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.

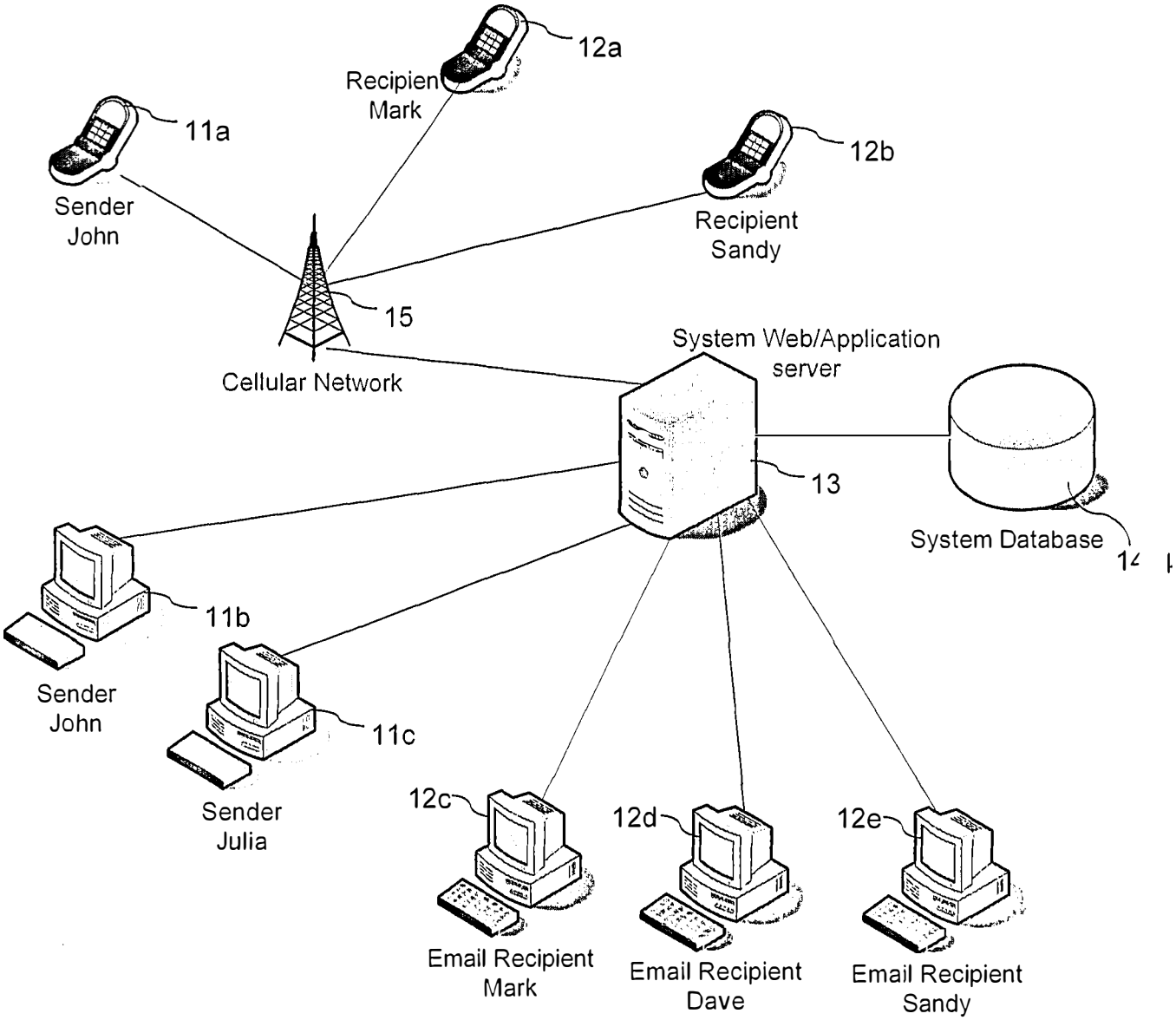
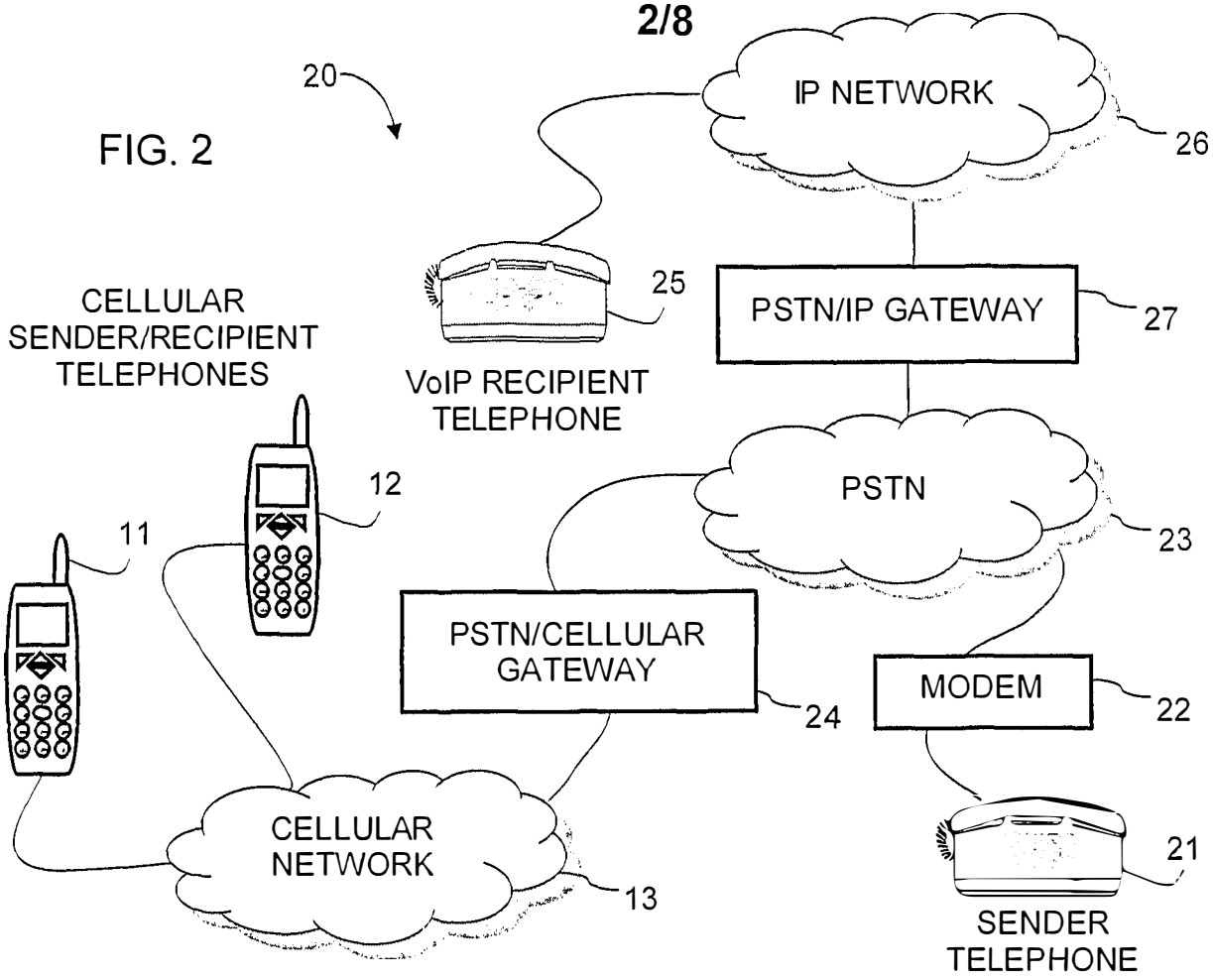

12a
Recipien
Mark
11a
Sender
John
12b
Recipient
Sandy
15
Cellular Network
System Web/Application
server
13
System Database
11b
Sender
John
11c
Sender
Julia
12c
12d
12e
Email Recipient
Mark
Email Recipient
Dave
Email Recipient
Sandy
20

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

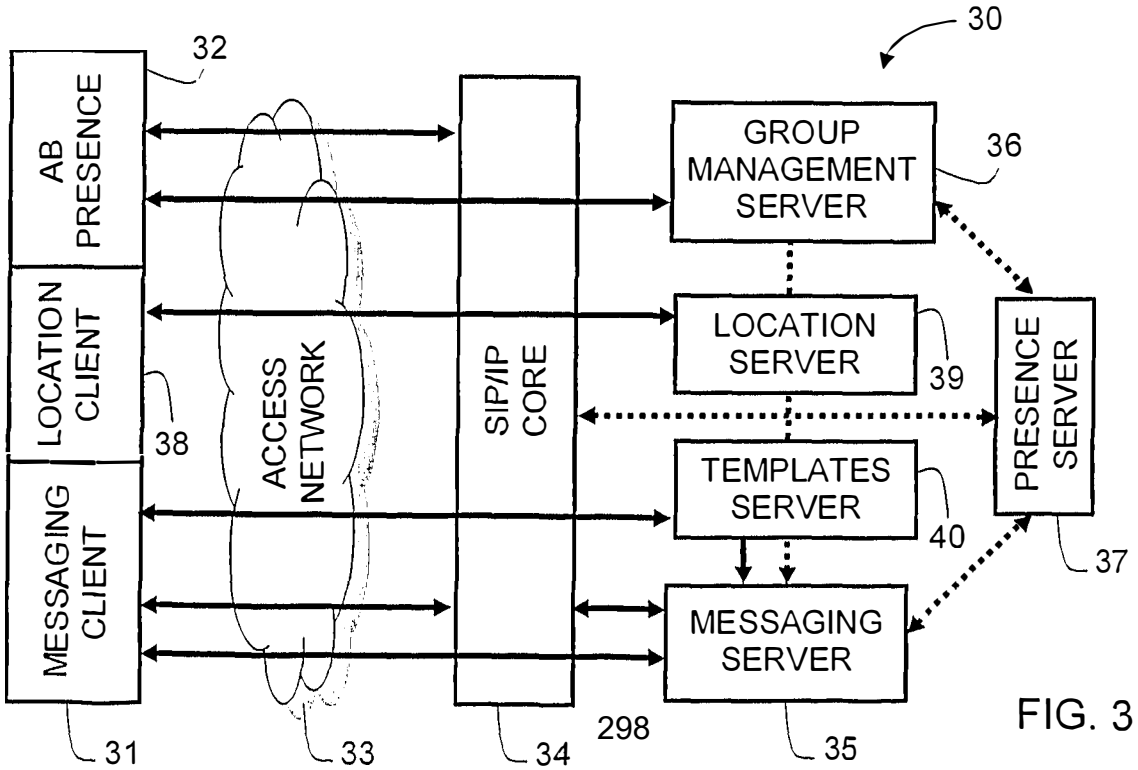

30
32
AB PRESENCE
LOCATION CLIENT
MESSAGING CLIENT
38
ACCESS NETWORK
SIP/IP CORE
GROUP MANAGEMENT SERVER
36
LOCATION SERVER
39
TEMPLATES SERVER
40
PRESENCE SERVER
37
MESSAGING SERVER
31
33
34
298
35

FIG. 3

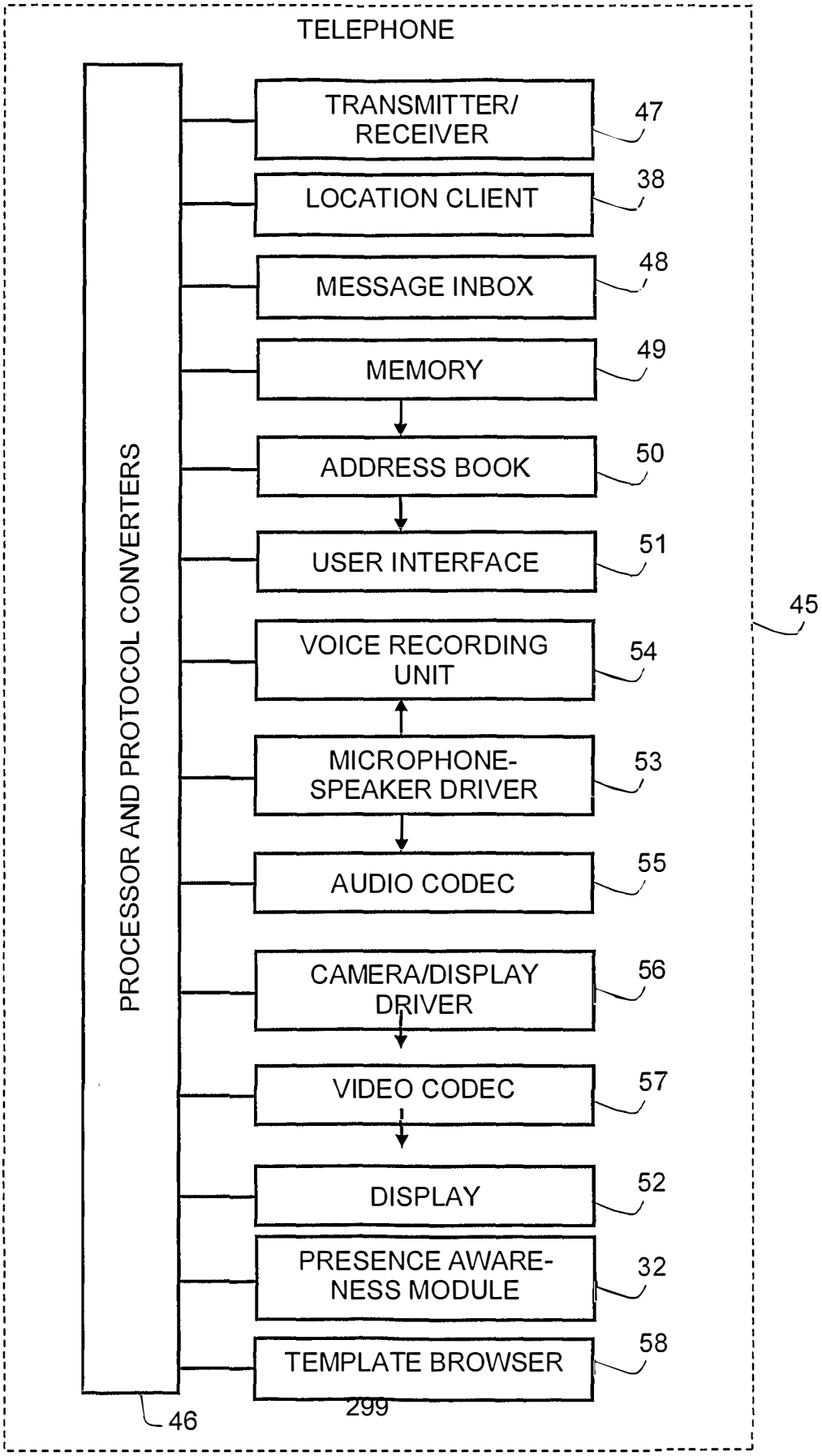

TELEPHONE
PROCESSOR AND PROTOCOL CONVERTERS
TRANSMITTER/ RECEIVER
47
LOCATION CLIENT
38
MESSAGE INBOX
48
MEMORY
49
ADDRESS BOOK
50
USER INTERFACE
51
VOICE RECORDING UNIT
54
MICROPHONE-SPEAKER DRIVER
53
AUDIO CODEC
55
CAMERA/DISPLAY DRIVER
56
VIDEO CODEC
57
DISPLAY
52
PRESENCE AWARE-NESS MODULE
32
TEMPLATE BROWSER
58
299
46
45

FIG. 4

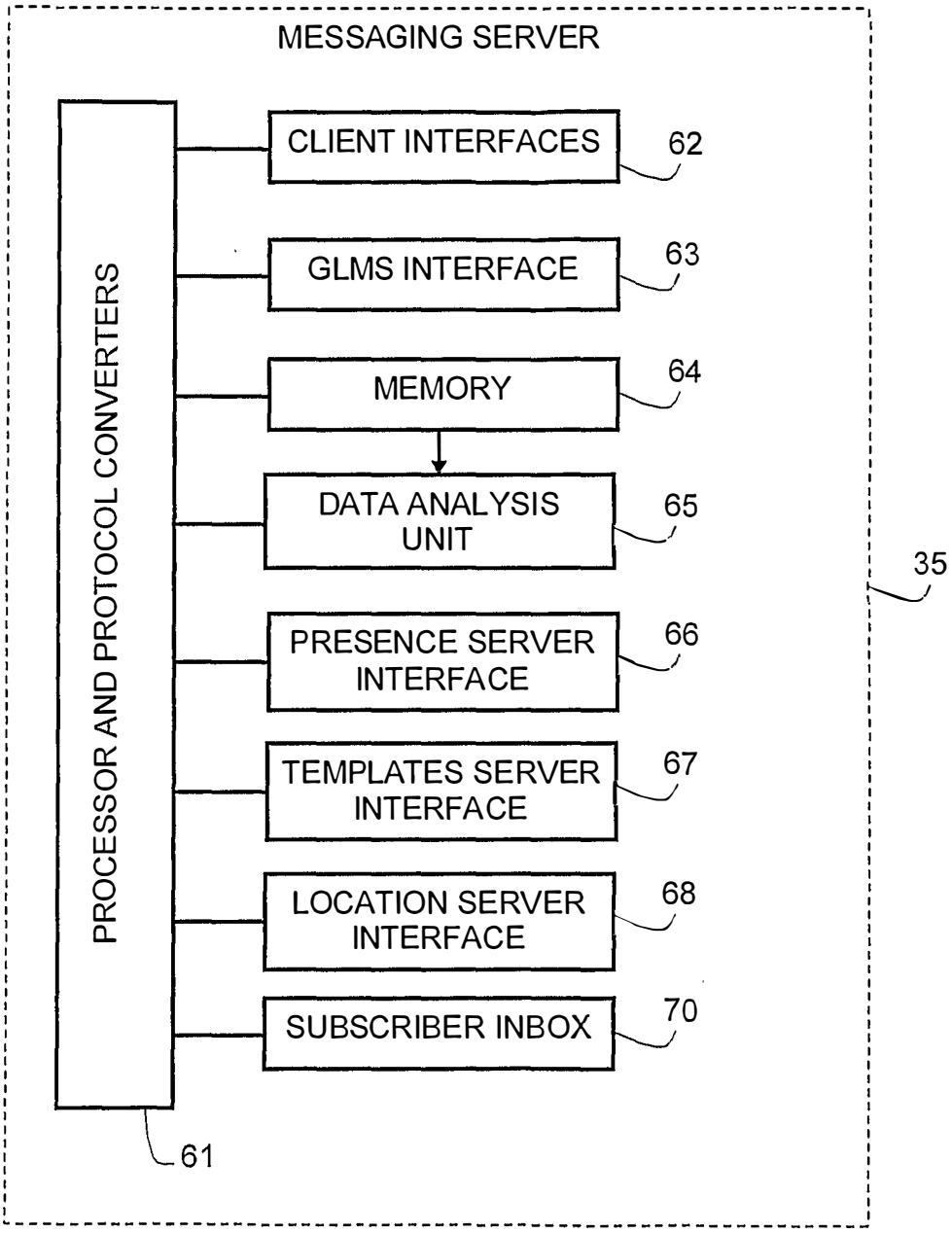

MESSAGING SERVER
PROCESSOR AND PROTOCOL CONVERTERS
CLIENT INTERFACES
62
GLMS INTERFACE
63
MEMORY
64
DATA ANALYSIS UNIT
65
PRESENCE SERVER INTERFACE
66
TEMPLATES SERVER INTERFACE
67
LOCATION SERVER INTERFACE
68
SUBSCRIBER INBOX
70
61
35

FIG. 5

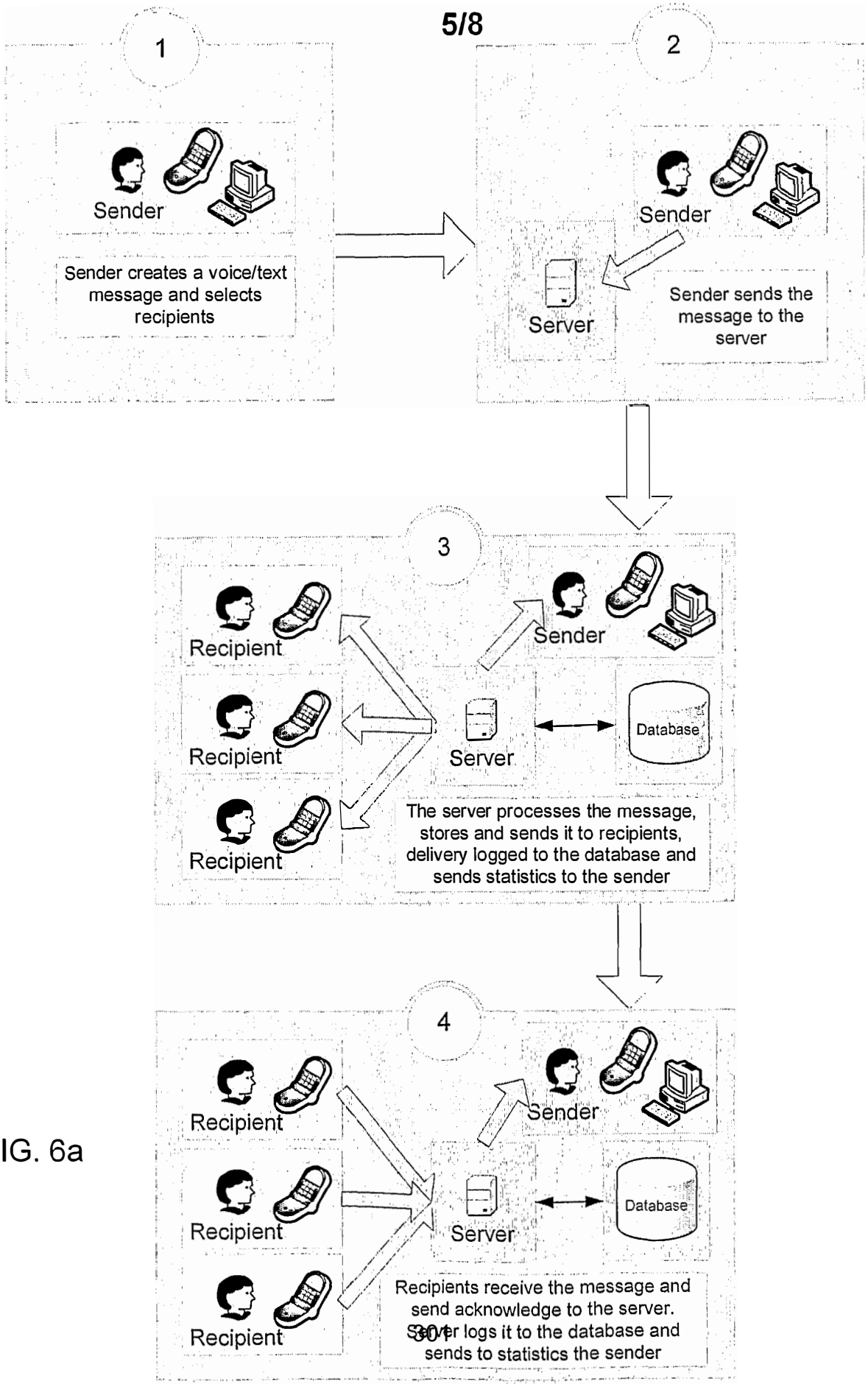

1
Sender
Sender creates a voice/text message and selects recipients
2
Sender
Server
Sender sends the message to the server
3
Recipient
Recipient
Recipient
Sender
Server
Database
The server processes the message, stores and sends it to recipients, delivery logged to the database and sends statistics to 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
301

FIG. 6a

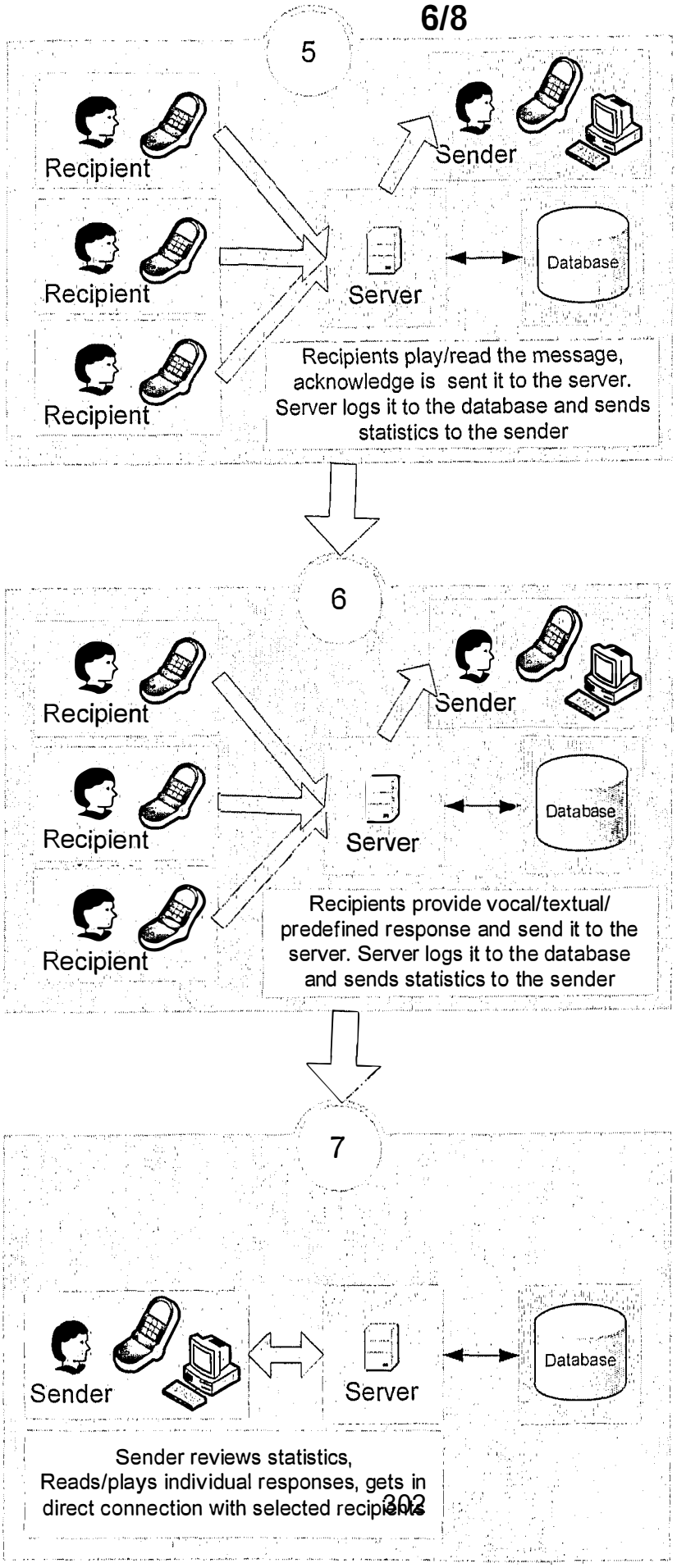

5
Recipient
Recipient
Recipient
Sender
Server
Database
Recipients play/read the message, acknowledge is sent it to the server. Server logs it to the database and sends statistics to the sender
6
Recipient
Recipient
Recipient
Sender
Server
Database
Recipients provide vocal/textual/ predefined response 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
302

