METHOD OF HAVING A USER COMMUNICATE WITH AT LEAST ONE DATABASE

The invention relates to a method of having a user communicate with at least one database via a network. It also relates to a user installation and network management means for implementing the method.

Advances in technology in the field of telecommunications enable an increase in information bit rates that should allow easier access to databases in existing networks such as the Internet.

One example of a technology enabling high bit rates is satellite communication.

However, it has been found that a high bit rate does not necessarily ensure fast access to databases and cannot prevent congestion of the network.

A network of databases is generally accessed using a protocol which assures that communications are reliable. The protocol entails exchanging data between "clients" and a "server" and these exchanges of data can slow down communication. To be more precise, when the data, in particular in the form of cells or packets, is transmitted from a transmitter to a receiver, the receiver sends back an acknowledgement to assure the transmitter that the data transmitted has been received correctly. If the data has not been received correctly, the transmitter receives an acknowledgement indicating this or does not receive any acknowledgement at all. In either case the transmitter retransmits the data.

The data is also retransmitted if the transmitter does not receive an acknowledgement within a particular time period after transmission.

The performance of networks and their communication nodes (routers) and network congestion mean that packets reach the receiver in a time such that the acknowledgement reaches the transmitter after that particular time period has elapsed. They are therefore considered to have been lost and are retransmitted by the transmitter, which leads to unnecessary transmission of data and therefore degrades the transmission capacity of the network, and possibly its performance.

The transmission control protocol (TCP), which is widely used, in particular on the Internet, is one protocol of the above type, for example.

The incompatibility of high bit rate communications and reliable communications in networks of databases is particularly clear when using a high bit rate communication system that introduces a non-negligible transmission delay.

This is the case in satellite transmission systems that are (or will be) used to

transmit data at high bit rates, in particular for "multimedia" applications.

It is nevertheless possible to use a less reliable protocol with no acknowledgements for fast transmission at high bit rates. One example is the user datagram protocol (UDP). However, the systematic use of this protocol is not compatible with transmission in a network of databases, because the transmission of a large proportion of data, and in particular of software, requires a high level of reliability.

The invention provides a method of access to databases via high bit rate communication systems without significant congestion of the network, combined with a satisfactory quality of transmission of data.

A first aspect of the invention provides a method of transmitting data from a database to a requesting client characterized in that a transmission protocol with acknowledgements or a transmission protocol without acknowledgements is chosen for each call.

Thus some data, in particular most pictures and sounds, does not require the highest possible level of reliability of transmission and it is then possible to choose a protocol with no acknowledgements which accords priority to speed, which is all the more beneficial in that the volume of such data is usually high.

Transmitting software requires a high level of reliability, for which a protocol with acknowledgements is chosen.

In one embodiment of the invention, for one and the same call, some parts are transmitted with an acknowledgement type protocol, those parts being software, for example, sources of scripts or man-machine interface pages (Web pages), and other parts, such as pictures or parts of pictures, are transmitted using a protocol which does not use acknowledgements.

It should be pointed out here that pictures and sounds are not necessarily always transmitted using a protocol with no acknowledgements. The choice of protocol is left to the user or to the application (management program). This is because some pictures require a high level of reliability, for example high-definition pictures, in particular for medical applications.

The choice of the protocol can be performed as and when required by the user or automatically, according to the type of data to be transmitted, and possibly the volume of data. If, during a call, the proportion of data that can be transmitted with a relatively low level of reliability is small compared to the data that has to be transmitted with a high level of reliability it is not essential to change protocol for that

small proportion of the data, as in this case the improvement in terms of speed would be small.

The application deciding on the nature of the protocol is located in the transmitting database or in an intermediate server between the client and the databases. In this latter situation, the server will control the call that it transmits to the client.

Another aspect of the invention, which can be used independently or in combination with the previous aspects, provides a database access method characterized in that it uses a protocol with acknowledgements and with a variable length acknowledgement window.

The length of the acknowledgement window of an acknowledgement protocol is the number of bits, bytes or cells that the receiver must receive before it transmits an acknowledgement signal.

