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(54) **METHOD AND APPARATUS PROVIDING CONNECTION RECOVERY FOR A CHAT CLIENT**

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H04L 12/26	(2006.01)
H04L 12/24	(2006.01)
H04L 29/14	(2006.01)

(52) **U.S. Cl.**
CPC ***H04L 67/145*** (2013.01); ***H04L 41/026*** (2013.01); ***H04L 41/06*** (2013.01); ***H04L 43/10*** (2013.01); ***H04L 69/40*** (2013.01)

(58) **Field of Classification Search**
CPC H04L 41/026; H04L 41/06; H04L 43/10; H04L 29/08612; H04L 29/06176; H04L 67/145; H04L 69/40
USPC 709/203, 227
See application file for complete search history.

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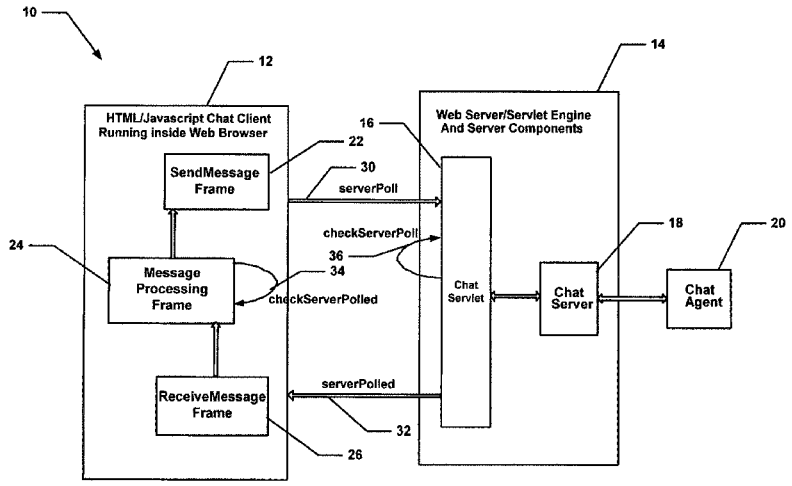
(57) **ABSTRACT**

A method, apparatus and computer program product for providing connection recovery for a chat client is presented. A chat session connection is established between a chat client and a server. Heartbeat messages are exchanged between the chat client and the server at predetermined time intervals. When a failure to receive a heartbeat message for longer than one of the predetermined time intervals, then a lost connection message is provided to at least one of the server and client. Messages for client are queued at the server while the connection is lost; and messages for the server are queued at the client while the connection is lost. If the connection can be re-established the queued messages are sent, otherwise the session is terminated.