FIG. 6b

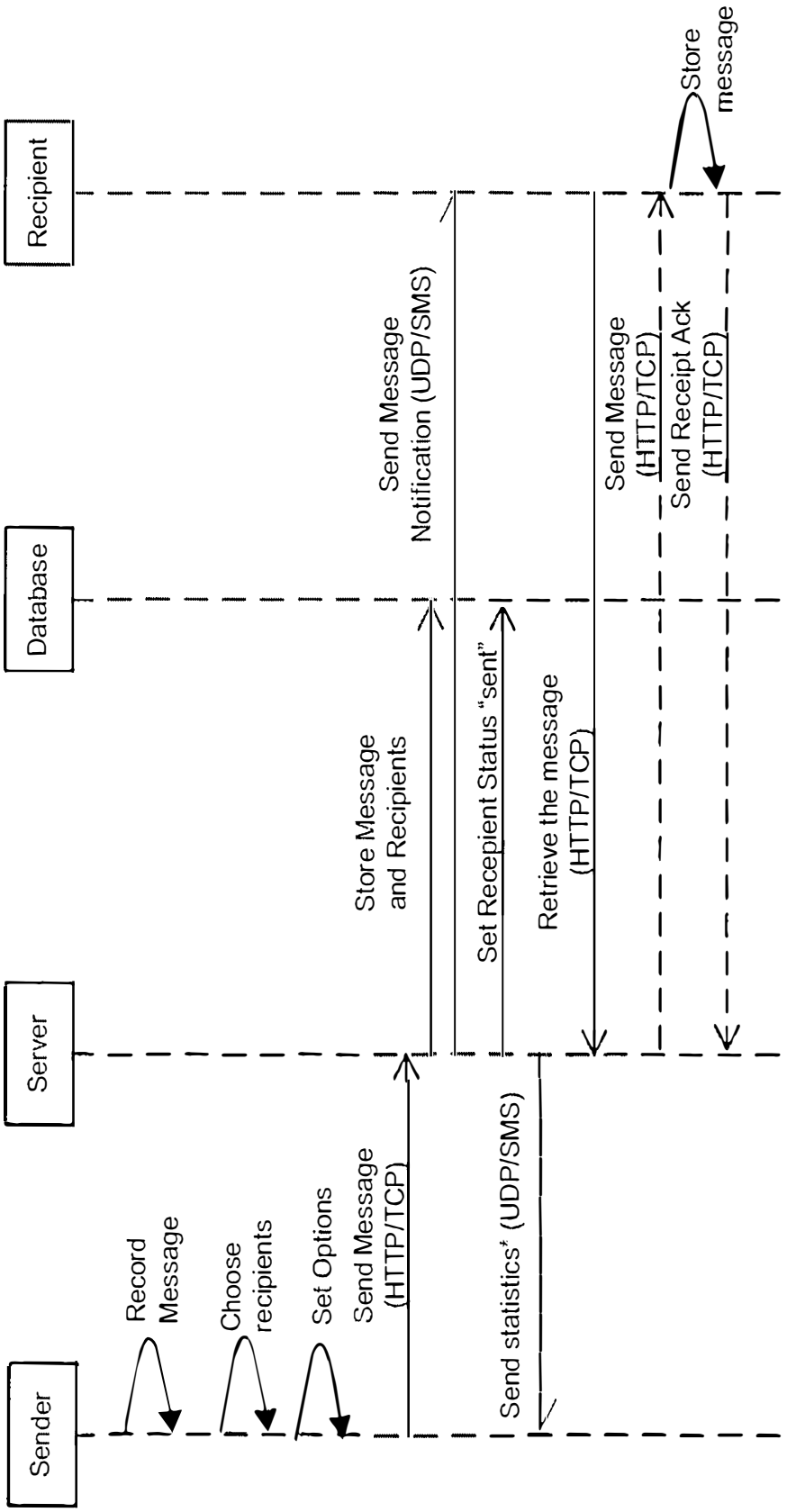

Sender
Server
Database
Recipient
Record Message
Choose recipients
Set Options
Send Message (HTTP/TCP)
Store Message and Recipients
Send Message Notification (UDP/SMS)
Set Recepient Status "sent"
Retrieve the message (HTTP/TCP)
Send Message (HTTP/TCP)
Send Receipt Ack (HTTP/TCP)
Store message
Send statistics*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

FIG. 7a

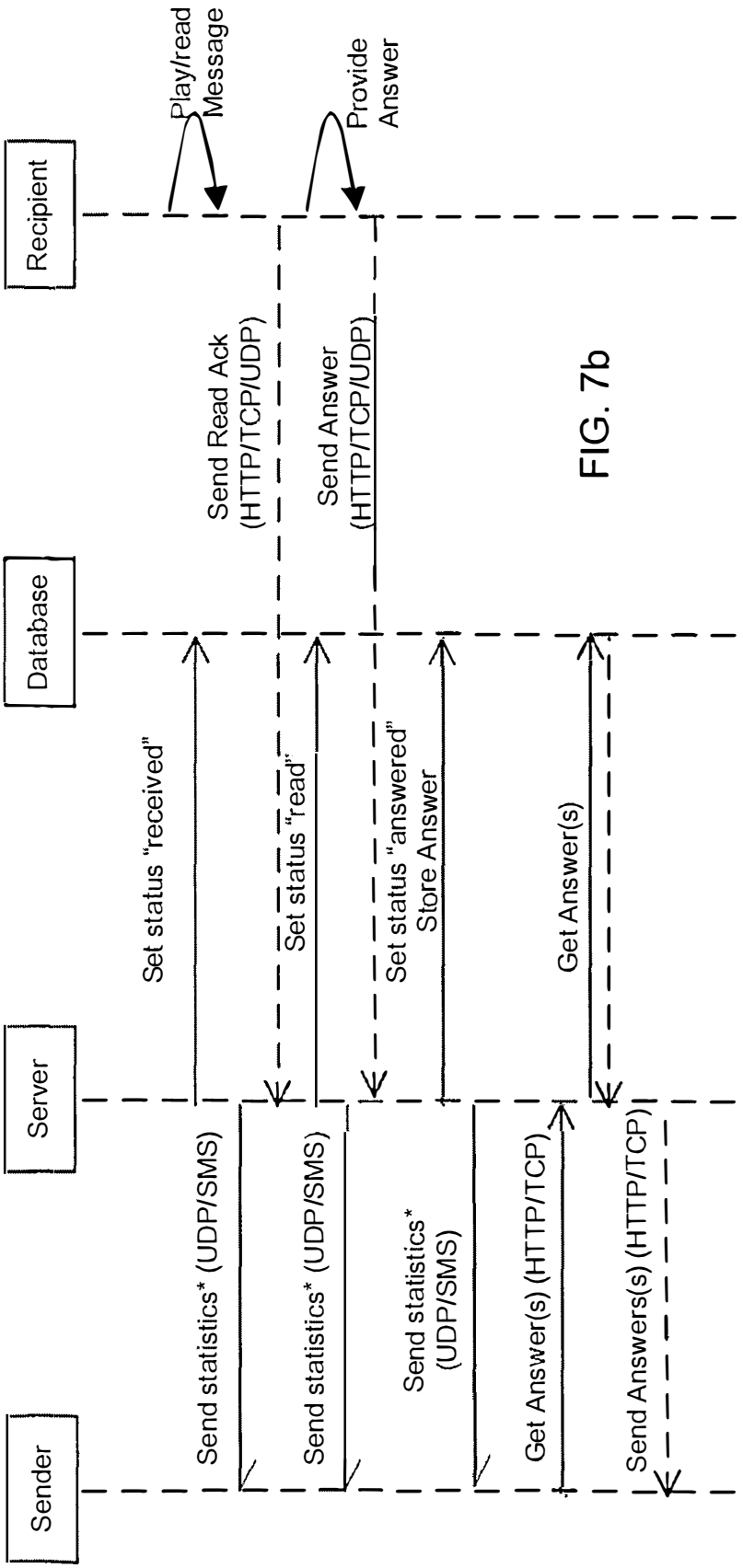

Sender
Server
Database
Recipient
Send statistics* (UDP/SMS)
Set status "received"
Send Read Ack (HTTP/TCP/UDP)
Play/read Message
Send statistics* (UDP/SMS)
Set status "read"
Send Answer (HTTP/TCP/UDP)
Provide Answer
Send statistics* (UDP/SMS)
Set status "answered" Store Answer
Get Answer(s) (HTTP/TCP)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

FIG. 7b

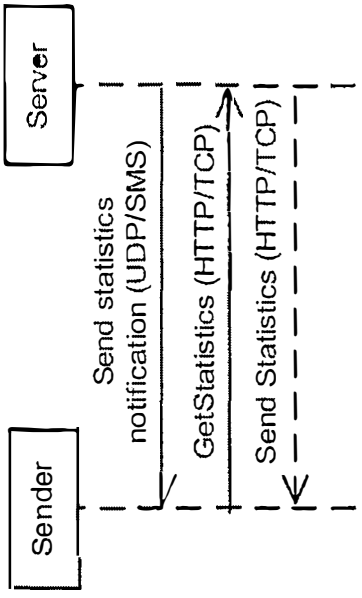

*Alternative Send Statistics Flow
Sender
Server
Send statistics notification (UDP/SMS)
GetStatistics (HTTP/TCP)
Send Statistics (HTTP/TCP)

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

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 November 2006	17/01/2007

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International application No
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11/118,297	28 April 2005 (28.04.2005)	US

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(75) Inventors/Applicants *(for US only)*: **NORMILE, Jim** [US/US]; 1725 Esberg Raod, Los Altos, California 94024 (US). **JEONG, Hyeonkuk** [KR/US]; 1149 Pheasant Hill Drive, San Jose, California 95120 (US). **ABUAN, Joe** [US/US]; 838 Harmony Place, Milipitas, California 95035 (US). **TUNG, Berkat Shing** [US/US]; 8981 La Rivicra, Sacramento, California 95826 (US). **SALSBURY, Ryan** [US/US]; 1 Infinite Loop Ms: 302-3ks, Cupertino, California 95014 (US).

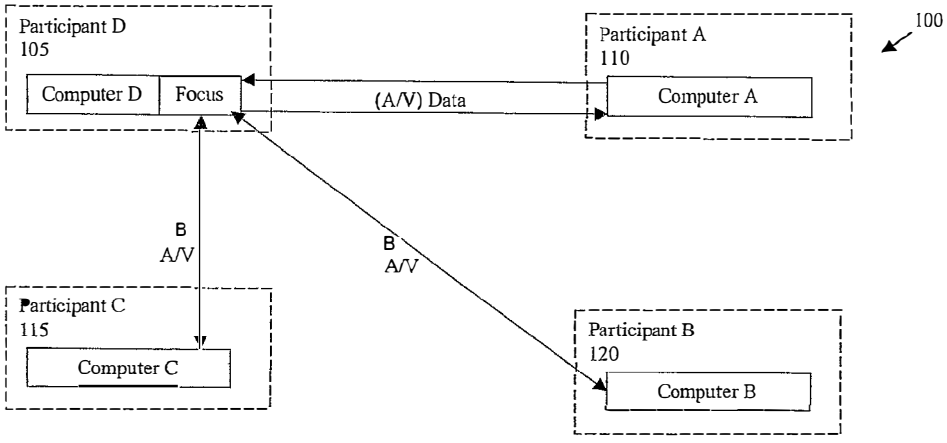
(74) Agent: **EDELI, Mani**; STATTLER JOHANSEN & ADELI LLP, 1875 CENTURY PARK EAST, Suite 1360, Los Angeles, California 90067 (US).

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[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.

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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.

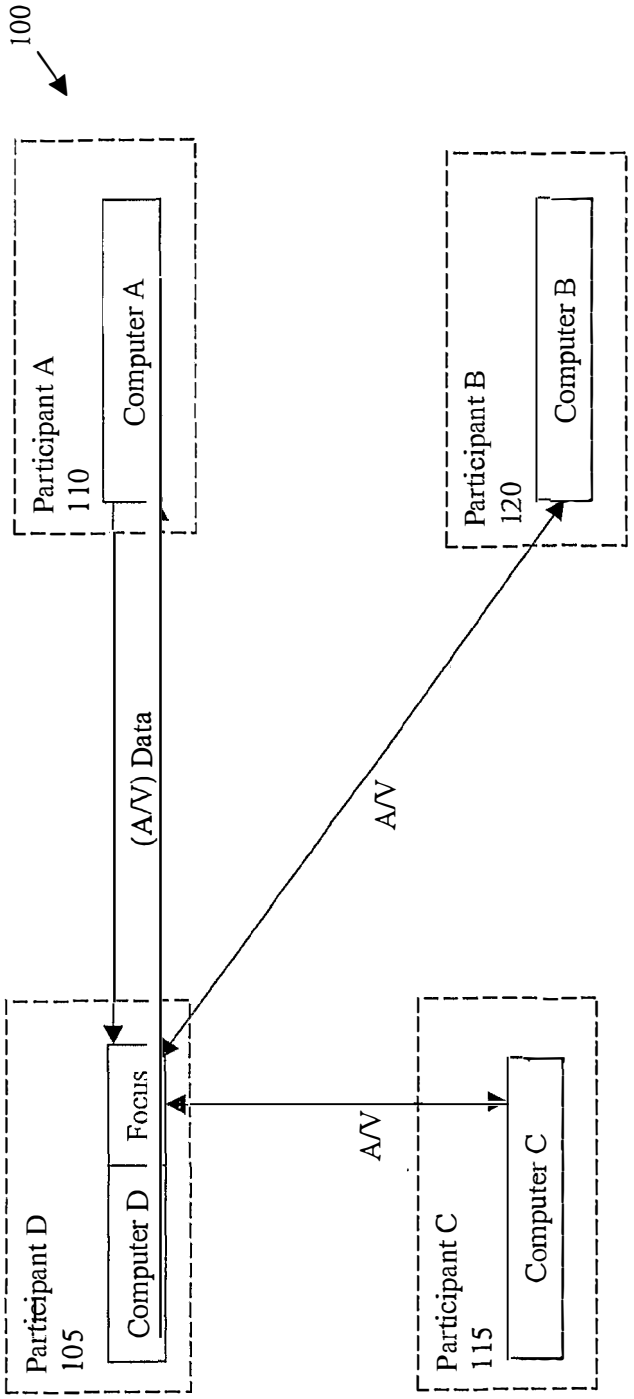

100
Participant A
110
Computer A
Participant B
120
Computer B
(A/V) Data
A/V
A/V
Participant D
105
Computer D
Focus
Participant C
115
Computer C

Figure 1

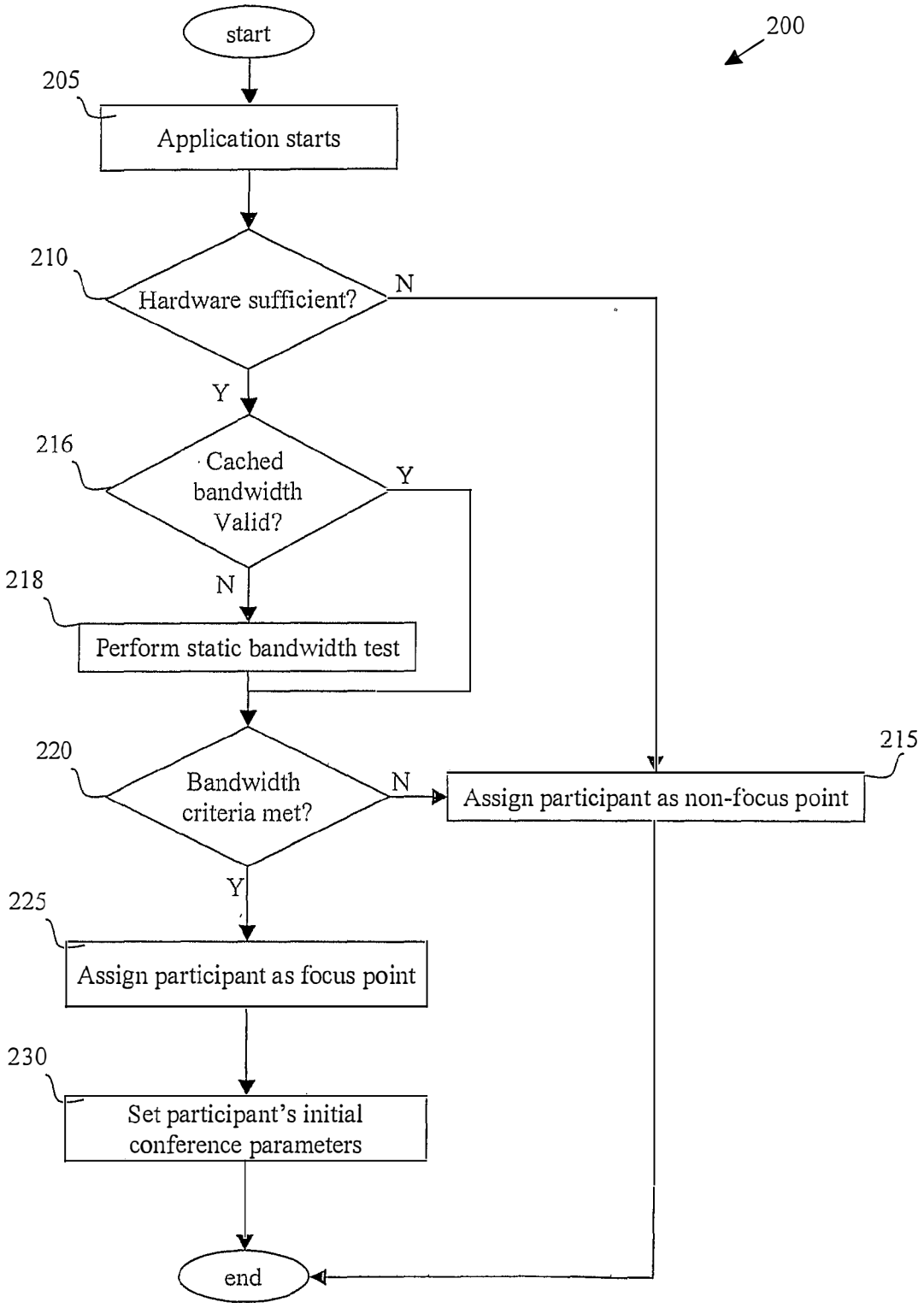

start
200
205
Application starts
210
Hardware sufficient?
N
Y
216
Cached bandwidth Valid?
Y
N
218
Perform static bandwidth test
220
Bandwidth criteria met?
N
215
Assign participant as non-focus point
Y
225
Assign participant as focus point
230
Set participant's initial conference parameters
end

Figure 2

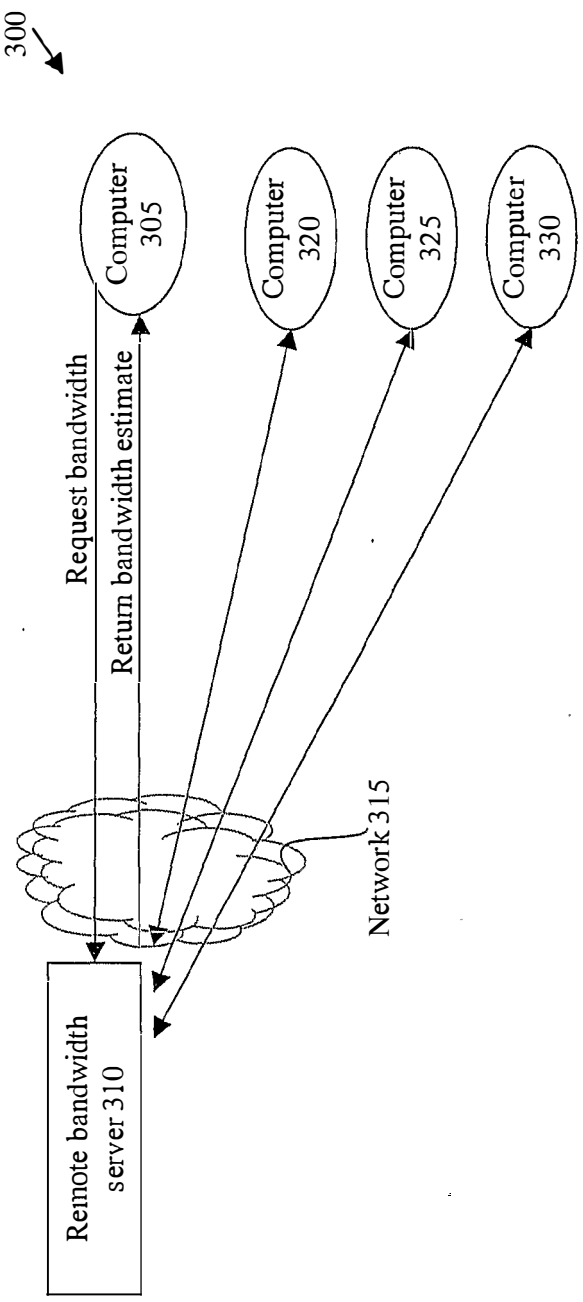

300
Computer 305
Computer 320
Computer 325
Computer 330
Request bandwidth
Return bandwidth estimate
Network 315
Remote bandwidth server 310

Figure 3

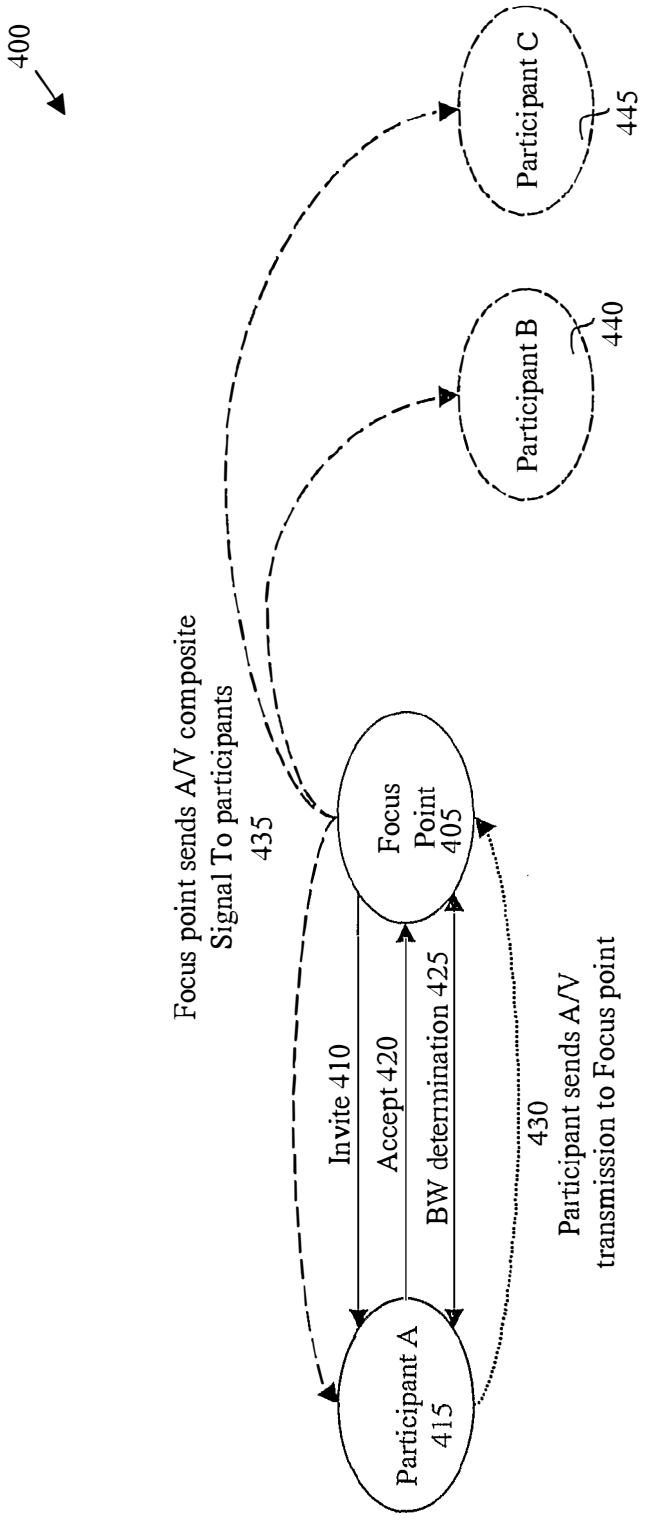

400
Participant C
445
Participant B
440
Focus point sends A/V composite
Signal To participants
435
Focus
Point
405
Invite 410
Accept 420
BW determination 425
430
Participant sends A/V
transmission to Focus point
Participant A
415

