLAN devices, the communication being performed using virtual address information created for a VLAN device as an activatable VLAN client terminal among the VLAN client terminals constituting the VLAN group based on the response signal, and the VLAN session; and

a suspension processing unit configured to notify of suspension of the VLAN device; wherein

if the suspension processing unit notifies of suspension of the VLAN device, during a time when at least two VLAN devices are communicating with each other using the virtual address information and the VLAN session, the VLAN session control unit is configured to close the VLAN session related to the VLAN device about which suspension has been notified.

6. The relay server according to claim 5, wherein, if operation of the

first relay server or the second relay server is suspended during a time when at least two VLAN devices are communicating with each other using the virtual address information and the VLAN session, the suspension processing unit is configured to notify of suspension of the one or more VLAN devices connected to the suspended first relay server or the one or more VLAN devices connected to the suspended second relay server.

7. The relay server according to claim 5 or 6 wherein the suspension processing unit determines the number of the activated VLAN devices except the VLAN device about which suspension has been notified, and if the number of the activated VLAN devices is one or less, the VLAN session establishing unit configured to close all of the VLAN session established in the VLAN group.

8. The relay server according to any of claims 5 through 7, wherein the virtual address information includes a virtual IP address and a virtual MAC address given to the VLAN device.

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[0003]

A relay communication system shown in Patent Document 1 can configure a virtual network in which the remote local area networks (LANs) are directly connected with each other, as in the virtual private network (VPN). Moreover, in the relay communication system, it is easy to

What is claimed is:

1. A relay communication system comprising:

a first network;

a second network;

a first relay server connected to the first network;

a second relay server connected to the second network, and configured to communicate with the first relay server via a third network;

one or more client terminals connected to the first relay server via the first network; and

one or more client terminals connected to the second relay server via the second network; wherein

each of the first relay server, the second relay server, the one or more client terminals connected to the first relay server, and the one or more client terminals connected to the second relay server includes:

a relay group information storage unit configured to store relay group information that indicates the first relay server, the second relay server, the one or more client terminals connected to the first relay server and one or more client terminals connected to the second relay server constitute a relay group;

a relay server information storage unit configured to store relay server information including activation information of the first relay server, activation information of the second relay server, activation/registration information of the one or more client terminals connected to the first relay server, and activation/registration information of the one or more client terminals connected to the second relay server;

an information sharing unit configured to allow the first relay server, the second relay server, the one or more client terminals connected to the first relay server, and the one or more client terminals connected to the second relay server, to share the relay group information and the relay server information;

a VLAN group information control unit configured to allow VLAN client terminals constituting a VLAN group in the relay group to share VLAN group information, at least two of the one or more client terminals connected to the first relay server and the one or more client terminals connected to the second relay server being the VLAN client terminals, the VLAN group information including hub information having identification information of the first relay server and identification information of the second relay server, to which the VLAN client terminal is connected, session information that indicates a connecting-side and a connected-side of a session established between the first relay server and the second relay server, and identification

information that identifies the VLAN client terminals;

each of the first relay server and the second relay server further includes:

an activation command control unit configured to transmit a response signal including address information of a VLAN device as an activatable VLAN client terminal in a case of receiving an activation instruction of the VLAN group;

a VLAN session control unit configured to establish a hub session as a VLAN session between the first relay server and the second relay server based on the session information, and establish a device session as a VLAN session between the first relay server or the second relay server and the VLAN device that is connected to the first relay server or the second relay server; and

a suspension processing unit configured to notify of suspension of the VLAN device;

each of the one or more client terminals connected to the first relay server and the one or more client terminals connected to the second relay server further including a virtual address control unit configured to create virtual address information related to the VLAN device based on the response signal, and transmit the virtual address information to the VLAN device, and

during a time when at least two VLAN devices are communicating with each other using the virtual address information and the VLAN session, if the suspension processing unit notifies of the suspension of the VLAN device, the virtual address control unit deletes the VLAN device about which the suspension has been notified from the virtual address information, and the VLAN session control unit is configured to close the VLAN session related to the VLAN device about which the suspension has been notified.

