With some deferred-time applications, there are several stages at which the user can choose to ignore the message, or can avoid taking a necessary step to receive and view the video. The sequence of actions necessary to view a video may result in a receiver not viewing the video. Some commercial senders of videos, such as advertisers, may want to limit the possibility that a receiver might ignore or "opt out" of viewing a video.

Symmetry

Applications that involve the transmission of videos over a network, such as the Internet, generally use an asymmetric system design that divides the supporting technologies into two distinct groups: the video messaging "Sender" and the video messaging "Receiver." The "Sender" uses a sender computer provided with one set of software tools to capture, edit, and otherwise generate streaming video content. Prior art software products that perform the "sending" operations include the Microsoft Media Encoder and the Real G2 Producer. The VideoShare Producer of the copending U.S.S.N. 09/497,587 is another system and method for sending a streaming video from a sender to a server and then on to a viewer. The "Receiver" uses a receiver computer that is provided with a different set of software tools to receive, manipulate, and display the video. Prior art software products that implement the "receiver" functionality include the Windows Media Player and Real G2 Player.

In asymmetric systems, the sending computer often cannot determine important features of the receiving computer. The receiving computer also often cannot determine important features of the sending computer. As an example, the sending computer generally does not have any information about the kind of software that the receiver computer has available. The sending computer generally cannot determine the capabilities of the receiver computer, such as CPU power or available network connection speeds. The sending computer generally knows nothing about the default control setting of the receiving computer as regards security protocols, preferred formats, and the like. In general, the application running on the sending computer and the application running on the receiving computer do not communicate directly. The "Sender" transmits a message for receipt by the "Receiver," without assurance that the "Receiver" is available to receive the message, or that the "Receiver" can decipher the message that it does receive.

Furthermore, as a practical matter it is difficult, if not impossible, to extend the features of one of the "Sender" and the "Receiver" without a corresponding improvement or addition of capabilities by the other. Software for use in such applications is written and developed by

various organizations. In the absence of uniform standards, each developer can prepare software that has different features from the software of others. Some of the features can be proprietary. As one example, it is difficult to extend the features of both the video sending and receiving aspects at the same time. In such instances, a "Sender" and a "Receiver" may find that they cannot communicate. An example of such a failure to be able to communicate that is well known is the inability of some older Web browser software to correctly render Web pages prepared for use with different browser software because the embedded commands in the pages were not understood or were incorrectly interpreted by browsers other than the intended browser software.

Network Structure

The VideoShare Producer system and method, which is described as one embodiment in copending U.S.S.N. 09/497,587, is a solution that depends on the operation of a server. FIG. 2A depicts the structure of the VideoShare system and method as represented by the VideoShare Producer embodiment. A "sender A" using sender computer 302 generates or obtains a video that the "sender" wishes to share with or publish to a "receiver B." In one embodiment described in copending U.S.S.N. 09/497,587, sender computer 302 has a copy of the VideoShare Producer software that is used to obtain, prepare and transmit the video. In the VideoShare system and method, the sender computer 302 of "sender A" appears to have a direct connection to the receiver computer 304 of "receiver B." The dotted arrow from "A" to "B" denotes the apparent connection. In practice, the sender computer 302 of "sender A" transmits the video segment to a server 306 that is operated by a hosting service, such as the VideoShare service. This upload is denoted by the arrow extending from the sender computer 302 to the VideoShare server 306. The VideoShare server 306 in turn notifies the receiver computer 304 of "receiver B" that a video is available for viewing. Upon an acknowledgment from B that the video is desired by B, the VideoShare server 306 streams the video to the receiver computer 304 for viewing by B. The streaming of the video is denoted by the arrow extending from the VideoShare server 306 to the receiver computer 304. The receiver computer 304 uses software designed to display a streaming video, such as the Microsoft Media Player, for example, in order to display the video to "receiver B."

In the VideoShare Producer system and method, when A, using sender computer 302, wants to send B, who uses receiver computer 304, a video message (for example, a Video Greeting Card), the apparent connection is between the computers 302, 304 of A and B directly.

However, the actual data connection is between A's sender computer 302 and the VideoShare server 306 and then between the server 306 and B's receiver computer 304.

The steps in the process are outlined in overview in flowchart 201 in FIG. 2B, and as described in U.S.S.N. 09/497,587. At step 202, Sender A records a video message using sender computer 302 and associated hardware and software. At step 203, Sender A uploads the video message to VideoShare Server 306. In step 204, VideoShare Server 306 notifies Receiver B, who operates receiver computer 304, that a video message is available. In step 205, Receiver B acknowledges the notification (and requests delivery of the message). At step 206, the VideoShare Server 306 streams the video message to receiver computer 304, where Receiver B views the message. The apparent transaction, that of Sender A sending a video message to Receiver B, does not in fact occur directly, but only through the intermediation of the VideoShare Server 306, which is called on to both receive the video message and send on the video message. There is a computational load and transmission bandwidth requirement for each transmission of the video file. The operational costs, computational load, and bandwidth requirements to service a growing user base become ever larger as the number of users and the amount of traffic increases.

In the model embodied in the VideoShare service, videos are uploaded to, stored on, and streamed from a server system, such as server computer 306, which can comprise one hosting facility at one location or multiple facilities at multiple locations. Each hosting facility can service a large number of concurrent users. The VideoShare Producer system and method can be considered topologically to be a "Star Network" where all clients machines that are operating in the system are in constant communication with a node, and all video traffic passes through the server.

Such topologies have three main limitations.

First, as the number of client computers concurrently using a server grows, the load on the single server node of the network increases rapidly. For example, in the system of FIG. 2, in which only A's sender computer 302 and B's receiver computer 304 are connected via server 306, A can send a video only to B. However, if there are many additional users operating computers connected to the server 306, for example users C through Z, A can now send the same video to a plurality of recipients, namely B through Z. That is, the number of potential interactions (i.e., transmissions) increases at a rate far faster than the rate of increase of users. In the limit, the number of interactions is given by the theory of the number of combinations of N

things, where N is an integer greater than 1, taken two at a time. This number increases at a rate of the order of the square of the number N of client computers and their users. As the load grows, the server's finite resources must be ever more thinly distributed to each client computer. In such a case, increased success in sharing video over a network requires more infrastructure to continue to perform the necessary tasks at an acceptable level of performance.

Second, a failure on the single node of the network causes a large disruption of service to the connections of many client computers to the server. It is not uncommon that a single server problem can create communication problems for tens-of-thousands of client computers (and their users) at once. In addition, disturbances of a server that are less than complete failures can seriously degrade the service of many, for example by lengthening the time required to process requests that pass through the server.

Third, in a network that has a server, the costs to build, to operate, and to maintain the server can be large. In particular, when the size of the typical message is large, such as is the case with video files, and the amount of traffic increases, the costs to maintain the ability of the server to perform at an acceptable level can escalate quickly.

Caching & Routing

A network that employs a server to handle data that flows between sender computers and receiver computers will in general require additional storage capacity in order to hold the messages that are in transmission to receiver computers that cannot immediately accept the messages. This situation involves having one or more caches or storage such as hard disks to hold the messages for later transmission from the server to the intended recipient computer. The server will then have to deal with the overhead of storing and retrieving messages in addition to the demands of receiving and sending the messages. If the server is also responsible for routing the messages sent between a sender computer and a receiver computer, the server will spend time communicating with other computers to determine whether sufficient bandwidth exists on a particular connection to carry the intended message, as well as time spent by the server in sending the message itself.

Extensibility

Extensibility refers to the ease or difficulty (and in the extreme, the very possibility) of expanding a system, for example by adding additional capacity and/or additional operational features. Normally, when a piece of software is released to the public, extensibility is accomplished through different versions that are sold separately as complete packages or through

upgrades. The user often is charged for upgrades to software packages. For example, version 1.0 of a word processor generally has fewer features than version 2.0 of the same software. The end user who wants to upgrade a software package must install the new version of software manually, typically either through an Internet download or through a purchase.

With the advent of the Component Object Model (COM) in 1995, operating systems, such as the Windows operating systems, made available runtime binding of software objects. Runtime binding means that when the software application is run, a number of software objects, each comprising one core functionality, can become active and can create connections to one another. In the COM model, a particular object can be replaced with a different version of that object, with an associated change only in the function that the particular object provides. Therefore, in the Component Object Model, a software release is a collection of individual, replaceable, objects, rather than a single monolithic piece of software that must be reassembled in order to change some feature of the code. As long as software developers maintain a consistent Application Programming Interface (API), it is possible to exchange one version of a software object for another at runtime (i.e., perform an upgrade of a selected functionality).

The Invention and the Attributes of Immediacy, Symmetry, Network Structure, Caching & Routing, and Extensibility

The present invention, one embodiment of which is called the Instant Video Messenger (IVM), relates to methods and systems that provide advantages in Immediacy, Symmetry, Network Structure, Caching & Routing, and Extensibility.

Immediacy

FIG. 3 shows the relationship of an embodiment of the invention to the prior art NetMeeting technology and to the VideoShare Producer technology of the copending U.S.S.N. 09/497,587. The embodiment is called the Instant Video Messenger (IVM). IVM falls into an intermediate position along the horizontal "immediacy" axis because the time for delivery from Sender A to Receiver B may range from nearly instantaneous to a lengthy interval, as will be described in more detail below. IVM is neither "Real-time" nor is it fully "Deferred-time". IVM allows content creators the ability (and the possibility) to send streaming video content with little delay to viewers with few chances to "opt-out." IVM can be used in conjunction with both free personal use or paid-for professional services.

Symmetry

With the VideoShare Producer described in copending U.S.S.N. 09/497,587, functionality can be added to the Producer (e.g., video sending) and the web site (e.g., storage, notification, and the like). However, functionality generally cannot be added to the playback features that are available to a user who employs a third party playback application, such as the Windows Media Player, for example.

Even if there is an agreement among software providers as to the features to be accommodated, there can still be "run-time" issues relating to compatibility. For example, a change of preferences or status by one of the sender computer and the receiver computer (e.g., changing connection speeds) needs to be communicated to the other, and there may be no mechanism to do so. For example, if a computer begins a new task, in particular in a multithreaded operating environment, the capacity available to those tasks that were running when the new task begins may have to be reduced. As an example, a communication link that exists when a new task begins may have to slow down to allow the computer's CPU to have an opportunity to handle the new task, and conversely, when a task ends, the CPU is freed of a requirement to service the terminating task, and can devote more effort to the communication, link which may then be capable of speeding up.

According to one embodiment of the invention, the network configuration that supports the Instant Video Messenger is completely symmetric. The software running on the sender computer is exactly the same as the software running on the receiver computer, with the possible exception for differences due to version updates. The "Send/Receive" package can be prepared in a modular form comprising one or more Dynamic Link Library (.DLL) files, so that updating an installed copy of the software can be carried out by replacing an older version of a .DLL file with the most current version. The Instant Video Messenger is able to address the "knowledge" issues (i.e., the sender computer "knows" about the software operating on the receiver computer), because both computers operate the same software. The Instant Video Messenger is able to address the "feature extensibility" issues, (i.e., issues that relate to improvements that appear in both the sender software and the receiver software at the same time) because the software has a common origin, and is modular, thereby allowing updates of the corresponding transmit and receive modules at the same time.

Network Structure

FIG. 4A shows a topology in accordance with one embodiment of the invention. According to the invention, the IVM client software that operates on a sender computer 302 has the capacity to transfer the contents of a video message directly to other IVM client software operating on a receiver computer 304. Each Sender/Receiver is capable of streaming video itself, without reliance on a network centralized server. In the IVM system servers have a more limited role than in the traditional client/server network model. In an IVM system, servers, such as the server 406, are responsible for database transactions, which require limited bandwidth and computational power in comparison to the higher bandwidth and computational requirements for streaming video from a server, in the traditional client/server model. In one embodiment, the server 406 has only limited database requirements. Such limited requirements for transmission bandwidth and for limited database manipulation simplify the replication of the server 406, because the server 406 need not be expensive or complicated. Ease of replication of the server 406 is useful to provide redundancy in case of critical operational failure of the server 406, and to allow the addition of more such servers as the IVM system grows (i.e., more IVM client computers are added) and user demand for the IVM service/system increases. According to the present invention, the embodiment called the Instant Video Messenger does not rely on a video streaming center 306.

FIG. 4B shows the steps in the process in overview in flowchart 401. At step 402, Sender A, using sender computer 302, asks the IVM Server 406 if Receiver B is online via receiver computer 304. IVM Server 406 responds that Receiver B is online. At step 403, Sender A records a video message using sender computer 302 and associated hardware and software. At step 404, Sender A, using sender computer 302, notifies Receiver B that a video message is ready for transmission to Receiver B via receiver computer 304. In step 405, Receiver B acknowledges the notification (and requests delivery of the message). At step 206, Sender A, using sender computer 302, streams the video message to receiver computer 304, where Receiver B views the message. The apparent transaction, that of Sender A sending a video message to Receiver B, occurs directly without the intermediation of the IVM Server 406, which not called on to either receive the video message or send on the video message. The exemplary process that occurs as described in FIG. 4A is distinct from the process as described in FIG. 2A, which requires the intermediation of the VideoShare Server 306 .

Caching & Routing

The Instant Video Messenger dynamically routes video messages across its network. The IVM server 406 can determine whether any particular sender computer 302 and/or receiver computer 304 is/are on-line and available to send or receive video information (e.g., video files). The IVM server 406 also can re-route messages if network (e.g., Internet) traffic volume creates a problem with transmission between the sender computer 302 and the receiver computer 304.

In addition, the IVM system can employ nodes that can store the messages that pass through them, enabling archiving applications, as described in more detail below. In one embodiment, a pool of video content can automatically build up by using such archiving applications. A node used to store such content can later be used to redistribute the material.

Extensibility

The Instant Video Messenger uses the COM technology to provide extensibility. When a new version of an object that uses the COM technology is developed, a user who has the old version is notified of the availability of the software object upgrade. The user can also be notified of the availability of new objects that provide additional functionality. For example, VideoShare has created a video effect COM API for use by software developers. This API provides an interface for the addition of new and improved video effects. Examples of video effects that are available in expensive, professional quality systems, and that can be provided in the IVM software, include cross-fading, titling, and blue-screening. As objects that incorporate or provide such functionality become available from the development community, they can immediately be available to the IVM end user, without the need for purchasing an upgrade or downloading the entire IVM software package. The IVM software thus provides the feature of extensibility.

Since the Instant Video Messenger is symmetric, COM objects that provide new features can be prepared for both the sender computer (i.e., generation of material for transmission that enables a new feature) and for the receiver computer (i.e., the presentation of the material of the new feature to the recipient). To maintain complete symmetry, the upgraded COM objects for the sender and for the receiver are released together. Examples of new features include capabilities such as customized streams and meta-data that associate information with URL links and other ties to electronic commerce (e-commerce), as well as other hooks that enable a wider range of uses of video rather than just watching the images. A hook is a code segment that presently performs no useful function other than being a placeholder, but that can be substituted

with another COM object that performs a desired function. An example of a hook is a subroutine that includes only the command "return." These new and improved COM objects can be added to the IVM software at any time.

The Instant Video Messenger permits, but does not limit, users to include additional information streams that are synchronous with the audio/video content. These peripheral synchronous information streams will be sent simultaneously with the primary audio and video streams. For example, the user can use these additional synchronous information streams to display business presentation slides. When the audio and video stream reaches a particular time location in the stream, for example when a CEO describes his or her business, a business presentation slide appears on the Instant Video Message receiver's computer. Another example of additional information streams associates "clickable-regions" (i.e., regions that are linked to an action that is activated by using a pointing device such as a mouse to highlight the region and then activating or clicking a mouse button) within a video frame, enabling the receiver of the Instant Video Message to bring up additional information (e.g., text descriptions such as a help screen, hyperlink URLs, and the like) by merely clicking on different areas of the video frame while watching the video.

Instant Video Messenger Solution

As shown in FIG. 4, the Instant Video Messenger uses a direct peer-to-peer connection between the computer 302 of A and the computer 304 of B. If A wants to send B a video message, the computer 302 of A sends the video content directly to the computer 304 of B. The video can be in either streaming or non-streaming format. This entire transaction is under the control of an Instant Video Messenger Server 406 (IVMS 406) that coordinates the run-time state of all members of the IVM Network (IVMN). The Instant Video Messenger Server 406 is notified when a given IVM user is on- or off-line, where the user is located (e.g., the user's IP address), what the user's Internet connections are (e.g. port address, firewall, proxy server configurations, and the like), and what the user's general activity has been (e.g., number of videos sent and/or received). The Instant Video Messenger Server 406 informs the sender computer 302 either that the receiver computer 304 is on-line (and a transmission is thus possible) or that the receiver computer 304 is not on-line. However, the Instant Video Messenger Server 406 does not have to deal with the details of, or the control of, a subsequent transmission.

Furthermore, as depicted in FIG. 5, the IVM Server 406 is capable of sending messages, for example video messages, on its own account to the computers 302, 304 of both users A and

B. For example, after Sender A, using sender computer 302, streams a video message to Receiver B, using receiver computer 304, the IVM Server 406 can send its own video message (or messages) to either or both of Sender A and Receiver B via each user's computer 302, 304. Such a message can be, for example, video advertising, video promotion material, or other videos related to a particular theme as part of the services provided by the IVM Network. In one embodiment, the message sent by the IVM Server 406 appears in a window such as that depicted in FIG. 16, for example when either or both of the Sender A or the Receiver B is using Microsoft Outlook for e-mail service.

As shown in FIG. 16, the Windows Media Player 910 is displayed with the message pre-loaded. The recipient of this embedded message only needs to activate the play button 920 on the Windows Media Player to see the video segment, rather than going to a URL hyper-link. The embodiment includes the conventional dialog boxes for entry of an email address for a recipient (box 902), a "carbon copy" ("cc") address (box 904), and a subject (box 906). In the embodiment shown, instructions are presented below the Windows Media Player 910 for the convenience of the recipient. This embodiment can also be used by a Receiver B to receive and view a message sent by Sender A.

In one embodiment, depicted in FIG. 6, IVM users are grouped together by IVM Channels. IVM Channels can represent areas of commonality of interest, such as hobbies, business interests, sports interests, and the like. IVM Channels can be used to form a convenient set of well-organized users, for receipt of video messages such as advertisement, product/service offerings, and special offers (for example, special saver airline fares). In one embodiment, this feature of the IVM network allows the IVM Server 406 to deliver instant video messages to a well-organized base of users. The users who are members of a Channel may also use the Channel to contact each other.

In accordance with the invention, a sender using sender computer 302 who desires to send a video message to a receiver using receiver computer 304 communicates with one or more IVM Channels IVC1 602, IVC2 604, IVC3 606, IVC4 608 in the set of IVM Channels 600 located on the network, such as the Internet, to find out if the receiver computer 304 is on-line. These communications are denoted by the bidirectional arrow that interconnects the sender A and receiver B with the set of IVM Channels 600. If the receiver computer 304 is on-line, the sender computer 302 can transmit the video message directly to the receiver computer 304, as denoted by the arrow from A to B.

The software, when operating on the receiver computer 304, performs a number of useful actions. The software can determine that the sender computer 302, or another computer, has sent a video message to it. In one embodiment, the software can receive and display the video message for the viewer of the receiver computer 304 without any activity or intervention by the viewer, and without the necessity of an action by a viewer of the receiver computer 304. The software can invoke other software modules to accomplish the display of the video message, again without any activity or intervention by the viewer, and without the necessity of an action by a viewer of the receiver computer 304.

The software can issue a notification message to "Receiver B" (e.g., the operator or viewer of receiver computer 304) that a message is being sent to receiver computer 304. In one embodiment, the software can detect and display information about the sender and the message. The software can display for "Receiver B" any or all of an identifier of the sender of the video message, a subject of the video message, and a title of the video message. This information can be used by "Receiver B" to decide if, and when, he or she wants to view the video message. In this embodiment, the software can additionally present to a viewer of the receiver computer 304 an opportunity to select one of accepting the streaming video message, and rejecting the streaming video message. When the viewer makes a choice, the software accepts the response of the viewer and processes the message in accordance with the response of the viewer. As an additional feature, the software can present to the viewer any combination of choices that includes rejecting the streaming video message and at least one of accepting the streaming video message for immediate display, and accepting the streaming video message for storage in a machine-readable memory, for display at a later time. In response to a selection of the choice of accepting the message for storage in a machine-readable memory, the software can, for example, direct the video to be saved on a machine-readable medium, such as a hard drive or any machine-readable medium that makes the video message available to the viewer at a later time.

The machine-readable medium can be, for example, a computer floppy disk, a computer hard drive, a magnetic tape or the like, a CD-ROM, computer memory such as static or dynamic RAM, ROM, PROM, EPROM or the like, and/or any other mechanism or medium for storing machine-readable files, instructions, data or software. In a network, the machine-readable medium can be physically attached to a computer different from one on which the data may be used, or the software may operate. For example, in a network, an archival copy of software can reside on one computer and a copy can be copied to another computer, where the copy is

executed or otherwise used. If transfer time is not an issue, as when a viewer of a video puts off viewing to a later time, a file containing data or information (such as a video, a text file, a database file, a spreadsheet template or the like) may reside on the same computer as the one that received the file, or on a different computer that stores the file for the convenience of the viewer.

Each IVM client computer maintains a personal IVM Contact List for the user of the computer, which is a list of other IVM users that are allowed to send messages to and to receive messages from the user. A user employs one of several notification methods such as email or Instant Messaging forums such as ICQ to invite another individual to communicate. Furthermore, the user can invite other individuals who have computers connected to the network, but who are unregistered with the IVM Network and whose computers do not have installed IVM software, to become users through an install executable that is sent in an email notification. The receiver of the email message can agree to accept the message by opening the email data attachment. This email data attachment contains the initial software codes needed to install the Instant Video Messenger software on the receiver's machine. His or her computer automatically executes the installation program, and the most recent version of the IVM software is installed and prepared for immediate use.

The installed software enables the transmission and receipt of message components, which can include, for example,

1) Video stream
2) Audio stream
3) Thumbnail image
4) Subject text
5) Message body text
6) Document attachments (file transfers such as WinWord, and the like)
7) Power-point slide presentations
8) Meta-data

A video message includes at least a video stream.

When a user operating a sender computer 302 wishes to send a video message to a receiver who operates a receiver computer 304 that is not on-line at that time, the Instant Video Messenger Server 406 (or an IVM Channel 602, 604, 606, 608) allows the sender to transmit a message for later reception and viewing by the receiver. FIG. 7 depicts an embodiment of a

system and method that provides such functionality according to the invention. One embodiment involves a connection with the VideoShare technology described in copending U.S.S.N. 09/497,587. The sender computer 302 has a video message that the operator of the computer 302 wishes to transmit to the receiver computer 304. However, receiver computer 304 is off line. One of the IVM Channel Servers 602, 604, 606, 608 informs the sender computer 302 of this situation. The sender computer 302 is prompted by the IVM Channel Server 602 (for example) of the possibility of storing that video in the sender's VideoCenter supported by VideoShare server computer 710 for later delivery to the intended recipient. The sender computer 302 can send the video message for storage at server computer 710. Server computer 710 can transmit the video message, for example, via e-mail or via Web retrieval as described in copending U.S.S.N. 09/497,587, to the intended recipient computer 304 when that computer 304 is again on-line.

The Instant Video Messenger system includes a Instant Video Messenger Channel Provider Kit that enables third parties (e.g., affiliates, partners, co-developers and the like) to provide additional Instant Video Messenger Channels to the IVM community. The Instant Video Messenger Channel Provider Kit includes all of the components for hosting an IVM Channel on a server computer. The components include, but are not limited to, software, database connectivity, and communication protocols. The IVM Channel Provider dedicates a server computer to manage all of the communications between the server and the computers of the channel users (or channel members). The IVM Channel Provider installs database software such as Microsoft SQL 7 on the server to allow the server to handle a database that identifies the users and their computers. The IVM Channel Provider uses the database software to manage information to be communicated to the channel members, and configures the IVM Channel Provider software with an IVM Channel name and description. The IVM Channel Provider (or Host) can decide how it wishes to implement the service based on the expected demand for its IVM Channel services.

These channels can be directed towards a particular customer segment, for example a segment based on thematic areas or common interests, such as for example, travel, auctions, or computers. As additional IVM Channels are developed by Instant Video Messenger Channel Providers, IVM users can be notified of their introduction.

Furthermore, the IVM Channel Provider Kit enables third party organizations to insert additional video streams before and/or after video messages that are sent from one user to another, including, but not limited to, advertisements in the form of video, still images, audio, and text.

An alternative embodiment of the messaging systems and methods of the invention is depicted schematically in a flow diagram 800 shown in FIG. 8. The sender (i.e., Sender A) of the video message begins by launching the computer communication module 3000, known in this exemplary embodiment as the Videoshare 2Peer application software 3000, on his or her computer 302, as denoted at box 805. The sender uses the 2peer application software 3000, and so is also referred to as the "user" in FIG. 8. Using the sender computer 302, the user logs into a 2peer channel, as indicated at box 810. A 2peer channel is an embodiment of an IVM channel, generally 600, of FIGs. 6 and 7. The user records a message comprising video and possible audio or other components, as indicated at box 815, which is reached from box 810 by travelling through Node A. In one or more optional steps, generally denoted by dotted box 820, the user can attach meta-data to the video message. At box 825, the user selects at least one recipient. The user can optionally select more than one recipient. For the purpose of the description, it is assumed that only one recipient is selected. However, if a plurality of recipients are selected, each recipient is handled individually, without regard for the situation of any other recipient.

The user communicates, using the 2Peer application software 3000 and the sender computer 302, with the IVM server 406, and requests the online status of the intended recipient (i.e. Receiver B). IVM server 406 checks whether the receiver computer 304 of Receiver B is online via an IVM channel. The result of the inquiry is communicated to the sender. All of the request, the check, and the communication of results of the check is denoted by the box 830. Based on the online status of the receiver computer 304, either of two paths are selected.

If the receiver computer 304 is online, corresponding to the arrow labeled "yes" exiting box 830, the Receiver B is notified, as indicated at box 835, using receiver computer 304 and a copy of the 2Peer application software 3000 thereon, that Sender A wishes to send a video message to Receiver B. At box 840, the Receiver B selects whether he or she wishes to accept the video message, decline the video message, or defer receipt of the message. If the receiver accepts the message, as denoted by box 845, the sender, using sender computer 302 and the 2Peer application software 3000 thereon, steams the video to receiver computer 304, where the Receiver B can view the video message. The user is then carried in the system and method back

to Node A, where the process can be repeated, or the user can terminate the process as indicated by the box 850.

If instead, the Recipient B declines the video message, the system and method operate by informing the user that the recipient has decline the message, as indicated at box 855. The user is then carried in the system and method back to Node A, where the process can be repeated, or the user can terminate the process as indicated by the box 850.

In the third alternative, the Recipient B defers receipt of the message, as denoted by the arrow from box 840 to box 860. Box 860 indicates the action that the sender is notified that receipt of the message is being deferred by the recipient.

If the recipient computer 304 is offline, the sender is informed that the receiver computer is not available to accept a video message, as indicated at box 865.

In either the case of a recipient deferring acceptance of a video message, or the case of a receiver computer 304 that is not online, the systems and methods of the invention allow a substantially similar series of steps to take place.

At box 870, the sender, using the sender computer 302 and the 2Peer application software 3000, is asked by the IVM server 406 whether the sender wishes to store the message that cannot be delivered immediately. If the sender declines to store the message, the systems and methods of the invention carry the sender back to Node A, where the process can be repeated, or the user can terminate the process as indicated by the box 850.

If the sender does wish to store the message, the sender's status as a registered member of the VideoShare service is checked, as indicated at box 875. If the sender is not a registered member of the VideoShare service, the sender is registered for the service, as indicated at box 880. If the sender is a registered member, or has just registered, the sender logs on to the VideoShare service, as denoted at box 885. The sender then transfers the video message, using sender computer 302, to the VideoShare server 710, as indicated at box 890. The systems and methods of the invention carry the sender back to Node A, where the process can be repeated, or the user can terminate the process as indicated by the box 850.

As indicated ay box 895, when the VideoShare server 710 determines that the receiver computer 304 of Recipient B is online, it streams the video message file to the receiver computer 304 in a manner that is transparent to the sender, who may not be online when such streaming occurs.

Sample Applications

The rich feature set and wide range of video and audio messaging is also suited to a corporate environment, particularly enabling remote communications such as intra-office video memos as well as messages sent between remote and home offices. The Instant Video Messenger can, for example, be used by co-workers to keep in touch with each other while working on a project, including such activities as sending text, audio, and video messages to one another while sharing collaborative documents.

Implementation Details

The entire Instant Video Messenger software system can be implemented in C++ within the Microsoft Foundation Class (MFC), ATL/COM, and ActiveX application frameworks. Each functional component (capture, compression, saving, contact list, etc.) can be a separate .DLL file. Such modularity allows easy upgrading, as users only have to download the components that have changed (generally files measured in the 10s of Kbytes).

The Instant Video Messenger software is distributed and installed on a user's computer that has a connection, either temporary or permanent, to a network, such as, but not limited to, the Internet. The user may have a video capture device, such as a Web Camera or a video digitizing card, but it is not required for operation of the Instant Video Messenger. Users that do not have a video source can still elect to load in pre-existing media files and can send those media files as Instant Video Messages.

Communications between each member of the communication session and the Instant Video Messenger Network can be performed via Transmission Control Protocol/Internet Protocol (TCP/IP) socket connections or User Datagram Protocol (UDP) connectionless datagrams. The user can select which TCP/IP or UDP network Port to use for communications as well as video streaming.

In one embodiment according to the invention, the software structure is organized as a three-tier software system. The lowest level tier is a COM based set of functional components that implement the core functionality such as video capture, audio capture, network communication, and contact list management. The middle software tier exists as an interface layer which binds the lower level software tier to a graphical user interface such as windows, buttons, text, etc. This software layer is written as ActiveX components. The top software tier is written as an Microsoft Foundation Class (MFC) desktop application, grouping together the ActiveX components into a final product offering. This software installs itself (upon startup of

the computer) into the Windows Tool Bar as a small icon that can be opened and closed at the user's will. The software runs on the user's machine until it is shut down or manually terminated.

Referring to FIG. 9, a user of the system, such as a private individual working from home, or a professional working from a business, employs a computer system 302. The user has an intention of sending a video message to a viewer of the message who is situated at another computer, that will be described in more detail below. The user of the computer system 302 may also be referred to as the "sender" or "Sender A", and computer system 302 may be referred to as the sender computer 302. The computer system 302 can include a computer which can be a personal computer of conventional type such as a desktop or laptop computer, a hand held device such as a PDA, or a more powerful computer such as a workstation, a server, a minicomputer, a mainframe, or the like.

The computer system 302 can operate software including a web browser such as Microsoft Internet Explorer or Netscape Navigator or Communicator or the like, for communication over a network such as the Internet via the World Wide Web (hereinafter "the Web"), or to permit wireless communication. The computer system 302 can operate software that can manipulate video segment files. The computer system 302 can communicate with video sources, such a video cameras and video recording machines, if the user wishes to employ such sources. Conventional commercially available personal computers typically have sufficient capability to meet these requirements. The computer system 302 can also employ video segments generated digitally by the computer and appropriate software, or by another computer, if the user wishes to employ such techniques. In one embodiment, the computer system 302 operates one or more modules that are part of a computer communication module 3000 called VideoShare 2Peer.

The VideoShare 2Peer 3000 is a software application package that the user can download from the Web site www.2peer.com or that the user can obtain in other formats such as on a CD-ROM or bundled with other software or hardware. In the present invention, one or more modules that are components of the VideoShare 2Peer 3000 are present in software that the sender computer 302 controls. The one or more modules of the VideoShare 2Peer software can be operated by the user under his or her control on his or her computer, in the computer system 302, in order to provide the capability of recording, converting, and optionally, compressing video segments, creating one or more identifiers for a video segment, and transmitting a video

segment with one or more of the identifiers to a receiver computer 304 when the receiver computer 304 is simultaneously online with the sender computer. If the receiver computer 304 is not online, the sender computer can optionally transmit the video segment to a host computer 60 for storage at a location under the control of the host computer 60. The host computer 60 will be described further below. In addition, the software modules can provide the capability to make a request of a server computer 406 that server computer 406 determine the online status of a receiver computer 304 to which the sender would like to send a video message, and that the status be reported to the sender computer 302 so that the sender computer 302 can determine whether sending the video message directly to the receiver computer 304 independent of the server computer 406 is appropriate, or whether the video message should be sent to a host computer 60 for storage and for later transmission to the receiver computer 304.

The computer in the computer system 302 of the user one can be connected to one or more kinds of equipment for generating video segments, such as a video camera such as a Web cam 12 or another type of video camera such as a professional quality video camera. The computer in the computer system 302 of the user can be connected to one or more kinds of equipment for providing prerecorded video segments, such as a video recorder 14, or another computer that can create digital video segments through the use of suitable software, such as for example digital video segments that have been created for various commercial films, or the like. Once the sender has obtained a video segment, and has manipulated it according to the procedures described below with regard to the operation of the software comprising the computer communication module, or its equivalent, the video segment with one or more identifiers is transmitted to the receiver computer 304 directly if the receiver computer 304 is online, or the video is sent the host computer 60 for storage and for retransmission to the receiver computer 304 at a later time.

The host computer 60 can include one or more server computers 62, 62', 62'' that communicate via a network such as the Web with other computers, such as the computer in the user's computer system 302. The one or more server computers 62, 62', 62'' also communicate with a storage array 64, or optionally with a plurality of storage arrays substantially similar to storage array 64. The storage array 64 can be any convenient storage system, such as a redundant array of magnetic storage disks, one or more readable and writeable CD-ROMs, random access semiconductor memory, any combination of such storage devices, or the like. The host computer

60 can connect via the Web to one or more computers that comprise the Web, conceptually denoted by the box 70.

A video segment that is stored and controlled by the host computer 60 may be delivered to and displayed for a viewer in a variety of formats, and through a variety of methods, as denoted generally by the box 80. In different embodiments, a video segment can be displayed as: a video greeting card 81, such as a person wishing another a happy birthday; as video email 82, as video that can be viewed on a remote website 83 (e.g., a video segment embedded into the remote website so that a viewer who visits the remote website sees the video segment as part of the page that is presented); as video commerce 84, for example a video that depicts a person describing his or her experience and training as part of a resume submitted on-line; or as a video advertisement 85, for example a video depicting the benefits or showing the use of a product. Many other like applications of the technology can be envisioned. The video segment can be made available to the viewer as a streaming video that is sent to the viewer. In some embodiments, the viewer can use a hand held device such as a PDA or a cellular telephone that can connect to a network such as the Internet to view the video segment.

In FIG. 10, the computer 16 of the user's computer system 302 is shown. The box 18 is intended to schematically depict a user of a computer video input device, which device can be the computer 16 operating suitable software to generate digital video, or can be another such computer, or can be the web cam or video camera 12, or can be the video recording device 14, or the like. The user begins by producing and/or recording a video segment on the hard disk of the computer 16 or within the temporary memory of a handheld device. As a second step, the video segment of step 1 can optionally be compressed and /or can be changed as regards the computer file format in which it is recorded on the hard disk. As a third step, the sender uses the computer 16 to request from the server computer 406 an indication of the online status of the receiver computer 304. As a fourth step, if the receiver computer 304 is determined to be online, the video segment recorded on the hard drive of the computer 16 is transmitted with one or more identifiers to the receiver computer 304. In different embodiments, the identifiers can include information comprising at least one of an identifier of the sender of the video message, a subject of the video message, and a title of the video message. The fourth step is schematically depicted by the arrow pointing generally from the computer 16 to the computer 90 of the viewer. The box 92 is intended to schematically depict a user of a display device. In one embodiment, the display device can be the computer 90, or the display device can be a display device such as a Web TV,

or can be a video output device such as a television set with a suitable decoder, or the like. The display device can also be a wireless hand held device such as a PDA or a cellular telephone or the like. The streaming video segment can in one embodiment be delivered as part of a video greeting card 81. In an alternative embodiment, the video can be delivered as a streaming video directly to the viewer from the sender computer , without the viewer having to activate the receiver computer 304 .

As shown in FIG. 11, the user can obtain a copy of the VideoShare 2Peer software by downloading a copy of the software from the Website www.VideoShare.com 50, as indicated by the picture at numeral 1. Alternatively, the user can obtain a copy of the VideoShare 2Peer software on machine readable media such as a CD-ROM or the like. The VideoShare 2Peer software can be bundled with one or more utility or application programs that are useful for a user to have, such as a "container" application so that the VideoShare 2Peer software can be operated on a desktop computer. The user can install the VideoShare 2Peer software on his or her computer 16and can register with the IVM service at no charge. In registering for the IVM service, the user obtains a username and a password that can be used to identify the user. The activity of installing the IVM software comprising the computer communication module on the user's personal computer or the like and registering with the IVM system is indicated by the picture at the numeral 2.

In order to use the system, the user first obtains a video segment. The user can create the video segment, for example with a Web cam 12, or the user can use an existing video segment obtained from a video recorder 16, as indicated by the picture at the numeral 3. The VideoShare 2Peer 3000 software includes a module that has direct capture capabilities that permit the user to create the video segment.

The user can employ the VideoShare 2Peer 3000 software modules to optionally compress the video; to determine if a video segment is in a format that is compatible with streaming video; to convert the video to a file format that is compatible with streaming video if the video segment is not already in a file format that is compatible with streaming video; and to transmit the video segment together with one or more identifiers that represent selections that the user can make (for example, a still image selected from the series of images that comprise the video segment, and an identifier of the sender of the video segment (e.g., the user). The activities carried out in conjunction with the VideoShare 2Peer 3000 software modules are generally indicated by the graphic at numeral 4.

The video segment and the identifier(s) can be transmitted to the receiver computer 304 directly if the receiver computer 304 is online, or if the receiver computer 304 is not online, can be transmitted to the host computer 60 for storage and for later distribution to the receiver computer 304. In one embodiment, the video message is transmitted in a streaming video file format. This transmission activity is denoted by the graphic at numeral 5.

Upon a determination that the intended receiver computer 304 is online the host computer 60 sends the video in streaming video format to the receiver computer 304, where a viewer can observe the video in real time. The activity of serving the video segment as a streaming video is denoted by the graphic at numeral 8.

Alternatively, if the receiver computer 304 is not online, the sender computer 302 can send the video message to a host computer, as indicated at numeral 6, which host can then send the video on to the receiver computer when it is online, as shown at numeral 7.

The majority of the VideoShare 2Peer software was developed as a Windows 95, Windows 98, and Windows 2000 ("Windows 9x/2000") compatible ActiveX control (e.g. an .OCX file), with additional components existing as active template library (ATL) component object model (COM) components that are instantiated during runtime. A "container application," named "2peer.exe," allows the VideoShare 2Peer ActiveX Control to be executed from the Windows 9x/2000 desktop. The VideoShare 2Peer Active X Control can also be embedded into a web page, as is done within the www.2peer.com web site.

The custom written VideoShare 2Peer software includes the following binary/source code components: (1) VideoShare 2Peer ActiveX Control (2peer.ocx), (2) Streaming media rendering engine (vsrender.dll), (3) Streaming media network object (vsnetwork.dll), (4) Buddy-list Contact management (vscontact.dll), (5) 2Peer Channel management (vschannel.dll), (6) VideoCapture object (DirectShowRecord.dll and VFWrecord.dll), (7) VideoPlayback object (DSPlay.dll), and (8) Media management (vsmedia.dll)

All components were entirely written by VideoShare Inc. The VideoShare 2Peer software is built upon the following third-party technologies that provide lower-level device support, document sharing, and file format conversion: (1) Microsoft's DirectShow; (2) Microsoft's Windows Media Technologies; (3) Microsoft's Video for Windows; (4) MAPI; AND (5) ICQ.

When the user launches the VideoShare 2Peer software comprising the computer communication module, he or she will see the window depicted in FIG. 12 appear on his or her computer 16 operating the Win9x/2000 operating system. The login screen can be made optional

for repeat users by providing a unique identifier for the user, such as a password, or by installing on the user's computer or the like a record similar to the "cookies" used by some interactive computer systems operating on a network such as the Internet.

When the user enters in his or her username in the box 410 labeled VideoShare Login Name and his or her password in the box 415 labeled VideoShare Password and activates the "Start VideoShare 2Peer" button 420, the VideoShare 2Peer 3000 software opens a TCP/IP socket connection to the VideoShare Upload/Database Server via port 80 in order to avoid typical Firewall and/or Proxy Server problems. If the box 430 labeled Remember password is checked, the VideoShare 2Peer 3000 software will remember the user's password, eliminating the necessity to type in that information each time the software is started. The VideoShare Upload/Database Server then verifies the validity of the username/password. Furthermore, the VideoShare 2Peer 3000 software will notify the user if there is a more recent version of the software available, giving him or her the opportunity to automatically download and install the new software.

With this login dialog, the user can also receive help, by activating the "Help" button 450, taking the user to a web page on the VideoShare web site. The login dialog box can also be used to create a new VideoShare user account, by clicking the "Create Another Account" button 460.

Once the login process has been completed, the VideoShare 2Peer 3000 software looks for available DirectShow audio and video capture devices. These available devices are enumerated and listed within the "Settings Tab" as described later. The VideoShare 2Peer 3000 software initializes the audio and video capture device, by recalling as a default the device that was used most recently.

VideoShare 2Peer Software Preview/Capture/Import Process

After the capture device initialization, the VideoShare 2Peer software displays the window depicted in FIG. 13.

The image 510 in the middle of the window is the video input stream from the initialized, default video capture source. The image in FIG. 13 is that of an employee of the assignee of the present invention, in the offices of the assignee. The VideoShare 2Peer software automatically builds a DirectShow "preview graph" where the video stream from the video device is displayed on the screen, but is not saved to disk. This gives the user the opportunity to adjust the camera, e.g. an opportunity to correct the camera position, the camera focus, the camera angle, the magnification of the image, and the like.

At the top of this window, the user is presented with five different "tabs", each presenting the user with different aspects of the VideoShare 2Peer software comprising the computer communication module. In FIG. 13, the tab labeled "Record/Playback" 520 is active, indicating that the VideoShare 2Peer software comprising the computer communication module is ready to acquire and/or display a video segment.

At the bottom of the window, there is a status message 522 that displays the current operation of the VideoShare 2Peer software comprising the computer communication module. In FIG. 13, the status message 522 prompts the user to either activate the Record button 531 to create a new video segment, or to import an existing video segment by activating the Import Video button 535, both of which are described in more detail below.

Directly below the video preview image 510 is a Capture/Playback Control Panel 530 that includes the following items:

- Record button 531 which begins a new audio/video capture;
- Stop button 532 which terminates an active audio/video capture operation;
- Play button 533 which initiates the playing back of the last recorded or imported video;
- Delete button 534 which cancels the last record or import operation and begins a new video preview;
- Import Video button 535 which allows the user to select a pre-existing video file from his or her hard drive;
- Save and Share button 536, which in the present embodiment activates software modules that convert the current video file into a compressed streaming format, and that send the video; and
- Shuttle Bar 537 which is used to control the current position of the playback file together with forward button 537 and reverse button 538, allowing the user to rewind and fast forward through the current video.

The software modules that operate upon the activation of Save and Share button 536 will be covered in a subsequent section in this document in detail.

When the user begins to record a video, the VideoShare 2Peer software builds a new "Capture Graph" that renders the video stream to both the display window as well as to a temporary .AVI file on the user's hard drive. The audio/video capturing continues until the user activates the "Stop" button 532 at which point the VideoShare 2Peer software stops the "Capture

Graph", destroys the DirectShow filter, builds a Direct Show "Playback Graph", and displays the first frame of the captured video as video preview image 510. When the user activates the Play button 533 the DirectShow "Playback Graph" is put into running mode, playing back the entire recorded video from beginning to end.

The user can also choose to import a pre-existing video, which in one embodiment can be a file format selected from the AVI, MPEG, or QuickTime file formats, by activating the Import Video button 535. The VideoShare 2Peer software automatically renders the correct DirectShow filter to display an imported video correctly.

**Save and Share Process**

Once a video segment has been recorded or imported into the user's computer 16 that is running the VideoShare 2Peer software, the user can choose to process the video segment with various optional alternatives by activating the Save and Share button 536. When the Save and Share button 536 is activated, the video segment is archived and distributed automatically. The VideoShare 2Peer software greatly simplifies the entire process by seamlessly automating the following steps that are depicted in FIG. 14A:

- Video file format conversion, as required;
- Compression to a streaming multimedia format at a user-specified bitrate;
- Creating a "Thumbnail" JPEG snapshot of the video file, as an identifier that a user or a viewer can observe in order to assess the content of the video segment;
- if RC on line, sending video message to RC;
- if RC not on line, optionally sending the resultant video and thumbnail files to the VideoShare server computers 62, 62'; and
- Logging the transactions and managing the user's storage account, including causing the generation of an identification tag that the server computers 62, 62' can employ to retrieve the video segment for viewing.

FIG. 14A shows a flow diagram 600 of an embodiment of the invention in which the VideoShare 2Peer software automates a number of steps in connection with uploading a video segment by activation of the Save and Share button 536 described in FIG. 13. As indicated at box 605, a user first obtains and selects a video segment for processing for distribution. The box 605 schematically encapsulates all of the actions that a user takes as described in relation to FIGs. 4 and 5 above. When the user activates the Save and Share button 536 the actions

described below that are enclosed by the dotted line 607 are automatically carried out under the control of the VideoShare 2Peer software.

The VideoShare 2Peer software subjects the selected video segment to analysis to determine whether the selected video segment is or is not in a file format that is compatible with a streaming video format, as indicated at diamond 610. Formats that are compatible with streaming media formats include formats such as MPEGs and QuickTime videos. If the selected video segment is not compatible with a streaming video format, it is converted to a compatible format, as depicted by the arrow labeled "NO" that points from the diamond 610 to the box 615, "Convert to compatible file format." The conversion process performed by the VideoShare 2Peer software creates a DirectShow filter graph that decompresses the video file into a temporary, uncompressed AVI file.

The video segment file in a format that is compatible with streaming video is then temporarily stored in the user's computer 16, for example as a file on the hard drive of computer 16. This storing step is performed if the file was originally in a format compatible with streaming video by following the arrow marked "YES" that points from the diamond 610 to the box 620, "Temporarily store file." Alternatively, the storing step is performed if the file was originally not in a format compatible with streaming video by following the arrow that points from the box 615 to the box 620.

The stored temporary file representing the selected video is then analyzed by the VideoShare 2Peer software , as represented by diamond 625, "Should file be compressed?" to determine if the temporarily stored file should be compressed. If the software determines that the file should be compressed, as indicated by the arrow labeled "YES" that points from the diamond 625 to the box 630, labeled "Compress file," the file is compressed. The compression involves compressing the video file to a user-specified bitrate, or the bandwidth that is required to view the video without disruption in the transmission. The user can select the desired bitrate via the "Settings Tab" that is described in more detail below.

The file is then converted to a streaming multimedia format file as indicated by the box 635, labeled "Convert file to streaming multimedia format ("SMF") file," as denoted by the arrow pointing from the box 630 to the box 635. If the file is not to be compressed, the flow follows the arrow labeled "NO" pointing from the diamond 625 to the box 635, and the file is then converted to a streaming multimedia format file as schematically represented by the box 635.

The process that is performed by the VideoShare 2Peer software as denoted by the box 635 involves reading in the video file, frame by frame, and converting the video into a streaming multimedia format. In one embodiment, the VideoShare 2Peer software uses the Windows Media Streaming Format, known as ASF or WMF, but it is not technologically restricted to this choice. The Windows Media Streaming Format comprises MPEG 4 v3 for the video stream and the Windows Media Audio format for the audio stream. The output of this file is stored as a temporary file on the user's hard drive, in one embodiment.

The flow diagram indicates that the process makes a "thumbnail" of the video file, as represented schematically by the box 640, labeled "Create and temporarily store JPEG "thumbnail" identifier." The VideoShare 2Peer software produces a JPEG still image that is used as a reference image to the entire video file. It is an identifier of the subject matter or content of the video that a user or a viewer can readily recognize, as compared to an alphanumeric string such as a typical string used to identify a file by its drive, directory (and one or more subdirectories) and filename. Such alphanumeric identifiers are useful, but may be totally uninformative as to the content or subject matter contained in the identified file or video segment. In one embodiment, the VideoShare 2Peer software creates the "thumbnail" by taking the "middle" image of the entire video file, as measured by the temporal duration of the file. In another embodiment, the selection of an image from which to make the "thumbnail" can be left to the discretion of the user. This JPEG file is also stored as a temporary file on the user's hard drive, in one embodiment.

The next part of the process is either sending the video message to the receiver computer 304, if the receiver computer 304 is online, or optionally sending the video message to the host computer 60 if the receiver computer 304 is not on line.

Using the symmetric software present on both the sender computer 302 and the receiver computer 304, the sender 40 (or Sender A) can send the video message directly to the receiver computer 304 if the receiver computer 304 is online, as indicated at box 641. As shown in Fig. 4B, Sender A, using sender computer 302, asks IVM Server 406 if Receiver B is online via receiver computer 304. For explanatory purposes, we will assume that IVM Server 406 responds that Receiver B is online. Sender A records, or already has recorded, a video message using sender computer 302 and the associated hardware and software. Sender A, using sender computer 302, notifies Receiver B via receiver computer 304 that a video message is ready for transmission. Assuming that Receiver B wishes to accept the video message, Receiver B

acknowledges notification using receiver computer 304 and requests delivery of the message. Sender A, using sender computer 302, streams the video message to Receiver B via receiver computer 304. Using the symmetric software present on both the sender computer 302 and the receiver computer 304, the sender 40 (or Sender A) can send the video message directly to the receiver computer 304 if the receiver computer 304 is online, as indicated at box 641.

In the event that the receiver computer 304 is not online, the IVM Server 406 informs sender computer 302 that the receiver computer 304 is not online. Rather than sending a message to the receiver computer 304, the sender computer 320 sends the video message to a VideoShare server computer 710 (or host computer 60) for storage at server computer 710, and for later delivery to the intended recipient. Server computer 710 can transmit the video message, for example, via e-mail or via Web retrieval as described in copending U.S.S.N. 09/497,587, to the intended recipient computer 304 when that computer 304 is again on-line. These steps are shown in boxes 645, 650, 655, 660 and 670.

The optional part of the process is the upload operation, in which the VideoShare 2Peer software contacts the host computer 60, which in one embodiment is the VideoShare Upload/Database Server at the VideoShare hosting facility. This portion of the automated process is denoted by the box 645 labeled "Transfer ("upload") temporarily stored SMF file and JPEG thumbnail identifier to host computer 60." The VideoShare 2Peer software notifies the host computer 60 that the user wishes to place his or her video into a repository maintained by the host computer 60, which in one embodiment can be the VideoShare VideoCenter, which is a repository of all recorded and uploaded videos to date. This upload is performed automatically via a direct TCP/IP socket connection over a specific connection port of the user's computer known as port 80. The VideoShare 2Peer software uses a standard communications protocol to perform this transfer to the host computer 60. In another embodiment, a proprietary protocol can be used, for example if one wants to maintain the security of information contained in the video segment. In another embodiment, the video segment can be encrypted in order to provide enhanced security. Both the compressed video streaming multimedia file and the thumbnail image are uploaded at substantially the same time.

As schematically depicted by box 650, labeled "Delete temporary file to conserve storage space on user's computer," the VideoShare 2Peer software removes all of the temporary files that were created in the course of the automated processing described above. This feature provides for the user a convenient, secure, and transparent process, with the benefit that the user's

computer storage device(s), for example one or more hard drives, do not become cluttered with unnecessary and obsolete files.