Figure 4

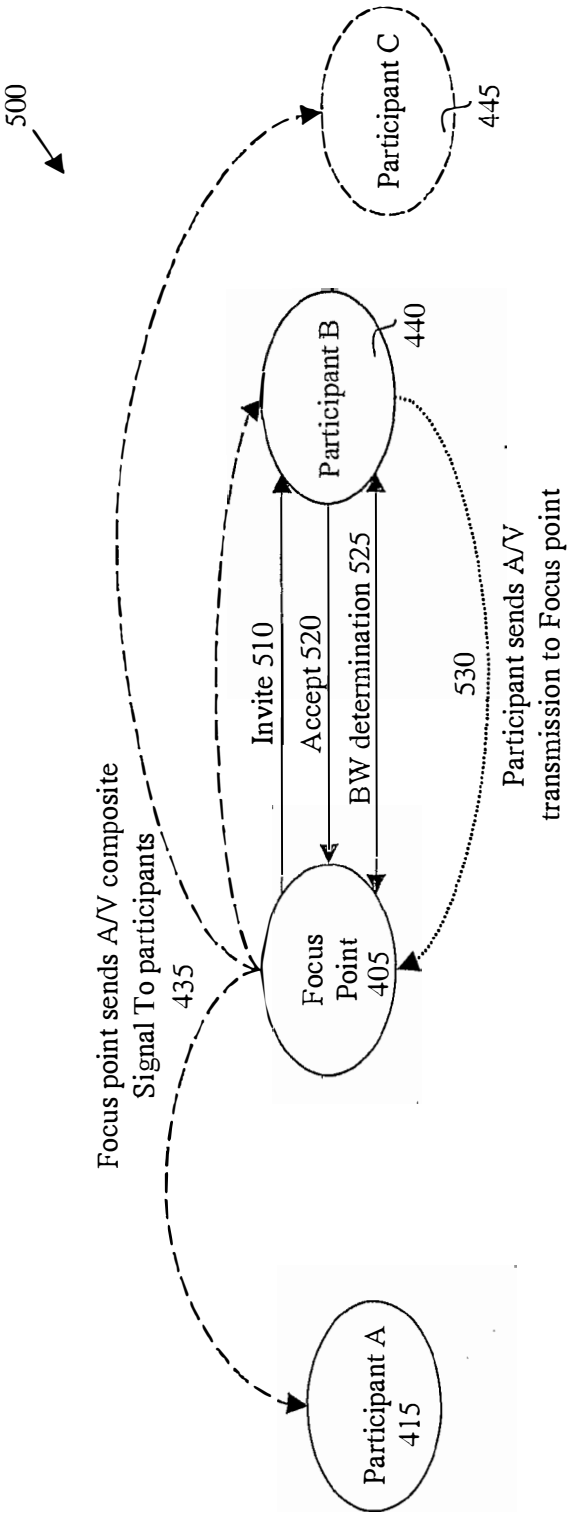

500
Participant C
445
Participant B
440
Invite 510
Accept 520
BW determination 525
530
Participant sends A/V
transmission to Focus point
Focus point sends A/V composite
Signal To participants
435
Focus
Point
405
Participant A
415

Figure 5

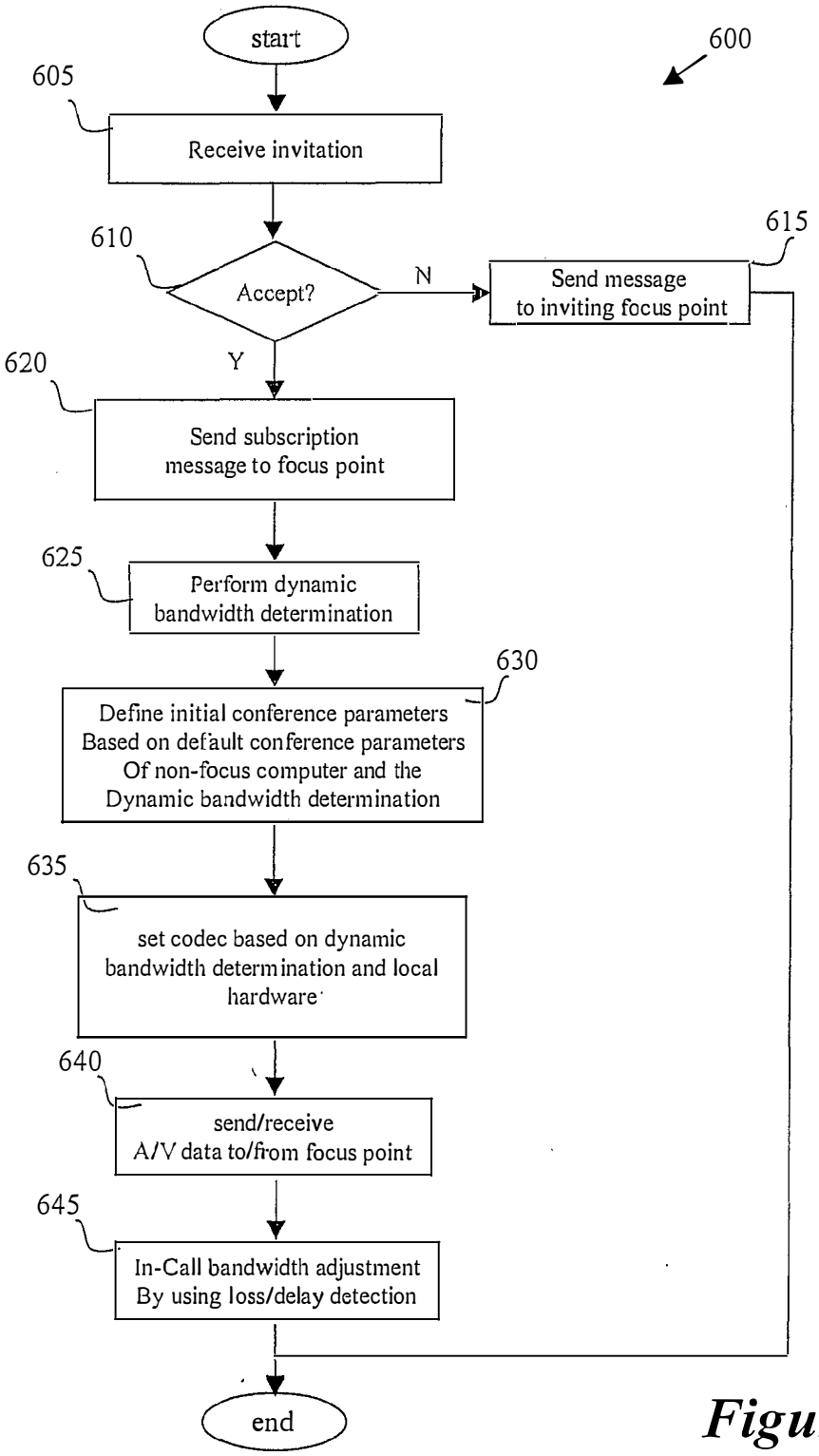

start
600
605
Receive invitation
610
Accept?
N
615
Send message
to inviting focus point
Y
620
Send subscription
message to focus point
625
Perform dynamic
bandwidth determination
630
Define initial conference parameters
Based on default conference parameters
Of non-focus computer and the
Dynamic bandwidth 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

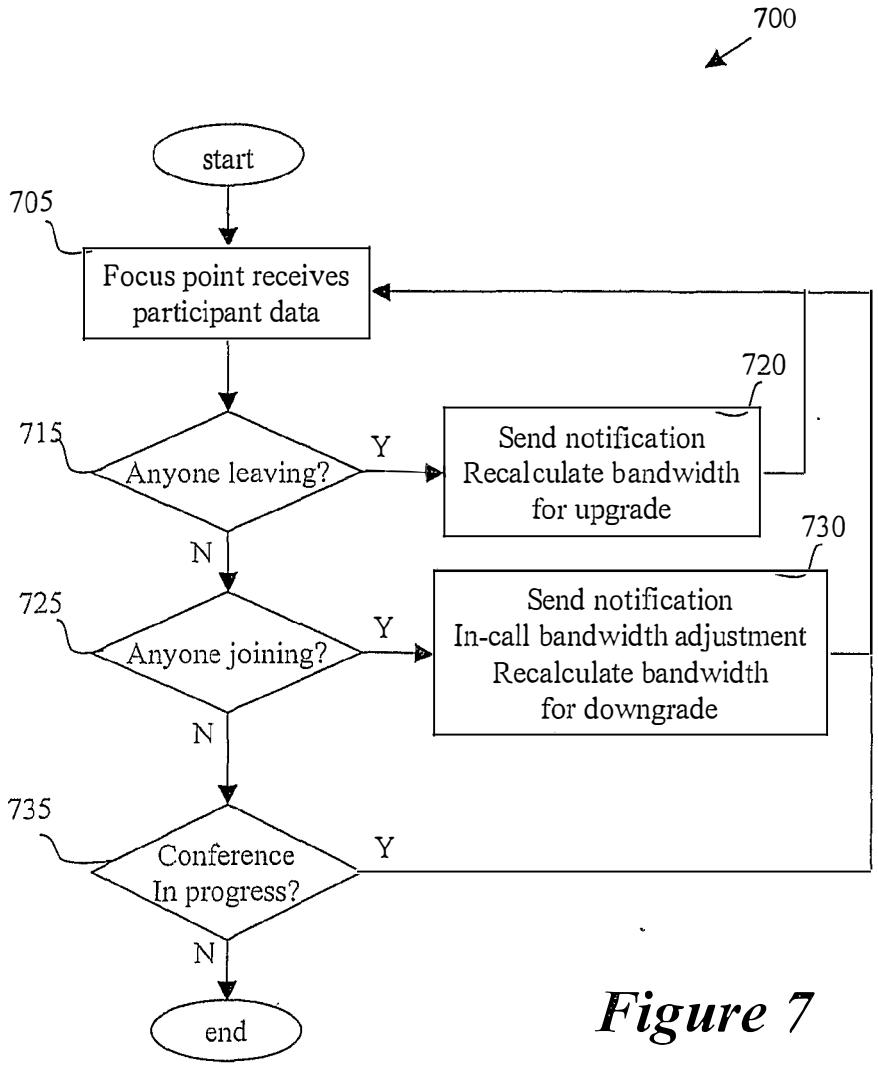

700
start
705
Focus point receives participant data
720
715
Anyone leaving?
Y
Send notification
Recalculate bandwidth for upgrade
730
N
725
Anyone joining?
Y
Send notification
In-call bandwidth adjustment
Recalculate bandwidth for downgrade
N
735
Conference In progress?
Y
N
end

Figure 7

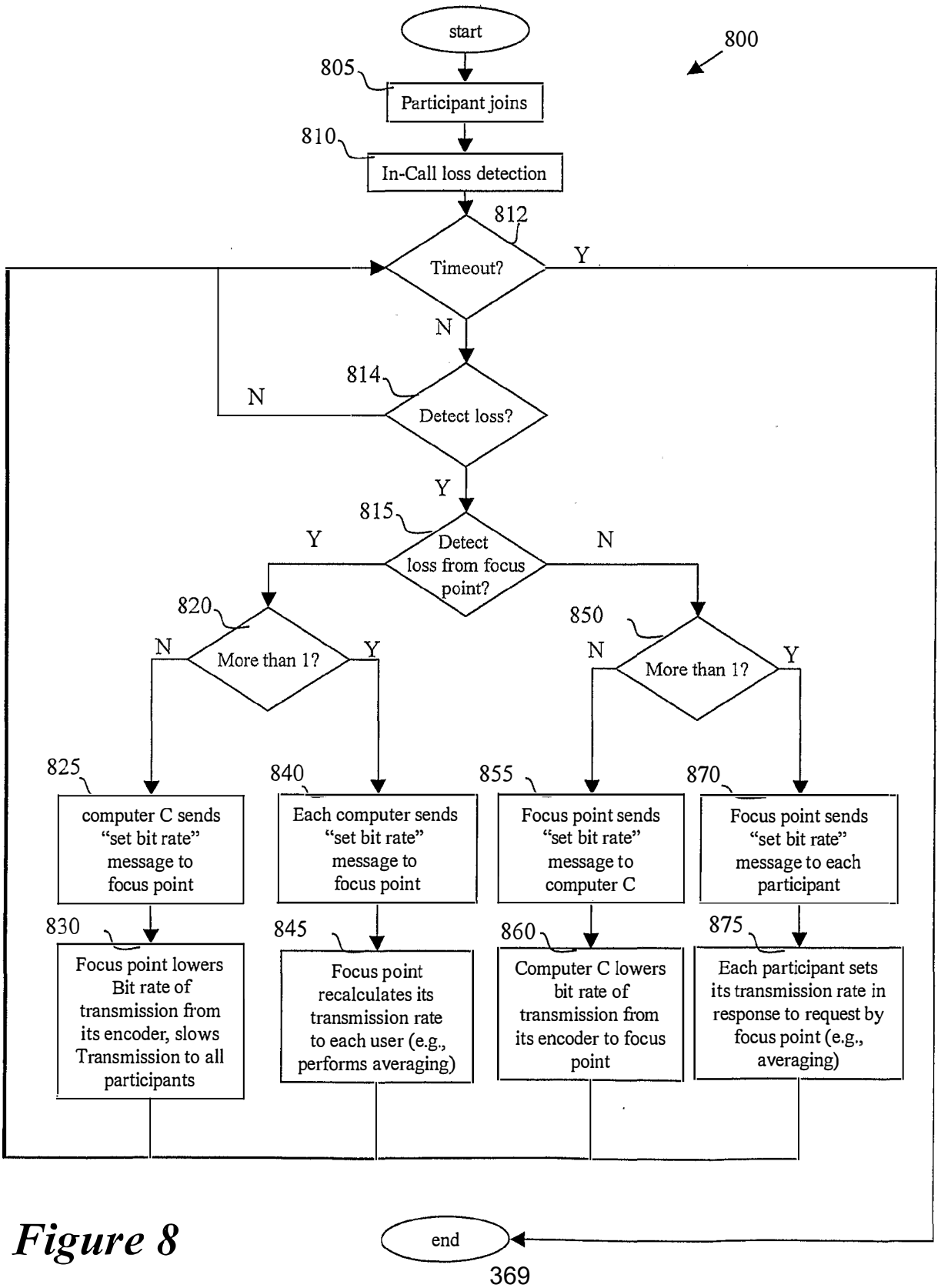

start
800
805
Participant joins
810
In-Call loss detection
812
Timeout?
Y
N
814
Detect loss?
N
Y
815
Detect loss from focus point?
Y
N
820
More than 1?
N
Y
850
More than 1?
N
Y
825
computer C sends "set bit rate" message to focus point
840
Each computer sends "set bit rate" message to focus point
855
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
369

Figure 8

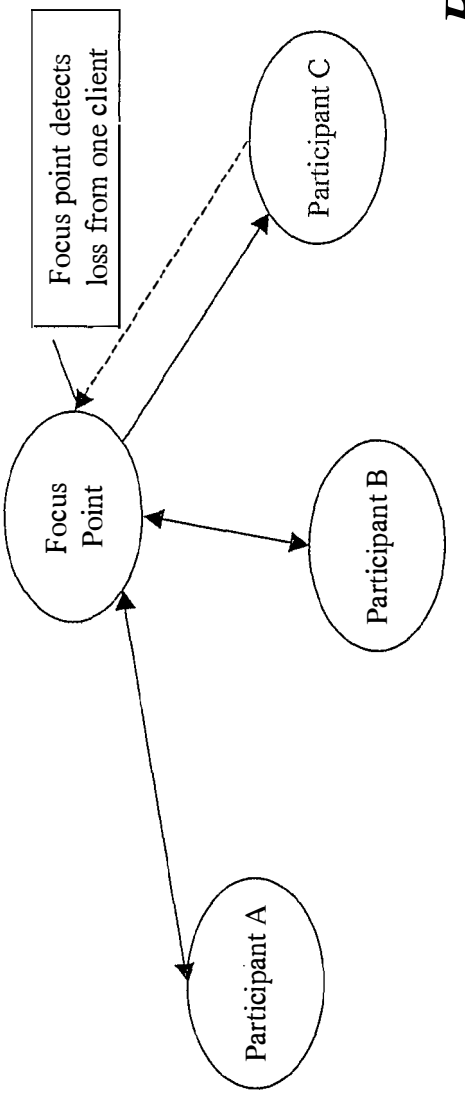


Figure 9

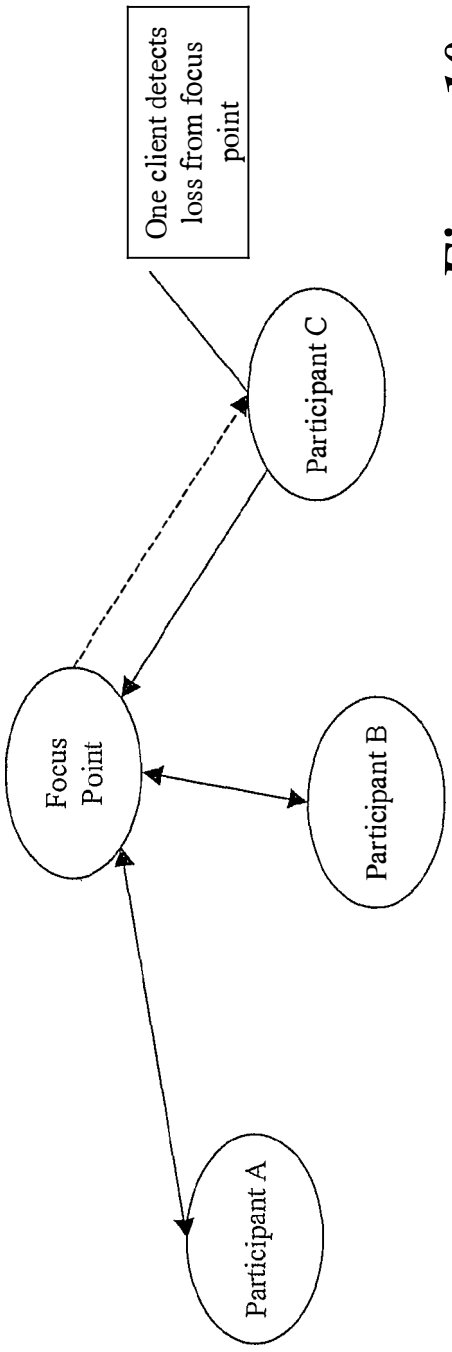


Figure 10

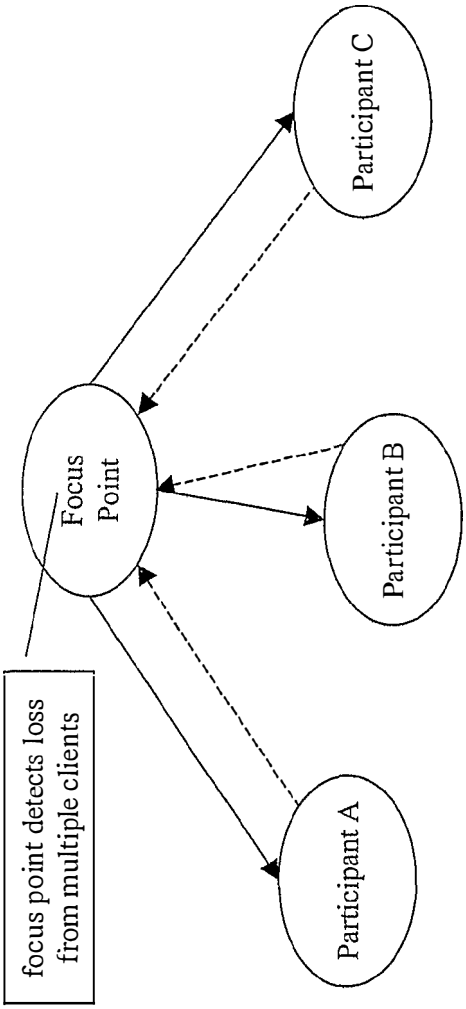


Figure 11

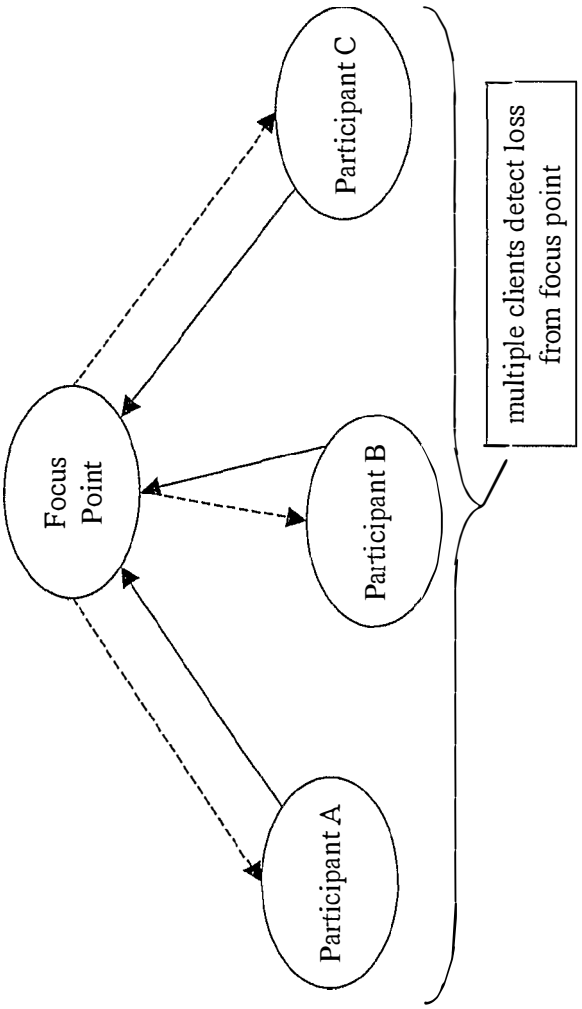


Figure 12

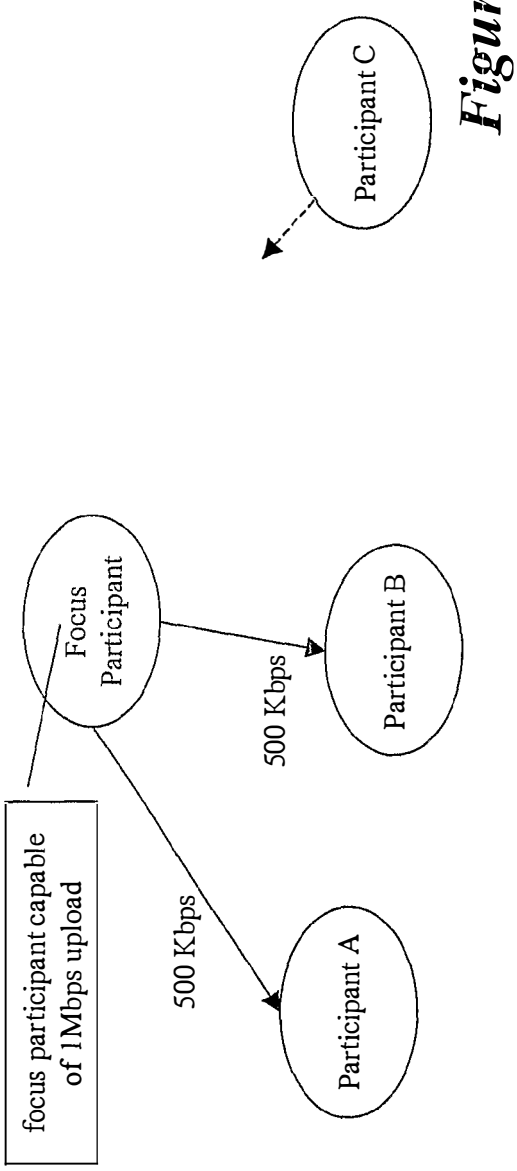


Figure 13

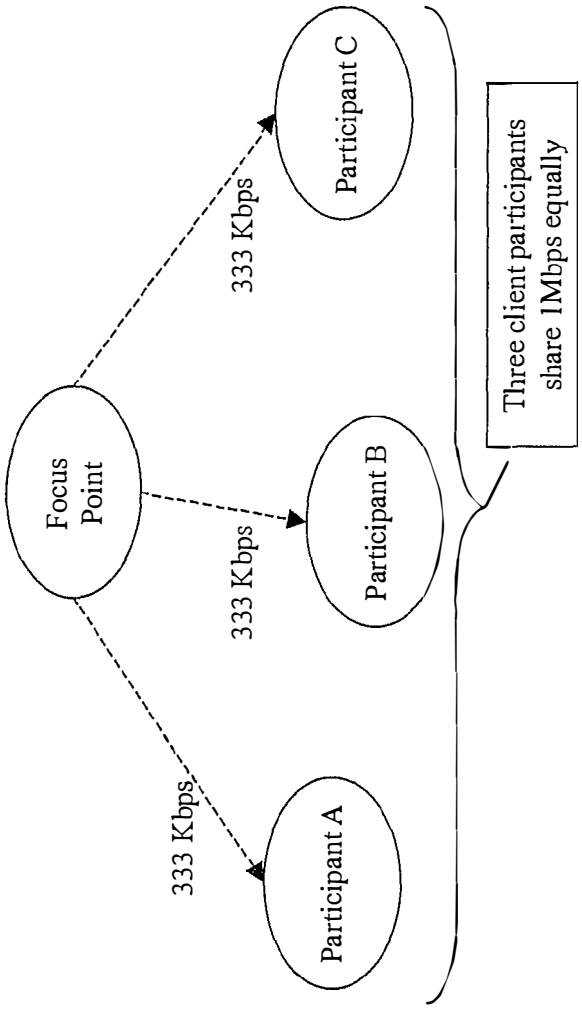


Figure 14

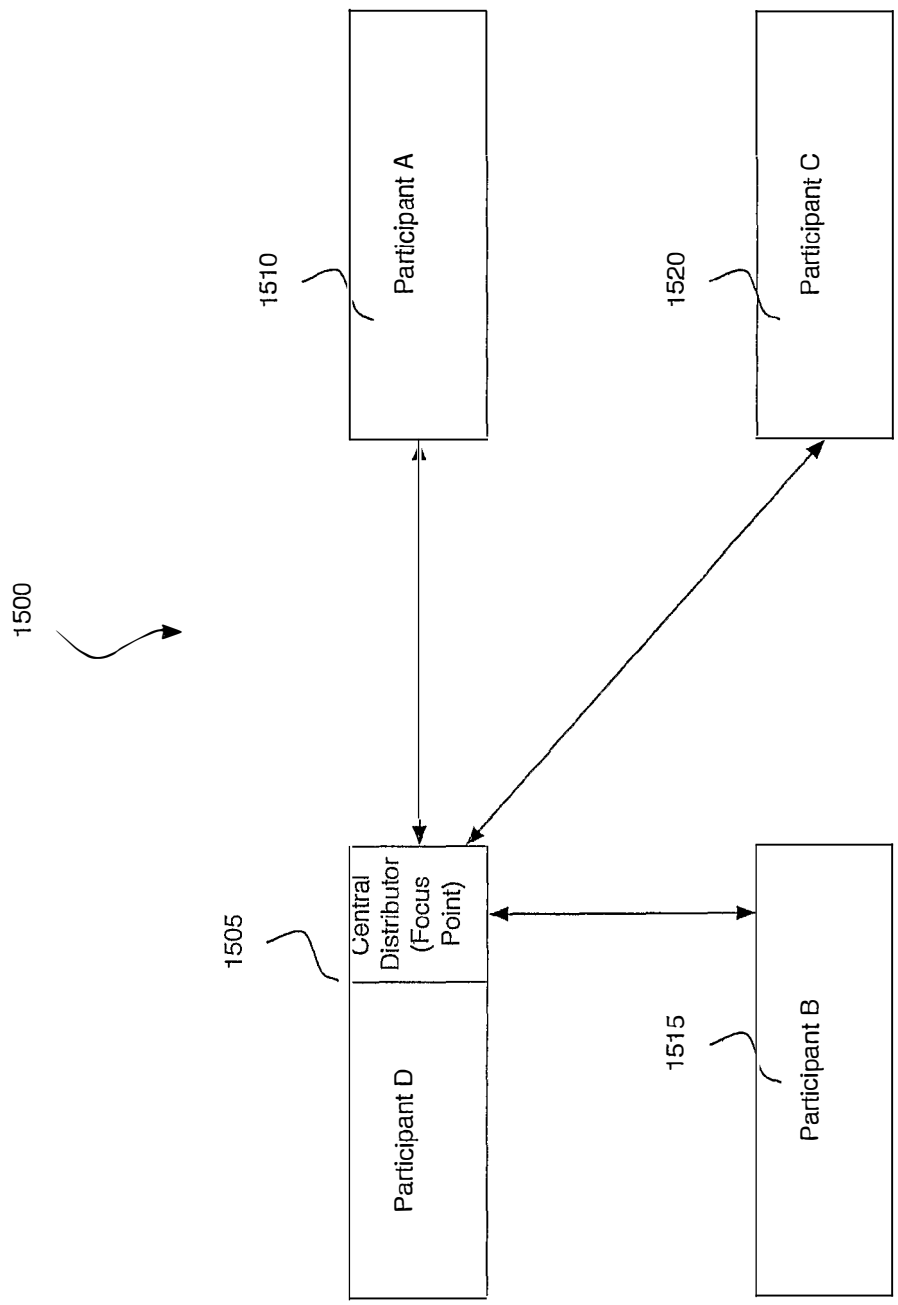

1500
1510
Participant A
1520
Participant C
1505
Central Distributor (Focus Point)
Participant D
1515
Participant B