14 Claims, 4 Drawing Sheets



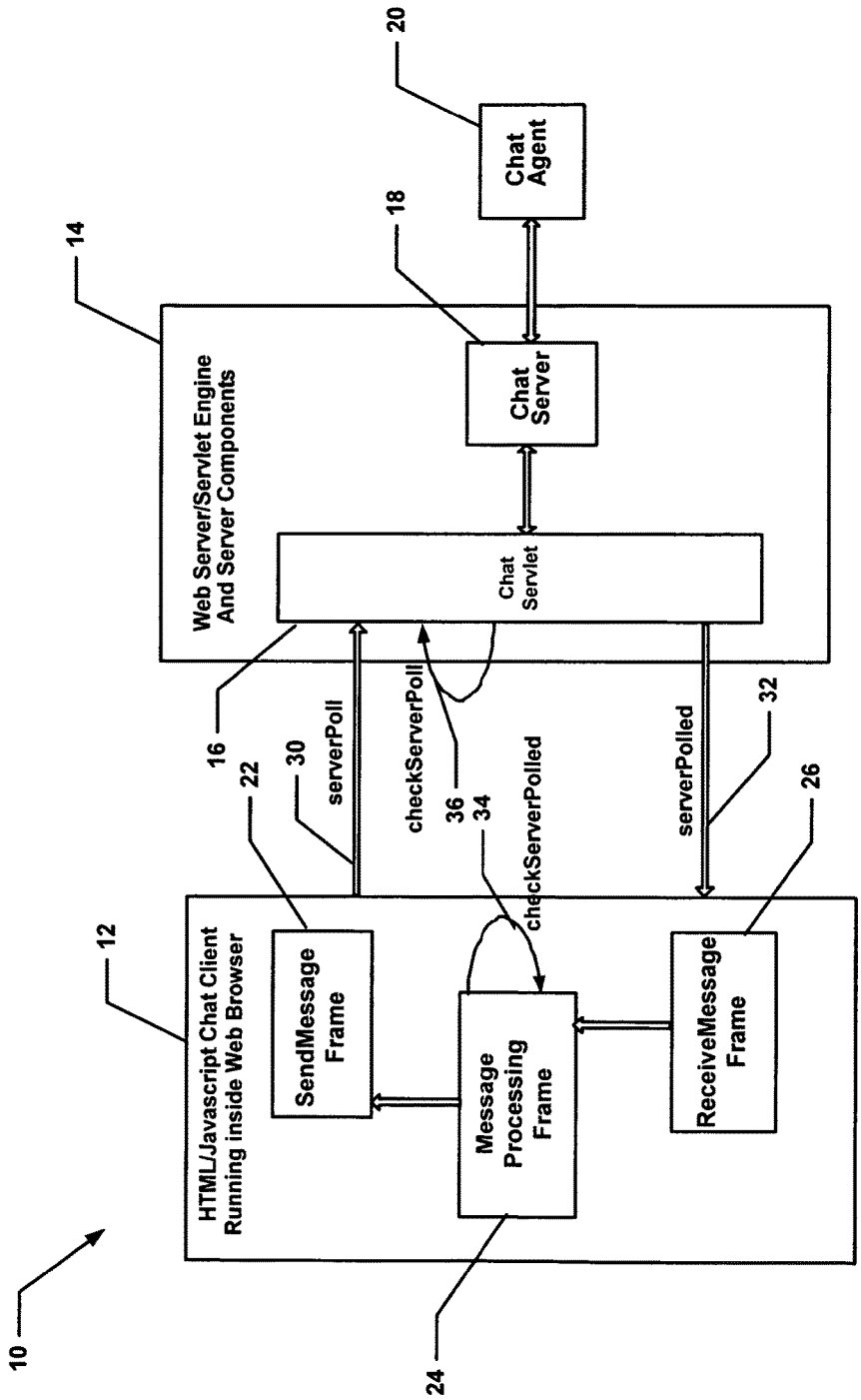

10
12
HTML/Javascript Chat Client Running inside Web Browser
14
Web Server/Servlet Engine And Server Components
16
Chat Servlet
18
Chat Server
20
Chat Agent
22
SendMessage Frame
24
Message Processing Frame
26
ReceiveMessage Frame
30
serverPoll
32
serverPolled
34
checkServerPolled
36
checkServerPoll