In the event that the video message has been sent to the host, the VideoShare 2Peer software and the host computer 60 (for example, the VideoShare Upload/Database Server) will update the user's account to account for the required storage space that the video requires. The necessary logging, creation of an identification tag, and storing of the video and the associated identifier or identifiers is also performed automatically, as schematically depicted by box 655.

The user can optionally add additional identification and control information about the user, and about how and under what conditions the video is to be made available for distribution, as schematically indicated by box 660. The user is automatically prompted to provide this information, but has the option to forego making a decision immediately. The transmission of video segment files to viewers is discussed in more detail below, and is represented in FIG. 14A by the box 670 labeled "Transmit file to viewer" which is outside the region 607 as an indication that the transmission of files to viewers is an action beyond the material discussed above in conjunction with the Save and Share button 536 of FIG. 13.

FIG. 14B shows a flow diagram 601 of another embodiment of the invention in which software automates a number of steps in connection with uploading a video segment. Many of the steps already described in connection with FIG. 14A also occur in the embodiment depicted in FIG. 14B, and are numbered in the same manner as in FIG. 14A. In FIG. 14B, there is first an optional step indicated by the box 604 labeled "Optional: User authentication with server" in which the User is optionally required to provide identification, such as a user name and password, that authenticates the identity of the user to the server or host computer 60. The user then obtains and selects a video segment for processing for distribution, as indicated at box 605 that schematically encapsulates all of the actions that a user takes as described in relation to FIGs. 4 and 5 above. When the user activates the Save and Share button 536 the actions described below that are enclosed by the dotted line 608 are automatically carried out under the control of the VideoShare 2PeerSoftware comprising the computer communication module.

As discussed in relation to FIG. 14A, the VideoShare 2Peer software subjects the selected video segment to analysis to determine whether the selected video segment is or is not in a file format that is compatible with a streaming video format, as indicated at diamond 610. If the selected video segment is not compatible with a streaming video format, it is converted to a compatible format, as depicted by the arrow labeled "NO" that points from the diamond 610 to

the box 615, "Convert to compatible file format." The conversion process performed by the VideoShare 2Peer software creates a DirectShow filter graph that decompresses the video file into a temporary, uncompressed AVI file.

The video segment file in a format that is compatible with streaming video is then temporarily stored in the user's computer 16, for example as a file on the hard drive of computer 16. This storing step is performed if the file was originally in a format compatible with streaming video by following the arrow marked "YES" that points from the diamond 610 to the box 620, "Temporarily store file." Alternatively, the storing step is performed if the file was originally not in a format compatible with streaming video by following the arrow that points from the box 615 to the box 620.

The stored temporary file representing the selected video is then analyzed by the VideoShare 2Peer software, and optionally compressed as represented by the box 623 labeled "Optional compression of file." The file is then converted to a streaming multimedia format file as indicated by the box 635, labeled "Convert file to streaming multimedia format ("SMF") file." Alternatively, a file from the box 620 can be uploaded to the host computer 60 without being converted to a streaming format, and the conversion to a streaming video format can be accomplished at the host computer 60. The process that is performed by the VideoShare 2Peer software as denoted by the box 635 involves reading in the video file, frame by frame, and converting the video into a streaming multimedia format.

The flow diagram indicates that the process makes a "thumbnail" of the video file, as represented schematically by the box 640, labeled "Create and temporarily store JPEG "thumbnail" identifier."

Using the symmetric software present on both the sender computer 302 and the receiver computer 304, the sender 40 (or Sender A) can send the video message directly to the receiver computer 304 if the receiver computer 304 is online, as indicated at box 641.

In the event that the receiver computer 304 is not online, the IVM Server 406 informs sender computer 302 that the receiver computer 304 is not online. Rather than sending a message to the receiver computer 304, the sender computer 320 sends the video message to a VideoShare server computer 710 (or host computer 60) for storage at server computer 710, and for later delivery to the intended recipient. Server computer 710 can transmit the video message, for example, via e-mail or via Web retrieval as described in copending U.S.S.N. 09/497,587, to

the intended recipient computer 304 when that computer 304 is again on-line. These steps are shown in boxes 645, 650, 655, 660 and 670.

The optional part of the process is the upload operation, in which the VideoShare 2Peer software contacts the host computer 60, which in one embodiment is the VideoShare Upload/Database Server at the VideoShare hosting facility. This portion of the automated process is denoted by the box 645 labeled "Transfer ("upload") temporarily stored SMF file and JPEG thumbnail identifier to host computer 60." The VideoShare 2Peer software notifies the host computer 60 that the user wishes to place his or her video into a repository maintained by the host computer 60, which in one embodiment can be the VideoShare VideoCenter, which is a repository of all recorded and uploaded videos to date. This upload is performed automatically via a direct TCP/IP socket connection over a specific connection port of the user's computer known as port 80. The VideoShare 2Peer software uses a standard communications protocol to perform this transfer to the host computer 60. In another embodiment, a proprietary protocol can be used, for example if one wants to maintain the security of information contained in the video segment. In another embodiment, the video segment can be encrypted in order to provide enhanced security. Both the compressed video streaming multimedia file and the thumbnail image are uploaded at substantially the same time.

The next part of the process is the upload operation, in which the VideoShare 2Peer software contacts the host computer 60, which in one embodiment is the VideoShare Upload/Database Server at the VideoShare hosting facility. This portion of the automated process is denoted by the box 645 labeled "Transfer ("upload") temporarily stored SMF file and JPEG thumbnail identifier to host computer 60." Both the compressed video streaming multimedia file and the thumbnail image are uploaded at substantially the same time.

As schematically depicted by box 650, labeled "Delete temporary file to conserve storage space on user's computer," the VideoShare 2Peer software removes all of the temporary files that were created in the course of the automated processing described above. This feature provides for the user a convenient, secure, and transparent process, with the benefit that the user's computer storage device(s), for example one or more hard drives, do not become cluttered with unnecessary and obsolete files.

In the event that the video message has been sent to the host, the VideoShare 2Peer software and the host computer 60 (for example, the VideoShare Upload/Database Server) will update the user's account to account for the required storage space that the video requires. The

necessary logging, creation of an identification tag, and storing of the video and the associated identifier or identifiers is also performed automatically, as schematically depicted by box 655.

The user can optionally add additional identification and control information about the user, and about how and under what conditions the video is to be made available for distribution, as schematically indicated by box 660. The user is automatically prompted to provide this information, but has the option to forego making a decision immediately. The transmission of video segment files to viewers is discussed in more detail below, and is represented in FIG. 14B by the box 670 labeled "Transmit file to viewer" which is outside the region 608 as an indication that the transmission of files to viewers is an action beyond the material discussed above in conjunction with the Save and Share button 536 of FIG. 13.

FIG. 14C shows a flow diagram 602 of an embodiment of the invention in which software automates a number of steps in the formatting of a video segment. In particular, in this embodiment, the video segment that the user wishes to provide in streaming video format is compressed into a plurality of formats, each of which is encoded for optimal display at a different transmission bitrate. There can be a benefit to recording the same video segment in multiple formats. For example, a casual viewer may have only a slow speed modem, such as a 28.8 kilobaud (kB) modem. For such a viewer, the slow transmission speed can make the size of a file a critical feature. Such a user can view a video in real time if it is formatted for a 28.8 kB modem, but not if it is formatted for appreciably higher transmission speeds. Another user, for example, one who has a T1 connection that can handle transmission speeds up to approximately 1.5 megabaud, could successfully receive a version of the same video segment that is formatted for higher transmission speeds, with the possibility of having a better quality image and higher resolution, perhaps with better audio as well. The T1 user could see the version of the video segment intended for 28.8 kB transmission if he or she wanted to, but might prefer to see a video segment that appeared to be more professional in quality. By using a system that can automatically discriminate the transmission speed capabilities of the hardware that the user employs, the embodiment allows each user to view a version of the video segment that is optimally configured for the user's hardware.

In particular, the steps of the method enclosed within the dotted rectangle 609 are automated by software that embodies the present invention. As described above, the user obtains and selects a video segment for processing for distribution, as indicated at box 605 that schematically encapsulates all of the actions that a user takes as described in relation to FIGs. 4

and 5 above. When the user activates the Save and Share button 536 the actions described below that are enclosed by the dotted line 609 are automatically carried out under the control of the VideoShare 2PeerSoftware comprising the computer communication module.

As discussed in relation to FIG. 14A, the VideoShare 2Peer software subjects the selected video segment to analysis to determine whether the selected video segment is or is not in a file format that is compatible with a streaming video format, as indicated at diamond 610. If the selected video segment is not compatible with a streaming video format, it is converted to a compatible format, as depicted by the arrow labeled "NO" that points from the diamond 610 to the box 615, "Convert to compatible file format." The conversion process performed by the VideoShare 2Peer software creates a DirectShow filter graph that decompresses the video file into a temporary, uncompressed AVI file.

The video segment file in a format that is compatible with streaming video is then temporarily stored in the user's computer 16, for example as a file on the hard drive of computer 16. This storing step is performed if the file was originally in a format compatible with streaming video by following the arrow marked "YES" that points from the diamond 610 to the box 620, "Temporarily store file." Alternatively, the storing step is performed if the file was originally not in a format compatible with streaming video by following the arrow that points from the box 615 to the box 620.

The temporarily stored file is then compressed in multiple streaming multimedia formats, as denoted by the box 633. In the present example, three files will be used to describe the process, but it should be understood that more or fewer than three formats may be created at substantially the same time. The resulting multiple files are denoted by the three boxes 634, 636 and 638 labeled "Bandwidth Target A," "Bandwidth Target B," and "Bandwidth Target C," respectively. Each file is optimally encoded for play as a streaming video segment at a particular transmission rate and bandwidth, such as 28.8 kB, 56 kB, 100kB, 300kB, or other transmission rates.

As described above, the method includes a step of creating and temporarily storing a "thumbnail" identifier, as denoted by the box 640. Rather than transmitting one video segment in one SMF with one thumbnail, the embodiment of FIG. 14C transmits all the files 634, 636 and 638 in association with the single thumbnail and any other identifiers that are selected as appropriate. For example, each SMF file can be identified as to its bandwidth. In an alternative embodiment, the system transmits only a single SMF file with its associated identifiers, including

the JPEG "thumbnail," and the multiple bandwidth variants of the SMF file are generated at the host computer 60. This embodiment may be advantageous when the user has only a slow speed modem, and would be severely time constrained by having to upload multiple files.

Using the symmetric software present on both the sender computer 302 and the receiver computer 304, the sender 40 (or Sender A) can send the video message directly to the receiver computer 304 if the receiver computer 304 is online, as indicated at box 641.

In the event that the receiver computer 304 is not online, the IVM Server 406 informs sender computer 302 that the receiver computer 304 is not online. Rather than sending a message to the receiver computer 304, the sender computer 320 sends the video message to a VideoShare server computer 710 (or host computer 60) for storage at server computer 710, and for later delivery to the intended recipient. Server computer 710 can transmit the video message, for example, via e-mail or via Web retrieval as described in copending U.S.S.N. 09/497,587, to the intended recipient computer 304 when that computer 304 is again on-line. These steps are shown in boxes 645, 650, 655, 660 and 670.

The remaining steps of this embodiment, as denoted by the boxes 650, 655, 660 and 670, correspond substantially to the steps in FIG. 14A represented by the boxes identified with the corresponding numerals. It should be noted that the precise order of some of the steps, for example, the step denoted by the box 655 and the step denoted by the box 650, can be interchanged without a different outcome of the overall process. Other such interchanges in sequence are possible as well, again without a different outcome of the overall process.

FIG. 14D depicts an embodiment of the database 64 of the host computer 60 on which are recorded the three exemplary bandwidth target files 634, 636 and 638 for FIG. 14C. These files are available for delivery over a computer network to a viewer. The files 634, 636 and 638 represent three versions of the same video segment in streaming multimedia format, each suitable for optimal viewing by a user having hardware operating at the transmission rate corresponding to the format of one of the files.

As shown in FIG. 14E, the user (or the viewer) transmits to the host computer 60 a request for a particular video segment, denoted by the arrow from the box labeled "USER" to the box 960 labeled "Connection Speed Detector." Host computer 60 can include hardware that can sense the transmission speed of a user computer 16, or of a computer used by a person desiring to view a video segment. Alternatively, the host computer 60 can inquire of the computer on the network that is connected to the user computer 16 or the computer of a viewer about the speed of

connection that is being maintained. When the information is available to the host computer 60, the host computer 60 can determine which file of the files exemplified by 634, 636 and 638 is most appropriate to serve to the user or viewer, as denoted by the box 692 labeled "Logic to select and serve SMF file to User." The host computer 60 then transmits the appropriate file to the user, as denoted by the arrow from the box 692 to the box 694 labeled "User receives and views SMF file." Alternatively, the viewer can request the transmission of a file encoded at a specific bitrate.

When the user begins the process described in relation to FIG. 14A, in one embodiment, the "Progress Dialog" screen 700 depicted in FIG. 15 is presented, reflecting the status of the process in real time. The "Progress Dialog" screen 700 notifies the user about the total number of bytes that have to be uploaded to perform the transfer and it also informs the user of the number of bytes and the percentage of the file that have been uploaded in real time.

FIG. 16 shows one embodiment of a screen, discussed above, that displays a video message.

FIG. 17 shows a screen 1000 used to control the status of a video queue. When the user, after recording or importing a video, clicks the "Save and Share" button 536 of FIG. 13 while in "offline mode", the VideoShare 2Peer software performs the first three steps of the "Save and Share Process," namely, the video file format conversion represented by box 615 of FIG. 14A, the compression of the video segment to a streaming multimedia format at a user-specified bitrate represented by the box 635 of FIG. 14A, and the creation of a "Thumbnail" JPEG snapshot of the video file represented by the box 640 of FIG. 14A. The resulting output files are stored in a local database for later use in the "Sharing Queue," which is an operation similar to the temporary storage of files depicted in FIG. 14A. In the middle of FIG. 17 is a dialog box 1010 that displays a list of video segments that are ready to be uploaded to the VideoShare Web site. The small "Preview" window 1020 in the upper left corner of FIG. 17 is a DirectShow playback graph that allows the user to review the stored video segment that is highlighted in the dialog box 1010. The user can use this window to preview the video segment file by activating the "Preview" button 1030, to delete the video segment file by activating the "Delete" button 1040, and to upload and publish the video by activating the "Save and Share Now" button 1050.

The "Save and Share Now" button 1050 performs the uploading process on each of the queued videos, creating a TCP/IP connection to the VideoShare Upload/Database Server, transferring the file to the VideoShare web site, and updating the user's VideoShare account, in a

manner substantially similar to the method employed by the Save and Share button 536 of FIG. 13 to accomplish the same activities.

**Audio/Video Setting Process**

FIG. 18 shows a screen 1100 used to control the operational settings of equipment connected to the user's computer. Another feature of the VideoShare 2Peer software the ability of the user to change the configuration of the audio, video, and compression devices through the use of the "Settings" tab 1110. Upon activation of the Settings tab 1110, the screen 1100 is active.

The user can select the "bitrate" at which the streaming multimedia files will be compressed by using the set of radio buttons 1120 at the upper left corner of the screen 1100. The default setting is "56k Modem" which corresponds to a user using a 56k modem. This default setting is denoted by the 56k Modem radio button 1120 appearing with a dot, while the remaining radio buttons for bitrate 1120 are blank. In one embodiment, the pie graph 1130 that appears at the upper right corner of screen 1100 indicates the percentage of the user's VideoShare storage space that is full. In the embodiment shown, the user has filled approximately 3.13% of the available storage capacity available for storing files. Two pull-down menus, "Camera source device" box 1140 and "Audio source device" box 1150, list all of the available video and audio capture sources that the user has available on his or her Win9x/2000 machine. The user can select a source of audio or video by activating the appropriate pull-down menu box and locating a device of his or her choosing. To the right of these pull-down menus, there are two buttons, "Video Settings..." 1160 and "Audio Settings..." 1170 that allow the user to change the properties of the currently selected audio and video device. Such properties include image size, capture compression, lighting conditions, and the like. The screen 1100 also provides to the user the current working directory information in a the box 1180 and the current queue directory information in the box 1190, which the user can optionally change by entering new values in either or both boxes 1180 and 1190.

Equivalents

While the invention has been particularly shown and described with reference to specific preferred embodiments, it should be understood by those skilled in the art that various changes in

form and detail may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

Claims

1. A method of sending a streaming video message over a network, comprising the steps of:

receiving at a server computer an indication that the operator of a sender computer intends to send a streaming video message to a receiver computer over a network;

determining whether said receiver computer is online; and

communicating from said server computer to said sender computer whether said receiver computer is online, wherein an indication that said receiver computer is online signals to said sender computer that streaming said video message directly from said sender computer to said receiver computer over the network is appropriate.

2. The method of claim 1, wherein the step of receiving at a server computer an indication that the operator of a sender computer intends to send a streaming video message to a receiver computer is performed by a supervisory computer communication module operable on said server computer.

3. The method of claim 1, wherein the step of determining whether said receiver computer is online is performed by a supervisory computer communication module operable on said server computer.

4. The method of claim 1, wherein the step of communicating from said server computer to said sender computer whether said receiver computer is online is performed by a supervisory computer communication module operable on said server computer.

5. A method of sending a streaming video message over a network, comprising the steps of:

sending to a server computer an indication that the operator of a sender computer intends to send a streaming video message to a receiver computer over a network;

receiving at said sender computer an indication of whether said receiver computer is online; and

in response to an indication that said receiver computer is online, streaming said video message from said sender computer to said receiver computer over the network independent of the operation of said server computer.

6. The method of claim 5, wherein the step of streaming said video message from said sender computer to said receiver computer comprises:

providing on said sender computer a computer communication module operable on each of said sender computer and said receiver computer; and

streaming said video message from said communication module of said sender computer to said receiver computer over the network independent of the operation of said server computer.

7. The method of claim 6, wherein providing a computer communication module operable on each of said sender computer and said receiver computer comprises providing individual copies of the same communication module to at least one of the sender computer and the receiver computer, each copy operable on each of said sender computer and said receiver computer.

8. The method of claim 7, wherein the step of providing individual copies of the same communication module comprises providing individual copies of the same communication module, said communication module being symmetric in operation.

9. The method of claim 8, wherein the step of providing individual copies of the same communication module, said communication module being symmetric in operation comprises providing communication modules that are modular.

10. The method of claim 8, wherein the step of providing individual copies of the same communication module, said communication module being symmetric in operation comprises providing communication modules that can determine the features present in another communication module operating on another computer.

11. The method of claim 5, wherein the step of streaming said video message from said sender computer to said receiver computer over the network independent of the operation of said server computer comprises performing said streaming operation using only communication modules present on said sender computer and said receiver computer.

12. The method of claim 5, further comprising the step:

in response to an indication that said receiver computer is not online, optionally sending said video message from said sender computer to a host computer, for storage and later transmission to said receiver computer, independent of the operation of said server computer.

13. The method of claim 5, wherein said video message comprises video information.

14. The method of claim 13, wherein said video message further comprises information selected from audio information, a thumbnail image, a text identifying a subject, a message body text, a document attachment, a slide and meta-data.

15. A computer program recorded on a machine-readable medium, the computer program adapted to transmit and receive streaming video messages over a network independent of a server computer, the computer program when operating on a sender computer performing the steps of:

requesting from a server computer the status of a receiver computer, said receiver computer being the intended recipient of a video message;

receiving an indication of the online status of said receiver computer; and

in response to an indication that said receiver computer is online, streaming said video message from said computer program of said sender computer to said computer program of said receiver computer independent of the operation of said server computer.

16. The computer program recorded on a machine-readable medium of claim 15, wherein said computer program is further capable, when operating on a receiver computer, of performing the step of:

determining that a video message is being sent by a sender computer.

17. The computer program recorded on a machine-readable medium of claim 16, wherein said computer program is further capable, when operating on a receiver computer, of performing the step of:

displaying to a viewer of said receiver computer information about said video message, said information comprising at least one of an identifier of the sender of said message, a subject of said message, and a title of said message.

18. The computer program recorded on a machine-readable medium of claim 15, wherein said computer program is further capable, when operating on a receiver computer, of performing the steps of:

receiving said streaming video message; and

displaying said streaming video message to a viewer of said receiver computer.

19. The computer program recorded on a machine-readable medium of claim 18, wherein the step of receiving said streaming video message comprises;

receiving said streaming video message;

presenting to a viewer of said receiver computer an opportunity to select one of:

(i) accepting the streaming video message; and

(ii) rejecting the streaming video message;

accepting a response of said viewer; and

processing said message in accordance with the response of said viewer.

20. The computer program recorded on a machine-readable medium of claim 19, wherein the step of accepting the streaming video message comprises at least one of;

(i) accepting the streaming video message for immediate display; and

(ii) accepting the streaming video message for storage in a machine-readable memory for display at a later time.

21. The computer program recorded on a machine-readable medium of claim 15, wherein said computer program is further capable, when operating on a receiver computer, of performing the step of:

receiving said streaming video message is accomplished without the necessity of an action by a viewer of said computer.

22. The computer program recorded on a machine-readable medium of claim 21, wherein displaying said streaming video message is accomplished without the necessity of an action by a viewer of said computer.

23. The computer program recorded on a machine-readable medium of claim 21, wherein displaying said video message is performed by invoking the operation of a video display module.

24. The computer program recorded on a machine-readable medium of claim 15, further performing the step of:

in response to an indication that said receiver computer is not online, optionally sending said video message from said communication module of said sender computer to a host computer, for storage and later transmission to said communication module of said receiver computer, independent of the operation of said server computer.

25. The computer program recorded on a machine-readable medium of claim 15, wherein said video message comprises video information.

26. The computer program recorded on a machine-readable medium of claim 25, wherein said video message further comprises information selected from audio information, a thumbnail image, a text identifying a subject, a message body text, a document attachment, a slide and meta-data.

27. A computer program recorded on a machine-readable medium, the computer program adapted to operate a server computer and to provide server functionality including database connectivity and communication protocols, the computer program when operating on a server computer performing the steps of:

determining the online status of said receiver computer; and

providing an indication of said status to said sender computer, such that in response to an indication that said receiver computer is online, streaming said video message from said

computer program of said sender computer to said computer program of said receiver computer is accomplished independent of the operation of said server computer.

28. The computer program recorded on a machine-readable medium of claim 27, the computer program performing the further step of:

accepting a request from a sender computer about the status of a receiver computer, said receiver computer being the intended recipient of a video message.

29. The computer program recorded on a machine-readable medium of claim 27, the computer program performing the further step of:

providing communication protocols for exchanging information between interconnected computers.

30. The computer program recorded on a machine-readable medium of claim 27, the computer program performing the further step of:

providing a database in which to store information, including information about sender and receiver computers authorized to communicate with said server computer.

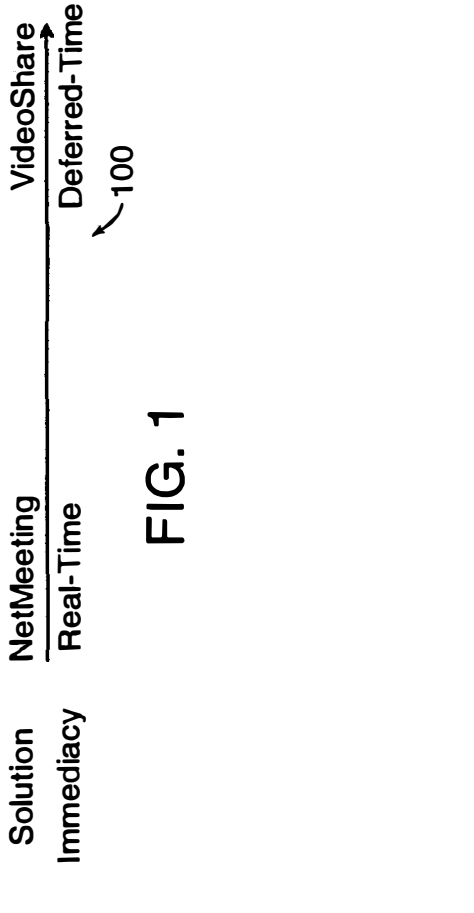



FIG. 1

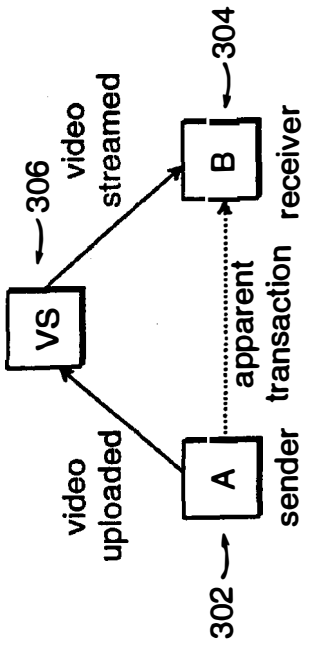



FIG. 2A

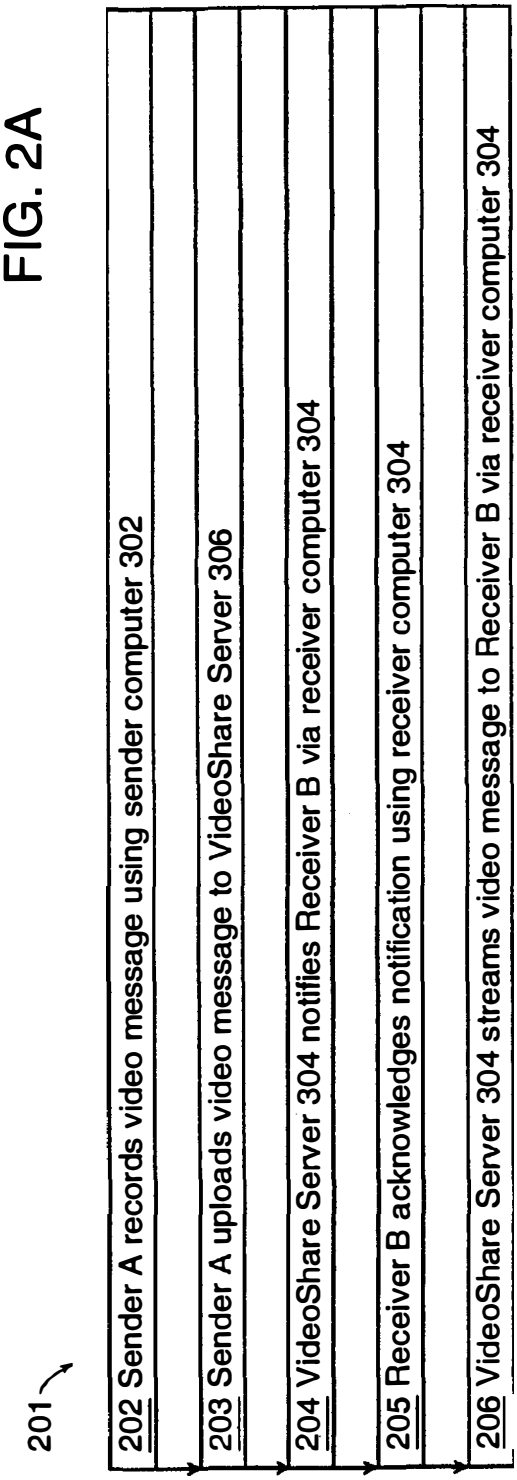



FIG. 2B

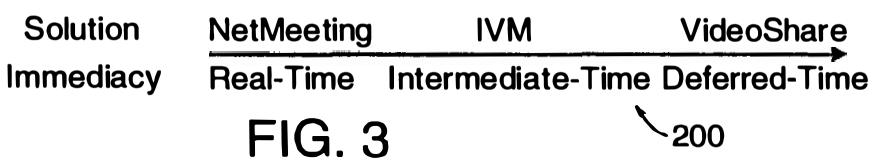



FIG. 3

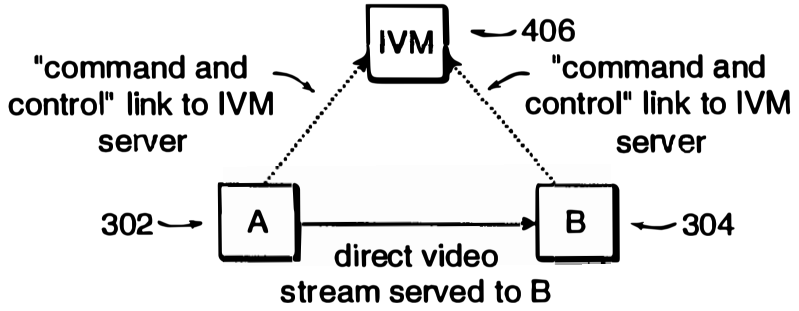



FIG. 4A

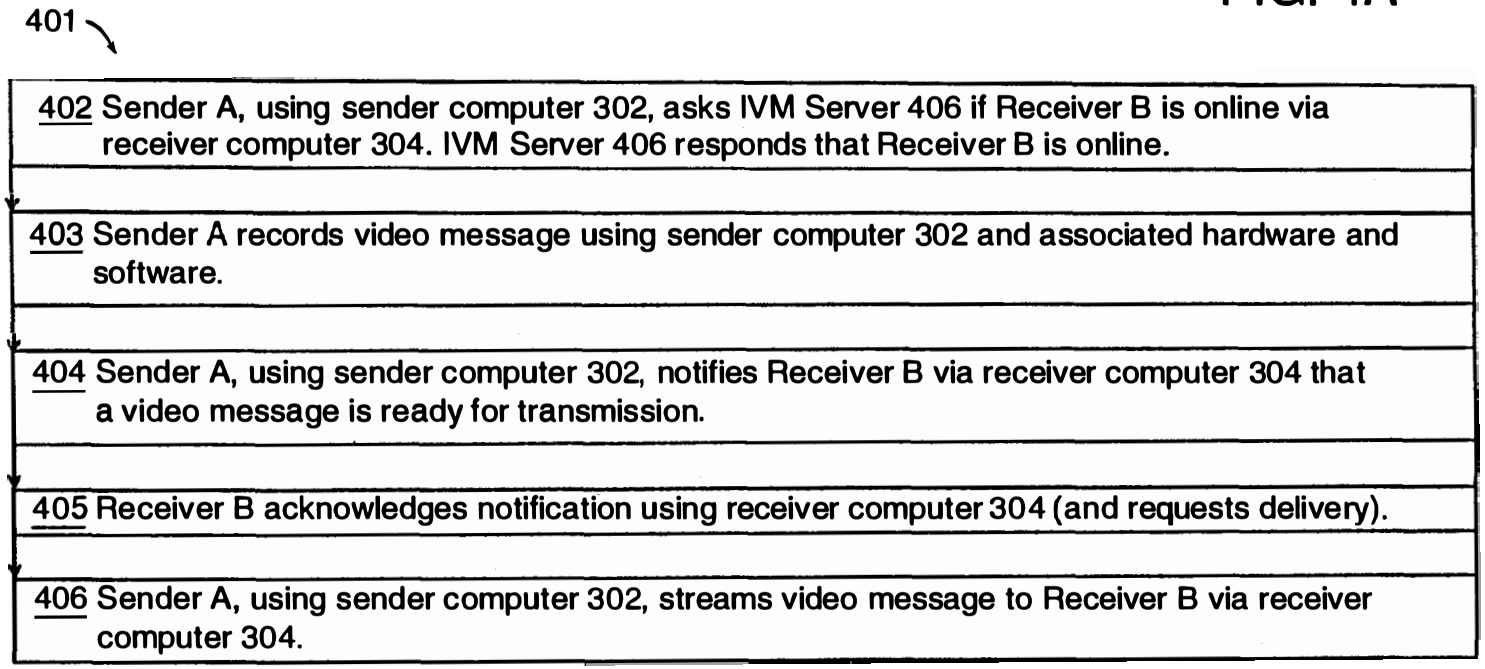



FIG. 4B



SUBSTITUTE SHEET (RULE 26)

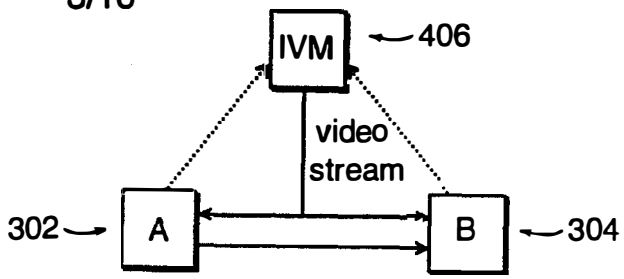



FIG. 5

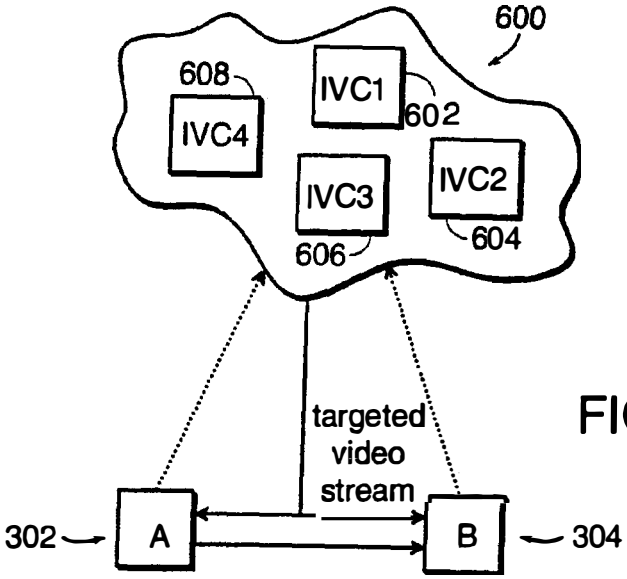



FIG. 6

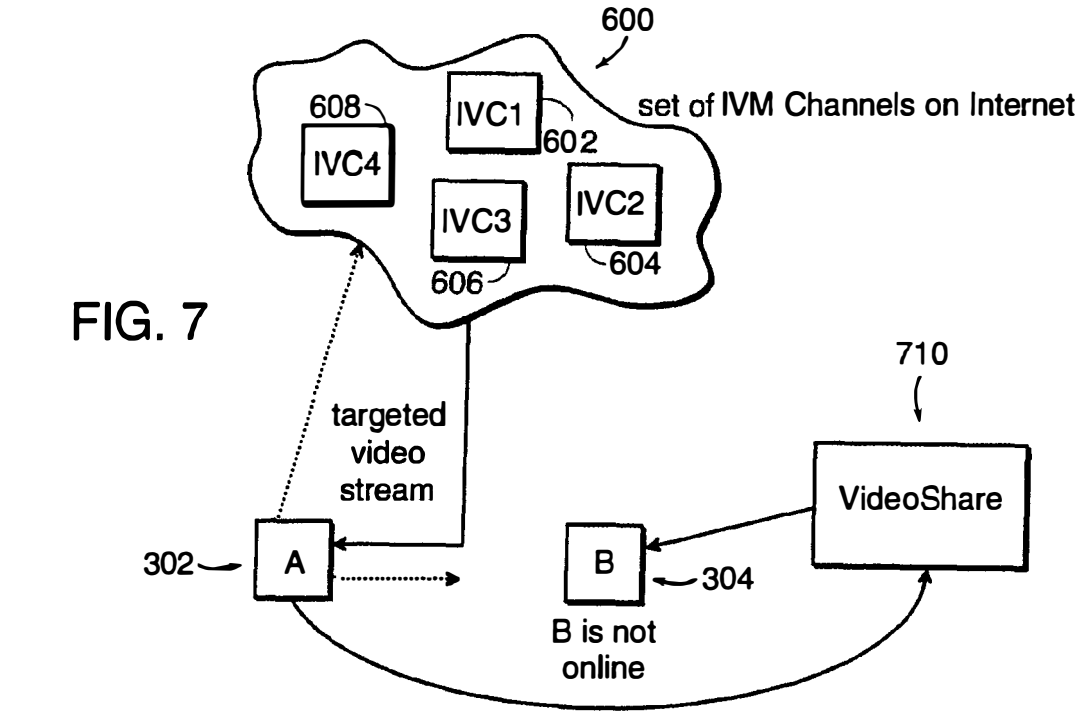



FIG. 7

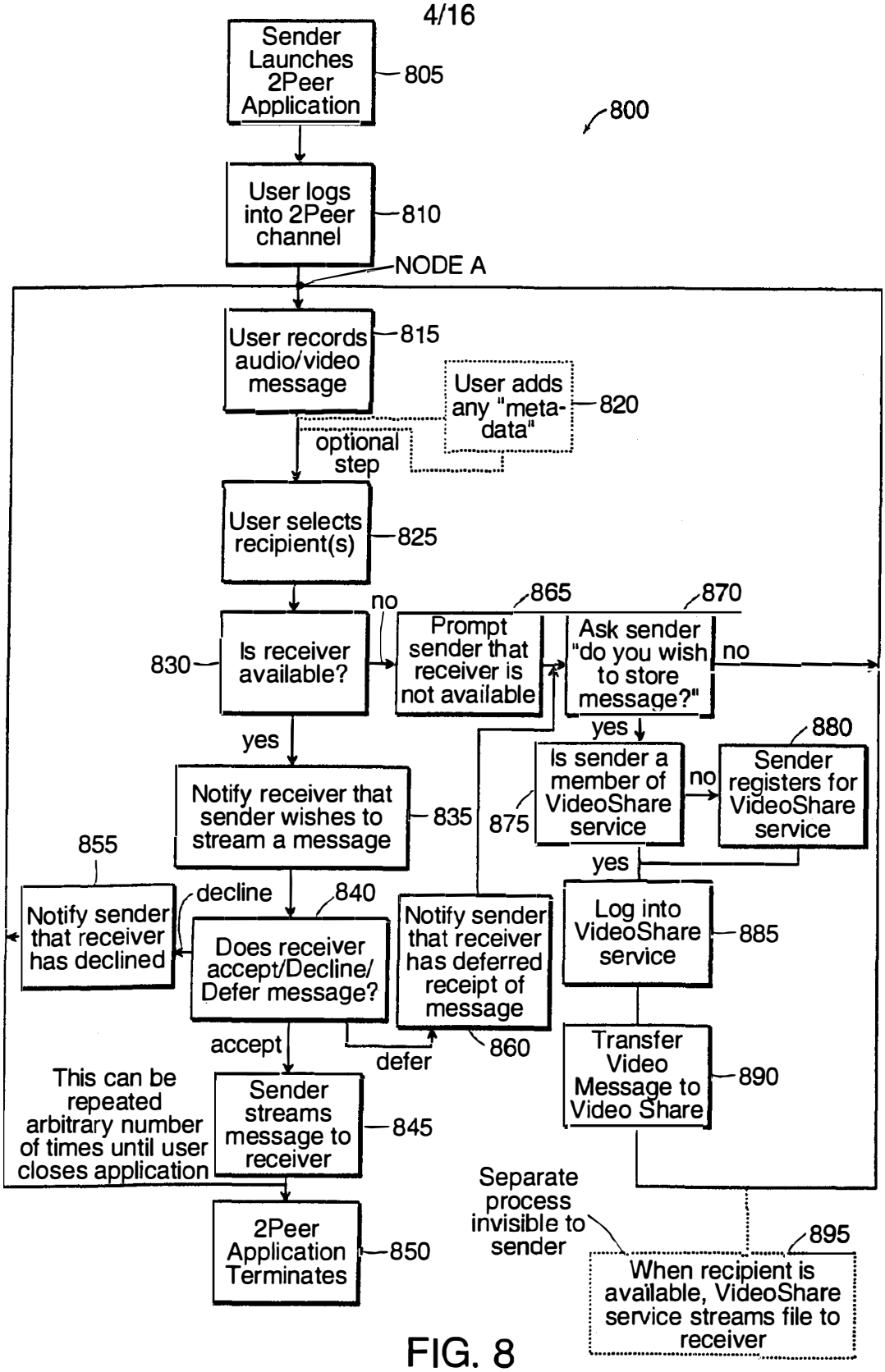

Sender Launches 2Peer Application
805
800
User logs into 2Peer channel
810
NODE A
User records audio/video message
815
User adds any "meta-data"
820
optional step
User selects recipient(s)
825
Is receiver available?
830
no
Prompt sender that receiver is not available
865
Ask sender "do you wish to store message?"
870
no
yes
Is sender a member of VideoShare service
875
no
Sender registers for VideoShare service
880
yes
Notify receiver that sender wishes to stream a message
835
yes
855
Notify sender that receiver has declined
decline
Does receiver accept/Decline/ Defer message?
840
Notify sender that receiver has deferred receipt of message
Log into VideoShare service
885
accept
defer
860
Transfer Video Message to Video Share
890
This can be repeated arbitrary number of times until user closes application
Sender streams message to receiver
845
Separate process invisible to sender
2Peer Application Terminates
850
When recipient is available, VideoShare service streams file to receiver
895

FIG. 8

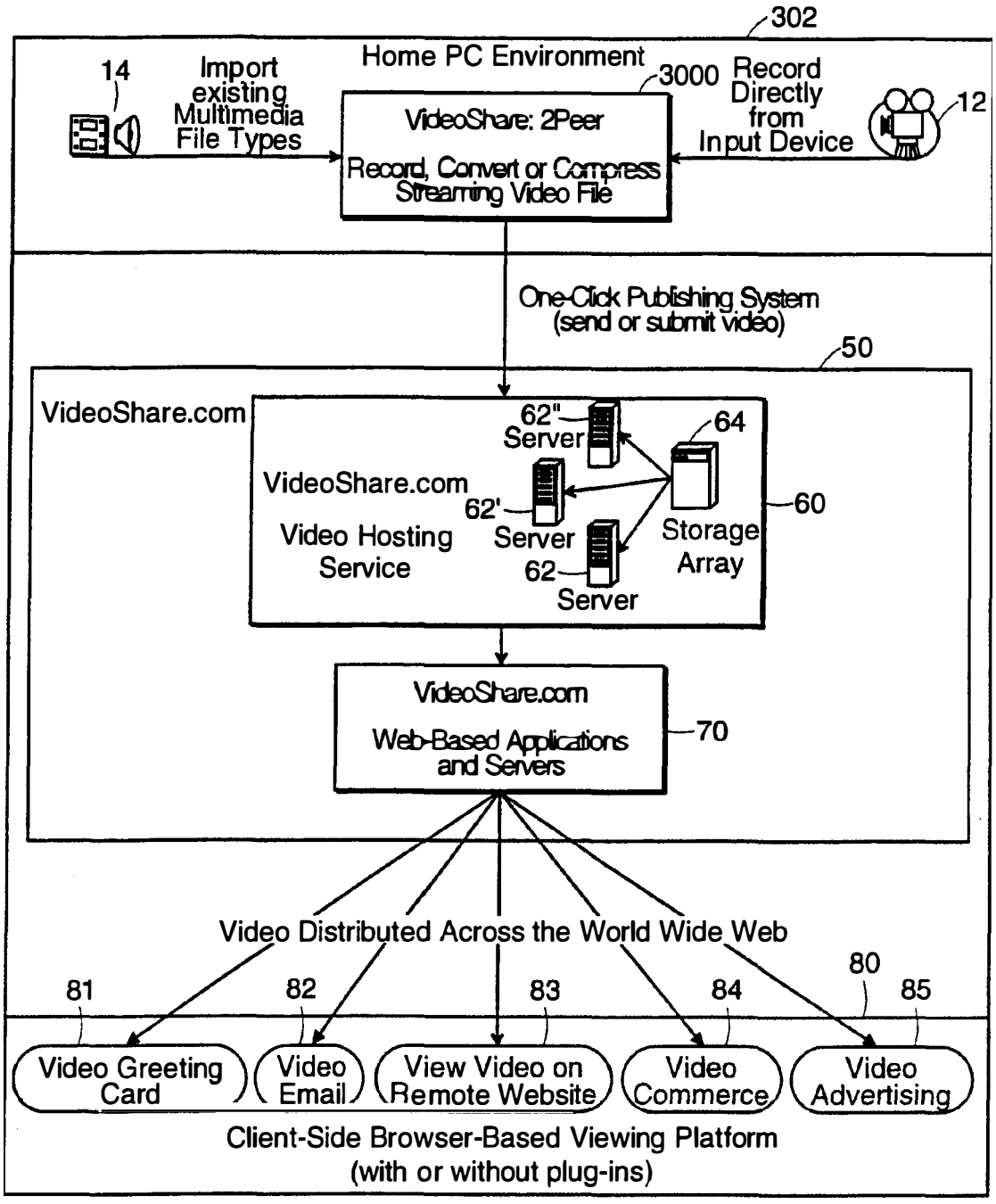

302
Home PC Environment
14
Import existing Multimedia File Types
3000
VideoShare: 2Peer
Record, Convert or Compress Streaming Video File
Record Directly from Input Device
12
One-Click Publishing System (send or submit video)
50
VideoShare.com
62"
Server
64
VideoShare.com
62'
Server
Video Hosting Service
62
Server
Storage Array
60
VideoShare.com
Web-Based Applications and Servers
70
Video Distributed Across the World Wide Web
81
82
83
84
80
85
Video Greeting Card
Video Email
View Video on Remote Website
Video Commerce
Video Advertising
Client-Side Browser-Based Viewing Platform
(with or without plug-ins)

FIG. 9

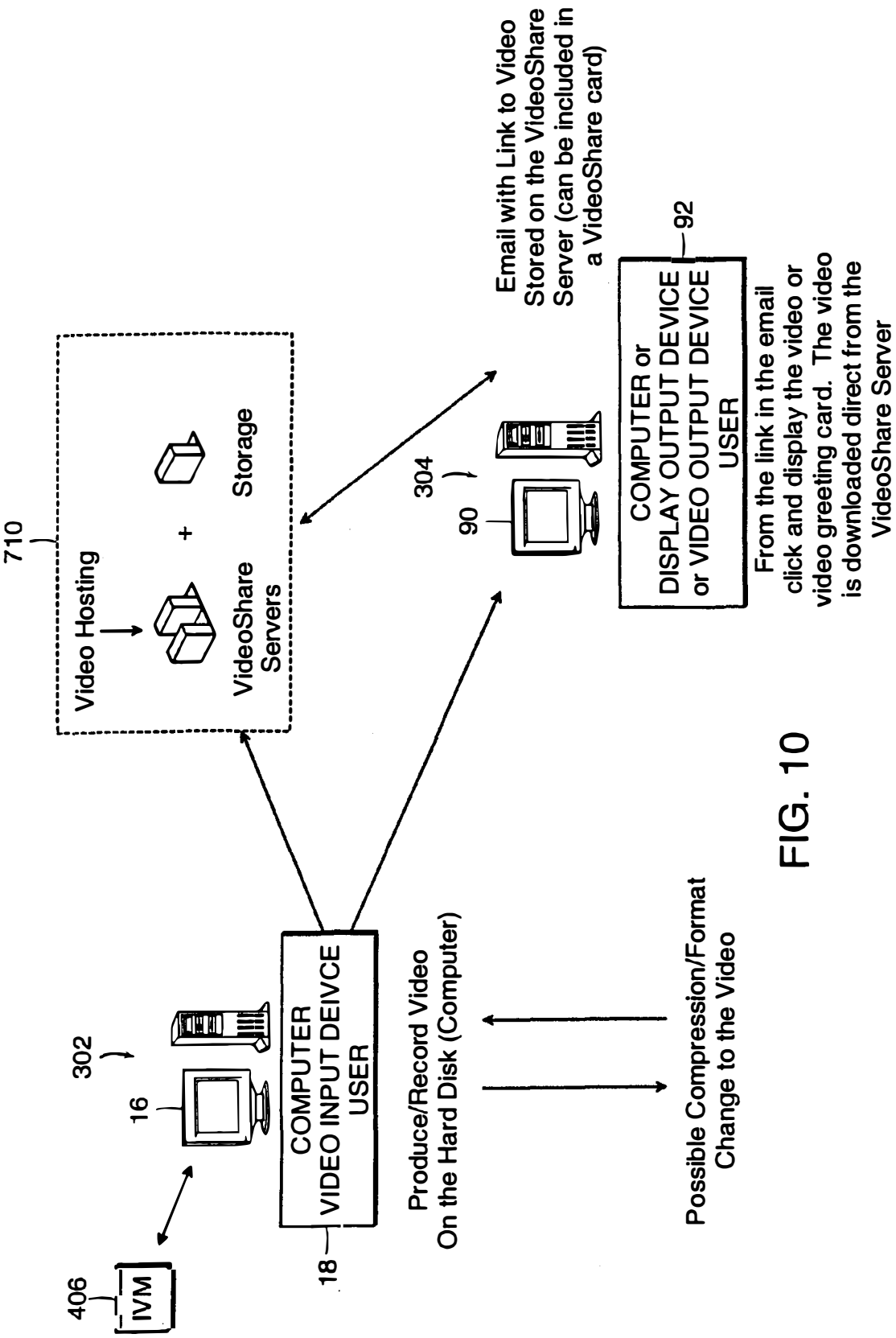
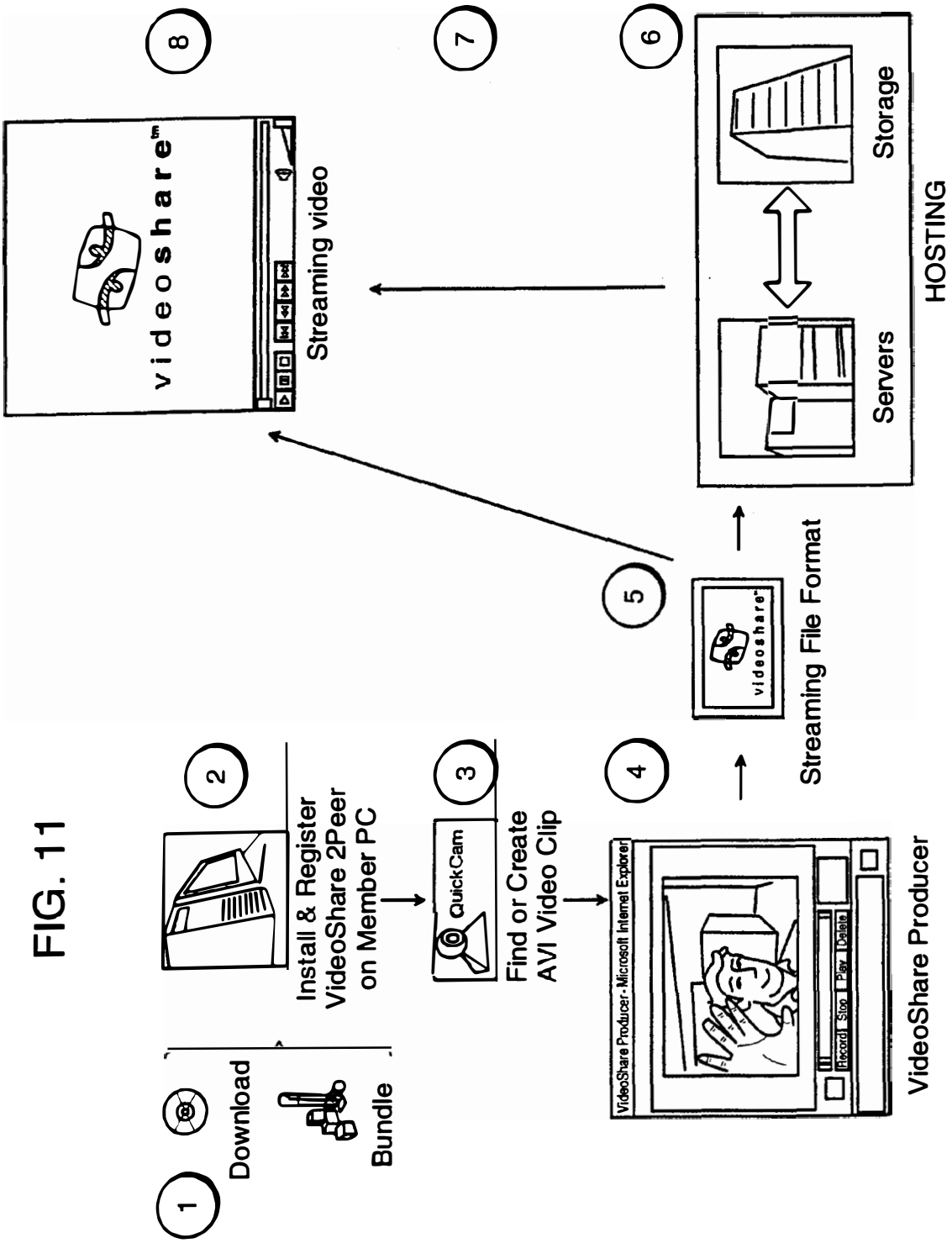

710
Video Hosting
+
Storage
VideoShare Servers
Email with Link to Video Stored on the VideoShare Server (can be included in a VideoShare card)
304
90
92
COMPUTER or DISPLAY OUTPUT DEVICE or VIDEO OUTPUT DEVICE USER
From the link in the email click and display the video or video greeting card. The video is downloaded direct from the VideoShare Server
302
16
406
IVM
18
COMPUTER VIDEO INPUT DEIVCE USER
Produce/Record Video On the Hard Disk (Computer)
Possible Compression/Format Change to the Video

FIG. 10

FIG. 11


1
Download
Bundle
2
Install & Register
VideoShare 2Peer
on Member PC
3
QuickCam
Find or Create
AVI Video Clip
4
VideoShare Producer - Microsoft Internet Explorer
Record Stop Play Delete
VideoShare Producer
5
videoshare
Streaming File Format
6
Storage
Servers
HOSTING
7
8
videoshare
Streaming video

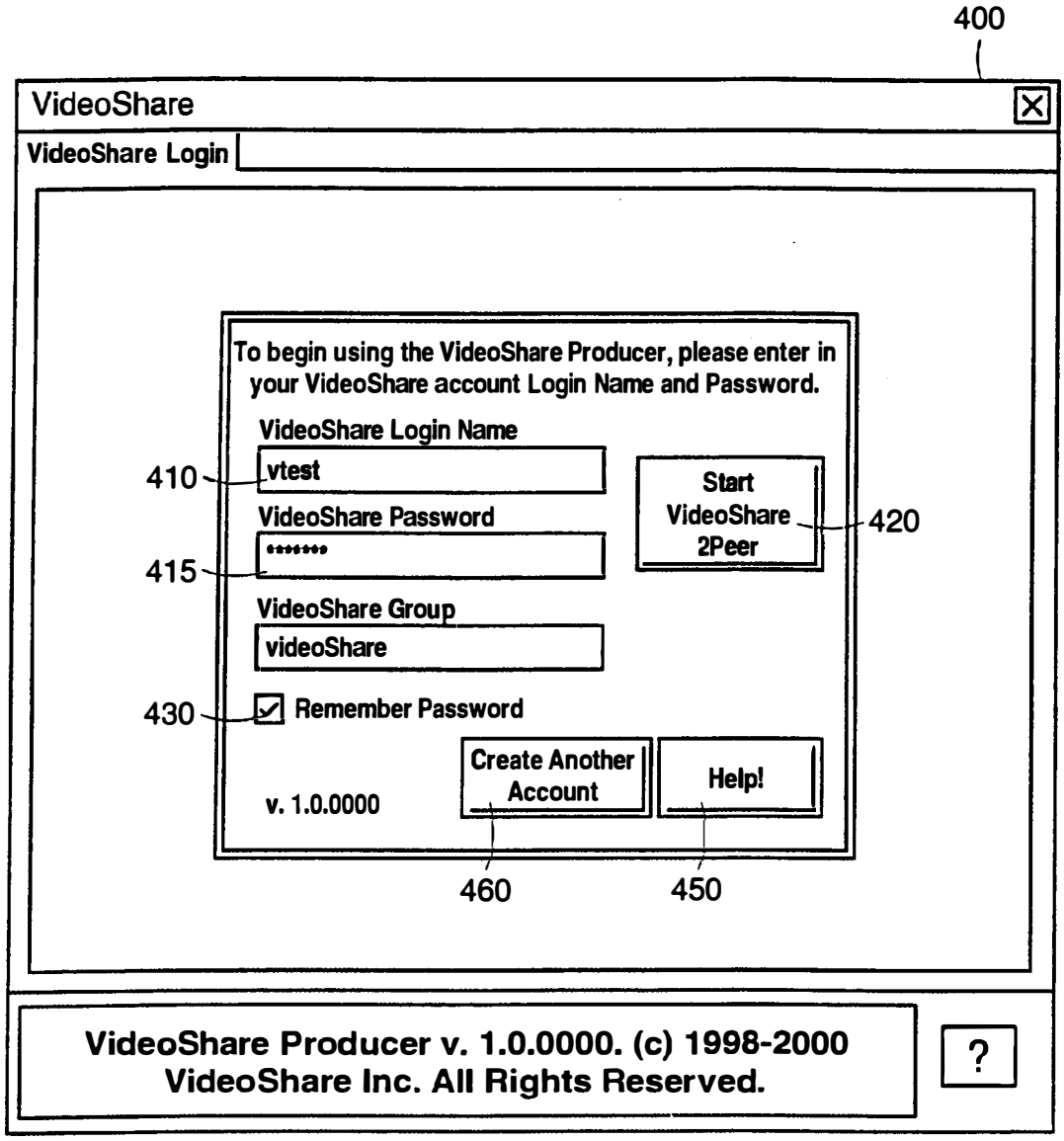

400
VideoShare
VideoShare Login
To begin using the VideoShare Producer, please enter in your VideoShare account Login Name and Password.
VideoShare Login Name
410
vtest
VideoShare Password
415
VideoShare Group
videoShare
430
Remember Password
Start VideoShare 2Peer
420
Create Another Account
Help!
v. 1.0.0000
460
450
VideoShare Producer v. 1.0.0000. (c) 1998-2000 VideoShare Inc. All Rights Reserved.
?