Figure 15

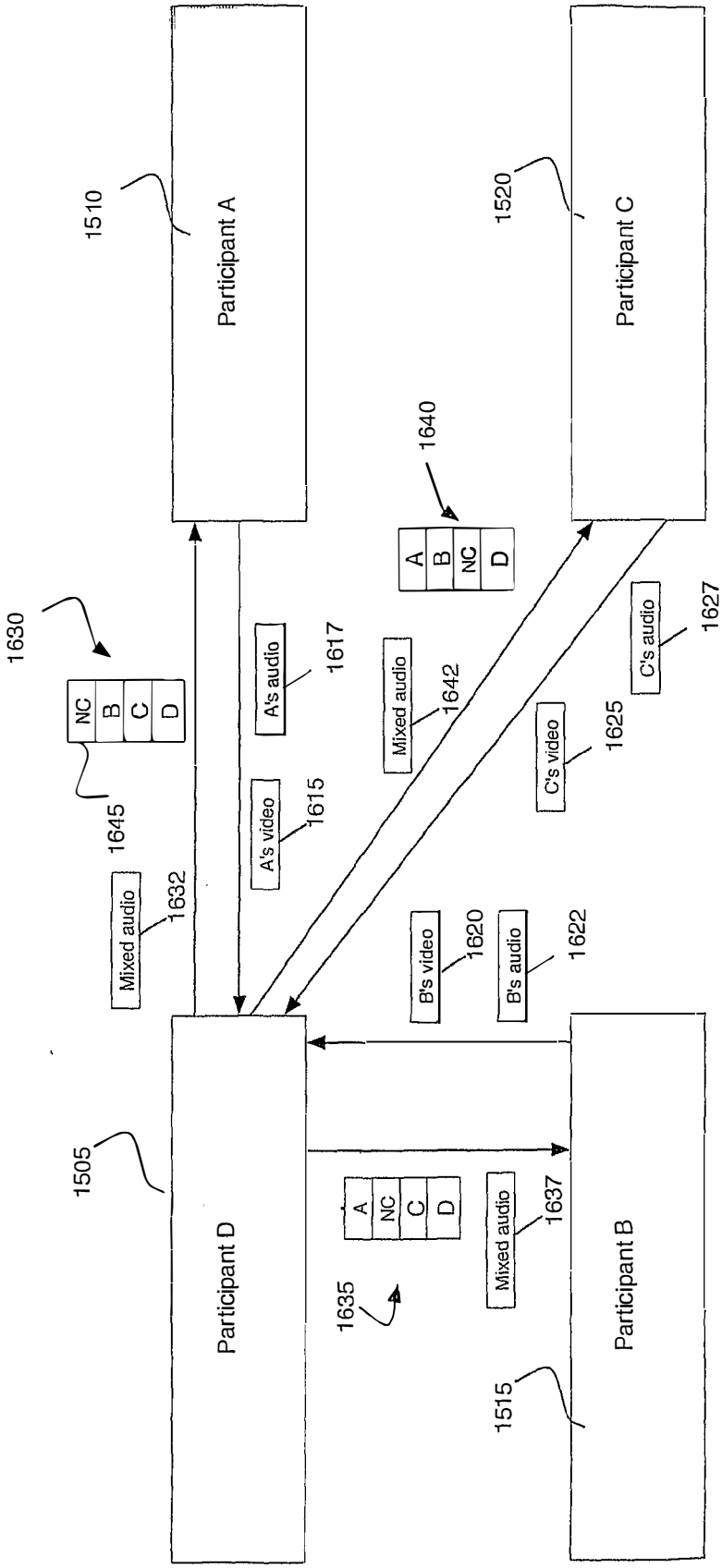

Participant A
1510
Participant C
1520
Participant D
1505
Participant B
1515
1630
NC
B
C
D
1645
A's audio
1617
A's video
1615
Mixed audio
1632
1640
A
B
NC
D
Mixed audio
1642
C's audio
1627
C's video
1625
B's video
1620
B's audio
1622
A
NC
C
D
1635
Mixed audio
1637

Figure 16

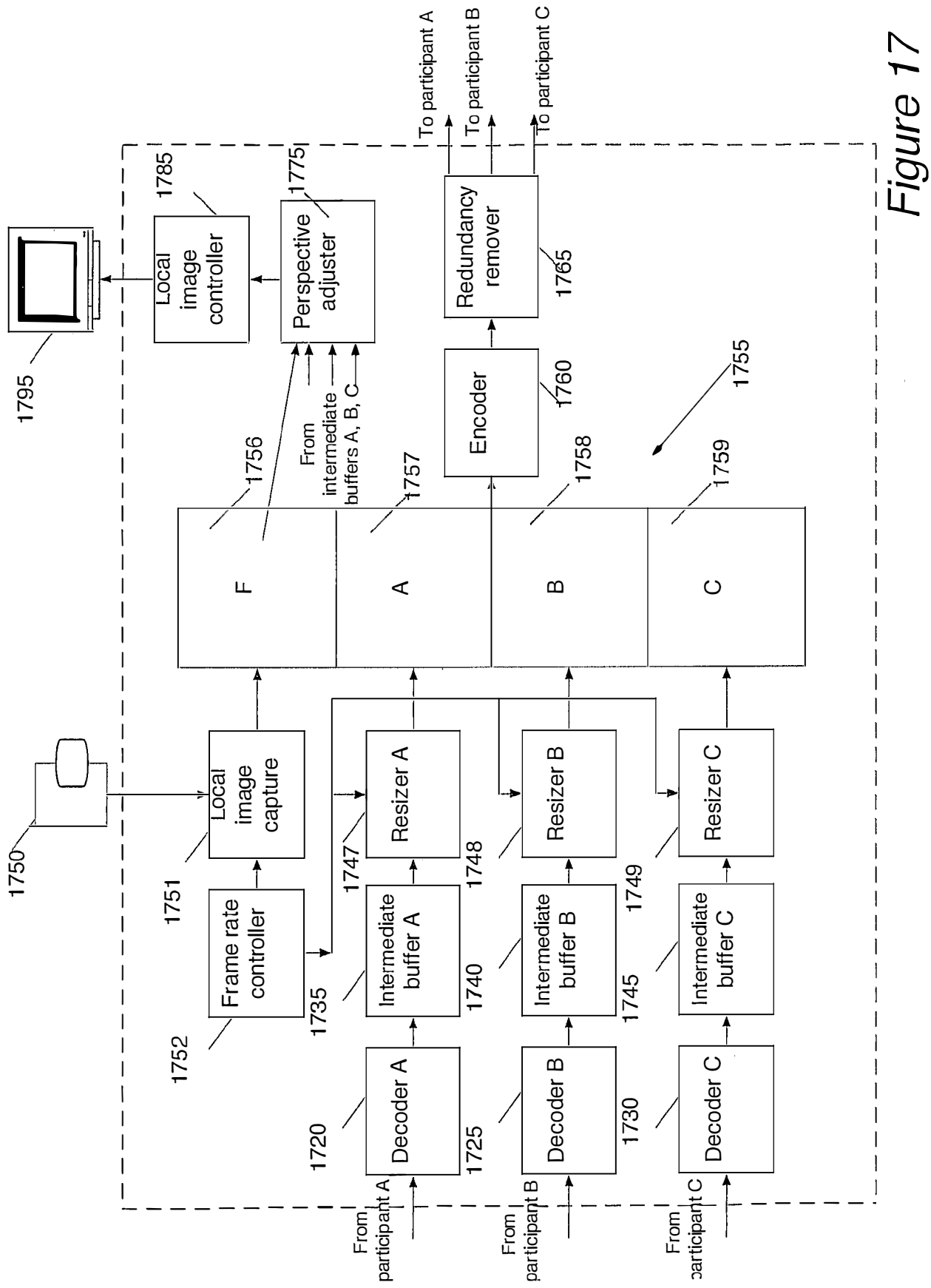

To participant A
To participant B
To participant C
1785
1775
Local image controller
Perspective adjuster
Redundancy remover
1765
1795
From intermediate buffers A, B, C
1756
1757
Encoder
1760
1758
1755
1759
F
A
B
C
1750
Local image capture
1751
Resizer A
Resizer B
Resizer C
1747
1748
1749
Frame rate controller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

Figure 17

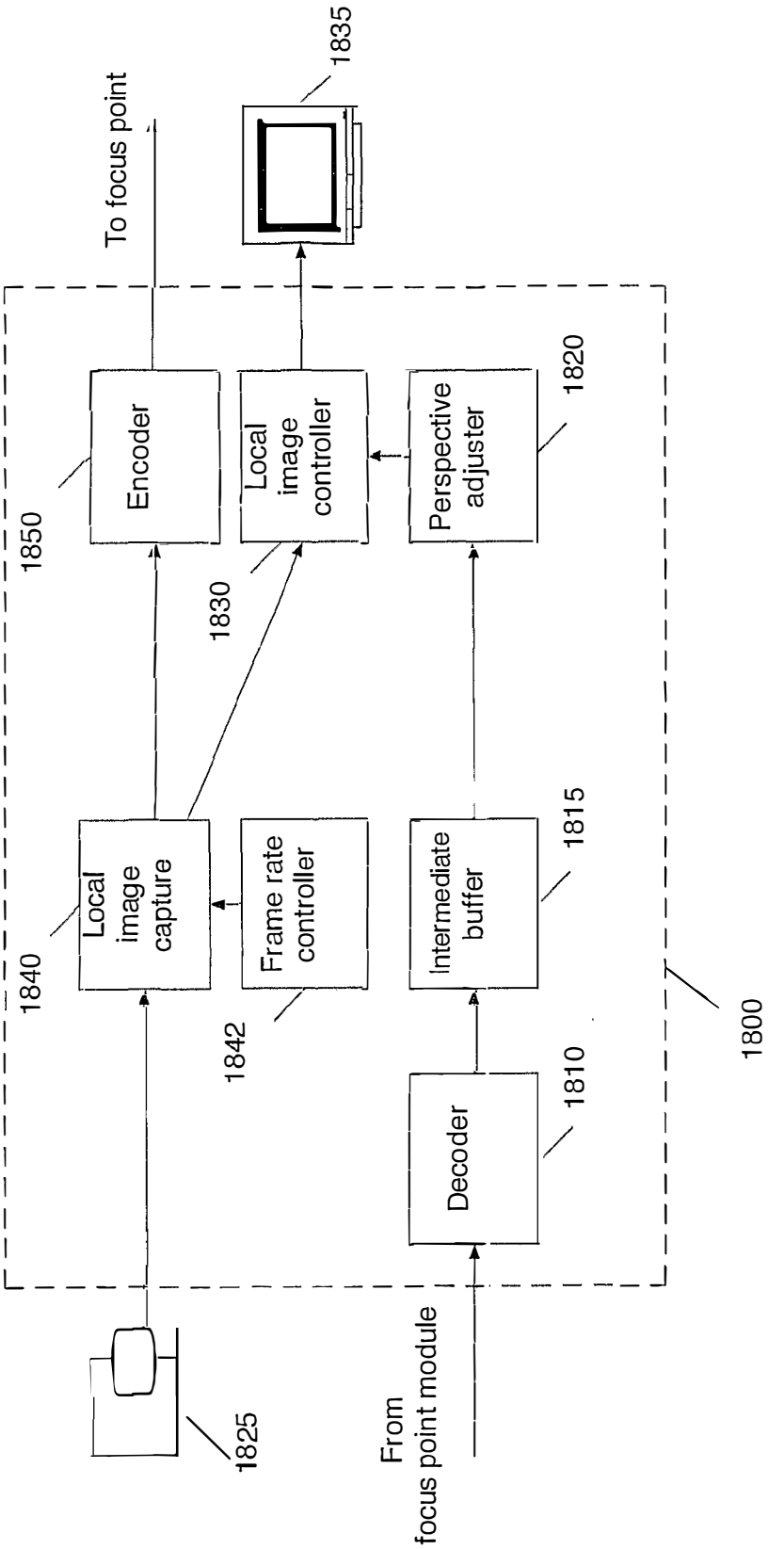

To focus point
1835
Encoder
Local image controller
Perspective adjuster
1820
1850
1830
Local image capture
Frame rate controller
Intermediate buffer
1815
1840
1842
Decoder
1810
1800
1825
From focus point module

Figure 18

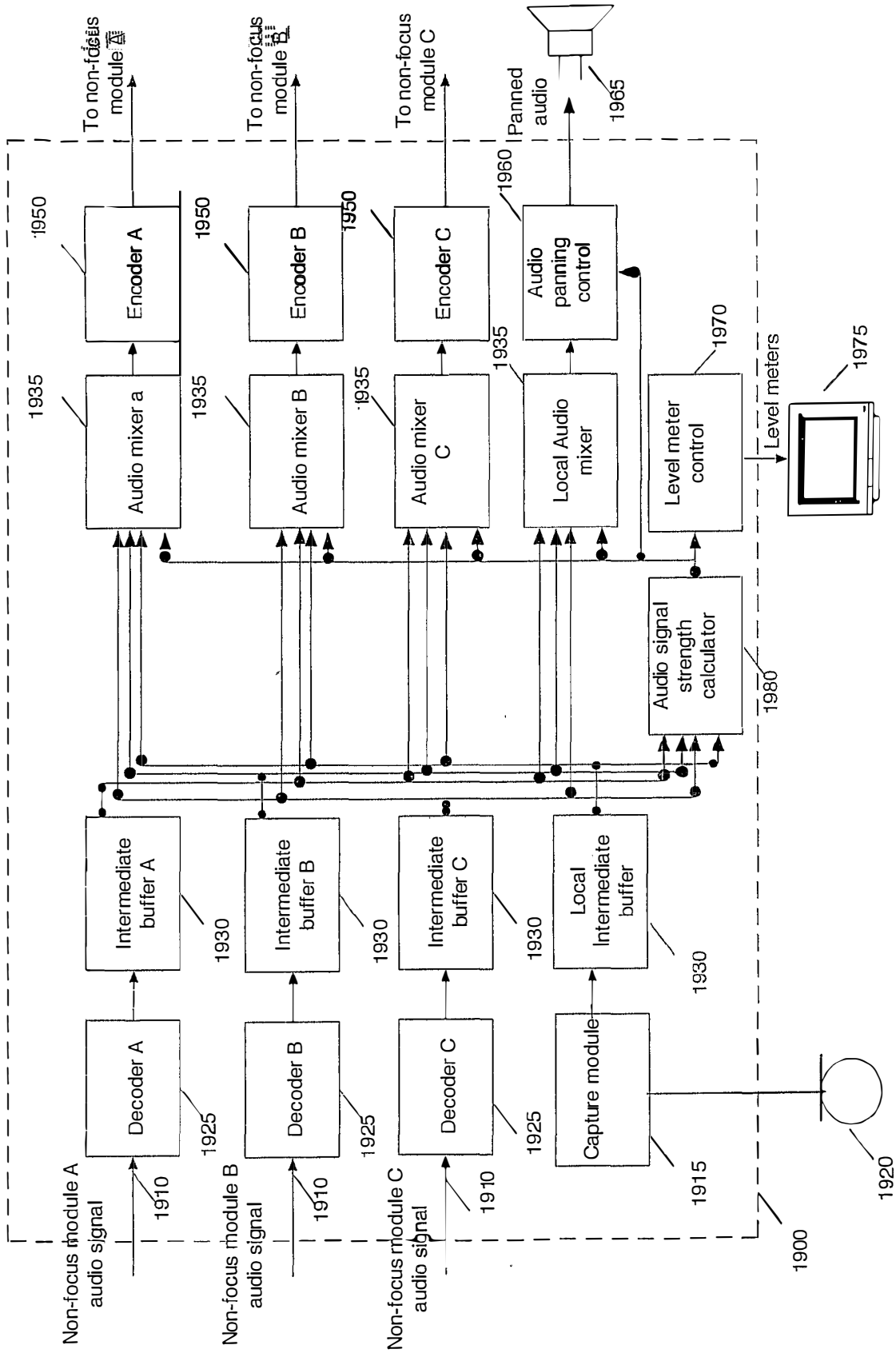

Non-focus module A audio signal
Non-focus module B audio signal
Non-focus module C audio signal
1910
Decoder A
Decoder B
Decoder C
1925
Intermediate buffer A
Intermediate buffer B
Intermediate buffer C
Local Intermediate buffer
1930
Capture module
1915
1920
1900
Audio mixer a
Audio mixer B
Audio mixer 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

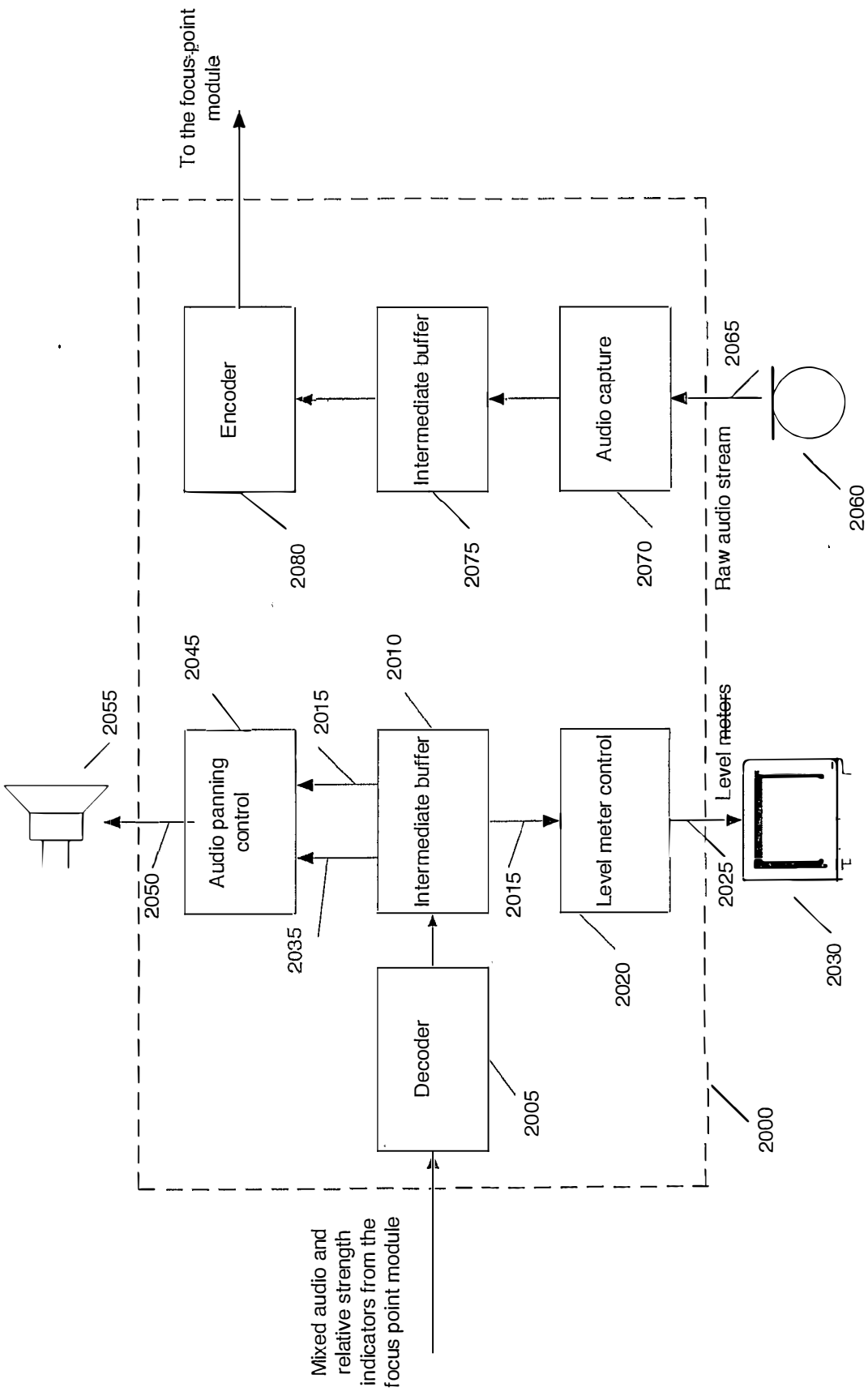

To the focus-point module
Encoder
Intermediate buffer
Audio capture
2065
Raw audio stream
2060
2080
2075
2070
2045
2010
2055
2015
Audio panning control
Intermediate buffer
Level meters
2050
2035
2015
Level meter control
2025
2030
2020
Decoder
2005
2000
Mixed audio and relative strength indicators from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