Figure 1

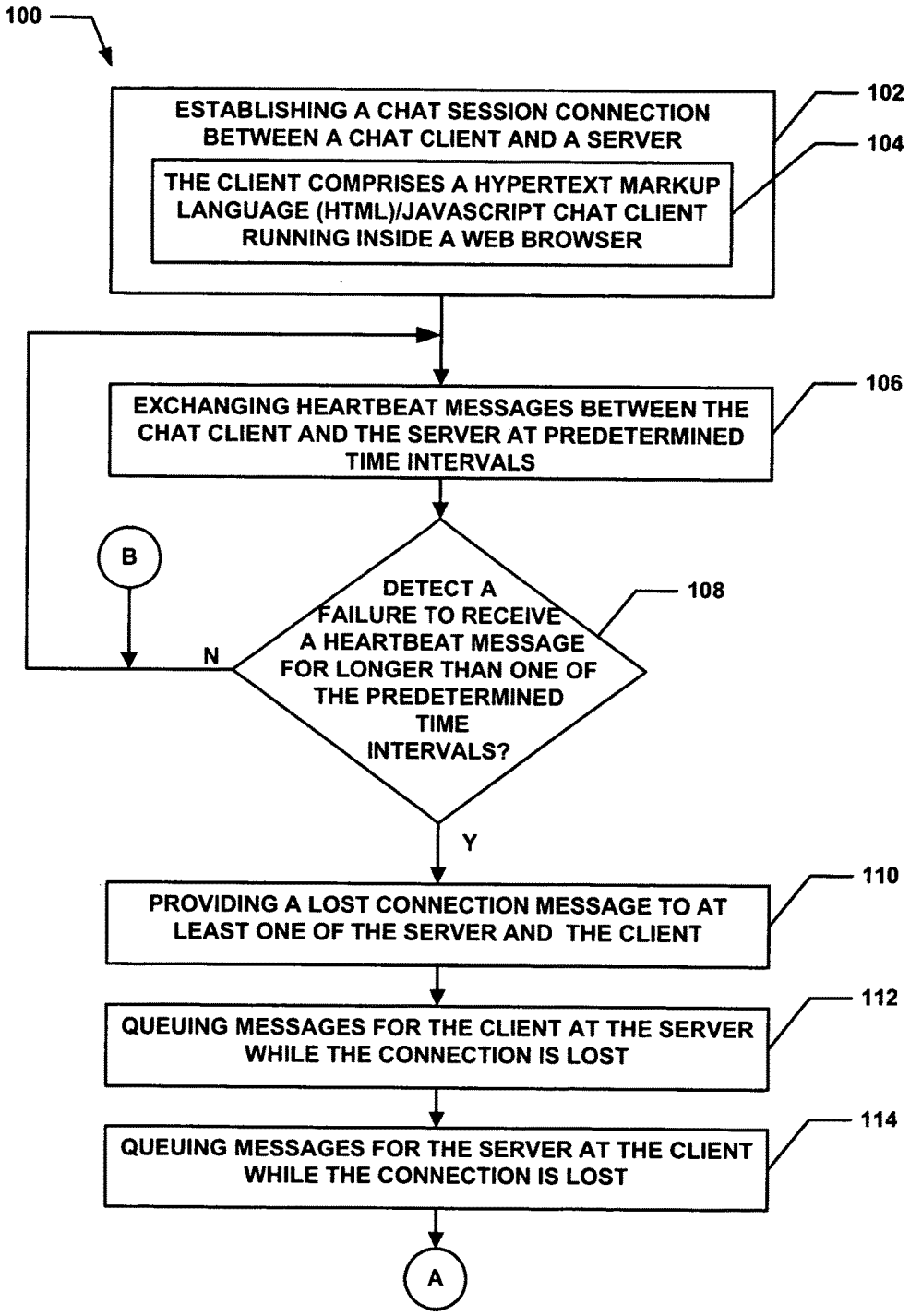

100
ESTABLISHING A CHAT SESSION CONNECTION BETWEEN A CHAT CLIENT AND A SERVER
THE CLIENT COMPRISES A HYPERTEXT MARKUP LANGUAGE (HTML)/JAVASCRIPT CHAT CLIENT RUNNING INSIDE A WEB BROWSER
102
104
EXCHANGING HEARTBEAT MESSAGES BETWEEN THE CHAT CLIENT AND THE SERVER AT PREDETERMINED TIME INTERVALS
106
B
DETECT A FAILURE TO RECEIVE A HEARTBEAT MESSAGE FOR LONGER THAN ONE OF THE PREDETERMINED TIME INTERVALS?
108
N
Y
PROVIDING A LOST CONNECTION MESSAGE TO AT LEAST ONE OF THE SERVER AND THE CLIENT
110
QUEUING MESSAGES FOR THE CLIENT AT THE SERVER WHILE THE CONNECTION IS LOST
112
QUEUING MESSAGES FOR THE SERVER AT THE CLIENT WHILE THE CONNECTION IS LOST
114
A