FIG. 12

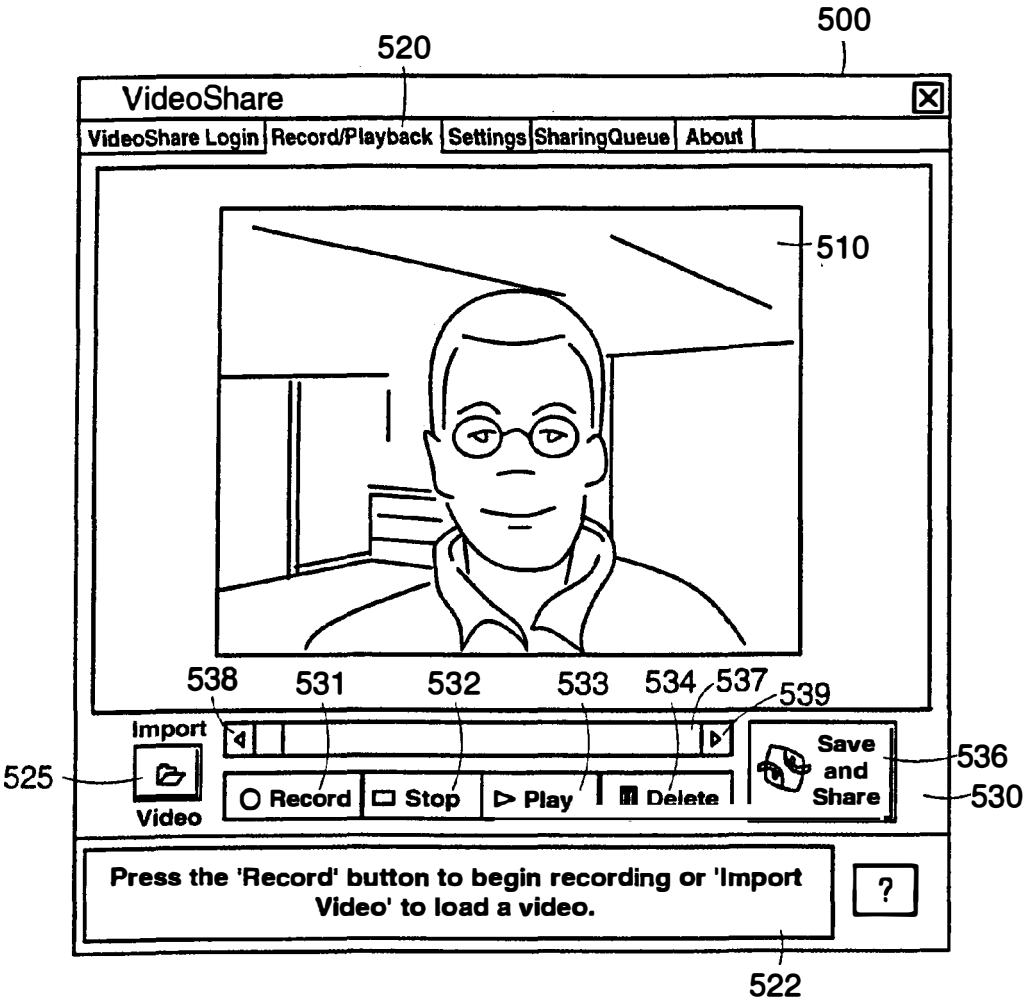

500
520
VideoShare
VideoShare Login
Record/Playback
Settings
SharingQueue
About
510
538
531
532
533
534
537
539
Import
525
Video
Record
Stop
Play
Delete
Save and Share
536
530
Press the 'Record' button to begin recording or 'Import Video' to load a video.
?
522

FIG. 13

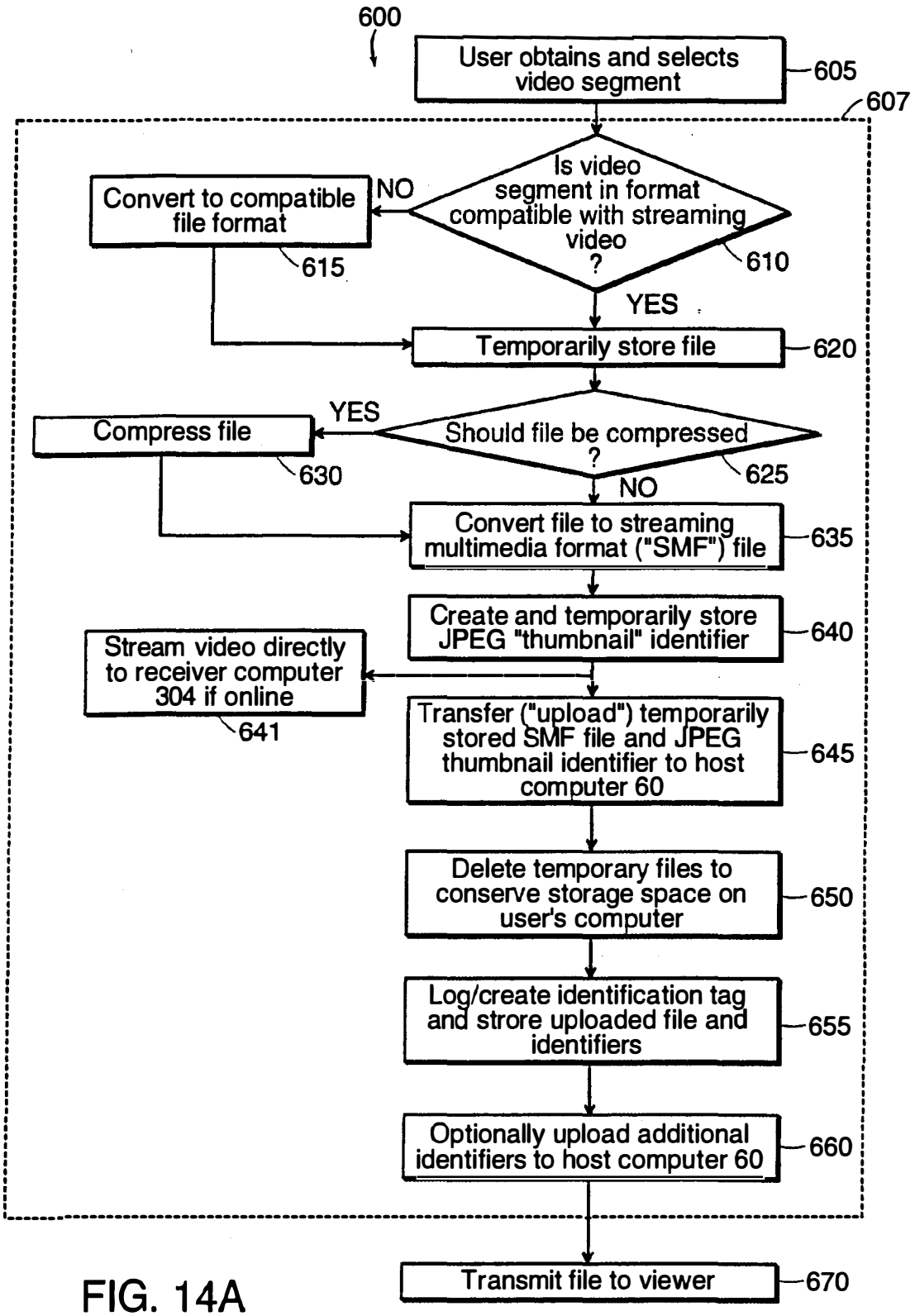

600
User obtains and selects video segment
605
607
Is video segment in format compatible with streaming video ?
610
NO
Convert to compatible file format
615
YES
Temporarily store file
620
Should file be compressed ?
625
YES
Compress file
630
NO
Convert file to streaming multimedia format ("SMF") file
635
Create and temporarily store JPEG "thumbnail" identifier
640
Stream video directly to receiver computer 304 if online
641
Transfer ("upload") temporarily stored SMF file and JPEG thumbnail identifier to host computer 60
645
Delete temporary files to conserve storage space on user's computer
650
Log/create identification tag and strore uploaded file and identifiers
655
Optionally upload additional identifiers to host computer 60
660
Transmit file to viewer
670

FIG. 14A

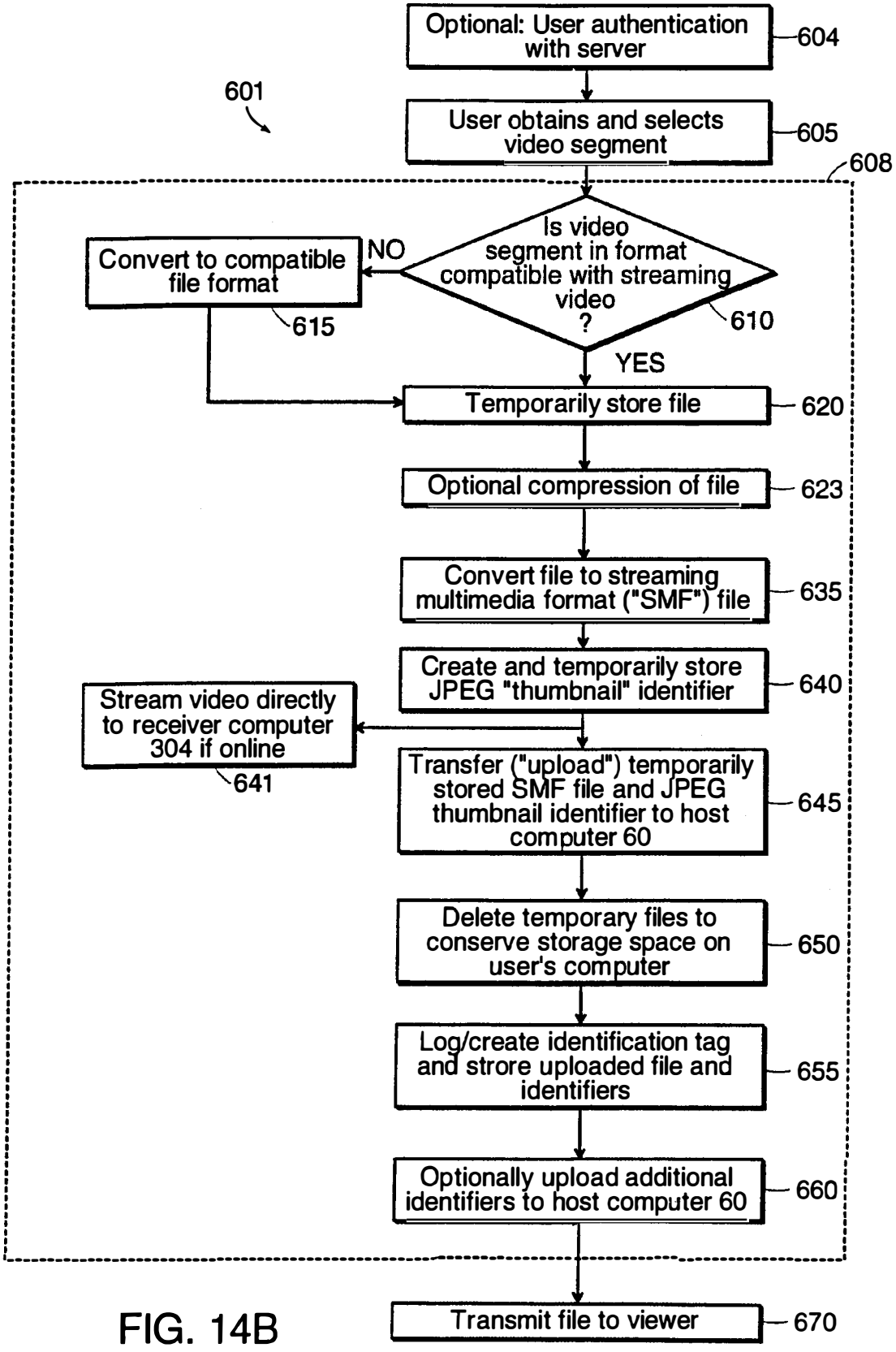

Optional: User authentication with server
604
601
User obtains and selects video segment
605
608
Is video segment in format compatible with streaming video ?
610
NO
Convert to compatible file format
615
YES
Temporarily store file
620
Optional compression of file
623
Convert file to streaming multimedia format ("SMF") file
635
Create and temporarily store JPEG "thumbnail" identifier
640
Stream video directly to receiver computer 304 if online
641
Transfer ("upload") temporarily stored SMF file and JPEG thumbnail identifier to host computer 60
645
Delete temporary files to conserve storage space on user's computer
650
Log/create identification tag and strore uploaded file and identifiers
655
Optionally upload additional identifiers to host computer 60
660
Transmit file to viewer
670

FIG. 14B

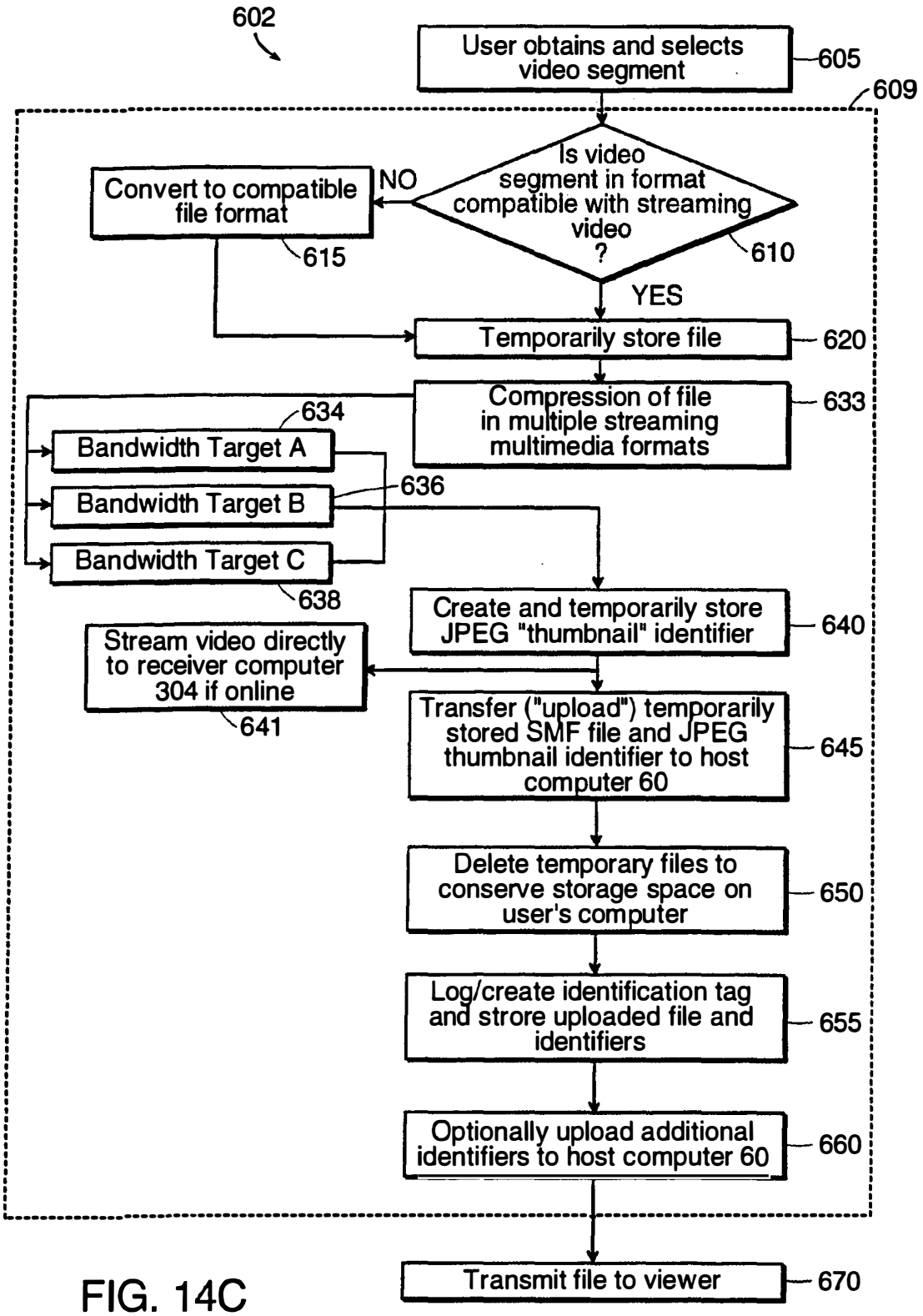

602
User obtains and selects video segment
605
609
Is video segment in format compatible with streaming video ?
610
NO
Convert to compatible file format
615
YES
Temporarily store file
620
Compression of file in multiple streaming multimedia formats
633
634
Bandwidth Target A
636
Bandwidth Target B
Bandwidth Target C
638
Create and temporarily store JPEG "thumbnail" identifier
640
Stream video directly to receiver computer 304 if online
641
Transfer ("upload") temporarily stored SMF file and JPEG thumbnail identifier to host computer 60
645
Delete temporary files to conserve storage space on user's computer
650
Log/create identification tag and strore uploaded file and identifiers
655
Optionally upload additional identifiers to host computer 60
660
Transmit file to viewer
670

FIG. 14C

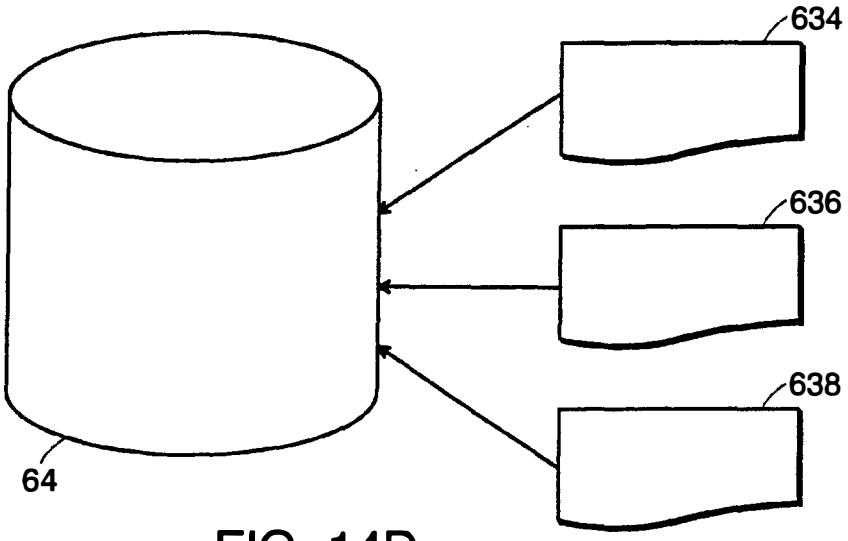



FIG. 14D

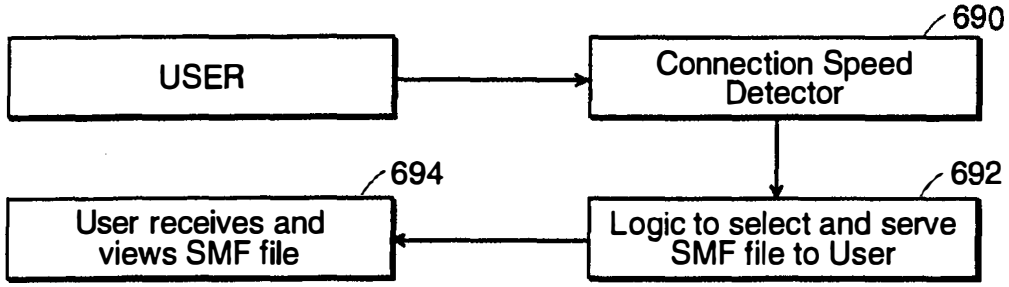



FIG. 14E

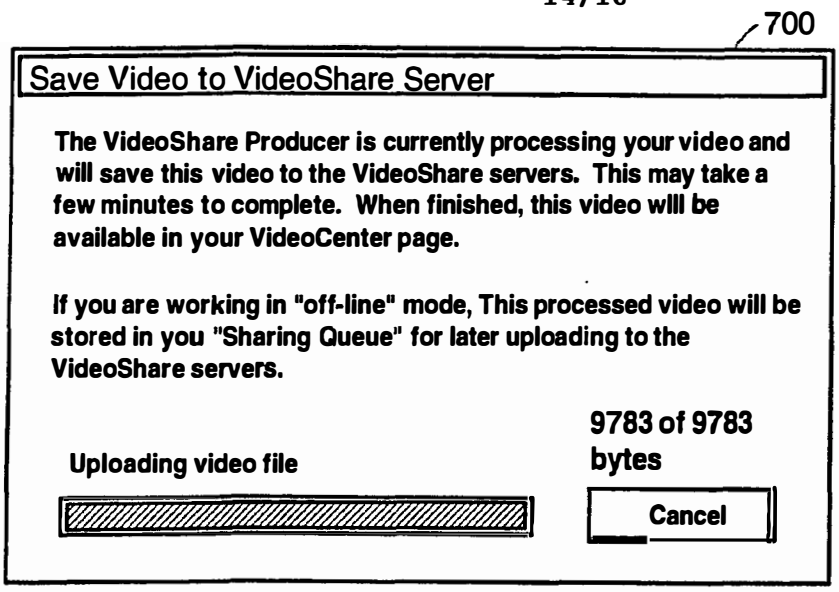
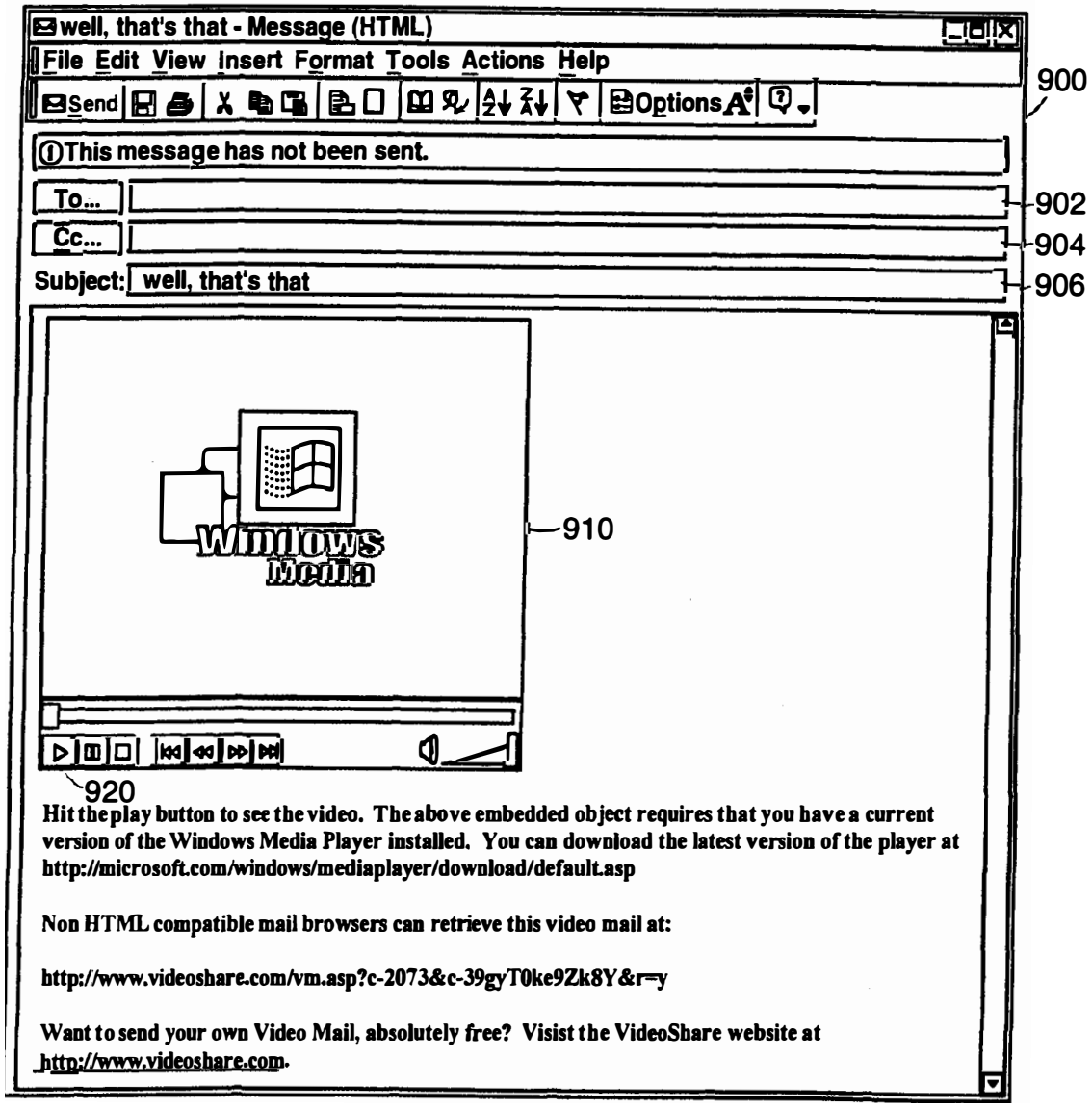

700
Save Video to VideoShare Server
The VideoShare Producer is currently processing your video and will save this video to the VideoShare servers. This may take a few minutes to complete. When finished, this video will be available in your VideoCenter page.
If you are working in "off-line" mode, This processed video will be stored in you "Sharing Queue" for later uploading to the VideoShare servers.
Uploading video file
9783 of 9783 bytes
Cancel

FIG. 15

FIG. 16


well, that's that - Message (HTML)
File Edit View Insert Format Tools Actions Help
Send
Options
This message has not been sent.
To...
Cc...
Subject: well, that's that
900
902
904
906
910
920
Hit the play button to see the video. The above embedded object requires that you have a current version of the Windows Media Player installed. You can download the latest version of the player at http://microsoft.com/windows/mediaplayer/download/default.asp
Non HTML compatible mail browsers can retrieve this video mail at:
http://www.videoshare.com/vm.asp?c-2073&c-39gyT0ke9Zk8Y&r=y
Want to send your own Video Mail, absolutely free? Visist the VideoShare website at http://www.videoshare.com.

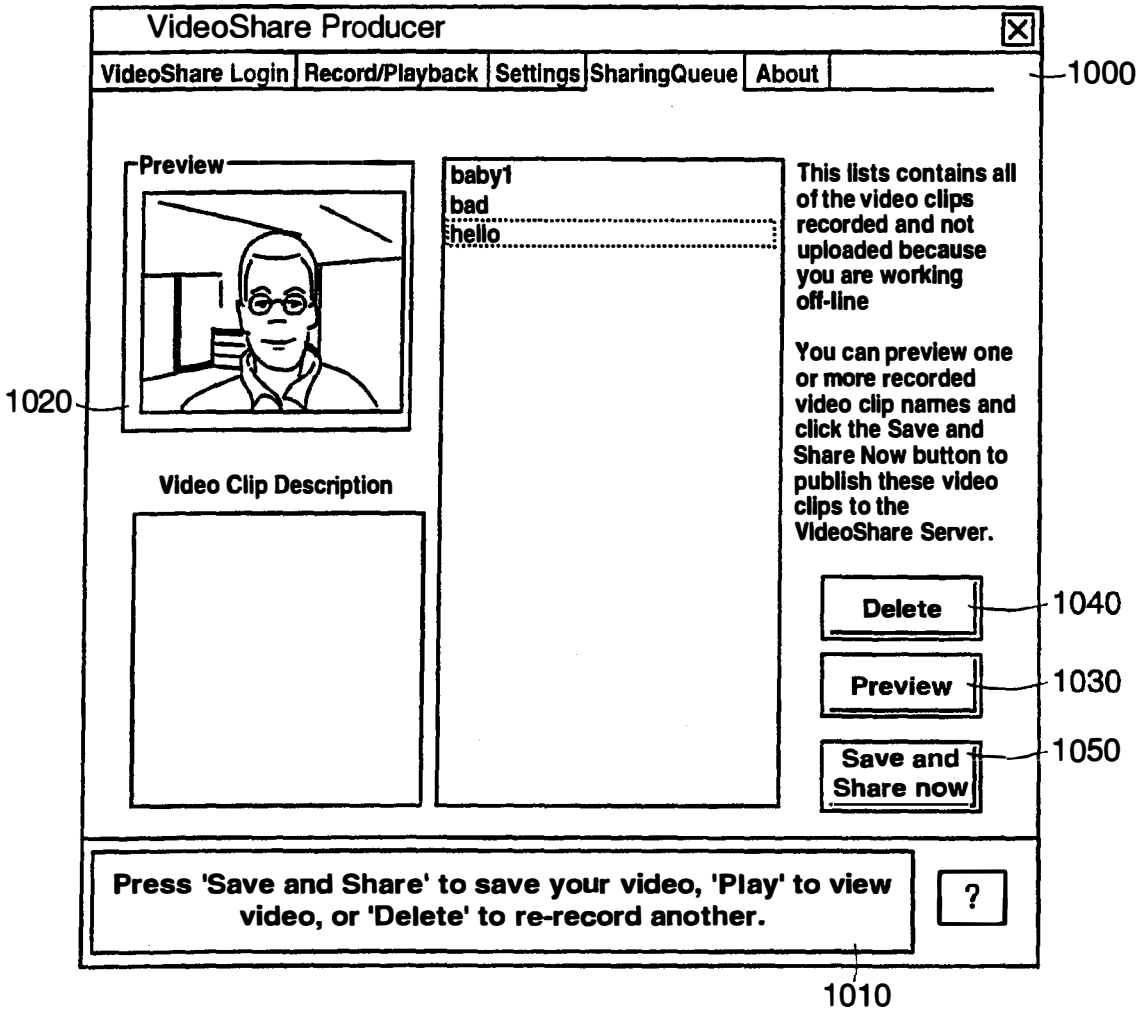

VideoShare Producer
VideoShare Login
Record/Playback
Settings
SharingQueue
About
1000
Preview
1020
baby1
bad
hello
This lists contains all of the video clips recorded and not uploaded because you are working off-line
You can preview one or more recorded video clip names and click the Save and Share Now button to publish these video clips to the VideoShare Server.
Video Clip Description
Delete
1040
Preview
1030
Save and Share now
1050
Press 'Save and Share' to save your video, 'Play' to view video, or 'Delete' to re-record another.
?
1010

FIG. 17

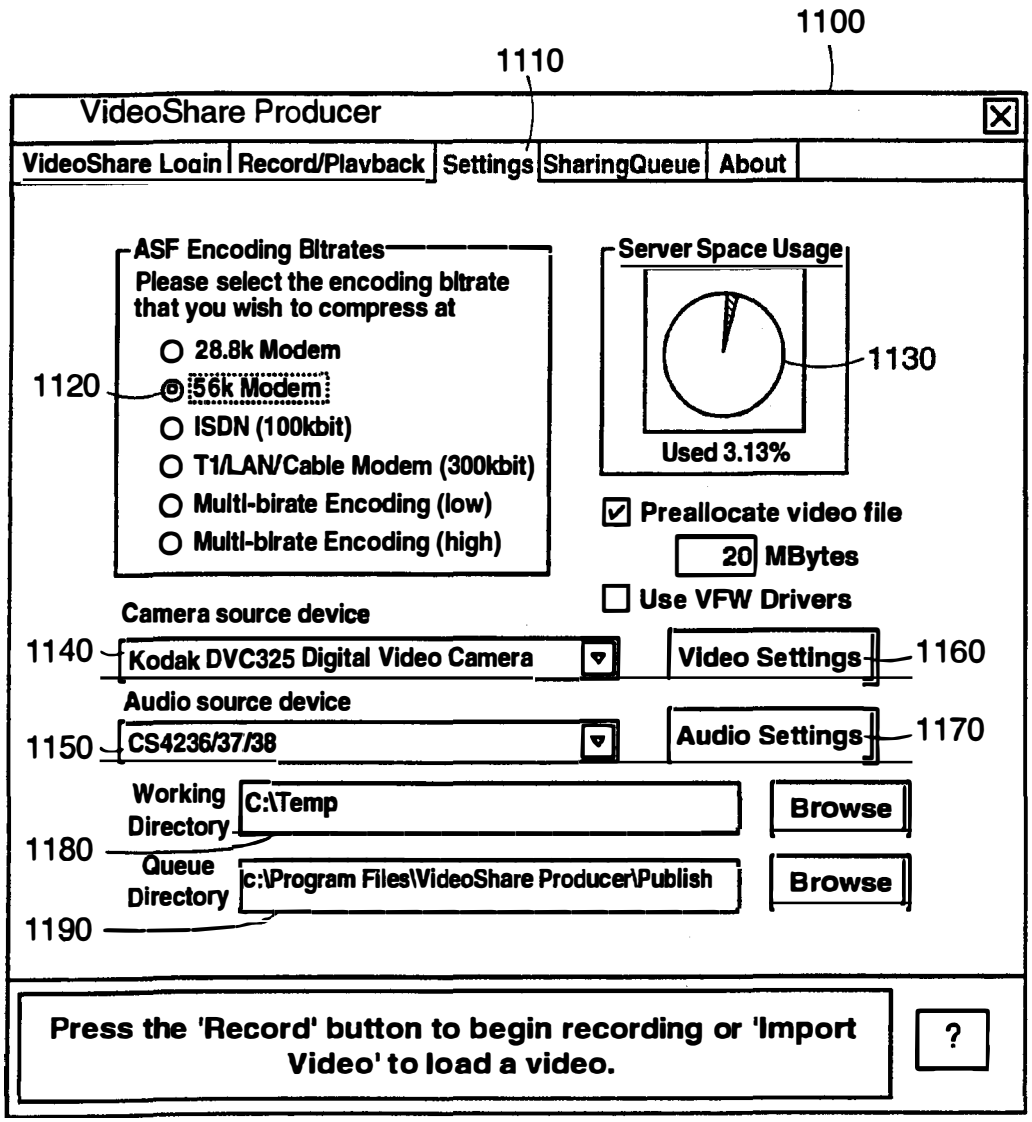

1100
1110
VideoShare Producer
VideoShare Login
Record/Playback
Settings
SharingQueue
About
ASF Encoding Bitrates
Please select the encoding bitrate that you wish to compress at
28.8k Modem
56k Modem
ISDN (100kbit)
T1/LAN/Cable Modem (300kbit)
Multi-birate Encoding (low)
Multi-birate Encoding (high)
1120
Server Space Usage
Used 3.13%
1130
Preallocate video file
20 MBytes
Use VFW Drivers
Camera source device
1140
Kodak DVC325 Digital Video Camera
Video Settings
1160
Audio source device
1150
CS4236/37/38
Audio Settings
1170
Working Directory
C:\Temp
Browse
1180
Queue Directory
c:\Program Files\VideoShare Producer\Publish
Browse
1190
Press the 'Record' button to begin recording or 'Import Video' to load a video.
?

FIG. 18

# INTERNATIONAL SEARCH REPORT

Intern: al Application No
PCT/US 00/21214

**A. CLASSIFICATION OF SUBJECT MATTER**
IPC 7 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04N H04L H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, WPI Data, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | ZDNET: "honeyq v1.5"<br>ZDNET DOWNLOADS INFO, 'Online!<br>6 November 1997 (1997-11-06), XP002150290<br>Retrieved from the Internet:<br><URL:http://www.zdnet.com/downloads/stories/info/0,,000LVZ,.html><br>'retrieved on 2000-10-16!<br>the whole document<br>--- | 1,3-9,<br>11,<br>13-16,<br>18,25-30 |
| A | WO 98 16045 A (MIRABILIS LTD ;VARDI ARIEH (IL); AMNON AMIR (IL); GOLDFINGER YAIR)<br>16 April 1998 (1998-04-16)<br>abstract<br>page 2, line 14 - line 34<br>page 6, line 33 -page 7, line 9<br>figures 1-3<br>claims 1,7,8,11-14,23<br>---<br>-/-- | 1,3-9,<br>13,15,<br>27-30 |

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 18 October 2000 | 03/11/2000 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Fantini, F |

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication,where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | ICQ INC.: "Mirabilis Announces Special Version of its Popular ICQ To Support Microsoft NetMeeting 2.0" PRESS RELEASE ICQ INC., 'Online! 28 April 1997 (1997-04-28), XP002150291 Retrieved from the Internet: <URL:http://www.icq.com/press/press_release_netmeeting.html> 'retrieved on 2000-10-16! the whole document --- | 1,5,15, 27 |
| A | JOSÉ ALVEAR: "Guide to Streaming Multimedia" 9 April 1998 (1998-04-09) , WILEY COMPUTER PUBLISHING XP002150113 Chapter 11 "RealNetworks' RealAudio and RealVideo" --- | 1,5,15, 27 |
| A | EP 0 762 763 A (AT & T CORP) 12 March 1997 (1997-03-12) abstract figure 1 ----- | 1,5,15, 27 |

1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern. al Application No
PCT/US 00/21214

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| WO 9816045 A | 16-04-1998 | AU 4395497 A | 05-05-1998 |
| | | BR 9712207 A | 25-01-2000 |
| | | CN 1240083 A | 29-12-1999 |
| | | EP 1013044 A | 28-06-2000 |
| EP 0762763 A | 12-03-1997 | US 5760823 A | 02-06-1998 |
| | | AU 698760 B | 05-11-1998 |
| | | AU 6436996 A | 06-03-1997 |
| | | CA 2179215 A | 02-03-1997 |
| | | JP 9331514 A | 22-12-1997 |

Form PCT/ISA/210 (patent family annex) (July 1992)

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
22 February 2007 (22.02.2007)

PCT

(10) International Publication Number
WO 2007/020627 A1

(51) International Patent Classification:
*G07F 17/32* (2006.01)

(21) International Application Number:
PCT/IL2006/000931

(22) International Filing Date: 10 August 2006 (10.08.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
170279 15 August 2005 (15.08.2005) IL

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(72) Inventor: **ROUJINSKY, John** [IL/IL]; 26 Zalman Shazar Street, 42493 Netanya (IL).

(74) Agent: **REINHOLD COHN AND PARTNERS**; P.o.box 4060, 61040 Tel Aviv (IL).

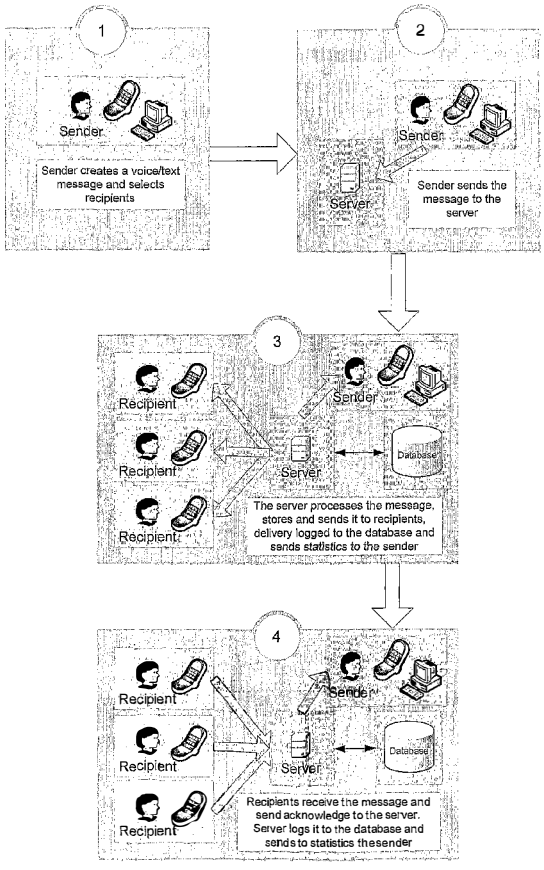
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *with international search report*

*[Continued on next page]*

**(54) Title:** METHOD AND SYSTEM FOR OBTAINING FEEDBACK FROM AT LEAST ONE RECIPIENT VIA A TELECOMMUNICATION NETWORK




**(57) Abstract:** A system (30) for obtaining feedback from at least one recipient via a telecommunication network, includes a communication device (45) having a messaging client (31) in bi-directional communication with a messaging server (35) for receiving one or more events relating to a recipient receiving or responding to a media message sent by a communication device (45). A Group Management Server (36) stores definitions and properties of registered users and user groups of the system, and a templates server (40) stores message templates for access by communication devices (45) connected thereto.



WO 2007/020627 A1

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# Method and system for obtaining feedback from at least one recipient via a telecommunication network

## FIELD OF THE INVENTION

This invention relates generally to voice messaging and particularly to multi-media messaging having a voice component.

## BACKGROUND OF THE INVENTION

Mobile Decisions developed by Netalizer, Inc. of Tel Aviv, Israel allows text based information to be communicated via the cellular network to multiple end devices using WAP. A particular application of Mobile Decisions provides recipients with a text-based menu providing different voting options that may be selected using the scrolling features of the end device. The user responses are stored by a central server that may be adapted to perform statistical analysis on the user responses and convey the results to the users' end devices or web interface.

Conveying text messages and responding to questionnaires and surveys using Mobile Decisions requires manual operation of the telephone interface. This is time-consuming, and in the ever-increasing drive to render mobile telephones smaller it is cumbersome and prone to error. Moreover, it may not always be convenient or even safe, particularly in those situations where the user requires use of both hands for other purposes, such as driving. But even apart from this, text-based interfaces require literary and technical proficiency that may be beyond the capabilities of some users. Clearly, such problems would be avoided if the menus were voice driven rather than text-based.

Voice activated menu systems are known in the patent literature. For example, US Patent No. 4,451,700 (Kempner *et al.*) published May 29, 1984 discloses a telephone based automatic audience survey system for polling an audience to obtain data representative of the opinion regarding a question of interest. Incoming calls are answered with an analog voice signal that both identifies the telephone based automatic audience survey system and queries a response in regard to the question of interest. In response to the answers provided to the query portions of the analog voice signal, data representative of the consensus regarding the question of interest is provided and displayed in real-time.

US 2004/0234065A1 (Anderson) published Nov. 25, 2004 discloses an automated telemarketing method for computer-based interactive speech application, where information is conveyed to customer upon sending greeting and upon receiving a message from the customer. A telephone call is initiated to a potential customer using an auto-dialing device and a voice platform is notified that the potential customer has answered the telephone call. The voice platform includes a text-to-speech device and a speech recognition device. In response to receiving the notification, a verbal greeting provided by the text-to-speech device is sent to the potential customer. The method further comprises conversing with the potential customer via the voice platform in response to sending the verbal greeting. The conversing includes receiving a message from the potential customer via the speech recognition device. Information is provided to the potential customer responsive to the message.

WO 0041415A1 (Isotalo) published July 13, 2000 describes a method for implementing a voting service by means of a mobile telephone, in which the vote cast by the mobile phone subscriber is sent using a digital telephone as a short message over radio networks. Confirmation of the casting of the vote is also sent as a short message.

US 2003/0100321A1 (Rao *et al.*) published May 29, 2003 and entitled "*Instantaneous polling utilizing a message service mobile phone network*" discloses a polling system for voting, auction bidding, opinion surveying, and the like, communicable with mobile communications devices for performing information collection responsive to input from the mobile communications devices, utilizing an existing short message service (SMS) and/or Internet wireless applications protocol (WAP), and information processing means for processing and analyzing the information collected. The collected information is stored, organized, analyzed, and transmitted to the mobile communication devices using SMS, or through the Internet using WAP, or to Internet-connected devices of any kind.

EP1450570A1 published August 25, 2004 to Lucent Technologies Inc. and entitled "*Communication to one mobile station of update of call participation availability status of another mobile station*" discloses an application server component of an apparatus that comprises a buddy list service that monitors a status (e.g., online, offline, busy, on a call) of mobile stations to determine whether they are available for participation in a call.

It would clearly be desirable to provide a system allowing questionnaires and surveys to be effected using mobile telephones that allow both prompts and responses to contain media content other than text alone.

## SUMMARY OF THE INVENTION

It is an object of the invention to provide a method and system allowing questionnaires and surveys to be effected using mobile telephones that allow both prompts and responses to contain media content other than text alone. Within the context of the following description and the appended claims, such a message will be referred to as a "media message". It is therefore to be understood that within the context of the invention and claims the term "media" can refer to any message such as voice, video etc. and can also be a multimedia message integrating different types of media.

This object is realized in accordance with a first aspect of the invention by a method for obtaining feedback from at least one recipient via a telecommunication network, the method comprising:

compiling a media message using a sending device;

sending the media message to a server for storing together with a respective identity of each recipient; and

receiving one or more events relating to a recipient receiving or responding to said media message.

In accordance with one embodiment of the invention, such a method is carried out by end-user device using the service to send a voice message to one or more recipients. In a typical implementation, after sending the voice message, the sender receives acknowledgement from the server that the voice message has been received. The events may relate simply to the fact that a recipient has opened an incoming message; or it may be that he or she has responded and the answer is thus stored at the server for access by the sender. Likewise, the events may be pushed by the server to the sender; or the sender may actively request updates by accessing the server.

In accordance with another aspect of the invention, there is provided a method for obtaining feedback from at least one recipient via a telecommunication network, the method comprising:

receiving from a sender device message data indicative of a recorded message that a sender device wishes to convey to a recipient device;

storing said message data together with a respective identity of each recipient device;

conveying data to each recipient device pertaining to said message data;

storing events relating to an activity performed by a recipient device on receiving or responding to said data;

analyzing said events so as to generate status data; and

storing the status data for access by the sender.