The transmitter (database or intermediate server) decides to vary the acknowledgement window according to the proportion of packets retransmitted, for example. If that proportion is high, the acknowledgement window is made smaller so that each retransmission of data represents a smaller volume of data to be transmitted, which also increases the probability of correct transmission in a given time interval.

The receiver can also determine the variation of the acknowledgement window according to the bit rate received. If a low bit rate is received, the receiver transmits to the transmitter a signal requesting a shorter acknowledgement window.

The method according to the invention finds a particularly beneficial application in the case of a satellite transmission system in which all calls from a user or client of the system pass through a connection station, in particular a terrestrial connection station. This description relates to the example of a transmission system using satellites in low or medium Earth orbit in which the Earth is divided into areas which each include a connection station. Each area has a diameter of the order of 700 kilometers, for example, and is such that at all times a satellite of a constellation is visible for connecting a client in the area to the connection station and, when that satellite is no longer able to relay the call between the user and the station, another satellite takes over immediately.

In this case, the transmission method according to the invention can easily be used between the connection station and the users. Transmission times are greatest in this part of the network, between the station and the users, so that the

acknowledgement mechanism can impose the greatest penalty here.

However, the method according to the invention is not limited to a system with satellites in low or medium Earth orbit; it can equally apply to a geostationary satellite system.

Users are connected to the network of databases via a server located in the connection station or connected to the connection station.

If the network of databases is the Internet or a similar network, it is known in the art for database enquiries from clients to be intercepted by "proxy" servers, interception being effected for both directions, i.e. from clients to databases and from databases to clients. In the proxy servers the responses transmitted by the databases are retained for some time in the storage means of the proxy server and the pages loaded into the server are transmitted to clients without a new connection to the database being required. Accordingly, the method according to the invention can be controlled from a proxy server of this kind located in or connected to a connection station.

Another aspect of the invention therefore provides a server for access to a network of databases characterized in that it includes, for selecting the data transmission protocol type - with or without acknowledgements - for data to be transmitted to clients, the type being chosen automatically in the server according to the nature of the data to be transmitted and/or information provided by clients and/or the volume of data.

When an acknowledgement-type protocol is used, the server preferably includes means for adjusting the size of the acknowledgement window. The invention encompasses a server intended to communicate with one or more clients using an acknowledgement-type transmission protocol characterized in that it includes means for varying the size of the acknowledgement window, for example according to the bit rates for transmission from that server to the client.

A further aspect of the invention provides a client unit, i.e. a database interrogation unit. The unit is characterized in that it includes means for choosing between transmission with acknowledgements and transmission without acknowledgements, the choice being reflected, at the level of the means available to the user, by a choice between reliable transmission and fast transmission, for example.

In one embodiment of the invention the client unit can receive data on two different channels, one dedicated to an acknowledgement-type protocol and the other to a protocol without acknowledgements, and includes means for re-ordering data

received on the two channels. The re-ordered data is preferably displayed in a browser of the client unit.

The selection means can be associated with a conventional computer and consist, for example, of a JAVA applet or script constituting an interface of the browser.

The selection means can also operate automatically in the database server or in the intermediate ("proxy") server; in this case, the choice between the protocols is based on the type of file to be downloaded, for example the suffix of the file name, such as picture.bmp, picture.jpg or page.html. For example, if the database interrogated supplies high-resolution pictures, the transmission protocol requested will also be an acknowledgement-type protocol and if the database interrogated supplies sounds, such as music, the protocol requested can be of the type without acknowledgements.

The selection means can also operate automatically in the client unit, the choice between protocols being based on the query submitted or the request addressed to the databases.

The present invention provides a method of transmitting data from a database to a requesting client. For each communication, a choice is made between a TCP transmission protocol with acknowledgements and a UDP transmission protocol without acknowledgements.

In one embodiment of the invention, for a given request from a client, some data is transmitted with a transmission protocol with acknowledgements and other data is transmitted with a protocol without acknowledgements.

In one embodiment of the invention the transmission protocol is chosen according to the nature of the request expressed by the user.

In one embodiment of the invention the protocol is chosen according to the nature of the data to be transmitted and/or its volume.