Figure 2A

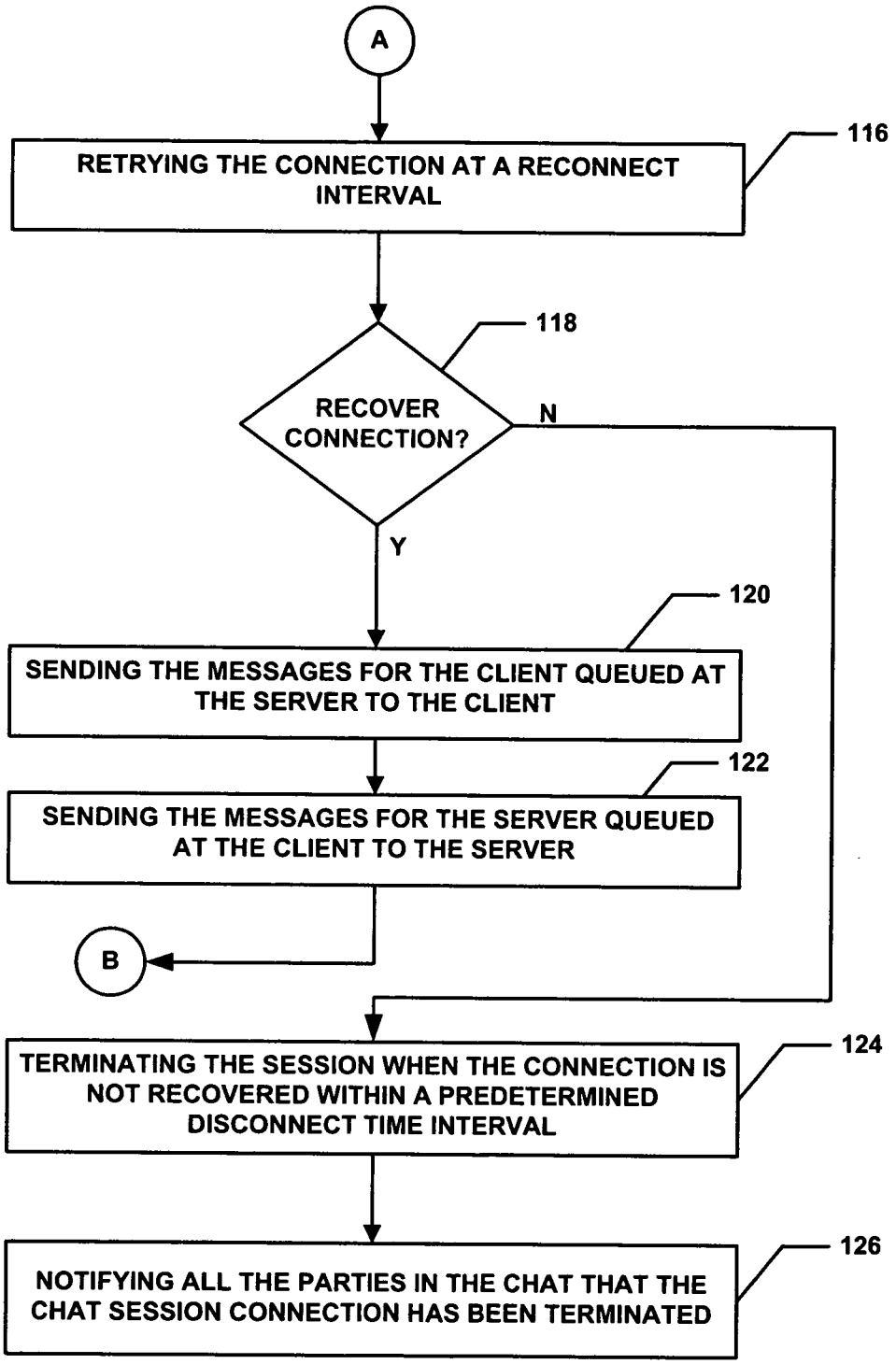

A
RETRYING THE CONNECTION AT A RECONNECT INTERVAL
116
118
RECOVER CONNECTION?
N
Y
120
SENDING THE MESSAGES FOR THE CLIENT QUEUED AT THE SERVER TO THE CLIENT
122
SENDING THE MESSAGES FOR THE SERVER QUEUED AT THE CLIENT TO THE SERVER
B
124
TERMINATING THE SESSION WHEN THE CONNECTION IS NOT RECOVERED WITHIN A PREDETERMINED DISCONNECT TIME INTERVAL
126
NOTIFYING ALL THE PARTIES IN THE CHAT THAT THE CHAT SESSION CONNECTION HAS BEEN TERMINATED

Figure 2B

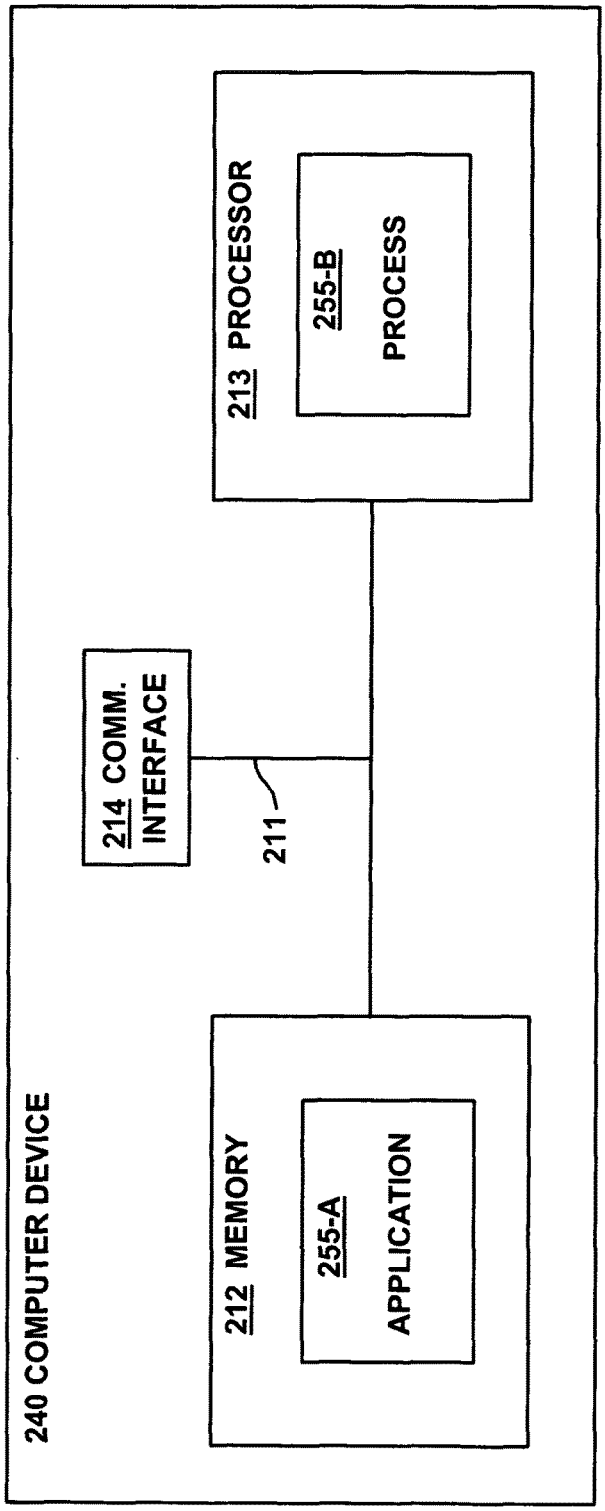

240 COMPUTER DEVICE
212 MEMORY
255-A
APPLICATION
214 COMM. INTERFACE
211
213 PROCESSOR
255-B
PROCESS

Figure 3

METHOD AND APPARATUS PROVIDING CONNECTION RECOVERY FOR A CHAT CLIENT

BACKGROUND

Chat sessions have become ubiquitous. Chat sessions are a text-conferencing capability via the Internet allowing real-time communication between two users via computer. A chat session enables two or more people to use the computer as a text conferencing system. Once a chat has been initiated, either user can enter text by typing on the keyboard and the entered text will appear on the other user's monitor. Most networks and online services offer a chat feature.