In accordance with one embodiment of the invention, such a method is typically carried out by a server operating the service to receive a voice message sent by a sender, to convey the voice message to one or more recipients and to receive and process their responses. The server typically operates an inbox for each recipient and, upon receiving a response (i.e. event) stores pertinent data in the corresponding recipient's inbox. Data pertaining to each message could be notification of an awaiting message or could be the message itself. Storing the status data for access by the sender is the default for one-to-many; but the status data could be sent directly to the sender.

It should however be noted that the advantages of the invention derive not only from the ease of recording voice messages in preference to typing text messages, but also from the greater convenience of listening to a message for many users. Many of these advantages can be realized using other forms of multimedia beside, or in addition to, voice. For example, messages may be audio-video clips that may be conveyed independent of regular voice messages or may accompany such messages. For example, a voice message may prompt the recipients to provide feedback concerning a set of options that are displayed visually on an accompanying video clip. In such case, the prompt itself remains vocal and the multimedia adds content. But the invention embraces also the possibility that a multimedia message is formulated by the sender and then conveyed to selected recipients. Such multimedia messages will typically include voice, but not necessarily so.

## BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, an embodiment will now be described with regard to audio messages, by way of non-limiting example only, with reference to the accompanying drawings, in which:

**Figs. 1 and 2** show pictorially representations of communication systems that allow a source telephone to convey audio-messages to multiple receiving devices and to receive feedback according to a non-limiting embodiment;

**Fig. 3** schematically shows a client-server system suitable for implementing another non-limiting embodiment;

**Fig. 4** is a block diagram showing functionally an enhanced telephone adapted to convey an audio message to at least one receiving device;

**Fig. 5** is a block diagram showing functionally a messaging server adapted to receive an audio message, convey it to multiple recipients, and process and feed back received responses;

**Figs. 6a and 6b** are pictorial flow charts showing operation of the system according to an embodiment of the invention; and

**Figs. 7a and 7b** are a sequence diagram showing the principal dialog between two telephones operating in accordance with an embodiment of the invention; and

**Fig. 7c** shows a detail of the sequence diagram shown in Figs. 7a and 7b depicting an alternative embodiment relating to statistics flow between the sender and the server.

## DETAILED DESCRIPTION OF EMBODIMENTS

Fig. 1 shows pictorially a system 10 according to an embodiment for conveying audio messages from one or more sender devices 11a, 11b, 11c to one or more receiving devices 12a, 12b, 12c and receiving feedback via an application server 13, which stores messages and feedback in a database 14. As shown, the devices 11a, 12a and 12b are mobile telephones coupled to each other and to the application server 13 via the Cellular Network 15. The devices 11b, 11c, 12c, 12d and 12e are computers that are inter-connected via the Internet to the application server 13. In such a system, a sender, John, can send a voice message via the mobile telephone 11a to a recipient, Mark, using the mobile telephone 12a. Likewise, senders can use either telephones or computers to send

messages. In the latter case, the web interface of the application server 13 is used. Even if a sender has sent the message using a telephone, statistics can be seen using computer and *vice versa*. Recipients can receive messages either to phone or computer, in the latter case use of e-mail being most likely. Thus, as shown by way of illustration in the figure, recipients, Mark, Dave and Sandy receive e-mail messages at their respective computers 12c, 12d and 12e in response to vocal messages communicated by any of the senders using mobile a telephone 11a or computers 11b, 11c.

Fig. 2 is a pictorial representation of a hybrid system 20 for conveying audio messages between a sender cellular telephone 11a and a recipient mobile telephone 12a connected to the cellular network 15. Additionally, a smart PSTN telephone 21 connected to the PSTN 22 via a modem 23 may also serve as a sender telephone, in which case the PSTN 22 serves as a conduit to the cellular network 13 via a PSTN/Cellular gateway 24. A VoIP telephone 25 may serve as either a sender or recipient and is coupled to an IP network 26 that is connected to the PSTN 23 via a PSTN/IP gateway 27. The only substantive difference between the system 10 shown in Fig. 1 and the hybrid system 20 shown in Fig. 2 is that in the system 20 signaling and media are conveyed from one network to the other via the PSTN/Cellular gateway 24 or the PSTN/IP gateway 27, which operate in a manner well known in the art to convert the signals between PSTN and IP or PSTN and Cellular protocols and *vice versa*.

By way of example, so far as the IP network 26 is concerned, the PSTN/IP gateway 27 functions as an intermediate recipient that receives signaling and media from the sender telephone 21. In the IP network 26, the signaling and media are received together by the PSTN/IP gateway 27 on the same path and allow connection to the VoIP recipient telephone 25. An audio, and optionally, video stream conveyed by the sender telephone 21 is directed by the PSTN 23 to the PSTN/IP gateway 27, which in turn determines that the required destination is either the cellular recipient telephone 12 in the cellular network 13 or the VoIP recipient telephone 24 in the IP network 26. If the recipient is the cellular telephone 12, the message reaches the PSTN/Cellular gateway 24, which determines that the destination address is a telephone in the cellular network 15. If the recipient is the VoIP recipient telephone 24, the PSTN/IP gateway 27 receives the signaling and media on separate paths in the PSTN 23, performs the required protocol conversion, and re-directs the signaling and media on a common path

in the IP network 26 to the recipient telephone. The PSTN/IP gateway 27 converts IP network instant messages to the necessary format for PSTN. Thus, the invention allows audio messaging in real time within the cellular network or between the cellular network and the IP network or the PSTN as well as allowing streaming functionality between the PSTN and the other two networks.

Fig. 3 schematically shows a client-server system 30 suitable for carrying out a non-limiting embodiment of the invention. The system 30 includes a messaging client 31 having an optional AB presence unit 32 that are loaded into a sending or receiving device shown as 45 in Fig. 4. The messaging client 31 is coupled via an access network 33 to a SIP/IP core 34 (constituting a protocol handler) and thence to a messaging server 35, thus allowing bi-directional communication between the messaging client 31 and the messaging server 35. The AB presence unit 32, if provided, is likewise coupled to the SIP/IP core 34 and thence to a Group Management Server 36. The Group Management Server 36 stores definitions and properties of registered users and user groups of the system, such as ID, address, Group ID etc. This allows a sender device to access such properties thus facilitating contact and group access and management remotely. Optionally, a presence server 37 coupled to the SIP/IP core 34 and to the messaging server 35 and the Group Management Server 36 may also be provided. Optionally a location client 38 may be provided in the sending or receiving device 45 for operating in conjunction with a location server 39 for allowing the location server 39 to compile a list showing the location of each device. As will be explained later, this allows recipient profiles or classifications to be location-dependent so that messages can be sent to recipients whose location is within prescribed limits. For example, a taxi dispatcher wishing to direct taxis to a client can use this information to send the order only to those taxis that are located within a prescribed radius of the client's location. A templates server 40 allows message templates to be stored centrally for access by the sending devices connected thereto. As will be explained later, templates are standard message objects that may include voice, text and other media and optionally designated recipients, thus allowing commonly used messages to be pre-formatted and saving time. Although in Fig. 3 the messaging server 35, the Group Management Server 36, the location server 39 and the templates server 40 are shown as separate, distributed components, it will be appreciated that they can be realized by a single server. Likewise,

any or all of these servers can be realized by distributed servers, as is well known in the art.

The system 30 may be implemented in any IP network, *e.g.*, cellular, Wireless LAN, wireline IP based connection, Modem connection and over any bearer – PSTN, PLMN, etc. The messaging client 31 can run on different devices such as mobile phones, smart phones, WDAs PDAs, etc. and be implemented in variety of technologies, for example Java, J2ME, Brew, Symbian, Linux, Windows, PocketPC, SmartPhone, PalmOS, or others. Java and J2ME are trademarks of Sun Microsystems Inc., Brew is a registered trademark of Qualcomm Inc., San Diego, USA. Symbian is a trademark of Symbian Software Limited, London, UK. "Linux" is a registered trademark of Linus Torvalds, the original author of the Linux kernel. Windows, PocketPC, and SmartPhone, are registered trademarks of Microsoft Corporation, Redmond, USA. PalmOS is a registered trademark of PalmSource, Inc. and its licensor, Palm Trademark Holding Company LLC. The client-server system 30 can utilize variety of protocols for notification/message loading/sending answers. Thus, with the current state of art for cellular networks, the following is expected to be used:

- iDEN or other 'always on' networks:
  - Notification: UDP/SMS
  - The rest: HTTP/Socket
- GPRS/CDMA
  - Notification: SMS
  - The rest: HTTP/Socket

The AB presence unit 32 is a client that connects to the presence server 37 to provide presence and service identification data. The messaging client 31 does not obtain this data directly from the presence server but rather takes data provided by the presence client (the AB presence unit 32) and uses this data to update the presence data and the service information received from the network. If the presence information (information about the properties of potential recipient devices) is not required, then both the AB presence unit 32 and the presence server 37 may be dispensed with. Otherwise, both the AB presence unit 32 and the presence server 37 are needed.

Fig. 4 is a block diagram showing the functionality of an enhanced telephone 45 (constituting a communication device) according to the non-limiting embodiment that

may serve as either a sender or receiving device. In this depicted example, the telephone 45 is a cellular telephone that is enhanced by a software client. The telephone 45 has a processor and protocol converters shown generally as 46. A transmitter/receiver 47 allows cellular transmissions and receptions in a known manner. The location client 38 described above with reference to Fig. 3 optionally operates in conjunction with the location server 39 to include the sender's location within the message. In the absence of the location client 38 and/or the location server 39, this may be done manually by the sender. A message inbox 48 provides a view of a subscriber inbox for each recipient on the messaging server, including limited local storage of incoming messages, downloaded from the server. A memory 49 stores data such as an address book 50 and optionally sender/recipient profiles and a user interface 51 allows respective telephone numbers of one or more recipient addresses to be selected for conveying voice and/or video streaming thereto. Address book function allows use of phone's contact list or contacts and groups managed by the system, either on the phone or on the system's server. Typically, the user interface 51 includes a keypad and scrolling keys for typing text messages and selecting options displayed on a display 52.

The enhanced telephone 45 also has a microphone/speaker driver 53 that allows speech to be converted to electrical signals for recording using a voice recording unit 54 and which may be encoded by an audio codec 55 for producing an audio stream in a known manner. By virtue of the microphone/speaker driver 53, a message can be played immediately and loudly using a loudspeaker of the phone, regardless of the phone's settings before the reception of the message, so no manual intervention is required at all. The voice recording unit 54 includes a conventional user interface that provides play/record and forward/backward rewind facilities. A recorded message is stored in the memory 49 and may be edited before sending. Likewise, a camera/display driver 56 allows a video image to be captured and is coupled to a video codec 57 that converts it to a video stream in a known manner. The presence awareness module 32 allows the user to determine at a glance whether a receiving device is on-line and available for receiving a message. Presence awareness is functionally similar to a buddy list, such as the one described in EP 1450570A1, allowing, for example, the status of members thereof to be displayed using suitable icons. The status may also indicate whether a receiving device associated with a selected member is an enhanced device or is a simple

device. This information may be used to avoid the sender inadvertently trying to send video messages to a receiving device that is flagged as being incapable of video messaging. It is also used to inform the server of device capabilities so that the server knows which protocol to use, which data format etc. for each recipient device. By such means, if the sender sends a video message to multiple recipient devices, some of which do not have video capability, the server is able to convey the full messages to those recipient devices that have video capability, while removing message components that are not supported by other recipient devices. A template browser 58 operates in conjunction with the templates server 40, shown in Fig. 3, for accessing templates and optionally allowing templates to be downloaded from the templates server 40. This obviates the need for local storage, although it will be understood that limited local storage of most commonly required templates may also be provided.

Fig. 5 is a block diagram showing the functionality of the messaging server 35 shown in Fig. 3 being adapted to handle messaging between a sender device and a receiving device according to a non-limiting embodiment of the present invention. The messaging server 35 has a processor and protocol converters shown generally as 61. Furthermore, the messaging server 35 has client interfaces 62 that are coupled to the processor 61 and serve as first and second interfaces for coupling to respective first and second telephone devices. Both of the telephone devices have a display and a voice recording/play unit as explained above. A GLMS interface 63 allows groups to be defined so that an incoming call directed to one member of the group may be automatically sent to the other members of the group. Accordingly, multicast transmissions may be conveyed to several parties simultaneously. A memory 64 stores message data and possibly icons or other image data of registered users.

The messaging server 35 further has a data analysis unit 65 that is adapted to process data received from recipient device in response to messages conveyed thereto by a sender device. This allows events to be logged and statistics to be compiled, as explained in greater detail below with reference to Figs. 6a, 6b and 7 of the drawings, and conveyed to the sending device for vocalization and/or display thereby. A presence server interface 66 allows connection of the optional presence server 37 as described above with reference to Fig. 3. A templates server interface 67 allows connection of the templates server 40 as described above with reference to Fig. 3. A location server

interface 68 allows connection of the location server 39 as described above with reference to Fig. 3. The messaging server 35 also provides storage for a plurality of subscriber inboxes each in respect of a different registered subscriber, providing storage of messages even when the designated recipients are off-line and allowing subscribers to access and browse messages whenever it becomes convenient.

Figs. 5a and 5b are pictorial flow charts showing operation of the system according to an embodiment of the invention. The sender creates a voice/text message and selects those recipients to whom he wishes to send the message. The message and destination data are sent from the sender 11 to the server 13, which processes and stores the message, and sends it to the recipients 12. The server 13 logs delivery to the database 14, analyzes the feedback events and conveys statistics to the sender. Statistics at this stage would include: total number of recipients, the number of recipients to whom the message has been sent, and the number of recipients to whom the message has not yet been sent yet. Recipients receive the message and send acknowledge signals to the server 13, which the server 13 logs to the database 14. The server 13 analyzes the acknowledge signals so as to compile statistics regarding which recipients have received the message, logs statistics to the database 14 and sends them to the sender 11. Recipients 12 opening the message to play or read it, send an acknowledge signal to the server 13, which analyzes the acknowledge signals so as to compile statistics regarding which recipients have opened the message, logs statistics to the database 14 and sends them to the sender 11. The sender may review the statistics, read or play individual responses and make direct contact with selected recipients. Recipients may likewise make predefined vocal or textual responses, which are conveyed to the server, which logs statistics to the database 14 and sends them to the sender 11.

Notification of an awaiting message may be communicated to a recipient in a variety of different ways, such as vocally or visually as is known in the art. For example, a beep or a pre-recorded voice file may be vocalized or a vibration signal may be produced. Additionally, or alternatively, if the recipient device is suitably enabled, visual notification may be given, such as a picture of the sender or another image or an icon depicting a message category, for example. The notification message, in whatever form it is given, may remain either for a fixed time period or until the recipient responds

or acknowledges receipt. The recipient may play the message or activate a snooze function, which causes the message to remain dormant for a fixed time period.

The notification message may be configured to provide different levels of information according to system setup or based on user-selected options. At its most basic, no information may be provided other than the actual fact that a message has arrived. In this case, the recipient has to retrieve the message even if he/she only wants to know who the sender is. Alternatively, the notification may include details of the sender, such as name, phone number, picture etc. Details may be shown textually or may be vocalized.

Upon playing a message, answers may be given in a variety of ways. For example, a limited number of options may be enumerated 0 through 9, thus allowing a recipient to select a desired option by pressing the appropriate numeric key. When a message is displayed visually, scrolling options may be provided assuming the receiving device has a suitable interface, in the same way that many mobile telephones allow selection of a desired contact from an address book. A less sophisticated approach is to vocalize each option in turn and interpret a key press as an acceptance of the most recently vocalized option.

The recipient can send a voice reply in addition to the above options or instead of choosing predefined option or providing textual/numeric answer (if allowed by sender) or, if he chooses, he can call the sender. Awaiting messages can be accorded different priorities according to settings that are defined for each recipient. According to different implementations, the priorities can be set by the recipient locally or a user profile for each recipient can be set and stored at the server. Thus, messages may be set so as not to played immediately, or if not responded within predefined period of time, to be played a specified number of times. Alternatively, messages may be set so as to be played immediately. The profile may be varied according to the sender so that messages from low priority senders are merely notified, while messages from high priority senders, who could be individuals or groups, such as spouse, boss, emergency services etc. are played immediately. Likewise, the messages themselves may be categorized so that messages of a specific category like "urgent" are played immediately. The profile can be set to remind the recipient of unread messages at predefined time intervals. A user interface is provided to allow recipients to delete one or more messages and to

view messages according to sender, time, or category; to save the sender in an address book and to forward a message to someone else.

The voice recording unit 39 is used to record and play a message. Recording can be interrupted in the middle and continued later, restarted or aborted. Optionally, responses received vocally can also be recorded using one voice chunk for each answer. The voice recording unit 39 can be adapted to compile messages of predetermined types that are processed differently. According to an embodiment, on recording a message, the sender may set the message definition to one of the following:

- Info – no answer required
- Open – numeric/textual/voice/multimedia answer is required
- Select – selection of one of a number of predefined options is required.

The sender may also indicate whether the message includes answers and, if so, he may:

- Define number of answers in the message
- Define whether voice answer is allowed/required
- Define whether voice answer only is allowed
- Define whether recipient receives information about the message in notification, or has to download the message.
- Add Digital Sound Processing (DSP) effects to the message with ability to preview the processed message. Digital Sound Processing allows sound effects used in the music industry, like "echo", "compressor", "limiter", "overdrive", "distortion", "vocoder" etc. to be added, and to modify pitch or speed of the recorded message.

In addition to a vocal recording, a message may also include text, in which case the sender may:

- Enter message text (optional)
- Enter text for each option of predefined answer
- Optional client based template for text. Such templates allow for textual entry and include widely used questions, like "Would you call me please?" "Are you coming to …?" etc. This save time by allowing selection and possibly customization of an appropriate template instead of typing the text in full.

The user interface 36 allows the sender to choose recipients by list selection, by alphabet, by categories (e.g. family, friends, work), by phone number, and private number and allows a Voice Tag to be attached to the message. By "private number" is meant a push-to-talk number (similar to phone number) used in iDEN network.. Voice Tags are usually recipient's/sender's name recorded as a voice message. So, for example, when messages arrives, the phone could "say" "you have a message from John", where John is a voice tag. Recipients may also be selected from phone's contacts, favorites, recently used recipients, groups list, groups recently used, "Speed Dial", by entering phone number(s), and by Location/Presence information (e.g. "everybody located in radius of X meters from me", or "everybody who is on-line now"). The sender may select whether to send only to phone or other addresses (email, PDA etc) as well. He may also have the option to send MMS if the client application according to the invention is not available on the recipient device. He can prioritize a message to choose if message will be forced to play or not and to select how many times to play. A "speed dial" facility is provided to map some users/ groups / send templates. A user can assign a pre-defined user/group or template to a phone button. Pressing this button associates the respective user or group to a message and instantly sends it, all with a single action. Alternatively, a pre-recorded message template can be mapped to the phone button. In such case, pressing the button requires the user to specify one or more recipients, which can also be done by depressing a button to which the desired recipient(s) is/are mapped.

Templates allow standard messages to be prepared in advance and sent directly, or to be edited and then sent. If a template includes only a message, the recording phase will be skipped. However, templates may also include predefined recipients as well, in which case they will be sent right away. Templates may be stored on the server or on the client. Server templates may also be popular or fashionable voice templates such as funny-sounding widely-used messages/questions. Upon selecting a template, control proceeds to the regular send flow with ability to change some options. Templates are usually created by recording a message in the normal way and saving as a template.

The sender may control the manner in which notifications are sent by the web application server by setting a notification policy that applies for a specific message or

template or in respect of specified recipients or groups of recipients. The notification policy may be set to:

- Receive notification after each recipient state transition
- Receive notification after each recipient answer
- Receive notification after all recipients answered + time period
- Receive voice notification [for each of 3 above]
- Receive statistics each X minutes during Y minutes

Scheduling allows a message to be sent once after a specified time delay or at defined date or time. Alternatively, a message may be sent repeatedly at specified time intervals (like each Monday at 8:00). Also, TTL (time to live) intervals may be defined during which the system will try to deliver the message to recipients and/or will accept recipient answers.

Once messages have been sent, they may be tracked together with any feedback received from the recipients. Sent messages have visual content may be viewed and their audio content may be played. Summary statistics such as total sent messages, number of messages received, number of messages read, and number of messages answered can be displayed. Summary response statistics such as minimum, maximum, sum, average of numeric responses may be shown; and distribution of answers for messages with predefined answers. If voice answers exist, a suitable icon may be displayed, which when pressed causes voice answers to be played. Recipient classification allows different behaviors to be defined for messages coming from a particular category. For example, messages from family may be played immediately. It also allows browsing of messages in inbox per category, thus allowing messages from family or any other selected recipient category to be browsed. Each recipient may be selected for listing his or her respective answer, allowing a desired recipient to be called. All responses and statistics can be displayed visually or vocalized, thus permitting hands-free operation.

Provisioning options facilitate system interaction with users that can be set by sender or recipient or provisioned remotely by a system/customer administrator, this being useful in corporate environment. The system/customer administrator may also specify which options can be modified by the user and whether setting of recipient is overridden by setting in the message or *vice versa*. Settings include:

- Play messages immediately
- Play messages loudly using speaker
- All other vibration/lighting/sound options as described above in connection with recipient and sender options.
- Re-play messages a defined number of times
- Allow/disallow stopping message play
- Do not send status to the server ("hiding")
- Send predefined voice/text message back if recipient is busy and not able to read/listen to messages (for example, during a meeting).
- Forward all incoming messages to a specified phone/email address.

It is possible to specify the above options generally or per recipient/group/-category. Remote provisioning of these options might be used in the following cases:

- Corporate environment: for example, corporate administrator can disable recipients to set "silent" mode or "hiding" for messages sent by the organization.
- Restoring settings of a user when the phone is changed: all the settings are stored on the server and can be replicated when the user's phone is changed.
- The system facilitates selling certain features for an additional fee. In such a case, the service operator will enable these options for subscribers remotely.

It also means that if a particular option is set in the message and not at the recipient phone, the message setting takes precedence and *vice versa* (unless otherwise provisioned by system administrator).

Figs. 7a and 7b are a sequence diagram showing the principal dialog between two telephones operating in accordance with an embodiment of the invention and showing suitable protocols for conveying messages between different components of the system. As shown, the sender records a message and selects recipients and options. The message is then sent to the messaging server using HTTP/TCP. The server stores the message together with the identities of the recipients in the message database and conveys to each recipient notification that a message has arrived. This may be done using UDP/SMS. As noted above, the message options may define the message as high priority in which case the notification may be omitted and the message will be conveyed directly to the recipient for immediate play. Once the notification or the message itself

has been sent, the server sets a recipient status to "sent", stores the status in the message database and sends statistics to the sender using UDP/SMS.

Upon receiving notification of an awaiting message, the recipient may retrieve the message from the server by sending a request using HTTP/TCP, whereupon the server conveys the message to the recipient also using HTTP/TCP. The recipient acknowledges receipt of the message by sending a receipt acknowledgement signal to the server, also using HTTP/TCP. The server now knows that the message was received and sets the recipient status to "received", stores the status in the message database and sends statistics to the sender using UDP/SMS.

The recipient can store and/or play the message locally. Upon playing (i.e. reading) the message, the recipient sends a read acknowledgement signal to the server, also using HTTP/TCP. The server now knows that the message was read and sets the recipient status to "read", stores the status in the message database and sends statistics to the sender using UDP/SMS. When the recipient answers the messages, the answer is sent to the server using HTTP/TCP. The server sets the status to "answered", stores the status along with the answer in the message database and sends statistics to the sender using UDP/SMS. At this point, the sender can send a query to the server using HTTP/TCP to access the recipient's answer or the respective answers of more than one recipient. The server retrieves the answers from the database and sends them to the sender using HTTP/TCP.

According to an alternative embodiment shown in Fig. 7c, statistics are not sent to the sender whenever the status changes, but rather notification about status change is delivered to the sender. The sender device retrieves statistics from the server in accordance with various behavior options that can be set by the sender. Sender options may also bet set to adjust the frequency of statistics messaging. In this case, the server initiates the communication of statistics to the sender, but rather than doing so whenever recipient status changes, does so at preset time intervals if the status of one or more recipients has changed subsequent to the previous communication of statistics to the sender.

In an embodiment of the invention, the dialog between the sender devices and the recipient devices via the messaging server may be implemented using Session

Initiation Protocol (SIP) (the current edge of VoIP Telephony) but one of ordinary skill in the art would readily recognize that any other suitable protocol may be employed.

Although the invention has been described with particular regard to applications that convey simple voice messages, it is to be understood that the invention is not limited to voice-only messages. Thus, messages may include also text, video and other multi-media content and, as noted above, may be messages of a single media type other than text alone.

In the embodiments described above, messages are recorded by the sender at his or her sending device, be it a telephone or computer. However, the invention also contemplates other approaches to compiling messages. For example, the sender can establish streaming or voice communication with the messaging server and dictate messages for direct storage by the messaging server. Alternatively, the messaging server can access a database of standard messages that are sent to recipients in response to a designated event. The event may be a message sent manually by the sender containing a message ID pointing to a message in the database that is to be forwarded to specified recipients. Alternatively, standard messages may be pre-recorded on the recipient device thus allowing a specific message to be played by embedding the appropriate message ID in the message to the recipient. Message playing on the recipient device can be done via streaming or by using voice communication. This scenario can be extended to a case when the receiving handset checks whether a required message already exists on the phone and if not, retrieves it from the server. The message protocol preferably allows the sender to specify that the recipient device should persistently store the message for future use. These options reduce traffic between the sender and the messaging server.

However, even more significantly it allows the invention to be applied to automated messaging systems that do not require human initiation. For example, the sender may be a computer that is responsive to an event for sending a specified message to one or more designated recipients. The event can be a simple event, such as a date or time; or it can be produced by a sensor such as a smoke sensor that detects a fire and automatically alerts a group of fire-fighters; or it can be a composite event determined by a situation awareness program. Composite events also include allow for multiple

responses to the same message e.g. first time to acknowledge reception, the second time to acknowledge reading, the third time to acknowledge completion of task.

These features find application in an automatic monitoring system where operator feedback is required. Thus, to take the emergency fire service as an example, a voice message may alert the emergency crew and indicate the location of the fire as determined by the location of the sender device embedded in the message conveyed by the sender. The message may be conveyed to all fire-fighters in a specified group or to the fire-station operator. Upon receipt of the alert signal a first message is automatically conveyed to the system operator showing that the alert was sent. When one or more fire-fighters open the message a second message is conveyed to the system operator. Upon dispatching a crew to the fire, a third message may be conveyed; and upon completion of the task, a fourth message may be conveyed. To this end, the messaging server may be provided with a task module that allows tasks to be compiled for access and display by authorized recipients. Any authorized recipient can open the task screen and select a desired task, e.g. by clicking on the task, for opening a standard message menu allowing a selected message to be associated with the selected task and conveyed to the sender.

The invention further allows message escalation in situations where a designated recipient does not acknowledge the message within a specified amount of time, whereby the system automatically sends it to somebody else and so on. For example, in the fire-fighter scenario this technique may be used to ensure that if the alert is sent to the fire-station operator and is not acknowledged within a specified time limit, it will be forwarded to the next in command and so on until it is acknowledged.

One of ordinary skill in the art will understand that the client and the messaging server may be suitably programmed computers. In this context, it is to be noted that the borderline between portable telephones and computers is becoming increasingly vague since both may be equipped with a processor, memory and internal program as well as interfaces to peripheral equipment, such as a video camera and display, which may be built-in. Therefore, for the purpose of interpreting the attached claims no distinction is implied and it is to be understood that reference to a "portable telephone" and to "telephone" may equally apply to a computer having a suitable communications interface. Likewise, the invention contemplates a computer program being readable by a

computer for executing the method of the invention. The invention further contemplates a machine-readable memory tangibly embodying a program of instructions executable by the machine for executing the method of the invention.

Likewise, although the embodiments have been described with particular reference to a store-and-forward mechanism, it is to be understood that this is by way of example only. There are advantages in exploiting the store-and-forward mechanism because it does not require recipients to be on-line when sending the messages and it obviates the need for presence awareness as is required in Push-to-Talk telephony. However, Push-to-Talk telephony is becoming increasingly popular and many cellular telephones are being provided with Push-to-Talk actuators and presence awareness. Such telephones may certainly be used to carry out the invention, so as to provide additional functionality as described.

The above description of illustrative, non-limiting embodiments has been given by way of an example. The above and other features of the invention including various novel method operations and a system and a device of the various novel components have been particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood that the particular process and construction of parts embodying the invention is shown by way of an illustration only and not as a limitation of the invention. The principles and features of this invention may be employed in varied and numerous embodiments without departing from the scope of the invention as defined by the appended claims and equivalents thereof.

## CLAIMS:

**1.** A method for obtaining feedback from at least one recipient via a telecommunication network, the method comprising:

compiling a media message using a sending device;

sending the media message to a server for storing together with a respective identity of each recipient;

receiving one or more events relating to a recipient receiving or responding to said media message.

**2.** The method according to claim 1, further including:

receiving acknowledgement from the server that the media message has been received.

**3.** The method according to claim 1 or 2, wherein said events are uploaded to the sending device by the server without requiring an active request by the sending device.

**4.** The method according to claim 1 or 2, further including downloading said events from the server.

**5.** The method according to any one of claims 1 to 4, further including:

receiving information relating to status data derived from said events.

**6.** The method according to any one of claims 1 to 5, wherein the media message is a voice message.

**7.** The method according to any one of claims 1 to 5, wherein the media message includes voice.

**8.** The method according to any one of claims 1 to 6, further including using a pre-formatted template to compile the media message.

**9.** The method according to claim 8, wherein the pre-formatted template includes designated recipients.

**10.** A method for obtaining feedback from at least one recipient via a telecommunication network, the method comprising:

receiving from a sending device message data indicative of a recorded message that a sender device wishes to convey to a recipient device;

storing said message data together with a respective identity of each recipient device;

conveying data to each recipient device pertaining to said message data notification of awaiting message or could be message itself;

storing events relating to an activity performed by a recipient device on receiving or responding to said data;

analyzing said events so as to generate status data; and

storing the status data for access by the sender.

**11.** A computer program comprising computer program code means for performing the method of any one of claims 1 to 10, when said program is run on a computer.

**12.** A computer program as claimed in claim 11 embodied on a computer readable medium.

**13.** A system (30) for obtaining feedback from at least one recipient via a telecommunication network, the system including:

a communication device (45) having a messaging client (31) in bi-directional communication with a messaging server (35) for receiving one or more events relating to a recipient receiving or responding to a media message sent by a communication device (45),

a Group Management Server (36) storing definitions and properties of registered users and user groups of the system, and

a templates server (40) for storing message templates for access by communication devices (45) connected thereto.

**14.** The system according to claim 13, further comprising a presence server (37) coupled to the protocol handler (34), to the messaging server (35) and to the Group Management Server (36), said presence server (37) operating in conjunction with an AB presence unit (32) in the messaging client (31) for providing properties of potential recipient devices.

**15.** The system according to claim 13 or 14, further comprising a location client (38) operating in conjunction with a location server (39) for allowing the location server (39) to compile a list showing the location of each device.

**16.** The system according to any one of claims 13 to 15, wherein any two or more of the messaging server (35), the Group Management Server (36), the location server (39) and the templates server (40) are realized by a single server.

**17.** The system according to any one of claims 13 to 16, wherein said templates are standard message objects that include one or more media types in a group comprising: audio, video, pictures.

**18.** The system according to claim 17, wherein the templates also include text objects.

**19.** The system according to any one of claims 17 to 18, wherein said templates further include designated recipients.

**20.** A communication device (45) for use with the system according to claim 13, for allowing a sending device to obtain feedback from at least one recipient device, said device comprising:

a processor (46),

a transmitter/receiver (47) coupled to the processor (46) for allowing wireless transmission and reception,

a message inbox (48) providing a view of a subscriber inbox for each recipient on the messaging server (35),

a memory (49) for storing an address book (50) and optionally sender/recipient profiles, and

a user interface (51) allowing selection of one or more recipient addresses.

**21.** The communication device (45) according to claim 20, further comprising:

a microphone/speaker driver (53) for converting speech to electrical signals, and

a voice recording unit (54) coupled to the microphone/speaker driver (53) for recording the electrical signals.

**22.** The communication device according to claim 21, further comprising an audio codec (55) coupled to the microphone/speaker driver (53) for encoding the electrical signals and producing an audio stream

**23.** The communication device according to any one of claims 20 to 22, further including a presence awareness module (32) for allowing a user to determine at a glance whether a receiving device is on-line and available for receiving a message.

**24.** The communication device according to any one of claims 20 to 23, further including a template browser (58) for accessing templates from the templates server (40).

**25.** The communication device according to any one of claims 20 to 23, further including a template browser (58) for accessing templates from the templates server (40).

**26.** The communication device according to any one of claims 20 to 25, further including a display (52).

**27.** The communication device (45) according to claim 26, further comprising:

a camera/display driver (56) for capturing a video image, and

a video codec (57) coupled to the camera/display driver (56) for converting the video image to a video stream.

**28.** A messaging server (35) for use with the system according to claim 13, for allowing a sending device to obtain feedback from at least one recipient device, said messaging server (35) comprising:

a processor (61),

first and second interfaces (62) coupled to the processor (61) for coupling to respective first and second communication devices,

a memory (64) coupled to the processor (61) for storing message data, and

a data analysis unit (65) coupled to the processor (61) and being adapted to process data received from recipient device in response to messages conveyed thereto by a sender device.

**29.** The messaging server (35) according to claim 28, further including a GLMS interface (63) for allowing groups to be defined so that an incoming call directed to one member of the group may be automatically sent to the other members of the group.

**30.** The messaging server (35) according to claim 28 or 29, wherein the memory stores icons or other image data of registered users.

**31.** The messaging server (35) according to any one of claims 28 to 30 for use with the system according to claim 14, further including a presence server interface (66) for connection to the presence server (37).

**32.** The messaging server (35) according to any one of claims 28 to 31, further including a templates server interface (67) for connection to the templates server (40).

**33.** The messaging server (35) according to any one of claims 28 to 32, for use with the system according to claim 14, further including a location server interface (68) for connection to the location server (39).

**34.** The messaging server (35) according to any one of claims 28 to 33, wherein said memory provides storage for a plurality of subscriber inboxes each in respect of a different registered subscriber.

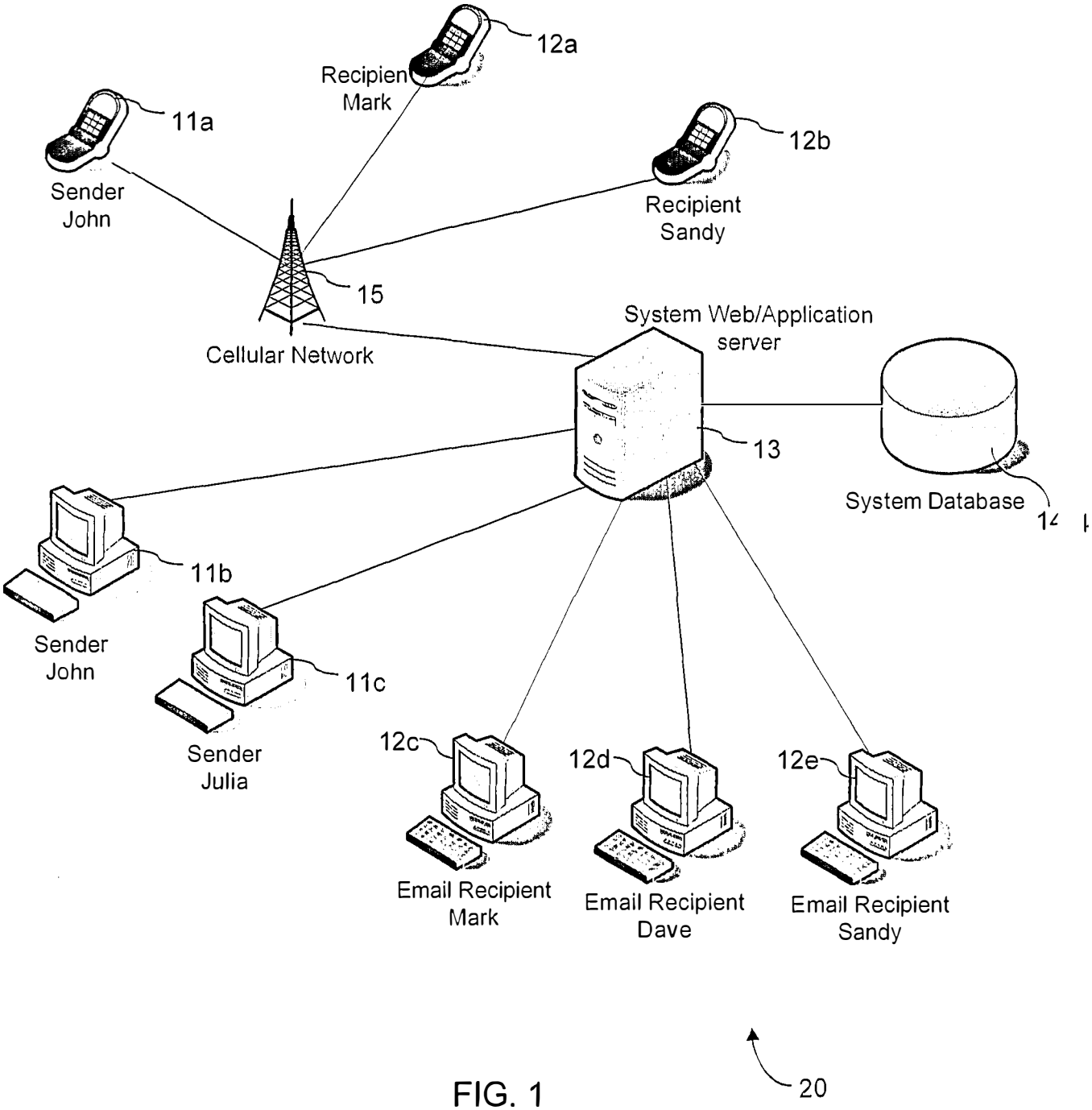
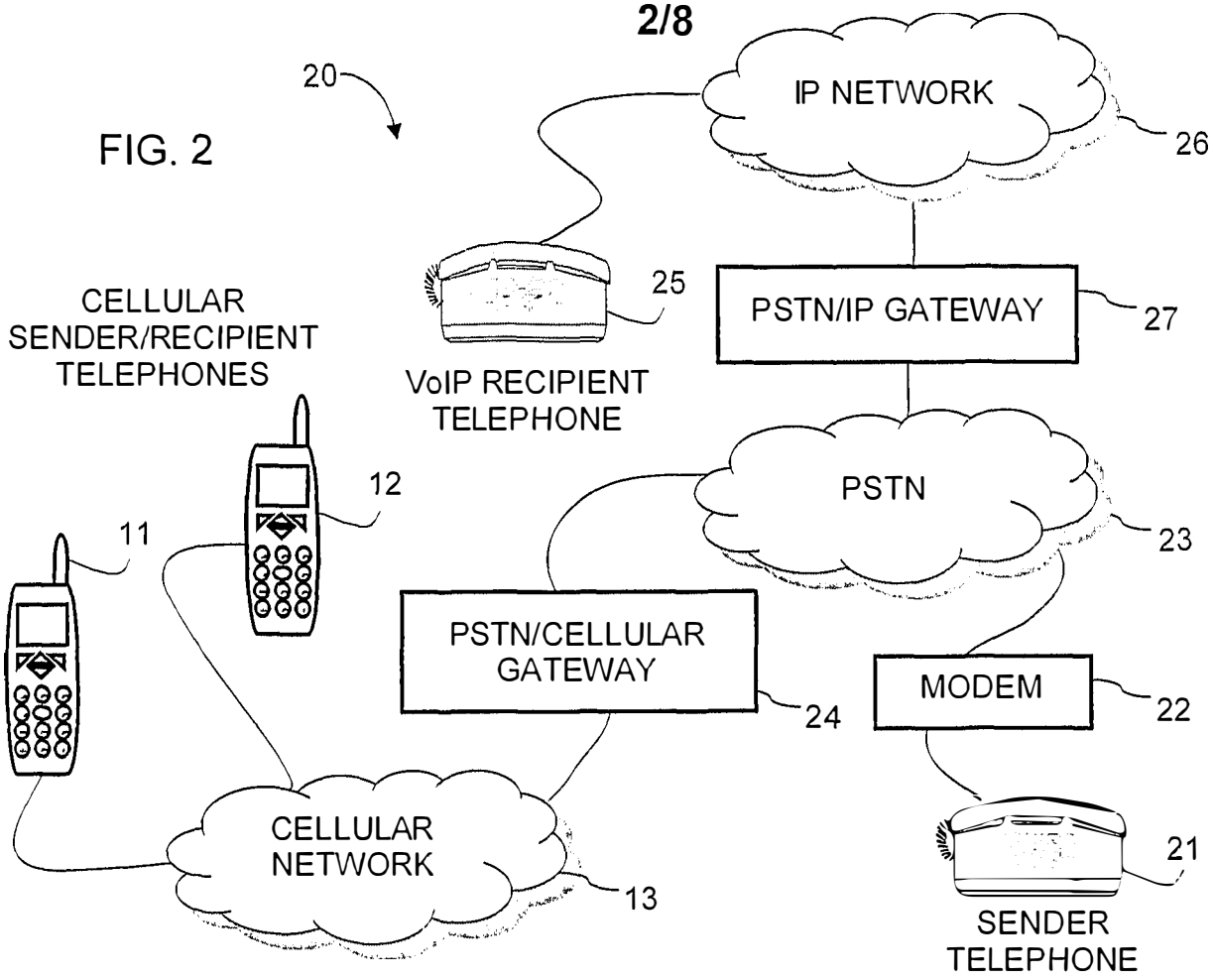

12a
Recipien
Mark
11a
Sender
John
12b
Recipient
Sandy
15
Cellular Network
System Web/Application
server
13
System Database
11b
Sender
John
11c
Sender
Julia
12c
12d
12e
Email Recipient
Mark
Email Recipient
Dave
Email Recipient
Sandy
20

FIG. 1

FIG. 2


20
IP NETWORK
26
25
PSTN/IP GATEWAY
27
CELLULAR SENDER/RECIPIENT TELEPHONES
VoIP RECIPIENT TELEPHONE
12
11
PSTN
23
PSTN/CELLULAR GATEWAY
24
MODEM
22
CELLULAR NETWORK
13
21
SENDER TELEPHONE

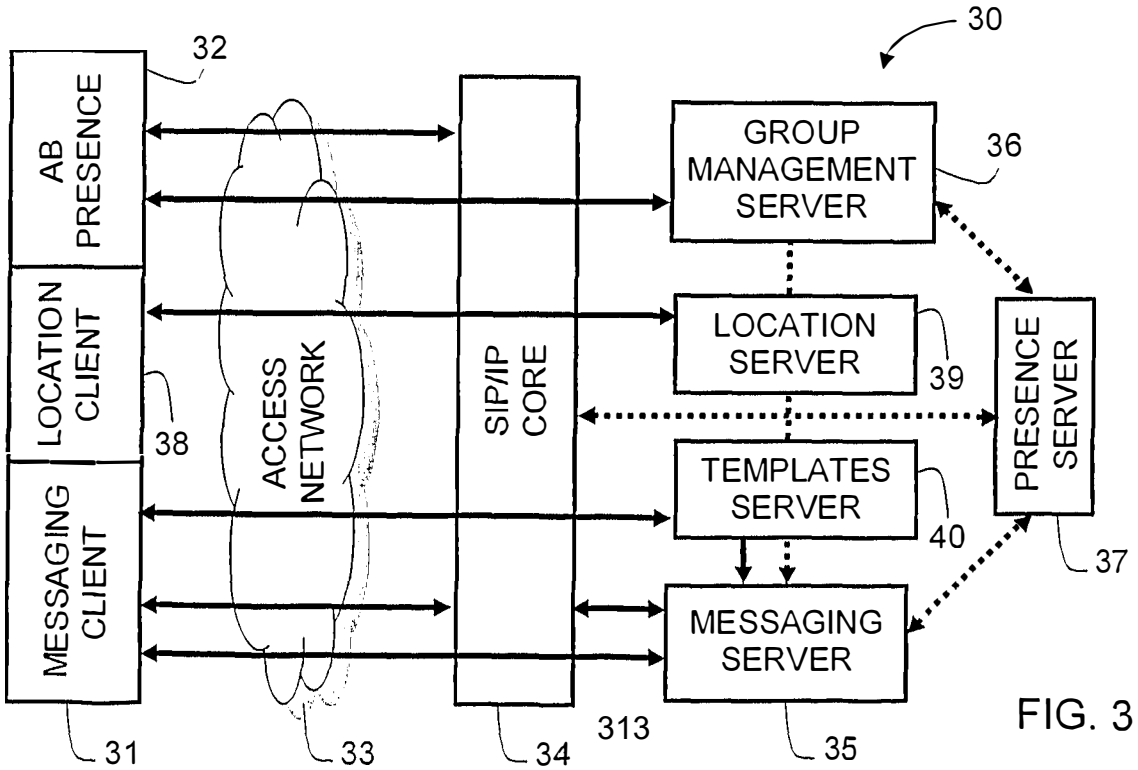

30
32
AB PRESENCE
LOCATION CLIENT
MESSAGING CLIENT
38
ACCESS NETWORK
SIP/IP CORE
GROUP MANAGEMENT SERVER
36
LOCATION SERVER
39
TEMPLATES SERVER
40
PRESENCE SERVER
37
MESSAGING SERVER
31
33
34
313
35

FIG. 3

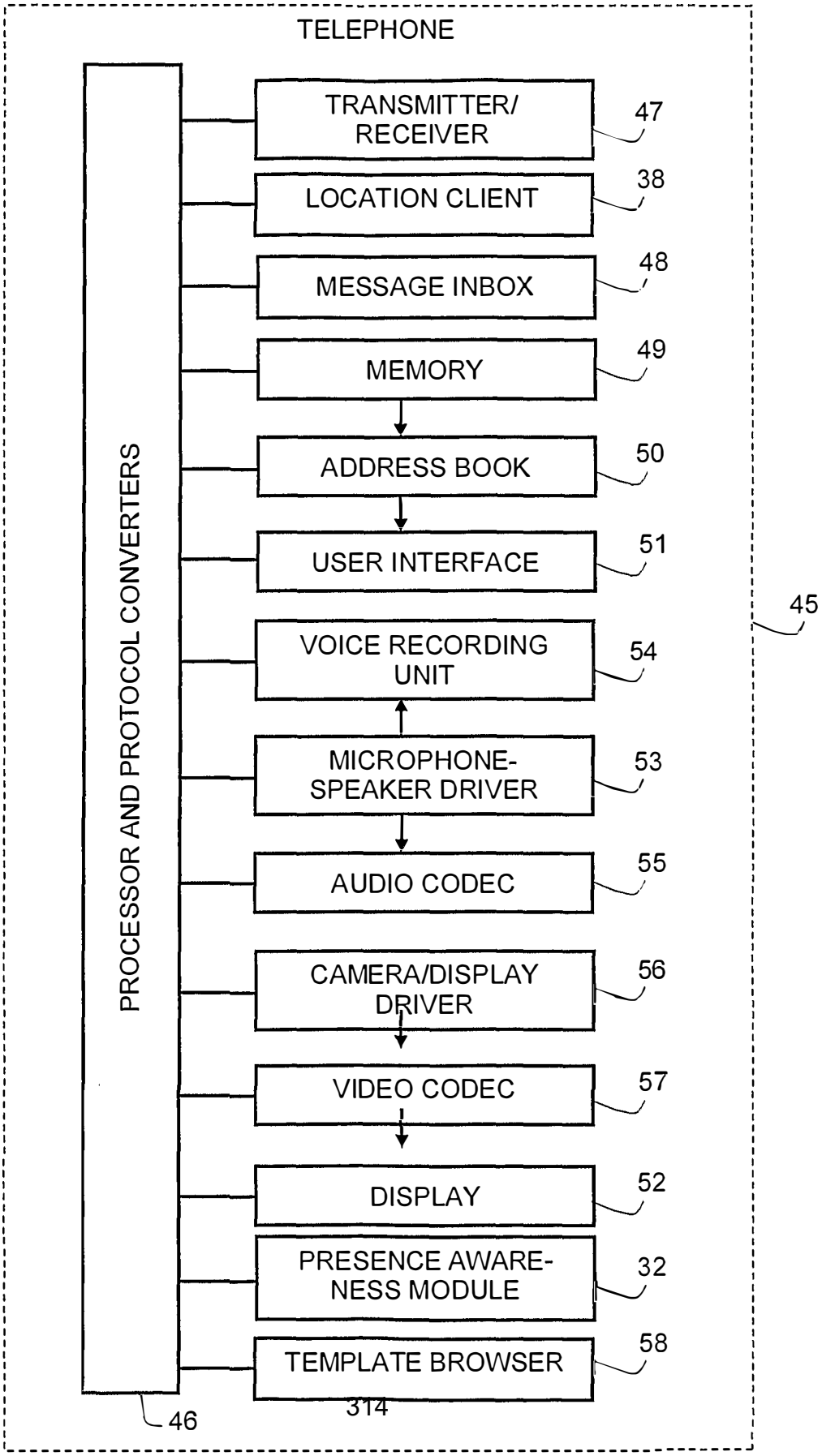

TELEPHONE
PROCESSOR AND PROTOCOL CONVERTERS
TRANSMITTER/ RECEIVER
47
LOCATION CLIENT
38
MESSAGE INBOX
48
MEMORY
49
ADDRESS BOOK
50
USER INTERFACE
51
VOICE RECORDING UNIT
54
MICROPHONE-SPEAKER DRIVER
53
AUDIO CODEC
55
CAMERA/DISPLAY DRIVER
56
VIDEO CODEC
57
DISPLAY
52
PRESENCE AWARE-NESS MODULE
32
TEMPLATE BROWSER
58
314
46
45