Figure 20

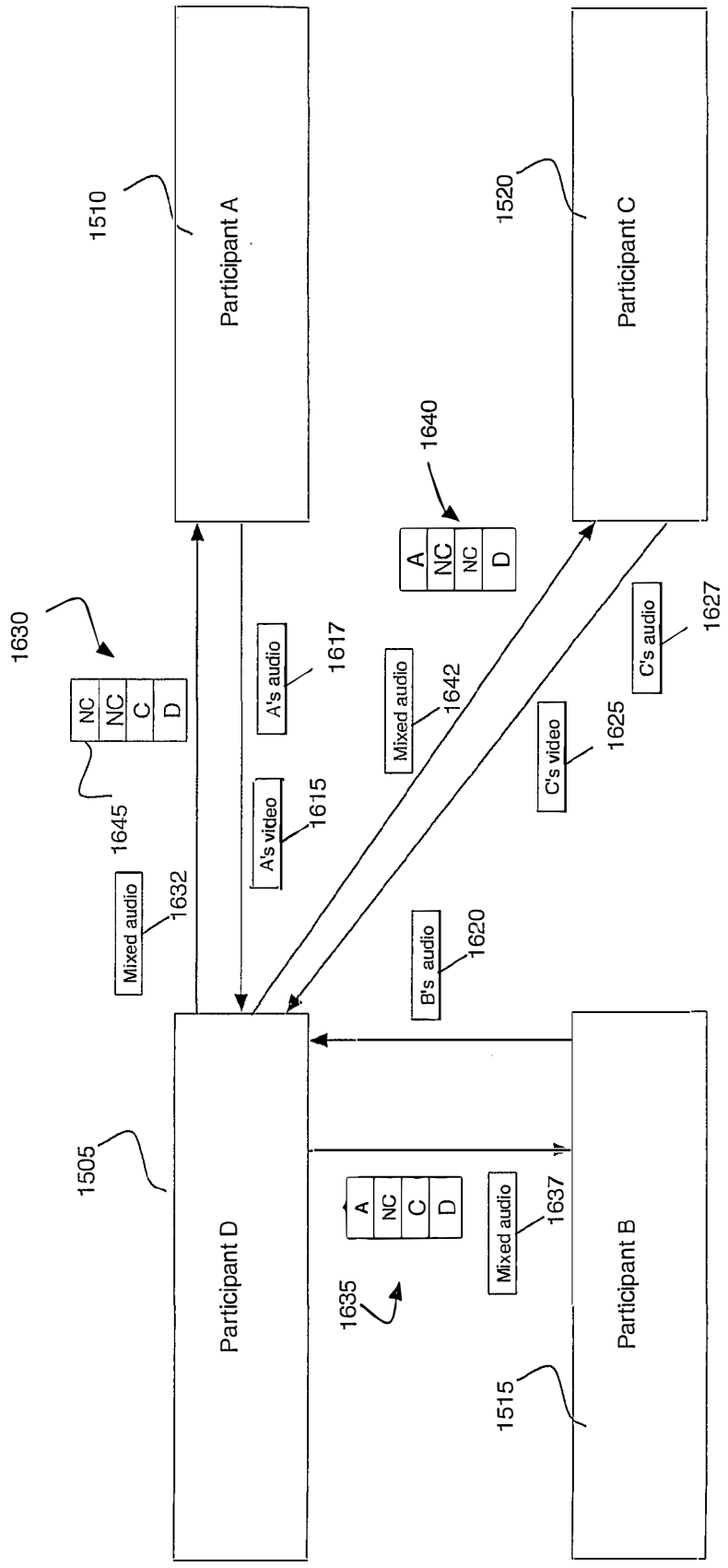

Participant A
1510
Participant C
1520
Participant D
1505
Participant B
1515
1630
NC
NC
C
D
1645
A's audio
1617
A's video
1615
Mixed audio
1632
1640
A
NC
NC
D
Mixed audio
1642
C's audio
1627
C's video
1625
B's audio
1620
1635
A
NC
C
D
Mixed audio
1637

Figure 21

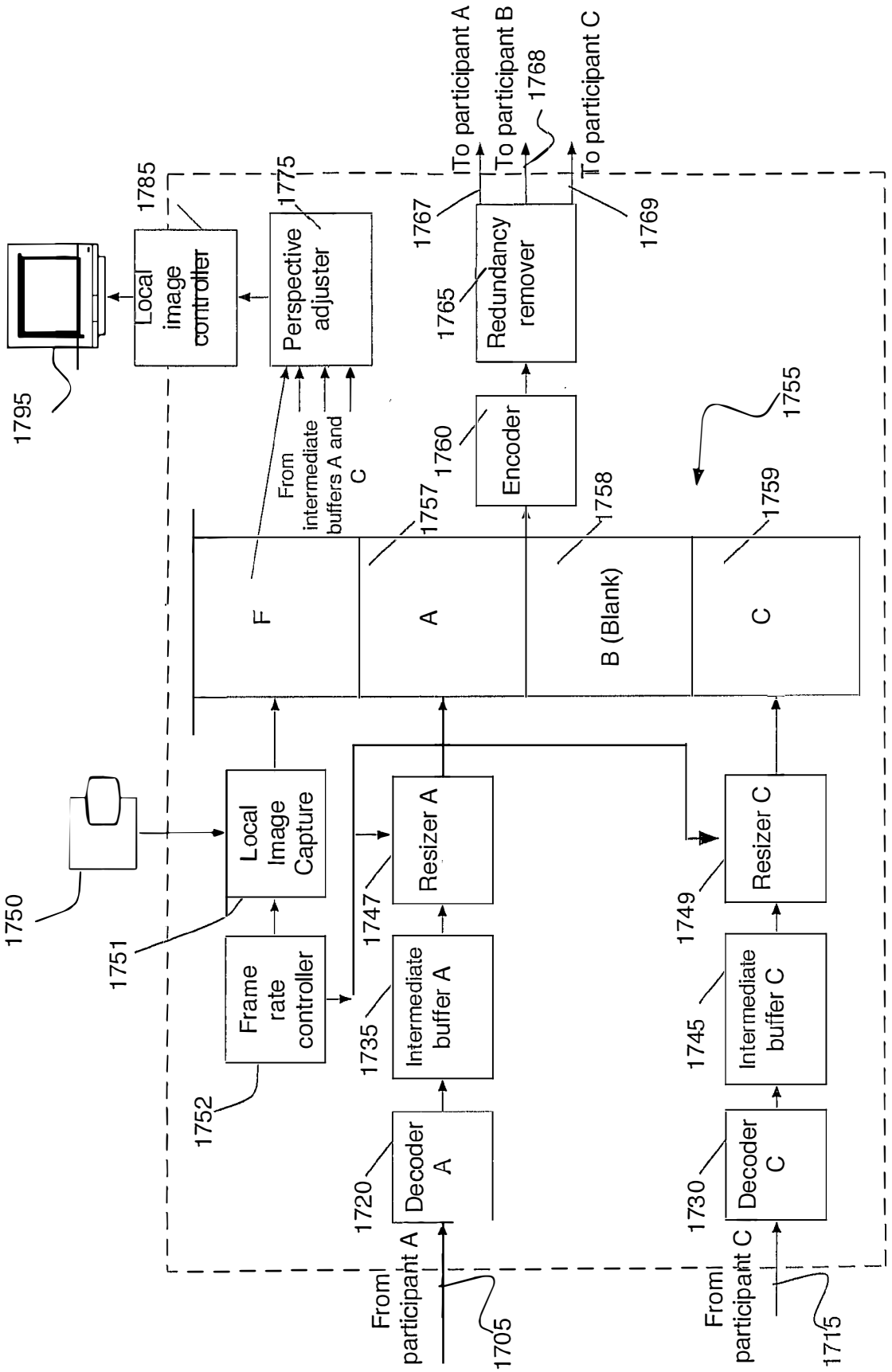

From participant A
From participant C
1705
1715
1720
Decoder A
1730
Decoder C
1735
Intermediate buffer A
1745
Intermediate buffer C
1747
Resizer A
1749
Resizer C
1750
1751
Local Image Capture
1752
Frame rate controller
F
A
B (Blank)
C
1755
1757
1758
1759
From intermediate buffers A and C
1760
Encoder
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

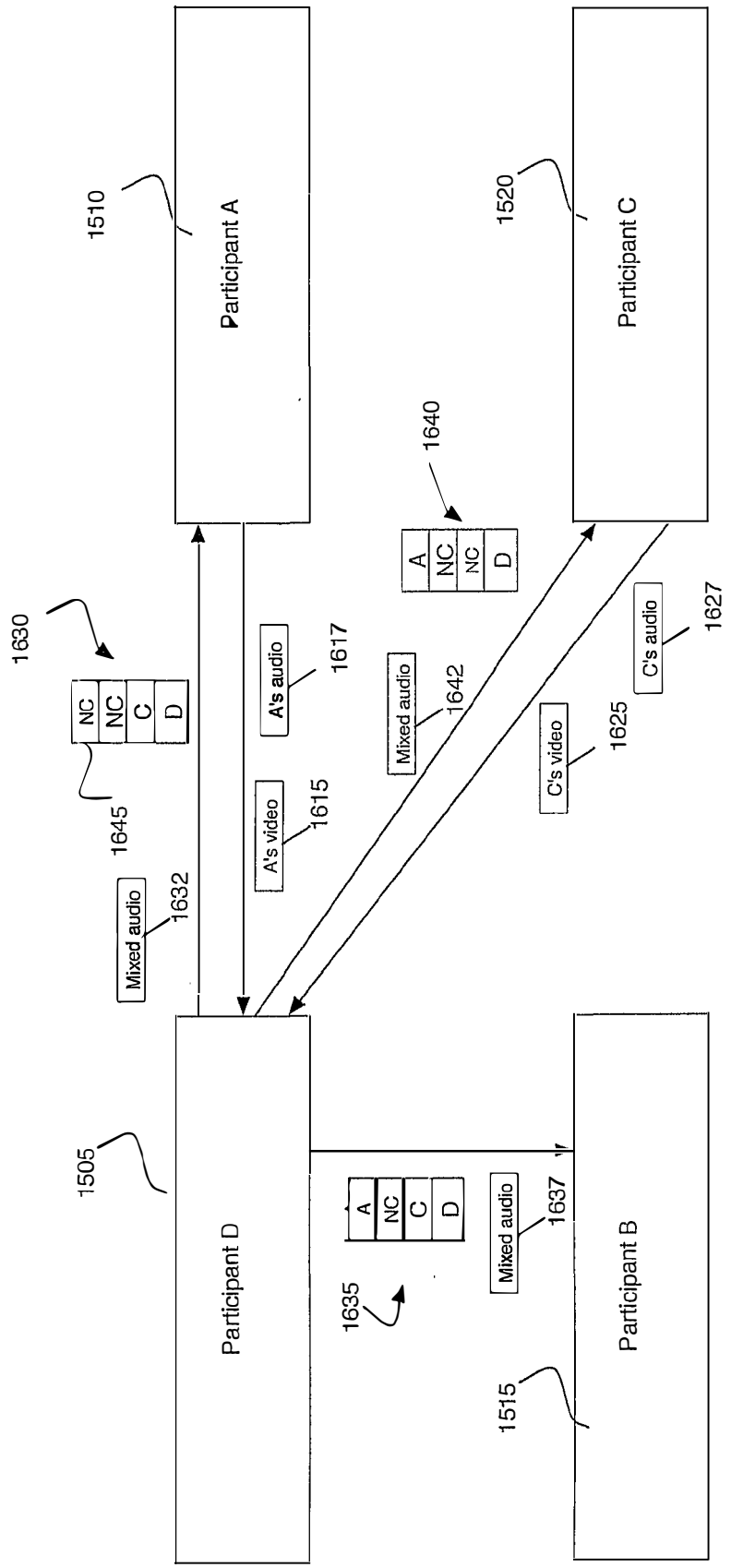

Participant A
1510
Participant C
1520
Participant D
1505
Participant B
1515
1630
NC
NC
C
D
1645
Mixed audio
1632
A's video
1615
A's audio
1617
1640
A
NC
NC
D
Mixed audio
1642
C's video
1625
C's audio
1627
1635
A
NC
C
D
Mixed audio
1637

Figure 23

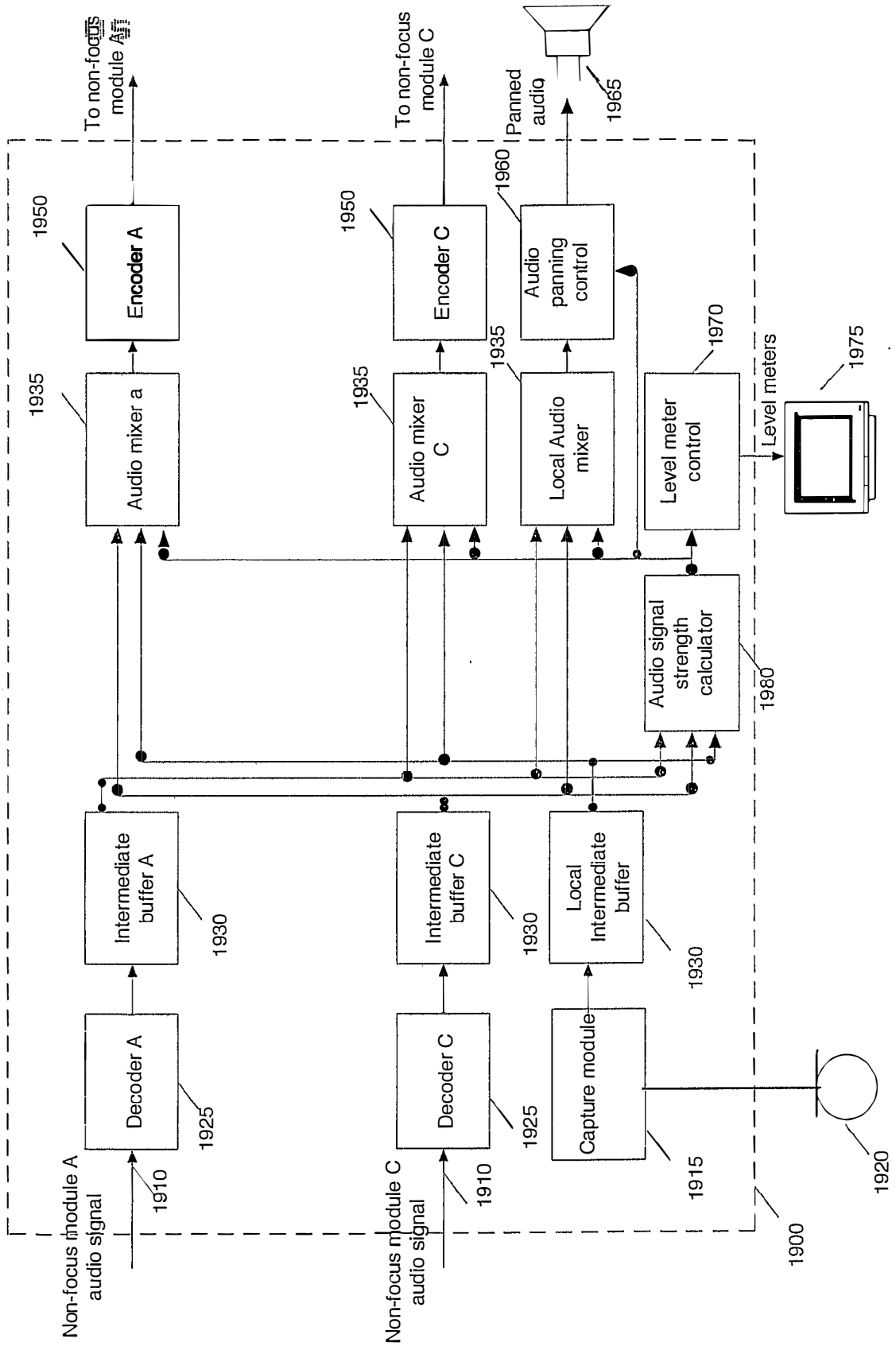

Non-focus module A audio signal
Non-focus module C audio signal
1910
1910
Decoder A
Decoder C
1925
1925
Capture module
1915
1920
Intermediate buffer A
Intermediate buffer C
Local Intermediate buffer
1930
1930
1930
Audio mixer a
Audio mixer C
Local Audio mixer
1935
1935
1935
Encoder A
Encoder C
1950
1950
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:	47496863
Application Number:	17889108
International Application Number:	
Confirmation Number:	2115
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:	REBLP003C21
Receipt Date:	08-FEB-2023
Filing Date:	16-AUG-2022
Time Stamp:	11:14:20
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	REBLP003C21_IDS_2.pdf	23218 ca6dced2cab124f5a6a2e486e64eaa2e896047a6	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	REBLP003C21_1449_2.pdf	28488 b9b6f06534ac46eb92b792b7cca4833df1e39889	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	WO2006092810A2.pdf	3341743 a79f808f204f83b2c957eb1dc4ab3aae0d038afe	no	23
Warnings:					
Information:					
4	Foreign Reference	WO20010110128A1.pdf	8107885 e947b1017f9d86c0d3d786775e24525c29cc51ff	no	70
Warnings:					
Information:					
5	Foreign Reference	WO2007020627A1.pdf	4345795 23a15da1389ada2a2346afe96d7116aaf445a0bc	no	39
Warnings:					
Information:					
6	Foreign Reference	WO2006116750A2.pdf	6594144 c232b8fc4742a3c5743d056d515871aa0c4eafc3	no	74
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7	Non Patent Literature	US16669865_OA_02242020.pdf	1925631 33392c431827177f51a0f40ee4eb5657b6d13e9b	no	39
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9	Non Patent Literature	US16424131_FinalOA_01212021.pdf	747460 2f40a64e5fc7be340896559e11c5d427100eb230	no	25
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10	Non Patent Literature	US17062060_OA_02082021.pdf	8970144 8db751df9394dbd081788abb4945807b938f50bb	no	49
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11	Non Patent Literature	US17977948_OA_01092023.pdf	6113243 58bab8c75818825d60ca09440da7c3c035c97fe3	no	41
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14	Non Patent Literature	US17977963_OA_02062023.pdf	3187568 dcce89644c54e059036bd3aed3ccbfa4ab4ac444	no	41
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15	Non Patent Literature	ScottWerndorferPMQVoll_1001.pdf	612773 06a3e6d62ee96287ba2980c7ee17596408b85906	no	3
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16	Non Patent Literature	ScottWerndorferPMQVoll_1002.pdf	655999 01230c2a019e4f4c5b7c612f162750a8d4f53f21	no	2
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18	Non Patent Literature	ScottWerndorferPMQVoll_1004.pdf	638660 a088aa32ac0b7c6b4aba3984d8af1d8e590cfa7a	no	5
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23	Non Patent Literature	ScottWerndorferPMQVoll_1009_.pdf	149992 967347ff72acac04ae4473a3d9442f861c13a448	no	1

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: KATIS et al.	Attorney Docket No.: REBLP003C21
Application No.: 17/889,108	Examiner: Unassigned
Filed: August 16, 2022	Group: Unassigned
Title: TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS	Confirmation No.: 2115

CERTIFICATE OF EFS-WEB TRANSMISSION

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 February 8, 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. REBLP003C21).

Respectfully submitted,
BEYER LAW GROUP LLP

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	Filing Date	August 16, 2022
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(Use Several Sheets if Necessary)		Page 1 of 1
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U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2010/0027417	02/04/10	Franceschini et al.			06/29/06
	2.						
	3.						
	4.						
	5.						

Foreign Patent or Published Foreign Patent Application

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	6.	WO2007/049165	05/03/07	PCT				
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	8.							
	9.							

Other Documents

Examiner Initial	No.	Author, Title, Place (e.g. Journal) of Publication, Date
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Examiner	Date Considered

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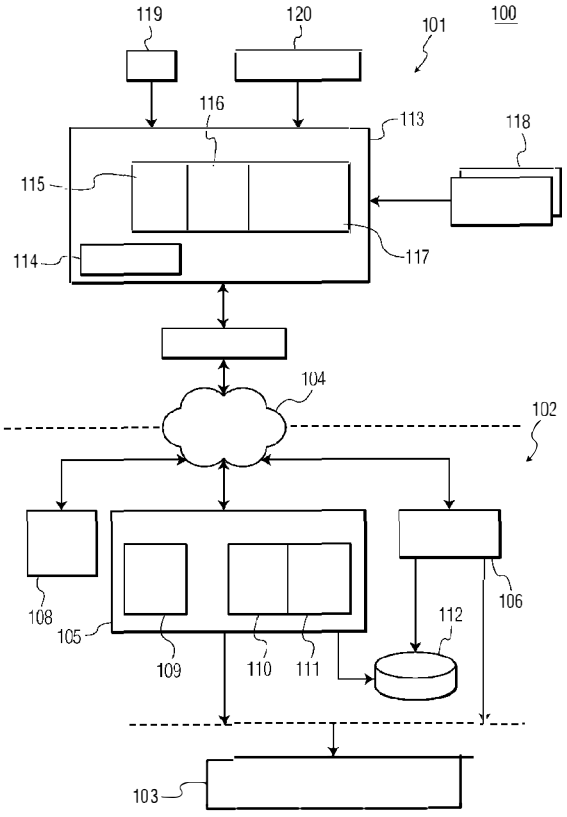
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[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR TRAFFIC FLOW CONTROL OF STREAMING VIDEO



(57) Abstract: A method and apparatus are provided for transmitting streaming video. The method and apparatus include dynamically altering the transmission rate based on bandwidth considerations; or predicting bandwidth availability in a network, or both.

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RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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METHOD AND APPARATUS FOR TRAFFIC FLOW CONTROL OF STREAMING VIDEO

DESCRIPTION

The present application is related to and claims priority from U.S. Patent Application Serial Number 60/730,088 (Atty. Docket 001362) entitled "Interactive Patient Care System" and filed on October 25, 2005. The disclosure of that application is specifically incorporated herein by reference.

Video communications are ubiquitous in present society. In addition to many traditional displays such as television, devices such as computers, personal digital assistants (PDAs) and cellular telephones are adapted to receive video information for display.

Video is often delivered over a network via an internet protocol (IP). One type of video that is often provided over an IP is streaming video. Streaming video is often transmitted over a network. For example, the streaming video may be transmitted over a broadband network. Typically, streaming media is transferred in packets over the network. A short amount of the video, perhaps one second, is buffered locally in a streaming video player to average out fluctuations in the channel. The streaming video player plays the video from the buffer which is often a block of local memory (RAM).

Streaming video can require relatively large bandwidth capabilities for efficient transmission. If the medium between the transmitter and the receiver of the streaming video cannot provide the requisite bandwidth, degradation of the quality of the images may result. This degradation can be

manifest as artifacts and macroblocking, for example. As the disparity between the bandwidth requirements and the bandwidth availability increases, the severity of the video degradation increases. Illustratively, the duration and severity of artifacts can increase.

One approach to ensuring a particular quality of service (QoS) of streaming video is to provide a dedicated endpoint-to-endpoint link for the streaming video. Such a link will ensure a specified bandwidth is maintained. While a dedicated link is useful in providing a guaranteed QoS of streaming video, the use of such a link is reserved for one, or at most a few users. Because each link must be established and equipment is required for each link, the cost and efficiency of such an undertaking is impractical.

There is a need for a method and apparatus for providing streaming video that overcomes at least the shortcomings noted above.

In accordance with an example embodiment, a method of video communication includes transmitting streaming video over a non-dedicated communication link. The method further includes receiving the streaming video and determining a bandwidth change in the link. Furthermore, the method includes altering the rate of the transmitting based on the change.

In accordance with another example embodiment, an apparatus for video transmission and reception includes a media server adapted to transmit streaming video and a video player adapted to receive the streaming video. Based on a bandwidth change in a link between the video player and the media server, the video player is adapted to alter a transmission rate of the streaming video.

In accordance with yet another example embodiment, in a communication system, a method of video communication includes: transmitting streaming video in packets from a media server to a video player at a first transmission rate; determining a number of packets lost in the transmitting; comparing the number of packets lost to a threshold value; and based on the comparing, continuing the transmitting at the first transmission rate or switching the transmitting to a second transmission rate.

In accordance with yet another embodiment, in a communication system, a method of video communication, includes estimating a bandwidth capacity for one or more paths of the video communication. The method also includes based on the estimating, selecting a transmission rate for each of the paths; and transmitting streaming video from a media server to a video player along each path at the selected transmission rate.

The invention is best understood from the following detailed description when read with the accompanying drawing figures. It is emphasized that the various features are not necessarily drawn to scale. In fact, the dimensions may be arbitrarily increased or decreased for clarity of discussion.

Fig. 1 is a simplified block diagram of a patient information system in accordance with an example embodiment.

Fig. 2 is a flow-diagram of a method in accordance with an example embodiment.

Fig. 3 is a flow-diagram of a method in accordance with an example embodiment.

Fig. 4 is a flow-diagram of a method in accordance with an example embodiment.

In the following detailed description, for purposes of explanation and not limitation, example embodiments disclosing specific details are set forth in order to provide a thorough understanding of the present teachings. However, it will be apparent to one having ordinary skill in the art having had the benefit of the present disclosure that other embodiments that depart from the specific details disclosed herein. Moreover, descriptions of well-known devices, hardware, software, methods, systems and protocols may be omitted so as to not obscure the description of the example embodiments. Nonetheless, such hardware, software, devices, methods, systems and protocols that are within the purview of one of ordinary skill in the art may be used in accordance with the example embodiments. Finally, wherever practical, like reference numerals refer to like features.

The example embodiments described relate to a patient information system in which streaming video may be provided to a patient. The patient information system may be as described in the above-referenced application. However, the present teachings are not limited to patient information system applications. To this end, other applications of the present teachings are contemplated and such applications may be effected in embodiments unrelated to patient information systems. For example, the methods and apparati of the present teachings may be implemented in entertainment applications, non-medical educational video services, and video gaming. Beneficially, the methods and apparati of the present teachings result in the communication of streaming video that at most minimally interferes with the QoS of other users of a network.

Fig. 1 is a simplified block diagram of a patient information system 100 in accordance with an example embodiment. The system 100 includes a patient system 101, a

server 102 and a clinician terminal 103. The server 102 and the patient system 101 are in communication via a network 104. The link between the network and the patient terminal is illustratively in accordance with a known internet protocol (IP). The network 104 may be a broadband network over coaxial cable or over a fiber-optic link. In either case, known components and software may be implemented to realize the networks. For example, in a fiber-optic network equipment such as transceivers would be provided and in the broadband cable network, equipment such as cable-modems would be provided.

Alternatively, the network 104 may be a wireless network or a digital subscriber line (XDSL) network. The wireless network would include the infrastructure specified by the protocol of the system. For example, the wireless network could be in compliance with the IEEE 802.11, or its progeny, or compliance with proposed IEEE 802.22, often referred to as spectrum agile radio systems (SARS). The XDSL network would be implemented over plain old telephone service (POTS) lines with the requisite XDSL infrastructure.

The clinician terminal 103 may be a personal computer having the requisite presentation layer software (user interface software) for interfacing with the server 102, the network 104 and the patient system 101. The terminal 103 may be connected to a server 102 through a known intranet connection, such as a wired or wireless connection. The server 102, which may be referred to as a host center, and the intranet connection are well-known to one skilled in the art of information technology and as such are not described in detail to avoid obscuring the description of the embodiments.

In the example embodiment presently described, in the interest of simplicity of description, one patient system

101, one server 102 and one clinician terminal 103 are shown and described. However, it is contemplated that the patient information system 100 includes a plurality of the patient systems 101, a plurality of servers 102 and a plurality of clinician terminals 103 as needed.