2. The relay communication system according to claim 1, wherein, if operation of the first relay server or the second relay server is suspended during a time when at least two VLAN devices are communicating with each other using the virtual address information and the VLAN session, the suspension processing unit is configured to notify of suspension of the one or more VLAN devices connected to the suspended first relay server or the one or more VLAN devices connected to the suspended second relay server.

3. The relay communication system according to any of claims 1 and 2,

wherein the suspension processing unit determines the number of the VLAN devices which are activated except the VLAN device about which the suspension has been notified, and if the number of the activated VLAN devices is one or less, the VLAN session control unit closes all of the VLAN sessions established in the VLAN group.

4. The relay communication system according to any of claims 1 through 3, wherein the virtual address information includes a virtual IP address and a virtual MAC address given to the VLAN device.

5. A relay server configured to serve as a second relay server connected to a second network, and communicate with a first relay server connected to a first network, the relay server comprising:

a relay group information storage unit configured to store relay group information that indicates the first relay server, the second relay server, one or more client terminals connected to the first relay serer via the first network, and one or more client terminals connected to the second relay server via the second network constitute a relay group;

a relay server information storage unit configured to store relay server information including activation information of the first relay server, activation information of the second relay server, activation/registration information of the one or more client terminals connected to the first relay server, and activation/registration information of the one or more client terminals connected to the second relay server;

an information sharing unit configured to allow the first relay server, the second relay server, the one or more client terminals connected to the first relay server, and one or more client terminals connected to the second relay server, to share the relay group information and the relay server information,

a VLAN group information control unit configured to allow VLAN client terminals constituting a VLAN group in the relay group to share VLAN group information, at least two of the one or more client terminals connected to the first relay server and the one or more client terminals connected to the second relay server being the VLAN client terminals, and the VLAN group information including hub information having identification information of the first relay server and identification information of the second relay server, to which the VLAN client terminal is connected, session information that indicates a connecting-side and a connected-side of a session established between the first relay server and the second relay server, and identification information that identifies the VLAN client terminals, ;

an activation command control unit configured to transmit a response signal including address information of a VLAN device as an activatable VLAN client terminal in a case of receiving an activation instruction of the VLAN group;

a VLAN session control unit configured to establish a hub session as a VLAN session between the first relay server and the second relay server based on the session information, and establish a device session as a VLAN session with the VLAN device connected to the second relay server;

a relay server communication control unit configured to control communication between the VLAN devices, the communication being performed using virtual address information created for a VLAN device as an activatable VLAN client terminal among the VLAN client terminals constituting the VLAN group based on the response signal, and the VLAN session; and

a suspension processing unit configured to notify of suspension of the VLAN device; wherein

if the suspension processing unit notifies of suspension of the VLAN device, during a time when at least two VLAN devices are communicating with each other using the virtual address information and the VLAN session, the VLAN session control unit is configured to close the VLAN session related to the VLAN device about which suspension has been notified.

6. The relay server according to claim 5, wherein, if operation of the first relay server or the second relay server is suspended during a time when at least two VLAN devices are communicating with each other using the virtual address information and the VLAN session, the suspension processing unit is configured to notify of suspension of the one or more VLAN devices connected to the suspended first relay server or the one or more VLAN devices connected to the suspended second relay server.

7. The relay server according to any of claims 5 and 6 wherein the suspension processing unit determines the number of the activated VLAN devices except the VLAN device about which suspension has been notified, and if the number of the activated VLAN devices is one or less, the VLAN session control unit configured to close all of the VLAN session established in the VLAN group.

8. The relay server according to any of claims 5 through 7, wherein the virtual address information includes a virtual IP address and a virtual MAC address given to the VLAN device.