FIG. 4

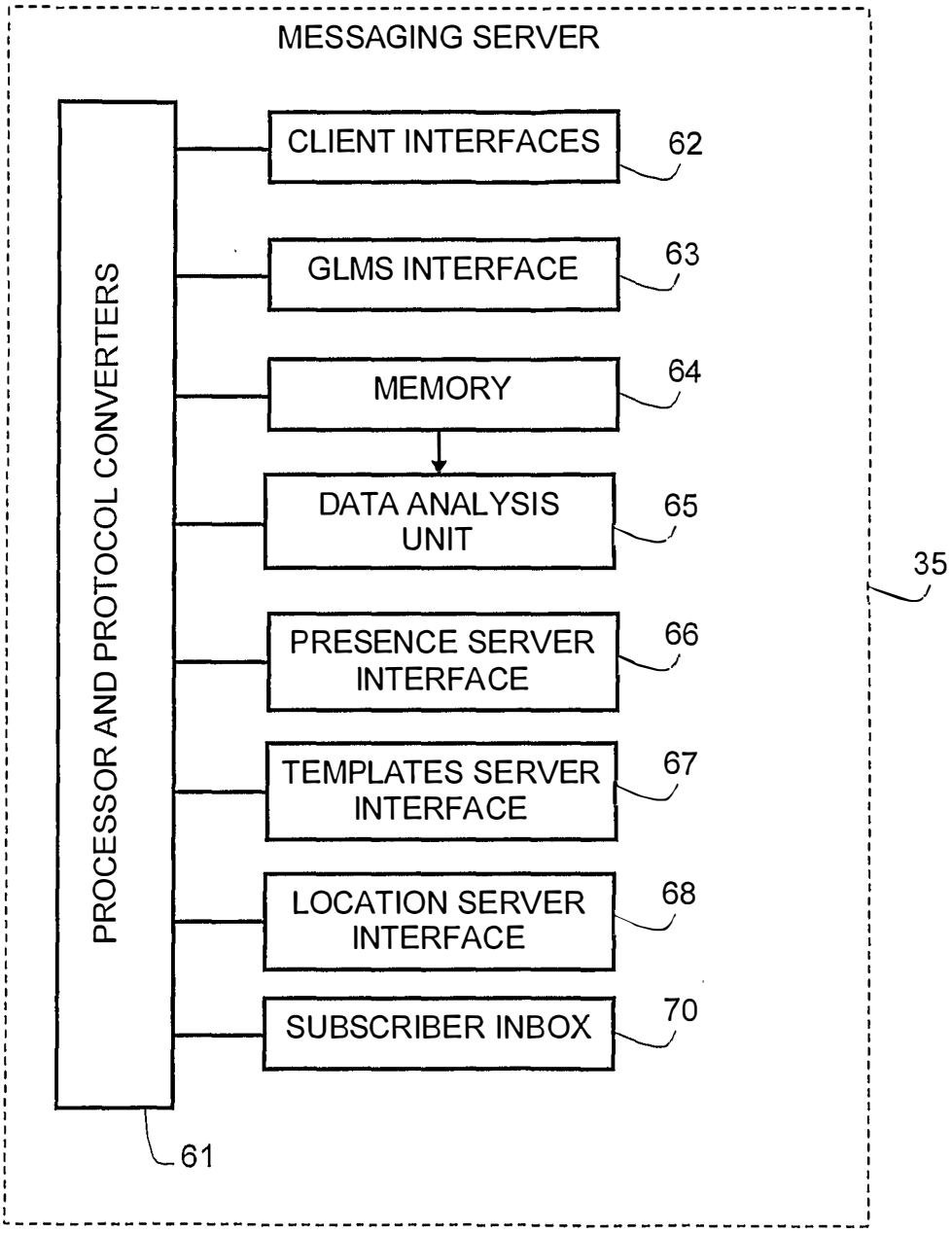

MESSAGING SERVER
PROCESSOR AND PROTOCOL CONVERTERS
CLIENT INTERFACES
62
GLMS INTERFACE
63
MEMORY
64
DATA ANALYSIS UNIT
65
PRESENCE SERVER INTERFACE
66
TEMPLATES SERVER INTERFACE
67
LOCATION SERVER INTERFACE
68
SUBSCRIBER INBOX
70
61
35

FIG. 5

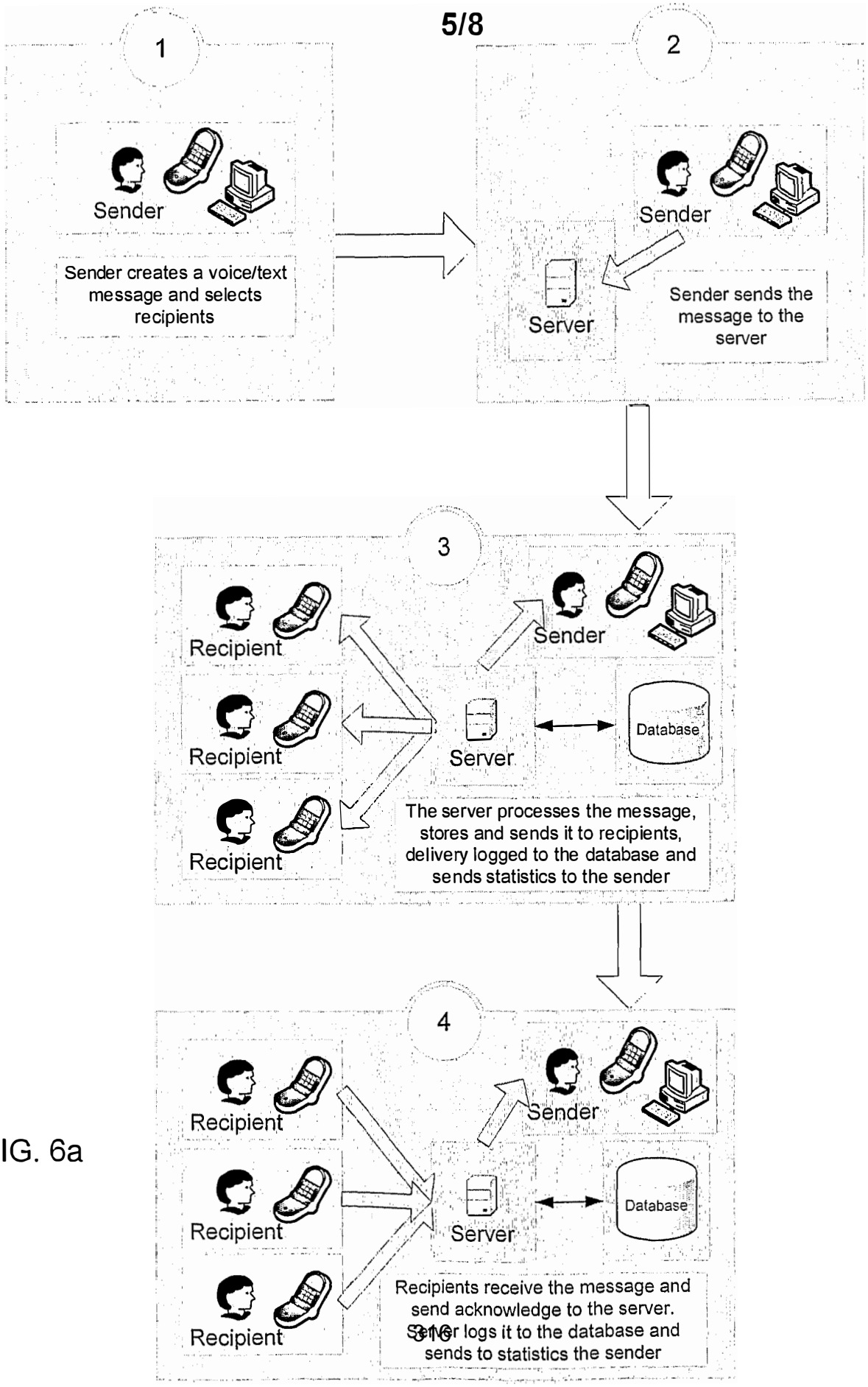

1
Sender
Sender creates a voice/text message and selects recipients
2
Sender
Server
Sender sends the message to the server
3
Recipient
Recipient
Recipient
Sender
Server
Database
The server processes the message, stores and sends it to recipients, delivery logged to the database and sends statistics to the sender
4
Recipient
Recipient
Recipient
Sender
Server
Database
Recipients receive the message and send acknowledge to the server. Server logs it to the database and sends to statistics the sender

FIG. 6a

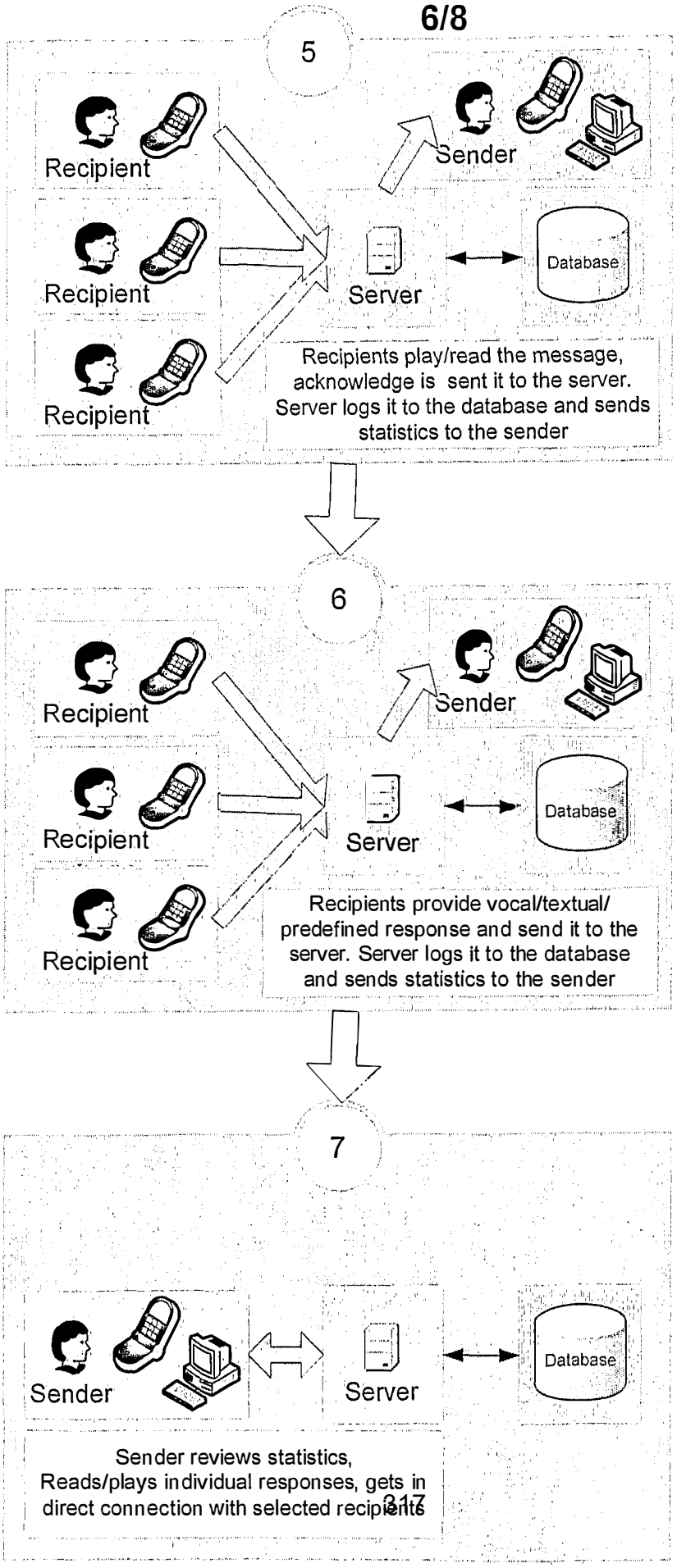

5
Recipient
Recipient
Recipient
Sender
Server
Database
Recipients play/read the message, acknowledge is sent it to the server. Server logs it to the database and sends statistics to the sender
6
Recipient
Recipient
Recipient
Sender
Server
Database
Recipients provide vocal/textual/ predefined response and send it to the server. Server logs it to the database and sends statistics to the sender
7
Sender
Server
Database
Sender reviews statistics, Reads/plays individual responses, gets in direct connection with selected recipients

FIG. 6b

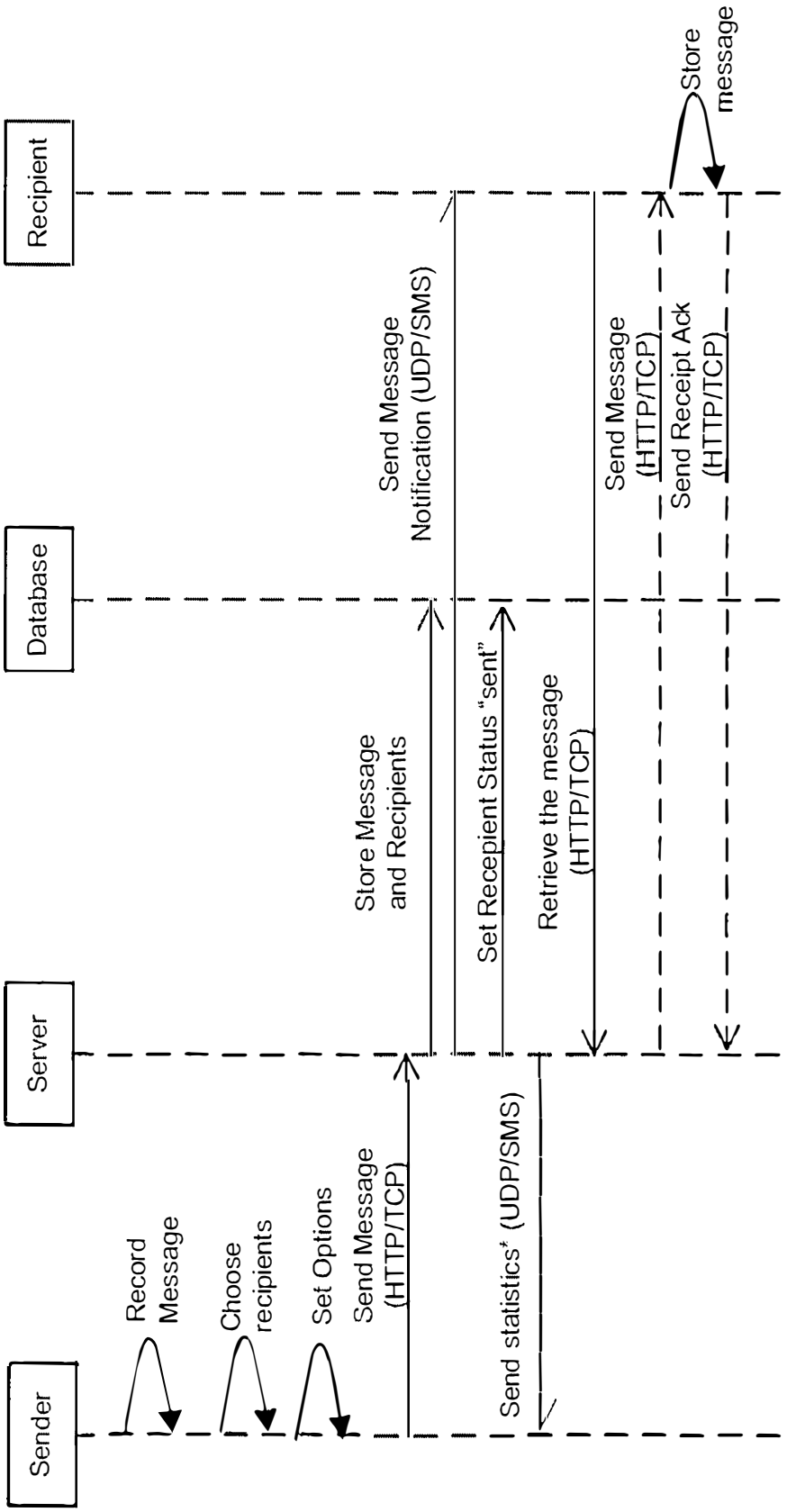

Sender
Server
Database
Recipient
Record Message
Choose recipients
Set Options
Send Message (HTTP/TCP)
Store Message and Recipients
Send Message Notification (UDP/SMS)
Set Recepient Status "sent"
Retrieve the message (HTTP/TCP)
Send Message (HTTP/TCP)
Send Receipt Ack (HTTP/TCP)
Store message
Send statistics* (UDP/SMS)

FIG. 7a

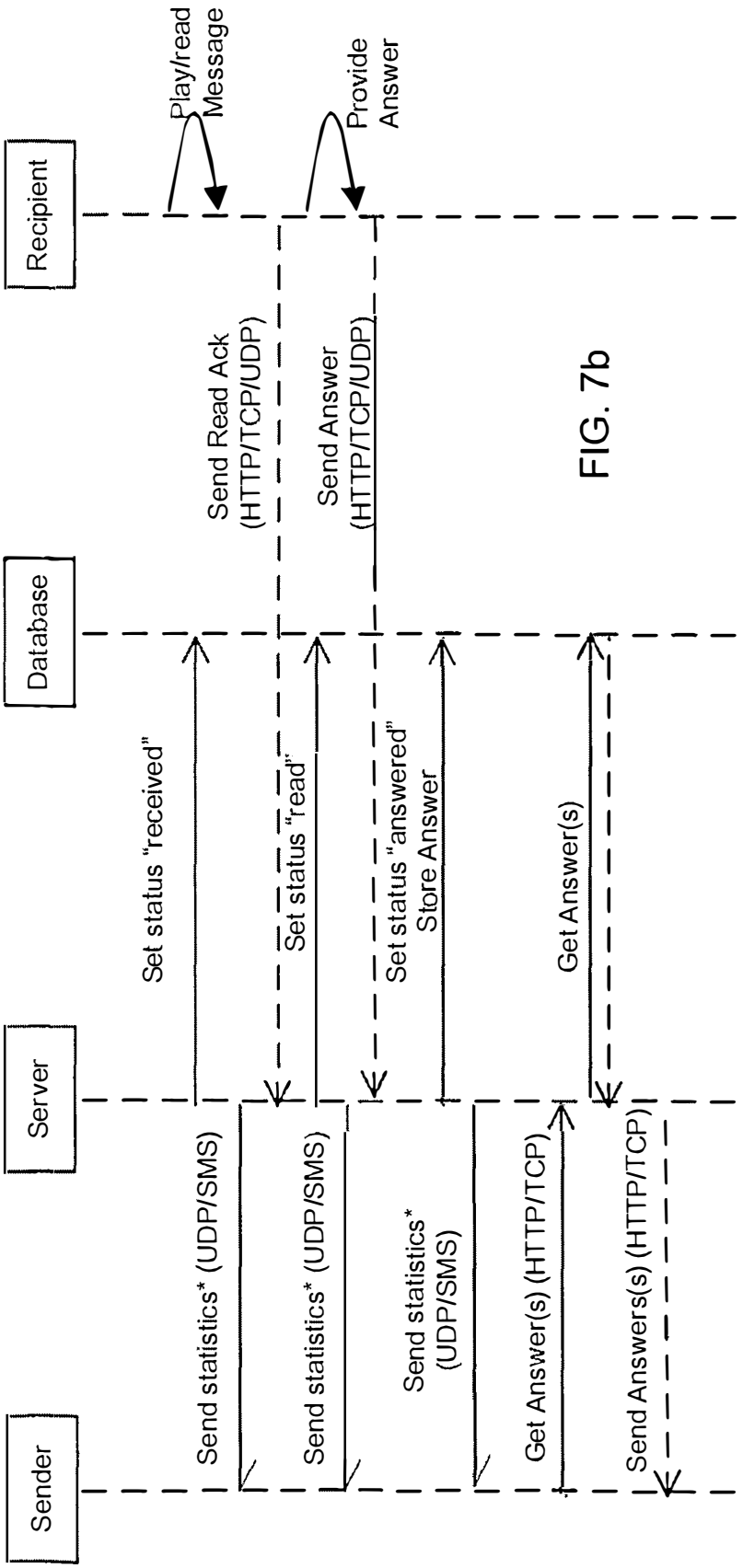

Sender
Server
Database
Recipient
Send statistics* (UDP/SMS)
Set status "received"
Send Read Ack (HTTP/TCP/UDP)
Play/read Message
Send statistics* (UDP/SMS)
Set status "read"
Send Answer (HTTP/TCP/UDP)
Provide Answer
Send statistics* (UDP/SMS)
Set status "answered" Store Answer
Get Answer(s) (HTTP/TCP)
Get Answer(s)
Send Answers(s) (HTTP/TCP)

FIG. 7b

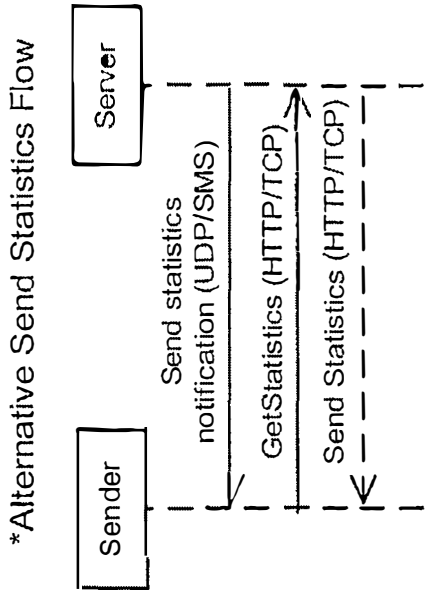

*Alternative Send Statistics Flow
Sender
Server
Send statistics notification (UDP/SMS)
GetStatistics (HTTP/TCP)
Send Statistics (HTTP/TCP)

FIG. 7c

# INTERNATIONAL SEARCH REPORT

International application No
PCT/IL2006/000931

A. CLASSIFICATION OF SUBJECT MATTER
INV. G07F17/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
2 November 2006 (02.11.2006)

PCT

(10) International Publication Number
WO 2006/116750 A2

(51) International Patent Classification:
*H04L 12/16* (2006.01) *H04Q 11/00* (2006.01)

(21) International Application Number:
PCT/US2006/016469

(22) International Filing Date: 27 April 2006 (27.04.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

| | | |
|---|---|---|
| 11/118,931 | 28 April 2005 (28.04.2005) | US |
| 11/118,932 | 28 April 2005 (28.04.2005) | US |
| 11/118,297 | 28 April 2005 (28.04.2005) | US |


(71) Applicant *(for all designated States except US)*: **APPLE COMPUTER, INC.** [US/US]; 1 Infinite Loop, Cupertino, California 95014 (US).

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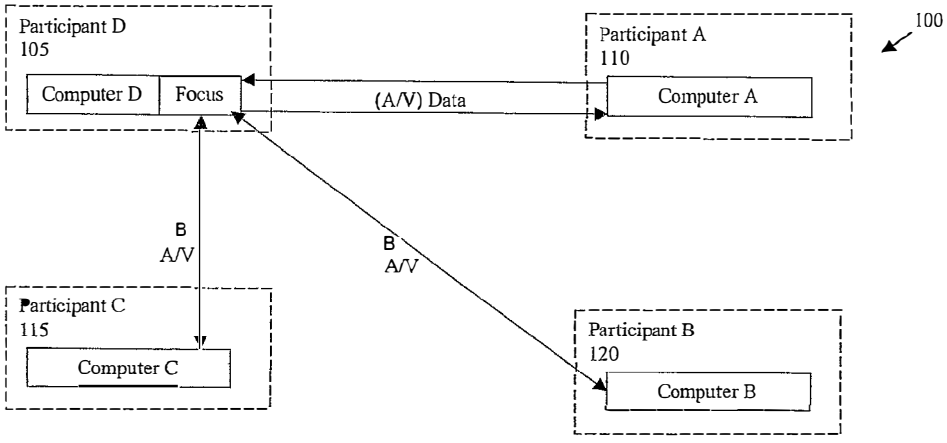
(74) Agent: **EDELI, Mani**; STATTLER JOHANSEN & ADELI LLP, 1875 CENTURY PARK EAST, Suite 1360, Los Angeles, California 90067 (US).

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(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*[Continued on next page]*

(54) Title: MULTI-PARTICIPANT CONFERENCING




(57) Abstract: Some embodiments provide an architecture for establishing a multi-participant conference. This architecture has one participant's computer in the conference act as a central content distributor for the conference. The central distributor receives data (e.g., video and/or audio streams) from the computer of each other participant, and distributes the received data to the computers of all participants. In some embodiments, the central distributor receives A/V data from the computers of the other participants. From such received data, the central distributor of some embodiments generates composite data (e.g., composite image data and/or composite audio data) that the central distributor distributes back to the participants. The central distributor in some embodiments can implement a heterogeneous audio/video conference. In such a conference, different participants can participate in the conference differently. For instance, different participants might use different audio or video codecs. Moreover, in some embodiments, one participant might participate in only the audio aspect of the conference, while another participant might participate in both audio and video aspects of the conference.



WO 2006/116750 A2

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# MULTI-PARTICIPANT CONFERENCING

## BACKGROUND

In recent years, users of local and wide area networks (e.g., the Internet) have upgraded to increasingly higher bandwidth connections. The common user also has access to greater computer hardware processing power. At the same time, the coders and decoders (codecs) for video transmission over a network connection have seen improvements such that an individual user has the capability to stream and receive real-time video over the Internet with off-the-shelf components. All this has allowed individual users to begin chatting, sharing, and videoconferencing with point-to-point technologies on their computers.

However, bandwidth remains a constrained resource that must be shared over many users. Likewise, processing power is typically shared by the operating system and several applications in a typical user's computer hardware. These factors have been barriers to the use of personal computers in establishing a conference with more than two participants. Such a conference will be referenced below as a multi-participant conference.

Several approaches are possible for multi-participant conferencing. One such approach is the full-mesh topology, which is the extension of two-participant point-to-point methods to multi-participant conferencing. Under the full-mesh topology, each participant sends all of its audio and/or video (A/V) data to all other participants in the multi-participant conference. However, the full mesh topology requires a high amount of processing power and broad bandwidth at and between each participant of the multi-participant conference. Even with just a few participants, the full-mesh topology quickly becomes untenable because each participant and each network connection is responsible for sending and receiving a burdensome amount of data. Moreover, the weakest connection or hardware point determines the maximum capability of a conference for all participants in the full-mesh topology.

The star topology is another possible approach for multi-participant conferencing. In prior art this approach uses a central server to receive data from all participants in the conference and send all that data back out to each participant. The required server needs high bandwidth and processing power. The server requirements scale with the number of conferences to be hosted, making this approach unusable for wide scale deployment.

Thus, there is a need in the art for a better architecture for multi-participant conferencing. Ideally, such an architecture would allow the participants to use off-the-shelf computers and typically available bandwidth and not require the deployment of dedicated servers.

## SUMMARY OF THE INVENTION

Some embodiments provide an architecture for establishing a multi-participant conference. This architecture has one participant's computer in the conference act as a central content distributor for the conference. The central distributor receives data (e.g., video and/or audio streams) from the computer of each other participant, and distributes the received data to the computers of all participants.

In some embodiments, the central distributor receives A/V data from the computers of the other participants. From such received data, the central distributor of some embodiments generates composite data (e.g., composite image data and/or composite audio data) that the central distributor distributes back to the participants.

The central distributor in some embodiments can implement a heterogeneous audio/video conference. In such a conference, different participants can participate in the conference differently. For instance, different participants might use different audio or video codecs. Moreover, in some embodiments, one participant might participate in only the audio aspect of the conference, while another participant might participate in both audio and video aspects of the conference.

The computers of the central distributor and the participants can take a variety of forms. In other words, these computers can be embedded in any type of device, such as standalone desktop, laptop, and/or handheld computer, or consumer electronic or communication device, home media center, hub, etc.

## BRIEF DESCRIPTION OF THE DRAWINGS

The novel features of the invention are set forth in the appended claims. However, for purpose of explanation, several embodiments of the invention are set forth in the following figures.

Figure 1 illustrates a multi-participant focus-point conference.

Figure 2 illustrates a focus point assessment process according to some embodiments of the invention.

Figure 3 illustrates participants performing static bandwidth estimation with a remote server.

Figure 4 illustrates a first computer inviting a second computer to establish a two-participant conference.

Figure 5 illustrates a first computer inviting a third computer to establish a multi-participant conference.

Figure 6 illustrates a detailed process flow of acceptance by a participant.

Figure 7 illustrates a process flow for a focus computer that receives data from a participant after acceptance by the participant.

Figure 8 illustrates an in-call bandwidth adjustment process.

Figure 9 illustrates a focus computer detecting loss from one non-focus computer.

Figure 10 illustrates a non-focus computer detecting loss from the focus computer.

Figure 11 illustrates a focus computer detecting loss from multiple non-focus computers.

Figure 12 illustrates multiple non-focus computers detecting loss from a focus computer.

Figure 13 illustrates a focus computer distributing its upload bandwidth over two participants.

Figure 14 illustrates a focus computer distributing its upload bandwidth over three participants.

Figure 15 illustrates an example of a video conference.

Figure 16 illustrates an example of data exchange in a four participant conference.

Figure 17 illustrates the video codec section of the focus point module or a focus computer.

Figure 18 illustrates a non focus video codec section of a non focus point module of a non focus computer.

Figure 19 illustrates an audio codec section of the focus point module of the focus computer.

Figure 20 illustrates a non focus audio codec section of a non focus point module of a non focus computer.

Figure 21 illustrates an example where a participant does not provide any video data to a focus computer.

Figure 22 illustrates an example of a focus point video codec.

Figure 23 illustrates an example where a participant does not provide any audio or video data to a focus computer.

Figure 24 illustrates an example of a focus point audio codec.

## DETAILED DESCRIPTION OF THE INVENTION

In the following description, numerous details are set forth for purpose of explanation. However, one of ordinary skill in the art will realize that the invention may be practiced without the use of these specific details. In other instances, well-known structures and devices are shown in block diagram form in order not to obscure the description of the invention with unnecessary detail.

Some embodiments provide an architecture for establishing a multi-participant conference. This architecture has one participant's computer in the conference act as a central content distributor for the conference. In some embodiments, the central distributor is a participant that meets certain criteria. The criteria of some embodiments may include whether the participant has sufficient bandwidth and processing power. The central distributor is also referred to below as a focus point computer or focus computer for the multi-participant video conference. The computers of the other participants will be referred to below as non-focus computers.

The central distributor receives data (e.g., video and/or audio streams) from the computer of each other participant, and distributes the received data to the computers of all participants. In some embodiments, the central distributor (1) receives A/V data from the computers of the other participants, and from such data, (2) generates composite data (e.g., composite image data and/or composite audio data) that it distributes back to the participants.

The central distributor in some embodiments can implement a heterogeneous audio/video conference. In such a conference, different participants can participate in the conference differently. For instance, different participants might use different audio or video codecs. Moreover, in some embodiments, one participant might participate in only the audio aspect of the conference, while another participant might participate in both audio and video aspects of the conference.

## I. FOCUS POINT ARCHITECTURE

Figure 1 illustrates an example of a conference architecture 100 of some embodiments of the invention. This architecture allows multiple participants to engage in a conference. In the example illustrated in Figure 1, four participants A, B, C, and D are engaged in a conference through their four computers 105-120.

The architecture 100 has participant D's computer 105 serve as a focus point computer and the computers 110, 115, and 120 of the other participants A, B, and C serve as non-focus computers. During the conference, each non-focus computer 110, 115, and 120 connects to the focus point 105 through a network (not shown). The network can be any network, such as a local area network, a wide area network, a network of networks (i.e., the Internet), etc. The network allows conference data to pass between the focus computer 105 and the non-focus computers 110, 115, and 120. As shown Figure 1, the non-focus computers 110, 115, and 120 do not pass conference data directly to each other in the focus-point architecture 100.

During the conference, the focus point computer 105 serves as the central distributor of audio/video content to the other computers. As the central distributor of audio/video content, the focus computer 105 receives A/V data from each participant, composites and encodes the received data, and then transmits the composite data to each of the non-focus computers.

In some embodiments, the focus point computer removes a particular non-focus participant's data from the composite data that the focus point computer transmits to the particular non-focus participant. Also, in some embodiments, the focus point computer embeds relative audio strength values in the composite audio data to facilitate the use of audio level meters and audio panning at the non-focus computers. Such audio and video compositing are further described in U.S. Patent Application 11/118,555 entitled "Audio

Processing in a Multi-Participant Conference", filed with the attorney docket number APLE.P0087, and in U.S. Patent Application 11/118,553 entitled "Video Processing in a Multi-Participant Video Conference", filed with the attorney docket number APLE.P0091. Both these applications are incorporated herein by reference.

Some embodiments are implemented by an A/V conference application (e.g., iChat® provided by Apple Computer, Inc.) that allows a computer to act as a focus computer or a non-focus computer in a multi participant conference. As such, during an A/V conference, the conferencing application receives, composites, and distributes A/V content when serving as a focus computer. However, one of ordinary skill will realize that other embodiments may implement the receiving, compositing, and distribution as one or more separate modules.

In some embodiments, a focus point computer sets up a multi-participant conference by inviting two or more participants to join the conference. Before a computer can act as a focus point computer that is capable of inviting multiple participants to a multi-participant conference, the computer must first be designated as a focus point capable computer. The next section (Section II) describes how some embodiments designate a computer as focus point capable. Section II also describes how a focus point computer invites participants to set up a multi-participant conference. Section III describes messaging over Session Initiation Protocol and encryption. Section IV describes the operations of focus and non-focus computers once a multi-participant conference is underway. Section V describes heterogeneous multi-participant conferencing.

## II. SETTING UP A CONFERENCE

### A. Focus-Point Assessment Process

As mentioned above, some embodiments are implemented by an A/V conferencing application that allows a computer to act as a focus or non-focus computer in a multi participant conference. When the conferencing application of some embodiments starts on a

particular computer, the application performs a focus-point assessment process to determine whether the particular computer can serve as a focus point for a multi-participant conference.

Figure 2 illustrates an example of such a focus-point assessment process 200 of some embodiments. As shown in this figure, this process 200 starts (at 205) each time that the conferencing application starts. Next, at 210 the process performs an inspection of the participant's computer. To aid in the determination of whether a computer can be a focus point, and to provide additional constraints in the default static conference capabilities of a computer, some embodiments perform a local hardware inspection at 210 of the focus-point assessment process 200. If, at 210, the local hardware determination does not meet the criteria for a focus point, then the focus-point assessment process 200 transitions to 215 where the computer is designated as non-focus point capable.

If the hardware determination does meet the criteria for a focus point, then the focus point assessment process 200 proceeds to 216 where the process begins a determination of whether the computer has sufficient bandwidth to act as a focus point computer. At 216, some embodiments first determine whether a static bandwidth test is required. In these embodiments, the results of prior static bandwidth tests are stored to non-volatile memory (i.e., cached). These embodiments check whether the cached bandwidth values are still valid. If the cached bandwidth values are still valid, the process 200 forgoes the static bandwidth test described below (at 218) and instead uses the cached values to determine whether the bandwidth criteria for a focus computer is met (at 220). The cached values of these embodiments also determine the default conferencing capabilities of the computer.

If, at 216, the cached values are no longer valid, then the focus-point assessment process performs a new or initial static bandwidth test (at 218) to determine whether the conferencing application's computer meets the bandwidth criteria for acting as a focus point.

As further described below, the results of this initial test are cached in some embodiments and used to set the default conferencing capabilities of the computer.

To perform the initial static bandwidth test at 218, some embodiments employ a server (e.g., the ".mac"® server provided by Apple Computer, Inc.) that is located at a remote location from the conferencing application's computer. Figure 3 illustrates a conferencing application's computer 305 performing an initial static bandwidth test with a remote bandwidth server 310 through a network 315 (e.g., through the Internet). As shown in this figure, the initial static bandwidth test involves the computer 305 sending a request to the server 310 for an assessment of the network bandwidth available to the computer 305. In response, the server 310 sends and receives packets from the computer 305 to assess its available bandwidth. Once the server 310 has completed its assessment of the computer's available bandwidth, it provides the computer with an estimate of its bandwidth, as shown in Figure 3. As further shown in Figure 3, the bandwidth server 310 receives bandwidth determination requests from other computers.

Due to the number of requests at a given time, or for a variety of other reasons (e.g., network congestion, downtime, etc.), the bandwidth server 310 may not be available to respond to a particular request by the focus-point assessment process 200. For the cases when the bandwidth server is unavailable, the conferencing application of some embodiments caches (i.e., retains in non-volatile memory) the last successful static bandwidth estimate.

Regardless of whether the bandwidth estimate is newly performed (218) or is cached (216), the focus-point assessment process 200 then applies (at 220) the bandwidth estimate to a set of rules that determine whether the computer can be a focus point. If the initial static bandwidth estimate does not meet (at 220) the criteria for a focus point, then the process 200 transitions to 215. At 215, the computer is designated as non-focus point capable and then the focus-point assessment process 200 terminates. If the initial static bandwidth estimate is

deemed sufficient (at 220) to meet the focus point bandwidth criteria, the process 200 transitions to 225 and the participant is designated as focus point capable. A focus capable computer may act as either a focus computer or a non-focus computer, and may host or join both peer-to-peer and multi-participant conferences. A non-focus computer, however, may host only a peer-to-peer conference, but may join both peer-to-peer and multi-participant conferences.

At 230, the focus-point assessment process 200 applies the initial bandwidth estimate to a set of rules to define the default conferencing capability (i.e., defines a set of default conference parameters) for the computer to potentially use in the next conference the computer initiates or joins. For instance, some embodiments utilize sets of rules for the cases where the computer is (1) a participant in a peer-to-peer conference, (2) a client (i.e., a non-focus computer) in a multi-participant conference, or (3) a focus point in a multi-participant conference. Tables 1-3 below illustrate examples of such rules for some embodiments. These tables illustrate examples where the initial estimated bandwidth determines the default frame rate and frame size for the focus point and non-focus point computers' encoders. These tables also show that the rules vary depending upon whether the participant acts as a focus point or a client, and whether the conference is peer-to-peer or multi-participant.

Table 1. Either Participant in Peer-to-Peer Conference

| bandwidth (bps) | frame rate | frame size (H.263/H.264) |
|---|---|---|
| >1.0M | 30fps | 352x288/640x480 |
| 500K-1.0M | 30fps | 352x288/320x240 |
| <500K | 15fps | 176x144/160x120 |

Table 2. Client (Non-Focus Computer) in Multi-Participant Conference

| bandwidth (bps) | frame rate | frame size (H.263/H.264) |
|---|---|---|
| >500K | 30fps | 352x288/320x240 |
| <500K | 15fps | 176x144/160x120 |

Table 3. Focus Point Computer in Multi-Participant Conference

| bandwidth (bps) | frame rate | frame size (H.264) |
|---|---|---|
| >500K | 30fps | 320x240 |
| 200K-500K | 15fps | 160x120 |
| <200K | 15fps | 80x60 |

At 230, the focus-point assessment process 200 of some embodiments sets the computer's default conference capabilities not only based on the bandwidth estimate but also on the hardware inspection described above. Table 4 below illustrates one possible set of these rules that are based on both hardware and bandwidth considerations. As shown in this table, the hardware configurations can include type, speed, and number of processors, where the processors in this example are the G-series processors used by Apple Computer, Inc.

Table 4. Maximum Conferencing/Encoding Capability by Processor

| #, type processor(s) speed (in GHz) | frame rate | frame size (H.263/H.264) |
|---|---|---|
| 2, G5 (2.5+) | 30fps | 352x288/640x480 |
| 1, G4 (0.933-1.33) | 15fps | 352x288/160x120 |
| 1, G3 (0.600-0.867) | 15fps | 176x144/na |

Some embodiments may store the information gathered by the focus-point assessment process 200 for later use. For instance, this stored information may be used later if the conferencing application cannot establish contact with the bandwidth determining server. This information may also be transmitted to a participant as part of a call or invitation to conference. The invitation to begin a conference is described next.

**B. Setting Up a Multi-Participant Conference**

Once a computer is deemed focus point capable, the computer may initiate a two-participant conference with another computer. The focus point capable computer may further invite additional non-focus computers to establish a multi-participant conference. Figures 4-6 illustrate one example of such a multi-participant conference set up.

Specifically, Figure 4 illustrates a process 400 that first focus-capable computer 405 of some embodiments performs to invite a second computer 415 to join a conference. The

focus capable computer 405 may then invite additional non-focus computers 440 and 445 to join the conference in-progress, in order to establish a multi-participant conference. For purposes of nomenclature, the focus capable computer will be referred to as a focus computer when a third (non-focus) computer joins the existing two-participant conference and a multi-participant conference is established.

### 1. Invitation and Acceptance

In the examples illustrated in Figures 4-6, it is assumed that the first computer 405 has been designated focus point capable by a focus-point assessment process 200 that was performed previously. To initiate a new conference, the first focus-capable computer 405 sends an invitation 410 to a second computer 415. In some embodiments, the invitation 410 typically includes the maximum conference capabilities of the first focus-capable computer 105. These capabilities are part of the set of default conference parameters (e.g., frame rate and size, codec, static bandwidth and hardware configuration) that were defined for the computer 405 in the previously performed assessment process 200. Also, in some embodiments, the invitation uses messaging over Session Initiation Protocol (SIP), which will be further described in detail later.

In some embodiments, a participant operating the first computer may specify conference parameters that do not utilize the first computer's full conferencing capabilities (e.g., selecting an audio conference even though the first computer 405 might have sufficient resources for a high definition video conference). Hence, in such cases, the invitation 410 does not include the maximum conference capabilities of the first focus-capable computer 105.

Upon receiving the invitation, the second computer 415 may decline or accept. The second computer 415 may decline by sending a message to decline to conference. The second computer 415 may also accept by sending an acceptance message 420 back to the first focus-

capable computer 405. The acceptance message of some embodiments may include a subscription message. The subscription message informs the first focus-capable computer 405 that the second computer should receive conference notifications. In some embodiments, the acceptance message includes one or more conferencing parameters that indicate the second computer's conferencing capabilities in addition to the acceptance of the offer to conference. In some embodiments, the acceptance also uses messaging over Session Initiation Protocol (SIP).

If the second computer 415 accepts, then the first focus-capable computer 405 and the second computer 415 perform a dynamic bandwidth determination 425 between their two locations. In some embodiments, the dynamic bandwidth determination may aid in configuring the initial conference settings for the new two-participant conference. For instance, the dynamic bandwidth determination may aid in setting the initial frame rate and size for the encoders of the participants' computers.

The dynamic bandwidth determination of some embodiments measures the speed and/or loss rate of the connection between two computers by transmitting and receiving a series of successively larger packet groups. For instance, one embodiment sends three groups of packets from each transmitter to each receiver of the two computers. In this embodiment, the first group contains relatively small packets that are suitable for estimating the bandwidth of slow connections (e.g., less than 100 Kbps). The second group contains larger packets for estimating medium speed connections (e.g., between 100 Kbps and 500 Kbps). The third group contains large packets, which allows accurate bandwidth estimation for higher speed connections (e.g., greater than 500 Kbps). Some embodiments that employ this technique can make accurate estimates in less than one second. The process of dynamic bandwidth determination is described further in United States Patent Application 10/770,181, entitled "Automatic Detection of Channel Bandwidth," which is incorporated herein by reference.

During the dynamic bandwidth determination of some embodiments, one of the participants' computers may downgrade one or more of the computer's local conferencing parameters based on the actual determined dynamic bandwidth available for the conference. For instance, one computer might be capable of large frame sizes, but the bandwidth of the connection of the other computer may not support large frame sizes. Some embodiments use the tables shown above to adjust the computer's various local conferencing parameters based on the dynamic bandwidth determination. These adjustments to a computer's conferencing parameters, in turn adjusts the settings for the conference, both at setup and during the conference.

In some embodiments, the results of the dynamic bandwidth determination are stored to a log in non-volatile memory. These logged results may be examined to improve the bandwidth estimate by discarding outliers and performing averaging, or to accelerate the connection time of the conference by skipping the dynamic bandwidth detection step. Once dynamic bandwidth determination indicates the initial conference settings (e.g., the initial frame rate and size for the conference) between the participants' computers, the second computer 415 sends an A/V transmission to the first focus-capable computer 405.

Upon receiving the A/V transmission, the first focus-capable computer uses the initial conference settings for the conference. As described above, the initial conference settings form a set of parameters that contain the capabilities of the focus and non focus computers constrained by each participants' selections for the conference, and further constrained by the dynamic bandwidth determination. For instance, the first focus-capable computer of some embodiments uses the set of conference parameters to configure its coding and decoding modules for sending and receiving data to and from the second computer. These configurations might define a decoder for receiving data that was encoded by using a particular audio or video codec. These configurations might also define other means for

handling incoming data such as the configuration of a resizer that adjusts the frame sizes, or of a frame rate controller that controls encoding and/or decoding frame rates. Similarly, these parameters may be used in some embodiments to define the properties of an encoder for sending data back out to the particular participant or to all the participants in the conference.

The codec components of the focus and non-focus capable computer will be further described in Sections IV and V. Also, as further described below in Section V, the ability of the focus and non-focus computers to dynamically set up their conference parameters based on their capabilities and the available bandwidth, allows the focus computer to establish a heterogeneous multi-participant conference. A heterogeneous conference is one where different conferencing computers participate differently in the conference (e.g., transmit and/or receive different types of data, utilize different A/V encoders, etc.).

### 2. Overview of Switching from a Two-Participant Conference to a Multi-Participant Conference

Once a two-participant conference is underway, the first focus-capable computer 405 of some embodiments may invite additional computers, such as computers 440 and 445 in Figure 4. In such a case, the two-participant conference changes to a multi-participant conference. For instance, Figure 5 illustrates that the first focus-capable computer 405 may invite a third computer 440 (and a fourth computer 445) to the two-participant conference already established with the second computer 415.

Figure 5 illustrates the invitation 510 and acceptance 520 involving the third computer 440. In some embodiments, the invitation and acceptance (as well as the invitiation and acceptance of the fourth computer 445) proceed in the same manner as the invitation and acceptance process that were described above for the second computer 415.

However, in the embodiments described below, the process for inviting and accepting the third and fourth computers 440 and 445 is slightly more involved than the process for

inviting and accepting of the second computer 415. For instance, when the third computer 440 accepts the invitation to join the conference, some embodiments will send a notification to any other subscribed computers, in this case the second computer 415, that the third computer 440 has joined the conference.

More specifically, once the third computer 440 (1) receives an invitation 510, (2) accepts 520, and (3) performs dynamic bandwidth determination 525 with the first focus-capable computer 405, the third computer 440 sends A/V data to the first focus-capable computer 405. As mentioned above, this A/V data might include a set of conference parameters that indicate the third computer's maximum capability for the conference. The first focus-capable computer 405 upon receiving the third computer's A/V data may make certain adjustments for supporting multiple participants in the newly established multi-participant conference.

For instance, as further described below, the first focus-capable computer 405 might realize that the addition of the third computer diminishes the available bandwidth between the first and second computers. Accordingly, the first focus-capable computer 405 might then adjust one or more conference settings (e.g., size of the video images transmitted back and forth) to account for this difference. The first focus-capable computer would make such adjustments as participants join or leave the conference in order to maintain the conference quality and reliability. Such adjustments are further described below in sub-sections 3 and 4.

One of ordinary skill will recognize that multiple variations are possible for the setup process illustrated in Figures 4 and 5. For instance, in the illustrated embodiment, only the focus computer 405 invites additional participants to join the conference. However, in other embodiments, a participant other than the focus computer 405 may invite additional participants to join the conference.

Some embodiments may limit the total number of participants to four video participants, or to ten audio participants, to preserve the quality of the conference. However, one of ordinary skill will recognize that many combinations of video and audio participants are possible. In some embodiments, only the available resources limit the permutations of participant combinations. As mentioned above, these resources might include the bandwidth and local hardware available to the conference participants of these embodiments.

### 3. Participant Computer After Acceptance

Figure 6 illustrates a process 600 that a non-focus computer performs when it receives an invitation to join a conference from a focus computer. As shown in this figure, this process starts (at 605) when the non-focus computer receives an invitation from the focus computer. At 610, the non-focus computer's participant decides whether to accept the invitation to conference. If the non-focus computer's participant decides to decline the conference, the non-focus process 600 sends (at 615) a message to the focus computer declining the conference. After 615, the process 600 ends.

On the other hand, when the non-focus computer's participant decides to accept the invitation, the non-focus process 600 transitions from 615 to 620, where the non focus computer sends an acceptance to the focus computer. In some embodiments, the acceptance of the invitation includes the initial conference parameters (e.g., the codec, frame rate and size information) that indicate the static conferencing capabilities of the non-focus computer. Upon receiving this data, the focus computer of some embodiments defines the initial conference settings for its conference communications with the non-focus computer. Also at 620, the non-focus computer sends a subscription message to the focus computer. The subscription message triggers the focus and non-focus computers to begin (at 625) a dynamic bandwidth determination. As described above, this dynamic bandwidth determination identifies an estimated bandwidth between the focus and non-focus computers.

After the dynamic bandwidth determination at 625, the non-focus process 600 specifies (at 630) the initial conference settings (e.g., the codec, frame rate and size, etc.) that the non-focus computer should use in this conference. In some embodiments, the process specifies these settings (at 630) based on (1) the non-focus computer's default conference parameters, (2) the estimated bandwidth (identified at 630) between the focus and non-focus computers, and (3) any conference parameter specified in the focus computer's invitation.

The non-focus computer's default conference parameters are the conference parameters that the non-focus computer's video conferencing application specifies after this application performs its focus-point assessment process 200. The non-focus computer might not be able to use its default conference parameters when the focus computer invites the non-focus computer to a conference. For instance, the dynamic bandwidth determination (which is performed at 630) might specify an estimated bandwidth that might not be able to sustain some of the default parameters (e.g., frame sizes or codecs). Also, the focus computer's invitation might specify one or more conference parameters that are lower on the hierarchy of parameters. For instance, the non-focus computer's default conference parameters include the use of an H.264 encoder, but the focus computer's only invites the non-focus computer to use an H.263 encoder.

Accordingly, at 630, the process defines the initial conference parameters by starting with the non-focus computer's default conference parameters, and then possibly degrading one or more of these parameters to meet the parameters specified by the focus computer, or to meet the dynamically estimated bandwidth. When downgrading the parameters based on the dynamically estimated bandwidth, the process 600 traverses down the hierarchy of conference parameter sets in its conference parameter tables, which were described above. In some embodiments, downgrading the conference parameters might include, e.g., switching to

a lower bit rate codec, reducing the frame rate and/or the frame size of the non-focus computer's encoder.

After 630, the process 600 defines the non-focus computers' A/V codecs (i.e., its one or more encoders and decoders) based on the initial conference parameters defined at 630. Next, at 640, the process 600 sends the non-focus computer's A/V data to the focus computer. After 640, the process 600 performs an in-call adjustment process, which might result in the modification of the conference parameters that the focus and non-focus computers use in the conference to communicate with each other. The in-call adjustment process will be described in the next sub-section. After performing the in-call adjustment process, the process 600 ends.

### 4. In-Call Adjustments due to Actual Available Bandwidth and Loss/Delay

When participants join or leave a multi-participant conference, some embodiments allow for in-call adjustments to the conference parameters of one or more computers of one or more participants. Figure 7 conceptually illustrates a process 700 that the focus point computer iteratively performs during a multi-participant conference. This process 700 allows the focus computer to initiate in-call adjustments when a participant leaves or joins the conference.

As shown in Figure 7, the focus computer receives (at 705) A/V data from the participants during the conference. Next, at 715, the process 700 of the focus computer determines whether any participant has left the conference. If so, the focus computer sends (at 720) a notification of the participant's departure to the other participants in the conference. The non-focus computers of these other participants then use this data to deallocate the resources that they had previously allocated for decoding and displaying the departing participant's data.

At 720, the process 700 also initiates an in-call adjustment operation. This in-call adjustment operation can result in an upgrade of the conference parameters for one or more of the participants. For instance, the departure of a participant frees up more bandwidth for the focus computer to share with the remaining non-focus computers. This increase in bandwidth might in turn allow one or more of the computers to change to bigger frame sizes or better encoders. The computers might also change to bigger frame sizes or better encoders if the departing non-focus computer's capabilities and/or bandwidth previously required the focus point computer to utilize the smaller frame sizes or the weaker encoders. After a participant leaves, the focus and non-focus computers of some embodiments go through an adjustment period to detect losses and reset the conference parameters. This in-call adjustment period will be discussed in further detail below.

After 720, the process transitions to 705. From step 715, the process 700 transitions to 725 when it determines (at 715) that no participant has left the conference. At 725, the process 700 determines whether any new participant has joined the conference. If so, the focus computer sends a notification to the other participants in the conference that the new participant has joined at 730. Based on this notification, the other participants allocate resources for decoding and displaying the new participant's data.

At 730, the focus computer also performs an in-call adjustment operation, which might downgrade the conference parameters for one or more computers. For instance, the capabilities and/or bandwidth of the new participant's computer might require the focus computer to downgrade the conference parameters for the other computers. Also, the addition of the new participant might require the bandwidth that the focus point computer allocates to the other non-focus participants to be reduced below a threshold that would require one or more of the computers to redefine their conference parameters.