The Internet Relay Chat (IRC) protocol has been designed over a number of years for use with text based conferencing. The IRC Protocol is based on the client-server model, and is well suited to running on many machines in a distributed fashion. A typical setup involves a single process (the server) forming a central point for clients (or other servers) to connect to, performing the required message delivery/multiplexing and other functions.

The server forms the backbone of IRC as it is the only component of the protocol which is able to link all the other components together: it provides a point to which clients may connect to talk to each other, and a point for other servers to connect to. The server is also responsible for providing the basic services defined by the IRC protocol.

A client is anything connecting to a server that is not another server. There are two types of clients which both serve a different purpose. User Clients are generally programs providing a text-based interface that is used to communicate interactively via IRC. Unlike users, service clients are not intended to be used manually nor for talking. They have a more limited access to the chat functions of the protocol, while optionally having access to more private data from the servers. Services are typically automatons used to provide some kind of service (not necessarily related to IRC itself) to users. An example is a service collecting statistics about the origin of users connected on the IRC network.

To be able to exchange messages, two clients must be able to locate each other. Upon connecting to a server, a client registers using a label that is then used by other servers and clients to know where the client is located. Servers are responsible for keeping track of all the labels being used. The IRC protocol provides no mean for two clients to directly communicate. All communication between clients is relayed by the server(s).

SUMMARY

Conventional mechanisms for providing chat connections and sessions such as those explained above suffer from a variety of deficiencies. One such deficiency is that conventional solutions available today do not transparently recover a lost Hyper-Text transmission Protocol (HTTP) connection between the server and the client, nor notify the status of the connection to the parties involved. The solutions available today do not provide transparent recovery or near real-time time feedback. One conventional method provides a chat recovery upon a manual reload of the chat client.

Embodiments of the invention significantly overcome such deficiencies and provide mechanisms and techniques that provide a method of providing connection recovery for a chat client. This includes recovery of the communication

failures between the client running in the Internet browser and the backend server component hosted in the web server.

Particular embodiments of the presently described method of providing connection recovery for a chat client notify both the agent and the customer that the client connection has been lost and will try to reconnect automatically. Once the connection is reestablished both the agent and the customer are notified with the reconnect message and can carry on with the chat without any manual intervention. The methodology also takes care of missed poll intervals due to network latency or intermittent network glitch or any other unknown exceptions while submitting requests to the server by the client. If an interruption occurs due to a scripting error or customer inadvertently moving away from the chat hosting website, the framework detects that this particular client has not polled within the specified heartbeat interval and will feed appropriate messages to the agent notifying that the client has lost connection to the server and is currently unavailable. Meanwhile all the messages intended for the client to server or server to client are queued on the client and server respectively and are received by the client and server when the connection is established again.

In a particular embodiment of a method of providing connection recovery for a chat client, the method begins by establishing a chat session connection between a chat client and a server. Heartbeat messages are exchanged between the chat client and the server at predetermined time intervals. When a failure to receive a heartbeat message for longer than one of the predetermined time intervals is detected, then a lost connection message is provided to at least one of the server and client. Messages for client are queued at the server while the connection is lost, and messages for the server are queued at the client while the connection is lost. If the connection can be re-established the queued messages are sent, otherwise the session is terminated.

Other embodiments include a computer readable medium having computer readable code thereon for providing connection recovery for a chat client. The medium includes instructions for establishing a chat session connection between a chat client and a server. The medium also includes instructions for exchanging heartbeat messages between the chat client and the server at predetermined time intervals. The medium further includes instructions for detecting a failure to receive a heartbeat message for longer than one of the predetermined time intervals and instructions for providing a lost connection message to at least one of the server and the client. Additionally, the medium includes instructions for queuing messages for the client at the server while the connection is lost and instructions for queuing messages for the server at the client while the connection is lost. The medium further includes instructions wherein if the connection can be re-established the queued messages are sent, otherwise the session is terminated.

Still other embodiments include a computerized device, configured to process all the method operations disclosed herein as embodiments of the invention. In such embodiments, the computerized device includes a memory system, a processor, communications interface in an interconnection mechanism connecting these components. The memory system is encoded with a process that provides connection recovery for a chat client as explained herein that when performed (e.g. when executing) on the processor, operates as explained herein within the computerized device to perform all of the method embodiments and operations explained herein as embodiments of the invention. Thus any

computerized device that performs or is programmed to perform up processing explained herein is an embodiment of the invention.

