

PATENT APPLICATION

SCALABLE VIRTUAL WORLD CHAT CLIENT-SERVER SYSTEM

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SCALABLE VIRTUAL WORLD CHAT CLIENT-SERVER SYSTEM

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BACKGROUND OF THE INVENTION

The present invention relates to the field of packet communications. More specifically, in one embodiment the invention provides an efficient communications network for
10 client-server networks with large numbers of clients.

A client-server network is a network where one or more servers are coupled to one or more clients over a communications channel. Typically, each server and each client is assigned an address so that each can determine which
15 network messages are directed to it. While such a system may have only one server, it typically has many clients. A server object is one which waits for a request from a client object and then performs some service in response to the client request. A client is an object that makes the request. The
20 designation of a particular object (computer hardware and/or software process) as a "server" object or a "client" object is not fixed. Thus, a given object can be a server for some services and a client of other services.

A typical computer network has one or more file and
25 print servers with a number of clients, where the clients are the desktop computers or workstations of the computer users, all coupled to a high-speed network cable. Client-server communications in such a network are easily handled for several reasons. When clients are not all communicating with
30 the server at once the server need not be designed to handle all the clients at one time. Another reason is that the network traffic is much less than the network capacity furthermore, the clients in a typical computer network need not necessarily be communicating in real-time with the server.
35 However, where many client machines or processes are communicating with each other in real-time through the server, several problems arise.

For example, where a client-server system is used for real-time exchange of information, such as a distributed virtual reality network where users at client machines visually and aurally interact with other users at other client machines, communication is much more difficult, especially where the information is high-bandwidth data such as audio streams, graphic images and image streams. One application of such a client-server system is for game playing, where the positions and actions of each user need to be communicated between all the players to inform each client of the state changes (position, actions, etc.) which occurred at the other clients. The server might maintain global state information and serve as a data server for the clients as they request visual, program and other data as the game progresses.

Some game systems use a peer-to-peer architecture. In a peer-to-peer architecture, a copy of the data which is common to all clients is kept by the client and information which needs to pass between clients is broadcast over the network. This limits the number of clients which can be connected to the network, because the number of messages passing between clients is on the order of the square of the number of clients. With true broadcasting, one message is sent and all clients listen for it, but not all network topologies can handle broadcasts. Where less than all the clients are participating in a game, for example, messages cannot be broadcast because there are clients which should not be receiving the broadcast message. Instead, the broadcast between the players is handled by generating one message to each player client.

This architecture is further limited where the network is not a dedicated network, but is an open network, such as the Internet. As used herein, the term "Internet" refers to the global inter-network of networks which communicates primarily using packets sent according to TCP/IP (Transport Control Protocol/Internet Protocol) standards well known in the art of computer intercommunication. With Internet communications, true broadcasting is not even

possible because the network's extent is not known or fixed. Thus, messages to all players must be sent as separate messages. An additional problem with Internet communications is that packet delivery is not guaranteed nor is it even as
5 reliable as a dedicated network.

Therefore, what is needed is an efficient system for communication between many client systems over dedicated or open networks to provide graphical interaction between users operating the client systems.

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SUMMARY OF THE INVENTION

The present invention provides a highly scalable architecture for a three-dimensional graphical, multi-user, interactive virtual world system. In a preferred embodiment a
15 plurality of users interact in the three-dimensional, computer-generated graphical space where each user executes a client process to view a virtual world from the perspective of that user. The virtual world shows avatars representing the other users who are neighbors of the user viewing the virtual
20 word. In order that the view can be updated to reflect the motion of the remote user's avatars, motion information is transmitted to a central server process which provides positions updates to client processes for neighbors of the user at that client process. The client process also uses an
25 environment database to determine which background objects to render as well as to limit the movement of the user's avatar.

A further understanding of the nature and advantages of the inventions herein may be realized by reference to the
30 remaining portions of the specification and the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a client screen view in a virtual world
35 system according to the present invention.

FIG. 2 is a logical block diagram of the hardware elements of a virtual world system.

FIG. 3 is a block diagram of the elements of one embodiment of a virtual world system, showing two clients and one server.

FIG. 4 is a more detailed block diagram of a client system according to one embodiment of the present invention.

FIG.5 is an illustration of an avatar.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although the preferred embodiment of the present invention can be used in a variety of applications, as will be apparent after reading the below description, the preferred embodiment is described herein using the example of a client-server architecture for use in a virtual world "chat" system. In this chat system, a user at each client system interacts with one or more other users at other client systems by inputting messages and sounds and by performing actions, where these messages and actions are seen and acted upon by other clients. FIG. 1 is an example of what such a client might display.

Each user interacts with a client system and the client system is networked to a virtual world server. The client system are desktop computers, terminals, dedicated game controllers, workstations, or similar devices which have graphical displays and user input devices. The term "client" generally refers to a client machine, system and/or process, but is also used to refer to the client and the user controlling the client.

FIG. 1 is an illustration of a client screen display seen by one user in the chat system. Screen display 10 is shown with several stationary objects (wall, floor, ceiling and clickable object 13) and two "avatars" 18. Each avatar 18 is a three dimensional figure chosen by a user to represent the user in the virtual world. Each avatar 18 optionally includes a label chosen by the user. In this example, two users are shown: "Paula" and "Ken", who have chosen the "robot" avatar and the penguin avatar, respectively. Each user interacts with a client machine (not shown) which

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