The server 102 includes a processor 105. The server 102 also includes a measurement server 106, a device database 112 and a media delivery server 108. In an example embodiment, the server 102 may be an integrated component of hardware, software and firmware. Communications between the network 104 and the processor 105 and the network 104 and the measurement server 106 are illustratively in accordance with the hypertext transfer protocol (HTTP). Many features of the servers 106-108 are common to and described in detail in the above-referenced application. Certain salient features are provided herein.

The measurement server 106 receives the measurement data from the patient system 101 via the network. These data are analyzed at the measurement server for appropriate action by the clinician. The data garnered from the measurement server 106 are provided via an SQL link to the database 112. In addition, the measurement server 106 provides the measurement analysis (e.g., reports or digests) to the clinician terminal 103 via the intranet.

The media delivery server 108 provides the streaming video as well as information in other formats to the patient information system 101. The streaming video may be in accordance with the real time streaming protocol (RTSP), or the real time protocol (RTP) or the real time control protocol (RTCP).

The processor 105 includes a configuration server 109, a set-top box (STB) server 110 and a STB loader server 111. The

details of these components are found in the incorporated application referenced above.

Due to the sensitivity of the information being transferred between the clinician and the patient, the links between the terminal 103, the server 102 and the patient system 101 are beneficially secure. In a specific embodiment, the connection includes encryption and other known security measures to provide a virtual private network (VPN) in accordance with the virtual private network consortium (VPNC). In this manner, the secure link may be provided via public access links, such as telephone and coaxial cable lines. Alternatively, if a wireless local area network wireless (LAN) or wireless wide are network (WAN) are used in any of the links of the example embodiments, known encryption and security measures may be implemented to ensure that information transmitted over the link is secure.

The patient system 101 includes a control module 113 that may be an STB as described in the above-referenced application. Notably, the control module 113 may be referred to as a video player. In a specific embodiment, the control module 113 converts and displays streaming video from the media delivery server 108. The control module also includes firmware 114, an STB loader 115, a TV user-interface (UI) 116 and a measurement gateway 117.

The firmware 114 and the STB loader are adapted to decode streaming video from the media delivery server 108. The hardware, software and firmware required for this decoding is specific to the protocol used for transmission of the streaming video.

A plurality of measurement devices 118 may be included, but not in all systems. The measurement devices may be coupled to the client module 113 by a wired or wireless link. The control module also is coupled to a video display 119 and

may be controlled by a remote control device 120. Details of the components and functions of the patient system 101 are described more fully in the above-referenced application.

Fig. 2 is a flow-diagram of a method of streaming video traffic control in accordance with an example embodiment. The method is best understood when reviewed in conjunction with Fig. 1 as well. Common details are generally not repeated so as to avoid obscuring the description of the present example embodiments.

At step 201, the patient system 101 receives streaming video. In a specific embodiment, the streaming video is digitized video packet data transmitted in accordance with the RTSP protocol from the media delivery server 108. The decoding of these data is known to one skilled in the art.

At step 202, the patient system 101 determines that a change in the transmission bandwidth of the streaming video link has occurred. The determination of the change in the transmission bandwidth may be accomplished by a number of methods. Illustratively, the firmware 114 and loader 115 of the STB 113 include a decoder. The decoder is adapted to determine the number and severity of artifacts present in a streaming video signal from the media delivery server 108. If there are artifacts, the media delivery server 108 and the network 104 are presently unable to meet the bandwidth of the decoder. Thus, the media delivery server 108 and the network 104 are unable to provide digitized streaming video at a rate required by the control module 113 (video player) to generate uninterrupted video images, and the decoder detects this failure. Alternatively, the bandwidth capability of the media delivery server 113 and the network 104 may be increased. In this case, the control module 113 detects the under-use of capacity.

At step 203, the media delivery server 108 alters the transmission rate. The altering of the transmission rate of the streaming video may be effected to achieve different goals. In one example embodiment, the STB 113 provides a message to the media delivery server 108 that the transmission rate of the streaming video is too great for the present capacity of the network. With this error message, the STB 113 may include a command to transmit at a lower data rate.

In a specific embodiment, the media delivery server 108 is adapted to provide multiple streams of video simultaneously and substantially synchronized. Each stream is provided at a different transmission rate; but only one of the streams may be transmitted to the STB 113 at a time. If the current stream is too great for present network capacity, the command from the STB 113 will include an instruction to switch to a specified lower transmission rate. Moreover, the different video streams may include indices or markers identifying particular frames of the streaming video. The command would identify a next marker at which to switch to the streaming video of a lower transmission rate. At the switch, the media delivery server 108 will transmit the selected streaming video to the network 104 for delivery to the STB 113.

As noted previously, the STB 113 is adapted to detect transmission errors. In a specific embodiment, a header is provided in the stream of video packets. The header will include the duration and transmission rate of the streaming video. If the packets of streaming video are not arriving at the prescribed data rate, or if certain packets do not arrive at the STB 113, or both, the STB 113 will algorithmically determine the rate of transmission, or quantify the number of packets lost in a particular period of time, or both. After

this determination, the STB 113 algorithmically determines a lower rate of transmission.

An error message is then sent to the media delivery server 108 with instructions on an action to be taken. Illustratively, the action may include instructing the server 104 to transmit another of the simultaneous video streams at a defined index point. Alternatively, the action may instruct the server 104 to terminate transmission if the bandwidth capability is insufficient to maintain transmission of the streaming video.

At the termination of step 203, the process may be repeated beginning at step 201.

Among other benefits, the methods of the example embodiments foster providing a suitable streaming video QoS to the patient. Notably, if the service is lowered, it is acceptable; and if insufficient bandwidth does not exist presently, the video may be viewed at a later time when the network 103 and server 108 can maintain at least a minimum transmission rate. Moreover, the termination of service will reduce the loading of the network 104 and server 108. As such other users in the network 104 will have improved service. For example, terminating one video stream for a time may suffice to allow the transmission of other video streams at full or reduced transmission rates.

Fig. 3 is a flow-diagram of a method of streaming video traffic control in accordance with an example embodiment. The method is best understood when reviewed in conjunction with Fig. 1 as well. Common details are generally not repeated so as to avoid obscuring the description of the present example embodiments.

At step 301, the media delivery server 108 extracts a measure of the packet loss rate of streaming video packets transmitted from the media delivery server 108 to the patient

system 101. The method of determining packet loss may be a known method. Illustratively, known techniques of compiling packet-loss statistics from the receiver (e.g., the STB 113) may be implemented via the chosen protocol. For example, RTP or RTSP protocols provide for determining packet loss statistics at the receiver of the packets. According to an example embodiment, these data may be provided to the media delivery server 108.

At step 302, the packet loss data is compared to a threshold value. In an example embodiment, the media delivery server 108 is adapted to algorithmically compare the packet loss data with the threshold value. Notably, there may be more than one threshold value, with each value corresponding to a particular transmission rate. Based on the comparison, the algorithm would determine if any change in the transmission rate is required to maintain a particular QoS; and if a change is required to select the transmission rate most closely related to one of the threshold values.

For purposes of illustration, suppose there are three threshold values of packet loss rate, T1, T2 and T3, where T1 represents the greatest threshold (lowest transmission rate) and T3 represents the lowest threshold (highest transmission rate). Suppose that the packet loss data were between T1 and T2. Because selecting the highest transmission rate (corresponding to the highest transmission rate) would result in an unacceptable QoS, the server would select the transmission rate corresponding to the second threshold T2. In this manner, the QoS would be acceptable. If the server 108 were already transmitting at this 'mid' data rate, no change would be required. If the server 108 were transmitting at a higher data rate, the server 108 would change the transmission rate to the middle transmission rate. Finally, if the server 108 were transmitting at a lower data

rate, the server 108 would change its transmission rate to a higher data rate.

In an example embodiment, the determination of packet loss of other error correction technique may be carried out based on a number of criteria. For example, sampled transmissions to determined packet loss may be carried out at predetermined time intervals or at specified times; or may be based on data based, such as at selected data points. In addition, the sampling rate may be governed by the most recent error data. To this end, if the packet loss data from a most recent sample is near a threshold, the sampling rate may be increased as the likelihood of reaching the threshold level may also be increased.

At step 303, if the packets lost value is at or above the threshold, the method continues to step 304. At step 304, the server will switch to another transmission rate based on the analysis of step 302. If at step 303, the packets lost value is below the threshold, the method continues to step 305. The server will continue to transmit the streaming video at the same rate. At the end of steps 304, 305 the method repeats beginning at step 301.

Fig. 4 is a flow diagram of a method of streaming video communication in accordance with an example embodiment. Unlike the methods described to this point, which were dynamic in nature, the present method is more predictive. The method is best understood when reviewed in conjunction with Fig. 1 as well. Common details are generally not repeated so as to avoid obscuring the description of the present example embodiments. Notably, combined methods and apparati for transmitting streaming video incorporating aspects of both the dynamic and the predictive methods of the example embodiments are contemplated.

At step 401, the bandwidth capacity of one or more of the paths between the media delivery server 108 and the STB 113 are estimated. In one embodiment, a static gross map of potential congestion of data traffic in the paths is determined. In another embodiment, the potential congestion may be computed based on expected data traffic loading for each path. The static map or the function are illustratively based on locations of receivers (e.g., STBs 113) and network information such as IP addresses and pathchar function call results.

At step 402, based on the estimate, the transmission rate (bitrate) for a video stream or a group of video streams may be determined. Notably, the estimate will provide capacity levels for data transmission for each path. Illustratively, the server 108 selects a transmission rate commensurate with the loading capacity of the paths.

At step 403, the streaming video is transmitted at the selected transmission rate. In an embodiment, a sequence of streams are transmitted at selected transmission rates based on the predicted traffic loading of the paths between the server 108 and the STB 113 at the time of transmission of each video stream.

In view of this disclosure it is noted that the various methods and devices described herein can be implemented in hardware and software. Further, the various methods and parameters are included by way of example only and not in any limiting sense. In view of this disclosure, those skilled in the art can implement the present teachings in determining their own techniques and needed equipment to effect these techniques, while remaining within the scope of the appended claims.

CLAIMS

1. A method of video communication, comprising:

transmitting streaming video over a communication link;

receiving the streaming video (201);

determining a bandwidth change in the link (202); and

altering a rate of decoding the streaming video based on the bandwidth change (203).

2. A method as recited in claim 1, wherein the altering further comprises reducing the rate (304) of the transmitting if the bandwidth change is negative.

3. A method as recited in claim 1, wherein the altering further comprises terminating the transmitting (304) if the bandwidth change results in a bandwidth that is less than a minimum value.

4. A method as recited in claim 1, wherein the altering further comprises:

simultaneously providing more than one video stream of the streaming video and each of the video streams is provided at a different transmission rate; and

based on the bandwidth change, switching to another of the video streams that is transmitted at a lower transmission rate.

5. A method as recited in claim 1, wherein the altering further comprises:

simultaneously providing more than one video stream of the streaming video and each of the video streams is provided at a different transmission rate; and

based on the bandwidth change, switching to another of the video streams that is transmitted at a higher transmission rate.

6. A method as recited in claim 4, further comprising:

including indices at selected points of each of the video streams; and effecting the switching at a next index of the another video stream.

7. An apparatus for video transmission and reception, comprising:

a video player (113), which receives streaming video and, based on a bandwidth change, alters a transmission rate of the streaming video.

8. An apparatus as recited in claim 7, wherein the video player reduces the transmission rate if the bandwidth change is negative.

9. An apparatus as recited in claim 7, wherein the video player terminates transmission of the streaming video.

10. An apparatus as recited in claim 7, wherein a media server (108) simultaneously provides more than one video stream of the streaming video and each of the video streams is provided at a different transmission rate and the video player is adapted to select one of video streams based on the bandwidth change.

11. An apparatus as recited in claim 7, wherein the video player is a component of a patient information system (100) and the media server is a component of a host center (102).

12. In a communication system, a method of video communication, comprising:

transmitting streaming video in packets from a media server to a video player at a first transmission rate;

determining a number of packets lost (301) in the transmitting;

comparing the number of packets lost (302) to a threshold value; and

based on the comparing, continuing the transmitting at the first transmission rate (305) or switching the transmitting to a second transmission rate (304).

13. A method as recited in claim 12, wherein the second transmission rate is less than the first transmission rate.

14. A method as recited in claim 12, wherein the wherein the second transmission rate is greater than the first transmission rate.

15. A method as recited in claim 12, wherein the video player is a component of a patient information system (100) and the media server is a component of a host center.

16. In a communication system, a method of video communication, comprising:

estimating a bandwidth capacity for one or more paths of the streaming video communication (401);

based on the estimating, selecting a transmission rate for each of the paths (402); and

transmitting streaming video from a media server to a video player along each path at the selected transmission rate (403).

17. A method as recited in claim 16, wherein the estimating further comprises:

compiling a static gross map of the paths of the system; and

predicting locations on the map where traffic congestion may occur.

18. A method as recited in claim 16, wherein the estimating further comprises:

computing a function of expected traffic loading for each of the paths of the system.

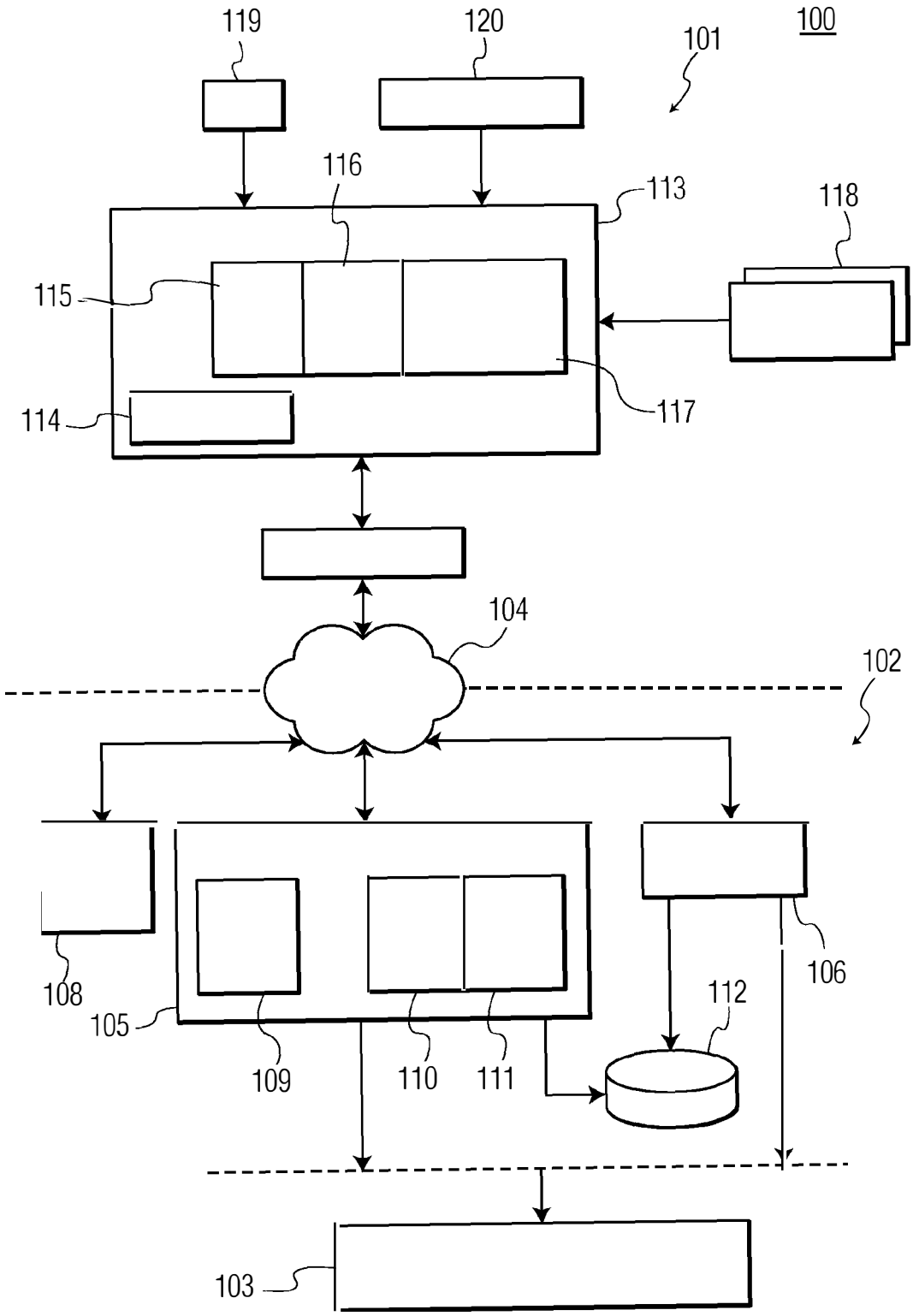

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FIG. 1

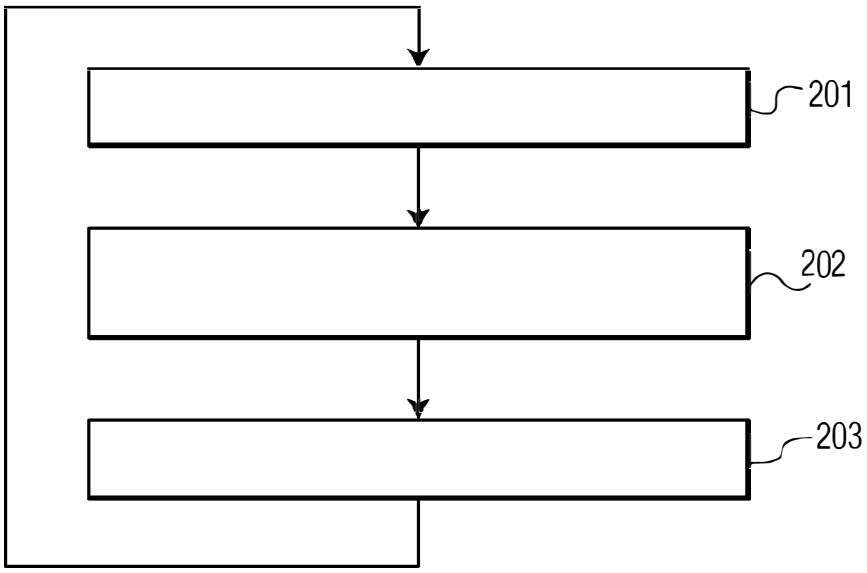


FIG. 2

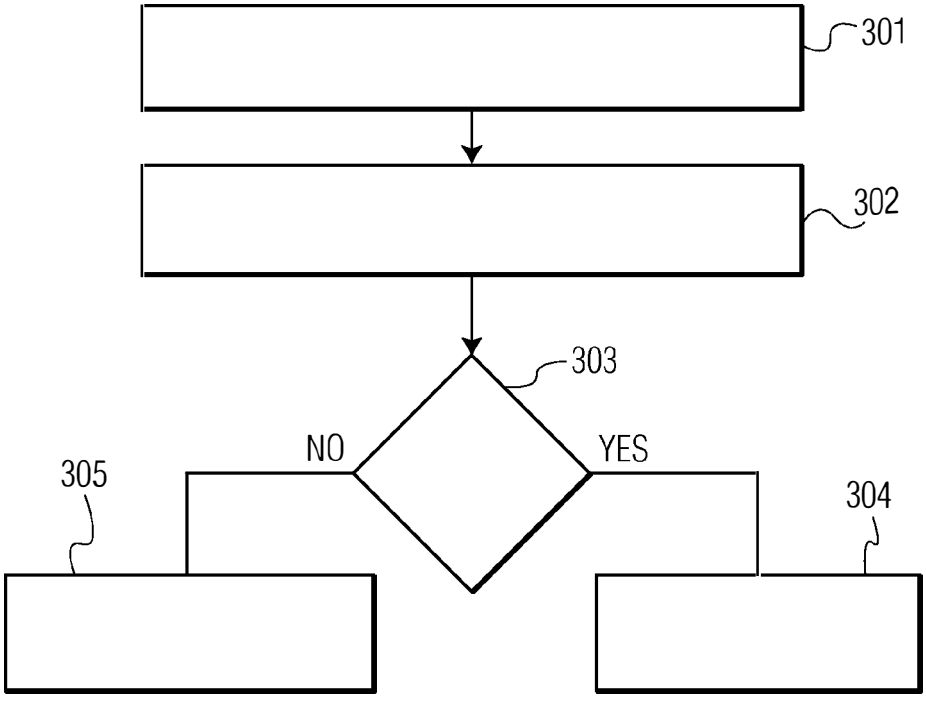


FIG. 3

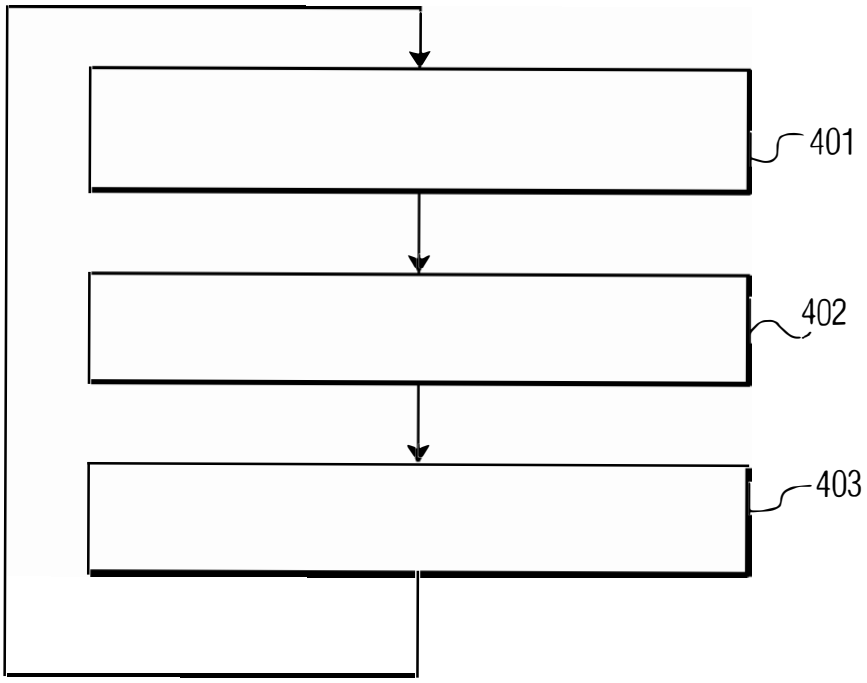


FIG. 4

Electronic Acknowledgement Receipt

EFS ID:	47574175
Application Number:	17889108
International Application Number:	
Confirmation Number:	2115
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/Cara Hedin
Filer Authorized By:	James W. Rose
Attorney Docket Number:	REBLP003C21
Receipt Date:	22-FEB-2023
Filing Date:	16-AUG-2022
Time Stamp:	18:04:59
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	REBLP003C21_IDS_3.pdf	23213 b521ce6b740ebaeae6d249e97e82f4b729b17dfb	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	REBLP003C21_1449_3.pdf	22974 b05afc19a33110c1116568bd0262089a6f92e923	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	WO2007049165A2.pdf	2766944 0cbaaf5ba6f536c61172e90c72347b0dabf5ba79	no	22
Warnings:					
Information:					
		Total Files Size (in bytes):	2813131		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: KATIS et al.	Attorney Docket No.: REBLP003C21
Application No.: 17/889,108	Examiner: Unassigned
Filed: August 16, 2022	Group: Unassigned
Title: TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS	Confirmation No.: 2115

CERTIFICATE OF EFS-WEB TRANSMISSION

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 February 8, 2023.

Signed: /Cara Hedin/
Cara Hedin

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. REBLP003C21).

Respectfully submitted,
BEYER LAW GROUP LLP

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

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Palo Alto, CA 94303-1887
650-842-1300

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/889,108	Filing Date 08/16/2022	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $240 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	03/15/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37CFR 1.16(i))	* 43	Minus	** 43	= 0		x $40 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x $192 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/TINA J BARDEN/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: KATIS et al.	Attorney Docket No.: REBLP003C21
Application No.: 17/889,108	Examiner: Unassigned
Filed: August 16,2022	Group: Unassigned
Title: TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS	Confirmation No.: 2115

CERTIFICATE OF EFS-WEB TRANSMISSION
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 March 15, 2023.
Signed: /Cara Hedin/
Cara Hedin

SECOND PRELIMINARY AMENDMENT

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

Dear Commissioner:

It is requested that the amendments as provided herein be entered prior to examination.

Amendments to the drawings, which begin on page 2 of this paper.

Amendments to the specification, which begin on page 3 of this paper.

Amendments to the Claims are reflected in the listing of claims, which begin on page 4 of this paper.

Remarks begin on page 11 of this paper.

Amendments to the Drawings

Substitute copies of Fig. 2A, Fig 2B and Fig. 3 are submitted herewith. Fig. 2A, Fig 2B and Fig. 3 have been amended so that reference numerals 25a, 20b, 20c, 25b and 20a are now orientated in the same direction as the figure(s). No new matter has been added.

Amendments to the Specification

Please amend the specification as follows:

On page 16 after paragraph [0071], please add the following paragraph:

[0072] **Broadcast:** a message can be designated by a sender as a broadcast. For example, the leader of a team can be giving updates (e.g., a Fire Chief) without the whole team hearing, or he can broadcast updates to everyone. Any urgent transmissions by his team members inside the building ("Look out, the floor is going to collapse!") override his non-essential side conversations and are played immediately. The push to talk buttons could be designed to have multiple levels of priority (e.g., push it in halfway for a normal priority transmission and all the way for an urgent or emergency one).

On page 31, please amend paragraph [0125] as follows:

[0125] The MCMS server application 80 is a multi-tiered architecture including a MCMS Database Module 20a, a Store and Stream (SAS) Module 20b, a Messaging/Signaling Module 20c, Conversations/Messages management services 20f, Priority services 20g, Contacts (including User and Authentication) services 20h, Presence/Status service 20i, and Messages/Signals services 20**j**. The aforementioned modules and services of the application 78 are similar or the same as the modules and services having like reference numerals as the Client 12, and therefore are not described in detail herein, except for one notable exception. In various embodiments, the MCMS server application 80 and Store and Stream module 84, including the MCMS database 82, is configured to support many Users in one instance of the application. The one instance may be further configured to support multiple domains, where each domain is defined as a group of Users (i.e., a corporation or other group of Users belonging to a common organization). This architecture allows each application 78 on Server 16 to serve multiple users (or domains), where each user (or domain) is not visible to other Users. This partitioning is referred to as "multi-tenancy".