Other arrangements of embodiments of the invention that are disclosed herein include software programs to perform the method embodiment steps and operations summarized above and disclosed in detail below. More particularly, a computer program product is one embodiment that has a computer-readable medium including computer program logic encoded thereon that when performed in a computerized device provides associated operations providing connection recovery for a chat client as explained herein. The computer program logic, when executed on at least one processor with a computing system, causes the processor to perform the operations (e.g., the methods) indicated herein as embodiments of the invention. Such arrangements of the invention are typically provided as software, code and/or other data structures arranged or encoded on a computer readable medium such as an optical medium (e.g., CD-ROM), floppy or hard disk or other a medium such as firmware or microcode in one or more ROM or RAM or PROM chips or as an Application Specific Integrated Circuit (ASIC) or as downloadable software images in one or more modules, shared libraries, etc. The software or firmware or other such configurations can be installed onto a computerized device to cause one or more processors in the computerized device to perform the techniques explained herein as embodiments of the invention. Software processes that operate in a collection of computerized devices, such as in a group of data communications devices or other entities can also provide the system of the invention. The system of the invention can be distributed between many software processes on several data communications devices, or all processes could run on a small set of dedicated computers. At least two computers are needed one for server and CRM chat agent and the other for the client running browser)

It is to be understood that the embodiments of the invention can be embodied strictly as a software program, as software and hardware, or as hardware and/or circuitry alone, such as within a data communications device. The features of the invention, as explained herein, may be employed in data communications devices and/or software systems for such devices such as those manufactured by Avaya Inc. of Lincroft, N.J.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of preferred embodiments of the invention, as illustrated in the accompanying drawings in which like reference characters refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention.

FIG. **1** illustrates a block diagram of a system providing connection recovery for a chat client in accordance with embodiments of the invention;

FIGS. **2**A and **2**B illustrate flow diagrams of a particular embodiment of a method of providing connection recovery for a chat client; and

FIG. **3** illustrates an example computer device architecture for a computer device that performs connection recovery for a chat client in accordance with embodiments of the invention.

DETAILED DESCRIPTION

Referring now to FIG. **1**, a particular embodiment of an environment **10** which provides connection recovery for a chat session is shown. The system includes a chat client **12**, in this embodiment realized as an HTML/JavaScript chat client running inside a browser. The client **12** is shown including a SendMessage frame **22**, a Message Processing Frame **24** and a ReceiveMessage frame **26**. The SendMessage frame **22** is a hidden frame which is used by the Message Processing Frame **24** to send the messages. The Message Processing Frame **24** is a hidden frame that contains the logic of sending, receiving and processing messages. The ReceiveMessage frame **26** is a hidden frame which is used by the Message Processing Frame **24** to receive the message and for the Chat Servlet **18** to write the callback messages.

The client **12** is in communication with a server **14**, realized in this embodiment as a web server/servlet engine and further including server components. The server components include a Chat Servlet **16** in communication with a Chat Server **18**. Also shown is a Chat Agent **20** in communication with the Chat Server **18**. The Chat Servlet **16** performs the server side tasks and acts as a proxy between the client **12** and the Chat Server **18**. The Chat Server **18** hosts the chat room and maintains the state and various statistics of a chat. The Chat Agent **20** is a client application for a real agent.

In a particular example, a mechanism is provided wherein a Chat Client **12** and a Chat Servlet **16** running inside the Servlet Engine **14** exchange heartbeat messages during a configurable poll interval. Both the client **12** and server **14** component are configured to check for the heartbeat messages every configurable check interval (greater than a poll interval). The heartbeat mechanism happens in two hidden frames namely tunnsend (e.g., SendMessage Frame **22**) and tunnreceive (e.g., ReceiveMessage Frame **26**) keeping the mechanism transparent to the client.

A poll message (e.g., serverPoll **30**) sent from the client **12** to the server **14** results is a response where the hidden frame gets a serverPolled **32** JavaScript function callback. The client keeps checking for the serverPolled message **32** for every configured check interval (checkServerPolled **34**), similarly the server component **14** checks for successful client poll message for every configured check interval (checkServerPoll **36**). If either client **12** or the server component **14** does not see a heartbeat message during the check interval then the client **12** displays the message "Lost connection to the server, retrying . . . " and the server component **14** sends a message to the agent **20** "Client has lost connection to the server, retrying . . . ".

The chat customer client **12** and chat agent **20** are now both aware of the communication issue. During this period (where the chat client **12** and the chat agent **20** have lost communication) any chat messages sent by the customer are queued up on the chat client **12** and any messages sent by the agent **20** are queued up on the server component **14** side.

When the connection loss is realized by the client **12** a hidden frame keeps retrying the connection every configurable reconnect interval by sending a serverPoll message **30** and checking for serverPolled message **32**. The number of attempts made by the client **12** to retrieve the connection is limited by a configurable disconnect interval (which may be measured from the time when the connection is lost). The connection is recovered if the client receives a successful serverPolled message **32**. If the connection is not recovered within the disconnect interval then both the chat client **12** and the agent client **20** are notified that the chat customer has disconnected and the chat call is disconnected. All the

parameters are configurable thus providing great flexibility in solving communication issues related to slow and/or malfunctioning networks.