Also, at 730, the focus and non-focus computers commence an in-call loss detection operation for a particular interval of time (e.g., for 20 seconds) after the focus computer transmits the notification at 730 or the non-focus computers receive the notification at 730. If the detection operation of any of the computers detects packet loss, one or more conference parameters of one or more computers might be modified, as further described below.

After 730, the process 700 transitions to 735, where it determines whether the multi-participant conference is still in progress. If not, the process ends. Otherwise, the process returns back to 705, which was described above.

**a) In-Call Loss Detection**

As mentioned above, some embodiments perform in-call bandwidth adjustments particularly at the start of a new conference or when a new participant joins a conference already underway. Figure 8 conceptually illustrates an in-call bandwidth adjustment process 800 of some embodiments. The in-call bandwidth adjustment process 800 begins at 805 when a new non-focus computer joins the conference.

After the new computer joins the conference, the focus and non-focus computers perform (at 810) an in-call loss detection operation. Such an operation is commenced when the focus point computer (at 730 of the process 700 of Figure 7) starts such an operation and instructs each non-focus computer to perform such an operation.

The focus computer of these embodiments may also perform in-call bandwidth detection with the other computers already in the conference. These embodiments attempt to preserve the quality of the conference for the participants by detecting the transmission quality for each participant. In these embodiments, packet loss and delay may be used as a particular measure of quality for the in-call adjustments. Although, other embodiments may employ different parameters to measure quality for the conference participants. Next, the

method some embodiments employ to perform in-call bandwidth detection at 810 is described.

For a small time window at the beginning of a new conference or after a new participant joins a conference already in progress, each participant detects the amount of packet loss and delay at its receiver. This discussion will proceed by only referring to packet loss since packets exhibiting significant delay are considered dropped or lost during real-time transmission. For some embodiments, this small time window is approximately 15-20 seconds after acceptance by each participant joining the conference.

The in-call bandwidth detection at 810 might reveal that one or more participants' computers detect loss. If the time window for the in-call adjustment has not elapsed at step 812, then the process 800 checks for loss at step 814. If the process 800 does not detect loss at 814, then the process 800 returns to step 812 and continues to check for loss until the time elapses at step 812, otherwise the process concludes.

If the process 800 detects loss at step 812, the focus computer will then determine the type of loss at 815. In some embodiments, the type of loss detected at 812 can be divided into four categories of loss, or states of the conference during the time window for the in-call bandwidth detection. These embodiments may then respond appropriately to the type of loss detected. These conditional states may trigger in-call adjustments that will be described in further detail below. In some embodiments, each of the four conditional states caused by a non-focus computer joining may cause the focus computer and other computers in the conference to pass additional messages to and from each other. The conferencing computers might use these messages to indicate their particular status or needs during the conference and up/downgrade the conference in response to the messages. In some embodiments, the focus computer redistributes its upload bandwidth to each computer in the conference.

For instance, Figure 8 illustrates four conditional states 825, 840, 855 and 870 that some embodiments assume, which cause these in-call adjustments based on bandwidth. Specifically, state 825 and 840 represent conditions where one or more than one non-focus computer detects loss from the focus computer, respectively. States 855 and 870 represent conditions where the focus computer detects loss from one or multiple non-focus computers, respectively. The process 800 distinguishes the conditional states by using a two step inquiry beginning at step 815, where the process 800 determines whether the loss is from the focus point computer. If the loss is from the focus computer, the process checks whether the loss is detected by one or more than one participant at step 820. To distinguish the case where one participant experiences loss from the case where multiple participants experience loss, the focus computer will wait for approximately 500 milliseconds after a message from a non-focus computer indicating loss from that computer to see if other computers report loss. One of ordinary skill will recognize that other embodiments will wait for a time other than 500 milliseconds. If only one participant detects loss at step 820, then the process 800 transitions to step 825, which is the first of the four cases discussed in detail below.

***Examples of what to do about Loss, Four Cases***

**Case_1: Computer C's Download is the Bottleneck.** Only Computer C detects loss from the focus computer.

Figure 10 illustrates loss detected by one non-focus computer C for data from a focus computer (step 825 in Figure 8). As shown in Figure 10, solid lines to and from the focus computer represent normal data transmission. However, the dashed line from the focus computer to the non-focus computer C indicates loss detected by the non-focus computer C. In this condition, the non-focus computer C of some embodiments will send a "set bit rate" packet to the focus computer (at 825). Thus, when only one participant detects loss, the focus computer of these embodiments adjusts the frame rate and/or the frame size (i.e., the bit rate)

at the focus computer's encoder to accommodate the non-focus computer experiencing loss/difficulty with reception (at 830). In some embodiments, the focus computer sets its transmission bit rate to the value contained in the set bit rate packet (i.e., to the value requested by the non-focus computer detecting loss).

For the embodiments where the focus computer only transmits using one encoder, the focus computer's transmission will be downgraded for all participants in the particular conference. In other words, the focus computer typically sends the same bit rate (i.e., the bit rate of the most constrained participant) to all non-focus computers in these embodiments. In this case, the non-focus computer C is said to be the bottleneck for the conference (likely due to lack of sufficient download bandwidth). Should the non-focus computer C leave the conference, the focus computer of some embodiments might then re-evaluate the conference parameters to check whether it is possible to upgrade the conference for the remaining participants.

After the process 800 performs the in-call adjustment based on the loss detected by one non-focus computer at step 830, the process 800 returns to step 812 to check whether the time has elapsed. In some embodiments, the process 800 repeats several times before the time has elapsed. If the time has elapsed at step 812, the process 800 concludes. Otherwise, the process 800 proceeds to step 814 as described above. If at step 820, however, the process 800 determines that more than one participant detects loss from the focus computer, then the process 800 transitions to step 840.

**Case_2: Focus Computer's Upload is the Bottleneck**, e.g., Computers A, B and C each detect packet loss from the focus computer.

Figure 12 illustrates loss detected by multiple participants for data from the focus computer (step 840 in Figure 8). As shown in Figure 12, solid lines represent normal data transmission, while dashed lines represent packet loss. In some embodiments, when the focus

computer receives notification of loss from multiple participants (at 840), the focus computer resets its transmission bit rate to each participant (at 845). In some embodiments, each non-focus computer sends a request for a different bit rate in a set bit rate packet to the focus computer. The focus computer of these embodiments may sum the value contained in the bit rate requests and divide by the number of requests it receives to adjust its transmission bit rate. In other words, the focus computer of these embodiments sets its transmission bit rate to the average rate requested by those participants in the conference that reported loss. In these embodiments, the focus computer may adjust its transmission bit rate by adjusting the frame rate or frame size of its encoder. For the embodiments in which the focus computer only uses a single encoder, the transmission bit rates to each non-focus computer are typically equal.

As mentioned above, to distinguish the first case (where the participant C was the bottleneck, and the only recipient reporting loss) from the second case (where multiple recipients report loss), the focus computer of some embodiments will wait before resetting its transmission bit rate, to see how many participants report loss. The waiting period may be different in different embodiments (e.g., 500 milliseconds, one second, etc.).

After the process 800 makes adjustments based on loss from the focus computer detected by multiple non-focus computers at step 845, the process 800 returns to step 812 to check whether the time has elapsed. If at step 815, the process 800 determines that the loss is not detected from the focus computer (i.e., the loss is from one or more non-focus computers), then the process 800 transitions to step 850 to determine from how many computers the focus computer detects loss. The focus computer of some embodiments may perform this determination by using the same waiting method as described above. If only one computer detects loss at step 850, then the process 800 transitions to step 855.

**Case_3: Computer C's Upload is the Bottleneck.**

Figure 9 illustrates loss detected by a focus computer for data from one non-focus computer C (step 855 in Figure 8). As shown in Figure 9, the solid lines to and from the focus computer indicate normal data transmission, while the dashed line from the non-focus computer C to the focus computer indicates loss (e.g., dropped or delayed packets) detected by the focus computer. When the focus computer detects loss from only one non-focus computer, the focus computer of some embodiments may send a request to that non-focus computer, in this case non-focus computer C, to lower the non-focus computer's transmission bit rate (at 855). In some embodiments, the request is contained in a "set bit rate" packet. The focus computer of some embodiments may request that the non-focus computer lower its transmission bit rate equal to the bit rate of the most constrained participant in the particular conference. In this case, the non-focus computer C is likely not the most constrained participant in the conference. However, reducing the computer C's transmission bit rate (at 860) will allow the focus computer to maintain the conference (i.e., to adequately send and receive conference data to and from all of the conference participants, including the most constrained participants).

Once the process 800 adjusts to the loss detected from one non-focus computer at step 860, the process 800 returns to step 812 to check whether the time has elapsed. If the focus computer detects loss from more than one non-focus computer at step 850, then the process 800 transitions to step 870.

**Case_4: Focus Computer's Download is the Bottleneck.**

Figure 11 illustrates loss detected by the focus computer for data from multiple participants (step 870 in Figure 8). In Figure 11, the dashed lines indicate loss of packets detected by the focus computer for data from each non-focus computer A, B and C in the conference. When the focus computer detects loss from multiple participants, the focus computer of some embodiments sends a "set bit rate" packet to all the conference participants

to lower their transmission bit rates to a rate determined by the focus point (at 870). The focus computer of some embodiments requests the bit rate of each participant to be set at the average bit rate previously received from all the non-focus computers in the conference (at 875). Upon receiving the set bit rate packet from the focus computer, each non-focus computer will set its transmission bit rate to the requested bit rate. In this case, the focus computer is said to be the bottleneck in the conference. This bottleneck is likely due to insufficient download bandwidth for the focus computer. Once the process 800 adjusts the conference for this kind of loss at step 875, the process 800 returns to step 812 to check whether the time has elapsed. As mentioned above, the process 800 may repeat several times before the time elapses at step 812. Once the time has elapsed at step 812, then the process 800 concludes.

***An Example of the Three Bandwidth Adjustments for a Conference***

At this time, it might be useful to review three possible opportunities to configure a conference based on bandwidth at three separate times for a given conference. To distinguish these three configuration phases, they are referred to as (1) static estimation, (2) dynamic determination, and (3) in-call adjustment. For instance, a focus capable participant may initially (1) estimate that it is capable of sending at about 1.0 Mbps at application startup. During invitation and acceptance of a conference, a non-focus computer and the focus computer may (2) determine that each is able transmit and receive at about 1.0 Mbps in the conference. After which, a third participant may join the conference. The third participant may have (1) estimated its own bandwidth at 1.0 Mbps when its conferencing application started. The third participant may also (2) determine that a 1.0 Mbps conference is possible with the focus computer.

However, the focus computer is already conferencing at its maximum 1.0 Mbps upload with the second participant's computer. In this situation, the in-call bandwidth

adjustment (3) should detect loss at either or both of the second and third participants. Upon encountering this situation, the focus computer will downgrade the conference (i.e., will divide its available 1.0 Mbps upload bandwidth between the second and third participants) to preserve the quality of the conference for all subscribed participants. Figure 13 illustrates an example where the focus computer divides its 1.0 Mbps upload over two non-focus computers. Figure 14 illustrates an example where the focus computer redistributes its 1.0 Mbps for three non-focus computers at 333 Kbps each, when a non-focus computer C joins. This example of a third participant joining a two-participant conference to form a multi-participant conference illustrates one embodiment, of an in-call bandwidth adjustment. Specifically, the focus computer performs in-call adjustment by bandwidth redistribution. The components and operation of the focus computer during a conference is discussed in Section IV.

## III. SIP MESSAGING AND ENCRYPTION

Some embodiments allow messaging over a different set of ports than the ports used for video or for audio data transmission. Some of these embodiments employ messaging over Session Initiation Protocol (SIP), which is particularly useful for setting up a conference (invitation and acceptance), and for sending messages during the conference (e.g., status updates regarding participants joining or leaving). These messages can be used for signaling setup procedures and up/down-grade procedures at various times during a conference (i.e., when participants join or leave).

The typical Session Initiation Protocol (SIP) packet includes a header and a body. Some embodiments add additional information to the SIP packet body by using the Session Description Protocol (SDP). SDP information may contain certain parameters useful in video encoding such as codec, frame rate, and image size. For instance, to invite to conference, the focus computer of some embodiments will send a SIP packet containing a proposed set of

conference parameters that are stored in bit fields (e.g., codec, frame rate, and image size, hardware description, and conference status). Particularly novel in some embodiments is the SDP information in the invitation sent by the focus computer. In some embodiments, this SDP information includes the default image sizes for peer-to-peer and multi-participant conferences, when setting up a new conference, and for up/downgrading an existing conference. These embodiments may also include the set of standard SDP information typically required for conferencing. This set of standard SDP information is defined in the IETF specification regarding SIP.

As mentioned above, the messages of some embodiments include parameters such as conference status, bit rate, and hardware description, which may include machine and processor type (e.g., PowerPC G3, G4, G5, etc.), number of CPUs, and speed of CPUs. Conference status information typically includes the number of participants and/or the participants who are joining/leaving with their conferencing capabilities and hardware descriptions.

In these embodiments, a focus computer may send a set of proposed conferencing parameters in an invitation to conference message by using a SIP packet. The recipient of the SIP packet can compare its conference capabilities with the invitation sent by the focus computer to aid in the formulation of an acceptance message and/or the initial conference packets. As previously mentioned, these initial conference packets may include conference parameters as well as A/V data intended for the focus computer. The SIP packet recipients of these embodiments may further cache information from the received invitation message for future reference in the present conference, or even future conferences involving the particular focus computer that sent the invitation.

During acceptance, the client can send a confirmation SIP packet containing SDP parameters with the same conference parameters that were offered by the focus computer, or

with one or more downgraded parameters (e.g., a smaller image size, a lower codec such as H.263 instead of H.264). The SDP parameters for the conference may also be adjusted at various times during a conference. For instance, the conference parameters may be downgraded when the conference changes from a two-participant to a multi-participant conference and when additional participants join the multi-participant conference. Conversely, the conference parameters may be upgraded when participants leave the conference and, specifically, when the conference changes from a multi-participant to a two-participant conference.

In other words, the various bandwidth measurements for the embodiments above, when used in conjunction with a set of rules, may determine the capabilities of each encoder and the availability and settings of each decoder for each participant in a conference. These capabilities and settings may form the parameters for a conference. For instance, a group of participants with G5 processors can perform videoconferencing at 320x240 resolution using the H.264 codec. More examples of these rules are illustrated in the tables of Section II of this application. The conference parameters may need to be passed or updated at various times during a conference. This task is accomplished in some embodiments through the use of SIP packets containing SDP fields to hold the "session description" information.

Some embodiments transmit the SIP packets over the Universal Datagram Protocol (UDP). However, a multi-participant conference may have too much hardware description and bandwidth information in the SIP packets to fit in a single UDP packet. Thus, some embodiments compress the SIP/SDP information and tags. This compression shortens attribute names, status strings, and XML tags. These embodiments allow the conference messages to continue to be relayed by using SIP over UDP. As is known in the art, UDP has particular advantages for real-time transmission, such as A/V data transmissions during multi-participant conferencing.

Some embodiments use an automated encryption process to securely initiate a conference and securely transmit A/V data between a focus computer and non-focus computers. This encryption process selects the type of encryption to use between the focus computer and a non-focus computer by traversing a hierarchy of encryption options based on the encryption capabilities of the focus and non-focus computers (e.g., based on whether each participant's computer supports certificate based encryption, or another method of encryption). This encryption process also pre-tabulates counter and encryption keys during system idle time (e.g., before the next packet is encoded.). During a conference, the most compute-intensive operation is the encoding of video information for transmission in packets. The encoded data packets may then be encrypted by using an encryption key. Encryption of data packets might involve applying the encryption key to a data packet through a logic function (e.g., XOR), which does not add much computation. However, calculation of the key for encryption may lengthen the time to send a data packet. Thus, some embodiments pre-calculate an encryption key in a separate process from the encoding process, before the encryption key is needed for a packet, or even before the video data for that particular packet enters the encoder. In these embodiments, one or more keys may be calculated and stored for use with the next grouping of data that is intended for encoding and packetization, after a previous packet is transmitted but before the next packet is encoded.

## IV. OPERATION

### A. Example of Focus-Point Video Conference

Figure 15 illustrates an example of a video conference 1500 according to the focus-point architecture described above. In this example, a focus computer 1505 of a participant D is engaged in a video conference with three computers 1510-1520 of three participants A, B, and C through a network (not shown). As mentioned above, the focus computer 1505 serves

as a central distributor of audio/video content during the video conference.

As the central distributor of audio/video content, the focus point 1505 receives A/V data from each participant, composites and encodes the A/V data, and then transmits the composite A/V data to each of the non-focus machines. Figure 16 shows an example of such an exchange for the four participant example of Figure 15. Specifically, Figure 16 illustrates the focus point 1505 receiving one video frame 1615-1625 from each participant.

From the received images 1615-1625, the focus point 1505 generates and transmits a composite frame to each non-focus participant. As shown in Figure 16, the focus computer 1505 removes a particular non-focus participant's video frame from the composite frame that the focus computer 1505 transmits to the particular non-focus participant, in order to save bandwidth. For instance, Figure 16 illustrates for participant A, a composite image 1630 that does not have participant A's own image 1615. Instead of a non-focus participant's own image, the focus computer inserts a empty-field flag 1645 in the location of the non-focus participant's image in the composite image 1630, in order to indicate the absence of the frame corresponding to the non-participant's own image. Once each non-focus computer receives its encoded composite image, the non-focus computer decodes the composite frame, extracts each of the sub-frames in the composite frame and then displays the decoded, extracted frames on its display. Some embodiments do not use the empty-field flag 1645, and instead simply remove the image of a particular non-focus participant from the composite image sent to the particular non-focus participant. For instance, in some embodiments, the non-focus point module's decoder determines how the video image is composed with remaining encoded sub images because each encoded macroblock in each image has an identifier that represents its location.

As shown in Figure 16, the focus computer 1505 also mixes and encodes the audio

signals 1617, 1622, and 1627 that it receives from the non-focus computers, and then transmits the mixed, encoded signals 1632, 1637, and 1642 to the non-focus computers. In some embodiments, the focus computer 1505 removes a particular non-focus participant's audio signal from the mixed audio signal that the focus point transmits to the particular non-focus participant, otherwise the particular non-focus participant will hear his own voice when the mixed audio is played on the participant computer's loudspeakers. Also, in some embodiments, the focus point 1505 calculates signal strength indicia for each participants' audio signals, and appends the signal strength indicia to the mixed signals that it sends to each participant. The non-focus computers then use the appended signal strength indicia to display audio level meters that indicate the volume levels of the different participants, and to pan the audio across the loudspeakers of a participant's computer in order to help identify orators during the conference.

Some embodiments are implemented by a video conference application that can perform both focus and non-focus point operations. In some embodiments, this video conference application has two modules, a focus-point module and a non-focus point module that run on top of an operating system of a video-conference participant's computer. During a multi-participant video conference, the video conference application uses the focus-point module when this application is serving as the focus point of the conference, and uses the non-focus point module when it is not serving as the focus point. The focus-point module performs focus-point A/V processing operations when the video conference application is the focus point of a multi-participant video conference. On the other hand, the non-focus point module performs non-focus point A/V processing operations when the application is not the focus point of the conference. In some embodiments, the focus and non-focus point modules share certain resources.

The focus-point module of the focus computer 1505 and the non-focus point modules

of the non-focus computers 1510-1520 are described in the sub-sections below.

### B. Focus-Point Module's Video Codec Section

For some embodiments of the invention, Figure 17 illustrates the video codec section of the focus-point module of focus computer 1505 of Figure 15. Figure 17 shows focus-point module as utilizing three decoders 1720-1730, three intermediate buffers 1735-1745, three resizers 1747-1749, a local image capture module 1751, a frame rate controller 1752, a composite image buffer 1755, an encoder 1760, a redundancy remover 1765, a perspective adjuster 1775, and a local image controller 1785.

The decoders 1720-1730, the intermediate buffers 1735-1745, and the resizers 1747-1749 form three video decoding pipelines into three sections 1757-1759 of the composite image buffer 1755. These three video decoding pipelines allow the focus-point module to decode and composite video signals from non-focus computers 1510-1520 during the video conference.

Specifically, each decoder 1720, 1725, or 1730 is responsible for decoding video signals from one non-focus computer during a video conference. The focus computer 1505 defines a decoder for a particular non-focus participant during the set up process when the particular non-focus participant joins the conference. The focus computer 1505 might subsequently change or modify this decoder as a result of subsequent in-call adjustment operations.

After decoding a received frame, each decoder 1720, 1725, or 1730 stores the decoded frame in an intermediate buffer 1735, 1740, or 1745, which, in some embodiments, is a location in the memory of the focus-point computer. At a particular frame sampling rate, each resizer 1747, 1748, or 1749 (1) retrieves a frame that is stored in its corresponding intermediate buffer, (2) resizes this frame, if such resizing is necessary, and (3) stores the

frame in its corresponding section in the composite image buffer 1755. For instance, the resizer 1748 retrieves a decoded frame of the participant B from the intermediate buffer 1740, resizes this retrieved frame if necessary, and stores this frame in the composite-buffer section 1758.

The frame rate controller 1752 defines the frame sampling rate at which the resizers 1747-1749 retrieve frames from the intermediate buffers 1735-1745. The frame rate controller 1752 determines this rate based on a variety of factors, which may include the system bandwidth, the computational resources of the focus-point computer, the number of participants in the video conference, etc. At the frame sampling rate that the controller 1752 supplies to the resizers 1747-1749, the frame rate controller 1752 also directs the local image capture module 1751 to store frames in section 1756 of the composite image buffer 1755. These stored frames are the images of the video-conference participant who is using the focus-point computer during the video conference. These images are captured by the camera 1750 and the local image capture module 1751 at the focus-point computer. In some embodiments, the frame rate controller 1752 changes the particular frame rate during a video conference, as the conditions of the video conference change.

As mentioned above, the resizers 1747-1749 retrieve frames from the buffers 1735-1745 based on the frame rate they receive from the controller 1752. Before storing a retrieved frame in the composite image buffer, a resizer resizes the retrieved frame when the non-focus computer that supplied this frame supplied it at a different size than the size of the composite-buffer section for this frame. For instance, to save bandwidth or computational resources during the encoding, a non-focus computer might encode and transmit smaller frames (i.e., encode frames at coarser level of granularity and transmit packets with less encoded content for each frame).

The focus computer 1505 defines the resizing operation for a particular non-focus participant during the set up process when the particular non-focus participant joins the conference. The focus computer 1505 might subsequently change or modify this resizing operation as a result of subsequent in-call adjustment operations.

As mentioned above, the resizers 1747-1749 store potentially-resized frames in their corresponding sections 1757-1759 of the composite image buffer 1755. In some embodiments, the composite image buffer 1755 is a location in the memory of the focus-point computer, and each section 1756-1759 in this buffer is a contiguous logical section at this location in the memory.

At the sampling rate that the controller 1752 defines, the encoder 1760 encodes the composite frame that is stored in the composite image buffer. The encoder encodes the sub-frame that is stored in each section 1756, 1757, 1758, or 1759 independently of the sub-frames that are stored in the other sections of the composite image buffer 1755. The encoder 1760 decouples the encoding of each sub-frame in each section 1756, 1757, 1758, or 1759 so that the encoding of each sub-frame does not depend on any other sub-frame (i.e., the encoding of one section does not use video data beyond the boundaries of each section). For example, the encoding of the macroblocks in the sub-frame of participant A in section 1757 does not depend on the encoding of the macroblocks in the sub-frame of participant B in the section 1758.

The focus computer 1505 defines the encoder 1760 during the set up process when a video conference commences. The focus computer 1505 might subsequently change or modify this encoder as a result of subsequent in-call adjustment operations.

After encoding a composite frame, the encoder 1760 supplies the redundancy remover with an encoded video stream that contains each participant's encoded video data in a

separate section (i.e., contains different participants encoded video data in separate, non-interleaved sections). The non-interleaved structure of the encoded stream allows the redundancy remover to remove quickly a particular non-focus participant's video data from the video stream that is to be transmitted to the particular non-focus participant.

Once the redundancy remover removes each participant's redundant image data from the participant's video stream, the redundancy remover transmits the participant's video stream to the participant. Accordingly, Figure 17 illustrates the redundancy remover 1765 sending three video streams to the three non-focus participants A, B, and C.

Figure 17 also illustrates that the perspective adjuster 1775 of the focus-point module retrieves the focus point participant's image from focus point sub image 1756 in the composite image buffer 1755. The perspective adjuster 1775 also retrieves non-focus participants sub images from the intermediate buffers 1735, 1740, and 1745.In some embodiments, this adjuster receives these frames at the frame rate specified by the frame rate controller 1752. The adjuster 1775 adjusts each non-focus participant's frame for a perspective view on the display 1795 of the focus-point computer. It then supplies the adjusted frames to the local image controller, which then renders the frames for display on the display device 1795.

Figure 17 provides a simplified conceptual illustration of the focus-point module's decoding and encoding operations. One of ordinary skill will realize that the non-focus point module will have other components in other embodiments. For instance, in some embodiments, this module will have one or more modules to prevent duplicate encoding and/or decoding of an identical frame or very similar frames. These additional modules are further described in the above-incorporated U.S. Patent Application entitled "Video Processing in a Multi-Participant Video Conference".

### C. Non-Focus Point Module's Video Codec Section

For some embodiments of the invention, Figure 18 illustrates a non-focus video codec section 1800 of a non-focus point module of a non-focus computer 1510, 1515, or 1520. The video codec section 1800 performs encoding and decoding operations. For its encoding operation, the video codec section 1800 utilizes a local image capture module 1840, a frame rate controller 1842, and an encoder 1850. For its decoding operation, the video codec section 1800 utilizes a decoder 1810, an intermediate buffer 1815, a perspective adjuster 1820, and a local image controller 1830.

During the video conference, a camera 1825 attached to the non-focus computer films the video-conference participant who is using the non-focus point computer. During the encoding operation, the local image capture module 1840 receives and captures video frames that are produced by the camera. At a particular sampling rate that is specified by the frame rate controller 1842, the local image capture module 1840 directs the captured frames to the encoder 1850, which then encodes and transmits the frames to focus-point computer. In some embodiments, the encoder 1840 and the frame rate of the controller 1842 are defined during the setup process for the non-focus computer, and are susceptible to changes through in-call adjustments during the video conference as the conference conditions change.

During its decoding operation, the video codec section 1800 receives composite frames from the focus point module and decodes them for display on the display device 1835 of the non-focus computer. Specifically, the decoding process when the video codec section 1800 receives a video stream that contains a composite frame from the focus point module. Next, the decoder 1810 decodes the received composite frame, and stores the decoded composite frame in the intermediate buffer. In some embodiments, the decoder 1810 is defined during the setup process for the non-focus computer, but might change through in-

call adjustments during the video conference as the conference conditions change.

Each decoded composite frame includes several sub-frames, where each sub-frame represents a frame of one of the other participants in the video conference. The perspective adjuster 1820 then retrieves the decoded sub-frames from the intermediate buffer, and adjusts the perspective view of these images of the other conference participant. The adjuster 1820 supplies the adjusted frames to the local image controller 1830. The local image controller also receives a video frame of the local non-focus point video-conference participant from the local image capture 1840. From the adjusted frames of the other conference participants and the local participant's captured frame, the local image controller 1830 then renders the video-conference display presentation for display on the display device 1835 of the non-focus computer.

Figure 18 provides a simplified conceptual illustration of the non-focus point module's decoding and encoding operations. One of ordinary skill will realize that the non-focus point module will have other components in other embodiments. For instance, in some embodiments, this module will have one or more modules to prevent duplicate encoding and/or decoding of an identical frame or very similar frames. These additional modules are further described in the above-incorporated U.S. Patent Application entitled "Video Processing in a Multi-Participant Video Conference".

**D. Focus-Point Module's Audio Codec Section**

For some embodiments of the invention, Figure 19 illustrates an audio codec section 1900 of the focus-point module of the focus computer 1505. The focus audio codec 1900 generates mixed audio signals for transmitting to non-focus participants, and performs audio presentation for the conference participant who is using the focus point computer during the video conference.

For its audio mixing operation, the focus audio codec 1900 utilizes one decoder 1925 and one intermediate buffer 1930 for each incoming audio signal, an intermediate buffer 1930 for the focus point audio signal, one audio capture module 1915, one signal strength calculator 1980, one audio mixer 1935 for each mixed audio signal, and one encoder 1950 for each transmitted mixed audio signal. For its audio presentation operation at the focus-point computer, the focus audio codec 1900 also utilizes one audio panning control 1960 and one level meter control 1970.

During its audio mixing operation, two or more decoders 1925 receive two or more audio signals 1910 containing digital audio samples from two or more non-focus point modules. The decoders 1925 decode and store the decoded audio signals in two or more intermediate buffers 1930. In some embodiments, the decoder 1925 for each non-focus computer's audio stream uses a decoding algorithm that is appropriate for the audio codec used by the non-focus computer. This decoder is specified during the process that sets up the audio/video conference. The decoder for each stream might change during a video conference as a result of in-call adjustment operations.

The focus audio codec 1900 also captures audio from the participant that is using the focus point computer, through microphone 1920 and the audio capture module 1915. The focus audio codec stores the captured audio signal from the focus-point participant in its corresponding intermediate buffer 1930.

Next, the audio signal strength calculator 1980 calculates signal strength indicia corresponding to the strength of each received signal. Audio signal strength calculator 1980 assigns a weight to each signal. In some embodiments, the audio signal strength calculator 1980 calculates the signal strength indicia as the Root Mean Square (RMS) power of the audio stream coming from the participant to the focus point. The RMS power is calculated from the following formula:

$$\text{RMS} = \sqrt{\frac{\sum_{i=1}^{N} (Sample_i)^2}{N}},$$

where N is the number of samples used to calculate the RMS power and $Sample_i$ is the $i^{th}$ sample's amplitude. The number of samples, N, that audio signal strength calculator 1980 uses to calculate RMS value depends on the sampling rate of the signal. For example, in some embodiments of the invention where the sampling rate is 8 KHz, the RMS power might be calculated using a 20 ms chunk of audio data containing 160 samples. Other sampling rates may require a different number of samples.

The audio codec 1900 then utilizes the audio mixers 1935 to mix the buffered audio signals. Each audio mixer 1935 generates mixed audio signals for one of the participants. The mixed audio signal for each particular participant includes all participants' audio signals except the particular participant's audio signal. Eliminating a particular participant's audio signal from the mix that the particular participant receives eliminates echo when the mixed audio is played on the participant computer's loudspeakers.

The mixers 1935 mix the audio signals by generating a weighted sum of these signals. To obtain an audio sample value at a particular sample time in a mixed audio signal, all samples at the particular sampling time are added based on the weight values computed by the audio signal strength calculator 1980. In some embodiments, the weights are dynamically determined based on the calculated signal strength indicia to achieve certain objectives. Example of such objectives include (1) the elimination of weaker signals, which are typically attributable to noise, and (2) the prevention of one participant's audio signal from overpowering other participants' signals, which often results when one participant consistently speaks louder than the other or has better audio equipment than the other. In some embodiments, the mixers 1935 append the signal strength indicia of all audio signals that were summed up to generate the mixed signal.

Next, for the non-focus computers' audio, the encoders 1950 encode the mixed audio signals and send them to their corresponding non-focus modules. Each particular encoder is specified during the process that added the non-focus computer corresponding to the particular encoder to the video conference. The encoder for each stream might change during a video conference as a result of in-call adjustment operations.

The mixed audio signal for the focus point computer is sent unencoded to focus point audio panning control 1960. Also, the signal strength indicia is sent to the level meter 1970 of the focus audio codec, which then generates the appropriate volume level indicators for display on the display device 1975 of the focus point computer.

One of ordinary skill will realize that other embodiments might implement the focus point module differently. For instance, in some embodiments, the focus point produces a single mixed signal that includes every participant's audio. This stream along with signal strength indicia is sent to every participant. When playing this stream, a participant will mute playback if that same participant is the primary contributor. This scheme saves focus point computing time and provides echo suppression without requiring separate, distinct streams for each participant. Also, during IP multicast, the focus point stream bandwidth can be reduced. In these embodiments, the focus point has one audio mixer and one encoder.

### E. Non Focus Point Module's Audio Codec Section

For some embodiments of the invention, Figure 20 illustrates a non-focus audio codec section 2000 of a non-focus point module of a non-focus computer 1510, 1515, or 1520. In this example, the non-focus audio codec 2000 utilizes a decoder 2005, two intermediate buffers 2010 and 2075, a level meter control 2020, an audio panning control 2045, an audio capture module 2070, and an encoder 2080.

The non-focus audio codec performs encoding and decoding operations. During the encoding operation, the audio signal of the non-focus point participant's microphone 2060 is captured by audio capture module 2070 and is stored in its corresponding intermediate buffer 2075. The encoder 2080 then encodes the contents of the intermediate buffer 2075 and sends it to the focus point module. The encoder 2080 is specified during the process that added the non-focus computer to the particular conference. The encoder 2080 might be changed or modified during a video conference as a result of in-call adjustment operations.

The decoding operation of the non-focus audio codec 2000 starts when the decoder 2005 receives audio packets from the focus point module. The decoder 2005 decodes each received audio packet to obtain mixed audio data and the signal strength indicia associated with the audio data. Like the encoder 2080, the decoder 2005 is specified during the process that added the non-focus computer to the particular conference. The decoder 2005 might be changed or modified during a video conference as a result of in-call adjustment operations.

The decoder 2005 saves the decoded mixed audio data and associated signal strength indicia in the intermediate buffer 2010. The signal strength indicia are sent to level meter control 2020 to display the audio level meters on the non-focus participant's display 2030. In a multi-participant audio/video conference, it is desirable to identify active speakers. One novel feature of the current invention is to represent the audio strengths by displaying audio level meters corresponding to each speaker's voice strength. Level meters displayed on each participant's screen express the volume level of the different participants while the mixed audio signal is being heard from the loud speakers 2055. Each participant's volume level can be represented by a separate level meter, thereby, allowing the viewer to know the active speakers and the audio level from each participant at any time.

The decoded mixed audio signal and signal strength indicia stored in the intermediate buffer 2010 are also sent to the audio panning control 2045 to control the non-focus

participant's loudspeakers 2055. Audio panning helps identify the location of the currently speaking participants on the screen and produces stereo accounting for location. Some embodiments achieve audio panning through a combination of signal delay and signal amplitude adjustment. For instance, when the participant whose image is placed on the left side of the screen speaks, the audio coming from the right speaker is changed by a combination of introducing a delay and adjusting the amplitude to make the feeling that the voice is coming from the left speaker.

The audio and video codec operations of the focus and non-focus modules are further described in the above-incorporated patent applications.

## V. HETEROGENEOUS MULTI-PARTICIPANT VIDEO CONFERENCE

The above described focus-point architecture can seamlessly support heterogeneous multi-participant conferencing, where different conferencing computers participate differently in the conference. For instance, some embodiments allow different non-focus computers to use different audio encoders 2080. To facilitate such a difference, the focus-point computer 1505 would use different audio decoders 1910 for the different audio encoders 2080 of the non-focus computers.

Similarly, some embodiments allow different non-focus computers to use different video encoders 1850. To facilitate such a difference, the focus-point computer 1505 would use different video decoders 1720-1730 for the different encoders 1850 of the non-focus computers. Some embodiments also allow different non-focus computers to provide different sized frames, by allowing the resizers 1747-1749 of the focus computer to resize differently the different sized frames of the non-focus computers.

Moreover, in some embodiments, a participant might not provide any video data to the focus computer. Figure 21 illustrates an example of such a situation. In this example, the

conference includes four participants A, B, C, and D, with the participant D's computer serving as the focus point and the participant B's computer providing only audio data.

In this example, all that the focus computer 1505 would have to do would be to forego defining in its video codec a video-decoding pipeline for the participant B. Figure 22 illustrates an example of such a focus point video codec 2200. As shown in Figure 22, the focus point video codec 2200 includes only two video-decoding pipelines, one for the participant A and one for participant C. For the participant B's image in the composite image, the codec 2200 stores a blank image in some embodiments. In other embodiments, the codec 2200 would not even define a section in the composite image buffer 1755 for the participant B. In either approach, the composite frames that are sent to the non-focus participants will not contain any video data regarding participant B. Accordingly, no participant will show any video of participant B.

However, given that in this example participant B is still providing audio data, the focus point uses the audio codec 1900 of Figure 19, which has an audio decoder 1925, an intermediate audio buffer 1930, an audio mixer 1935, and an audio encoder 1950 for the participant B. These components decode the participant B's audio data, store this data, mix this data with the audio data of the other participants, and then encode and transmit the mixed data to other participants.

In some embodiments, a participant might not provide any audio or video data to the focus computer. Figure 23 illustrates an example of such a situation. In this example, the conference includes four participants A, B, C, and D, with the participant D's computer serving as the focus point and the participant B's computer providing no audio or video data.

In this example, the focus computer 1505 would not only forego defining in its video codec a video-decoding pipeline for the participant B, but also would forego defining, in its

audio codec, audio decoding and mixing pipelines for the participant B. Figure 24 illustrates an example of such a focus point audio codec 2400. As shown in Figure 24, the focus point audio codec 2400 includes only two audio-decoding pipelines, one for the participant A and one for participant C. Also, the focus point audio codec 2400 includes only three audio mixers, one for the participant A, one for participant C, and one for the participant D.

The foregoing has described methods and apparatus for multi-participant conferencing. One of ordinary skill will also recognize that the invention can be embodied in other specific forms without departing from the spirit of the invention, even though the invention has been described with reference to numerous specific details. For instance, even through the embodiments described above perform the focus point designation before the set up of the video conference, other embodiments designate a focus point computer during the video conference set up. In view of the foregoing, one of ordinary skill in the art would understand that the invention is not to be limited by the foregoing illustrative details, but rather is to be defined by the appended claims.

CLAIMS

We claim:

1. A method of establishing a conference through a plurality of devices, the method comprising:

a) designating a device as a focus point for said conference, and designating the remaining devices as non-focus point devices, said designation based on a set of criteria relating to the conferencing capabilities of the focus-point device; and

b) from the non-focus devices, receiving audio and/or video signals at the focus point device and distributing the received signals to the non-focus devices.

2. The method of claim 1, wherein the designation is performed before the setting up of the video conference.

3. The method of claim 1, wherein the designation is performed during the setting up of the video conference.

4. The method of claim 1, wherein the set of criteria includes a set of hardware criteria relating to hardware components of the focus-point device.

5. The method of claim 1, wherein the devices are interconnected through a network, wherein the set of criteria includes a set of criteria relating to an estimated network bandwidth of the focus-point device.

6. The method of claim 5 further comprising using a remote bandwidth server to obtain said estimated bandwidth.

7. The method of claim 1, wherein the set of criteria are used to determine a set of default parameters for said conference.

8. The method of claim 7, said set of default parameters comprising at least one

parameter selected from a group comprising bit rate, encoding codec, and video-image size.

9. A method of establishing a conference through a plurality of devices, said method comprising:

a) estimating bandwidth for a device;

b) setting up said conference based on said estimated bandwidth;

c) measuring bandwidth between two devices in the conference; and

d) adjusting said conference based on said measured bandwidth.

10. The method of claim 9, wherein adjusting said conference comprises downgrading one or more parameters in a set of parameters for said conference, wherein downgrading comprises changing said parameter to a lower quality level, wherein said lower quality level requires fewer data bits.

11. The method of claim 9, wherein adjusting said conference comprises upgrading one or more parameters in a set of parameters for said conference, wherein upgrading comprises changing said parameter to a higher quality level, wherein said higher quality level requires more data bits.

12. The method of claim 9, wherein said estimating comprises using a bandwidth server separate from the devices to perform the estimation.

13. The method of claim 9, wherein said measuring comprises determining packet delay.

14. The method of claim 9, wherein said measuring comprises determining packet loss.

15. The method of claim 9 further comprising:

determining the quality of data, said data quality determination performed at one of said devices; and

adjusting said conference based on said determination of data quality.

16. The method of claim 15, wherein said data quality includes packet delay.

17. The method of claim 15, wherein said data quality includes packet loss.

18. A heterogeneous conference between a plurality of devices, the conference comprising:

a focus point device and at least two non-focus point devices;

wherein the focus point device receives conference content data from the non-focus point devices and redistributes the received conference content data to the non-focus point devices;

wherein a first non-focus point device provides content data that is based on a first set of conference parameters while a second non-focus point device provides content data that is based on a second set of conference parameters that is different than the first set of conference parameters.

19. The conference of claim 18, wherein the first and second conference parameters include the type of content data being provided, wherein different types of content data is provided by the first and second non-focus point devices.

20. The conference of claim 18, wherein the first and second conference parameters include a size for a frame of the content data, wherein the first and second non-focus point devices provide different sized frames to the focus point device.

21. The conference of claim 20, wherein the focus point device comprises more than one resizer for resizing content data from the first and second non-focus point devices.

22. The conference of claim 18, wherein the content data includes video data, wherein the conference parameters includes the type of video encoders used by the first and second non-focus point devices, wherein the first and second non-focus point devices use different types of video encoders.

23. The conference of claim 18, wherein the conference content data includes audio data, wherein the conference parameters includes the type of audio encoders used by the first and second non-focus point devices, wherein the first and second non-focus point devices use different types of audio encoders.

24. The conference of claim 18, wherein the content data from the first non-focus point device includes video data and the content data from the second non-focus point device does not includes video data.

25. The conference of claim 24, wherein the focus point device includes a video decoder, wherein the video decoder defines a video-decoding pipeline for the first non-focus point device, wherein the video decoder foregoes defining a video-decoding pipeline for the second non-focus point device.

26. The conference of claim 25, wherein the redistributed content data from the focus point device to the first non-focus point device includes a composite frame, wherein the composite frame does not contain video data from the second non-focus point device.

27. The conference of claim 25, wherein the focus point device only provides audio data to the second non-focus point device.

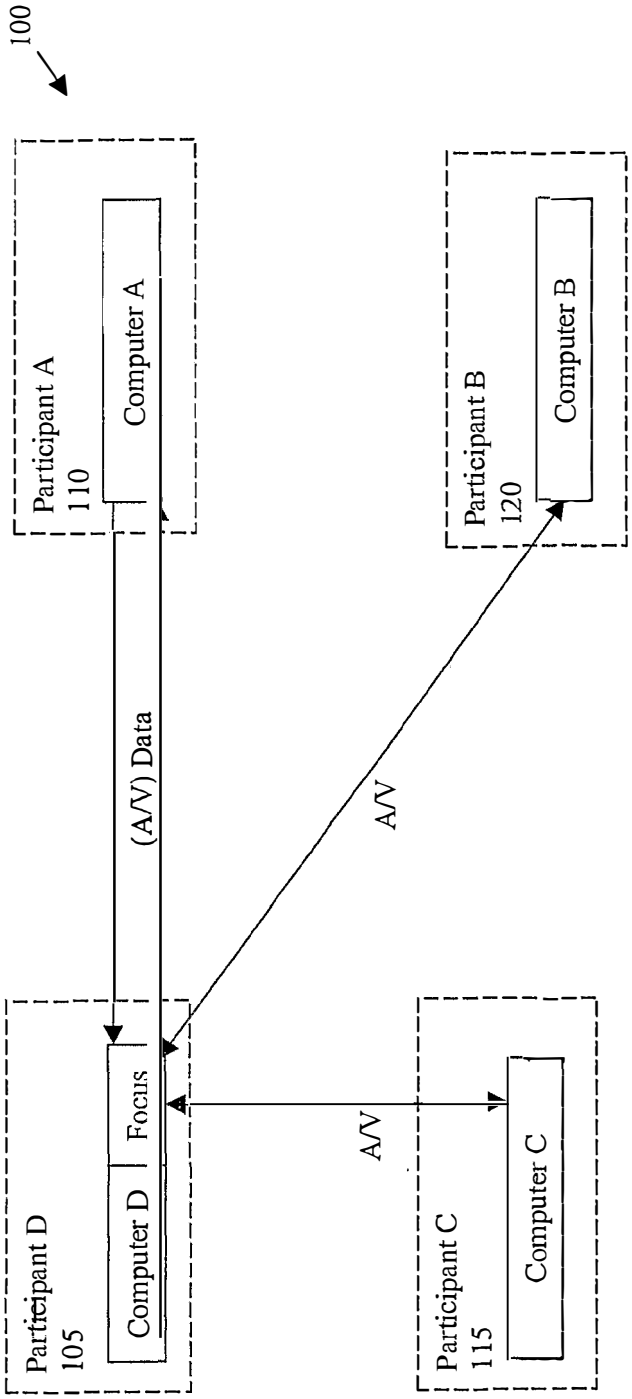

100
Participant A
110
Computer A
Participant B
120
Computer B
(A/V) Data
A/V
Participant D
105
Computer D
Focus
A/V
Participant C
115
Computer C

*Figure 1*

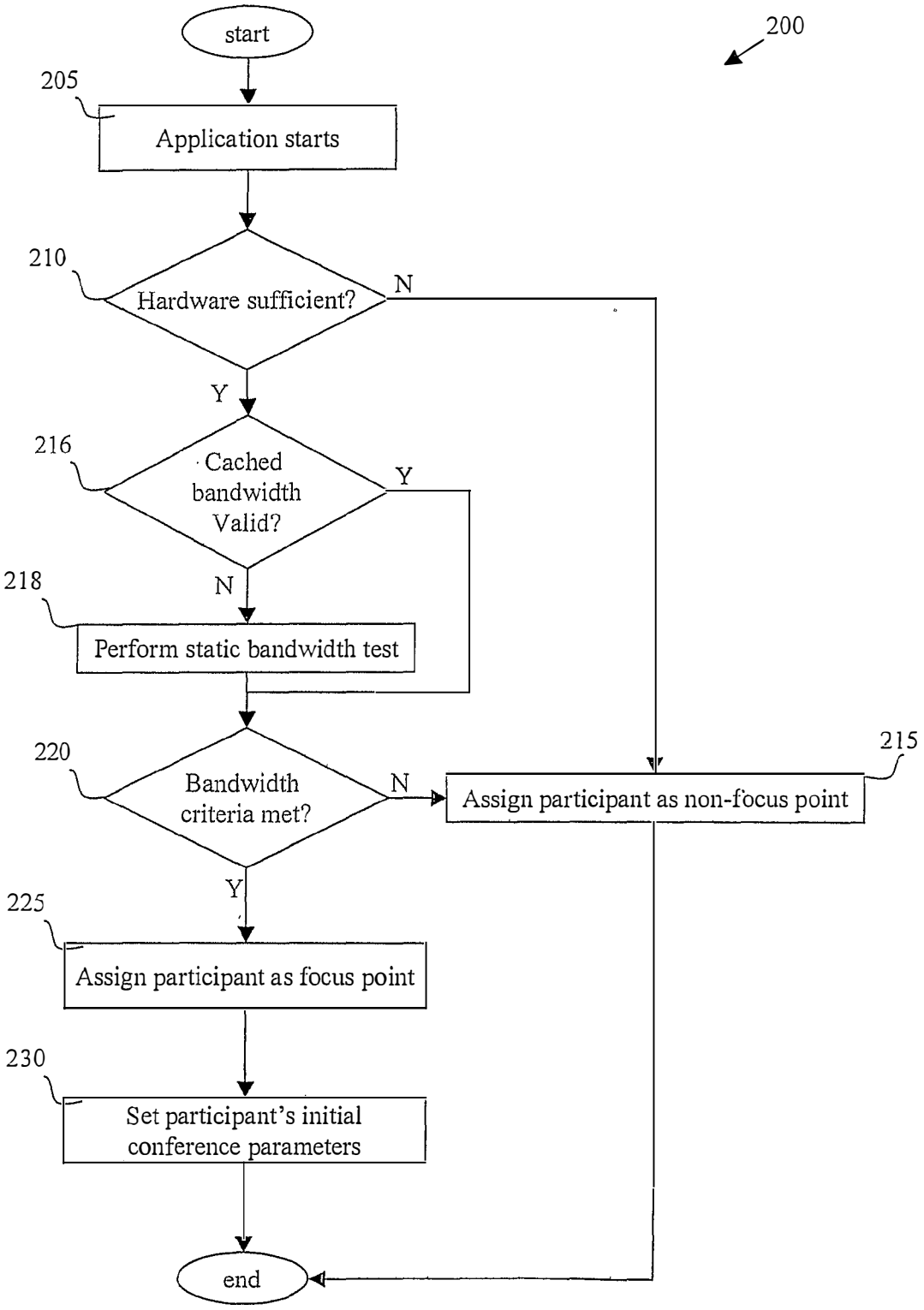

start
200
205
Application starts
210
Hardware sufficient?
N
Y
216
Cached bandwidth Valid?
Y
N
218
Perform static bandwidth test
220
Bandwidth criteria met?
N
215
Assign participant as non-focus point
Y
225
Assign participant as focus point
230
Set participant's initial conference parameters
end

*Figure 2*

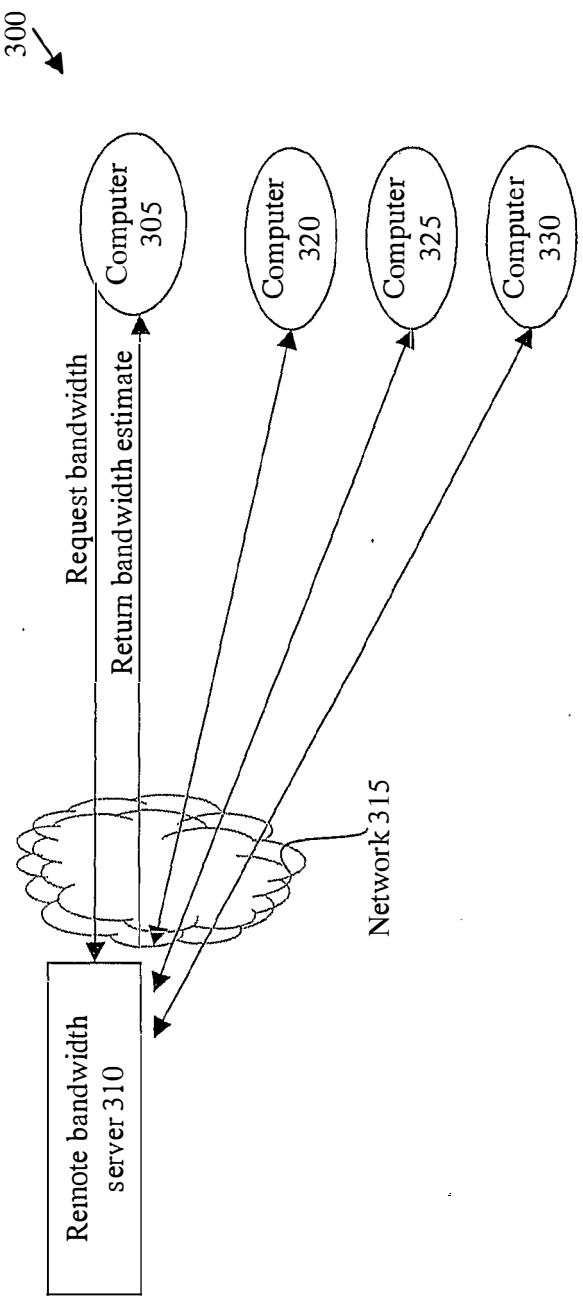

300
Computer 305
Computer 320
Computer 325
Computer 330
Request bandwidth
Return bandwidth estimate
Network 315
Remote bandwidth server 310