In one embodiment of the invention, when a transmission protocol with acknowledgements is chosen, the length of the acknowledgement window is chosen for each call.

In one embodiment of the invention the acknowledgement window is made smaller when a transmitted data error rate exceeds a predetermined value.

The present invention also provides a terminal for connection to a database including two reception channels, one for data received using a transmission protocol with acknowledgements and the other for data received using a protocol without

acknowledgements.

In one embodiment of the invention the terminal includes an interface which can be actuated by the user to indicate a choice between reliable transmission and fast transmission.

In one embodiment of the invention the terminal includes means for automatically selecting reliable transmission or fast transmission according to the request addressed to the database.

In one embodiment of the invention the terminal includes means for re-ordering files received on two different channels.

In one embodiment of the invention re-ordered files are processed in the browser of the terminal.

The present invention further provides a server intended to be included in a network between one or more users and databases, the purpose of the server being to interpret requests from users and/or to store data received from databases. It includes means for selecting the protocol for transmitting data from the server to the user, the choice being between a transmission protocol with acknowledgements and a transmission protocol without acknowledgements.

In one embodiment of the invention the server includes means for varying the acknowledgement window (N) if a protocol with acknowledgements is used.

In one embodiment of the invention the acknowledgement window is reduced in size when the transmission error rate increases.

The present invention finally provides an application of the server to a satellite transmission system in which calls from each user are relayed by a connection station, calls between users and the connection station pass through a satellite and the server is located in the connection station or connected to the connection station.

Other features and advantages of the invention will become apparent from the following description of embodiments of the invention, which description is given with reference to the accompanying drawings, in which:

Figure 1 is a diagram showing a system using the method according to the invention,

Figure 2 is a diagram showing one aspect of the method according to the invention,

Figure 3 is a diagram showing a different embodiment of a system according to the invention.

The system shown by way of example in Figure 1 includes a number of client

installations. Only one client installation 10 is shown. The system further includes a proxy server (proximity server) 12 which is located in a connection station of a satellite telecommunication system and the Internet (network of databases), only one server 14 being shown in the figure.

The client installation 10 conventionally includes a browser 16 which sends a request 18 to a remote server 14. The request 18 is intercepted by the server 12 whose function is to interpret the query transmitted by the client in order to limit the connection time to the remote server 14. Because the network is the Internet, the call 20 between the servers 12 and 14 is a TCP call, i.e. with an acknowledgement for each group of data.

The data received from the server 14 by the server 12 is retransmitted to the user or client installation 10.

According to the invention, the connection between the server 12 and the installation 10 uses one or both of two separate channels 22 and 24. The channel 22 uses the TCP (with acknowledgements). The channel 24 uses the UDP transmission (without acknowledgements). The channel 22 is used mainly for transmissions for which a high level of reliability is needed and the channel 24 is used mainly to transmit data for which speed is the main criterion.

The browser 16 of the user installation 10 includes an interface such as a JAVA applet enabling the user to determine the required transmission quality, i.e. reliable transmission or fast transmission. This decision of the user is interpreted by the server 12 and is acted on according to the level of use of the network between the server 12 and the user 10 and the data to be transmitted from the server 12 to the user 10. Thus a multimedia transmission including a mixture of software and pictures could be transmitted on the channels 22 and 24 in parallel. The channel 22 would use the TCP to transmit the software and the channel 24 would transmit the picture data using the UDP.

The server 12 further includes means for varying the acknowledgement window for data transmitted by the TCP channel 22.

Figure 2 is a diagram showing the principle of an acknowledgement window. When a receiver R sends a request 30 to a transmitter E, the transmitter E sends data to the receiver R and, when it has received a particular number N of bytes, the receiver sends an acknowledgement 32 to the transmitter. If the transmitter E has not received the acknowledgement correctly, it sends the N bytes again. This retransmission increases the density of the traffic in a proportion that increases as the number N of

bytes increases. Accordingly, when, for example, the server 12 notices that transmission quality is defective, it reduces the length N of the acknowledgement window to limit the quantity of data to be retransmitted. This can reduce the risk of congestion of the network.