A flow chart of a particular embodiment of the presently disclosed method is depicted in FIGS. **2**A and **2**B. The rectangular elements are herein denoted "processing blocks" and represent computer software instructions or groups of instructions. The diamond shaped elements, are herein denoted "decision blocks," represent computer software instructions, or groups of instructions which affect the execution of the computer software instructions represented by the processing blocks.

Alternatively, the processing and decision blocks represent steps performed by functionally equivalent circuits such as a digital signal processor circuit or an application specific integrated circuit (ASIC). The flow diagrams do not depict the syntax of any particular programming language. Rather, the flow diagrams illustrate the functional information one of ordinary skill in the art requires to fabricate circuits or to generate computer software to perform the processing required in accordance with the present invention. It should be noted that many routine program elements, such as initialization of loops and variables and the use of temporary variables are not shown. It will be appreciated by those of ordinary skill in the art that unless otherwise indicated herein, the particular sequence of steps described is illustrative only and can be varied without departing from the spirit of the invention. Thus, unless otherwise stated the steps described below are unordered meaning that, when possible, the steps can be performed in any convenient or desirable order.

Referring now to FIGS. **2**A and **2**B, a particular embodiment of a method **100** of providing connection recovery for a chat client is shown. The method **100** begins with processing block **102** wherein a chat session connection is established between a chat client and a server. In a particular embodiment, as shown in processing block **104**, the client comprises a Hypertext Markup Language (HTML)/JavaScript chat client running inside a web browser.

Processing block **106** discloses exchanging heartbeat messages between the chat client and the server at predetermined time intervals. The time interval is preferably equal to poll interval.

At decision block **108** a determination is made regarding whether there was a failure to detect a heartbeat message for longer than one of the predetermined time intervals. When there was not a failure to detect a heartbeat message processing continues at processing block **106**. On the other hand, when there is a failure to detect a heartbeat message for longer than the predetermined time interval, then processing continues at processing block **110**.

At processing block **110**, a lost connection message is provided to at least one of the server and the client, and preferably to both. At processing block **112**, messages for the client are queued at the server while the connection is lost. Similarly, in processing block **114**, messages for the server are queued at the client while the connection is lost.

Processing block **116** recites retrying the connection at a reconnect interval. The reconnect interval may be set to an appropriate value to compensate for network conditions.

At decision block **118**, a determination is made regarding whether the session connection has been recovered. When the connection is recovered, processing continues at processing block **120**. When the attempt to recover the session connection fails, processing continues at processing block **124**.

At processing block **120**, when the connection is recovered, any messages for the client which have been queued at the server are sent to the client. Similarly, at processing block **122**, any messages for the server which have been queued at the client are sent to the server. Processing then continues at processing block **106** et seq.

At processing block **124**, when the attempt to recover the session connection fails, when the connection is not recovered within a predetermined disconnect time interval the session is terminated. The predetermined disconnect time interval can be adjusted to account for slow and/or malfunctioning networks. At processing block **126**, all the parties involved in the chat session are notified that the chat session connection has been terminated.

FIG. **3** illustrates example architectures of a computer system **240**. The computer system **240** may be any type of computerized system such as a personal computer, workstation, portable computing device, mainframe, server or the like. In this example, the system includes an interconnection mechanism **211** that couples a memory system **212**, a processor **213**, and a communications interface **214**. The communications interface **214** allows the computer system **240** to communicate with external devices or systems.

The memory system **212** may be any type of computer readable medium that is encoded with an application **255**-A that represents software code such as data and/or logic instructions (e.g., stored in the memory or on another computer readable medium such as a disk) that embody the processing functionality of embodiments of the invention for the agent **255** as explained above. The processor **213** can access the memory system **212** via the interconnection mechanism **211** in order to launch, run, execute, interpret or otherwise perform the logic instructions of the applications **255**-A for the host in order to produce a corresponding agent process **255**-B. In other words, the process **255**-B represents one or more portions of the application **255**-A performing within or upon the processor **213** in the computer system.

It is to be understood that embodiments of the invention include the applications (i.e., the un-executed or non-performing logic instructions and/or data) encoded within a computer readable medium such as a floppy disk, hard disk or in an optical medium, or in a memory type system such as in firmware, read only memory (ROM), or, as in this example, as executable code within the memory system **212** (e.g., within random access memory or RAM). It is also to be understood that other embodiments of the invention can provide the applications operating within the processor **213** as the processes. While not shown in this example, those skilled in the art will understand that the computer system may include other processes and/or software and hardware components, such as an operating system, which have been left out of this illustration for ease of description of the invention.