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1.-3. (Cancelled)

4. (Currently Amended) A method comprising:

maintaining a ~~server~~ **communication** infrastructure on a network;

receiving, at the ~~server~~ **communication** infrastructure, information from an initiating participant of a multi-media conversation, the information ~~indicative of~~ **used by the communication infrastructure for ascertaining and notifying** one or more second participants ~~invited for participation~~ **to join** in the multi-media conversation;

receiving, at the ~~server~~ **communication** infrastructure, video media of a video message associated with the multi-media conversation, the video media streamed by a first client device associated with the initiating participant;

selectively streaming, via the ~~server~~ **communication** infrastructure, at least portions of the video media of the video message to one or more second client devices associated with the one or more second participants respectively,

the selective streaming of the video media of the video message by the ~~server~~ **communication** infrastructure enabling the one or more second participants to selectively render the at least portions of the video media of the video message in a real-time mode:

(a) while the video media of the video message is ~~being~~ streamed by the first client device; and

(b) without first setting up an end-to-end connection over the network between the first client device and any of the one or more second client devices respectively; and

enabling ~~any of the initiating participant or~~ the one or more second participants **that have joined the multi-media conversation** to selective participate in the multi-media conversation by any one or a combination of:

(i) selectively rendering the video media of the video message in the real-time mode or a time-shifted mode;

(ii) selectively adding to the multi-media conversation one or more additional messages that is/are associated with the video message~~, the one or more additional messages containing one or more types of media~~; and

(iii) selectively rendering the one or more additional messages that is/are associated with the video message.

5. (Previously Presented) The method of claim 4, wherein the adding of at least one of the one or more additional messages overlaps with the streaming of the video media of the video message by the first client device.

6. (Currently Amended) The method of claim 4, wherein the selective participation includes simultaneously rendering:

the video media of the video message in the real-time mode; and

the one or more additional messages that **is/**are added while the video media of the video message is ~~**being**~~ streamed by the first client device.

7. (Currently Amended) The method of claim 4, wherein the selective participation includes simultaneously rendering:

the video media of the video message in a time-shifted mode; and

the one or more additional messages ~~**that have been**~~ added to the multi-media conversation.

8. (Previously Presented) The method of claim 4, wherein the adding of at least one of the one or more additional messages occurs after the streaming of the video media of the video message by the first client device is complete.

9. (Previously Presented) The method of claim 4, further comprising enabling adding any of the one or more additional messages associated with the multi-media conversation during or after any of:

(c) the streaming of the video media of the video message by the first client device;

(d) the rendering of the video media of the video message in the real-time; or

(e) the rendering of the video media of the video message in the time-shifted mode.

10. (Currently Amended) The method of claim 4, wherein the one or more additional messages are organized and listed in a time-order in which the one or more additional messages were ~~**individually**~~ added to the multi-media conversation **respectively**.

11. (Currently Amended) The method of claim 4, wherein the one or more **additional messages may selectively** ~~**types of media**~~ include: voice; video; photo; text; location data; sensor data; image; or other data.

12. (Cancelled)

13. (Currently Amended) The method of claim 4, further comprising ascertaining, by the ~~server~~ **communication** infrastructure**[[,]]** one or more IP address(es) for the one or more second client devices.

14. (Cancelled)

15. (Cancelled)

15. (Cancelled)

16. (Previously Presented) The method of claim 4, further comprising:

enabling the initiating participant to initiate multiple multi-media conversations by creating and disseminating multiple video messages, each of which may be selectively rendered in the real-time mode or the time-shifted mode and each has a string of one or more additional messages associated therewith; and

enabling the initiating participant to selectively switch participation among the multiple multi-media conversations.

17. (Previously Presented) The method of claim 4, further comprising:

tagging the multi-media conversation using one or more tags; and

enabling the multi-media conversation to be searchable using the one or more tags.

18. (Previously Presented) The method of claim 4, further comprising transcoding the video media of the video message from one encoding format as streamed by the first client device to one or more second encoding format(s) suitable for rendering on the one or more second client devices respectively.

19. (Currently Amended) The method of claim 4, further comprising:

ascertaining packet loss along a delivery route over the network to a select second client device;

ascertaining an available bandwidth along the delivery route over the network to the select second client device based on the ascertained packet loss; and

selectively degrading a quality **level** of the video media of the video message, commensurate with the ascertained bandwidth, when streaming the video media of the video message along the delivery route over the network to the select second client device.

20. (Previously Presented) The method of claim 4, further comprising providing two or more rendering options for rendering the video media of the video message, the two or more rendering options including: play; play fast; play slow; jump back; jump forward; jump to start; jump to head; rewind; pause; and play again.

21. (Previously Presented) The method of claim 4, further comprising assigning one or more attributes to the multi-media conversation, the one or more attributes including;

(c) a name for the multi-media conversation;

(d) a name for the initiating participant;

(e) a name or names for any of the initiating or second participant(s) that have added any of the one or more additional messages to the multi-media conversation respectively;

(f) a date or time for each of the video message and the one or more additional messages added to the multi-media conversation respectively, and

(g) any combination of (c) through (f).

22. (Previously Presented) The method of claim 4, wherein the streaming of the video media of the video message further comprises:

segmenting the video media of the video message into a sequence of segments, the segments including a payload;

adaptively adjusting a number of bits representing the video media of the video message contained in the payloads of the segments, the number of bits adaptively adjusted based on an ascertained bandwidth over a network connection; and

streaming the sequence of segments, with the adaptively adjusted number of bits contained in the payloads, over the network connection.

23. (Previously Presented) The method of claim 4, further comprising:

transcoding the video media of the video message; and

streaming the video media of the video message to the one or more second client devices as originally encoded or as transcoded as needed for rendering on the one or more second client devices respectively.

24. (Currently Amended) The method of claim 4, further comprising adaptively adjusting a number of bits contained in video media payloads used to stream the video media of the video message by the ~~server~~ **communication** infrastructure to each of the one or more second client devices respectively, the adaptive adjustment based on bandwidth conditions over network connection(s) between the ~~server~~ **communication** infrastructure and the one or more second client devices respectively.

25. (Currently Amended) The method of claim 4, further comprising segmenting the video message into a plurality of indexed media payloads, the plurality of indexed media payloads ~~being~~ time-stamped, sequentially numbered, and associated by a message identifier.

26. (Previously Presented) The method of claim 4, further comprising enabling the initiating participant to initiate multiple conversations with multiple video messages at designated times or fixed time intervals respectively.

27. (Currently Amended) The method of claim 4, **wherein the information is indicative that the video message is a broadcast, and in response, the communication infrastructure ascertains and notifies** ~~further comprising notifying~~ the one or more second participants **for broadcast** of the video message.

28. (Currently Amended) The method of claim 4, further comprising requiring the initiating participant, and the one or more second participants, to each log into and be authenticated by the ~~server~~ **communication** infrastructure before initiating or participating in the multi-media conversation.

29. (Currently Amended) The method of claim 4, further comprising:

providing a user interface for each of the first client device and the one or more second client devices respectively; and

enabling the initiating participant, and the one or more second participants, to **initiate and** selectively **join and** participate in the multi-media conversation through the user interface provided on the first client device and each of the one or more second client devices respectively.

30. (Currently Amended) The method of claim 4, further comprising distributing an application for execution on client devices of users of a multi-media messaging service

implemented by the ~~server~~ **communication** infrastructure, the application defining a user interface that enables the users of the multi-media messaging service to selectively initiate and/or participate in a plurality of multi-media ~~conversation~~ **conversations**, each including at least one video message, that can be rendered in the real-time mode **or the time-shifted mode**.

31. (Currently Amended) The messaging system of claim 4, further comprising ascertaining, by the ~~server~~ **communication** infrastructure, one or more IP address(es) for the one or more second client devices using one of:

(c) the information received at the ~~server~~ **communication** infrastructure ~~and defined by the initiating participant of the multi-media conversation~~ **for ascertaining the one or more second participants**;

(d) presence status information for the one or more second client devices**, associated with the ascertained one or more second participants,** that are logged-in and authenticated by the ~~server~~ **communication** infrastructure**[[,]]** and available on the network respectively, or

(e) a combination of (c) and (d).

32. (Currently Amended) The method of claim 4, further comprising:

storing the video media of the video message and the one or more additional messages in one or more storage locations accessible by the ~~server~~ **communication** infrastructure; and

serving the video media of the video message, and the one or more additional messages, from the one or more storage locations to any of ~~the first client device or~~ the one or more second client devices.

33. (Currently Amended) The method of claim 4, wherein the video media of the video message is **selectively** made available **by the communication infrastructure** to the one or more second client devices ~~by: providing a notice of the video message to the one or more second participants; and configuring the server infrastructure to selectively stream the video media of the video message to the one or more second client devices~~ for rendering either in (i) the real-time mode or (ii) **out of storage in** the time-shifted mode.

34.-45. (Cancelled)

46. (New) The method of claim 4, wherein the information is indicative of one of the following:

(i) one or more users of the communication infrastructure;

(ii) a group of users of the communication infrastructure;

(iii) a channel with one or more users of the communication infrastructure associated therewith;

(iv) one or more contacts defined by or associated with the initiating participant; or

(v) a broadcast; and

in response, configuring the communication infrastructure to ascertain the one or more second participants of the multi-media conversation in compliance with (i) through (v) as indicated in the information respectively.

47. (New) The method of claim 4, wherein the video message is a broadcast.

48. (New) The method of claim 4, further comprising:

providing the initiating participant an ability for selectively designating the information for the video message as one of a broadcast, for an identified user, for identified multiple users, for a defined group of users, or for a channel; and

configuring the communication infrastructure to ascertain the one or more second participants of the multi-media conversation in compliance with the selected designation.

49. (New) The method of claim 4, further comprising:

providing the initiating participant an ability for designating the video message as a broadcast; and

in response to the designation, configuring the communication infrastructure to broadcast the video message to at least some of the one or more second participants.

50. (New) The method of claim 4, wherein the video message is broadcast to the one or more second participants that positively responded to the notification.

Remarks

In the previous Preliminary Amendment filed on November 18, 2022, it is recognized that two exact copies of claim 15 were presented. Both instances of claim 15 have been cancelled in the present amendment to rectify that error.

Should the Office have any continuing questions or concerns related to the present application, the Examiner is encouraged to contact the undersigned at the telephone number provided below to expeditiously address such issues or concerns.

Respectfully submitted,
BEYER LAW GROUP LLP

/James W. Rose/

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650-842-1300 (Office)
650 315 8401 (Cell)

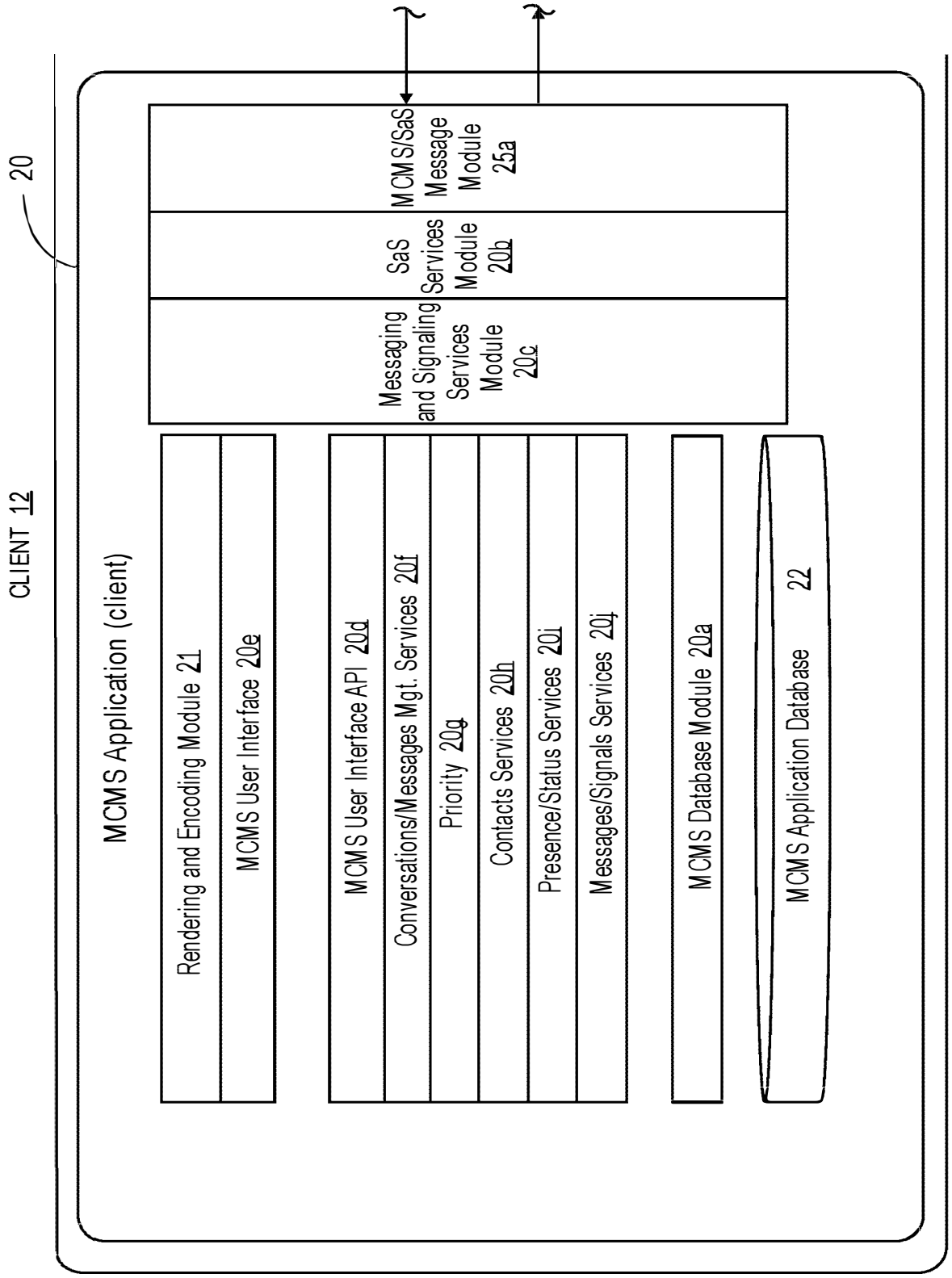


FIG. 2A

FIG. 2A | FIG. 2B

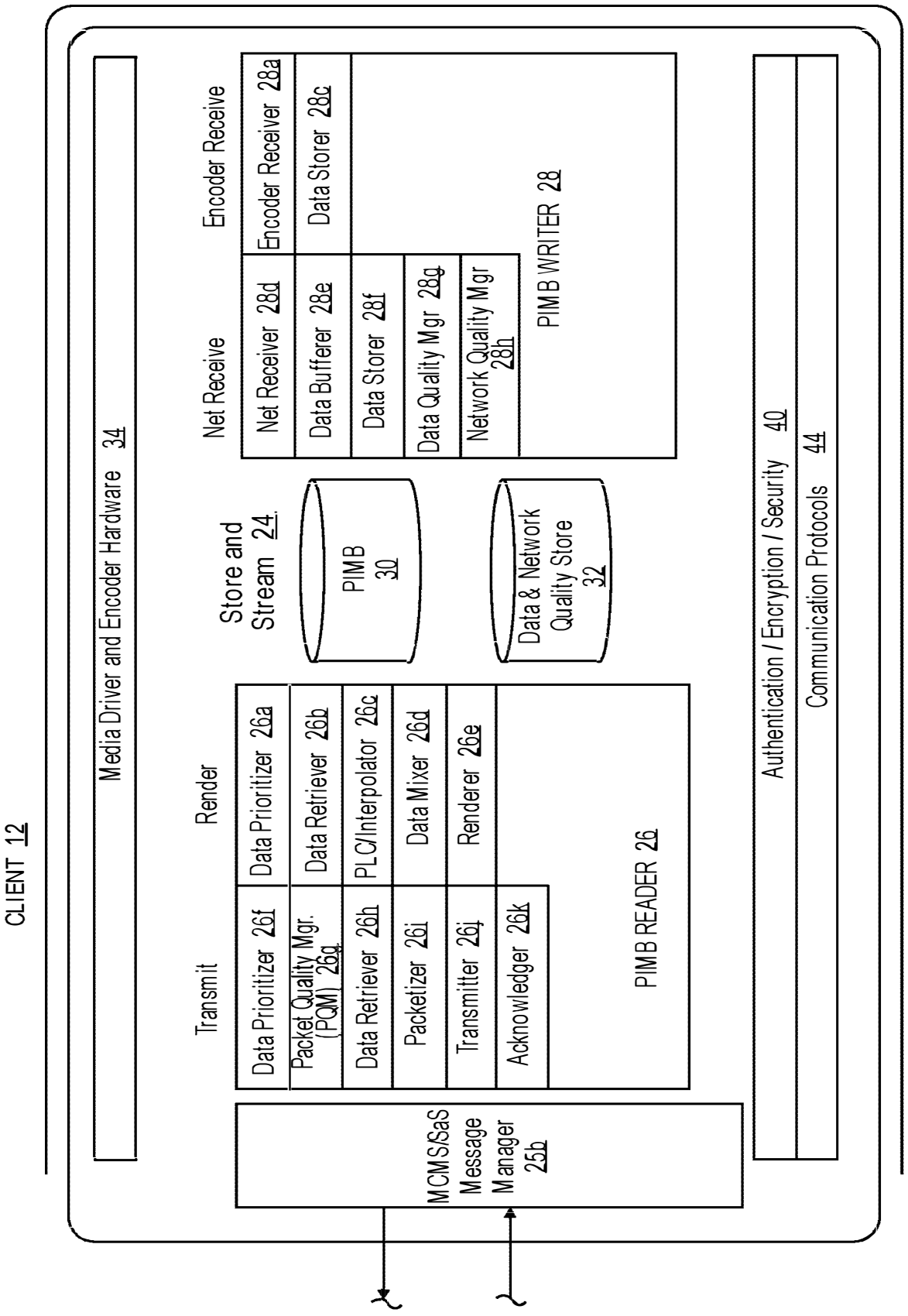


FIG. 2B

FIG. 2A | FIG. 2B

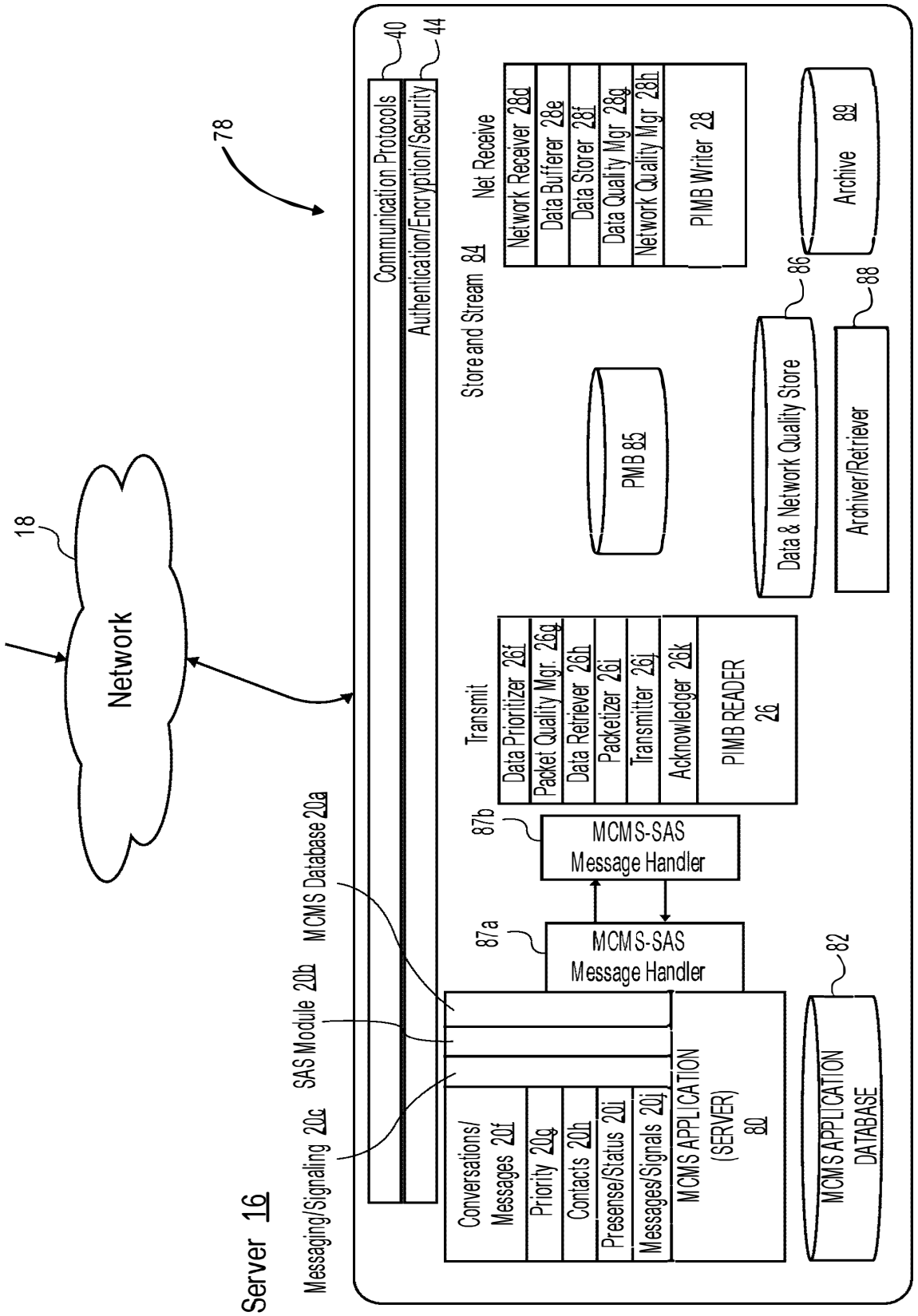

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FIG. 3

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/889,108	**03/15/2023 11:27:31 AM ET**	**REBLP003C21**

Title of Invention

TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	2115	FILED BY	Cara Hedin
PATENT CENTER #	61743472	FILING DATE	08/16/2022
CUSTOMER #	76743	FIRST NAMED INVENTOR	Thomas E. KATIS
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	James Rose

Documents

TOTAL DOCUMENTS: 7

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
REBL_P003C21_Second_Prelim_Amend.pdf		11	-	62 KB
REBL_P003C21_Second_Prelim_Amend-A.PE.pdf	(1-1)	1	Preliminary Amendment	20 KB
REBL_P003C21_Second_Prelim_Amend-DRW.pdf	(2-2)	1	Drawings-only black and white line drawings	16 KB
REBL_P003C21_Second_Prelim_Amend-SPEC.pdf	(3-3)	1	Specification	20 KB
REBL_P003C21_Second_Prelim_Amend-CLM.pdf	(4-10)	7	Claims	45 KB

REBL_P003C21_Second_Prelim_Amend-REM.pdf	(11-11)	1	Applicant Arguments/Remarks Made in an Amendment	16 KB
REBLP003C21_Second_Preliminary_Amendment_Transmittal.pdf		1	Transmittal Letter	22 KB
REBLP003C21_REP_FIGS.pdf		3	Drawings-only black and white line drawings	1581 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
REBL_P003C21_Second_Prelim_Amend.pdf	409BBF4284B637A4BF4B04EF08A0268A80982D401774E37AAFFA4D774E4AC8A82103FDAB82CFFCDF9CDC0362D0CB490863E9AC6EBC2F7E0E0067419BE0B03F93
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REBL_P003C21_Second_Prelim_Amend-DRW.pdf	0D3215ACF8BC821534CEDA9B60C96B12B487A9C44813243A60BB429398A648222EE4985C70EA49E034E54DC02AD0C7F2EA0E89968037FCFB591220E4A7B0CB48
REBL_P003C21_Second_Prelim_Amend-SPEC.pdf	5E3ECDF2BC9975E44E66E022ACD3E9462CE9377F2EADCA12D512487113C8578D99C22B36C2F343EA1927C4E46716087A9729AC08A84AC7787DAC74F15EBA3619
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REBL_P003C21_Second_Prelim_Amend-REM.pdf	E9D5C0F5CA1873D947BABE4495CFB956CA8C3B4360A4D58101B96F6CF80802C219578E285BD283D5FA31CA2883C64DF30993092836745D877738D624CA79D430

REBLP003C21_Second_Preliminary_Amendment_Transmittal.pdf	1090E74747F1A03CAE8F1AB262555FB5120E6F7C9B8C5DCA56437DA13101C75B8521EFBAE6A7475225D66097B6BCA009F57CDD44F64CE76A525F89B4602829F0
REBLP003C21_REP_FIGS.pdf	4293F97174291C8B64E1DB525390F9C529EC7BBCAA5800EC31508B14E0F134E4EC394FF6E3A7E3D40C108039D392A5F0DC83BFE9048931935ADB941D2DC03DC9

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: KATIS et al.	Attorney Docket No.: REBLP003C21
Application No.: 17/889,108	Examiner: Unassigned
Filed: August 16,2022	Group: Unassigned
Title: TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS	Confirmation No.: 2115

CERTIFICATE OF EFS-WEB TRANSMISSION

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 March 15, 2023.

Signed: /Cara Hedin/
Cara Hedin

SECOND PRELIMINARY AMENDMENT TRANSMITTAL

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

Commissioner:

Transmitted herewith is an Amendment in the above-identified application.

The fee has been calculated as shown below.