*Figure 3*

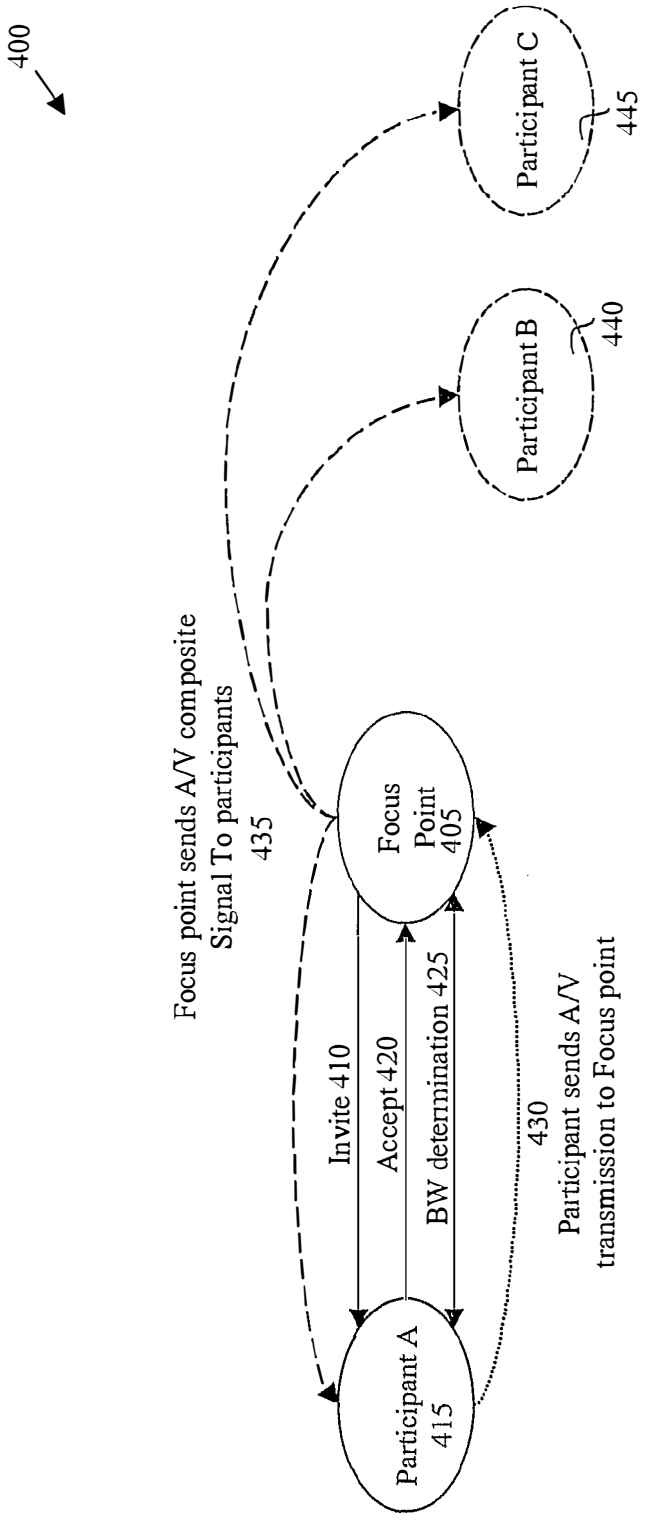

400
Participant C
445
Participant B
440
Focus point sends A/V composite
Signal To participants
435
Focus
Point
405
Invite 410
Accept 420
BW determination 425
430
Participant sends A/V
transmission to Focus point
Participant A
415

*Figure 4*

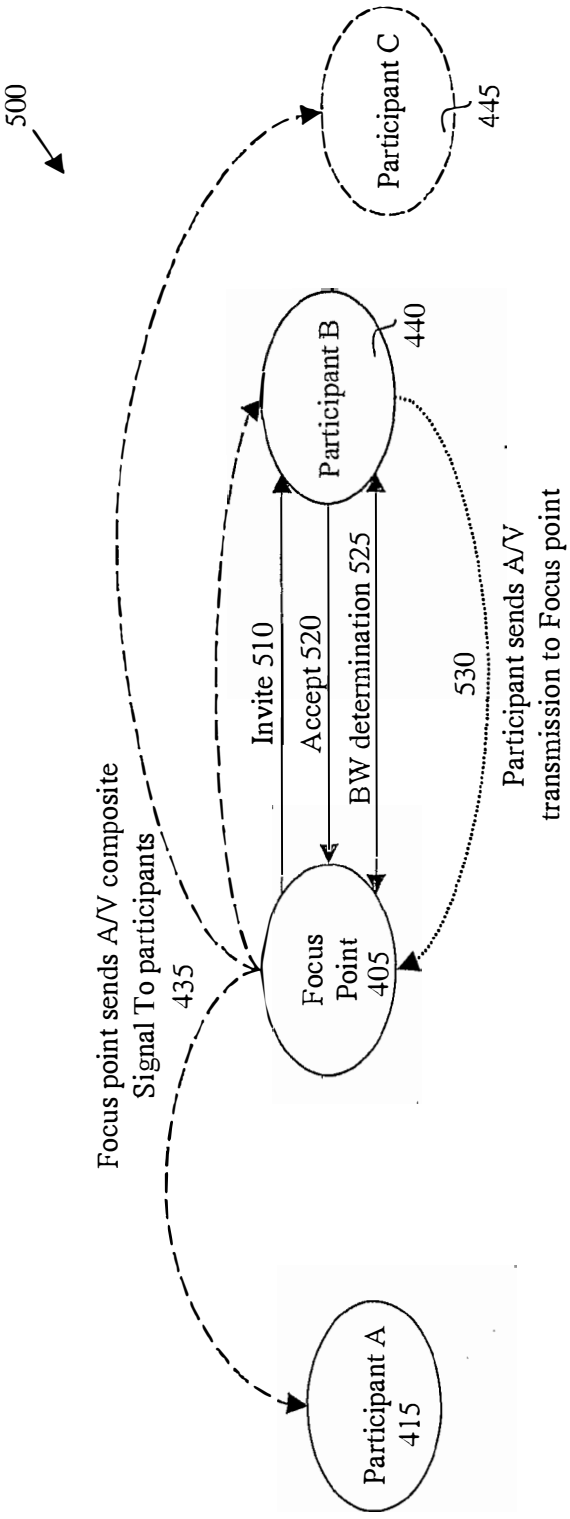

500
Participant C
445
Participant B
440
Invite 510
Accept 520
BW determination 525
530
Participant sends A/V
transmission to Focus point
Focus point sends A/V composite
Signal To participants
435
Focus
Point
405
Participant A
415

*Figure 5*

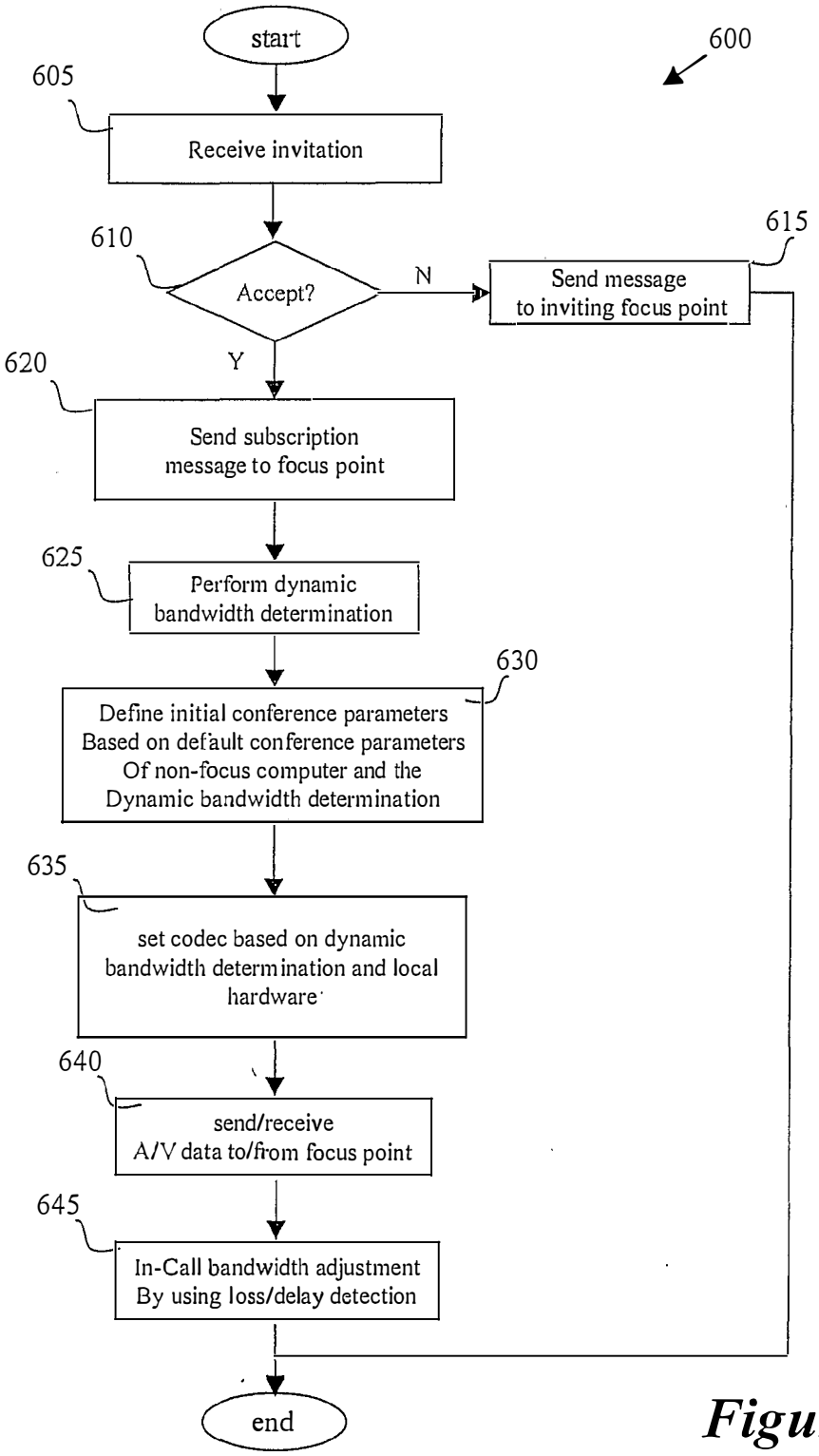

start
600
605
Receive invitation
610
Accept?
N
615
Send message
to inviting focus point
Y
620
Send subscription
message to focus point
625
Perform dynamic
bandwidth determination
630
Define initial conference parameters
Based on default conference parameters
Of non-focus computer and the
Dynamic bandwidth determination
635
set codec based on dynamic
bandwidth determination and local
hardware
640
send/receive
A/V data to/from focus point
645
In-Call bandwidth adjustment
By using loss/delay detection
end

*Figure 6*

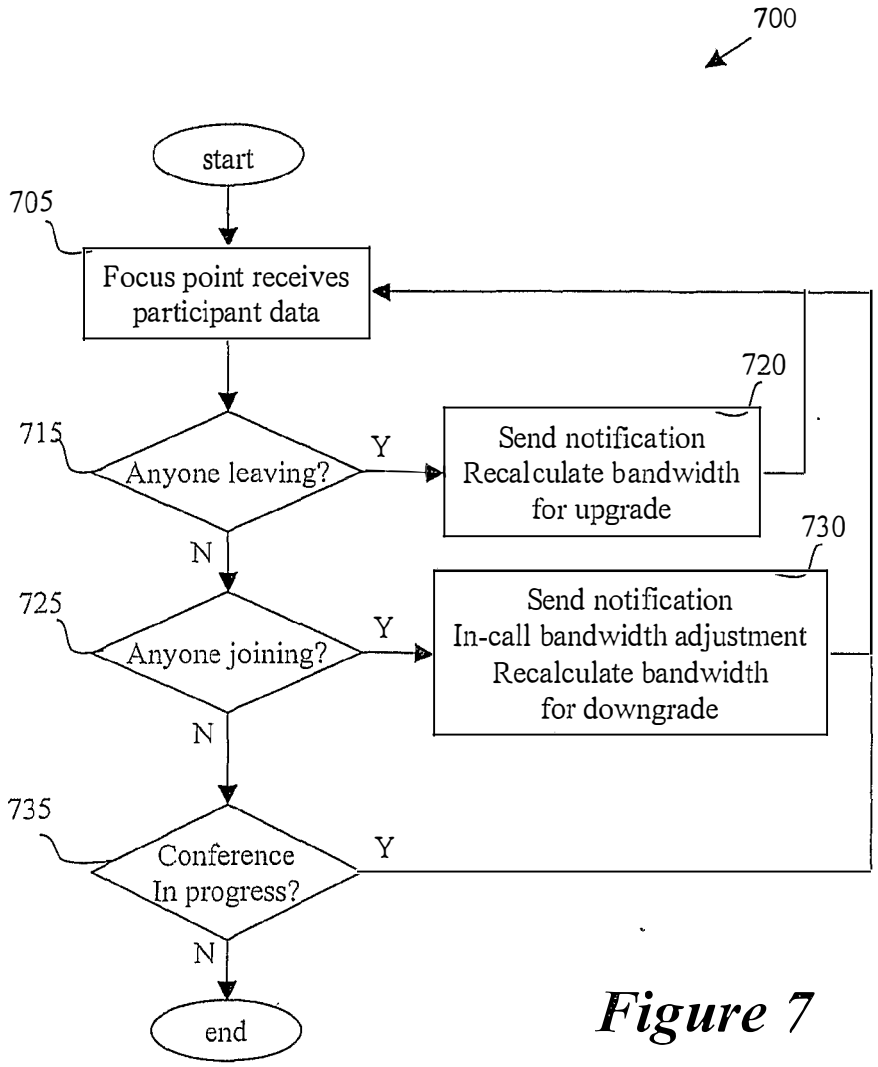

700
start
705
Focus point receives participant data
720
715
Anyone leaving?
Y
Send notification
Recalculate bandwidth for upgrade
730
N
725
Anyone joining?
Y
Send notification
In-call bandwidth adjustment
Recalculate bandwidth for downgrade
N
735
Conference In progress?
Y
N
end

*Figure 7*

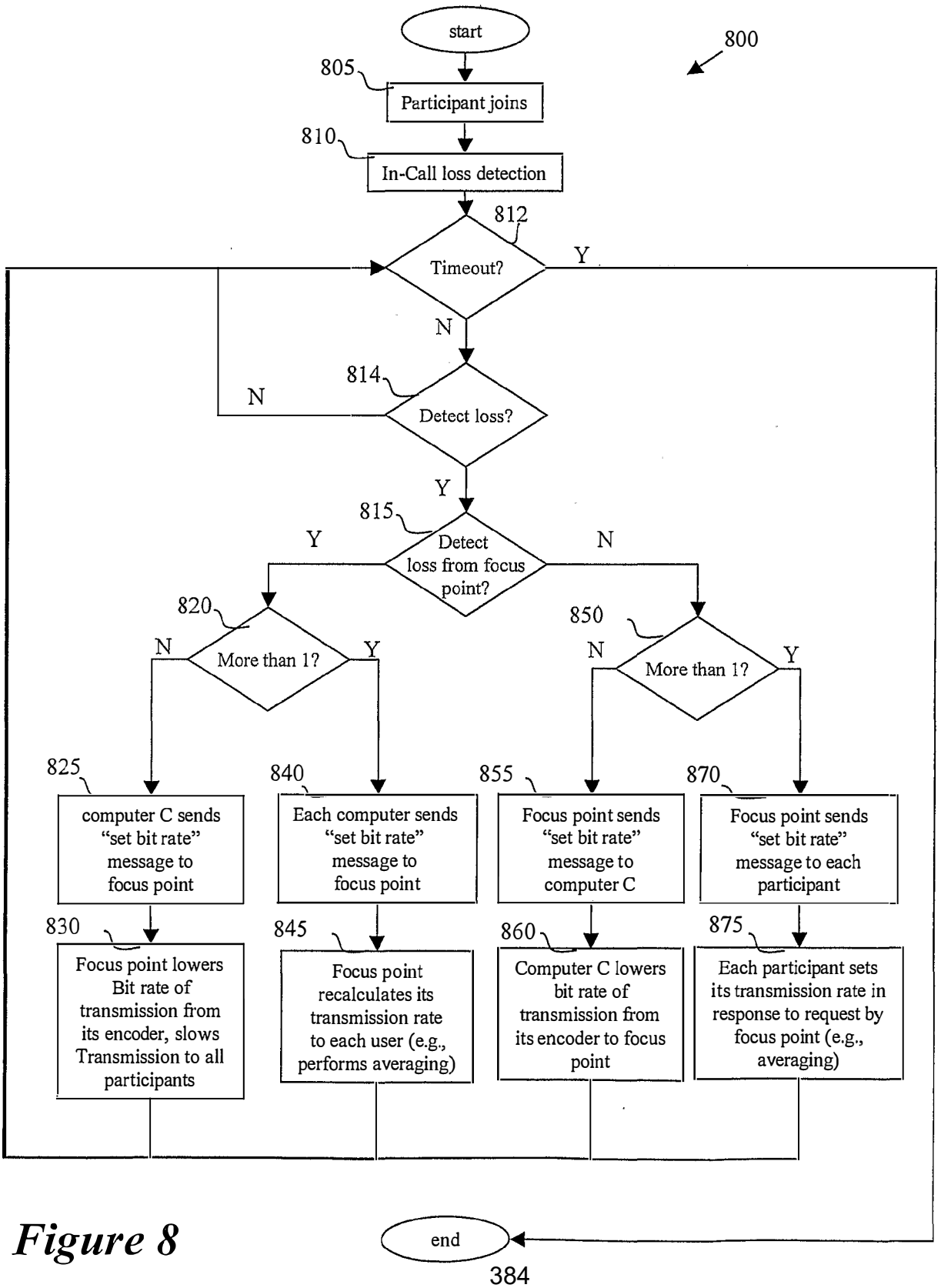

start
800
805
Participant joins
810
In-Call loss detection
812
Timeout?
Y
N
814
Detect loss?
N
Y
815
Detect loss from focus point?
Y
N
820
More than 1?
N
Y
850
More than 1?
N
Y
825
computer C sends "set bit rate" message to focus point
840
Each computer sends "set bit rate" message to focus point
855
Focus point sends "set bit rate" message to computer C
870
Focus point sends "set bit rate" message to each participant
830
Focus point lowers Bit rate of transmission from its encoder, slows Transmission to all participants
845
Focus point recalculates its transmission rate to each user (e.g., performs averaging)
860
Computer C lowers bit rate of transmission from its encoder to focus point
875
Each participant sets its transmission rate in response to request by focus point (e.g., averaging)
end
384

*Figure 8*

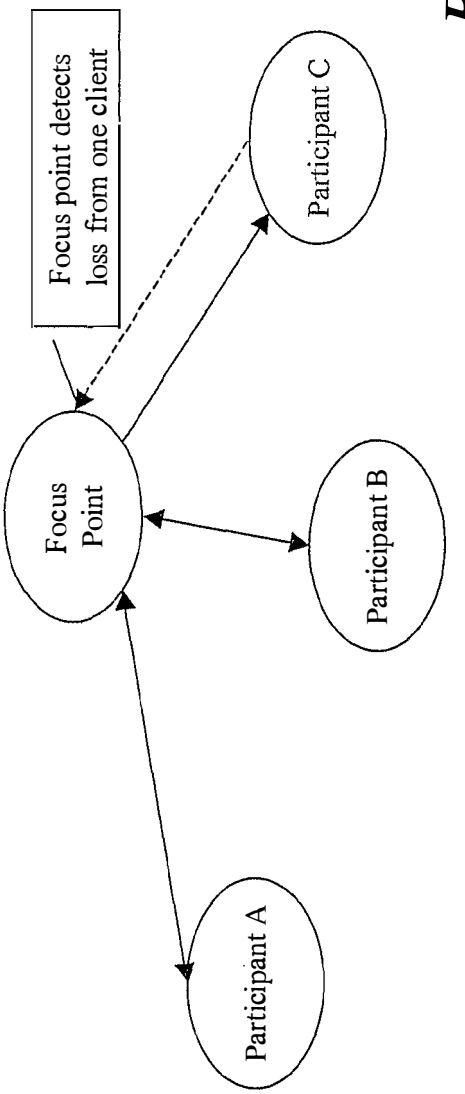



*Figure 9*

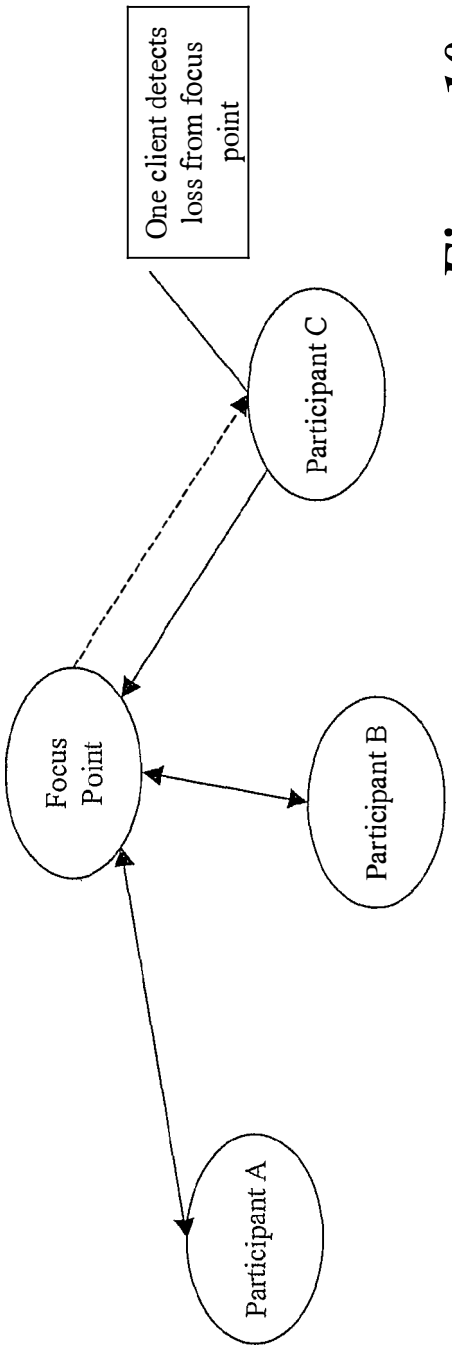



*Figure 10*

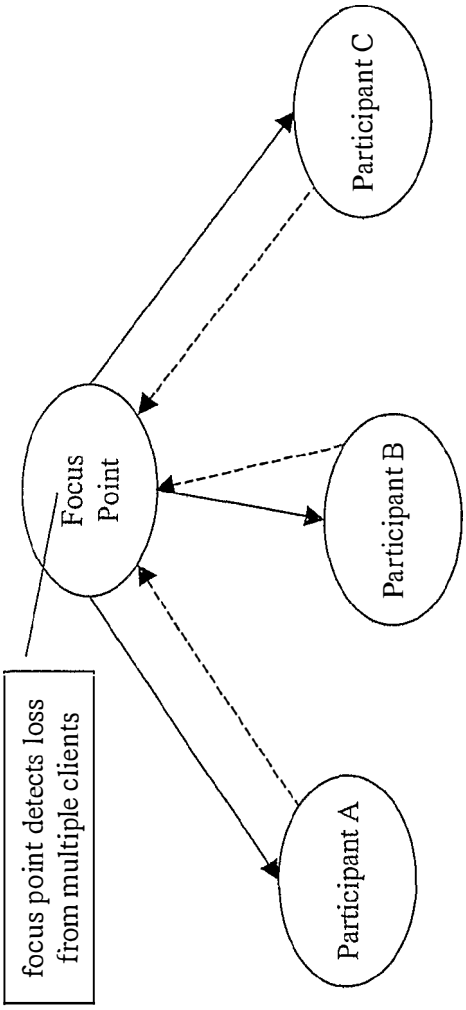



*Figure 11*

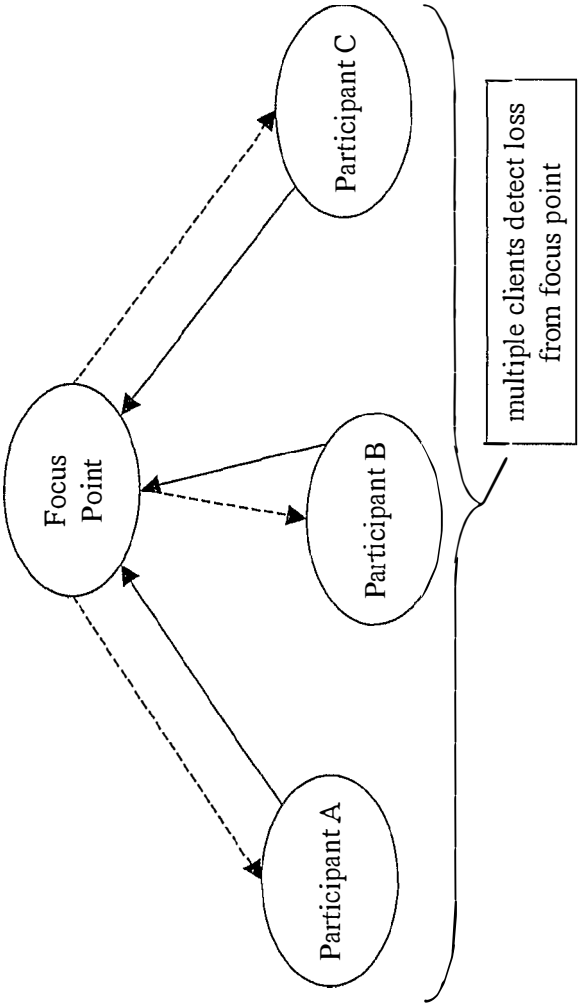



*Figure 12*

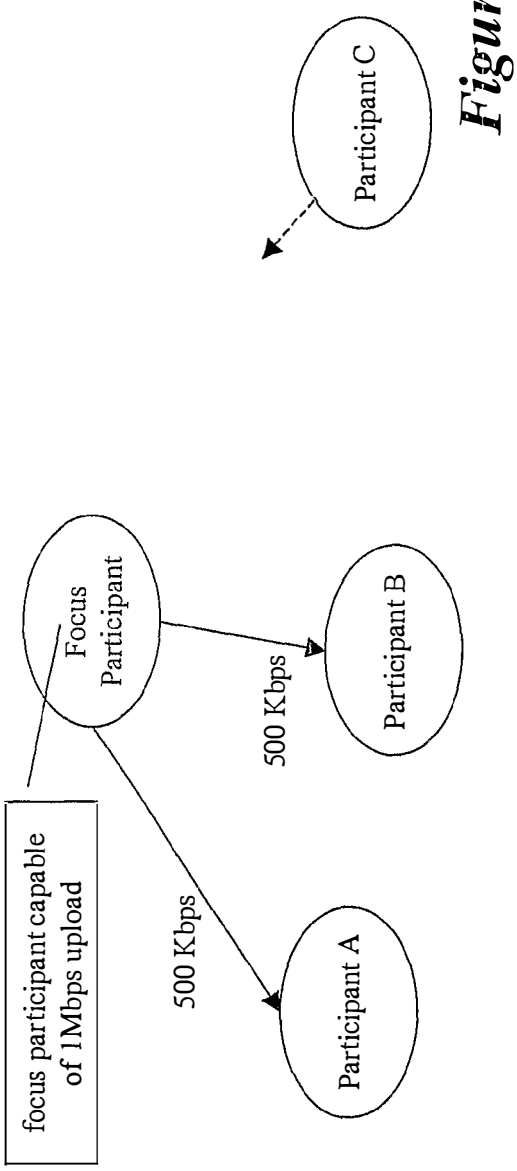



*Figure 13*

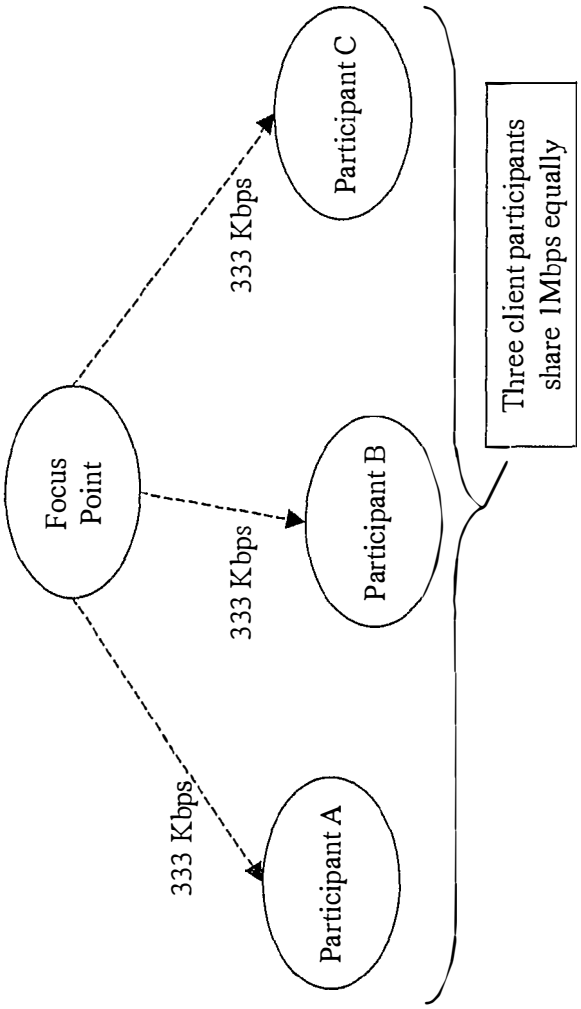



*Figure 14*

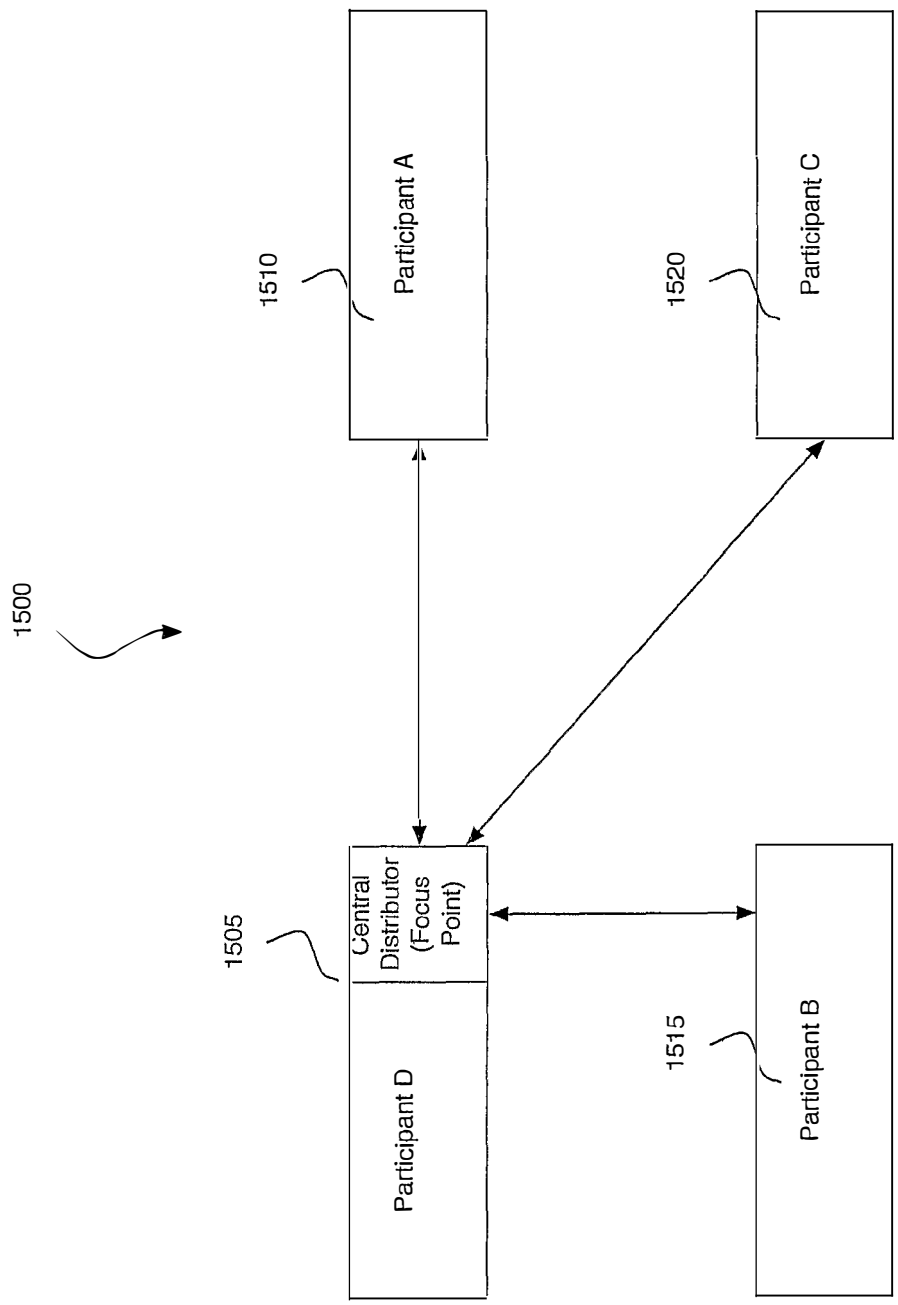

1500
1510
Participant A
1520
Participant C
1505
Central Distributor (Focus Point)
Participant D
1515
Participant B

*Figure 15*

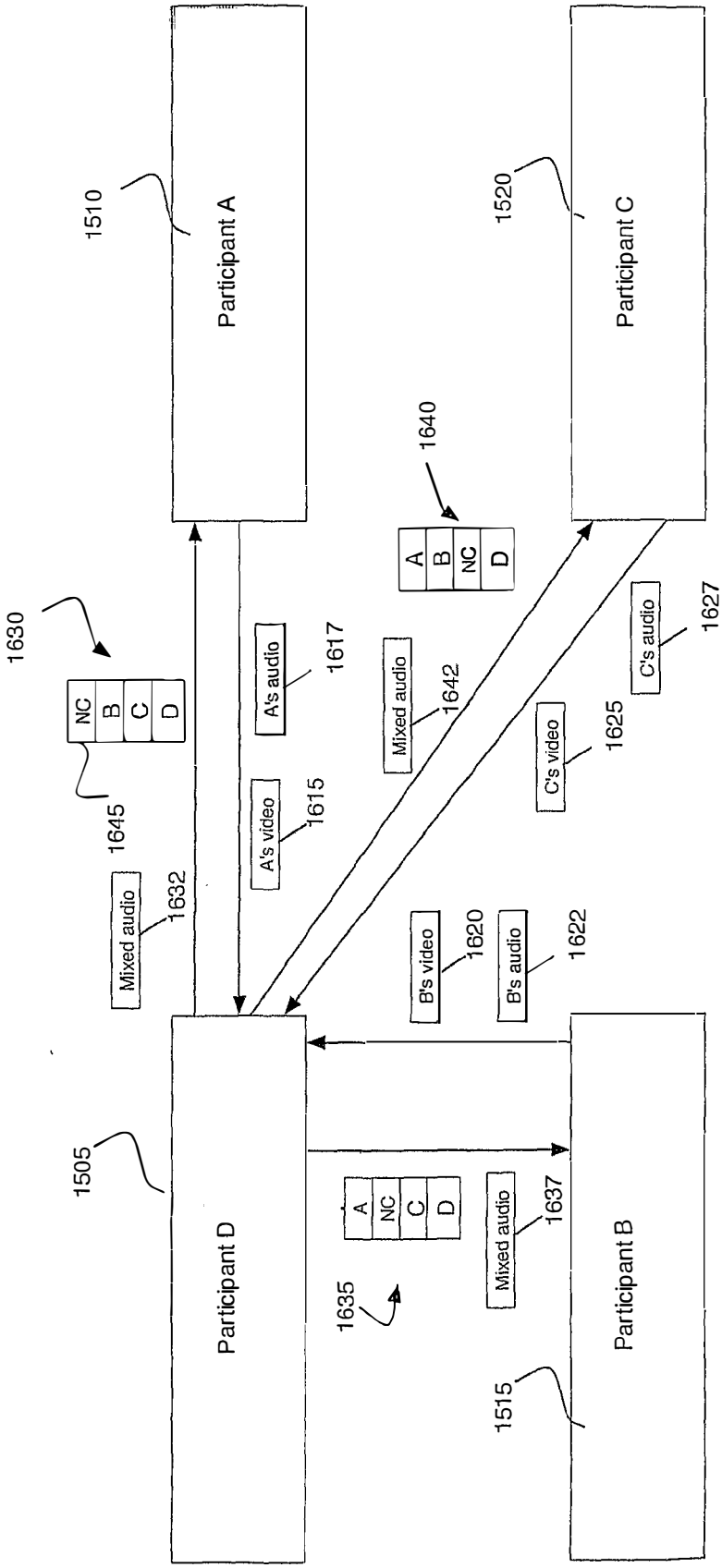

Participant A
Participant C
Participant D
Participant B
1510
1520
1505
1515
1630
NC
B
C
D
1645
1632
Mixed audio
A's video
1615
A's audio
1617
1640
A
B
NC
D
Mixed audio
1642
C's video
1625
C's audio
1627
B's video
1620
B's audio
1622
A
NC
C
D
1635
Mixed audio
1637

*Figure 16*

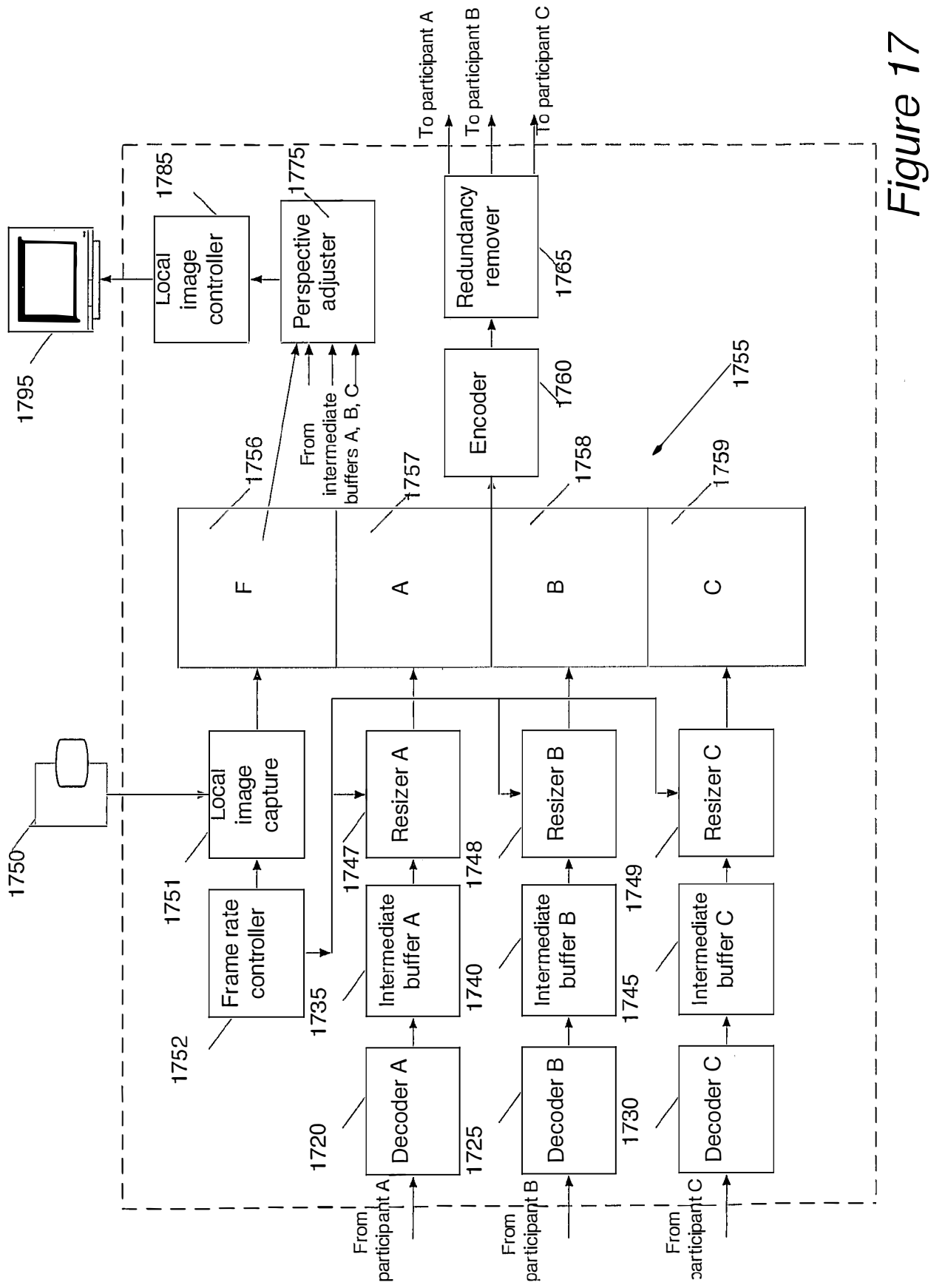

To participant A
To participant B
To participant C
1785
1775
Local image controller
Perspective adjuster
Redundancy remover
1765
1795
1760
Encoder
1755
From intermediate buffers A, B, C
1756
1757
1758
1759
F
A
B
C
1750
Local image capture
Resizer A
Resizer B
Resizer C
1751
1747
1748
1749
Frame rate controller
Intermediate buffer A
Intermediate buffer B
Intermediate buffer C
1752
1735
1740
1745
Decoder A
Decoder B
Decoder C
1720
1725
1730
From participant A
From participant B
From participant C

Figure 17

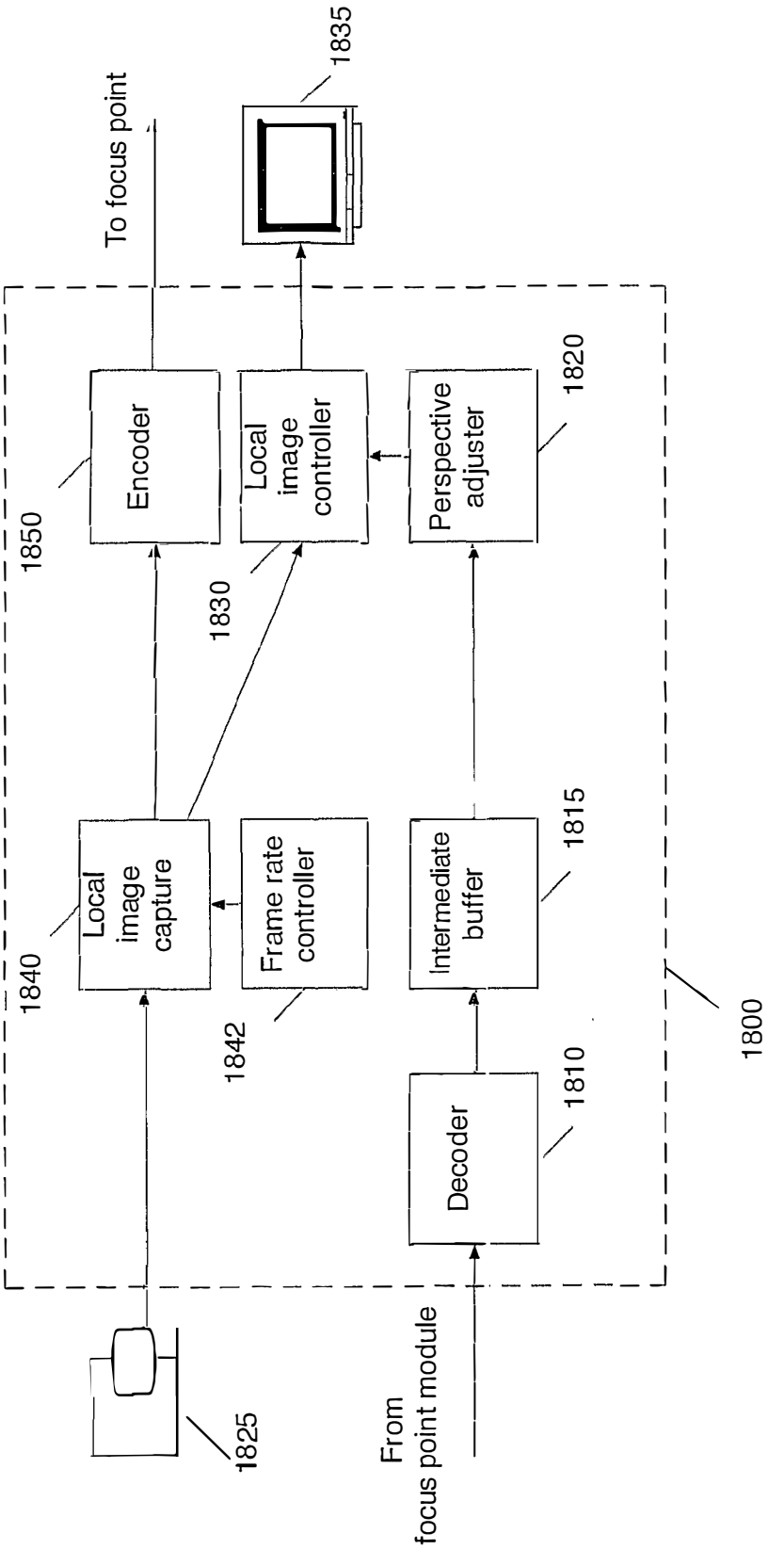

1835
To focus point
Encoder
Local image controller
Perspective adjuster
1820
1850
1830
Local image capture
Frame rate controller
Intermediate buffer
1815
1840
1842
1800
Decoder
1810
1825
From focus point module

*Figure 18*

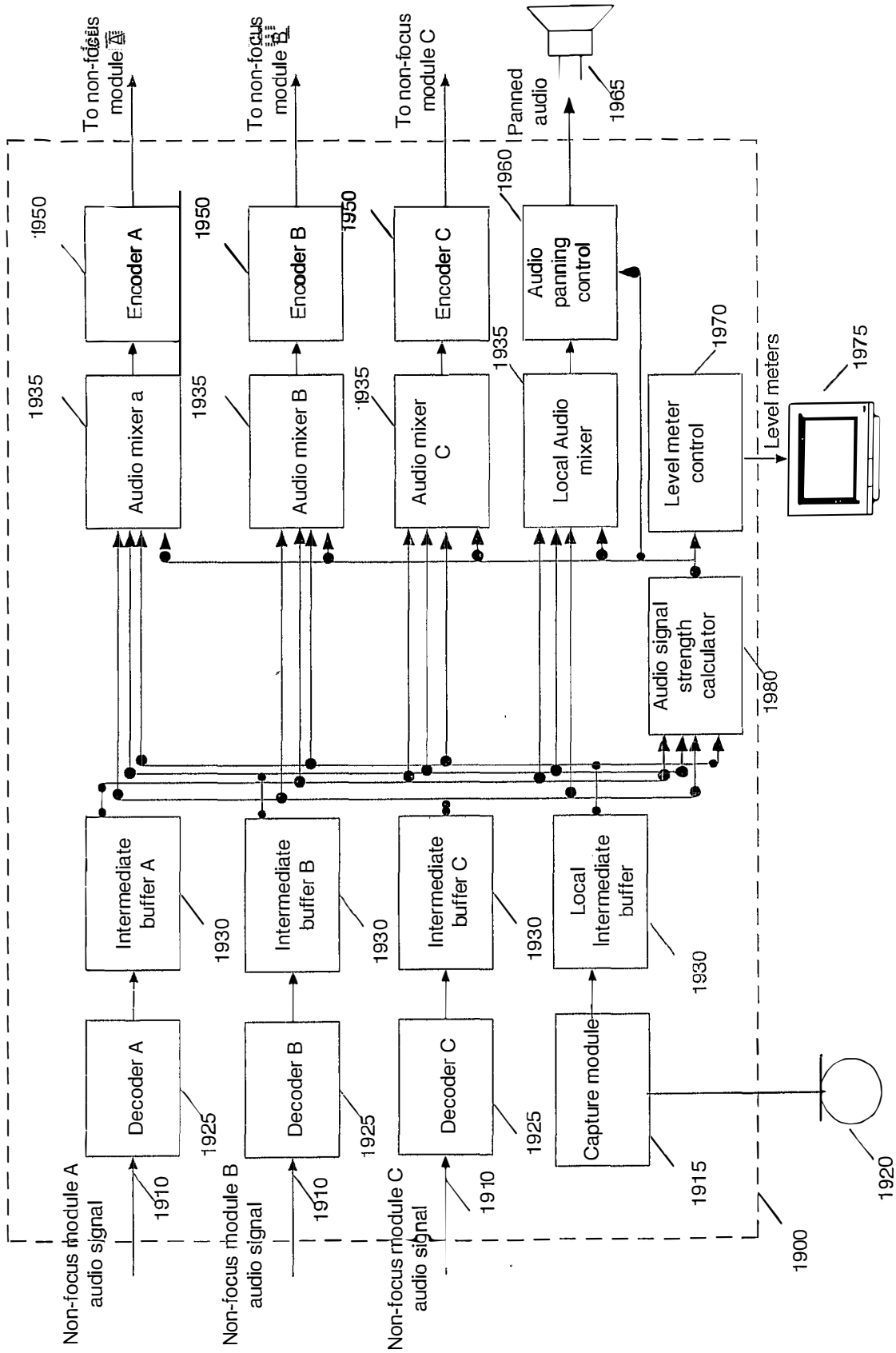

Non-focus module A audio signal
Non-focus module B audio signal
Non-focus module C audio signal
1910
Decoder A
Decoder B
Decoder C
1925
Intermediate buffer A
Intermediate buffer B
Intermediate buffer C
Local Intermediate buffer
1930
Capture module
1915
1920
1900
Audio mixer a
Audio mixer B
Audio mixer C
Local Audio mixer
1935
Audio signal strength calculator
1980
Level meter control
1970
Level meters
1975
Audio panning control
1960
Panned audio
1965
Encoder A
Encoder B
Encoder C
1950
To non-focus module A
To non-focus module B
To non-focus module C