Having described preferred embodiments of the invention it will now become apparent to those of ordinary skill in the art that other embodiments incorporating these concepts may be used. Additionally, the software included as part of the invention may be embodied in a computer program product that includes a computer useable medium. For example, such a computer usable medium can include a readable memory device, such as a hard drive device, a CD-ROM, a DVD-ROM, or a computer diskette, having computer readable program code segments stored thereon. The computer readable medium can also include a communications link, either optical, wired, or wireless, having program code segments carried thereon as digital or analog signals. Accordingly, it is submitted that that the invention

should not be limited to the described embodiments but rather should be limited only by the spirit and scope of the appended claims.

What is claimed is:

1. A computer-implemented method in which a computer system running a chat client performs operations providing connection recovery, the method comprising:

requesting by said computer system a chat session connection with a server;

sending, from said computer system, heartbeat messages from the computer system to said server at a predetermined time interval in a first hidden frame, keeping the heartbeat messages transparent from said chat client, wherein said sending heartbeat messages comprises sending, by said computer system, a serverPoll message to said server;

receiving a return heartbeat message from the server in response to each of the heartbeat messages sent from the computer system, wherein the return heartbeat message comprises a serverPolled function callback in a second hidden frame;

detecting, by said computer system, a failure to receive a serverPolled function callback for longer than one of said predetermined time intervals, indicating said chat client connection is lost; and

queuing messages at said computer system while said chat session connection is lost.

2. The method of claim **1** further comprising, in response to said failure to receive a serverPolled function callback, said computer system retrying the connection at a reconnect interval.

3. The method of claim **2** further comprising:

when said retrying the chat session connection is successful, said computer system sending said messages queued at said computer system to said server.

4. The method of claim **2** further comprising said computer system terminating said session when said chat session connection is not recovered within a predetermined disconnect time interval.

5. A non-transitory computer readable storage medium having computer readable code embodied therewith, the computer readable program code comprising:

computer readable program code configured to provide requesting by said computer system a chat session connection with a server;

computer readable program code configured to provide sending, from said computer system, heartbeat messages from the computer system to said server at a predetermined time interval in a first hidden frame, keeping the heartbeat messages transparent from said chat client, wherein said sending heartbeat messages comprises sending, by said computer system, a serverPoll message to said server;

computer readable program code configured to provide receiving a return heartbeat message from the server in response to each of the heartbeat messages sent from the computer system, wherein the return heartbeat message comprises a serverPolled function callback in a second hidden frame;

computer readable program code configured to provide detecting, by said computer system, a failure to receive a serverPolled function callback for longer than one of said predetermined time intervals, indicating said chat client connection is lost; and

computer readable program code configured to provide queuing messages at said computer system while said chat session connection is lost.

6. The non-transitory computer readable storage medium of claim **5** further comprising computer readable program code configured to provide, in response to said failure to receive a serverPolled function callback, retrying the connection at a reconnect interval.

7. The non-transitory computer readable storage medium of claim **6** further comprising computer readable program code configured to provide:

said computer system recovering said connection; and

said computer system sending said messages queued at said computer system to said server.

8. The non-transitory computer readable medium of claim **6** further comprising computer readable program code configured to provide said computer system terminating said session when said chat session connection is not recovered within a predetermined disconnect time interval.

9. A computer system running a chat client, said computer system comprising:

a memory;

a processor;

a communications interface;

an interconnection mechanism coupling the memory, the processor and the communications interface; and

wherein the memory is encoded with a connection recovery process for a chat client application that when performed on the processor, provides a process for processing information, the process causing the computer system to perform the operations comprising:

requesting by said computer system a chat session connection with a server;

sending, from said computer system, heartbeat messages from the computer system to said server at a predetermined time interval in a first hidden frame, keeping the heartbeat messages transparent from said chat client, wherein said sending heartbeat messages comprises sending, by said computer system, a serverPoll message to said server;

receiving a return heartbeat message from the server in response to each of the heartbeat messages sent from the computer system, wherein the return heartbeat message comprises a serverPolled function callback in a second hidden frame;

detecting, by said computer system, a failure to receive a serverPolled function callback for longer than one of said predetermined time intervals, indicating said chat client connection is lost; and

queuing messages at said computer system while said chat session connection is lost.

10. The computer system of claim **9** wherein the computer system further performs the operation of, in response to said failure to receive a serverPolled function callback, said computer system retrying the connection at a reconnect interval.

11. The computer system of claim **10** wherein the computer system further performs the operations of recovering said connection; and

said computer system sending said messages queued at said computer system to said server.

12. The computer system of claim **10** wherein the computer system further performs the operations of terminating said session when said chat session connection is not recovered within a predetermined disconnect time interval.

13. The method of claim **1** wherein said predetermined time interval is configurable in order to provide flexibility in solving communication issues related to a malfunctioning network.

14. The non-transitory computer readable medium of claim **5** wherein said predetermined time interval is configurable in order to provide flexibility in solving communication issues related to a malfunctioning network.

* * * * *