	Claims After Amendment		Highest Previously Paid For	Present Extra	Small Entity Rate Fee	Large Entity Rate Fee
Total Claims	32	MINUS	42	0	x 40 = $0.00	x 100 = $0.00
Independent Claims	01	MINUS	03	0	x 192 = $0.00	x 460 = $0.00
Multiple Dependent Claim Present and Fee Not Previously Paid						
				Total	$0.00	$0.00

☒ Applicant(s) believe that no (additional) Extension of Time is required; however, if it is determined that such an extension is required, Applicant(s) hereby petition that such an extension be granted and authorize the Commissioner to charge the required fees for an Extension of Time under 37 CFR 1.136 to Deposit Account No. 50-4481.

☒ Please charge the required fees, or any additional fees required to facilitate filing the enclosed response, to Deposit Account No. 50-4481 (Order No. REBLP003C21).

Respectfully submitted,
BEYER LAW GROUP LLP

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

P. O. Box 51887
Palo Alto, CA 94303-1887
650-842-1300 (Office)
650 315 8401 (Cell)

Form 1449 (Modified)	Atty Docket No.	REBLP003C21
	Application No.:	17/889,108
Information Disclosure Statement By Applicant	Applicant	KATIS et al.
	Filing Date	August 16, 2022
	Group	Unassigned
(Use Several Sheets if Necessary)		Page 1 of 1
	Date Submitted	February 8, 2023

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2021/0409362	12/30/21	Katis et al.			09/13/21
	2.	2023/0047999	02/16/23	Katis et al.			10/31/23
	3.	2023/0051915	02/16/23	Katis et al.			10/31/23
	4.	2023/0065310	03/02/23	Katis et al.			10/31/23
	5.	2005/0210394	09/22/05	Crandall et al.			03/14/05
	6.	2008/0080677	04/03/08	Samdadiya et al.			09/29/06

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-Class	Translation Yes	Translation No
	7.							
	8.							
	9.							
	10.							

Other Documents

Examiner Initial	No.	Author, Title, Place (e.g. Journal) of Publication, Date
	11.	Katis et al., U.S. Application No. 18/086,468, filed on December 21, 2022.
	12.	
	13.	
	14.	
	15.	
	16.	
	17.	

Examiner	Date Considered

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: KATIS et al.	Attorney Docket No.: REBLP003C21
Application No.: 17/889,108	Examiner: Unassigned
Filed: August 16, 2022	Group: Unassigned
Title: TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS	Confirmation No.: 2115

CERTIFICATE OF EFS-WEB TRANSMISSION
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 February 8, 2023.

Signed: /Cara Hedin/
Cara Hedin

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. REBLP003C21).

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

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/889,108	**03/30/2023 04:22:32 PM ET**	**REBLP003C21**

Title of Invention

TELECOMMUNICATION AND MULTIMEDIA MANAGEMENT METHOD AND APPARATUS

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	2115	FILED BY	Cara Hedin
PATENT CENTER #	61840986	FILING DATE	08/16/2022
CUSTOMER #	76743	FIRST NAMED INVENTOR	Thomas E. KATIS
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	James Rose

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
REBLP003C21_IDS_4.pdf	2	Transmittal Letter	23 KB
REBLP003C21_1449_4.pdf	1	Information Disclosure Statement (IDS) Form (SB08)	22 KB

Warning: This is not a USPTO supplied IDS fillable form. Data in the form cannot be automatically loaded to other USPTO systems.

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)

REBLP003C21_IDS_4.pdf	C7532F8B341D1ACD0BED299258FE386EA3C044C5010269D3E98563A7B59291200F0F96201418DB495AEA57308397EDA69CE5F50A540E76CBBBB8F9195EC100B2
REBLP003C21_1449_4.pdf	91BFAB2424EE1C5CD2986E01C9014946D2A33E684010696366 8997AD5D77A3791127B4A41B3DD9BED125A8B58C4F7CEADD 1F2A669FC574FE189992E8E74B0B33

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Notice of References Cited	Application/Control No. 17/889,108	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
*	A	US-20060268750-A1	11-2006	Weiner; Moshe	H04M3/56	370/260
*	B	US-20010052019-A1	12-2001	Walters, Robert J.	G06Q30/06	709/219
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

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					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*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
	17/889,108	KATIS et al.
	Examiner	Art Unit
	MELUR RAMAKRISHNAIAH	2651

✓	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	05/07/2023								
	1	-								
	2	-								
	3	-								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
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	42	-								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/889,108	KATIS et al.
	Examiner	**Art Unit**
	MELUR RAMAKRISHNAIAH	2651

CLAIM		DATE								
Final	Original	05/07/2023								
	43	-								
	44	-								
	45	-								
	46	✓								
	47	✓								
	48	✓								
	49	✓								
	50	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/889,108	KATIS et al.
	Examiner	Art Unit
	MELUR RAMAKRISHNAIAH	2651

CPC - Searched*		
Symbol	Date	Examiner
H04L65/403, 5/10, 65/764, 65/752, 51/42, 65/1083, 65/4015, 61/2503, 51/216	05/07/2023	mrk
H04N7/147, 7/15	05/07/2023	mrk
H04M 1/64, 3/53, 11/00, 3/5307	05/07/2023	mrk
H04W 4/12; G06F 15/16	05/07/2023	mrk

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
379	93.01		

* 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	05/07/2023	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
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PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L14	81	messag$ SAME stream$ SAME play$ SAME server SAME identification SAME users SAME senders 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	2023/05/06 10:28 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Form 1449 (Modified)	Atty Docket No.	REBLP003C21
	Application No.:	17/889,108
Information Disclosure Statement By Applicant	Applicant	KATIS et al.
	Filing Date	August 16, 2022
	Group	Unassigned
(Use Several Sheets if Necessary)		Page 1 of 1
	Date Submitted	February 8, 2023

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2021/0409362	12/30/21	Katis et al.			09/13/21
	2.	2023/0047999	02/16/23	Katis et al.			10/31/23
	3.	2023/0051915	02/16/23	Katis et al.			10/31/23
	4.	2023/0065310	03/02/23	Katis et al.			10/31/23
	5.	2005/0210394	09/22/05	Crandall et al.			03/14/05
	6.	2008/0080677	04/03/08	Samdadiya et al.			09/29/06

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-Class	Translation Yes	Translation No
	7.							
	8.							
	9.							
	10.							

Other Documents

Examiner Initial	No.	Author, Title, Place (e.g. Journal) of Publication, Date
	11.	Katis et al., U.S. Application No. 18/086,468, filed on December 21, 2022.
	12.	
	13.	
	14.	
	15.	
	16.	
	17.	

Examiner	Date Considered
/MELUR RAMAKRISHNAIAH/	05/05/2023

Examiner: Initial citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /M.R/

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L39	98	H04L65/752.cpc. AND H04N7/147.cpc. 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	2023/05/06 02:16 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L3	86	H04N7/147.cpc. AND H04L51/10.cpc. 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	2023/05/05 02:46 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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BIB DATA SHEET

CONFIRMATION NO. 2115

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
17/889,108	08/16/2022 RULE	379	2651	REBLP003C21

APPLICANTS

Voxer IP LLC, San Feancisco, CA;

INVENTORS

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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 17/473,199 09/13/2021 ABN
which is a CON of 17/062,060 10/02/2020 PAT 11146516
which is a CON of 16/669,865 10/31/2019 PAT 10841261
which is a CON of 16/161,474 10/16/2018 PAT 10511557
which is a CON of 15/937,361 03/27/2018 PAT 10158591
which is a CON of 15/923,287 03/16/2018 PAT 10129191
which is a CON of 15/584,224 05/02/2017 PAT 10142270
which is a CON of 15/231,240 08/08/2016 PAT 9674122
which is a CON of 14/799,528 07/14/2015 PAT 9456087
which is a CON of 14/198,043 03/05/2014 PAT 9154628
which is a CON of 13/555,034 07/20/2012 PAT 8705714
which is a CON of 12/037,256 02/26/2008 PAT 8243894
which is a CON of 12/028,400 02/08/2008 PAT 8180029
which claims benefit of 60/937,552 06/28/2007
and claims benefit of 60/999,619 10/19/2007

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

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
08/29/2022

Foreign Priority claimed ☐ Yes ☑ No		STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119(a-d) conditions met ☐ Yes ☑ No	☐ Met after Allowance	WY	33	3	1
Verified and Acknowledged Examiner's Signature	Initials				

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

BIB (Rev. 05/07).

FILING FEE RECEIVED 0.00	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	❑ All Fees ❑ 1.16 Fees (Filing) ❑ 1.17 Fees (Processing Ext. of time) ❑ 1.18 Fees (Issue) ❑ Other _____ ❑ Credit

PE2E SEARCH - Search History (Prior Art)

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L33	3	H04L65/752.cpc. AND H04L51/10.cpc. AND video 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	2023/05/06 12:58 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Prior Art)

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L53	12	H04L51/216.cpc. AND video near1 communications 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	2023/05/07 07:54 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Prior Art)

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L58	8	video near1 messag$ adj4 stream$ SAME sender 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	2023/05/07 08:07 AM

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There are no Interference searches to show.

Form 1449 (Modified)	Atty Docket No.	REBLP003C21
	Application No.:	17/889,108
Information Disclosure Statement By Applicant	Applicant	KATIS et al.
	Filing Date	August 16, 2022
	Group	Unassigned
(Use Several Sheets if Necessary)		Page 1 of 1
	Date Submitted	February 8, 2023

U.S. Patent Documents

Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2010/0027417	02/04/10	Franceschini et al.			06/29/06
	2.						
	3.						
	4.						
	5.						

Foreign Patent or Published Foreign Patent Application

Examiner Initial	No.	Document No.	Publication Date	Country or Patent Office	Class	Sub-Class	Translation Yes	Translation No
	6.	WO2007/049165	05/03/07	PCT				
	7.							
	8.							
	9.							

Other Documents

Examiner Initial	No.	Author, Title, Place (e.g. Journal) of Publication, Date
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	11.	
	12.	
	13.	
	14.	
	15.	
	16.	

Examiner	Date Considered
/MELUR RAMAKRISHNAIAH/	05/05/2023

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
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	Date Submitted	August 16, 2022

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Examiner Initial	No.	Patent No.	Date	Patentee	Class	Sub-class	Filing Date
	1.	2001/0000540	04/26/01	COOPER et al.			11/30/00
	2.	2001/0025377	09/27/01	HINDERKS			12/29/00
	3.	2001/0038610	11/08/01	DECKER et al.			04/10/01
	4.	2001/0043602	11/22/01	BROWN			12/08/00
	5.	2001/0049745	12/06/01	SCHOEFFLER			05/03/01
	6.	2001/0052019	12/13/01	WALTERS et al.			02/05/01
	7.	2002/0006802	01/17/02	SAARELA et al.			12/30/98
	8.	2002/0016818	02/07/02	KIRANI et al.			07/06/01
	9.	2002/0032799	03/14/02	WIEDEMAN et al.			04/24/01
	10.	2002/0067739	06/06/02	WILKES et al.			07/22/98
	11.	2002/0091848	07/11/02	AGRESTA et al.			09/05/01
	12.	2002/0120666	08/29/02	LANDSMAN, et al.			09/13/01
	13.	2002/0126817	09/12/02	HARIRI et al.			06/05/01
	14.	2002/0128029	09/12/02	NISHIKAWA, et al.			01/07/02
	15.	2002/0143959	10/03/02	EL-BAZE et al.			04/03/01
	16.	2002/0150094	10/17/02	CHENG, et al.			10/26/01
	17.	2002/0154745	10/24/02	SHTIVELMAN			04/24/01
	18.	2002/0159600	10/31/02	WEINER			07/27/01
	19.	2002/0184368	12/05/02	WANG			04/06/01
	20.	2003/0027566	02/06/03	WEINER			07/30/01
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	22.	2003/0028632	02/06/03	DAVIS			08/02/01
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	24.	2003/0084106	05/01/03	EREV et al.			10/31/01
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Examiner	Date Considered
/MELUR RAMAKRISHNAIAH/	05/05/2023

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	28.	2003/0172116	09/11/03	CURRY et al.			03/10/02
	29.	2003/0172233	09/11/03	MUGITANI et al.			08/30/01
	30.	2003/0186722	10/02/03	WEINER			03/28/02
	31.	2003/0208543	11/06/03	ENETE et al.			07/27/01
	32.	2003/0210265	11/13/03	HAIMBERG			05/10/02
	33.	2003/0236892	12/25/03	Coulombe			05/31/02
	34.	2004/0017905	01/29/04	WARRIER et al.			12/17/02
	35.	2004/0019539	01/29/04	RAMAN, et al.			12/17/02
	36.	2004/0039839	02/26/04	KALYANARAMAN et al.			02/10/03
	37.	2004/0045036	03/04/04	TERASAKI			08/26/03
	38.	2004/0052218	03/18/04	KNAPPE			09/06/02
	39.	2004/0074448	04/22/04	BUNT			10/25/01
	40.	2004/0090959	05/13/04	CINGHITA et al.			09/04/02
	41.	2004/0233844	11/25/04	YU et al.			05/23/03
	42.	2004/0095900	05/20/04	SIEGEL			11/14/02
	43.	2004/0117722	06/17/04	HARADA			11/18/03
	44.	2004/0119814	06/24/04	Clisham et al.			12/20/02
	45.	2004/0125816	07/01/04	XU et al.			12/12/03
	46.	2004/0127279	07/01/04	GATTO et al.			07/20/01
	47.	2004/0151158	08/05/04	GANNAGE et al.			11/10/03
	48.	2004/0170158	09/02/04	MAN-HAK TSO et al.			12/16/03
	49.	2004/0179092	09/16/04	LAPOINT			03/12/04
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	51.	2004/0192378	09/30/04	WULKAN			03/25/03
	52.	2004/0203670	10/14/04	KING, et al.			02/27/04
	53.	2004/0207724	10/21/04	CROUCH et al.			04/17/03
	54.	2004/0207870	10/21/04	TAKAHASHI et al.			11/25/03

Examiner	/MELUR RAMAKRISHNAIAH/	Date Considered	05/05/2023

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Information Disclosure Statement By Applicant	Applicant	KATIS et al.
	Filing Date	Herewith
	Group	Unassigned
(Use Several Sheets if Necessary)		Page 3 of 30
	Date Submitted	August 16, 2022

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	56.	2004/0252679	12/16/04	WILLIAMS et al.			04/24/03
	57.	2004/0255148	12/16/04	MONTEIRO, et al.			05/04/04
	58.	2004/0258220	12/23/04	LEVINE et al.			03/29/02
	59.	2005/0020246	01/27/05	KANG			07/09/04
	60.	2005/0021819	01/27/05	KILKKI			01/23/04
	61.	2005/0025308	02/03/05	TISCHER et al.			08/30/04
	62.	2005/0030932	02/10/05	KELLY et al.			09/14/04
	63.	2005/0037706	02/17/05	SETTLE			08/01/03
	64.	2005/0053033	03/10/05	KELLY, et al.			09/15/04
	65.	2005/0175084	08/11/05	HONDA et al.			02/20/04
	66.	2005/0058070	03/17/05	BURGHARDT et al.			07/29/04
	67.	2005/0076084	04/07/05	LOUGHMILLER et al.			10/03/03
	68.	2005/0086311	04/21/05	ENETE et al.			12/30/03
	69.	2005/0095981	05/05/05	BENCO, DAVID			10/31/03
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	72.	2005/0135333	06/23/05	ROJAS			12/18/03
	73.	2005/0144247	06/30/05	CHRISTENSEN et al.			12/09/03
	74.	2005/0160345	07/21/05	WALSH et al.			12/24/03
	75.	2005/0202807	09/15/05	AYYASAMY			05/11/05
	76.	2005/0207487	09/22/05	MONROE			02/14/05
	77.	2005/0210394	09/22/05	CRANDALL et al.			03/14/05
	78.	2005/0215228	09/29/05	FOSTICK et al.			03/26/04
	79.	2005/0220137	10/06/05	PRIGENT et al.			03/17/05
	80.	2005/0237999	10/27/05	SHORES et al.			04/23/04
	81.	2005/0259682	11/24/05	YOSEF et al.			02/02/01
	82.	2005/0288101	12/29/05	LOCKTON ET AL.			06/24/05

Examiner	/MELUR RAMAKRISHNAIAH/	Date Considered	05/05/2023

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	84.	2006/0023969	02/02/06	LARA ET AL.			05/02/05
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	86.	2006/0045038	03/02/06	KAY, ET AL.			08/27/04
	87.	2006/0046758	03/02/06	EMAMI-NOURI ET AL.			09/02/04
	88.	2006/0059199	03/16/06	LAPPALAINEN ET AL.			08/18/05
	89.	2006/0059267	03/16/06	CUGI ET AL.			11/10/04
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	92.	2006/0080704	04/13/06	LE HUEROU ET AL.			10/07/05
	93.	2006/0093304	05/04/06	BATTEY ET AL.			12/14/05
	94.	2006/0107285	05/18/06	MEDVINSKY			11/17/05
	95.	2006/0111130	05/25/06	LEE ET AL.			11/03/05
	96.	2006/0047750	03/02/06	Schmitt et al.			08/12/05
	97.	2006/0116167	06/01/06	RAVIV; RANI			09/01/03
	98.	2006/0121925	06/08/06	JUNG			12/06/05
	99.	2006/0146822	07/06/06	KOLAKOWSKI ET AL.			12/30/04
	100.	2006/0160522	07/20/06	JENNINGS			01/20/05
	101.	2006/0168003	07/27/06	VAU ET AL.			09/08/03
	102.	2006/0172754	08/03/06	SHIN, ET AL.			01/27/06
	103.	2006/0176902	08/10/06	BELLORDRE			02/07/05
	104.	2006/0187897	08/24/06	DABBS ET AL.			12/16/05
	105.	2006/0189305	08/24/06	ANDO ET AL.			02/10/06
	106.	2006/0203802	09/14/06	CHOU ET AL.			03/14/05
	107.	2006/0211411	09/21/06	HAARAMO ET AL.			04/10/06
	108.	2006/0212582	09/21/06	GUPTA, ET AL.			03/15/05

Examiner	/MELUR RAMAKRISHNAIAH/	Date Considered	05/05/2023

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	109.	2006/0221174	10/05/06	YANG			04/04/05
	110.	2006/0221995	10/05/06	BERKMAN			04/04/05
	111.	2006/0224748	10/05/06	GUPTA, ET AL.			03/15/05
	112.	2006/0229934	10/12/06	LAW			06/05/06
	113.	2006/0232663	10/19/06	GANDHI ET AL.			04/14/05
	114.	2006/0244588	11/02/06	HANNAH, ET AL.			03/20/06
	115.	2006/0245367	11/02/06	JEFFERY ET AL.			07/30/04
	116.	2006/0248149	11/02/06	KRAFT ET AL.			04/28/05
	117.	2006/0251167	11/09/06	VAN DER SCHAAR ET AL.			12/16/03
	118.	2006/0253599	11/09/06	MONTEIRO, ET AL.			07/10/06
	119.	2006/0268750	11/30/06	WEINER			05/02/04
	120.	2006/0274698	12/07/06	TWITCHELL			06/05/06
	121.	2006/0274721	12/07/06	FLANAGAN			06/01/05
	122.	2006/0276714	12/07/06	HOLT, ET AL.			06/06/05
	123.	2006/0282544	12/14/06	MONTEIRO, ET AL.			08/22/06
	124.	2006/0288391	12/21/06	PUTHIYEDATH			08/23/06
	125.	2006/0294259	12/28/06	MATEFI, ET AL.			10/24/03
	126.	2006/0003740	01/05/06	MUNJE			06/30/04
	127.	2007/0001869	01/04/07	HUNZINGER			06/29/05
	128.	2007/0002832	01/04/07	SYLVAIN			06/22/05
	129.	2007/0006021	01/04/07	NICHOLSON ET AL.			01/10/06
	130.	2007/0008884	01/11/07	TANG			10/07/03
	131.	2007/0067407	03/22/07	BETTIS ET AL.			02/13/06
	132.	2007/0081622	04/12/07	BRUDER ET AL.			10/06/06
	133.	2007/0110046	05/17/07	FARRELL ET AL.			09/09/04
	134.	2007/0123267	05/31/07	WHINNETT, ET AL.			11/29/05
	135.	2007/0123284	05/31/07	SCHLIWA-BERTLING ET AL.			12/22/03
	136.	2007/0147263	06/28/07	LIAO ET AL.			06/23/06

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	137.	2007/0150555	06/28/07	HE ET AL.			11/30/06
	138.	2007/0155346	07/05/07	MIJATOVIC ET AL.			02/10/06
	139.	2007/0168863	07/19/07	BLATTNER ET AL.			04/25/06
	140.	2007/0177549	08/02/07	LO ET AL.			12/27/06
	141.	2007/0180032	08/02/07	PEARSON			01/27/06
	142.	2007/0182819	08/09/07	MONROE			12/28/06
	143.	2007/0184868	08/09/07	ALLEN et al.			02/02/07
	144.	2007/0189327	08/16/07	KONDA			02/13/06
	145.	2007/0190987	08/16/07	VAANANEN			08/08/01
	146.	2007/0192427	08/16/07	BERSTIS et al.			02/16/06
	147.	2007/0195742	08/23/07	ERDMAN et al.			02/21/06
	148.	2007/0207782	09/06/07	TRAN			03/06/06
	149.	2007/0207785	09/06/07	CHATTERJEE et al..			01/08/07
	150.	2007/0226804	09/27/07	SOMKIRAN, et al.			12/29/06
	151.	2007/0238472	10/11/07	WANLESS			04/05/07
	152.	2007/0263575	11/15/07	CHOE			11/16/06
	153.	2007/0268887	11/22/07	SCHWARTZ			05/19/06
	154.	2007/0271331	11/22/07	MUTH			05/17/07
	155.	2007/0288574	12/13/07	KOSTER			06/09/06
	156.	2007/0294333	12/20/07	YANG et al.			09/27/06
	157.	2007/0300007	12/27/07	BULUSU et al.			06/21/06
	158.	2007/0294263	12/20/07	Punj			05/08/07
	159.	2008/0000979	01/03/08	POISNER			06/30/06
	160.	2008/0134235	06/05/08	KALABOUKIS			12/05/06
	161.	2008/0002621	01/03/08	GINZBURG, et al.			06/29/06
	162.	2008/0002691	01/03/08	QI et al.			06/29/06
	163.	2008/0025300	01/31/08	LIDE, et al..			07/31/06
	164.	2008/0031250	02/07/08	MEHTA, et al..			08/01/06

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	165.	2008/0031448	02/07/08	DANG et al.			06/20/07
	166.	2008/0062246	03/13/08	WOODWORTH			08/14/06
	167.	2008/0086700	04/10/08	RODRIGUEZ et al.			10/06/06
	168.	2008/0091804	04/17/08	SWANBURG			10/11/06
	169.	2008/0091839	04/17/08	MITCHELL et al..			10/16/06
	170.	2008/0095173	04/24/08	BUGENHAGEN			10/19/06
	171.	2008/0095338	04/24/08	COSKY			10/18/06
	172.	2008/0109865	05/08/08	SU et al.			11/03/06
	173.	2008/0151786	06/26/08	Li			12/21/06
	174.	2008/0062246	03/13/08	Woodworth.			08/14/06
	175.	2008/0182560	07/31/08	Beije			12/27/07
	176.	2008/0115087	05/15/08	ROLLIN et al.			11/13/06
	177.	2008/0117901	05/22/08	KLAMMER			11/22/06
	178.	2008/0119210	05/22/08	SNYDER et al.			07/18/03
	179.	2008/0123623	05/29/08	KURGANOV et al..			06/25/04
	180.	2008/0123628	05/29/08	EVERARD			11/27/06
	181.	2008/0134054	06/05/08	CLARK et al.			11/30/06
	182.	2008/0147910	06/19/08	HIBBARD et al.			09/29/06
	183.	2008/0155032	06/26/08	TOEROE			12/21/06
	184.	2008/0163312	07/03/08	FAUST et al.			12/28/06
	185.	2008/0165707	07/10/08	BAIRD et al.			01/04/07
	186.	2008/0165791	07/10/08	DEGRAZIA			01/09/07
	187.	2008/0168173	07/10/08	MUNJE et al.			01/04/07
	188.	2008/0178251	07/24/08	SHIN			03/30/07
	189.	2008/0189295	08/07/08	KHEDOURI et al.			12/27/07
	190.	2008/0205444	08/28/08	CAMPBELL et al..			02/28/07
	191.	2008/0231684	09/25/08	UNDERWOOD et al.			03/23/07
	192.	2008/0256255	10/16/08	MORDOVSKOI et al.			04/02/08

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	194.	2008/0273077	11/06/08	COWHERD			05/02/07
	195.	2008/0288989	11/20/08	ZHENG			05/14/07
	196.	2009/0003544	01/01/09	KATIS et al.			03/05/08
	197.	2009/0003545	01/01/09	KATIS et al.			04/14/08
	198.	2009/0003547	01/01/09	KATIS et al.			05/16/08
	199.	2009/0003560	01/01/09	KATIS et al.			03/19/08
	200.	2009/0003563	01/01/09	KATIS et al.			04/18/08
	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
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	221.	20150035934	02/05/15	CHEN			07/31/14
	222.	2017/0272489	09/21/17	KATIS et al.			06/06/17
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	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
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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
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	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
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	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
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	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
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	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
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	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
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	360.	8,671,210	03/11/14	Branam et al.			05/07/07

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PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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L14	81	messag$ SAME stream$ SAME play$ SAME server SAME identification SAME users SAME senders 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	2023/05/06 10:28 AM

PE2E SEARCH - Search History (Interference)

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PE2E SEARCH - Search History (Prior Art)

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L6	0	H04M1/64.cpc. AND H04L51/10.cpc. AND stream$ 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	2023/05/06 10:24 AM

PE2E SEARCH - Search History (Interference)

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PE2E SEARCH - Search History (Prior Art)

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L32	27	H04L51/216.cpc. AND H04L51/10.cpc. AND video 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	2023/05/06 12:49 PM

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