Operation is as follows:

In response to the request 18, the client unit 10 receives an html page which it analyzes and loads into a memory (arrow 40), such as the hard disk 42 of a computer. The data stored on the hard disk 42 consists of the addresses of objects and the names of files.

Then (arrows 18_1, 18_2) each object address and file name is transferred from the memory 42 to the browser 16 (arrow 44) so that the applet 26 sends requests 18_1, 18_2, etc for each object. The chosen channel 22 or 24 is determined by the proxy server 12.

After loading the various objects in sequence, the client unit re-orders the files or objects received, which generally comprise data of various kinds, such as hypermedia or hypertext files. The re-ordered data can be used or displayed in the browser 16 of the client unit.

In this example, the server 12 is located in a connection station 10 of a satellite transmission system, the station constituting a user of the transmission system.

Note that choosing the protocol or transmission channel is of practical benefit, especially in the direction from the database 14 or the server 12 to a client installation 10, because the volume of data to be transmitted is greater in this direction than in the other direction. However, the principle of choosing the protocol can be generalized, for example to transmitting data between two users.

In the embodiment of the invention shown in Figure 3 the client terminal 10_1 includes a browser 16_1 and a local proximity server 50.

The browser 16_1 communicates with the proximity server 12_1 via the local server 50.

The local server 50 manages calls to the server 12_1 using either a UDP type protocol on the channel 24_1 or a TCP type protocol on the channel 22_1, the choice being made in accordance with the invention.

The browser 16_1 is conventional, i.e. it sends requests, processes html pages and displays data received.

CLAIMS

1. A method of transmitting information from a database to a requesting client, characterized in that a transmission protocol (TCP) with acknowledgements or a transmission protocol (UDP) without acknowledgements is chosen for each call.
2. A method according to claim 1, characterized in that, for a given request from a client, some data is transmitted with a transmission protocol with acknowledgements and other data is transmitted with a protocol without acknowledgements.
3. A method according to claim 1 or claim 2, characterized in that the transmission protocol is chosen according to the nature of the request expressed by the user.
4. A method according to any of claims 1 to 3, characterized in that the protocol is chosen according to the nature of the data to be transmitted and/or the volume of the data to be transmitted.
5. A method according to any one of the preceding claims, characterized in that, when a transmission protocol with acknowledgements is used, the length (N) of the acknowledgement window is chosen for each call.
6. A method according to claim 5, characterized in that the length of the acknowledgement window is reduced when a transmitted data error rate is found to exceed a predetermined value.
7. A terminal for connection to a database, characterized in that it includes two reception channels (22, 24), one (22) for data received with a transmission protocol with acknowledgements and the other (24) for data received with a protocol without acknowledgements, and an interface operable by the user to indicate a choice between reliable transmission and fast transmission.
8. A terminal for connection to a database, characterized in that it includes two reception channels (22, 24), one (22) for data received with a transmission protocol with acknowledgements and the other (24) for data received with a protocol without acknowledgements, and means for automatically selecting reliable transmission or fast transmission according to the request addressed to the database.
9. A terminal according to claim 7 or claim 8, characterized in that it includes a browser (16_1) communicating with both reception channels via a local proximity server (50) controlling the flows of communication with the remote database.
10. A terminal according to claim 7 or claim 8, characterized in that it includes means for re-ordering the files received on the two different channels.

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11. A terminal according to claim 10, characterized in that the re-ordered files are used in the browser (16) of the terminal.

12. A server (12) adapted to be incorporated into a network between one or more users and databases, the function of that server being to interpret the requests of the user and/or to store data received from the database, characterized in that it includes means for selecting the protocol for transmitting data from the server to the user, the selection being between a transmission protocol with acknowledgements and a transmission protocol without acknowledgements.

13. A server according to claim 12, characterized in that it includes means for varying the acknowledgement window (N) when using a protocol with acknowledgements.

14. A server according to claim 13, characterized in that the acknowledgement window is reduced in size when the transmission error rate increases.

15. Application of the server according to any of claims 12 to 14 to a satellite transmission system in which calls of each user are relayed by a connection station, calls between users and the connection station passing through a satellite, the server being disposed in the connection station or connected to the connection station.

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