Figure 19

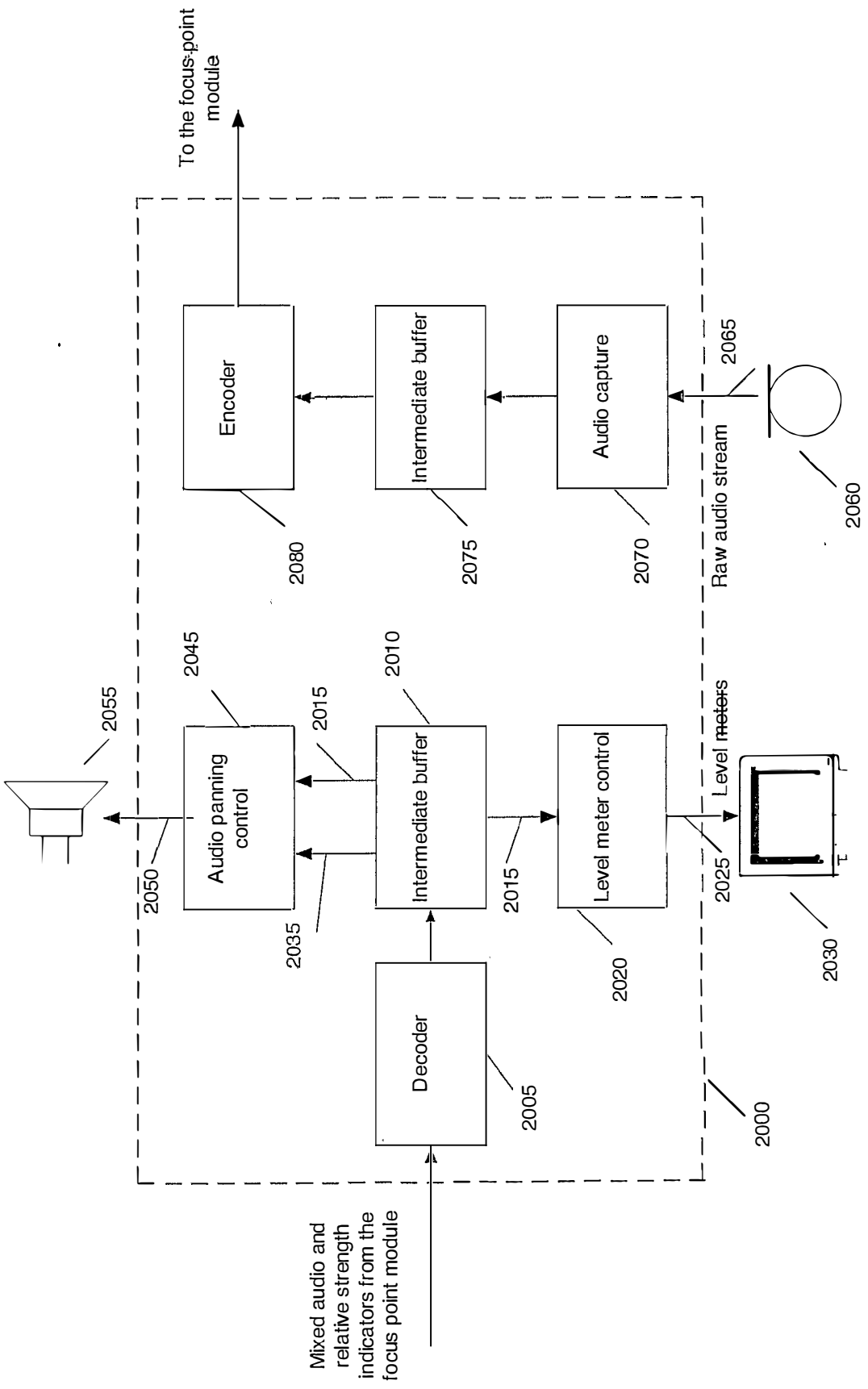

To the focus-point module
Encoder
Intermediate buffer
Audio capture
2065
Raw audio stream
2060
2080
2075
2070
2045
2010
2055
2015
Audio panning control
Intermediate buffer
Level meters
2050
2035
2015
Level meter control
2025
2030
2020
Decoder
2005
2000
Mixed audio and relative strength indicators from the focus point module

*Figure 20*

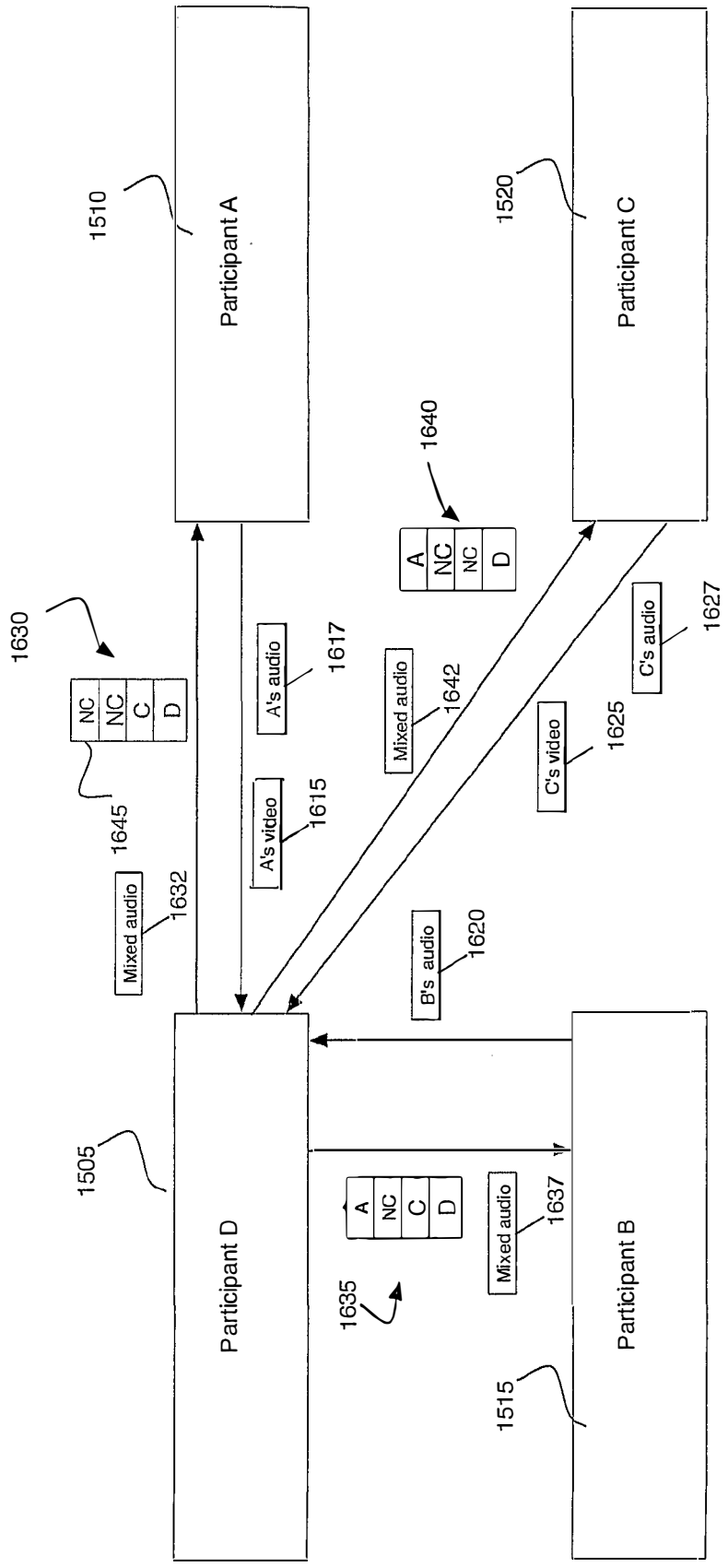

1510
Participant A
1520
Participant C
1505
Participant D
1515
Participant B
1630
NC
NC
C
D
1645
Mixed audio
1632
A's audio
1617
A's video
1615
1640
A
NC
NC
D
Mixed audio
1642
B's audio
1620
C's audio
1627
C's video
1625
A
NC
C
D
1635
Mixed audio
1637

*Figure 21*

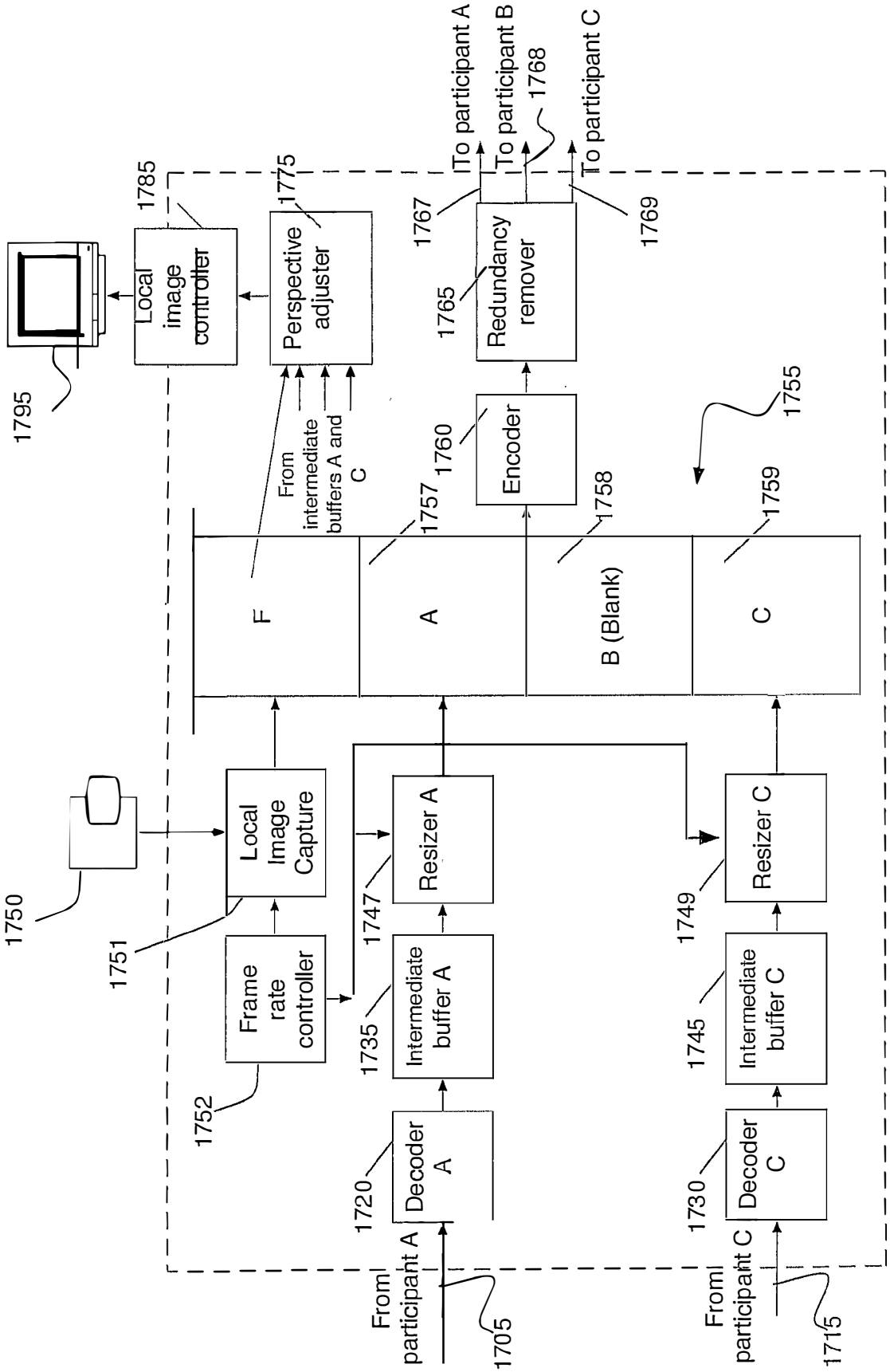

From participant A
From participant C
1705
1715
1720
Decoder A
1730
Decoder C
1735
Intermediate buffer A
1745
Intermediate buffer C
1747
Resizer A
1749
Resizer C
1750
1751
Local Image Capture
1752
Frame rate controller
F
A
B (Blank)
C
1755
1757
1758
1759
1760
Encoder
From intermediate buffers A and C
1765
Redundancy remover
1767
To participant A
1768
To participant B
1769
To participant C
1775
Perspective adjuster
1785
Local image controller
1795

*Figure 22*

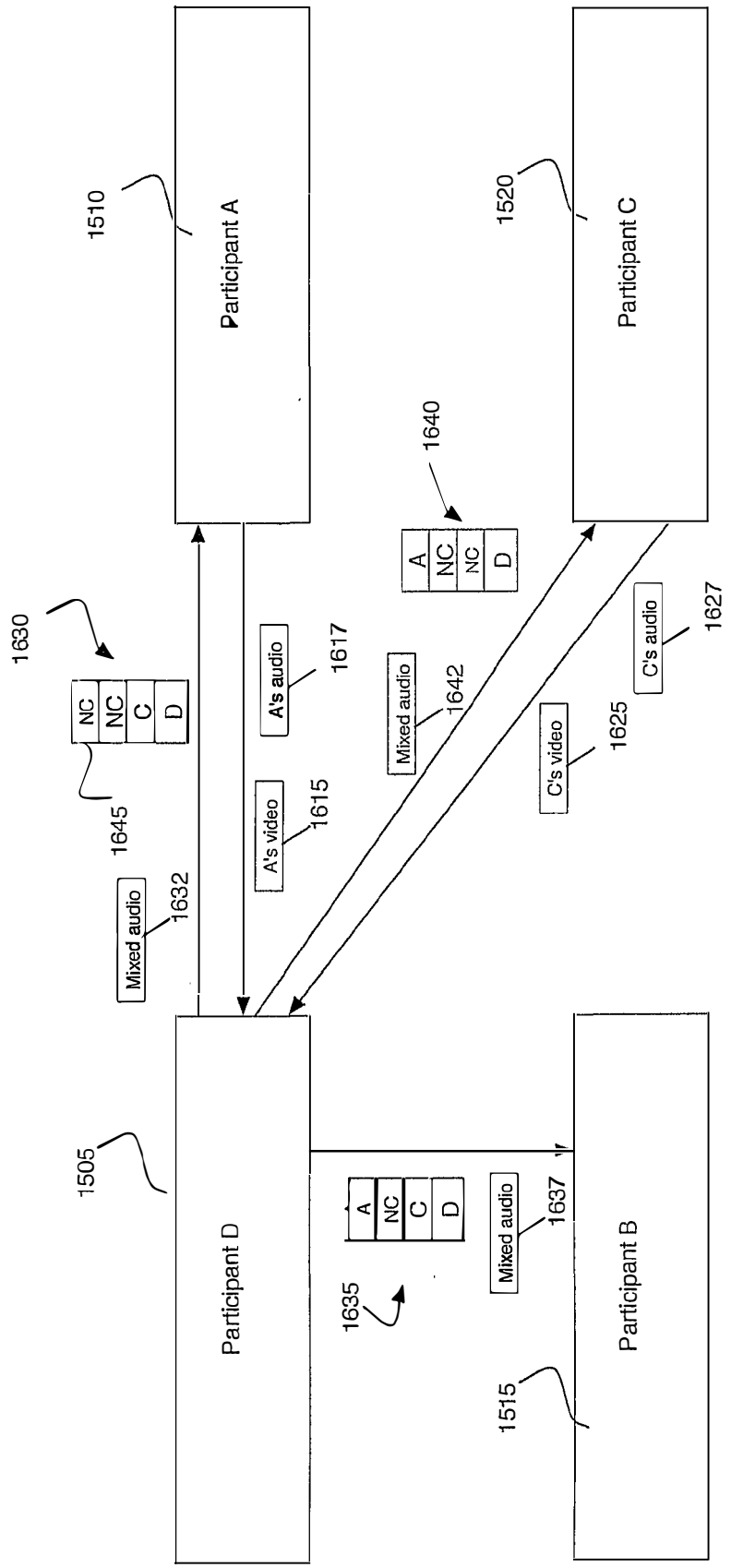

1510
Participant A
1520
Participant C
1640
A
NC
NC
D
1630
NC
NC
C
D
1645
A's audio
1617
A's video
1615
Mixed audio
1642
C's audio
1627
C's video
1625
Mixed audio
1632
1505
Participant D
A
NC
C
D
1635
Mixed audio
1637
Participant B
1515

*Figure 23*

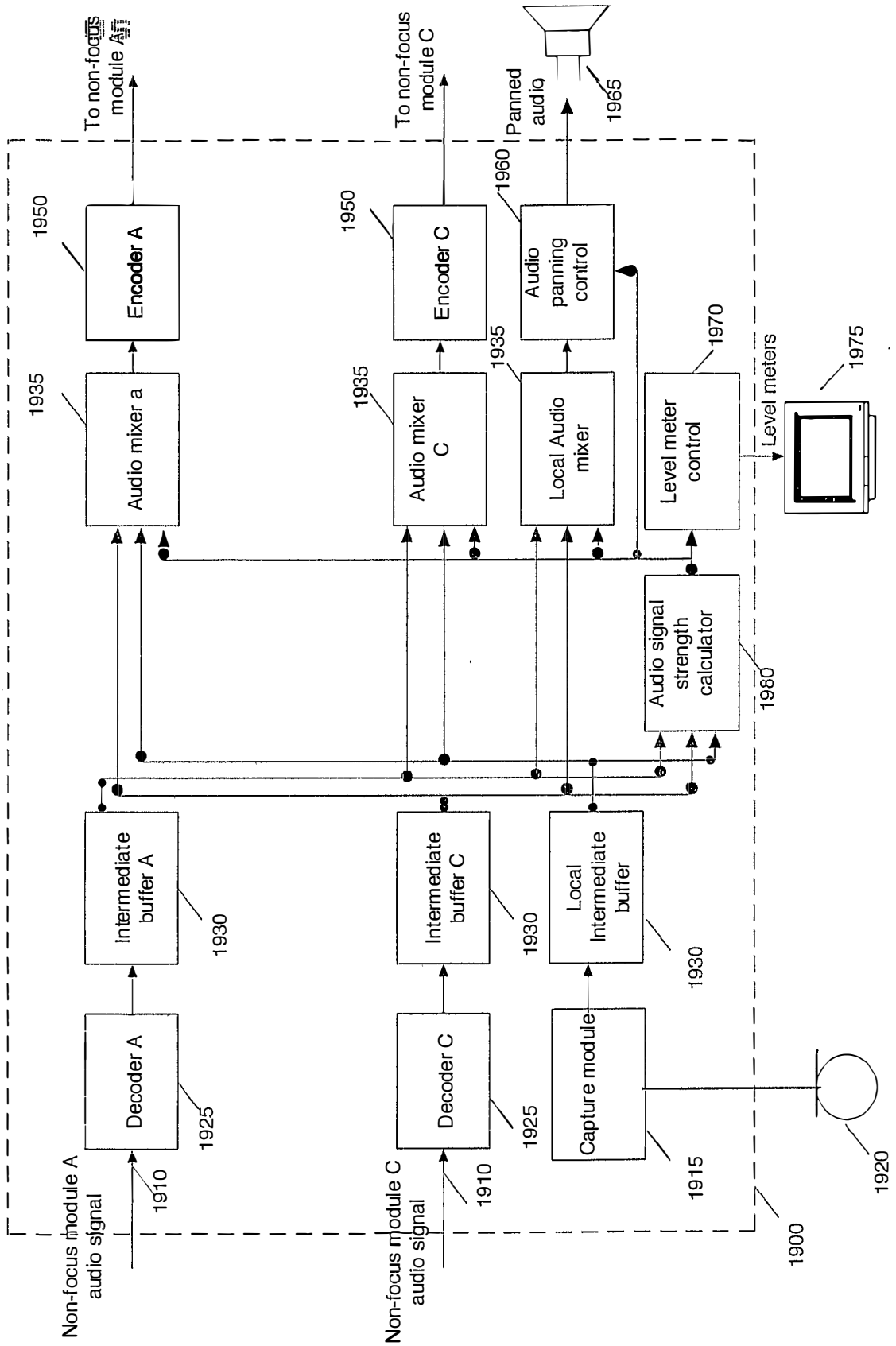

Non-focus module A audio signal
Non-focus module C audio signal
1910
1910
Decoder A
Decoder C
1925
1925
Capture module
1915
1920
Intermediate buffer A
Intermediate buffer C
Local Intermediate buffer
1930
1930
1930
Audio mixer a
Audio mixer C
Local Audio mixer
1935
1935
1935
Encoder A
Encoder C
1950
1950
Audio panning control
1960
Panned audio
1965
To non-focus module A
To non-focus module C
Audio signal strength calculator
1980
Level meter control
1970
Level meters
1975
1900

*Figure 24*

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 47435913 |
| **Application Number:** | 17977963 |
| **International Application Number:** | |
| **Confirmation Number:** | 5201 |
| **Title of Invention:** | TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS |
| **First Named Inventor/Applicant Name:** | Thomas E. KATIS |
| **Customer Number:** | 76743 |
| **Filer:** | James W. Rose/Kellianne Bartlett |
| **Filer Authorized By:** | James W. Rose |
| **Attorney Docket Number:** | REBLP003C24 |
| **Receipt Date:** | 26-JAN-2023 |
| **Filing Date:** | 31-OCT-2022 |
| **Time Stamp:** | 18:47:04 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Transmittal Letter | REBLP00C324_IDS_2.pdf | 23281<br>e18cdca3e997a76cbbcbe3c74411c82d3cfc56b4 | no | 2 |

**Warnings:**

| | | | | | |
|---|---|---|---|---|---|
| **Information:** | | | | | |
| 2 | Information Disclosure Statement (IDS) Form (SB08) | REBLP003C24_1449_2.pdf | 27271<br>f1681b7c199db5b9364b1347607e713e38e76cc8 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 3 | Foreign Reference | WO2006092810A2.pdf | 3341743<br>a79f808f204f83b2c957eb1dc4ab3aae0d038afe | no | 23 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Foreign Reference | WO20010110128A1.pdf | 8107885<br>e947b1017f9d86c0d3d786775e24525c29cc51ff | no | 70 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Foreign Reference | WO2007020627A1.pdf | 4345795<br>23a15da1389ada2a2346afe96d7116aaf445a0bc | no | 39 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 6 | Foreign Reference | WO2006116750A2.pdf | 6594144<br>c232b8fc4742a3c5743d056d515871aa0c4eafc3 | no | 74 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 7 | Non Patent Literature | US16669865_OA_02242020.pdf | 1925631<br>33392c431827177f51a0f40ee4eb5657b6d13e9b | no | 39 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 8 | Non Patent Literature | US16669865_OAFinal_07132020.pdf | 209929<br>59d222616a1111060e872088bbb4e7d43c52d2c1 | no | 7 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

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|---|---|---|---|---|---|
| 9 | Non Patent Literature | US16424131_OA_06252020.pdf | 1990942<br>b538e561abb74a5fe1c494088a05dbb0f85cb0e2 | no | 40 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 10 | Non Patent Literature | US16424131_FinalOA_01212021.pdf | 747460<br>2f40a64e5fc7be340896559e11c5d427100eb230 | no | 25 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 11 | Non Patent Literature | US17062060_OA_02082021.pdf | 8970144<br>8db751df9394dbd081788abb4945807b938f50bb | no | 49 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 12 | Non Patent Literature | US17977948_OA_01092023.pdf | 6113243<br>58bab8c75818825d60ca09440da7c3c035c97fe3 | no | 41 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 13 | Non Patent Literature | US17977959_OA_01202023.pdf | 3350628<br>e1edb5b51b548e7036fff9ccd944bbea390d08f6 | no | 41 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 14 | Non Patent Literature | ScottWerndorferPMQVoll_1001.pdf | 612773<br>06a3e6d62ee96287ba2980c7ee17596408b85906 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 15 | Non Patent Literature | ScottWerndorferPMQVoll_1002.pdf | 655999<br>01230c2a019e4f4c5b7c612f162750a8d4f53f21 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |

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| 16 | Non Patent Literature | ScottWerndorferPMQVoll_1003.pdf | 530481<br>f7c714c1f46e3a1cbcd3e91e645e150203eb8652 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 17 | Non Patent Literature | ScottWerndorferPMQVoll_1004.pdf | 638660<br>a088aa32ac0b7c6b4aba3984d8af1d8e590cfa7a | no | 5 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 18 | Non Patent Literature | ScottWerndorferPMQVoll_1005.pdf | 510280<br>3ec7a7bea32ea418c85e8ba5b6691930e2de99d8 | no | 1 |
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| **Information:** | | | | | |
| 19 | Non Patent Literature | ScottWerndorferPMQVoll_1006.pdf | 877444<br>fcd793d61792caf160d53e7f9170fe6d75521c19 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 20 | Non Patent Literature | ScottWerndorferPMQVoll_1007.pdf | 148925<br>781e0c8072a2dad8022bb964ef9e07b1230aed20 | no | 1 |
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| **Information:** | | | | | |
| 21 | Non Patent Literature | ScottWerndorferPMQVoll_1008.pdf | 145308<br>35008ba50ef7885bfd87d125089929b774285049 | no | 1 |
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| **Information:** | | | | | |
| 22 | Non Patent Literature | ScottWerndorferPMQVoll_1009_.pdf | 149992<br>967347ff72acac04ae4473a3d9442f861c13a448 | no | 1 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | | **Total Files Size (in bytes):** | 50017958 | |

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**National Stage of an International Application under 35 U.S.C. 371**

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**New International Application Filed with the USPTO as a Receiving Office**

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*IN THE UNITED STATES PATENT AND TRADEMARK OFFICE*

| | |
|---|---|
| In re application of: KATIS et al. | Attorney Docket No.: REBLP003C24 |
| Application No.: 17/977,963 | Examiner: RAMAKRISHNAIAH, MELUR |
| Filed: October 31, 2022 | Group: 2651 |
| Title: TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS | Confirmation No.: 5201 |

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I hereby certify that this correspondence is being transmitted electronically through EFS-WEB to the Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450 on January 26, 2023.

Signed: /Kellianne Bartlett/
Kellianne Bartlett

# INFORMATION DISCLOSURE STATEMENT
# 37 CFR §§1.56 AND 1.97(b)

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

The reference(s) identified in the attached PTO Form 1449 (copies of non-U.S. references are attached) may be material to examination of the above-identified patent application. Applicants identify the reference(s) in compliance with their duty of disclosure pursuant to 37 CFR §§1.56 and 1.97. The Examiner is requested to make the identified reference(s) of official record in this application.

This Information Disclosure Statement is not to be construed as a representation that a search has been made, that additional information material to the examination of this application does not exist, or that the identified reference(s) indeed constitute prior art.

This Information Disclosure Statement is: (i) filed within three (3) months of the filing date of the above-referenced application, (ii) believed to be filed before the mailing date of a first Office Action on the merits, or (iii) believed to be filed before the mailing of a first Office Action after the filing of a Request for Continued Examination under §1.114. Accordingly, it is believed that no fees are due in connection with the filing of this Information Disclosure

Statement. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 50-4481 (Order No. REBLP003C24).

Respectfully submitted,
BEYER LAW GROUP LLP

/James W. Rose/
James W. Rose
Registration No. 34,239

P. O. Box 51887
Palo Alto, CA 94303-1887
650-842-1300

| Notice of References Cited | Application/Control No. 17/977,963 | Applicant(s)/Patent Under Reexamination KATIS et al. | |
|---|---|---|---|
| | Examiner MELUR RAMAKRISHNAIAH | Art Unit 2651 | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Name | CPC Classification | US Classification |
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| | B | | | | | |
| | C | | | | | |
| | D | | | | | |
| | E | | | | | |
| | F | | | | | |
| | G | | | | | |
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**FOREIGN PATENT DOCUMENTS**

| * | | Document Number Country Code-Number-Kind Code | Date MM-YYYY | Country | Name | CPC Classification |
|---|---|---|---|---|---|---|
| | N | WO-0110128-A1 | 02-2001 | WO | BOISSIERE G | H04L29/06027 |
| | O | WO-2006050751-A1 | 05-2006 | WO | HUNDSCHEIDT F | H04L51/38 |
| | P | | | | | |
| | Q | | | | | |
| | R | | | | | |
| | S | | | | | |
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**NON-PATENT DOCUMENTS**

| * | | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/977,963 | KATIS et al. |
| | Examiner | Art Unit |
| | MELUR RAMAKRISHNAIAH | 2651 |

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| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

**CLAIMS**

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 01/07/2023 | | | | | | | | |
| | 1 | ✓ | | | | | | | | |
| | 2 | ✓ | | | | | | | | |
| | 3 | ✓ | | | | | | | | |
| | 4 | ✓ | | | | | | | | |
| | 5 | ✓ | | | | | | | | |
| | 6 | ✓ | | | | | | | | |
| | 7 | ✓ | | | | | | | | |
| | 8 | ✓ | | | | | | | | |
| | 9 | ✓ | | | | | | | | |
| | 10 | ✓ | | | | | | | | |
| | 11 | ✓ | | | | | | | | |
| | 12 | ✓ | | | | | | | | |
| | 13 | ✓ | | | | | | | | |
| | 14 | ✓ | | | | | | | | |
| | 15 | ✓ | | | | | | | | |
| | 16 | ✓ | | | | | | | | |
| | 17 | ✓ | | | | | | | | |
| | 18 | ✓ | | | | | | | | |
| | 19 | ✓ | | | | | | | | |
| | 20 | ✓ | | | | | | | | |
| | 21 | ✓ | | | | | | | | |
| | 22 | ✓ | | | | | | | | |
| | 23 | ✓ | | | | | | | | |
| | 24 | ✓ | | | | | | | | |
| | 25 | ✓ | | | | | | | | |
| | 26 | ✓ | | | | | | | | |
| | 27 | ✓ | | | | | | | | |
| | 28 | ✓ | | | | | | | | |
| | 29 | ✓ | | | | | | | | |
| | 30 | ✓ | | | | | | | | |

| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 17/977,963 | KATIS et al. |
| | Examiner | Art Unit |
| | MELUR RAMAKRISHNAIAH | 2651 |

| CPC - Searched* | | |
|---|---|---|
| Symbol | Date | Examiner |
| H04N51/10, 51/216, 51/224, 51/226, 51/58, 51/56, | 01/07/2023 | mrk |

| CPC Combination Sets - Searched* | | |
|---|---|---|
| Symbol | Date | Examiner |
| | | |

| US Classification - Searched* | | | |
|---|---|---|---|
| Class | Subclass | Date | Examiner |
| 52 | 0001 | 01/07/2023 | mrk |
| 348 | 14.01-14.16 | 01/07/2023 | mrk |

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

| Search Notes | | |
|---|---|---|
| Search Notes | Date | Examiner |
| PE2E search | 01/07/2023 | mrk |

| Interference Search | | | |
|---|---|---|---|
| US Class/CPC Symbol | US Subclass/CPC Group | Date | Examiner |
| | | | |

## PE2E SEARCH - Search History (Prior Art)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | British Equivalents | Time Stamp |
|---|---|---|---|---|---|---|---|
| L13 | 1 | (video near1 messages OR multimedia near1 messages) SAME server SAME sender SAME receiver SAME rendering AND @ad<"20070628" | (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | OR | ON | ON | 2023/01/07 11:24 AM |

## PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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# BIB DATA SHEET

**CONFIRMATION NO. 5201**

| SERIAL NUMBER | FILING or 371(c) DATE | CLASS | GROUP ART UNIT | ATTORNEY DOCKET NO. |
|---|---|---|---|---|
| 17/977,963 | 10/31/2022<br>RULE | 052 | 2651 | REBLP003C24 |

**APPLICANTS**

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**INVENTORS**

Thomas E. KATIS, Jackson, WY;
James T. PANTTAJA, San Francisco, CA;
Mary G. PANTTAJA, San Francisco, CA;
Matthew J. RANNEY, Oakland, CA;

**** CONTINUING DATA ***************************

This application is a CON of 17/889,108 08/16/2022
which is a CON of 17/473,199 09/13/2021 ABN
which is a CON of 17/062,060 10/02/2020 PAT 11146516
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which claims benefit of 60/937,552 06/28/2007
and claims benefit of 60/999,619 10/19/2007

**** FOREIGN APPLICATIONS ***************************

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| Foreign Priority claimed ☐ Yes ☑ No<br>35 USC 119(a-d) conditions met ☐ Yes ☐ No<br>Verified and Acknowledged /MELUR RAMAKRISHNAIAH/ Examiner's Signature | ☐ Met after Allowance<br>Initials | STATE OR COUNTRY | SHEETS DRAWINGS | TOTAL CLAIMS | INDEPENDENT CLAIMS |
|---|---|---|---|---|---|
| | | WY | 33 | 30 | 1 |

**ADDRESS**

BEYER LAW GROUP LLP / VOXER IP
P. O. Box 51887
Palo Alto, CA 94303-1887
UNITED STATES

**TITLE**

TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS

| | | ☐ All Fees |
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|---|---|---|---|---|---|---|---|
| L16 | 49 | video near1 messages SAME server SAME rendering AND @ad<"20070628" | (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | OR | ON | ON | 2023/01/07 12:00 PM |

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|---|---|---|---|---|---|---|---|
| L14 | 111 | (video near1 messages OR multimedia near1 messages) SAME server SAME rendering AND @ad<"20070628" | (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) | OR | ON | ON | 2023/01/07 11:25 AM |

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|---|---|---|---|---|---|---|---|
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## PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

| Form 1449 (Modified) | Atty Docket No. | REBLP003C22 |
|---|---|---|
| | Application No.: | Unassigned |
| Information Disclosure Statement By Applicant | Applicant | KATIS et al. |
| | Filing Date | Herewith |
| | Group | Unassigned |
| (Use Several Sheets if Necessary) | | Page 1 of 30 |
| | Date Submitted | October 31, 2022 |

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| Examiner Initial | No. | Patent No. | Date | Patentee | Class | Sub-class | Filing Date |
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| | 201. | 2009/0006609 | 01/01/09 | LINDBERG et al. | | | 06/29/07 |
| | 202. | 2009/0024743 | 01/22/09 | ZHANG | | | 09/25/08 |
| | 203. | 2009/0037541 | 02/05/09 | WILSON | | | 08/03/07 |
| | 204. | 2009/0049140 | 02/19/09 | STODDARD et al. | | | 08/17/07 |
| | 205. | 2009/0063698 | 03/05/09 | XU et al. | | | 09/04/07 |
| | 206. | 2009/0103689 | 04/23/09 | KATIS et al. | | | 10/17/08 |
| | 207. | 2009/0124238 | 05/14/09 | WILSON | | | 10/08/08 |
| | 208. | 2009/0175211 | 07/09/09 | JAKOBSEN; JENS | | | 04/17/07 |
| | 209. | 2009/0175425 | 07/09/09 | LEE | | | 01/03/08 |
| | 210. | 2010/0005168 | 01/07/10 | WILLIAMS et al. | | | 06/30/09 |
| | 211. | 2010/0030864 | 02/04/10 | PETRY et al.. | | | 10/12/09 |
| | 212. | 2010/0046535 | 02/25/10 | BUGENHAGEN et al. | | | 10/14/09 |
| | 213. | 2010/0074324 | 03/25/10 | QIAN | | | 09/22/09 |
| | 214. | 2010/0199133 | 08/05/10 | KATIS et al. | | | 09/02/09 |
| | 215. | 2010/0255818 | 10/07/10 | BOZIONEK et al. | | | 05/14/10 |
| | 216. | 2010/0279663 | 11/04/10 | WANG et al. | | | 05/01/09 |
| | 217. | 2011/0010459 | 01/13/11 | STOKKING et al. | | | 12/22/08 |
| | 218. | 2011/0019662 | 01/27/11 | KATIS et al. | | | 09/15/10 |
| | 219. | 2012/0114108 | 05/10/12 | KATIS et al. | | | 09/26/11 |

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| | Application No.: | Unassigned |
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| | 220. | 2015/0350270 | 12/03/15 | CARAS | | | 12/24/13 |
| | 221. | 20150035934 | 02/05/15 | CHEN | | | 07/31/14 |
| | 222. | 2017/0272489 | 09/21/17 | KATIS et al. | | | 06/06/17 |
| | 223. | 2018/0013704 | 1/11/18 | KATIS et al.. | | | 09/20/17 |
| | 224. | 2019/0280998 | 09/12/19 | Katis et al. | | | 05/28/19 |
| | 225. | 2021/0021552 | 01/21/21 | Katis et al. | | | 10/02/20 |
| | 226. | 4,807,224 | 02/21/89 | NARON, et al. | | | 08/21/87 |
| | 227. | 5,117,422 | 05/26/92 | HAUPTSCHEIN, et al. | | | 07/09/90 |
| | 228. | 5,128,932 | 07/07/92 | LI, SHUO-YEN R. | | | 08/27/90 |
| | 229. | 5,283,818 | 02/01/94 | KLAUSNER, et al. | | | 03/31/92 |
| | 230. | 5,375,018 | 12/20/94 | KLAUSNER, et al. | | | 07/17/91 |
| | 231. | 5,390,236 | 02/14/95 | KLAUSNER, et al. | | | 05/12/92 |
| | 232. | 5,487,167 | 01/23/96 | DINALLO, et al. | | | 08/09/94 |
| | 233. | 5,524,140 | 06/04/96 | KLAUSNER, et al. | | | 06/07/95 |
| | 234. | 5,572,576 | 11/05/96 | KLAUSNER, et al. | | | 03/15/94 |
| | 235. | 5,651,054 | 07/22/97 | DUNN et al. | | | 04/13/95 |
| | 236. | 5,692,213 | 11/25/97 | GOLDBERG et al. | | | 10/12/95 |
| | 237. | 5,734,963 | 03/31/98 | FITZGERALD, et al. | | | 06/06/95 |
| | 238. | 5,737,011 | 04/07/98 | LUKACS | | | 05/03/95 |
| | 239. | 5,889,764 | 03/30/99 | NEEDHAM, et al. | | | 08/02/96 |
| | 240. | 5,918,158 | 06/29/99 | LAPORTA, et al.. | | | 07/24/96 |
| | 241. | 5,958,005 | 09/28/99 | THORNE et al.. | | | 07/17/97 |
| | 242. | 5,963,551 | 10/05/99 | MINKO | | | 11/18/96 |
| | 243. | 5,970,122 | 10/19/99 | LAPORTA, et al.. | | | 07/24/96 |
| | 244. | 6,037,932 | 03/14/00 | FEINLEIB | | | 10/07/96 |
| | 245. | 6,092,120 | 07/18/00 | SWAMINATHAN, et al. | | | 06/26/98 |
| | 246. | 6,104,757 | 08/15/00 | RHEE | | | 05/15/98 |

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| | 248. | 6,212,535 | 04/03/01 | WEIKART et al. | | | 09/19/96 |
| | 249. | 6,122,668 | 09/19/00 | TENG et al. | | | 11/02/95 |
| | 250. | 6,233,389 | 05/15/01 | BARTON, et al. | | | 07/30/98 |
| | 251. | 6,262,994 | 07/17/01 | DIRSCHEDL, et al. | | | 11/14/97 |
| | 252. | 6,335,966 | 01/01/02 | TOYODA | | | 09/01/99 |
| | 253. | 6,378,035 | 04/23/02 | PARRY, et al. | | | 04/06/99 |
| | 254. | 6,411,685 | 06/25/02 | O'NEAL | | | 01/29/99 |
| | 255. | 6,480,783 | 11/12/02 | MYR | | | 03/17/00 |
| | 256. | 6,507,586 | 01/14/03 | SATRAN, et al. | | | 08/24/98 |
| | 257. | 6,564,261 | 05/13/03 | GUDJONSSON et al. | | | 05/09/00 |
| | 258. | 6,577,599 | 06/10/03 | GUPTA, et al. | | | 06/30/99 |
| | 259. | 6,580,694 | 06/17/03 | BAKER | | | 08/16/99 |
| | 260. | 6,594,693 | 07/15/03 | BORWANKAR et al. | | | 01/22/99 |
| | 261. | 6,671,732 | 12/20/03 | WEINER | | | 07/24/00 |
| | 262. | 6,690,654 | 02/10/04 | ELLIOTT et al. | | | 10/01/98 |
| | 263. | 6,700,902 | 03/02/04 | MEYER | | | 10/19/98 |
| | 264. | 6,717,925 | 04/06/04 | LEPPISAARI, et al. | | | 08/10/98 |
| | 265. | 6,721,703 | 04/13/04 | JACKSON et al. | | | 03/02/01 |
| | 266. | 6,721,784 | 04/13/04 | LEONARD et al. | | | 12/30/99 |
| | 267. | 6,791,949 | 09/14/04 | RYU, et al. | | | 04/28/00 |
| | 268. | 6,792,085 | 09/14/04 | RIGALDIES et al. | | | 09/10/99 |
| | 269. | 6,807,565 | 10/19/04 | DODRILL et al. | | | 06/27/00 |
| | 270. | 6,807,578 | 10/19/04 | SATRAN, et al. | | | 03/14/01 |
| | 271. | 6,829,473 | 12/07/04 | RAMAN, et al. | | | 12/17/02 |
| | 272. | 6,834,039 | 12/21/04 | KELLY, et al. | | | 11/27/00 |
| | 273. | 6,850,965 | 02/01/05 | ALLEN | | | 06/26/01 |
| | 274. | 6,865,398 | 03/08/05 | Mangal et al. | | | 02/04/02 |
| | 275. | 6,912,544 | 06/28/05 | WEINER | | | 08/31/00 |

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| | 276. | 6,931,114 | 08/16/05 | MARTIN | | | 12/22/00 |
| | 277. | 6,970,926 | 11/29/05 | NEEDHAM, et al. | | | 10/03/00 |
| | 278. | 6,973,309 | 12/06/05 | RYGULA, et al.. | | | 03/14/02 |
| | 279. | 6,993,009 | 01/31/06 | KELLY, et al. | | | 12/08/00 |
| | 280. | 6,996,624 | 02/07/06 | LECROY, et al. | | | 09/27/01 |
| | 281. | 7,002,913 | 02/21/06 | HUANG, et al. | | | 01/18/01 |
| | 282. | 7,002,973 | 02/21/06 | MCLAMPY et al. | | | 04/27/01 |
| | 283. | 7,039,040 | 05/02/06 | BURG | | | 06/07/99 |
| | 284. | 7,039,675 | 05/02/06 | KATO | | | 06/30/99 |
| | 285. | 7,039,761 | 05/02/06 | WANG et al. | | | 08/11/03 |
| | 286. | 7,047,030 | 05/16/06 | FORSYTH | | | 05/02/02 |
| | 287. | 7,058,392 | 06/06/06 | WEINMAN, JR. | | | 12/03/02 |
| | 288. | 7,082,164 | 07/25/06 | CHADDHA | | | 05/20/02 |
| | 289. | 7,111,044 | 09/19/06 | LEE | | | 11/12/02 |
| | 290. | 7,113,767 | 09/26/06 | VÄÄNÄNEN | | | 08/20/01 |
| | 291. | 7,117,521 | 10/03/06 | PUTHIYEDATH | | | 08/31/01 |
| | 292. | 7,139,371 | 11/21/06 | MCELVANEY | | | 12/13/05 |
| | 293. | 7,171,491 | 01/30/07 | O'TOOLE, et al. | | | 05/24/01 |
| | 294. | 7,180,944 | 02/20/07 | LIN et al.. | | | 07/08/04 |
| | 295. | 7,187,941 | 03/06/07 | SIEGEL | | | 11/14/02 |
| | 296. | 7,218,709 | 05/15/07 | GARG, et al. | | | 12/22/03 |
| | 297. | 7,228,359 | 06/05/07 | MONTERIO | | | 02/12/02 |
| | 298. | 7,233,589 | 06/19/07 | TANIGAWA, et al. | | | 08/30/02 |
| | 299. | 7,236,738 | 06/26/07 | SETTLE | | | 08/01/03 |
| | 300. | 7,240,105 | 07/03/07 | SATRAN, et al.. | | | 01/26/01 |
| | 301. | 7,277,453 | 10/02/07 | CHIN et al. | | | 05/30/03 |
| | 302. | 7,283,809 | 10/16/07 | WEINMAN, JR. | | | 09/19/05 |
| | 303. | 7,304,951 | 12/04/07 | RHEE | | | 11/21/01 |
| | 304. | 7,305,438 | 12/04/07 | CHRISTENSEN et al. | | | 12/09/03 |

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| | 305. | 7,313,593 | 12/25/07 | PULITO, et al. | | | 10/24/00 |
| | 306. | 7,339,937 | 03/04/08 | MITRA et al. | | | 11/15/02 |
| | 307. | 7,339,993 | 03/04/08 | Brooks et al. | | | 02/10/00 |
| | 308. | 7,349,871 | 03/25/08 | LABROU, et al.. | | | 07/29/03 |
| | 309. | 7,382,881 | 06/03/08 | UUSITALO, et al. | | | 06/12/03 |
| | 310. | 7,403,775 | 07/22/08 | PATEL, et al.. | | | 05/13/05 |
| | 311. | 7,415,284 | 08/19/08 | HOOVER et al. | | | 09/02/04 |
| | 312. | 7,415,291 | 08/19/08 | KIRKPATRICK | | | 09/28/01 |
| | 313. | 7,426,191 | 09/16/08 | SALESKY et al. | | | 03/21/05 |
| | 314. | 7,444,306 | 10/28/08 | VARBLE | | | 10/22/04 |
| | 315. | 7,483,899 | 01/27/09 | BERRY et al. | | | 01/11/05 |
| | 316. | 7,613,773 | 11/03/09 | WATT | | | 12/31/03 |
| | 317. | 7,626,951 | 12/01/09 | CROY et al. | | | 08/15/06 |
| | 318. | 7,634,652 | 12/15/09 | MCENROE et al. | | | 01/12/06 |
| | 319. | 7,636,327 | 12/22/09 | DORAN | | | 07/29/03 |
| | 320. | 7,656,836 | 02/02/10 | BAKER et al. | | | 10/05/06 |
| | 321. | 7,656,838 | 02/02/10 | Fauconnier et al. | | | 08/16/05 |
| | 322. | 7,719,975 | 05/18/10 | MALLET et al. | | | 10/25/06 |
| | 323. | 7,730,142 | 06/01/10 | LEVASSEUR; THIERRY | | | 06/30/06 |
| | 324. | 7,742,429 | 06/22/10 | HUANG et al. | | | 06/04/04 |
| | 325. | 7,809,388 | 10/05/10 | OTHMER | | | 02/26/04 |
| | 326. | 7,818,444 | 10/19/10 | Brueck et al. | | | 02/09/07 |
| | 327. | 7,899,045 | 03/01/11 | SHANKARA | | | 06/09/06 |
| | 328. | 7,930,419 | 04/19/11 | Mullig et al. | | | 12/04/06 |
| | 329. | 7,908,389 | 03/15/11 | ZUCKERMAN et al. | | | 06/20/07 |
| | 330. | 7,913,053 | 03/22/11 | NEWLAND | | | 02/15/05 |
| | 331. | 7,957,363 | 06/07/11 | DEEN et al. | | | 05/26/05 |
| | 332. | 7,970,918 | 06/28/11 | THOMPSON et al. | | | 12/23/05 |

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| | 333. | 7,996,553 | 08/09/11 | KELLER et al. | | | 10/23/03 |
| | 334. | 8,027,276 | 09/27/11 | NIERHAUS | | | 04/14/04 |
| | 335. | 8,045,682 | 10/25/11 | JÖNSSON | | | 06/30/06 |
| | 336. | 8,086,222 | 12/27/11 | VAANANEN | | | 03/30/07 |
| | 337. | 8,094,647 | 01/10/12 | ELLIOTT et al.. | | | 06/14/01 |
| | 338. | 8,099,512 | 01/17/12 | KATIS et al. | | | 10/17/08 |
| | 339. | 8,121,270 | 02/21/12 | KATIS et al. | | | 05/16/08 |
| | 340. | 8,130,921 | 03/06/12 | KATIS et al. | | | 04/25/08 |
| | 341. | 8,175,234 | 05/08/12 | KATIS et al. | | | 05/05/08 |
| | 342. | 8,180,029 | 05/05/12 | KATIS et al. | | | 02/08/08 |
| | 343. | 8,180,030 | 05/15/12 | KATIS et al. | | | 02/15/08 |
| | 344. | 8,243,894 | 08/14/12 | KATIS et al. | | | 02/26/08 |
| | 345. | 8,271,003 | 09/18/12 | OTHMER et al. | | | 03/23/07 |
| | 346. | 8,296,366 | 10/23/12 | HUAI | | | 05/27/04 |
| | 347. | 8,311,050 | 11/13/12 | KATIS et al. | | | 03/24/08 |
| | 348. | 8,315,377 | 11/20/12 | DALOZ; CLAUDE | | | 05/16/07 |
| | 349. | 8,345,836 | 01/01/13 | KATIS et al. | | | 04/25/08 |
| | 350. | 8,401,582 | 03/19/13 | KATIS et al. | | | 12/16/08 |
| | 351. | 8,401,583 | 03/19/13 | KATIS et al. | | | 12/16/08 |
| | 352. | 8,463,927 | 06/11/13 | LIANG; SONYA RONGSHENG | | | 12/29/06 |
| | 353. | 8,526,456 | 09/03/13 | KATIS et al. | | | 11/01/12 |
| | 354. | 8,532,270 | 09/10/13 | KATIS et al. | | | 05/07/12 |
| | 355. | 8,533,611 | 09/10/13 | KATIS et al. | | | 09/16/09 |
| | 356. | 8,559,319 | 10/15/13 | KATIS et al. | | | 10/17/08 |
| | 357. | 8,565,149 | 10/22/13 | KATIS et al. | | | 03/05/08 |
| | 358. | 8,645,477 | 02/04/14 | KATIS et al. | | | 09/02/09 |
| | 359. | 8,670,531 | 03/11/14 | KATIS et al. | | | 05/06/10 |
| | 360. | 8,671,210 | 03/11/14 | Branam et al. | | | 05/07/07 |

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| | 363. | 8,693,647 | 04/08/14 | KATIS et al. | | | 07/13/12 |
| | 364. | 8,705,714 | 04/22/14 | KATIS et al. | | | 07/20/12 |
| | 365. | 8,744,050 | 06/03/14 | KATIS et al. | | | 05/27/08 |
| | 366. | 8,817,955 | 08/26/14 | MILSTEIN | | | 06/30/06 |
| | 367. | 8,825,772 | 09/02/14 | KATIS et al. | | | 08/16/10 |
| | 368. | 8,832,299 | 09/09/14 | KATIS et al. | | | 07/17/12 |
| | 369. | 8,849,927 | 09/30/14 | KATIS et al. | | | 08/16/10 |
| | 370. | 8,902,749 | 12/02/14 | KATIS et al. | | | 02/26/08 |
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| | 373. | 9,154,628 | 10/06/15 | KATIS et al. | | | 03/05/14 |
| | 374. | 9,178,916 | 11/03/15 | KATIS et al. | | | 08/16/10 |
| | 375. | 9,338,113 | 05/10/16 | KATIS et al. | | | 08/28/15 |
| | 376. | 9,456,087 | 09/27/16 | KATIS et al. | | | 07/14/15 |
| | 377. | 9,608,947 | 03/28/17 | KATIS et al. | | | 08/17/16 |
| | 378. | 9,621,491 | 04/11/17 | KATIS et al. | | | 09/06/16 |
| | 379. | 9,634,969 | 04/25/17 | KATIS et al. | | | 04/06/16 |
| | 380. | 9,674,122 | 06/06/17 | KATIS et al. | | | 08/08/16 |
| | 381. | 9,742,712 | 08/22/17 | KATIS et al. | | | 09/06/16 |
| | 382. | 9,762,861 | 09/12/17 | KALABOUKIS | | | 12/05/06 |
| | 383. | 9,800,528 | 10/24/17 | KATIS et al. | | | 08/10/16 |
| | 384. | 9,800,538 | 10/24/17 | MOSTAFA | | | 08/02/01 |
| | 385. | 10,129,191 | 11/13/18 | KATIS et al. | | | 03/16/18 |
| | 386. | 10,142,270 | 11/27/18 | KATIS et al. | | | 05/02/17 |
| | 387. | 10,158,591 | 12/18/18 | KATIS et al. | | | 3/27/18 |
| | 388. | 10,326,721 | 06/18/19 | KATIS et al. | | | 03/16/18 |

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| | 397. | 2006/0029050 | 02/09/06 | HARRIS | | | 07/29/05 |
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| | Filing Date | Herewith |
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| | Application No.: | Unassigned |
| Information Disclosure Statement By Applicant | Applicant | KATIS et al. |
| | Filing Date | Herewith |
| | Group | Unassigned |
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| | Application No.: | Unassigned |
| Information Disclosure Statement By Applicant | Applicant | KATIS et al. |
| | Filing Date | Herewith |
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| L4 | 58 | (messag$ ) SAME convers$ SAME multimedia SAME servers SAME user near1 devices AND @ad<"20070628" | (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) | OR | ON | ON | 2023/01/07 08:08 AM |

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|---|---|---|---|---|
| 17/977,963 | 10/31/2022 | Thomas E. KATIS | REBLP003C24 | 5201 |

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